

REPORT ID: 14331.00.T22.RP4

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## Bornish Wind Energy Centre – Turbine T22 IEC 61400-11 Edition 3.0 Measurement Report

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Prepared for:

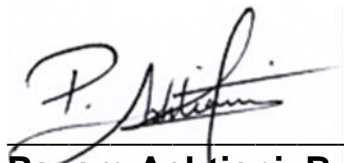
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28 November 2018 – Revision #4



## Revision History

Revision Number	Description	Date
1	Issued Edition 2.1 test report	5 November 2013
2	Issued Edition 3.0 test report (based on data from 2014)	20 November 2017
3	Issued Edition 3.0 test report (based on new test from 2018)	31 May 2018
4	Formatting changes to Appendix, Added Appendix F.03	28 November 2018

**This report in its entirety, including appendices contains 121 pages.**

## Statement Qualifications and Limitations

This report was prepared by Aercoustics Engineering Limited in accordance with International Standard IEC 61400-11 (Edition 3.0, released 2012-11), “Wind turbine generator systems – Part 11: Acoustic noise measurement techniques”. This report is specific only to the Wind Turbine identified in this report.

Aercoustics Engineering Limited shall not be responsible for any events or circumstances that may have occurred since the date on which the Wind Turbine was tested and/or this report was prepared, or for any inaccuracies contained in information that was provided to Aercoustics Engineering Limited. Further, Aercoustics Engineering Limited agrees that this report represents test data analysed as per the above described standard for the specific Wind Turbine described in this report, but Aercoustics Engineering Limited makes no other representations with respect to this report or any part thereof.

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This Statement of Qualifications and Limitations is attached to and forms part of this report.

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# 1 Introduction

Aercoustics Engineering Limited (Aercoustics) was retained by Bornish Wind LP (“BWLP”) to conduct an acoustic measurement of turbine T22 at the Bornish Wind Energy Centre. The purpose of the measurement was to provide verification of the maximum noise emission of the turbine. The measurement was carried out in accordance with International Standard IEC 61400-11 (Edition 3.0, released 2012-11), “Wind turbine generator systems – Part 11: Acoustic noise measurement techniques”. This report is specific only to Turbine T22.

# 2 Wind Turbine Information

## 2.1 Wind turbine equipment specific information

Wind turbine specific equipment information for turbine T22 was provided by BWLP and is summarized in Tables 1 – 5.

Table 1 - Wind Turbine Details

Wind Turbine Details	
Manufacturer	General Electric
Model Number	1.6-100
Turbine ID	WBN-022 (Bornish-22)

Table 2 - Operating Details

Operating Details	
Vertical or Horizontal axis wind turbine	Horizontal
Upwind or downwind rotor	Upwind
Hub height	80m
Horizontal distance from rotor centre to tower axis	4100mm
Diameter of rotor	100m
Tower type (lattice or tube)	Tube
Passive stall, active stall, or pitch controlled turbine	Pitch Controlled
Constant or variable speed	Variable
Power curve	See Figure B.01
Rotational speed at each integer standardised wind speed	See Figure B.02
Rated power output	1.62 MW
Control software version	V.04.07.02C

Table 3 - Rotor Details

Rotor Details	
Rotor control devices	Electric Motor
Presence of vortex generators, stall strips, serrated trailing edges	No
Blade type	GE 48.7 Glass- TPI
Serial number	S/N: 20303 GE ID # D21907-101-03932-W860 S/N: 10297 GE ID # D21907-101-03933-W860 S/N: 50277 GE ID # D21907-101-03931-W860
Number of blades	3

Table 4 - Gearbox Details

Gearbox Details	
Manufacturer	Nanjing
Model number	FDMD
Serial number	E07667-101-03835-W924

Table 5 - Generator Details

Generator Details	
Manufacturer	Hitachi
Model number	HIG-3669J00 GE ID Tag #1-6-HEAD-31662-P
Serial number	114470-102-03828-W930

## 2.2 Wind Turbine Location

Turbine T22 is located in the municipality of North Middlesex, Ontario approximately 1200m West of Centre Road, and 1000m South of Coldstream Road. The area surrounding T22 is flat and consists primarily of farmland. The UTM coordinates of Turbine T22 are Zone 17T 443882m E 4773285m N.

A general layout of the area in which the turbine is located is provided in the site plan (Figure A.01).

### 3 Measurement Details

#### 3.1 Measurement Equipment

##### 3.1.1 Acoustic Measurement Equipment

A summary of acoustic equipment utilized by Aercoustics for the measurement of turbine T22 is summarized in Table 6.

Table 6 - Acoustic Measurement Equipment

Equipment	Manufacturer Name & Model	Serial Number
Acoustic Data acquisition system	LMS SCADA Mobile	22163146
Microphone	[B&K 4189-A-021], B&K 4189 ([Mic/Preamp unit], Mic)	[2622169], 2625417
Pre-amplifier	B&K 2671	2614900
Acoustic calibrator	B&K 4231	3012380

Calibration of the measurement setup was carried out before and after Aercoustics set of measurements.

##### 3.1.2 Meteorological Equipment

Wind speed for Turbine ON was derived from the power curve (as per procedures outlined in IEC 61400-11). Wind direction for turbine ON measurements was utilized from the nacelle anemometer located at hub height (80m high) from turbine T22. Data for background measurements was obtained from a 10m high anemometer, which was placed as per guidelines outlined in IEC-61400-11.

The meteorological equipment is summarized in Table 7

Table 7 – Meteorological Measurement Equipment

Equipment	Manufacturer Name & Model	Serial Number
Anemometer	VAISALA WXT520	G4420002
Serial to Analog Converter	NOKEVAL 7470	A159784

#### 3.2 Measurement Setup

##### 3.2.1 Microphone Placement

The measurement microphone was setup 132m from the base of the turbine in 'Position 1', (i.e. downwind of the turbine, as per IEC 61400-11) at an elevation of 0m relative to the base of T22. The slant distance ( $R_1$ ) from microphone location to rotor centre includes the distance from rotor center (hub) to tower axis ( $R_1 = 157.9\text{m}$ ). The microphone was placed in the centre of a circular, acoustically reflective board.

During the measurement period only data points for which the microphone was within 15 degrees of downwind from the turbine were used. The microphone position relative to downwind of the turbine was monitored via the yaw angle output provided from the turbine system (discussed further in Section 3.5). During placement of the microphone the turbine was parked and the reference yaw angle for that measurement logged.

When measurements of T22 were taken, the surrounding land was planted with grass roughly 2 to 4 inches in length. The grass was short and as such the influence on the measurement was considered negligible. There were no nearby reflecting surfaces (houses, barns etc.); as such the influence from reflecting surfaces was considered to be negligible.

Photos of the measurement setup are provided in Figure A.02, Appendix A.

### 3.2.2 Double Windscreen Setup

A double windscreen setup was not utilized.

### 3.3 Measurement Schedule

Table 8 provides a summary of the test date and times. Data was logged in 10 second intervals for post-processing (as per the measurement standard).

Table 8 - Measurement Schedule Summary

Date	Test Type	Start Time	Finish time
May 18, 2018	Turbine ON	9:31 am	10:15 am
	Background	10:18 am	11:10 am
	Turbine ON	11:17 am	2:38 pm
	Turbine ON	2:43 pm	4:08 pm

### 3.4 Meteorological Conditions

Detailed meteorological data relevant to the measurement is provided in Appendix E.

As previously mentioned, wind speed for Turbine ON was derived from T22's power curve (as per the standard), while wind direction was provided by T22's nacelle yaw position (located at hub height). Background data was obtained from an anemometer located 10m above ground level near T22.

Temperature and pressure readings during the measurement period were provided by the 10m anemometer, located near turbine T22 for the duration of Aercoustics measurements.

### 3.5 Turbine operational information

Output data from the turbine (Power, yaw, RPM, pitch angle, and nacelle wind speed) were obtained as analog output signals that were simultaneously acquired with the acoustic and anemometer measurement data using Aercoustics data acquisition system.



## 4 Measurement Results

### 4.1 Deviations from IEC-61400-11 Edition 3.0

No deviations.

### 4.2 Special Notes & Considerations

Bornish Turbine T20 and T21 were parked for the duration of the test.

### 4.3 Analysis Details

The following section outlines analysis of the measurement data acquired for T22. The data presented is exclusive of transient events such as vehicle traffic, wildlife, air traffic etc. The site has been assessed to have a roughness length of 0.05m, representative of farmland with some vegetation.

#### 4.3.1 Double Windscreen Adjustment

As previously mentioned, no double wind screen was used, as such the measurement data did not require adjustment.

#### 4.3.2 Wind Speed Correction

The wind speed for each measurement data point for Turbine ON was derived through the power curve (as per Section 8.2.1.1 of IEC-61400-11). For data points during Turbine ON that were outside the allowed range of the power curve, the wind speed was derived from the nacelle anemometer wind speed (as specified in Section 8.2.1.2 of IEC-61400-11).

Background wind speed was derived utilizing data acquired with the 10m anemometer and normalizing the wind speed (as per Section 8.2.2 of IEC-61400-11).

Table 9 - Calculated nacelle anemometer ( $k_{nac}$ ) and 10m ( $k_Z$ ) wind speed k-factor

$k_{nac}$	$k_Z$
1.07	1.17

### 4.4 Type B uncertainties

Type B uncertainties were obtained through interpretation of information provided in Annex C of IEC-61400-11, and instrument uncertainties obtained from the calibration certificate. A summary of Type B uncertainties is provided in Table 10, while detailed information (including data in 1/3 octave) is provided in Appendix C.



Table 10 - Summary of Type B uncertainties

Component	Typical (dB)	Used (dB)
Calibration	0.2	0.2
Board	0.3	0.3
Distance & direction	0.1	0.1
Air absorption	0	0
Weather conditions	0.5	0.5
Wind speed measured	0.7	0.7
Wind speed derived	0.2	0.2
Wind speed from power curve	0.2	0.2

#### 4.5 Sound Pressure Level Measurements

Sound pressure level measurements are summarized in Table 11. Detailed 1/3 Octave band spectrum data, respective uncertainties, and analysis plots are provided in Appendix C. A copy of the measurement data used for analysis is provided in Appendix E and includes meteorological and turbine operational data.

Table 11 - Summary of Sound Pressure Level Measurements

Wind Speed (m/s)	Turbine ON		Background		Turbine ON, Background adjusted $L_{eq}$ , (dBA)
	$L_{eq}$ , (dBA)	# of data pts	$L_{eq}$ , (dBA)	# of data pts	
7	51.3	10	43.5	13	50.7
7.5	52.7	53	44.6	19	52.1
8	53.1	38	43.3	25	52.7
8.5	53.3	35	44.7	22	52.8
9	53.2	40	43.6	27	52.8
9.5	53.5	172	44.8	33	53.0
10	53.6	208	44.9	20	53.0
10.5	53.6	175	44.8	19	53.1
11	53.6	163	46.0	18	53.0

#### 4.6 Sound Power Level of Turbine

The calculated sound power level of the turbine T22 (as per IEC 61400-11) is summarized in Table 11 (hub height) and Table 13 (10m height). Detailed 1/3 Octave band spectrum data and respective uncertainties are provided in Appendix C.

Table 12 -  $L_{WA, K}$  at each integer wind speed

Wind Speed (m/s)	Apparent $L_{WA}$ , (dBA)	Uncertainty (dB)
7	99.7	0.8
7.5	101.0	0.9
8	101.6	0.9
8.5	101.7	0.9
9	101.7	0.9
9.5	102.0	0.9
10	102.0	0.9
10.5	102.0	0.9
11	102.0	0.9

Table 13 -  $L_{WA 10m, K}$  at each integer wind speed

Wind Speed (m/s)	Apparent $L_{WA}$ , (dBA)	Uncertainty (dB)
5	100.5	1.4
6	101.7	0.9
7	102.0	0.8
8	102.0	0.9

#### 4.7 Tonality Analysis

The tonality analysis for Turbine T22 is summarized in Table 14, while plots of narrow band spectra at each wind speed are provided in Appendix D. The  $\Delta L_{tn}$  and  $\Delta L_a$  values reported represent the energy average of all data points with an identified tone that falls within the same frequency origin (as specified in Section 9.5.8 in IEC-61400-11).

The narrow band spectra provided in the plots represents an energy average of all data points in the given wind speed bin for both Turbine ON and Background.

Table 14 - Tonality Assessment Summary

Wind Speed (m/s)	Frequency (Hz)	Tonality, $\Delta L_{tn}$ (dB)	Tonal audibility, $\Delta L_a$ (dB)	FFT's with tones	Total # of FFT's	Presence (%)
7	572	-1.6	0.8	10	10	100%
7	1168	-2.9	0.1	7	10	70%
7.5	591	-5.4	-3.0	21	53	40%
7.5	1187	-0.2	2.8	23	53	43%
8	620	-4.0	-1.6	21	38	55%
8	1200	0.2	3.2	11	38	29%
8	1239	-0.7	2.3	24	38	63%
8.5	621	-2.6	-0.2	27	35	77%
8.5	1229	-0.4	2.6	29	35	83%
8.5	1796	-5.2	-1.8	15	35	43%
9	618	-2.0	0.4	35	40	88%
9	1243	-2.3	0.7	27	40	68%
9.5	633	2.0	4.5	88	172	51%
9.5	1280	-2.4	0.7	38	172	22%
9.5	1809	-6.3	-2.8	69	172	40%
10	635	2.3	4.8	74	208	36%
10	1206	-2.5	0.5	42	208	20%
10	1256	-2.8	0.3	165	208	79%
10.5	633	2.1	4.6	76	175	43%
10.5	1271	-2.6	0.4	48	175	27%
11	633	2.4	4.8	82	163	50%
11	1274	-1.5	1.5	51	163	31%

## 5 Closure

Measurements and analysis were carried on Turbine T22 of the Bornish Wind Energy Centre, located in municipality of North Middlesex, Ontario as per International IEC 61400-11 (Edition 3.0, released 2012-11), “Wind turbine generator systems – Part 11: Acoustic noise measurement techniques”.

Should you have any questions or comments please do not hesitate to contact the authors of this report.

## 6 References

1. International Standard IEC 61400-11 (Edition 3.0, released 2012-11), “Wind turbine generator systems – Part 11: Acoustic noise measurement techniques”.

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## Appendix A Site Details

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**Legend**  
 □ Bornish - Turbine



14331.00.T22.RP4  
 Scale: NTS  
 Drawn by: AM  
 Reviewed by: PA  
 Date: May 29, 2018  
 Revision: 1

**Project Name**  
 Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**  
 Site Plan

**Figure A.01**





14331.00.T22.RP4

Scale:NTS  
Drawn by:AM  
Reviewed by:PA  
Date:May 29, 2018  
Revision:1

**Project Name**

Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

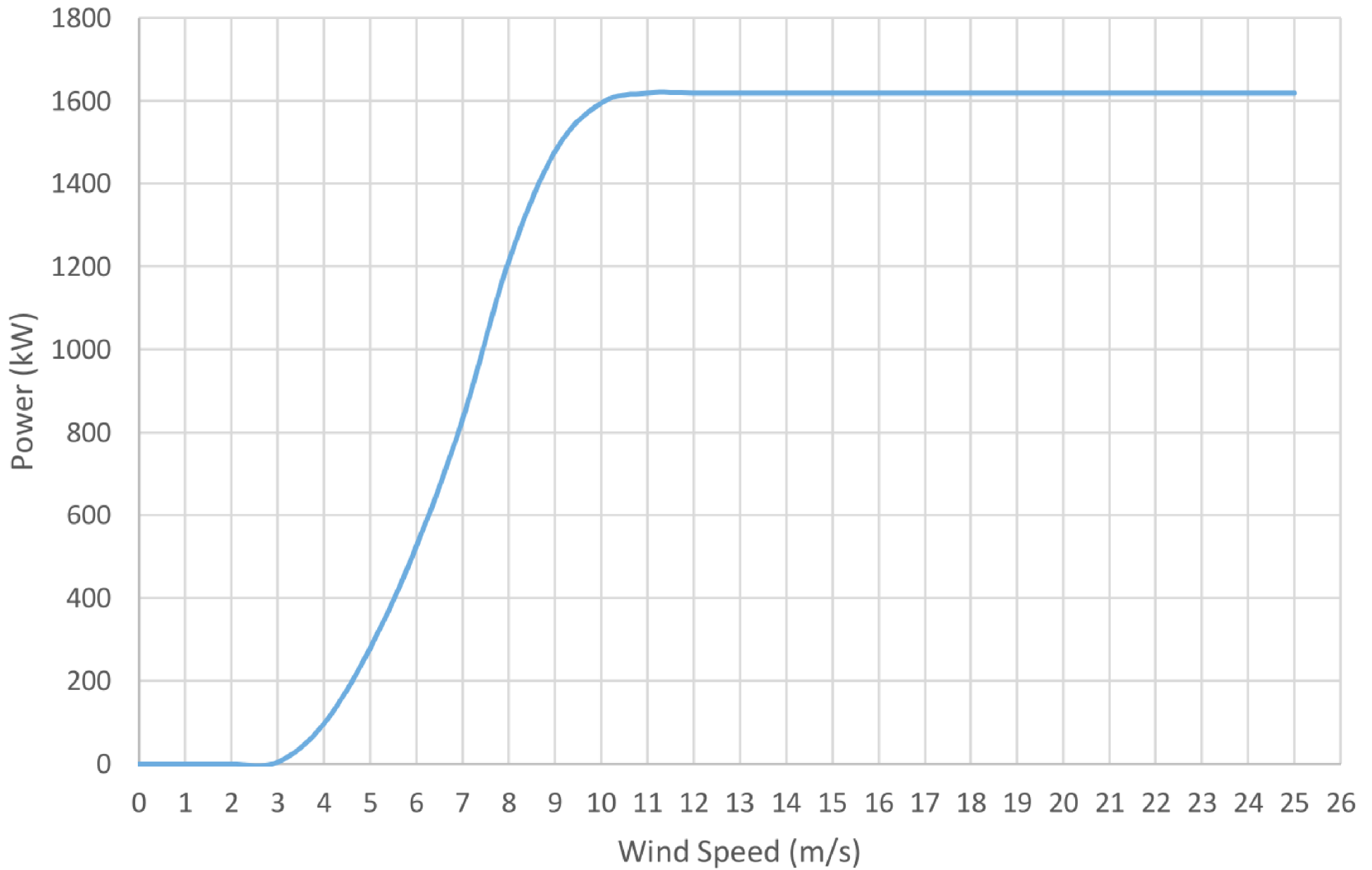
Site Photos

**Figure A.02**

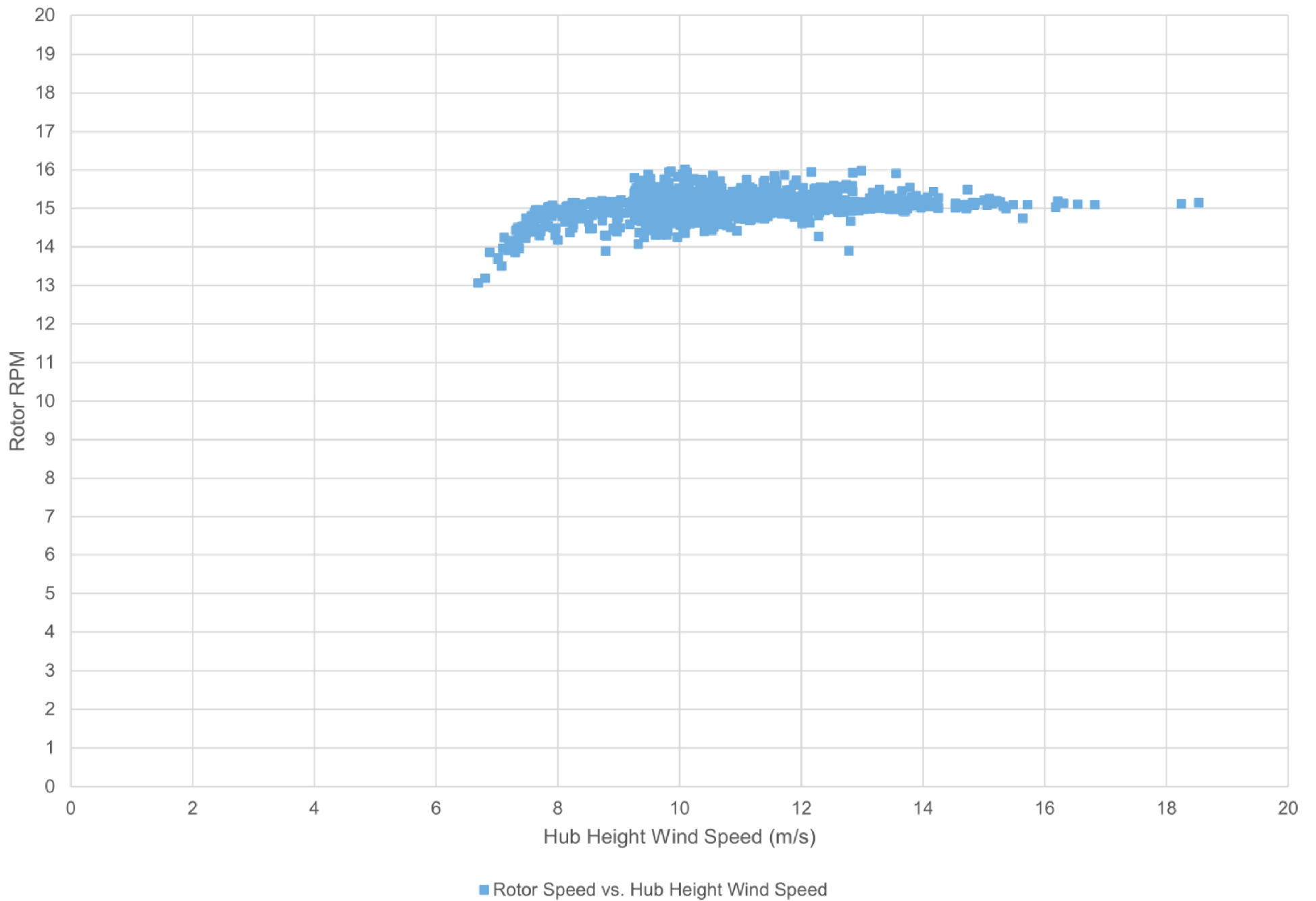
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## Appendix B Turbine Information

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## Table B.01 Allowed range of power curve and required wind speeds

Project: Bornish Wind Energy Centre - Turbine T09 - IEC 61400-11 Measurement  
 Report ID: 14331.00.T22.RP4

Page 1 of 1  
 Created on: 5/29/2018

Power Curve & Required Wind Speeds		
Power Curve Tolerance	1%	
Acceptable range min	3	m/s
Acceptable range max	9	m/s
Min allowable range	3	m/s
Max allowable range	9	m/s
Power Output	1620	kW
85% Power	1377	kW
Corresponding wind speed	8.62	m/s
Minimum bin	7.0	m/s
Maximum bin	11.0	m/s

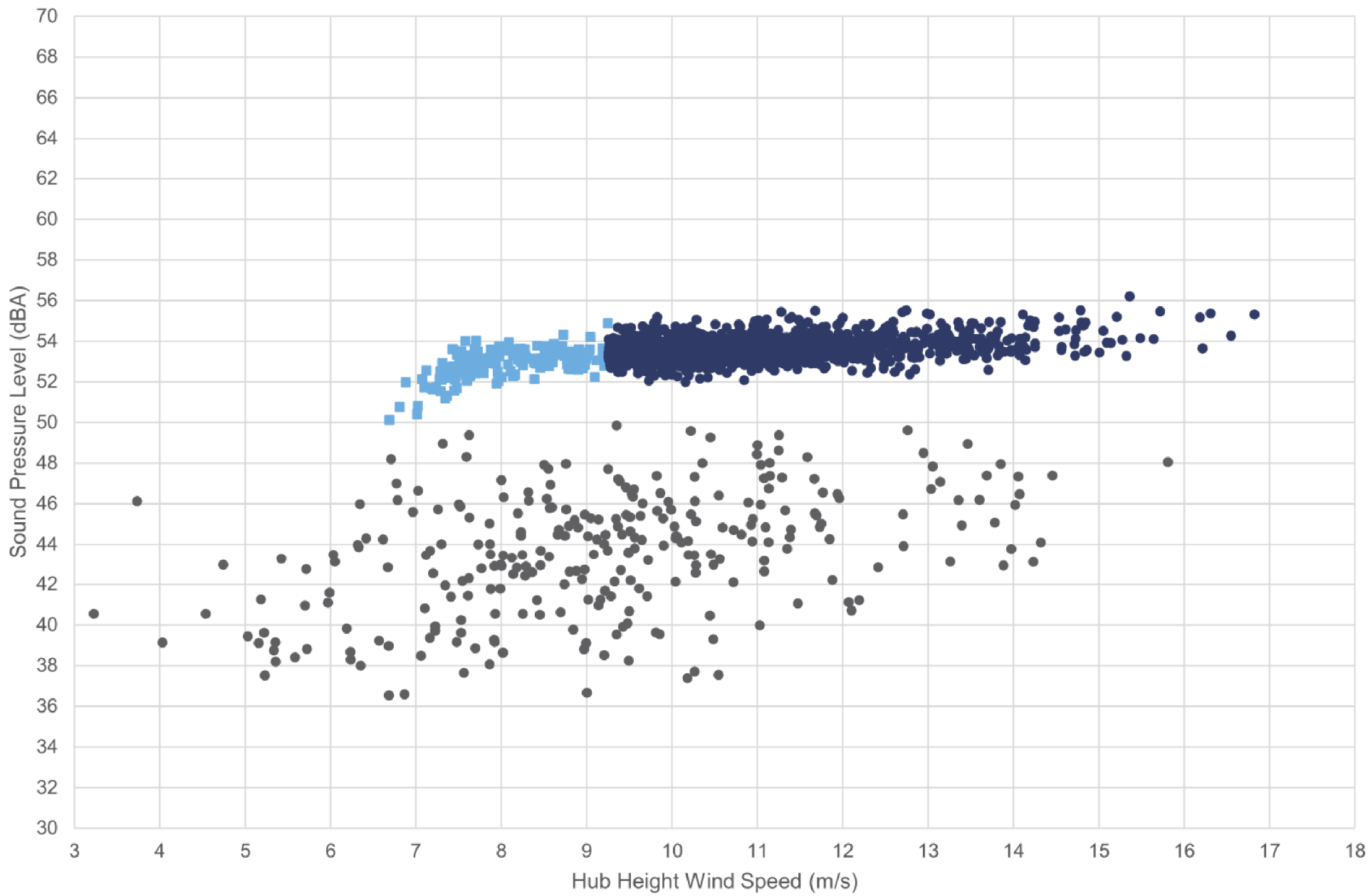
Hub Wind Speed (m/s)	Power [kW]	+ value = acceptable slope of power curve
0	0	-32.4
1	0	-32.4
2	0	-28.4
3	4	60.6
4	97	149.6
5	279	212.6
6	524	275.6
7	832	348.6
8	1213	231.6
9	1477	86.6
10	1596	-8.4
11	1620	-32.4
12	1620	-32.4
13	1620	-32.4
14	1620	-32.4
15	1620	-32.4
16	1620	-32.4
17	1620	-32.4
18	1620	-32.4
19	1620	-32.4
20	1620	-32.4
21	1620	-32.4
22	1620	-32.4
23	1620	-32.4
24	1620	-32.4
25	1620	

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## Appendix C

### Apparent Sound Power Level

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■ Turbine ON - Derived from power curve    
 ● Turbine ON - Derived from nacelle anemometer    
 ● Background



14331.00.T22.RP4

Scale: NTS  
 Drawn by: AM  
 Reviewed by: PA  
 Date: May 29, 2018  
 Revision: 1

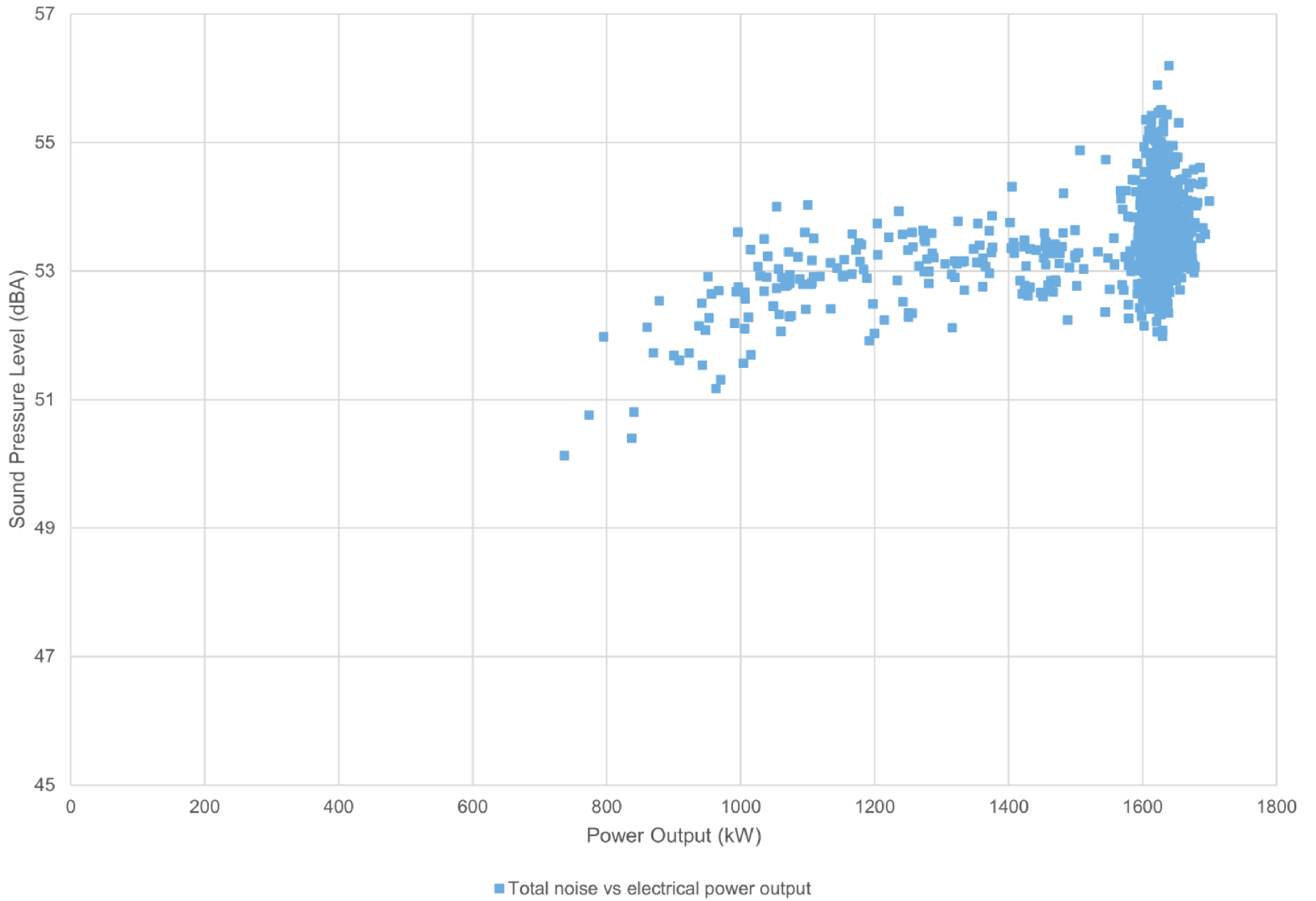
**Project Name**

Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of overall measurement data pairs at Position 1 (Turbine ON & Background)

**Figure C.01**



■ Total noise vs electrical power output



14331.00.T22.RP4

Scale:NTS  
 Drawn by:AM  
 Reviewed by:PA  
 Date:May 29, 2018  
 Revision:1

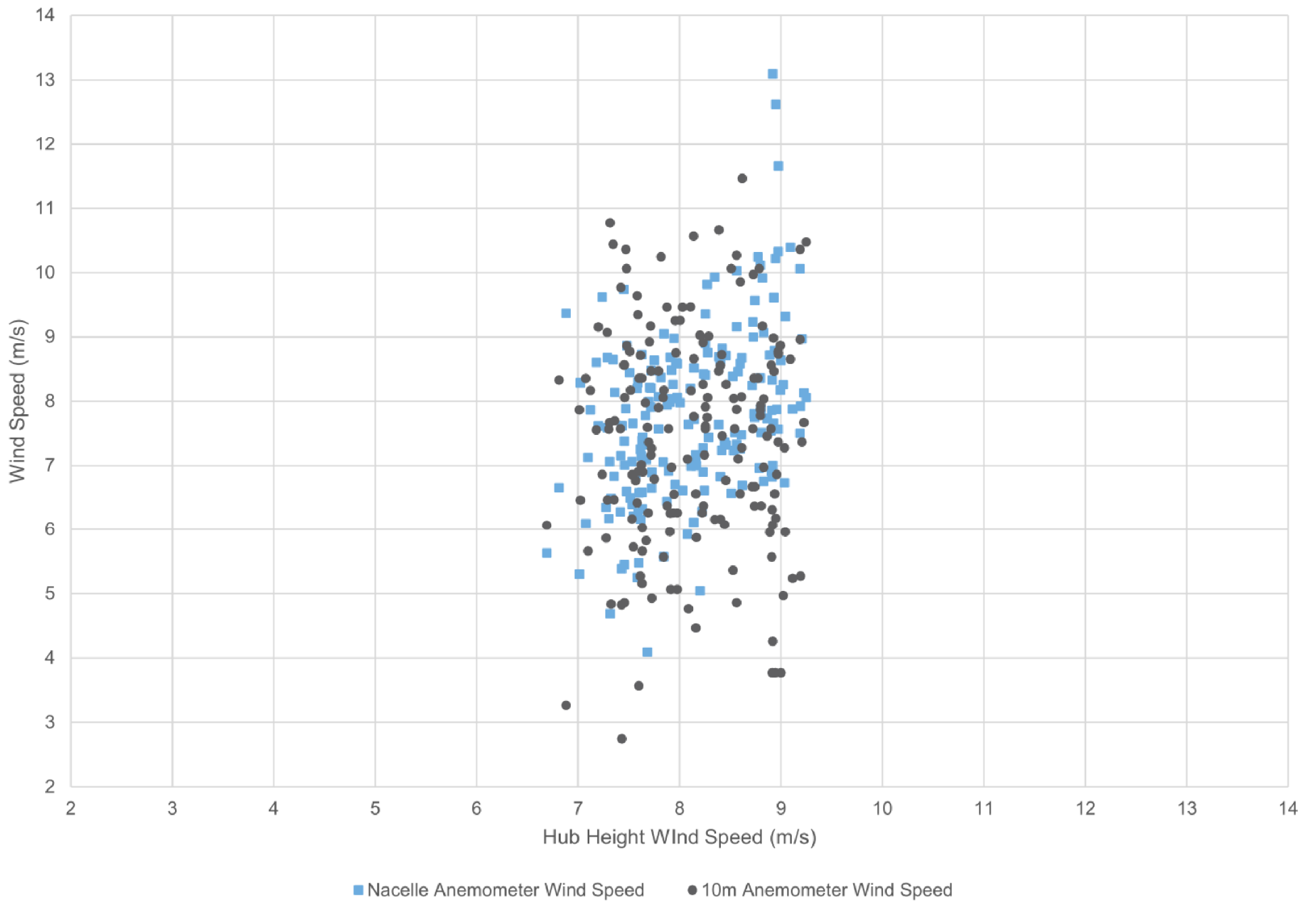
**Project Name**

Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of measured total noise vs. electrical power output

**Figure C.02**



■ Nacelle Anemometer Wind Speed    ● 10m Anemometer Wind Speed



14331.00.T22.RP4

Scale: NTS  
 Drawn by: AM  
 Reviewed by: PA  
 Date: May 29, 2018  
 Revision: 1

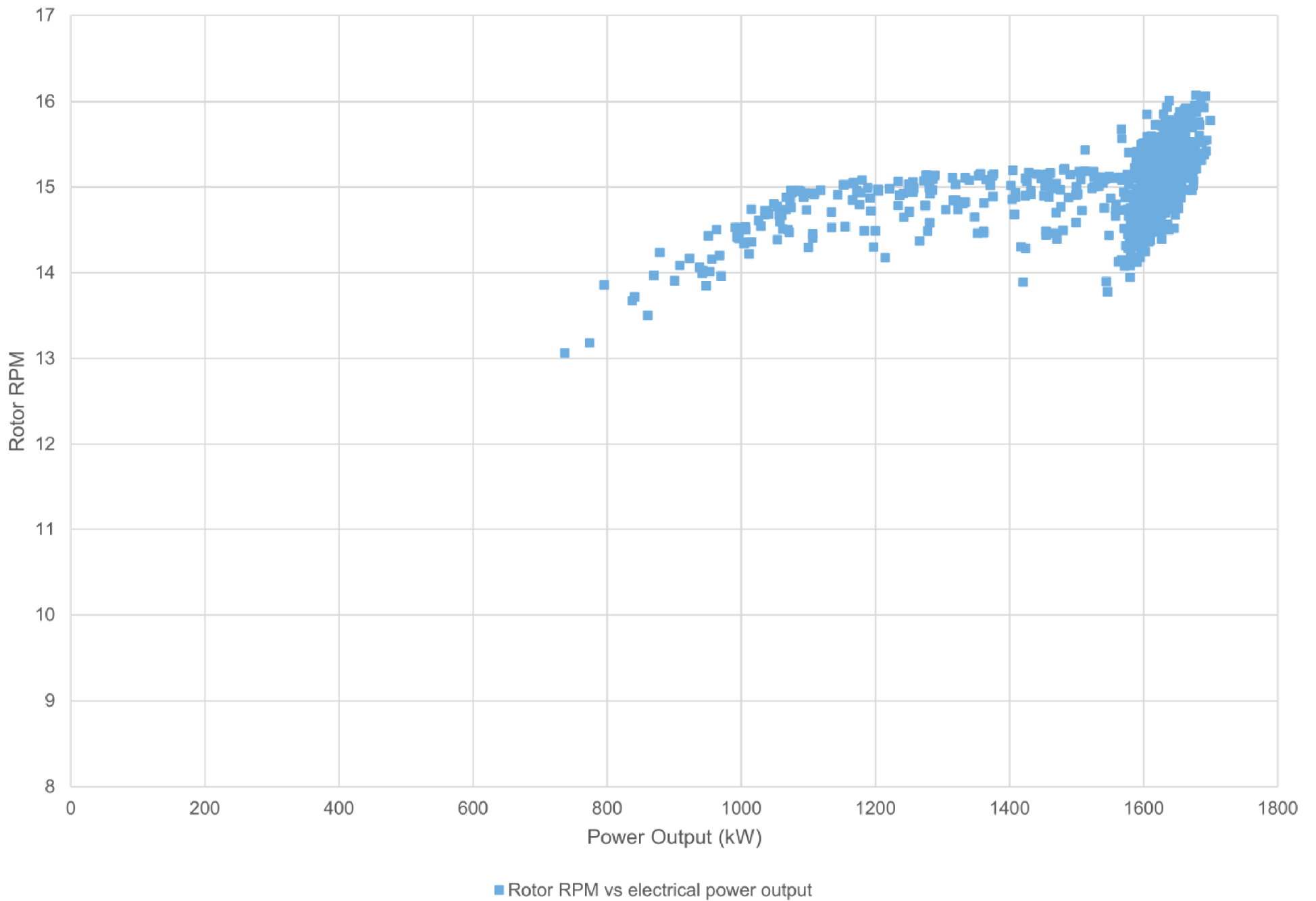
**Project Name**

Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

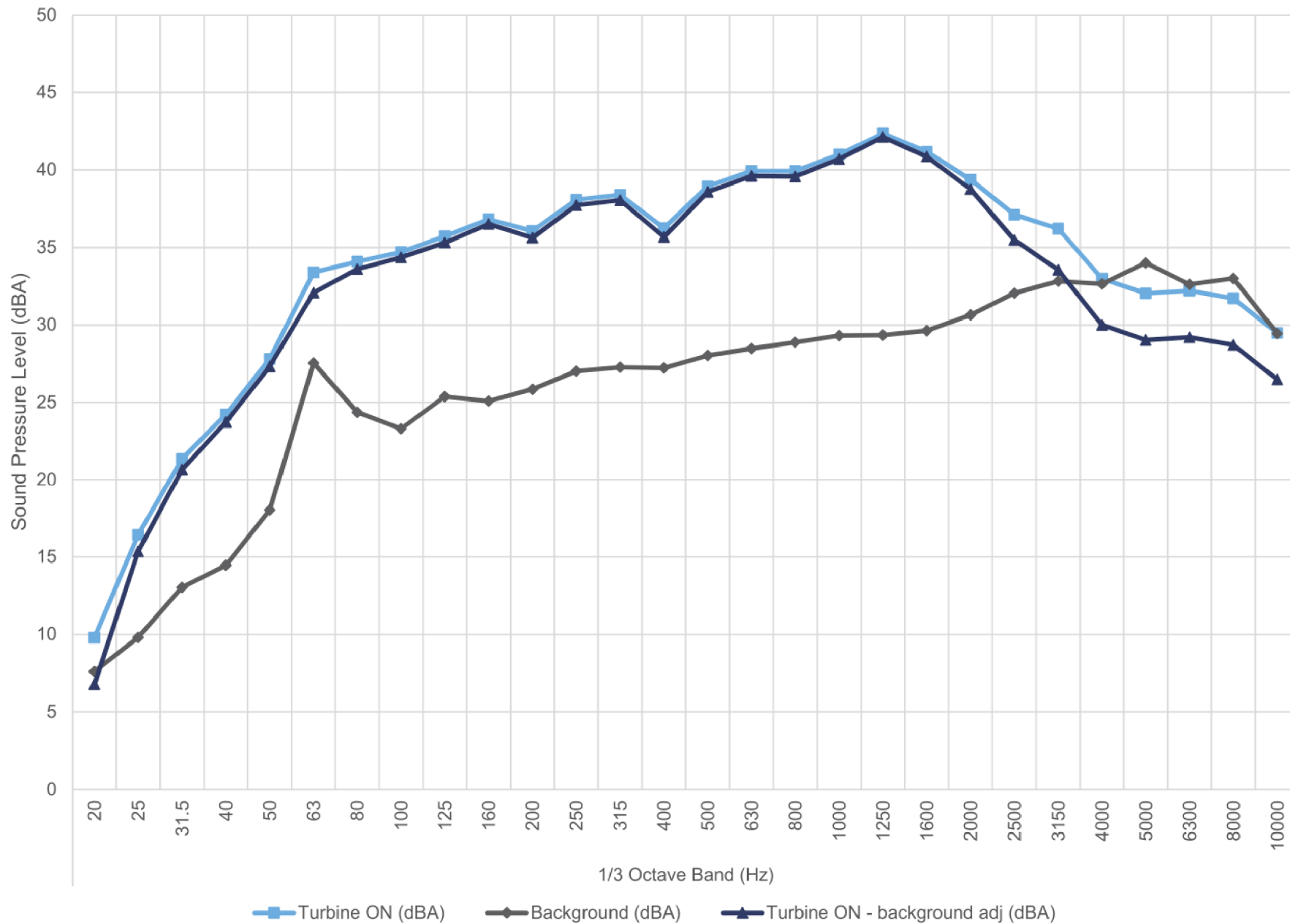
**Figure Title**

Plot of power curve relative to nacelle anemometer and 10m anemometer

**Figure C.03**



### 7.0 m/s - Hub Height



14331.00.T22.RP4

Scale:NTS  
 Drawn by:AM  
 Reviewed by:PA  
 Date:May 29, 2018  
 Revision:1

**Project Name**

Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

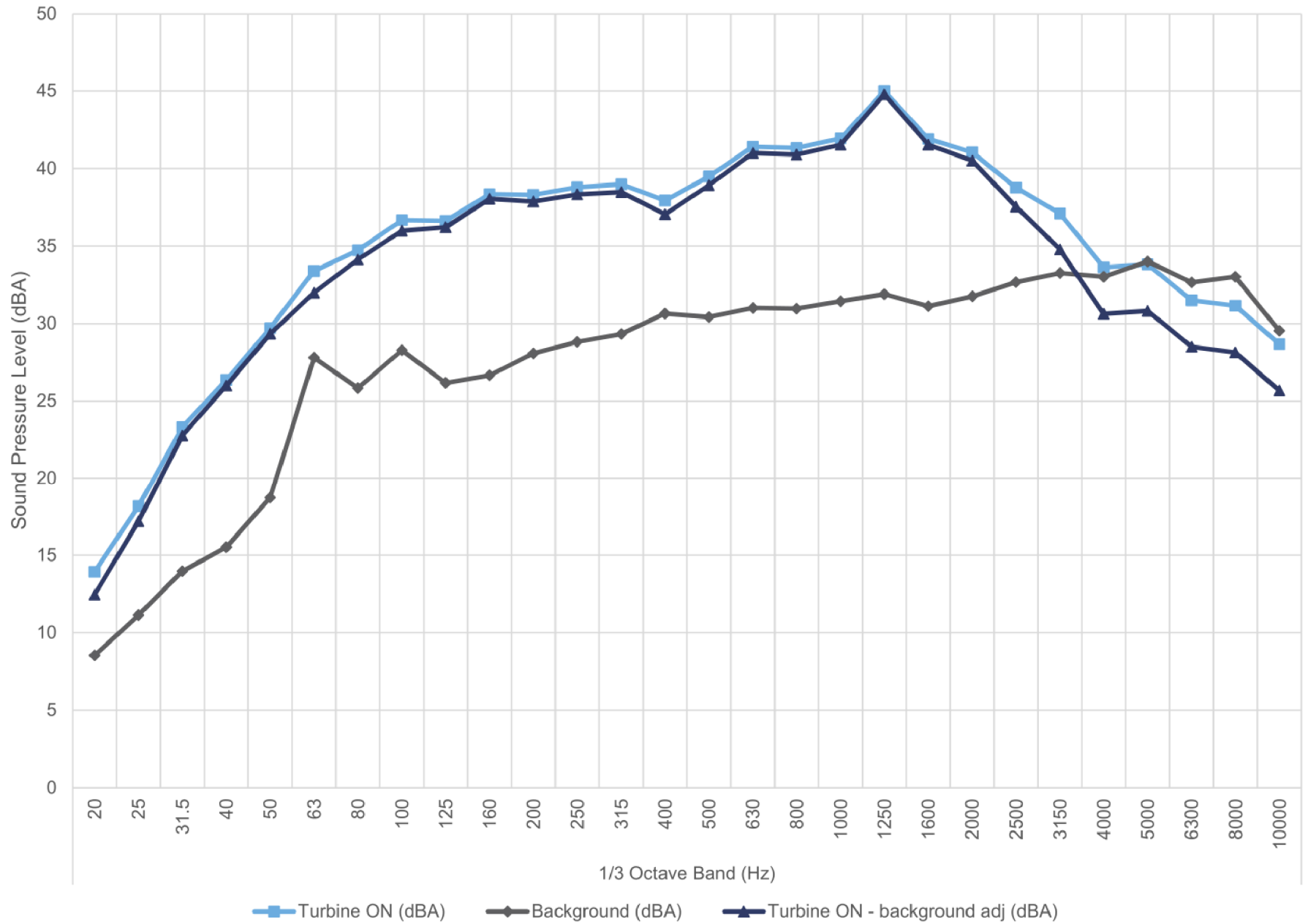
**Figure Title**

Plot of sound pressure spectrum in 1/3 Ocave at 7 m/s

**Figure C.05**



## 7.5 m/s - Hub Height



14331.00.T22.RP4

Scale: NTS  
 Drawn by: AM  
 Reviewed by: PA  
 Date: May 29, 2018  
 Revision: 1

**Project Name**

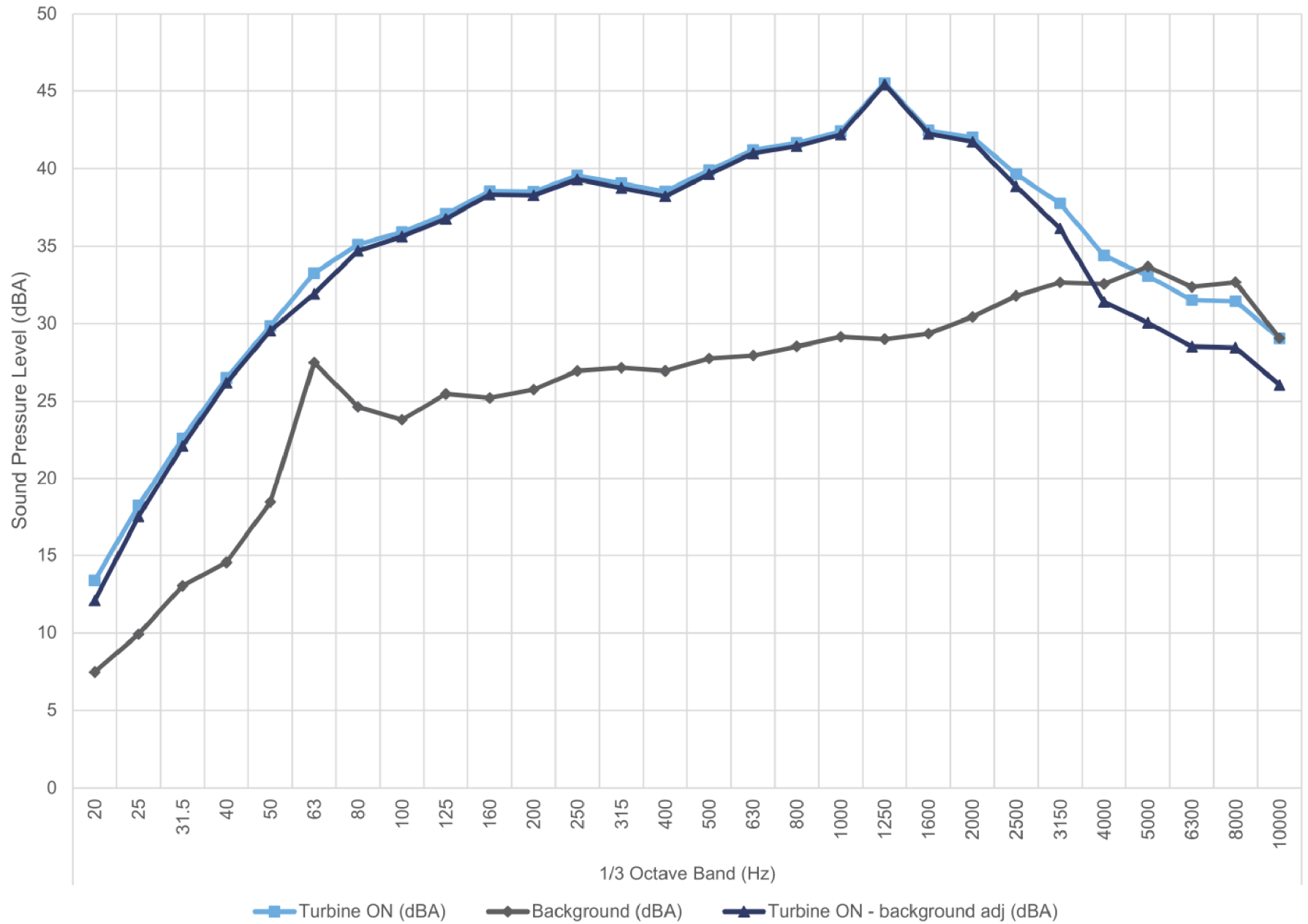
Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of sound pressure spectrum in 1/3 Octave at 7.5 m/s

**Figure C.06**

### 8.0 m/s - Hub Height



14331.00.T22.RP4

Scale: NTS  
 Drawn by: AM  
 Reviewed by: PA  
 Date: May 29, 2018  
 Revision: 1

**Project Name**

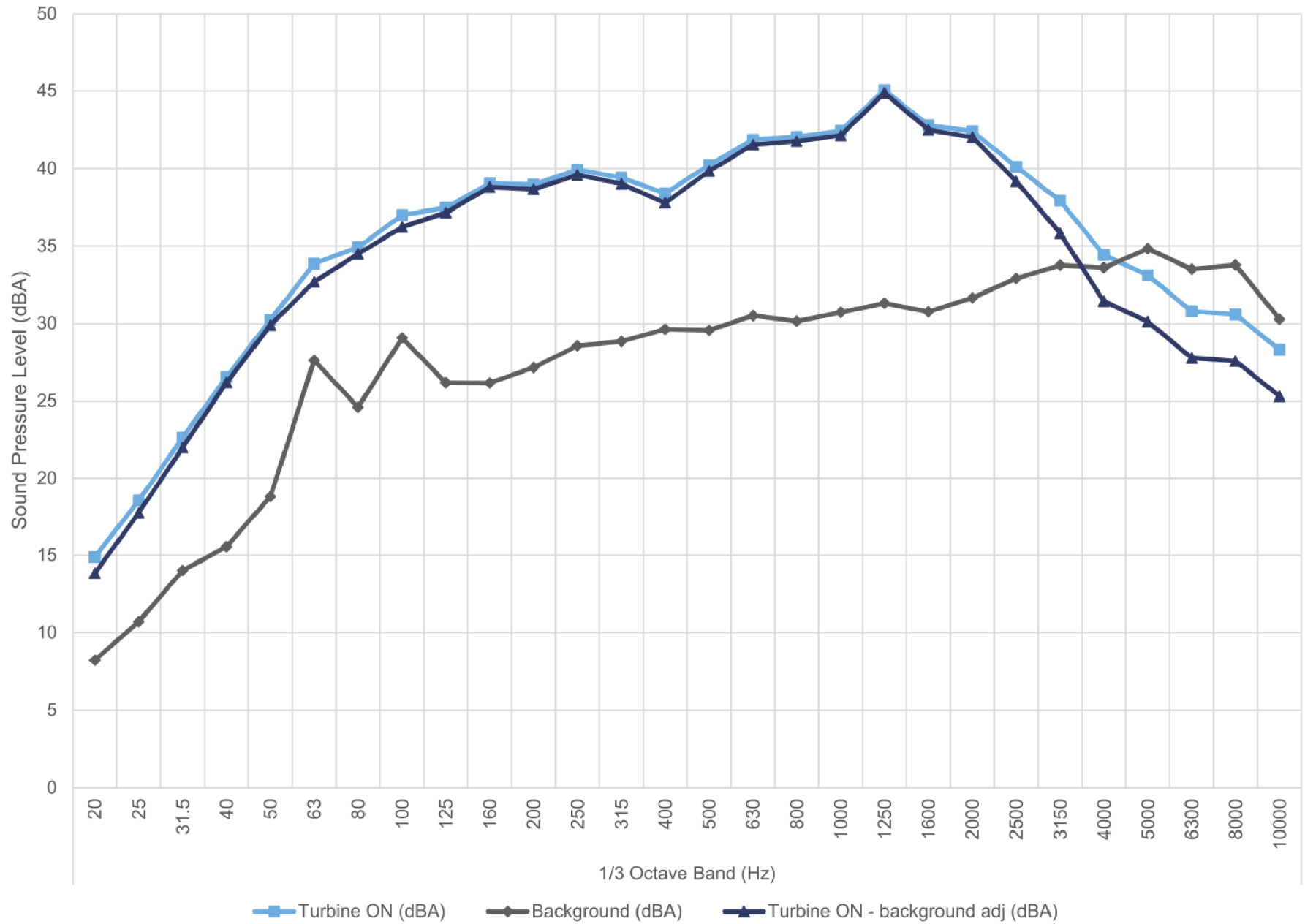
Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of sound pressure spectrum in 1/3 Octave at 8 m/s

**Figure C.07**

## 8.5 m/s - Hub Height



14331.00.T22.RP4

Scale: NTS  
 Drawn by: AM  
 Reviewed by: PA  
 Date: May 29, 2018  
 Revision: 1

**Project Name**

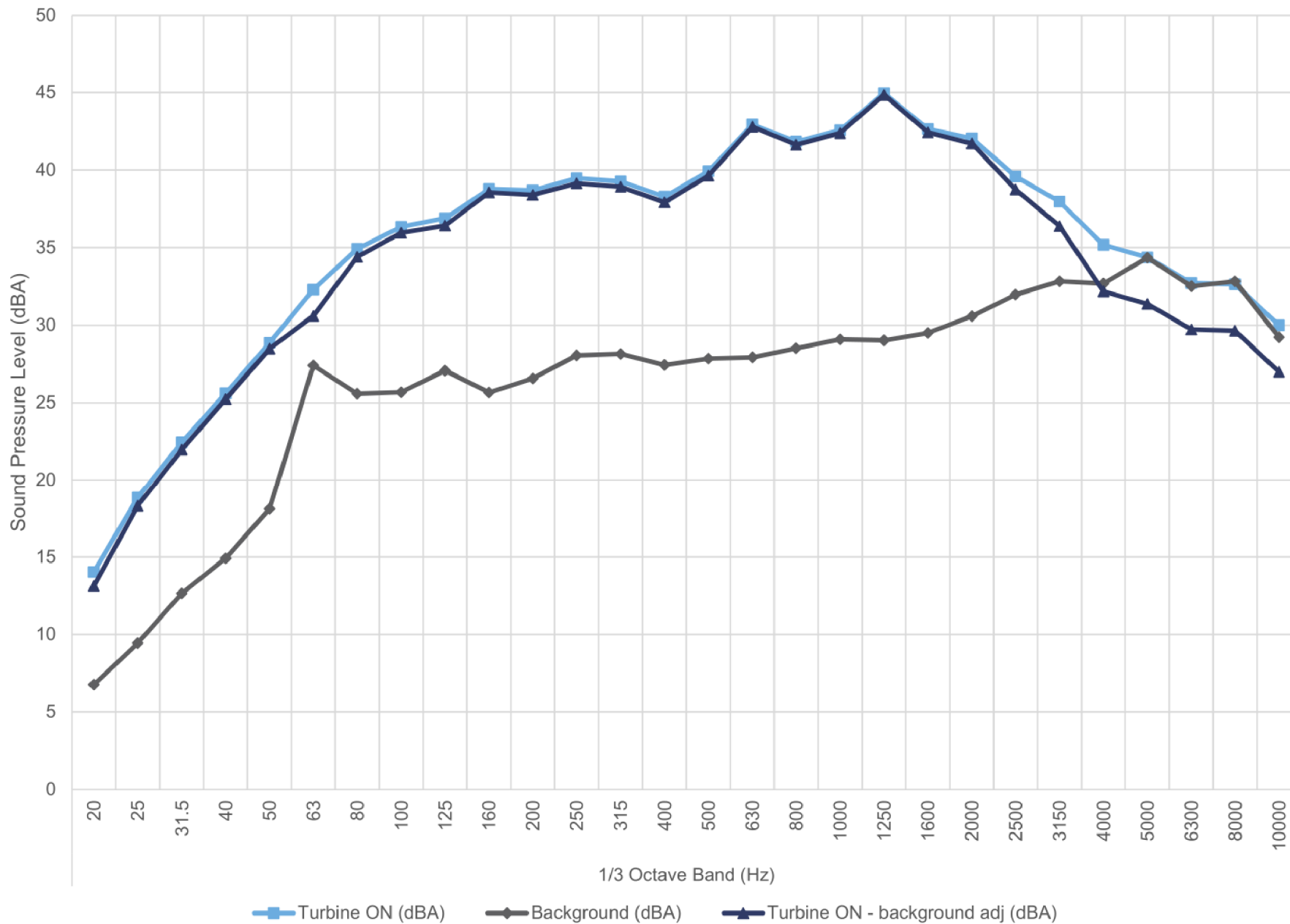
Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of sound pressure spectrum in 1/3 Octave at 8.5 m/s

**Figure C.08**

### 9.0 m/s - Hub Height



14331.00.T22.RP4

Scale: NTS  
 Drawn by: AM  
 Reviewed by: PA  
 Date: May 29, 2018  
 Revision: 1

**Project Name**

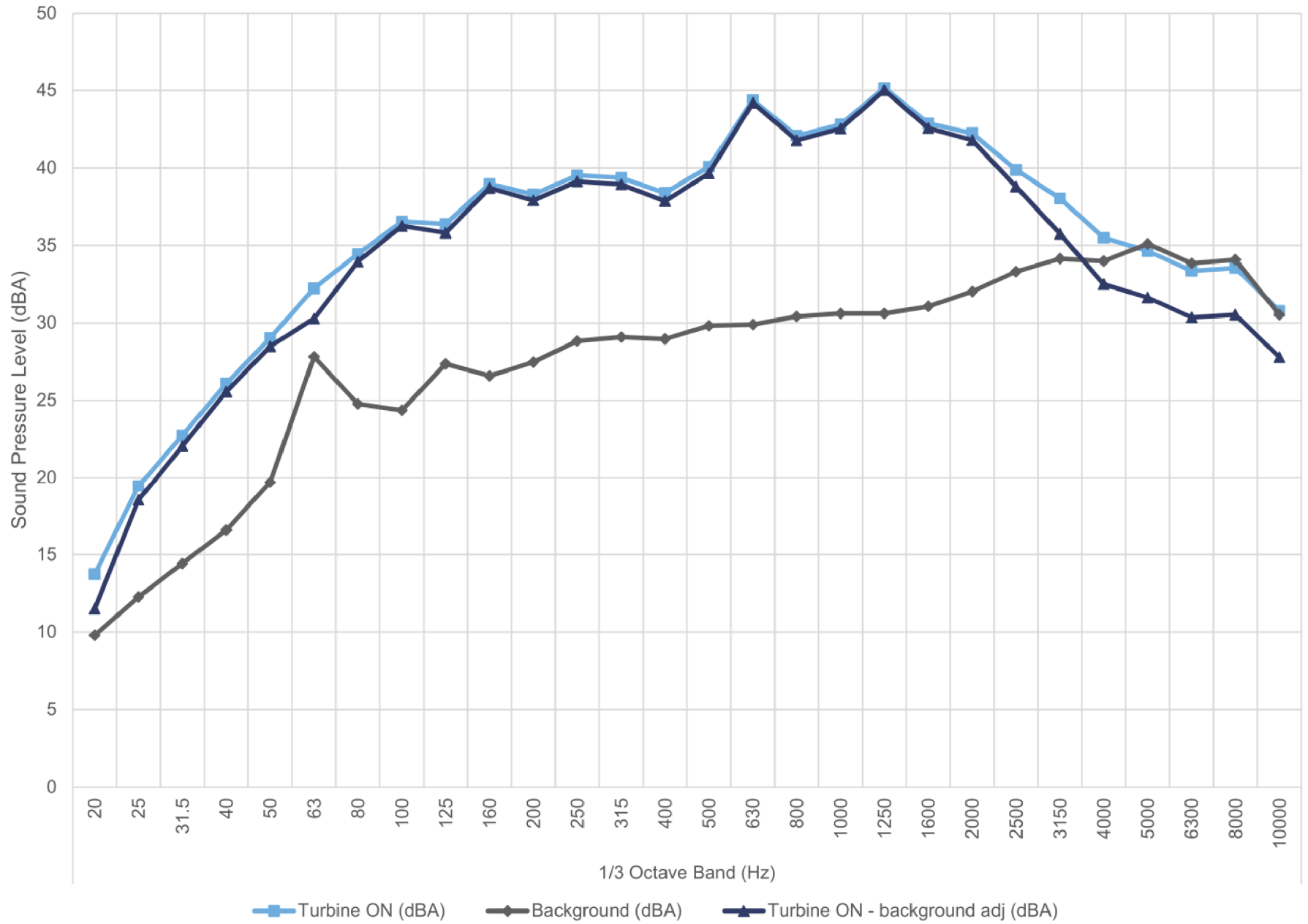
Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of sound pressure spectrum in 1/3 Octave at 9 m/s

**Figure C.09**

### 9.5 m/s - Hub Height



14331.00.T22.RP4

Scale: NTS  
 Drawn by: AM  
 Reviewed by: PA  
 Date: May 29, 2018  
 Revision: 1

**Project Name**

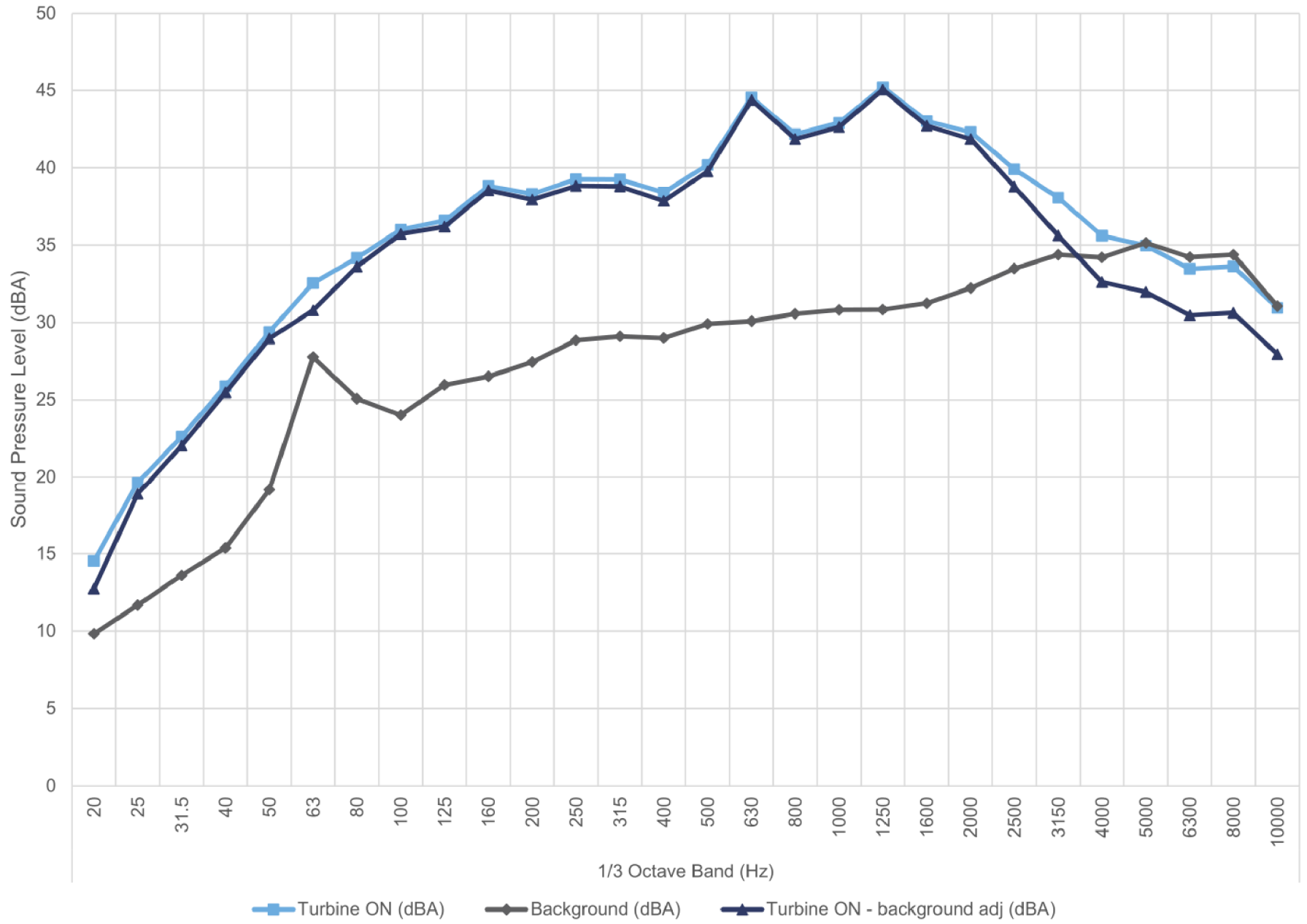
Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of sound pressure spectrum in 1/3 Octave at 9.5 m/s

**Figure C.10**

# 10.0 m/s - Hub Height



14331.00.T22.RP4

Scale: NTS  
 Drawn by: AM  
 Reviewed by: PA  
 Date: May 29, 2018  
 Revision: 1

**Project Name**

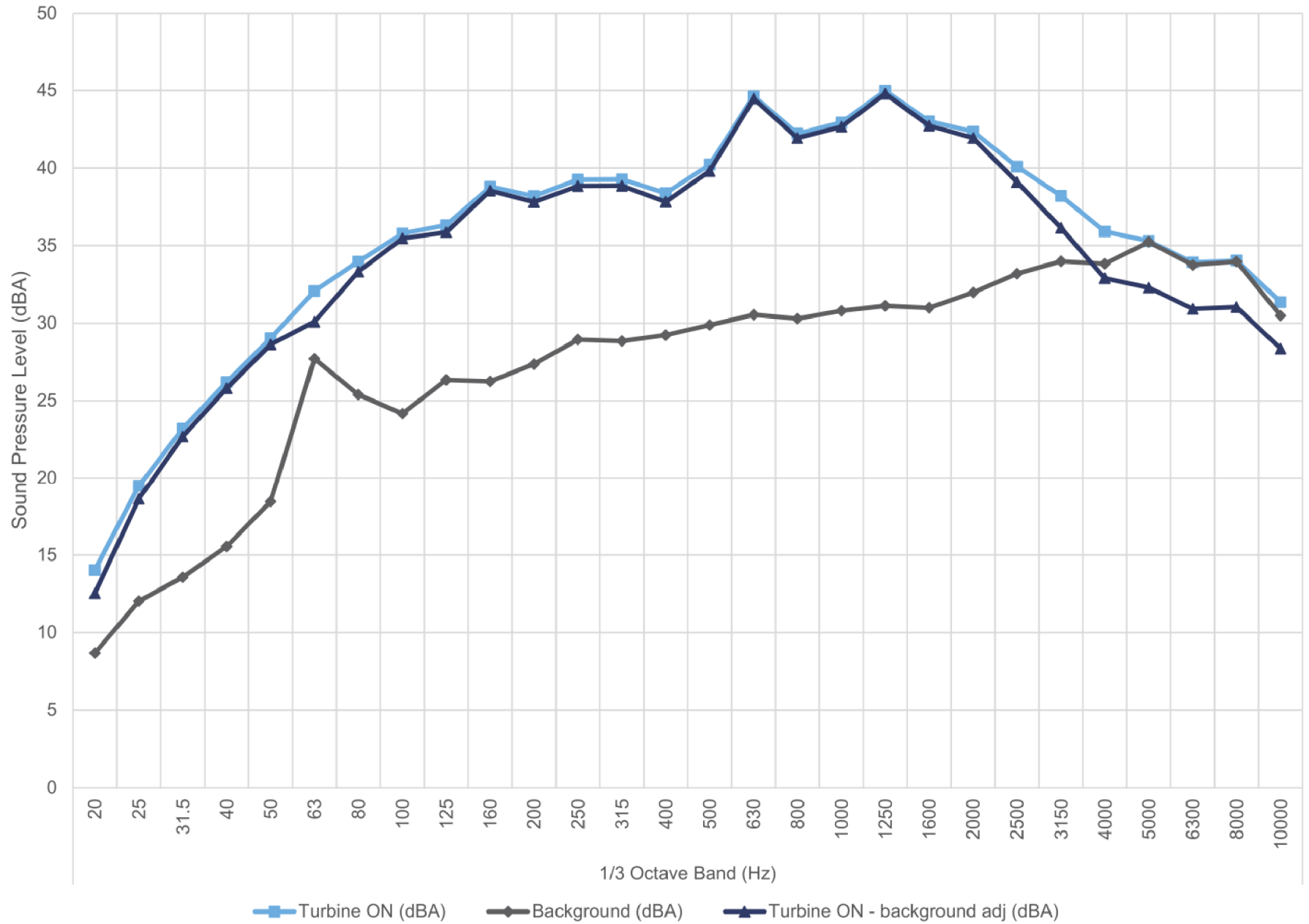
Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of sound pressure spectrum in 1/3 Octave at 10 m/s

**Figure C.11**

# 10.5 m/s - Hub Height



14331.00.T22.RP4

Scale:NTS  
 Drawn by:AM  
 Reviewed by:PA  
 Date:May 29, 2018  
 Revision:1

**Project Name**

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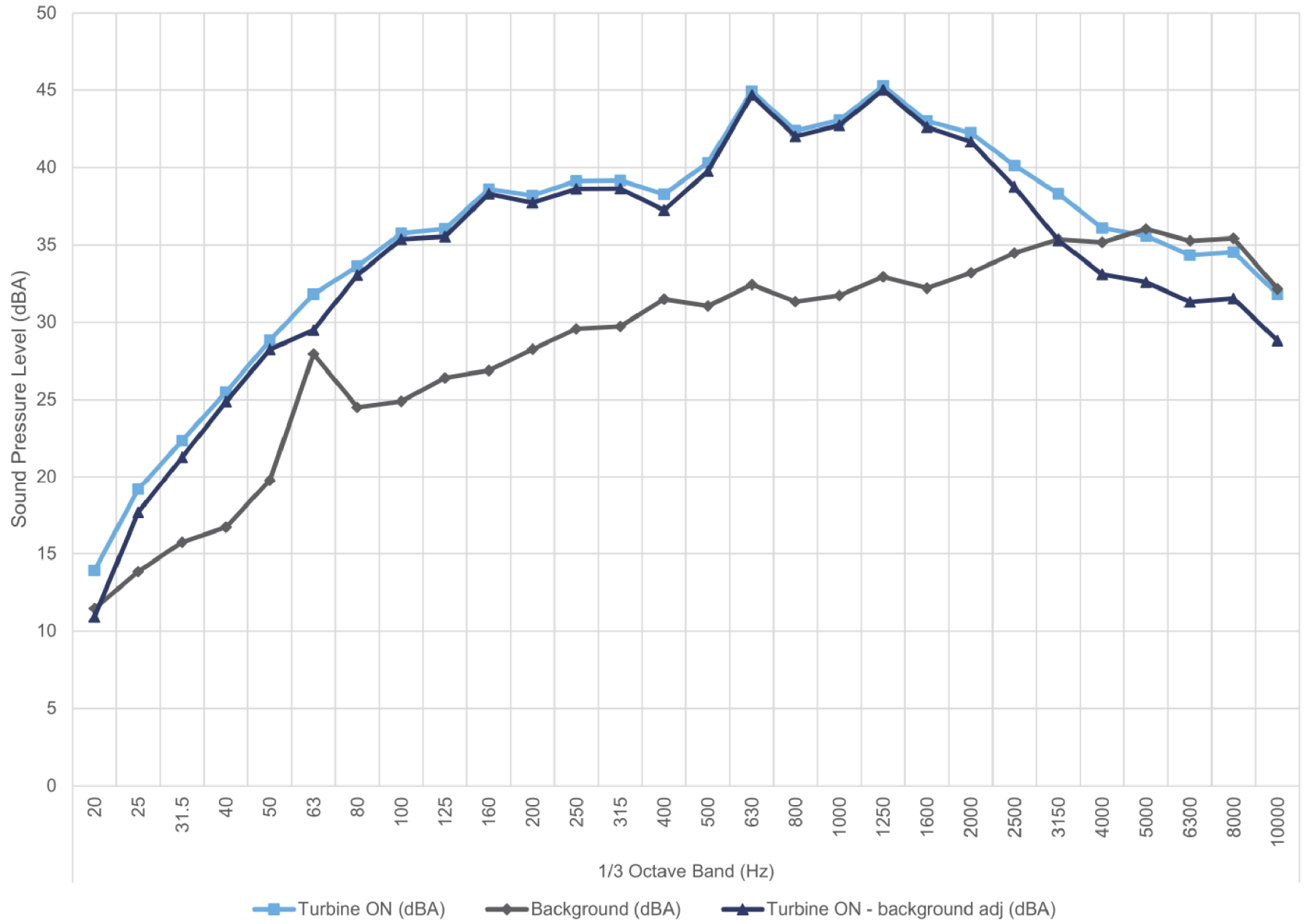
**Figure Title**

Plot of sound pressure spectrum in 1/3 Ocave at 10.5 m/s

**Figure C.12**



# 11.0 m/s - Hub Height



14331.00.T22.RP4

Scale: NTS  
 Drawn by: AM  
 Reviewed by: PA  
 Date: May 29, 2018  
 Revision: 1

**Project Name**

Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of sound pressure spectrum in 1/3 Octave at 11 m/s

**Figure C.13**

# Table C.01 Detailed apparent sound power level data at hub height

Project: Bornish Wind Energy Centre - Turbine T22 - IEC 61400-11 Measurement  
 Report ID: 14331.00.T22.RP4

Page 1 of 2  
 Created on: 5/29/2018

1/3 Octave values marked with brackets [ ] denote less than 3 dB difference between Turbine ON and Background

Overall levels marked with an asterisk \* denote 3 to 6 dB difference between Turbine ON and Background, while Overall values with less than 3 dB difference between Turbine ON and Background are not reported

Wind Bin (m/s)	Parameter	1/3 Octave Band (Hz)																		Overall										
		20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000		1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
7.0	Turbine ON (dBA)	9.8	16.4	21.4	24.2	27.8	33.4	34.1	34.7	35.7	36.8	36.1	38.1	38.4	36.2	38.9	39.9	39.9	41.0	42.3	41.2	39.4	37.1	36.2	33.0	32.0	32.2	31.7	29.5	51.3
	Background (dBA)	7.6	9.8	13.0	14.5	18.0	27.5	24.4	23.3	25.4	25.1	25.9	27.0	27.3	27.2	28.0	28.5	28.9	29.3	29.4	29.6	30.6	32.1	32.8	32.7	34.0	32.6	33.0	29.4	43.5
	Turbine ON - background adj (dBA)	[6.8]	15.4	20.7	23.7	27.3	32.1	33.6	34.4	35.3	36.5	35.6	37.7	38.0	35.7	38.6	39.6	39.6	40.7	42.1	40.9	38.8	35.5	33.6	[30]	[29]	[29.2]	[28.7]	[26.5]	50.7
	Signal to noise (dB)	2.2	6.6	8.3	9.8	9.8	5.8	9.7	11.4	10.4	11.7	10.2	11.1	11.1	9.0	10.9	11.4	11.0	11.7	13.0	11.5	8.7	5.1	3.4	0.3	-2.0	-0.4	-1.3	0.0	7.8
	Uncertainty (dB)	4.1	1.9	1.2	1.6	1.1	1.3	0.9	0.9	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	1.2	2.1	2.4	2.4	2.5	3.0	3.6	0.8
7.5	PWL (dBA)	[55.7]	64.3	69.6	72.7	76.3	81.0	82.6	83.3	84.3	85.5	84.6	86.7	87.0	84.6	87.5	88.6	88.5	89.7	91.1	89.8	87.7	84.4	82.5	[78.9]	[78]	[78.2]	[77.7]	[75.4]	99.7
	Turbine ON (dBA)	13.9	18.2	23.3	26.4	29.7	33.4	34.7	36.7	36.6	38.4	38.3	38.8	39.0	37.9	39.5	41.4	41.3	41.9	45.0	41.9	41.1	38.8	37.1	33.6	33.8	31.5	31.1	28.7	52.7
	Background (dBA)	8.5	11.1	14.0	15.5	18.7	27.8	25.8	28.3	26.2	26.7	28.1	28.8	29.3	30.6	30.4	31.0	31.0	31.4	31.9	31.1	31.7	32.7	33.3	33.0	34.0	32.7	33.0	29.5	44.6
	Turbine ON - background adj (dBA)	12.5	17.2	22.8	26.0	29.3	32.0	34.1	36.0	36.2	38.0	37.9	38.3	38.5	37.0	38.9	41.0	40.9	41.5	44.8	41.5	40.5	37.5	34.8	[30.6]	[30.8]	[28.5]	[28.1]	[25.7]	52.1
	Signal to noise (dB)	5.4	7.0	9.3	10.8	11.0	5.6	8.9	8.4	10.5	11.7	10.2	10.0	9.6	7.3	9.1	10.4	10.4	10.5	13.1	10.8	9.3	6.1	3.8	0.6	-0.2	-1.1	-1.9	-0.9	8.1
8.0	Uncertainty (dB)	2.9	2.1	1.3	1.7	1.2	1.4	1.0	1.0	0.9	0.9	0.8	0.8	0.8	0.9	0.8	0.8	0.8	0.8	0.8	0.8	1.1	2.0	2.5	2.4	2.6	3.1	3.8	0.9	
	PWL (dBA)	61.4	66.2	71.7	75.0	78.3	80.9	83.1	84.9	85.2	87.0	86.8	87.3	87.4	86.0	87.9	90.0	89.9	90.5	93.7	90.5	89.5	86.5	83.7	[79.6]	[79.8]	[77.5]	[77.1]	[74.6]	101.0
	Turbine ON (dBA)	13.4	18.2	22.6	26.5	29.9	33.2	35.1	35.9	37.1	38.5	38.5	39.5	39.0	38.5	39.9	41.2	41.7	42.4	45.5	42.5	42.0	39.6	37.7	34.4	33.1	31.5	31.5	29.0	53.1
	Background (dBA)	7.5	9.9	13.0	14.6	18.4	27.5	24.6	23.8	25.5	25.2	25.7	26.9	27.2	26.9	27.7	27.9	28.5	29.1	29.0	29.4	30.4	31.8	32.7	32.5	33.7	32.4	32.7	29.1	43.3
	Turbine ON - background adj (dBA)	12.1	17.5	22.1	26.2	29.5	31.9	34.7	35.6	36.8	38.3	38.3	39.3	38.8	38.2	39.6	41.0	41.4	42.2	45.4	42.2	41.7	38.9	36.1	[31.4]	[30.1]	[28.5]	[28.5]	[26]	52.7
8.5	Signal to noise (dB)	5.9	8.3	9.6	11.9	11.4	5.8	10.5	12.1	11.6	13.3	12.8	12.6	11.9	11.6	12.2	13.2	13.1	13.3	16.5	13.1	11.6	7.8	5.1	1.8	-0.6	-0.8	-1.2	0.0	9.8
	Uncertainty (dB)	2.8	2.0	1.4	1.7	1.3	1.4	1.0	0.9	0.9	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.0	1.6	2.5	2.4	2.6	3.2	3.9	0.9	
	PWL (dBA)	61.1	66.5	71.1	75.2	78.5	80.9	83.7	84.6	85.7	87.3	87.2	88.3	87.7	87.2	88.6	89.9	90.4	91.2	94.4	91.2	90.7	87.8	85.1	[80.4]	[79]	[77.5]	[77.4]	[75]	101.6
	Turbine ON (dBA)	14.9	18.5	22.6	26.6	30.2	33.9	34.9	37.0	37.5	39.0	39.0	39.9	39.4	38.4	40.2	41.9	42.0	42.4	45.1	42.8	42.4	40.1	37.9	34.4	33.1	30.8	30.6	28.3	53.3
	Background (dBA)	8.2	10.7	14.0	15.6	18.8	27.6	24.6	29.1	26.2	26.2	27.1	28.6	28.8	29.6	29.6	30.5	30.1	30.7	31.3	30.8	31.7	32.9	33.8	33.6	34.8	33.5	33.8	30.3	44.7
9.0	Turbine ON - background adj (dBA)	13.8	17.8	22.0	26.2	29.9	32.7	34.5	36.2	37.1	38.8	38.7	39.6	39.0	37.8	39.8	41.5	41.8	42.1	44.9	42.5	42.0	39.2	35.8	[31.4]	[30.1]	[27.8]	[27.6]	[25.3]	52.8
	Signal to noise (dB)	6.7	7.8	8.6	11.0	11.4	6.2	10.3	7.9	11.3	12.9	11.8	11.4	10.6	8.8	10.7	11.4	11.9	11.7	13.8	12.0	10.8	7.2	4.2	0.8	-1.7	-2.7	-3.2	-2.0	8.6
	Uncertainty (dB)	2.7	2.1	1.4	1.8	1.3	1.4	1.0	1.1	1.0	0.9	0.8	0.8	0.8	0.8	0.9	0.8	0.8	0.8	0.8	0.8	1.1	1.9	2.5	2.4	2.6	3.2	3.9	0.9	
	PWL (dBA)	62.8	66.7	71.0	75.2	78.9	81.6	83.5	85.2	86.1	87.8	87.6	88.5	88.0	86.7	88.8	90.5	90.7	91.1	93.8	91.5	91.0	88.1	84.8	[80.4]	[79.1]	[76.8]	[76.5]	[74.3]	101.7
	Turbine ON (dBA)	14.0	18.9	22.5	25.6	28.9	32.3	34.9	36.3	36.9	38.8	38.7	39.5	39.3	38.3	39.9	42.9	41.8	42.6	45.0	42.6	42.0	39.6	38.0	35.2	34.4	32.7	32.6	30.0	53.2
9.0	Background (dBA)	6.8	9.5	12.7	14.9	18.1	27.4	25.6	25.7	27.1	25.7	26.6	28.1	28.2	27.4	27.9	27.9	28.5	29.1	29.0	29.5	30.6	32.0	32.8	32.7	34.4	32.5	32.8	29.2	43.6
	Turbine ON - background adj (dBA)	13.1	18.3	22.0	25.2	28.5	30.6	34.4	36.0	36.4	38.6	38.4	39.2	38.9	37.9	39.6	42.8	41.6	42.4	44.8	42.4	41.7	38.8	36.4	[32.2]	[31.4]	[29.7]	[29.6]	[27]	52.8
	Signal to noise (dB)	7.3	9.4	9.8	10.7	10.7	4.9	9.4	10.7	9.8	13.1	12.1	11.4	11.1	10.9	12.1	15.0	13.3	13.5	15.9	13.1	11.5	7.6	5.1	2.5	0.0	0.2	-0.2	0.8	9.6
	Uncertainty (dB)	2.4	1.8	1.2	1.6	1.2	1.5	1.0	0.9	0.9	0.8	0.7	0.8	0.7	0.8	0.7	0.7	0.7	0.7	0.8	0.7	0.7	1.0	1.5	2.4	2.4	2.5	3.1	3.8	0.9
	PWL (dBA)	62.1	67.3	70.9	74.2	77.4	79.6	83.4	84.9	85.4	87.5	87.4	88.1	87.9	86.9	88.6	91.8	90.6	91.3	93.8	91.4	90.7	87.7	85.3	[81.1]	[80.3]	[78.7]	[78.6]	[76]	101.7

# Table C.01 Detailed apparent sound power level data at hub height

Project: Bornish Wind Energy Centre - Turbine T22 - IEC 61400-11 Measurement  
 Report ID: 14331.00.T22.RP4

1/3 Octave values marked with brackets [ ] denote less than 3 dB difference between Turbine ON and Background

Overall levels marked with an asterisk \* denote 3 to 6 dB difference between Turbine ON and Background, while Overall values with less than 3 dB difference between Turbine ON and Background are not reported

Wind Bin (m/s)	Parameter	1/3 Octave Band (Hz)																		Overall										
		20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000		1250	1600	2000	2500	3150	4000	5000	6300	8000	10000
9.5	Turbine ON (dBA)	13.7	19.5	22.7	26.1	29.0	32.2	34.5	36.5	36.4	39.0	38.3	39.5	39.4	38.4	40.1	44.4	42.1	42.8	45.2	42.9	42.2	39.9	38.0	35.5	34.6	33.4	33.5	30.8	53.5
	Background (dBA)	9.8	12.3	14.4	16.6	19.7	27.8	24.8	24.4	27.4	26.6	27.5	28.8	29.1	29.0	29.8	29.9	30.4	30.6	30.6	31.1	32.0	33.3	34.2	34.0	35.1	33.9	34.1	30.5	44.8
	Turbine ON - background adj (dBA)	11.5	18.5	22.1	25.6	28.5	30.3	34.0	36.3	35.8	38.7	37.9	39.1	38.9	37.9	39.7	44.2	41.8	42.5	45.0	42.6	41.8	38.8	35.7	[32.5]	[31.6]	[30.4]	[30.5]	[27.8]	53.0
	Signal to noise (dB)	3.9	7.2	8.3	9.5	9.3	4.4	9.7	12.2	9.0	12.4	10.8	10.7	10.3	9.4	10.3	14.5	11.7	12.2	14.6	11.8	10.2	6.6	3.9	1.5	-0.5	-0.5	-0.6	0.2	8.7
	Uncertainty (dB)	3.6	2.1	1.3	1.7	1.2	1.6	0.9	0.9	1.0	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	1.1	2.0	2.4	2.3	2.5	3.1	3.8	0.9
	PWL (dBA)	60.5	67.5	71.0	74.5	77.4	79.2	82.9	85.2	84.8	87.7	86.9	88.1	87.9	86.8	88.6	93.2	90.7	91.5	94.0	91.5	90.8	87.8	84.7	[81.5]	[80.6]	[79.3]	[79.5]	[76.7]	102.0
10.0	Turbine ON (dBA)	14.5	19.6	22.6	25.9	29.4	32.5	34.2	36.0	36.6	38.8	38.3	39.2	39.2	38.4	40.2	44.5	42.2	42.9	45.2	43.0	42.3	39.9	38.1	35.6	35.0	33.5	33.6	30.9	53.6
	Background (dBA)	9.8	11.7	13.6	15.4	19.2	27.8	25.1	24.0	26.0	26.5	27.4	28.9	29.1	29.0	29.9	30.1	30.6	30.8	30.8	31.3	32.2	33.5	34.4	34.2	35.2	34.2	34.4	31.1	44.9
	Turbine ON - background adj (dBA)	12.7	18.9	22.1	25.5	29.0	30.8	33.6	35.7	36.2	38.5	37.9	38.8	38.8	37.9	39.8	44.4	41.9	42.6	45.1	42.7	41.9	38.8	35.6	[32.6]	[32]	[30.5]	[30.6]	[27.9]	53.0
	Signal to noise (dB)	4.7	8.0	9.0	10.5	10.2	4.8	9.1	12.0	10.6	12.3	10.9	10.4	10.1	9.4	10.3	14.5	11.6	12.1	14.4	11.8	10.1	6.4	3.7	1.4	-0.2	-0.8	-0.8	-0.1	8.6
	Uncertainty (dB)	3.2	2.0	1.2	1.7	1.2	1.5	1.0	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.8	0.8	0.8	0.8	1.1	2.1	2.5	2.4	2.5	3.1	3.9	0.9
	PWL (dBA)	61.7	67.8	71.0	74.4	77.9	79.7	82.6	84.7	85.2	87.5	86.9	87.8	87.8	86.8	88.7	93.3	90.8	91.6	94.0	91.7	90.8	87.7	84.6	[81.6]	[80.9]	[79.4]	[79.6]	[76.9]	102.0
10.5	Turbine ON (dBA)	14.0	19.5	23.2	26.2	29.0	32.1	34.0	35.8	36.3	38.8	38.2	39.3	39.3	38.4	40.2	44.6	42.2	42.9	45.0	43.0	42.4	40.1	38.2	35.9	35.3	33.9	34.0	31.4	53.6
	Background (dBA)	8.7	12.0	13.6	15.6	18.5	27.7	25.4	24.2	26.3	26.3	27.4	28.9	28.9	29.2	29.9	30.5	30.3	30.8	31.1	31.0	32.0	33.2	34.0	33.8	35.2	33.8	34.0	30.5	44.8
	Turbine ON - background adj (dBA)	12.5	18.6	22.7	25.8	28.6	30.1	33.3	35.5	35.9	38.5	37.8	38.8	38.9	37.8	39.8	44.5	41.9	42.7	44.8	42.7	41.9	39.1	36.1	[32.9]	[32.3]	[30.9]	[31]	[28.4]	53.1
	Signal to noise (dB)	5.4	7.5	9.6	10.6	10.6	4.4	8.6	11.6	10.0	12.5	10.8	10.3	10.4	9.2	10.4	14.1	11.9	12.1	13.9	12.0	10.4	6.9	4.2	2.1	0.1	0.2	0.1	0.9	8.8
	Uncertainty (dB)	2.8	2.0	1.2	1.6	1.1	1.5	0.9	0.9	0.9	0.8	0.7	0.8	0.7	0.8	0.7	0.7	0.7	0.8	0.8	0.8	0.8	1.0	1.8	2.4	2.3	2.5	3.1	3.7	0.9
	PWL (dBA)	61.5	67.6	71.7	74.8	77.6	79.1	82.3	84.4	84.8	87.5	86.8	87.8	87.8	86.8	88.8	93.4	90.9	91.6	93.8	91.7	90.9	88.1	85.1	[81.9]	[81.3]	[79.9]	[80]	[77.3]	102.0
11.0	Turbine ON (dBA)	13.9	19.2	22.4	25.5	28.8	31.8	33.6	35.7	36.0	38.6	38.2	39.1	39.2	38.3	40.3	44.9	42.4	43.1	45.3	43.0	42.2	40.1	38.3	36.1	35.6	34.3	34.5	31.8	53.6
	Background (dBA)	11.4	13.8	15.8	16.7	19.8	28.0	24.5	24.9	26.4	26.9	28.3	29.6	29.7	31.5	31.0	32.4	31.3	31.7	32.9	32.2	33.2	34.5	35.4	35.2	36.0	35.3	35.4	32.2	46.0
	Turbine ON - background adj (dBA)	[10.9]	17.7	21.3	24.9	28.3	29.5	33.0	35.4	35.5	38.3	37.7	38.6	38.6	37.2	39.8	44.7	42.0	42.7	45.0	42.6	41.7	38.7	[35.3]	[33.1]	[32.6]	[31.3]	[31.5]	[28.8]	53.0
	Signal to noise (dB)	2.5	5.3	6.6	8.8	9.1	3.8	9.1	10.9	9.6	11.7	9.9	9.6	9.4	6.8	9.3	12.5	11.0	11.3	12.3	10.8	9.0	5.7	2.9	0.9	-0.4	-0.9	-0.9	-0.3	7.6
	Uncertainty (dB)	4.5	2.4	1.4	1.8	1.2	1.7	1.0	0.9	0.9	0.9	0.8	0.8	0.8	0.9	0.8	0.8	0.7	0.8	0.8	0.8	0.8	1.2	2.4	2.4	2.3	2.5	3.1	3.8	0.9
	PWL (dBA)	[59.9]	66.6	70.2	73.8	77.2	78.5	82.0	84.3	84.5	87.3	86.7	87.6	87.6	86.2	88.7	93.6	91.0	91.7	94.0	91.6	90.6	87.7	[84.3]	[82]	[81.5]	[80.3]	[80.5]	[77.8]	102.0

# Table C.02 Detailed apparent sound power level data at 10m height

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1/3 Octave values marked with brackets [ ] denote less than 3 dB difference between Turbine ON and Background

Overall levels marked with an asterisk \* denote 3 to 6 dB difference between Turbine ON and Background, while Overall values with less than 3 dB difference between Turbine ON and Background are not reported

Wind Bin (m/s)	Parameter	1/3 Octave Band (Hz)																		Overall										
		20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	
5.0	Turbine ON (dBA)	12.7	17.1	23.2	26.2	29.2	33.6	34.5	35.9	36.2	37.9	37.6	38.4	38.7	37.4	39.1	41.1	40.8	41.4	44.4	41.3	40.2	37.8	36.3	32.6	32.2	31.2	30.4	28.1	52.1
	Background (dBA)	8.4	10.6	13.6	15.1	18.5	27.7	25.2	26.6	25.8	25.9	27.0	28.1	28.4	29.2	29.4	29.9	30.1	30.5	30.8	30.5	31.3	32.5	33.2	33.0	34.0	32.8	33.2	29.7	44.1
	Turbine ON - background adj (dBA)	10.6	16.0	22.7	25.8	28.8	32.2	34.0	35.3	35.8	37.6	37.2	38.0	38.3	36.6	38.6	40.8	40.4	41.1	44.3	40.9	39.6	36.3	33.3	[29.6]	[29.2]	[28.2]	[27.4]	[25.1]	51.5
	Signal to noise (dB)	4.2	6.5	9.6	11.1	10.8	5.9	9.3	9.3	10.4	12.0	10.6	10.3	10.3	8.1	9.7	11.2	10.8	10.9	13.6	10.8	8.9	5.3	3.1	-0.4	-1.8	-1.6	-2.8	-1.7	8.0
	Uncertainty (dB)	4.8	3.3	2.0	2.7	1.9	2.2	1.6	1.6	1.5	1.4	1.2	1.2	1.2	1.3	1.2	1.2	1.2	1.2	1.3	1.2	1.3	1.8	3.1	3.5	3.4	3.6	4.5	5.5	1.4
	PWL (dBA)	59.5	64.9	71.6	74.8	77.8	81.2	82.9	84.3	84.7	86.6	86.1	86.9	87.3	85.6	87.5	89.7	89.4	90.0	93.2	89.9	88.6	85.2	82.3	[78.5]	[78.1]	[77.1]	[76.3]	[74]	100.5
6.0	Turbine ON (dBA)	14.3	18.6	22.7	26.3	29.7	33.3	34.9	36.6	37.1	38.7	38.7	39.5	39.2	38.4	40.0	41.9	41.8	42.4	45.2	42.6	42.1	39.8	37.9	34.6	33.8	31.7	31.7	29.2	53.1
	Background (dBA)	7.5	10.0	13.2	14.9	18.4	27.4	25.0	26.9	26.5	25.7	26.7	28.0	28.2	28.2	28.5	28.9	29.1	29.7	29.9	29.9	30.9	32.2	33.1	33.0	34.2	32.8	33.1	29.5	43.9
	Turbine ON - background adj (dBA)	13.4	18.0	22.2	25.9	29.4	31.9	34.4	36.1	36.7	38.5	38.5	39.2	38.9	38.0	39.7	41.6	41.6	42.2	45.0	42.4	41.7	38.9	36.1	[31.6]	[30.8]	[28.7]	[28.7]	[26.2]	52.7
	Signal to noise (dB)	6.9	8.7	9.5	11.3	11.3	5.8	9.9	9.7	10.6	13.0	12.0	11.5	11.1	10.2	11.5	12.9	12.7	12.8	15.3	12.7	11.2	7.5	4.8	1.6	-0.5	-1.1	-1.5	-0.3	9.3
	Uncertainty (dB)	2.5	1.9	1.2	1.6	1.2	1.3	0.9	0.9	0.9	0.7	0.8	0.8	0.8	0.7	0.8	0.7	0.8	0.7	0.8	0.8	0.8	1.0	1.7	2.4	2.3	2.4	3.1	3.8	0.9
	PWL (dBA)	62.3	66.9	71.1	74.9	78.3	80.9	83.4	85.1	85.6	87.5	87.4	88.2	87.9	87.0	88.6	90.6	90.5	91.2	94.0	91.3	90.7	87.9	85.1	[80.6]	[79.7]	[77.7]	[77.6]	[75.2]	101.7
7.0	Turbine ON (dBA)	14.2	19.5	22.8	25.9	29.2	32.4	34.3	36.2	36.5	38.9	38.3	39.3	39.3	38.4	40.1	44.3	42.1	42.8	45.2	42.9	42.3	39.9	38.1	35.6	34.9	33.4	33.5	30.8	53.5
	Background (dBA)	9.5	12.0	14.0	16.1	19.3	27.9	25.1	24.1	26.5	26.4	27.2	28.6	28.8	28.7	29.6	29.7	30.3	30.5	30.5	30.9	31.9	33.2	34.0	33.9	35.1	33.8	34.0	30.5	44.7
	Turbine ON - background adj (dBA)	12.4	18.6	22.2	25.5	28.8	30.6	33.8	35.9	36.1	38.6	38.0	39.0	38.9	37.9	39.7	44.1	41.8	42.6	45.0	42.7	41.9	38.9	35.9	[32.6]	[31.9]	[30.4]	[30.5]	[27.8]	53.0
	Signal to noise (dB)	4.7	7.5	8.8	9.9	10.0	4.6	9.2	12.1	10.0	12.5	11.1	10.7	10.5	9.7	10.5	14.5	11.9	12.3	14.6	12.0	10.4	6.7	4.1	1.7	-0.2	-0.4	-0.5	0.3	8.8
	Uncertainty (dB)	3.0	1.9	1.2	1.6	1.1	1.4	0.9	0.8	0.9	0.8	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.8	0.8	0.7	1.0	1.8	2.3	2.1	2.3	2.9	3.6	0.8
	PWL (dBA)	61.4	67.6	71.1	74.4	77.7	79.5	82.7	84.9	85.0	87.6	86.9	87.9	87.8	86.8	88.7	93.1	90.8	91.5	94.0	91.6	90.8	87.9	84.9	[81.6]	[80.9]	[79.4]	[79.5]	[76.8]	102.0
8.0	Turbine ON (dBA)	13.8	19.3	22.7	25.8	28.9	31.8	33.8	35.7	36.4	38.5	38.1	39.2	39.2	38.4	40.3	44.9	42.4	43.1	45.2	43.1	42.3	40.1	38.2	35.9	35.3	34.1	34.3	31.6	53.7
	Background (dBA)	10.6	12.9	15.0	16.1	19.2	27.8	24.1	24.5	26.5	26.7	27.9	29.4	29.5	30.5	30.7	31.5	31.0	31.4	32.1	31.9	33.0	34.3	35.2	35.0	36.4	35.1	35.2	31.9	45.8
	Turbine ON - background adj (dBA)	11.0	18.2	21.9	25.4	28.4	29.7	33.3	35.4	36.0	38.2	37.6	38.7	38.7	37.6	39.8	44.7	42.1	42.8	45.0	42.7	41.8	38.8	35.3	[32.9]	[32.3]	[31.1]	[31.3]	[28.6]	53.1
	Signal to noise (dB)	3.2	6.4	7.7	9.7	9.7	4.1	9.8	11.3	10.0	11.9	10.2	9.8	9.6	7.9	9.7	13.4	11.4	11.8	13.1	11.2	9.4	5.9	3.0	0.9	-1.1	-1.0	-1.0	-0.4	7.9
	Uncertainty (dB)	4.3	2.2	1.3	1.7	1.2	1.6	0.9	0.9	0.9	0.8	0.8	0.8	0.8	0.9	0.8	0.8	0.7	0.8	0.8	0.8	0.8	1.1	2.4	2.4	2.3	2.4	3.1	3.8	0.9
	PWL (dBA)	59.9	67.1	70.8	74.3	77.4	78.6	82.3	84.4	84.9	87.2	86.6	87.7	87.6	86.5	88.8	93.7	91.0	91.8	94.0	91.7	90.8	87.8	84.2	[81.9]	[81.3]	[80.1]	[80.2]	[77.5]	102.0

## Table C.03 Type B measurement uncertainty summary

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Overall Equipment Uncertainties		
	Typical values	Used values
Calibration	0.2 dB	0.2 dB
Board	0.3 dB	0.3 dB
Distance	0.1 dB	0.1 dB
Air absorption	0 dB	0 dB
Weather	0.5 dB	0.5 dB

1/3 Octave Band Uncertainties		
Frequency (Hz)	Microphone Uncertainty	Overall (including overall equipment Uncertainties)
20	0.8 dB	2 dB
25	0.8 dB	1.6 dB
31.5	0.5 dB	1.1 dB
40	0.5 dB	1.5 dB
50	0.5 dB	1.1 dB
63	0.5 dB	0.9 dB
80	0.5 dB	0.8 dB
100	0.5 dB	0.8 dB
125	0.5 dB	0.8 dB
160	0.5 dB	0.8 dB
200	0.3 dB	0.7 dB
250	0.3 dB	0.7 dB
315	0.3 dB	0.7 dB
400	0.3 dB	0.7 dB
500	0.3 dB	0.7 dB
630	0.3 dB	0.7 dB
800	0.3 dB	0.7 dB
1000	0.3 dB	0.8 dB
1250	0.3 dB	0.8 dB
1600	0.3 dB	0.8 dB
2000	0.3 dB	0.7 dB
2500	0.5 dB	0.8 dB
3150	0.5 dB	1.1 dB
4000	0.5 dB	1.1 dB
5000	0.5 dB	1 dB
6300	0.5 dB	1.1 dB
8000	0.5 dB	1.4 dB
10000	1.3 dB	1.7 dB

**Table C.04 Detailed measurement uncertainty at hub height**  
 Project: Bornish Wind Energy Centre - Turbine T22 - IEC 61400-11 Measurement  
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Wind Bin (m/s)	Parameter	Average Wind Speed (m/s)	# of data points	Parameter	1/3 Octave Band (Hz)																	Overall													
					20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630	800		1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000		
7.0	Turbine ON	7.06	10	Average (dBA)	10.6	17.3	22.1	24.2	28.6	34.3	35.1	34.6	35.7	36.6	36.0	38.3	38.7	36.7	38.9	40.6	40.3	41.2	42.7	41.3	39.5	37.3	36.6	33.4	32.5	32.9	32.2	30.1	51.6		
				Uncertainty A (dB)	1.0	1.2	1.6	1.2	0.6	1.6	1.4	0.9	0.9	0.6	0.6	0.3	0.5	0.3	0.6	0.4	0.3	0.3	0.5	0.4	0.3	0.4	0.3	0.4	0.5	0.6	0.7	0.8		1.0	0.8
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0		1.1	1.4
	Background	7.05	13	Combined Uncertainty (dB)	2.2	2.0	1.9	1.9	1.2	1.9	1.6	1.2	1.2	1.0	0.9	0.8	0.8	0.9	0.8	0.8	0.9	0.8	0.8	0.9	0.9	0.9	0.8	0.9	1.2	1.2	1.2	1.3	1.7	1.9	
				Average (dBA)	7.5	9.8	13.0	14.4	18.0	27.5	24.3	23.2	25.4	25.1	25.8	27.0	27.3	27.2	28.0	28.5	28.9	29.3	29.4	29.6	30.6	32.0	32.8	32.6	34.0	32.6	33.0	29.4	43.5		
				Uncertainty A (dB)	1.2	0.8	0.3	0.2	0.3	0.3	0.4	0.2	0.3	0.3	0.6	0.8	0.9	1.0	1.0	1.0	0.8	0.9	1.1	1.2	1.3	1.3	1.3	1.3	1.4	1.4	1.5	1.4		1.5	
7.5	Turbine ON	7.53	53	Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7			
				Combined Uncertainty (dB)	2.1	1.7	1.2	1.6	1.2	1.0	0.9	0.9	0.9	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.1	1.1	1.4	1.7		
				Average (dBA)	14.2	18.2	23.4	26.5	29.8	33.3	34.7	36.8	36.7	38.5	38.5	38.8	39.0	38.0	39.5	41.5	41.4	42.0	42.0	45.2	42.0	41.2	38.9	37.1	33.6	33.9	31.4	31.1	28.6	52.7	
	Background	7.52	19	Uncertainty A (dB)	0.6	0.6	0.5	0.6	0.5	0.4	0.4	0.4	0.3	0.2	0.2	0.2	0.2	0.1	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.2	0.4	0.4	0.4	0.4				
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7		
				Combined Uncertainty (dB)	2.1	1.7	1.2	1.6	1.2	1.0	0.9	0.9	0.9	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.1	1.1	1.4	1.7		
8.0	Turbine ON	8.01	38	Average (dBA)	8.6	11.2	14.0	15.6	18.8	27.8	25.9	28.5	26.2	26.7	28.1	28.9	29.4	30.8	30.5	31.1	31.0	31.5	32.0	31.2	31.8	32.7	33.3	33.0	34.0	32.7	33.0	29.5	44.6		
				Uncertainty A (dB)	1.2	0.9	0.6	0.5	0.4	0.3	0.5	1.2	0.5	0.7	0.8	0.9	1.0	1.3	1.1	1.2	1.0	0.9	1.1	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		1.0	1.1
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1		1.4	1.7
	Background	8.01	25	Combined Uncertainty (dB)	2.3	1.9	1.2	1.6	1.1	1.0	1.0	1.5	1.0	1.1	1.1	1.1	1.2	1.5	1.3	1.4	1.2	1.2	1.3	1.3	1.3	1.3	1.3	1.5	1.5	1.4	1.5	1.7	2.0		
				Average (dBA)	13.4	18.2	22.6	26.5	29.9	33.2	35.1	35.9	37.1	38.5	38.5	39.6	39.0	38.5	39.9	41.2	41.7	42.4	42.4	45.5	42.5	42.1	39.7	37.8	34.4	33.0	31.5	31.5	29.1	53.1	
				Uncertainty A (dB)	0.6	0.6	0.7	0.6	0.5	0.5	0.4	0.3	0.4	0.3	0.4	0.3	0.2	0.3	0.2	0.3	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.3	0.4	0.5	0.5	0.4		
8.5	Turbine ON	8.50	40	Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7			
				Combined Uncertainty (dB)	2.1	1.8	1.2	1.6	1.2	1.0	0.9	0.9	0.9	0.9	0.7	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.1	1.1	1.4	1.7		
				Average (dBA)	8.2	10.7	14.0	15.6	18.8	27.6	24.6	29.1	26.2	26.2	27.1	28.6	28.8	29.6	29.6	30.5	30.1	30.7	31.3	30.8	31.7	32.9	33.8	33.6	34.8	33.5	33.8	30.3	44.7		
	Background	8.50	22	Uncertainty A (dB)	0.8	0.6	0.5	0.3	0.3	0.3	0.3	1.3	0.3	0.4	0.5	0.6	0.8	0.6	0.7	0.5	0.5	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.6	0.6	0.7			
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4		1.7	
				Combined Uncertainty (dB)	2.1	1.7	1.2	1.6	1.1	1.0	0.9	0.9	0.9	0.9	0.8	0.9	0.9	0.9	1.1	0.9	1.0	0.9	0.9	1.0	0.9	0.9	1.0	1.2	1.2	1.1	1.2	1.5	1.8		
9.0	Turbine ON	8.97	43	Average (dBA)	14.1	18.8	22.4	25.6	28.8	32.3	35.0	36.3	36.9	38.8	38.7	39.5	39.3	38.3	39.9	42.8	41.8	42.6	44.9	42.6	42.0	39.6	38.0	35.2	34.4	32.7	32.6	29.9	53.2		
				Uncertainty A (dB)	0.5	0.6	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.1	0.1	0.2	0.1	0.1	0.1	0.2	0.3	0.5	0.5		0.4	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1		1.4	1.7
	Background	9.01	27	Combined Uncertainty (dB)	2.0	1.7	1.2	1.6	1.1	1.0	0.9	0.9	0.9	0.9	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.1	1.1	1.4	1.8		
				Average (dBA)	6.7	9.4	12.6	14.9	18.1	27.4	25.6	25.6	27.1	25.6	26.5	28.1	28.1	27.4	27.8	27.9	28.5	29.1	29.0	29.5	30.6	32.0	32.8	32.7	34.3	32.5	32.8	29.2	43.6		
				Uncertainty A (dB)	0.6	0.4	0.3	0.2	0.2	0.2	0.5	0.6	0.5	0.3	0.5	0.6	0.6	0.6	0.5	0.5	0.4	0.5	0.6	0.6	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7		0.8	
Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7					
Combined Uncertainty (dB)	2.1	1.7	1.1	1.5	1.1	1.0	1.0	1.0	1.0	0.9	0.8	0.9	0.9	0.9	0.9	0.9	0.9	0.8	0.9	0.9	1.0	1.0	1.0	1.1	1.3	1.3	1.2	1.3	1.5	1.9					

# Table C.04 Detailed measurement uncertainty at hub height

Project: Bornish Wind Energy Centre - Turbine T22 - IEC 61400-11 Measurement  
 Report ID: 14331.00.T22.RP4

Wind Bin (m/s)	Parameter	Average Wind Speed (m/s)	# of data points	Parameter	1/3 Octave Band (Hz)																Overall																	
					20	25	31.5	40	50	63	80	100	125	160	200	250	315	400	500	630		800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000					
9.5	Turbine ON	9.52	191	Average (dBA)	13.7	19.5	22.7	26.1	29.0	32.2	34.5	36.5	36.4	39.0	38.3	39.5	39.4	38.4	40.1	44.4	42.1	42.8	45.2	42.9	42.2	39.9	38.0	35.5	34.6	33.4	33.5	30.8	53.5					
				Uncertainty A (dB)	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.2	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7			
				Combined Uncertainty (dB)	2.0	1.7	1.1	1.5	1.1	1.0	0.8	0.9	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7			
	Background	9.48	33	Average (dBA)	9.8	12.3	14.5	16.6	19.7	27.8	24.8	24.4	27.4	26.6	27.5	28.8	29.1	29.0	29.8	29.9	30.4	30.6	30.6	31.1	32.0	33.3	34.1	34.0	35.1	33.8	34.1	30.5	44.8					
				Uncertainty A (dB)	0.9	0.7	0.5	0.5	0.4	0.2	0.3	0.3	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6			
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7			
10.0	Turbine ON	10.01	200	Average (dBA)	14.5	19.6	22.6	25.9	29.4	32.6	34.2	36.0	36.6	38.8	38.3	39.2	39.2	38.4	40.2	44.5	42.2	42.9	45.2	43.0	42.3	39.9	38.1	35.6	35.0	33.5	33.6	30.9	53.6					
				Uncertainty A (dB)	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.2		
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7			
				Combined Uncertainty (dB)	2.0	1.7	1.1	1.5	1.1	1.0	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7			
	Background	10.01	20	Average (dBA)	9.8	11.7	13.6	15.3	19.2	27.8	25.1	24.0	25.9	26.5	27.4	28.9	29.1	29.0	29.9	30.1	30.6	30.8	30.8	31.3	32.2	33.5	34.4	34.2	35.2	34.2	34.4	31.1	44.9					
				Uncertainty A (dB)	1.1	0.7	0.4	0.3	0.4	0.3	0.5	0.3	0.3	0.4	0.5	0.5	0.6	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.7	0.8	0.8	0.8	0.8	0.9	0.9	0.9	0.9			
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7			
10.5	Turbine ON	10.47	159	Average (dBA)	14.0	19.5	23.3	26.2	29.0	32.1	34.0	35.8	36.3	38.8	38.2	39.3	39.3	38.4	40.2	44.6	42.2	42.9	45.0	43.0	42.4	40.1	38.2	35.9	35.3	33.9	34.0	31.3	53.6					
				Uncertainty A (dB)	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.3	
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7			
				Combined Uncertainty (dB)	2.0	1.7	1.1	1.6	1.1	1.0	0.9	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7			
	Background	10.44	19	Average (dBA)	8.3	11.8	13.3	15.4	18.3	27.7	25.5	24.1	26.3	26.2	27.2	28.9	28.7	28.9	29.7	30.3	30.2	30.7	30.9	30.8	31.8	33.0	33.8	33.7	35.1	33.6	33.8	30.3	44.6					
				Uncertainty A (dB)	1.1	1.0	0.5	0.4	0.3	0.3	0.7	0.3	0.5	0.4	0.6	0.7	0.7	0.9	0.9	0.9	0.8	0.7	0.8	0.9	0.9	1.0	1.0	1.0	0.9	1.1	1.0	1.0	1.1	1.0	1.1			
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7			
11.0	Turbine ON	11.00	167	Average (dBA)	13.9	19.2	22.3	25.5	28.8	31.8	33.6	35.7	36.0	38.6	38.2	39.1	39.2	38.3	40.3	44.9	42.4	43.1	45.3	43.0	42.2	40.1	38.3	36.1	35.6	34.3	34.6	31.8	53.6					
				Uncertainty A (dB)	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.3		
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7			
				Combined Uncertainty (dB)	2.0	1.7	1.1	1.6	1.1	1.0	0.9	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7			
	Background	11.03	18	Average (dBA)	11.6	14.0	15.9	16.8	19.9	28.0	24.5	24.9	26.4	26.9	28.3	29.6	29.8	31.6	31.1	32.5	31.4	31.8	33.0	32.3	33.3	34.5	35.4	35.2	36.1	35.4	35.5	32.3	46.1					
				Uncertainty A (dB)	1.1	0.9	0.7	0.4	0.3	0.2	0.3	0.2	0.3	0.4	0.4	0.5	0.8	0.5	0.8	0.5	0.5	0.7	0.6	0.6	0.7	0.6	0.6	0.7	0.7	0.7	0.7	0.8	0.7	0.8	0.7	0.8		
				Uncertainty B (dB)	2.0	1.6	1.1	1.5	1.1	0.9	0.8	0.8	0.8	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.8	0.8	0.8	0.7	0.8	1.1	1.1	1.0	1.1	1.4	1.7			

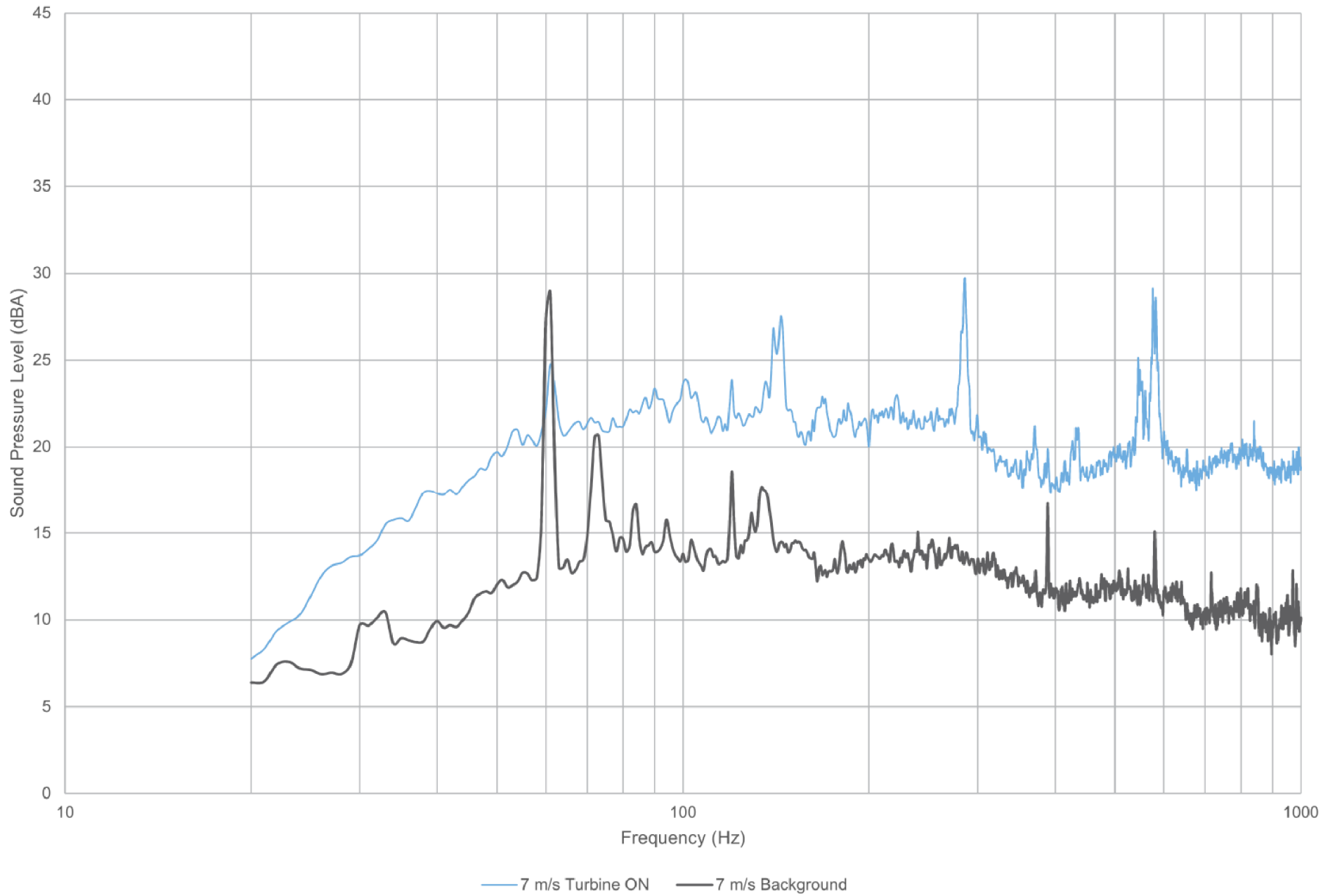


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## Appendix D Tonality Assessment

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7 m/s



14331.00.T22.RP4

Scale:NTS  
Drawn by:AM  
Reviewed by:PA  
Date:May 29, 2018  
Revision:1

**Project Name**

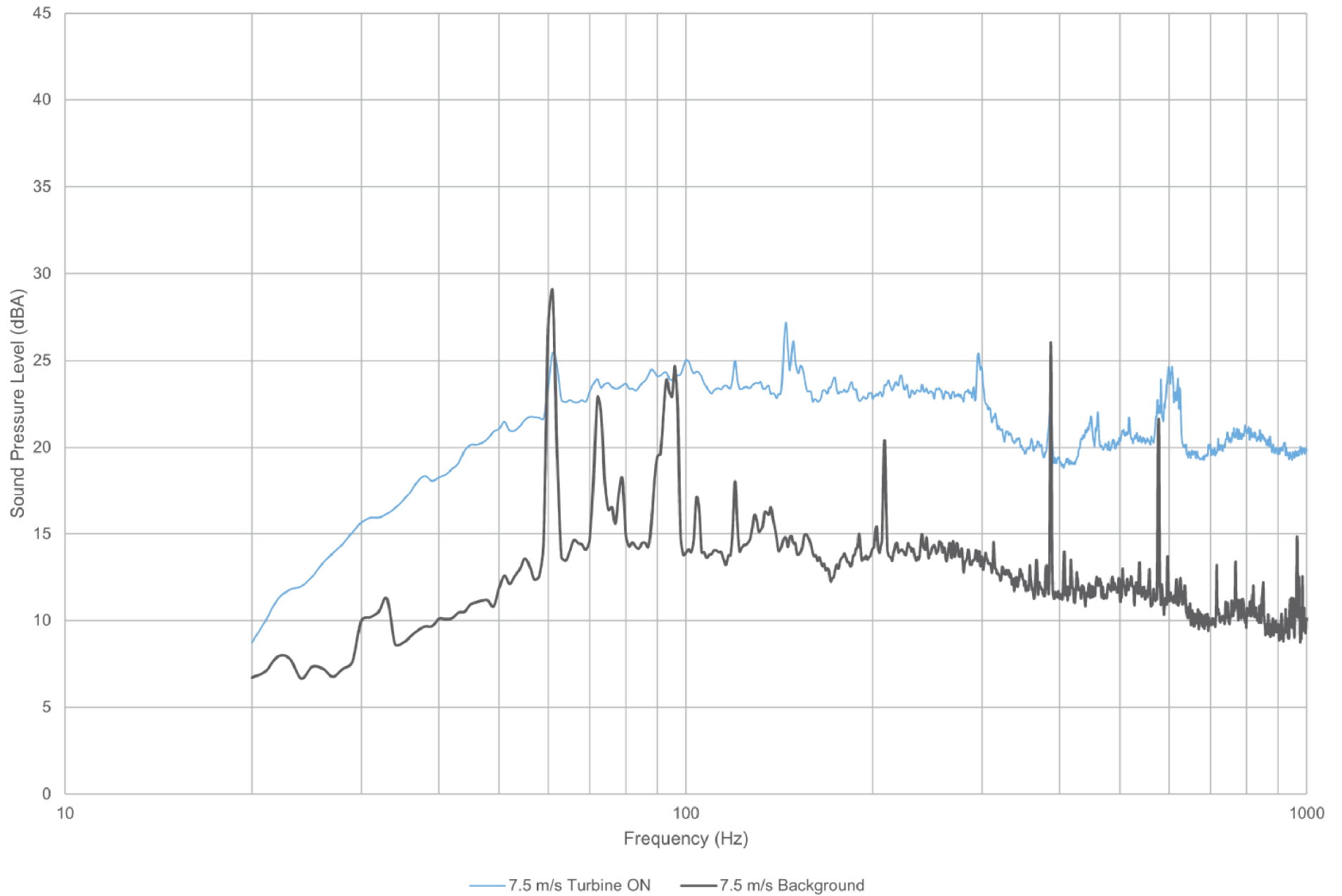
Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of narrow band spectra - Turbine ON vs. Background at 7 m/s

**Figure D.01**

7.5 m/s



14331.00.T22.RP4

Scale:NTS  
Drawn by:AM  
Reviewed by:PA  
Date:May 29, 2018  
Revision:1

**Project Name**

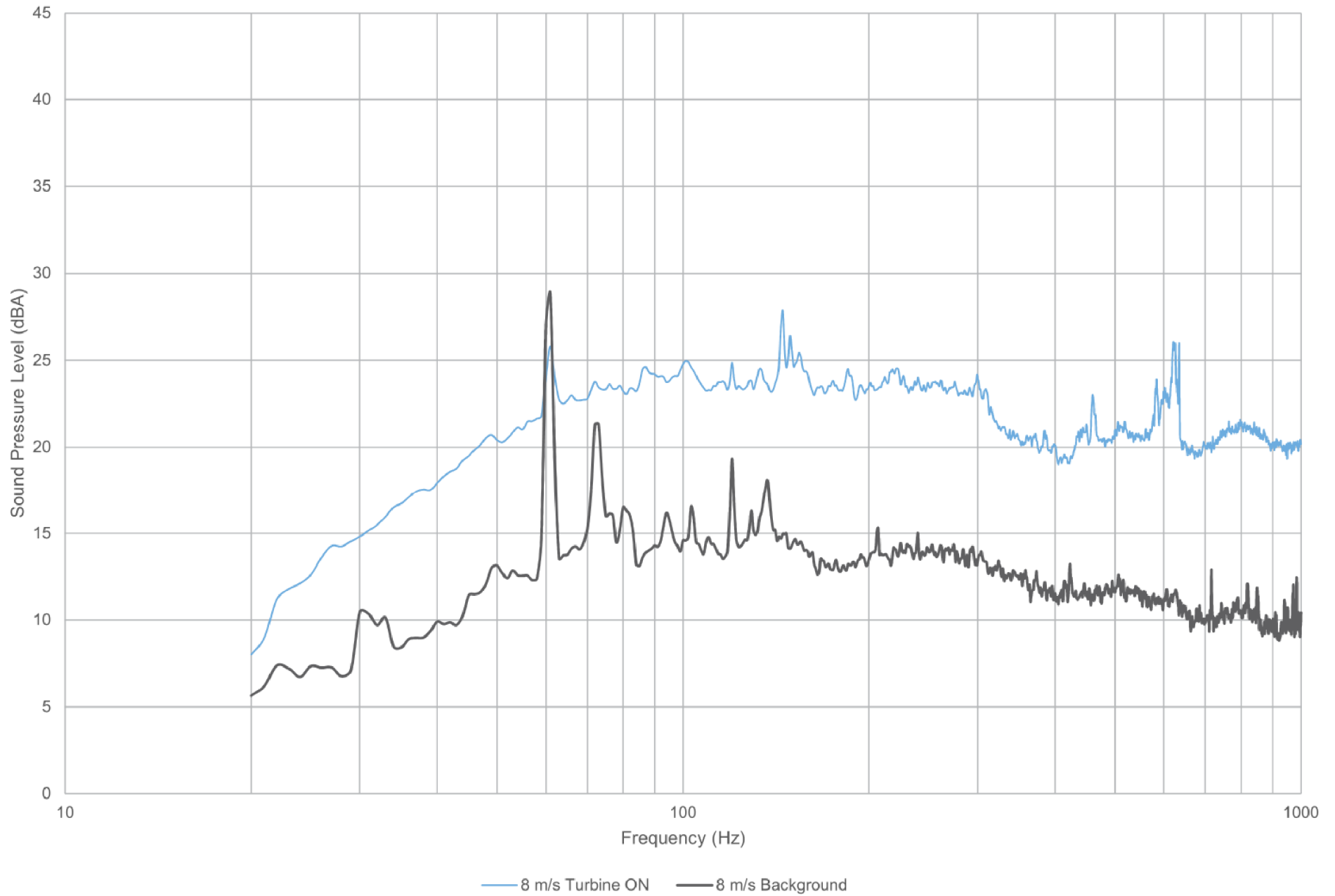
Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of narrow band spectra - Turbine ON vs. Background at 7.5 m/s

**Figure D.02**

8 m/s



14331.00.T22.RP4

Scale:NTS  
Drawn by:AM  
Reviewed by:PA  
Date:May 29, 2018  
Revision:1

**Project Name**

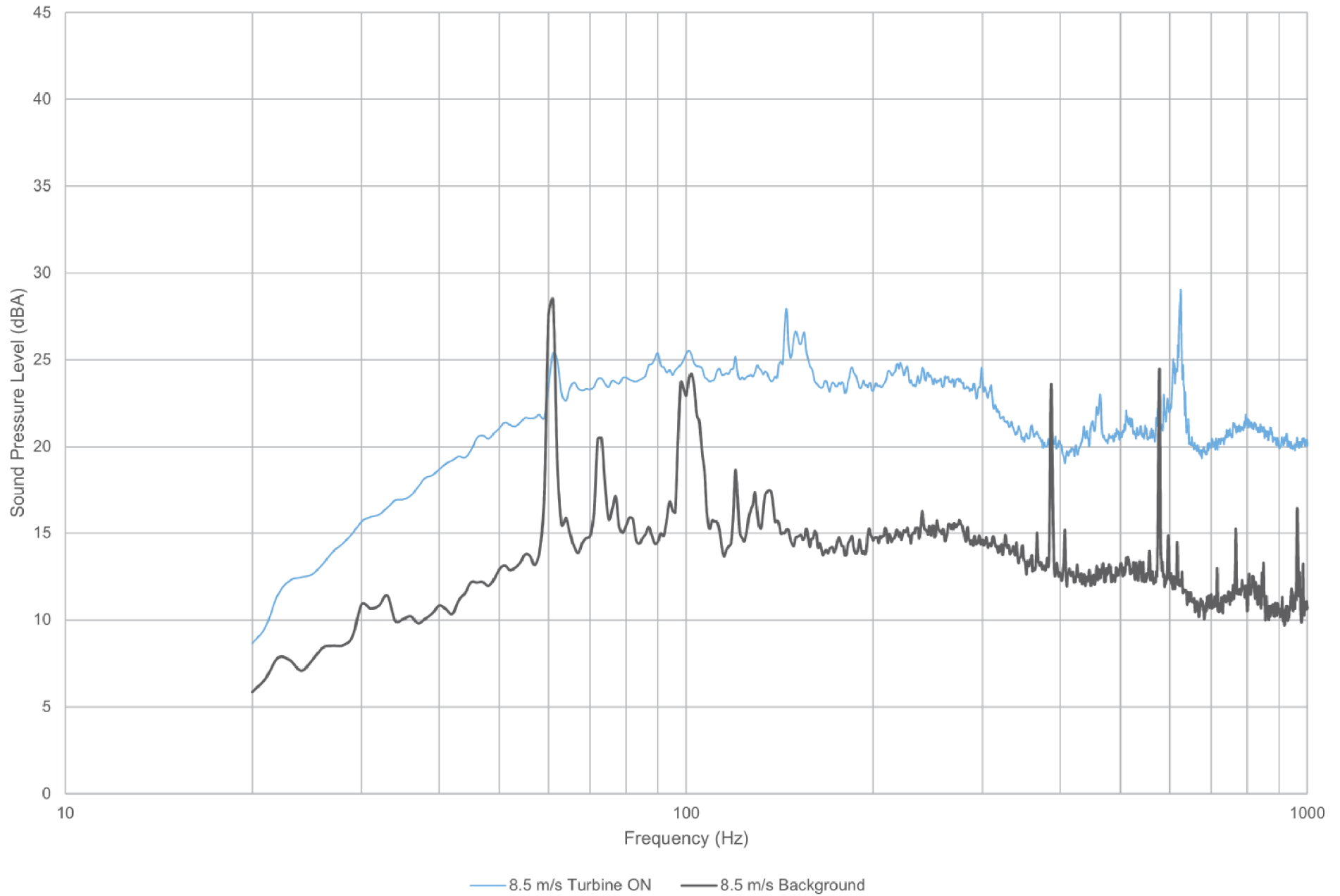
Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of narrow band spectra - Turbine ON vs. Background at 8 m/s

**Figure D.03**

8.5 m/s



14331.00.T22.RP4

Scale:NTS  
Drawn by:AM  
Reviewed by:PA  
Date:May 29, 2018  
Revision:1

**Project Name**

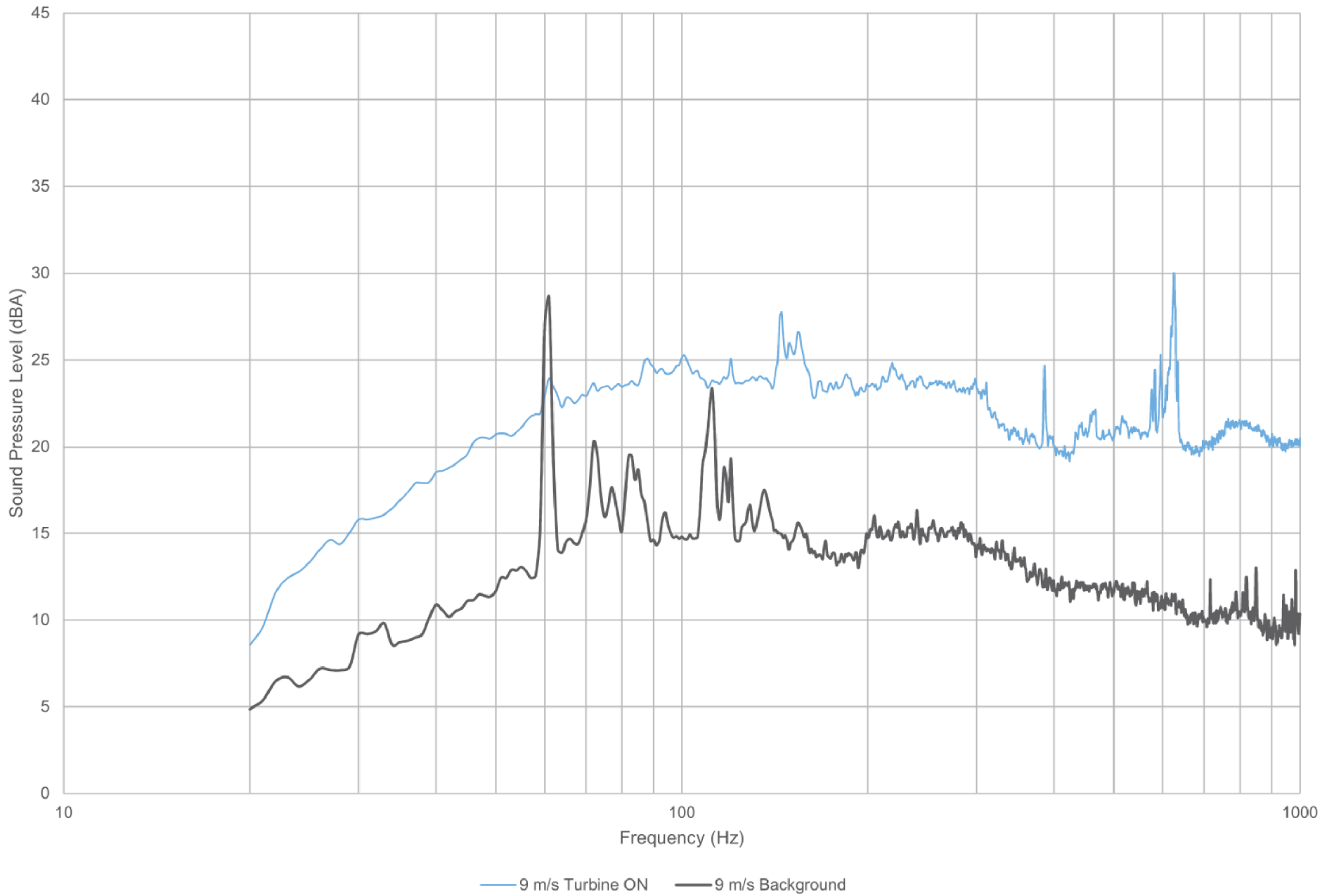
Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of narrow band spectra - Turbine ON vs. Background at 8.5 m/s

**Figure D.04**

9 m/s



14331.00.T22.RP4

Scale:NTS  
Drawn by:AM  
Reviewed by:PA  
Date:May 29, 2018  
Revision:1

**Project Name**

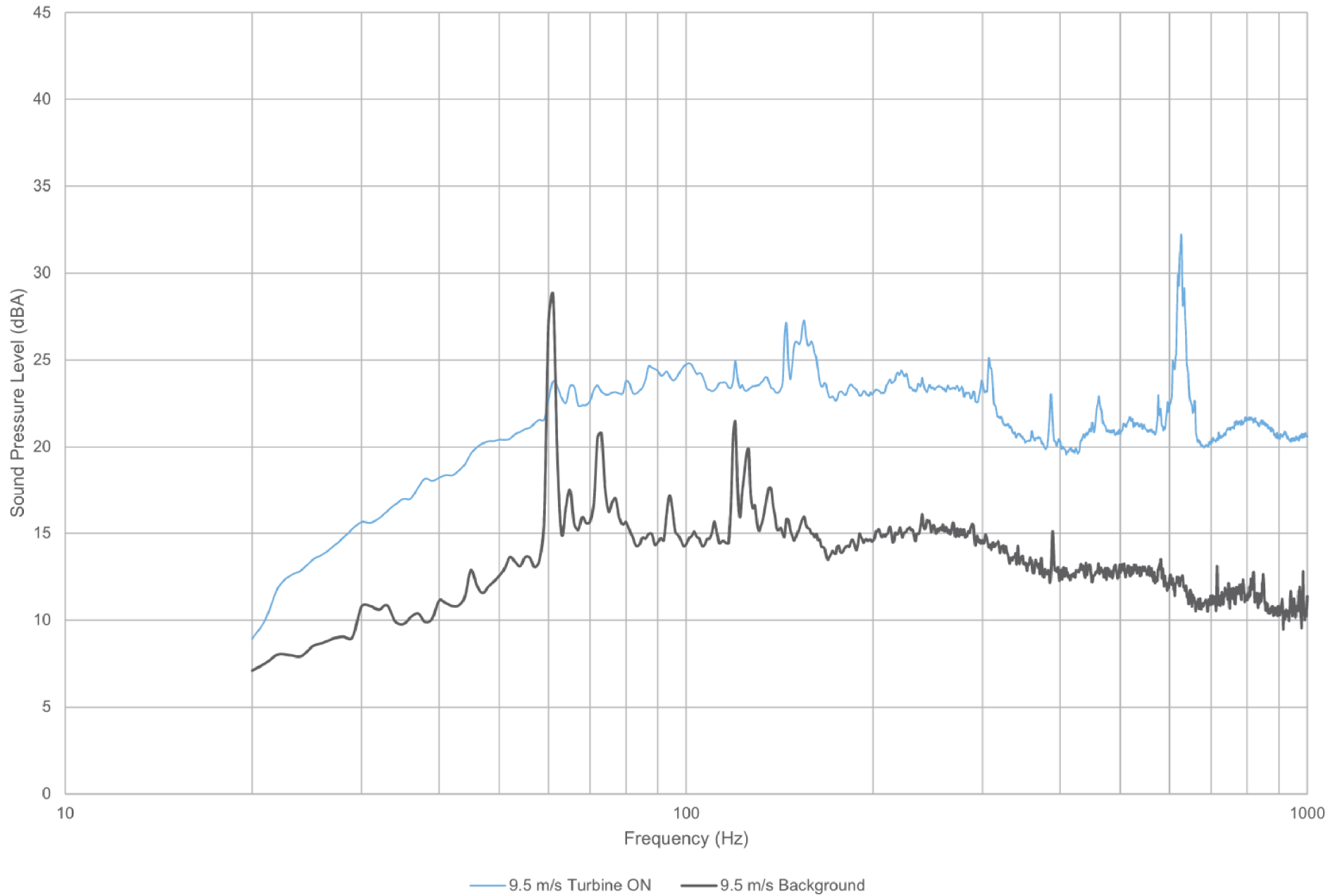
Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of narrow band spectra - Turbine ON vs. Background at 9 m/s

**Figure D.05**

9.5 m/s



14331.00.T22.RP4

Project Name



Scale: NTS  
Drawn by: AM  
Reviewed by: PA  
Date: May 29, 2018  
Revision: 1

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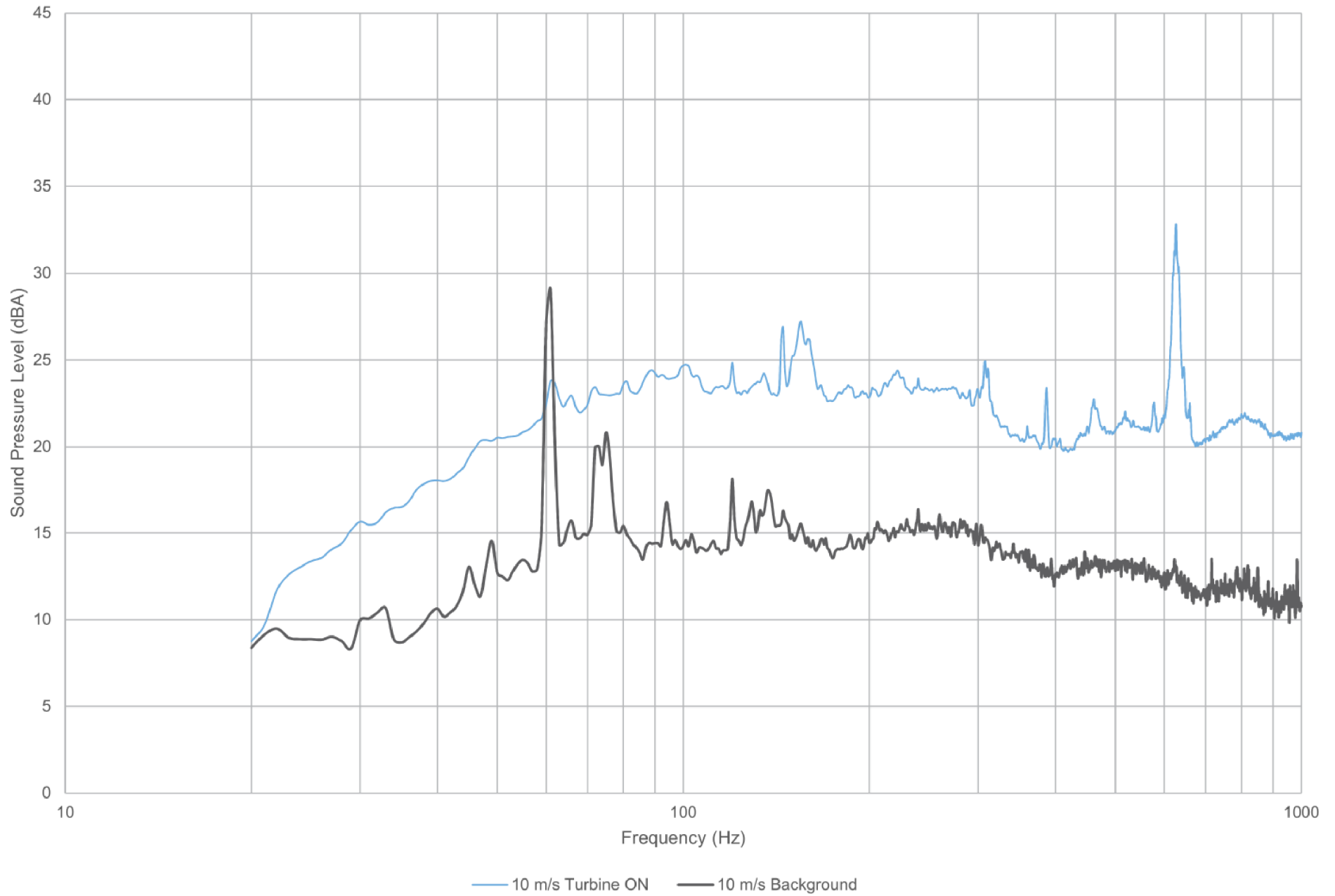
Figure Title

Plot of narrow band spectra - Turbine ON vs. Background at 9.5 m/s

Figure D.06



10 m/s



14331.00.T22.RP4

Scale:NTS  
Drawn by:AM  
Reviewed by:PA  
Date:May 29, 2018  
Revision:1

**Project Name**

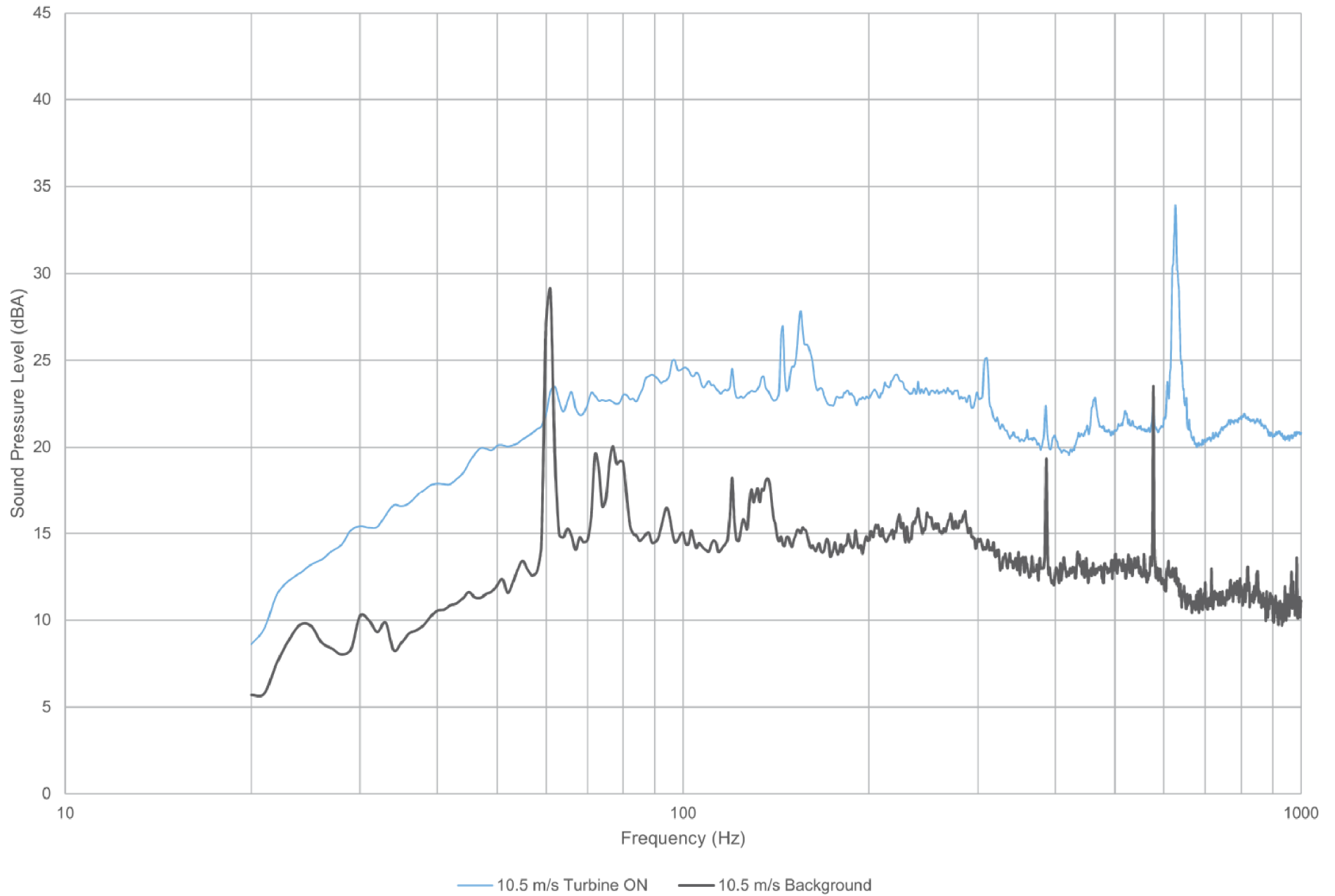
Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of narrow band spectra - Turbine ON vs. Background at 10 m/s

**Figure D.07**

10.5 m/s



14331.00.T22.RP4

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**Project Name**

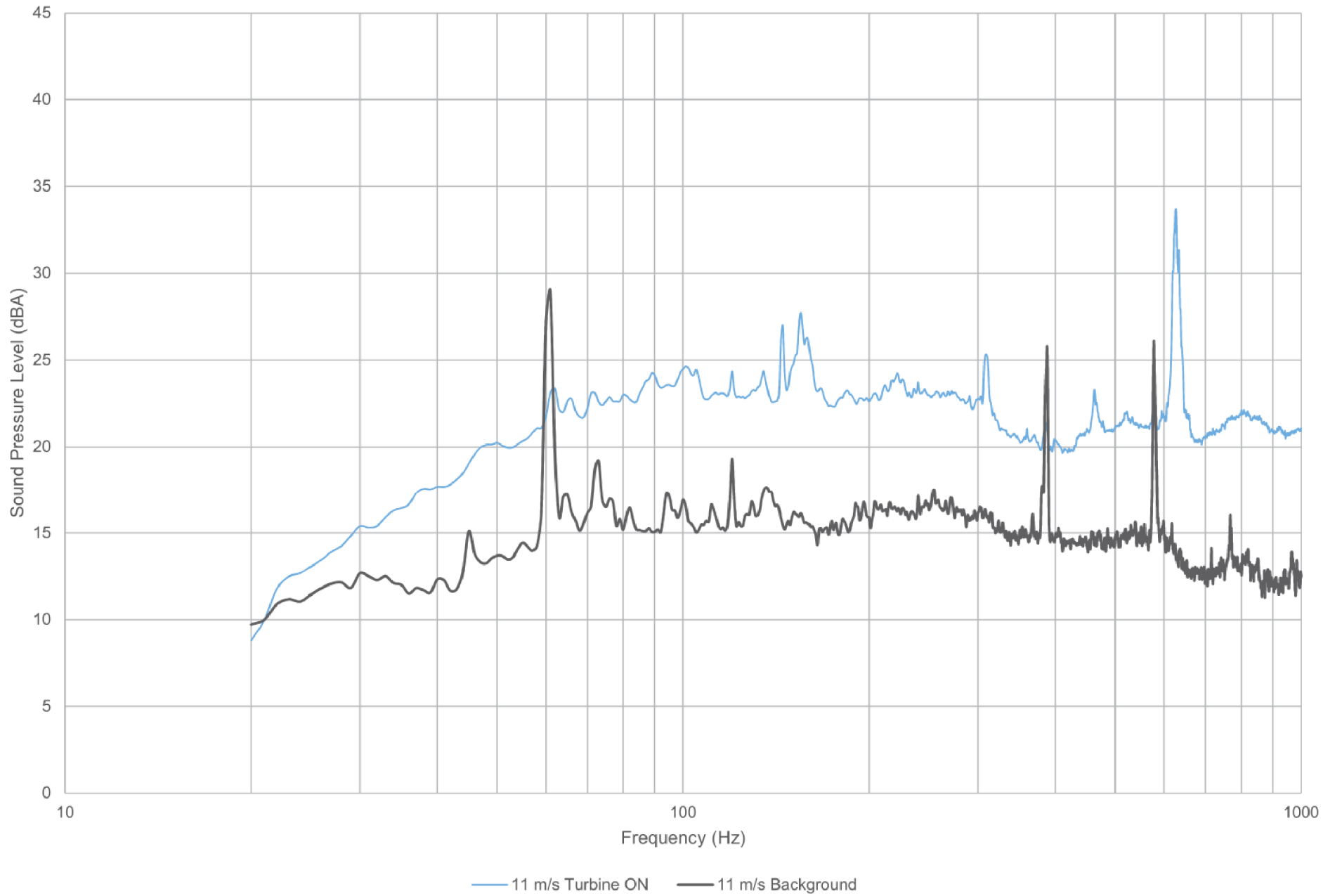
Bornish Wind Energy Centre - IEC 61400-11 Edition 3.0 - Turbine T22

**Figure Title**

Plot of narrow band spectra - Turbine ON vs. Background at 10.5 m/s

**Figure D.08**

11 m/s



14331.00.T22.RP4

Scale: NTS  
Drawn by: AM  
Reviewed by: PA  
Date: May 29, 2018  
Revision: 1

Project Name

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Figure Title

Plot of narrow band spectra - Turbine ON vs. Background at 11 m/s

Figure D.09

# Table D.01 Tonality Assessment Table - 7 m/s

Project: Bornish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement

Report ID: 14331.00.T22.RP4

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
74	545			19.0	38.1	38.9	0.9	-2.3	3.2
76	553			19.2	38.3	37.0	-1.3	-2.4	1.1
58	560			20.1	39.2	35.9	-3.3	-2.4	-0.9
1922	576			20.4	39.5	40.2	0.7	-2.4	3.1
1921	576			19.7	38.9	38.1	-0.7	-2.4	1.7
656	579			19.9	39.1	33.8	-5.3	-2.4	-2.9
73	582			21.0	40.1	31.3	-8.9	-2.4	-6.5
1919	582			20.2	39.3	38.9	-0.5	-2.4	1.9
153	583			20.6	39.8	33.3	-6.5	-2.4	-4.1
1920	585			20.3	39.5	39.4	-0.1	-2.4	2.3
Average	572						-1.6	-2.4	0.8

## Table D.02 Tonality Assessment Table - 7 m/s (2)

Project: Bornish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement

Report ID: 14331.00.T22.RP4

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
656	1153			19.6	40.4	38.7	-1.6	-3.0	1.3
1922	1154			20.5	41.3	39.6	-1.7	-3.0	1.3
1921	1154			20.5	41.2	35.6	-5.6	-3.0	-2.7
58	1163			19.8	40.6	34.4	-6.2	-3.0	-3.2
1919	1170			20.6	41.4	40.5	-0.9	-3.0	2.1
1920	1177			20.8	41.6	40.1	-1.5	-3.0	1.5
73	1202			21.5	42.4	35.1	-7.3	-3.0	-4.4
Average	1168						-2.9	-3.0	0.1

# Table D.03 Tonality Assessment Table - 7.5 m/s (1)

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
1914	573			22.5	41.6	36.3	-5.4	-2.4	-3.0
1915	574			20.6	39.7	35.3	-4.4	-2.4	-2.0
104	575			20.0	39.1	35.2	-3.9	-2.4	-1.5
385	578			21.3	40.4	37.8	-2.7	-2.4	-0.3
1918	582			19.8	38.9	38.1	-0.8	-2.4	1.6
103	582			20.4	39.6	36.6	-3.0	-2.4	-0.6
202	583			20.6	39.7	36.5	-3.2	-2.4	-0.8
1917	584			20.3	39.4	30.8	-8.6	-2.4	-6.2
396	592			21.1	40.3	27.2	-13.1	-2.4	-10.7
526	593			21.0	40.2	30.6	-9.6	-2.4	-7.2
655	596			21.1	40.2	27.8	-12.4	-2.4	-10.0
57	596			20.9	40.1	31.9	-8.1	-2.4	-5.7
1682	598			21.0	40.2	29.6	-10.6	-2.4	-8.2
413	598			20.6	39.8	35.8	-4.0	-2.4	-1.6
412	598			20.8	40.0	32.3	-7.6	-2.4	-5.2
1913	598			21.3	40.5	32.3	-8.2	-2.4	-5.8
1916	599			19.9	39.1	34.4	-4.7	-2.4	-2.3
372	601			20.8	40.0	30.4	-9.7	-2.4	-7.3
528	601			20.4	39.6	36.0	-3.6	-2.4	-1.2
570	602			20.8	40.0	31.4	-8.6	-2.4	-6.2
1912	602			20.8	40.0	35.1	-4.9	-2.4	-2.5
Average	591						-5.4	-2.4	-3.0

# Table D.04 Tonality Assessment Table - 7.5 m/s (2)

Project: Bornish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement

Report ID: 14331.00.T22.RP4

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
104	1138			20.4	41.2	37.5	-3.6	-2.9	-0.7
1915	1147			20.8	41.6	39.5	-2.0	-2.9	0.9
385	1154			22.0	42.8	42.1	-0.7	-3.0	2.2
1917	1159			21.3	42.1	31.0	-11.1	-3.0	-8.1
1918	1159			20.4	41.2	39.1	-2.1	-3.0	0.9
202	1165			21.0	41.8	38.9	-2.9	-3.0	0.1
396	1179			20.4	41.3	34.2	-7.0	-3.0	-4.1
412	1194			21.3	42.2	42.2	0.0	-3.0	3.0
1727	1195			20.7	41.6	39.8	-1.8	-3.0	1.2
1914	1195			22.0	42.9	45.3	2.4	-3.0	5.3
1682	1196			21.2	42.2	41.9	-0.2	-3.0	2.8
1728	1196			20.0	40.9	42.1	1.2	-3.0	4.2
413	1198			21.1	42.0	41.4	-0.6	-3.0	2.4
1916	1198			20.5	41.4	41.0	-0.4	-3.0	2.6
1913	1200			21.6	42.5	46.6	4.1	-3.0	7.1
528	1200			20.0	40.9	40.4	-0.5	-3.0	2.5
568	1200			20.9	41.9	37.5	-4.4	-3.0	-1.4
655	1200			21.8	42.8	40.3	-2.4	-3.0	0.5
372	1202			21.2	42.1	39.9	-2.2	-3.0	0.8
1912	1204			21.2	42.2	45.8	3.6	-3.0	6.6
57	1205			20.5	41.4	41.8	0.4	-3.0	3.4
651	1207			20.6	41.6	40.5	-1.1	-3.0	1.9
652	1208			20.6	41.6	44.7	3.2	-3.0	6.2
Average	1187						-0.2	-3.0	2.8



# Table D.05 Tonality Assessment Table - 8 m/s (1)

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
1558	605			20.2	39.4	30.2	-9.2	-2.4	-6.8
1678	606			21.0	40.2	32.2	-8.0	-2.4	-5.6
410	608			21.0	40.2	35.0	-5.2	-2.4	-2.8
1907	614			20.3	39.5	26.4	-13.1	-2.4	-10.7
263	615			20.8	40.0	36.6	-3.4	-2.4	-1.0
434	617			21.1	40.3	32.8	-7.6	-2.4	-5.1
573	617			21.0	40.3	31.9	-8.3	-2.4	-5.9
1749	619			21.2	40.4	38.2	-2.2	-2.4	0.2
653	619			20.9	40.2	27.2	-13.0	-2.4	-10.6
404	620			21.4	40.6	34.1	-6.5	-2.4	-4.1
369	620			20.9	40.1	33.0	-7.1	-2.4	-4.7
393	621			21.2	40.5	30.8	-9.6	-2.4	-7.2
375	621			21.7	41.0	36.0	-4.9	-2.4	-2.5
436	622			21.3	40.6	40.2	-0.4	-2.4	2.0
374	622			21.4	40.6	35.9	-4.7	-2.4	-2.3
949	624			21.2	40.4	37.7	-2.8	-2.4	-0.3
392	624			21.0	40.3	37.1	-3.2	-2.4	-0.7
71	626			20.9	40.2	39.2	-1.0	-2.4	1.5
947	627			21.5	40.7	32.3	-8.5	-2.4	-6.0
650	629			20.7	39.9	39.7	-0.2	-2.4	2.3
407	635			21.7	41.0	42.1	1.1	-2.4	3.6
Average	620						-4.0	-2.4	-1.6

## Table D.06 Tonality Assessment Table - 8m/s (2)

Project: Bornish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
1845	1167			20.8	41.7	30.7	-11.0	-3.0	-8.0
105	1186			20.9	41.8	42.7	0.9	-3.0	3.9
1910	1198			20.7	41.6	46.7	5.1	-3.0	8.1
1909	1204			20.8	41.8	43.0	1.2	-3.0	4.2
1678	1205			20.9	41.9	42.9	1.0	-3.0	4.0
1906	1206			20.6	41.5	43.1	1.5	-3.0	4.5
1911	1206			20.7	41.6	43.9	2.3	-3.0	5.3
59	1206			21.5	42.4	28.3	-14.1	-3.0	-11.1
172	1208			20.6	41.5	36.6	-5.0	-3.0	-2.0
653	1209			21.5	42.4	37.4	-5.0	-3.0	-2.0
761	1210			22.6	43.6	40.8	-2.8	-3.0	0.2
Average	1200						0.2	-3.0	3.2

# Table D.07 Tonality Assessment Table - 8 m/s (3)

Project: Bornish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
1435	1222			20.5	41.4	43.8	2.4	-3.0	5.4
1907	1222			20.5	41.5	42.3	0.8	-3.0	3.8
1436	1222			21.0	42.0	39.8	-2.3	-3.0	0.8
878	1222			21.9	42.9	35.9	-7.0	-3.0	-4.0
1749	1223			21.1	42.1	39.7	-2.4	-3.0	0.6
386	1231			21.2	42.2	41.0	-1.3	-3.0	1.8
263	1231			20.9	41.9	40.8	-1.2	-3.0	1.9
408	1234			20.5	41.5	40.5	-1.1	-3.0	1.9
434	1235			21.3	42.4	42.0	-0.3	-3.0	2.7
410	1236			21.1	42.2	45.5	3.4	-3.0	6.4
71	1237			20.5	41.5	40.6	-0.9	-3.0	2.1
573	1237			21.2	42.2	41.1	-1.1	-3.0	2.0
369	1239			20.6	41.7	43.7	2.0	-3.0	5.0
1440	1242			20.8	41.9	38.0	-3.9	-3.0	-0.8
375	1242			20.9	41.9	43.2	1.3	-3.0	4.3
436	1244			21.2	42.3	39.1	-3.1	-3.0	-0.1
374	1246			21.3	42.4	39.1	-3.3	-3.0	-0.2
392	1247			20.9	41.9	41.3	-0.7	-3.0	2.3
947	1247			21.6	42.7	38.9	-3.9	-3.0	-0.8
393	1247			21.2	42.2	41.8	-0.5	-3.0	2.6
650	1249			20.3	41.3	39.7	-1.6	-3.0	1.4
404	1253			21.3	42.4	42.0	-0.4	-3.0	2.6
949	1261			21.3	42.4	40.3	-2.2	-3.0	0.9
407	1269			21.7	42.8	40.1	-2.8	-3.0	0.3
Average	1239						-0.7	-3.0	2.3

# Table D.08 Tonality Assessment Table - 8.5 m/s (1)

Project: Bornish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
86	608			21.3	40.5	37.4	-3.1	-2.4	-0.7
402	608			20.6	39.9	37.4	-2.5	-2.4	-0.1
1902	608			20.4	39.6	34.0	-5.6	-2.4	-3.2
1901	611			20.3	39.5	35.6	-3.9	-2.4	-1.4
1904	611			20.0	39.2	33.7	-5.5	-2.4	-3.1
368	614			20.7	39.9	37.3	-2.7	-2.4	-0.2
1905	614			20.1	39.3	35.0	-4.2	-2.4	-1.8
1903	617			19.8	39.0	30.9	-8.2	-2.4	-5.8
433	619			21.3	40.6	42.6	2.0	-2.4	4.5
426	622			20.2	39.5	36.1	-3.4	-2.4	-0.9
762	622			20.9	40.2	30.5	-9.7	-2.4	-7.3
203	622			21.6	40.8	29.8	-11.0	-2.4	-8.6
204	623			21.2	40.4	37.1	-3.3	-2.4	-0.9
641	623			20.7	40.0	40.6	0.7	-2.4	3.1
581	624			21.2	40.5	37.6	-2.9	-2.4	-0.5
67	625			20.6	39.8	39.4	-0.4	-2.4	2.0
387	625			21.2	40.4	38.4	-2.0	-2.4	0.4
1335	626			21.4	40.6	40.8	0.1	-2.4	2.6
763	626			21.2	40.5	34.3	-6.1	-2.4	-3.7
1441	626			20.9	40.2	33.9	-6.3	-2.4	-3.8
1437	626			20.7	40.0	33.7	-6.3	-2.4	-3.8
946	626			21.2	40.5	34.4	-6.1	-2.4	-3.6
1559	626			20.7	40.0	31.7	-8.3	-2.4	-5.9
1442	626			20.8	40.0	33.7	-6.3	-2.4	-3.9
642	627			21.0	40.2	37.6	-2.6	-2.4	-0.2
190	632			20.7	40.0	38.9	-1.1	-2.4	1.3
1752	636			21.0	40.3	43.3	3.0	-2.4	5.5
Average	621						-2.6	-2.4	-0.2

# Table D.09 Tonality Assessment Table - 8.5 m/s (2)

Project: Bornish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
1422	1179			20.9	41.8	36.6	-5.1	-3.0	-2.1
1085	1205			21.5	42.5	38.0	-4.5	-3.0	-1.5
1493	1209			21.4	42.4	39.1	-3.3	-3.0	-0.3
581	1212			21.1	42.1	37.3	-4.8	-3.0	-1.8
173	1215			21.4	42.3	41.7	-0.6	-3.0	2.4
1902	1215			21.1	42.1	44.6	2.5	-3.0	5.5
1901	1216			21.7	42.6	44.5	1.9	-3.0	4.9
67	1220			21.1	42.1	42.0	-0.1	-3.0	2.9
1903	1222			20.5	41.5	40.0	-1.6	-3.0	1.5
1904	1222			21.2	42.2	43.2	1.0	-3.0	4.1
229	1223			21.1	42.1	40.8	-1.3	-3.0	1.7
402	1224			21.5	42.5	43.4	0.9	-3.0	3.9
86	1225			21.1	42.1	42.0	-0.1	-3.0	3.0
556	1227			20.7	41.7	41.8	0.0	-3.0	3.1
1905	1228			21.0	42.0	43.9	1.9	-3.0	4.9
203	1234			21.8	42.8	40.4	-2.4	-3.0	0.6
368	1235			21.0	42.0	42.1	0.1	-3.0	3.1
762	1237			20.5	41.5	40.6	-0.9	-3.0	2.1
190	1238			20.7	41.7	39.2	-2.4	-3.0	0.6
426	1238			20.4	41.4	41.8	0.4	-3.0	3.5
433	1239			21.6	42.6	42.2	-0.4	-3.0	2.6
642	1240			20.8	41.8	43.3	1.6	-3.0	4.6
1559	1242			21.0	42.1	41.1	-1.0	-3.0	2.0
204	1244			20.8	41.9	40.3	-1.6	-3.0	1.5
641	1246			20.7	41.8	37.3	-4.5	-3.0	-1.5
736	1247			22.0	43.0	43.5	0.5	-3.0	3.5
763	1248			21.0	42.1	43.2	1.1	-3.0	4.2
387	1250			21.4	42.5	42.1	-0.4	-3.0	2.7
1441	1250			21.0	42.1	39.7	-2.3	-3.0	0.7
Average	1229						-0.4	-3.0	2.6

## Table D.10 Tonality Assessment Table - 8.5 m/s (3)

Project: Bornish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
923	1709			18.9	41.2	26.8	-14.5	-3.3	-11.1
1085	1746			19.1	41.5	33.3	-8.2	-3.4	-4.8
1422	1756			18.5	41.0	35.5	-5.4	-3.4	-2.1
1493	1774			19.0	41.5	25.2	-16.3	-3.4	-12.9
1902	1804			17.6	40.1	38.1	-2.1	-3.4	1.3
402	1806			18.5	41.1	32.6	-8.5	-3.4	-5.1
1904	1811			17.6	40.2	39.5	-0.7	-3.4	2.7
1901	1812			17.9	40.4	40.7	0.2	-3.4	3.6
67	1812			17.8	40.4	35.5	-4.9	-3.4	-1.5
581	1815			17.7	40.3	24.6	-15.8	-3.4	-12.4
86	1817			18.5	41.1	35.9	-5.1	-3.4	-1.7
556	1817			18.4	41.0	27.2	-13.8	-3.4	-10.4
368	1819			18.3	40.9	26.4	-14.4	-3.4	-11.0
1752	1819			18.6	41.2	24.8	-16.4	-3.4	-13.0
1905	1819			17.5	40.1	37.7	-2.5	-3.4	0.9
Average	1796						-5.2	-3.4	-1.8

# Table D.11 Tonality Assessment Table - 9 m/s (1)

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
510	583			20.8	39.9	39.4	-0.5	-2.4	1.9
501	595			20.8	39.9	39.9	-0.1	-2.4	2.3
1211	595			20.8	40.0	38.6	-1.4	-2.4	1.0
154	597			21.5	40.7	37.2	-3.5	-2.4	-1.1
1733	607			21.0	40.2	35.5	-4.8	-2.4	-2.4
1204	608			21.2	40.4	29.7	-10.7	-2.4	-8.3
430	608			21.2	40.4	27.3	-13.1	-2.4	-10.7
167	611			20.3	39.5	37.0	-2.5	-2.4	-0.1
937	612			20.7	39.9	36.5	-3.5	-2.4	-1.0
1197	614			21.4	40.6	33.4	-7.2	-2.4	-4.7
1203	614			21.2	40.4	33.3	-7.2	-2.4	-4.7
168	618			20.8	40.0	39.7	-0.3	-2.4	2.2
1201	619			21.1	40.4	39.3	-1.1	-2.4	1.3
1198	620			20.8	40.1	35.1	-5.0	-2.4	-2.6
1199	620			20.8	40.0	35.8	-4.2	-2.4	-1.8
1200	621			20.7	39.9	38.4	-1.5	-2.4	0.9
358	622			21.0	40.2	39.4	-0.8	-2.4	1.6
640	622			20.7	40.0	33.5	-6.5	-2.4	-4.1
1734	623			20.8	40.0	27.2	-12.8	-2.4	-10.4
520	623			20.7	40.0	39.2	-0.8	-2.4	1.6
1202	623			21.5	40.7	36.6	-4.2	-2.4	-1.7
425	624			21.2	40.4	41.7	1.3	-2.4	3.8
1215	625			21.7	40.9	42.0	1.0	-2.4	3.5
1753	625			20.6	39.9	31.2	-8.7	-2.4	-6.3
174	625			21.5	40.7	40.4	-0.4	-2.4	2.1
1196	626			21.1	40.4	43.1	2.7	-2.4	5.1
60	626			20.8	40.1	39.1	-1.0	-2.4	1.5
68	627			20.9	40.1	32.2	-7.9	-2.4	-5.5
764	627			21.0	40.2	36.5	-3.7	-2.4	-1.3
405	628			20.7	40.0	35.5	-4.5	-2.4	-2.0
414	628			21.2	40.5	36.5	-3.9	-2.4	-1.5
1679	628			20.9	40.2	33.9	-6.3	-2.4	-3.9
376	629			22.4	41.7	39.1	-2.6	-2.4	-0.1
649	629			20.9	40.2	40.6	0.5	-2.4	2.9
634	635			21.8	41.1	44.6	3.5	-2.4	5.9
Average	618						-2.0	-2.4	0.4



## Table D.12 Tonality Assessment Table - 9 m/s (2)

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
167	1222			20.5	41.5	43.0	1.5	-3.0	4.5
1202	1223			22.1	43.1	41.6	-1.5	-3.0	1.5
937	1223			20.9	41.9	38.3	-3.6	-3.0	-0.6
1198	1224			21.3	42.2	35.9	-6.4	-3.0	-3.4
1204	1225			21.4	42.4	42.2	-0.2	-3.0	2.8
1203	1226			21.1	42.1	41.1	-1.0	-3.0	2.0
1197	1228			21.5	42.5	41.1	-1.4	-3.0	1.6
168	1235			20.7	41.7	43.7	1.9	-3.0	4.9
1201	1239			21.0	42.1	37.4	-4.7	-3.0	-1.7
1199	1240			20.8	41.9	40.4	-1.5	-3.0	1.6
154	1243			21.7	42.8	36.5	-6.3	-3.0	-3.2
764	1246			20.8	41.9	40.9	-1.0	-3.0	2.0
1200	1246			20.5	41.6	37.2	-4.4	-3.0	-1.4
520	1247			20.8	41.9	37.3	-4.6	-3.0	-1.6
358	1247			20.8	41.9	40.8	-1.0	-3.0	2.0
1753	1247			20.9	42.0	37.3	-4.7	-3.0	-1.7
1215	1248			21.7	42.7	37.3	-5.4	-3.0	-2.4
425	1248			20.8	41.9	38.9	-3.1	-3.0	0.0
390	1249			20.6	41.7	37.9	-3.8	-3.0	-0.7
174	1251			20.9	41.9	39.1	-2.9	-3.0	0.2
1196	1252			20.9	41.9	38.8	-3.1	-3.0	-0.1
376	1254			22.6	43.7	38.3	-5.4	-3.0	-2.4
60	1254			20.5	41.5	37.6	-3.9	-3.0	-0.9
414	1256			21.5	42.6	39.1	-3.5	-3.0	-0.4
405	1256			20.6	41.7	38.2	-3.5	-3.0	-0.5
649	1257			20.8	41.9	39.5	-2.4	-3.0	0.6
634	1269			21.7	42.8	41.5	-1.3	-3.0	1.7
Average	1243						-2.3	-3.0	0.7

# Table D.13 Tonality Assessment Table - 9.5 m/s (1)

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Total Audibility (dB)
1395	625			20.9	40.1	43.2	3.0	-2.4	5.5
309	625			21.1	40.3	44.4	4.1	-2.4	6.5
677	625			22.5	41.8	43.6	1.8	-2.4	4.3
1798	625			21.2	40.4	41.3	0.8	-2.4	3.3
6	625			21.3	40.6	41.1	0.5	-2.4	3.0
1598	625			21.6	40.8	40.3	-0.5	-2.4	1.9
1795	625			20.8	40.0	45.3	5.3	-2.4	7.7
814	625			21.7	40.9	39.6	-1.4	-2.4	1.1
931	625			21.2	40.4	33.6	-6.8	-2.4	-4.4
828	625			21.3	40.6	39.5	-1.1	-2.4	1.4
912	625			20.8	40.1	40.6	0.5	-2.4	2.9
1649	625			20.9	40.1	43.8	3.7	-2.4	6.1
562	625			20.9	40.2	44.9	4.7	-2.4	7.1
552	625			21.1	40.4	42.6	2.2	-2.4	4.6
1312	626			21.5	40.8	43.6	2.8	-2.4	5.3
339	626			21.1	40.3	42.4	2.1	-2.4	4.6
230	626			21.1	40.3	43.2	2.9	-2.4	5.3
45	626			20.9	40.2	41.8	1.6	-2.4	4.0
120	626			21.1	40.4	41.5	1.2	-2.4	3.6
128	626			20.7	39.9	41.9	2.0	-2.4	4.4
794	626			21.5	40.7	41.4	0.7	-2.4	3.1
423	626			20.7	39.9	43.3	3.3	-2.4	5.8
547	626			20.6	39.8	44.7	4.8	-2.4	7.3
1207	627			20.8	40.0	43.2	3.1	-2.4	5.6
1534	627			21.0	40.3	42.3	2.0	-2.4	4.4
217	627			21.0	40.3	41.7	1.5	-2.4	3.9
303	627			21.5	40.8	43.6	2.8	-2.4	5.2
1787	627			20.7	40.0	44.6	4.6	-2.4	7.0
1788	627			21.3	40.5	46.4	5.8	-2.4	8.2
453	627			21.3	40.6	43.3	2.7	-2.4	5.2
160	627			21.0	40.2	43.1	2.9	-2.4	5.3
1143	627			21.7	40.9	45.6	4.6	-2.4	7.1
1867	627			20.2	39.5	41.0	1.5	-2.4	4.0
560	627			20.1	39.4	42.3	2.9	-2.4	5.4
1698	627			21.8	41.0	43.0	2.0	-2.4	4.4
1554	627			20.5	39.8	42.2	2.4	-2.4	4.8
1897	627			21.9	41.2	44.1	2.9	-2.4	5.3
1278	628			21.6	40.8	45.2	4.4	-2.4	6.8
799	628			21.3	40.5	40.6	0.1	-2.4	2.6
508	628			21.0	40.2	41.8	1.6	-2.4	4.0
391	628			21.0	40.2	40.1	-0.2	-2.4	2.3
1112	628			21.1	40.4	37.5	-2.9	-2.4	-0.4
881	628			21.0	40.3	42.1	1.8	-2.4	4.3
1667	629			21.6	40.9	43.4	2.5	-2.4	4.9
1531	631			20.9	40.2	43.2	3.0	-2.4	5.5
1518	631			20.7	40.0	44.0	4.0	-2.4	6.4
1740	632			21.0	40.3	44.0	3.8	-2.4	6.2
373	632			21.5	40.8	32.1	-8.7	-2.4	-6.3
63	632			20.9	40.2	35.1	-5.1	-2.4	-2.6
644	633			21.8	41.0	41.6	0.6	-2.4	3.0
849	633			20.9	40.1	43.4	3.2	-2.4	5.7
1874	633			20.7	39.9	43.2	3.2	-2.4	5.7
558	633			21.5	40.8	43.3	2.5	-2.4	5.0
1118	634			21.6	40.8	41.9	1.0	-2.4	3.5
572	634			21.5	40.8	45.6	4.9	-2.4	7.3
1103	634			21.5	40.7	40.4	-0.3	-2.4	2.1
1745	634			21.1	40.4	42.8	2.4	-2.4	4.8
1889	634			20.5	39.8	43.3	3.4	-2.4	5.9
1737	634			21.5	40.8	40.4	-0.4	-2.4	2.0
360	634			21.6	40.9	44.4	3.5	-2.4	5.9
195	634			21.5	40.8	45.5	4.8	-2.4	7.2
1070	635			22.5	41.8	41.6	-0.1	-2.4	2.3
111	636			21.2	40.5	44.2	3.7	-2.4	6.1
925	636			22.2	41.5	41.9	0.4	-2.4	2.9
802	636			21.8	41.1	36.0	-5.1	-2.4	-2.7
253	636			20.6	39.9	45.6	5.7	-2.4	8.1
566	637			20.9	40.2	43.9	3.7	-2.4	6.2
1110	637			21.6	40.9	39.6	-1.2	-2.4	1.2
139	637			21.5	40.8	43.7	2.8	-2.4	5.3
1219	637			22.2	41.5	37.8	-3.7	-2.4	-1.2
705	638			22.7	42.0	39.8	-2.2	-2.5	0.2
92	638			21.7	41.0	42.5	1.6	-2.5	4.0

## Table D.13 Tonality Assessment Table - 9.5 m/s (1)

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
534	638			21.7	41.0	43.0	2.0	-2.5	4.5
485	638			21.4	40.7	45.2	4.5	-2.5	6.9
524	641			21.7	41.0	38.2	-2.8	-2.5	-0.3
533	642			21.4	40.7	43.7	3.0	-2.5	5.5
65	643			20.8	40.1	42.4	2.4	-2.5	4.8
1618	644			21.7	41.0	34.9	-6.1	-2.5	-3.7
511	646			23.4	42.7	34.9	-7.8	-2.5	-5.4
645	647			21.9	41.2	36.2	-5.0	-2.5	-2.6
440	650			22.2	41.5	41.3	-0.2	-2.5	2.2
1485	651			21.9	41.2	39.6	-1.6	-2.5	0.9
502	651			23.7	43.1	38.8	-4.3	-2.5	-1.8
157	655			21.5	40.8	40.0	-0.8	-2.5	1.6
398	657			22.8	42.2	42.3	0.1	-2.5	2.6
90	658			22.3	41.6	44.7	3.1	-2.5	5.5
1710	660			22.1	41.4	39.0	-2.4	-2.5	0.1
665	660			23.0	42.4	39.6	-2.8	-2.5	-0.3
Average	633						2.0	-2.4	4.5

# Table D.14 Tonality Assessment Table - 9.5 m/s (2)

Project: Bornish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement

Report ID: 14331.00.T22.RP4

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
1795	1267			21.0	42.2	36.3	-5.9	-3.0	-2.8
1118	1268			21.8	42.9	36.2	-6.8	-3.0	-3.7
572	1268			21.2	42.4	37.4	-4.9	-3.0	-1.9
1103	1268			21.6	42.7	31.6	-11.1	-3.0	-8.1
360	1268			21.8	42.9	43.4	0.4	-3.0	3.5
195	1268			21.6	42.7	39.8	-2.9	-3.0	0.2
644	1269			21.8	43.0	38.8	-4.2	-3.0	-1.1
1520	1269			21.6	42.7	35.8	-6.9	-3.0	-3.9
1737	1269			21.0	42.1	37.8	-4.3	-3.0	-1.2
849	1269			21.5	42.6	37.4	-5.1	-3.0	-2.1
802	1269			21.2	42.4	38.0	-4.4	-3.0	-1.3
65	1270			21.7	42.8	41.6	-1.3	-3.0	1.8
253	1271			20.8	41.9	40.5	-1.4	-3.0	1.6
925	1272			22.4	43.5	38.8	-4.7	-3.0	-1.6
566	1273			20.8	41.9	41.6	-0.4	-3.1	2.7
534	1273			21.5	42.7	44.2	1.6	-3.1	4.6
90	1273			22.7	43.8	41.2	-2.6	-3.1	0.4
139	1275			21.5	42.6	42.3	-0.3	-3.1	2.8
1110	1275			21.5	42.6	41.4	-1.2	-3.1	1.9
485	1276			21.4	42.5	42.7	0.2	-3.1	3.2
92	1276			21.6	42.8	42.8	0.0	-3.1	3.1
547	1278			20.8	41.9	40.1	-1.9	-3.1	1.2
524	1281			21.3	42.4	44.0	1.5	-3.1	4.6
1395	1281			21.4	42.6	39.3	-3.2	-3.1	-0.2
1219	1282			21.9	43.1	41.2	-1.9	-3.1	1.2
705	1284			22.2	43.3	43.5	0.1	-3.1	3.2
533	1285			21.7	42.9	40.7	-2.2	-3.1	0.8
398	1286			22.6	43.7	38.1	-5.6	-3.1	-2.6
558	1287			21.2	42.4	40.4	-2.0	-3.1	1.1
1745	1287			20.9	42.1	37.6	-4.4	-3.1	-1.4
1618	1288			21.4	42.6	32.6	-10.0	-3.1	-7.0
111	1290			21.4	42.6	43.5	0.8	-3.1	3.9
157	1291			21.5	42.7	39.1	-3.6	-3.1	-0.5
645	1293			21.4	42.6	39.6	-3.0	-3.1	0.1
1485	1303			21.8	43.0	39.3	-3.7	-3.1	-0.6
440	1307			21.9	43.1	39.4	-3.7	-3.1	-0.6
1710	1315			21.5	42.8	34.4	-8.4	-3.1	-5.3
665	1321			22.5	43.7	30.4	-13.3	-3.1	-10.3
Average	1280						-2.4	-3.1	0.7

# Table D.15 Tonality Assessment Table - 9.5 m/s (3)

Project: Bornish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement

Report ID: 14331.00.T22.RP4

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
1708	1714			18.3	40.6	29.5	-11.1	-3.4	-7.8
1602	1763			19.1	41.6	28.6	-13.0	-3.4	-9.6
1698	1772			18.8	41.3	26.8	-14.4	-3.4	-11.1
1492	1775			18.3	40.7	26.9	-13.8	-3.4	-10.4
1598	1778			18.8	41.3	32.5	-8.8	-3.4	-5.4
1722	1779			18.6	41.1	30.7	-10.4	-3.4	-7.0
832	1788			19.2	41.7	33.5	-8.2	-3.4	-4.8
1640	1790			18.9	41.4	34.1	-7.3	-3.4	-3.9
931	1796			18.3	40.9	37.8	-3.1	-3.4	0.3
1398	1801			18.1	40.7	27.9	-12.8	-3.4	-9.4
1114	1801			19.0	41.5	35.6	-5.9	-3.4	-2.5
1554	1802			18.3	40.8	32.7	-8.1	-3.4	-4.7
932	1802			17.8	40.4	38.8	-1.6	-3.4	1.8
1387	1802			17.8	40.4	37.1	-3.3	-3.4	0.1
1527	1802			18.0	40.6	31.4	-9.2	-3.4	-5.7
1652	1804			18.2	40.7	34.7	-6.1	-3.4	-2.7
1794	1804			18.0	40.5	39.7	-0.8	-3.4	2.6
1480	1804			18.1	40.6	24.4	-16.3	-3.4	-12.9
1844	1805			18.6	41.2	37.4	-3.8	-3.4	-0.4
663	1808			17.7	40.3	31.9	-8.4	-3.4	-5.0
1265	1808			18.3	40.9	38.7	-2.2	-3.4	1.2
1070	1808			19.5	42.0	32.2	-9.9	-3.4	-6.5
1867	1808			17.9	40.4	34.5	-5.9	-3.4	-2.5
1621	1808			18.5	41.1	39.0	-2.1	-3.4	1.3
934	1809			18.6	41.2	37.1	-4.1	-3.4	-0.7
337	1809			17.0	39.6	30.0	-9.5	-3.4	-6.1
45	1810			17.9	40.4	24.0	-16.5	-3.4	-13.1
469	1810			17.9	40.4	24.1	-16.3	-3.4	-12.9
751	1810			18.0	40.6	39.2	-1.4	-3.4	2.0
217	1811			18.0	40.6	24.3	-16.3	-3.4	-12.9
391	1811			18.6	41.1	29.5	-11.7	-3.4	-8.3
1675	1811			18.5	41.0	28.4	-12.6	-3.4	-9.2
876	1812			17.1	39.6	36.9	-2.8	-3.4	0.6
802	1812			17.7	40.3	27.1	-13.2	-3.4	-9.8
471	1812			18.2	40.7	32.3	-8.4	-3.4	-5.0
460	1813			17.9	40.5	27.8	-12.7	-3.4	-9.3
6	1813			18.2	40.8	30.5	-10.2	-3.4	-6.8
349	1813			17.4	40.0	28.9	-11.1	-3.4	-7.7
1742	1814			19.0	41.5	29.6	-11.9	-3.4	-8.5
1379	1816			17.9	40.5	35.5	-5.0	-3.4	-1.6
1103	1816			18.3	40.9	30.7	-10.2	-3.4	-6.8
560	1816			18.8	41.4	25.7	-15.7	-3.4	-12.3
1890	1817			18.2	40.8	33.2	-7.6	-3.4	-4.2
85	1817			18.3	40.9	35.6	-5.3	-3.4	-1.9
852	1819			18.1	40.7	36.6	-4.1	-3.4	-0.7
826	1819			17.9	40.5	33.1	-7.4	-3.4	-4.0
216	1819			18.2	40.8	30.6	-10.2	-3.4	-6.8
839	1819			17.8	40.4	35.2	-5.2	-3.4	-1.8
1267	1819			17.8	40.4	41.4	1.0	-3.4	4.4
1345	1820			18.1	40.7	36.0	-4.7	-3.4	-1.3
1133	1820			17.8	40.4	39.5	-0.9	-3.4	2.5
491	1820			17.3	39.8	31.3	-8.5	-3.4	-5.1
1858	1821			17.8	40.4	38.1	-2.3	-3.4	1.1
843	1821			18.5	41.1	30.3	-10.7	-3.4	-7.3
935	1822			18.4	41.0	35.4	-5.6	-3.4	-2.2
1419	1822			17.2	39.8	37.1	-2.7	-3.4	0.7
1513	1822			17.7	40.3	32.9	-7.4	-3.4	-4.0
1795	1823			18.3	40.9	32.6	-8.3	-3.4	-4.9
1216	1823			18.7	41.3	34.9	-6.4	-3.4	-3.0
1747	1824			18.2	40.8	33.5	-7.3	-3.4	-3.9
543	1824			18.0	40.6	26.0	-14.5	-3.4	-11.1
301	1824			17.7	40.3	23.7	-16.6	-3.4	-13.2
662	1824			17.8	40.4	27.3	-13.1	-3.4	-9.7
848	1825			17.7	40.3	37.6	-2.8	-3.4	0.6
1772	1825			18.6	41.2	28.5	-12.7	-3.4	-9.3
186	1825			18.0	40.6	29.5	-11.2	-3.4	-7.8
346	1826			17.2	39.8	26.6	-13.2	-3.4	-9.8
1083	1827			18.2	40.8	33.3	-7.5	-3.4	-4.1
1530	1827			17.6	40.2	23.6	-16.5	-3.4	-13.1
Average	1809						-6.3	-3.4	-2.8

# Table D.16 Tonality Assessment Table - 10 m/s (1)

Project: Bornish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement

Report ID: 14331.00.T22.RP4

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Total Audibility (dB)
643	628			20.6	39.8	41.4	1.6	-2.4	4.0
1061	628			22.8	42.0	45.0	3.0	-2.4	5.4
1091	628			21.6	40.8	45.2	4.4	-2.4	6.8
1414	628			21.2	40.5	41.9	1.4	-2.4	3.8
1537	628			20.8	40.1	40.5	0.4	-2.4	2.8
1627	628			21.8	41.1	44.8	3.7	-2.4	6.1
1317	628			22.2	41.4	44.6	3.1	-2.4	5.6
1601	628			21.2	40.4	39.5	-0.9	-2.4	1.6
164	629			21.5	40.8	42.4	1.6	-2.4	4.1
594	629			22.4	41.7	46.3	4.6	-2.4	7.1
593	629			22.6	41.9	45.0	3.1	-2.4	5.5
545	629			20.9	40.1	45.5	5.4	-2.4	7.8
1509	629			20.7	39.9	42.6	2.6	-2.4	5.1
1761	629			21.1	40.3	42.7	2.3	-2.4	4.8
1693	629			21.4	40.7	44.8	4.2	-2.4	6.6
769	630			21.5	40.8	43.7	2.9	-2.4	5.4
768	630			21.5	40.8	45.2	4.5	-2.4	6.9
1075	630			21.3	40.5	41.4	0.9	-2.4	3.3
338	630			20.6	39.9	42.3	2.4	-2.4	4.9
343	630			20.9	40.1	43.4	3.3	-2.4	5.7
397	630			22.6	41.9	42.6	0.7	-2.4	3.2
305	631			21.8	41.1	45.2	4.1	-2.4	6.5
21	631			21.8	41.1	40.6	-0.5	-2.4	2.0
4	631			21.3	40.5	40.0	-0.6	-2.4	1.9
125	631			20.9	40.2	41.8	1.6	-2.4	4.1
779	631			21.6	40.8	44.3	3.5	-2.4	5.9
1560	631			21.7	40.9	42.9	2.0	-2.4	4.4
765	631			21.9	41.1	42.3	1.1	-2.4	3.6
1666	631			20.9	40.2	43.2	3.0	-2.4	5.5
1620	632			21.6	40.8	44.1	3.2	-2.4	5.7
191	632			20.9	40.2	40.4	0.2	-2.4	2.7
400	633			21.2	40.5	43.7	3.2	-2.4	5.7
578	633			21.3	40.6	42.5	1.9	-2.4	4.3
1111	633			21.3	40.6	42.0	1.4	-2.4	3.9
1712	633			21.2	40.5	41.3	0.8	-2.4	3.3
254	633			21.3	40.5	44.9	4.3	-2.4	6.8
1427	633			20.7	40.0	44.1	4.1	-2.4	6.6
1528	633			21.1	40.3	42.6	2.3	-2.4	4.7
1348	633			21.9	41.2	42.4	1.2	-2.4	3.6
1360	633			21.3	40.6	42.5	1.8	-2.4	4.3
724	634			20.8	40.1	44.4	4.3	-2.4	6.8
1689	634			21.4	40.7	44.2	3.5	-2.4	6.0
342	634			21.0	40.3	42.5	2.2	-2.4	4.6
512	634			21.0	40.2	41.4	1.1	-2.4	3.6
476	634			21.0	40.3	43.1	2.8	-2.4	5.2
419	634			21.7	41.0	44.2	3.2	-2.4	5.7
467	634			21.5	40.7	43.9	3.1	-2.4	5.6
432	635			21.8	41.1	43.8	2.7	-2.4	5.1
531	635			21.8	41.1	42.2	1.0	-2.4	3.5
291	635			21.8	41.1	44.1	3.0	-2.4	5.4
840	635			21.7	41.0	42.6	1.6	-2.4	4.1
1685	635			21.5	40.7	43.4	2.7	-2.4	5.1
1743	635			21.6	40.9	43.5	2.7	-2.4	5.1
756	636			21.0	40.3	43.1	2.8	-2.4	5.3
1655	636			21.1	40.4	44.9	4.5	-2.4	6.9
1108	636			21.4	40.7	41.7	1.0	-2.4	3.5
767	637			20.9	40.2	44.0	3.8	-2.4	6.3
530	637			22.1	41.4	39.6	-1.8	-2.4	0.6
122	637			21.1	40.4	44.4	4.0	-2.4	6.5
1605	639			21.3	40.6	42.5	1.9	-2.5	4.4
1738	639			21.1	40.4	37.7	-2.7	-2.5	-0.2
189	639			21.0	40.2	42.4	2.2	-2.5	4.6
365	641			21.9	41.2	43.3	2.1	-2.5	4.6
91	644			21.7	41.0	44.1	3.1	-2.5	5.5
666	645			21.8	41.1	37.6	-3.6	-2.5	-1.1
1218	646			22.4	41.7	41.6	-0.1	-2.5	2.4
178	646			22.1	41.4	43.9	2.5	-2.5	4.9
1625	647			21.2	40.5	42.2	1.6	-2.5	4.1
1704	647			21.8	41.1	39.1	-2.0	-2.5	0.5
660	648			22.1	41.5	41.1	-0.4	-2.5	2.1
658	660			22.3	41.7	39.6	-2.1	-2.5	0.4
155	660			22.1	41.4	40.8	-0.7	-2.5	1.8

## Table D.16 Tonality Assessment Table - 10 m/s (1)

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611	660			22.4	41.8	45.1	3.3	-2.5	5.8
610	662			23.3	42.7	41.0	-1.7	-2.5	0.8
Average	635						2.3	-2.4	4.8

# Table D.17 Tonality Assessment Table - 10 m/s (2)

Project: Bornish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement

Report ID: 14331.00.T22.RP4

Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
530	1145			22.1	42.9	30.1	-12.8	-2.9	-9.8
594	1151			22.7	43.5	32.8	-10.7	-3.0	-7.7
1378	1152			22.0	42.8	42.3	-0.5	-3.0	2.4
1093	1154			22.4	43.2	40.4	-2.8	-3.0	0.2
1627	1155			22.1	42.9	37.1	-5.8	-3.0	-2.9
593	1155			22.6	43.4	38.8	-4.6	-3.0	-1.7
1091	1162			22.6	43.4	35.9	-7.5	-3.0	-4.6
657	1169			22.1	43.0	33.4	-9.6	-3.0	-6.6
500	1183			20.6	41.5	26.8	-14.7	-3.0	-11.7
1674	1199			20.2	41.1	39.7	-1.4	-3.0	1.6
119	1208			20.4	41.4	39.8	-1.6	-3.0	1.4
123	1208			21.8	42.8	39.3	-3.5	-3.0	-0.5
608	1208			21.0	42.0	41.3	-0.7	-3.0	2.3
733	1211			20.4	41.3	42.7	1.3	-3.0	4.3
1748	1212			21.6	42.6	39.2	-3.4	-3.0	-0.4
1676	1212			21.2	42.1	39.2	-3.0	-3.0	0.0
1052	1214			21.3	42.3	39.5	-2.8	-3.0	0.2
1192	1214			21.3	42.3	41.0	-1.3	-3.0	1.8
549	1215			22.1	43.0	34.7	-8.3	-3.0	-5.3
1084	1216			21.3	42.3	37.6	-4.6	-3.0	-1.6
1512	1217			20.4	41.4	41.1	-0.2	-3.0	2.8
1557	1217			20.3	41.3	39.9	-1.4	-3.0	1.6
1609	1219			21.2	42.2	40.7	-1.5	-3.0	1.6
1616	1220			21.4	42.3	37.6	-4.8	-3.0	-1.8
1212	1220			22.5	43.5	32.6	-10.9	-3.0	-7.9
463	1221			21.1	42.0	38.8	-3.2	-3.0	-0.2
758	1222			20.5	41.5	41.7	0.2	-3.0	3.2
1285	1222			21.8	42.8	40.2	-2.6	-3.0	0.4
1428	1222			20.5	41.5	41.7	0.2	-3.0	3.2
183	1222			20.6	41.6	39.9	-1.7	-3.0	1.3
732	1223			20.5	41.5	40.0	-1.5	-3.0	1.5
1629	1223			21.4	42.4	42.3	-0.2	-3.0	2.9
182	1223			20.7	41.7	42.6	0.9	-3.0	3.9
238	1224			20.3	41.2	41.6	0.4	-3.0	3.4
1612	1225			20.7	41.7	39.5	-2.2	-3.0	0.8
16	1225			21.0	42.0	38.3	-3.7	-3.0	-0.7
1194	1226			21.2	42.2	38.4	-3.8	-3.0	-0.8
1622	1226			21.3	42.3	36.1	-6.1	-3.0	-3.1
1098	1227			20.8	41.8	37.9	-3.9	-3.0	-0.9
237	1227			20.6	41.6	39.0	-2.6	-3.0	0.4
759	1228			20.6	41.6	37.1	-4.5	-3.0	-1.5
459	1228			20.6	41.6	39.9	-1.7	-3.0	1.3
Average	1206						-2.5	-3.0	0.5



# Table D.18 Tonality Assessment Table - 10 m/s (3)

Project: Bornish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
1860	1230			20.5	41.5	41.2	-0.3	-3.0	2.7
1287	1230			20.5	41.5	39.3	-2.3	-3.0	0.8
169	1230			21.3	42.3	44.2	1.8	-3.0	4.8
144	1230			21.0	42.0	37.5	-4.5	-3.0	-1.5
83	1230			21.0	42.0	37.3	-4.6	-3.0	-1.6
137	1231			20.8	41.8	40.1	-1.7	-3.0	1.3
956	1231			21.0	42.1	33.6	-8.5	-3.0	-5.5
1506	1231			21.2	42.2	35.4	-6.8	-3.0	-3.8
920	1232			21.3	42.3	36.0	-6.3	-3.0	-3.3
290	1232			21.1	42.1	40.5	-1.5	-3.0	1.5
351	1232			21.3	42.3	34.9	-7.4	-3.0	-4.4
20	1232			20.6	41.6	40.6	-1.0	-3.0	2.0
750	1233			20.9	41.9	38.1	-3.9	-3.0	-0.8
723	1233			20.4	41.5	36.9	-4.5	-3.0	-1.5
49	1234			20.9	42.0	40.6	-1.4	-3.0	1.6
444	1234			20.9	42.0	38.7	-3.3	-3.0	-0.2
445	1234			21.3	42.4	41.7	-0.6	-3.0	2.4
401	1235			20.9	41.9	40.2	-1.8	-3.0	1.2
347	1235			20.5	41.5	41.6	0.1	-3.0	3.2
861	1235			21.1	42.2	38.8	-3.3	-3.0	-0.3
1670	1235			20.7	41.7	39.8	-2.0	-3.0	1.1
345	1236			20.7	41.7	39.0	-2.7	-3.0	0.3
236	1236			21.2	42.2	41.6	-0.6	-3.0	2.4
916	1237			21.0	42.0	37.1	-4.9	-3.0	-1.9
80	1237			22.7	43.7	34.2	-9.5	-3.0	-6.5
51	1238			21.1	42.1	35.5	-6.6	-3.0	-3.6
357	1238			21.4	42.4	40.6	-1.8	-3.0	1.2
906	1238			21.3	42.3	39.9	-2.4	-3.0	0.6
288	1238			21.1	42.1	41.8	-0.3	-3.0	2.7
711	1238			21.5	42.5	38.5	-4.0	-3.0	-1.0
829	1238			20.5	41.5	36.2	-5.4	-3.0	-2.3
1838	1238			20.2	41.3	36.3	-5.0	-3.0	-2.0
1783	1239			21.0	42.0	37.1	-4.9	-3.0	-1.9
151	1239			20.5	41.5	38.4	-3.1	-3.0	-0.1
331	1239			20.4	41.4	38.9	-2.5	-3.0	0.5
66	1239			20.7	41.8	38.2	-3.6	-3.0	-0.6
721	1241			20.3	41.4	37.8	-3.6	-3.0	-0.5
845	1241			21.4	42.4	39.2	-3.2	-3.0	-0.2
1101	1241			21.6	42.6	35.9	-6.8	-3.0	-3.7
259	1241			20.5	41.5	41.0	-0.5	-3.0	2.5
311	1243			21.0	42.1	39.1	-2.9	-3.0	0.1
1336	1243			21.3	42.4	39.0	-3.3	-3.0	-0.3
473	1243			20.8	41.9	39.3	-2.6	-3.0	0.4
489	1244			20.8	41.8	39.9	-1.9	-3.0	1.1
136	1244			21.0	42.0	40.8	-1.3	-3.0	1.8
1761	1244			21.2	42.3	37.5	-4.7	-3.0	-1.7
1537	1244			20.8	41.8	37.9	-4.0	-3.0	-0.9
1533	1244			20.9	41.9	39.4	-2.5	-3.0	0.5
788	1245			21.1	42.1	36.9	-5.2	-3.0	-2.2
1837	1245			20.6	41.7	38.3	-3.4	-3.0	-0.4
622	1246			21.0	42.1	38.1	-4.0	-3.0	-1.0
1899	1246			20.8	41.9	39.1	-2.8	-3.0	0.3
1856	1246			21.2	42.3	39.3	-3.0	-3.0	0.0
476	1246			21.2	42.2	38.8	-3.4	-3.0	-0.4
1706	1246			20.7	41.7	37.9	-3.8	-3.0	-0.8
815	1246			20.9	41.9	38.8	-3.2	-3.0	-0.1
675	1246			20.5	41.6	38.4	-3.2	-3.0	-0.1
1542	1246			21.3	42.4	36.0	-6.3	-3.0	-3.3
209	1246			21.3	42.3	40.7	-1.6	-3.0	1.4
727	1247			20.9	41.9	41.1	-0.8	-3.0	2.2
1283	1247			21.6	42.6	40.9	-1.8	-3.0	1.3
519	1248			20.3	41.3	38.7	-2.6	-3.0	0.4
1782	1248			20.9	41.9	39.8	-2.1	-3.0	0.9
769	1248			21.3	42.3	37.5	-4.9	-3.0	-1.8
1636	1248			20.7	41.8	43.4	1.6	-3.0	4.7
1374	1248			20.8	41.9	37.4	-4.4	-3.0	-1.4
341	1248			20.3	41.4	39.3	-2.1	-3.0	0.9
397	1249			23.3	44.4	41.9	-2.5	-3.0	0.5
1871	1249			21.4	42.5	39.3	-3.1	-3.0	-0.1
1601	1249			21.2	42.3	36.3	-6.0	-3.0	-3.0
1861	1249			21.0	42.1	32.7	-9.4	-3.0	-6.3
1298	1250			21.4	42.4	40.4	-2.1	-3.0	0.9

# Table D.18 Tonality Assessment Table - 10 m/s (3)

Project: Bornish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
1509	1250			20.9	42.0	36.2	-5.7	-3.0	-2.7
791	1251			21.5	42.6	31.4	-11.2	-3.0	-8.2
1427	1251			21.3	42.4	35.5	-6.9	-3.0	-3.9
1049	1251			22.0	43.1	35.8	-7.3	-3.0	-4.2
545	1251			21.3	42.3	40.8	-1.5	-3.0	1.5
330	1251			20.8	41.9	37.1	-4.8	-3.0	-1.8
1292	1252			21.0	42.0	36.4	-5.7	-3.0	-2.7
1316	1252			21.3	42.3	38.3	-4.1	-3.0	-1.0
1771	1252			20.8	41.9	37.8	-4.1	-3.0	-1.0
1807	1252			20.4	41.5	39.5	-2.0	-3.0	1.0
1814	1253			21.6	42.7	40.3	-2.4	-3.0	0.6
1586	1253			21.4	42.5	40.6	-1.9	-3.0	1.1
1188	1253			21.1	42.2	35.8	-6.4	-3.0	-3.3
159	1253			21.1	42.2	41.3	-0.9	-3.0	2.1
643	1253			20.3	41.4	38.6	-2.8	-3.0	0.3
661	1254			21.3	42.4	39.2	-3.2	-3.0	-0.2
1545	1254			21.2	42.3	36.4	-5.9	-3.0	-2.9
1724	1254			20.4	41.4	38.1	-3.4	-3.0	-0.3
594	1254			21.7	42.8	40.5	-2.3	-3.0	0.8
858	1255			21.4	42.5	37.7	-4.8	-3.0	-1.8
1061	1255			22.8	43.9	40.0	-3.9	-3.0	-0.9
1231	1255			21.7	42.8	34.5	-8.3	-3.0	-5.2
1360	1255			21.8	42.9	35.5	-7.4	-3.0	-4.3
4	1257			20.9	41.9	39.6	-2.3	-3.0	0.7
1055	1258			21.9	43.0	40.6	-2.4	-3.0	0.6
1693	1258			21.5	42.6	36.8	-5.7	-3.0	-2.7
164	1258			20.8	41.9	40.0	-1.9	-3.0	1.1
1414	1260			20.8	41.9	35.8	-6.1	-3.0	-3.1
343	1260			21.0	42.1	38.8	-3.3	-3.0	-0.2
191	1261			20.9	42.0	39.8	-2.3	-3.0	0.8
93	1261			20.8	41.9	38.6	-3.3	-3.0	-0.3
1560	1261			21.0	42.1	40.6	-1.5	-3.0	1.6
1666	1261			21.5	42.6	38.2	-4.4	-3.0	-1.4
765	1262			21.8	42.9	37.5	-5.4	-3.0	-2.4
125	1262			21.6	42.7	41.3	-1.4	-3.0	1.7
248	1262			20.4	41.5	40.0	-1.5	-3.0	1.5
224	1262			21.0	42.1	39.5	-2.6	-3.0	0.5
305	1262			21.7	42.8	40.8	-2.0	-3.0	1.1
1620	1263			21.6	42.7	38.0	-4.7	-3.0	-1.7
1528	1263			21.3	42.4	39.0	-3.3	-3.0	-0.3
338	1263			20.9	42.0	33.0	-9.0	-3.0	-5.9
472	1264			21.3	42.4	36.7	-5.7	-3.0	-2.6
254	1264			21.0	42.1	39.6	-2.5	-3.0	0.5
779	1265			21.2	42.3	40.5	-1.8	-3.0	1.2
1689	1266			21.6	42.7	39.8	-2.9	-3.0	0.2
1348	1266			21.5	42.6	38.2	-4.4	-3.0	-1.4
400	1267			21.1	42.2	36.8	-5.4	-3.0	-2.4
1218	1268			21.9	43.0	35.1	-7.8	-3.0	-4.8
1106	1268			21.4	42.5	34.6	-7.9	-3.0	-4.8
578	1268			20.9	42.1	40.1	-1.9	-3.0	1.1
512	1268			20.8	42.0	40.9	-1.0	-3.0	2.0
1712	1269			21.2	42.3	39.9	-2.4	-3.0	0.6
1111	1269			21.1	42.2	38.8	-3.4	-3.0	-0.4
46	1269			20.9	42.0	39.7	-2.3	-3.0	0.7
432	1271			21.6	42.8	45.7	2.9	-3.0	5.9
1685	1271			22.1	43.3	42.9	-0.4	-3.0	2.6
1655	1271			21.3	42.4	41.5	-1.0	-3.0	2.1
1317	1271			22.3	43.5	42.4	-1.1	-3.0	2.0
756	1272			21.2	42.3	41.6	-0.7	-3.0	2.3
724	1273			21.8	42.9	36.1	-6.8	-3.1	-3.8
768	1273			21.3	42.4	42.6	0.1	-3.1	3.2
1627	1273			21.8	42.9	38.7	-4.2	-3.1	-1.2
938	1273			21.9	43.0	39.5	-3.5	-3.1	-0.5
1704	1273			21.8	42.9	35.8	-7.1	-3.1	-4.1
342	1273			21.1	42.3	42.2	0.0	-3.1	3.0
291	1273			21.9	43.1	43.8	0.8	-3.1	3.8
467	1273			21.4	42.6	37.1	-5.4	-3.1	-2.4
122	1274			21.4	42.5	40.6	-1.9	-3.1	1.2
767	1274			20.7	41.9	40.3	-1.6	-3.1	1.4
636	1275			21.4	42.6	39.8	-2.7	-3.1	0.3
189	1275			21.1	42.2	44.1	1.9	-3.1	4.9
840	1276			21.6	42.7	40.6	-2.1	-3.1	0.9

# Table D.18 Tonality Assessment Table - 10 m/s (3)

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
1075	1276			21.3	42.4	40.5	-2.0	-3.1	1.1
155	1276			22.0	43.2	33.4	-9.8	-3.1	-6.8
1605	1277			21.4	42.6	39.1	-3.5	-3.1	-0.5
1108	1277			21.6	42.7	40.8	-1.9	-3.1	1.2
530	1278			22.3	43.4	39.8	-3.6	-3.1	-0.6
626	1278			20.7	41.9	38.3	-3.6	-3.1	-0.5
21	1278			22.1	43.2	35.2	-8.0	-3.1	-4.9
419	1278			21.9	43.0	45.8	2.8	-3.1	5.8
531	1279			21.5	42.7	42.8	0.2	-3.1	3.2
1115	1281			21.7	42.9	36.9	-6.0	-3.1	-2.9
610	1282			22.6	43.7	29.3	-14.4	-3.1	-11.4
1743	1283			21.6	42.8	40.7	-2.1	-3.1	1.0
1738	1285			21.1	42.3	40.5	-1.7	-3.1	1.3
365	1285			21.8	42.9	41.5	-1.4	-3.1	1.6
660	1289			22.0	43.2	39.7	-3.4	-3.1	-0.4
666	1291			21.6	42.8	37.2	-5.5	-3.1	-2.5
611	1291			22.9	44.1	36.7	-7.4	-3.1	-4.3
1625	1292			21.3	42.5	33.4	-9.1	-3.1	-6.0
178	1292			21.5	42.7	43.1	0.4	-3.1	3.5
91	1292			21.3	42.5	41.3	-1.2	-3.1	1.9
658	1325			21.9	43.2	37.7	-5.5	-3.1	-2.4
Average	1256						-2.8	-3.0	0.3

# Table D.19 Tonality Assessment Table - 10.5 m/s (1)

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Total Audibility (dB)
846	627			20.9	40.2	44.7	4.5	-2.4	6.9
820	627			21.6	40.8	39.9	-1.0	-2.4	1.5
1657	627			21.6	40.9	46.0	5.1	-2.4	7.6
1857	627			21.2	40.4	44.8	4.3	-2.4	6.7
1853	627			20.4	39.6	41.0	1.4	-2.4	3.9
133	627			21.6	40.9	43.4	2.5	-2.4	5.0
1290	627			20.7	40.0	41.3	1.3	-2.4	3.8
1262	627			21.9	41.2	42.1	0.9	-2.4	3.3
140	627			21.2	40.4	42.5	2.1	-2.4	4.6
816	628			21.4	40.7	40.4	-0.3	-2.4	2.2
522	628			21.1	40.4	44.3	3.8	-2.4	6.3
1628	628			22.2	41.5	42.9	1.4	-2.4	3.8
1651	628			20.8	40.1	43.1	3.0	-2.4	5.4
1659	628			21.0	40.3	43.6	3.3	-2.4	5.8
1754	628			21.2	40.5	44.0	3.5	-2.4	5.9
1092	628			21.6	40.9	45.2	4.3	-2.4	6.8
443	628			21.5	40.7	43.0	2.3	-2.4	4.8
1340	628			21.5	40.8	44.7	3.9	-2.4	6.4
1413	628			21.3	40.6	43.8	3.2	-2.4	5.6
1392	628			20.8	40.0	43.8	3.8	-2.4	6.3
800	628			21.4	40.6	40.1	-0.5	-2.4	1.9
1729	628			20.8	40.1	39.5	-0.6	-2.4	1.8
518	628			21.0	40.2	43.3	3.1	-2.4	5.5
955	629			21.2	40.5	38.3	-2.2	-2.4	0.2
1633	629			20.9	40.1	40.6	0.5	-2.4	2.9
165	629			21.1	40.4	43.0	2.7	-2.4	5.1
1647	629			21.2	40.4	42.8	2.4	-2.4	4.8
1826	629			20.5	39.8	41.6	1.8	-2.4	4.2
1547	630			20.7	40.0	44.5	4.5	-2.4	7.0
789	630			21.9	41.2	41.6	0.4	-2.4	2.8
1363	631			21.2	40.4	41.6	1.2	-2.4	3.7
1412	631			20.8	40.0	44.1	4.1	-2.4	6.5
1846	631			20.7	40.0	37.4	-2.6	-2.4	-0.1
1573	631			21.2	40.4	42.9	2.5	-2.4	4.9
184	631			20.7	40.0	42.6	2.6	-2.4	5.1
742	631			21.6	40.9	41.5	0.6	-2.4	3.0
766	632			22.9	42.1	38.0	-4.2	-2.4	-1.7
574	632			22.1	41.4	38.1	-3.2	-2.4	-0.8
8	632			21.5	40.8	42.1	1.4	-2.4	3.8
1100	632			20.9	40.2	43.4	3.2	-2.4	5.7
1490	632			20.9	40.1	46.0	5.9	-2.4	8.3
296	633			21.7	41.0	44.1	3.1	-2.4	5.5
1195	633			21.3	40.6	47.1	6.5	-2.4	8.9
1117	633			21.9	41.2	41.7	0.5	-2.4	3.0
205	633			23.0	42.2	39.2	-3.0	-2.4	-0.6
873	633			21.7	40.9	43.3	2.4	-2.4	4.9
1325	634			21.9	41.1	40.5	-0.7	-2.4	1.8
513	634			21.3	40.5	43.4	2.8	-2.4	5.3
1796	634			20.4	39.6	42.7	3.1	-2.4	5.6
1396	634			21.3	40.6	43.2	2.6	-2.4	5.0
350	634			20.7	40.0	43.9	3.9	-2.4	6.4
1102	634			21.3	40.6	45.1	4.5	-2.4	7.0
1288	635			21.3	40.6	43.5	3.0	-2.4	5.4
450	635			21.8	41.1	41.6	0.5	-2.4	3.0
69	635			20.8	40.1	44.6	4.5	-2.4	7.0
96	635			20.9	40.2	40.8	0.6	-2.4	3.0
126	635			20.9	40.2	42.9	2.8	-2.4	5.2
1862	635			20.8	40.0	36.4	-3.7	-2.4	-1.2
627	636			21.6	40.9	42.1	1.2	-2.4	3.6
583	636			21.8	41.1	42.9	1.9	-2.4	4.3
138	636			20.9	40.2	41.8	1.6	-2.4	4.1
3	636			22.0	41.3	41.7	0.4	-2.4	2.9
1453	636			22.6	41.8	32.1	-9.7	-2.4	-7.2
1888	637			20.8	40.1	44.0	3.9	-2.4	6.3
1891	638			20.7	39.9	40.4	0.4	-2.5	2.9
1541	639			20.9	40.2	42.8	2.6	-2.5	5.0
223	640			21.3	40.6	43.4	2.8	-2.5	5.3
466	641			22.0	41.3	39.5	-1.8	-2.5	0.6
474	641			21.1	40.4	42.8	2.4	-2.5	4.8
1626	642			22.6	41.9	43.5	1.7	-2.5	4.1
953	646			21.6	41.0	40.0	-1.0	-2.5	1.5
546	652			22.1	41.4	42.2	0.8	-2.5	3.3

## Table D.19 Tonality Assessment Table - 10.5 m/s (1)

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1736	653			21.1	40.4	37.1	-3.4	-2.5	-0.9
939	653			22.2	41.5	40.1	-1.5	-2.5	1.0
1849	659			22.9	42.3	42.0	-0.2	-2.5	2.2
928	659			22.9	42.2	38.6	-3.6	-2.5	-1.2
Average	633						2.1	-2.4	4.6

# Table D.20 Tonality Assessment Table - 10.5 m/s (2)

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
1413	1258			20.8	41.9	37.4	-4.5	-3.0	-1.5
1262	1258			21.8	42.8	34.9	-8.0	-3.0	-4.9
184	1258			20.8	41.9	39.5	-2.4	-3.0	0.7
205	1259			22.3	43.4	33.1	-10.3	-3.0	-7.3
1647	1259			21.1	42.2	38.6	-3.6	-3.0	-0.5
1569	1259			21.1	42.2	37.3	-4.9	-3.0	-1.8
1490	1259			21.3	42.4	37.9	-4.4	-3.0	-1.4
1290	1260			21.2	42.3	37.3	-5.0	-3.0	-2.0
1547	1260			21.0	42.1	40.1	-2.0	-3.0	1.0
133	1261			21.2	42.3	38.8	-3.6	-3.0	-0.5
1100	1263			21.1	42.2	39.3	-2.9	-3.0	0.1
1573	1263			21.2	42.3	40.7	-1.6	-3.0	1.4
165	1263			21.4	42.5	41.9	-0.6	-3.0	2.5
1195	1264			21.1	42.2	37.2	-5.0	-3.0	-2.0
8	1265			20.8	41.9	39.2	-2.8	-3.0	0.3
296	1265			21.6	42.7	37.1	-5.6	-3.0	-2.5
1392	1266			20.9	42.1	34.2	-7.9	-3.0	-4.8
1796	1267			21.1	42.2	36.8	-5.4	-3.0	-2.3
513	1267			21.1	42.3	42.3	0.0	-3.0	3.1
742	1267			21.8	42.9	40.9	-2.1	-3.0	1.0
1340	1268			21.8	42.9	39.5	-3.4	-3.0	-0.4
1102	1268			21.3	42.5	39.8	-2.6	-3.0	0.4
350	1269			20.8	41.9	41.3	-0.7	-3.0	2.4
1117	1269			21.8	43.0	40.3	-2.7	-3.0	0.4
1302	1270			22.2	43.3	40.4	-2.9	-3.0	0.2
1288	1271			21.4	42.5	39.4	-3.1	-3.0	-0.1
766	1273			22.3	43.4	38.0	-5.4	-3.1	-2.4
522	1273			21.3	42.4	40.8	-1.6	-3.1	1.4
1626	1273			22.8	43.9	41.6	-2.3	-3.1	0.7
223	1273			21.9	43.0	43.0	0.0	-3.1	3.0
69	1274			20.9	42.1	42.0	-0.1	-3.1	3.0
126	1275			21.0	42.2	39.5	-2.7	-3.1	0.3
1888	1275			20.7	41.8	41.2	-0.6	-3.1	2.4
466	1275			21.6	42.7	42.9	0.2	-3.1	3.2
1891	1277			21.7	42.9	38.7	-4.2	-3.1	-1.1
953	1278			21.6	42.7	41.6	-1.1	-3.1	1.9
627	1278			21.6	42.7	41.8	-0.9	-3.1	2.1
1541	1278			21.8	43.0	36.8	-6.1	-3.1	-3.1
546	1278			22.2	43.3	37.6	-5.7	-3.1	-2.6
450	1280			22.0	43.2	44.0	0.8	-3.1	3.9
583	1280			22.1	43.2	32.0	-11.2	-3.1	-8.1
939	1281			22.1	43.3	37.2	-6.1	-3.1	-3.0
474	1283			20.8	42.0	44.1	2.1	-3.1	5.2
140	1286			21.3	42.5	39.0	-3.4	-3.1	-0.4
1396	1287			21.5	42.6	39.0	-3.6	-3.1	-0.6
245	1290			22.0	43.2	37.2	-6.0	-3.1	-2.9
3	1291			21.5	42.7	41.8	-0.9	-3.1	2.2
1736	1306			20.9	42.1	34.5	-7.6	-3.1	-4.5
Average	1271						-2.6	-3.0	0.4

# Table D.21 Tonality Assessment Table - 11 m/s (1)

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Total Audibility (dB)
730	627			21.1	40.4	41.3	0.8	-2.4	3.3
672	627			21.6	40.8	43.8	2.9	-2.4	5.4
633	627			21.6	40.9	41.8	0.9	-2.4	3.4
1671	627			21.5	40.7	44.2	3.5	-2.4	6.0
601	627			20.9	40.2	44.6	4.4	-2.4	6.8
1131	627			21.8	41.0	43.6	2.6	-2.4	5.0
1751	627			21.5	40.8	42.6	1.8	-2.4	4.2
827	627			21.5	40.8	40.5	-0.3	-2.4	2.1
1352	627			21.6	40.8	40.2	-0.6	-2.4	1.8
1270	627			22.3	41.5	44.3	2.8	-2.4	5.2
589	627			21.5	40.7	43.6	2.9	-2.4	5.3
782	627			21.5	40.8	41.9	1.1	-2.4	3.5
1575	627			20.9	40.2	41.7	1.5	-2.4	4.0
292	627			21.2	40.4	43.0	2.5	-2.4	5.0
871	628			22.4	41.6	38.7	-2.9	-2.4	-0.5
1832	628			20.6	39.9	44.1	4.2	-2.4	6.6
486	628			20.7	40.0	43.9	3.9	-2.4	6.3
318	628			21.5	40.7	42.3	1.6	-2.4	4.0
1825	628			20.7	39.9	44.1	4.2	-2.4	6.6
1359	628			21.4	40.6	40.3	-0.3	-2.4	2.1
585	628			21.4	40.6	43.6	3.0	-2.4	5.4
1644	628			21.5	40.8	47.5	6.7	-2.4	9.2
1553	628			21.8	41.1	41.7	0.7	-2.4	3.1
712	628			21.1	40.4	44.4	4.0	-2.4	6.5
40	629			21.3	40.5	38.2	-2.4	-2.4	0.1
748	629			21.2	40.5	43.3	2.8	-2.4	5.2
481	629			21.2	40.4	44.1	3.7	-2.4	6.1
1833	629			21.1	40.4	43.2	2.8	-2.4	5.3
1776	629			20.9	40.1	42.1	1.9	-2.4	4.4
1487	629			21.4	40.6	44.4	3.8	-2.4	6.2
1503	629			21.5	40.8	43.2	2.5	-2.4	4.9
1475	630			22.1	41.3	40.4	-0.9	-2.4	1.5
1486	630			21.3	40.6	44.2	3.6	-2.4	6.0
1780	630			21.0	40.3	43.3	3.0	-2.4	5.5
1151	631			22.5	41.8	44.6	2.8	-2.4	5.3
1872	631			21.3	40.5	44.8	4.2	-2.4	6.7
914	631			21.5	40.8	44.5	3.7	-2.4	6.2
559	631			21.7	40.9	42.8	1.9	-2.4	4.3
1594	631			20.3	39.6	43.8	4.2	-2.4	6.6
1583	631			21.0	40.3	41.0	0.7	-2.4	3.2
1343	631			21.5	40.8	38.9	-1.9	-2.4	0.6
1529	632			20.2	39.5	42.6	3.1	-2.4	5.6
1226	632			21.2	40.5	41.1	0.6	-2.4	3.1
804	632			21.3	40.6	40.4	-0.2	-2.4	2.3
874	633			21.7	41.0	43.7	2.7	-2.4	5.2
671	633			21.5	40.7	44.6	3.8	-2.4	6.3
1191	633			21.3	40.5	43.4	2.8	-2.4	5.3
297	634			21.8	41.0	44.6	3.5	-2.4	6.0
868	634			23.0	42.3	43.1	0.8	-2.4	3.2
1326	634			21.3	40.6	44.2	3.6	-2.4	6.1
317	634			22.0	41.3	43.1	1.8	-2.4	4.3
1841	634			20.5	39.8	43.1	3.3	-2.4	5.8
1757	634			21.4	40.7	43.9	3.2	-2.4	5.7
1789	634			21.8	41.1	49.3	8.2	-2.4	10.7
625	634			21.6	40.9	43.3	2.4	-2.4	4.9
833	635			22.7	42.0	43.3	1.3	-2.4	3.8
498	635			21.5	40.7	42.7	2.0	-2.4	4.4
1349	635			21.5	40.8	41.5	0.7	-2.4	3.2
97	635			21.1	40.4	42.0	1.6	-2.4	4.1
451	635			21.8	41.0	41.5	0.4	-2.4	2.9
449	635			21.5	40.8	42.6	1.7	-2.4	4.2
1684	636			21.3	40.6	44.8	4.2	-2.4	6.6
725	636			21.5	40.8	44.0	3.2	-2.4	5.6
1631	636			21.3	40.6	43.1	2.5	-2.4	4.9
1269	636			22.8	42.1	43.1	1.0	-2.4	3.4
115	637			22.1	41.4	43.2	1.8	-2.4	4.2
715	637			21.4	40.7	42.6	1.9	-2.4	4.3
420	637			21.5	40.8	41.8	1.0	-2.4	3.4
1426	637			21.4	40.7	38.5	-2.2	-2.4	0.2
1303	638			21.9	41.2	43.1	1.8	-2.5	4.3
842	638			21.5	40.8	43.4	2.6	-2.5	5.1
1801	638			21.2	40.5	42.6	2.0	-2.5	4.5

## Table D.21 Tonality Assessment Table - 11 m/s (1)

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
194	639			22.0	41.3	45.4	4.1	-2.5	6.5
316	639			22.9	42.2	41.2	-0.9	-2.5	1.5
503	641			21.6	40.9	40.9	0.0	-2.5	2.5
692	641			21.7	41.0	42.2	1.2	-2.5	3.6
158	643			21.7	41.0	44.0	2.9	-2.5	5.4
1755	645			22.9	42.3	38.4	-3.8	-2.5	-1.4
2	649			22.3	41.7	33.8	-7.8	-2.5	-5.4
1744	653			21.7	41.0	38.2	-2.8	-2.5	-0.4
1515	655			22.0	41.4	36.9	-4.5	-2.5	-2.0
1896	659			22.3	41.7	44.0	2.3	-2.5	4.8
Average	633						2.4	-2.4	4.8



# Table D.22 Tonality Assessment Table - 11 m/s (2)

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Measurement #	Centre frequency (Hz)	Energy average of all masking lines (dB)	Background (dB)	Background adjusted criterion level (dB)	Masking level (dB)	Tone level (dB)	Determination of tonality (dB)	Frequency dependent audibility criterion (dB)	Tonal Audibility (dB)
1487	1260			21.7	42.7	35.1	-7.6	-3.0	-4.6
1594	1261			20.9	42.0	37.3	-4.7	-3.0	-1.6
914	1261			21.4	42.5	38.1	-4.4	-3.0	-1.4
1832	1261			20.7	41.8	35.6	-6.2	-3.0	-3.1
1583	1262			21.2	42.3	38.1	-4.2	-3.0	-1.1
486	1263			20.6	41.8	38.6	-3.1	-3.0	-0.1
1343	1263			21.8	42.9	29.6	-13.3	-3.0	-10.3
292	1263			21.0	42.1	40.0	-2.1	-3.0	0.9
1270	1263			21.7	42.8	37.2	-5.6	-3.0	-2.6
1191	1263			21.5	42.7	35.1	-7.6	-3.0	-4.5
1529	1264			20.8	41.9	37.8	-4.1	-3.0	-1.1
804	1266			21.3	42.4	38.9	-3.5	-3.0	-0.4
1841	1266			21.4	42.5	36.1	-6.4	-3.0	-3.3
297	1267			22.0	43.1	42.4	-0.8	-3.0	2.3
1789	1267			21.9	43.0	40.8	-2.3	-3.0	0.8
671	1267			21.1	42.3	41.4	-0.9	-3.0	2.2
317	1268			22.1	43.2	43.2	-0.1	-3.0	3.0
833	1268			21.9	43.1	40.3	-2.8	-3.0	0.3
842	1270			21.8	42.9	44.6	1.7	-3.0	4.7
868	1270			22.7	43.8	41.4	-2.4	-3.0	0.6
1684	1270			21.5	42.6	40.7	-1.9	-3.0	1.1
1326	1271			21.5	42.6	40.9	-1.7	-3.0	1.3
451	1271			21.7	42.8	42.0	-0.9	-3.0	2.2
1631	1272			21.6	42.7	40.4	-2.3	-3.0	0.7
585	1272			21.7	42.8	39.4	-3.4	-3.0	-0.4
1780	1272			21.0	42.1	34.6	-7.5	-3.0	-4.4
1840	1273			20.9	42.1	41.6	-0.4	-3.1	2.6
1269	1273			22.8	43.9	46.1	2.1	-3.1	5.2
1426	1273			21.6	42.7	43.0	0.3	-3.1	3.4
725	1274			21.3	42.4	44.8	2.4	-3.1	5.5
498	1275			21.1	42.3	41.3	-1.0	-3.1	2.1
1349	1275			21.9	43.1	39.1	-4.0	-3.1	-0.9
625	1276			21.4	42.5	41.1	-1.4	-3.1	1.7
1801	1276			21.2	42.3	40.1	-2.2	-3.1	0.9
449	1276			21.3	42.5	43.2	0.7	-3.1	3.8
115	1277			22.7	43.8	34.7	-9.1	-3.1	-6.1
420	1277			21.8	42.9	43.5	0.6	-3.1	3.6
194	1278			21.8	43.0	47.2	4.2	-3.1	7.3
316	1278			22.7	43.9	44.4	0.5	-3.1	3.6
692	1280			21.8	43.0	43.0	0.1	-3.1	3.1
503	1281			21.4	42.5	42.3	-0.3	-3.1	2.8
1757	1281			20.9	42.1	43.6	1.5	-3.1	4.6
158	1282			22.1	43.3	40.8	-2.5	-3.1	0.6
1751	1286			21.8	43.0	38.5	-4.5	-3.1	-1.4
1755	1287			22.4	43.6	33.1	-10.5	-3.1	-7.4
559	1287			21.7	42.9	43.1	0.2	-3.1	3.3
2	1288			22.0	43.2	40.2	-3.0	-3.1	0.1
1303	1291			22.2	43.4	43.1	-0.3	-3.1	2.7
1744	1307			21.5	42.7	38.3	-4.4	-3.1	-1.3
1515	1309			21.0	42.2	33.6	-8.6	-3.1	-5.5
1896	1309			22.0	43.3	42.7	-0.6	-3.1	2.5
Average	1274						-1.5	-3.1	1.5

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## Appendix E Measurement Data

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# Table E.01 Measurement data - Turbine ON

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\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (hPa)	Relative Humidity (%)
1			1619	96.2	96.2	8.4	15.7	10.4	9.9	14.5	99.7	33
2	11.1	54.0	1635	96.2	96.2	8.4	15.7	10.4	9.9	14.5	99.7	33
3	10.7	53.8	1602	96.2	96.2	6.5	15.2	10.0	10.6	14.5	99.7	33
4	10.1	52.8	1626	96.2	96.2	7.7	15.2	9.5	7.8	14.5	99.7	33
5			1597	96.2	96.2	5.0	14.9	8.1	8.4	14.5	99.7	33
6	9.5	53.7	1629	96.2	96.2	6.7	15.2	8.9	8.4	14.5	99.7	33
7			1620	96.2	96.2	5.6	15.0	7.9	10.0	14.6	99.7	31
8	10.3	54.1	1633	96.2	96.2	6.8	15.1	9.6	8.1	14.6	99.7	31
9	11.9	53.8	1631	96.2	96.2	8.4	15.2	11.2	7.0	14.6	99.7	31
10			1619	96.2	96.2	4.3	14.9	7.9	9.4	14.6	99.7	31
11	11.2	53.2	1655	96.2	96.2	5.5	15.2	10.5	8.4	14.6	99.7	31
12	12.2	54.4	1635	96.2	96.2	9.8	15.4	11.8	8.3	14.6	99.7	31
13	12.2	53.7	1616	96.2	96.2	8.6	15.1	11.4	10.6	14.5	99.7	31
14	12.5	53.3	1633	96.2	96.2	10.0	15.2	11.7	8.0	14.5	99.7	31
15	13.0	53.1	1621	96.2	96.2	8.0	15.0	12.4	6.9	14.5	99.7	31
16	9.8	52.8	1610	96.2	96.2	6.8	14.8	9.2	7.3	14.5	99.7	31
17			1644	96.2	96.2	4.9	14.8	7.1	6.3	14.5	99.7	31
18			1625	96.2	96.2	4.3	14.7	5.7	4.0	14.5	99.7	31
19			1628	96.2	96.2	3.9	14.9	8.5	10.1	14.5	99.7	32
20	9.8	52.7	1614	96.2	96.2	2.2	14.6	9.2	10.4	14.5	99.7	32
21	9.8	53.7	1690	96.2	96.2	5.2	15.5	9.2	9.5	14.5	99.7	32
22	13.8	54.1	1631	96.2	96.2	6.4	15.5	12.9	7.9	14.5	99.7	32
23	11.6	54.1	1621	96.2	96.2	9.0	15.3	10.9	8.1	14.5	99.7	32
24	11.9	53.1	1607	96.2	96.2	6.9	14.9	11.1	7.5	14.5	99.7	32
25			1641	96.2	96.2	8.2	15.2	8.7	6.1	14.5	99.7	31
26	14.1	53.8	1634	96.2	96.2	9.5	15.3	13.2	8.0	14.5	99.7	31
27	13.0	53.8	1619	96.2	96.2	9.3	15.0	12.2	6.5	14.5	99.7	31
28	14.7	53.3	1623	96.2	96.2	10.2	15.1	13.8	6.1	14.5	99.7	31
29	14.9	53.6	1625	96.2	96.2	10.5	15.1	13.9	6.3	14.5	99.7	31
30	12.3	53.5	1602	96.2	96.2	10.4	15.0	11.5	9.6	14.5	99.7	31
31	13.5	53.4	1623	96.2	96.2	9.7	15.0	12.0	7.1	14.5	99.7	32
32	11.6	53.0	1620	96.2	96.2	9.4	15.0	10.9	6.2	14.5	99.7	32
33	14.0	53.0	1645	96.2	96.2	10.0	15.2	13.2	10.2	14.5	99.7	32
34	13.7	53.9	1602	96.2	96.2	9.4	15.0	12.9	9.9	14.5	99.7	32
35	12.1	53.3	1633	96.2	96.2	8.2	15.0	11.3	10.3	14.5	99.7	32
36	11.3	54.2	1622	96.2	96.2	7.4	15.0	10.6	9.5	14.5	99.7	31
37	10.3	52.9	1613	96.2	96.2	6.1	14.8	9.5	8.4	14.5	99.7	31
38	10.6	53.2	1642	96.2	96.2	6.5	15.1	9.9	8.2	14.5	99.7	31
39	11.5	53.6	1634	96.2	96.2	7.3	15.1	10.8	8.1	14.5	99.7	31
40	10.8	53.8	1630	96.2	96.2	6.0	15.2	10.2	8.7	14.5	99.7	31
41	11.6	53.0	1621	96.2	96.2	8.4	15.1	10.9	8.4	14.5	99.7	31
42	11.1	52.7	1613	96.2	96.2	6.4	14.9	10.4	7.4	14.5	99.7	31
43	10.5	53.2	1615	96.2	96.2	3.6	14.6	8.6	6.8	14.5	99.7	31
44	9.4	53.3	1626	96.2	96.2	4.1	15.1	9.8	9.5	14.5	99.7	31
45	9.4	53.3	1642	96.2	96.2	4.1	15.1	9.8	8.1	14.5	99.7	31
46	9.9	53.3	1626	96.2	96.2	6.8	15.4	9.3	8.3	14.5	99.7	31
47	12.2	53.4	1641	96.2	96.2	6.1	15.4	11.5	7.4	14.5	99.7	31
48			1599	96.2	96.2	6.4	14.9	8.1	8.6	14.5	99.7	31
49	10.1	53.0	1599	96.2	96.2	4.4	14.6	9.4	8.5	14.5	99.7	31
50			1595	96.2	96.2	1.2	14.2	8.5	8.6	14.5	99.7	31
51	9.8	53.0	1672	96.2	96.2	1.7	15.0	9.1	8.5	14.5	99.7	31
52			1651	96.2	96.2	3.2	15.2	8.3	8.7	14.5	99.7	31
53			1619	96.2	96.2	2.5	15.0	8.6	8.4	14.5	99.7	31
54			1601	96.2	96.2	0.8	14.6	8.1	7.0	14.5	99.7	31
55	7.7	52.4	1097	96.2	96.2	0.9	14.7	8.0	7.4	14.5	99.7	31
56	7.6	52.3	1058	96.2	96.2	0.9	14.6	6.3	6.9	14.5	99.7	31
57	7.3	52.1	938	96.2	96.2	1.2	14.1	6.3	5.9	14.5	99.7	31
58	7.0	52.0	841	96.2	96.2	0.8	13.7	8.3	6.5	14.5	99.7	31
59	7.9	51.9	1192	96.2	96.2	0.4	14.9	9.0	6.6	14.5	99.7	31
60	8.9	52.7	1448	96.2	96.2	0.6	15.1	8.7	6.0	14.5	99.7	31
61	7.7	52.9	1109	96.2	96.2	0.8	14.9	6.6	7.3	14.5	99.7	31
62	7.7	52.8	1093	96.2	96.2	0.8	14.9	4.1	7.6	14.5	99.7	31
63	9.3	53.1	1589	96.2	96.2	0.9	15.3	8.7	7.6	14.5	99.7	31
64			1631	96.2	96.2	2.4	15.6	8.7	6.7	14.5	99.7	31
65	9.3	53.6	1593	96.2	96.2	1.8	15.0	8.7	8.5	14.5	99.7	31
66	9.9	53.3	1611	96.2	96.2	1.1	15.1	9.3	6.9	14.5	99.7	31
67	8.3	53.1	1305	96.2	96.2	0.2	14.7	9.9	6.2	14.5	99.8	32
68	9.1	53.1	1491	96.2	96.2	-0.2	15.1	7.9	5.2	14.5	99.8	32
69	10.7	53.9	1633	96.2	96.2	0.8	15.3	10.0	5.2	14.5	99.8	32
70			1564	96.2	96.2	0.2	15.1	8.3	7.3	14.5	99.8	32
71	7.9	53.1	1178	96.2	96.2	0.7	14.9	8.7	6.3	14.5	99.8	32
72	7.5	52.9	1039	96.2	96.2	7.0	15.7	7.7	6.9	14.5	99.8	32
73	7.1	52.1	861	96.2	96.2	1.2	13.5	6.1	8.4	14.6	99.8	32
74	6.8	50.8	774	96.2	96.2	1.0	13.2	6.7	8.3	14.6	99.8	32
75	6.7	50.1	737	96.2	96.2	1.0	13.1	5.6	6.1	14.6	99.8	32
76	7.9	50.4	839	96.2	96.2	0.6	13.7	5.3	7.9	14.6	99.8	32
77	10.8	53.3	1666	96.2	96.2	-0.3	15.4	10.1	7.7	14.6	99.8	32
78			1589	96.2	96.2	5.8	15.3	8.6	6.4	14.6	99.8	32
79	10.8	53.4	1590	96.2	96.2	0.9	14.9	8.9	6.9	14.7	99.8	31
80	10.0	54.3	1652	96.2	96.2	7.8	15.8	9.3	7.5	14.7	99.8	31
81			1602	96.2	96.2	4.4	15.1	6.7	10.0	14.7	99.8	31
82			1605	96.2	96.2	6.9	15.1	7.8	8.6	14.7	99.8	31
83	10.1	52.3	1570	96.2	96.2	0.2	14.4	9.4	10.2	14.7	99.8	31
84	10.8	52.1	1600	96.2	96.2	0.6	14.5	10.2	10.8	14.7	99.8	31
85	9.7	52.9	1628	96.2	96.2	1.1	14.7	9.1	8.7	14.8	99.7	31
86	8.4	53.2	1320	96.2	96.2	0.8	14.8	8.6	8.6	14.8	99.7	31
87			1634	96.2	96.2	0.2	15.3	7.9	8.6	14.8	99.7	31
88			1636	96.2	96.2	3.3	15.5	7.9	9.2	14.8	99.7	31

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (hPa)	Relative Humidity (%)
89			1622	96.2	96.2	2.2	15.3	7.5	9.3	14.8	99.7	31
90	9.5	54.6	1629	96.2	96.2	6.3	15.7	8.9	11.7	14.8	99.7	31
91	9.8	53.8	1633	96.2	96.2	6.9	15.6	9.2	7.4	14.8	99.8	31
92	9.6	54.1	1600	96.2	96.2	7.6	15.2	9.0	7.7	14.8	99.8	31
93	10.0	53.4	1607	96.2	96.2	6.9	14.9	9.3	9.1	14.8	99.8	31
94			1634	96.2	96.2	5.9	15.0	8.4	7.5	14.8	99.8	31
95	10.4	53.2	1625	96.2	96.2	5.9	15.0	9.7	9.1	14.8	99.8	31
96	10.7	52.7	1633	96.2	96.2	6.7	15.3	10.0	9.6	14.8	99.8	31
97	10.8	53.3	1582	96.2	96.2	5.1	14.6	10.1	8.7	14.9	99.8	31
98			1580	96.2	96.2	0.3	13.9	8.1	8.4	14.9	99.8	31
99	9.1	52.2	1488	96.2	96.2	0.1	14.9	10.4	8.7	14.9	99.8	31
100			1670	96.2	96.2	3.2	15.8	8.0	9.0	14.9	99.8	31
101			1559	96.2	96.2	1.6	14.8	8.0	7.7	14.9	99.8	31
102	7.5	52.7	1035	96.2	96.2	0.6	14.7	6.4	6.9	14.9	99.8	31
103	7.3	52.1	948	96.2	96.2	1.2	13.8	6.2	7.6	14.9	99.8	30
104	7.3	51.2	963	96.2	96.2	0.5	14.5	8.6	10.4			

# Table E.01 Measurement data - Turbine ON

Project: Borish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement  
Report ID: 14331.00.T22.RP4

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Date Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
177			1644	96.2	96.2	1.8	7.5	15.1	99.8	31		
178	10.2	54.2	1600	96.2	96.2	3.0	15.5	9.5	8.1	15.1	99.8	31
179			1621	96.2	96.2	4.2	15.5	7.5	7.8	15.1	99.8	31
180			1630	96.2	96.2	6.5	15.5	7.6	8.1	15.1	99.8	31
181			1590	96.2	96.2	5.0	14.9	8.7	6.6	15.2	99.8	31
182	10.0	53.3	1620	96.2	96.2	3.7	14.7	9.3	7.3	15.2	99.8	31
183	9.8	53.0	1635	96.2	96.2	2.3	14.8	9.2	9.8	15.2	99.8	31
184	10.6	53.2	1636	96.2	96.2	4.1	15.2	9.9	9.4	15.2	99.8	31
185			1610	96.2	96.2	3.6	15.0	8.6	7.1	15.2	99.8	31
186	9.3	53.5	1617	96.2	96.2	2.0	14.8	8.7	7.7	15.2	99.8	31
187			1596	96.2	96.2	1.3	14.4	8.1	8.2	15.3	99.8	31
188	11.7	54.1	1638	96.2	96.2	5.3	11.0	11.0	11.4	15.3	99.8	31
189	10.0	53.9	1620	96.2	96.2	2.9	15.2	9.4	7.0	15.3	99.8	31
190	8.4	52.9	1320	96.2	96.2	1.0	15.0	6.8	6.2	15.3	99.8	31
191	10.0	53.6	1626	96.2	96.2	4.6	15.3	9.4	10.7	15.3	99.8	31
192			1678	96.2	96.2	6.6	16.1	7.4	12.2	15.3	99.8	31
193	12.2	54.0	1596	96.2	96.2	8.0	15.5	11.4	9.4	15.3	99.8	30
194	11.1	54.7	1612	96.2	96.2	8.0	15.3	10.4	9.1	15.3	99.8	30
195	9.6	53.7	1635	96.2	96.2	6.1	14.9	9.0	11.5	15.3	99.8	30
196			1640	96.2	96.2	7.6	15.0	8.3	9.9	15.3	99.8	30
197	11.4	52.8	1615	96.2	96.2	5.4	14.8	10.6	8.5	15.3	99.8	30
198	11.0	52.7	1636	96.2	96.2	5.3	15.0	10.3	8.6	15.3	99.8	30
199	10.4	54.1	1624	96.2	96.2	5.8	15.0	9.7	8.5	15.4	99.8	31
200			1613	96.2	96.2	3.4	14.7	8.3	10.3	15.4	99.8	31
201			1592	96.2	96.2	3.1	14.6	8.4	9.8	15.4	99.8	31
202	7.5	52.3	1011	96.2	96.2	0.1	14.2	7.9	10.4	15.4	99.8	31
203	8.6	53.0	1372	96.2	96.2	0.5	15.0	7.3	9.9	15.4	99.8	31
204	8.6	53.4	1376	96.2	96.2	0.2	15.2	6.7	11.5	15.4	99.8	31
205	10.5	54.0	1605	96.2	96.2	9.2	15.9	8.9	10.7	15.4	99.8	30
206	12.8	53.8	1605	96.2	96.2	8.8	15.8	12.0	9.5	15.4	99.8	30
207	11.6	54.9	1602	96.2	96.2	9.5	15.1	10.9	8.3	15.4	99.8	30
208	11.5	53.6	1633	96.2	96.2	8.9	15.1	10.8	7.7	15.4	99.8	30
209	10.2	54.1	1634	96.2	96.2	9.9	15.2	9.6	8.0	15.4	99.8	30
210	12.7	53.3	1622	96.2	96.2	9.5	15.0	11.9	9.6	15.4	99.8	30
211	11.0	53.1	1629	96.2	96.2	8.9	15.1	10.3	12.3	15.5	99.8	30
212	10.6	54.1	1631	96.2	96.2	8.2	14.9	9.9	8.7	15.5	99.8	30
213	9.3	53.4	1635	96.2	96.2	8.7	15.2	8.7	8.5	15.5	99.8	30
214			1620	96.2	96.2	8.2	15.0	8.1	9.0	15.5	99.8	30
215	11.3	53.5	1628	96.2	96.2	5.9	14.7	10.5	10.8	15.5	99.8	30
216	9.7	53.1	1616	96.2	96.2	3.0	14.5	9.1	9.0	15.5	99.8	30
217	9.7	52.9	1658	96.2	96.2	5.1	15.1	9.1	9.9	15.4	99.8	30
218	11.1	53.5	1663	96.2	96.2	5.7	15.4	10.4	10.5	15.4	99.8	30
219			1604	96.2	96.2	6.7	15.1	8.2	10.2	15.4	99.8	30
220	10.6	52.8	1600	96.2	96.2	3.9	14.6	9.9	10.0	15.4	99.8	30
221			1637	96.2	96.2	2.2	14.8	8.9	8.9	15.4	99.8	30
222			1648	96.2	96.2	6.5	15.5	7.8	9.3	15.4	99.8	30
223	10.3	53.8	1624	96.2	96.2	7.6	15.1	9.6	10.5	15.4	99.8	30
224	10.1	53.4	1610	96.2	96.2	6.3	15.2	9.5	8.5	15.4	99.8	30
225			1612	96.2	96.2	6.2	14.9	8.4	7.2	15.4	99.8	30
226			1605	96.2	96.2	2.5	14.4	7.5	7.5	15.4	99.8	30
227			1647	96.2	96.2	2.2	14.7	7.9	7.8	15.4	99.8	30
228			1605	96.2	96.2	1.4	14.5	7.7	7.3	15.4	99.8	30
229	8.7	53.3	1409	96.2	96.2	0.0	14.9	7.7	6.4	15.4	99.8	30
230	9.6	53.9	1642	96.2	96.2	1.9	15.6	9.0	8.9	15.4	99.8	30
231	13.6	54.1	1661	96.2	96.2	5.1	15.9	12.7	10.4	15.4	99.8	30
232			1592	96.2	96.2	4.2	15.2	7.8	10.7	15.4	99.8	30
233	12.5	53.4	1631	96.2	96.2	6.2	15.5	11.7	11.5	15.4	99.8	30
234			1590	96.2	96.2	4.5	14.9	8.3	9.6	15.4	99.8	30
235	11.6	53.1	1636	96.2	96.2	5.5	15.2	10.8	6.7	15.4	99.8	30
236	10.2	53.7	1610	96.2	96.2	6.0	14.9	9.5	8.6	15.4	99.8	30
237	9.9	52.9	1624	96.2	96.2	3.9	14.8	9.3	8.4	15.4	99.8	30
238	9.8	53.1	1631	96.2	96.2	3.5	14.8	9.2	7.5	15.4	99.8	30
239	10.5	53.7	1637	96.2	96.2	4.1	15.0	9.8	9.4	15.4	99.8	30
240	9.6	52.9	1608	96.2	96.2	3.0	14.8	9.0	8.0	15.4	99.8	30
241			1628	96.2	96.2	4.5	15.1	9.5	8.6	15.4	99.8	30
242			1604	96.2	96.2	0.1	14.4	7.4	9.2	15.4	99.8	30
243			1644	96.2	96.2	1.0	15.0	7.7	9.0	15.4	99.8	30
244			1646	96.2	96.2	1.0	15.1	8.1	7.0	15.4	99.8	30
245	10.4	54.1	1607	96.2	96.2	4.6	15.7	9.7	8.5	15.4	99.8	30
246	11.9	54.0	1639	96.2	96.2	7.0	15.7	11.2	8.4	15.4	99.8	30
247			1599	96.2	96.2	5.6	15.1	8.4	6.9	15.4	99.8	30
248	10.0	53.1	1611	96.2	96.2	5.8	15.0	9.3	10.3	15.4	99.8	30
249	12.7	53.6	1620	96.2	96.2	7.4	15.2	11.9	6.2	15.4	99.8	30
250			1609	96.2	96.2	5.0	14.9	8.6	6.2	15.4	99.8	30
251			1607	96.2	96.2	5.2	14.7	7.1	6.5	15.4	99.8	30
252	10.3	53.0	1650	96.2	96.2	3.7	15.1	9.7	9.8	15.4	99.8	30
253	9.5	53.2	1633	96.2	96.2	6.7	15.3	8.9	6.0	15.5	99.8	31
254	10.2	53.5	1630	96.2	96.2	6.1	15.3	9.6	6.9	15.5	99.8	31
255			1588	96.2	96.2	5.2	14.7	7.7	5.8	15.5	99.8	31
256			1633	96.2	96.2	5.7	15.1	8.5	8.4	15.5	99.8	31
257	9.7	52.9	1632	96.2	96.2	5.7	15.1	9.1	4.5	15.5	99.8	31
258	11.2	53.2	1622	96.2	96.2	5.0	14.9	10.5	5.0	15.5	99.8	31
259	9.9	53.7	1616	96.2	96.2	4.1	14.9	9.2	8.3	15.5	99.8	31
260			1625	96.2	96.2	2.6	14.7	7.1	5.9	15.8	99.8	31
261			1618	96.2	96.2	2.1	14.7	8.3	7.6	15.8	99.8	31
262	9.5	53.2	1548	96.2	96.2	-0.2	14.4	8.9	6.5	15.8	99.8	31
263	9.2	53.0	1275	96.2	96.2	1.8	14.8	7.3	7.3	15.8	99.8	31
264			1206	96.2	93.3	12.0	10.8	9.3	10.3	17.5	99.7	27

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Date Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
265			1281	96.2	93.3	13.3	11.4	10.9	9.0	17.5	99.7	27
266			1293	96.2	93.3	14.0	11.6	10.7	9.2	17.5	99.7	27
267			1337	96.2	93.3	14.2	12.0	10.6	10.4	17.5	99.7	27
268			1374	96.2	93.3	13.2	12.2	11.8	9.3	17.5	99.7	27
269			1411	96.2	93.3	12.2	12.5	11.8	9.5	17.5	99.7	27
270			1442	96.2	93.3	10.8	12.8	12.6	8.7	17.4	99.7	27
271			1491	96.2	93.3	12.3	13.5	9.1	9.3	17.4	99.7	27
272			1495	96.2	93.3	12.2	13.6	12.0	8.6	17.4	99.7	27
273	12.8	52.4	1544	96.2	93.3	10.9	13.9	12.0	9.2	17.5	99.7	27
274	12.3	52.4	1596	96.2	93.3	10.2	14.3	11.5	8.5	17.3	99.7	28
275	12.8	53.2	1623	96.2	93.3	11.3	14.7	12.0	8.1	17.3	99.7	28
276			1161	96.2	93.3	10.5	14.9	12.8	8.0	17.3	99.7	28
277	10.9	54.5	1614	96.2	93.3	11.1	15.0	10.2	12.4	17.3	99.7	28
278	12.9	54.3	1631	96.2	93.3	9.7	15.1	12.1	11.9	17.3	99.7	28
279	12.7	54.1	1633	96.2	93.3	11.6	15.2	11.9	12.1	17.3	99.7	28
280	13.5	54.5	1625	96.2	93.3	10.7	15.1	12.6	9.3	17.3	99.7	

# Table E.01 Measurement data - Turbine ON

Project: Borish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement  
 Report ID: 14331.00.T22.RP4

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
353			1604	96.2	90.3	0.0	11.8	7.6	6.9	17.7	99.7	28
354			1637	96.2	90.3	1.4	14.9	8.3	8.3	17.7	99.7	28
355			1621	96.2	90.3	0.4	14.9	7.4	7.8	17.7	99.7	28
356	10.3	53.4	1639	96.2	90.3	-0.2	14.9	9.7	7.7	17.7	99.7	29
357	10.1	54.1	1618	96.2	90.3	-0.4	15.1	9.4	7.0	17.7	99.7	29
358	8.9	53.3	1458	96.2	90.3	0.5	15.1	7.7	9.0	17.7	99.7	29
359			1534	96.2	90.3	0.1	15.1	8.4	9.7	17.7	99.7	29
360	9.4	54.6	1631	96.2	90.3	0.4	15.3	8.8	8.2	17.7	99.7	29
361	11.9	54.2	1638	96.2	90.3	0.0	15.2	11.1	7.2	17.7	99.7	29
362			1845	96.2	90.3	0.6	15.4	8.2	6.0	17.9	99.7	28
363			1614	96.2	90.3	0.8	15.2	7.8	6.3	17.9	99.7	28
364	9.6	53.0	1598	96.2	90.3	0.0	15.0	8.0	8.0	17.9	99.7	28
365	9.9	54.0	1641	96.2	90.3	1.3	15.4	9.3	6.6	17.9	99.7	28
366			1606	96.2	90.3	2.7	15.0	8.5	7.5	17.9	99.7	28
367			1609	96.2	90.3	-1.3	14.9	8.6	6.0	17.9	99.7	28
368	8.7	53.4	1409	96.2	90.3	0.4	14.9	9.6	6.7	17.9	99.7	28
369	7.9	53.3	1172	96.2	90.3	0.7	15.0	6.9	7.6	17.9	99.7	28
370	7.7	52.9	1089	96.2	90.3	0.9	15.0	7.1	5.8	17.9	99.7	28
371	52.7	7.5	1066	96.2	90.3	1.0	14.5	5.4	4.9	17.9	99.7	28
372	7.6	52.9	1074	96.2	90.3	0.9	14.8	7.4	5.7	17.9	99.7	28
373	9.7	53.2	1622	96.2	90.3	-0.4	15.2	9.1	6.0	17.9	99.7	28
374	8.2	53.4	1257	96.2	90.3	1.1	15.0	7.0	5.9	17.9	99.7	28
375	53.9	7.9	1180	96.2	90.3	0.6	15.1	8.0	5.1	17.9	99.7	28
376	9.0	54.2	1482	96.2	83.3	0.6	15.2	9.3	6.0	17.9	99.7	29
377			1592	96.2	78.6	0.1	15.1	9.4	4.9	17.9	99.7	29
378			1340	96.2	78.6	1.0	15.1	7.3	5.7	17.9	99.7	29
379			1546	96.2	78.6	-0.3	15.1	8.6	5.8	17.9	99.7	29
380			1614	96.2	78.6	0.6	15.2	9.0	4.1	18.1	99.7	28
381			1281	96.2	78.6	0.2	14.9	7.1	5.7	18.1	99.7	28
382			1168	96.2	78.6	0.7	15.1	7.8	6.0	18.1	99.7	28
383			78.6	96.2	0.0	15.1	8.3	6.3	6.3	18.1	99.7	28
384			1022	96.2	81.6	1.1	14.5	7.1	4.3	18.1	99.7	28
385	7.3	52.6	965	96.2	87.4	0.9	14.2	6.5	4.8	18.1	99.7	28
386	8.2	52.3	1256	96.2	87.4	0.6	14.9	7.2	4.5	18.1	99.7	28
387	8.6	53.6	1371	96.2	87.4	-0.1	15.1	8.6	6.6	18.1	99.7	29
388	7.6	52.8	1074	96.2	87.4	0.8	15.0	6.3	6.0	18.1	99.7	29
389	7.6	52.3	1073	96.2	87.4	0.9	14.8	6.3	5.2	18.1	99.7	29
390	8.8	52.6	1429	96.2	87.4	-0.1	15.2	9.9	9.2	18.1	99.7	29
391	9.6	53.5	1557	96.2	87.4	-0.1	15.1	9.0	7.6	18.1	99.7	28
392	10.8	53.3	1632	96.2	87.4	0.5	15.0	8.1	6.3	18.3	99.7	28
393	8.2	53.6	1256	96.2	87.4	0.7	15.1	7.1	6.6	18.3	99.7	28
394	7.5	53.2	1041	96.2	87.4	1.0	14.7	6.2	5.7	18.3	99.7	28
395	7.4	52.7	968	96.2	87.4	1.1	14.2	6.8	6.5	18.3	99.7	28
396	10.1	54.7	1621	96.2	87.4	0.7	14.7	5.9	6.0	18.3	99.7	28
397	10.1	54.4	1673	96.2	87.4	2.2	15.2	9.4	8.4	18.3	99.7	29
398	9.4	54.0	1570	96.2	87.4	3.1	14.9	8.8	6.7	18.3	99.7	29
399	10.8	53.5	1632	96.2	87.4	2.4	15.2	10.1	6.6	18.3	99.7	29
400	10.2	53.3	1613	96.2	87.4	2.0	15.0	9.5	7.2	18.3	99.7	29
401	9.8	53.1	1610	96.2	87.4	1.2	14.8	9.2	6.6	18.3	99.7	29
402	8.7	53.4	1404	96.2	87.4	0.1	14.9	9.2	7.6	18.3	99.7	29
403	7.7	53.5	1109	96.2	87.4	0.7	14.9	6.9	4.9	18.3	99.7	29
404	8.2	53.5	1276	96.2	87.4	1.3	15.1	8.4	6.4	18.3	99.7	29
405	8.9	52.7	1461	96.2	87.4	0.2	15.2	8.8	6.6	18.3	99.7	29
406			1644	96.2	87.4	0.7	15.3	8.0	5.2	18.3	99.7	29
407	8.1	53.9	1236	96.2	87.4	0.5	14.9	7.6	4.8	18.3	99.7	29
408	7.8	52.9	1154	96.2	87.4	0.9	15.0	5.6	5.6	18.3	99.7	29
409	7.6	52.7	1054	96.2	87.4	1.0	14.8	5.2	6.4	18.3	99.7	29
410	8.0	53.7	1204	96.2	87.4	0.1	15.0	8.6	5.1	18.3	99.7	29
411	7.5	53.5	1035	96.2	87.4	1.0	14.7	7.1	6.2	18.3	99.7	29
412	7.4	52.7	997	96.2	87.4	1.0	14.4	7.6	2.7	18.3	99.7	29
413	7.8	52.8	1066	96.2	87.4	0.9	14.7	7.2	5.3	18.3	99.7	29
414	8.9	53.5	1466	96.2	87.4	0.5	15.1	7.0	4.3	18.3	99.7	29
415			1645	96.2	87.4	1.7	15.5	8.4	5.8	18.3	99.7	28
416			1616	96.2	87.4	3.5	15.3	8.0	5.8	18.3	99.7	28
417			1611	96.2	87.4	6.0	15.6	8.3	6.5	18.3	99.7	28
418			1620	96.2	87.4	5.3	15.2	8.0	8.7	18.3	99.7	28
419	9.9	54.5	1621	96.2	87.4	6.6	15.4	9.3	8.3	18.3	99.7	28
420	11.2	53.8	1603	96.2	87.4	6.8	15.1	10.5	6.7	18.3	99.7	28
421			1629	96.2	87.4	5.5	14.9	9.7	6.7	18.4	99.7	28
422	10.3	53.4	1642	96.2	87.4	6.0	15.1	9.6	6.7	18.4	99.7	28
423	9.4	53.2	1608	96.2	87.4	4.8	14.9	8.9	5.5	18.4	99.7	28
424			1489	96.2	87.4	0.3	14.2	7.8	6.2	18.4	99.7	28
425	8.9	53.6	1453	96.2	87.4	0.2	15.0	7.9	5.6	18.4	99.7	28
426	8.6	53.1	1365	96.2	87.4	1.3	15.1	8.5	7.1	18.3	99.7	29
427	11.9	53.8	1652	96.2	87.4	1.4	15.6	11.1	8.1	18.3	99.7	29
428	11.8	54.3	1647	96.2	90.3	3.0	15.5	11.1	6.9	18.2	99.7	28
429			1576	96.2	90.3	1.7	14.7	7.5	8.0	18.3	99.7	29
430	9.0	53.1	1476	96.2	90.3	-0.7	15.0	8.2	8.9	18.3	99.7	29
431			1625	96.2	90.3	0.7	15.3	7.6	8.3	18.3	99.7	29
432	10.0	54.7	1629	96.2	90.3	1.8	15.2	9.4	8.4	18.2	99.7	28
433	8.6	53.9	1375	96.2	90.3	-0.4	14.9	8.7	7.3	18.3	99.7	28
434	8.2	53.6	1272	96.2	90.3	0.4	15.1	6.3	6.3	18.3	99.7	28
435			1618	96.2	90.3	0.5	15.3	8.5	9.5	18.3	99.7	28
436	8.1	53.6	1242	96.2	90.3	0.5	14.9	8.2	9.5	18.3	99.7	28
437			1835	96.2	90.3	0.6	15.3	7.7	9.6	18.3	99.7	28
438			1648	96.2	90.3	5.5	15.8	7.4	8.3	18.3	99.7	28
439			1632	96.2	90.3	6.2	15.8	8.2	4.8	18.3	99.7	28
440	9.4	53.6	1595	96.2	90.3	7.3	15.4	8.8	8.7	18.4	99.7	28

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
441	11.9	54.1	1608	96.2	90.3	7.8	15.2	11.0	8.1	18.4	99.7	28
442	12.3	52.7	1630	96.2	90.3	8.5	15.2	11.6	7.5	18.4	99.7	28
443	10.3	53.8	1615	96.2	90.3	6.7	14.9	9.6	6.0	18.3	99.7	28
444	9.8	53.2	1628	96.2	90.3	5.8	14.9	9.2	6.2	18.3	99.7	29
445	9.8	53.3	1637	96.2	85.0	4.5	14.8	9.2	7.3	18.3	99.7	29
446	11.4	52.9	1622	96.2	84.5	3.8	14.7	10.6	8.7	18.3	99.7	29
447			1657	96.2	84.5	3.2	15.2	8.5	5.9	18.3	99.7	29
448	14.1	53.8	1619	96.2	84.5	6.7	15.1	13.2	6.2	18.3	99.7	29
449	10.8	54.1	1630	96.2	84.5	5.5	15.4	10.1	6.1	18.3	99.7	29
450	10.3	54.1	1631	96.2	84.5	8.8	15.3	9.6	8.7	18.3	99.7	29
451	11.0	53.6	1628	96.2	84.5	8.6	15.1	10.3	8.6	18.3	99.7	29
452	12.2	53.8	1621	96.2	84.5	8.4	15.0	11.4	9.5	18.3	99.7	29
453	9.5	53.7	1627	96.2	84.5	8.5	15.1	8.9	7.1	18.3	99.7	29
454	13.7	54.2	1618	96.2	84.5	8.8	15.0	12.9	5.6	18.3	99.7	29
455	10.7	54.2	1629	96.2	84.5	7.5	15.0	8.2	6.6	18.3	99.7	29
456	9.5	52.8	1638	96.2	84.5	7.7	15.1					

# Table E.01 Measurement data - Turbine ON

Project: Borish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement  
Report ID: 14331.00.T22.RP4

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
529			1660	96.2	96.2	0.2	14.4	7.5	8.2	18.6	99.7	29
530	10.1	54.3	1620	96.2	96.2	2.3	15.5	9.5	9.3	18.6	99.7	29
531	9.8	54.3	1649	96.2	96.2	5.2	15.8	9.1	7.3	18.6	99.7	29
532			1568	96.2	96.2	4.5	15.1	7.8	9.2	18.6	99.7	29
533	9.3	54.2	1629	96.2	96.2	5.3	15.5	8.7	8.5	18.6	99.7	29
534	9.7	54.6	1632	96.2	96.2	6.4	15.2	9.1	6.8	18.6	99.7	29
535			1623	96.2	96.2	4.8	15.0	6.0	10.3	18.6	99.7	29
536			1576	96.2	96.2	2.7	14.4	7.4	9.5	18.6	99.7	29
537			1610	96.2	96.2	2.7	14.5	8.6	6.5	18.6	99.7	29
538			1616	96.2	96.2	1.9	14.8	8.2	6.9	18.6	99.7	29
539			1675	96.2	96.2	1.7	15.1	8.4	7.4	18.6	99.7	28
540			1648	96.2	96.2	3.3	15.3	8.3	7.2	18.6	99.7	28
541			1607	96.2	96.2	3.1	15.0	8.6	8.2	18.6	99.7	28
542			1611	96.2	96.2	1.5	14.9	7.1	6.1	18.8	99.7	28
543	9.7	53.0	1622	96.2	96.2	0.2	14.8	8.1	7.6	18.8	99.7	28
544			1644	96.2	96.2	2.4	15.0	7.8	3.8	18.8	99.7	29
545	9.8	54.3	1669	96.2	96.2	4.6	15.5	9.2	6.3	18.8	99.7	29
546	10.7	54.4	1602	96.2	96.2	4.7	15.2	10.0	7.8	18.8	99.7	29
547	9.3	53.4	1640	96.2	96.2	5.3	15.4	8.7	7.0	18.8	99.7	29
548			1588	96.2	96.2	2.7	14.7	7.6	7.1	18.8	99.7	29
549	10.0	54.0	1652	96.2	96.2	5.5	15.2	9.3	6.9	18.8	99.7	29
550			1618	96.2	96.2	6.4	15.2	8.1	5.7	18.8	99.7	29
551			1618	96.2	96.2	5.1	15.0	6.9	10.0	18.8	99.7	29
552	9.4	54.1	1603	96.2	96.2	3.5	14.8	8.8	8.4	18.8	99.7	29
553			1608	96.2	96.2	2.5	14.5	7.7	8.7	18.8	99.7	29
554			1641	96.2	96.2	2.2	15.0	7.9	8.7	18.8	99.7	29
555	10.6	53.1	1619	96.2	96.2	1.1	14.6	10.0	7.8	18.8	99.7	29
556	8.4	53.1	1331	96.2	96.2	-0.9	14.8	7.4	6.1	18.8	99.7	29
557			1549	96.2	96.2	1.4	15.1	7.0	4.8	18.8	99.7	29
558	9.5	54.1	1640	96.2	96.2	1.5	15.5	8.9	7.3	18.8	99.7	29
559	11.0	54.4	1585	96.2	96.2	1.6	14.9	10.3	9.2	18.8	99.7	29
560	9.6	53.8	1656	96.2	96.2	-0.8	15.2	9.0	7.9	18.8	99.7	29
561			1602	96.2	96.2	1.8	15.1	7.0	8.8	18.8	99.7	29
562	9.6	54.0	1641	96.2	96.2	0.4	15.4	9.0	5.9	18.8	99.7	29
563			1658	96.2	96.2	4.8	15.8	8.1	6.5	18.8	99.7	29
564			1592	96.2	96.2	3.7	15.3	8.4	7.2	18.8	99.7	29
565	11.2	53.9	1639	96.2	96.2	4.0	15.3	10.5	7.6	18.8	99.7	29
566	9.3	53.8	1595	96.2	96.2	3.3	15.0	8.8	8.3	18.8	99.7	29
567			1605	96.2	96.2	2.1	14.6	8.6	8.7	18.8	99.7	29
568	7.8	52.8	1078	96.2	96.2	0.2	14.5	7.1	7.0	19.0	99.7	28
569	7.5	53.1	1026	96.2	96.2	0.9	14.6	8.4	6.8	19.0	99.7	28
570	7.3	52.3	953	96.2	96.2	1.1	14.0	4.7	10.8	19.0	99.7	28
571			1639	96.2	96.2	-0.6	15.1	8.3	8.6	19.0	99.7	28
575	9.5	54.2	1605	96.2	96.2	0.2	15.0	8.9	6.1	19.0	99.7	28
573	8.1	53.3	1250	96.2	96.2	1.2	15.0	8.1	10.6	19.0	99.7	28
574	10.3	54.0	1651	96.2	96.2	2.2	15.7	9.7	7.5	18.8	99.7	28
575			1627	96.2	96.2	2.8	15.5	8.2	10.4	18.8	99.7	28
576			1615	96.2	96.2	3.2	15.2	7.6	9.6	18.8	99.7	28
577			1620	96.2	96.2	2.3	15.1	8.5	8.4	18.8	99.7	28
578	9.8	54.0	1623	96.2	96.2	3.6	15.2	9.2	7.1	18.8	99.7	28
579			1586	96.2	96.2	0.9	14.6	6.9	6.4	18.8	99.7	28
580			1648	96.2	96.2	2.6	15.0	5.8	6.4	18.8	99.7	28
581	8.6	53.1	1362	96.2	96.2	0.4	14.5	7.3	10.3	18.8	99.7	28
582			1645	96.2	96.2	-0.2	15.1	7.3	7.6	18.8	99.7	28
583	10.7	54.0	1653	96.2	96.2	3.5	15.7	10.0	6.9	18.8	99.7	28
584			1598	96.2	96.2	7.8	15.4	8.7	8.4	18.8	99.7	28
585	11.0	53.8	1585	96.2	96.2	4.8	14.8	10.3	7.8	18.6	99.7	29
586			1611	96.2	96.2	3.2	14.5	8.4	4.8	18.6	99.7	29
587	12.7	54.0	1631	96.2	96.2	9.8	15.6	11.9	4.6	18.6	99.7	29
588	13.4	54.0	1622	96.2	96.2	9.5	15.0	12.5	5.3	18.6	99.7	29
589	10.8	54.7	1618	96.2	96.2	9.5	15.1	10.1	9.5	18.6	99.7	29
590	11.3	55.4	1637	96.2	96.2	9.6	15.1	10.6	8.4	18.6	99.7	29
591			1622	96.2	96.2	10.1	15.1	12.2	9.0	18.8	99.7	29
592	10.5	54.8	1617	96.2	96.2	8.0	14.9	9.8	7.3	18.8	99.7	29
593	9.8	54.9	1629	96.2	96.2	9.3	15.2	9.2	6.6	18.8	99.7	29
594	9.8	54.9	1630	96.2	96.2	10.0	15.1	9.2	7.7	18.8	99.7	29
595			1631	96.2	96.2	9.3	15.0	8.6	8.4	18.8	99.7	29
596	13.1	54.1	1624	96.2	96.2	9.7	15.1	12.2	7.3	18.8	99.7	29
597	11.9	53.7	1613	96.2	96.2	7.5	14.9	11.2	7.6	19.0	99.7	29
598	11.8	53.5	1614	96.2	96.2	6.4	14.9	11.1	9.1	19.0	99.7	29
599			1648	96.2	96.2	9.3	15.2	8.3	7.4	19.0	99.7	29
600	11.9	54.0	1620	96.2	96.2	10.7	15.0	10.6	10.6	19.0	99.7	29
601	10.9	53.6	1623	96.2	96.2	8.5	15.2	10.2	8.9	19.0	99.7	29
602	12.9	53.9	1612	96.2	96.2	9.3	14.9	12.1	8.2	19.0	99.7	29
603	10.4	53.6	1632	96.2	96.2	7.3	15.0	9.8	11.9	19.0	99.7	29
604	11.1	53.0	1617	96.2	96.2	6.6	14.7	10.7	10.4	19.0	99.7	29
605			1600	96.2	96.2	9.3	14.4	7.1	9.5	19.0	99.7	29
606	11.0	53.8	1656	96.2	96.2	3.6	14.9	10.3	11.3	19.0	99.7	29
607			1621	96.2	96.2	9.3	14.9	7.2	8.5	19.0	99.7	29
608	10.2	53.5	1617	96.2	96.2	9.3	14.6	9.5	10.7	19.0	99.7	29
609			1690	96.2	96.2	9.3	15.0	14.4	9.0	19.0	99.7	29
610	9.9	54.6	1676	96.2	96.2	8.6	16.0	10.2	8.0	19.0	99.7	29
611	10.2	54.7	1615	96.2	96.2	8.5	15.8	9.6	8.6	19.0	99.7	29
612	11.5	55.0	1621	96.2	96.2	9.3	15.0	9.8	8.0	19.0	99.7	29
613	12.5	53.3	1627	96.2	96.2	9.6	15.0	11.7	11.0	19.0	99.7	29
614	11.4	55.2	1628	96.2	96.2	9.3	15.1	10.7	9.2	19.0	99.7	29
615	12.3	53.7	1629	96.2	96.2	9.3	15.1	11.5	11.9	19.0	99.7	29
616	14.0	53.6	1632	96.2	96.2	9.1	15.0	13.1	10.3	19.0	99.7	29

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
617	11.9	53.4	1624	96.2	96.2	9.3	15.1	11.1	11.4	19.0	99.7	29
618	11.7	53.8	1630	96.2	96.2	9.3	15.1	10.9	12.2	19.0	99.7	29
619	13.0	53.4	1627	96.2	96.2	9.9	15.2	12.2	10.9	19.0	99.7	29
620	12.3	53.9	1626	96.2	96.2	9.9	15.1	11.5	10.8	19.0	99.7	29
621			1615	96.2	96.2	8.1	14.8	7.3	9.6	18.8	99.7	28
622	9.9	53.3	1633	96.2	96.2	6.4	15.0	9.3	9.6	18.8	99.7	28
623			1620	96.2	96.2	6.8	14.7	7.8	10.7	18.8	99.7	28
624			1634	96.2	96.2	3.6	14.6	8.9	8.4	18.8	99.7	28
625	11.0	53.6	1694	96.2	96.2	5.3	15.4	10.3	10.6	18.8	99.7	28
626	10.8	54.2	1639	96.2	96.2	5.7	15.2	9.6	9.2	18.8	99.7	28
627	10.4	53.1	1605	96.2	96.2	4.9	14.9	9.7	10.7	18.8	99.7	28
628	11.5	52.9	1605	96.2	96.2	2.2	14.8	10.7	13.2	18.8	99.7	28
629	10.7	53.4	1638	96.2	96.2	3.4	15.0	10.0	7.8	18.8	99.7	28
630			1635	96.2	96.2	5.6	14.9	7.2	8.3	18.8	99.7	28
631			1627	96.2	96.2	4.5	14.9	7.5	8.1	18.8	99.7	28
632	7.7	54.0	1100	96.2	96.2	-1.5	14.3	8.2	8.9	18.8	99.7	28

# Table E.01 Measurement data - Turbine ON

Project: Borish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement  
Report ID: 14331.00.T22.RP4

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Date Point #	Standardized Wind Speed	LAg	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
705	9.5	54.7	1649	96.2	90.3	6.5	18.8	8.9	7.5	19.4	99.7	29
706	11.8	54.7	1614	96.2	90.3	8.1	15.3	11.1	10.0	19.4	99.7	29
707	11.9	54.1	1600	96.2	90.3	10.6	15.3	11.2	9.4	19.4	99.7	29
708	11.9	53.8	1617	96.2	90.3	8.5	15.0	11.1	9.8	19.4	99.7	29
709	11.2	52.6	1636	96.2	90.3	7.4	15.0	10.5	8.5	19.4	99.7	28
710	11.0	53.1	1628	96.2	90.3	6.4	14.9	10.3	8.3	19.4	99.7	28
711	9.8	53.7	1628	96.2	90.3	7.4	15.1	9.2	7.3	19.4	99.7	28
712	11.1	53.6	1618	96.2	90.3	7.4	15.0	10.4	8.7	19.4	99.7	28
713			1623	96.2	90.3	6.2	14.8	7.0	8.9	19.4	99.7	28
714			1624	96.2	90.3	4.1	14.7	7.2	6.5	19.4	99.7	28
715	11.0	53.9	1652	96.2	90.3	7.1	15.3	10.3	8.4	19.4	99.7	29
716			1616	96.2	90.3	6.1	14.7	8.6	7.8	19.4	99.7	29
717	14.2	54.8	1652	96.2	90.3	8.8	15.4	13.3	8.6	19.4	99.7	29
718	14.1	53.3	1624	96.2	90.3	8.3	15.2	13.2	9.5	19.4	99.7	29
719	10.4	53.4	1621	96.2	90.3	9.2	15.1	9.8	9.0	19.4	99.7	29
720	11.5	52.6	1621	96.2	90.3	7.0	15.0	10.7	8.8	19.4	99.7	29
721	9.9	52.4	1634	96.2	90.3	6.1	14.9	9.2	10.2	19.4	99.7	29
722	11.3	53.3	1613	96.2	90.3	5.9	14.9	10.6	9.2	19.4	99.7	29
723	10.2	52.5	1625	96.2	90.3	4.7	14.8	9.5	8.3	19.4	99.7	29
724	10.0	53.6	1643	96.2	90.3	6.5	15.4	9.4	8.3	19.4	99.7	29
725	11.0	54.2	1626	96.2	90.3	8.3	15.2	10.3	9.3	19.4	99.7	29
726	10.6	53.6	1610	96.2	90.3	6.8	14.9	10.0	10.2	19.4	99.7	29
727	10.1	53.2	1634	96.2	90.3	6.3	15.0	9.5	9.1	19.5	99.7	29
728			1623	96.2	90.3	8.2	15.1	8.5	8.2	19.5	99.7	29
729	10.5	53.0	1642	96.2	90.3	6.4	15.1	9.8	9.0	19.5	99.7	29
730	11.0	53.2	1606	96.2	90.3	6.1	14.7	10.4	10.4	19.5	99.7	29
731	11.6	53.0	1637	96.2	90.3	3.4	14.9	10.9	6.6	19.5	99.7	29
732	10.1	52.8	1612	96.2	90.3	4.8	14.7	9.5	7.2	19.5	99.7	29
733	9.8	53.3	1622	96.2	90.3	1.1	14.7	9.2	10.3	19.4	99.7	28
734	9.7	52.7	1624	96.2	90.3	0.3	14.4	7.2	8.2	19.4	99.7	28
735	7.6	52.9	1602	96.2	90.3	0.7	14.9	6.2	8.7	19.4	99.7	28
736	8.7	54.3	1405	96.2	90.3	0.8	15.2	9.0	10.0	19.4	99.7	28
737			1626	96.2	90.3	0.4	15.5	5.7	10.8	19.4	99.7	28
738			1639	96.2	90.3	5.6	15.6	8.3	6.5	19.4	99.7	28
739	11.7	53.4	1668	96.2	90.3	3.6	15.9	11.0	7.2	19.4	99.7	29
740			1611	96.2	90.3	7.1	15.9	8.1	8.5	19.4	99.7	29
741	12.5	54.3	1625	96.2	90.3	7.4	15.4	11.7	11.7	19.4	99.7	29
742	10.5	53.7	1596	96.2	90.3	6.2	14.8	9.8	8.7	19.4	99.7	29
743	12.5	52.7	1627	96.2	90.3	5.3	15.0	11.7	9.0	19.4	99.7	29
744			1617	96.2	90.3	6.2	15.0	10.4	7.3	19.2	99.7	29
745	10.4	52.8	1618	96.2	90.3	5.9	14.9	9.7	7.9	19.3	99.7	29
746			1637	96.2	90.3	6.9	15.3	8.5	8.5	19.3	99.7	29
747	10.6	53.6	1623	96.2	90.3	7.5	15.1	9.9	6.3	19.2	99.7	29
748	10.8	53.6	1642	96.2	90.3	6.9	15.1	10.1	10.1	19.3	99.7	29
749			1616	96.2	90.3	6.0	14.9	8.3	7.3	19.2	99.7	29
750	9.8	53.3	1616	96.2	90.3	4.2	14.8	9.2	6.4	19.3	99.7	29
751	9.7	54.0	1635	96.2	90.3	3.8	15.0	9.1	5.6	19.3	99.7	29
752			1635	96.2	90.3	4.5	15.0	7.5	6.8	19.3	99.7	29
753			1607	96.2	90.3	2.5	14.7	8.6	7.9	19.3	99.7	29
754			1675	96.2	90.3	5.1	15.5	7.0	5.4	19.3	99.7	29
755	11.5	53.5	1633	96.2	90.3	6.6	15.4	10.8	2.7	19.3	99.7	29
756	9.9	53.5	1608	96.2	90.3	5.4	15.0	9.3	6.2	19.6	99.7	30
757	10.3	53.2	1627	96.2	90.3	5.4	15.1	9.7	5.9	19.6	99.7	30
758	9.8	52.7	1601	96.2	90.3	3.6	14.6	8.1	4.7	19.6	99.7	30
759	9.8	52.6	1623	96.2	90.3	3.3	14.8	9.2	5.6	19.6	99.7	30
760			1567	96.2	90.3	0.2	14.1	7.7	6.1	19.6	99.7	30
761	7.9	53.4	1177	96.2	90.3	0.8	14.8	8.0	6.0	19.6	99.7	30
762	8.5	53.2	1624	96.2	90.3	0.5	15.1	8.7	6.8	19.9	99.7	29
763	8.5	53.7	1354	96.2	90.3	1.1	15.1	7.2	8.0	19.9	99.7	29
764	9.0	53.6	1481	96.2	90.3	-0.2	15.2	8.7	7.3	19.9	99.7	29
765	9.8	54.4	1690	96.2	90.3	3.3	15.9	9.2	7.7	19.9	99.7	29
766	10.7	54.3	1575	96.2	90.3	5.9	15.1	10.1	7.6	19.9	99.7	29
767	10.2	53.6	1614	96.2	90.3	6.3	15.4	9.6	6.8	19.9	99.7	29
768	10.2	54.3	1625	96.2	90.3	6.2	15.2	9.6	7.1	20.0	99.7	29
769	19.9	53.6	1615	96.2	90.3	6.5	15.0	9.2	5.7	20.0	99.7	29
770	10.5	53.2	1633	96.2	90.3	5.2	15.0	9.8	5.5	20.0	99.7	29
771			1602	96.2	90.3	4.1	14.7	8.1	4.3	20.0	99.7	29
772			1633	96.2	90.3	3.7	14.9	8.6	5.0	20.0	99.7	29
773			1624	96.2	90.3	2.9	14.9	7.3	5.3	20.0	99.7	29
774			1656	96.2	90.3	4.8	15.3	7.3	4.7	20.1	99.7	28
775			1606	96.2	90.3	4.8	15.0	7.1	7.9	20.1	99.7	28
776			1642	96.2	90.3	5.2	15.3	10.3	10.3	20.1	99.7	28
777	10.9	53.7	1622	96.2	90.3	5.8	15.1	10.2	8.5	20.1	99.7	28
778	11.5	54.8	1616	96.2	90.3	7.2	15.2	10.8	6.6	20.1	99.7	28
779	10.1	54.0	1624	96.2	90.3	7.5	15.2	9.4	8.7	20.1	99.7	28
780	11.8	53.8	1626	96.2	90.3	7.0	15.0	11.0	11.0	20.1	99.7	27
781	9.6	54.0	1640	96.2	90.3	8.5	15.3	9.0	7.2	20.1	99.7	27
782	11.2	53.4	1611	96.2	90.3	8.5	15.1	10.5	8.1	20.1	99.7	27
783	10.8	52.9	1615	96.2	90.3	8.1	15.0	10.1	6.7	20.1	99.7	27
784			1624	96.2	90.3	8.4	15.1	8.5	8.2	20.1	99.7	27
785	11.9	53.4	1624	96.2	90.3	10.4	15.3	11.1	8.1	20.1	99.7	27
786	11.5	54.6	1628	96.2	87.4	9.9	15.1	10.8	7.3	19.9	99.7	27
787	11.2	53.8	1646	96.2	87.4	7.7	15.0	10.6	6.5	19.9	99.7	27
788	10.2	53.4	1631	96.2	87.4	8.1	15.0	9.6	9.1	19.9	99.7	27
789	10.4	53.9	1627	96.2	87.4	8.5	15.1	9.8	7.1	19.9	99.7	27
790	15.1	53.9	1628	96.2	87.4	9.4	15.1	14.2	6.3	19.9	99.7	27
791	10.0	53.7	1626	96.2	87.4	9.5	15.2	9.3	6.1	19.9	99.7	27
792	11.8	52.7	1624	96.2	87.4	9.5	15.1	11.0	6.9	19.7	99.7	28

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Date Point #	Standardized Wind Speed	LAg	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
793	10.9	52.8	1624	96.2	87.4	8.7	15.1	10.2	7.7	19.7	99.7	28
794	9.3	53.2	1638	96.2	87.4	9.5	15.1	8.7	6.3	19.7	99.7	28
795			1623	96.2	87.4	8.8	15.0	8.4	9.1	19.7	99.7	28
796	11.5	53.3	1628	96.2	87.4	8.0	15.0	10.8	10.5	19.7	99.7	28
797	11.9	53.4	1632	96.2	87.4	8.0	15.0	11.2	10.0	19.7	99.7	28
798	9.3	53.2	1639	96.2	87.4	7.5	15.1	8.7	9.1	19.7	99.7	27
799	9.6	53.3	1626	96.2	87.4	8.5	15.1	9.0	9.2	19.7	99.7	27
800	10.4	53.3	1626	96.2	87.4	7.6	14.9	9.7	8.7	19.7	99.7	27
801			1625	96.2	87.4	4.7	14.7	8.4	8.6	19.7	99.7	27
802	9.6	53.2	1638	96.2	87.4	7.9	15.2	9.0	8.0	19.7	99.7	27
803	10.9	53.2	1623	96.2	87.4	7.3	15.1	10.2	4.9	19.7	99.7	27
804	11.0	53.2	1622	96.2	87.4	8.0	15.2	10.3	4.8	19.4	99.7	28
805	11.5	53.3	1648	96.2	87.4	9.2	15.3	10.8	5.0	19.4	99.7	28
806	11.4	53.6	1606	96.2	87.4	8.2	14.7	10.7	3.0	19.4	99.7	28
807			1635	96.2	87.4	6.0</						

# Table E.01 Measurement data - Turbine ON

Project: Borish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement  
 Report ID: 14331.00.T22.RP4

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (Pa)	Relative Humidity (%)
881	9.3	53.3	1605	96.2	87.4	11.1	10	8.7	10.2	19.7	99.6	29
882			1639	96.2	87.4	5.3	15.6	8.1	13.0	19.7	99.6	29
883			1617	96.2	87.4	9.4	15.5	8.6	13.0	19.7	99.6	29
884			1621	96.2	87.4	9.3	15.3	7.6	11.7	19.7	99.6	29
885	13.5	54.1	1633	96.2	87.4	10.1	15.1	12.7	11.5	19.7	99.6	29
886	11.9	53.6	1622	96.2	87.4	9.3	15.0	11.1	11.0	19.7	99.6	29
887	12.4	54.1	1617	96.2	87.4	10.4	15.1	11.6	10.3	19.6	99.6	28
888	12.2	54.2	1634	96.2	87.4	10.1	15.1	11.4	9.9	19.6	99.6	28
889	12.2	54.2	1630	96.2	87.4	10.5	15.1	11.5	8.9	19.6	99.6	28
890			1634	96.2	87.4	10.9	15.1	8.4	8.0	19.6	99.6	28
891	12.5	54.5	1626	96.2	87.4	11.5	15.1	11.7	8.2	19.6	99.6	28
892	14.8	54.9	1628	96.2	87.4	12.4	15.1	17.4	10.4	19.6	99.6	28
893	16.2	55.2	1630	96.2	87.4	11.7	15.0	15.2	8.4	19.5	99.6	29
894	14.8	54.9	1635	96.2	87.4	11.7	15.1	13.9	8.3	19.5	99.6	29
895	14.3	55.0	1632	96.2	87.4	10.4	15.0	13.3	10.0	19.5	99.6	29
896	10.5	53.9	1630	96.2	87.4	9.2	15.0	9.8	7.7	19.5	99.6	29
897	12.1	54.3	1638	96.2	87.4	7.5	15.0	11.3	6.0	19.5	99.6	29
898	10.3	54.1	1622	96.2	87.4	8.1	15.0	9.7	10.4	19.5	99.6	29
899	11.2	54.0	1632	96.2	87.4	7.9	15.1	10.2	8.8	19.5	99.6	29
900	13.2	54.3	1620	96.2	87.4	9.9	15.2	12.4	5.0	19.5	99.6	29
901	14.8	54.8	1631	96.2	87.4	10.4	15.1	13.9	5.1	19.5	99.6	29
902	15.2	55.2	1610	96.2	87.4	12.4	15.2	14.2	7.3	19.5	99.6	29
903	12.7	55.4	1613	96.2	87.4	10.5	14.9	11.9	4.7	19.5	99.6	29
904			1626	96.2	87.4	9.2	15.0	10.9	9.6	19.6	99.6	29
905	10.8	53.3	1632	96.2	87.4	8.1	15.0	10.1	9.5	19.6	99.6	29
906	9.9	53.6	1618	96.2	87.4	7.2	14.9	8.3	7.4	19.6	99.6	29
907	10.4	53.6	1646	96.2	87.4	8.1	15.2	9.7	6.3	19.6	99.6	29
908	12.6	53.9	1625	96.2	87.4	8.7	15.2	11.8	7.0	19.6	99.6	29
909	11.7	54.0	1620	96.2	87.4	8.3	15.1	11.0	9.5	19.6	99.6	29
910	10.7	53.7	1622	96.2	87.4	6.5	14.8	10.1	4.5	19.7	99.6	29
911			1637	96.2	87.4	6.3	15.1	7.8	10.1	19.7	99.6	28
912	9.3	53.0	1613	96.2	87.4	7.8	15.1	8.7	5.8	19.7	99.6	28
913	11.6	53.6	1642	96.2	87.4	6.9	15.2	11.8	10.1	19.7	99.6	28
914	11.2	54.0	1602	96.2	87.4	9.1	15.0	10.5	7.6	19.7	99.6	28
915	11.0	53.8	1634	96.2	87.4	7.0	15.0	10.3	4.5	19.7	99.6	28
916	9.8	53.6	1634	96.2	87.4	6.1	15.0	9.2	9.0	19.8	99.6	28
917	10.5	53.4	1619	96.2	87.4	4.5	14.8	9.8	9.0	19.8	99.6	28
918			1639	96.2	87.4	5.8	15.0	7.3	7.2	19.8	99.6	28
919			1598	96.2	87.4	5.1	15.1	8.4	7.4	19.8	99.6	28
920	10.2	53.6	1640	96.2	87.4	7.1	15.3	9.6	5.6	19.8	99.6	28
921			1541	96.2	87.4	5.9	14.8	7.7	8.7	19.8	99.6	28
922			1546	96.2	87.4	1.5	13.8	8.3	8.1	19.7	99.6	28
923	8.5	53.1	1352	96.2	87.4	-0.9	14.5	8.4	5.4	19.7	99.6	28
924			1526	96.2	87.4	1.0	15.1	7.5	7.8	19.7	99.6	28
925	9.7	54.7	1545	96.2	87.4	2.0	15.1	9.0	9.3	19.7	99.6	28
926			1526	96.2	87.4	-0.4	15.0	6.2	8.5	19.7	99.6	28
927			1592	96.2	87.4	-0.4	15.1	8.2	7.6	19.7	99.6	28
928	10.5	54.3	1567	96.2	87.4	4.4	15.7	9.8	9.8	19.7	99.6	28
929			1513	96.2	87.4	4.9	15.4	6.8	8.6	19.7	99.6	29
930			1523	96.2	87.4	5.0	15.0	7.0	7.7	19.7	99.6	29
931	9.6	53.1	1591	96.2	87.4	1.5	14.6	9.0	6.8	19.7	99.6	29
932	9.4	53.4	1637	96.2	87.4	2.1	14.9	8.8	9.7	19.7	99.6	29
933			1625	96.2	87.4	2.6	15.0	8.3	8.3	19.7	99.6	29
934	9.5	53.6	1615	96.2	87.4	1.1	14.6	8.9	6.3	19.7	99.6	29
935	9.6	53.6	1619	96.2	87.4	0.9	15.0	9.0	7.4	19.7	99.6	29
936	11.2	54.0	1607	96.2	87.4	1.0	14.9	10.5	7.6	19.7	99.6	29
937	8.8	53.3	1432	96.2	87.4	-0.2	14.9	6.8	7.0	19.7	99.6	29
938	10.1	54.2	1621	96.2	87.4	1.8	15.5	9.4	4.9	19.7	99.6	29
939	10.5	54.3	1604	96.2	87.4	2.8	15.4	9.8	5.7	19.7	99.6	29
940			1804	96.2	87.4	0.7	14.9	7.0	4.4	19.8	99.6	29
941	11.8	53.7	1645	96.2	87.4	2.6	15.3	11.0	7.9	19.8	99.6	29
942			1647	96.2	87.4	3.3	15.4	8.6	9.3	19.8	99.6	29
943	11.4	53.6	1600	96.2	87.4	3.3	15.0	10.6	7.9	19.8	99.6	29
944			1010	96.2	87.4	0.4	14.4	9.6	6.6	19.8	99.6	29
945	7.8	52.3	1075	96.2	87.4	0.8	14.9	7.4	6.9	19.9	99.6	29
946	8.3	53.3	1286	96.2	87.4	0.3	15.1	8.8	8.1	19.9	99.6	29
947	7.9	53.6	1167	96.2	87.4	0.7	15.0	7.9	6.4	19.9	99.6	29
948			1525	96.2	87.4	0.2	15.2	8.4	9.0	19.9	99.6	29
949	8.0	53.5	1221	96.2	87.4	0.6	15.0	6.6	9.5	19.9	99.6	29
950			1638	96.2	87.4	-0.1	15.3	8.5	5.6	19.9	99.6	29
951			1622	96.2	87.4	4.6	15.7	7.8	5.4	20.0	99.6	29
952			1613	96.2	87.4	5.5	15.4	4.6	20.0	99.6	29	
953	10.6	53.9	1621	96.2	87.4	7.1	15.6	10.0	7.7	20.0	99.6	29
954			1601	96.2	87.4	4.9	14.9	5.9	6.4	20.0	99.6	29
955	10.3	52.9	1620	96.2	87.4	5.7	15.0	9.6	8.3	20.0	99.6	29
956	9.8	52.6	1624	96.2	87.4	5.1	14.9	9.1	8.2	20.0	99.6	29
957			1625	96.2	87.4	5.7	15.1	7.7	9.8	20.0	99.6	28
958	11.5	53.8	1630	96.2	87.4	9.5	15.5	10.8	8.6	20.0	99.6	28
959			1618	96.2	78.6	9.7	15.3	9.7	8.8	20.0	99.6	28
960			1628	96.2	78.6	10.3	15.1	12.6	6.4	20.0	99.6	28
961			1639	96.2	78.6	8.6	15.0	11.1	3.9	20.0	99.6	28
962			1622	96.2	78.6	9.6	15.1	10.2	4.2	20.0	99.6	28
963			1634	96.2	78.6	9.9	15.0	13.3	4.1	20.0	99.6	28
964			1622	96.2	78.6	6.9	14.9	10.1	4.4	20.0	99.6	29
965			1630	96.2	78.6	6.8	15.0	10.9	6.1	20.0	99.6	29
967			1628	96.2	78.6	6.1	14.8	10.3	26.3	20.0	99.6	29
968			1614	96.2	78.6	3.1	14.5	9.4	6.4	20.0	99.6	29

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (Pa)	Relative Humidity (%)
969			1622	96.2	78.6	4.1	15.1	6.3	8.3	19.9	99.6	28
970			1651	96.2	78.6	6.8	15.4	9.0	6.8	20.1	99.6	28
971			1616	96.2	78.6	5.7	15.1	10.8	7.3	20.1	99.6	28
972			1627	96.2	78.6	4.7	15.0	9.1	7.8	20.1	99.6	28
973			1599	96.2	78.6	2.4	14.5	11.3	3.1	20.1	99.6	28
974			1645	96.2	78.6	2.9	15.0	8.7	5.0	20.1	99.6	28
975			1587	96.2	78.6	1.5	14.4	8.5	6.7	20.1	99.6	28
976			1194	96.2	78.6	0.6	14.7	7.4	6.6	20.1	99.6	28
977			1587	96.2	78.6	-0.9	15.1	9.4	6.4	20.1	99.6	28
978			1234	96.2	78.6	0.6	15.1	6.7	4.6	20.1	99.6	28
979			1643	96.2	78.6	1.8	15.6	9.7	5.4	20.1	99.6	28
980			1629	96.2	78.6	4.1	15.6	12.5	5.5	20.1	99.6	28
981			1618	96.2	78.6	4.1	15.5	9.8	9.5	20.1	99.6	29
982			1624	96.2	78.6	5.1	15.5	10.8	8.6	20.1	99.6	29
983			1599	96.2	78.6	5.0	15.1	11.3	7.4	20.1	99.6	29
984			1655	96.2	78.6	3.5	15.2	12.1	6.2	20.1	99.6	29
985			1626	96.2	78.6	5.4	15.2	6.3	5.9	20.1	99.6	29
986			1631	96.2	78.6	4.6	15.0	10.0	6.9	20.		



# Table E.01 Measurement data - Turbine ON

Project: Borish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement  
 Report ID: 14331.00.T22.RP4

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Date Point #	Standardized Wind Speed	L/Ang	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
1057	12.0	54.9	1629	96.2	87.4	10.3	11.1	11.2	8.4	19.8	99.6	30
1058	12.6	54.5	1628	96.2	87.4	10.3	15.1	11.8	9.8	20.0	99.6	30
1059	11.8	54.7	1645	96.2	87.4	9.2	15.0	11.0	7.8	20.0	99.6	30
1060	12.0	55.2	1621	96.2	87.4	11.0	15.1	11.2	7.0	20.0	99.6	30
1061	9.8	55.2	1629	96.2	87.4	10.1	15.0	9.2	8.3	20.0	99.6	30
1062	11.3	54.0	1625	96.2	87.4	9.7	15.0	10.6	10.8	20.0	99.6	30
1063	11.8	53.5	1635	96.2	87.4	9.7	15.1	11.0	9.8	20.0	99.6	30
1064			1631	96.2	87.4	10.0	15.1	8.4	10.1	20.0	99.6	30
1065	11.4	53.9	1640	96.2	87.4	10.3	15.2	10.7	7.8	20.0	99.6	30
1066	13.4	53.8	1627	96.2	87.4	9.4	15.0	12.5	11.0	20.0	99.6	30
1067			1616	96.2	87.4	5.8	14.8	7.9	9.9	20.0	99.6	30
1068			1590	96.2	87.4	6.4	15.1	8.6	10.1	20.0	99.6	30
1069			1638	96.2	87.4	0.7	14.5	7.7	10.2	20.0	99.6	30
1070	9.3	54.1	1700	96.2	87.4	6.9	15.8	8.7	9.5	20.0	99.6	29
1071	11.6	54.4	1608	96.2	87.4	7.8	15.2	10.2	9.8	20.0	99.6	29
1072	12.5	54.7	1615	96.2	87.4	6.2	15.1	11.7	9.9	20.0	99.6	29
1073	11.2	54.4	1609	96.2	87.4	4.0	14.7	10.5	12.3	20.0	99.6	29
1074			1641	96.2	87.4	6.9	15.1	7.3	9.8	20.0	99.6	29
1075	10.2	53.7	1625	96.2	87.4	8.6	15.2	9.6	11.0	20.0	99.6	29
1076			1620	96.2	87.4	9.0	15.1	7.9	10.5	19.8	99.6	30
1077	11.9	53.8	1630	96.2	87.4	8.0	15.1	11.1	10.4	19.8	99.6	30
1078	12.5	54.7	1624	96.2	87.4	9.0	15.1	11.7	7.7	19.8	99.6	30
1079	10.6	54.1	1601	96.2	87.4	6.5	14.8	10.0	9.3	19.8	99.6	30
1080	11.0	54.8	1647	96.2	87.4	5.5	15.0	10.3	9.6	19.8	99.6	30
1081			1624	96.2	87.4	5.0	14.7	8.0	8.5	19.8	99.6	30
1082	12.4	53.6	1649	96.2	87.4	6.4	15.3	11.6	8.7	19.8	99.6	30
1083	9.5	53.6	1598	96.2	87.4	4.9	14.8	8.9	8.9	19.8	99.6	30
1084	10.0	53.1	1598	96.2	87.4	0.9	14.2	9.3	10.0	19.8	99.6	30
1085	8.7	53.4	1407	96.2	87.4	-0.7	14.7	7.8	8.4	19.8	99.6	30
1086	10.1	54.3	1638	96.2	87.4	8.7	16.0	9.5	10.2	19.8	99.6	30
1087	13.9	53.5	1600	96.2	87.4	8.1	15.3	13.0	9.6	19.8	99.6	30
1088	11.4	55.1	1612	96.2	87.4	7.9	15.1	10.7	10.2	19.9	99.6	30
1089	10.3	54.4	1623	96.2	87.4	6.2	15.0	9.6	8.5	19.9	99.6	30
1090	11.5	53.7	1640	96.2	87.4	7.3	15.1	10.8	6.9	19.9	99.6	30
1091	10.1	54.0	1623	96.2	87.4	7.8	15.2	9.4	7.6	19.9	99.6	30
1092	10.6	54.7	1613	96.2	87.4	7.1	15.0	10.0	6.8	19.9	99.6	30
1093	10.2	53.9	1635	96.2	87.4	6.3	15.1	9.6	9.1	19.9	99.6	30
1094	11.5	53.8	1628	96.2	87.4	7.0	15.1	10.8	8.8	20.0	99.6	30
1095	10.5	53.4	1647	96.2	87.4	7.7	15.2	9.8	7.6	20.0	99.6	30
1096			1608	96.2	87.4	7.6	15.0	8.6	6.7	20.0	99.6	30
1097	12.0	53.9	1617	96.2	87.4	5.7	14.8	11.2	7.5	20.0	99.6	30
1098	10.2	53.1	1625	96.2	87.4	3.9	14.8	9.5	7.3	20.0	99.6	30
1099	11.3	53.1	1642	96.2	87.4	4.9	15.0	10.6	9.1	20.0	99.6	30
1100	10.5	53.5	1633	96.2	87.4	6.4	15.2	9.2	7.3	20.1	99.6	31
1101	9.9	53.7	1622	96.2	87.4	5.1	15.0	9.3	7.6	20.1	99.6	31
1102	10.3	53.7	1637	96.2	87.4	4.9	15.3	9.7	7.8	20.1	99.6	31
1103	9.3	53.2	1580	96.2	87.4	2.9	14.4	8.8	8.9	20.1	99.6	31
1104			1641	96.2	87.4	0.7	14.6	10.2	8.2	20.1	99.6	31
1105			1633	96.2	87.4	1.3	15.0	7.8	10.4	20.2	99.6	30
1106	9.8	54.0	1680	96.2	87.4	2.8	15.3	9.2	8.9	20.2	99.6	30
1107			1623	96.2	87.4	2.5	15.1	7.7	7.8	20.2	99.6	30
1108	9.8	54.0	1642	96.2	87.4	5.1	15.4	9.2	5.5	20.2	99.6	30
1109			1620	96.2	87.4	2.8	15.4	8.5	6.6	20.2	99.6	30
1110	9.4	53.7	1624	96.2	87.4	7.2	15.3	8.8	7.8	20.2	99.6	30
1111	9.8	54.1	1614	96.2	87.4	4.6	15.1	9.1	7.1	20.2	99.6	30
1112	9.5	53.7	1640	96.2	87.4	6.2	15.2	8.9	5.8	20.2	99.6	30
1113			1592	96.2	87.4	3.8	14.7	6.8	4.6	20.2	99.6	30
1114	9.6	53.8	1624	96.2	87.4	4.9	15.0	9.0	5.0	20.2	99.6	30
1115	10.0	53.6	1664	96.2	87.4	6.7	15.5	9.4	8.9	20.2	99.6	30
1116	11.2	53.3	1612	96.2	87.4	6.3	15.0	10.5	8.4	20.2	99.6	30
1117	10.4	54.0	1647	96.2	87.4	7.9	15.3	9.8	5.6	20.2	99.6	30
1118	9.6	53.6	1629	96.2	87.4	7.3	15.1	9.0	6.5	20.3	99.6	30
1119	10.4	53.3	1624	96.2	87.4	8.5	15.1	9.8	4.7	20.3	99.6	30
1120			1618	96.2	87.6	6.8	15.0	10.2	6.1	20.3	99.6	30
1121			1617	96.2	78.6	7.7	15.0	9.8	10.4	20.3	99.6	30
1122			1616	96.2	78.6	5.8	14.7	7.7	7.0	20.3	99.6	30
1123			1610	96.2	78.6	1.9	14.4	9.6	10.3	20.3	99.6	30
1124			1654	96.2	78.6	6.5	15.3	11.6	12.4	20.3	99.6	30
1125			1620	96.2	78.6	7.2	15.2	9.5	12.2	20.3	99.6	30
1126			1634	96.2	78.6	8.2	15.3	9.2	10.3	20.3	99.6	30
1127			1614	96.2	78.6	8.1	15.2	11.3	8.6	20.3	99.6	30
1128	11.5	54.2	1621	96.2	81.6	8.7	15.0	9.7	7.9	20.3	99.6	30
1129	12.4	54.3	1616	96.2	87.4	8.9	15.0	11.6	9.0	20.4	99.6	30
1130	13.4	54.7	1646	96.2	87.4	9.5	15.2	12.5	9.3	20.4	99.6	30
1131	10.9	54.1	1625	96.2	87.4	9.2	15.1	10.2	7.0	20.4	99.6	30
1132	11.0	53.9	1616	96.2	87.4	8.0	14.9	10.3	9.1	20.4	99.6	30
1133	9.4	53.6	1624	96.2	87.4	7.7	14.9	8.8	9.5	20.4	99.6	30
1134	12.3	54.3	1634	96.2	87.4	7.3	15.1	11.5	8.2	20.4	99.6	30
1135	12.8	54.4	1612	96.2	87.4	10.6	15.1	12.0	11.0	20.4	99.6	29
1136	12.9	54.5	1629	96.2	87.4	11.0	15.2	12.0	9.7	20.4	99.6	29
1137	14.1	55.3	1631	96.2	87.4	10.3	15.0	13.2	7.6	20.3	99.6	29
1138	12.0	54.3	1637	96.2	87.4	10.6	15.1	11.2	6.4	20.3	99.6	29
1139	14.8	54.9	1636	96.2	87.4	13.3	15.1	13.6	10.6	20.3	99.6	29
1140	12.5	54.4	1631	96.2	87.4	9.9	15.0	11.7	8.0	20.3	99.6	29
1141	12.1	53.8	1623	96.2	87.4	10.0	15.1	11.4	6.8	20.2	99.6	30
1142	13.5	53.6	1620	96.2	87.4	9.7	15.0	12.6	6.6	20.2	99.6	30
1143	9.7	54.0	1619	96.2	87.4	9.5	15.0	9.1	6.9	20.2	99.6	30
1144			1644	96.2	87.4	9.5	15.1	12.5	6.7	20.2	99.6	30

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Date Point #	Standardized Wind Speed	L/Ang	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
1145	12.1	54.4	1623	96.2	87.4	9.3	15.1	11.3	5.4	20.2	99.6	30
1146	11.0	53.6	1629	96.2	87.4	9.6	15.1	10.3	7.8	20.2	99.6	30
1147	12.2	54.0	1625	96.2	87.4	10.7	15.1	11.4	9.4	20.3	99.6	30
1148	12.7	53.2	1633	96.2	87.4	8.9	15.0	11.9	8.9	20.3	99.6	30
1149	12.2	54.2	1636	96.2	87.4	11.3	15.2	11.4	8.5	20.3	99.6	30
1150	14.5	55.2	1631	96.2	87.4	10.2	15.1	13.6	12.1	20.3	99.6	30
1151	11.1	54.2	1620	96.2	87.4	11.3	15.1	10.4	11.7	20.3	99.6	30
1152	13.5	54.9	1635	96.2	87.4	11.1	15.1	12.7	9.7	20.3	99.6	30
1153	11.6	54.3	1622	96.2	87.4	10.3	15.0	10.8	10.5	20.2	99.6	29
1154	12.7	53.7	1647	96.2	87.4	10.6	15.2	11.9	9.4	20.2	99.6	29
1155	11.4	53.9	1622	96.2	87.4	10.5	15.1	10.7	7.5	20.2	99.6	29
1156	16.2	53.6	1628	96.2	87.4	12.3	15.2	15.2	9.1	20.2	99.6	29
1157	16.5	54.3	1624	96.2	87.4	11.5	15.1	15.5	11.0	20.2	99.6	29

# Table E.01 Measurement data - Turbine ON

Project: Borish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement  
 Report ID: 14331.00.T22.RP4

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAnq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
1233			1621	96.2	78.6	9.9	15.0	11.2	8.4	20.6	99.5	31
1234			1621	96.2	78.6	9.9	15.0	11.5	6.4	20.6	99.5	31
1235			1643	96.2	78.6	10.4	15.1	11.2	8.9	20.6	99.5	31
1236			1629	96.2	78.6	10.4	15.1	10.2	5.9	20.6	99.5	30
1237			1640	96.2	78.6	9.7	15.1	9.3	5.4	20.6	99.5	30
1238			1635	96.2	78.6	8.4	15.0	11.0	6.9	20.6	99.5	30
1239			1614	96.2	78.6	6.2	14.7	8.2	7.5	20.6	99.5	30
1240			1638	96.2	78.6	6.2	15.1	11.1	4.8	20.6	99.5	30
1241			1655	96.2	78.6	8.8	15.4	10.4	5.2	20.6	99.5	30
1242			1607	96.2	78.6	7.9	15.0	9.2	6.2	20.6	99.5	30
1243			1626	96.2	78.6	7.2	15.0	9.1	4.7	20.6	99.5	30
1244			1633	96.2	78.6	8.3	14.8	8.4	8.7	20.6	99.5	30
1245			1656	96.2	78.6	5.5	15.2	8.4	6.4	20.6	99.5	30
1246			1634	96.2	78.6	7.7	15.3	8.4	4.3	20.6	99.5	30
1247			1609	96.2	78.6	6.6	15.0	9.0	8.7	20.6	99.5	30
1248			1634	96.2	78.6	6.9	15.2	11.2	5.9	20.6	99.5	30
1249			1632	96.2	78.6	8.4	15.1	10.4	5.2	20.6	99.5	30
1250			1616	96.2	78.6	7.5	15.0	8.6	7.5	20.6	99.5	30
1251			1643	96.2	78.6	8.0	15.2	11.4	9.2	20.6	99.5	30
1252			1632	96.2	78.6	7.1	15.1	9.1	7.5	20.6	99.5	30
1253			1623	96.2	78.6	6.4	15.0	8.5	9.4	20.6	99.5	30
1254			1635	96.2	78.6	5.6	15.0	9.6	6.2	20.5	99.5	30
1255			1628	96.2	78.6	9.8	15.3	12.7	4.8	20.5	99.5	30
1256			1610	96.2	78.6	9.0	15.1	11.6	5.5	20.5	99.5	30
1257			1624	96.2	78.6	9.3	15.1	11.9	5.3	20.5	99.5	30
1258			1619	96.2	78.6	10.2	15.1	13.5	9.0	20.5	99.5	30
1259			1627	96.2	78.6	8.7	15.0	12.5	7.9	20.5	99.5	30
1260	11.7	55.5	1625	96.2	84.5	9.5	15.1	10.9	8.6	20.4	99.5	30
1261	11.7	54.3	1652	96.2	87.4	9.6	15.2	10.9	9.6	20.4	99.5	30
1262	10.8	53.7	1627	96.2	87.4	10.5	15.1	9.9	7.4	20.4	99.5	30
1263	12.8	53.7	1627	96.2	87.4	10.0	15.1	12.0	9.2	20.4	99.5	30
1264			1619	96.2	87.4	7.8	14.8	10.1	10.8	20.4	99.5	30
1265	9.6	53.4	1623	96.2	87.4	4.1	14.5	8.0	10.0	20.3	99.5	30
1266			1611	96.2	87.4	4.7	14.9	8.3	10.7	20.3	99.5	30
1267	9.4	53.8	1630	96.2	87.4	3.2	14.9	8.7	6.4	20.3	99.5	30
1268	12.5	54.5	1635	96.2	87.4	10.6	15.5	11.8	8.4	20.3	99.5	30
1269	11.1	55.1	1623	96.2	87.4	10.4	15.2	10.3	10.0	20.3	99.5	30
1270	10.8	54.3	1613	96.2	87.4	10.0	15.0	10.1	7.0	20.3	99.5	30
1271	13.1	54.1	1621	96.2	87.4	9.7	15.0	12.3	7.0	20.2	99.5	31
1272	11.3	53.7	1646	96.2	87.4	10.1	15.1	10.6	8.8	20.2	99.5	31
1273	14.1	54.1	1631	96.2	87.4	11.0	15.1	13.2	9.9	20.2	99.5	31
1274	12.8	53.8	1626	96.2	87.4	9.2	15.0	12.0	8.4	20.2	99.5	31
1275	13.2	54.2	1621	96.2	87.4	7.8	15.1	12.3	9.5	20.2	99.5	31
1276	13.1	53.0	1622	96.2	87.4	8.8	15.0	12.3	10.3	20.2	99.5	31
1277	13.7	53.2	1641	96.2	87.4	8.7	15.2	12.8	8.9	20.1	99.5	30
1278	9.4	54.0	1631	96.2	87.4	8.7	15.1	8.8	8.9	20.1	99.5	30
1279	11.1	54.7	1621	96.2	87.4	8.6	15.1	10.4	9.8	20.1	99.5	30
1280	11.8	54.4	1650	96.2	87.4	8.8	15.0	11.0	9.7	20.1	99.5	30
1281	10.3	53.8	1632	96.2	87.4	7.7	15.0	9.6	10.0	20.1	99.5	30
1282	11.5	54.3	1635	96.2	87.4	8.1	15.0	10.7	10.0	20.1	99.5	30
1283	10.1	54.0	1622	96.2	87.4	7.2	14.9	9.5	10.5	20.0	99.5	31
1284	11.5	53.5	1621	96.2	87.4	5.9	14.9	10.8	8.3	20.0	99.5	31
1285	9.8	53.2	1599	96.2	87.4	3.2	14.4	9.2	8.1	20.0	99.5	31
1286	10.7	53.0	1651	96.2	87.4	3.4	14.8	10.0	10.2	20.0	99.5	31
1287	9.9	52.8	1632	96.2	87.4	2.8	14.9	9.3	11.3	20.0	99.5	31
1288	10.7	53.7	1677	96.2	87.4	4.6	15.4	10.0	9.9	20.0	99.5	31
1289			1613	96.2	87.4	5.6	15.2	8.6	10.3	19.9	99.5	31
1290	10.4	52.9	1620	96.2	87.4	3.9	14.9	9.7	10.1	19.9	99.5	31
1291	10.8	53.0	1622	96.2	87.4	3.6	15.0	10.1	7.4	19.9	99.5	31
1292	10.1	53.2	1652	96.2	87.4	5.4	15.2	9.4	6.6	19.9	99.5	31
1293	11.7	53.6	1630	96.2	87.4	6.3	15.4	10.9	5.8	19.9	99.5	31
1294	11.9	54.1	1630	96.2	87.4	6.8	15.3	11.2	6.4	19.9	99.5	31
1295	11.6	52.9	1614	96.2	87.4	6.9	15.1	10.8	7.8	19.9	99.5	32
1296	11.0	53.2	1616	96.2	87.4	6.2	15.0	10.3	7.2	19.9	99.5	32
1297	11.9	53.4	1609	96.2	87.4	6.0	15.1	11.2	6.8	19.9	99.5	32
1298	10.2	53.8	1638	96.2	90.3	6.5	15.1	9.5	5.8	19.9	99.5	32
1299	12.4	53.8	1638	96.2	90.3	5.7	15.1	11.6	7.6	19.9	99.5	32
1300	10.8	53.7	1602	96.2	90.3	4.9	14.7	10.1	7.0	19.9	99.5	32
1301	10.3	53.6	1622	96.2	90.3	2.6	14.9	9.6	6.1	20.0	99.5	32
1302	10.3	54.3	1687	96.2	90.3	8.2	15.5	9.7	6.5	20.0	99.5	32
1303	11.0	55.0	1621	96.2	90.3	9.4	15.4	10.3	6.9	20.0	99.5	32
1304	10.4	53.7	1630	96.2	90.3	9.4	15.1	9.6	11.9	20.0	99.5	32
1305	10.4	53.7	1630	96.2	90.3	9.4	15.1	9.8	10.4	20.0	99.5	32
1306	12.7	53.7	1627	96.2	90.3	10.0	15.2	11.9	7.9	20.0	99.5	32
1307	14.1	54.2	1620	96.2	90.3	11.1	15.1	13.2	7.9	20.0	99.5	32
1308	11.4	53.7	1632	96.2	90.3	11.4	15.1	10.6	9.4	20.0	99.5	31
1309	15.3	53.3	1633	96.2	90.3	10.1	15.1	14.4	7.8	20.1	99.5	31
1310	12.9	54.3	1628	96.2	90.3	10.1	15.1	12.1	6.5	20.1	99.5	31
1311	12.3	53.2	1633	96.2	90.3	9.1	15.0	11.5	8.0	20.1	99.5	31
1312	8.7	54.1	1636	96.2	90.3	8.4	15.1	9.1	8.1	20.2	99.5	31
1313	11.2	53.9	1629	96.2	90.3	8.2	15.0	10.5	8.5	20.2	99.5	31
1314	12.6	54.2	1629	96.2	90.3	8.7	15.1	11.8	7.5	20.2	99.5	31
1315	14.1	54.1	1613	96.2	90.3	8.2	15.0	11.3	8.2	20.2	99.5	31
1316	10.6	53.5	1626	96.2	90.3	8.2	15.1	9.4	8.5	20.2	99.5	31
1317	9.8	54.6	1624	96.2	90.3	11.9	15.2	9.2	4.6	20.2	99.5	31
1318	13.7	53.6	1636	96.2	90.3	9.6	15.1	12.8	4.8	20.2	99.5	31
1319	11.3	54.0	1648	96.2	90.3	10.8	15.3	10.8	8.5	20.2	99.5	32
1320	13.1	54.3	1613	96.2	90.3	10.2	15.1	12.3	8.6	20.2	99.5	32

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAnq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
1321	14.9	53.5	1621	96.2	90.3	10.5	15.1	13.9	7.2	20.2	99.5	32
1322	12.6	53.6	1638	96.2	90.3	7.3	14.9	11.8	8.2	20.2	99.5	32
1323	15.6	54.1	1607	96.2	90.3	7.2	14.7	14.7	10.0	20.2	99.5	32
1324			1618	96.2	90.3	4.7	14.6	8.4	10.2	20.2	99.5	32
1325	10.7	53.5	1696	96.2	90.3	8.4	15.3	10.0	9.2	20.3	99.5	30
1326	10.9	53.8	1624	96.2	90.3	8.3	15.2	10.2	4.9	20.3	99.5	30
1327	11.6	53.6	1636	96.2	90.3	8.1	15.1	10.8	9.8	20.3	99.5	30
1328	11.5	53.7	1623	96.2	90.3	6.4	15.0	10.8	8.2	20.3	99.5	30
1329	11.4	53.8	1619	96.2	90.3	6.4	14.9	10.7	7.9	20.3	99.5	30
1330	10.4	52.6	1592	96.2	90.3	3.5	14.4	9.7	7.3	20.3	99.5	30
1331			1627	96.2	90.3	1.2	14.4	8.2	8.4	20.2	99.5	32
1332			1622	96.2	90.3	1.2	14.9	7.3	7.9	20.2	99.5	32
1333			1647	96.2	90.3	1.6	15.4	7.9	6.9	20.2	99.5	32
1334			1620	96.2	90.3	1.2	15.1	8.2	5.8	20.2	99.5	32

# Table E.01 Measurement data - Turbine ON

Project: Borish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement  
 Report ID: 14331.00.T22.RP4

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	L/Ang	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
1409	10.4	53.2	1620	96.2	93.3	9.1	10	8.3	20.8	99.5	30	30
1410	11.2	53.3	1639	96.2	93.3	6.1	15.0	10.5	9.3	20.8	99.5	30
1411			1620	96.2	93.3	5.8	14.9	7.4	8.7	20.8	99.5	30
1412	10.8	53.1	1634	96.2	93.3	6.4	15.2	9.9	8.0	20.8	99.5	30
1413	10.5	53.4	1632	96.2	93.3	6.6	15.2	9.8	8.6	20.8	99.5	30
1414	9.8	53.5	1638	96.2	93.3	6.8	15.1	9.2	9.4	20.7	99.5	30
1415	11.8	52.7	1623	96.2	93.3	6.3	15.1	11.1	7.3	20.7	99.5	30
1416	12.2	53.2	1634	96.2	93.3	7.7	15.2	11.4	7.7	20.7	99.5	30
1417	10.3	53.3	1619	96.2	93.3	7.2	15.1	9.7	6.7	20.7	99.5	30
1418	10.6	53.1	1622	96.2	93.3	5.7	14.8	9.9	8.3	20.7	99.5	30
1419	9.4	52.5	1621	96.2	93.3	4.5	14.8	8.8	8.8	20.7	99.5	30
1420			1631	96.2	93.3	4.4	14.9	8.1	7.2	20.5	99.5	30
1421			1598	96.2	93.3	2.6	14.5	8.4	7.1	20.5	99.5	30
1422	8.6	52.8	1362	96.2	93.3	-1.1	14.5	10.0	7.9	20.5	99.5	30
1423	12.8	53.6	1665	96.2	93.3	1.4	14.7	7.2	7.9	20.5	99.5	30
1424			1622	96.2	93.3	3.1	15.4	9.9	6.9	20.5	99.5	30
1425	11.6	53.7	1657	96.2	93.3	5.6	15.8	10.8	7.6	20.5	99.5	30
1426	11.2	53.4	1606	96.2	93.3	6.1	15.3	10.5	5.7	20.4	99.5	30
1427	9.9	53.3	1697	96.2	93.3	4.4	14.9	9.2	6.4	20.4	99.5	30
1428	10.2	53.0	1602	96.2	93.3	2.3	14.6	9.5	5.3	20.4	99.5	30
1429			1839	96.2	93.3	2.0	14.8	8.6	7.5	20.4	99.5	30
1430			1631	96.2	93.3	3.9	15.1	8.5	7.6	20.4	99.5	30
1431	9.6	53.7	1631	96.2	93.3	2.7	14.9	9.0	7.3	20.4	99.5	30
1432	9.3	53.6	1625	96.2	93.3	3.4	15.0	8.7	7.6	20.4	99.5	31
1433	9.3	52.9	1625	96.2	93.3	2.6	15.0	8.7	8.4	20.4	99.5	31
1434			1600	96.2	93.3	1.4	14.7	7.2	8.0	20.4	99.5	31
1435	8.1	52.9	1234	96.2	93.3	-0.3	14.8	5.9	7.1	20.4	99.5	31
1436	7.9	52.9	1189	96.2	93.3	0.6	15.0	8.3	6.3	20.4	99.5	31
1437	8.3	53.0	1281	96.2	93.3	1.1	15.1	9.4	7.6	20.4	99.5	31
1438	8.3	53.2	1086	96.2	93.3	0.8	15.0	7.8	8.0	20.4	99.5	31
1439	7.6	52.5	1048	96.2	93.3	0.9	14.8	6.9	8.0	20.5	99.5	31
1440	7.8	52.9	1152	96.2	93.3	0.7	15.0	7.1	8.1	20.5	99.5	31
1441	8.3	53.2	1289	96.2	93.3	1.4	15.1	7.4	9.0	20.5	99.5	31
1442	8.4	52.9	1135	96.2	93.3	0.3	15.1	7.6	8.5	20.5	99.5	31
1443			1629	96.2	84.5	10.1	15.1	10.0	7.4	20.6	99.5	30
1444	10.8	53.4	1603	96.2	84.5	9.5	15.0	10.1	5.9	20.6	99.5	30
1445	12.5	54.5	1628	96.2	84.5	8.7	15.0	11.7	8.8	20.6	99.5	30
1446	10.5	53.6	1640	96.2	84.5	9.6	15.1	9.8	7.2	20.6	99.5	30
1447	12.2	53.2	1633	96.2	84.5	9.3	15.0	11.4	4.7	20.5	99.5	30
1448	10.3	54.0	1628	96.2	84.5	6.7	14.9	9.7	4.9	20.5	99.5	30
1449	11.8	53.6	1627	96.2	84.5	7.9	15.0	11.0	5.8	20.6	99.5	30
1450			1628	96.2	84.5	6.7	14.9	7.9	4.5	20.6	99.5	30
1451			1607	96.2	84.5	5.9	14.8	8.0	4.5	20.5	99.5	30
1452			1632	96.2	84.5	4.8	14.9	8.4	6.5	20.6	99.5	30
1453	10.3	53.9	1622	96.2	84.5	3.5	15.3	9.7	3.5	20.5	99.5	31
1454			1625	96.2	78.6	8.7	15.2	10.1	7.5	20.6	99.5	31
1455			1619	96.2	75.7	9.7	15.2	9.8	8.6	20.6	99.5	31
1456			1625	96.2	75.7	10.2	15.1	11.9	7.9	20.6	99.5	31
1457			1619	96.2	75.7	9.7	15.0	10.3	5.3	20.6	99.5	31
1458			1625	96.2	75.7	9.6	15.1	9.7	9.7	20.6	99.5	31
1459			1606	96.2	75.7	8.1	14.9	10.8	7.8	20.7	99.5	29
1460			1653	96.2	75.7	9.0	15.2	11.8	5.4	20.7	99.5	29
1461			1618	96.2	75.7	7.5	14.9	9.8	6.7	20.7	99.5	29
1462			1629	96.2	75.7	6.7	14.9	8.9	10.1	20.7	99.5	29
1463			1640	96.2	75.7	6.9	15.2	11.0	10.1	20.7	99.5	29
1464			1619	96.2	75.7	5.7	14.9	8.7	10.6	20.7	99.5	29
1465			1654	96.2	75.7	9.0	15.4	10.2	8.9	20.6	99.5	30
1466			1618	96.2	75.7	8.9	15.1	10.8	5.1	20.6	99.5	30
1467			1622	96.2	75.7	9.2	15.2	15.5	7.3	20.6	99.5	30
1468			1629	96.2	75.7	8.6	15.0	9.5	5.0	20.6	99.5	30
1469			1629	96.2	75.7	7.7	15.0	10.0	7.9	20.6	99.5	30
1470			1635	96.2	75.7	7.5	15.0	9.7	7.4	20.6	99.5	30
1471			1632	96.2	75.7	8.1	15.2	11.3	7.9	20.6	99.5	30
1472			1616	96.2	75.7	6.8	14.8	10.1	8.0	20.6	99.5	30
1473			1622	96.2	75.7	6.0	15.0	9.3	4.4	20.6	99.5	30
1474			1615	96.2	75.7	5.2	14.8	10.5	7.7	20.6	99.5	30
1475	11.2	53.8	1633	96.2	81.6	7.2	15.2	10.5	4.0	20.6	99.5	30
1476	11.1	53.7	1607	96.2	87.4	5.3	15.0	10.4	5.5	20.6	99.5	30
1477	9.6	54.3	1617	96.2	96.6	4.9	14.9	9.0	7.3	20.8	99.5	30
1478	9.5	53.8	1661	96.2	96.2	7.0	15.2	8.9	4.5	20.8	99.5	30
1479	12.4	53.3	1606	96.2	96.2	5.8	15.1	11.6	8.1	20.8	99.5	30
1480	9.4	52.5	1630	96.2	96.2	4.9	15.3	7.2	7.2	20.8	99.5	30
1481	10.6	53.0	1645	96.2	96.2	7.0	14.5	9.9	5.9	20.8	99.5	30
1482			1639	96.2	96.2	1.1	14.8	8.0	7.9	20.8	99.5	30
1483			1683	96.2	96.2	3.8	15.6	11.2	6.7	20.9	99.5	31
1484	11.6	53.8	1654	96.2	96.2	4.9	15.7	10.8	8.5	20.9	99.5	31
1485	9.5	54.2	1631	96.2	96.2	7.5	15.5	8.9	8.8	20.9	99.5	31
1486	10.8	54.4	1613	96.2	96.2	6.7	15.2	10.1	10.4	20.9	99.5	31
1487	11.0	54.4	1615	96.2	96.2	6.4	14.9	10.3	8.3	20.9	99.5	31
1488	10.9	53.5	1638	96.2	96.2	4.8	14.8	10.2	8.5	20.9	99.5	31
1489			1638	96.2	96.2	4.4	14.9	8.7	9.1	20.9	99.5	30
1490	10.6	53.9	1648	96.2	96.2	6.0	15.2	10.0	4.1	20.9	99.5	30
1491	9.7	53.3	1597	96.2	87.4	-0.5	14.3	9.1	6.1	20.9	99.5	30
1493	8.6	53.2	1362	96.2	87.4	0.8	14.8	9.2	4.9	20.9	99.5	30
1494			1659	96.2	87.4	0.9	15.4	8.4	6.6	20.9	99.5	30
1495			1617	96.2	87.4	2.2	15.2	7.9	4.9	20.7	99.5	30
1496	12.8	53.9	1669	96.2	87.4	4.7	15.9	12.0	6.8	20.7	99.5	30

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	L/Ang	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
1497	11.4	54.0	1627	96.2	87.4	8.0	15.7	10.7	5.0	20.7	99.5	30
1498	13.2	54.5	1623	96.2	87.4	9.4	15.4	12.3	6.9	20.7	99.5	30
1499	12.2	53.6	1626	96.2	87.4	8.8	15.1	11.4	7.3	20.7	99.5	30
1500	13.9	54.0	1627	96.2	87.4	8.7	15.1	13.0	9.2	20.7	99.5	30
1501	13.1	54.2	1634	96.2	93.3	8.5	15.0	12.2	9.0	20.8	99.5	31
1502	12.4	53.9	1625	96.2	100.1	9.6	15.2	11.6	9.7	20.8	99.5	31
1503	11.2	53.7	1628	96.2	103.0	10.4	15.1	10.5	9.8	20.8	99.5	31
1504	12.8	53.3	1616	96.2	103.0	10.0	15.1	12.0	11.4	20.8	99.5	31
1505	13.1	53.7	1626	96.2	103.0	8.6	15.0	12.3	10.0	20.8	99.5	31
1506	10.1	53.2	1609	96.2	103.0	6.8	14.8	9.5	7.1	20.8	99.5	31
1507			1629	96.2	103.0	4.8	14.8	7.2	11.1	20.8	99.5	30
1508	11.3	53.5	1649	96.2	103.0	6.3	15.2	10.6	9.4	20.8	99.5	30
1509	9.8	52.9	1617	96.2	103.0	5.4	14.9	9.2	8.3	20.8	99.5	30
1510			1642	96.2	103.0	3.5	15.0	7.9	7.5	20.8	99.5	30
1511			1616	96.2	103.0	4.4	14.8	7.6	7.6	20.8	99.5	30
1512	9.9	52.8	1628	96.2	103.0	2.9	14.7	9.2	6.4	20.8	99.5	

# Table E.01 Measurement data - Turbine ON

Project: Borish Wind Energy Centre- Turbine T22 - IEC 61400-11 Measurement  
 Report ID: 14331.00.T22.RP4

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
1585	11.9	53.6	1622	96.2	103.0	8.2	11.2	8.2	20.7	99.5	31	31
1586	10.2	54.0	1628	96.2	103.0	9.1	15.1	9.6	8.4	20.7	99.5	31
1587	12.5	53.2	1624	96.2	103.0	9.5	15.1	11.7	12.1	20.7	99.5	31
1588	11.1	52.9	1632	96.2	103.0	8.0	15.1	10.4	11.0	20.7	99.5	31
1589	12.8	53.2	1626	96.2	103.0	8.0	14.9	12.0	10.6	20.7	99.5	30
1590	11.6	53.3	1625	96.2	103.0	7.9	15.1	10.9	11.5	20.7	99.5	30
1591	9.3	53.4	1621	96.2	103.0	7.1	15.0	8.7	10.6	20.7	99.5	30
1592	12.2	53.5	1625	96.2	103.0	8.4	15.1	11.4	8.6	20.7	99.5	30
1593	12.3	53.5	1630	96.2	103.0	8.9	15.2	11.5	7.7	20.7	99.5	30
1594	10.9	53.0	1624	96.2	103.0	8.5	15.0	10.2	9.5	20.7	99.5	30
1595	10.3	52.9	1627	96.2	103.0	7.2	15.0	8.7	8.3	20.5	99.5	30
1596	10.9	52.7	1622	96.2	103.0	6.7	15.1	8.1	7.1	20.5	99.5	30
1597	10.9	52.7	1594	96.2	103.0	3.3	14.4	10.2	6.4	20.5	99.5	30
1598	9.6	53.0	1677	96.2	103.0	4.6	15.2	9.0	8.5	20.5	99.5	30
1599	12.1	53.3	1607	96.2	103.0	6.3	15.1	11.3	6.8	20.5	99.5	30
1600	10.1	53.0	1638	96.2	103.0	5.3	15.1	8.1	7.3	20.5	99.5	30
1601	10.1	53.0	1583	96.2	103.0	2.4	14.4	9.5	8.7	20.4	99.5	30
1602	9.6	53.1	1638	96.2	103.0	1.4	14.7	9.0	6.8	20.4	99.5	30
1603	10.3	53.3	1673	96.2	103.0	5.7	15.6	9.6	8.5	20.4	99.5	30
1604	10.4	53.3	1636	96.2	103.0	7.1	15.4	7.3	8.4	20.4	99.5	30
1605	9.8	53.8	1618	96.2	103.0	6.5	15.2	9.1	8.9	20.4	99.5	30
1606	11.6	53.4	1635	96.2	103.0	7.5	15.3	10.8	9.1	20.4	99.5	30
1607	10.2	53.1	1619	96.2	103.0	6.8	15.0	8.0	9.3	20.5	99.5	31
1608	10.2	53.1	1602	96.2	103.0	4.8	14.7	7.3	10.2	20.5	99.5	31
1609	10.2	53.1	1634	96.2	100.1	4.4	14.8	9.6	9.1	20.5	99.5	31
1610	10.3	53.2	1638	96.2	100.1	5.7	15.1	7.9	7.5	20.5	99.5	31
1611	10.3	53.2	1610	96.2	100.1	4.0	14.8	9.6	6.1	20.5	99.5	31
1612	9.8	53.0	1613	96.2	100.1	3.1	14.8	9.2	6.8	20.5	99.5	31
1613	12.2	53.5	1665	96.2	100.1	3.4	15.2	11.4	8.4	20.5	99.5	30
1614	10.4	53.1	1614	96.2	100.1	1.2	14.5	8.0	7.7	20.5	99.5	30
1615	10.4	53.1	1614	96.2	100.1	1.9	14.5	8.8	8.6	20.5	99.5	30
1616	10.0	53.3	1638	96.2	100.1	-1.2	15.1	9.3	9.2	20.5	99.5	30
1617	10.6	54.1	1682	96.2	100.1	4.1	15.2	9.9	8.2	20.5	99.5	31
1618	9.5	53.7	1631	96.2	100.1	3.9	15.5	8.9	6.8	20.5	99.5	30
1619	9.8	54.4	1609	96.2	100.1	4.7	15.2	7.6	10.8	20.4	99.5	31
1620	9.8	54.4	1590	96.2	100.1	3.4	15.0	9.2	9.0	20.4	99.5	31
1621	9.3	53.9	1621	96.2	100.1	6.1	14.7	8.1	8.4	20.4	99.5	31
1622	10.0	53.6	1655	96.2	100.1	2.3	15.2	7.3	8.2	20.4	99.5	31
1623	10.3	53.7	1601	96.2	100.1	2.3	14.6	9.6	9.8	20.4	99.5	31
1624	10.3	53.7	1601	96.2	100.1	3.8	15.6	8.0	8.2	20.4	99.5	31
1625	10.2	53.6	1653	96.2	100.1	7.1	15.7	9.6	9.7	20.4	99.5	31
1626	10.3	55.1	1622	96.2	100.1	6.7	15.3	9.6	7.7	20.4	99.5	31
1627	9.9	54.6	1616	96.2	90.3	6.9	15.2	9.3	10.0	20.4	99.5	31
1628	10.6	54.0	1611	96.2	84.5	7.5	15.1	9.8	8.3	20.4	99.5	31
1629	9.8	53.3	1603	96.2	84.5	4.7	14.6	9.2	10.1	20.4	99.5	31
1630	11.7	53.1	1647	96.2	84.5	3.9	15.0	11.0	10.9	20.4	99.5	31
1631	10.9	53.7	1659	96.2	84.5	7.3	15.3	10.3	7.5	20.4	99.5	30
1632	11.3	53.2	1619	96.2	84.5	6.6	15.2	10.6	7.8	20.4	99.5	30
1633	10.3	53.1	1624	96.2	84.5	6.5	15.0	9.7	7.9	20.4	99.5	30
1634	10.3	53.3	1629	96.2	87.4	5.4	14.9	9.7	7.8	20.4	99.5	30
1635	10.7	53.8	1656	96.2	94.1	5.3	15.1	10.2	9.2	20.4	99.5	30
1636	9.8	53.7	1617	96.2	103.0	5.2	15.0	9.1	9.0	20.4	99.5	30
1637	10.2	53.4	1611	96.2	103.0	3.4	14.6	9.6	7.9	20.4	99.5	31
1638	10.2	53.4	1616	96.2	103.0	2.1	14.8	7.4	6.0	20.4	99.5	31
1639	9.9	53.1	1605	96.2	103.0	1.5	14.5	7.4	9.1	20.4	99.5	31
1640	9.4	53.1	1675	96.2	103.0	0.2	15.2	8.8	7.4	20.4	99.5	31
1641	11.6	53.6	1593	96.2	103.0	6.7	15.4	10.8	6.9	20.4	99.5	31
1642	11.8	53.4	1625	96.2	103.0	5.1	15.3	11.0	9.2	20.4	99.5	31
1643	10.2	53.4	1612	96.2	103.0	6.0	15.1	8.5	9.6	20.4	99.5	30
1644	10.8	54.4	1624	96.2	103.0	6.3	15.2	10.1	8.7	20.4	99.5	30
1645	10.4	53.7	1611	96.2	100.1	7.4	15.1	8.6	10.3	20.4	99.5	30
1646	10.3	53.7	1637	96.2	93.3	6.7	15.2	8.3	11.1	20.4	99.5	30
1647	10.3	53.1	1649	96.2	90.3	6.2	15.1	9.7	9.2	20.4	99.5	30
1648	9.7	53.7	1619	96.2	90.3	7.9	15.1	8.3	8.4	20.4	99.5	30
1649	11.2	53.8	1610	96.2	90.3	6.8	15.0	9.1	9.4	20.4	99.5	30
1650	10.4	53.2	1636	96.2	90.3	7.2	15.2	10.5	8.4	20.4	99.5	30
1651	10.4	53.2	1606	96.2	90.3	4.4	14.8	9.7	7.8	20.4	99.5	30
1652	9.4	52.8	1626	96.2	90.3	3.4	14.6	8.8	6.4	20.4	99.5	30
1653	11.6	54.4	1660	96.2	90.3	3.4	15.1	7.4	8.0	20.4	99.5	30
1654	11.6	54.4	1660	96.2	90.3	6.6	15.4	10.8	8.3	20.3	99.5	30
1655	10.0	53.9	1623	96.2	90.3	7.3	15.3	9.3	9.7	20.3	99.5	30
1656	12.0	53.7	1616	96.2	90.3	6.2	15.2	8.3	8.1	20.3	99.5	30
1657	10.3	54.3	1630	96.2	90.3	8.1	15.1	9.6	7.7	20.3	99.5	30
1658	11.9	53.6	1632	96.2	90.3	7.9	15.1	11.2	8.9	20.3	99.5	30
1659	10.5	53.3	1629	96.2	90.3	7.6	15.0	9.8	8.9	20.3	99.5	30
1660	11.3	53.9	1627	96.2	90.3	7.7	15.0	10.6	9.0	20.3	99.5	31
1661	10.2	53.4	1614	96.2	90.3	7.5	15.1	8.5	8.2	20.3	99.5	31
1662	10.2	53.4	1636	96.2	90.3	7.9	15.1	8.5	8.8	20.3	99.5	31
1663	11.7	52.8	1619	96.2	90.3	6.9	15.0	11.0	8.6	20.3	99.5	31
1664	10.2	53.9	1627	96.2	90.3	8.9	15.0	8.4	8.3	20.3	99.5	31
1665	10.2	53.9	1627	96.2	90.3	4.7	14.8	8.0	9.6	20.3	99.5	31
1666	9.8	54.0	1650	96.2	90.3	7.4	15.2	9.2	7.8	20.3	99.5	30
1667	10.4	53.9	1631	96.2	90.3	6.9	15.2	8.7	8.1	20.3	99.5	30
1668	11.3	54.2	1602	96.2	90.3	9.3	15.2	10.5	9.3	20.3	99.5	30
1669	10.4	53.6	1616	96.2	90.3	8.1	15.0	9.7	8.1	20.3	99.5	30
1670	10.1	53.4	1636	96.2	90.3	6.3	14.9	9.5	7.3	20.3	99.5	30
1671	11.1	53.9	1642	96.2	90.3	7.6	15.1	10.4	4.7	20.3	99.5	30
1672	12.3	53.8	1623	96.2	90.3	6.7	15.0	11.6	4.7	20.3	99.5	30

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
1673	10.0	52.7	1635	96.2	90.3	3.6	14.5	7.6	7.0	20.3	99.5	30
1674	10.0	52.7	1635	96.2	90.3	2.0	14.6	9.4	7.7	20.3	99.5	30
1675	9.4	53.2	1626	96.2	90.3	3.3	14.9	8.8	8.4	20.3	99.5	30
1676	9.9	53.1	1633	96.2	90.3	1.9	14.7	9.2	7.2	20.3	99.5	30
1677	10.4	53.8	1626	96.2	90.3	0.1	14.8	9.8	8.6	20.3	99.5	30
1678	7.8	53.1	1134	96.2	90.3	0.3	14.7	7.6	8.5	20.3	99.5	30
1679	8.9	53.2	1452	96.2	90.3	1.1	15.1	6.9	8.6	20.3	99.5	30
1680	12.2	53.5	1625	96.2	90.3	-1.3	15.1	8.5	8.2	20.3	99.5	30
1681	7.5	53.3	1015	96.2	90.3	1.0	14.7	6.6	10.1	20.3	99.5	30
1682	7.6	52.9	1062	96.2	90.3	0.8	14.5	6.6	8.4	20.3	99.5	30
1683	10.9	54.0	1580	96.2	90.3	3.8	15.1	8.8	7.6	20.3	99.5	31
1684	10.9	54.0										

# Table E.01 Measurement data - Turbine ON

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\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	L/Aeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
1761	10.1	53.3	1629	96.2	93.3	9.2	9.4	10.3	20.5	99.5	30	30
1762	13.8	53.5	1629	96.2	93.3	8.8	15.1	13.0	8.0	20.5	99.5	30
1763			1623	96.2	93.3	8.7	15.1	10.4	7.0	20.5	99.5	30
1764	12.1	52.5	1633	96.2	93.3	7.8	15.1	11.3	9.0	20.5	99.5	30
1765	12.7	52.7	1620	96.2	93.3	6.7	14.9	11.9	9.5	20.5	99.5	30
1766	11.8	53.2	1635	96.2	93.3	6.5	15.0	11.0	7.6	20.7	99.5	30
1767	11.0	53.5	1634	96.2	93.3	7.2	15.2	10.3	8.9	20.7	99.5	30
1768	12.9	53.2	1622	96.2	93.3	7.0	15.0	12.1	6.5	20.7	99.5	30
1769	12.8	52.6	1632	96.2	93.3	6.3	15.0	12.0	5.6	20.7	99.5	30
1770	11.2	53.1	1635	96.2	93.3	6.6	15.0	10.5	6.7	20.7	99.5	30
1771	10.1	53.8	1614	96.2	93.3	6.9	15.0	9.5	7.2	20.7	99.5	30
1772	9.4	53.0	1622	96.2	93.3	6.7	15.0	8.2	20.7	99.5	31	
1773	11.5	54.0	1649	96.2	93.3	5.6	15.0	10.8	7.3	20.7	99.5	31
1774	11.8	54.0	1630	96.2	93.3	7.3	15.2	11.1	11.0	20.7	99.5	31
1775	11.7	53.5	1622	96.2	93.3	6.9	15.2	10.2	8.2	20.7	99.5	31
1776	10.9	53.0	1610	96.2	93.3	6.9	15.0	10.2	8.3	20.7	99.5	31
1777	13.7	52.6	1609	96.2	93.3	5.2	14.9	12.8	6.6	20.7	99.5	31
1778			1627	96.2	93.3	3.9	14.8	6.8	7.8	20.8	99.5	31
1779	12.0	53.6	1629	96.2	93.3	7.6	15.3	11.2	10.7	20.8	99.5	31
1780	10.8	53.3	1636	96.2	93.3	7.6	15.2	10.1	11.8	20.8	99.5	31
1781	11.9	53.5	1608	96.2	93.3	7.4	15.0	11.1	8.8	20.8	99.5	31
1782	9.9	53.5	1621	96.2	93.3	6.5	14.9	9.3	10.1	20.8	99.5	31
1783	10.2	53.5	1633	96.2	93.3	5.9	15.0	9.5	9.5	20.8	99.5	31
1784	10.5	53.7	1639	96.2	93.3	5.9	15.0	9.9	8.8	20.9	99.5	30
1785			1618	96.2	93.3	6.4	15.1	8.3	8.2	20.9	99.5	30
1786	12.9	53.5	1609	96.2	93.3	6.7	15.0	12.1	8.5	20.9	99.5	30
1787	9.3	53.1	1629	96.2	93.3	6.0	15.1	8.7	7.7	20.9	99.5	30
1788	9.7	53.8	1640	96.2	93.3	7.3	15.2	9.1	6.1	20.9	99.5	30
1789	11.0	55.0	1619	96.2	93.3	6.6	15.2	10.3	7.9	20.9	99.5	30
1790	10.6	53.1	1636	96.2	93.3	7.6	15.1	9.9	7.3	20.9	99.5	30
1791	12.7	54.2	1638	96.2	93.3	8.8	15.2	11.9	7.2	20.9	99.5	30
1792	11.7	54.4	1623	96.2	93.3	8.2	15.0	10.9	8.7	20.9	99.5	30
1793			1608	96.2	93.3	5.3	14.6	8.5	9.3	20.9	99.5	30
1794	9.6	53.0	1633	96.2	93.3	3.5	14.8	9.0	9.0	20.9	99.5	30
1795	9.6	53.9	1651	96.2	93.3	7.2	15.3	9.0	9.3	20.9	99.5	30
1796	10.6	53.1	1627	96.2	93.3	5.3	15.0	9.9	8.5	20.9	99.5	30
1797			1629	96.2	93.3	5.9	15.0	8.4	7.5	20.9	99.5	30
1798	9.3	53.5	1616	96.2	93.3	4.7	15.0	8.7	7.8	20.9	99.5	30
1799	11.1	53.8	1635	96.2	93.3	5.8	15.0	10.4	10.9	20.9	99.5	30
1800	11.8	53.7	1641	96.2	93.3	6.6	15.4	11.1	10.6	20.9	99.5	30
1801	11.0	53.3	1628	96.2	93.3	9.0	15.4	10.3	10.2	20.9	99.5	30
1802	13.5	54.9	1630	96.2	93.3	9.0	15.1	12.7	9.9	20.8	99.5	30
1803			1609	96.2	93.3	9.0	15.0	13.6	8.9	20.8	99.5	30
1804	14.2	53.6	1629	96.2	93.3	9.2	15.2	13.3	6.8	20.8	99.5	30
1805	13.0	54.0	1621	96.2	93.3	9.2	15.1	12.2	7.4	20.8	99.5	30
1806	11.2	52.7	1629	96.2	93.3	8.9	15.1	10.5	8.2	20.8	99.5	30
1807	9.8	53.2	1622	96.2	93.3	9.0	15.1	9.2	7.6	20.6	99.5	31
1808	14.6	54.6	1632	96.2	93.3	9.3	15.1	13.7	7.2	20.6	99.5	31
1809	12.4	53.9	1633	96.2	93.3	9.9	15.2	11.7	6.5	20.6	99.5	31
1810	13.4	54.3	1640	96.2	93.3	8.8	15.1	12.6	8.8	20.6	99.5	31
1811	11.6	52.9	1631	96.2	93.3	9.8	15.2	10.9	8.0	20.6	99.5	31
1812	13.4	53.1	1627	96.2	93.3	10.3	15.1	12.6	9.0	20.6	99.5	31
1813	13.5	53.3	1625	96.2	93.3	9.7	15.1	12.7	8.5	20.7	99.5	31
1814	10.2	54.2	1639	96.2	93.3	10.8	15.2	9.6	9.5	20.7	99.5	31
1815	11.2	54.1	1627	96.2	93.3	10.0	15.2	10.4	10.5	20.7	99.5	31
1816	14.7	54.1	1631	96.2	93.3	10.6	15.1	13.8	9.5	20.7	99.5	31
1817			1631	96.2	93.3	11.1	15.2	8.0	9.7	20.7	99.5	31
1818	14.0	53.5	1623	96.2	93.3	11.6	15.1	13.1	8.9	20.7	99.5	31
1819	10.3	53.1	1630	96.2	93.3	10.8	15.1	9.7	8.5	20.7	99.5	30
1820	14.6	53.6	1627	96.2	93.3	10.4	15.1	13.6	9.7	20.7	99.5	30
1821	13.8	53.5	1609	96.2	93.3	9.8	15.0	12.8	7.9	20.7	99.5	30
1822	10.5	52.7	1627	96.2	93.3	8.4	15.0	9.8	10.4	20.7	99.5	30
1823	9.7	52.6	1631	96.2	93.3	7.2	14.9	9.1	11.0	20.7	99.5	30
1824	12.5	53.3	1646	96.2	93.3	8.3	15.1	11.7	10.4	20.7	99.5	30
1825	11.1	53.2	1634	96.2	93.3	8.9	15.2	10.4	8.2	20.6	99.5	30
1826	10.6	52.7	1621	96.2	93.3	6.4	14.9	9.9	7.3	20.6	99.5	30
1827	11.7	53.0	1619	96.2	93.3	6.1	14.9	11.0	7.4	20.6	99.5	30
1828	12.6	52.5	1635	96.2	93.3	4.9	14.9	11.8	8.9	20.6	99.5	30
1829	9.3	52.8	1639	96.2	93.3	4.9	14.9	9.7	7.6	20.6	99.5	30
1830	10.4	52.9	1647	96.2	93.3	4.4	15.1	9.8	5.9	20.6	99.5	30
1831	11.5	53.9	1625	96.2	93.3	7.3	15.2	10.8	8.4	20.5	99.5	31
1832	10.8	53.3	1621	96.2	93.3	6.0	15.2	10.1	7.6	20.5	99.5	31
1833	11.1	53.2	1622	96.2	93.3	7.6	15.1	10.4	7.5	20.5	99.5	31
1834	11.9	53.0	1639	96.2	93.3	7.8	15.2	11.2	7.4	20.5	99.5	31
1835	12.6	53.0	1619	96.2	93.3	8.2	15.0	11.8	10.0	20.5	99.5	31
1836	12.2	53.2	1620	96.2	93.3	7.2	15.0	11.4	8.8	20.5	99.5	31
1837	10.2	52.7	1623	96.2	93.3	6.7	14.9	9.5	9.1	20.6	99.5	30
1838	10.0	52.4	1639	96.2	93.3	6.2	15.1	9.4	9.1	20.6	99.5	30
1839	11.5	53.3	1631	96.2	93.3	6.6	15.1	10.8	7.8	20.6	99.5	30
1840	10.8	53.3	1635	96.2	93.3	6.5	15.3	10.2	8.5	20.6	99.5	30
1841	11.2	53.2	1635	96.2	93.3	6.8	14.9	10.5	9.3	20.6	99.5	30
1842	12.3	53.0	1620	96.2	93.3	6.6	15.0	11.5	9.5	20.6	99.5	30
1843			1639	96.2	93.3	2.5	14.3	9.0	10.2	20.5	99.5	30
1844	9.6	53.0	1623	96.2	93.3	2.5	14.3	11.0	10.3	20.5	99.5	30
1845	8.0	52.5	1197	96.2	93.3	-0.1	14.3	6.7	9.3	20.5	99.5	30
1846	10.7	53.4	1655	96.2	93.3	0.1	15.2	10.0	6.7	20.5	99.5	30
1847			1643	96.2	93.3	3.8	15.7	8.4	8.4	20.5	99.5	30
1848			1581	96.2	93.3	1.3	14.8	7.0	7.7	20.5	99.5	30

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	L/Aeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
1849	10.7	54.2	1603	96.2	93.3	7.7	15.5	10.0	6.6	20.5	99.5	31
1850	12.3	53.3	1619	96.2	93.3	9.8	15.5	11.5	8.7	20.5	99.5	31
1851	13.3	53.5	1613	96.2	93.3	8.4	15.1	12.5	8.0	20.5	99.5	31
1852	10.3	53.0	1606	96.2	93.3	6.3	14.8	9.7	6.7	20.5	99.5	31
1853	10.4	53.2	1660	96.2	93.3	7.2	15.1	9.7	8.8	20.5	99.5	31
1854	11.3	53.6	1616	96.2	93.3	7.5	15.0	10.6	9.6	20.5	99.5	31
1855			1622	96.2	93.3	5.7	14.8	8.3	8.4	20.6	99.5	31
1856	10.1	53.8	1637	96.2	93.3	6.3	15.0	9.5	8.8	20.6	99.5	31
1857	10.3	53.9	1642	96.2	93.3	5.8	15.1	9.7	8.4	20.6	99.5	31
1858	9.3	53.2	1615	96.2	93.3	4.5	14.7	8.7	10.7	20.6	99.5	31
1859	11.3	52.9	1633	96.2	93.3	2.9	14.8	10.6	9.4	20.6	99.5	31
1860	10.0	53.3	1626	96.2	93.3	3.2	14.9	9.4	10.7	20.6	99.5	31
1861	9.8	53.6	16									

# Table E.01 Measurement data - Turbine ON

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\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
1937			312	96.2	90.3	19.2	10.5	11.9	8.2	20.9	99.4	31
1938			270	96.2	90.3	15.1	10.1	7.1	7.8	20.9	99.4	31
1939			199	96.2	90.3	14.1	9.9	7.3	6.6	20.9	99.4	31
1940			219	96.2	90.3	13.4	9.9	8.1	11.6	20.9	99.4	31
1941			178	96.2	90.3	12.8	10.1	7.7	9.6	20.9	99.4	31
1942			147	96.2	90.3	15.0	10.5	7.0	5.0	20.8	99.4	31
1943			102	96.2	90.3	16.0	10.3	7.4	3.8	20.8	99.4	31
1944			100	96.2	90.3	15.1	10.1	9.7	3.9	20.8	99.4	31
1945			100	96.2	90.3	14.2	10.0	6.1	5.2	20.8	99.4	31
1946			100	96.2	90.3	18.7	10.5	10.3	6.8	20.8	99.4	31
1947			100	96.2	90.3	17.9	10.2	8.0	12.6	20.8	99.4	31
1948			100	96.2	90.3	17.5	10.1	7.8	9.9	20.8	99.4	31

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Turbine Power Output (kW)	Reference Yaw Angle (°)	Yaw Angle (°)	Pitch Angle (°)	Rotor RPM	Nacelle Anemometer Wind Speed (m/s)	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
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# Table E.02 Measurement data - Background

Project: Bornish Wind Energy Centre - Turbine T22 - IEC 61400-11 Measurement  
 Report ID: 14331.00.T22.RP4

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Rotor RPM	10m Anemometer Wind Speed (m/s)	Air Temperature (C)	Pressure (kPa)	Relative Humidity (%)
1	10.1	44.4	-0.4	8.6	16	99.7	30
2	9.1	44.2	-0.5	7.8	16	99.7	30
3	9.4	44.5	-0.4	8.0	16	99.7	30
4	10.3	47.3	-0.4	8.8	16	99.7	30
5	11.7	47.2	-0.4	10.0	16	99.7	30
6	13.1	47.1	-0.4	11.2	16	99.7	30
7	10.2	49.6	-0.4	8.7	16	99.7	30
8	11.7	44.9	-0.4	10.0	16	99.7	30
9	12.7	45.5	-0.3	10.9	16	99.7	30
10	11.9	42.2	-0.3	10.2	16	99.7	30
11	12.2	41.2	-0.5	10.4	16	99.7	30
12	11.4	43.8	-0.3	9.7	16	99.7	30
13	13.9	42.9	-0.4	11.9	16	99.7	30
14	15.8	48.1	-0.4	13.5	16	99.7	29
15	14.0	45.9	-0.4	12.0	16	99.7	28
16	13.4	46.2	-0.3	11.4	16	99.7	28
17	13.1	47.8	-0.4	11.2	16	99.7	28
18	13.8	47.9	-0.4	11.8	16	99.7	28
19	14.2	43.1	-0.5	12.2	16	99.7	28
20	14.3	44.1	-0.5	12.2	16	99.7	28
21	14.5	47.4	-0.4	12.4	16	99.7	28
22	12.9	48.5	-0.4	11.1	16	99.7	28
23	10.2	45.5	-0.4	8.7	16	99.7	28
24	9.4	44.9	-0.3	8.0	16	99.7	28
25	10.0	45.7	-0.2	8.5	16	99.7	28
26	8.8	48.0	-0.2	7.5	16	99.7	28
27	9.7	46.0	-0.4	8.3	16	99.7	28
28	9.5	43.6	-0.5	8.1	16	99.7	28
29	9.7	43.2	-0.4	8.3	16	99.7	29
30	10.9	45.0	-0.3	9.3	16	99.7	29
31	10.3	43.5	-0.4	8.8	16	99.7	29
32	8.7	42.0	-0.4	7.5	16	99.7	29
33	10.8	44.5	-0.5	9.2	16	99.7	29
34	11.1	47.4	-0.5	9.5	16	99.7	29
35	11.8	44.3	-0.5	10.1	16	99.7	29
36	14.1	46.5	-0.5	12.0	16	99.7	29
37	11.0	47.9	-0.3	9.4	16	99.7	29
38	11.3	49.4	-0.6	8.6	16	99.7	29
39	9.5	45.5	-0.5	8.1	16	99.7	29
40	9.3	45.2	-0.5	8.0	16	99.8	29
41	11.7	45.5	-0.4	10.0	16	99.8	29
42	11.6	48.3	-0.6	9.9	16	99.8	29
43	14.1	47.1	-0.5	12.0	16	99.8	29
44	11.0	45.9	-0.5	9.4	16	99.8	29
45	10.9	44.1	-0.3	9.4	16	99.8	29
46	12.7	43.9	-0.4	10.9	16	99.7	29
47	11.1	47.3	-0.5	9.5	16	99.7	29
48	9.5	46.3	-0.4	8.2	16	99.7	29
49	10.5	46.4	-0.4	9.0	16	99.7	29
50	10.6	43.3	-0.4	9.0	16	99.7	29
51	10.0	44.4	-0.3	8.6	16	99.7	29
52	8.0	43.0	-0.4	8.6	16	99.8	29
53	7.5	42.2	-0.5	6.4	16	99.8	29
54	8.7	40.6	-0.1	7.4	16	99.8	29
55	9.8	47.4	0.0	8.4	16	99.8	29
56	8.2	44.4	-0.3	7.0	16	99.8	29
57	8.6	46.9	-0.3	7.3	16	99.8	29
58	6.7	48.2	0.0	5.8	16	99.8	29
59	6.3	46.0	0.0	5.4	16	99.8	30
60	7.5	45.9	-0.4	6.4	16	99.8	30
61	8.2	43.5	-0.4	7.0	16	99.8	30
62	7.6	45.3	-0.3	6.5	16	99.8	30
63	6.8	47.0	0.0	5.8	16	99.8	30
64	8.6	45.8	0.0	7.3	16	99.8	29
65	9.0	42.7	0.0	7.7	16	99.8	29
66	8.6	45.8	0.0	7.3	16	99.8	29
67	8.2	42.8	-0.1	7.0	16	99.8	29
68	9.4	42.7	-0.3	8.0	16	99.8	29
69	7.9	44.0	-0.4	6.7	16	99.8	29
70	10.3	37.7	-0.5	8.8	16	99.8	29
71	9.4	39.9	-0.6	8.1	16	99.8	29
72	9.5	38.2	-0.5	8.1	16	99.8	29
73	10.2	37.4	0.0	8.7	16	99.8	29
74	10.0	44.3	0.0	8.6	16	99.8	29
75	9.0	41.3	0.0	7.7	16	99.8	29
76	7.6	49.4	-0.1	6.5	16	99.8	29
77	7.2	42.5	-0.4	6.2	16	99.8	29
78	9.4	39.7	-0.4	6.2	16	99.8	29
79	7.9	38.1	-0.5	6.7	16	99.8	29
80	7.5	40.2	-0.4	6.4	16	99.8	29
81	8.0	41.8	-0.3	6.8	16	99.8	29
82	9.7	41.4	-0.6	8.3	16	99.8	29
83	9.0	36.7	-0.5	7.7	16	99.8	29

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Rotor RPM	10m Anemometer Wind Speed (m/s)	Air Temperature (C)	Pressure (kPa)	Relative Humidity (%)
84	10.5	39.3	-0.4	9.0	16	99.8	29
85	8.8	39.8	-0.4	7.6	16	99.8	29
86	7.3	41.9	-0.5	6.3	16	99.8	29
87	7.5	39.2	-0.5	6.4	16	99.8	29
88	8.0	38.6	-0.6	6.9	16	99.8	29
89	6.7	36.5	-0.5	5.7	16	99.8	29
90	6.9	36.6	-0.4	5.9	16	99.8	29
91	9.0	38.8	-0.3	7.7	16	99.8	29
92	9.5	42.2	-0.3	8.1	16	99.8	29
93	8.0	43.4	-0.4	6.9	16	99.8	29
94	9.5	40.7	-0.3	8.1	16	99.8	29
95	7.9	39.2	-0.2	6.8	16	99.8	29
96	6.7	39.0	-0.2	5.7	16	99.8	30
97	5.0	39.4	-0.3	4.3	16	99.8	30
98	5.6	38.4	-0.3	4.8	16	99.8	30
99	7.2	39.4	-0.3	6.1	16	99.8	30
100	9.2	38.5	-0.3	7.9	16	99.8	30
101	8.4	41.2	-0.3	7.2	16	99.8	30
102	7.1	38.5	-0.1	6.0	16	99.8	30
103	4.1	38.2	0.0	5.3	16	99.8	30
104	5.2	39.1	0.0	4.4	16	99.8	30
105	5.2	37.5	0.0	4.5	16	99.8	30
106	6.0	43.5	-0.2	5.2	16	99.8	30
107	8.5	46.2	-0.4	7.3	16	99.8	30
108	7.3	45.7	-0.4	6.2	16	99.8	30
109	5.4	43.3	-0.3	4.6	16	99.8	30
110	6.3	43.9	-0.3	5.4	16	99.8	30
111	7.4	41.1	-0.2	6.3	16	99.8	30
112	6.0	41.6	-0.2	5.1	16	99.8	30
113	6.0	41.1	-0.3	5.1	16	99.8	30
114	5.7	38.8	-0.2	4.9	16	99.8	30
115	4.0	39.1	-0.2	3.4	16	99.8	30
116	3.2	39.5	-0.2	2.8	16	99.8	30
117	5.4	39.1	-0.3	4.6	16	99.8	30
118	5.4	38.2	-0.3	4.6	16	99.8	30
119	9.2	41.7	-0.2	7.9	16	99.8	30
120	8.7	44.4	-0.2	7.5	16	99.8	30
121	6.2	39.8	-0.2	5.3	16	99.8	30
122	6.2	38.3	-0.3	5.3	16	99.8	30
123	4.5	40.5	-0.3	3.9	16	99.8	30
124	5.2	41.3	-0.2	4.4	16	99.8	30
125	6.3	44.0	-0.2	5.4	16	99.8	30
126	7.5	39.5	-0.3	6.4	16	99.8	30
127	5.2	39.6	-0.3	4.5	16	99.8	31
128	5.3	38.8	-0.3	4.6	16	99.8	31
129	7.2	39.9	-0.5	6.2	16	99.8	31
130	7.2	43.7	-0.5	6.1	16	99.8	31
131	7.8	42.8	-0.3	6.6	16	99.8	31
132	9.4	39.5	-0.3	8.0	17	99.8	30
133	12.1	40.7	-0.4	10.3	17	99.8	30
134	11.1	42.6	-0.4	9.5	17	99.8	30
135	10.2	43.5	-0.3	8.7	17	99.8	30
136	10.9	46.1	-0.3	9.3	17	99.8	30
137	9.8	45.6	-0.3	8.4	17	99.8	30
138	10.0	42.1	-0.2	8.6	17	99.7	29
139	8.0	38.6	-0.2	6.9	17	99.7	29
140	5.7	42.8	-0.4	4.9	17	99.7	29
141	7.0	40.5	-0.4	6.0	17	99.7	29
142	8.2	44.6	-0.4	7.0	17	99.7	29
143	7.0	45.6	-0.4	6.0	17	99.7	29
144	6.8	46.2	-0.5	5.8	17	99.8	31
145	8.3	46.1	-0.3	7.1	17	99.7	31
146	10.6	44.8	-0.4	9.1	17	99.7	31
147	11.7	45.4	-0.3	10.0	17	99.7	31
148	8.6	43.4	-0.3	7.3	17	99.7	31
149	9.6	45.4	-0.4	8.2	17	99.7	31
150	9.6	43.8	-0.4	8.2	17	99.8	29
151	11.9	46.5	-0.4	10.2	17	99.8	29
152	7.9	41.8	-0.5	6.7	17	99.8	29
153	9.2	44.5	-0.6	7.9	17	99.8	29
154	11.4	44.3	-0.4	9.7	17	99.8	29
155	14.0	43.8	-0.5	11.9	17	99.8	29
156	13.4	44.9	-0.6	11.4	17	99.7	28
157	13.5	48.9	-0.5	11.5	17	99.7	28
158	13.6	46.2	-0.4	11.6	17	99.7	28
159	13.7	47.4	-0.5	11.7	17	99.7	28
160	13.0	46.7	-0.6	11.1	17	99.7	28
161	11.9	48.9	-0.6	9.4	17	99.7	28
162	11.0	48.4	-0.6	9.4	17	99.8	28
163	11.3	47.3	-0.4	9.6	17	99.8	28
164	13.8	45.1	-0.5	11.8	17	99.8	28
165	13.3	43.1	-0.4	11.3	17	99.8	28
166	10.7	42.1	-0.5	9.2	17	99.8	28

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Rotor RPM	10m Anemometer Wind Speed (m/s)	Air Temperature (C)	Pressure (kPa)	Relative Humidity (%)
167	12.1	41.1	-0.5	10.3	17	99.8	28
168	11.7	45.0	-0.4	10.0	17	99.8	28
169	10.4	49.3	-0.4	8.9	17	99.8	28
170	12.8	49.6	-0.2	10.9</			

# Table E.02 Measurement data - Background

Project: Bornish Wind Energy Centre - Turbine T22 - IEC 61400-11 Measurement  
 Report ID: 14331.00.T22.RP4

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Rotor RPM	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
250	8.5	43.7	-0.4	7.2	17	99.7	29
251	7.7	44.0	-0.3	6.6	17	99.7	29
252	9.9	43.9	-0.4	8.5	17	99.7	30
253	10.4	40.5	-0.3	8.9	17	99.7	30
254	10.5	43.5	-0.3	8.9	17	99.7	30
255	9.5	45.3	-0.3	8.1	17	99.7	30
256	8.9	45.2	-0.3	7.6	17	99.7	30
257	8.6	47.7	-0.3	7.3	17	99.8	30
258	7.3	44.0	-0.3	6.2	17	99.7	29
259	9.0	44.4	-0.4	7.7	17	99.7	29
260	10.3	42.9	-0.4	8.8	17	99.7	29
261	10.0	46.1	-0.4	8.5	17	99.7	29
262	11.1	44.8	-0.3	9.5	17	99.7	29
263	9.5	44.6	-0.3	8.1	17	99.7	29
264	9.9	45.3	-0.3	8.5	17	99.7	28
265	9.5	46.8	-0.4	8.1	17	99.7	28
266	8.5	47.9	-0.4	7.3	17	99.7	28
267	10.3	46.1	-0.5	8.8	17	99.7	28
268	9.4	49.8	-0.4	8.0	17	99.7	28
269	9.4	47.1	-0.4	8.0	17	99.7	28
270	10.3	45.1	-0.5	8.8	17	99.7	29
271	10.4	48.0	-0.4	8.9	17	99.7	29
272	8.7	44.7	-0.4	7.4	17	99.7	29
273	11.1	48.0	-0.4	9.5	17	99.7	29
274	11.1	46.7	-0.3	9.5	17	99.7	28
275	12.4	42.8	-0.3	10.6	17	99.7	27
276	11.1	43.2	-0.3	9.5	17	99.7	27
277	9.6	46.7	-0.3	8.2	17	99.7	27
278	11.1	44.1	-0.3	9.5	17	99.7	27
279	10.3	42.6	-0.3	8.8	17	99.7	27

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Rotor RPM	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
333						#VALUE!	
334						#VALUE!	
335						#VALUE!	
336						#VALUE!	
337						#VALUE!	
338						#VALUE!	
339						#VALUE!	
340						#VALUE!	
341						#VALUE!	
342						#VALUE!	
343						#VALUE!	
344						#VALUE!	
345						#VALUE!	
346						#VALUE!	
347						#VALUE!	
348						#VALUE!	
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350						#VALUE!	
351						#VALUE!	
352						#VALUE!	
353						#VALUE!	
354						#VALUE!	
355						#VALUE!	
356						#VALUE!	
357						#VALUE!	
358						#VALUE!	
359						#VALUE!	
360						#VALUE!	
361						#VALUE!	
362						#VALUE!	

\*\*\*Blank data denotes values that were omitted in the analysis due to an extraneous event during recording

Data Point #	Standardized Wind Speed	LAeq	Rotor RPM	10m Anemometer Wind Speed (m/s)	Air Temperature (°C)	Pressure (kPa)	Relative Humidity (%)
416						#VALUE!	
417						#VALUE!	
418						#VALUE!	
419						#VALUE!	
420						#VALUE!	
421						#VALUE!	
422						#VALUE!	
423						#VALUE!	
424						#VALUE!	
425						#VALUE!	
426						#VALUE!	
427						#VALUE!	
428						#VALUE!	
429						#VALUE!	
430						#VALUE!	
431						#VALUE!	
432						#VALUE!	
433						#VALUE!	
434						#VALUE!	
435						#VALUE!	
436						#VALUE!	
437						#VALUE!	
438						#VALUE!	
439						#VALUE!	
440						#VALUE!	
441						#VALUE!	
442						#VALUE!	
443						#VALUE!	
444						#VALUE!	
445						#VALUE!	



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## Appendix F Supplementary Information for the Regulator

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## Appendix F.01 Calibration Certificates

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## ISO 17025

## As Left RECALIBRATION CERTIFICATE

Sales Region:	NA
Account:	Aercoustics Engineering Limited
Instrument:	LMS SCADAS
Manufacturer:	Siemens Industry Software B.V.
Type:	SCR202
Serial number(s):	22163146
Calibration method:	Two calibrated external standards (DC voltage and frequency) are used to calibrate the internal LMS SCADAS references: time/frequency accuracy of the internal system clock and amplitude accuracy of the internal signal sources. All input channels are calibrated against the internal references.
Ambient conditions:	The calibrations have been carried out in a controlled environment, at an ambient temperature of $23.3^{\circ}\text{C} \pm 0.3^{\circ}\text{C}$ and a relative humidity of $21\% \pm 5\%$ .
Calibration date:	February 27, 2018
Results:	The calibration results, together with their associated uncertainties, are included in this calibration certificate. <i>Calibration results within specification.</i>
Uncertainty:	The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$ , which for a normal distribution corresponds to a coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with publication EA-4/02.
Traceability:	The measurements have been executed using methods for which the traceability to international standards has been demonstrated towards the Raad voor Accreditatie.

Breda, February 27, 2018

Calibration performed by:



Hans Dam, Customer Service Engineer

Certificate approved by:



F. Lemmens, Production Manager

The Raad voor Accreditatie is one of the signatories of the Multilateral Agreement of the European Cooperation for Accreditation (EA) for the mutual recognition of calibration certificates.

Reproduction of the complete certificate is allowed. Parts of the certificate may only be reproduced with written approval of the calibration laboratory.

This certificate is issued provided that neither Siemens Industry Software B.V. nor the Raad voor Accreditatie assumes any liability.

Certificate number: 22163146-20180227-1

Page: 1 of 16

West Caldwell Calibration Laboratories Inc.

# Certificate of Calibration

for

## MICROPHONE UNIT

Manufactured by: BRUEL & KJAER  
Model No: 4189-A-021  
Serial No: 2622169  
Calibration Recall No: 28016

Submitted By:

Customer:  
Company: Aercoustics Engineering LTD.  
Address:

The subject instrument was calibrated to the indicated specification using standards traceable to the National Institute of Standards and Technology or to accepted values of natural physical constants. This document certifies that the instrument met the following specification upon its return to the submitter.

West Caldwell Calibration Laboratories Procedure No. 4189-A-021 BRUE

Upon receipt for Calibration, the instrument was found to be:

Within ( X )

tolerance of the indicated specification. See attached Report of Calibration.

West Caldwell Calibration Laboratories' calibration control system meets the requirements, ISO 10012-1 MIL-STD-45662A, ANSI/NCSL Z540-1, IEC Guide 25, ISO 9001:2008 and ISO 17025.

Note: With this Certificate, Report of Calibration is included.

Approved by:   
Felix Christopher (QA Mgr.)

Calibration Date: 05-Sep-17

Certificate No: 28016 - 1

QA Doc. #1051 Rev. 2.0 10/1/01

Certificate Page 1 of 1

ISO/IEC 17025:2005

 **West Caldwell  
Calibration  
Laboratories, Inc.**  
uncompromised calibration  
1575 State Route 96, Victor, NY 14564, U.S.A.



Calibration Lab. Cert. # 1533.01

**West Caldwell Calibration Laboratories, Inc.**  
 uncompromised calibration  
 1575 State Route 96, Victor NY 14564



Calibration Lab. Cert. # 1533.01

# REPORT OF CALIBRATION

for  
**Brüel & Kjær Microphone Unit**      **Model No.: 4189-A-021**      **Serial No.: 2622169**  
**Mic. Model No.: 4189**      **Serial No.: 2625417**  
**Preamp. Model No.: 2671**      **Serial No.: 2614900**  
**Company: Aercoustics Engineering LTD.**      **I. D. No.: XXXX**

Calibration results:		Ambient Temperature: 21.8 °C	
Before & after data same: ...X...		Ambient Humidity: 56.4 % RH	
Combined Sensitivity @ 250 Hz	and pressure of 98.432 kPa	Ambient Pressure: 98.432 kPa	
(Sens. with mic. and preamp.)	0 Volts Polarization voltage (External):	Calibration Date: 5-Sep-2017	
-26.54 dB re.1V/Pascal		Calibration Due: 5-Sep-2018	
47.10 mV/Pascal		Report Number: 28016 -1	
0.54 Ko ( - dB re 50 mV/Pascal)		Control Number: 28016	
Sensitivity: Pass			
Freq. Response: Pass			
All tests: Pass			

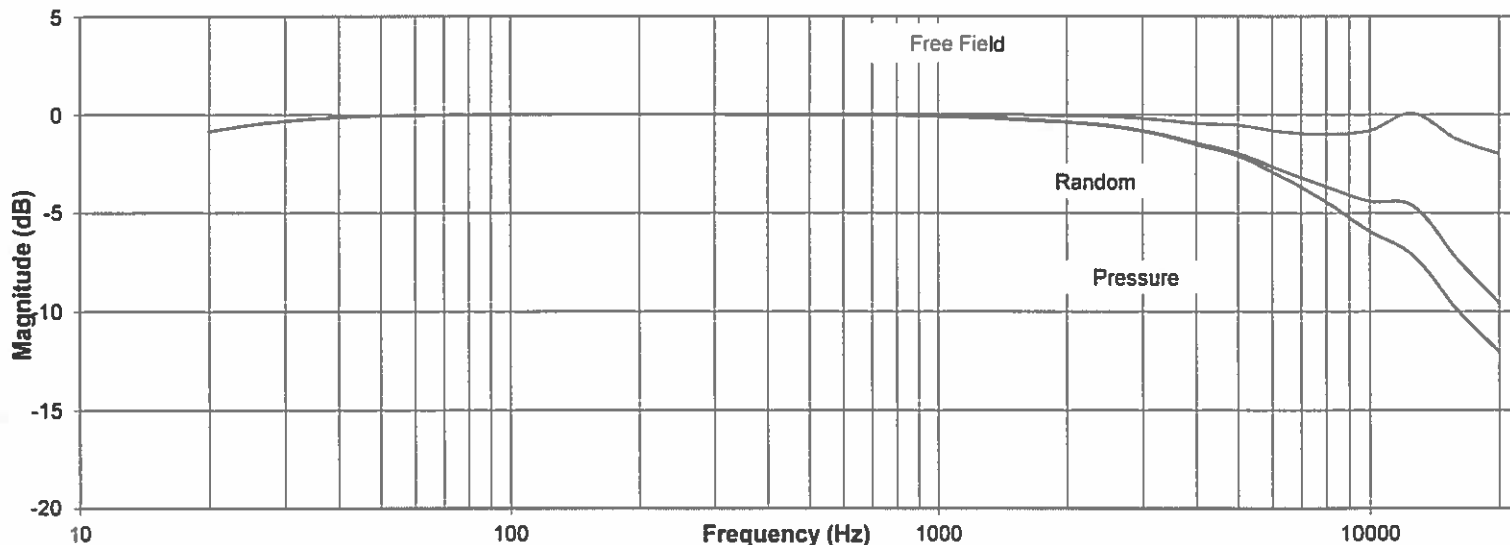
The above listed instrument meets or exceeds the tested manufacturer's specifications.  
 The IEC 651:1979 & 1993 Type 1 specification passed.

This Calibration is traceable through NIST test numbers: 683/284413-14

The expanded uncertainty of calibration: 0.079dB at 95% confidence level with a coverage factor of k=2.

The pressure response recorded with electroacoustic method.

Frequency Response



The above listed instrument was checked using calibration procedure documented in West Caldwell Calibration Laboratories Inc. procedure : Rev. 7.0 Jan. 24, 2014 Doc. # 1038 P4189A021B&K  
 Calibration was performed by West Caldwell Calibration Laboratories Inc. under Operating Procedures intended to implement the requirements of ISO10012-1, IEC Guide 25, ANSI/NCSL Z540-1, (MIL-STD-45662A) and ISO 9001:2008, ISO 17025

Calibrated on WCCL system type 9700

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Measurements performed by:  James Zhu

Rev. 7.0 Jan. 24, 2014 Doc. # 1038 P4189A021B&K

**West Caldwell Calibration Laboratories Inc.**

1575 State Route 96, Victor NY 14564  
 Tel. (585) 586-3900 FAX (585) 586-4327

*Calibration Data Record*

for  
 Model No.: 4189-A-021

Brüel & Kjær Microphone Unit  
 Company: Aercoustics Engineering LTD.

Serial No.: 2622169  
 I. D. No.: XXXX

Frequency Response ( Reference = 0 dB @ 250Hz )

Frequency [Hz]	Pressure [dB]	Free Field (dB)	Random (dB)
19.95	-0.85	-0.85	-0.85
25.12	-0.51	-0.51	-0.51
31.62	-0.28	-0.28	-0.28
39.81	-0.14	-0.14	-0.14
50.12	-0.06	-0.06	-0.06
63.10	-0.02	-0.02	-0.02
79.43	-0.01	-0.01	-0.01
100.00	0.00	0.00	0.00
125.89	0.00	0.00	0.00
158.49	0.00	0.00	0.00
199.53	0.01	0.01	0.01
251.19	0.00	0.00	0.00
316.23	0.00	0.00	0.00
398.11	-0.01	0.00	-0.01
501.19	-0.01	0.01	-0.01
630.96	-0.02	0.01	-0.02
794.33	-0.05	0.02	-0.05
1000.00	-0.09	0.01	-0.11
1258.93	-0.14	0.01	-0.17
1584.89	-0.23	-0.01	-0.29
1995.26	-0.39	-0.06	-0.39
2511.89	-0.59	-0.11	-0.55
3162.28	-0.94	-0.23	-0.91
3981.07	-1.51	-0.45	-1.42
5011.87	-2.11	-0.53	-1.97
6309.57	-3.15	-0.87	-2.83
7943.28	-4.38	-1.00	-3.63
10000.00	-5.92	-0.80	-4.39
12589.25	-7.13	0.07	-4.62
15848.93	-9.80	-1.21	-7.22
19952.62	-12.02	-1.97	-9.54

Freq. response: Expanded Uncertainty (dB) with coverage factor K = 2  
 20 to 63Hz 0.1dB, 63 to 12.5kHz 0.094dB, 12.5k to 16kHz 0.10dB, 16k to 20kHz 0.5dB.

Instruments used for calibration:	Date of Cal.	Traceability No.	Re-cal. Due Date
Brüel & Kjær 4226 S/N 1445428	3-Nov-2016	683/284413-14	3-Nov-2017
Brüel & Kjær 3560 S/N 2202374	3-Nov-2016	683/284413-14	3-Nov-2017
HP 33120A S/N 36043716	1-Oct-2016	,287708	1-Oct-2017
HP 34401A S/N 36064102	1-Oct-2016	,287708	1-Oct-2017

Cal. Date: 5-Sep-2017

Tested by: James Zhu

Calibrated on WCCL system type 9700

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Rev. 7.0 Jan. 24, 2014 Doc. # 1038 P4189A021B&K



**West Caldwell Calibration Laboratories Inc.**

# Certificate of Calibration

for

**ACOUSTICAL CALIBRATOR**

**Manufactured by:** BRUEL & KJAER  
**Model No:** 4231  
**Serial No:** 3012380  
**Calibration Recall No:** 28460

**Submitted By:**

**Customer:**  
**Company:** Aercoustics Engineering Ltd.  
**Address:**

The subject instrument was calibrated to the indicated specification using standards traceable to the National Institute of Standards and Technology or to accepted values of natural physical constants. This document certifies that the instrument met the following specification upon its return to the submitter.

West Caldwell Calibration Laboratories Procedure No. 4231 BRUE

Upon receipt for Calibration, the instrument was found to be:

Within ( X )

tolerance of the indicated specification. See attached Report of Calibration.  
The information supplied relates to the calibrated item listed above.

West Caldwell Calibration Laboratories' calibration control system meets the requirements, ISO 10012-1 MIL-STD-45662A, ANSI/NCSL Z540-1, IEC Guide 25, ISO 9001:2008 and ISO 17025.

Note: With this Certificate, Report of Calibration is included.

Approved by: 

**Calibration Date:** 30-Jan-18

Felix Christopher (QA Mgr.)

**Certificate No:** 28460 - 2

QA Doc. #1051 Rev. 2.0 10/1/01

Certificate Page 1 of 1

ISO/IEC 17025:2005

**West Caldwell Calibration Laboratories, Inc.**  
uncompromised calibration  
1575 State Route 96, Victor, NY 14564, U.S.A.



Calibration Lab. Cert. # 1533.01

**West Caldwell Calibration Laboratories, Inc.**  
 uncompromised calibration  
 1575 State Route 96, Victor NY 14564



# REPORT OF CALIBRATION

for

**Brüel & Kjær Acoustical Calibrator**  
**Company: Aercoustics Engineering Ltd.**

**Model No.: 4231**

**Serial No.: 3012380**  
**ID No.: XXXX**

**Calibration results:**

Before data: ..... After data: .....  
 Before & after data same: ...X...  
 Sound Pressure Level at 1000.0 Hz and pressure of 1013 hPa (mbar)  
 was 114.03 dB re 20 µPa

(Calibrator tested with 1/2" adaptor UC 0210)

IEC 1094-4 Type WS 2 P Microphone was used for measurement.

	114 dB	94 dB
Sound Pressure Level:	Pass	Pass
Frequency:	Pass	Pass
Distortion:	Pass	Pass
Stability:	Pass	Pass

**All tested parameters: Pass**

**Laboratory Environment:**

Ambient Temperature:	22.0	°C
Ambient Humidity:	30.9	% RH
Ambient Pressure:	99.768	kPa
Calibration Date:	30-Jan-2018	
Calibration Due:	30-Jan-2019	
Report Number:	28460 -2	
Control Number:	28460	

The above listed instrument meets or exceeds the tested manufacturer's specifications

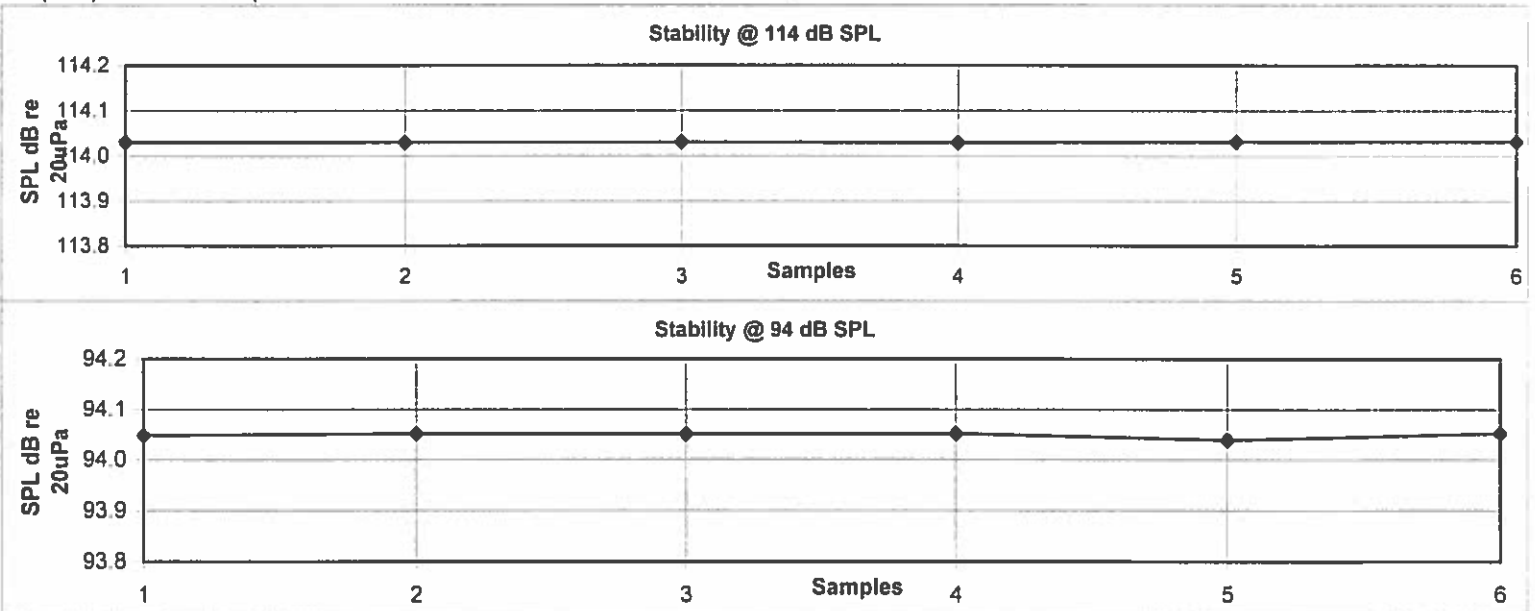
The IEC 942:1988 Class 1 specifications, passed.

The ANSI S1.4-1984 specifications, passed.

This Calibration is traceable through NIST test numbers: 822/275722-14

The expanded uncertainty of calibration: 0.11 dB at 95% confidence level with a coverage factor of k=2.

Graph represents six samples of Sound Pressure Level measured at 5 sec. interval.



The above listed instrument was checked using calibration procedure documented in West Caldwell

Calibration Laboratories Inc. procedure :

Rev. 7.0 Jan. 24, 2014 Doc. # 1038 4231B&K

Calibration was performed by West Caldwell Calibration Laboratories Inc. under Operating Procedures

intended to implement the requirements of ISO10012-1, IEC Guide 25, ANSI/NCSL Z540-1, (MIL-STD-45662A) and ISO 9001:2008, ISO 17025

Cal. Date: 30-Jan-2018

Measurements performed by: *James Zhu*

Calibrated on WCCL system type 9700

**James Zhu**

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Rev. 7.0 Jan. 24, 2014 Doc. # 1038 4231B&K



## West Caldwell Calibration Laboratories Inc.

1575 State Route 96, Victor NY 14564  
Tel. (585) 586-3900 FAX (585) 586-4327

*Calibration Data Record*

Brüel & Kjær Acoustical Calibrator  
Company: Aercoustics Engineering Ltd.

for  
Model No.: 4231

Serial No.: 3012380

All tested parameters: Pass

## Measured Sound Pressure Level ( Six samples measured at 5 sec. interval)

Sample	1	114.03 dB re 20 $\mu$ Pa	94.05 dB re 20 $\mu$ Pa	
	2	114.03	94.05	
	3	114.03	94.05	
	4	114.03	94.05	
	5	114.03	94.04	
	6	114.03	94.05	
	<b>Average</b>	<b>114.03</b> Spec. 114dB $\pm$ 0.2dB	<b>94.05</b>	Spec. 94 dB $\pm$ 0.2 dB

## Frequency measured (Three samples at 30 sec. Interval)

Sample	1	999.99 Hz	999.99 Hz	
	2	999.99	999.99	
	3	999.99	999.98	
	<b>Average</b>	<b>999.99</b>	<b>999.99</b>	Spec. 1000 Hz $\pm$ 0.1%

The Frequency expanded uncertainty of calibration: 45  $\mu$ Hz/Hz at 95% confidence level with a coverage factor of k=2.

Distortion measured	-56.2 dB	-54.9 dB	Spec. $\leq$ -40 dB
---------------------	----------	----------	---------------------

Instruments used for calibration:			Date of Cal.	Traceability No.	Re-cal. Due Date
Brüel & Kjær	4231	S/N 2308998	1-Aug-2017	822/275722-14	1-Aug-2018
Brüel & Kjær	4134	S/N 854464	1-Aug-2017	822/275722-14	1-Aug-2018
Brüel & Kjær	2669	S/N 2148476	1-Aug-2017	683/281764-14	1-Aug-2018
HP	34401A	S/N US360980	1-Aug-2017	,205342	1-Aug-2018
Brüel & Kjær	2636	S/N 1323964	1-Aug-2017	822/275722-14	1-Aug-2018
HP	33120A	S/N US360458	1-Aug-2017	,205342	1-Aug-2018

Cal. Date: 30-Jan-2018

Tested by: James Zhu

Calibrated on WCCL system type 9700

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Rev. 7.0 Jan. 24, 2014 Doc. # 1038 4231B&amp;K

Customer: AEROCOUSTICS ENGINEERING LTD  
1004 MIDDLEGATE ROAD  
SUITE 1100  
MISSISSAUGA, ON L4Y 1M4  
PO Number: TR2018.02.14



SCC Lab No 827



**Certificate/SO Number: 33-Q0W0C-20-1 Revision 0**

**Manufacturer:** Nokeval  
**Model Number:** 7470  
**Description:** Serial to Analog Converter  
**Serial Number:** A159784  
**ID:** NONE

**As-Found:** In Tolerance  
**As-Left:** In Tolerance

**Calibration Date:** Feb 20, 2018  
**Due Date:** Feb 20, 2020

**Calibrated To:** Manufacturer Specification  
**Calibration Procedure:** 1-AC58014-0

Transcat Calibration Laboratories have been audited and found in compliance with ISO/IEC 17025:2005. Accredited calibrations performed within the Lab's Scope of Accreditation are indicated by the presence of the Accrediting Body's Logo and Certificate Number. Any measurements on an accredited calibration not covered by that Lab's Scope of Accreditation are listed in the notes section of the certificate. SCC, NRC, CLAS or ANAB do not guarantee the accuracy of an individual calibration by accredited laboratories.

Transcat calibrations, as applicable, are performed in compliance with the requirements of the Transcat Quality Manual QAC-P01-000 Revision 1.0, the customer's Purchase Order and/or Quality Agreement requirements, ISO 9001:2008, ANSI/NCSL Z540.1-1994 (R2002). Complete records of work performed are maintained by Transcat and are available for inspection. Laboratory standards used in the performance of this calibration are listed below.

Transcat documents the traceability of measurements to the SI units through the National Institute of Standards and Technology (NIST), or the National Research Council of Canada (NRC), or other national measurement institutes (NMI) that are signatories to the CIPM Mutual Recognition Arrangement, or accepted fundamental and/or natural physical constants, or by the use of specified methods, consensus standards or ratio type measurements. Documentation supporting traceability information is available for review upon written request at a Transcat facility. The measured quantity and the measurement uncertainty are required for further dissemination of traceability.

Uncertainties are reported with a coverage factor  $k=2$ , providing a level of confidence of approximately 95%. All calibrations have been performed using processes having a TUR of 4:1 or better (3:1 for mass calibrations), unless otherwise noted. The Test Uncertainty Ratio (TUR) is calculated in accordance with NCSL International RP-18. For mass calibrations: Conventional mass referenced to 8.0 g/cm<sup>3</sup>.

The results in this report relate only to the item calibrated or tested. Recorded calibration data is valid at the time of calibration within the stated uncertainties at the environmental conditions noted. The determination of compliance to the specification is specific to the model/serial no./ID no. referenced above based on the tolerances shown; these tolerances are either the original equipment manufacturers (OEM's) warranted specifications or the client's requested specifications. This certificate may not be reproduced except in full, without the written approval of Transcat. Additional information, if applicable may be included on separate report(s).



Customer: AEROCOUSTICS ENGINEERING LTD  
 1004 MIDDLEGATE ROAD  
 SUITE 1100  
 MISSISSAUGA, ON L4Y 1M4  
 PO Number: TR2018.02.14



SCC Lab No 827

**Certificate/SO Number: 33-Q0W0C-20-1 Revision 0**

**As Found/As Left Data**

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	Cal Process		Units	TUR
						O Uncertainty (k=2; ±)	T Measurement Uncertainty (k=2; ±)		
<b>DC Current % Source - 0-20mA Ch #1</b>									
0 - 20mA	0%	±(0.1% Span)	-0.020	0.020	0.000 mA	9.2e-007	2.3e-003	mA	100.0 : 1
	25%	±(0.1% Span)	4.980	5.020	4.997 mA	1.9e-004	2.3e-003	mA	100.0 : 1
	50%	±(0.1% Span)	9.980	10.020	9.997 mA	3.2e-004	2.3e-003	mA	62.5 : 1
	75%	±(0.1% Span)	14.980	15.020	14.998 mA	1.2e-003	2.6e-003	mA	16.7 : 1
	100%	±(0.1% Span)	19.980	20.020	19.998 mA	1.4e-003	2.7e-003	mA	14.3 : 1
<b>DC Current % Source - 0-20mA Ch #2</b>									
0 - 20mA	0%	±(0.1% Span)	-0.020	0.020	0.002 mA	9.2e-007	2.3e-003	mA	100.0 : 1
	25%	±(0.1% Span)	4.980	5.020	4.996 mA	1.9e-004	2.3e-003	mA	100.0 : 1
	50%	±(0.1% Span)	9.980	10.020	10.000 mA	3.2e-004	2.3e-003	mA	62.5 : 1
	75%	±(0.1% Span)	14.980	15.020	15.000 mA	1.2e-003	2.6e-003	mA	16.7 : 1
	100%	±(0.1% Span)	19.980	20.020	19.999 mA	1.4e-003	2.7e-003	mA	14.3 : 1
<b>DC Current % Source - 0-20mA Ch #3</b>									
0 - 20mA	0%	±(0.1% Span)	-0.020	0.020	0.001 mA	9.2e-007	2.3e-003	mA	100.0 : 1
	25%	±(0.1% Span)	4.980	5.020	4.996 mA	1.9e-004	2.3e-003	mA	100.0 : 1
	50%	±(0.1% Span)	9.980	10.020	9.996 mA	3.2e-004	2.3e-003	mA	62.5 : 1
	75%	±(0.1% Span)	14.980	15.020	14.996 mA	1.2e-003	2.6e-003	mA	16.7 : 1
	100%	±(0.1% Span)	19.980	20.020	20.001 mA	1.4e-003	2.7e-003	mA	14.3 : 1
<b>DC Current % Source - 0-20mA Ch #4</b>									
0 - 20mA	0%	±(0.1% Span)	-0.020	0.020	0.001 mA	9.2e-007	2.3e-003	mA	100.0 : 1
	25%	±(0.1% Span)	4.980	5.020	4.992 mA	1.9e-004	2.3e-003	mA	100.0 : 1
	50%	±(0.1% Span)	9.980	10.020	9.997 mA	3.2e-004	2.3e-003	mA	62.5 : 1
	75%	±(0.1% Span)	14.980	15.020	14.996 mA	1.2e-003	2.6e-003	mA	16.7 : 1
	100%	±(0.1% Span)	19.980	20.020	20.001 mA	1.4e-003	2.7e-003	mA	14.3 : 1

Customer: AEROCOUSTICS ENGINEERING LTD  
 1004 MIDDLEGATE ROAD  
 SUITE 1100  
 MISSISSAUGA, ON L4Y 1M4  
 PO Number: TR2018.02.14



SCC Lab No 827

**Certificate/SO Number: 33-Q0W0C-20-1 Revision 0**

**As Found/As Left Data**

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	Cal Process		Measurement Uncertainty (k=2; ±)	Units	TUR
						O	T			
<b>DC Voltage % Source - 0-5V Ch#1</b>										
0 -5V	0%	±(0.1% Span)	-0.0050	0.0050	0.0009 V	5.0e-007		5.8e-004	V	100.0 : 1
	20%	±(0.1% Span)	0.9950	1.0050	1.0010 V	5.5e-006		5.8e-004	V	100.0 : 1
	40%	±(0.1% Span)	1.9950	2.0050	2.0001 V	1.1e-005		5.8e-004	V	100.0 : 1
	60%	±(0.1% Span)	2.9950	3.0050	2.9984 V	1.6e-005		5.8e-004	V	100.0 : 1
	80%	±(0.1% Span)	3.9950	4.0050	4.0001 V	2.1e-005		5.8e-004	V	100.0 : 1
	100%	±(0.1% Span)	4.9950	5.0050	4.9988 V	2.6e-005		5.8e-004	V	100.0 : 1
<b>DC Voltage % Source - 0-5V Ch#2</b>										
0 -5V	0%	±(0.1% Span)	-0.0050	0.0050	0.0002 V	5.0e-007		5.8e-004	V	100.0 : 1
	20%	±(0.1% Span)	0.9950	1.0050	1.0000 V	5.5e-006		5.8e-004	V	100.0 : 1
	40%	±(0.1% Span)	1.9950	2.0050	2.0010 V	1.1e-005		5.8e-004	V	100.0 : 1
	60%	±(0.1% Span)	2.9950	3.0050	2.9990 V	1.6e-005		5.8e-004	V	100.0 : 1
	80%	±(0.1% Span)	3.9950	4.0050	3.9980 V	2.1e-005		5.8e-004	V	100.0 : 1
	100%	±(0.1% Span)	4.9950	5.0050	5.0000 V	2.6e-005		5.8e-004	V	100.0 : 1
<b>DC Voltage % Source - 0-5V Ch#3</b>										
0 -5V	0%	±(0.1% Span)	-0.0050	0.0050	0.0001 V	5.0e-007		5.8e-004	V	100.0 : 1
	20%	±(0.1% Span)	0.9950	1.0050	0.9995 V	5.5e-006		5.8e-004	V	100.0 : 1
	40%	±(0.1% Span)	1.9950	2.0050	1.9991 V	1.1e-005		5.8e-004	V	100.0 : 1
	60%	±(0.1% Span)	2.9950	3.0050	2.9982 V	1.6e-005		5.8e-004	V	100.0 : 1
	80%	±(0.1% Span)	3.9950	4.0050	4.0008 V	2.1e-005		5.8e-004	V	100.0 : 1
	100%	±(0.1% Span)	4.9950	5.0050	5.0015 V	2.6e-005		5.8e-004	V	100.0 : 1

Customer: AEROCOUSTICS ENGINEERING LTD  
 1004 MIDDLEGATE ROAD  
 SUITE 1100  
 MISSISSAUGA, ON L4Y 1M4  
 PO Number: TR2018.02.14



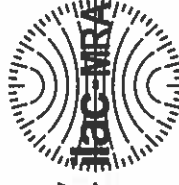
SCC Lab No 827

**Certificate/SO Number: 33-Q0W0C-20-1 Revision 0**

**As Found/As Left Data**

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	Cal Process		Units	TUR
						O Uncertainty (k=2; ±)	T Measurement Uncertainty (k=2; ±)		
<b>DC Voltage % Source - 0-5V Ch#4</b>									
0 - 5V	0%	±(0.1% Span)	-0.0050	0.0050	0.0001 V	5.0e-007	5.8e-004	V	100.0 : 1
	20%	±(0.1% Span)	0.9950	1.0050	1.0006 V	5.5e-006	5.8e-004	V	100.0 : 1
	40%	±(0.1% Span)	1.9950	2.0050	1.9991 V	1.1e-005	5.8e-004	V	100.0 : 1
	60%	±(0.1% Span)	2.9950	3.0050	2.9999 V	1.6e-005	5.8e-004	V	100.0 : 1
	80%	±(0.1% Span)	3.9950	4.0050	3.9984 V	2.1e-005	5.8e-004	V	100.0 : 1
	100%	±(0.1% Span)	4.9950	5.0050	4.9996 V	2.6e-005	5.8e-004	V	100.0 : 1
<b>DC Voltage % Source - 0-10V Ch#1</b>									
0 - 10V	0%	±(0.1% Span)	-0.010	0.010	0.001 V	5.0e-007	1.2e-003	V	100.0 : 1
	20%	±(0.1% Span)	1.990	2.010	2.000 V	1.1e-005	1.2e-003	V	100.0 : 1
	40%	±(0.1% Span)	3.990	4.010	4.000 V	2.1e-005	1.2e-003	V	100.0 : 1
	60%	±(0.1% Span)	5.990	6.010	6.000 V	3.1e-005	1.2e-003	V	100.0 : 1
	80%	±(0.1% Span)	7.990	8.010	7.997 V	4.1e-005	1.2e-003	V	100.0 : 1
	100%	±(0.1% Span)	9.990	10.010	9.997 V	5.2e-005	1.2e-003	V	100.0 : 1
<b>DC Voltage % Source - 0-10V Ch#2</b>									
0 - 10V	0%	±(0.1% Span)	-0.010	0.010	0.002 V	5.0e-007	1.2e-003	V	100.0 : 1
	20%	±(0.1% Span)	1.990	2.010	2.001 V	1.1e-005	1.2e-003	V	100.0 : 1
	40%	±(0.1% Span)	3.990	4.010	3.998 V	2.1e-005	1.2e-003	V	100.0 : 1
	60%	±(0.1% Span)	5.990	6.010	5.998 V	3.1e-005	1.2e-003	V	100.0 : 1
	80%	±(0.1% Span)	7.990	8.010	7.998 V	4.1e-005	1.2e-003	V	100.0 : 1
	100%	±(0.1% Span)	9.990	10.010	9.997 V	5.2e-005	1.2e-003	V	100.0 : 1

Customer: AEROCOUSTICS ENGINEERING LTD  
 1004 MIDDLEGATE ROAD  
 SUITE 1100  
 MISSISSAUGA, ON L4Y 1M4  
 PO Number: TR2018.02.14



SCC Lab No 827

**Certificate/SO Number: 33-Q0W0C-20-1 Revision 0**

**As Found/As Left Data**

Description	Setpoints	Accuracy	Low Limit	High Limit	As Found / As Left	Cal Process		Units	TUR
						O Uncertainty (k=2; ±)	T Measurement Uncertainty (k=2; ±)		
<b>DC Voltage % Source - 0-10V Ch#3</b>									
0 - 10V	0%	±(0.1% Span)	-0.010	0.010	0.000 V	5.0e-007	1.2e-003	V	100.0 : 1
	20%	±(0.1% Span)	1.990	2.010	1.999 V	1.1e-005	1.2e-003	V	100.0 : 1
	40%	±(0.1% Span)	3.990	4.010	4.001 V	2.1e-005	1.2e-003	V	100.0 : 1
	60%	±(0.1% Span)	5.990	6.010	6.000 V	3.1e-005	1.2e-003	V	100.0 : 1
	80%	±(0.1% Span)	7.990	8.010	7.999 V	4.1e-005	1.2e-003	V	100.0 : 1
	100%	±(0.1% Span)	9.990	10.010	9.998 V	5.2e-005	1.2e-003	V	100.0 : 1
<b>DC Voltage % Source - 0-10V Ch#4</b>									
0 - 10V	0%	±(0.1% Span)	-0.010	0.010	0.001 V	5.0e-007	1.2e-003	V	100.0 : 1
	20%	±(0.1% Span)	1.990	2.010	1.999 V	1.1e-005	1.2e-003	V	100.0 : 1
	40%	±(0.1% Span)	3.990	4.010	3.998 V	2.1e-005	1.2e-003	V	100.0 : 1
	60%	±(0.1% Span)	5.990	6.010	6.000 V	3.1e-005	1.2e-003	V	100.0 : 1
	80%	±(0.1% Span)	7.990	8.010	8.000 V	4.1e-005	1.2e-003	V	100.0 : 1
	100%	±(0.1% Span)	9.990	10.010	9.998 V	5.2e-005	1.2e-003	V	100.0 : 1

Customer: AEROCOUSTICS ENGINEERING LTD  
 1004 MIDDLEGATE ROAD  
 SUITE 1100  
 MISSISSAUGA, ON L4Y 1M4  
 PO Number: TR2018.02.14



SCC Lab No 827



## Certificate/SO Number: 33-Q0W0C-20-1 Revision 0

### Traceable Standards

Asset	Manufacturer	Model Number	Description	Cal Date	Due Date	Traceability Number	Use
N0150	Fluke Corporation	5700A	Calibrator	23-Jun-17	31-May-18	5-&N0150-14-1	AF
N0436	Agilent Technologies	3458A Opt 002	Digital Multimeter, 8.5 Digit	19-Apr-17	30-Apr-18	5-&N0436-14-1	AF/AL

The use of the standard is defined as: AF - used for as-found readings, AL - used for as-left readings.

### Environmental Data

Temperature	Temp / RH Asset
71.35°F / 21.86°C	N0457

**Calibrated At:**  
 4043 Carling Avenue  
 Ottawa, ON K2K 2A4

**Facility Responsible:**  
 4043 Carling Avenue  
 Ottawa, ON K2K 2A4  
 800-828-1470

**Unit Barcode:**  
 901B0150195

**Calibrated By:**  
 Mark King  
 Calibration Technician

Feb 20, 2018  
 15:08:17 -05:00

**Reviewed By:**  
 Francis Kane  
 Lab Manager

Feb 20, 2018  
 15:24:41 -05:00

**Date Received:** February 15, 2018  
**Service Level:** R9

**Certificate - Page 7 of 7**

**Customer Number:** 9-322110-000  
 OPS-F20-014R1 01/23/2017 FP001R1 10/12/2017





# SOH Wind Engineering LLC

141 Leroy Road · Williston, VT 05495 · USA

Tel 802.316.4368 · Fax 802.735.9106 · www.sohwind.com

## CERTIFICATE FOR CALIBRATION OF SONIC ANEMOMETER

Certificate number: 17.US1.10370

Date of issue: November 16, 2017

Type: Vaisala Weather Transmitter, WXT520

Serial number: G4420002

Manufacturer: Vaisala, Oyj, PL 26, FIN-00421 Helsinki, Finland

Client: Aercoustics Engineering Ltd., 1004 Middlegate RD, Suite 1100, S.Tower, Mississauga, ON L4Y 1M4, Canada

Anemometer received: November 15, 2017

Anemometer calibrated: November 15, 2017

Calibrated by: MEJ

Procedure: MEASNET, IEC 61400-12-1:2017 Annex F

Certificate prepared by: EJJ

Approved by: Calibration engineer, EJJ

Calibration equation obtained:  $v \text{ [m/s]} = 1.00118 \cdot f \text{ [m/s]} + 0.06286$

Standard uncertainty, slope: 0.00077

Standard uncertainty, offset: 0.13048

Covariance: -0.0000059 (m/s)<sup>2</sup>/m/s

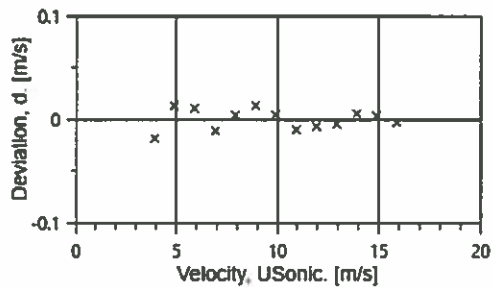
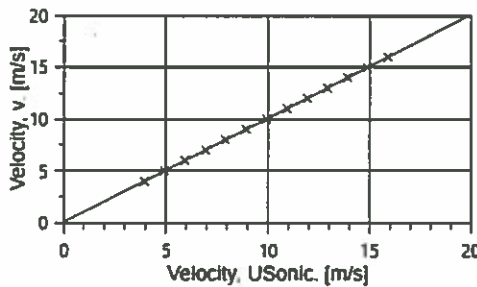
Coefficient of correlation:  $\rho = 0.999997$

Absolute maximum deviation: -0.019 m/s at 3.969 m/s

Barometric pressure: 1011.5 hPa

Relative humidity: 21.9%

Succession	Velocity pressure, q, [Pa]	Temperature in wind tunnel [°C]	Temperature in d.p. box [°C]	Wind velocity, v, [m/s]	Anemometer Output, f, [m/s]	Deviation, d, [m/s]	Uncertainty $u_c \text{ (k=2)}$ [m/s]
2	9.39	22.0	26.0	3.969	3.9200	-0.019	0.024
4	14.85	22.0	26.0	4.992	4.9103	0.013	0.025
6	21.38	22.0	26.0	5.990	5.9100	0.011	0.027
8	29.13	22.1	26.0	6.993	6.9333	-0.011	0.029
10	38.09	22.1	26.0	7.996	7.9200	0.004	0.032
12	48.35	22.1	26.0	9.010	8.9233	0.013	0.035
13-last	59.50	22.1	26.0	9.996	9.9172	0.004	0.038
11	72.14	22.0	26.0	11.006	10.9400	-0.010	0.041
9	85.76	22.0	26.0	12.000	11.9300	-0.007	0.044
7	100.55	22.0	26.0	12.993	12.9200	-0.005	0.047
5	116.73	22.0	26.0	14.000	13.9150	0.006	0.050
3	133.56	22.0	26.0	14.974	14.8900	0.004	0.053
1-first	152.12	21.9	26.0	15.979	15.9000	-0.003	0.057



AC-1746



## EQUIPMENT USED

Serial Number	Description
Njord1	Wind tunnel, blockage factor = 1.0035
2254	Control cup anemometer
-	Mounting tube, D = 19 mm
TT003	Summit Electronics, 1XPT100, 0-10V Output, wind tunnel temp.
TP001	PR Electronics 5102, 0-10V Output, differential pressure box temp.
DP004	Setra Model 239, 0-1 inWC, differential pressure transducer
HY002	Dwyer RHP-2D20, 0-10V Output, humidity transmitter
BP001	Setra Model 278, barometer
PL8	Pitot tube
XB002	Computer Board. 16 bit A/D data acquisition board
9PRZRW1	PC dedicated to data acquisition

Traceable calibrations of the equipment are carried out by external accredited institutions: Atlantic Scale, Essco Calibration Labs & Furness Controls. A real-time analysis module within the data acquisition software detects pulse frequency.



*Photo of the wind tunnel setup. The cross-sectional area is 2.5m x 2.5m.*

## UNCERTAINTIES

The documented uncertainty is the total combined uncertainty at 95% confidence level ( $k=2$ ) in accordance with EA-4/02. The uncertainty at 10 m/s comply with the requirements in the IEC 61400-12-1:2005 procedure. See Document US.12.01.004 for further details.

## COMMENTS

This sensor was calibrated at 0° for this certificate.

**Certificate number: 17.US1.10370**

All calibrations are done in the "As Left" condition unless otherwise noted.

This certificate must not be reproduced, except in full, without the approval of SOH Wind Engineering LLC



# SOH Wind Engineering LLC

141 Leroy Road · Williston, VT 05495 · USA  
Tel 802.316.4368 · Fax 802.735.9106 · www.sohwind.com

## CERTIFICATE FOR CALIBRATION OF SONIC ANEMOMETER

**Certificate number:** 17.US1.10369      **Date of issue:** November 16, 2017  
**Type:** Vaisala Weather Transmitter, WXT520      **Serial number:** G4420002  
**Manufacturer:** Vaisala, Oyj, PL 26, FIN-00421 Helsinki, Finland  
**Client:** Aercoustics Engineering Ltd., 1004 Middlegate RD, Suite 1100, S.Tower, Mississauga, ON L4Y 1M4, Canada

**Anemometer received:** November 15, 2017      **Anemometer calibrated:** November 15, 2017  
**Calibrated by:** MEJ      **Procedure:** MEASNET, IEC 61400-12-1:2017 Annex F  
**Certificate prepared by:** EJF      **Approved by:** Calibration engineer, EJF

**Calibration equation obtained:**  $v [m/s] = 1.02399 \cdot f [m/s] + 0.09265$

**Standard uncertainty, slope:** 0.00156

**Standard uncertainty, offset:** 0.17838

**Covariance:** -0.0000247 (m/s)<sup>2</sup>/m/s

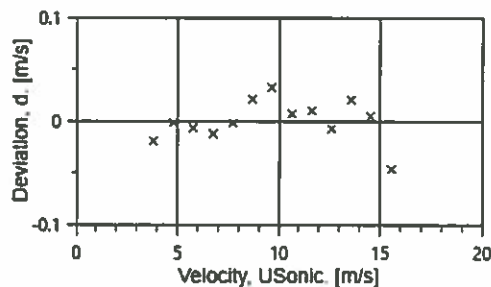
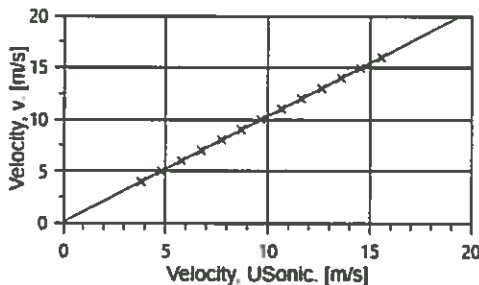
**Coefficient of correlation:**  $\rho = 0.999987$

**Absolute maximum deviation:** -0.046 m/s at 15.979 m/s

**Barometric pressure:** 1011.1 hPa

**Relative humidity:** 22.0%

Succession	Velocity pressure, q, [Pa]	Temperature in wind tunnel [°C]	Temperature in d.p. box [°C]	Wind velocity, v, [m/s]	Anemometer Output, f, [m/s]	Deviation, d, [m/s]	Uncertainty $u_c (k=2)$ [m/s]
2	9.41	22.0	26.0	3.975	3.8100	-0.019	0.024
4	14.86	22.0	26.0	4.996	4.7897	-0.002	0.025
6	21.40	22.1	26.0	5.994	5.7700	-0.007	0.027
8	29.14	22.1	26.0	6.996	6.7533	-0.012	0.029
10	38.16	22.1	26.0	8.006	7.7300	-0.002	0.032
12	48.35	22.1	26.0	9.012	8.6900	0.021	0.035
13-last	59.54	22.1	26.0	10.001	9.6448	0.032	0.038
11	72.13	22.1	26.0	11.009	10.6533	0.007	0.041
9	85.87	22.1	26.0	12.012	11.6300	0.010	0.044
7	100.56	22.1	26.0	12.998	12.6100	-0.008	0.047
5	116.94	22.0	26.0	14.015	13.5767	0.020	0.050
3	133.53	22.0	26.0	14.976	14.5300	0.005	0.053
1-first	152.03	22.0	26.0	15.979	15.5600	-0.046	0.057



AC-1746



## EQUIPMENT USED

Serial Number	Description
Njord1	Wind tunnel, blockage factor = 1.0035
2254	Control cup anemometer
-	Mounting tube, D = 19 mm
TT003	Summit Electronics, 1XPT100, 0-10V Output, wind tunnel temp.
TP001	PR Electronics 5102, 0-10V Output, differential pressure box temp.
DP004	Setra Model 239, 0-1inWC, differential pressure transducer
HY002	Dwyer RHP-2D20, 0-10V Output, humidity transmitter
BP001	Setra Model 278, barometer
PL8	Pitot tube
XB002	Computer Board. 16 bit A/D data acquisition board
9PRZRW1	PC dedicated to data acquisition

Traceable calibrations of the equipment are carried out by external accredited institutions: Atlantic Scale, Essco Calibration Labs & Furness Controls. A real-time analysis module within the data acquisition software detects pulse frequency.



*Photo of the wind tunnel setup. The cross-sectional area is 2.5m x 2.5m.*

## UNCERTAINTIES

The documented uncertainty is the total combined uncertainty at 95% confidence level ( $k=2$ ) in accordance with EA-4/02. The uncertainty at 10 m/s comply with the requirements in the IEC 61400-12-1:2005 procedure. See Document US.12.01.004 for further details.

## COMMENTS

This sensor was calibrated at 90° for this certificate.

**Certificate number:** 17.US1.10369

All calibrations are done in the "As Left" condition unless otherwise noted.

This certificate must not be reproduced, except in full, without the approval of SOH Wind Engineering LLC

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## Appendix F.02 E-Audit Checklist

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**Appendix G - (2017 Compliance Protocol AF5): E-Audit checklist**

**Wind Energy Project – Screening Document – Acoustic Audit Report – Emission IEC61400-11 Standard**  
 Information Required in the Acoustic Audit Report – Immission

Item #	Description	Complete?	Comment
1	Characterization of the wind turbine Items 1 to 26; IEC61400-11:2013, Section 10.2	✓	
2	Physical environment Items 27 to 33; IEC61400-11:2013, Section 10.3, Physical Environment	✓	
3	Measurement instrumentation Items 34 to 39; IEC61400-11:2013, Section 10.4, Instrumentation	✓	
4	Acoustic data Items 40 to 52; IEC61400-11:2013, Section 10.5, Acoustic Data	✓	
5	Non-acoustic data Items 50 to 53, and 56; IEC61400-11:2003 Section 10.6, Non-Acoustic Data Items 59 and 60; NPC-233, Section 12.3, Acoustic Audit – Acoustical Data, bullet point number 8, All necessary and supporting calculations	✓	
6	Uncertainty the apparent sound power level at integer wind speeds one-third octave band spectrum of the noise at the reference position at each integer wind speed the Tonality of the sound emissions of the wind turbine measured at the reference position	✓	
7	Additional information Item 60; NPC-233, Section 10, Report Format, bullet point number 4, Conclusions and Recommendations Item 61; NPC-233, Section 12.3, Acoustic Audit – Acoustical Data, bullet point number 8, All necessary and supporting calculations Item 62; NPC-233, Section 12.3, Acoustic Audit – Acoustical Data, bullet point number 3, Details of measurement procedure	✓	All data Excel sheet to be provided separately
8	Items 68 to 72; IEC61400-11:2013, Section 10.5, Acoustic Data	⊗	Items 68 to 72 acoustic data as per IEC 61400-11 standard are optional; low frequency noise, infrasound, impulsivity, amplitude modulation not reported
9	Non-acoustic data Items 73 to 74 are from IEC61400-11:2013, Section 10.6, Non-Acoustic Data	⊗	Items 73 to 74 non-acoustic data as per IEC 64100-11 standard are optional; turbulence intensity during acoustic meeasurements not reported

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## Appendix F.03

# Summary of Measurement Results

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## Summary of Measurement Results

### 1.1 Overall Sound Power Levels

From Table 12 of IEC test report 14431.00.T22.RP4:

Table 1 Overall A-weighted Sound Power Levels compared to REA Maximum Sound Power Level

Wind Speed (m/s)	Apparent $L_{WA}$ , (dBA)	Maximum Sound Power Level (dBA)* REA # 2494-94QQ97
7	99.7	103.5
7.5	101.0	103.5
8	101.6	103.5
8.5	101.7	103.5
9	102.0	103.5
9.5	102.0	103.5
10	102.0	103.5
10.5	102.0	103.5
11	102.0	103.5

\*Includes +0.5 dB, per Section E3.1 of the MECPP Compliance Protocol for Wind Turbine Noise

### 1.2 Octave Band Sound Power Levels

Table 2 Sound Power Levels (overall A-weighted levels and octave bands for each wind speed)

Wind Speed (m/s)	Octave Band (Hz), dBA								
	31.5	63	125	250	500	1000	2000	4000	8000
7	74.8	85.4	89.2	91.0	92.0	94.7	92.6	85.0	82.0
7.5	77.0	86.0	90.6	92.0	93.0	96.5	93.9	86.3	81.3
8	77.0	86.3	90.8	92.5	93.5	97.1	94.9	87.1	81.5
8.5	77.0	86.5	91.3	92.8	93.7	96.9	95.2	86.9	80.8
9	76.4	85.6	90.9	92.6	94.3	96.9	95.0	87.6	82.7
9.5	76.7	85.3	90.9	92.4	95.2	97.1	95.1	87.4	83.5
10	76.7	85.3	90.7	92.3	95.3	97.1	95.1	87.4	83.6
10.5	77.0	84.9	90.6	92.3	95.4	97.0	95.2	87.9	84.0
11	75.9	84.5	90.4	92.1	95.4	97.2	95.0	87.6	84.5

Table 3: [Table B2] Maximum Sound Power Level Spectrum (dBA) of the 1.62 MW Wind Turbine Generators

1-48	Octave Band (Hz), dBA								
	31.5	63	125	250	500	1000	2000	4000	8000
Sound Power Level	-	84	91.7	95.5	97.0	97.8	95.1	87.9	69.1



### 1.3 Tonal Audibility Values

From Table 14 of IEC test report 14331.00.T22.RP4:

Wind Speed (m/s)	Frequency (Hz)	Tonal audibility, $\Delta L_a$ (dB)	Tonal Audibility from AAR* (dB)
7	572	-1.6	0.8
7	1168	-2.9	0.1
7.5	591	-5.4	-3.0
7.5	1187	-0.2	2.8
8	620	-4.0	-1.6
8	1200	0.2	3.2
8	1239	-0.7	2.3
8.5	621	-2.6	-0.2
8.5	1229	-0.4	2.6
8.5	1796	-5.2	-1.8
9	618	-2.0	0.4
9	1243	-2.3	0.7
9.5	633	2.0	4.5
9.5	1280	-2.4	0.7
9.5	1809	-6.3	-2.8
10	635	2.3	4.8
10	1206	-2.5	0.5
10	1256	-2.8	0.3
10.5	633	2.1	4.6
10.5	1271	-2.6	0.4
11	633	2.4	4.8
11	1274	-1.5	1.5

\*Garrad Hassan – Noise Impact Assessment Report (April 15, 2018)

### 1.4 Statement of Compliance

Based on the results in Table 12 of the IEC 61400-11 test report to which this statement is attached, the maximum apparent overall sound power level of the test turbine complies with the overall sound power level in REA # 2494-94QQ97 and Section E3.1 of the MECP Compliance Protocol for Wind Turbine Noise.

The measured apparent octave band sound power levels do not satisfy the REA maximum permitted octave band sound power levels noted in Schedule B2 Table B2 in REA # 2494-94QQ97. However, it should be noted that the maximum apparent overall sound power level of the test turbine does satisfy the REA Maximum sound power level.

Based on the results in Table 14 of the IEC 61400-11 to which this statement is attached, the maximum tonal audibility of the test turbine exceeds the maximum tonal audibility of 2 dB as indicated in the statement from the manufacturer in Appendix E of the Acoustic Assessment Report dated March 19, 2013.

Due to the exceedance noted above the Protocol requires additional actions as detailed in Section E3.1.1 or E3.1.2 to demonstrate compliance.

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**End of Report**

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