

Small Wind Acoustic Testing



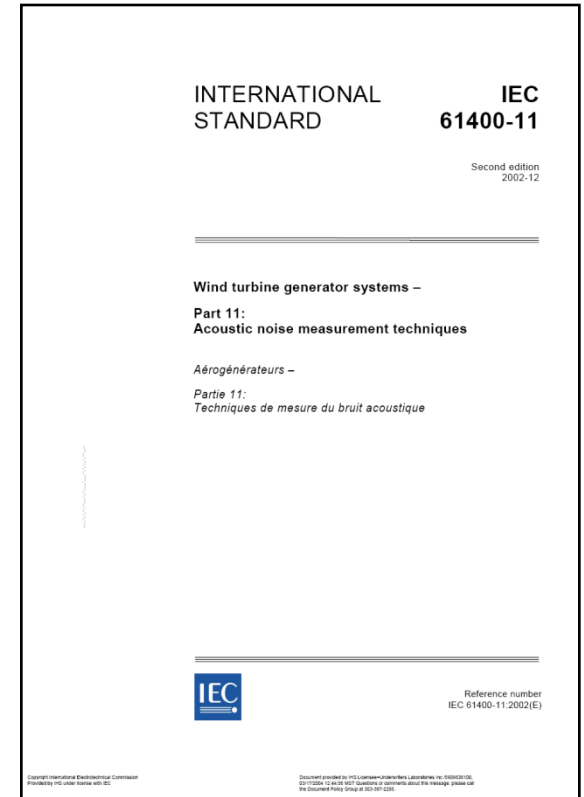
NREL / NWTC

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Relevant Documents

- IEC 61400-11 2002-12 Wind Turbine Generator Systems – Part 11: Acoustic Noise Measurement Techniques 2nd Edition
- AWEA Small Wind Turbine Performance and Safety Standard (Draft)



Instrumentation

Acoustic instrumentation

- Microphone and Preamplifier
- Acoustical calibrator
- Sound board
- Windscreen
- Recorder or data acquisition system

Other Instrumentation

- Power transducer
- Anemometer
- Wind vane
- Barometer
- Temperature sensor
- Rotor speed (optional)
- Datalogger or data acquisition system

Measurements

IEC 61400-11 Standard

1 minute averages

- A-weighted sound pressure level
- A-weighted one-third octave levels
- Power
- Wind speed
- Wind direction
- Rotor speed (optional)

10-second

- Narrowband spectra

At least every 2 hours

- Pressure
- temperature

Changes for small wind turbines

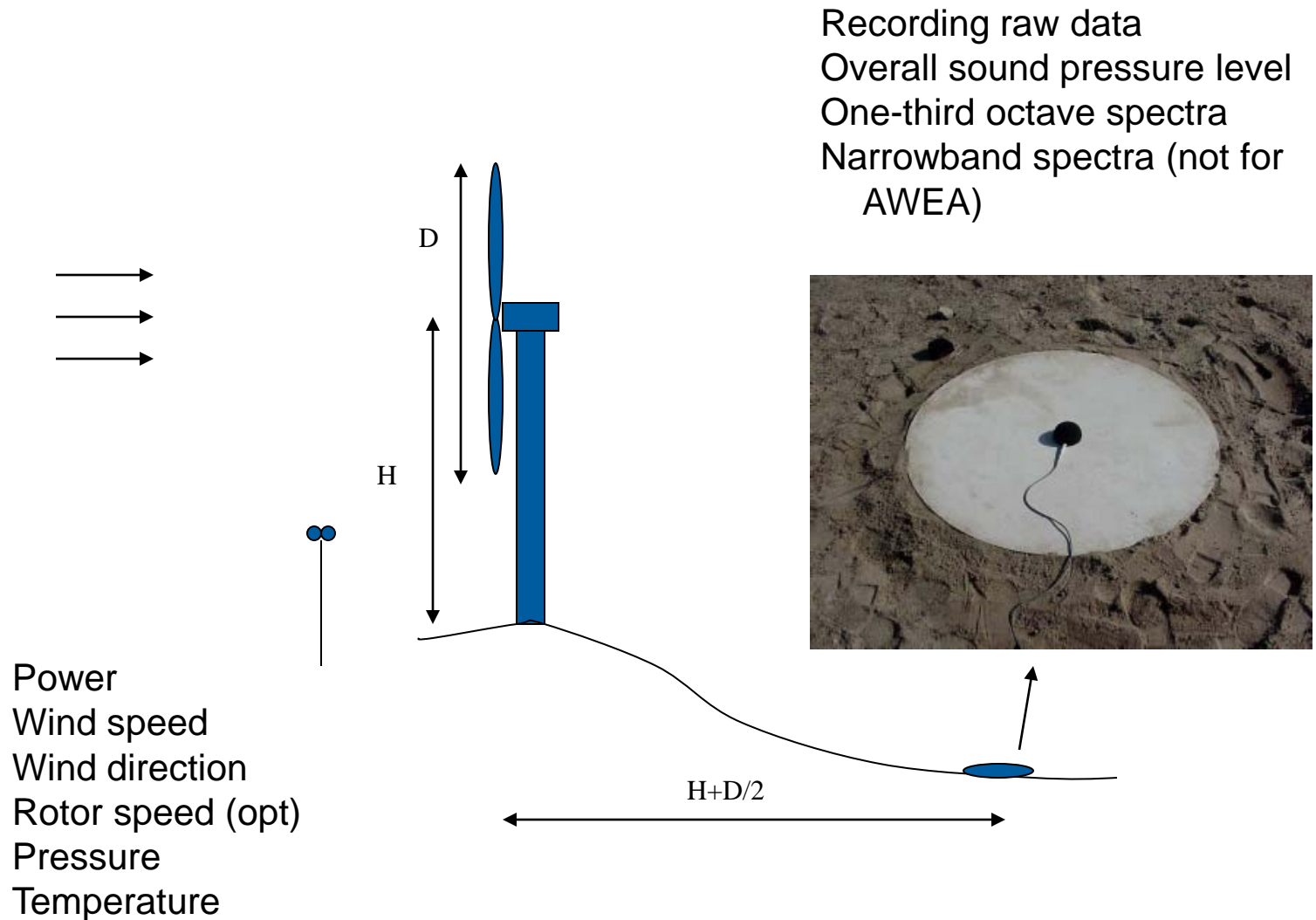
10-second

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Test method



AWEA Standard Changes to IEC

10-second averages for sound pressure levels and octave spectra

Measure wind speed instead of deriving

Binning data instead of regression

Cover as wide a wind speed range within limits of the secondary wind screen

Description of sound during overspeed protection

Tonality analysis not required but any observed tones reported

AWEA Standard – AWEA Rated Sound Level

The sound level that will not be exceeded 95% of the time, assuming an average wind speed of 5 m/s, a Rayleigh wind speed distribution, 100% availability, and an observer location 60 meters from the rotor center.

Interpretation: The sound pressure level for 9.8 m/s at a distance of 60 m

Reporting

Reported for integer wind speed bins from 6 to 10 m/s

- A-weighted sound power level
- One-third octave spectra
- Tonality (not numerically for AWEA, only observations)
- AWEA Rated Sound Level (AWEA only)

IEC Third Edition – SWT Annex

- 10-second averages
- Wider range around the microphone position
- Measured wind speed at rotor center
- Wind speed range from cut-in to 11 m/s as a minimum, should cover up to cut-out wind speed if possible particularly for turbines that have speed control mechanisms
- Binned, 1 m/s wide bins
- Tonality by ISO 1996-2:2007, based on one-third octave spectra
- Immission map

Questions about methods???

(the training session will cover more details
of how to do)