

# Sound Testing of Skystream

Southwest Windpower  
Testing conducted at:

USDA - Agricultural Research Service  
Bushland, TX

# Overview of Installation

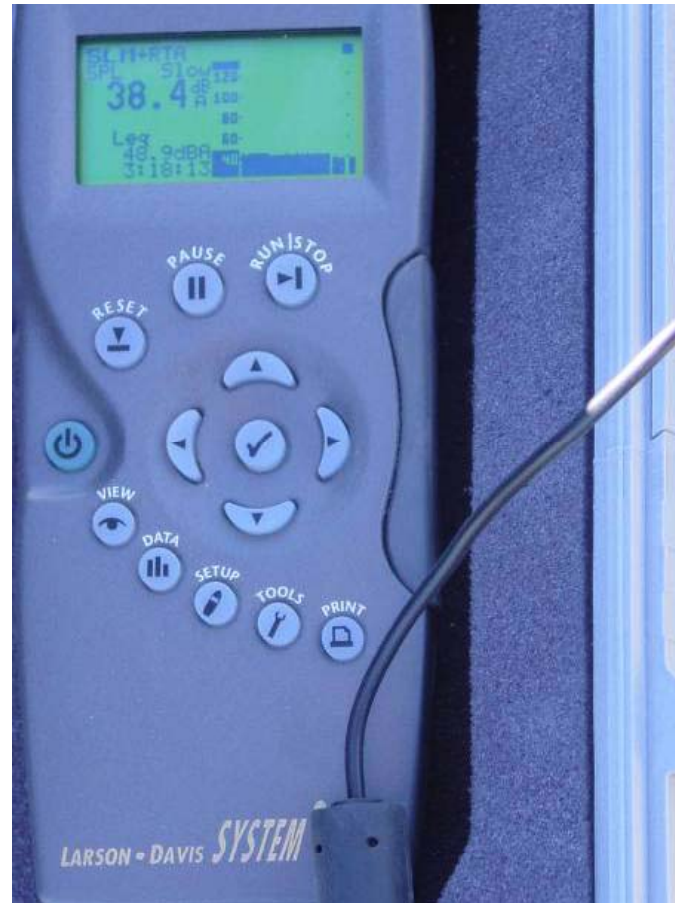
- The following presentation is a measurement and analysis of the acoustical noise from the Skystream 3.7m wind turbine connected to a 230 Volt single phase utility line . Data from the turbine and background noise was measured separately. Skystream was installed on a conventional 33' (10 meter) monopole tower which represents a worst case scenario for sound output.
- The IEC 61400-11 noise standard specifies that data is needed from 4 to 10 m/s with primary wind screen, secondary wind screen is used for higher winds.
  - The amount of data collected is 30 samples in each wind bin.
  - The standard recommends samples should be at least one minute however the actual data collected was 10 second samples which are considered to be more accurate.
  - The average noise at 4 m/s for the Skystream is less than the background noise. This is due to large standard deviation of about 5 dB.
- The equipment used was recommended for sound measurement testing in the IEC specification
- No special modifications were made to the turbine or tower. In standard field installations, towers are routinely modified with insulation to further dampen sound output.

# Equipment used and Location to Test Skystream

- Type 1 Sound Level Meter (SLM)
- Acoustical calibrator (IEC 60942 class 1)
- Diameter of microphone less than 1.3 cm
- Sound Board at least 1 m in dia., 1.2 cm thick
- Primary Wind Screen at least 9 cm in dia.
- Secondary Wind Screen at least 45 cm in dia., 1.3 cm to 2.5 cm thick (4 to 8 pores/cm)
- SLM located a distance of tower height + half rotor diameter downwind of Wind Turbine (WT)
- Anemometer 2-4 rotor diameters upwind of WT

# Equipment

## Larson-Davis Model 824 Sound Pressure Level Meter



# Equipment

## Primary and Secondary Microphones

Primary Wind Screen  
17.8cm (7") in diameter

Secondary Wind Screen  
61cm (24") in diameter



Sound Board 122 cm (48") in diameter and 1.9 cm (0.75") thick.

# Field Test Site



Skystream test was performed on a conventional 33' (10M) monopole tower. All other turbines on site were turned off during testing period



# Field Test Site Microphone Placement



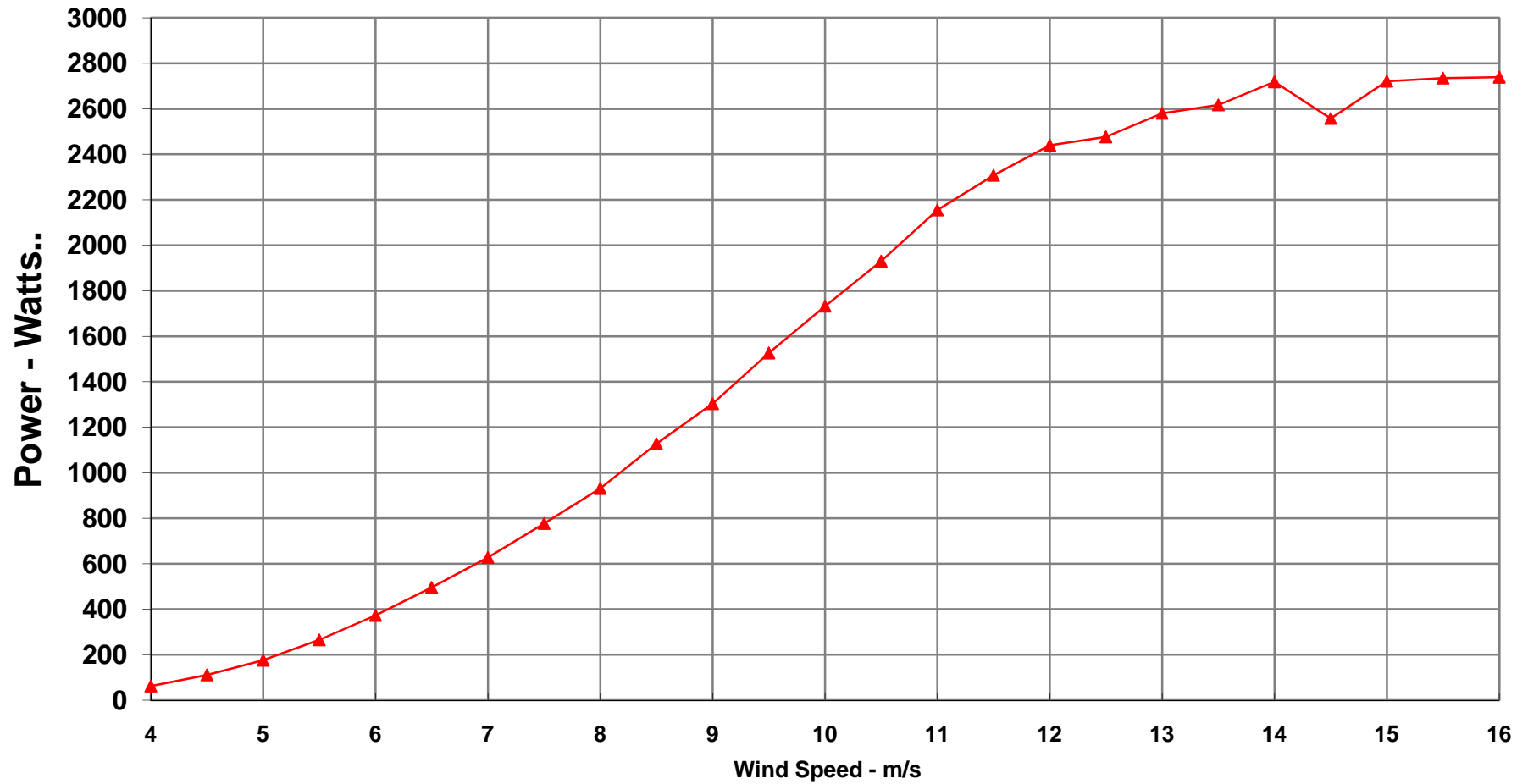
# Performance Results



# Turbine Performance During Sound Testing Period\*

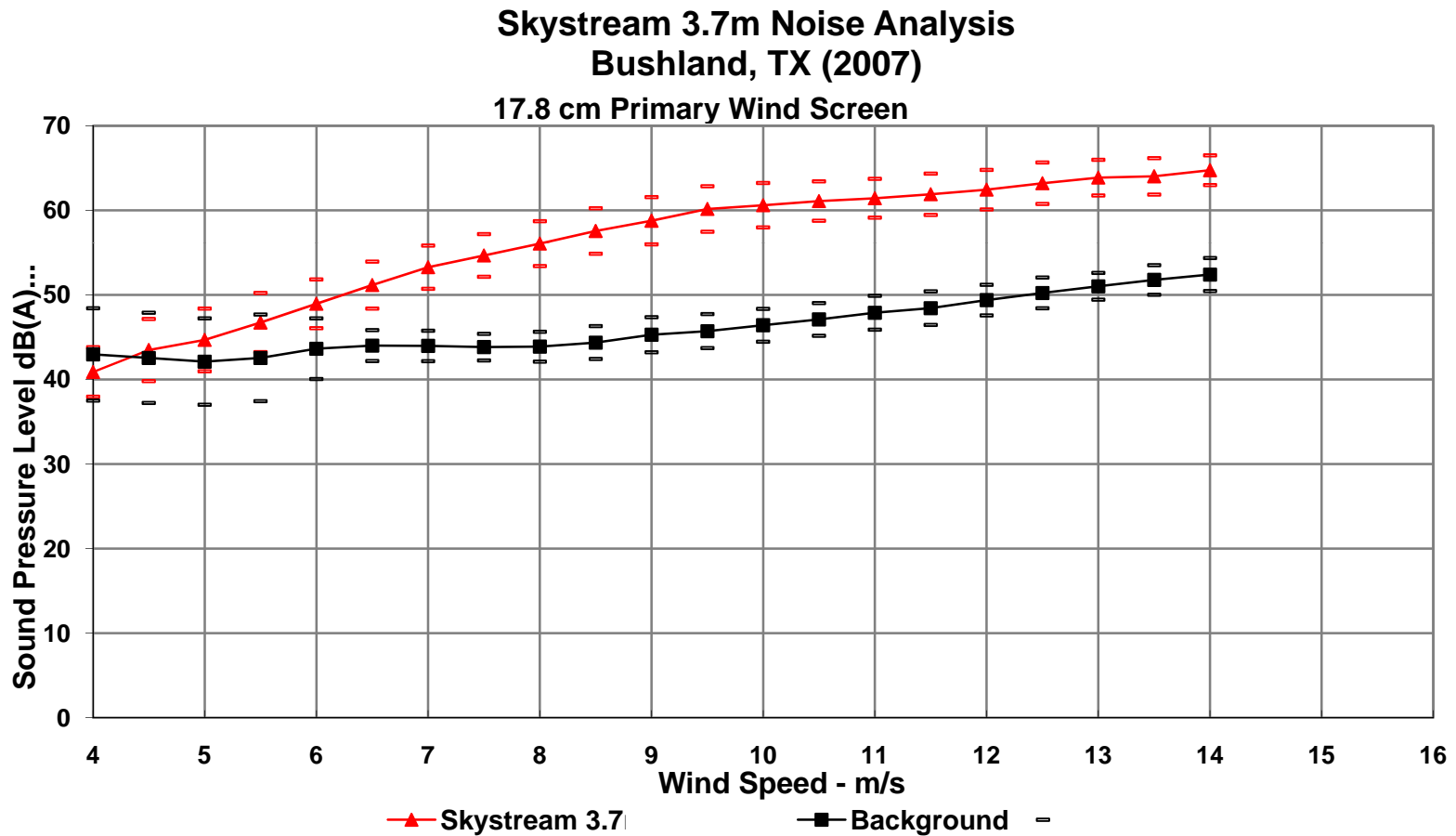
Skystream 3.7m Noise Analysis  
Bushland, TX (2007)

17.8 cm Primary Wind Screen



\*Note: Data is not corrected for elevation

# Skystream Sound Output Compared to Background

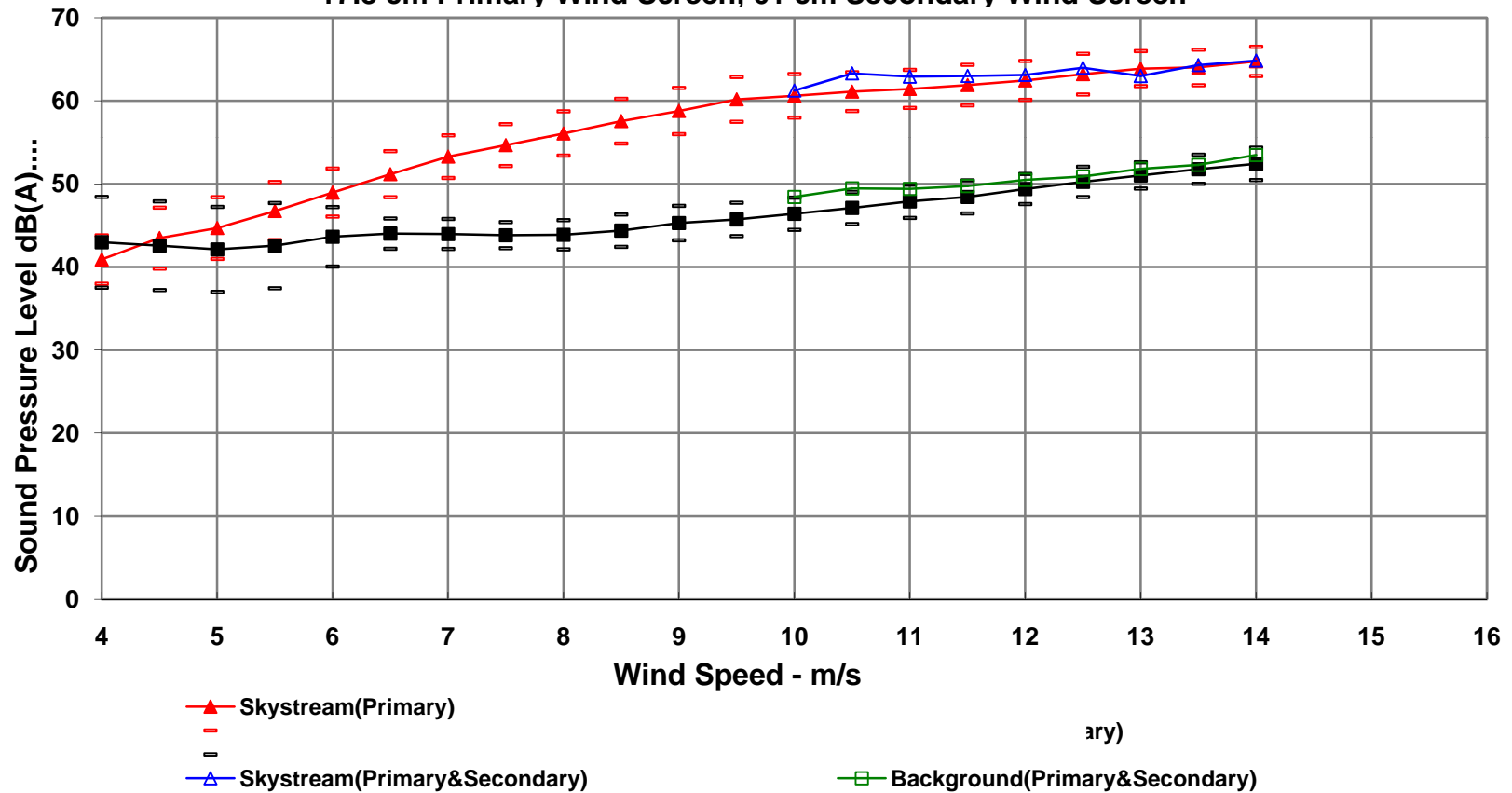


Sound output is measured separately from background sound and turbine sound

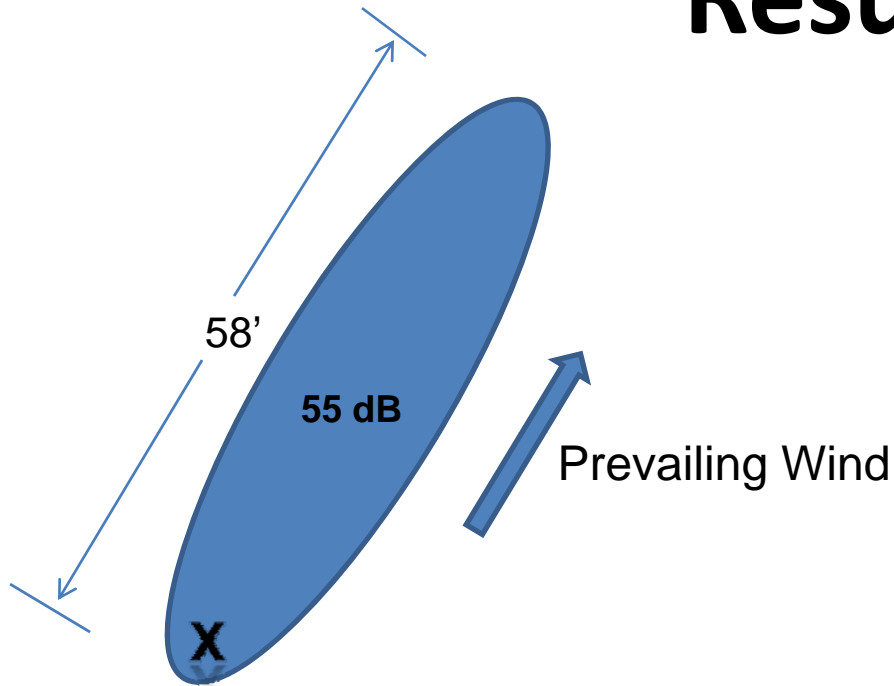
# Sound Analysis

## Skystream 3.7m Noise Analysis Bushland, TX (2007)

17.8 cm Primary Wind Screen, 61 cm Secondary Wind Screen



# Results



Skystream on 33' (10 M) tower



The charts translate to a sound pressure level (observer perception) of 55 dBA at a slant distance of 17.6 m from the rotor hub. For the wind turbine operating in a typical background noise of 44 dBA, the sound pressure level (observer perception) would be 55 dBA at a slant distance of 18.4 m from the rotor hub. Sound perception is heard downwind from the machine and dissipates as the distance increases.