Low Frequency and Infrasound Noise Immission from Wind Farms and the potential for Vibro-Acoustic disease

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Wind Farm LFN and VAD

- Introduction
- The Issue
- VAD
- Measurements of infrasound and low frequency noise from wind farms
- Comparison of Levels between Wind Farm and VAD Levels
- Why might this link occur?
- Conclusions

The Issue

http://kirbymtn.blogspot.com/2006/04/vibroacoustic-disease-and-wind.html

Saturday, April 01, 2006

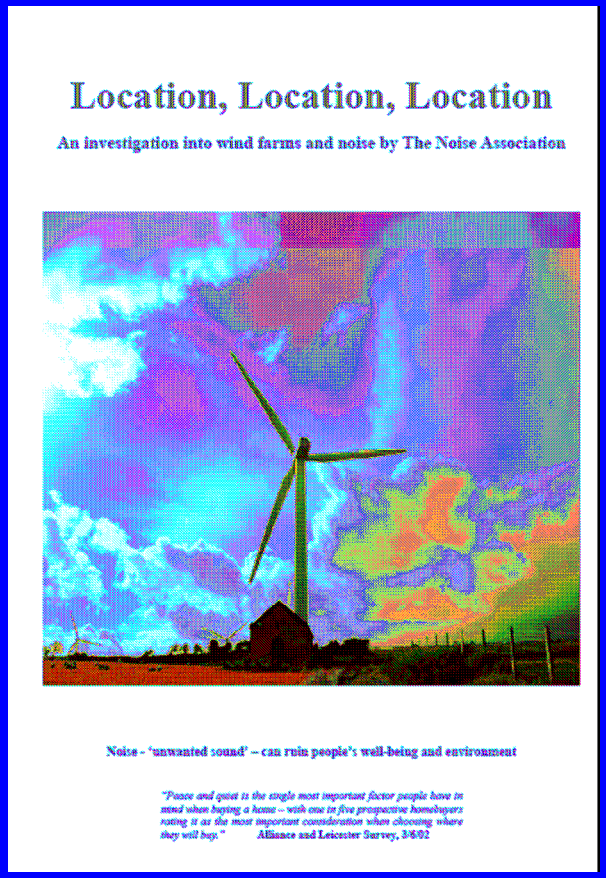
Vibroacoustic disease and wind turbines # _

From Calvin Luther Martin, Malone, N.Y.:

> Mariana Alves-Pereira, Dept. of Environmental Sciences & Engineering, New University of Lisbon, Caparica, Portugal, has for many years been part of a team of physicians and scientists studying the pathophysiology of low-frequency noise and infrasound on humans. She is Assistant Coordinator of the Vibroacoustic Disease Project.
>
> Alves-Pereira and colleagues have been doing epidemiologic studies of airline pilots and technicians and other people who are chronically exposed to low-frequency noise and infrasound. The effects are grim: cardiovascular, respiratory, neurologic, and renal pathology and symptoms, which they call vibroacoustic disease.
>
> Alves-Pereira, in discussion with physicians Amanda Harry in the U.K. and Nina Pierpont in the U.S., is now looking into the low-frequency noise and infrasound produced by industrial wind turbines, to determine whether they, too, can cause such vibroacoustic disease (VAD). Alves-Pereira's initial assessment, based on noise measurements taken inside and outside the homes of wind turbine neighbors, is that turbines are indeed a likely cause of VAD.

UK References

- UKNA Report: Location, Location, Location



In Portugal, where low frequency noise has been researched extensively, a link has been found with a complex illness known as vibroacoustic disease. Although this research has been mainly concerned with high levels of low frequency noise, it is felt that prolonged exposure to lower levels of low frequency noise may cause similar problems. Certainly the symptoms which some people living around wind turbines complain of are very similar to those of vibroacoustic disease.

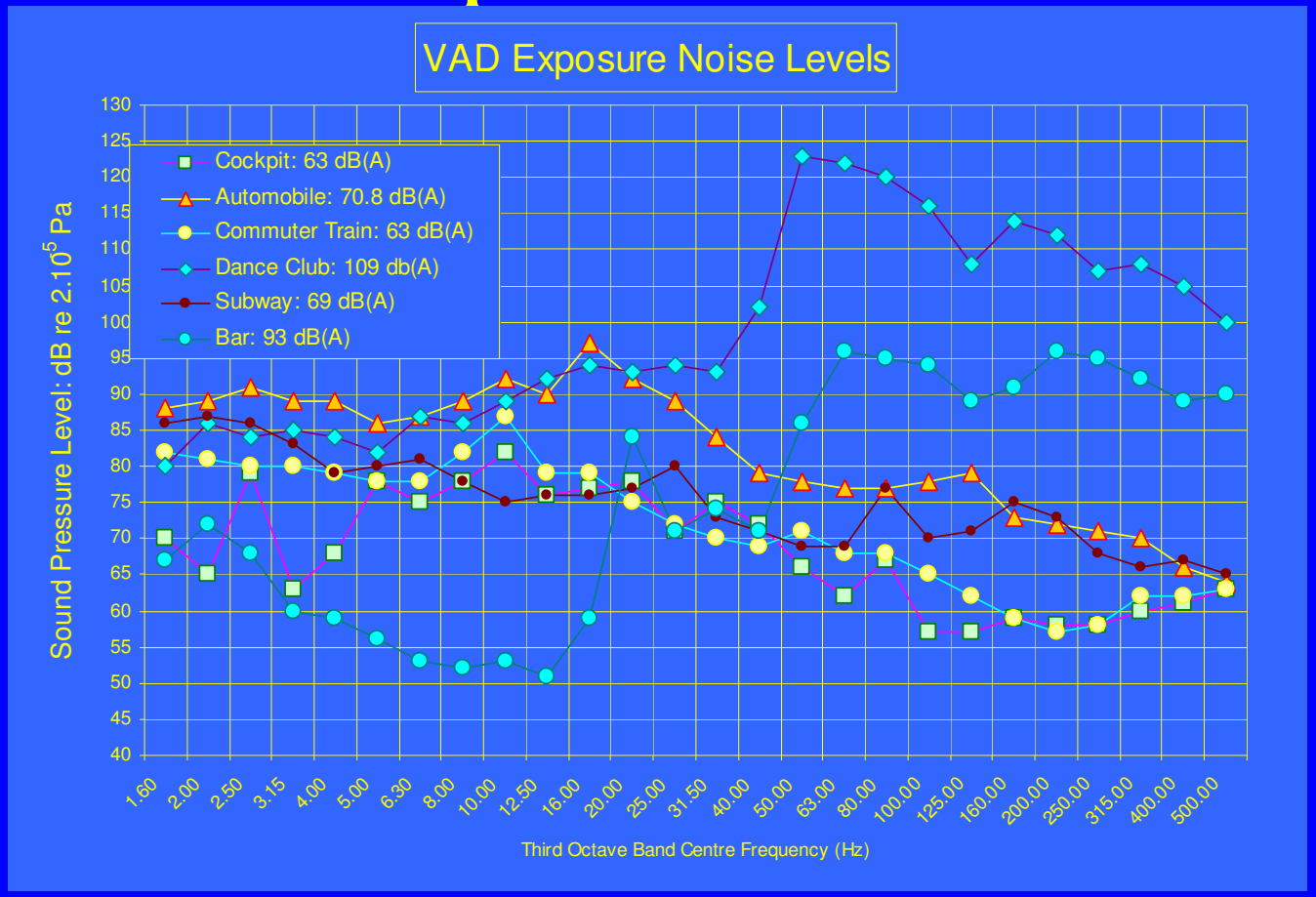
VAD Symptoms

Table 1. Data from a group of 140 aircraft technicians (selected from an initial group of 306 workers), occupationally exposed to LFN (8 hrs/day, 5 days/week). Exposure time (in years) refers to the amount of time it took for 70 individuals (50%) to develop the corresponding sign or symptom (Castelo Branco, 1999b).

Clinical Stage	Sign/Symptom
Stage I-Mild (1-4 years)	Slight mood swings, Indigestion and heart -burn, Mouth/throat infections, Bronchitis
Stage II-Moderate (4-10 years)	Chest pain, Definite mood swings, Back pain, Fatigue, Fungal, viral and parasitic sk in infections, Inflammation of stomach lining, Pain and blood in urine, Conjunctivitis, Allergies
Stage III–Severe (> 10 years)	Psychiatric disturbances, Haemorrhages of nasal, digestive and conjunctive mucosa, Varicose veins and haemorrhoids, Duodenal ulcers, Spastic colitis, Decrease in visual acuity, Headaches, Severe joint pain, Intense muscular pain, Neurological disturbances

Castelo Branco NAA, Rodriguez Lopez E, Alves-Pereira M, and Jones DR. (1999b) Vibroacoustic disease: some forensic aspects. *Aviation, Space and Environmental Medicine*, 70 (3, Suppl): A145-51.

VAD Exposure Noise Levels



Vibroasouctic disease: N.A.A. Castelo Branco and M. Alves-Pereira: : Noise & Health 2004, 6:23, 3-20

Low Frequency Noise: Bristol 2006

The measurement of low frequency noise at three UK wind farms

- Selection of measurement sites based upon reports in national press as giving rise to infrasound and low frequency noise
- Measurements performed at external and internal locations
- Measurements performed over extended periods: 2 – 4 weeks monitoring
- Analysis of periods when described by occupants as audible and “unacceptable”.

Infrasound Measurements

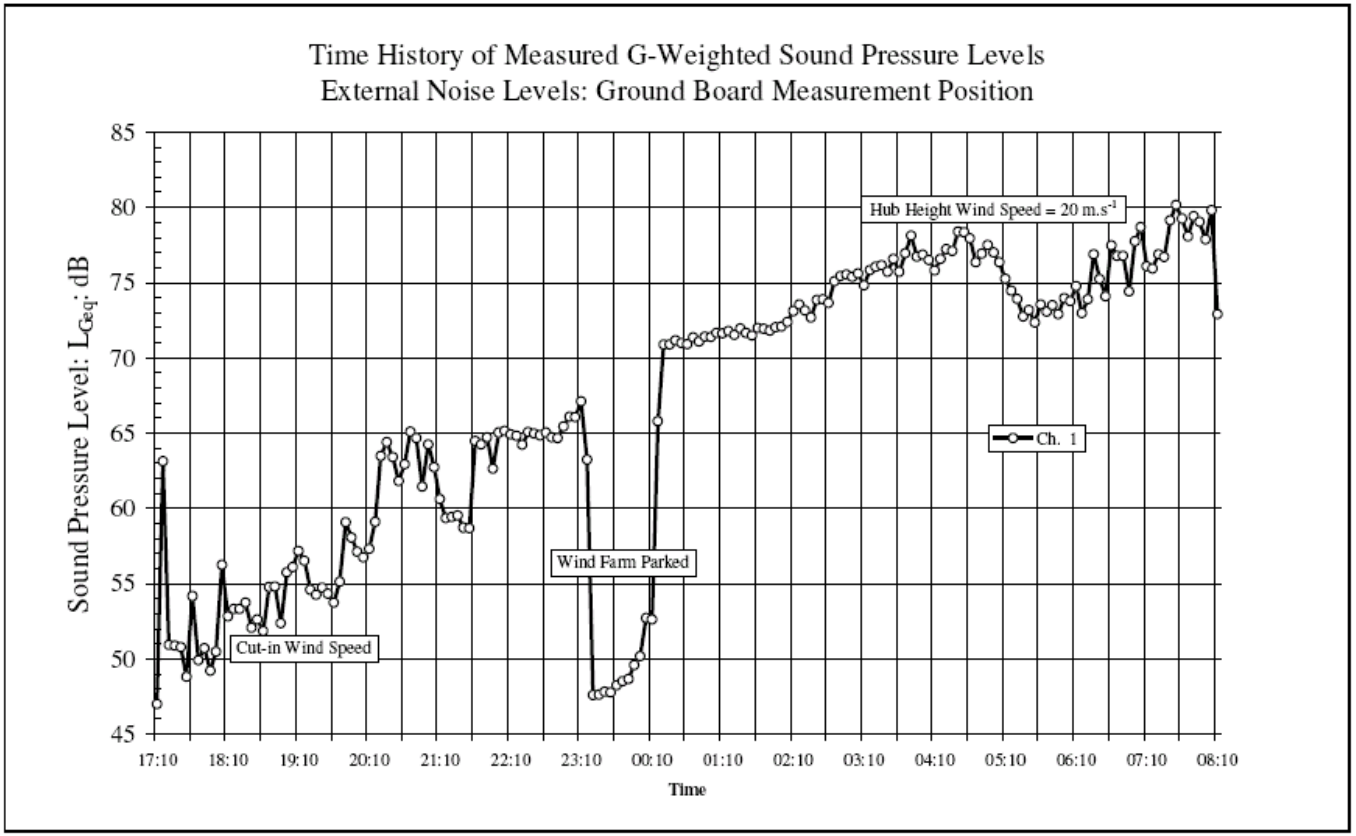


Figure 12: Time History Figure of G-Weighted Sound Pressure Levels for a Wind Farm

Infrasound Measurements

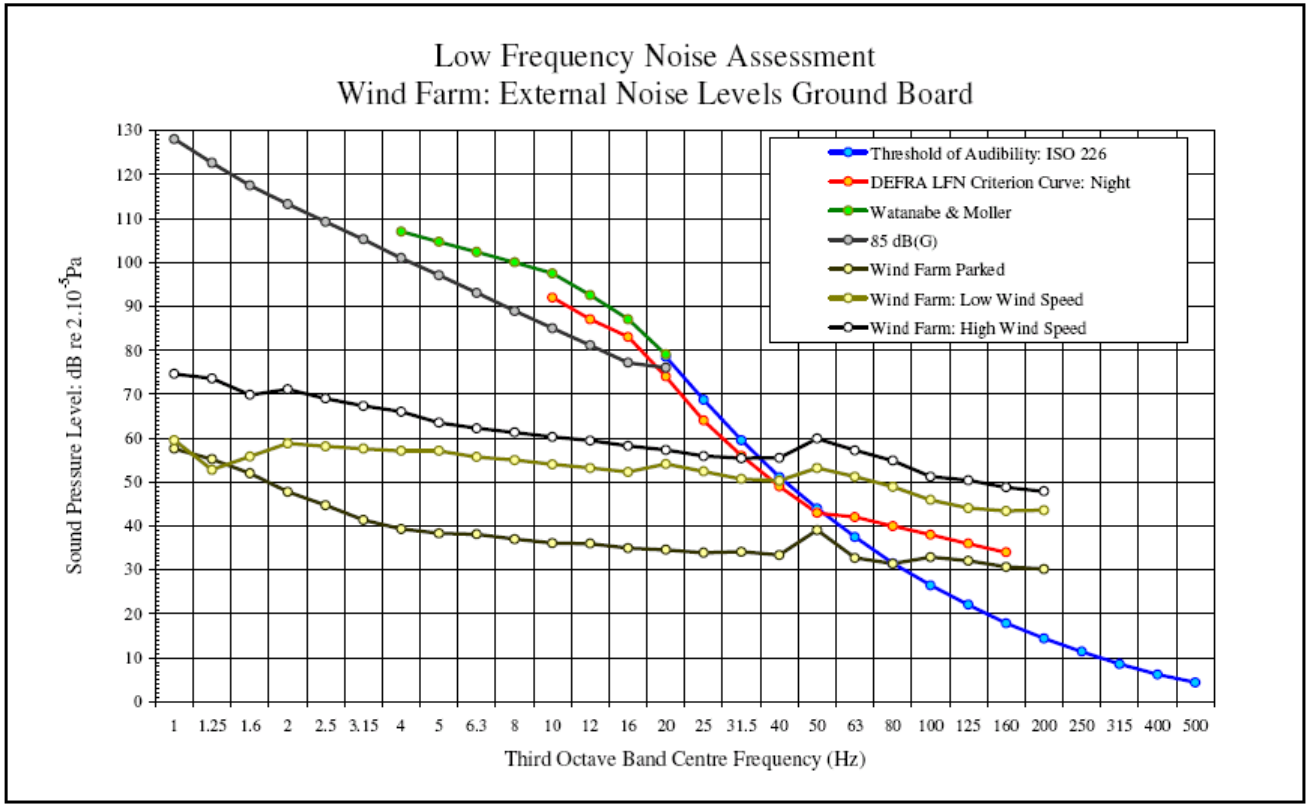
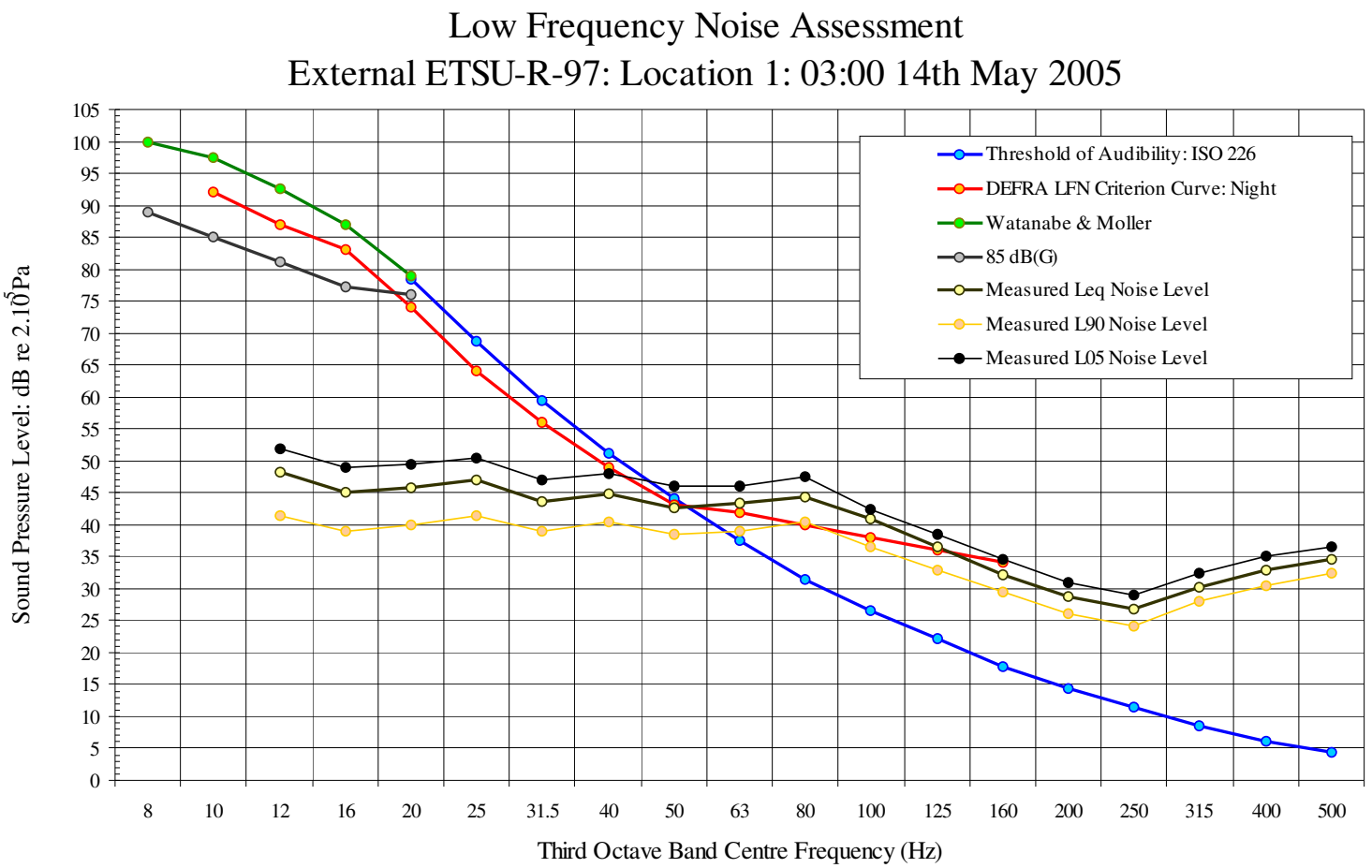
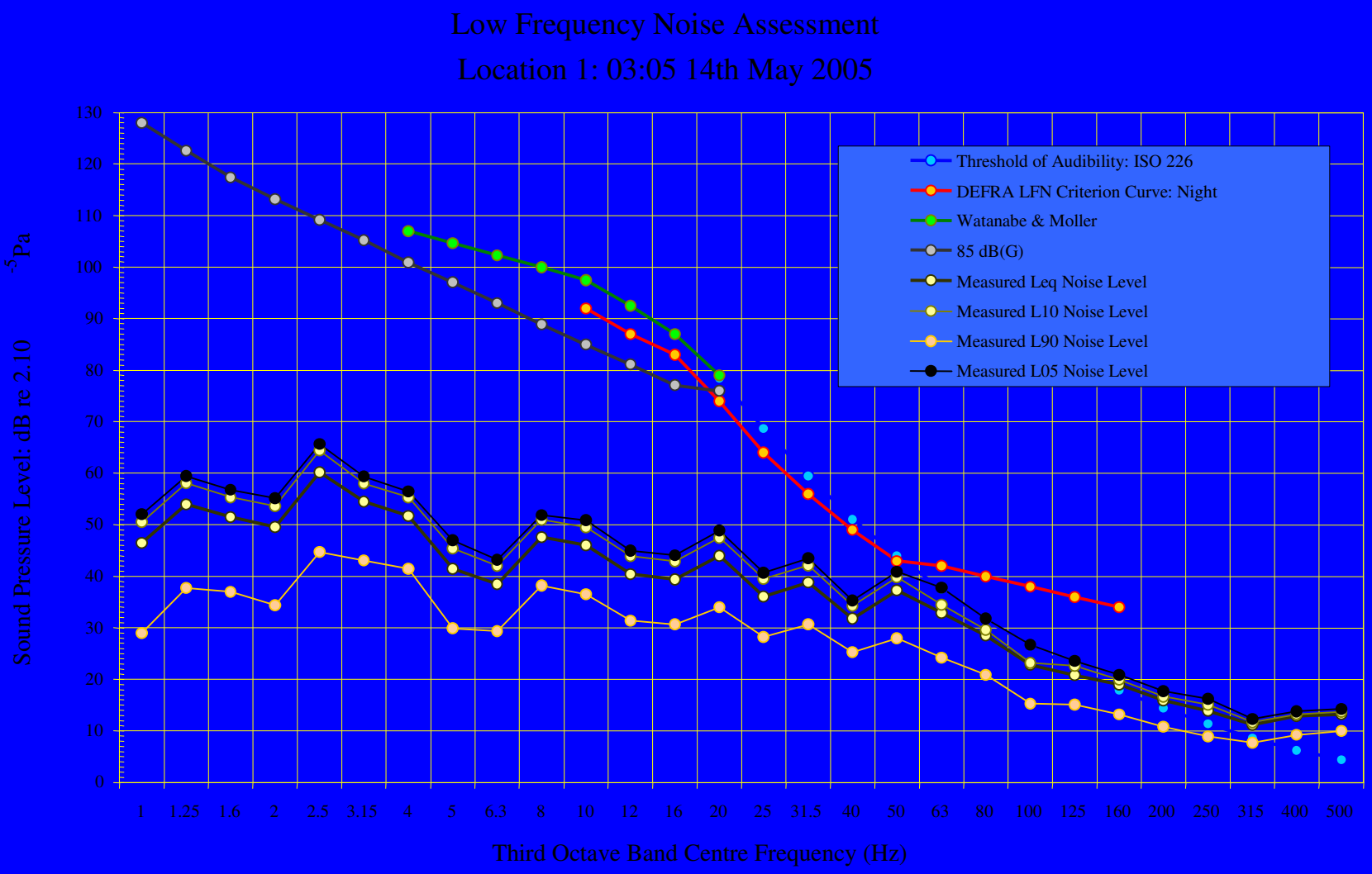


Figure 11: Measured Infrasound and Low Frequency Noise Levels: External Location on Ground Board

External Noise Levels

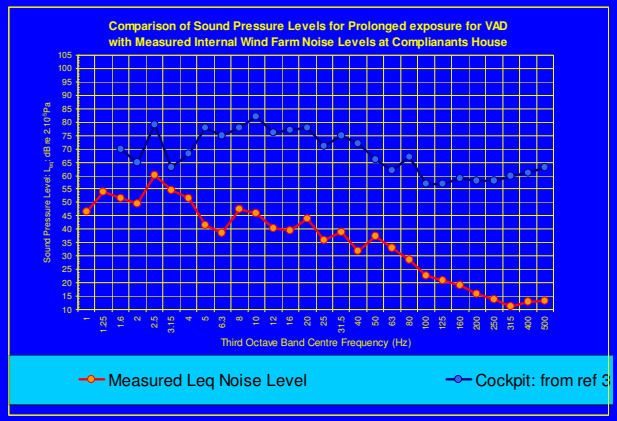


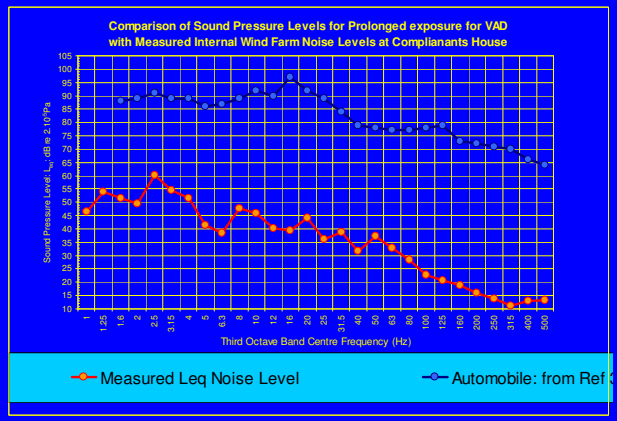
Internal Noise Level

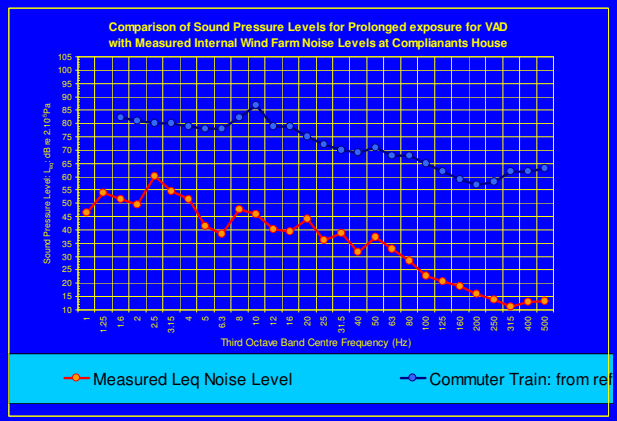


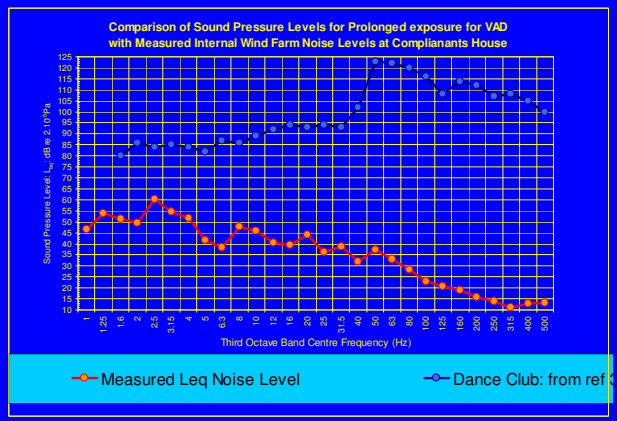
Low Frequency Noise: Bristol 2006

Comparison of Levels

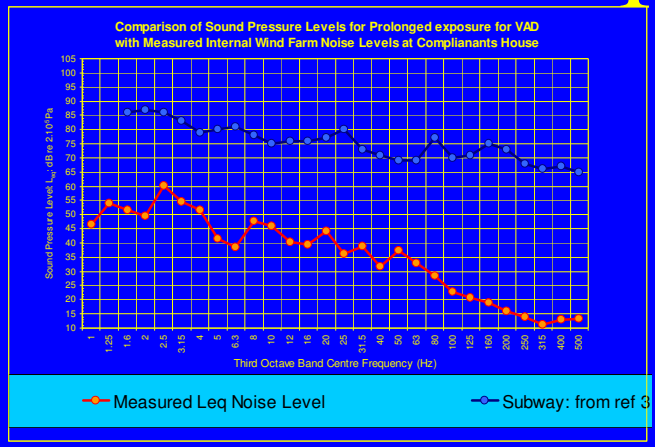


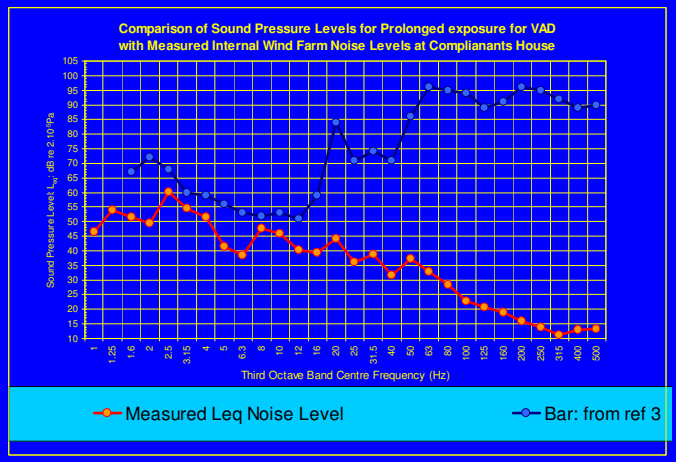


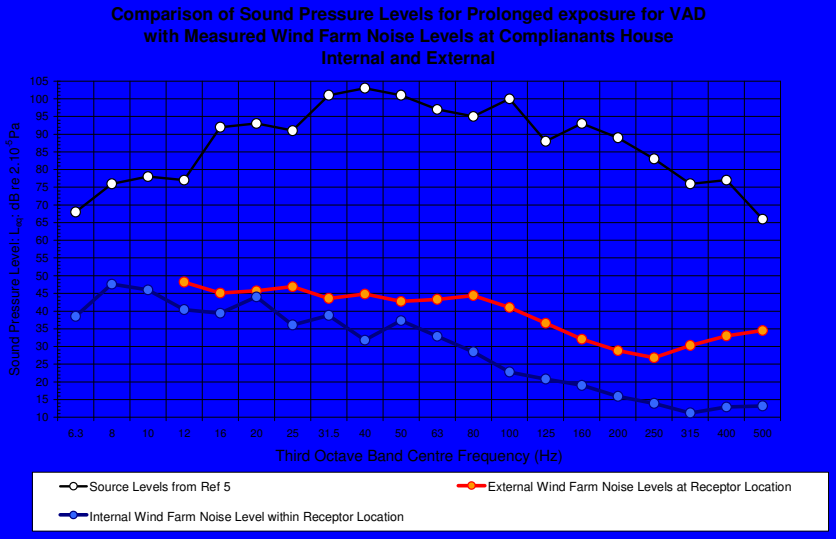




Comparison of Levels





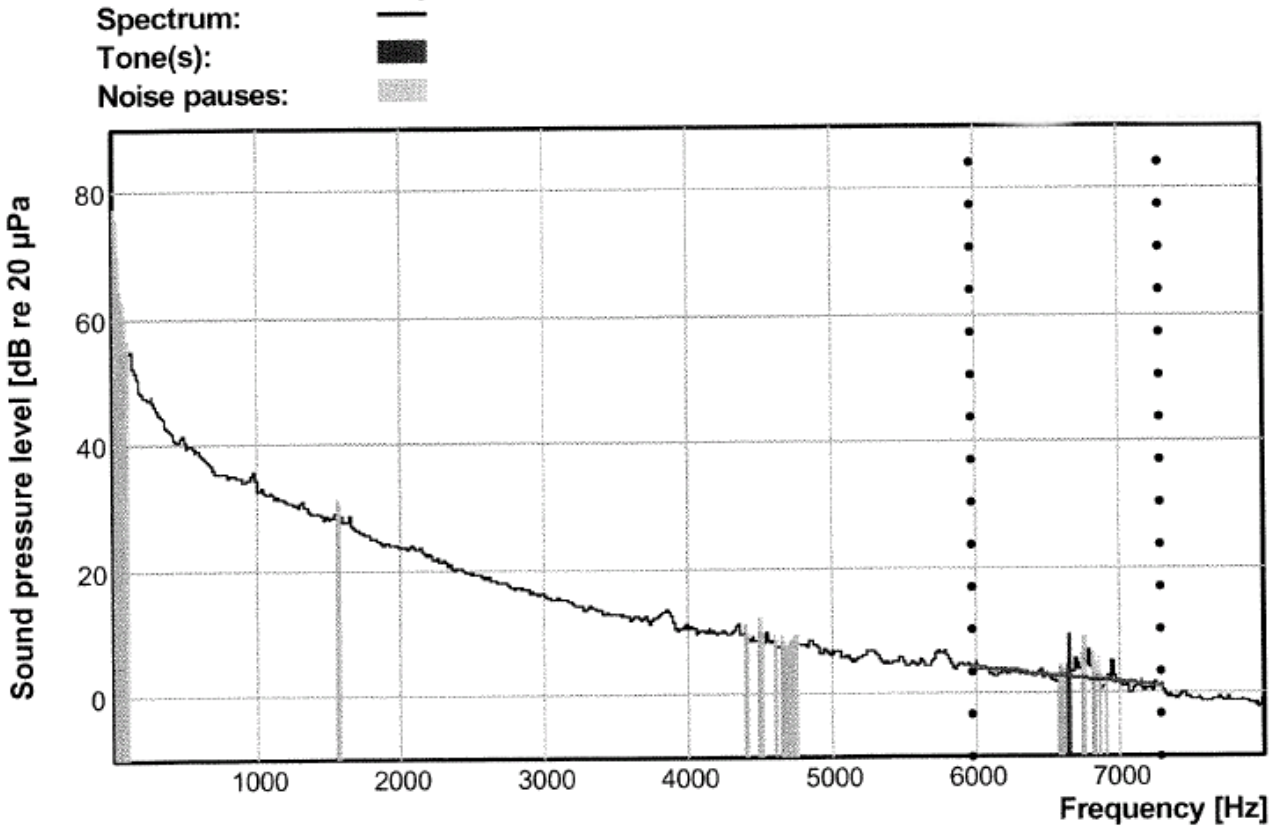


Low Frequency Noise: Bristol 2006

Why might this link occur?

9.2 Narrow band analysis

An FFT analysis of noise on the metal sheet at approx 8 m/s has been performed in order to determine tonal audibility of turbine noise.



Why might this link occur?

Bradworthy 01, Cornwall – Wind Farm Noise Monitoring December 2005

Wind Direction SW speed 14 – 27 MPH RAIN In Direct Wind

Location SS 304 135

Microphone - Normal

Instrument:	2250
Application:	BZ7223 Version 1.2
Start Time:	07/12/2005 18:27:17
End Time:	07/12/2005 18:29:20
Elapsed Time:	00:02:03
Bandwidth:	1/3-octave
Max Input Level:	140.50

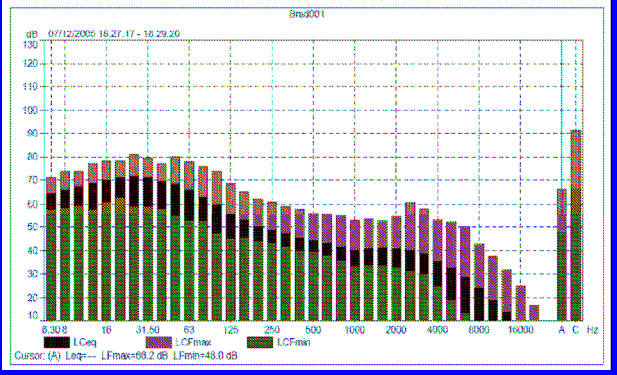
	Time	Frequency
Broadband (excl. Peak):	FSI	AC
Broadband Peak:	C	
Spectrum:	FS	C

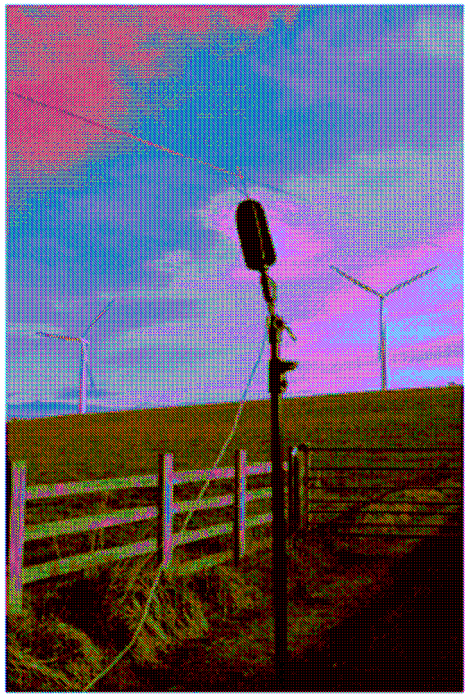
Instrument Serial Number:	2505941
Microphone Serial Number:	2508682
Input:	Top Socket
Windscreen Correction:	None
Sound Field Correction:	Free-field

Calibration Time:	07/12/2005 14:47:11
Calibration Type:	External reference
Sensitivity:	52.78 mV/Pa

Brad001 Text

	Start time	End time	Elapsed time	Overload [%]	[dB]	LAleq [dB]	LAFmax [dB]	LAFmin [dB]
Value				0.00	57.8	66.2	48.0	
Time	18:27:17	18:29:20	00:02:03					
Date	07/12/2005	07/12/2005						





Low Frequency Noise: Bristol 2006

Body Surface Induced Vibration from Low Frequency Noise

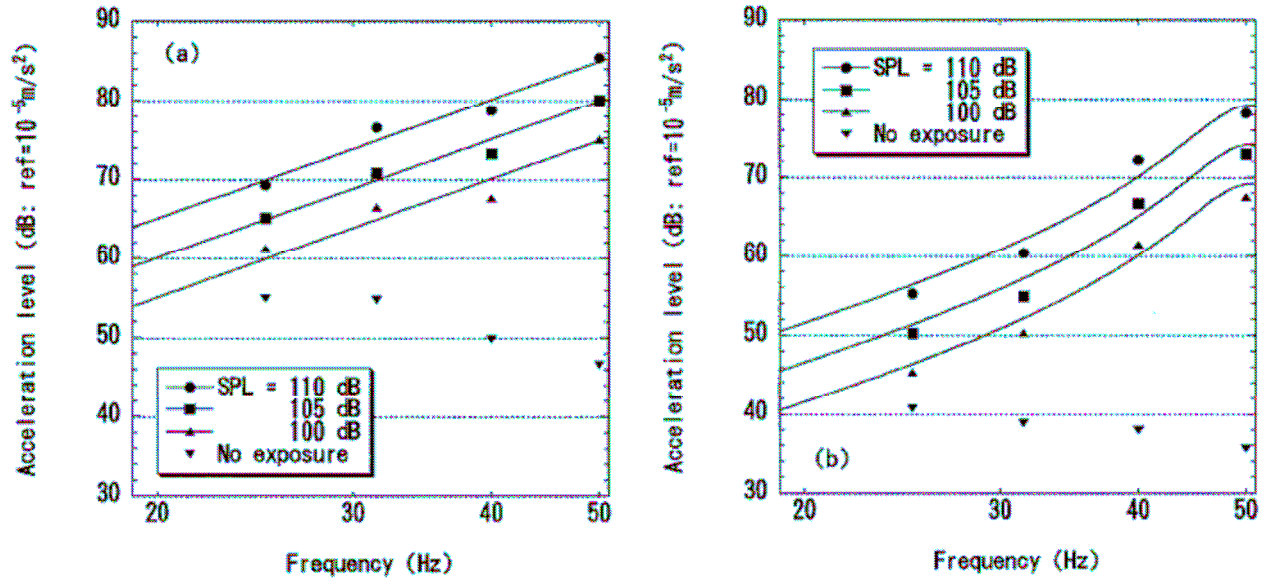


Fig. 1 The mean measured acceleration levels and the approximate curves. (a) On the left chest, and (b) on the forehead.

- Measurement of Human Body Surface Vibrations Induced by Complex Low-Frequency Noise Composed of Two Pure Tones: Y. Takahashi, S Maeda: Journal of Low Frequency Noise, Vibration and Active Control: Vol. 22 No. 4 2003
- A New Approach to Assess Low Frequency Noise in the Working Environment: Y. Takahashi, Y Yonekawa, K. Kanada: Industrial Health 2001, 39, 281 - 286

Conclusions

- Internal/External Infrasound and Low Frequency Data now available for operational wind farms in the UK
- Levels are significantly below those identified to give VAD
- Unlikely that symptoms will result through induced internal body vibration from incident wind farm noise