



**HAL**  
open science

## Infrasound sensitivity and harmonic distortion

Henri Boutin, John Smith, Joe Wolfe

► **To cite this version:**

Henri Boutin, John Smith, Joe Wolfe. Infrasound sensitivity and harmonic distortion. *Acoustics Australia*, 2014, 42 (2), pp.137. <hal-03583261>

**HAL Id: hal-03583261**

**<https://hal.science/hal-03583261v1>**

Submitted on 7 Mar 2022

**HAL** is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

# LETTER TO THE EDITOR

Henri Boutin, John Smith and Joe Wolfe

School of Physics, University of New South Wales, Sydney

## INFRASOUND SENSITIVITY AND HARMONIC DISTORTION

Human sensitivity to infrasound (IS) and the problems that it may or may not cause have become topical recently because of wind farms and both have been discussed here [1-5]. Determination of sensitivity to IS and assessment of its effects are complicated for several reasons.

One complication is that some common sources of infrasound with significant intensity, such as wind turbines and surf beaches, also emit power in the audible range, and that audible power is modulated at one of the IS frequencies. This makes the source audible and readily identified. If the source is regarded as an unattractive rather than a desirable feature, this modulated audible sound may become a nuisance and so could possibly trigger reactions that are not directly due to the IS component. (In contrast, one of the authors can report that three decades of living opposite a surf beach seem to have had no negative effects.)

Another complication is the difficulty of determining human sensitivity to IS. For low frequencies and high power, loudspeakers usually have harmonic distortion of one percent (-20 dB) or more. Because the sensitivity of the human hearing increases dramatically with increasing frequency below about 100 Hz, even small amounts of harmonic distortion of pure IS tones could produce audible distortion at higher harmonics.

In a recent research project studying nonlinear acoustical effects in a completely unrelated field, the present authors desired a powerful, low frequency source with very low harmonic distortion. This led us to develop a method of

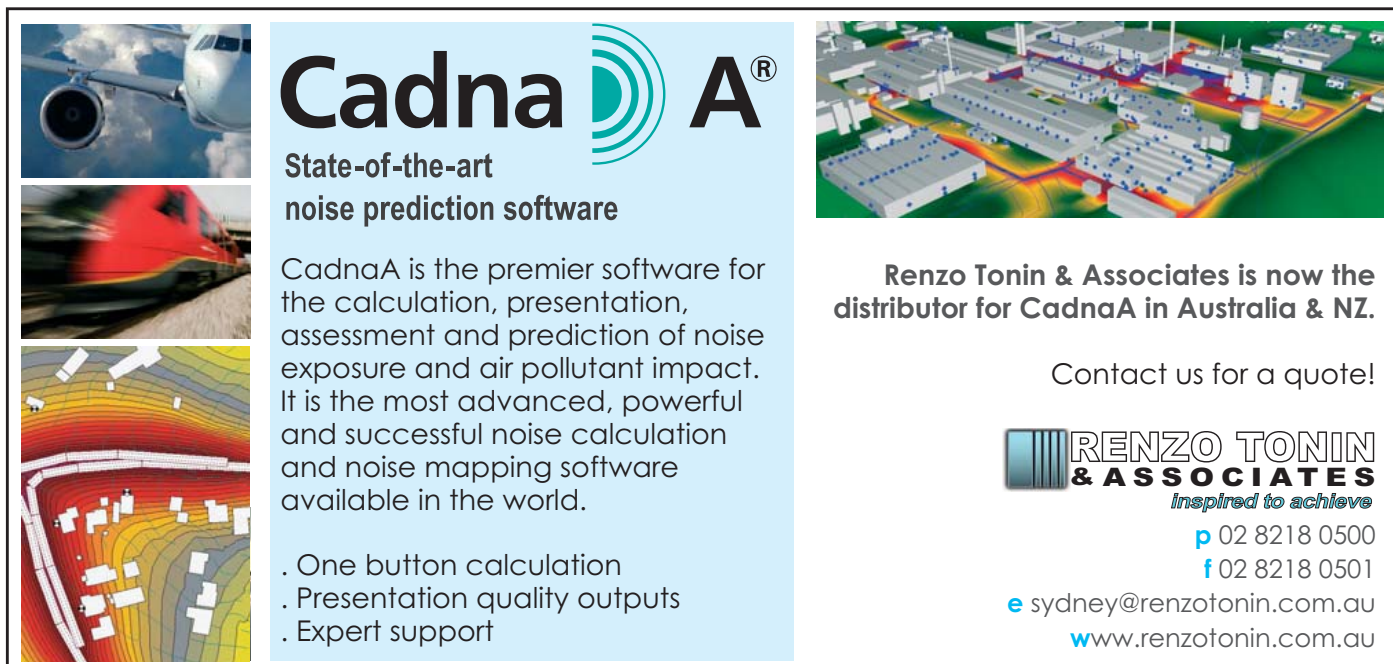
cancelling harmonic distortion and intermodulation products using an iterative method [6]. To demonstrate this, we used a loudspeaker that, at 107 dB, initially produced 10% harmonic distortion when driven with an input sine wave of 52 Hz (chosen to avoid confusion with harmonics of mains noise). This iterative method reduced the harmonic distortion over the audible range to less than -65 dB. One of the purposes of this letter is to draw this method to the attention of researchers seeking pure, low frequency sine waves for psychophysical measurements.

Henri Boutin, John Smith and Joe Wolfe

School of Physics, University of New South Wales, Sydney

## REFERENCES

- [1] V.V. Lenchine, "Amendment for wind farms environmental noise guidelines", *Acoustics Australia*, **37**, 24-25 (2009)
- [2] S. Cooper, "Wind farm noise – an ethical dilemma for the Australian Acoustical Society?", *Acoustics Australia*, **40**, 139-142 (2012)
- [3] P. Miskelly, Response to S. Cooper, *Acoustics Australia*, **41**, 139 (2013)
- [4] P. Alway, "Wind farm noise", *Acoustics Australia*, **41**, 195 (2013)
- [5] A. Bell, "Annoyance from wind turbines: role of the middle ear muscles", *Acoustics Australia*, **42**, 57 (2014)
- [6] Boutin, H., Smith J. and Wolfe, J. "Producing undistorted acoustic sine waves" *J. Acoust. Soc. America*. **135**, 1665-1667 (2014)



**Cadna A<sup>®</sup>**  
State-of-the-art  
noise prediction software

CadnaA is the premier software for the calculation, presentation, assessment and prediction of noise exposure and air pollutant impact. It is the most advanced, powerful and successful noise calculation and noise mapping software available in the world.

- . One button calculation
- . Presentation quality outputs
- . Expert support

**Renzo Tonin & Associates is now the distributor for CadnaA in Australia & NZ.**

Contact us for a quote!

**RENZO TONIN & ASSOCIATES**  
*Inspired to achieve*

p 02 8218 0500  
f 02 8218 0501  
e [sydney@renzotonin.com.au](mailto:sydney@renzotonin.com.au)  
[www.renzotonin.com.au](http://www.renzotonin.com.au)