

Physics Seminar

Wednesday 1/26/2011, 4:30 pm
Science & Engineering Building Auditorium

Randall D. Peters

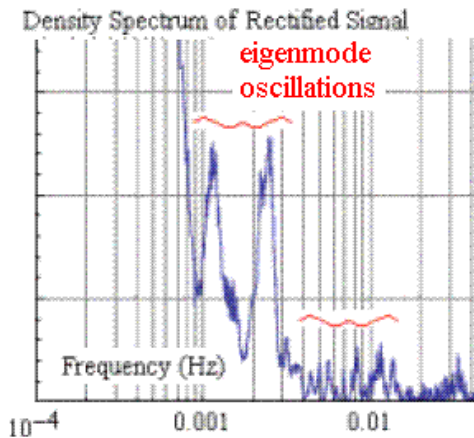
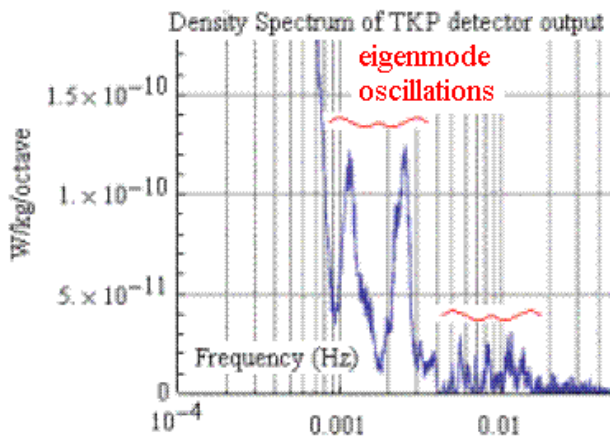
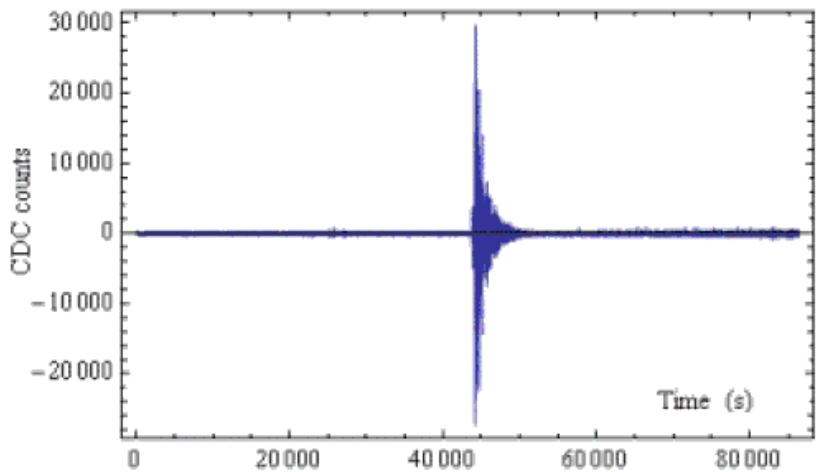
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**Another example of
Interdisciplinary Research
– that reveals widespread misunderstanding
of the frequency domain**

Confusion abounds in a number of places where *spectral density* is part of the name for functions used to describe experimental data. For example, there has been a general failure by seismologists to comply rigorously with Parseval's theorem. The resulting debacle involves the improper association of the words '*power*' and '*spectral density*' to describe the seismic function whose units are $\text{m}^2/\text{s}^4/\text{Hz}$ or g^2/Hz . Being dimensionally incompatible with energy per unit time, it is impossible for this function to properly represent the actual power measured with a seismometer; since the specific mechanical power can only have units of $\text{W}/\text{kg}/\text{Hz} = \text{m}^2/\text{s}^3/\text{Hz}$. It is no wonder, then, for the long-overdue need to carefully study two important natural phenomena -- (i) ever-present low frequency background noise of the Earth that is consistent with the $1/f$ (pink) form that is ubiquitous to the

universe, and (ii) the frequent occurrence of free-oscillations of Earth that are coincident with earthquakes. Observation of the latter, using the Fast Fourier Transform, requires that the relevant time domain records be first demodulated. In this seminar the speaker's "peak tracker" demodulator will be discussed again, in a different but related context to last week's talk that was concerned with the heart.

New Zealand earthquake of 3 Sep. 2010, magnitude 7.0
Recorded by the N-S channel of the VolksMeter seismograph located at the Edward Pigot Seismic Observatory in Coonabarabran, Australia



*Please join us for light refreshments
at 4:15pm outside SEB 203.*