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## Experimental demonstration of the fractal nature of unstable-resonator modes

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# Stellingen

behorende bij het proefschrift

*Experimental demonstration of the fractal nature of unstable-resonator modes*

## I

It is useless to quote the numerical value of the fractal dimension of a fractal object without specifying the method used to evaluate that dimension; that method needs to be related to the physics of the object being measured.

*Hoofdstuk 1 en 2 van dit proefschrift.*

## II

Choosing between the different versions of Virtual Source Theory is more a matter of taste, or convenience, rather than of precision.

*P. Horwitz, Appl. Opt. 15, 167 (1976).*

*W. H. Southwell, Opt. Lett. 3, 100 (1978).*

*M. V. Berry, C. Storm, and W. van Saarloos, Opt. Commun. 197, 393 (2001).*

## III

It is not often appreciated that unstable resonators support far fewer transverse modes than their stable counterparts. This asymmetry increases with the magnification of the unstable resonator. For this reason the dynamics of unstable cavities is actually simpler than the dynamics of their conservative counterparts.

*Hoofdstuk 2 van dit proefschrift.*

## IV

Acoustics may be a better field than optics to test the fractal nature of unstable-resonator modes, in view of the slower speed of wave propagation, the possibility of simultaneously recording the wave's phase and intensity, and the existence of impulse excitation power sources.

## V

The branches of physics with the most brilliant future will be the ones where the triad of analytical methods, numerical calculations and experiments can work in unison. This is illustrated by recent progress in our understanding of turbulence in the flow through pipes.

*Hof. B., et al, Science 305 1594 (2004).*

*Faisst H. , Eckhardt B., Phys. Rev. Lett. 91 224502.*

*Waleffe F., Phys. Rev. Lett. 81 4140 (1998)*

## VI

The abstractions about the physical world that form the core of theories about that world are simply abstractions. They are not part of the world that they try to represent.

## VII

The existence of a thermodynamic limit is a consequence of a generalized version of the Heisenberg principle, that says: "in the limit of small systems it is not possible to perform measurements that do not affect the state of the system being measured".

## VIII

In view of the fact that the US power grid nowadays experiences less frequent, but far more drastic blackouts, somber perspectives arise when we draw an analogy between the evolution of that grid and the globalization of the world economy.

*P. Farley, The unruly power grid, IEEE Spectrum Online.*

## IX

In view of the recent hype about the hydrogen economy we tend to forget that hydrogen is just a storage medium for the energy generated from a different source. That energy source, whichever it will be (solar, nuclear, thermonuclear, biomass), deserves to be called the energy of the future.

## X

We ought avoid thinking that the great scientists of the past were human beings touched by some kind of divine fire; they were simply men that were good at doing science.

Javier Loaiza  
Leiden, 23 November 2005