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Fractal - Scaling approaches in Radar and Radio Physics

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Currently the inadequacy of conventional physical models is clearly felt. Revolutionary steps which consist in transfer of integer measure signals obtained by a system to the fractional measure space and following calling of scaling ratios allow to bring absolutely new ideas and methods into conventional areas of classical radio physics and radio electronics and to get results rather unexpected for practice which are however physically valid. Fundamental issues concerning the application of fractal theory, fractional operators and scaling effects in radio location, radio engineering and radio physics are considered in this report. Multiple examples of such approach utilization in different directions of science and engineering are presented. Essential discrepancies of this fundamental direction and classical ways of development are shown basing on the problems of radio location, antenna systems, detectors and processing of multidimensional signals. Mathematical and physical problems arising from using the global fractal-scaling method proposed by the author and existing method of fractional operators are considered. The author develops and strengthens his ideas that the new "fractal" dimension must be firmly introduced into science and engineering at that not to an auxiliary role but as the fundamental clarifying factor. The fractal radio physics, fractal radio engineering and fractal radio location which are peculiar radio sciences inspired with the spirit and ideas of classical radio physics and radio engineering are fundamentally new directions. Here one need to combine physics, mathematics, engineering and see a new physic-mathematical problem in a technical issue and do practical conclusions for engineering from solving such a problem. Introduction of fractals, scaling effects and fractional operators may imply the radio electronics future since all the previous and present radio electronics is based exceptionally (and only!) on the theory of integral-valued functions and does not take into account the fractional measure in the informational theory.

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