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Fractal Resonators for Use in a Microwave Kinetic Inductance Detector

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Microwave Kinetic Inductance Detectors (MKID) are widely used for detecting low-energy photons due to their high sensitivity and ease of multiplexing, with applications in astronomy and spectroscopy. This work investigates using Hilbert fractal planar resonators as a substitute for conventional straight or meander resonators in MKID. The study addresses challenges in miniaturizing resonators to increase pixel density. Numerical simulations reveal how MKID sensitivity depends on the substrate thickness, microstrip fractal line width, and density. The results demonstrate significant potential for miniaturizing fractal resonators compared to meander ones due to a more uniform microwave field distribution. A novel method for continuously detecting resonant frequency shifts across multiple resonators simultaneously is proposed, replacing the sequential scanning typically used in MKID. This method, based on processing a multi-tone microwave signal, enables rapid detection without the "dead time" when detector pixels are inactive.

Type of presence

Presence online

Primary author: Dr KALENYUK, O.A. (G. V. Kurdyumov IMP of the N.A.S.U.)

Co-authors: Dr SHAPOVALOV, A.P. (Kyiv Academic University); Mr MARTYNENKO, I. O. (G. V. Kurdyumov IMP of the N.A.S.U.); Dr FUTIMSKY, S.I. (G. V. Kurdyumov IMP of the N.A.S.U.)

Presenter: Dr KALENYUK, O.A. (G. V. Kurdyumov IMP of the N.A.S.U.)

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