

Towards a Josephson Parametric Amplifier Based on Ferromagnetic Tunnel Junction

P. Darvehi¹, I. Chantarjee^{1,2}, A. Levochkina^{1,2}, G. Serpico², R. Satraiano², H. G. Ahmad²,
P. Mastrovito^{1,2}, A. Orsi², L. Parlato², G. Ausanio², G. P. Pepe², D. Montemurro^{1,2},
D. Massarotti^{3,1}, F. Tafuri², A. Vettoliere⁴, C. Granata⁴ and M. Esposito¹

¹CNR-SPIN, Complesso di Monte S. Angelo, via Cintia, 80126, Napoli, Italy

²Department of Physics, University Federico II, 80126, Naples, Italy

³Department of Electrical Engineering and Information Technology, University Federico II, 80125, Naples, Italy

⁴ISASI-CNR, Via Campi Flegrei, 34, 80078 Pozzuoli, Italy

Abstract: Toward realization of Josephson Parametric Amplifiers based on Ferromagnetic Tunnel Junctions, this work presents characterization of a prototype device designed and fabricated through collaboration between CNR SPIN Napoli, CNR ISASI Pozzuoli, and University of Naples.

Josephson Parametric Amplifiers (JPAs) are widely used in superconducting quantum circuits as near-quantum-limited microwave amplifiers. In standard designs, frequency tunability typically relies on external static electric or magnetic fields [1].

In this work, we move towards the realization of a Josephson Parametric Amplifier Based on Ferromagnetic Tunnel Junction. The presence of the ferromagnetic material in the junction barrier allows resonance frequency tunability by exploiting the magnetic hysteresis, with the advantage of avoiding the application of a static magnetic or electric field. I will present preliminary experimental characterizations of the first prototype device designed and fabricated as a collaboration between CNR SPIN Napoli, CNR ISASI Pozzuoli and University of Naples Federico II.

References

[1] Aumentado, Jose. "Superconducting parametric amplifiers: The state of the art in Josephson parametric amplifiers." *IEEE Microwave magazine* 21.8 (2020): 45-59.