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Amplification-Free System for High-Resolution Josephson Junctions' Characterization

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Superconducting circuits have proven to be one of the most promising platforms for quantum computing and sensing applications with Josephson junctions as one of their fundamental building blocks. Therefore, a reliable fabrication process and characterization apparatus of these components is of crucial importance for every experimental group in this field.

Traditional characterization of these components consists in a study of their Current-Voltage (IV) characteristic. Measurement setups typically rely on commercial functions generators and oscilloscopes to bias and read the response of the junction, respectively. These instruments, despite being user-friendly, are often very expensive if one wishes to reach a high resolution and dynamic range.

In this contribution we present an alternative, amplification-free approach. Based on a sound-card designed for high-fidelity music applications which, for a fraction of the cost of oscilloscopes and function generators, offers a high resolution and dynamic range. The selected sound-card is designed to be integrated with a Raspberry Pi single-board computer making it easily configurable. We have verified the functionality of our approach characterizing cross-type Al/Al-Ox/Al Josephson junctions microfabricated at FBK.

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