

Effect of LC-shunting on the IV-characteristics of a Josephson Junction under Microwave Radiation

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Abstract — We study the resonance features of the coupled system of Josephson junctions shunted by the LC-elements under electromagnetic irradiation. A strong effect of the external radiation on the IV-characteristics and voltage-time dependence is demonstrated. Crucial changes are found at the resonance condition when radiation frequency coincides with the Josephson and resonance circuit frequencies. It changes the amplitude dependence of the Shapiro step width. The optimized LC shunt leads to the increased step height for steps on the resonance branch of IV-characteristics at low amplitudes. The shunting of the Josephson junctions provides an extended range using the same microwave source, because Shapiro step demonstrates the first Bessel maximum at a much smaller power of radiation in comparison to the case of unshunted Josephson junctions. These features of Shapiro step on the resonance branch might be interesting for quantum metrology.

Keywords (Index Terms) — Josephson junction, LC shunt, resonance, electromagnetic radiation. IV characteristic, Shapiro step, quantum metrology.