

非正弦电流-相位关系约瑟夫森结动力学行为的分析

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S1 Nb/Al-Al₂O₃/Nb 约瑟夫森结的制备工艺以及扫描电子显微镜观察

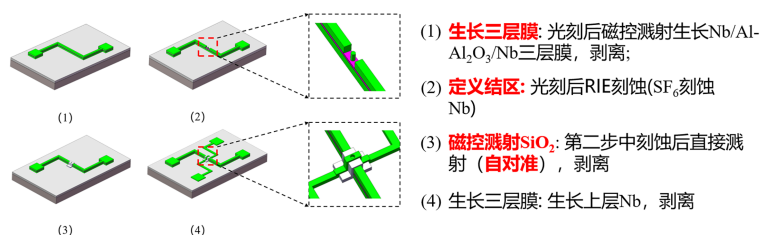


图 S1 Nb/Al-Al₂O₃/Nb 约瑟夫森结制备工艺流程

Fig. S1. Fabrication process flow of the Nb/Al-Al₂O₃/Nb Josephson junction.

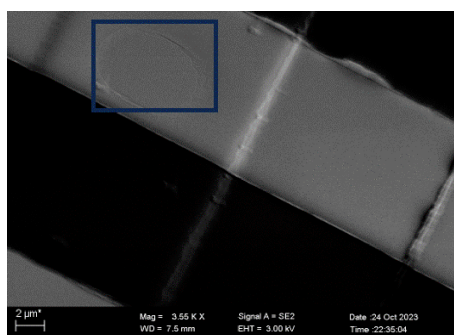


图 S2 Nb/Al-Al₂O₃/Nb 约瑟夫森结 SEM 观察 (蓝色方框内是结区)

Fig. S2. SEM micrograph of the Nb/Al-Al₂O₃/Nb Josephson junction. The junction region is indicated by the blue box.

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S2 ADS 仿真电路图

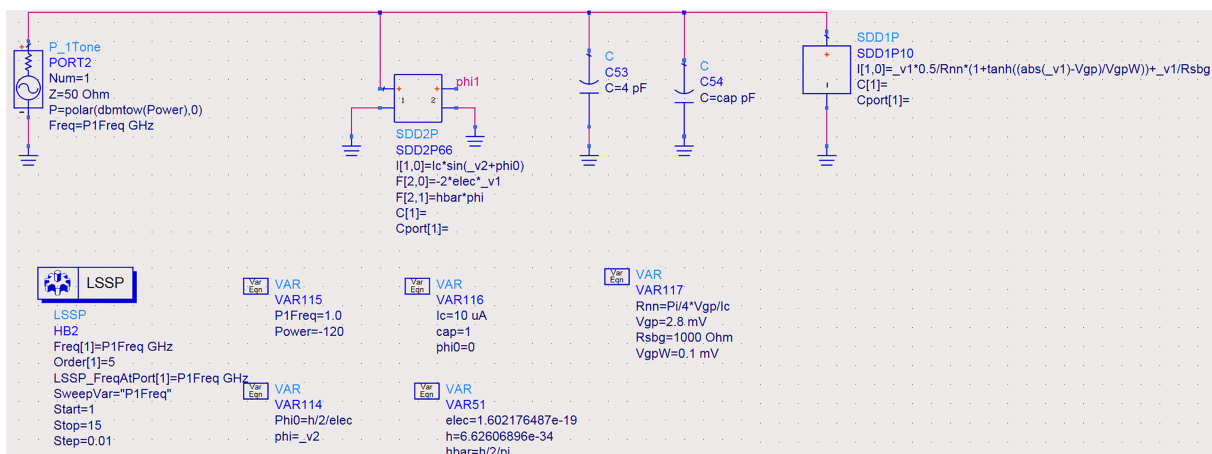


图 S3 正弦型 CPR 约瑟夫森结构建的非线性谐振器仿真

Fig. S3. Simulation of a nonlinear resonator based on a Josephson element with a sinusoidal CPR.

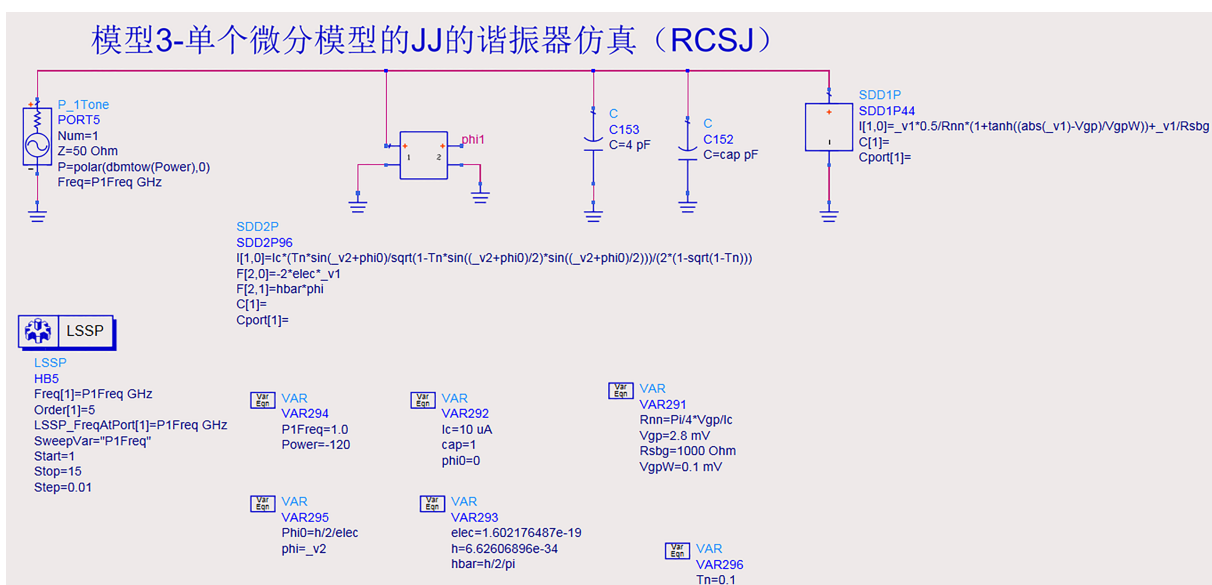
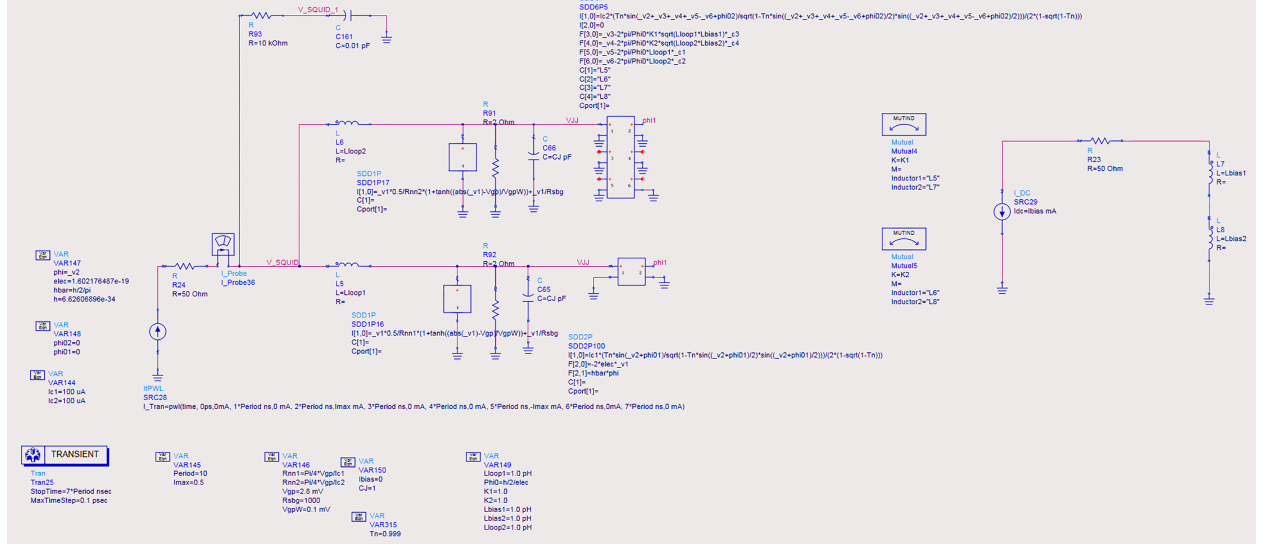


图 S4 非正弦型 CPR 约瑟夫森结构建的非线性谐振器仿真

Fig. S4. Simulation of a Josephson-junction-based nonlinear resonator with a non-sinusoidal CPR.



图S5 基于非正弦 CPR 约瑟夫森结的 DC-SQUID 瞬态仿真电路原理图 (模型遵循 RCSJ 等效电路并考虑回路磁通量子化)

Fig. S5. Transient-simulation circuit schematic of a DC-SQUID based on Josephson junctions with a non-sinusoidal CPR. The model follows the RCSJ equivalent circuit and enforces loop flux quantization.