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Noise Temperature of the Microstrip SQUID Amplifier with Cooling Fins[1] DARIN KINION, LLNL, JOHN CLARKE, UC Berkeley and LBNL — Microwave amplifiers, based on washer-type niobium dc SQUIDs with integrated input coils that act as a microstrip resonator operate at frequencies between 50 MHz and 2 GHz, and in principle are capable of reaching the Standard Quantum Limit (SQL) for linear amplifiers. In practice, heating of the shunt resistors may increase their Johnson noise thereby limiting the ultimate noise temperature before the SQL is reached. To reduce this noise contribution, we measure the noise temperature by cooling the devices to 25-500 mK in a dilution refrigerator, and by attaching large-area cooling fins to the shunts to minimize hot-electron effects. We have previously measured the noise temperature as a function of both frequency and physical temperature. At 800 MHz, the minimum noise temperature was 47 ± 4 mK (within 20% of the SQL) at a physical temperature of 90 mK, with no further improvement upon cooling. This limiting behavior could be an indication of either the SQL or of hot- electron effects in the shunts. We will present results of separate flux-noise measurements at 140 kHz where similar limiting behavior below 100 mK should be caused only by hot- electron effects, thus resolving the ambiguity.

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