The major reason of losing washer-based devices has been traced to too loose overetch design rules in the contact via definition. The random amount of misalignment between the layers then causes occasional shorts. The problem is straighforward to cure. Furthermore, the large number of devices on a wafer guarantees that a sufficient number of functional devices are found regardless of the less-than-expected yield.

The yield of multiloop-based devices was good. As an example, the characterstics and some details of the experimental setup for the 12-subloop un SQUID are shown in Figure 4 and Figure 5.

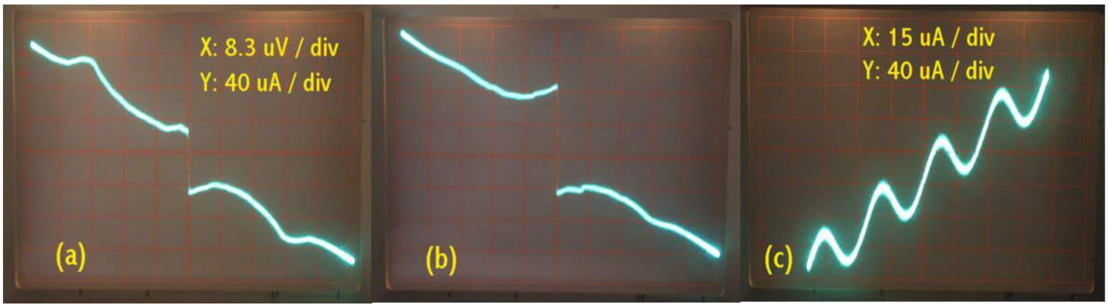

Figure 4: (a) IV characteristics of a un SQUID + external damping circuitry show the negative resistance region, half-integer flux quanta applied. (b) IV characteristics with integer flux quanta. (c) Φ-to-I characteristic show leakage of flux stimulus to the readout amplifier.

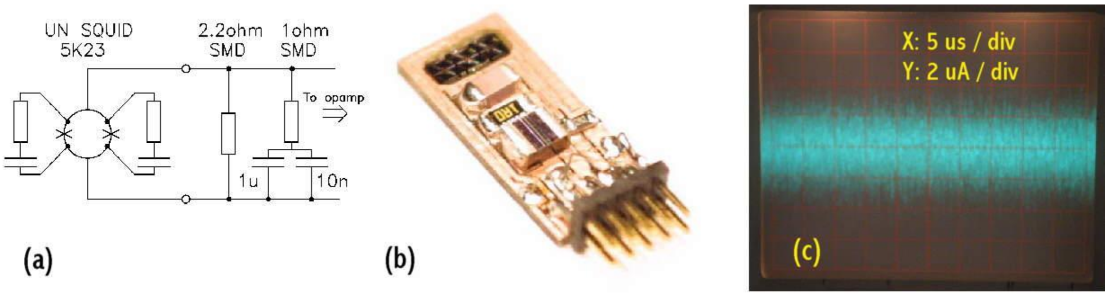

Figure 5: (a) Schematics of the damping circuit for the un SQUID. (b) Photogaraph of the chip carrier with the SQUID chip and SMD components. (c) The time trace of the SQUID current taken in the negative-resistance region indicates stable operation without parasitic oscillation.

3.2 Noise testing at 4.2K

3.2.1 Washer-type ac amplifier

The noise tests have been performed with a washer-type SQUID as a preamplifier (designated as RD-SQUID), coupled to flux-lock electronics with 500 kHz bandwith. The RD SQUID is read out directly with an operational amplifier. The electronic unit has provisions to utilize the Noise Cancellation method [2] which, however, have not been used so far. The SQUID characteristics and readout performance are depicted in Figure 6 and Figure 7.