

**A Liquid-Helium Free Superconducting Electron Cooler at the Storage Ring TARNII, T. TANABE,**

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An electron cooler at TARNII has been operated since 1989 INS. In 1994, the cooler was converted into the second generation cooler: an adiabatically expanded electron beam with a strong normal conducting solenoid up to 5 kG. The device produced an ultracold electron beam of the order of 7 meV after expanding the electron beam by a factor of 14 and high precision experiments on molecular ions have been performed<sup>1</sup>. In order to obtain a further low-temperature electron beam, a superconducting electron cooler with an expansion factor of 100 is now under construction. The gun solenoid is a liquid-helium free refrigerator-cooled NbTi superconducting magnet<sup>2</sup> with 20 cm room temperature bore and can produce a high magnetic field up to 3.5 T. An electron beam is expanded from a diameter of 5 mm to 50 mm in a gradually decreasing solenoid field from 3.5 T to 0.035 T. With this cooler it can be expected to reach an electron temperature of the order of 1 meV, resulting in an extremely fast cooling time and a very cold ion beam.

1 T. Tanabe et al., Phys. Rev. Lett. 75, 1066 (1995).

2 M. Urata et al., IEEE Trans. Appl. Supercon. 5, No. 2, 169 (1995).