

# Superconducting Proximity Effect in Superconductor-Graphene-Superconductor Josephson Junctions

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For the development of superconducting fault current limiter (SFCL), which consists of BSCCO bulk tube, fault current limiting elements made of BSCCO-2223 were fabricated and tested. The SFCL elements were composed of tube shaped Bi-2223 bulks and metal shunts for the stabilizers. Firstly, the Bi-2223 bulk tubes were processed based on the design of monofilar coils in order to acquire the large resistance and high voltage rating. 300 mm Bi-2223 tubes were designed to be the current path of a 410 mm long with 40 turns and 50 mm in diameter. The processed monofilar coil, as designed, had 300 A  $I_c$  at 77 K. In addition, the fabricated superconducting monofilar coils were combined with Cu-Ni for the use of metal shunt as the stabilizers. The Cu-Ni alloys were processed to have the same shape of the superconducting monofilar coils. The Cu-Ni coil had a resistivity of 32  $\mu\Omega$ -cm at 77 K and 37  $\mu\Omega$ -cm at 300 K. The metal shunts were attached to the inside of the Bi-2223 monofilar coil by a soldering technique. After the terminals made of copper were finally completed, the gap between the turns and the outside of the elements were filled with an epoxy and a dense mesh made of FRP. The completed SFCL elements went through the fault tests, and it confirmed that they showed the voltage rating of 160 V<sub>rms</sub> ( $E = 0.4$  Vrms/cm) could be accomplished.

Keywords: BSCCO-2223, Cu-Ni shunt, SFCL, monofilar coil