

A Novel Superconducting Cold-Electron Bolometer for the CMB polarization measurements

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We have tested a novel Superconducting Cold-Electron Bolometer (SCEB) [1] and a parallel/series array of CEBs [2] for measurement of the CMB foreground polarization at 350 GHz by BOOMERANG. We used advantage of the CEB to be fabricated on planar substrate and directly connected to the antenna in the optimal point, where the RF current is greatest. One layout consists of a 4 probes in a circular waveguide fed by a smooth-walled horn [3]. Another layout utilizes 4 ports of a cross-slot antenna with hyperhemispherical Si lens [4]. Both layouts should give polarization sensitivity better than 20 dB needed for foreground observations.

The SCEB is using a superconducting absorber with SIS' tunnel junction for power measurements and Josephson junction for DC and RF contacts. SQUID-geometry is used to suppress supercurrent in SIS' by magnetic field and keep supercurrent of Josephson junction without suppression [1]. An important advantage of this device is that it presents higher output impedance allowing JFET readout. The CEB array is used to split RF power between N parallel CEBs and collect series DC response for matching with JFET.

Bolometers are fabricated by advanced shadow evaporation technique for large area tunnel junctions. The first layer of Al absorber for SIS' junctions has fabricated with partly suppressed superconductivity by oxygen or by additional layer of Ti/Cr. For SIN junctions superconductivity of absorber is fully suppressed. First samples have demonstrated required IV-curve behaviour for Al-AlO_x-Al junctions under magnetic field. The NEP measurements will be reported at the conference.

[1] L.Kuzmin, A Superconducting CEB with SIS' and Josephson Tunnel Junctions, LTD-12, acc. to JLTP,2007.

[2] L.Kuzmin, An Array of CEBs with SIN Tunnel Junctions, EUCAS-07, acc. to JPCS,2007.

[3] P.K.Grimes, O.G.King, G.Yassin, M.E.Jones: *Compact broadband orthomode transducer*, Electron Lett.**43**,1146,2007.

[4] G.Chattopadhyay, J.Zmuidzinas, A Dual-Polarized Slot Antenna, IEEE TRANS ON ANTENNAS&PROPAGATION,**46**,736,1998.