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Electrical characterization of the low background Cu-PEN links of the CUORE experiment

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In the CUORE experiment, under contruction at LNGS (Gran Sasso National Laboratories), Cu-PEN tapes are the first part of the connecting links between the detector and the front-end electronics. The sensors, NTD thermistors held at 10 mK inside the cryostat, are directly bonded to the Cu-PEN tapes. At the other end, the tape plugs into a ZIF connector on a kapton board at the inner thermalization stage. The tapes are about 2 m long, and must guarantee a negligible parasitic conductance between channels, of the order of 10 pA/V. Guards (grounded links) are used to prevent crosstalk between channels on each tape and between neighbouring tapes. Deep electrical characterization on each tape is to be performed, to ascertain that they comply with the requirements of the experiment. The characterization method is presented here. The first part is based on the time domain reflectometry (TDR) technique, to check the integrity of the electrical link without touching the pad end of the tape, to avoid any possible damage to the bonding pads. The second part of the characterization is focused on the parasitic impedance between links. For this characterization, a commercial electrometer is used; custom boards, with remote control capability, were built and used in order to be able to check the links in a vacuum, and reach sensitivities of the order of 1 pA/V and below.

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