KET 02: An electron and ion telescope for an interstellar mission

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The recent AMS 02 measurements show that the very local interstellar spectra (VLIS) for galactic cosmic rays cannot be directly measured at the Earth below rigidities of 40-60 GV because of solar modulation. With Voyager 1 and Voyager II crossing the heliopause in 2012 and 2018, in situ experimental LIS data below 100 MeV/nuc constrain computed galactic CR spectra. However, the energy spectra in between can so far only be derived by models. This gap could be narrowed by flying an instrument like the The COsmic and Solar Particle INvestigation Kiel Electron Telescope (COSPIN/KET) that measured protons and alpha-particles in the energy range from about 4 to above 2000 MeV/n and electrons in the range up to 10 GeV in distinguished energy channels. Such a telescope would consist of two parts: 1) an entrance telescope of two semiconductors comprising a silica-aerogel Cherenkov detector with a refractive index of 1.066, selecting particles with speeds $v/c = b > 0.938$, and 2) a calorimeter, a lead-fluoride Cherenkov detector followed by a scintillation detector measuring escaping particles.