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Photo desorption studies on the FCC-hh Beam Screen at the KIT Electron Storage Ring KARA

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In the framework of the EuroCirCol(*) collaboration (work package 4 "Cryogenic Beam Vacuum System"), the fabrication of 3 FCC-hh beam-screen (BS) prototypes has been carried out, with the aim of testing them at room temperature on the KARA (previously known as ANKA) 2.5 GeV light source at Karlsruhe Institute of Technology. The 3 BS prototypes are going to be tested one after the other on a dipole radiation beamline which has been set-up by the collaboration. The name of the installation is BEam Screen TEstbench EXperiment (BESTEX). KARA has been chosen because its synchrotron radiation (SR) spectrum , photon flux, and power, match the one foreseen for the 50+50 TeV FCC-hh proton collider, of which the design study is due in 2019. Each of the 3 BS prototypes, 2 meter in length, implements a different design feature, namely: 1) baseline design (BD), with electro-deposited copper and no electron-cloud (EC) mitigation features; 2) BD with set of distributed cold-sprayed anti-EC clearing electrodes; 3) BD with laser-ablated anti-EC surface texturing. BESTEX is equipped with horizontal and vertical collimators, in order to direct the impinging SR photon fan onto different parts of the BS surfaces. The BS under test can be pivoted about a vertical axis so as to be able to irradiate alternatively the two sides of it, if necessary. A water-cooled photon absorber is placed at the exit of the 2m-long BS. The absorber is equipped with an insulated electrode which can be biased with a voltage so as to collect, or repel, the photo-electrons coming from the far end of the BS or generated on the photon absorber itself. Vacuum gauges are installed on the system upstream, downstream and in the middle of the BS under test. A residual-gas analyzer is also installed in the middle position. This paper will report on the status of BESTEX, the results obtained so far, and the comparison with extensive montecarlo simulations of the expected outgassing behavior under synchrotron radiation.

Primary author: Dr GONZALEZ GOMEZ, Luis Antonio (INFN e Laboratori Nazionali di Frascati (IT))

Co-authors: Mr GIL COSTA, Miguel (Centro de Investigaciones Energéti cas Medioambientales y Tecno); BELLAFONT, Ignasi; BAGLIN, Vincent (CERN); Dr CASALBUONI, Sara (IBPT-KIT); CHIGGIATO, Paolo (CERN); GARION, Cedric (CERN); HUTTEL, Erhard; KERSEVAN, Roberto (CERN); PEREZ, Francis (ALBA Synchrotron - CELLS)

Presenter: Dr GONZALEZ GOMEZ, Luis Antonio (INFN e Laboratori Nazionali di Frascati (IT))

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