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R and PY from candidate materials for the FCC-hh Vacuum system.

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In recent and future high performance energy colliders, the knowledge of many physical properties of the materials walls to be used is an essential prerequisite. Among others, it is necessary to study materials behaviour after exposure to the synchrotron radiation (SR) produced by the circulating particles. Such SR interacts with the machine vacuum walls and may produce photoelectrons, induce heat load, vacuum and beam instability. Actually, photon Reflectivity (R), Photo Yield (PY i.e. the number of photoelectrons produced per incident photon) and their geometrical distribution, are essential ingredients to simulation codes. Moreover, such parameters must be studied not only on realistic "technical materials", but also in conditions as close as possible to the operative ones. This implying a significant effort to study such properties at the very grazing angle of incidence (as low as 0.08°) at which such interaction occurs in real machines.
Here we present some results of an experimental campaign, carried out at the Optics Beamline of BESSY-II combined to the available versatile Reflectometer end station. This experimental set up, designed to investigate by "at wavelength" metrology quasi-perfect optical elements, is an ideal tool to perform Photon Reflectivity and Photo Yield studies of technical materials of interest for some present and future accelerators at very grazing incidence angles and in the 35 –1850 eV energy range. This photon energy range is only partially covering the one emitted by FCC-hh, whose SR spectrum has a critical energy of ˜4.5 keV. Nevertheless, since most of the expected phenomena related to SR are generally induced by low up to soft X-ray photons, this study cover a valuable part of it. As will be discussed in the following, surface coatings, roughness, nano-, micro- or macro- modification of a Cu surface are shown to significantly influence the parameters under study.

Primary authors: CIMINO, Roberto (LNF-INFN); LA FRANCESCA, Eliana (LNF-INFN Frascati (Rome) , Italy); ANGELUCCI, Marco; LIEDL, Andrea (Istituto Nazionale Fisica Nucleare Frascati (IT)); GONZALEZ GOMEZ, Luis Antonio (INFN e Laboratori Nazionali di Frascati (IT)); BELLAFONT, Ignasi; SIEWERT, Frank (Helmholtz Zentrum Berlin (DE)); SERTSU, Mewael (Helmholtz Zentrum Berlin (DE)); SOKOLOV, Andrey (Helmholtz Zentrum Berlin (DE)); SCHÄFERS, Franz (Helmholtz Zentrum Berlin (DE))

Presenter: CIMINO, Roberto (LNF-INFN)

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