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Performance characterisation at Daresbury Laboratory of CsTe photocathodes grown at CERN

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A UK X-FEL will require a high-performance photocathode to generate an electron beam with the necessary qualities. Caesium Telluride is a candidate material for this photocathode application.

The surface characteristics of a photocathode affect many important factors of the photoemission process including the photoemission threshold, the intrinsic emittance and the quantum efficiency. These factors in turn define and limit the achievable electron beam quality which is measurable using figures of merit like beam emittance, beam brightness and energy spread.

We present chemical analysis and photoemission performance measurements for caesium telluride photocathodes synthesized at CERN. The photocathodes were transported under ultra-high vacuum (UHV) and analysed at the STFC Daresbury Laboratory using ASTeC's Multiprobe (SAPI)*for surface characterisation via XPS and STM, and the unique Transverse Energy Spread Spectrometer (TESS)** for Mean Transverse Energy (MTE) measurements. The MTE measurements were made at both room and cryogenic temperatures. We discuss the evident correlations between the measured surface characteristics and the MTE values under a range of photocathode illumination wavelengths.

- B.L. Militsyn, 4-th EuCARD2 WP12.5 meeting, Warsaw, 14-15 March 2017

** L.B. Jones et al., Proc. FEL '13, TUPPS033, 290-293; https://accelconf.web.cern.ch/FEL2013/papers/tupso33.pdf

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