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Cathode response time measurements in a high gradient photo injector

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Photoinjectors are the primary choice for high-brightness electron beam sources today. A key element of these is the photocathode. In applications that require high average currents, semiconductor photocathodes are usually used due to their high quantum efficiency. Contrary to metal cathodes, electrons are not just extracted from the surface of a semiconductor but photons of the photocathode laser can penetrate up to several nanometers into the cathode material. On their way to the surface, these electrons can be scattered of phonons and thereby vary the path length they travel until they are emitted. These effects lead to a net delay and a lengthening of the extracted bunch w.r.t. the photocathode laser pulse. We present here first measurements of the cathode time response for Cs2Te cathodes, confirming previous theoretical models and enabling further studies of photocathode properties.

Primary authors: LOISCH, Gregor (DESY Zeuthen); Mr QIAN, Houjun (DESY); CHEN, Ye (DESY HH)

Presenter: LOISCH, Gregor (DESY Zeuthen)

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