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## Measurements of Quantum Efficiency and Sensitivity to Magnetic Fields of the MaPMTs R13743 and R13742

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The performance of the photon detectors in the upgraded LHCb RICH counters will be critical to the charged particle identification efficiency and to the physics goals of the LHCb experiment. Quantum Efficiency (QE) and the closely related the Photon Detection Efficiency (PDE) are the most important properties for single photon counting detectors. In vacuum photon tubes, the PDE generally is reduced by external magnetic fields, either by a reduction of the intrinsic gain or by an increased probability of the photoelectron not arriving at the first dynode. Local shielding can recover parts of the losses introduced by magnetic fields. We report on measurements of the Quantum Efficiency in the wavelength range of 200 to 800 nm of the 64-channel MaPMTs for the upgraded LHCb RICH detectors: the 2-inch R13743 and the 1-inch R13742. We also present the relative PDE with respect to no magnetic field in external longitudinal and transverse magnetic fields up to 30 Gauss. To reduce this loss of efficiency, magnetic shielding will be required. An unconventional space-saving layout of a magnetic shield was designed and the relative PDE was measured with these shields. Simulations of the properties of this layout were found to be in agreement with measurements.

### Registered

Yes

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