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Assessment performance of newly installed Basler Optical diagnostic digital system against the standard BTV system at CLEAR for future LHC upgrades.

In this work, the new digital system installed at CLEAR was analyzed. To measure its efficiency, beam Emittance and Twiss parameters were tested by comparing the results of the Basler digital camera with the results of the traditional BTV system. The new digital system presented better results regarding the quality and resolution of the beam images obtained. In addition, this digital system presented a smaller standard error of the mean beam size, which led to a lower final error of the emittance and Twiss parameters. Besides, Monte Carlos was used to propagate errors. In general, these results appear to be in agreement with the BTV camera, especially in current ranges near and equidistant to the minimum point of the parabola obtained after the Quadrupole Scan. In the horizontal plane, beam size values for current ranges far from the minimum point tend to create slightly different parabolas in both cameras, which leads to different results. In the vertical plane, this issue was not observed. In the horizontal plane, a normalized emittance of 17.163 ± 0.14 mm.mrad and 13.91 ± 0.18 mm.mrad and in the vertical plane were obtained for the Basler camera. On the other hand, a normalized emittance of 17.167 ± 0.12 mm.mrad in the horizontal plane and 13.84 ± 0.077 mm.mrad in the vertical plane for the BTV camera were obtained. All these calculation were done with an energy of 200 MeV.

Primary author: COCHA TOAPAXI, Carlos Eduardo

Presenter: COCHA TOAPAXI, Carlos Eduardo

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