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Fibre Bragg Grating (FBG) sensors as flatness and mechanical stretching sensors

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Fibre Bragg Grating (FBG) sensors have been so far mainly used in high energy physics as high precision positioning and re-positioning sensor and as low cost, easy to mount and low space consuming temperature sensors. FBGs are also commonly used for very precise strain measurements. In this work we present a novel use of FBGs as flatness and mechanical tensioning sensors applied to the wide GEM foils of the GE1/1 chambers of the CMS experiment at LHC. The GE1/1 CMS upgrade consists of 144 GEM chambers of about 0.5 m^2 active area each and based on the triple GEMs technology, to be installed in the very forward region of the CMS endcap. The large active area of each GE1/1 chamber consists of a single GEM foil (the GE1/1 chambers represent the largest GEM foils assembled and operated so far) to be mechanically stretched in order to secure its flatness and the consequent uniform performance of the GE1/1 chamber across its whole active surface. A network of FBG sensors has been used to determine the optimal mechanical tension applied and to characterise the mechanical stress applied to the foils. The results of the test done on a full size GE1/1 final prototype and possible future developments will be discussed.

Primary author: BENUSSI, Luigi (LNF)

Presenter: BENUSSI, Luigi (LNF)

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