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[B11] ATLAS ITk strip sensor quality assurance tests and results of ATLAS18 pre-production sensors

Tuesday, 25 October 2022 10:00 (15 minutes)

Towards the high luminosity (HL) operation of the Large Hadron Collider (LHC), the inner detector of the ATLAS detector is replaced by a fully silicon-based inner tracker (ITk). Its outer parts consist of 22,000 n^+-in-p type silicon strip sensors. In order to confirm key properties of the production sensors as well as to establish a flow to perform inspection and monitoring of the basic sensor properties, about 5\% of the total strip sensors were produced in 2020.

In this presentation, outcomes from quality assurance (QA), detailed characterisation for the pre-production key device parameters before and after irradiation, are discussed, focusing mainly on charge collection, I-V and C-V characteristics. The irradiation to QA test pieces was performed with proton, neutron or gamma-ray beams up to 1.6×10^{15} $n_{\mathrm{eq}}/\mathrm{cm}^2$ or 0.66 MGy, which are equivalent to 1.5 times the total expected radiation fluences at the HL-LHC operation. Overall, good performance was confirmed. Besides, the results from the 154 QA test pieces allowed us to confirm that variations in the performance with the same condition of irradiation are small. Through experiences from the pre-production, more detailed understanding of post-irradiated ITk strip sensors as well as procedures of irradiation and post-irradiation testing was acquired based on enough statistics, which gave us full confident to initiate the main production project over 3.8 years.

contact person e-mail

shigeki.hirose@cern.ch

Primary author: HIROSE, Shigeki (University of Tsukuba (JP))

Co-authors: HUNTER, Amelia (University of Birmingham (GB)); CHISHOLM, Andrew Stephen (University of Birmingham (GB)); BHARDWAJ, Avani (University of Toronto (CA)); CRICK, Benjamin Matthew (University of Toronto (CA)); CIUNGU, Bianca Monica (University of Toronto (CA)); Dr FLETA, Celeste (Instituto de Micro-electrónica de Barcelona, Centro Nacional de Microelectrónica (ES)); BACH MARQUÈS, Eric (Consejo Superior de Investigaciones Científicas (CSIC) (ES)); MANDIC, Igor (Jozef Stefan Institute (SI)); KOPSALIS, Ioannis (University of Birmingham (GB)); FERNANDEZ-TEJERO, Javier (Simon Fraser University (CA)); KROLL, Jiri (Czech Academy of Sciences (CZ)); KVASNICKA, Jiri (Czech Academy of Sciences (CZ)); LOMAS, Josh (University of Birmingham (GB)); HARA, Kazuhiko (University of Tsukuba (JP)); NAKAMURA, Koji (High Energy Accelerator Research Organization (JP)); SAITO, Kota (University of Tsukuba (JP)); GONELLA, Laura (University of Birmingham (UK)); MIKESTIKOVA, Marcela (Czech Academy of Sciences (CZ)); BASSO, Matthew (University of Toronto (CA)); ULLAN, Miguel (CNM-Barcelona (ES)); ALLPORT, Philip Patrick (University of Birmingham (UK)); ORR, Robert (University of Toronto (CA)); ISHII, Tatsuya (High Energy Accelerator Research Organization (JP)); KNIGHT, Timothy Michael (University of Toronto (CA)); LATONOVA, Vera (Czech Academy of Sciences (CZ)); CINDRO, Vladimir (Jozef Stefan Institute (SI)); GEORGE, William Frederick (University of Birmingham (GB)); UNNO, Yoshinobu (High Energy Accelerator Research Organization (JP))

Presenter: HIROSE, Shigeki (University of Tsukuba (JP))

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