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High rate capability and radiation tolerance of the new CMS pixel detector readout chip PROC600

The first layer of the CMS Phase I pixel detector will be placed at a distance of 3cm from the interaction point. At the instantaneous luminosity of $2 \times 10^{34} \text{ cm}^{-2}\text{s}^{-1}$ foreseen for the LHC operation in 2017-25, the pixel hit rate at this layer is expected to be as high as 600MHz/cm². A new readout chip, called PROC600, to be used for Layer 1 modules has been design at PSI. The pixel hit efficiency of the chip is above 99% at the rate of 600MH/cm². The properties and high rate capability of PROC600 will be discussed. The CMS Phase I pixel detector is expected to be in operation untill 2024/25. The total flux seen by the first layer will reach $2\text{-}3 \times 10^{15} \text{ neq/cm}^2$ which corresponds to 80-120MRad. To justify a robust and efficient operation of PROC600 it has been irradiated to a several doses up to 480MRad. The chip performance after irradiation including pixel hit efficiency will be presented.

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