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Commissioning of the Waveform-Sampling Scintillator Readout for the Belle II KLM Detector

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Commissioning of readout electronics for the Belle II K-Long and Muon (KLM) detector is discussed. Belle II is located at the interaction point of the SuperKEKB particle collider in Tsukuba, Japan. The KLM subdetector, formerly made solely from resistive-plate counters, has been partially upgraded with polyvinyltoluene scintillating bars, each covered in a TiO_2 reflective coating, embedded with a wavelength-shifting fiber, and instrumented with a Hamamatsu silicon photo multiplier (SiPM). The SiPM signals are read out by a giga-sample per second waveform-sampling ASIC with 16 μs of analog storage, the TARGETX. Each ASIC reads out 15 channels, and groups of 10 ASICs are controlled by a Spartan-6 FPGA. Challenges faced while commissioning the scintillator readout electronics are highlighted, including calibration of all $\sim$20k channels, TARGETX calibration, operation at a mean trigger rate of 30 kHz, and development of firmware with full-waveform readout and feature extraction.

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