

Results from the CBC3.1 readout ASIC for CMS 2S-modules

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The CBC3.1 is the final version of the CMS Binary Chip for readout of the outer radial region of the upgraded CMS Tracker at the High Luminosity LHC. The development began a decade ago.

The 254-channel, 130 nm CMOS ASIC is designed to be bump-bonded to a hybrid substrate to which sensors will be wire-bonded. It will instrument double-layer 2S-modules, containing two overlaid silicon microstrip sensors, aligned with a parallel orientation. On-chip logic identifies Level-1 trigger primitives from high transverse-momentum tracks by selecting correlated clusters in the two sensors.

The CBC3.1 was delivered in September 2018, and ~6000 chips from 13 wafers have been studied in detail using an automatic wafer probing setup. A high yield of good chips was observed but also patterns possibly characteristic of manufacturing variations, similar to some which had been noticed following manufacture of other chips in the same process. The process has since been optimised and 48 further wafers are expected imminently which will allow evaluation of production yields.

As the tracker will be operated at very low temperatures, of -20°C to -30°C , other measurements have been carried out to evaluate the CBC performance under expected operating conditions. Prototype modules are now being assembled and studied so that construction of the new tracker can begin in 2020.

The main features of the measured CBC3.1 performance will be summarised and detailed results from recent studies will be reported.

Submission declaration

Original and unpublished

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