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Commissioning and noise study of the ultra-thin chip-on-board PCB for the CALICE SiW-ECAL prototype

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Most future high energy e^+e^- colliders proposals consider using high granular calorimeters in their detectors concepts. One of such high granular calorimeters proposals silicon-tungsten electromagnetic calorimeter (SiW-ECAL) designed and constructed by the CALICE Collaboration. Its key features are: unprecedented high granularity and compactness featuring very low power consumption. This contribution reports on the development of an alternative for the basic unit of detection (Active Signal Unit) of the SiW-ECAL. This alternative consists of an ultra-thin PCB called Chip-on-Board (COB) which is equipped with wirebonded ASICs and pixelated silicon wafers. These COB boards feature an unprecedented low thickness of 1.2\,mm considering the internal complexity of the boards which allows a more compact design of the full calorimeter. This is to be compared with the 3-3.5 mm of the default solution variant using ASICs in BGA packaging. The design, production, equipment and a detailed study of the performance and noise response of such boards in beam tests (DESY, CERN) is reported in this contribution and compared with other PCB designs with less aggressive thickness requirements.

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