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Lecture: Interconnects and Assembly Technologies for Hybrid Pixel Detectors

Tuesday, 9 February 2021 13:00 (45 minutes)

Hybrid pixel detector modules are the basic building blocks of vertex detectors in HEP as well as solid state detector cameras for x-ray imaging. A pixelated sensor chip, made of silicon or III/V semiconductor, is connected to one or more electronic readout chips by thousands of electrically conductive interconnect structures.

The talk will give an overview of different types of interconnection and assembly technologies and their specific potential. Solder bump bonding, transient liquid phase bonding, metal-metal direct bonding and metal-oxide hybrid bonding are assembly technologies that will be described in this talk. In addition, the required number of modules is important for the definition of an appropriate assembly technique. The described technologies cover the range from single chip bumping for prototyping up to 300mm wafer bumping for future detector upgrades.

Beside the overview of common and advanced assembly technologies some examples of more complex electronic packaging approaches will be described more in detail. This part will include the 3D packaging technology of electronic readout chips with through silicon vias (TSV). Assembly and test results of hybrid pixel detector modules using TSV readout chips will be shown.

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