

Advanced Electronic Packaging Technologies for Hybrid Detectors

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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 introduction in the interconnection and assembly technologies and their specific requirements. The latest results of solder bump bonded hybrid modules for future HEP detector upgrades will be presented. Furthermore, we will give an overview of alternative bonding technologies, i.e. transient liquid phase bonding, metal-metal direct bonding and metal-oxide hybrid bonding. These technologies can be used for chip to wafer as well as wafer to wafer bonding approaches. Beside the overview of common and advanced assembly technologies, some examples of more complex electronic packaging concepts 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 presented in this talk.

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