

Integration of hybrid pixel detectors at VTT

S. Vähänen, S. Eränen, J. Kalliopuska and J. Salonen
VTT Technical Research Centre of Finland, 02150 Espoo, Finland
E-mail: Sami.Vahanen@VTT.fi

Since the late 1980's, VTT has done R&D for radiation sensors for various applications. The activities started with strip detectors and gradually the technology focus has shifted towards pixel detectors. In addition, detectors for numerous instruments and experiments have been fabricated over the years. Today, edgeless pixel detectors have the highest prospects due to their small footprint and ability to sort out yield and cost issues related to large-area detector arrays.

The emergence of pixel detectors brought major challenges to micro-packaging technology as the detectors were highly segmented and the required interconnects were small and even today the same challenges exist. A solder bump-based flip chip technology was applied on pixel detectors in 2000 and since then VTT has been a partner in various projects and experiments where flip chip hybridization of detectors has been needed. During the last 5 years Through Silicon Vias (TSV) have gained a lot of attention within the electronics packaging industry and the technology development has also been done within the high-energy physics community. TSVs are very attractive to be used in pixel detectors as they are a tool to solve the paramount problem related to building large detector arrays out of single detectors with minimal gaps. This is because the readout chip with TSVs – edgeless detector assembly has a significantly smaller footprint and a higher pixel fill factor than in the current detectors. This presentation gives a history of sensor development and micro-packaging at VTT, focuses on the present day status, and gives an outlook for the technology.