

## Embedded pitch adapters: a high-yield interconnection solution for strip sensors

*Saturday 26 September 2015 19:19 (1 minute)*

The interconnection of sensors and readout electronics is a subject of critical importance in the module design for High Energy Physics experiments, such as ATLAS. The sensors are made progressively larger, and the readout electronics smaller, and both contain increasingly more channels. The actual realization of the electrical connection between channels is not trivial and it becomes a yield issue when the experiment contains tens or hundreds of millions of strip channels. The question is not anymore if the bonding can be done, but if it can be done reliably enough to build a whole tracker in the required production time. A proposal to fabricate large area strip sensors with integrated, or embedded, pitch adapters is presented for the End-Cap part of the Inner Tracker in the ATLAS experiment. To implement the embedded pitch adapters, a second metal layer is used in the sensor fabrication, for signal routing to the ASICs.

Sensors with different types of embedded pitch adapters have been already fabricated in order to optimize the design and technology. Considerations on signal noise, pick-up, cross-talk, efficiency loss, and also on sensor yield reduction and technological limitations have been taken into account in the design and technology development, and will be discussed.

Interstrip capacitance tests taking into account all channel neighbors will be shown which reveal the important differences between the various designs considered. Noise figures obtained in full assembled modules will be correlated with these interstrip capacitance tests, showing that the tests performed on the bare sensors are a valid tool to estimate the final noise in the full module. The full modules have been taken to beam test in order to examine the incidence of cross-talk, pick-up, and signal loss. The detailed analysis will expose the performance difference between the different designs and the influence of technological factors such as second-metal track width or inter-metal oxide thickness. Finally, first results on irradiated sensors will be shown.

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**Session Classification:** After dinner POSTER session, with drinks: (All presenters are requested/encouraged to attend their posters; All participants are requested to participate the session, with drinks!)

**Track Classification:** Strips