

Subject: FCFD-32 channels, TIC recommendation

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Dear Colleagues,

this e-mail is to formulate a TIC recommendation based on the report presented at the May 11th TIC meeting by Sergey Los and the related discussion with the contribution of Artur Apresyan and the TIC members. The report and discussion are complemented by the extended documentation posted in the TIC meeting Indico agenda.

The FEE ASIC FCFD is designed to serve the ePIC barrel TOF subsystem.

The preliminary conceptual design assumed in the early stages for the barrel TOF detector was based on a hypothetical 128-channel dual-sided ASIC. The ASIC design progressed with the clear target to serve the barrel TOF subsystem. In this process potential critical aspects of the initial conceptual design have been analyzed and addressed. This resulted is the proposal of a new architecture based on a smaller single-side ASIC, namely the 32-channel FCFD. This design offers several superior technical characteristics, the most relevant being:

- Use direct wire-bonding between sensor and ASIC;
- Implement stand-alone modules as the fundamental unit;
- Simple modules offering easy access for testing;
- Easy aGND/dGND separation;
- Plenty of real estate for i/o and power.

This approach reduces the risk because a higher production yields is expected for chips which are substantially smaller than the 128-channel ones. Also the development of ASICs with reduced complexity can progress faster and can require less iterations during the development. No relevant cost impact is expected: in fact, the moderate increase due to wafer dicing is compensated by the smaller number of wafers, which decreases thanks to the increased yield, and by the easier bonding.

The 32-channel FCFD design is fully compatible with the principle design of the barrel TOF. Each 128-channel AC-LGAD strip sensor will be served by four FEE ASICs. The ASIC size guaranties to preserve the sensor pitch, while providing also the space needed for signal routing and for bonding.

No concern by the barrel TOF group or by the TIC members emerged during the discussion.

On the basis of report, documentation and discussion at the May 11th TIC meeting, the 32-channel FCFD option for equipping the barrel TOF is recommended by the TIC.

Best greetings, Silvia

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