Pixel tracker update

1. Vertex improvements after GSI data taking
2. Inner Tracker (IT) status
3. Conclusions

Vertex improvements after GSI data taking

Two main problems in the April GSI Data Taking Vertex readout:

- Wrong FPGA internal firmware trigger delay

  The delay was the one foreseen for the M26 sensor used in FIRST. The size was about half and so was the integration time (one frame readout time). The Delay was set in number of frames! Tested at the **BTF in june** using an external time unit.

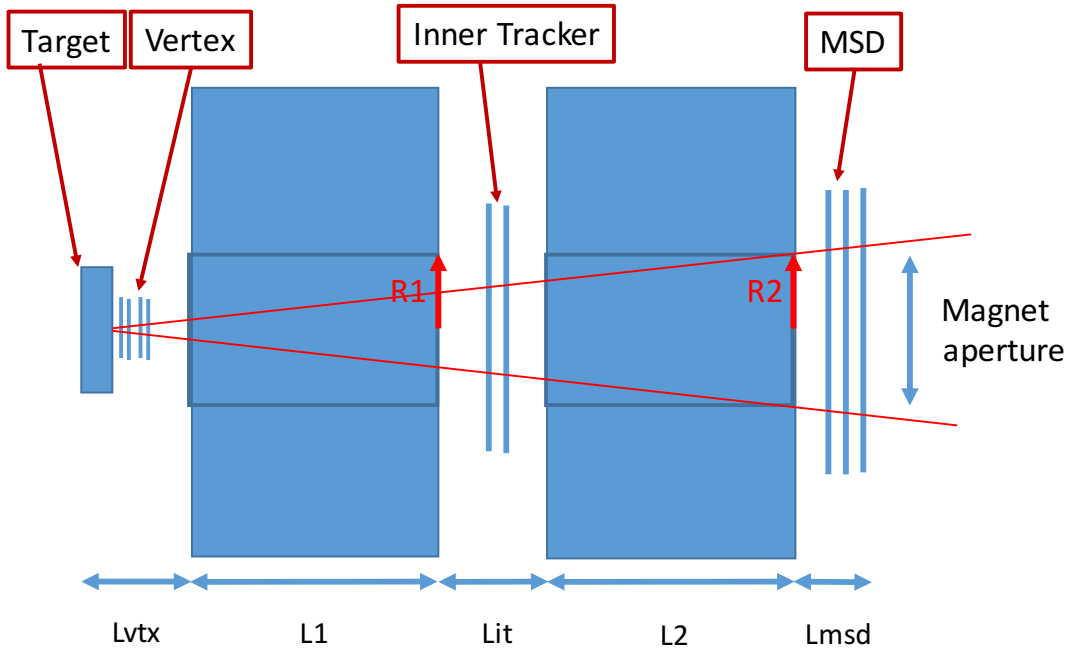
  Firmware modified accordingly.

- Data from one sensor arrives form two serial line, 16 MSBs from one and 16 LSBs from the second. They are desrialized in the FPGA and assembled in one word by the readout code running in the ARM linux CPU (in the FPGA) code. A bug, writing zero instead the real data in some special situations has been removed.

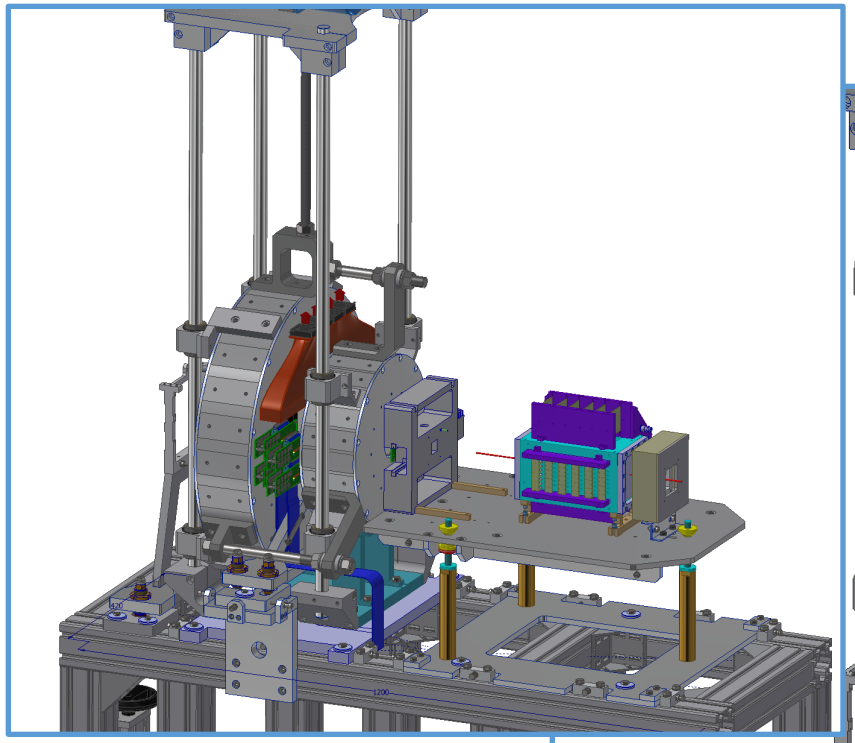
Those two problems produced a strong reduction of efficiency down to about 25%!!!!!!

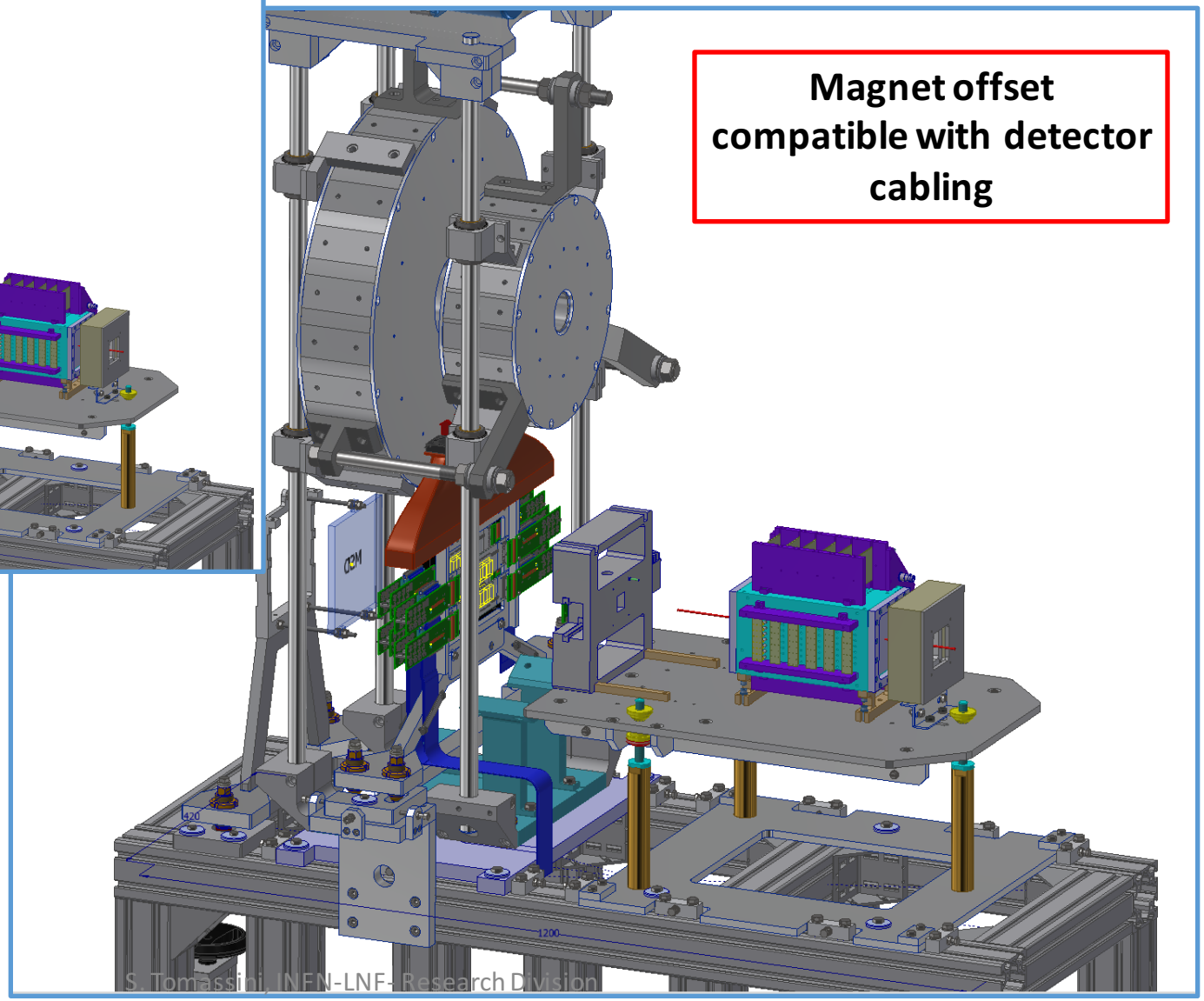
Magnetic system

					Radianti	Gradi
Lvtx	3,00		0,179	Accettanza M1 (gradi)	0,177	10,12
L1	11,00		0,177	Accettanza M2 (gradi)	0,175	10,02
Lit	5,00		0,171	Accettanza MSD (gradi)	0,169	9,70
L2	11,00		0,171	Accettanza IT1 (gradi)		
Lmsd	1,00			Accettanza IT2 (gradi)		
Rin1	2,50					
Rin2	5,30					
Dmsd	9,00					
ITdist	1,00					

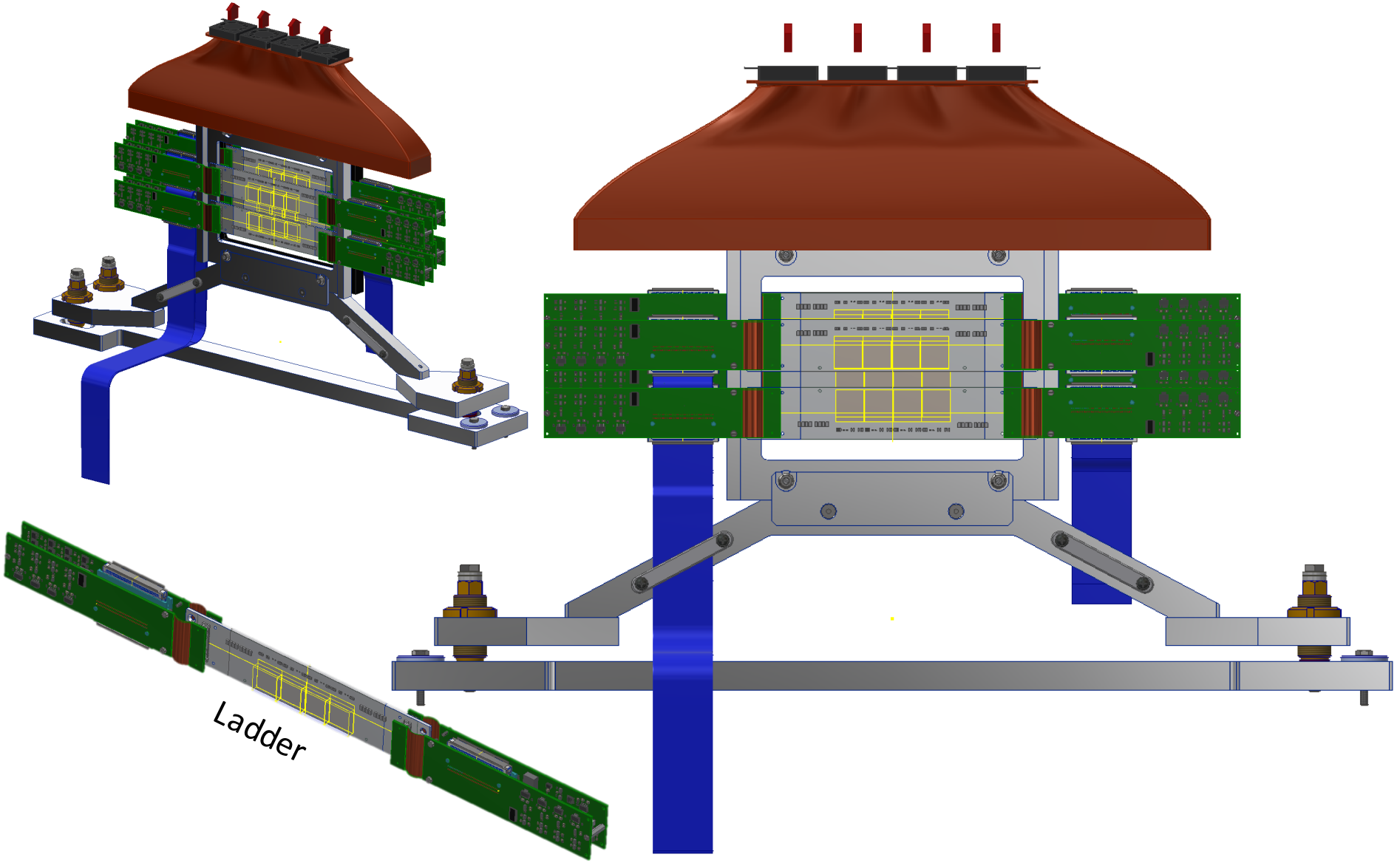


Calibration with straight tracks



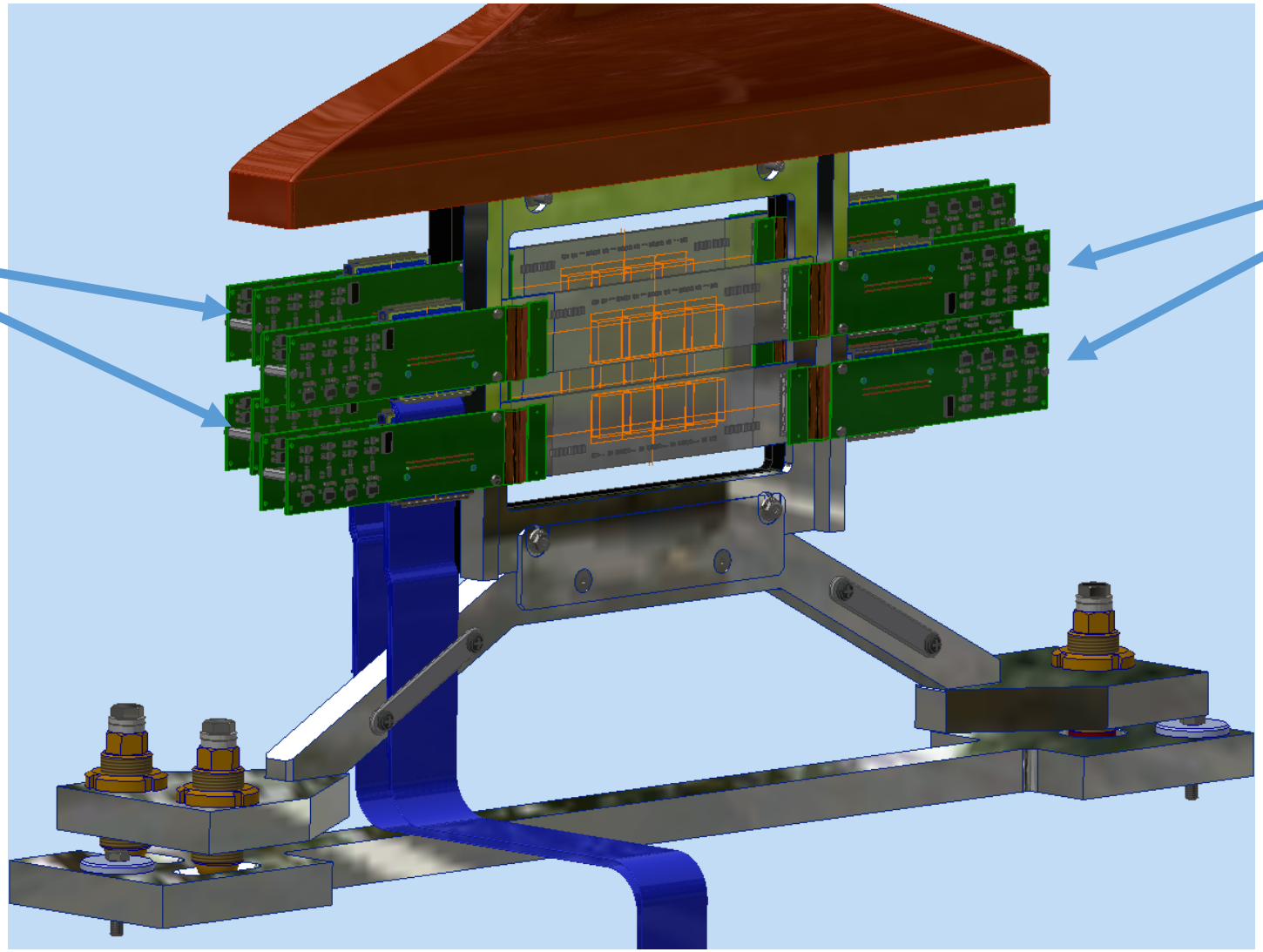


IT 1/2



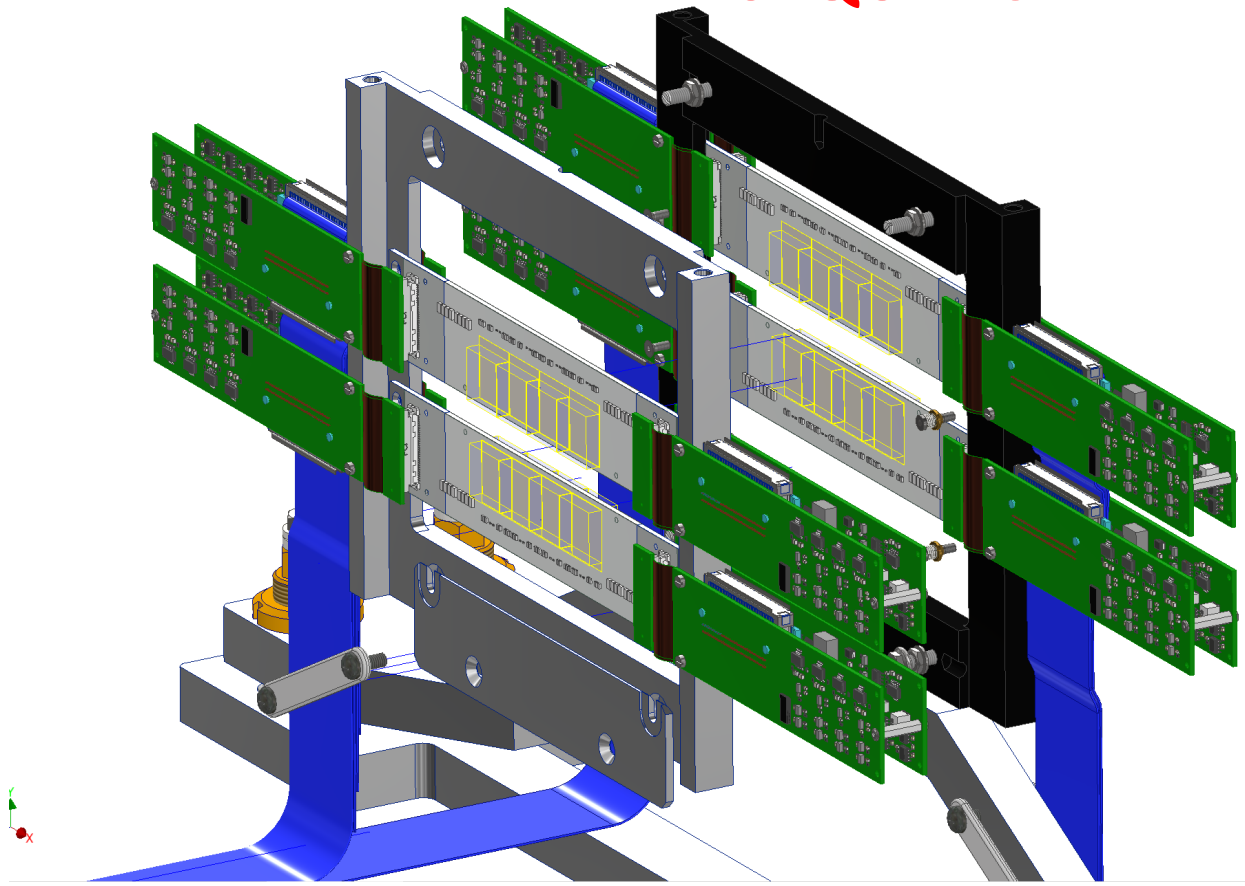
Inner Tracker (IT) status

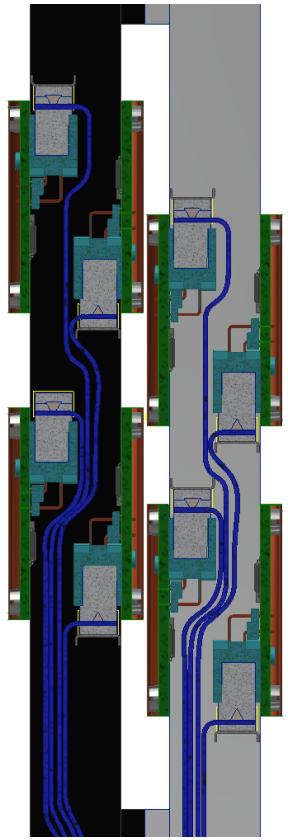
Two back ladders: one PlumeM28 + four Adapter_PlumeM28 each

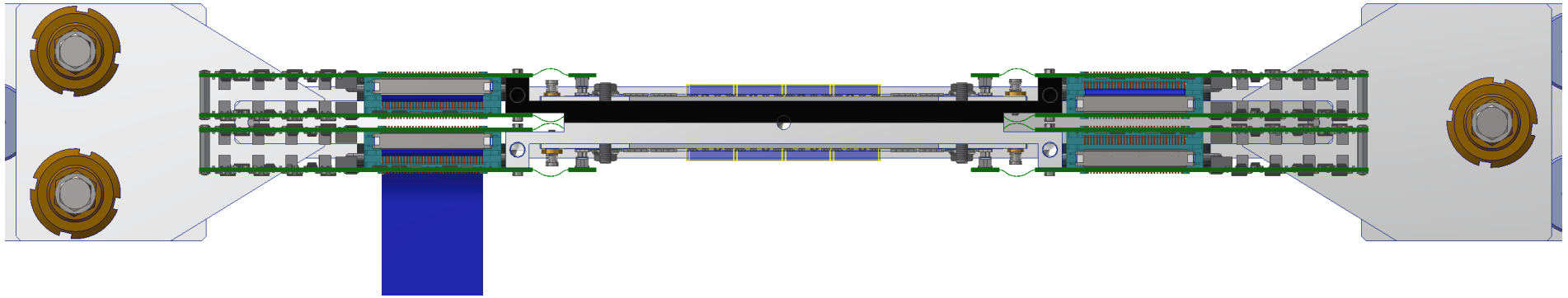


Two front ladders: one PlumeM28 + four Adapter_PlumeM28 each

IT INTEGRATION SEQUENCE







Inner Tracker (IT) list of needed components

Overall for the IT we need 3 different PCBs:

- **PlumeM28** (kapton PCB) to hold the sensors

  1 PlumeM28 holds 4 sensors and is definde a **module**. Two glued modules assembled with a RVC (**R**esistive **V**itreous **C**arbon foam) spacer thick 2mm forms a **Ladder**.
  The Inner Tracker is composed by 4 Ladders covering (acceptance) about 8x8 cm.

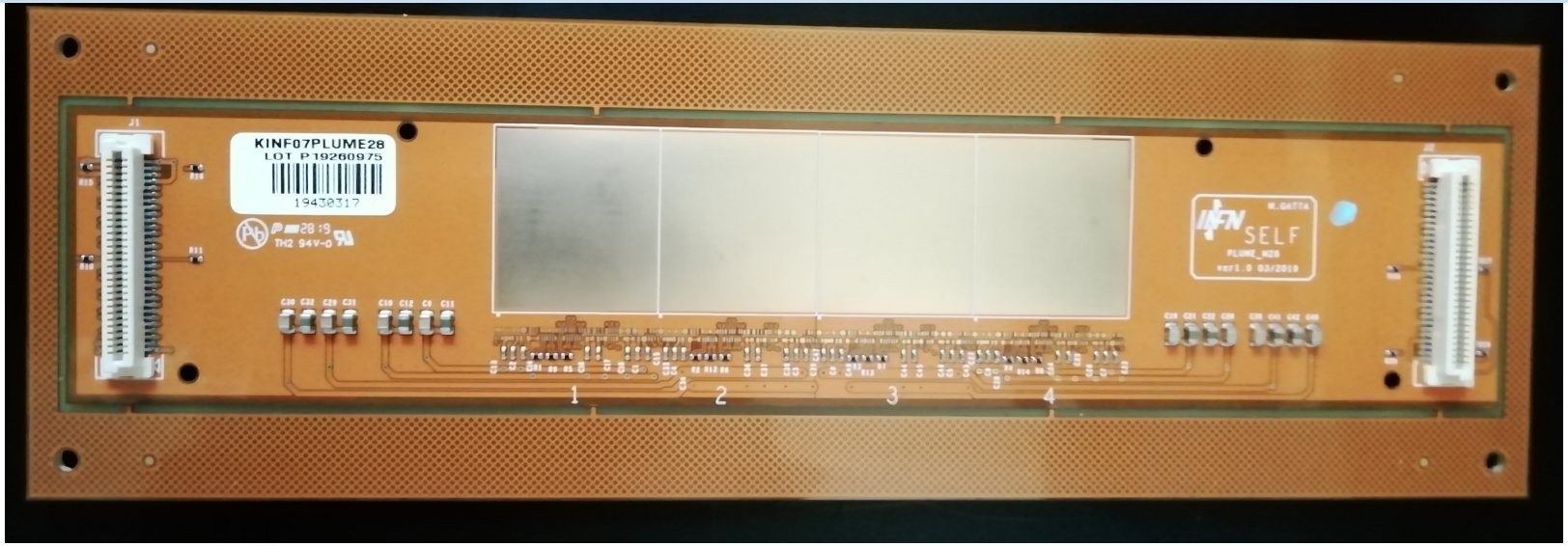
- **Adapter_PlumeM28** (Flex-Rigid PCB) to collect signals from 2 sensors (half of PlumeM28) on each side of a module and houses transcievers, monitors currents and voltages and includes “interlock” circuitry. Each adpapter_PlumeM28 is connected by a 68 wires flat cable to the subsequent CableAdapter_PlumeM28 board.

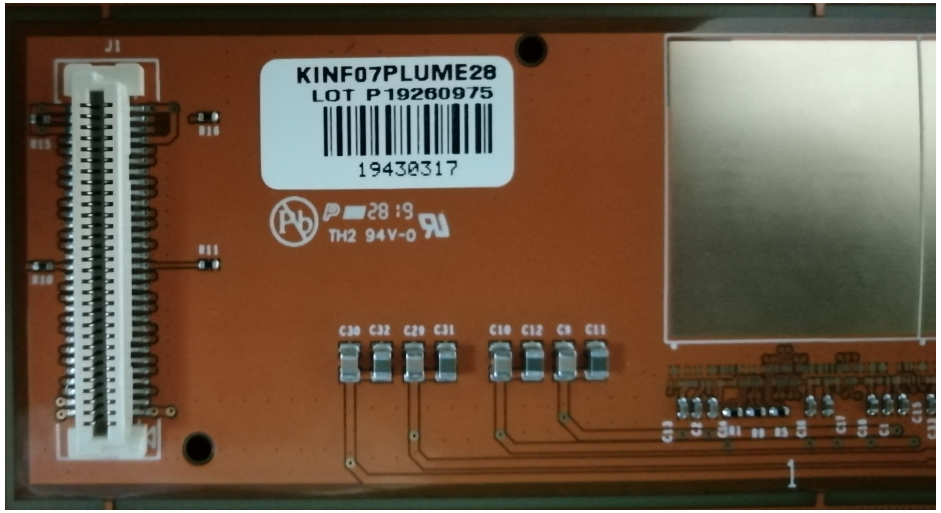
- **CableAdapter_PlumeM28** that translates all differential signals to single ended, provide the power supplies and master the Tigger, Busy, clocsk, etc… control signal.
  Two of this boards (we need 16 of this boards) are connectet to a **DE10_nano_SoC**

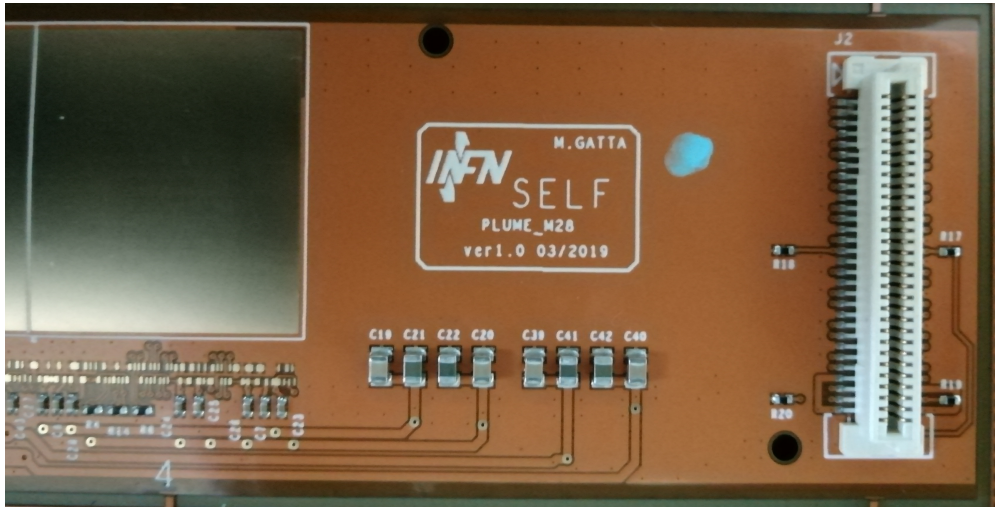
- **DE10-Nano-SoC from Terasic** each of the 8 needed reads 4 M28 sensors from 2 different PlumeM28 ladders. Sends data via one Gigabit link to the intermediate PC.

Inner Tracker (IT) status

The PlumeM28 first PCB prototypes: at G&A to start the assembly jig construction



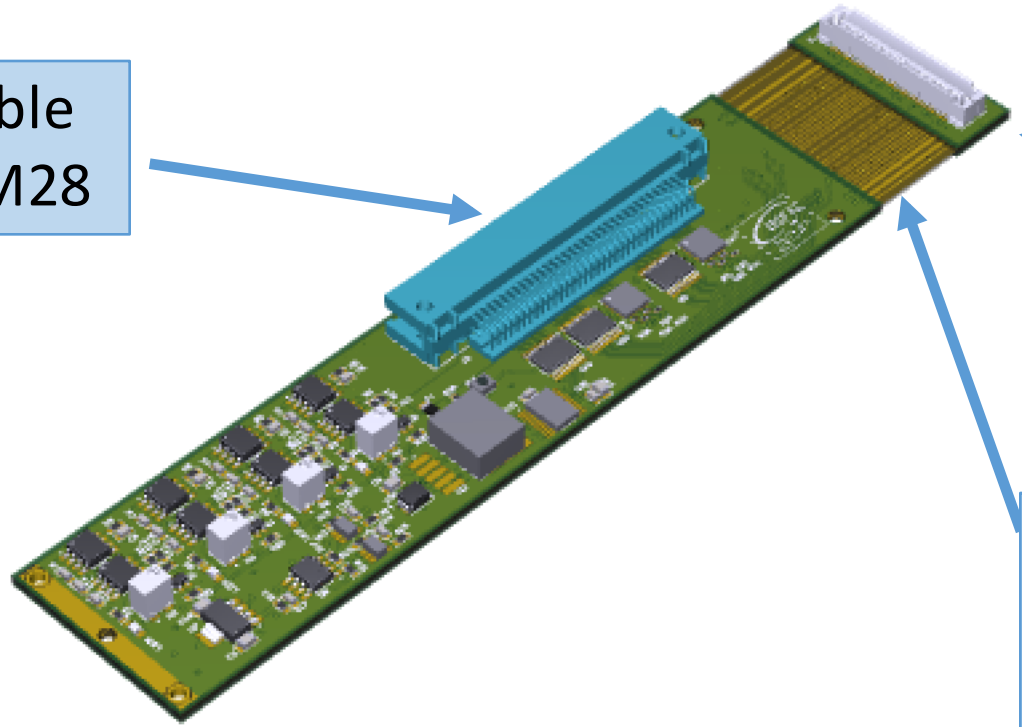




Inner Tracker (IT) status

The Adapter_PlumeM28 in production: expected delivery mid/end of December 2019

Output 68 pins for flat cable to CableAdapter_PlumeM28

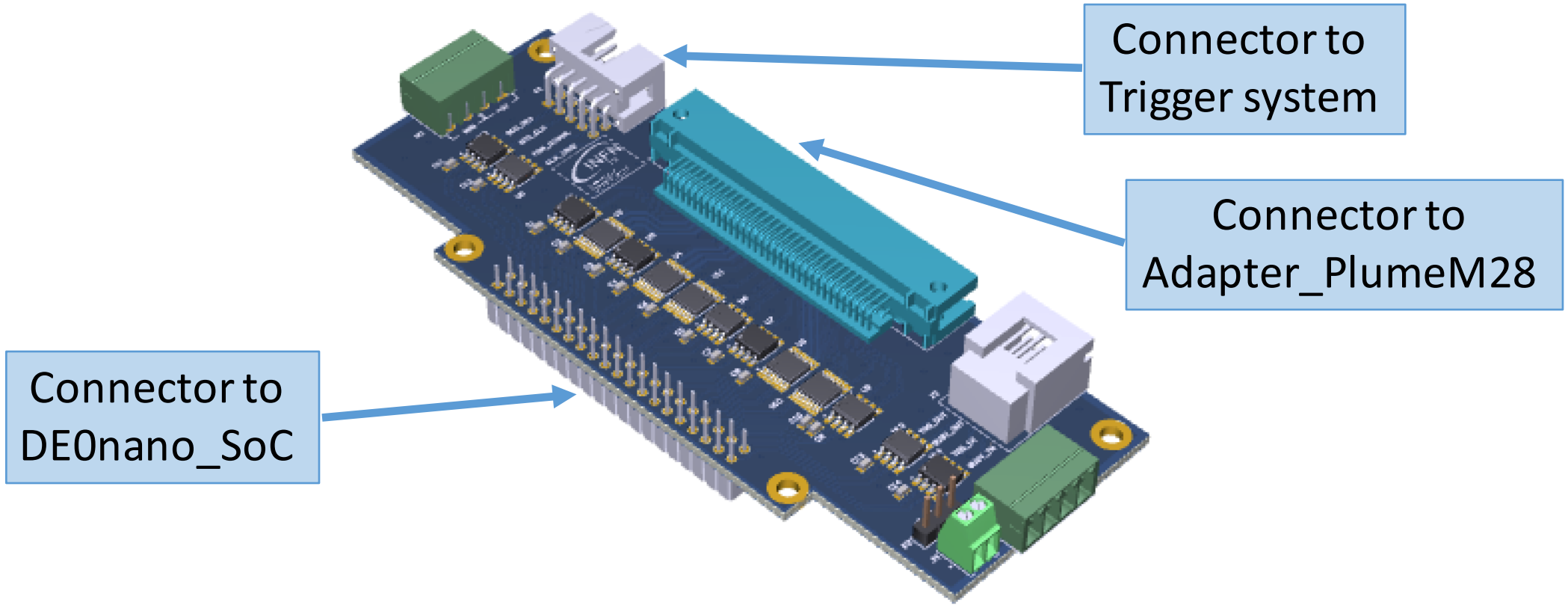


Connector to PlumeM28 side A/B

Kapton cable to mechanical Decouple the PlumeM28 to the Adapter

Inner Tracker (IT) status

The CableAdapter_PlumeM28 in production.
expected delivery end of January 2020



Inner Tracker status

• Adapter_PlumeM28	Prototypes ready and tested TESTED
• CableAdapter_PlumeM28	Prototypes ready and tested TESTED
• Connections cable and connectors	Available
• Read out firmware (Vertex firmware)	Available
• Read out boards (DE10-nano)	Available
• Slow control firmware	Under development
• Mechanical support structure	Prototype ready
• Intermediate PC (10 Gigabit ports)	Available
• PlumeM28 assembly components	Delivered to G&A december 2°, 2019
• 2° version of PlumeM28 PCB	in production (deliver beginning of july)
• Assembly of PlumeM28	STUCK UP

Conclusions

FOOT tracker mechanical setup:

- A realistic solution has been designed and IT part prototyped

Pixel vertex detector: (**DONE**)

- Tested at GSI
- Debugged and solved readout bugs at the BTF july 2019 test
- Firmware for threshold scan debugged Software procedure available.
- Slow control firmware under development

Magnet system:

- 2° bid started (Andrea Moggi talk)

Inner tracker:

- All board designed, prototyped and tested (except PlumeM28, see later)
- All boards ready for production
- The overall mechanical solution defined
- PlumeM28 boards assembly STUCK UP.

Discussion in the collaboration (IB) to be done