Power Management for ECAL Detector

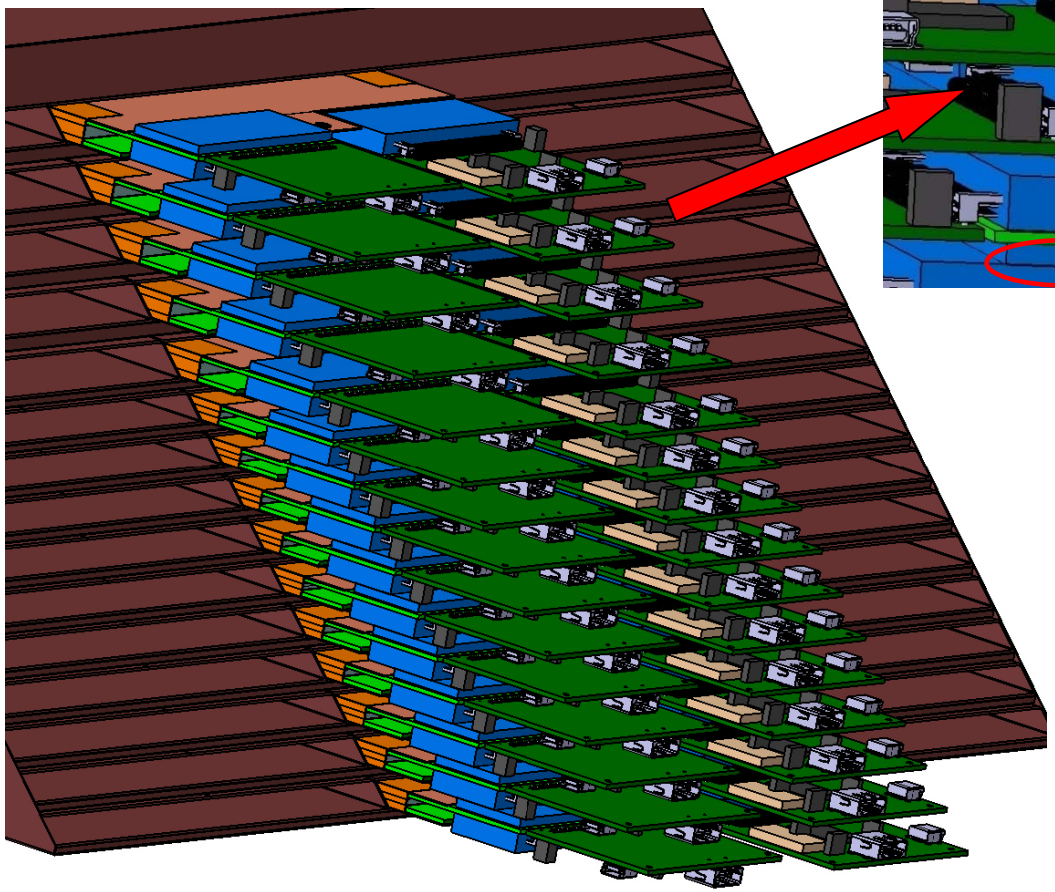
ECAL Prototype is based on « long » SLAB of 9 ASUs of 16 ROCs

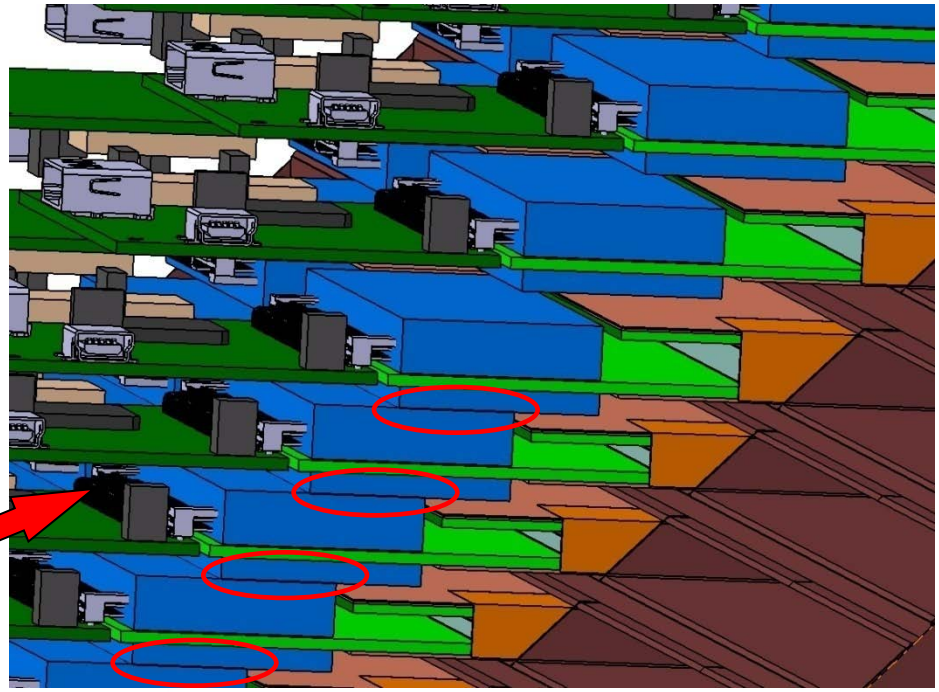
An « Adapter Board » is in charge of all mechanical and electrical « adaptations » for DIF and SLAB

Mechanical and Electrical Adapter to :

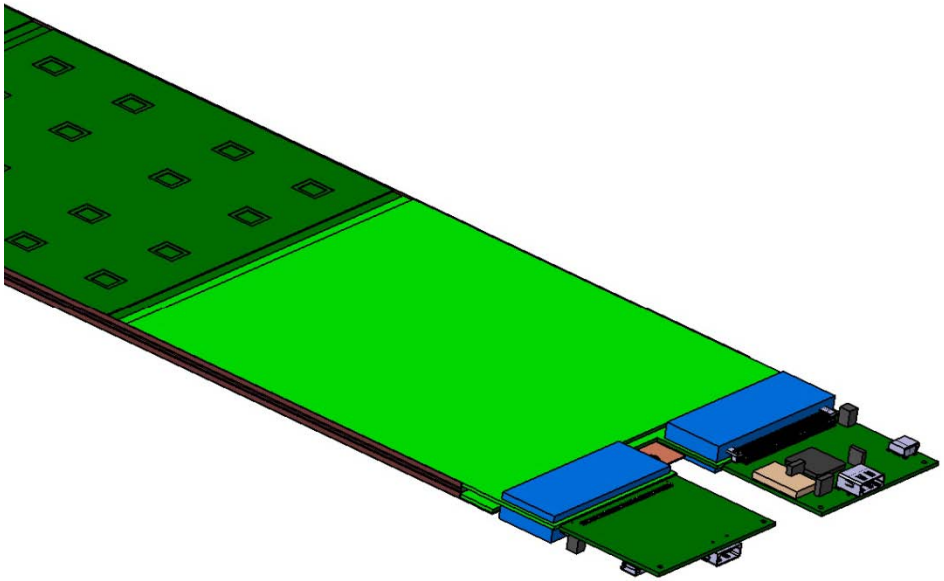
-SLAB:	through 4 x 36 pin conductive 3M film
-Si-Pin Wafer:	through 1x specific High Voltage Kapton film
-Digital I/F Board:	through 1 x 90 pin SAMTEC Connector
-Power Unit:	through 2 x low profile connectors (HV, LV)

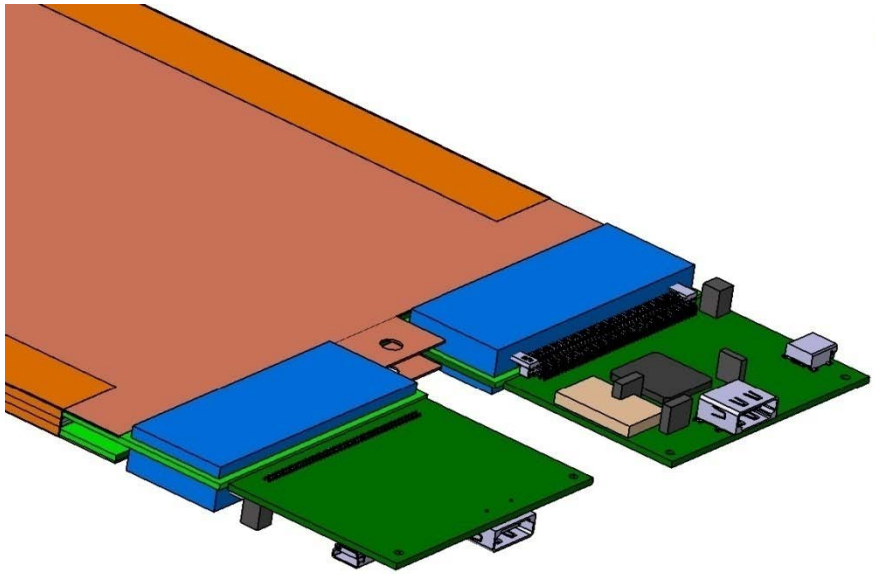
ECAL Prototype Termination



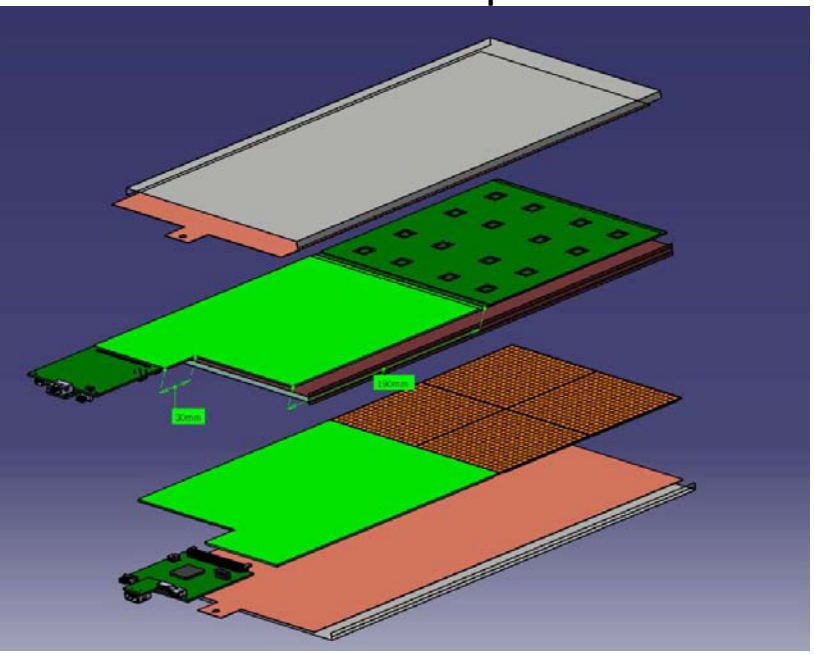


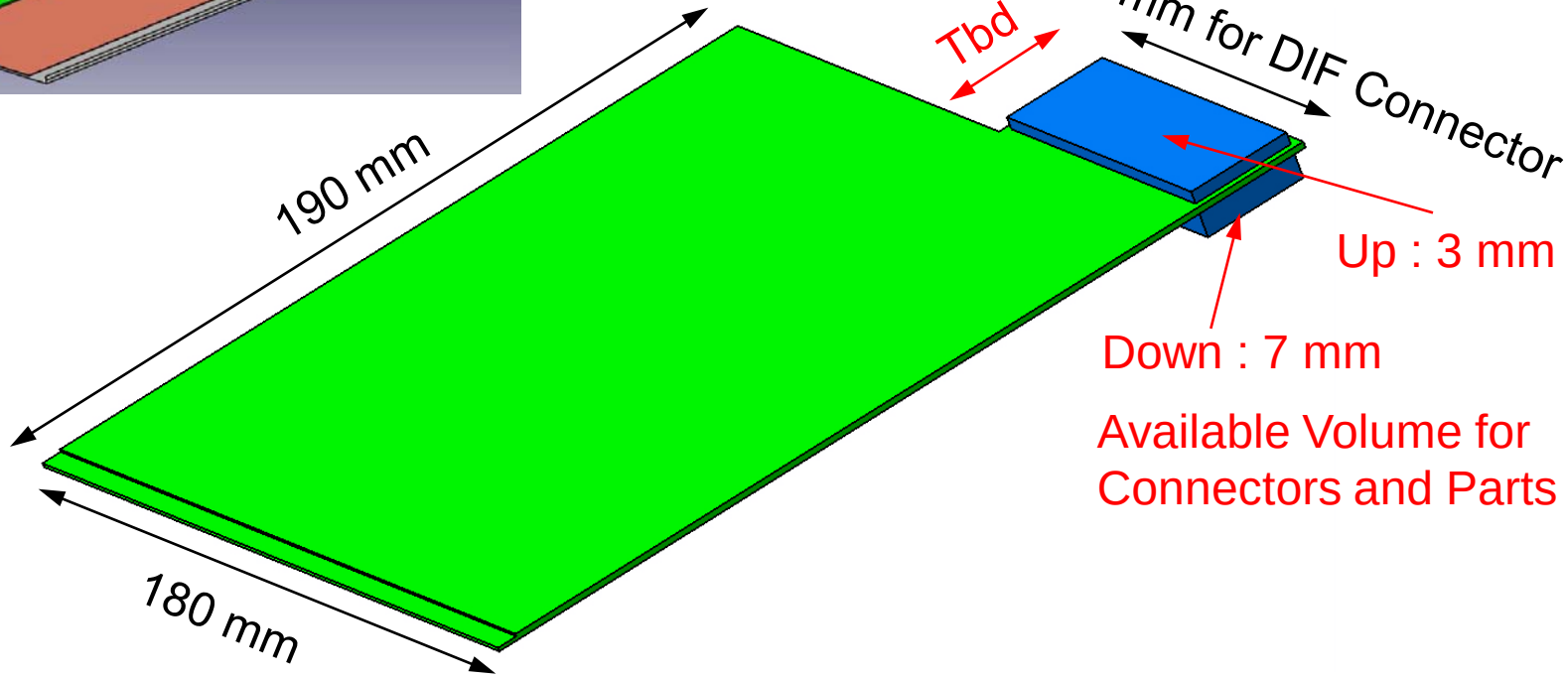
Adapter Board : available space for parts is in Blue





Updated mechanical Constraints for Adapter Board





Power Management for ECAL Detector

Adapter Board is in charge of Power Adaptation and Distribution

- LV : Linear Regulators to generate DVDD and AVDD
- HV : 150V is only filtered (no LDO)

Power Requirements

-Si-Pin Wafer: HV=150V, 0.005 mA, continuously

-Long SLAB: = 9 ASUs of 16 ROCs

Each ROC needs:

DVDD=3.3V, 11mA (ACQ) / 8mA (other op.)

AVDD=3.3V, 77mA (ACQ) / 20mA (CONV) / 0.01mA (other op.)

-DIF: DVDD=3.3V, 300mA, continuously

Power Management for ECAL Detector

Each « complete Detector » (DIF+ADAPT+long SLAB) requires

- DVDD: 1.88A (ACQ) / 1.45A (other op)
- AVDD: 11.08A (ACQ) / 2.88A (CONV) / 0.1A (other op.)
- HV: 0.045A

Use of LDO (Low Drop-Out) Voltage Regulators

- HV is only filtered, no LDO

- AVDD is « splitted » in two power nets AVDD1 and AVDD2
  each is regulated by 1 x **TPS75901KTT** (7.5A, adjust. output)
  Max. Dropout of **400mV** for 7.5A

- DVDD is regulated by 1 x **TPS75233Q** (2A max., fixed output)
  max. Dropout of **210mV** for 2A

➔Low Voltage = 3.7V to power LDOs

Power Management for ECAL Detector

Dynamical behaviour of LDOs is not well known
Especially for Current Pulses from few mA to 6A …

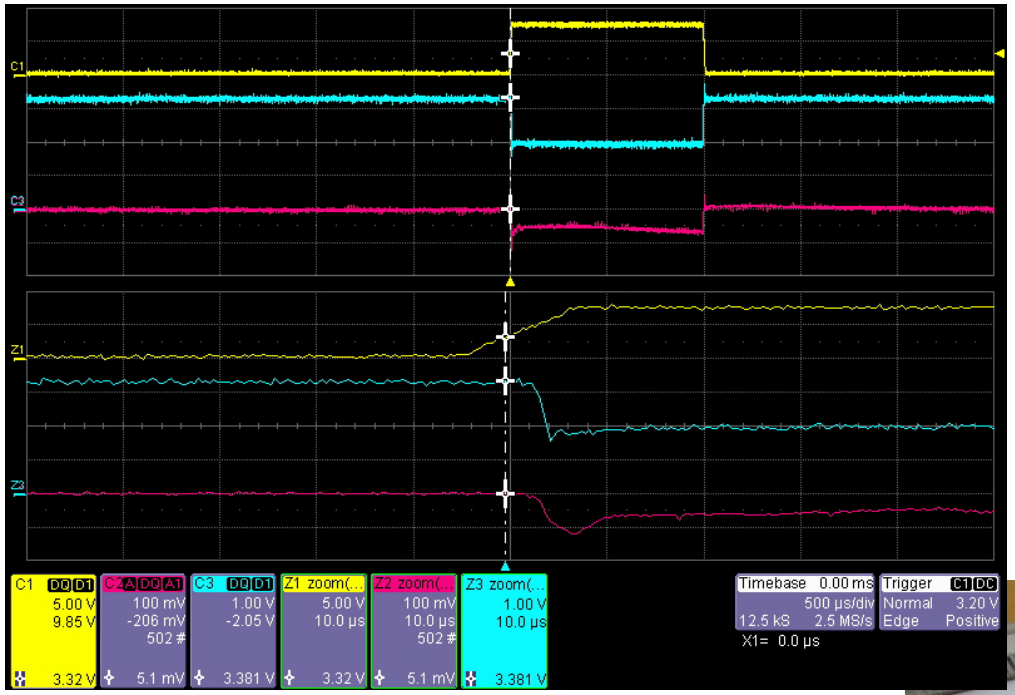
➔ To provide such currents, in addition to LDO are implemented
AVX BestCap Ultralow ESR SuperCapacitors

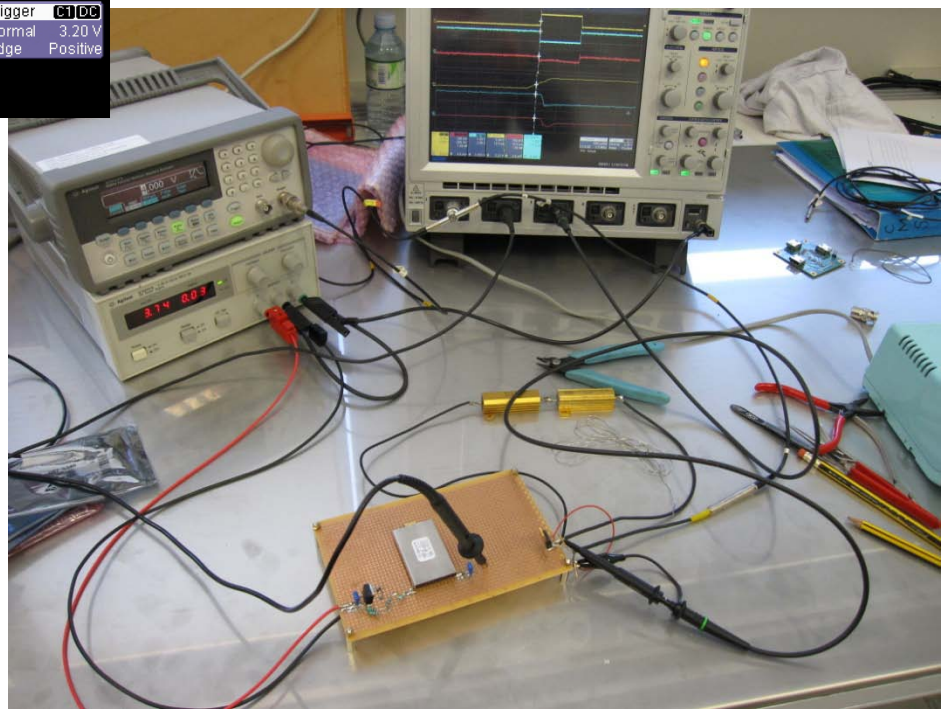
For each AVDD LDO : 2x BZ02 capa 400mF, 21 mOhm ESR
To provide up **to 6A during 2ms with 130mV max. drop**

For DVDD LDO, 1x BZ01 capa 60mF, 96 mOhm ESR
To provide up to **2A during 1ms with 50mV max. drop**

➔ **Default configuration : 3 x LDO + Huge Capacitor(s)**

Power Management
Electrical Test Bench





Command : 1% duty cycle
Vin= 3.3 V
Load : 1 A on 1 Ohm, 1 ms, rise=1 us
Vin undershoot : 100 mV

Power Management for ECAL Detector

The electrical TestBench is designed to check and optimize the Power Management

A possible evolution is under evaluation :

From 3 groups of 1 x LDO followed by Capacitor(s)

➔ To 1 LDO followed by 3 groups of Capacitor(s)