



# SiW Ecal Electrical interfaces

- A (still) poor man's view -



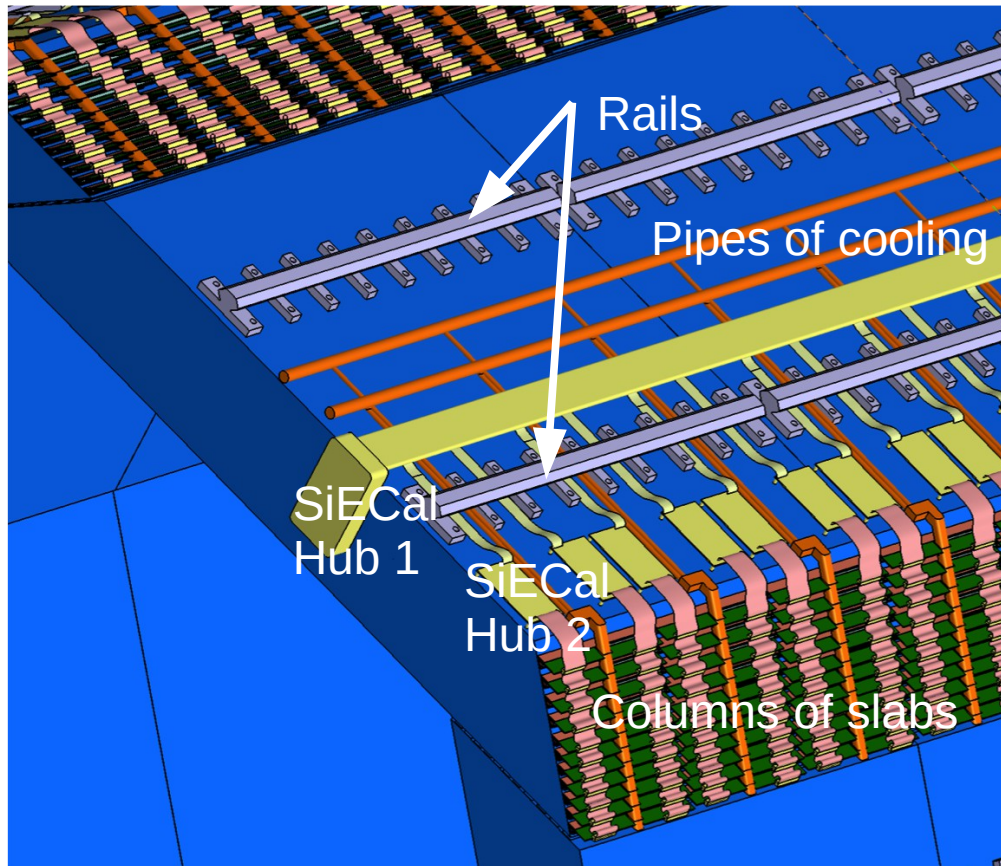
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ILD Integration Kick-off Meeting, LAL Orsay Feb. 2018

## Disclaimer for Ecal:

- I work out from what I have said back in September integrating some first feedback from electronic engineers at LAL and discussion with Henri
- Still all mistakes are mine
- Towards serious revision and prototyping in coming months!!!



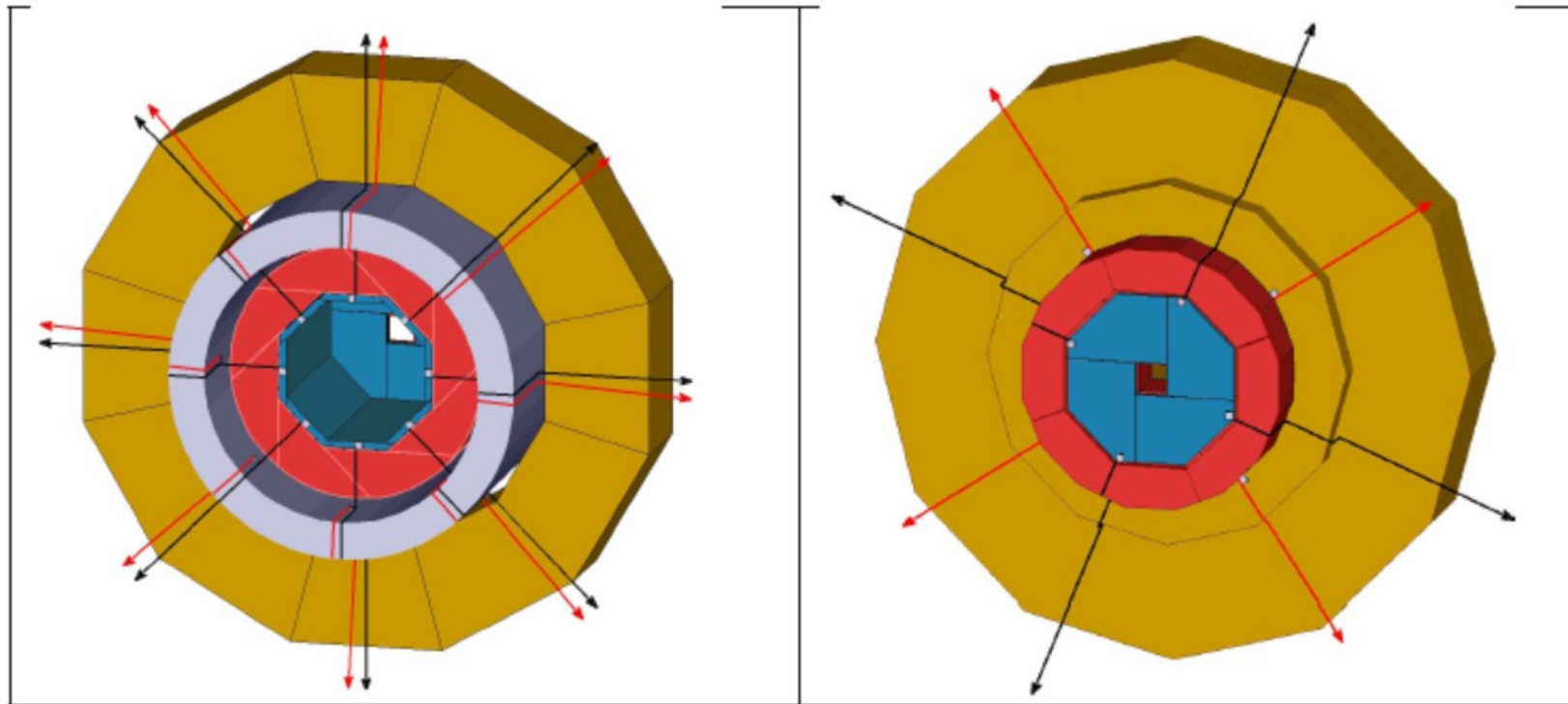
- SiEcal Hub 1  
(hub to external supplies and DAQ)

## SiECal internal components

- SiEcal Hub2
- (internal hub to be checked whether heat source)

Disclaimer: Design subject to change

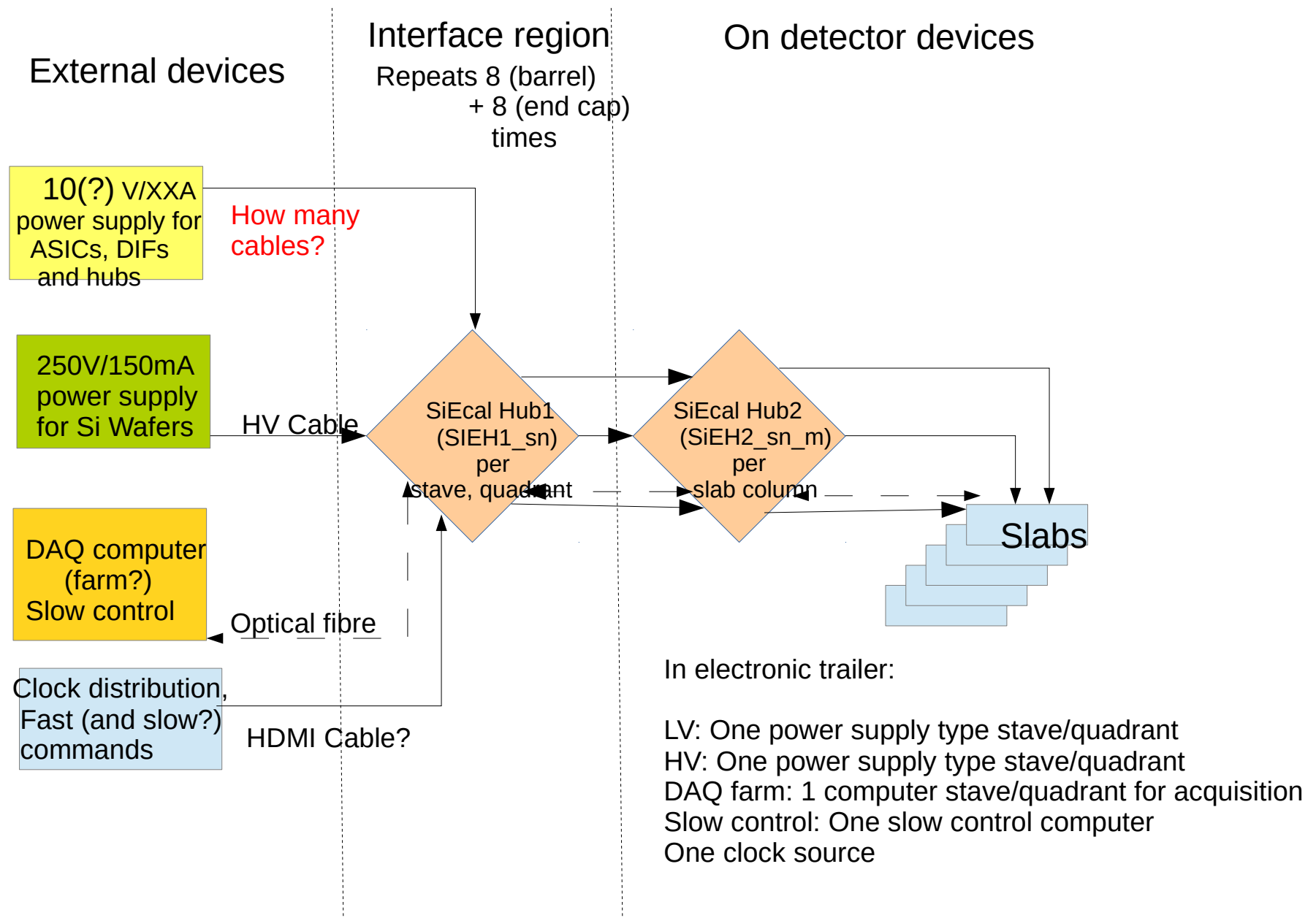
Question 1: 1 big SiEcal Hub 1 or a few smaller ones



- Service lines leaving from barrel

- Service lines leaving from endcap

Details see talk by Henri



- **LV**
  - Need to power Chip AVDD, DVDD, DIF and hubs
  - Peak currents for AVDD, DVDD will be fabricated by on-detector capacitances
  - **Power**
    - “On PCB”: ~2.1 kW total Ecal
    - DIF: ~2.5kW (0.3 W, will be operated in continuous mode)
    - Hubs: ~300 Hubs a << 50 W -> 1.5 kW if **5 W/hub** (to be validated in 2018)
    - => **Total: 4.6 + 1.5 kW = 6.1 kW**
  - Power supply will be of type Lambda TDK Genesis 1U, need 16 supplies (x2 for redundancy?)
  - => 2 racks, more to reduce power density
- **HV**
  - 300 V / 200 mA per stave/end cap quadrant
  - => **Total Power consumption ~1kW**
  - Assume 1 power supply per stave/end cap quadrant (may be too much)
  - => 16 power supplies (x2 for redundancy), e.g. iSeg supplies => should fit into 1-2 racks
- Computing and slow control
  - ....

Grand total:

Power: ~7 kW

Space: 4 racks w/o computing



- Regard power cables that enter into first hub (SiEcal Hub1)
- LV – Example for barrel stave (5 trapezoidal modules)
  - One stave consumes about 320 A (including factor 2 safety margin)
  - This leads to a power loss of about 10W/m along the entering power cable(s)\*
  - Question 1: Do we bring this current from outside to the detector
  - Question 2: If yes, one thick or a few thinner cables?
  - Question 3: If no, what about DC-DC Converters?
- HV
  - About factor 10 less current
- Remark on hubs
  - Estimation on power consumption given at KEK 50 W was largely exaggerated (mea culpa)
  - 5 W is more realistic
  - These need to be designed carefully to avoid that they become hotspots
  - Studies have started

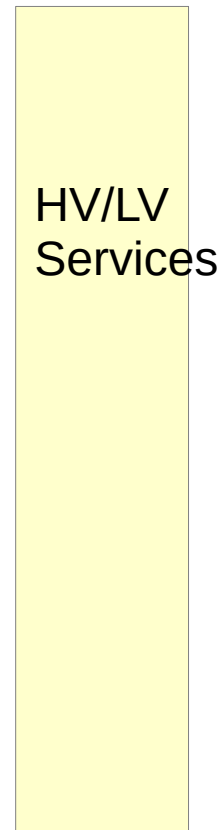
using technical data on required cable surfaces given on  
<https://www.sab-kabel.de/kabel-konfektion-temperaturmesstechnik/technische-daten/kabel-leitungen/sicherheitsgerechte-verwendung-von-kabeln-und-leitungen/grenzbedingungen/kabelquerschnitt-berechnen-strombelastbarkeit-tabelle.html>



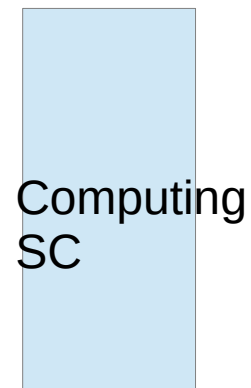
- Design architecture of power distribution (and clock distribution and data transfer)
  - More professional than so far by R.P.
- How many cables for power supply/octant (same for endcap quadrants)
  - 1 big or a few smaller ones?
- DC-DC Converters or not, if yes which ones and where?
- What is the real power dissipation of the supply cables for the LV?
  - Looks like 10W/m is a realistic number
- Select suited cables
- Come up with a design of the hubs and an estimation of the power consumption
  - Including prototypes
  - Ongoing work



**Backup ....**

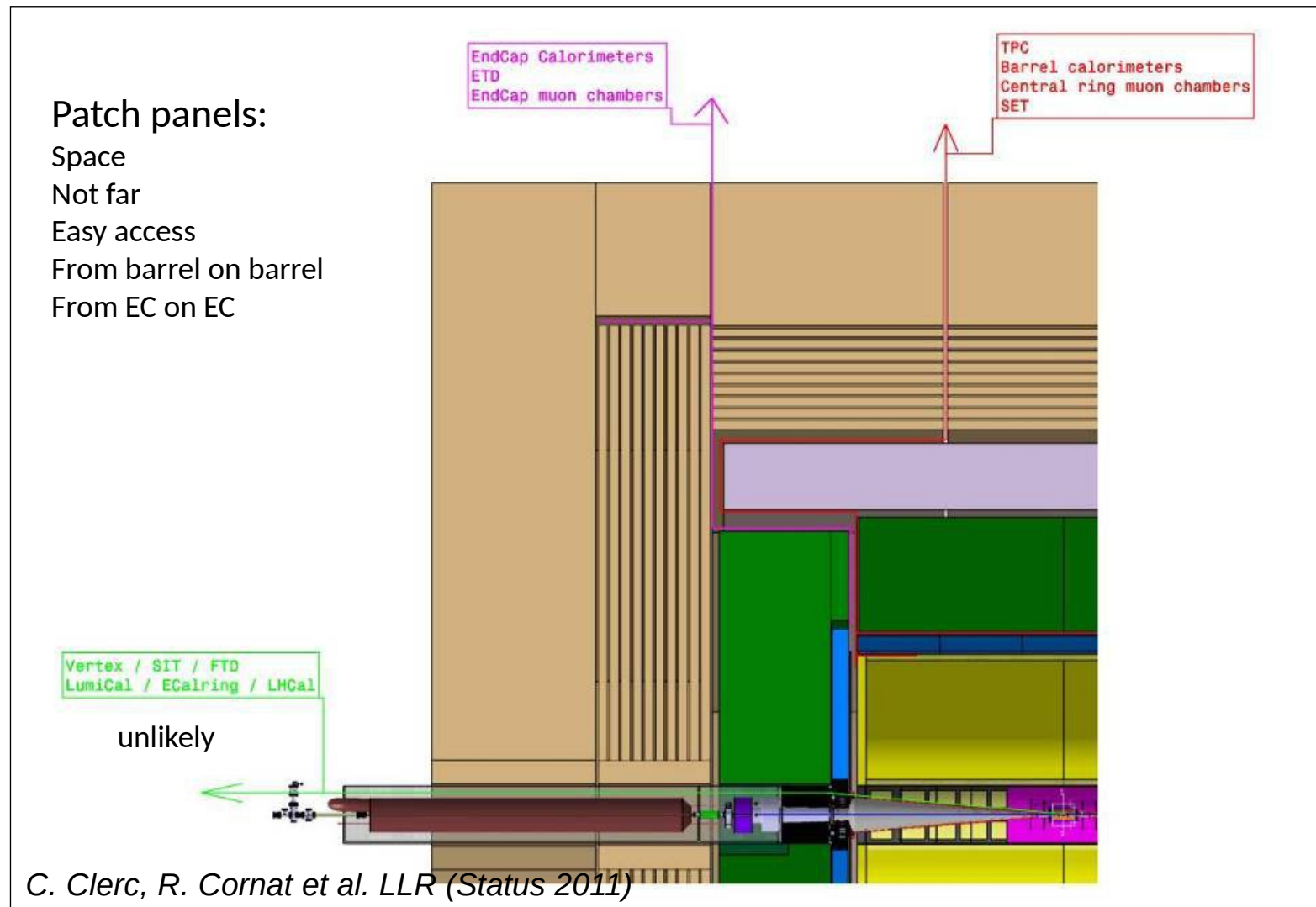


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One aisle should be enough  
Add a second as safety margin

## A reminder



Study for DBD needs regular update!!!!  
 Use ICD