

Status of the FCAL

32th FCAL collaboration workshop

10/5/18, Krakow

outlook

- LumiCal
- BeamCal
- LHCaI
- Costs
- conclusion

LumiCal

- Need to build a 20 (or more) layers setup
- Silicon sensors
 - we have enough sensors in Tel Aviv (thanks to Lezcek)
 - We bought from CERN (thanks to Eva) probe card to test a full sensor at once. It will be operational soon (1 month). Eva will come to TAU

Test of all the sensors this summer

LumiCal

- HV kapton : need to be produced
- Readout kapton : need to produce so possibility to change connectors to fit new readout
- Carbon fiber envelop should be produce (at CERN)
- There is enough frames and tungsten planes but need to be assembled : flat table and good technician. ~ one/two week(s) of work (1 technician and 1 physicist)
- Mainframe : someone needs to take over on it and learn how to use it

lumical

- Old read out
 - Enough APV to equip 16 full sensors (mechanical problems to check with mainframe technician)
 - Problems of the APV
 - Redesign of the charge divider cards
- New read out
 - FLAME will be ready around fall
 - Need to work on the connection to sensors
 - Need to work on the mechanics (mechanical problems to check with mainframe technician)

lumical

- New read out chain : FLAME + FPGA board
- DAQ ?
- Synchronization :
 - With APV ? Do we want to run in parallel (noise problem)
 - With EUDET tracker ?

BeamCal (Hans Henschel, Sergej Schuwalow)

- 10 sapphire wafers (300 um thick and 4 inches diameter) ordered.
Expected end of may
- Metallization/cut will be done at Fraunhofer IZM Institute.
- Final cut and bonding to the fanout is still under discussion
- Readout electronics is still open
- Prototype by the end of 2018

BeamCal electronics

- Chip will be submitted mid 2018 and received end 2018
- Need to coordinate connecting issues between the fanout of the sapphire and the FEB.
- Mechanics has to be foreseen (mainframe ?)

LHCal

- Nothing new concerning simulation or prototyping.

Test beam

- End of 2018 : test of the first FLAME chip (can be muon beam at cern):
 - Connection to the sensors ?
 - Need mainframe
 - DAQ ?
 - Synchronization with telescope needed ?
 - Manpower needed ?
- Mid 2019 (@ DESY):
 - 20 layers lumical
 - Both electronics

| | Quantity | Price (\$) | Total (k\$) |
|---------------------------|----------|------------|-------------|
| tungsten plates | 70 | 500 | 35 |
| support frames | 3 | 15000 | 45 |
| sensor support structures | 70 | 2000 | 140 |
| temparature stabilisation | 2 | 15000 | 30 |
| Silicon sensors | 900 | 200 | 180 |
| Laser | 2 | 10000 | 200 |
| Sensors | 20 | 1000 | 20 |
| Mirrors and frames | 20 | 15000 | 30 |
| Prototyping | 50 | 1000 | 50 |
| Chips | 3500 | 60 | 210 |
| Probecard for test | 1 | 40000 | 40 |
| PCB assembly | 750 | 70 | 52.5 |
| bonding | | | 50 |
| components | | | 50 |

LumiCal cost

| Receiver cards | 750 | 300 | 225 |
|----------------|-----|------|--------|
| Crates | 50 | 1000 | 50 |
| Crate computer | 50 | 1000 | 50 |
| Racks | 1 | 2000 | 2 |
| PCs | 5 | 2000 | 10 |
| HV | 5 | 4000 | 20 |
| LV | 5 | 4000 | 20 |
| Cables | | | 40 |
| | | | |
| TOTAL | | | 1369.5 |

My objection : Silicon sensors : 1 keuro

| | Quantity | Price (\$) | Total (k\$) |
|---------------------------|----------|------------|-------------|
| tungsten plates | 70 | 500 | 35 |
| support frames | 3 | 15000 | 45 |
| sensor support structures | 70 | 2000 | 140 |
| temparature stabilisation | 2 | 15000 | 30 |
| GaAs sensors | 900 | 400 | 360 |
| Laser | 2 | 10000 | 200 |
| Sensors | 20 | 1000 | 20 |
| Mirrors and frames | 20 | 15000 | 30 |
| Prototyping | 50 | 1000 | 50 |
| Chips | 3500 | 30 | 105 |
| Probecard for test | 1 | 40000 | 40 |
| PCB assembly | 350 | 70 | 24.5 |
| bonding | | | 40 |
| components | | | 30 |

BeamCal cost

| Receiver cards | 350 | 300 | 105 |
|----------------|-----|------|--------|
| Crates | 50 | 1000 | 50 |
| Crate computer | 50 | 1000 | 50 |
| Racks | 1 | 2000 | 2 |
| PCs | 5 | 2000 | 10 |
| HV | 5 | 4000 | 20 |
| LV | 5 | 4000 | 20 |
| Cables | | | 40 |
| | | | |
| TOTAL | | | 1266.5 |

LHCAL cost

| part | cost | |
|----------------|---------|-------------------------|
| Si sensors | 1.3 M\$ | 6\$/cm ² |
| Absorber | 1 M\$ | W: 180\$/kg |
| Fanout | 20 k\$ | |
| R/O | 200 k\$ | 1-2\$/channel KPIX chip |
| FE electronics | 50 k\$ | |
| DAQ | ? | |
| Power supply | ? | |
| Cables | ? | |
| Cooling | ? | |

conclusion

- Need good coordination between
 - Lumical sensors and readout
 - Sapphire sensors and readout
- Mainframe : need to have someone in charge
 - Production of new frames
 - Maybe modification for sapphire/new electronics/...
- Manpower :
 - Lot of electronics development on going
 - Sensor test and fabrication starting
 - Beam test(s)