

WORKSHOP

Dipartimento di Ingegneria - INFN Perugia

Modellazione termica, tracking e moduli per esperimenti di fisica

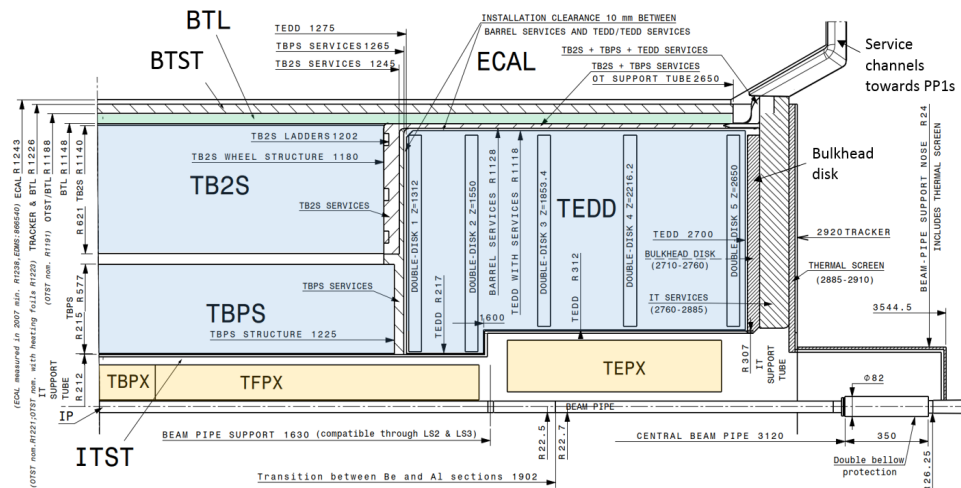
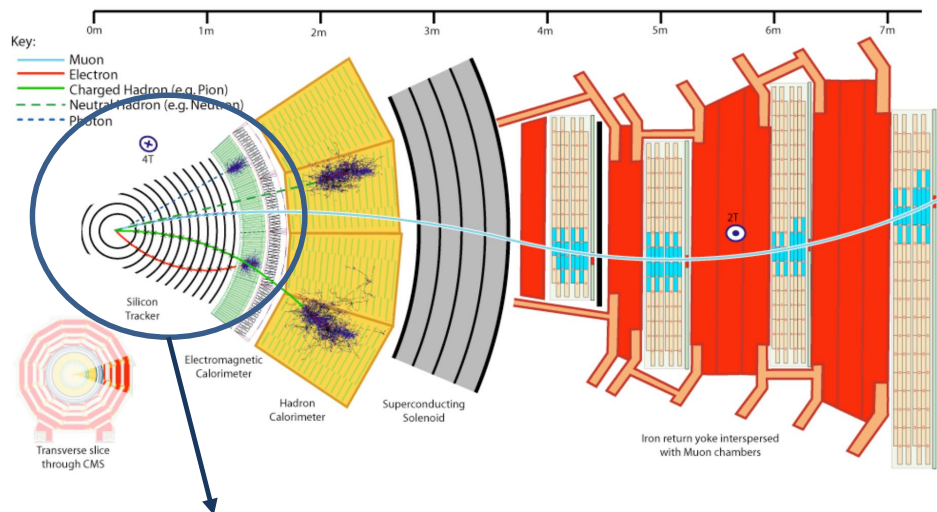
Gli studi termici in CMS



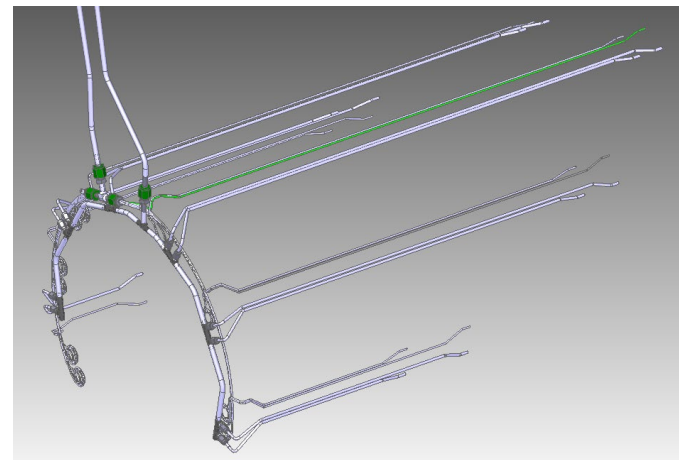
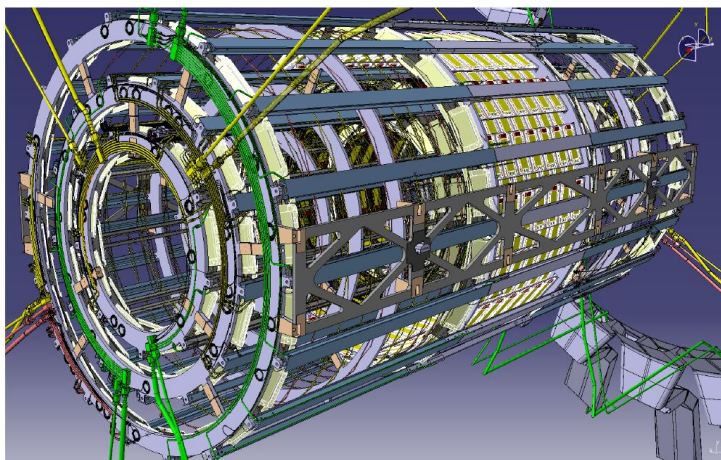
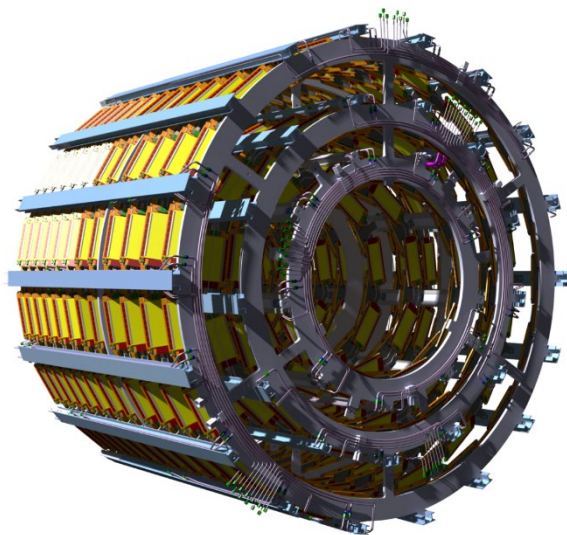
UNIVERSITÀ DEGLI STUDI
DI PERUGIA

Perugia, 11 gennaio 2021

Ing. Giorgio Baldinelli



Silicon tracker

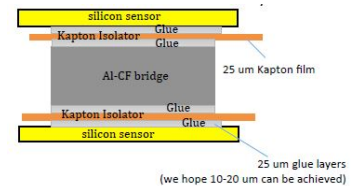
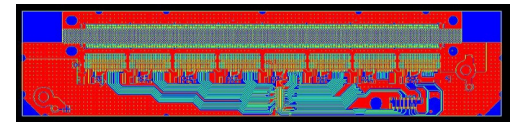


MODULES THERMAL CHALLENGES

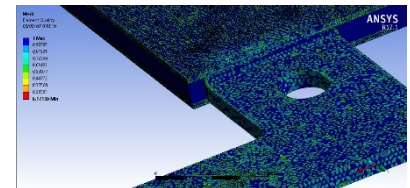
$$P(T) = U_{bias}(\Phi \cdot \alpha_0 \cdot V) \frac{T^2}{T_0^2} \exp\left(-\frac{\Delta E}{2k_b}\left(\frac{1}{T} - \frac{1}{T_0}\right)\right)$$

Power dissipation in sensors function of radiation

Modeling of hybrids traces inside flex PCBs



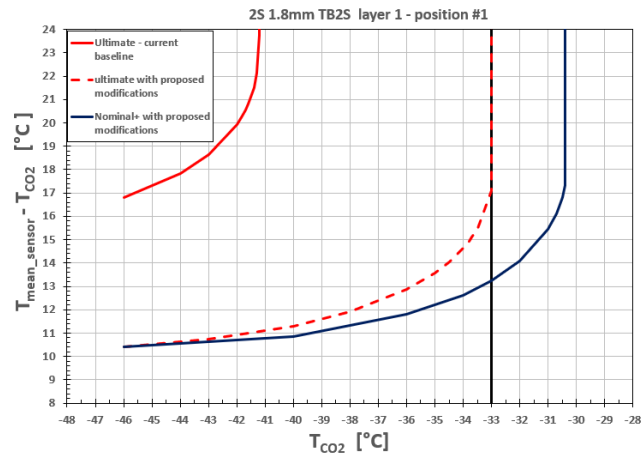
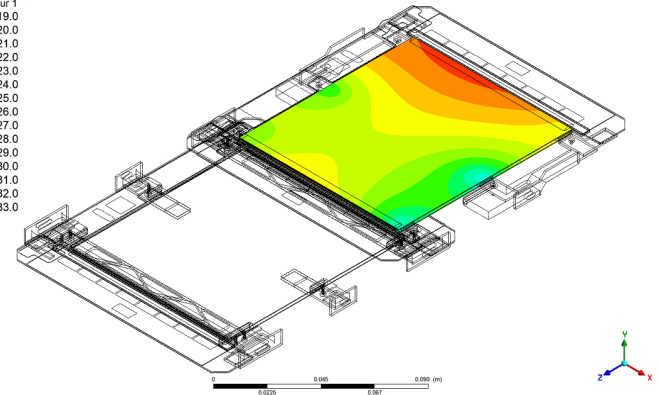
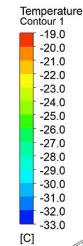
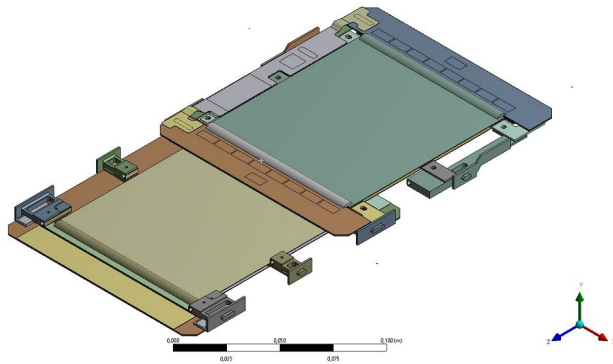
Modeling of thin layers (glues and isolators)



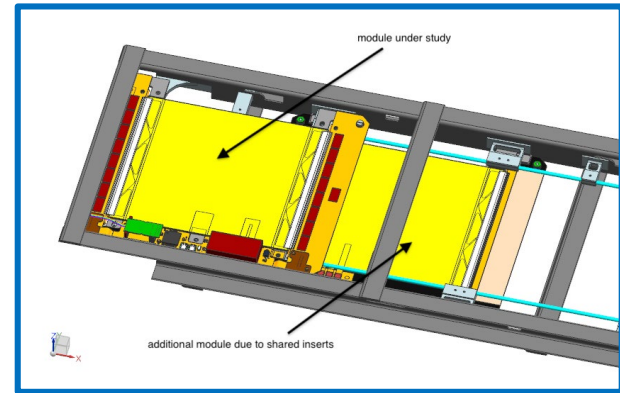
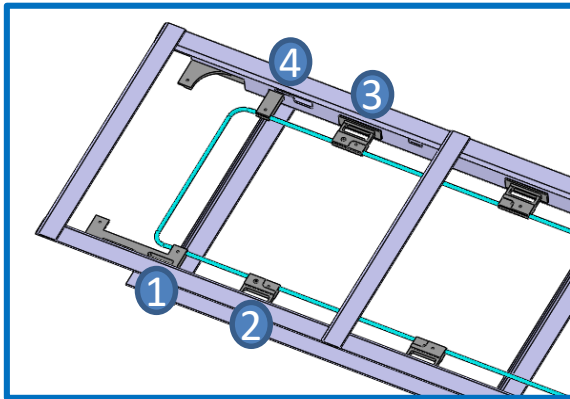
Coupling with the structure: study of thermal contact after integration



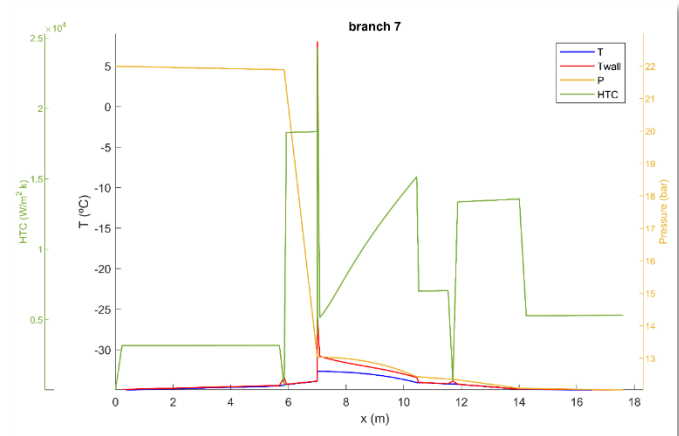
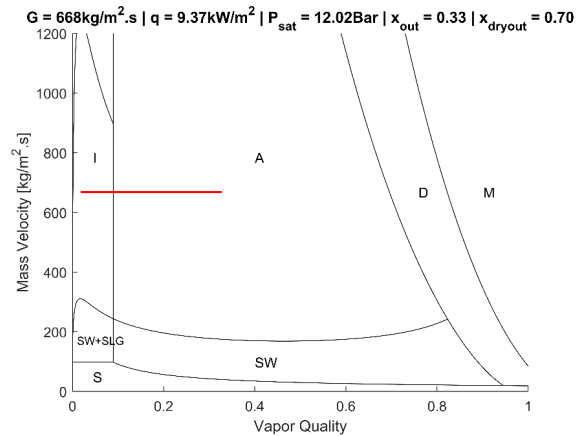
THERMAL RUNAWAY CHALLENGES



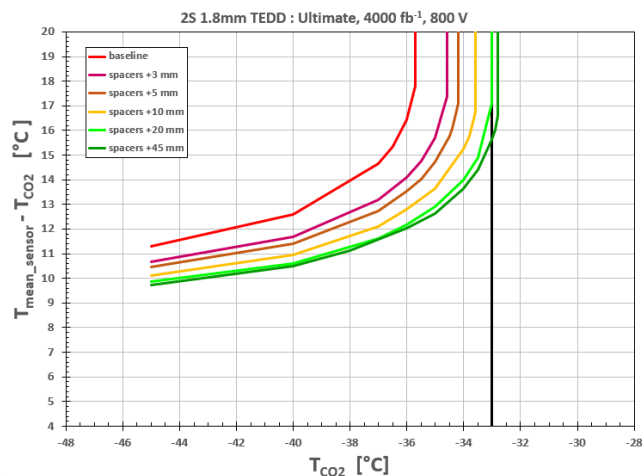
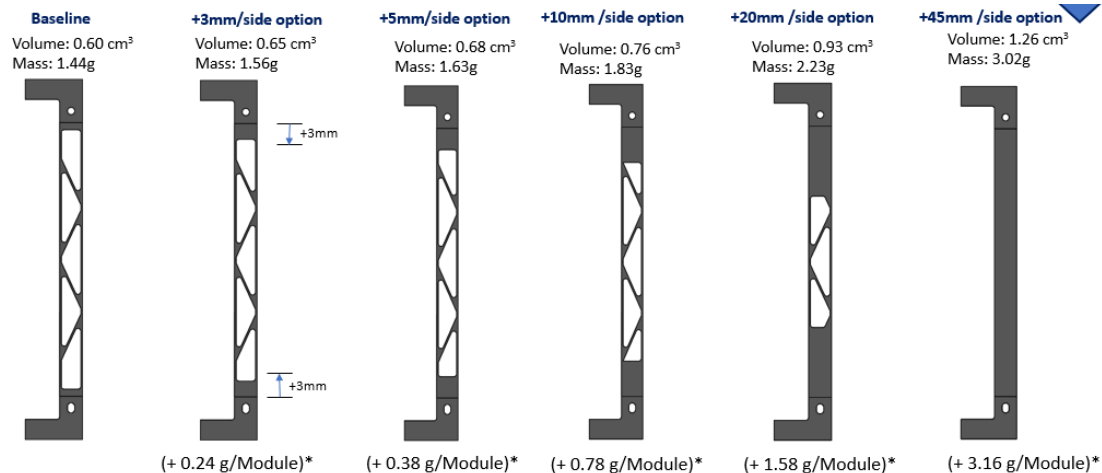
COOLING SYSTEMS CHALLENGES



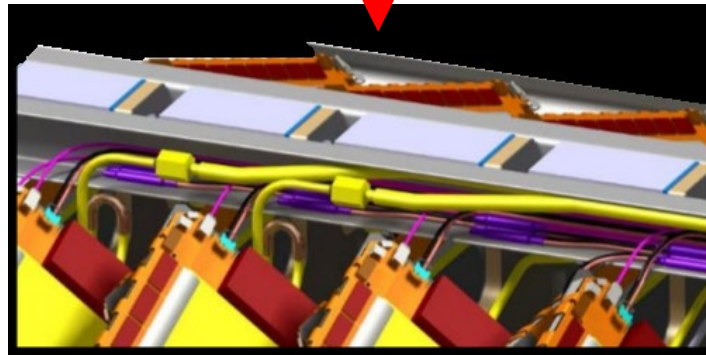
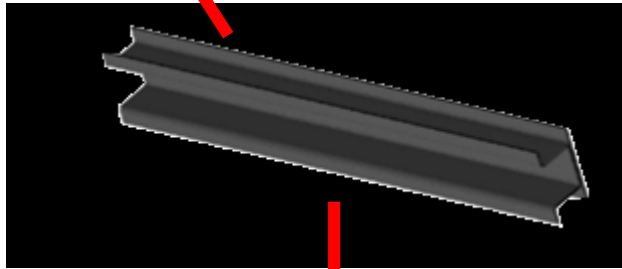
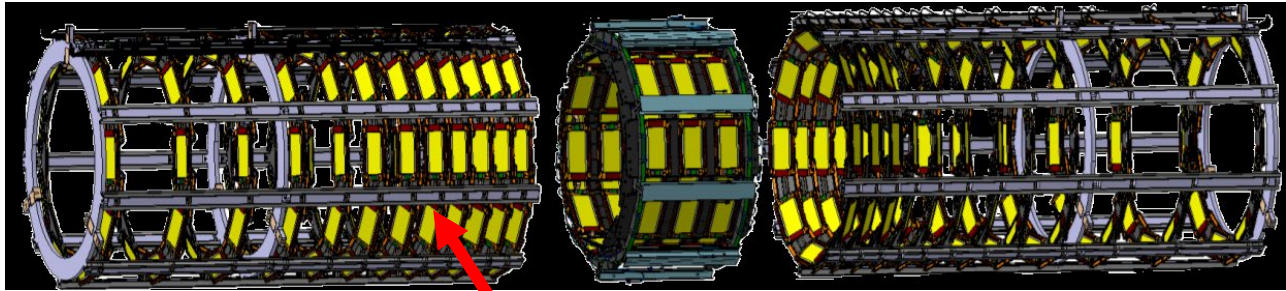
Boiling CO_2 at -35°C



THERMAL DESIGN OPTMISATION

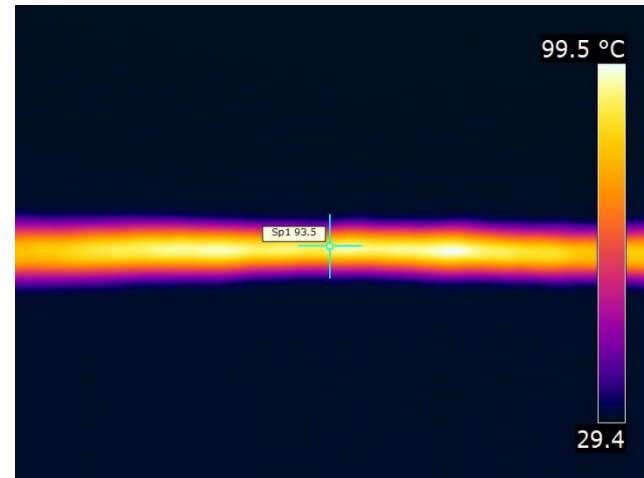
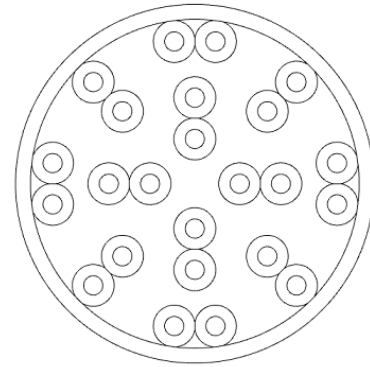
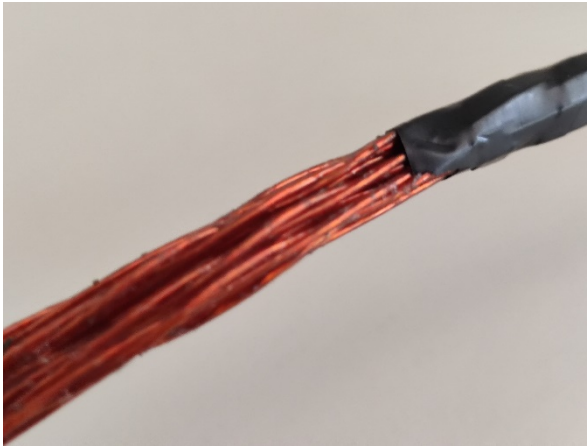


POWER CABLES THERMAL CHALLENGES

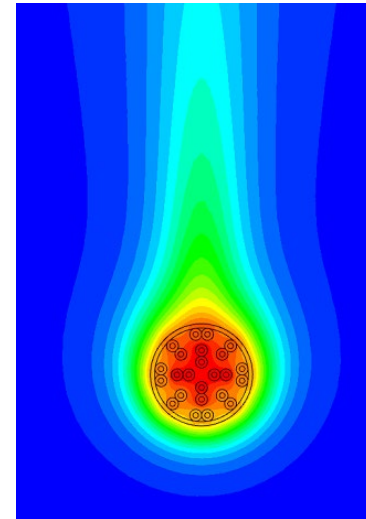
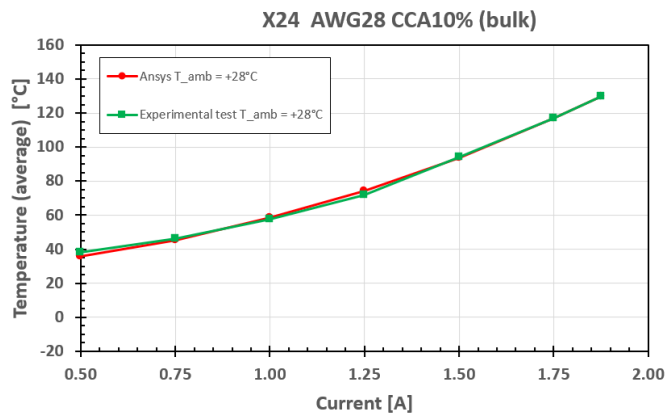




POWER CABLES THERMAL CHALLENGES

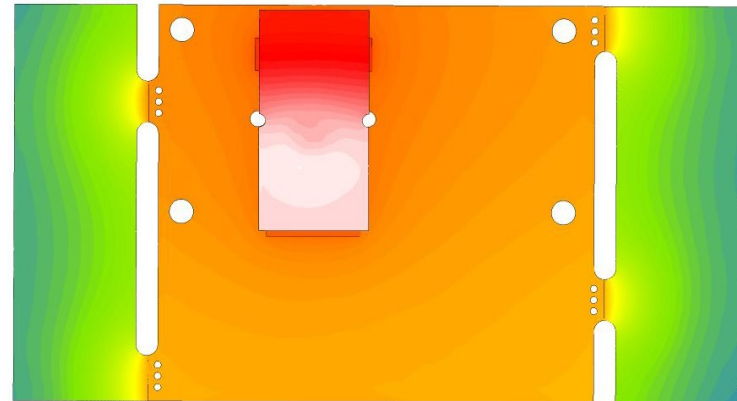
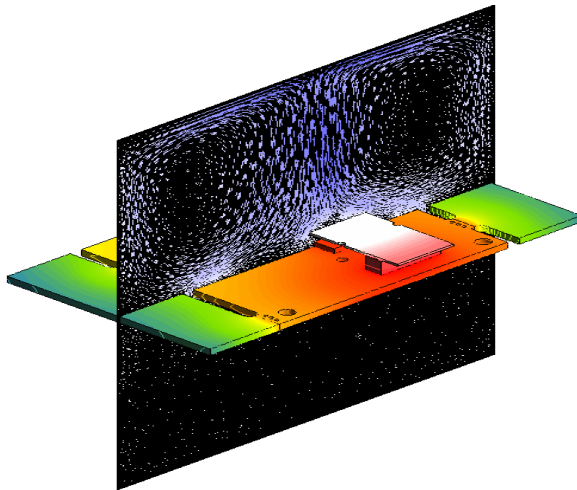
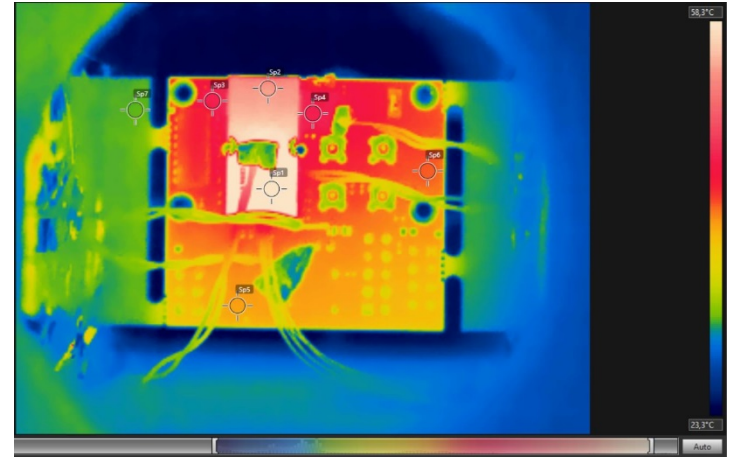
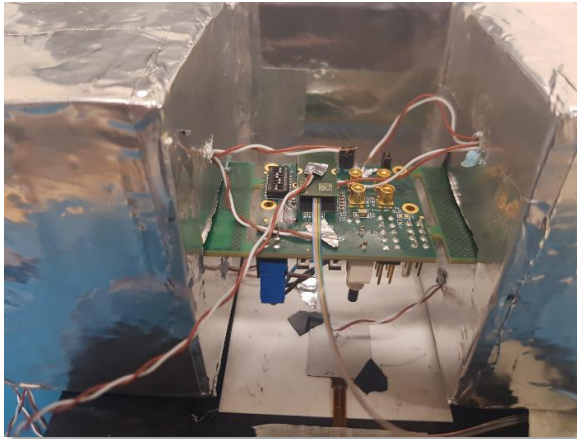


POWER CABLES THERMAL CHALLENGES



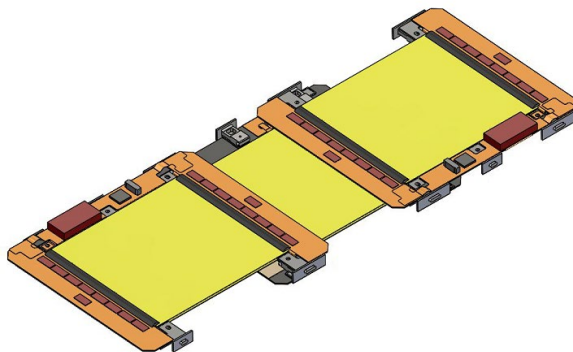
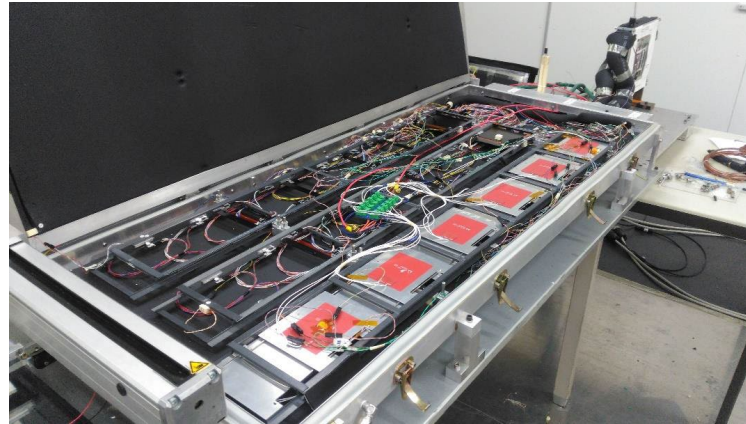


ELECTRONIC COMPONENTS THERMAL CHALLENGES



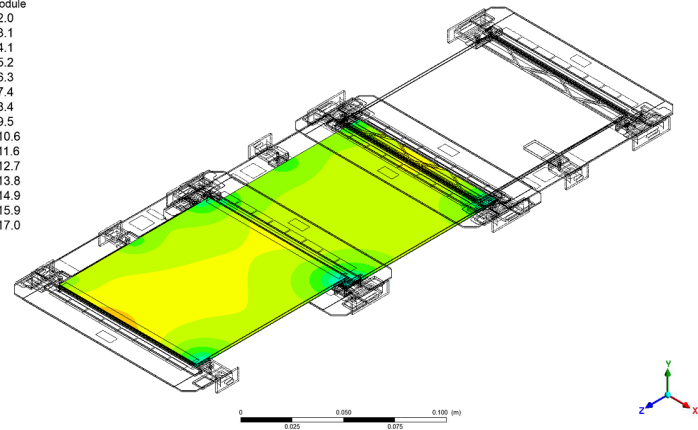


THERMAL CHALLENGES: VALIDATION



Temperature
realmodule
[C]

-2.0
-3.1
-4.1
-5.2
-6.3
-7.4
-8.4
-9.5
-10.6
-11.6
-12.7
-13.8
-14.9
-15.9
-17.0



DING - INFN COOPERATION: PEOPLE SINCE 2017

Francesco Bianchi

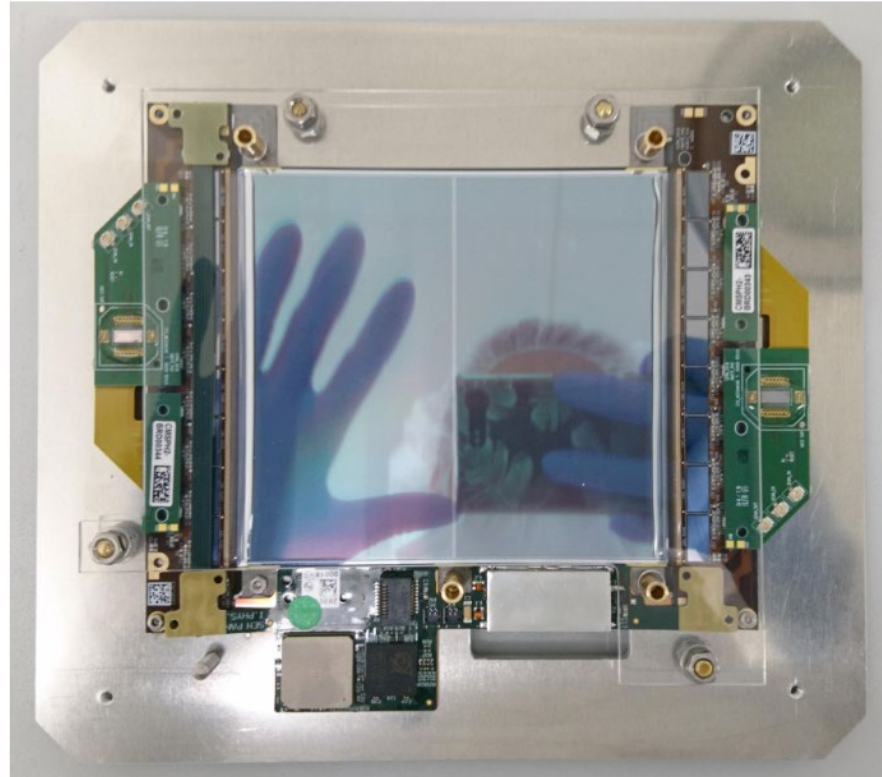
Mechanical Engineer – RTDa in Physics and Geology Department
Co-financed between the Engineering area and INFN funds



DING - INFN COOPERATION: PEOPLE SINCE 2017

Cristiano Turrioni

Mechanical Engineer - Ph. D. Student in Physics and Geology Department

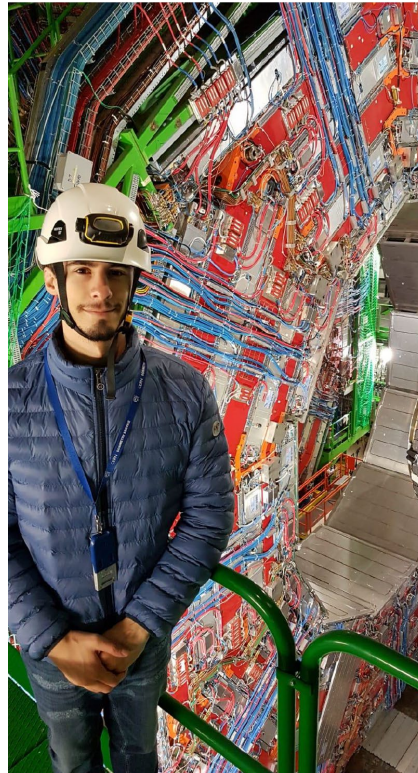




DING - INFN COOPERATION : PEOPLE SINCE 2017

Daniele Eugeni

Student - Technical Studentships - Mechanical Engineering at CERN 2019-2020





DING- INFN COOPERATION : PEOPLE SINCE 2017

Julia Taylor

Student- Summer student - Mechanical Engineering at CERN 2020

