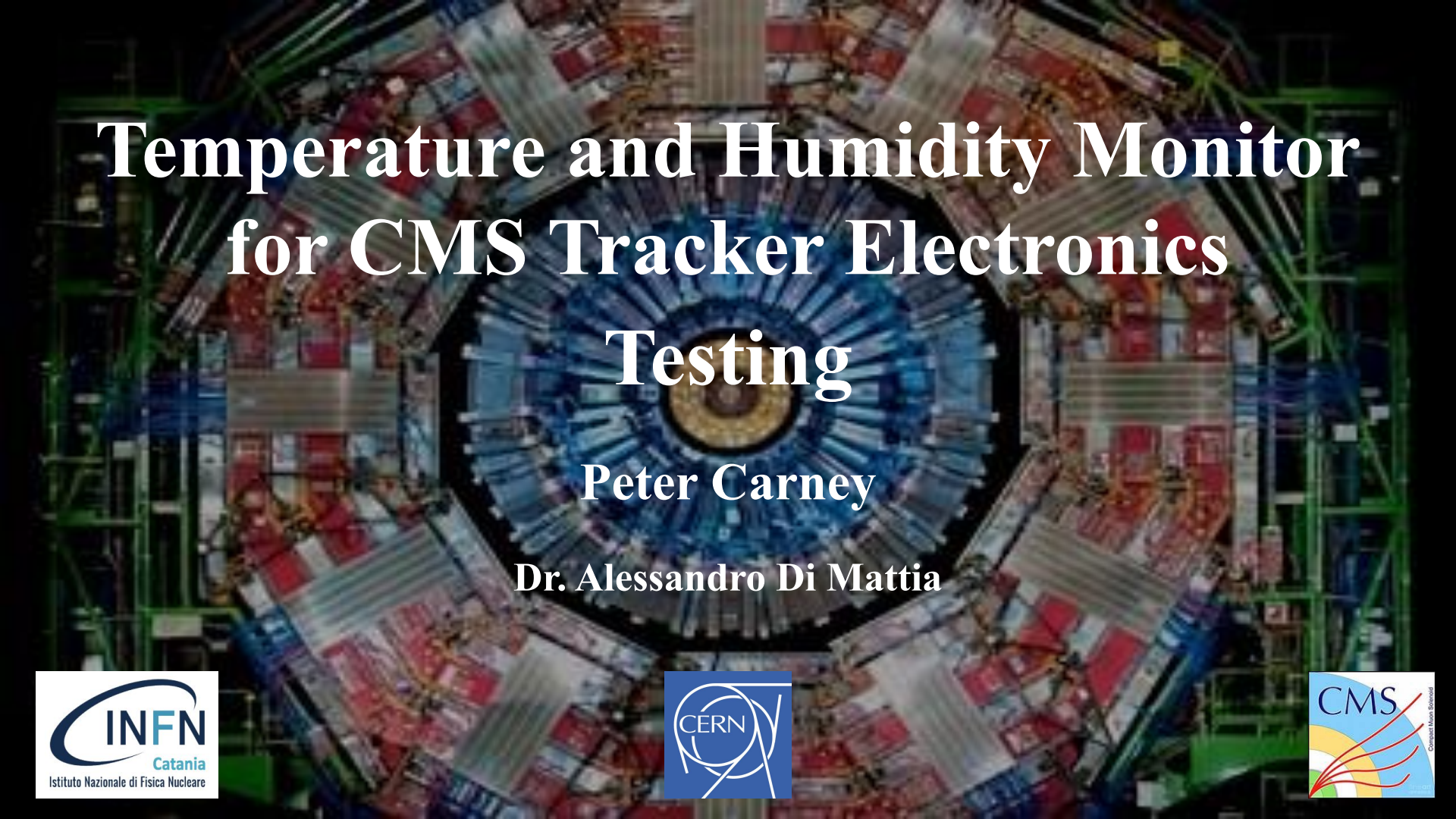

Temperature and Humidity Monitor for CMS Tracker Electronics Testing

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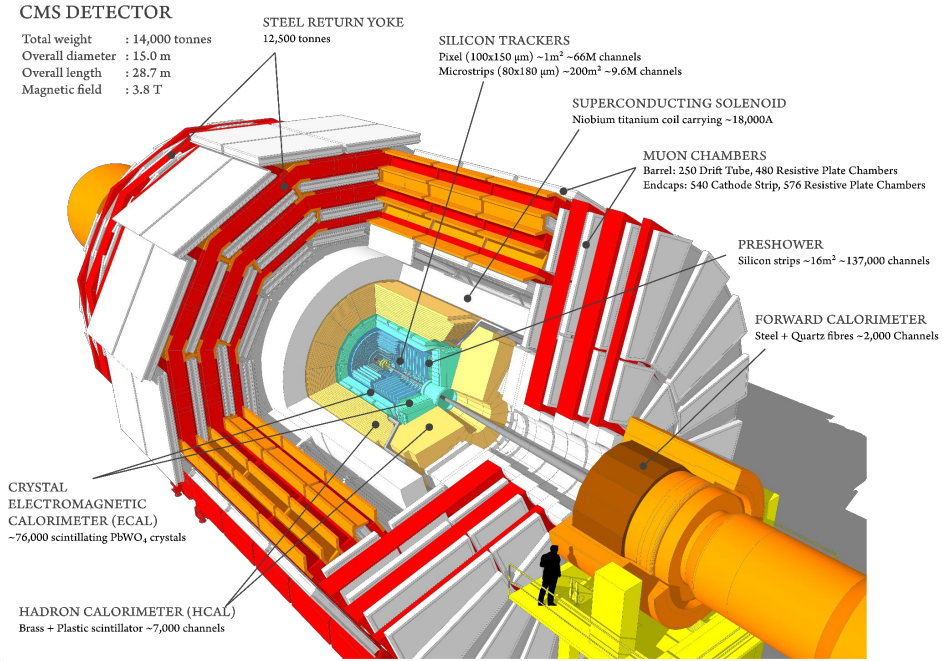
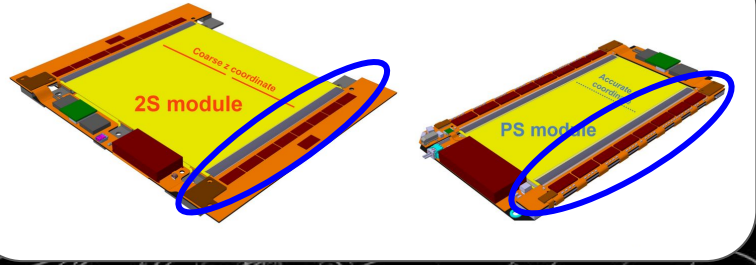
CERN

CMS
Compact Muon Solenoid

CMS Tracker System





Front End Hybrid Electronics

- Used to gather and deliver binary data from silicon sensor
- Phase-2 upgrade desires less bulk electronics

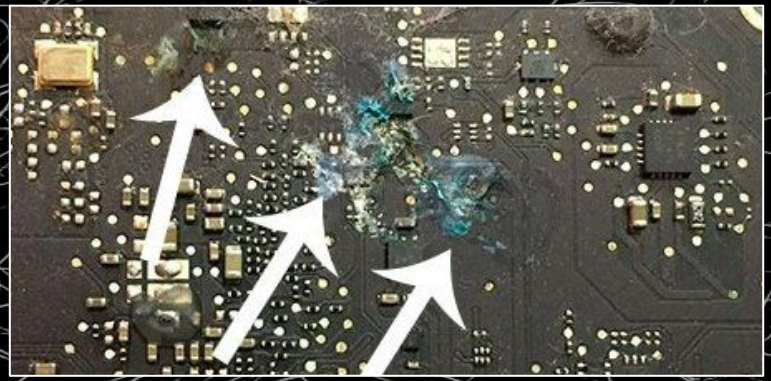
Testing of the Hybrids

- Tests of the Hybrid Electronics must be done in Climatic Chamber
- Testing done at 25 °C and -40 °C
- Temperature, dew point, and relative humidity monitor needed to conduct testing.

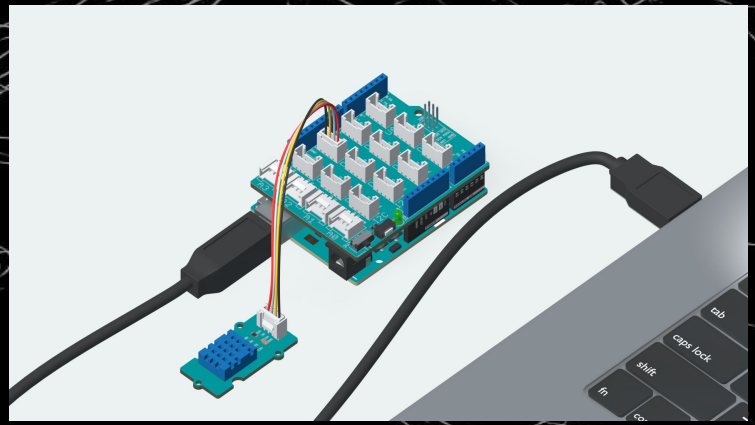
$$Dp(T,RH) = \frac{\lambda \cdot \left(\ln\left(\frac{RH}{100}\right) + \frac{\beta \cdot T}{\lambda + T} \right)}{\beta - \left(\ln\left(\frac{RH}{100}\right) + \frac{\beta \cdot T}{\lambda + T} \right)}$$

Why is the monitoring needed?

- Condensation ruins electronics → can cause a short circuit
- Climatic Chamber relative humidity sensor broken → We supply another

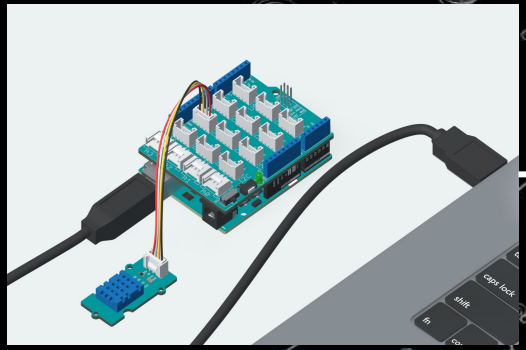


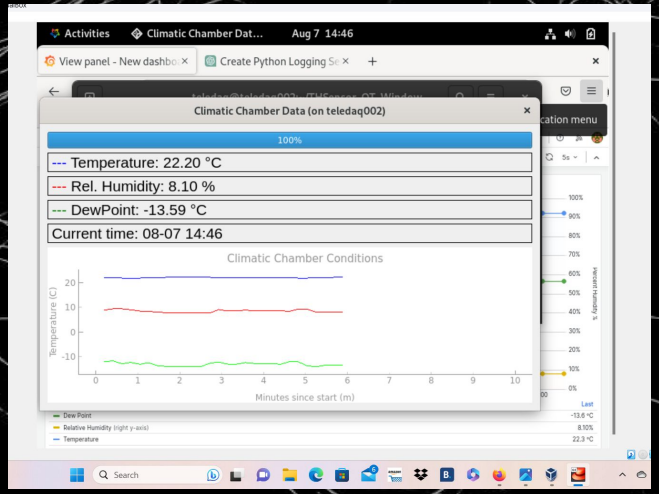
- Two Monitoring Systems used:
  - Built in chamber sensors
  - Strip sensors placed inside chamber



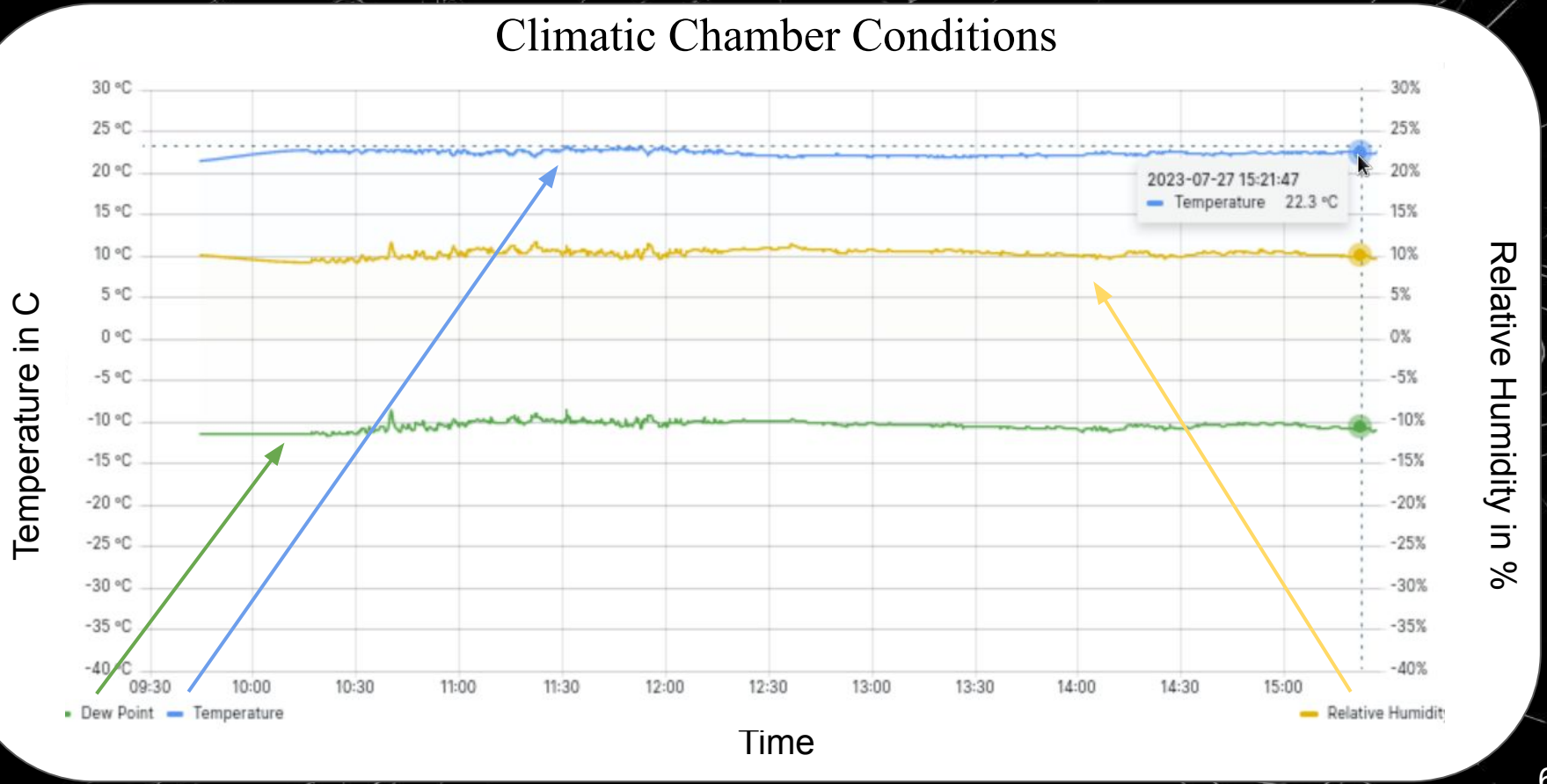
Set up in chamber

Getting Buckets

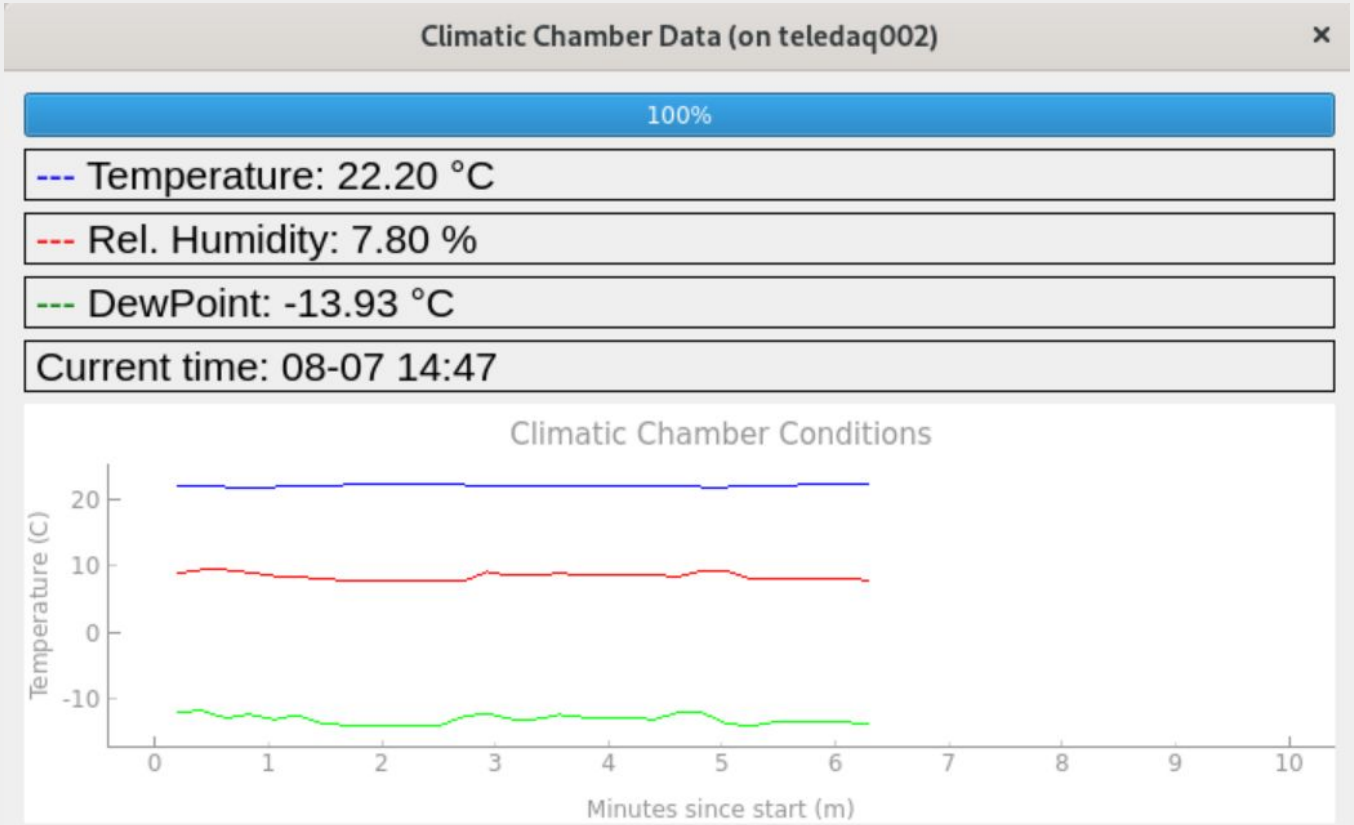




Creating Temperature Monitor pt. 1



Creating Temperature Monitor pt. 2



Accomplished

What's Next

- Run through cold cycle with monitoring system
- Debug minor issues with sensors
- Create some sort of warning system upon threshold crossing
- Add barometric sensors
- Actual Hybrid test starts beginning of 2024!

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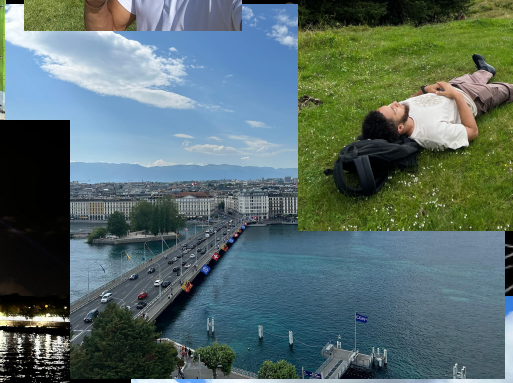
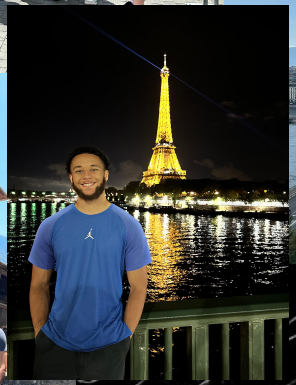
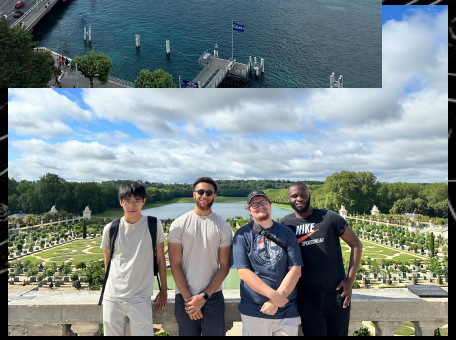
Thank you / Merci









chicChicken