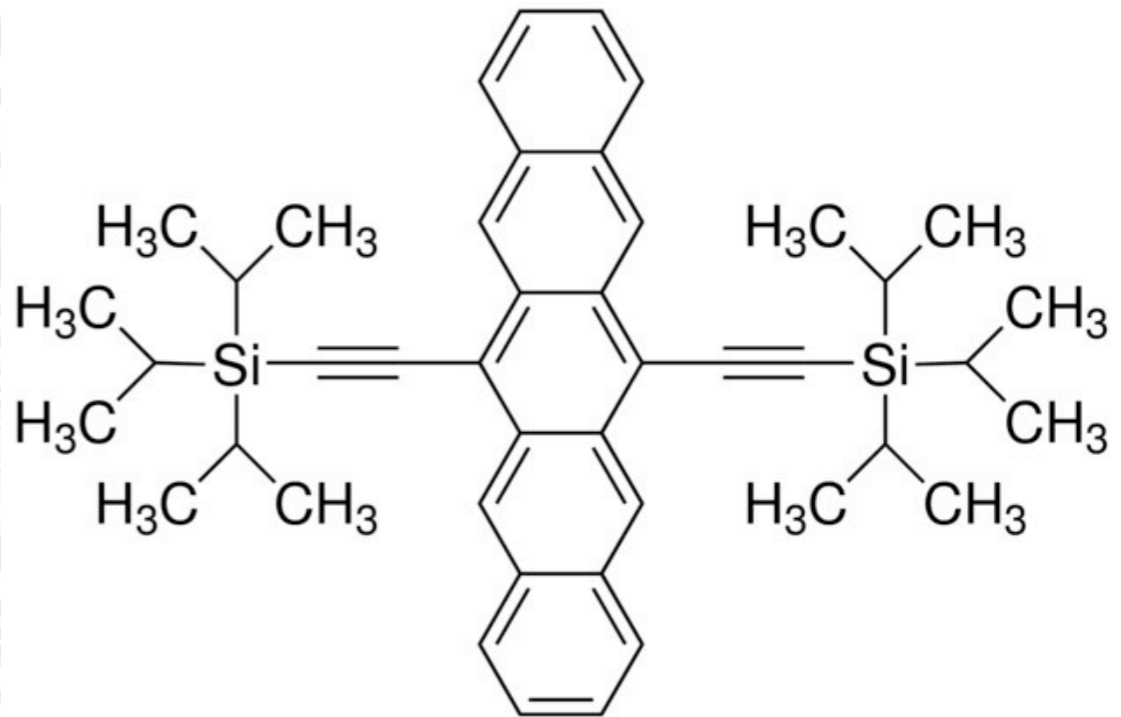


# Meet a USCMS Professor Scientist

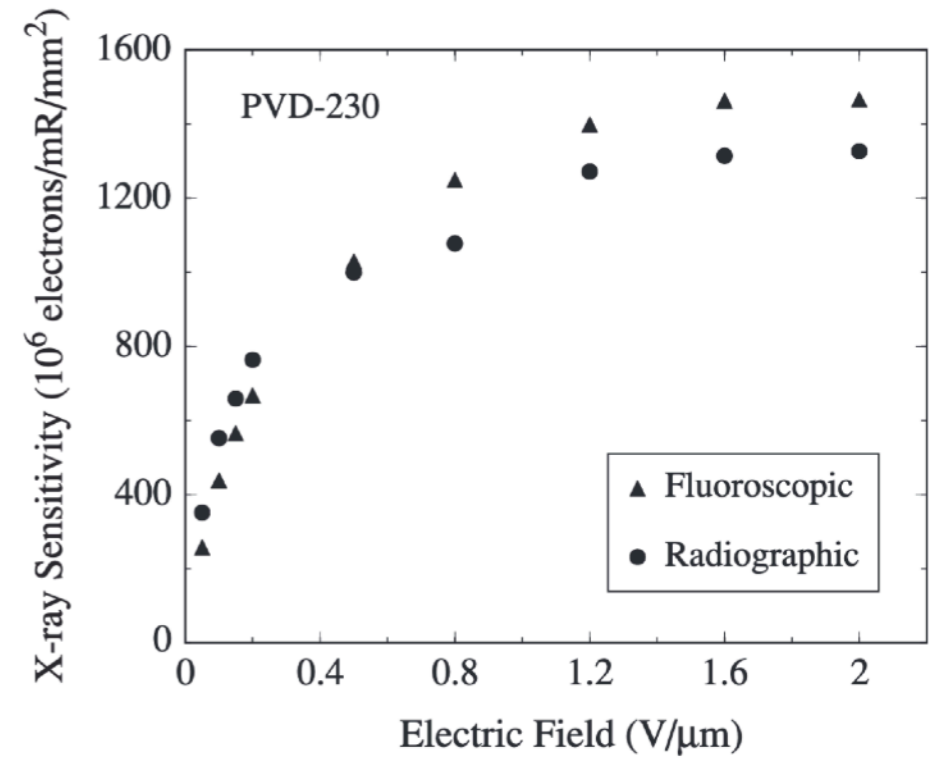
**Doug Berry**  
**Associate Scientist**  
**Fermilab**



- Started in research early
  - UROP - Undergraduate Research Opportunity Program (2003) - Material Science
    - Worked with Jihua Chen on crystalized TIPS-pentacene under Prof. David Martin
    - X-ray diffraction modeling and analysis
- Department of Radiation Oncology Division of Physics - Material Science
  - Worked with Prof. Larry Antonuk
  - X-Ray studies of organic thin-film detectors
    - Lead and Mercuric Iodide ( $PbI_2$  and  $HgI_2$ )
  - Characterization of indirect amorphous silicon x-ray detectors



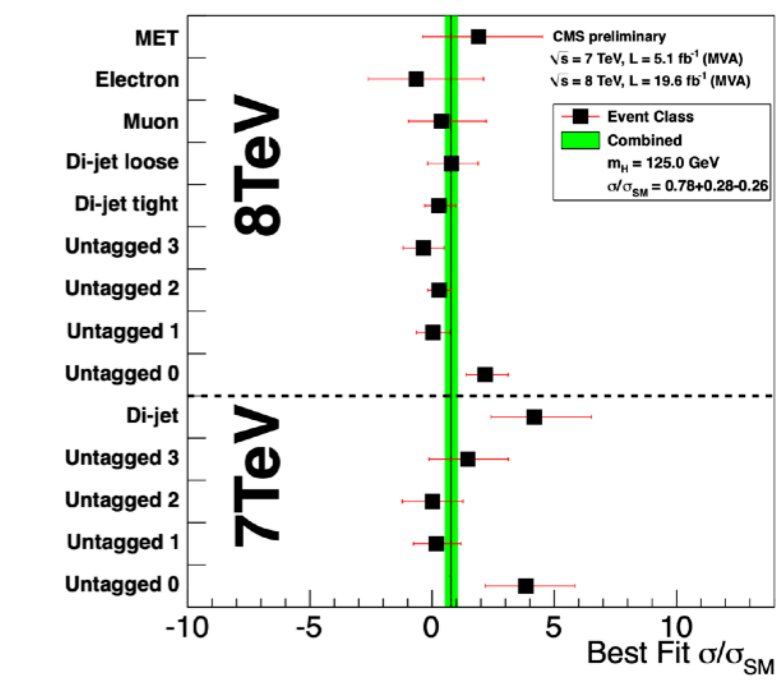
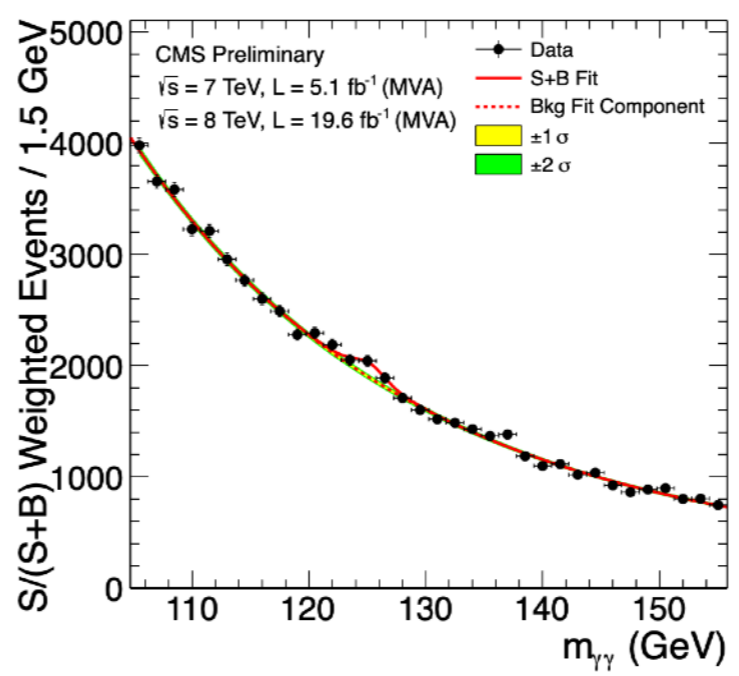
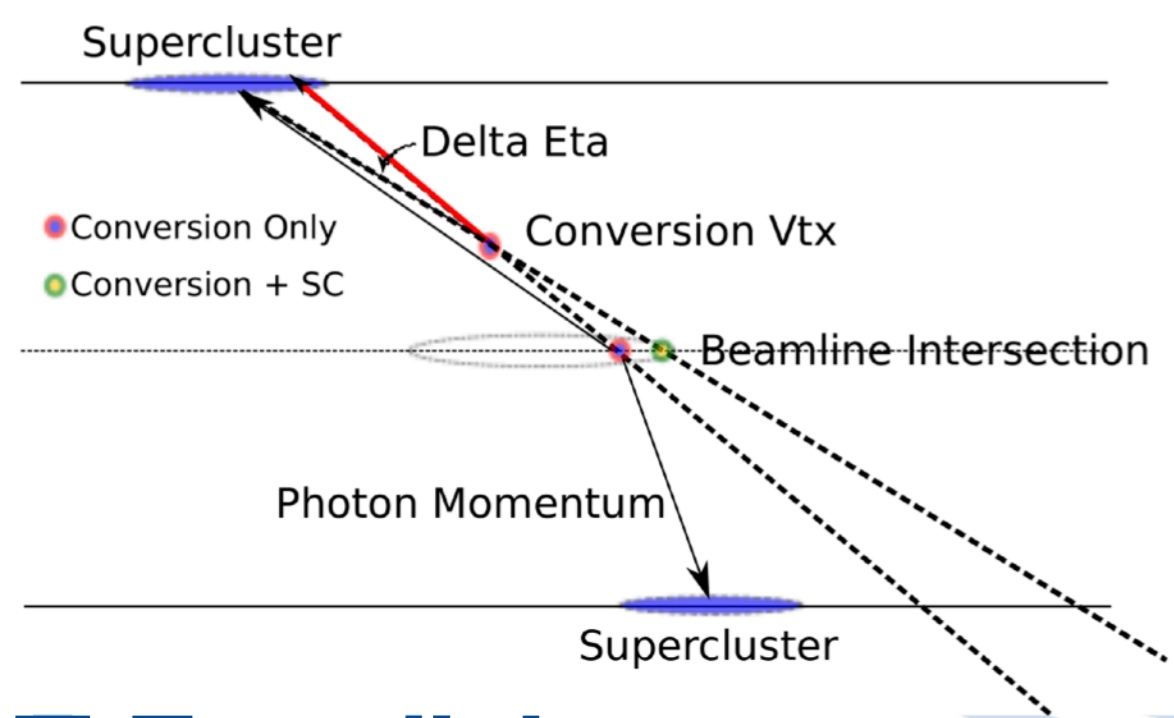
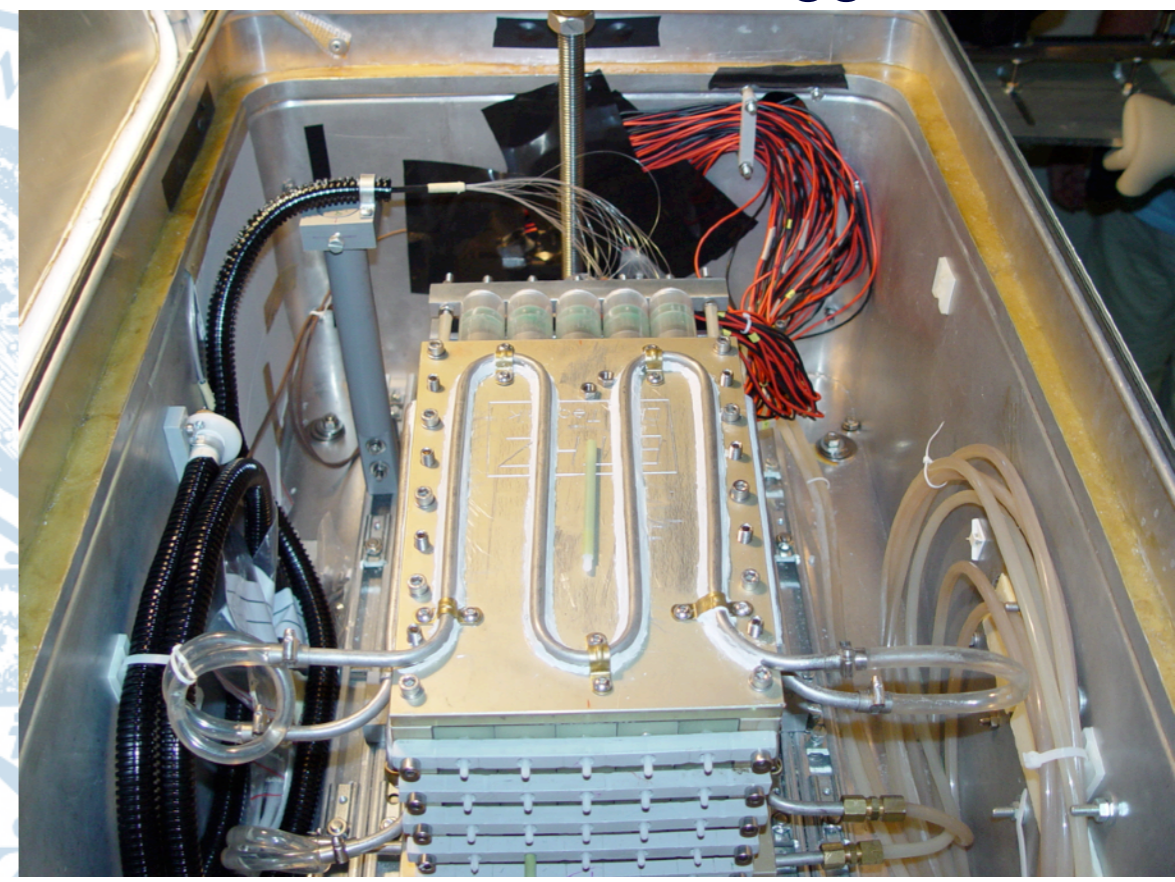
6,13-Bis(triisopropylsilylethynyl)pentacene



(a)

- High Energy Physics (CMS) - 2007 to 2013
  - With Advisors Prof. Colin Jessop and Research Prof. Nancy Marinelli
  - Radiation Damage and DQM for the ECAL - Electromagnetic Calorimeter
  - Search and discovery of the Higgs boson in the di-photon channel
    - Specialized in determining the Higgs vertex using converted photons

5x5 ECAL Test Beam "Trigger Tower"



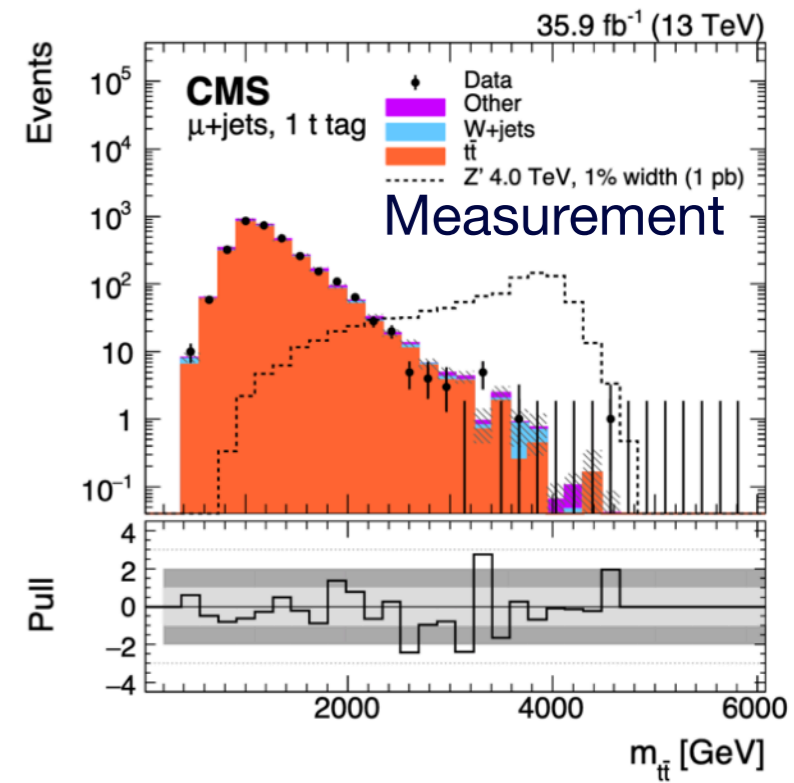
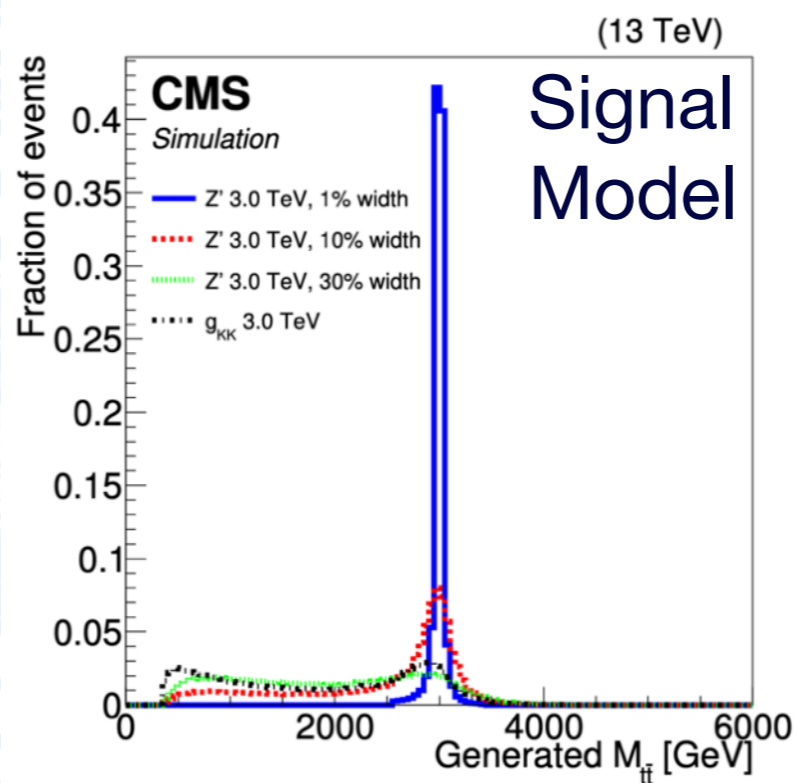
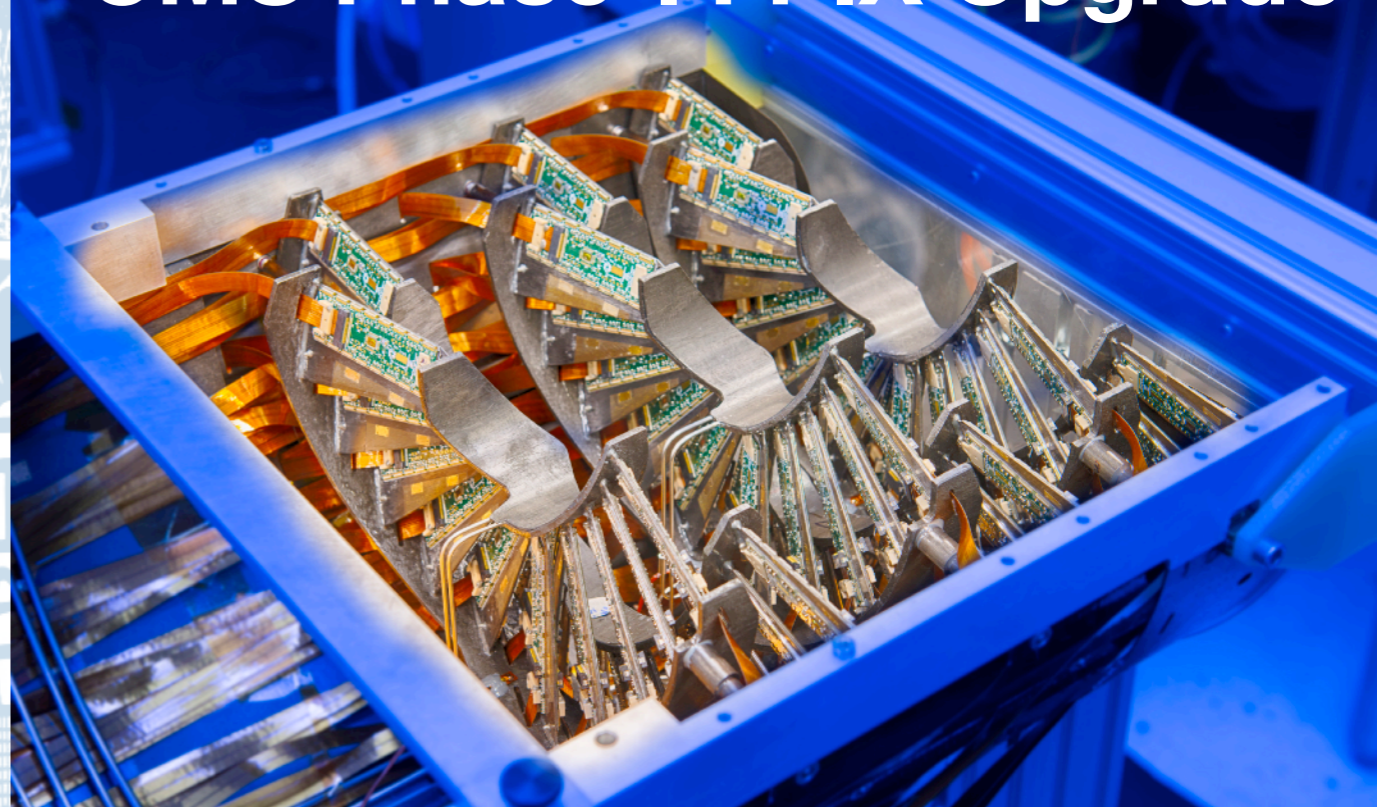


# Post Doc/Res Prof.



- High Energy Physics (CMS) - 2007 to 2013
- With Distinguished Professor Cecilia Gerber as Supervisor
- Research Associate - 2013 to 2016
- Visiting Research Assistant Professor - 2016 to 2019
- Manager for FPIX Module testing and database
- Search for heavy  $t\bar{t}$  resonances

## CMS Phase-I FPIX Upgrade

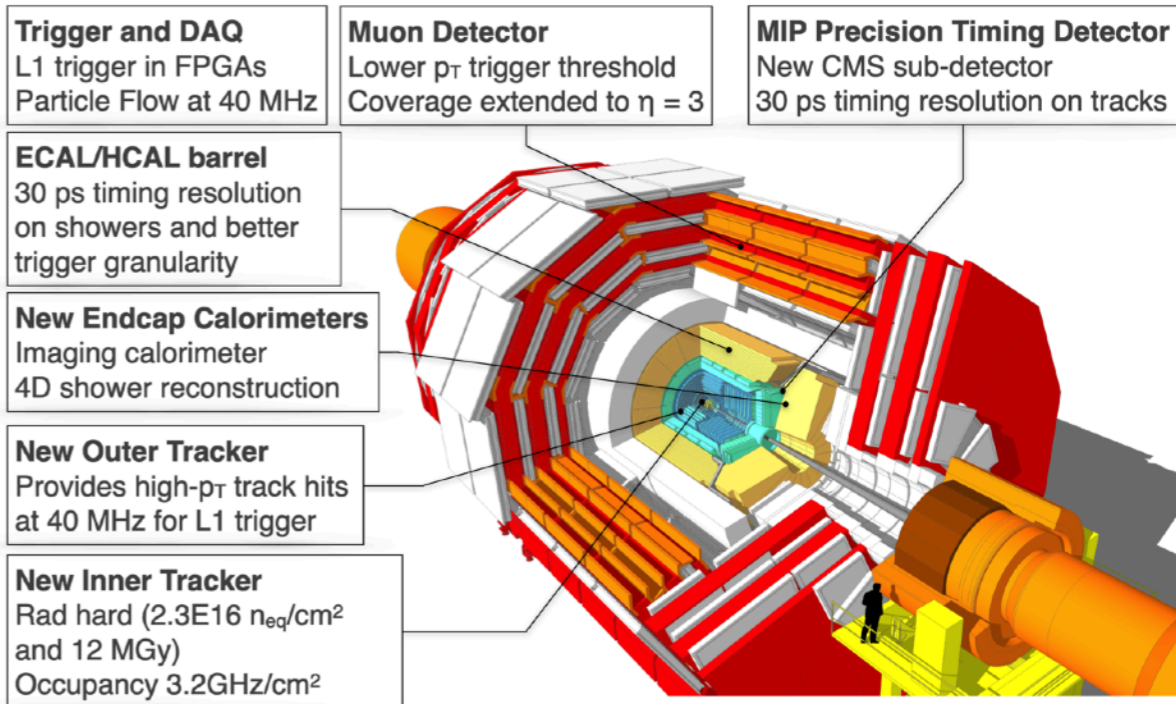




# Now - Fermilab

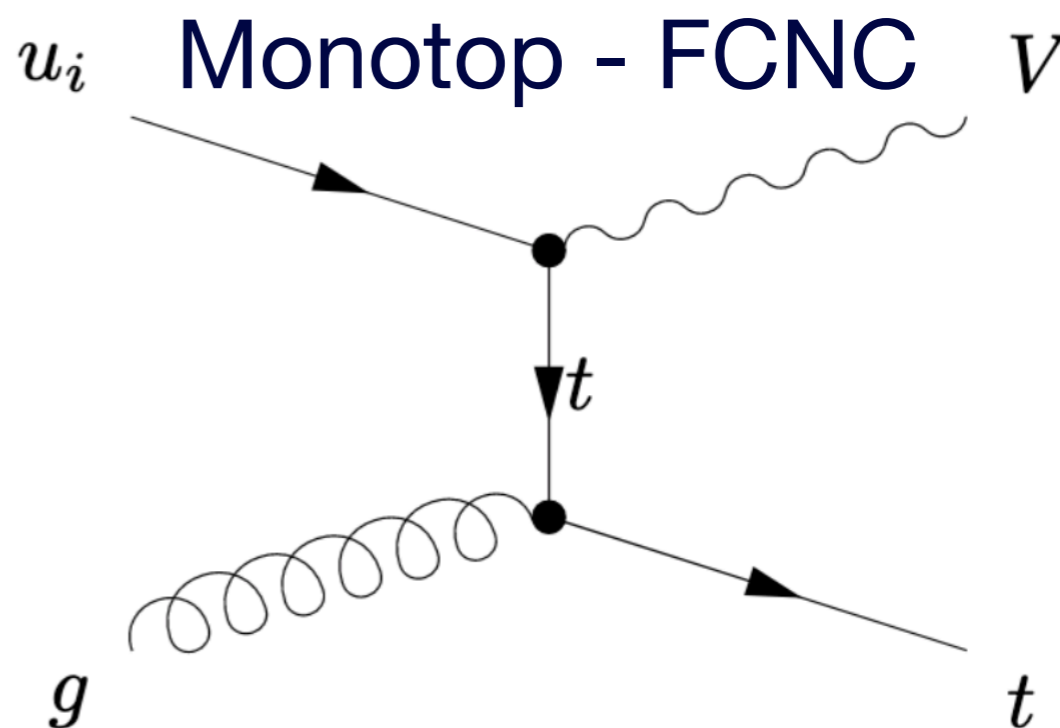
- High Energy Physics (CMS)
- Associate Scientist with Fermilab
- HL-LHC Outer Tracker upgrade
  - Mechanics and Integration for the Flat TBPS
  - Macro Pixel Sub-Assemblies (MaPSAs)
- Searching for dark matter produced in association with a top quark (Monotop)

## The CMS upgrade for HL-LHC (Phase II)



Fermilab

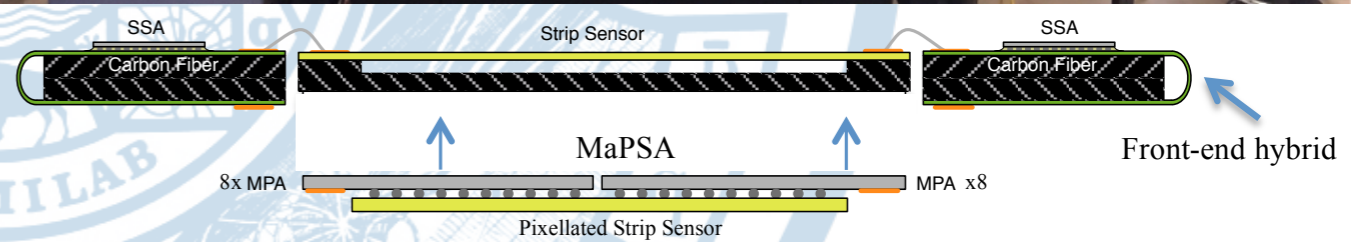
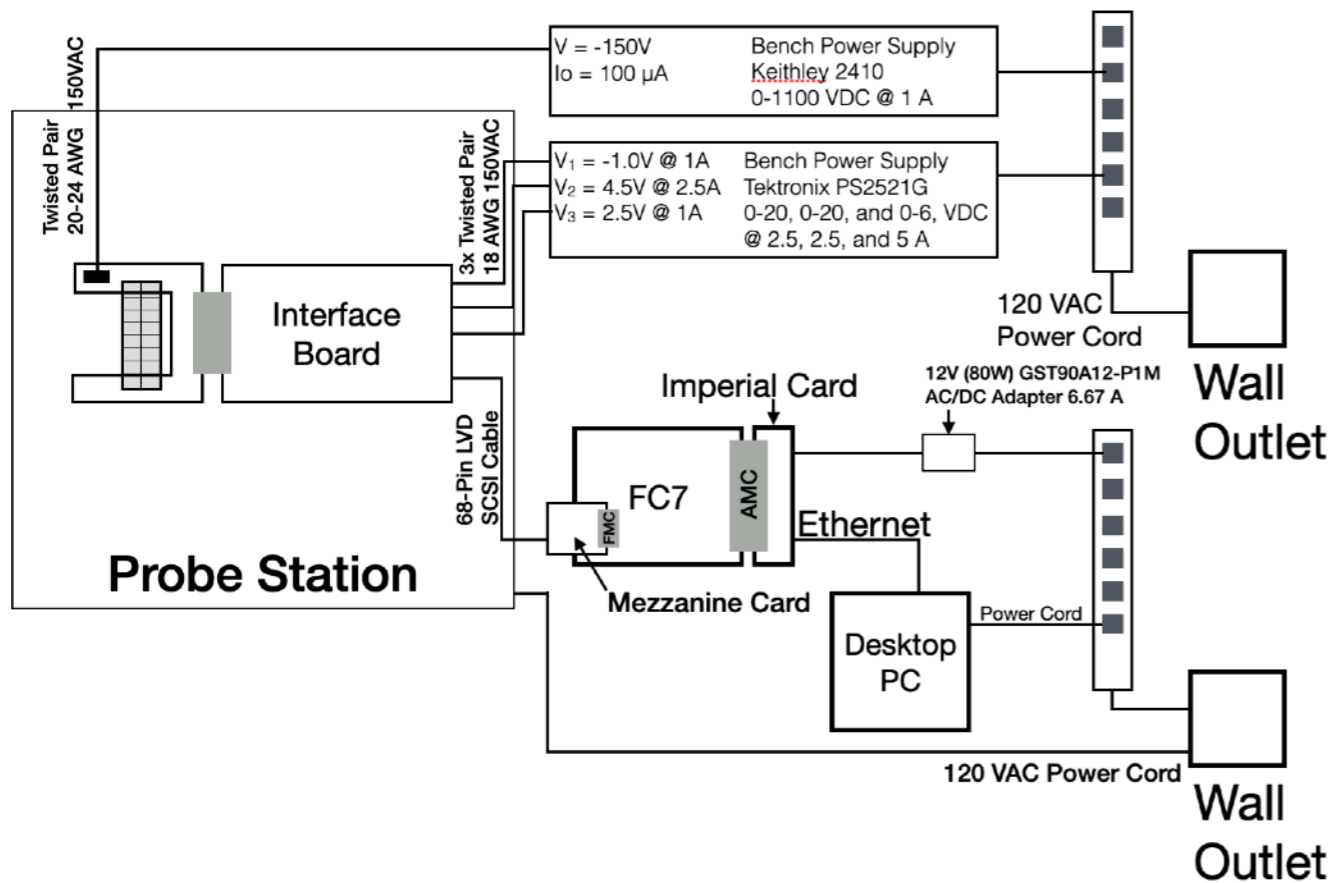
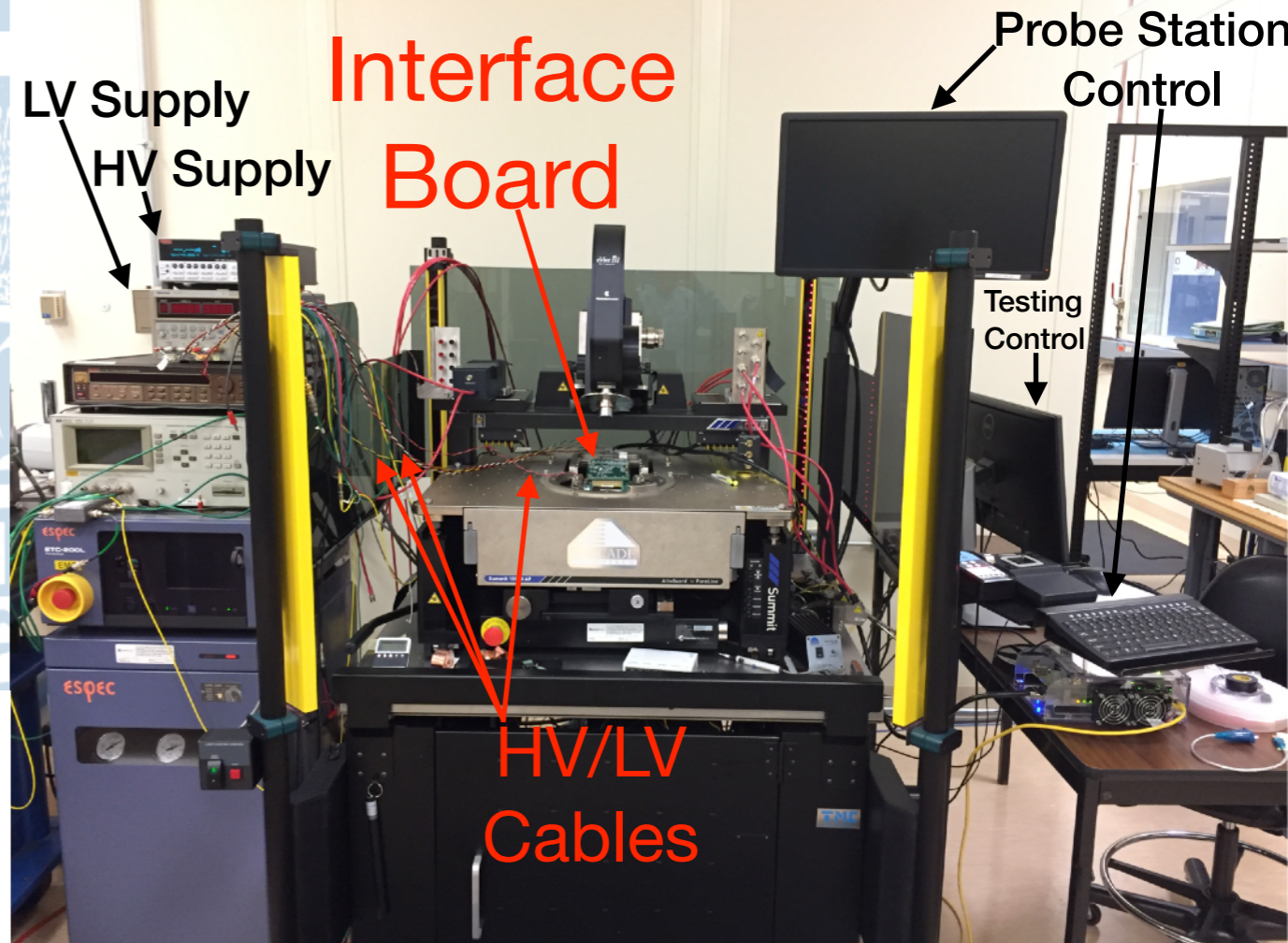
11 06/14/2022 F. Ravera | The Upgrade of the CMS detector for the HL-LHC





# Macro Pixel Sub-Assembly (MaPSA)

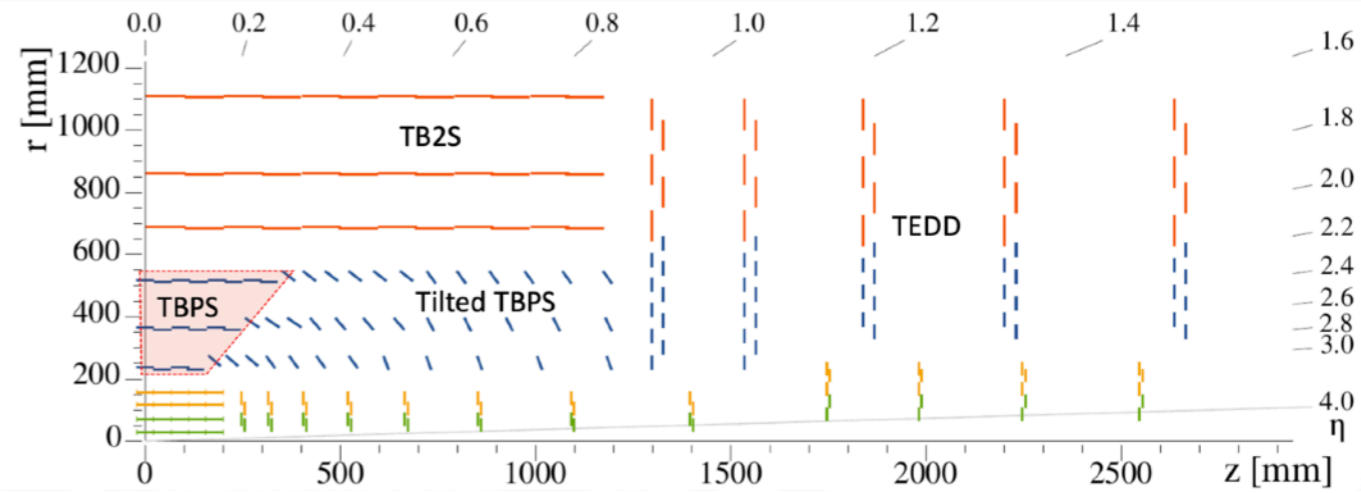
- A MaPSA is a sub component of a PS module
  - A silicon detector with large pixels
    - 1446  $\mu\text{m}$  x 100  $\mu\text{m}$  pixel pitch
    - 16 MPA ASICs
      - 1888 pixel per ASIC
    - 30208 pixel per MaPSA



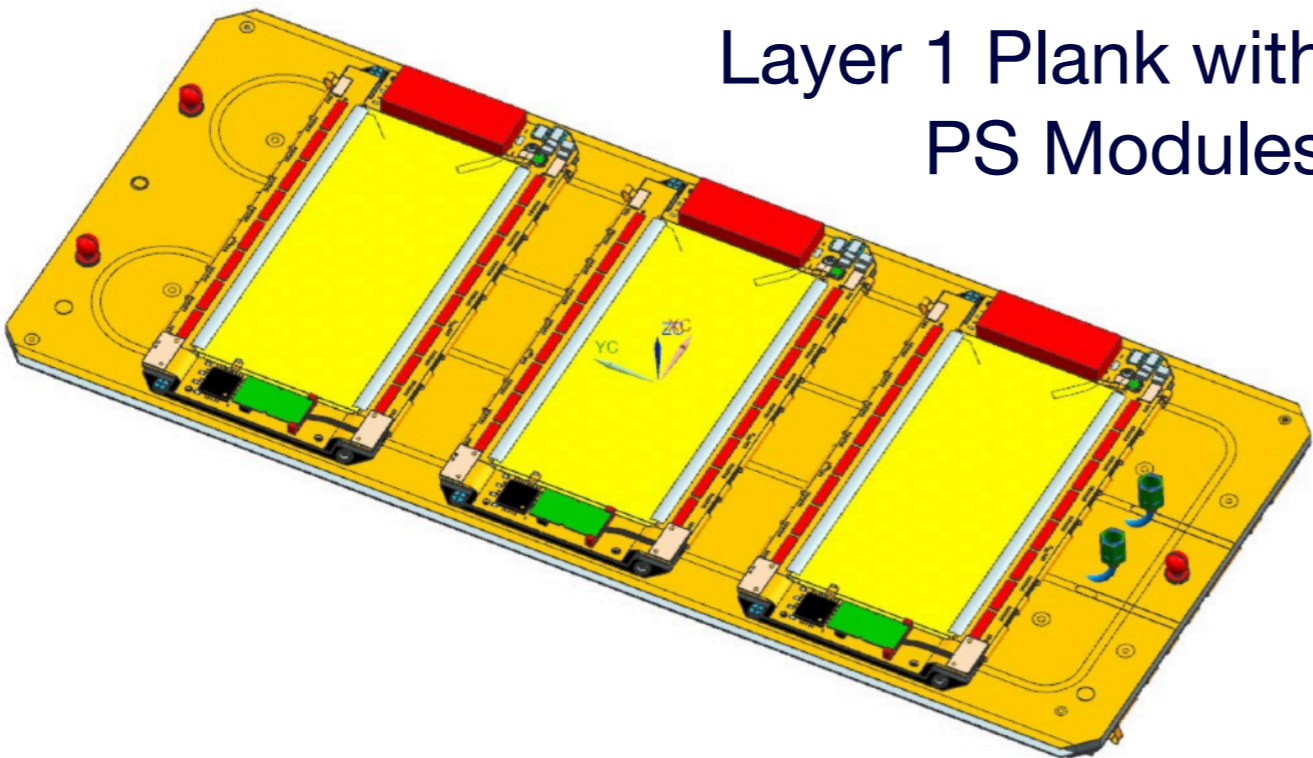


# Flat TBPS

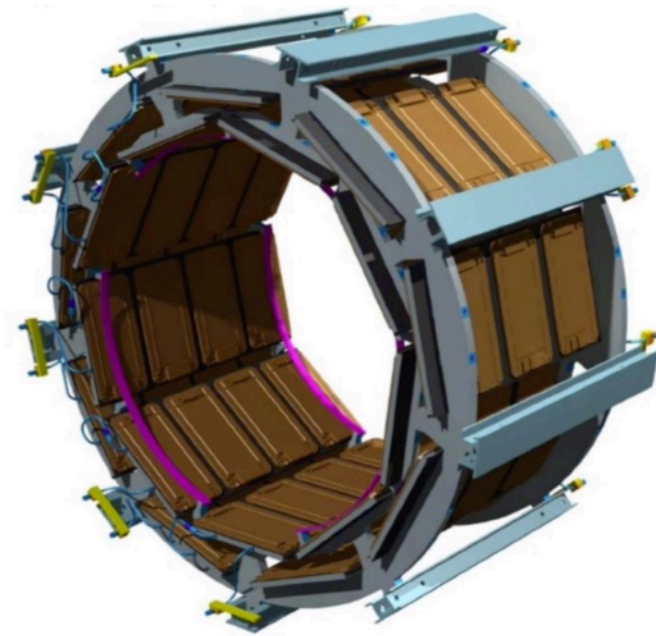
- The Flat TBPS is the inner low- $\eta$  section of the HL-LHC Outer Tracker Upgrade
  - Composed of carbon fiber/carbon foam planks
  - 2-phase CO<sub>2</sub> cooling system
  - 3 detector layers
  - 80 planks
  - 672 PS Modules



Layer 1 Plank with PS Modules



Layer 1 Ring with Planks



Layer 1 Ring with Planks

