CMS Pixel upgrade test-beam summary (T992)

Lorenzo Uplegger, Ryan Rivera
for the CMS pixel upgrade collaboration

Acknowledgments

Thanks for giving us two spills per minute, it allowed us to complete our program on time and get much more statistics but especially it let us sleep a little bit more!

Thanks a lot again!

Collaboration

Many different institutions and collaborators for the CMS pixel upgrade

- Fermilab
  S. Kwan, A. Prosser, L. Uplegger, R. Rivera, J. Andresen, J. Chramowicz, P. Tan, J. Yun, C. Lei
- Purdue
  E. Alagoz, O. Koybasi, G. Bolla, D. Bortoletto
- Syracuse
  J. Wang, M. Artuso
- Colorado
  M. Dinardo, S. Wagner, J. Cumalat
- Texas A&M
  I. Osipenkov
- Milano
  L. Moroni, D. Menasce, S. Terzo
- Torino
  M. Obertino, A. Solano
- Tata Institute
  S. Bose
- Buffalo
  A. Kumar

Motivation

• The CMS pixel detector is the closest detector to the interaction point. At a luminosity of 10^34 foreseen in the near future the current sensor technology will not survive longer than a year.

• Two different sensor technologies are currently under investigation

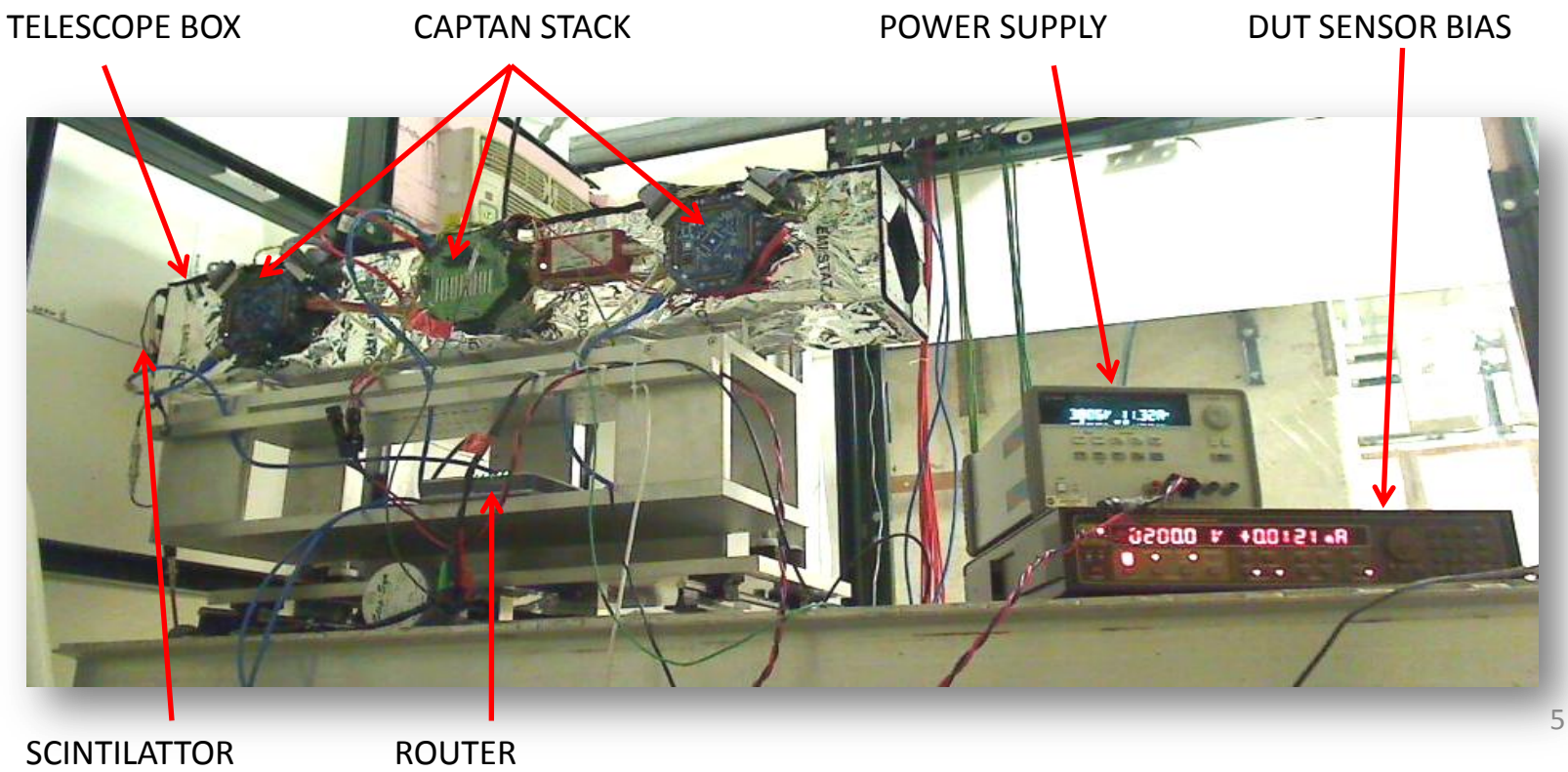
  • 3D sensors (the P+ implants are vertically inserted in the silicon reducing the distance between electrodes and thus reducing the necessary bias depletion voltage)

  • Diamond sensors which are intrinsically more radiation tolerant than silicon

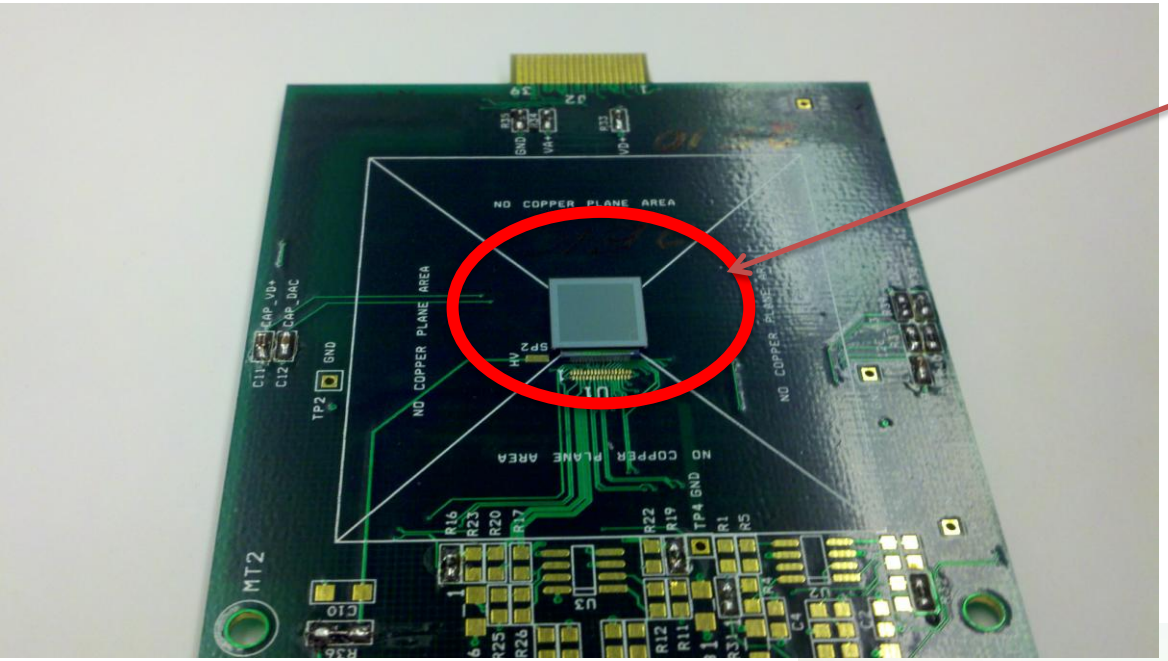
• We have prototypes for both kind of sensor and the goal of this test-beam was to test them to measure their properties.

Setup

Our pixel telescope is part of the MTEST facility.
Since March 2010, tracking has been requested and delivered to 5 official Fermilab experiments:
T992 - CMS SLHC sensor tests (MCZ, 3D,
Diamond) with Purdue and Syracuse.
T995 - Muon Detector/Tail Catcher.
T979 - Fast Timing Counters for PSEC.
T1004 - Dual Readout Calorimetry.
T1006 - Directly Coupled Tiles.

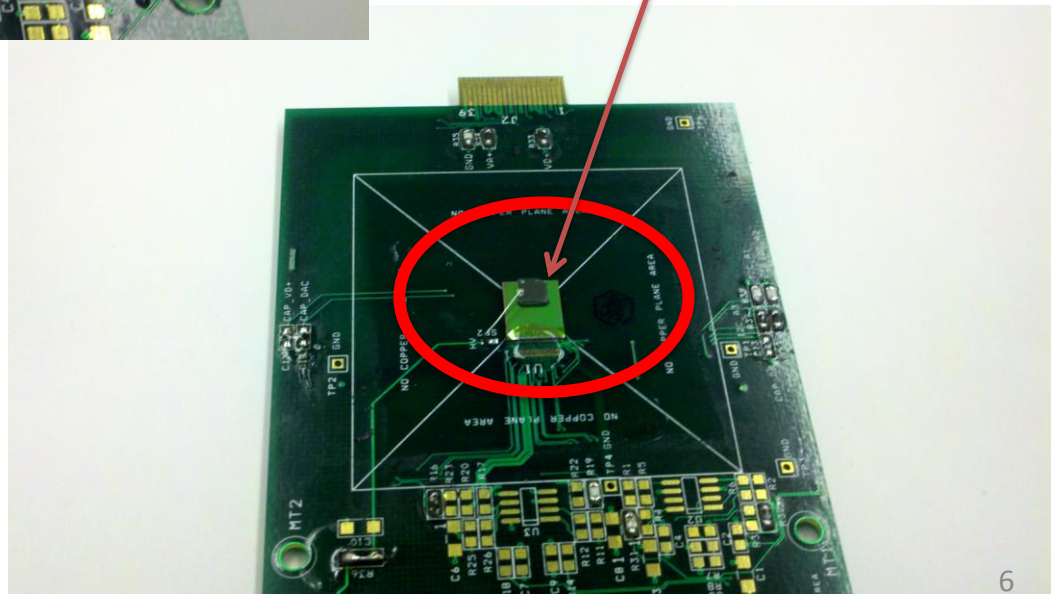


Detectors Under Test



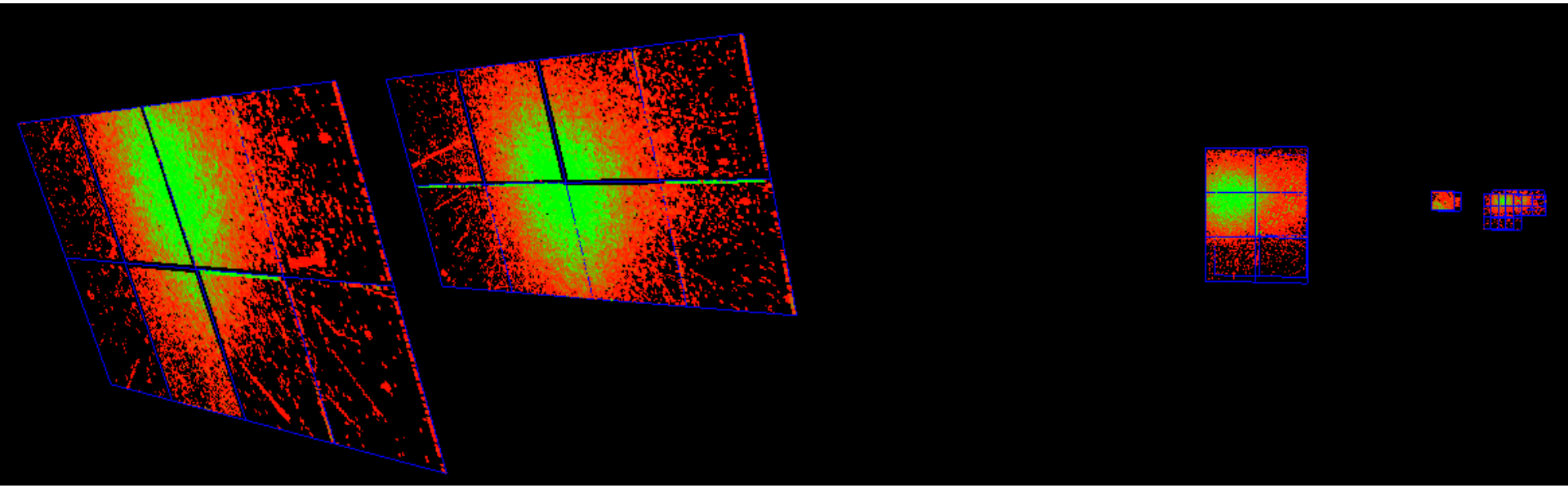
3D sensor

Diamond sensor

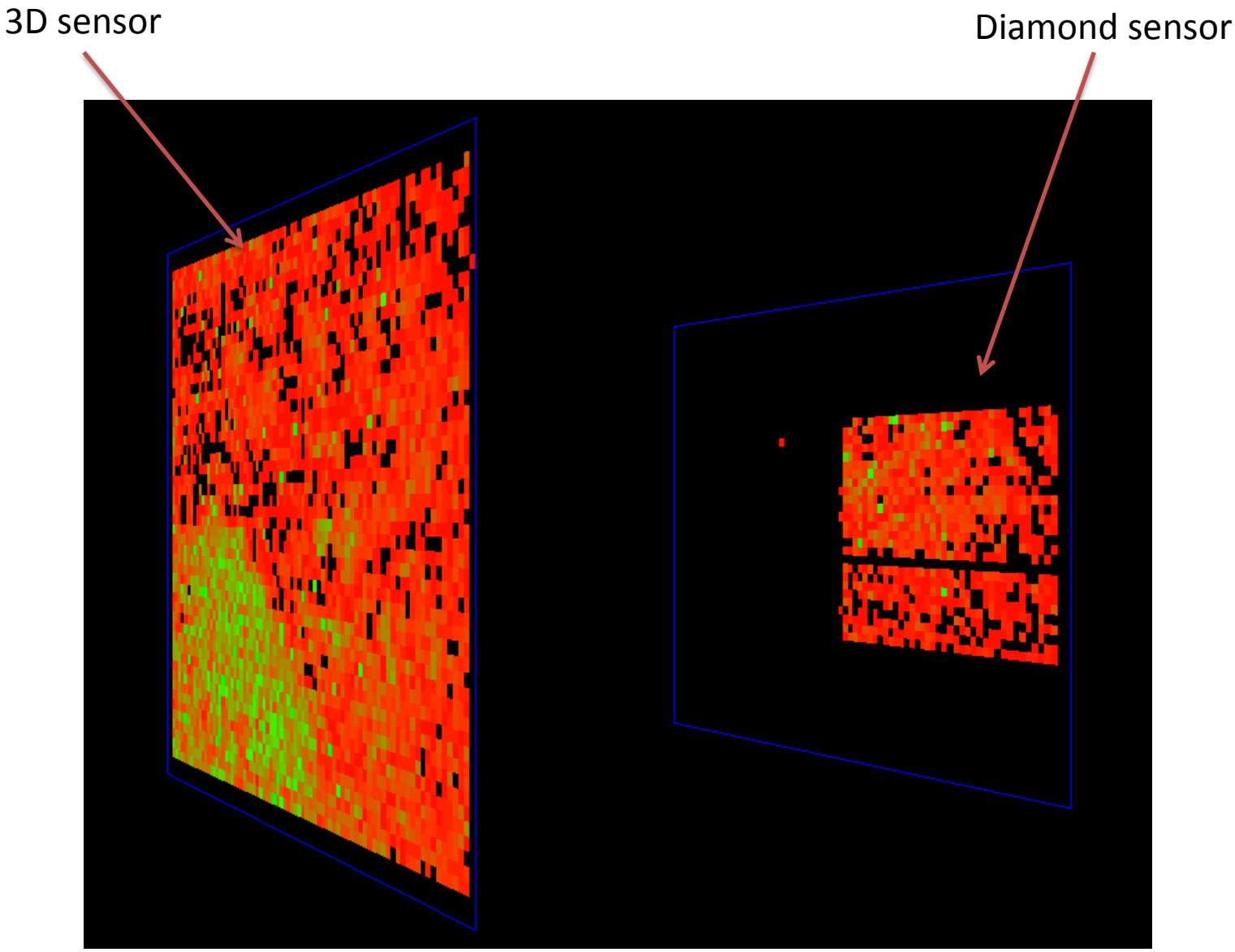


Results

Beam profile on the telescope planes

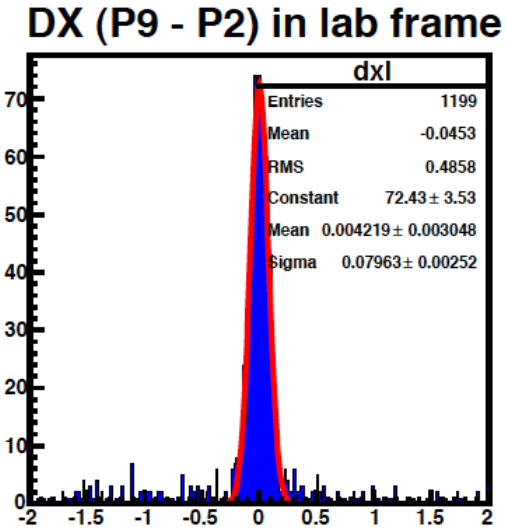


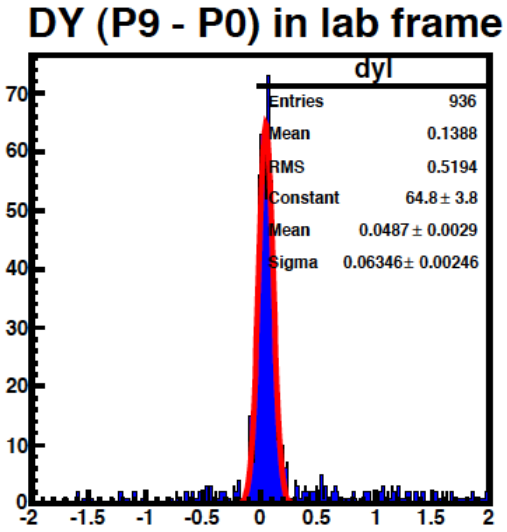
Results

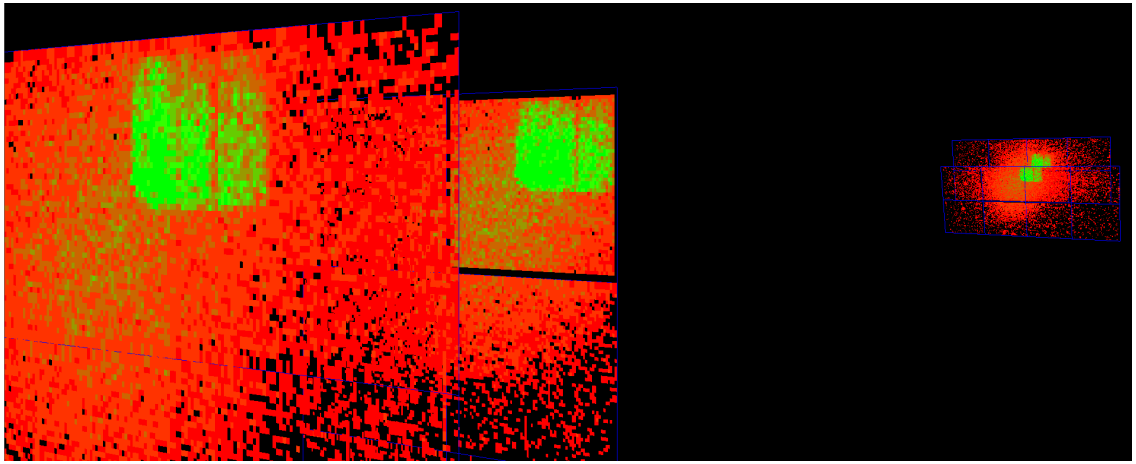


Results

Coincidences on the diamond detector







Conclusions

• Thanks to the high statistics we could accumulate with two spills per minute we were able to test 9 3D and 1 diamond sensors

• The last 2 detectors are still in the beam and will be tested by the end of the day!

• We will test in the future these detectors after they will be irradiated

Thanks again!