

QIE Testing and Dijet Scouting

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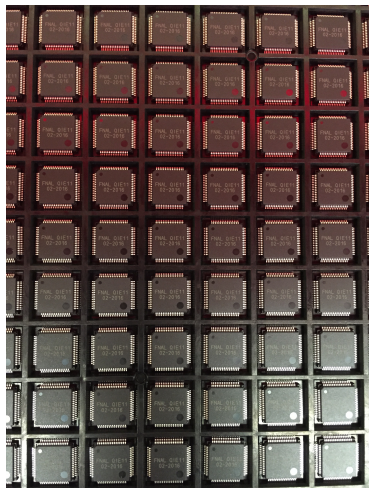


Summary

- I'm part of the new LPC graduate scholars program.
- My work:
 - QIE ASIC testing.
 - Dijet scouting search.
 - MC contact for Exotica and HCAL groups.

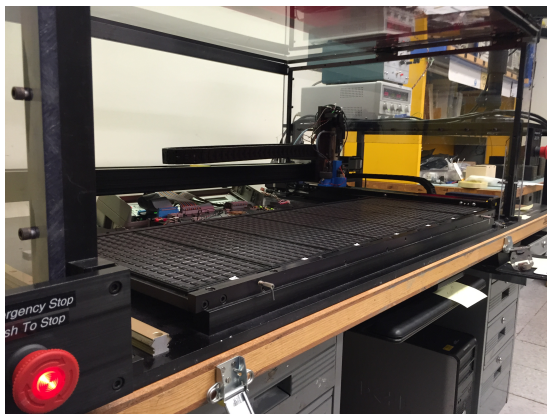
QIE testing

- QIE10 and QIE11 were designed at FNAL by Tom Zimmerman.
- They are used to digitize the signal from CMS's HCAL.
- In the past month we have tested 11 000 QIE11 chips.
 - Jim Hirschauer (FNAL), Titas Roy (Florida Institute of Technology), and Nadja Strobbe (FNAL)
- We test for basic functionality of the chips, the response to signal, pre-calibration distributions, and programability.
- Preparing to test QIE10 chips.

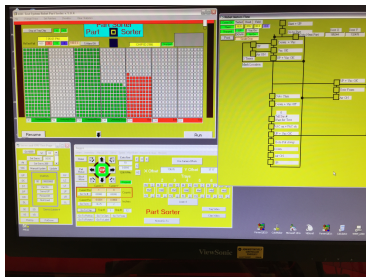


Robot

- QIE testing robot at FNAL (WH14W) designed by Al Baumbaugh and Lou Dal Monte.
- 1120 chips at a time are loaded into the robot.

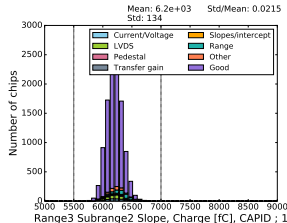
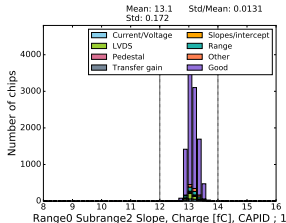
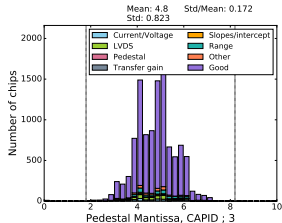
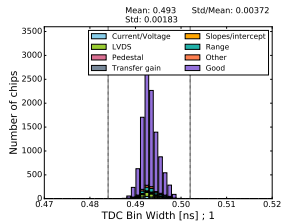


- After we've selected cuts on the test results, the robot sorts good and bad chips into separate trays.



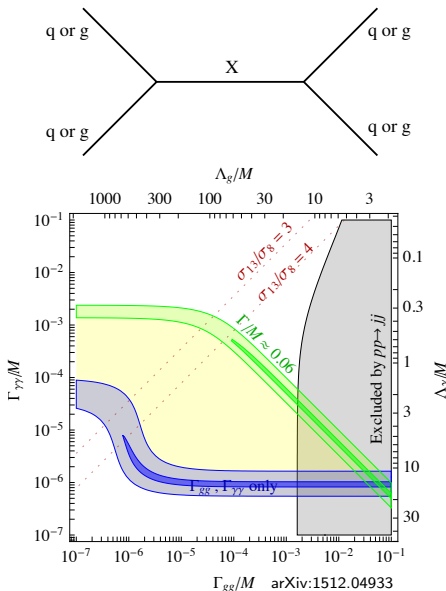
Testing results

- 98% of chips have basic functionality.
- 86% yield after outlier rejection and selection for uniformity.
- Tested and sorted 9484 good QIE11 chips available to assemble into QIE cards this week.
- Preparing to test QIE10 chips.



Dijet scouting analysis

- ATLAS and CMS have seen an excess in the diphoton spectrum at 750 GeV.
- A resonance produced by partons must decay to them.
- A cross section of $\sigma_{\gamma\gamma} \approx 10$ fb implies $\sigma_{jj} \approx 0.1$ –10 pb.
- A dijet analysis in 2015 data was published in PRL last year. It starts limits at 1.5 TeV.
- Scouting allows us to probe lower masses.



Dijet team

- I had been working on a different analysis, but switched to dijet scouting in part because of being based at the LPC.

● U. Athens

- Magda Diamantopoulou (student)
- Dimitris Karasavvas (student)
- Niki Saoulidou
- Eirini Tziaferi

● Caltech

- Dustin Anderson (student)
- Artur Apresyan
- Javier Duarte
- Si Xie

● CERN

- Federico De Guio
- Konstantinos Kousouris
- Maurizio Pierini

● U. Claude Bernard, Lyon

- Maxime Gouzvetich

● U. Cukurova

- Ayse Bat (student)
- Serdal Damarseckin (student)
- Emine Gurpinar
- Sertac Ozturk

● U. Cyprus

- Georgios Mavromanolakis

● Fermilab

- Robert Harris

● U. Helsinki

- Juska Pekkanen (student)
- Mikko Voutilainen

● Middle East Technical University

- Bora Isildak

● Institute Rudjer Boskovic

- Lucija Bajan (student)
- Dinko Ferencek
- Sasa Micanovic

● Rutgers University

- John Paul Chou
- Amitabh Lath
- David Sheffield (student)

● Sapienza, University of Rome

- Federico Preiato (student)
- Francesco Santanastasio

● Texas Tech

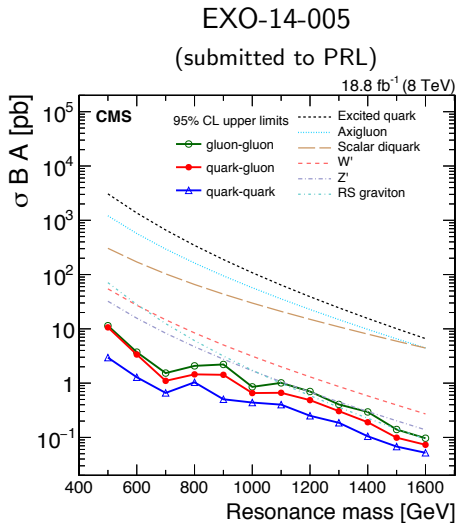
- Nural Akchurin
- Shuichi Kunori
- Sung-Won Lee
- Zhixing [Tyler] Wang (student)

● U. Zurich

- Andreas Hinzmann

Run I data scouting search

- Run I scouting set a limit of ~ 2 pb on a gluon-gluon resonance at 750 GeV.
- The corresponding signal for Run II would be ~ 10 pb.
- For parton lumi ratio ~ 5 for gg, we expect to be as sensitive as Run I with $\sim 4 \text{ fb}^{-1}$.



Data scouting in Run II

- Data scouting allows us to use a lower threshold trigger at the expense of skipping offline reconstruction and limiting the event size.
- Objects are reconstructed at the HLT and then their most important information is stored in scouting datasets.
- In Run I, we only had calo scouting with calo jets.
- We now have calo scouting and PF scouting with PF jets and much more information from the jets and all other objects in the event.
- The PF scouting in 2015 used a $H_T > 450$ GeV trigger compare to the 800 GeV trigger used by the high mass analysis.
- All PF scouting is parked (stored to tape without reconstruction).

Conclusion

- The dijet scouting analysis will be released at a summer conference.
- Tested and sorted 9484 good QIE11 chips for the HCAL endcap.
- Preparation for QIE10 chips is underway for the Forward Calorimeter.