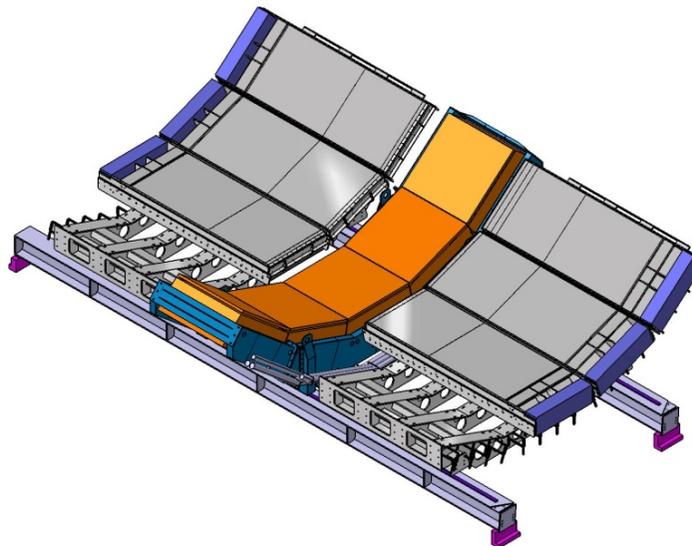


CCNU Efforts on ALICE-DCal

Yaping Wang
(for ALICE-CCNU group)



Institute of Particle Physics, CCNU, Wuhan, China
Key Lab. of Quark and Lepton Physics (CCNU), Ministry Of Education, China

Outline



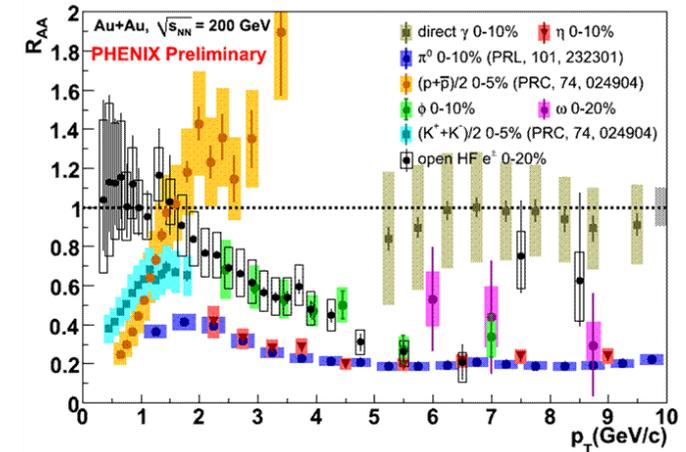
- ✓ Introduction
- ✓ DCal (Di-jet Calorimeter) at ALICE
- ✓ CCNU efforts on DCal
- ✓ Summary



Introduction – Results at RHIC

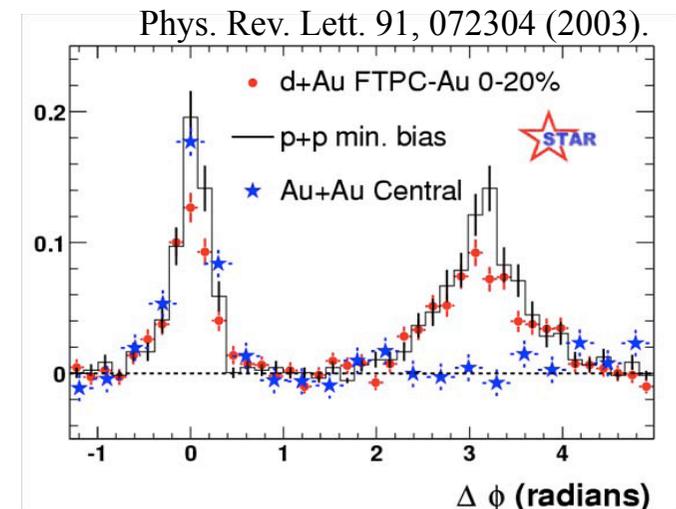
Jet quenching

- Suppression (relative to binary collision scaling) was found to be large (~ 5 times) for high p_T hadrons, and photons are not found suppressed.



Di-hadron correlations

- Significant correlation strength above uniform background is seen for p+p, d+Au collisions, consistent with di-jet production.
- Strong suppression of the correlation is observed for central Au+Au collisions.

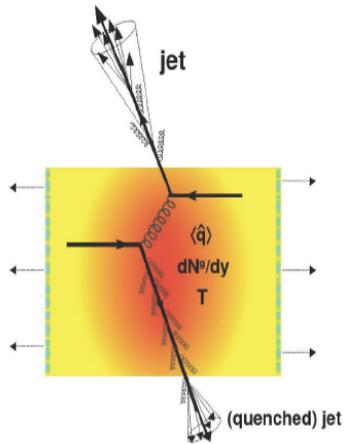


Full jet reconstruction and hadron-jet correlations at RHIC

- Full jet reconstruction makes a closer connection to the dynamics of jet quenching at the partonic level.

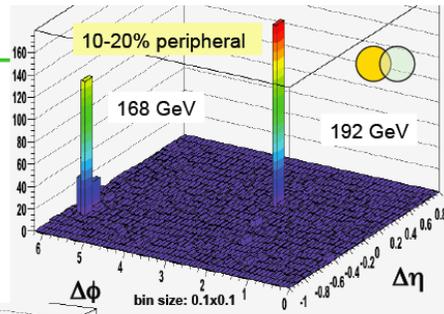
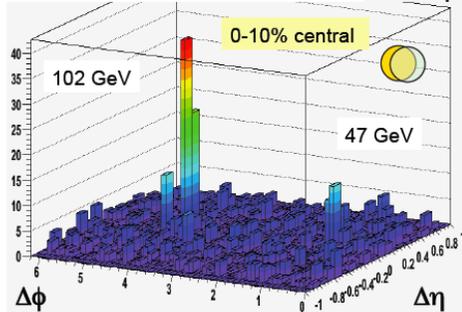
Introduction – Results at LHC

Jet quenching



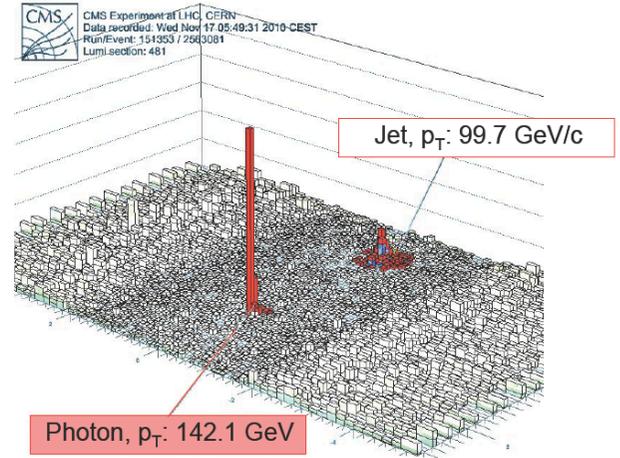
Charged Jets

- Jets in ALICE (TPC)
 - ⇒ we see qualitatively a similar effect
 - ⇒ quantitative analysis is ongoing
 - small acceptance (statistics), ⇒ need full 2010 data
 - try to include low p_t (study p_t -cut off dependence of imbalance)

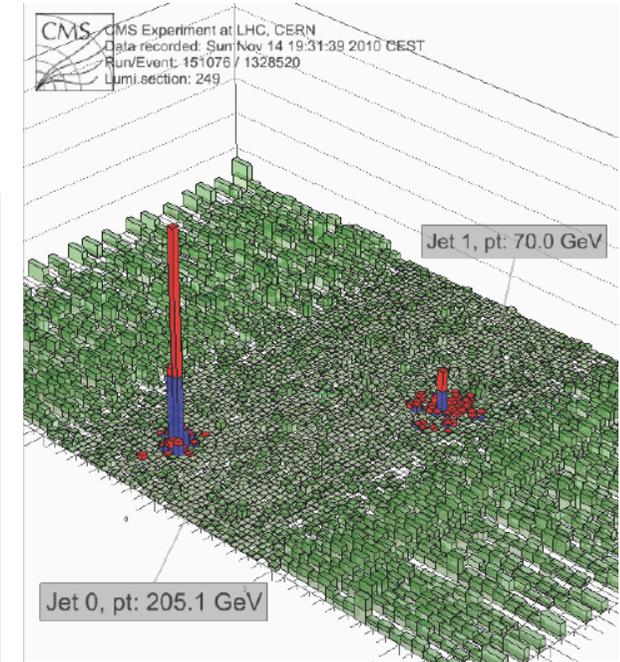


Plot from Jurgin Schukraft's talk

CERN, 2 Dec 2010 J. Schukraft

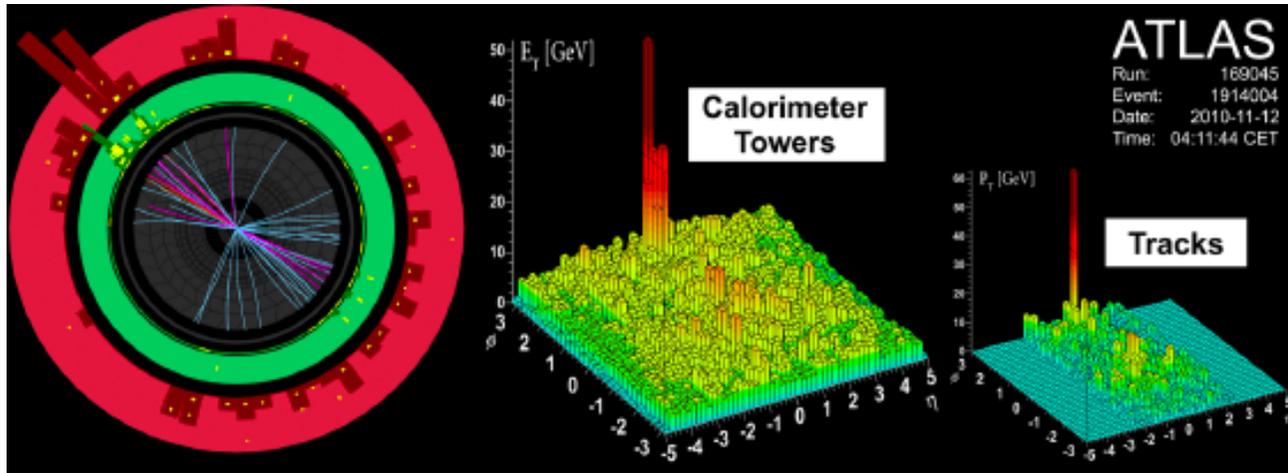


Photon, p_T : 142.1 GeV



Jet 0, p_T : 205.1 GeV

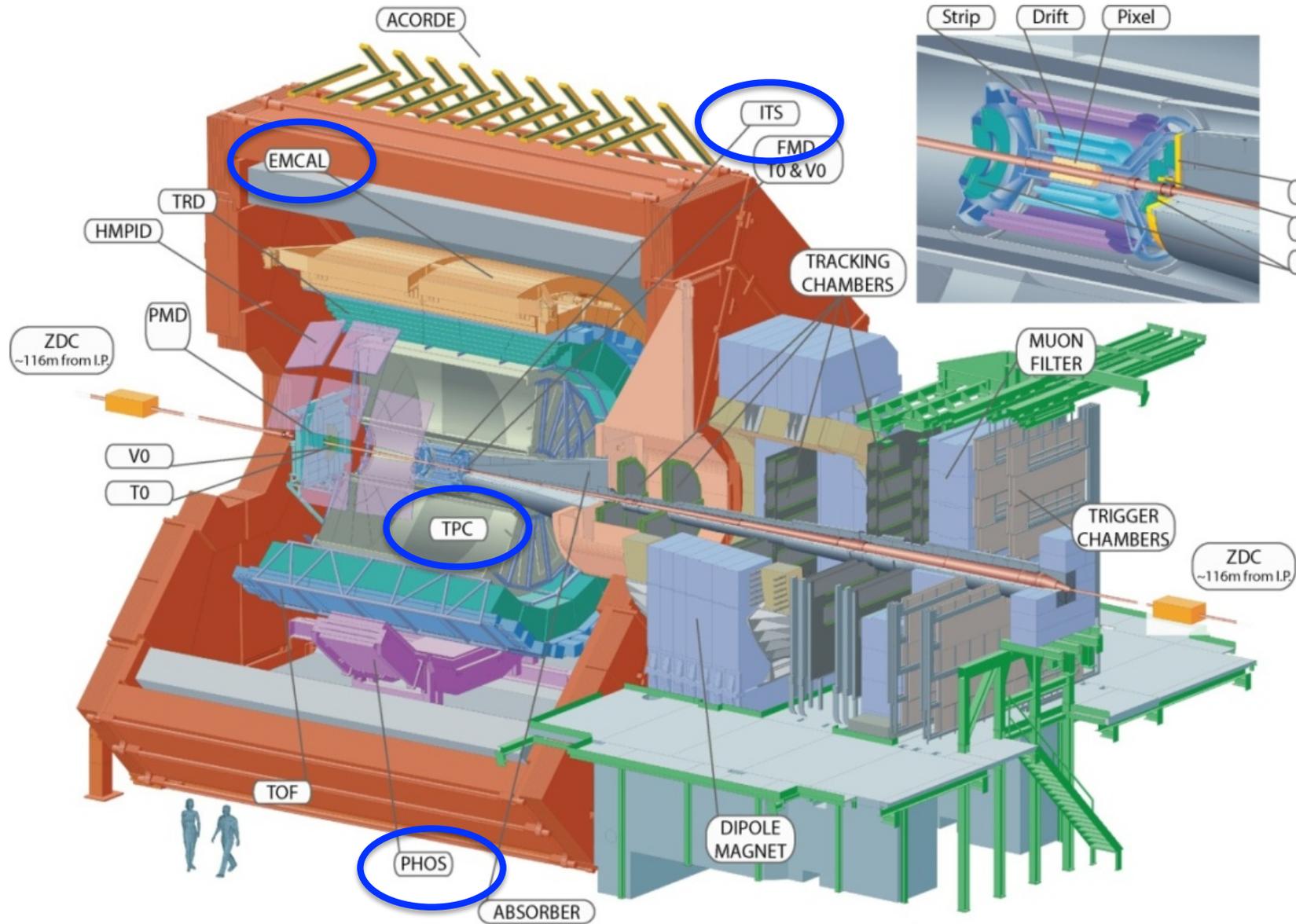
Jet 1, p_T : 70.0 GeV



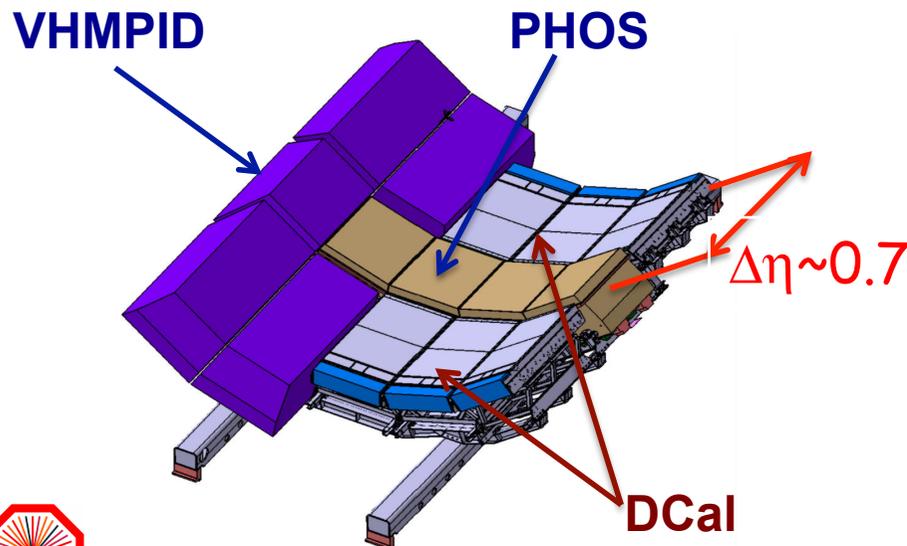
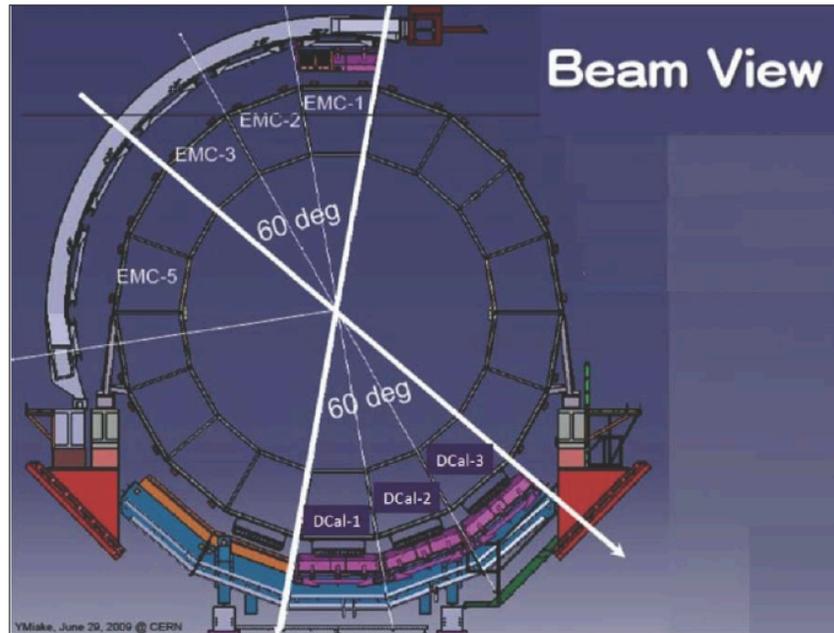
Plot from Brian A. Cole's talk on "Symposium on Jet Physics at RHIC and the LHC"

Plot from Gunther Roland's talk on "Symposium on Jet Physics at RHIC and the LHC"

Introduction – ALICE detectors



DCal at LHC/ALICE



- Adopt a basic detector design identical to that employed in ALICE EMCal.
 - $\Delta\phi = 60^\circ$ (on opposite side of EMCal)
 - $\Delta\eta = 0.7$ for DCal + PHOS
 - $\sim 11\%/\sqrt{E} \oplus 1.7\%$
- Extension of the acceptance of EMCal.
- Allow back-to-back hadron-jet, di-jet measurements in ALICE, with jet cone size $R = 0.4$, up to $E_T \sim 150$ GeV.
- Sufficient for π^0/γ discrimination up to $p_T \sim 30$ GeV/c in central Pb+Pb collisions.
- Energy measurements for electrons is comparable to the ALICE tracking system momentum measurements for $p_T > 20$ GeV/c.
- Enhance jet, gamma trigger capability.

DCal Physics measurements

1. Correlation of fully reconstructed jet pairs

- Enables unique jet quenching measurements, like di-jet energy balance.

2. Correlation of a recoiling b2b jet from a high p_T trig. π^0

- Provides an unique geometry bias, maximizing path length of the recoiling jet in hot medium.

3. Other measurements

- γ -jet correlations: golden channel and complementally to π^0 -jet, di-jet.
- γ -hadron correlations: supplements the γ -hadron capabilities of EMCal+PHOS.
- Inclusive measurements of photon, π^0 , and non-photonic electrons from heavy flavor (enhanced by $\sim 60\%$).
- Inclusive jet measurements (enhanced by $\sim 20\%$).
- ...

DCal at LHC/ALICE



China
[Central China Normal University \(CCNU\)](#)



Finland
University of Jyvaskyla



France
LPSC Grenoble, Subatech Nantes, IPHC Strasbourg



Italy
INFN Catania, LNF Frascati,



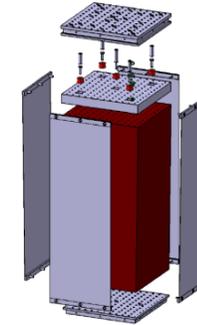
Japan
Hiroshima University, University of Tokyo, [University of Tsukuba](#)



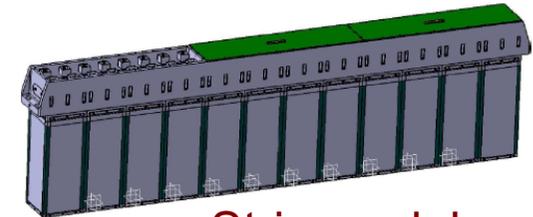
Switzerland
CERN



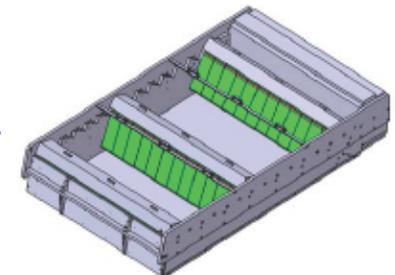
USA
Lawrence Berkeley National Laboratory, Wayne State University,
University of Houston, University of Tennessee, Lawrence Livermore
National Laboratory, Yale University, Oak Ridge National Laboratory,
Creighton University, Cal Poly San Luis Obispo, Purdue University



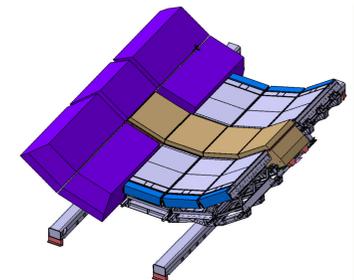
Module



Strip module



Super module





DCal at LHC/ALICE

Schedule:

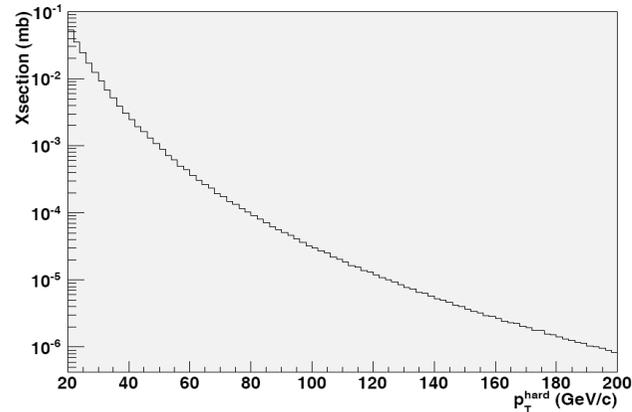
- DCal proposal was jointly presented to ALICE Collaboration by Tsukuba and CCNU in June, 2009, and ALICE-EMCal group joined.
- DCal proposal was approved in October 2009. (JCal -> XCal -> DCal)
- Total: 6 Super Module (192 x 6 = 1152 modules, 4608 readout channels).
- Modules production in China, France, and Japan, and USA.
 - 0.5 SM from Nantes (France)
 - 1.5 SM from Tsukuba (Japan)
 - 3.0 SM from Wayne State Univ. (USA)
 - 1.0 SM from Wuhan (China)
- Strip-module assembly will be done in Subatech/Nantes.
- Super Module assembly and cosmic test will be done in LPSC/Grenoble.
- **Scheduled to be inserted into the ALICE experimental area during the long LHC shutdown in 2012-2013.**



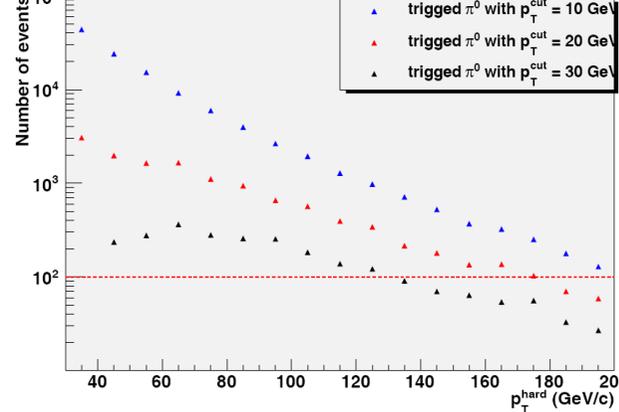
CCNU efforts on DCal

Yield estimates for di-jet and π^0 -jet

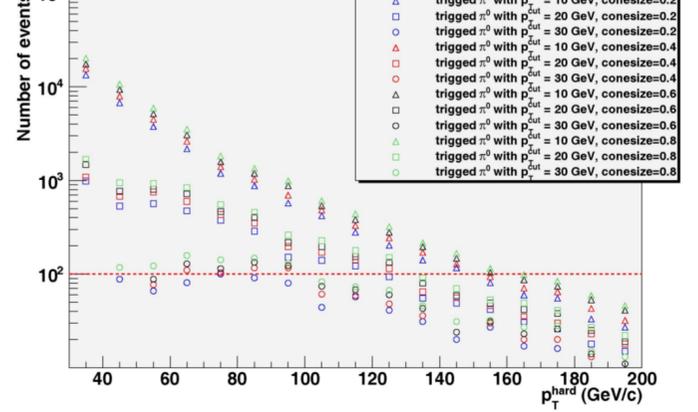
Xsection Distribution for Jet-Jet @10TeV



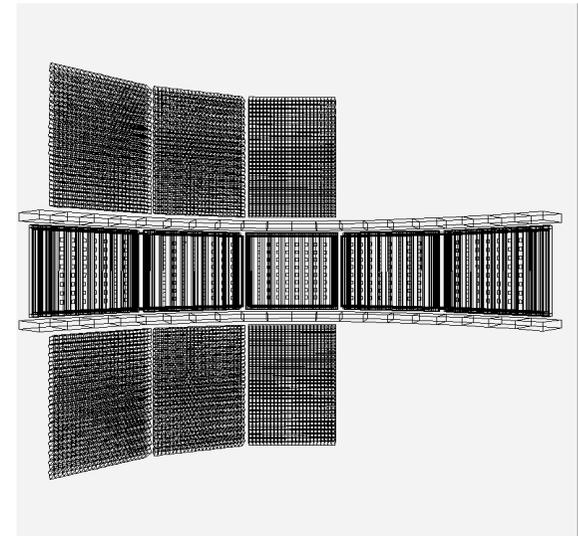
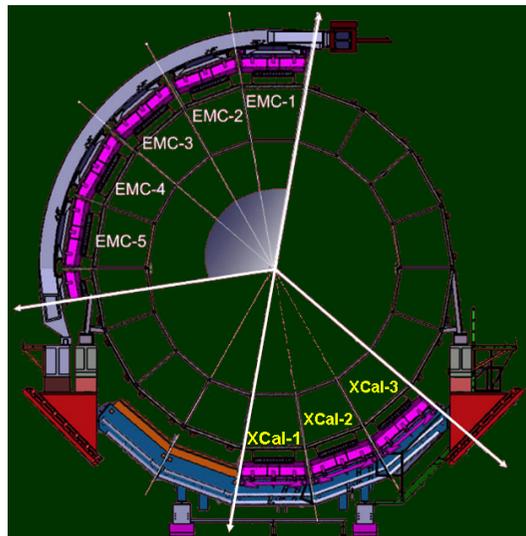
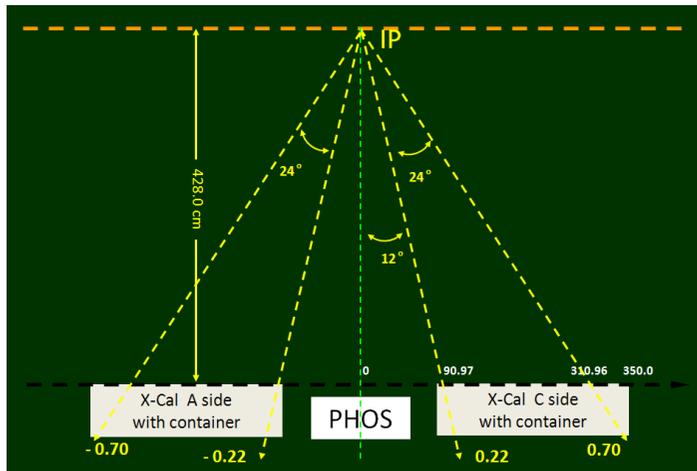
No. of Jet-Jet event with π^0 triggered in PHOS&XCAL



No. of π^0 -Jet event in PHOS&XCAL @10TeV in T=7e6s

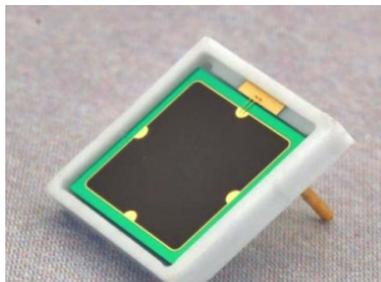
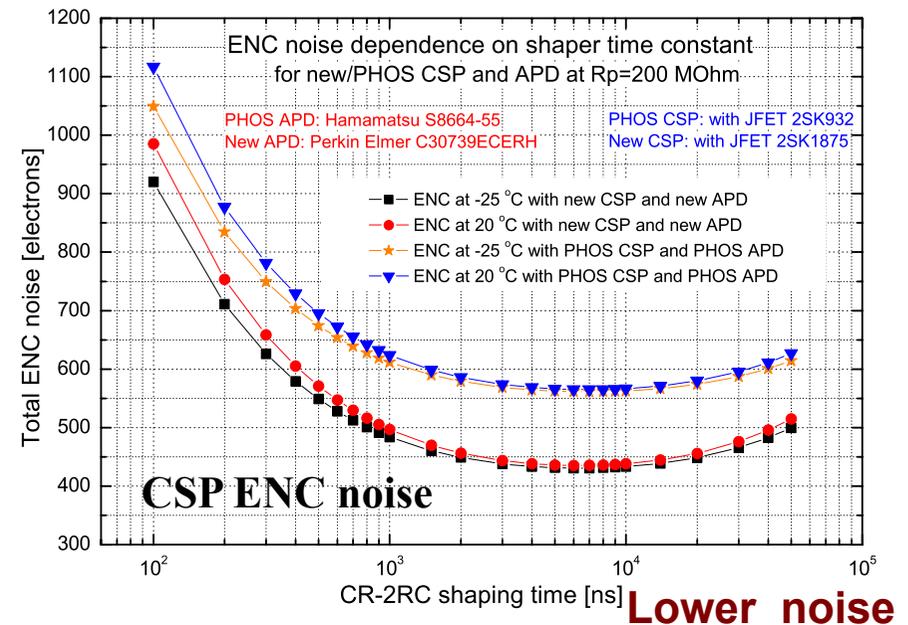
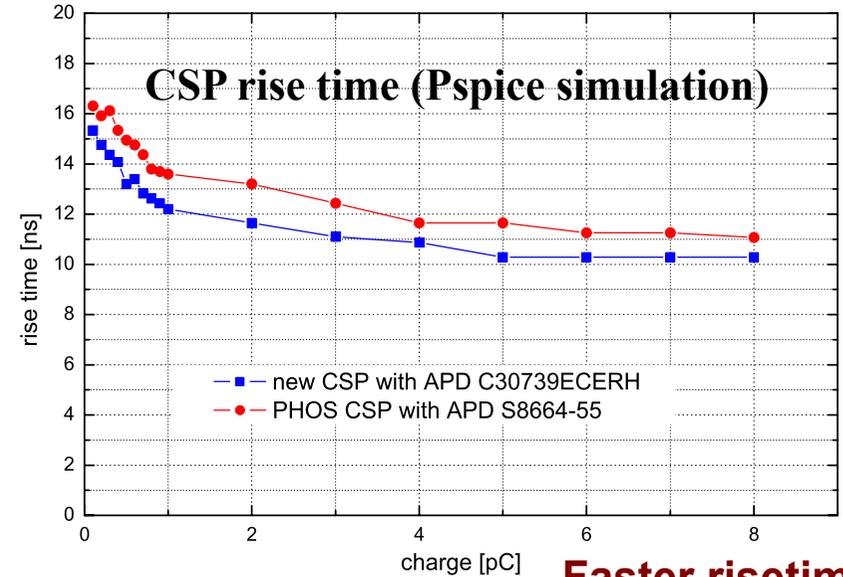
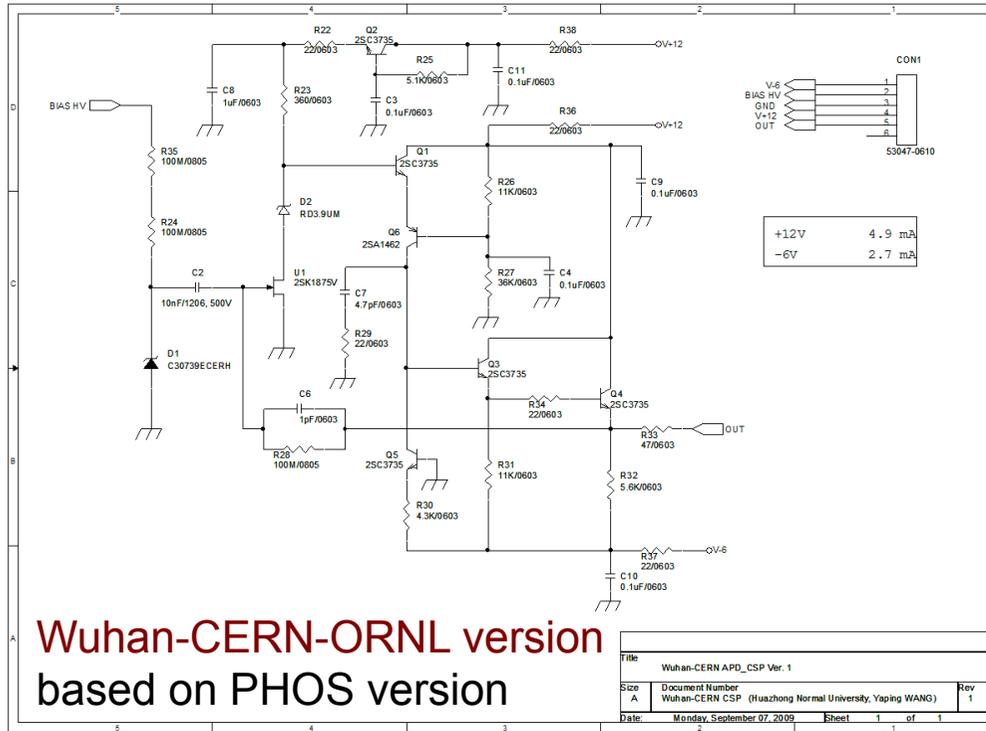


Coding realization of geometry for DCal with ALICE software

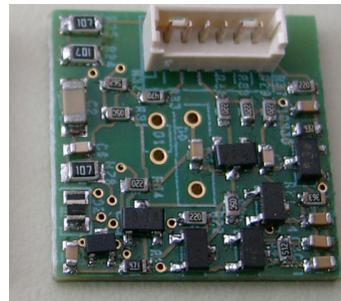


CCNU efforts on DCal

New CSP for EMCal & DCal



C30739ECERH
Perkin Elmer, U.S.



Less cost

CCNU efforts on DCal

Production in Wuhan

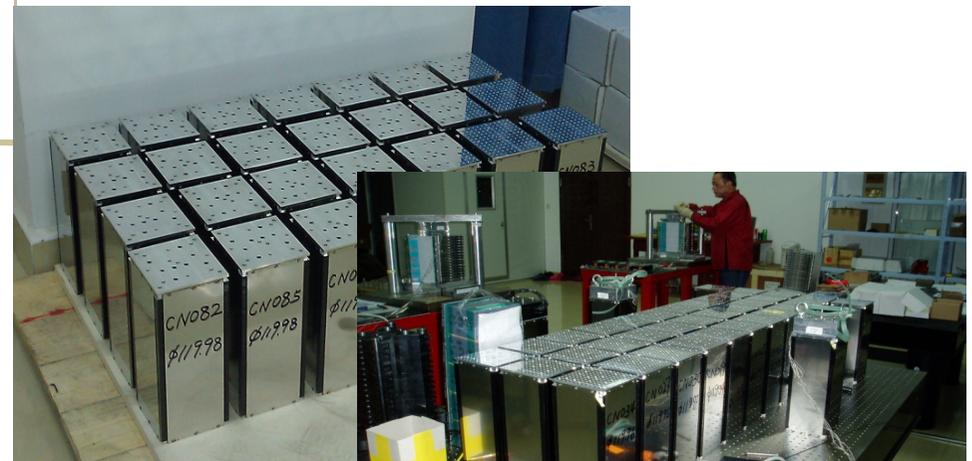


Assembly/compression training,
22nd ~ 25th Nov., 2010

Temperature is well controlled at around
20 °C, and the humidity is ~30%.



Parts procurements



Module mass production started on Dec.
8, 2010.

CCNU efforts on DCal

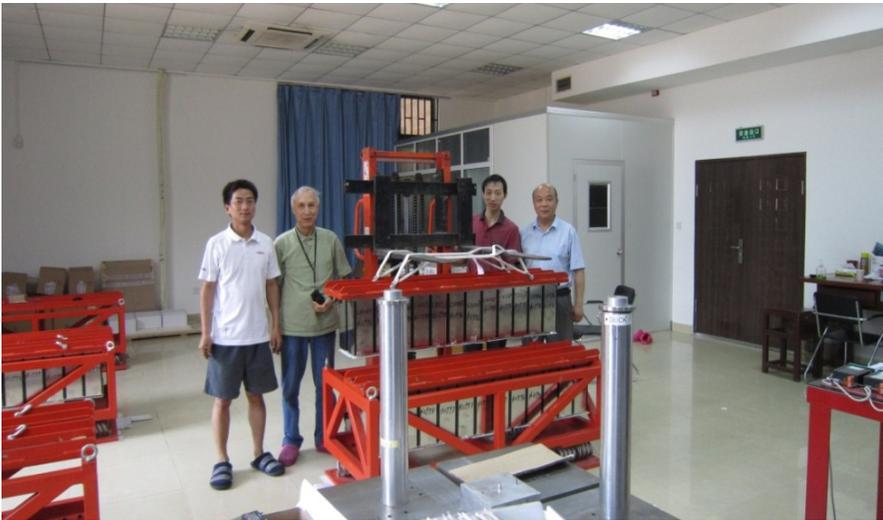
QC & packing in Wuhan



QC & Packing started in June, 2011.



Module mass production finished in July, 2011.

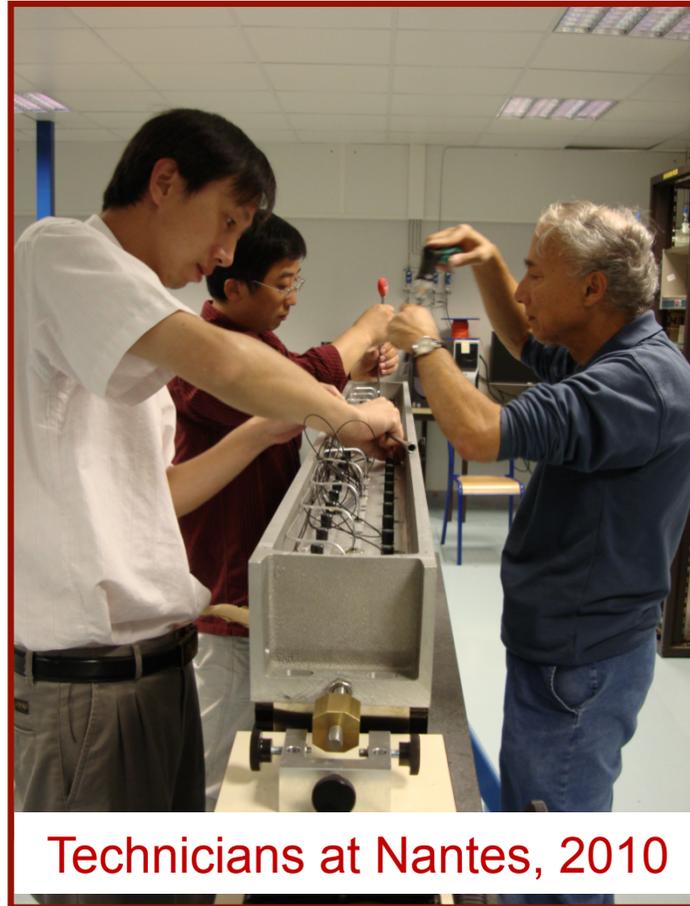


Picking up for shipping in August, 2011.
Arrived at Nantes on Sept. 2, 2011

CCNU efforts on DCal

Production outside

- In total, about 8 person.month in INFN-LNF/ Frascati for DCal fiber work in 2010 and 2011.
- 3 people were sent to Catania and Nantes for module assembly/ compression training for 13 days in 2010.
- Strip module assembly, super module assembly, and calibration test by cosmic will be started in March, 2012.



Technicians at Nantes, 2010



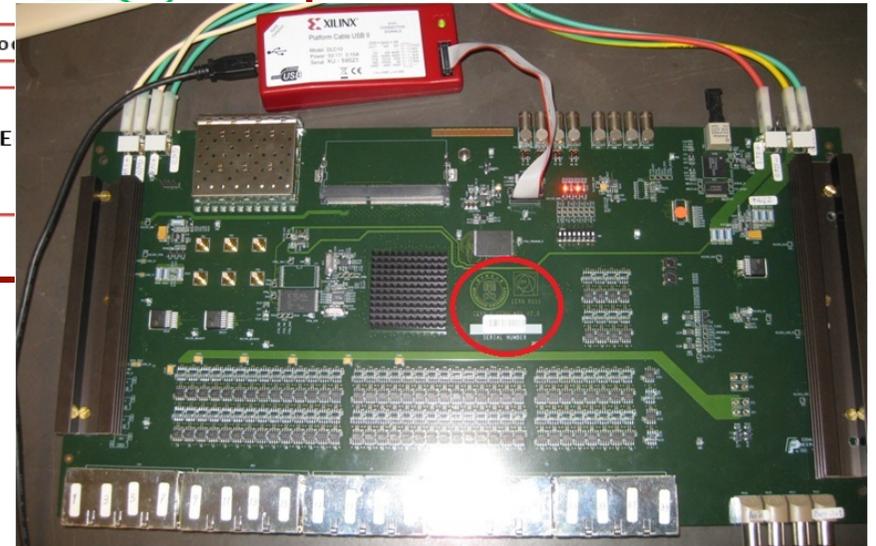
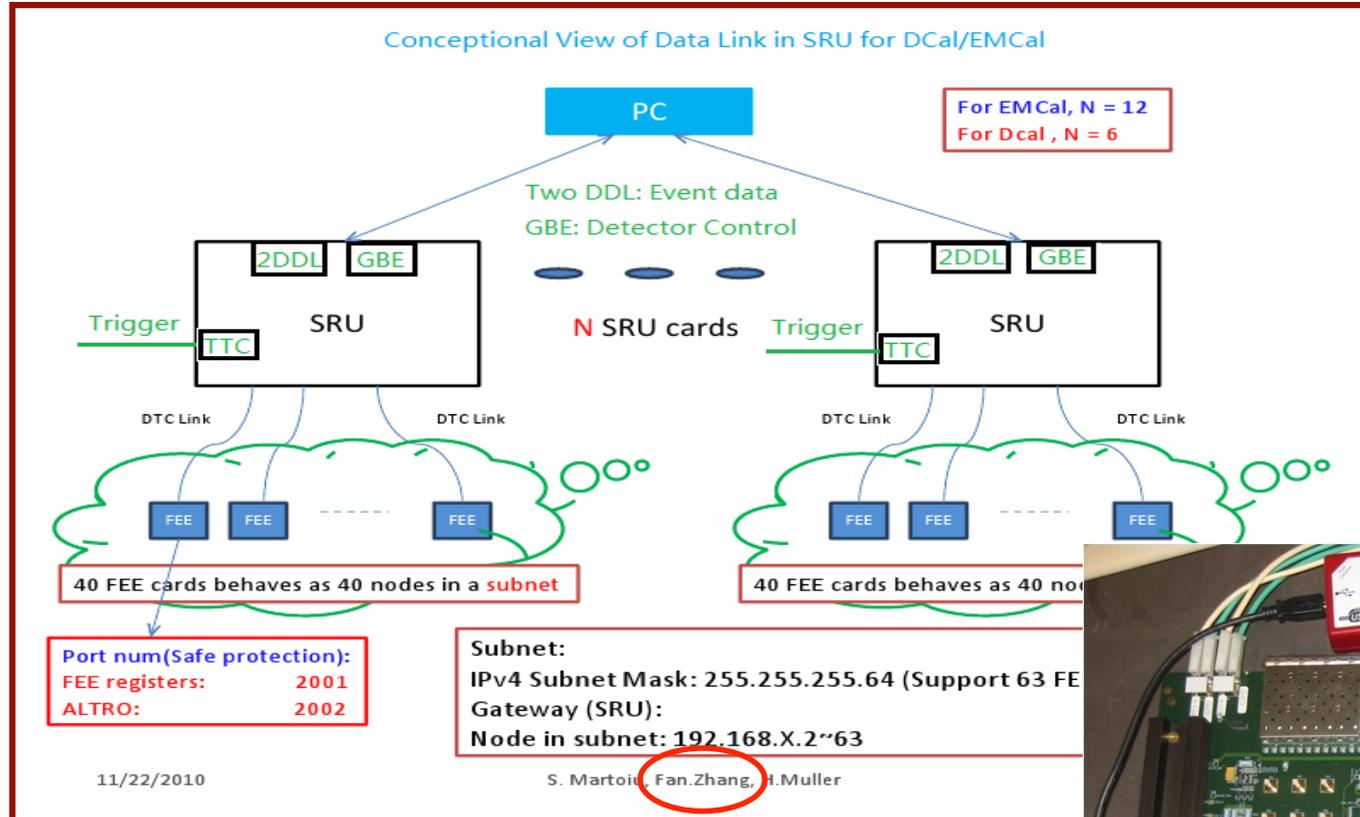
Technicians at Frascati, 2010



Technicians at Catania, 2010

CCNU efforts on DCal

Readout electronics for DCal



Scalable Readout Unit (SRU)

Summary

- DCal expands the physics capabilities of the ALICE/EMCal by enabling back-to-back correlation measurements (Di-jet correlations and π^0 -jet correlations), which are impossible with the EMCal alone.
- DCal enhance the existed measurements, like γ -jet / γ -hadron correlations, inclusive π^0 , photons, and non-photonic electrons from heavy flavor, etc.
- **Status of CCNU efforts on ALICE-DCal:**
 - DCal modules production completed successfully in 2011.
 - DCal stripmodule assembly, supermodule assembly, and calibration test will be started in March, 2012.
 - Involves in DCal readout electronics.
 - Working on physics analysis of neutral meson, γ -jet / γ -hadron corr.
 - Ready for π^0 -jet, and di-jet, heavy flavor production, etc.
- DCal will be installed in the next long LHC shutdown (2012-2013), and it's ready for taking Pb+Pb data at 5.5 TeV after the shutdown.

Thanks!