# ATLAS ITk Strip Module Production

#### Xin SHI On behalf of the IHEP ATLAS ITk Group

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## The Large Hadron Collider at CERN

LHCb

ATLAS



ALICE

27 km

#### LHC Point 1: The ATLAS Experiment



### ATLAS ITk Upgrade



- ATLAS Detector upgrade for the LHC high luminosity upgrade, all silicon tracking device
- ITk-Strip Barrel Layer 3-4: 4.8 cm Layer 1-2: 2.4cm
- Radiation hardness (1MeV n<sub>eq</sub>/cm<sup>2</sup>) Barrel short strip: 1.1×10<sup>15</sup> Barrel long strip: 0.6×10<sup>15</sup>
  Endcap inner layer strip: 1.6×10<sup>15</sup>



#### ITk Silicon Strip Detector Concept

• Stave/Petal + Mechanics Supported Silicon Modules



#### ITk Upgrade Project Timeline





#### 8 Staff Members (7 IHEP + 1 THU)



Xinchou Lou



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## Assembly and tests of barrel modules

• Produce 50 working modules during pre-production



Tooling for module handling





#### Silicon Strip Detector Module

 Silicon Sensor + Hybrid PCB (with Readout ASICs and control chips) + Power board + Glue and Wire-bonds



#### **Quality Control**

• Based on the prototype study, along with the current ATLAS SCT detector experience, improve the quality control (QC) of module production process

#### Control board QC



# Module QC Task: Evaluate max no. of modules in a bonder – by IHEP

- Design workholder for 2x2 module on BondJet820
- Released the first layout (thanks for Craig's help!)
- Processed at IHEP, will be evaluated at RAL



Drawing: Yuzhen Yang



Production: Fang Chen

#### IHEP Lab for ITk Upgrade

• An existing class 1000 Cleanroom with 150m<sup>2</sup>



- OGP Flash CNC 300 already purchased
- Hesse BondJet820 is being purchased



Flash CNC 300



## IHEP Dedicated Cleanroom for ITk-Strip

 A new cleanroom is proposed for the strip production.



 Drawing by Yuzhen Yang

#### Radiation-hard ASICs Import Issue

- Currently all of the radiation-hard ASICs in module (ABC, HCC, power control AMAC, DC-DC and FESAT are NOT allowed to be imported into China!
- **Milestone**: got export license for GF/IBM ASICs from US Department of Commerce and Export permission from Switzerland government.
- Actively in collaboration with RAL in UK to train our team in parallel

#### Collaboration with RAL

• RAL in UK is the leading institution on ATLAS ITk upgrade.



IHEP Team visited RAL on September 19, 2016

- MoU to be signed with RAL
- Staff rotation plan to maintain 2 FTE's at RAL for the coming years.
- Invited RAL collaborators to China. Craig Sawyer will visit IHEP in Jan 2017

#### **Module Production at RAL**

- Use glass-ASICs and plastic hybrid for dummy module production
- Use SmartScope to measure the height of glue



#### Sensor Electrical test at RAL

 ATLAS 07 Mini Sensor + ABC130, Learn basic silicon strip sensor test, measure I-V and Equivalent Input Noise



IV Data from k2410 at resource ASRL12::INSTR

#### Summary

- The HL-LHC upgrade requires ATLAS ITk upgrade to meet the challenge
- IHEP ATLAS team is making steady progress on barrel module assembly and tests
- More experience will be brought back to China