HGTD Module Assembly and Loading

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2019.6.10

Proposed HGTD minimal results for TDR

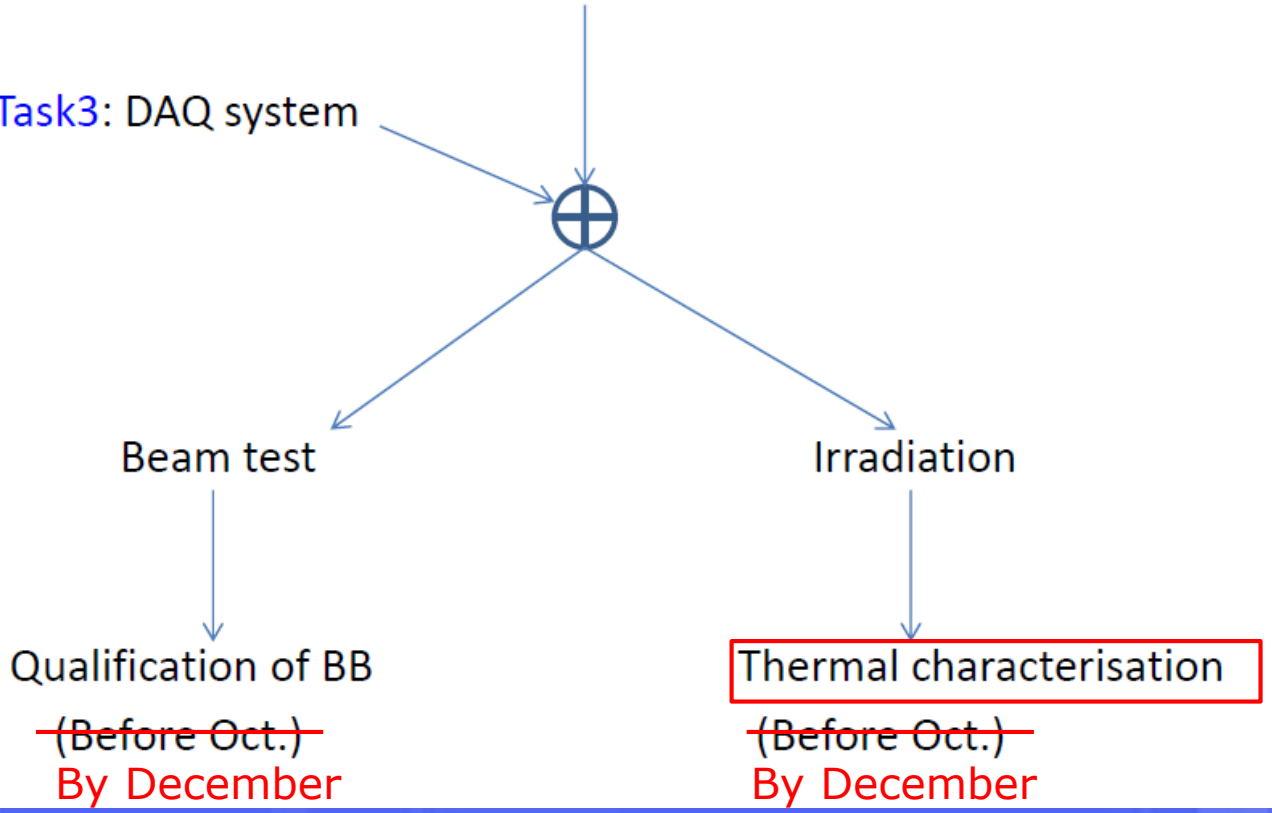
- Introduction — A. Henriques, L. Serin
- Sensor : Irradiation program
  Thermal runaway analysis
  Other studies (*)
- ASIC : Lab characterisation
  TID results
  Final design (*)
- Mini-module (5x5 channels) : bare module assembly
  bare module test beam performance
  bare module irradiated : lab measurements
- HGTD layout : Updated design with max fluence of 3.e15 n/cm2
- Performance : Updated performance with rel20.20
- Other activities update (*)

- Timeline

(*) Potential additional results

List of Critical Module Tasks

- Task1: Detailed production plan for ~10K modules
  - Assemble and test time
  - Manpower required
- Bump-bonding
  - Task2: ALTIROC1 “mini-modules” made with 5*5 sensors (Urgent!)
  - Task3: DAQ system



More to contribute

https://indico.cern.ch/event/823044/

HGTD Module Assembly and Loading

Wednesday, 29 May 2019 - *10:00*

: Sessions / : Talks : Breaks

	29 May 2019	
AM	10:00	Introduction - Lucia Masetti (Johannes Gutenberg Universitaet Mainz (DE)) Didier Lacour (LPNHE-Paris CNRS/IN2P3) Sebastian Grinstein (IFAE - Barcelona (ES)) () possible staves rearrangement.pdf
	10:10	Intermediate Plates Design - Didier Lacour (LPNHE-Paris CNRS/IN2P3) Didier Laporte (Centre National de la Recherche Scientifique (FR)) () 2019_05_29_update LPNHE HGTD.pdf
	10:30	Status of dummy bare module and bump-bonding at SINAO - Yanwen Liu (University of Science and Technology of China (CN)) () Dummy and Bump Bonding at SINANO.pdf Dummy and Bump Bonding at SINANO.pptx
	10:50	Bare module studies at IHEP - Zhijun Liang (Chinese Academy of Sciences (CN)) () IHEP_bump_bond_update_may29_v3.pdf IHEP_bump_bond_update_may29_v3.pdf IHEP_bump_bond_update_may29_v3.pptx
	11:00	Status of Hybridization and assembly at IFAE - Sebastian Grinstein (IFAE - Barcelona (ES)) () sgrinstein_hgtd_assembly_29May2019.pdf
	11:20	Flex status and splitted design (flex module and flex tail) - Maria Robles Manzano (Johannes Gutenberg Universitaet Mainz (DE)) () HGTD_assemblymeeting_29May2019_FLEX_Robles_v1.pdf
	11:40	A.O.B: what are the needs for the final assembly and commissioning at CERN and synergies with mod. assembly QA ?(space, clean room, cooling, tools....)? - Ana Maria Henriques Correia (CERN) () space and commissioning needs.pdf space and commissioning needs.pptx

Current schedule on TDR

- https://indico.cern.ch/event/779123/contributions/3280950/subcontributions/271383/attachments/1783601/2903161/go

8.4-Module assembly+loading in staves			
8.4.1- Bump-bonding	Specifications doc.+SPR	1 Jan 21	30 Sep 21
	PDR	Q4 21	Q4 21
	FDR	Q4 22	Q4 22
	Pre-production	1 Oct 22	30 Jan 23
	PRR	Q3 23	Q3 23
	Production (0-50%)	1 Sep 23	30 Jul 24
	Production (51-100%)	1 Aug 24	30 Jun 25
8.4.2-Flex cables	Specifications doc.+SPR	1 April 21	30 Sep 21
	PDR	Q4 21	Q4 21
	FDR	Q2 22	Q2 22
	Pre-production	1 Sep 22	30 Mar 23
	PRR	Q2 23	Q2 23
	Production (0-50%)	1 Sep 23	30 Oct 24
	Production (51-100%)	1 Nov 24	30 Sep 25
8.4.3-Modules assembly	Specifications doc.+SPR	1 Apr 21	30 Sep 21
	PDR	Q4 21	Q4 21
	FDR	Q3 22	Q3 22
	Pre-production	1 Jan 23	30 Aug 23
	PRR	Q4 23	Q4 23
	Production (0-50%)	1 Jan 24	15 Mar 25
	Production (51-100%)	1 Apr 25	1 Sep 26

Current schedule on TDR

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8.4.4-Modules loading on staves	Specifications doc.+SPR	1 April 21	30 Oct 21
	PDR	Q4 21	Q4 21
	FDR	Q4 22	Q4 22
	Pre-production	1 April 23	30 Dec 23
	PRR	Q1 24	Q1 24
	Production (0-50%)	1 Mar 24	30 April 25
	Production (51-100%)	1 May 25	30 Sep 26
8.7 Installation and commissioning			
8.7.1 and 8.7.3 (Services,p. panels,cool.,mod.)	Installation+QA (0-100%)	30 Jan 24	30 Apr 25
8.7.2 Back-end electronics inst. in USA15	Installation+QA (0-100%)	1 Jul 24	30 Jun 25
8.7.4 **HGTD-A (w/ 1 layer)**	**Installation**	**2 Jun 25**	**2 Jul 25**
8.7.4 **HGTD-C (w/ 1 1ayer)**	**Installation**	**3 Jul 25**	**1 Aug 25**
8.7.5 Commissioning in LS3 (w/ lL/EC)	Commissioning	3 Jul 25	10 Mar 26
8.7.6 **HGTD-A (w/ layer 2) in YETS27**	**Install in situ layer 2**	**1 Jan 27**	**30 Jan 27**
8.7.6 **HGTD-C (w/ layer 2) in YETS27**	**Install in situ layer 2**	**1 Feb 2027**	**2 Mar 27**
8.7.7 Commissioning in YETS27 (w/ 2L/EC)	Commissioning	1 Mar 27	30 May 27

Bare mini-modules (5x5 channels)

Bare module assembly :

- Bare module already assembled at IFAE and IHEP with ALTIROC1-V1 but cannot be used for any ASIC measurement (need to access to a debugging pad & probe to cure gate leakage current problem for discriminator)
  → currently (this week) trying to assemble one sensor shifted by one column to V1
- Bare module with ALTIROC1-V2 :
  → Expect first assembly in July (IFAE/IHEP) for lab measurements, testbeam and irradiation
  DESY testbeam : 19-25 Aug (debugging) & 4-17 Nov (non irradiated module performance)
  Irradiated module in testbeam in Nov ?
  Module irradiation : can not assemble sensor already irradiated (annealing)

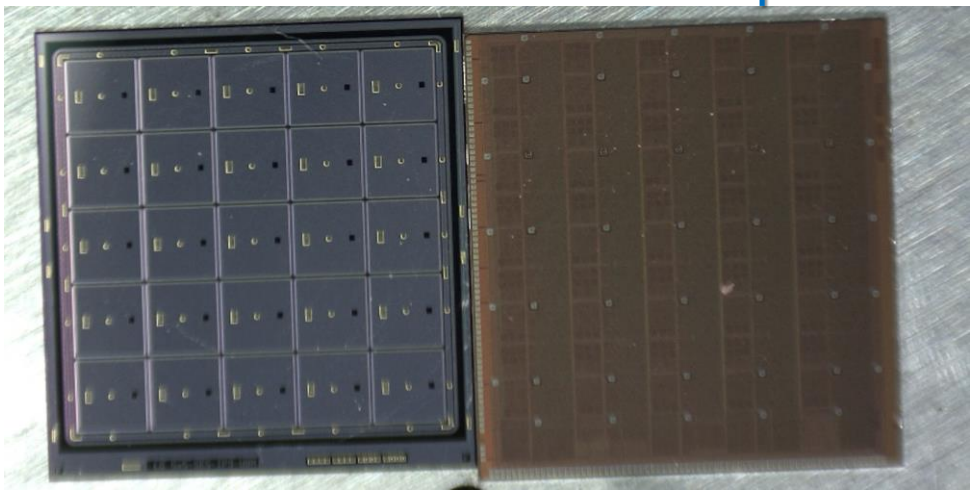
Assemble module → neutron irradiation → lab measurement (Q vsV) → TID → lab measurements

- Module assembly in German & Chinese companies

Bump bonding study

- Identify two company identified （both are top 10 packaging company
  - The National Center for Advanced Packaging (NCAP，华进)
    - http://www.ncap-cn.com/en/index.aspx

HPK 5x5 Sensors and Altirco1 chip in IHEP



5x5 sensor and ASIC

Bare module

Bond Test

- Proper tools needed
  - DIE SHEAR
  - FLIP CHIP PULL
- Operator

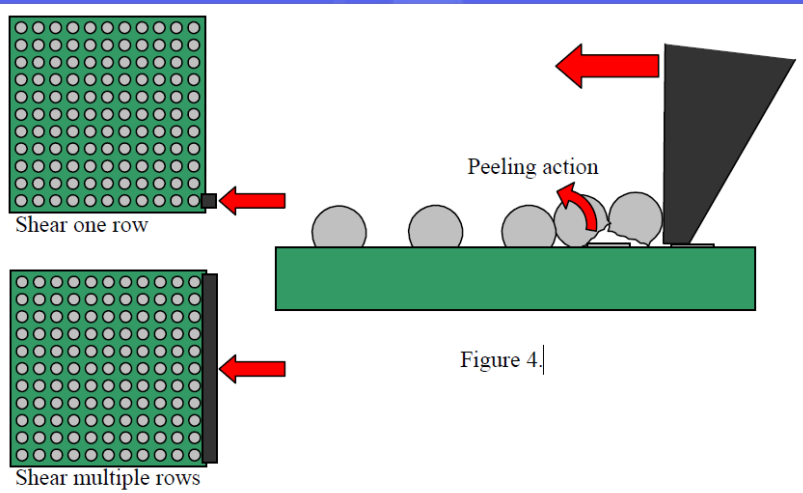


Figure 4.

Dage 4000 | Standards

The Dage 4000 conforms to and in some cases exceeds the following industry standards:

CBP/HBP	JEITA EIAJ ET-7407
BGA BUMP SHEAR	JEDEC JESD22-B117
AU BALL SHEAR	JEDEC JESD22-B116
BALL BOND SHEAR	ASTM F1269
WIRE PULL DT/NDT	MIL STD 883
DIE SHEAR	MIL STD 883
STUD PULL	MIL STD 883
FLIP CHIP PULL	JEDEC JESD22-B109

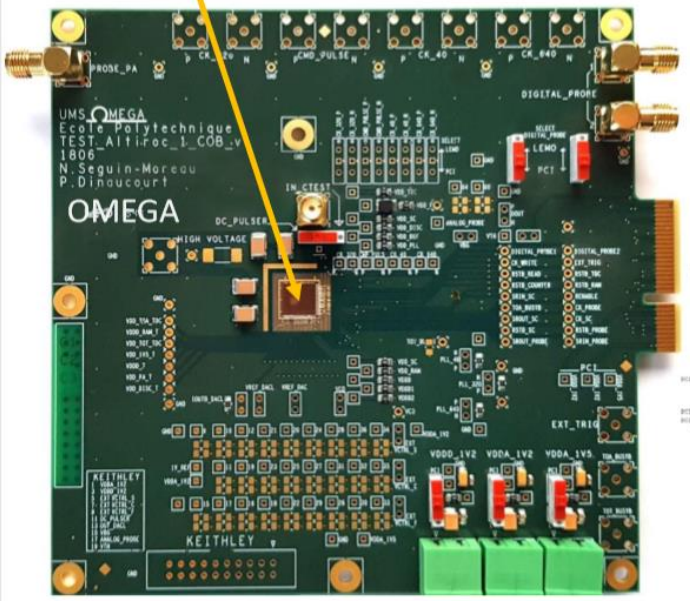
Setting up the FPGA Board

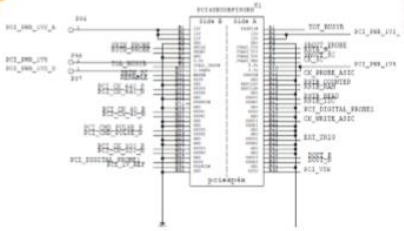
- Yunyun and Shuo are working on the FPGA board

SETUP for ALTIROC1 measurements

- One setup @ OMEGA + one setup @ SLAC, debug tests started at the end of November

Wire bonding @ IFAE





9

ALTIROC2 - Initial Design Review - Analog part measurements

What we can do now

- Possibility of sharing of resources with ITK
- Bump bonding test
  - Very “hardware”
- ALTIROC1 readout board