HYBRID AND MODULE QC R0-FOCUSED

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QUALITY CONTROL VS ASSURANCE

- QA: process oriented (sound design, cleanrooms, instructions, standards) - not this talk
- QC: product oriented (testing product quality)
- Oxford English dictionary:
- Control: *the restriction* of an activity, tendency, or phenomenon.
- E.g. 'crime control'

X

OVERVIEW (TDR)

- 7.6.1 Silicon Sensor (covered in Sensor session)
- 7.6.2 Hybrid Production Control
- 7.6.3 Hybrid & Module Visual Inspection
- 7.6.4 Hybrid & Module Metrology
- 7.6.5 Hybrid & Module Wire-bonding QC
- 7.6.6 Pass/Fail Grading for Wire-Bonded Hybrids & Modules
- 7.6.7 Hybrid & Module Electrical Tests

MAIN AIMS OF R0 QC

- Test the parameters of the assembled modules thus qualifying our design, production methods and QA
- Compare the results at various sites
- Test the proposed test sets thus qualifying our QC ideas
- Bring info for module parameter definition
- Test the existing test setups at institutions
- Test the data management (production database)

HYBRID PRODUCTION CONTROL

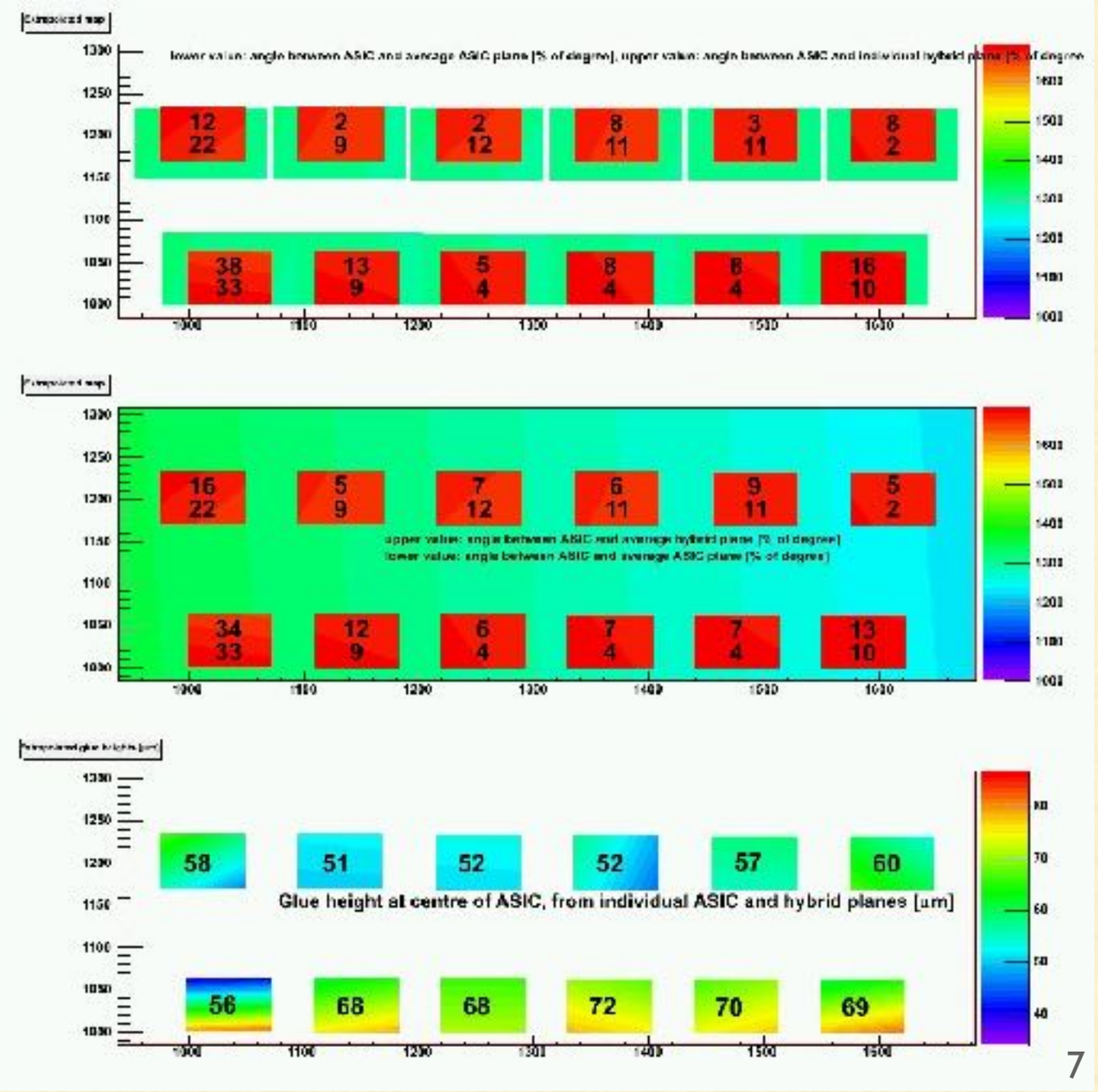
- Flex QC (Vendor)
- Passive component QC (Vendor)
- Basic electrical test after wire bonding (Institutes, PDB) Y
- Burn-in (Institutes) N
  - To identify ASIC infant mortality: not really task for R0 - skip

HYBRID AND MODULE VISUAL INSPECTION

- Tests/things to check:
  - Missing or damaged SMD components
  - Glue seepage covering wire bond pads or sensor guard rings
  - Debris or physical contaminants on items
  - Missing or dangling wire-bonds
- After each bonding row
- Photos uploaded to PDB

HYBRID AND MODULE METROLOGY (I, PDB)

- Tests:
  - x-y Hybrid Constraints
  - z Hybrid Constraints
  - Module Constraints in x-y
  - Module Constraints in z
- Do we have sets of measurement points?



HYBRID ELECTRICAL TESTS (I, PDB)

- Tests:
  - Chip Communication
  - Strobe delay
  - Three Point gain
  - Noise Occupancy
- Gained experience from Travelling DAQload
- Standard macros needed

MODULE ELECTRICAL TESTS (I, PDB)

- Tests:
  - Chip Communication
  - Strobe delay
  - Tuning (Trimming)
  - Response curve
  - Noise Occupancy
  - I-V curve
- Gained experience from Travelling DAQload
- Standard macros needed

THERMAL CYCLING AND LOW TEMPERATURE TESTING

- Thermal cycling considered necessary
- Temperature ranges to be defined (see next slide)
- Speeds TBD
- # of cycles: hybrid: 10, module: TBD
- Arrangement options:
  - jigs (+chillers or environmental chamber)
  - environmental chamber (w or w/o vacuum?)
  - modules biased/powered?

THERMAL CYCLING AND LOW TEMPERATURE TESTING

A.Blue, April 2015

Temperature °C	SCT Barrel Module	ECT E/C Module	Upgrade Barrel Module	Upgrade E/C Module
Hybrids				
Characterisation	27°C 37°C 0°C	0°C +/- 5°C	??	Same
LTT (first 50)	90 hrs at 37 °C 10 hr at 0 °C	90 hrs at 55°C 500V	-35	Same
LTT (after 50)	>10 hr at 37 °C > 10 hr at 0 °C	--	-35	Same
Thermal Cycling	--	-30°C to +50°C x10	-35	Same
Modules				
Long Term Tests	+0°C >20hrs	10°C >24hrs	-35 V hard to do	Same
Thermal Cycling	-25°C to +40°C x10	-30°C to +30°C x10	-35	Same
Thermal Shock	--	--	-35	Same

TDR: -40 degC

DATA MANAGEMENT

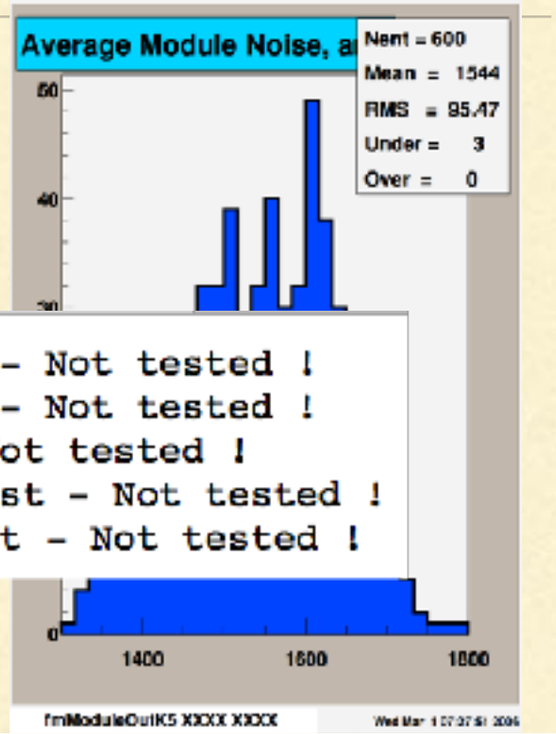
- Production database under development
- Andy communicates strip requirements
- Tools for module test uploads hopefully ready for R0 campaign
- Reporting not necessarily mature enough to get what we want
- Parallel spreadsheets necessary (a la DAQload)

PRODUCTION PROSPECTS

- R0 campaign should provide essential info on the production QC:
- necessity of steps
- number of cycles, tests needed
- feasibility of steps w.r.t. duration

SCT PRODUCTION TRACKING (ZD)

Topic	Plots
List of serial numbers	
Missing tests	
Average and chip gain	Average gain, Chip gain
Average and chip noise	Average noise, Chip noise
Average and chip NO	Average NO, Chip NO
Leakage current	Current @150 and @ 350V
Masked channels (from RC tests)	Number of masked channels
Hybrid temperature	Hybrid temperature
XY and Z Metrology	XY, Z

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20220270300329 DetModIV test - Not tested !
20220270300329 HybNoise test - Not tested !
20220270300329 HybRC test - Not tested !
20220270300329 ModSurveyXY test - Not tested !
20220270300329 ModSurveyZ test - Not tested !
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Module types

Y/M	Inner	L/Mid	S/Mid	Out	Total
200302	-	-	-	3 | 0 | 0	3 | 0 | 0
200303	2 | 2 | 0	-	-	10 | 9 | 2	12 | 11 | 2

Statistics of production sites

Y/M	Nikhef	Fr	Val	Man	Gva	MPI	Melb	Total
200302	-	-	3 | 0 | 0	-	-	-	-	3 | 0 | 0
200303	2 | 2 | 0	-	1 | 0 | 0	2 | 2 | 2	7 | 7 | 0	-	-	12 | 11 | 2
200305	-	-	-	3 | 3 | 3	1 | 1 | 1	1 | 0 | 0	-	5 | 4 | 4

PRODUCTION TRACKING (CL)

Summary	Built	Good	Pass	Hold	Failed	Not tested	Yield (G)	Yield (G+P)	Done(1)	Needed	Remaining (2)
All	2389	2052	158	113	55	11	86.3%	92.9%	107.9%	-172.	-48.
Clusters	**Built**	**Good**	**Pass**	**Hold**	**Failed**	**Not tested**	**Yield (G)**	**Yield (G+P)**	**Done(1)**	**Needed**	**Remaining (2)**
UK-V	916	798	60	46	12	0	87.1%	93.7%	107.2%	-58.	-2.
CS	716	651	29	4	27	5	91.6%	95.6%	112.8%	-82.	-27.
CE	757	603	69	63	16	6	80.3%	89.5%	104.1%	-32.	-19.