Birmingham Hybrid Assembly Status

Dave Charlton on behalf of the Birmingham team
10 December 2002

As of Friday 6th December, we have:

- 64 production hybrids received from KEK

- 47 have ASICs attached
- 3 have broken PA tracks (spotted in initial vis. insp.)
- 4 (at start) were “green” and not used
- 10 not yet started

Of the 47 “starts”:
- 34 are completely through the QA
- 11 are in normal production/QA sequence
- 2 require more work

We are now populating 6 hybrids per week

Additional assembly jigs on order: expect to go to 12 per week early in 2003 – then will hit several limits (test equipment, bonding machine, staff)

Detailed “check sheets” as used internally at Birmingham are available on the web at

http://www.ep.ph.bham.ac.uk/exp/ATLAS/sct/hybrids/assembly/

together with electrical test results

Hybrid S/N	State	Check Sheet	Electrical Tests	General comment(s)
20220330200064	Assembly	Whole - Visual QA - Pull test - ASICs		
20220330200063	Assembly	Whole - Visual QA - Pull test - ASICs		
20220330200062	Assembly	Whole - Visual QA - Pull test - ASICs		
20220330200061	Assembly	Whole - Visual QA - Pull test - ASICs		
20220330200060	Assembly	Whole - Visual QA - Pull test - ASICs		
20220330200059	Assembly	Whole - Visual QA - Pull test - ASICs		
20220330200058	Assembly	Whole - Visual QA - Pull test - ASICs	results	
20220330200057	Assembly	Whole - Visual QA - Pull test - ASICs	results	
20220330200056	Assembly	Whole - Visual QA - Pull test - ASICs	results	
20220330200055	Assembly	Whole - Visual QA - Pull test - ASICs	results	
20220330200054	Assembly	Whole - Visual QA - Pull test - ASICs	results	
20220330200053	Assembly	Whole - Visual QA - Pull test - ASICs	results	
20220330200052	Assembly	Whole - Visual QA - Pull test - ASICs	results	
20220330200051	Assembly	Whole - Visual QA - Pull test - ASICs	results	
20220330200050	Assembly	Whole - Visual QA - Pull test - ASICs		Broken track on PA
20220330200049	Assembly	Whole - Visual QA - Pull test - ASICs	results	
20220330200048	Assembly	Whole - Visual QA - Pull test - ASICs		
20220330200047	Assembly	Whole - Visual QA - Pull test - ASICs		
20220330200046	Assembly	Whole - Visual QA - Pull test - ASICs		
20220330200045	Assembly	Whole - Visual QA - Pull test - ASICs		
20220330200044	Assembly	Whole - Visual QA - Pull test - ASICs		
20220330200043	Assembly	Whole - Visual QA - Pull test - ASICs		Broken track on PA
20220330200042	Assembly	Whole - Visual QA - Pull test - ASICs		
20220330200041	Assembly	Whole - Visual QA - Pull test - ASICs		
20220330200040	Complete	Whole - Visual QA - Pull test - ASICs	results	
20220330200039	Complete	Whole - Visual QA - Pull test - ASICs	results	
20220330200038	Assembly	Whole - Visual QA - Pull test - ASICs - Rework	results	ASIC damaged in assembly and replaced
20220330200037	Complete	Whole - Visual QA - Pull test - ASICs	results	
20220330200036	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200035	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200034	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200033	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200032	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200031	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200030	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200029	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200028	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200027	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200026	Shipped	Whole - Visual QA - Pull test - ASICs	results	

20220330200025	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200024	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200023	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200022	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200021	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200020	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200019	Shipped	Whole - Visual QA - Pull test - ASICs		Broken track on PA, returned to KEK
20220330200018	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200017	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200016	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200015	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200014	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200013	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200012	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200011	Shipped	Whole - Visual QA - Pull test - ASICs - Rework	results	Chip replaced, apparently failed during initial electrical test
20220330200010	Shipped	Whole - Visual QA - Pull test - ASICs - Rework	results	One chip replaced as it had very ugly noise-occupancy
20220330200009	Shipped	Whole - Visual QA - Pull test - ASICs	results	
20220330200008	Shipped	Whole - Visual QA - Pull test - ASICs - Rework	results	One ASIC replaced, damaged during tests at RAL
20220330200007	Assembly	Whole - Visual QA - Pull test - ASICs - Rework	results	Some ASIC damage during gluing, so reworked
20220330200003	Shipped	Whole - Visual QA - Pull test - ASICs	results	Green hybrid
20220330200002	Shipped	Whole - Visual QA - Pull test - ASICs - Rework	results	Green hybrid

Issues with hybrids up to #20 were reported in October, so I will not repeat (unless asked!)

Problem Hybrids

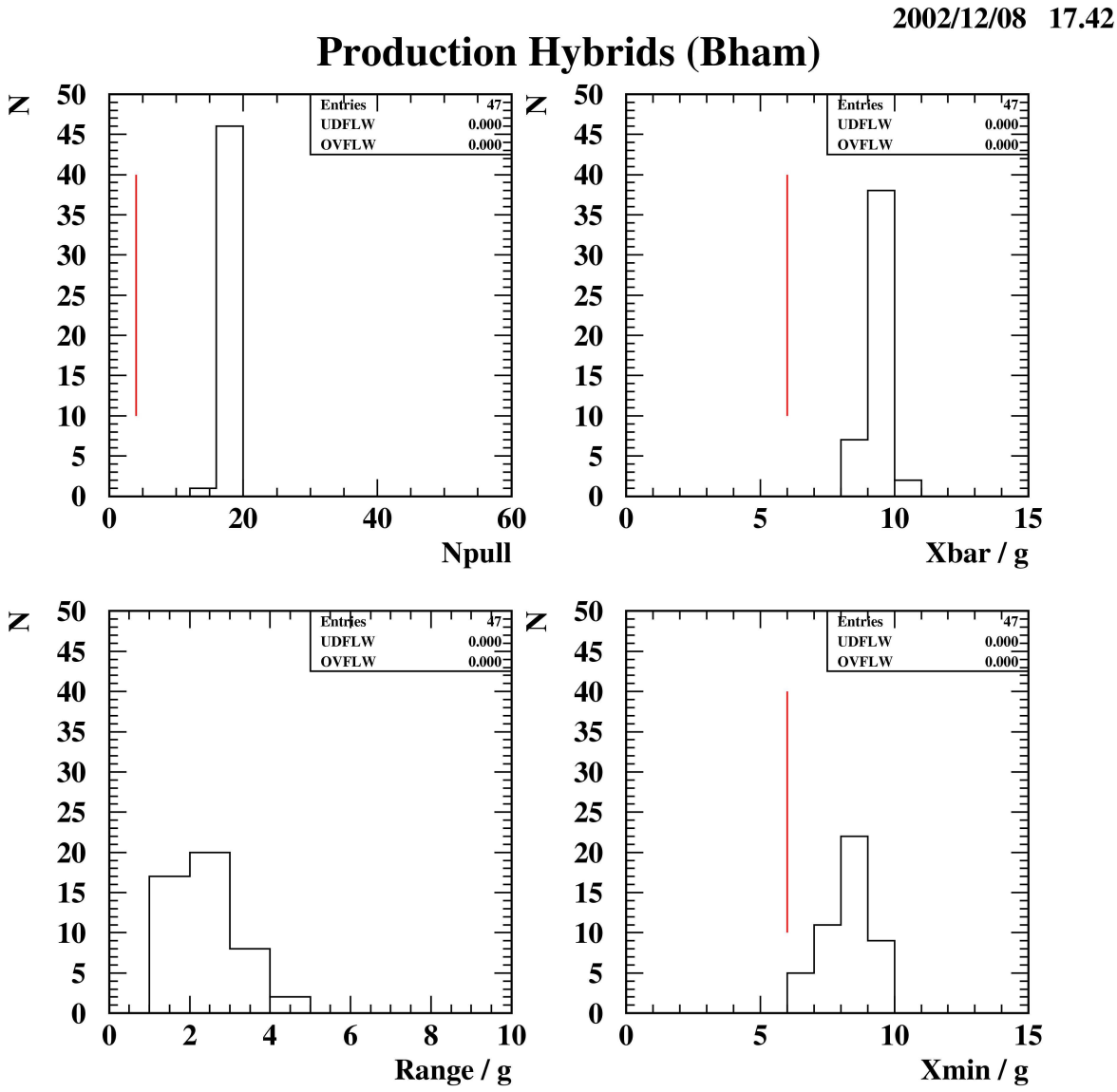
20220330200038

One ASIC (E13) damaged while hybrid being mounted on bonding machine: mounting screws since replaced

After ASIC replacement, bypass link between E13 and S01 fails: currently under study

In addition, 20220330200007 (damaged with tool while ASICs being pressed to give fillet) still under study - third ASIC will be replaced

Pull test results

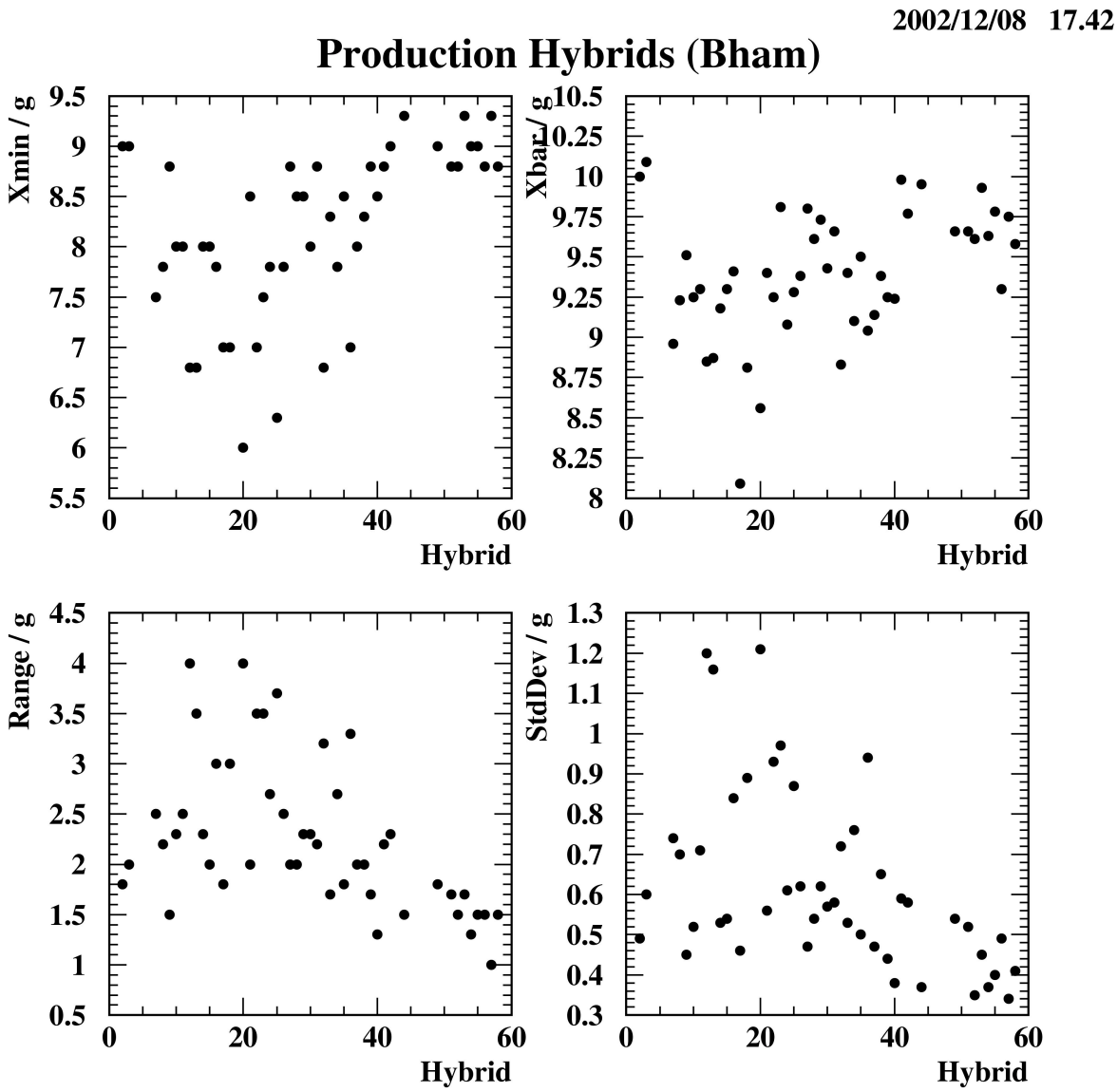


All pass X_{min}>6g criteria
We use at least 16 pull tests on each hybrid
PA pull tests now being done systematically (not shown)

New PA quality seems to be as good as expected (only a few new-PA hybrids so far bonded)

Pull test results (II)

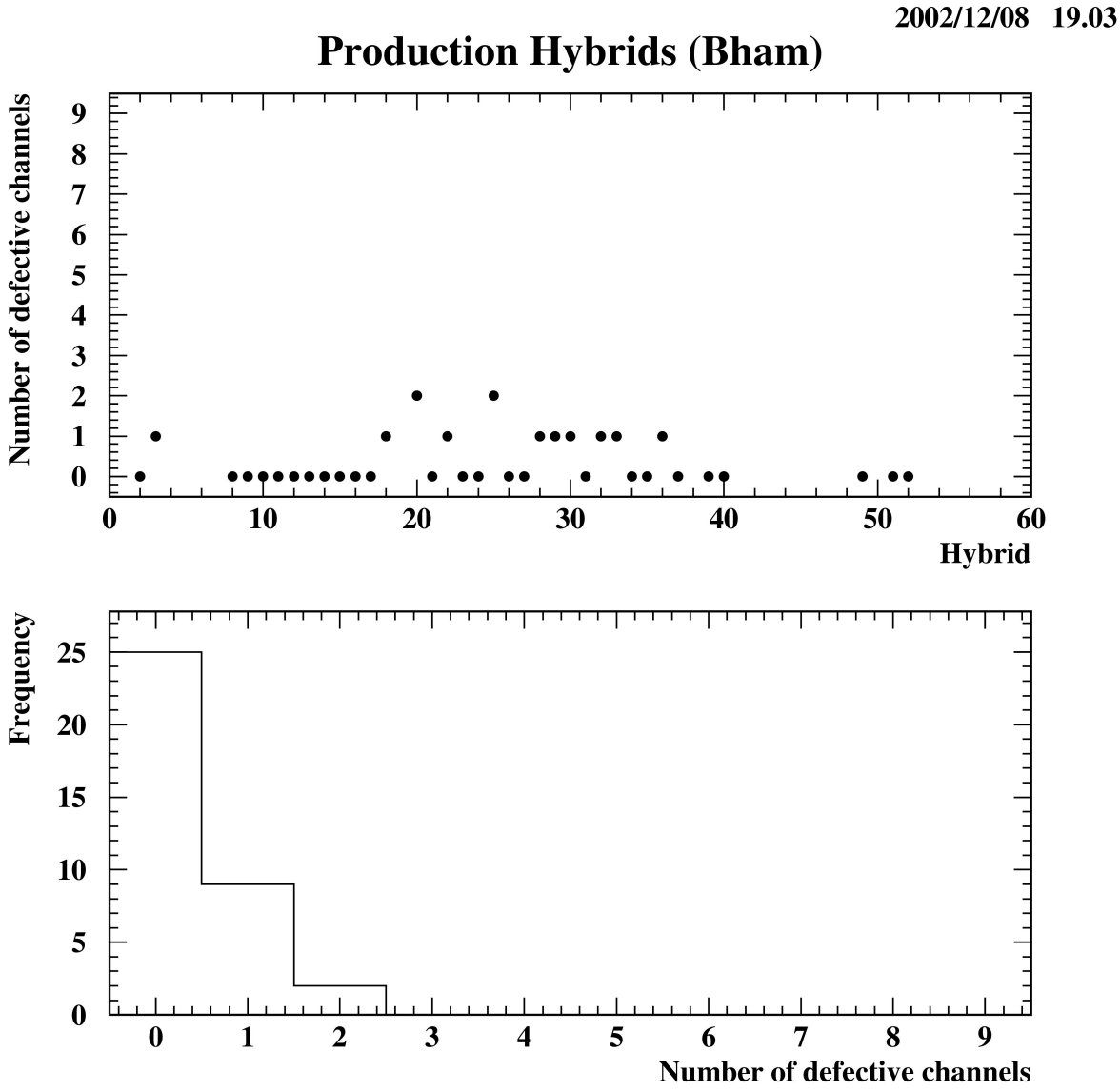
Evolution vs hybrid number:



Bond uniformity and quality now pretty good

Hybrid electrical test results

No further “bad” chips seen since last SCT week
“Bad” ASICs: 2 / 528 (0.4%)



Number of defective channels / hybrid = 13 / 36 = 0.4
(not all of these are truly dead)

Fairly consistent with KEK experience reported at Colmar LECC

Long-term Tests

In Birmingham, now have run on 42 hybrids for 90h each

For the most part, long-term tests have been uneventful
(with the exception of test suite stability problems, which mean that 90h tests of 6 hybrids crash typically 2-3 times)

Observations:

- It is important to run the LTT and cold test trimmed with noisy channels masked

- On many hybrids, odd channels occasionally pop up (3-pt gain) above the “partbonded” cut at 750 electrons, but usually only once or twice in 90h

- Two hybrids (29,55) have shown features in the noise-occupancy history:

    - #29 : After ~24h, noise-occy ~1e-5 appears, one channel (858) flagged noisy by 3PG. Sctdaq crashes soon after. On resuming, very low noise seen occasionally. LTT repeated with ch 858 masked: no noise-occy seen over full 90h
    - #55 : After ~2h, noise occy ~1e-4 appears and continues (through sctdaq crash) but sometimes lower than 1e-4, and near end of test dies away! STUCKCELL and 3PG noisy channel for ch 1079 correlate with noise-occy

    Problems apparently both from single channels

- One hybrid (22) had one chip measured with higher than usual noise (~800) on one 3-pt gain scan: LTT repeated and it didn't recur

A few hours of testing seems to be adequate, missing only very occasional "wobbly" channels

ASIC Statistics

To date:

Lot	Received	On Hybrids	Damaged	Bad	Vetoed	Unused
39992	324	312	4	2	3	3
39993	507	252	1	0	2	250
Total	831	564	5	2	5	253

Ignoring 250 not yet used in second lot, to date:

Total fraction of received ASICs used which end up on good hybrids: either 95% or 97%, depending on fate of hybrid 38

But statistics are still **very** small, and lot-to-lot variations may be rather larger than we have seen in UK-B

UK-B ASIC-Hybrid Schedule

We currently are mounting ASICs on 6 hybrids / week, which we can sustain now, if not reworking

This is limited by the long-term test (6-way electrical test system)

We wish to shorten the LTT now to the level approved for KEK – ie. 24h total, half cold and half warm

With this (and additional jigs currently on order), we can progress towards 12 hybrids / week, which is our target