

Readout electronics update 28-July-2020

HV-Mux: production order in progress with STFC and Cambridge in the UK, vendor says order now will have delivery in Nov-Dec 2020. Have 1500 from prototype batch on hand.

Powerboard: pre-production design (v3.1) complete and approved by ATLAS

- Started producing last batch of 45 v3.0c prototype boards June 1, progress will be slow due to low occupancy at lab
- Preparing order of 250 flexes for v3.1 with EPEC

ABCStar: pre-production wafers back from vendor May 2020, [wafer probing in progress](#)

AMAC: [FDR July 24](#)

- Question on eFuse for AMAC id on stave
- Several suggestions to check design, review went well

HCCStar:

- Revise submission schedule for HCCStarV1, in progress
- Do all the preproduction HCCStar and AMACStars need to be irradiated?!?

Coils: production order placed on Feb 21 2020, first batch of 100 coils arrived May 20, irradiation tests in progress, starting to measure dimensions of production coil samples with a Digital Microscope. Also starting electrical QA & QC measurements.

HCCStar Schedule

Milestones

- Complete essential design revisions by end of August
- Complete SEE simulations by end of September
- FDR possible in mid-October

Task	Estimate	Uncertainty	End Date
Replace LCB decoder with Verilog version	5	5	10-Aug-20
-- Adjust register implementation	5	5	17-Aug-20
-- Rewrite LCB passthru in Verilog	0	0	17-Aug-20
-- Rewrite LCB 40 MHz clock recovery in Verilog	0	0	17-Aug-20
Switch to synchronous resets	10	10	31-Aug-20
Update HPR module (triplicated)?	0	0	31-Aug-20
Verification stripped down verilog for 640 MHz simulation	3	3	3-Sep-20
SEE simulations	20	20	1-Oct-20
Final checks	10	10	15-Oct-20
PNR	10	10	29-Oct-20
Sign-off	5	5	5-Nov-20
Contingency (add uncertainties in quadrature)			15-Dec-20
Contingency (add uncertainties linearly)			9-Feb-21

HCCStar schedules (6 month slip is 600k for project)

P6 as of BCP-038 in June 2020

RE320670	Vendor Effort for Pre-Production for HCC and AMAC Wafers	40	10-Jul-20	4-Sep-20
RE320760	RECEIVE: Wafers from Fabrication Vendor	0		4-Sep-20
RE320770	Test Pre-Production HCCstar Wafers with Probe Card	20	4-Sep-20	2-Oct-20
RE320780	Wait for First Wafer to Complete Testing Before Sending to Sawing Vendor	5	4-Sep-20	11-Sep-20
RE320790	Send First Tested Wafer to Sawing Vendor	1	11-Sep-20	14-Sep-20
RE320810	Vendor Effort: Saw Wafer	20	15-Sep-20	13-Oct-20
RE320820	RECEIVE: Chips from Sawed First Wafer	0		13-Oct-20
RE320850	Ship Chips to Hybrid/Module Assembly/Test Sites	3	13-Oct-20	16-Oct-20
RE320870A	AVAIL: HCC Chips at BNL Hybrid Assembly Test Site	0		16-Oct-20
RE320880A	AVAIL: HCC Chips at LBNL Hybrid Assembly Test Site	0		16-Oct-20
RE320890A	AVAIL: HCC Chips at UCSC Hybrid Assembly Test Site	0		16-Oct-20

Previous slide: estimate range Nov 2020-Feb 2021, **pick Jan 2021**.
6 month slip from P6 above. Note that international schedule has Nov 2020.

Schedule with pessimism

RE320670	Vendor Effort for Pre-Production for HCC and AMAC Wafers	40	15-Jan-21	12-Mar-21
RE320760	RECEIVE: Wafers from Fabrication Vendor	0		12-Mar-21
RE320770	Test Pre-Production HCCstar Wafers with Probe Card	20	12-Mar-21	9-Apr-21
RE320780	Wait for First Wafer to Complete Testing Before Sending to Sawing Vendor	5	12-Mar-21	19-Mar-21
RE320790	Send First Tested Wafer to Sawing Vendor	1	19-Mar-21	22-Mar-21
RE320810	Vendor Effort: Saw Wafer	20	23-Mar-21	20-Apr-21
RE320820	RECEIVE: Chips from Sawed First Wafer	0		20-Apr-21
RE320850	Ship Chips to Hybrid/Module Assembly/Test Sites	3	20-Apr-21	23-Apr-21
RE320870A	AVAIL: HCC Chips at BNL Hybrid Assembly Test Site	0		23-Apr-21
RE320880A	AVAIL: HCC Chips at LBNL Hybrid Assembly Test Site	0		23-Apr-21
RE320890A	AVAIL: HCC Chips at UCSC Hybrid Assembly Test Site	0		23-Apr-21

Extra 2 months before modules can start

NB: available chips does not mean module building can be started immediately.
There is an extra 2 months from available AMAC to available Powerboards

P6 as of BCP-038 in June 2020

RE261188R	REQD: AMAC Prepro	0	10-19-20	(blank)
RE261190	Pre-Production Component Loading (2nd 75%)	22	10-19-20	11-17-20
RE261190M	Material for Pre-Production Component Loading (2nd 75%)	12	10-19-20	11-03-20
RE261210	Pre-Production Board Functional Tests Part (2nd 75%)	42	11-18-20	01-19-21
RE261220	Ship Pre-Production Boards to Module Sites	20	11-18-20	12-16-20
RE261230A	AVAIL: PrePro PP3b Power Boards for Module Sites	0	(blank)	12-16-20

2 months equals 60 modules (assuming 10 each for 3 sites each month)

Timon Heim – there will be spares left over from the 250 preproduction A powerboards that could be used.

Design changes for preproduction

- Three major issues with prototype design
 - ✓ 640 Mbps output
 - ✓ Logic reset for HCCStar event counters
 - SEE issues with control structures prevented us from seeing potential issues
- Challenges with estimates from December 2019
 - Multiple iterations take time
 - Parts of design have to grow to implement triplication as SEE mitigation
 - Limited space available in fixed area allowed, design adjustments have to be made
 - Slow down from COVID-19 crisis
 - AMAC design in parallel, FDR on 24 July

Prototype wafers – where are they now?

16 wafers from prototype chip run

- 1 wafer diced immediately in Nov 2018 without testing
- 10 wafers tested at RAL by Paul Keener & Jeff Dandoy in Feb/Mar 2019
 - 7 already diced
 - 2 wafers diced recently were sent to the UK – need HCCStars for Preproduction A
 - 1 wafer at Penn for probe station verification
- 5 wafers are at Penn for testing
 - Testing completed for AMAC by Luis Gutierrez Zagazeta and Sicong Lu
 - Testing still needed for HCCStar by James Heinlein & Paul Keener

Parts table (M. Morii)

- Note that Timon Heim already has AMACs needed for 250 preproduction powerboards at LBNL

	BNL	LBNL	SCIPP	Penn	Available in US	Prototype LS Modules (30)	Prototype X Hybrids (24)	Preprod-A LS Modules (30)	Preprod-A SS Modules (30)	Spares (+) or Needed (-)
Prototype Parts										
ABCStar	51	259	34	0	344	210	130			4
HCCStar	23	34	17	196	270	21	13	30	60	146
AMAC	0	0	0	192	192	21	0	30	30	111