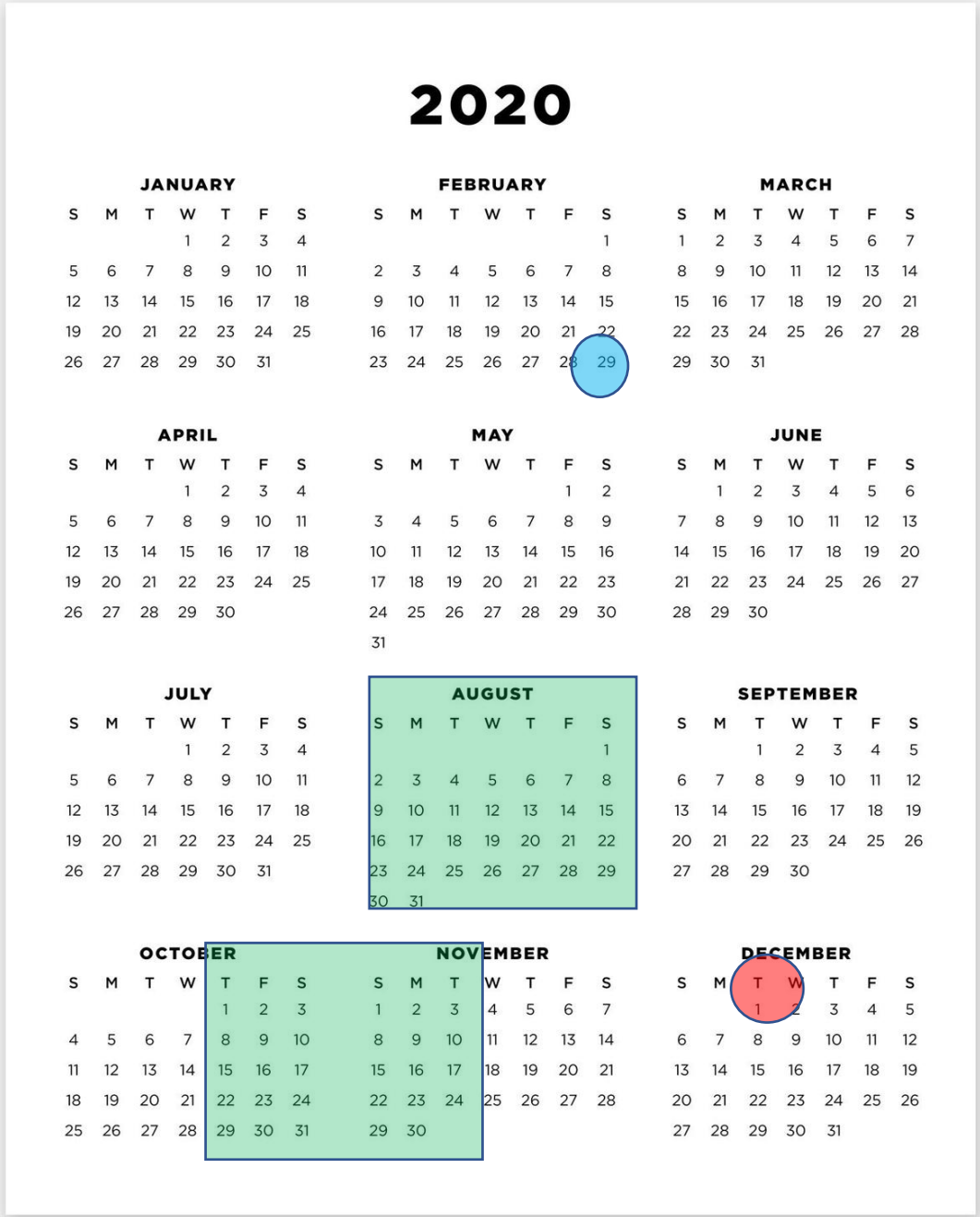
Calorimeter subproject status.

O.Tsai (UCLA), 02/28/2020

Dec. 1'st
FCS Assembled and Commissioned.



- **Hcal Assembly on the platform**

Due to uncertainty how smooth assembly will be we'll have to start it no later than Aug 3rd.

Milestones:

1. **Aug. 3 – start assembly of North Hcal**
2. **Oct. 15 – start assembly of South Hcal**

Schedule is very tight. Almost no room for mistakes.

Highest Risk Areas (Nov, 2018)

Status, Feb. 2020

- Timely delivery of absorber plates.

Mitigation: Parts trivial, we will identify backup vendors.
Impact on cost and schedule small.

On critical path, some optimism exist, but still ~ two months away from being certain.

- Timely production of scintillation tiles.

Mitigation: Part and process simple. We have at least one additional university shop which can step in production.
Impact on cost small.

Not on critical path. (ACU had to clarify status).

- New HPK SiPMs were not as extensively tested as previous version. Unexpected failure unlikely, but possible.

Mitigation: We'll test larger sample during Run19. Backup solution 15um sensors used by sPHENIX.
No impact on cost or schedule.

Two weeks ago it was a full blown crisis. Now on critical path. May be fully resolved very soon.

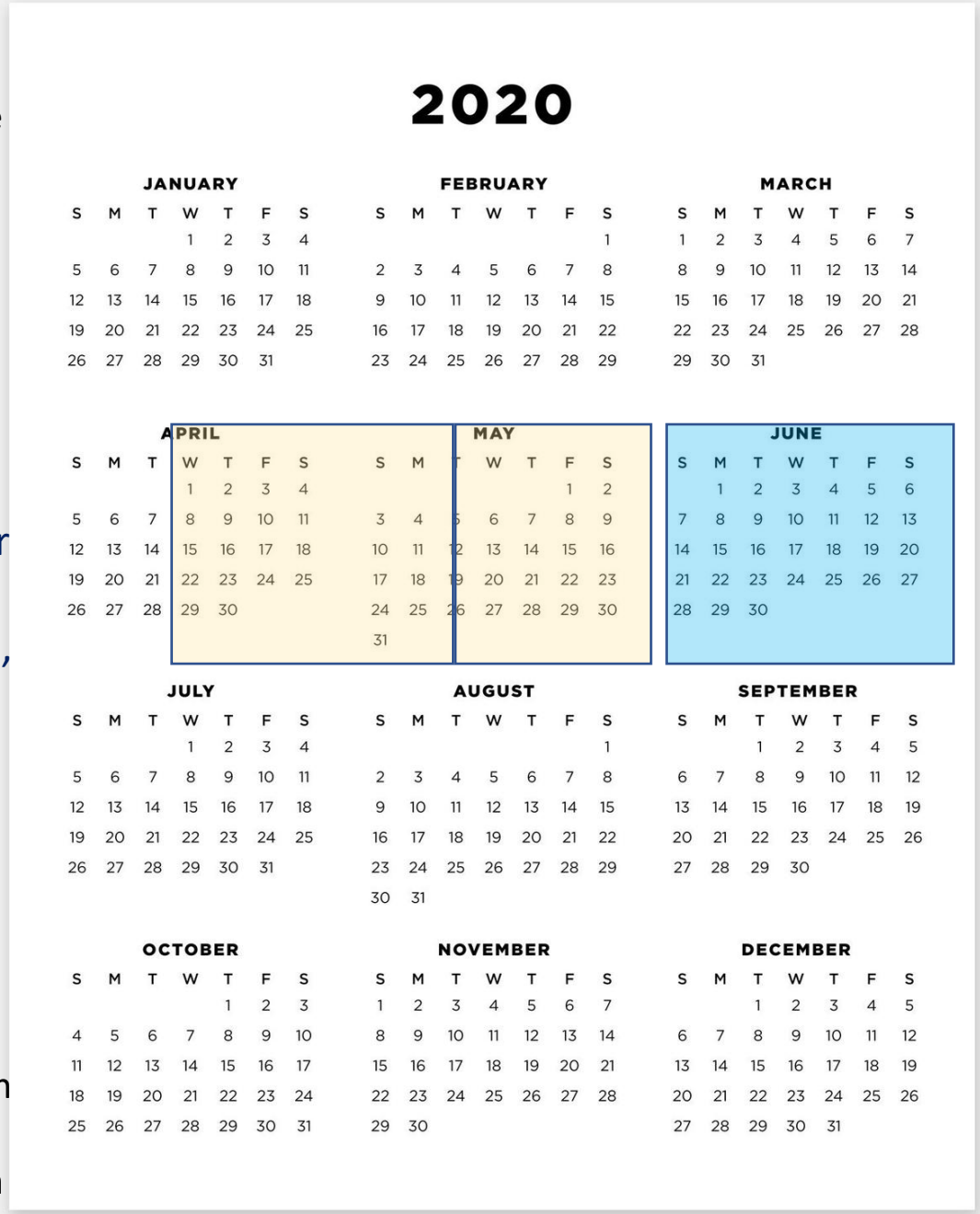
HPK Production Problem:

Middle of Feb. we learned that HPK will not be able to deliver S14160-3015PS (we got 1k of these as preproduction order in 2019, and produced SiPM boards, and glue them to ECal in Oct. 2019).

- Schedule impact was huge.

In two weeks FCS management worked out backup plan to use older version S12572-015P
(used in FNAL test Run, STAR Run 19, Stand at BNL, EIC R&D)

We'll be borrowing sPHENIX SiPMs. Almost settled…



- SiPM Boards production
- SiPM boards calibration

SiPM board calibration will be done by UCR students at UCLA.

HCal calibration may happen at BNL, TBD.

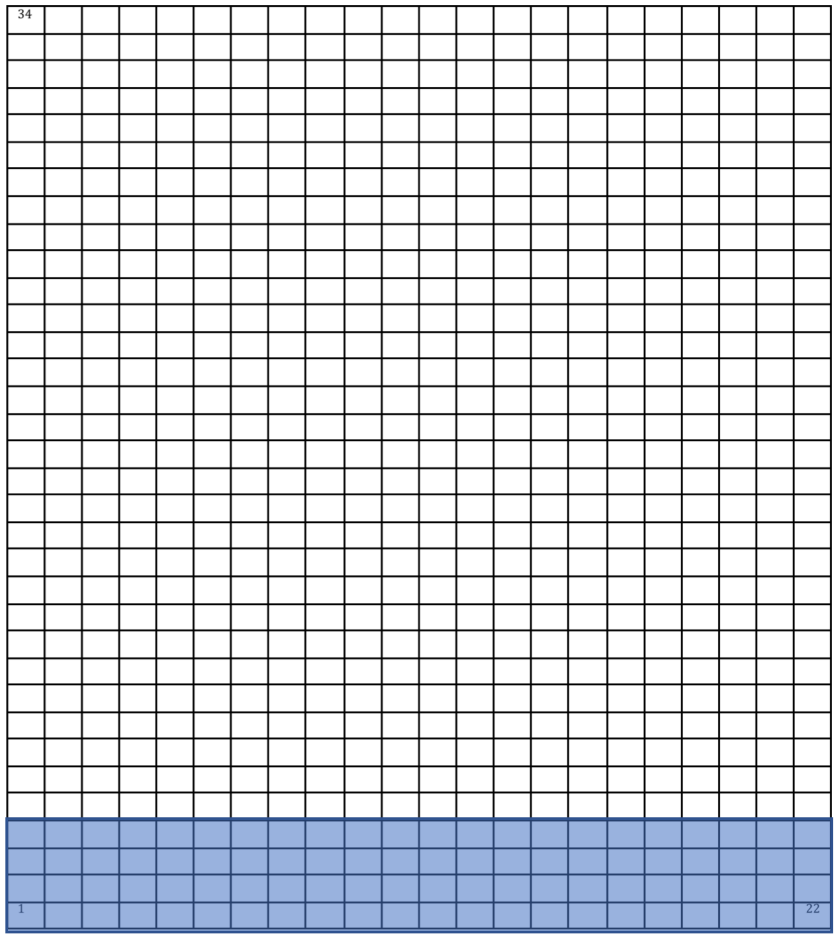
Important Lesson:

- Communication with HPK always difficult (typical for HPK). No direct link.
- Multiple requests to provide delivery schedule were un-answered.
- We did not put enough pressure on them…

If you are responsible for hardware delivery, please stay in good contact with vendors, your machine shops etc. Direct communication preferable.

- Request delivery dates.
- And follow up on this.

Technical Impact, changing SiPMs to older version.



1. Both South and North EcCal assemblies has bottom four rows of towers equipped with SiPM boards. (5% of total).
2. The other 5% of SiPM boards assembled, but not calibrated yet.
3. Re-guing new SiPM boards at the bottom will be tedious task. Removing SiPM boards will led to multiple failures of light guides, because SiPM boards had better joint to LG, then LG to the fiber bundle.
4. Operating with current version of FEEs (bias range is OK).

We have to keep these four rows as it is.

- In 2018 we did irradiation tests of samples of these new SiPMs at BNL. Cumulative exposure on neutron source was 183 hours (~ 10^{11}n/cm^2) Leakage current go from 40 nA – 300 uA, no change in the response after exposure.

- 10% preproduction board – we did not noticed increase in leakage current after assembly (T on silicone probably well below 100 C during soldering)

- Short term test with heating up S12572 and S14160 to 100 C and checking leakage current before/after heating cycle revealed nothing, i.e. no problem indicated by long term test by HPK…

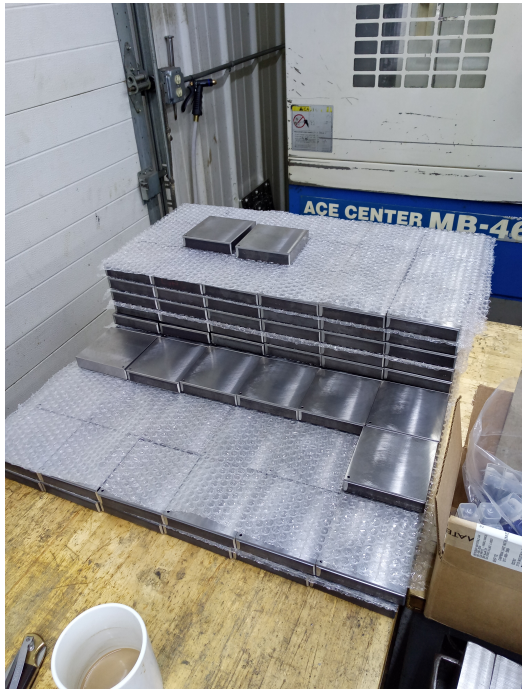
Absorber Plates:

‘Production/delivery chain’.

Chapman Lakes – Plating shop – BNL

About six shipment to BNL total. Each ~3k plates.
By Aug. 3’rd we need 3 shipments.

Communication between IUCF and CL is quite good, but there two additional transitions CL-Plating Shop, Plating shop – BNL….not clear who are communicators here.



Feb 26’th. Communication between Gerard and Ross Hardisty (CL) –> got first indication of delivery schedule

- Seemingly, rate of production at CL will be fine and there is room to boost it if needed.
- But CL still did not establish full production chain, awaiting for some special fixtures (sounds like for dowell pins holes)

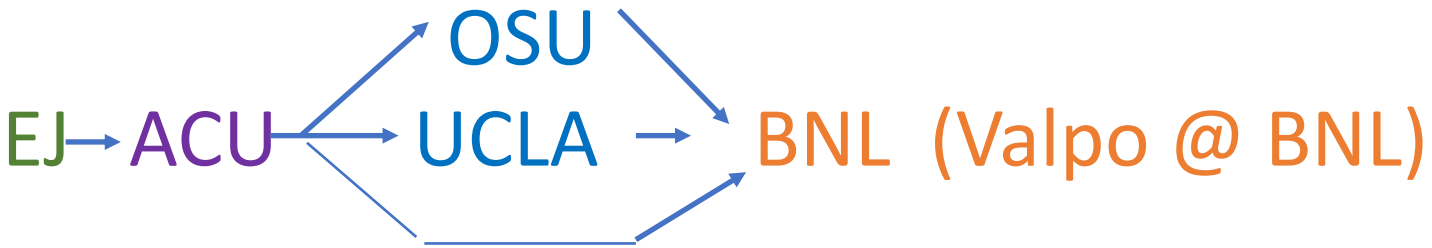
“My best estimate if things go perfectly, which they never do, would be shipping the first batch to the zinc plating vendor in 6 weeks.” – R.H.

We are guesstimating that there are ~ two weeks float to have 9k plates at BNL for Aug. 3’rd. Need to see first shipment in the STAR Assembly Hall to make better projections.

Next two months are critical to remove Absorber Plates from critical path.
Direct communication between IUCF and Chapman Lakes, Plating Shop and shipping arrangers required.

Scintillation Plates: Total 4050 Large Sc Sheets. Each yield 4 tiles. (Not on a critical path)

'Production/delivery chain'.



- Expecting last shipment of Sc. Sheets from EJ to ACU in late March (assuming UPS will locate lost box with 400 sheets. Jim D. already communicated EJ of potential need for additional 400 sheets)
- Machining at OSU and UCLA is steady. Both working on second batch of EJ sheets.
- Projecting, by late April OSU and UCLA will finish machining.
- Polishing/painting at BNL will resume in late May by Valpo (in Elke's lab in BLdg. 510, Wlodek is helping to clean it up)
- Still need to clarify rates of production at ACU. Need to hear this during next upgrade meeting.

There were early issues with miscommunications regarding shipping (EJ-ACU). Many other universities will be shipping parts to BNL. Please do it right. Provide tracking numbers etc. don't just pass it on your shipping department….
The sooner we'll start looking for a missed box, the better chances it will be found .

The rest of calorimeter parts/activities:

Rutgers – master plates , expecting first batch at BNL in April.

UCLA – electronics shop is ready for assembly of SiPM boards. Finished testing new WLS plates from EJ, requested to keep standard concentration.

VALPO – order for 405 WLS plates placed, EJ started to prepare for production.

UKY – order for 105 WLS plates is in process/ or may be already placed.

UCR – will be sending students to UCLA to calibrate SiPM boards when ready.

BNL (STSG) – shell for HCal

TEMPL - parts for shells and HCAL FEE interface plates. Bernd S. talked with his shop, indication there are no problems to produce these parts by requested dates.

Elke's list of students. Matched well with activities at BNL from May – Nov.

	Students for fSTAR summer shutdown 2020		
	Group	Student	Time at BNL
	ACU		
		3 undergrads	from June till early August
	Valpo		
		4 undergrads	mid may for 10 - 12 Weeks
	Kentucky		
		Hannah Harrision	any time after June
	Lehigh		
		3 undergrads	early June for 10 weeks
		1 grad students	early june, but maybe also available if needed in fall
	UCLA		
		2 grad students	July - mid. Sept.
	NPI Praha		
		Monika Robotkova	July to September
	CTU Praha		
		Veronika Prozorov	Autumn
	UCR		
		2 grad students	Oct-Nov
	Temple		
		2 grad students	Oct-Nov

June 2020

Activity calendar was discussed with Rahul, OK. Will be iterated

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
31	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21 Father's Day	22	23	24	25	26	27
28	29	30	1	2	3	4

Legend:

Infrastructure:

1. Hcal Roller Plates Shimming
2. Hcal Rails Stops
3. Hcal Wall Anchors
4. Ecal Shell – front side bars
5. Ecal Shell – Went angles at roller plates
6. Ecal Shell – Fan Boxes Complete. Tested.
7. Ecal Shell – Front Cover, Glue side angles
8. Ecal Shell – Light Tightening
9. Modification on CAD Vacuum Pump.

Ecal LED System Installed

Manpower:

- Infrastructure- STGS, CAD, Oleg
- Ecal LED – Tim C., Oleg
- Ecal gluing SiPM boards – Mike, Oleg, student(s)

July 2020

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
28	29	30	1	2	3	4
					Independence Day	Independence Day
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	1

Legend:

- Infrastructure
- ECal LED System Installed
- ECal Studs installed
- Ecal cooling installed/tested
- Hcal absorber blocks store on platform

If we'll have SiPM boards for Ecal we will be gluing them during July.

Manpower:
Last two weeks in July start bringing absorber blocks to the platform on south side
Oleg?/Students/STGS/CAD

August 2020

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
26	27	28	29	30	31	1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31	1	2	3	4	5

Legend:

1. Ecal Install FEEs
2. Ecal Cabling on detector

Hcal South Assembly.
Test. Moving Hcal, ½ stack complete.

Manpower:

- Ecal FEEs – Mike/Tim/Akio/student(s)
- Ecal Cabling – Akio/Mike/Tim/student(s)
- Hcal South Assembly – Oleg/Students/STGS/CAD?

Note: assuming we get sensors earlier from sPHENIX and will have Ecal SiPM boards in hand.

September 2020

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
30	31	1	2	3	4	5
6	7 Labor Day	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	1	2	3

Legend:

1. Hcal South Assembly, shell, cooling etc.
2. Ecal commissioning with LED
3. Hcal South install FEEs
4. Hcal South install LED system
5. Hcal South cabling
6. Hcal South commissioning with LED

Manpower:

- Hcal South Assembly – Oleg/students/STSG
- Hcal South FEEs, Cabling – Akio/Mike/Tim/student(s)
- Ecal commissioning with LEDs – All
- Hcal South commissioning – All

October 2020

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
27	28	29	30	1	2	3
4	5	6	7	8	9	10
11	12 Columbus Day	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31 Halloween

Legend:

1. Hcal South commissioning with LED
2. Hcal North Assembly

Manpower:

- Hcal South commissioning – All
- Hcal North Assembly – Oleg/Students/STGS

November 2020

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
			Veterans Day			
15	16	17	18	19	20	21
22	23	24	25	26	27	28
				Thanksgiving Day		
29	30	1	2	3	4	5

Legend:

1. Hcal North Assembly
2. Hcal North FEEs/cabling
3. Hcal North commissioning with LEDs

Manpower:

- Hcal North Assembly – Oleg/Students/STGS
- Hcal North FEE/Cabling – Akio/Mike/Tim/Oleg
- Hcal North Commissioning with LED - All

Summary:

1. Schedule is tight. We almost have no any slack anymore.
2. Few critical parts are still on critical path.
3. Manpower is adequate.
4. Next two months are particular critical to get everything in steady production mode.
5. There are no obvious conflicts with DEP and FEEs schedules to start commissioning in September.
6. Plan for commissioning has to be worked out.
7. Important to identify adequate manpower. As suggested by Elke, we'll discuss this during next regular meetings.