Energy Reach, Cryo, etc.

Jay Benesch

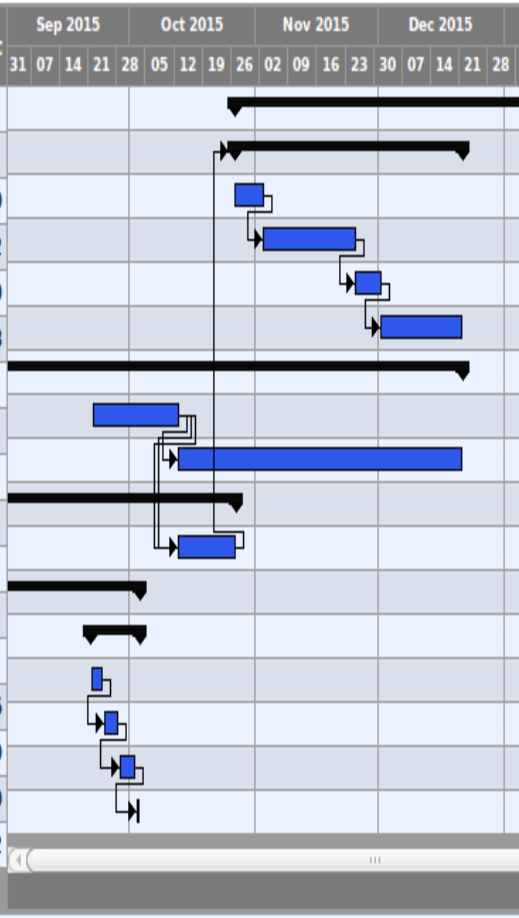
StayTreat Statistics

- Three days – July 15-17
- 12 Sessions
- 56 Presentations
- 46 Presenters
- ~30-50 participants, 104 invited with warning that room holds ~65
- https://www.jlab.org/indico/conferenceDisplay.py?confId=109

Fall 2015 (Arne)

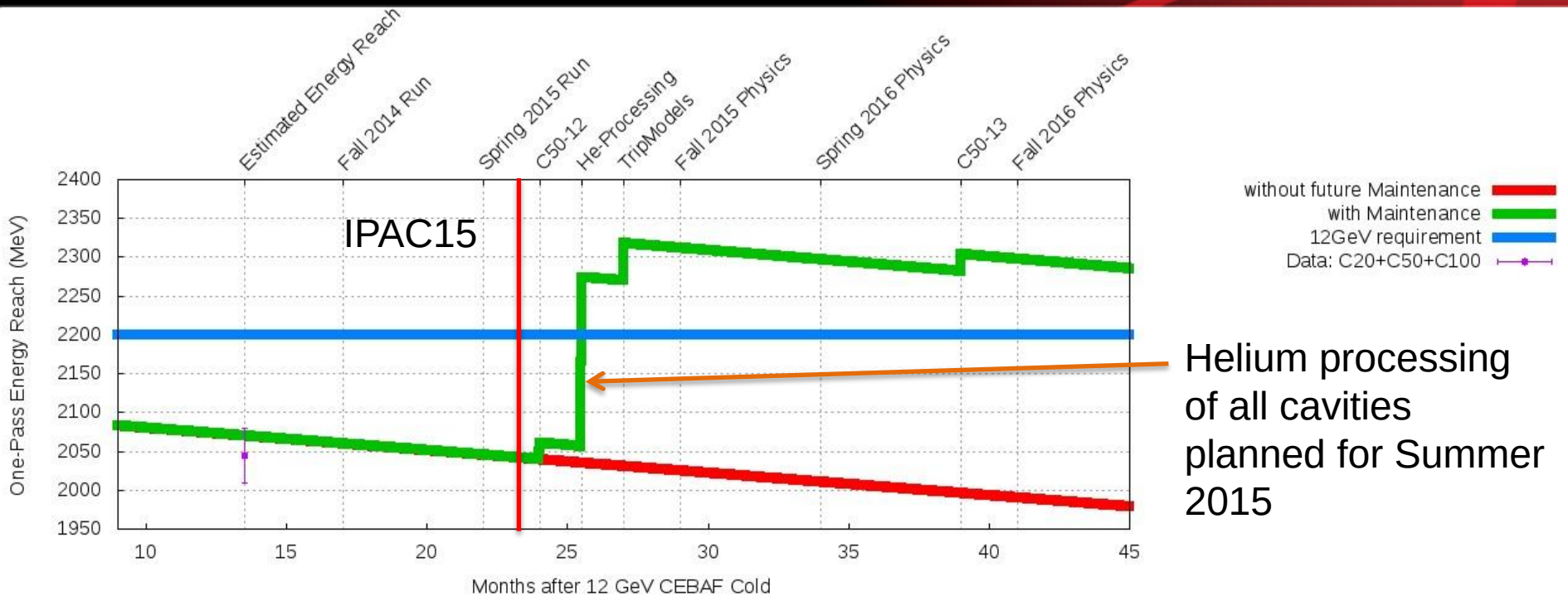
CEBAF Fall 2015 Beam Operations

Index	Name	Task Description	Start	End	Effort
7	**Physics 12GeV Initial Ops**		**Mon 2015-10-26 21:00**	**Sat 2016-10-01 00:00**	**16.0**
7.1	**Physics Period I: E>2GeV/pass**		**Mon 2015-10-26 21:00**	**Mon 2015-12-21 06:00**	**7.0**
7.1.1	Machine restoration	CEBAF 5.5pass E=12GeV...	Mon 2015-10-26 21:00	Mon 2015-11-02 20:00	1.0
7.1.2	12GeV optics/procedure finaliz...	CEBAF 5.5pass E=12GeV...	Mon 2015-11-02 20:00	Wed 2015-11-25 06:00	3.2
7.1.3	Thanksgiving Break		Wed 2015-11-25 06:00	Tue 2015-12-01 16:00	0.0
7.1.4	12GeV optics/procedure finaliz...	CEBAF 5.5pass E=12GeV...	Tue 2015-12-01 16:00	Mon 2015-12-21 06:00	2.8
10	**Cryogenic Tasks**		**Mon 2013-09-30 00:00**	**Mon 2015-12-21 06:00**	**1.0**
10.23	Cryo Restoration: CHL1, CHL2 on...		Mon 2015-09-21 21:00	Mon 2015-10-12 21:00	0.0
10.24	CHL1->SC1->South Linac, CHL2->S..		Mon 2015-10-12 21:00	Mon 2015-12-21 06:00	0.0
11	**SRF related activities**		**Wed 2013-08-28 19:00**	**Mon 2015-10-26 21:00**	**2.0**
11.12	C20 RF Trip Data Accumulation	24/7 operations	Mon 2015-10-12 21:00	Mon 2015-10-26 21:00	2.0
13	**Safety Systems Group Tasks**		**Fri 2013-09-06 16:00**	**Sat 2015-10-03 00:00**	**2.7**
13.3	**PSS Certification 2015 Summer S**		**Mon 2015-09-21 06:00**	**Sat 2015-10-03 00:00**	**2.7**
13.3.1	PSS pre-checks		Mon 2015-09-21 16:00	Thu 2015-09-24 00:00	0.6
13.3.2	PSS Static Certification		Thu 2015-09-24 16:00	Mon 2015-09-28 00:00	1.0
13.3.3	PSS Functional Certification		Mon 2015-09-28 16:00	Fri 2015-10-02 00:00	1.0
13.3.4	PSS Functional Certification F...		Fri 2015-10-02 16:00	Sat 2015-10-03 00:00	0.2



All effort and duration values are in weeks. 24/7 scenario

Gradient Maintenance (Arne)



Helium processing of all cavities planned for Summer 2015

- C20/C50 performance degradation:
  - 0.21 MV/m – year (~34 MeV/pass - year).
  - Cause of degradation is unknown, actively being investigated.
- C100 insufficient data to date to reliably estimate degradation, if any.

- Commissioning vs. Operations cavity performance:
  - $78\% < \frac{Operational\ Gradient}{Commissioning\ Gradient} < 94\%$

Energy Reach (Jay)

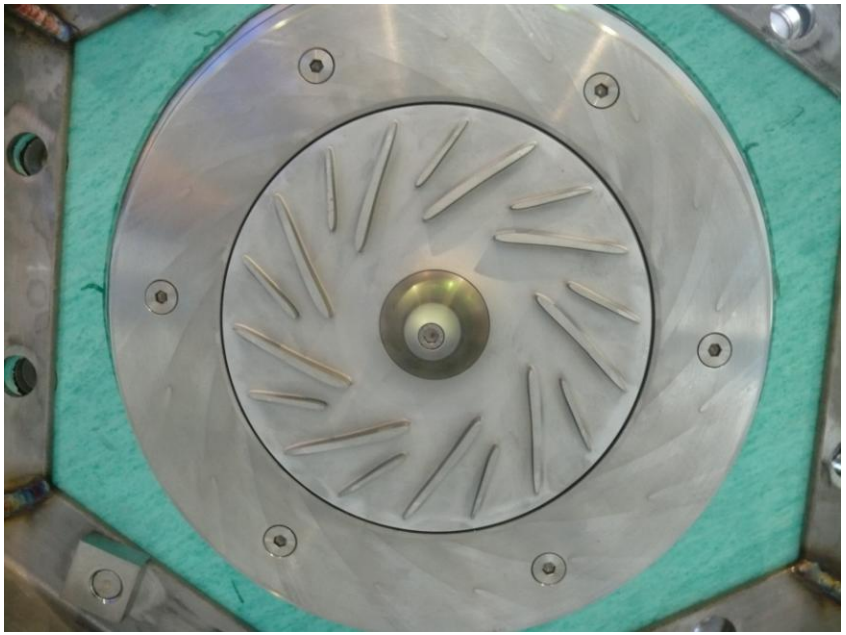
- See Drury talk 7/15 1330 at https://www.jlab.org/indico/conferenceDisplay.py?confId=109
- Nine modules completed of eleven scheduled as of 7/14
- Eleven cavities not processed of 72: eight cold window leaks, 2 CWWT sensors damaged in process, one prior CWWT dead
- Net 70% of scheduled cavities processed
- Two or more days are spent in pre/post measurements which have no operational utility. I urged that they not be done, but
- SRF is not using the procedure which worked in 1990s
- SRF is not using all available RF power nor challanging the gradients Drury decided were limits during 2012 re-commissioning (which was also of no operational utility)

CHL 2 – 4K box

- Didn’t meet LN2 consumption spec: 200 l/hr vs 70 l/hr
- Linde replacing internal heat exchanger with external under “warranty”, minimal JLab cost
- Hope to get to 60 l/hr
- Complete end of August or early September
- See 7/15 0955 talk by Jonathan Creel at https://www.jlab.org/indico/conferenceDisplay.py?confId=109

SC1 Repair Using SNS Compressor (Creel)

- Moved our wheel and backplate to the SNS compressor
- JLAB modified SNS compressor
  - LN2 supply and LN2 return connections
  - Magnetic bearing power and controls feedthroughs (x4)



SC1 CC4 Plan Forward (Creel)

- Estimate about 1 months of work remaining
  - Pull a vacuum on process piping
    - Check bearing controls
    - Test run compressor (balance and bearing control)
  - Visit from AL/S2M to certify bearings ready
  - Install vacuum shell and establish vacuum
  - Clean up system
  - Utubes and cooldown
  - Test by pumping down

No quote yet on AL/SCM repair of our CC4

Constraint on LLRF/Laser System (Grames)

Beam Condition	Hall D	Halls A, B, C
• Beam @ 1 - 4 passes	249.5 MHz	499* MHz (3-hall) 1 @ 249.5 MHz (4-hall)
• Beam @ 5th pass (Hall D OFF)	OFF	499* MHz
• Beam @ 5th pass (Hall D ON)	249.5 MHz	249.5 MHz

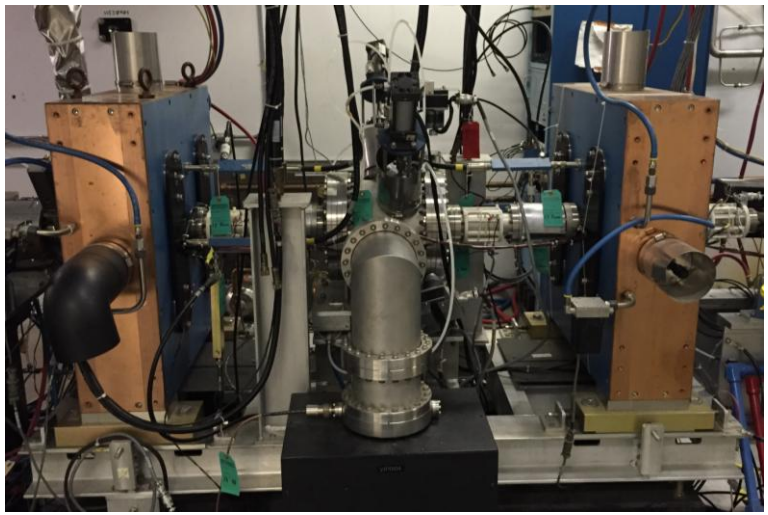
*Halls A, B, C can operate at 249.5 MHz generally if desired.

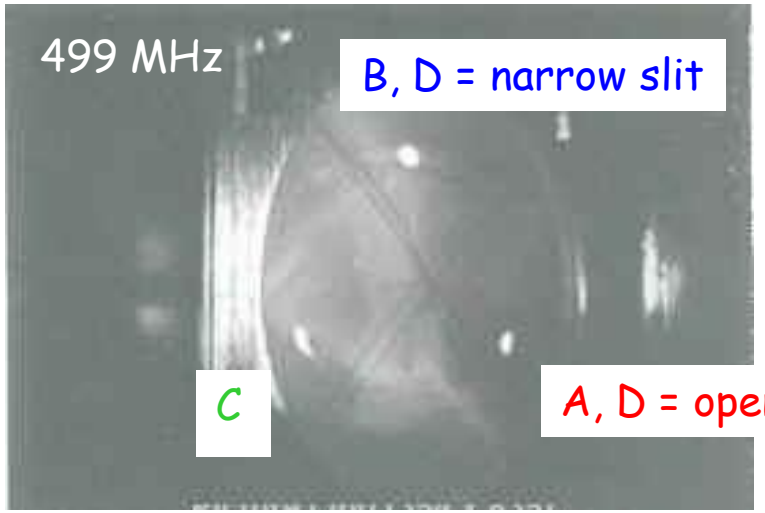
Major upgrade tasks

- Add a 4th fiber laser, combine with other 3 on laser table
- Generate bunch trains at both 499 and 249.5 MHz
- Achieve similar and reliable functionality at both rep rates
  - Means bunch length setup, procedures, mapping laser:rate:hall, etc.
- Demonstrate “sharing” of 3-beam chopper

Beam Chopping (Grames)

- The chopping system comprised of 3 physical “time window” apertures @ 499 MHz, defines the longitudinal acceptance.
- 3-hall operation allows each hall to have a unique aperture
- 4-hall operation requires two beams sharing one aperture
  - When D is low current 10’s-100’s nA can share with B
  - When D is high current 100’s-1000’s nA must share with A or C
- An alternative to sharing is to build a 250 MHz chopping system





SHMS suggestions (1)

- Buy workstation for TOSCA and external RAID array, ~$15K
- Buy two Opera MP use licenses, ~$15K
- Assign or hire someone to take over the model MH Moore developed and add upstream horizontal BE to it
- Develop a table of kinematics settings of the SHMS for all approved experiments and estimate magnet settings for each
- Solve model for each case, four cores for each of two cases simultaneously (two 3.4 GHz 6C processors, 256 GB RAM)
- Use post-processor to determine particle paths to detector package and primary beam to dump. Modify iron shielding on dump beam tube as needed.
- May want to buy additional Opera Optimizer licenses to have it adjust the magnet currents to refine spectrometer optics

SHMS suggestions (2)

Request that Ruben Fair's SC magnet group design a new HB magnet with ~7.5 degree minimum angle. This should allow enough magnetic and radiation shielding to get unscattered beam to dump and prevent the magnet internals from disintegrating due to radiation damage. Begin construction ~2020 so it's ready before the HB dies.