Maintenance and Upgrades at BNL CAD

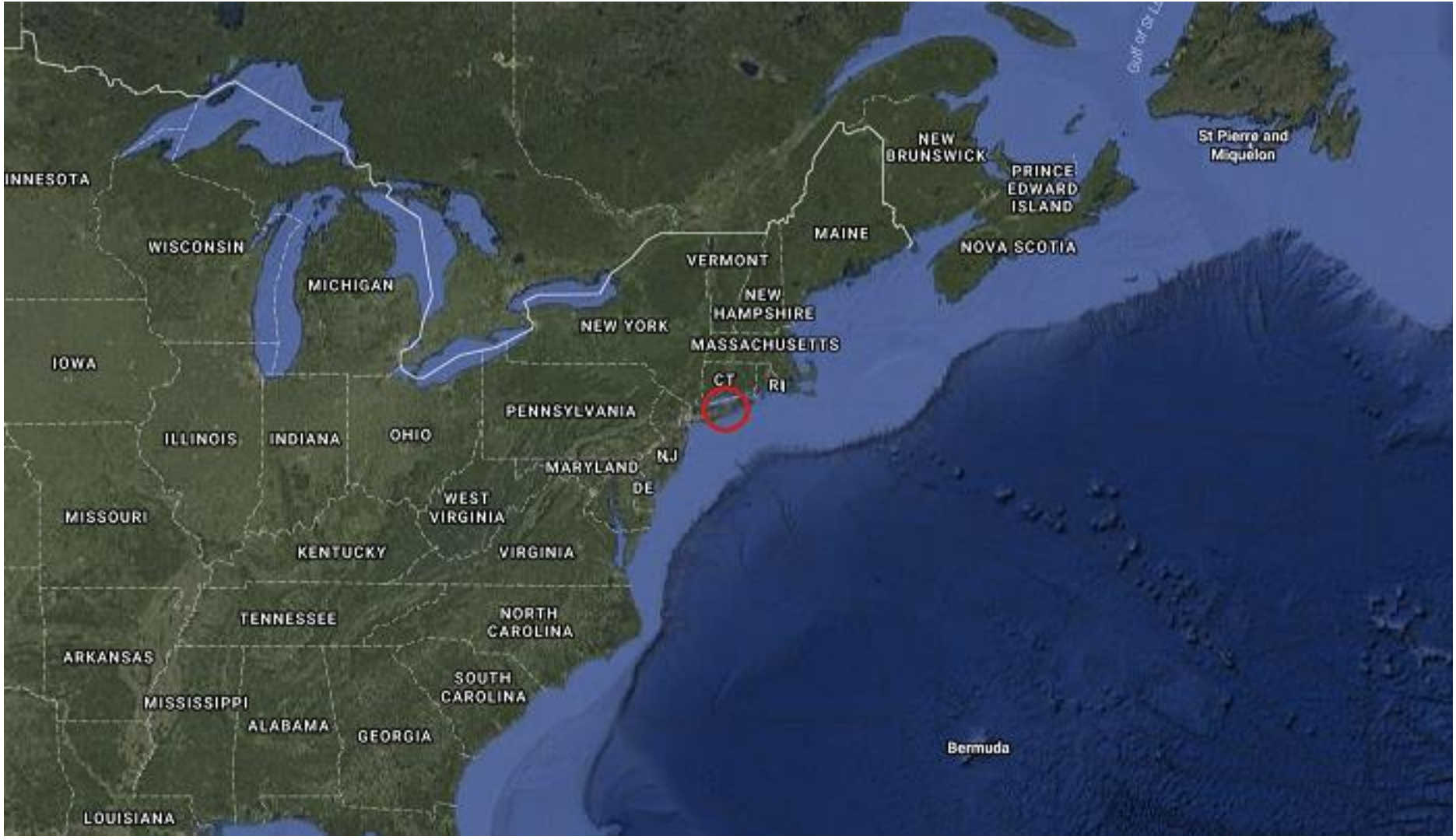
P. Sampson BNL USA

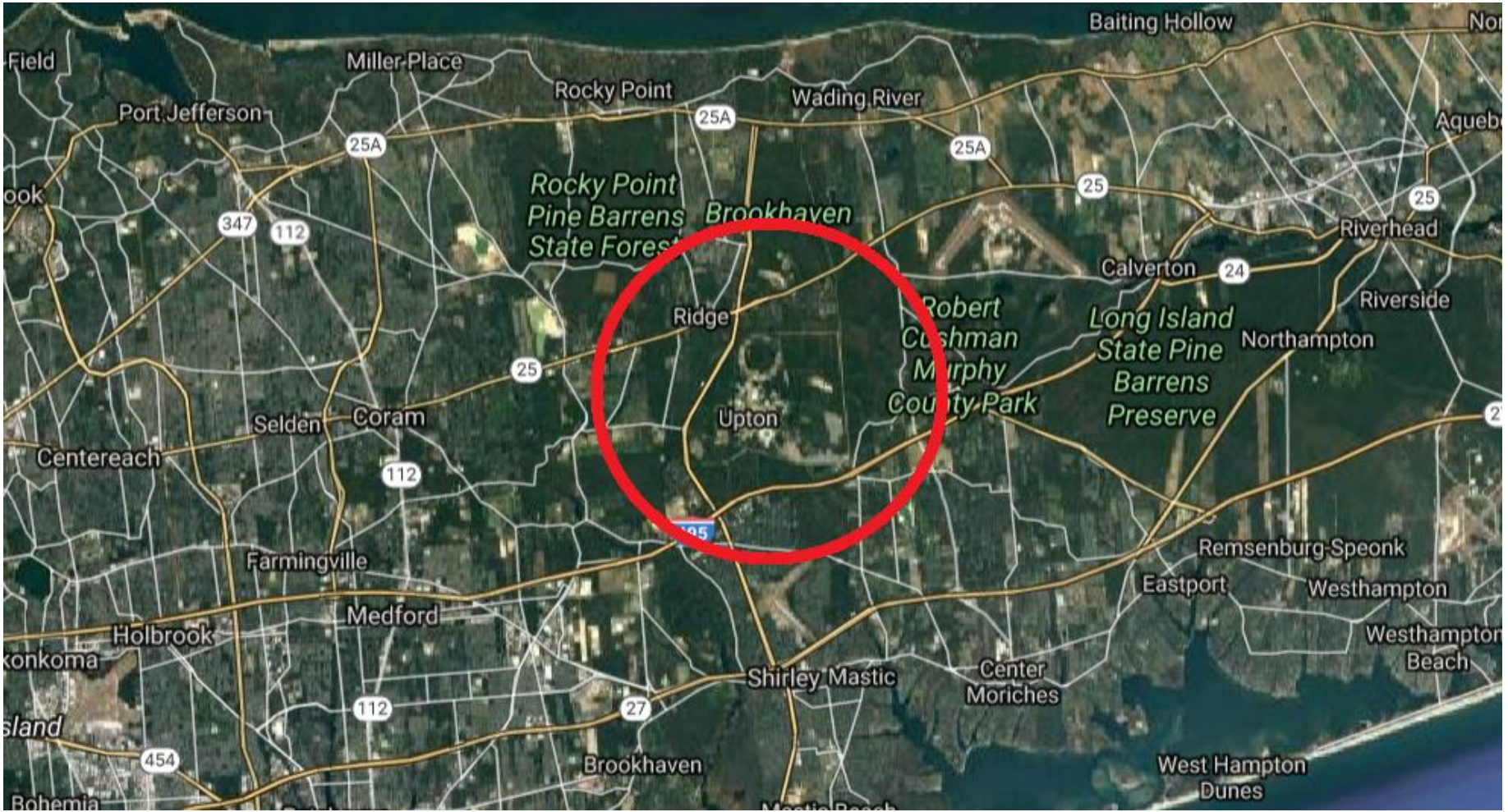
Intro

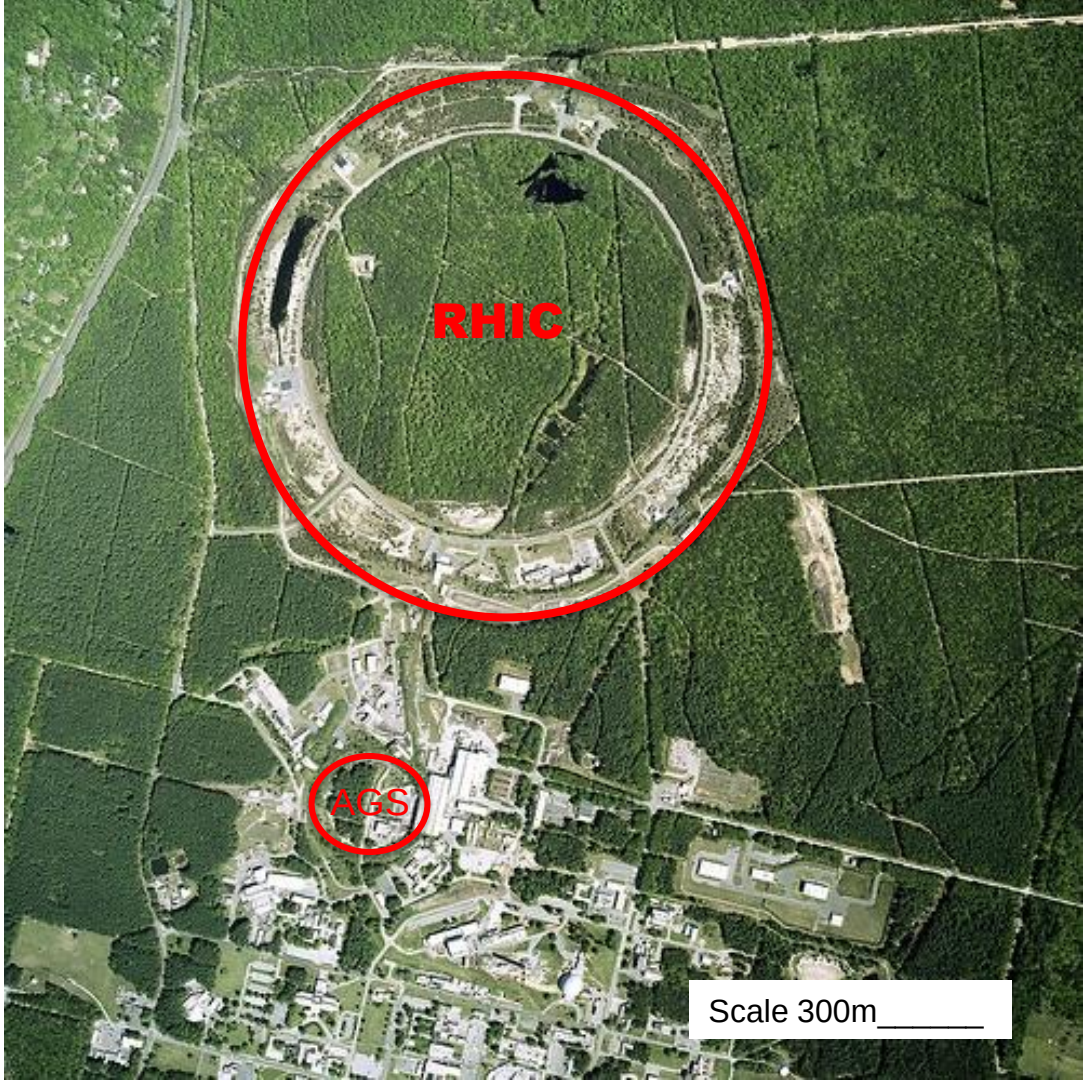
In order to maintain reliable operation of facilities in a large multi-discipline facility such as the Collider Accelerator complex, at which major upgrades are in progress, Various method and techniques have evolved...

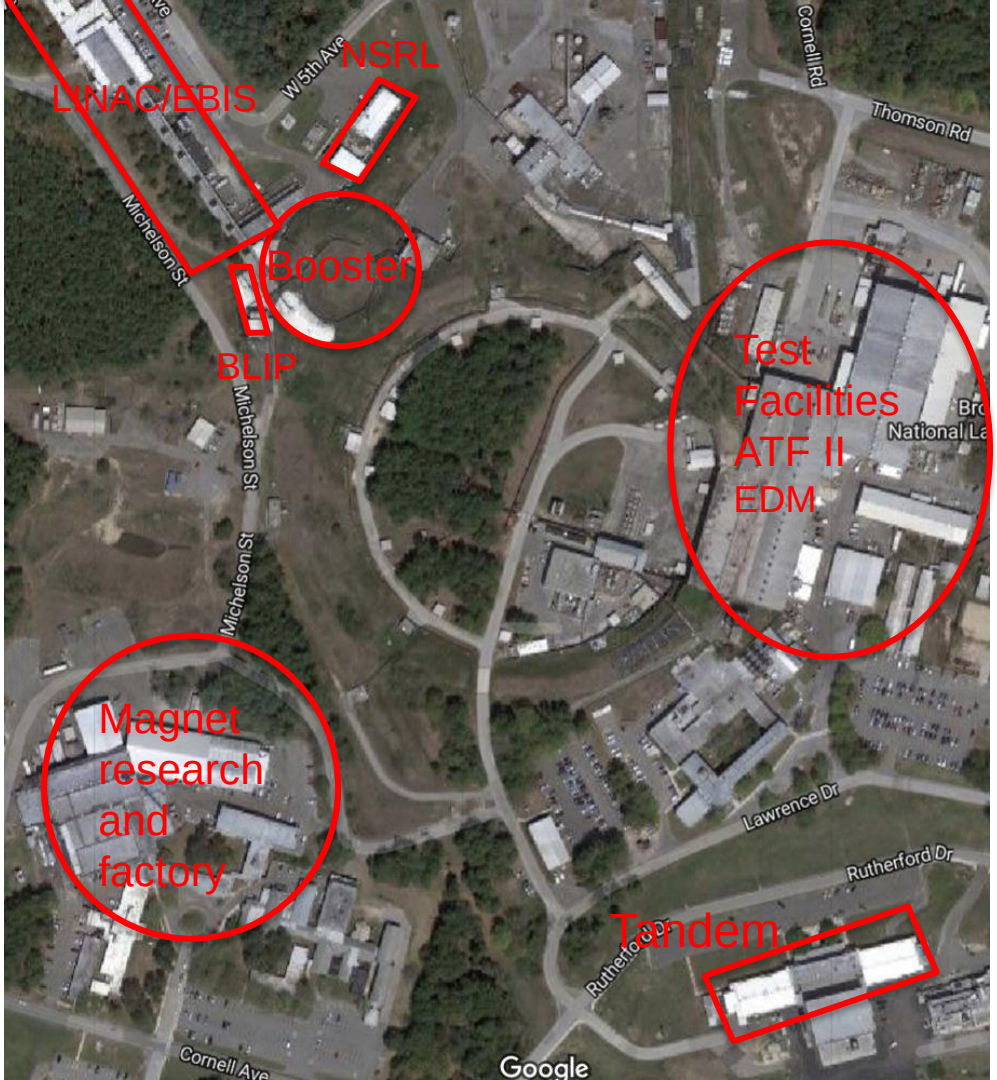
Introduction to CAD

- Large Multi faceted facility
- Annual Run for RHIC
- Multiple runs for other users
- New systems commissioning
- Extended running for Isotope production


INNESOTA
WISCONSIN
MICHIGAN
IOWA
ILLINOIS
INDIANA
OHIO
MISSOURI
KENTUCKY
WEST VIRGINIA
VIRGINIA
TENNESSEE
NORTH CAROLINA
ARKANSAS
SOUTH CAROLINA
MISSISSIPPI
ALABAMA
GEORGIA
LOUISIANA
NEW YORK
PENNSYLVANIA
MARYLAND
DE
NJ
CT
RI
MASSACHUSETTS
VERMONT
NEW HAMPSHIRE
MAINE
NEW BRUNSWICK
PRINCE EDWARD ISLAND
NOVA SCOTIA
St Pierre and Miquelon
Bermuda


Baiting Hollow
Miller Place
Rocky Point
Wading River
Port Jefferson
25A
Rocky Point
Pine Barrens
State Fores
Brookhaven
347
112
25
Riverhead
Calverton
24
Riverside
Ridge
Robert
Cushman
Murphy
County Park
Long Island
State Pine
Barrens
Preserve
Northampton
Selden
Coram
Upton
Centereach
112
Farmingville
Remsenburg-Speonk
Eastport
Westhampton
Medford
Holbrook
Shirley Mastic
Center
Moriches
Westhampton
Beach
112
27
454
Brookhaven
West Hampton
Dunes


RHIC
AGS
Scale 300m_____


LINAC/EBIS
NSRL
Booster
BLIP
Test
Facilities
ATF II
EDM
Magnet
research
and
factory
Tandem
W 5th Ave
Michelson St
Michelson St
Michelson St
Cornell Rd
Thomson Rd
Lawrence Dr
Rutherford Dr
Rutherford Dr
Cornell Ave
Google

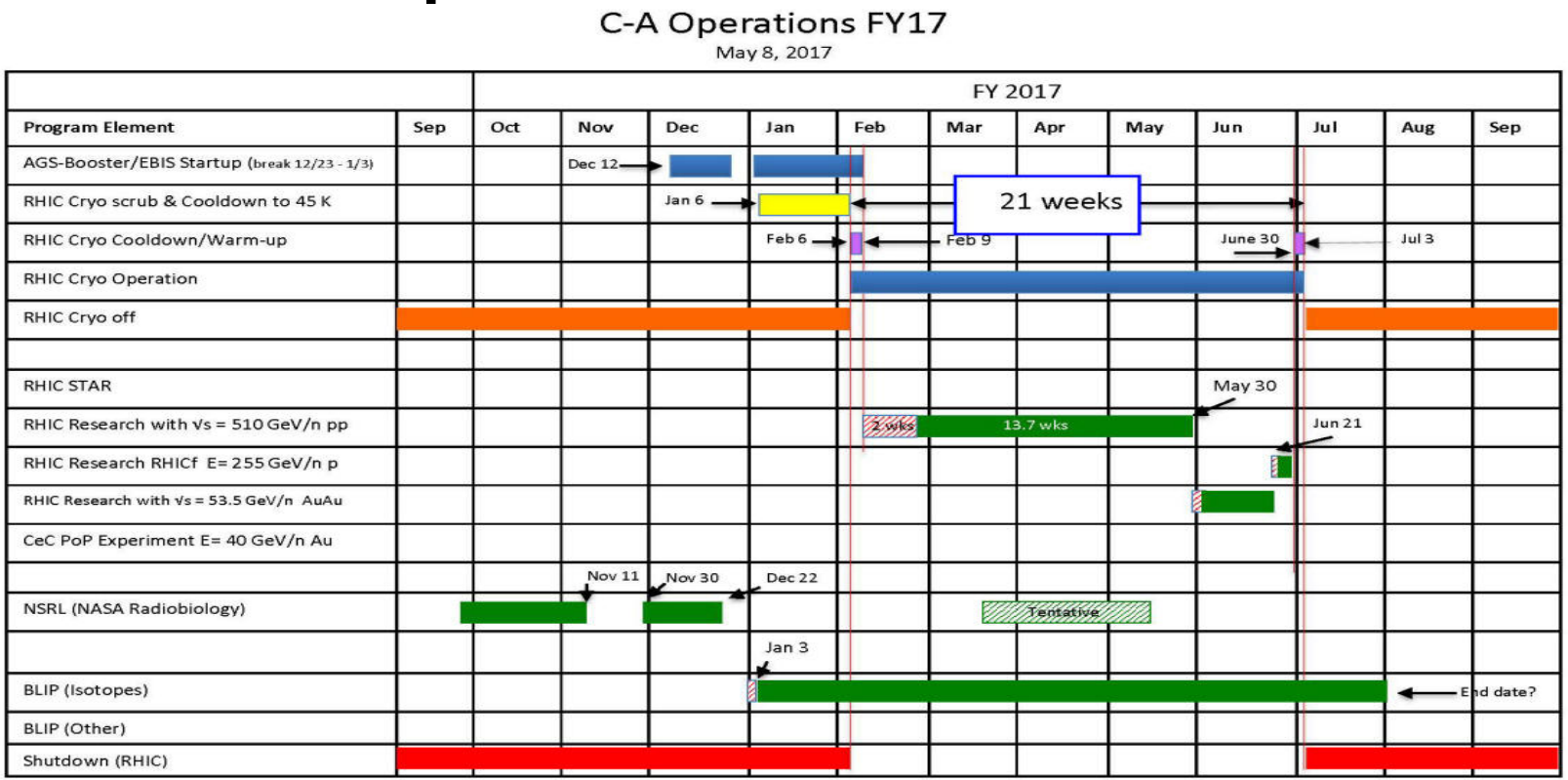
Discussion Topics

- Organizing the Shutdown
  - Methods for tiered approach
  - Prioritizing, Planning and sequencing of work
  - Testing, commissioning during shutdown
  - Construction of new facilities
  - Major upgrades
  - Maintenance

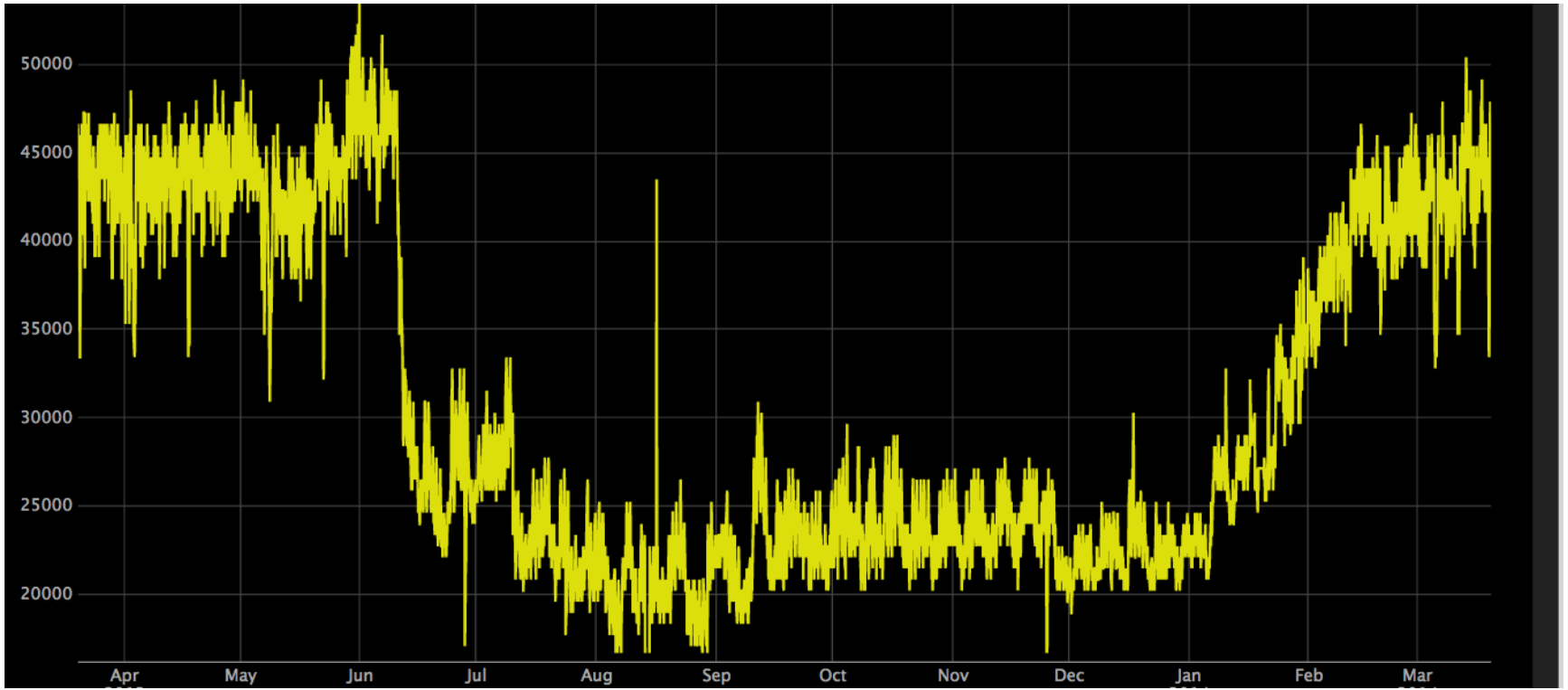
Organizing Shutdown

- Schedules
  - Independent schedules are must be coordinated with overall (RHIC) schedule
- Global considerations
  - Power consumption $$
  - Critical work and shutdown duration
- Resource utilization
  - Workers
  - Materials
  - Equipment

Department Schedule



Power Consumption (MWH)



Collect work requests

240	Beam Components & Instrumentation	AGS Video System- Checkout of All AGS Ring Cameras Including Repairs	12 hrs	N	AGS
241	Beam Components & Instrumentation	F18 House- Installation of Remote Temperature Monitoring	4 hrs	N	N/A
242	Beam Components & Instrumentation	A10 House- Installation of Remote Temperature Monitoring	4 hrs	N	N/A
243	Beam Components & Instrumentation	E10 House- Installation of Remote Temperature Monitoring	4 hrs	N	N/A
244	Beam Components & Instrumentation	H10 House- Installation of Remote Temperature Monitoring	4 hrs	N	N/A
237	Beam Components & Instrumentation	CAD Video Systems - Cleanup of Video Area Above MCR	TBD dys	C&WO	N/A
292	Beam Components & Instrumentation	AGS C15 Polarimeter - Removal of all Item Internal To Vacuum Chamber & Remove Electronics From Ring	2 dys	C&no	AGS
293	Beam Components & Instrumentation	AGS RLRM SYstem - Remove & Modify all 200V Bias Boards Incuding Testing	1 wks	N	N/A
309	Beam Components & Instrumentation	AGS BBQ - Fabricate New Boards/Install & Test- Modifications & Operational Checkout	TBD hrs	N	AGS
39	Controls	New controls for L18A datacon 3 devices, new analog bd's in L18A station.	2 wks	N	N/A
40	Controls	Install new Temp Monitor units for all AGS Bldgs that require them	5 wks	N	N/A
41	Controls	Replace Wiener Chassis's in AGS Bldg with Elma Chassis's	3 dys	N	N/A
42	Controls	Move the A5 Kicker Discharge trig to originate from CFE-L18A-VME	1 dys	N	N/A
146	Pulsed Power Supply	H10 Septum	2 dys	N	N/A
147	Access Controls	Check Doors	2 hrs	N	AGS
193	Access Controls	AGS ADIV and BDIV PLC Software	8 hrs	N	Booster, AGS, U-Up
43	Vacuum	REPLACE E-14 E-15 & E-16 ION PUMPS	1 dys	N	AGS
44	Vacuum	Inspect Turbo Stations	1 wks	IP	AGS
45	Vacuum	LEAK CHECK SECTOR "I-J"	1-2 hrs	N	AGS
46	Vacuum	REMOVE C-20 POLARIMETER VESSEL & VALVES	1 wks	N	AGS
47	Vacuum	REPAIR A-1 ION PUMP CABLE IN RING	1-2 hrs	N	AGS
48	Vacuum	TROUBLESHOOT J-1 ION PUMP / CABLE	TBD hrs	N	AGS

Prioritizing

- Work requests are submitted prior to shutdown or maintenance period.
- Review process
  - Department, division, project and group level
- Critical path items identified
- Prior to approval, priority is assigned.

Assess Priority and Critical Path

Jobs for March 22, 2017

Priority Jobs

Group	Job Title	Time Required	Status	Ring
Beam Components & Instrumentation	LEReC Laser System	3 hrs	RS	
Beam Components & Instrumentation	8 O'clock Vertical DX BPM- Investigate Signal Problems	30 min	RS	
Beam Components & Instrumentation	Sector 8 ZDC's - Crossover to CAD Cables	20 min	RS	

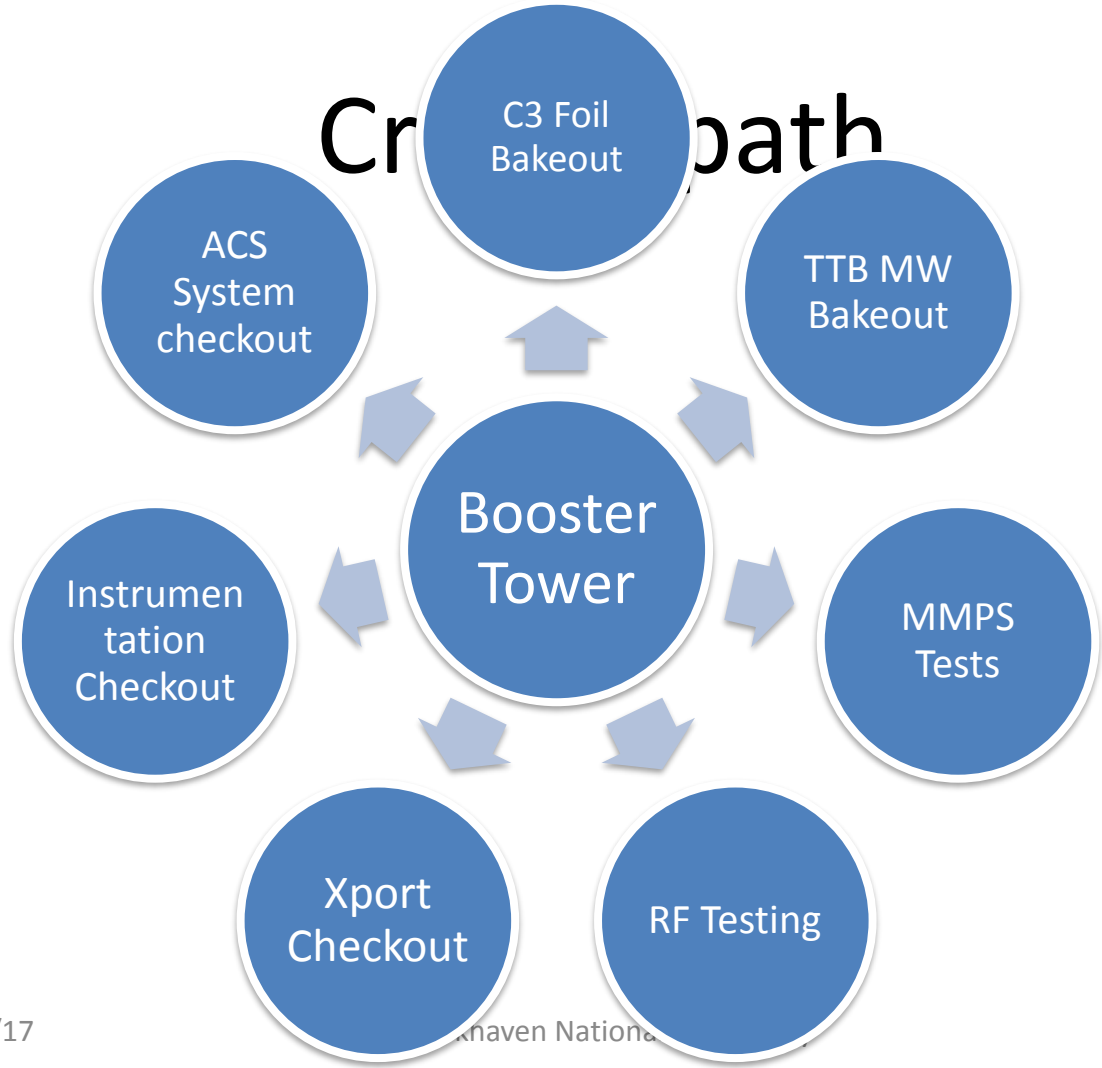
Group	Job Title	Time Required
r Supply (Booster/AGS)	BTA L18A power outage to do a tie in to spare 480 vac FDS	1 hr

Interdependence example: Booster Water Tower

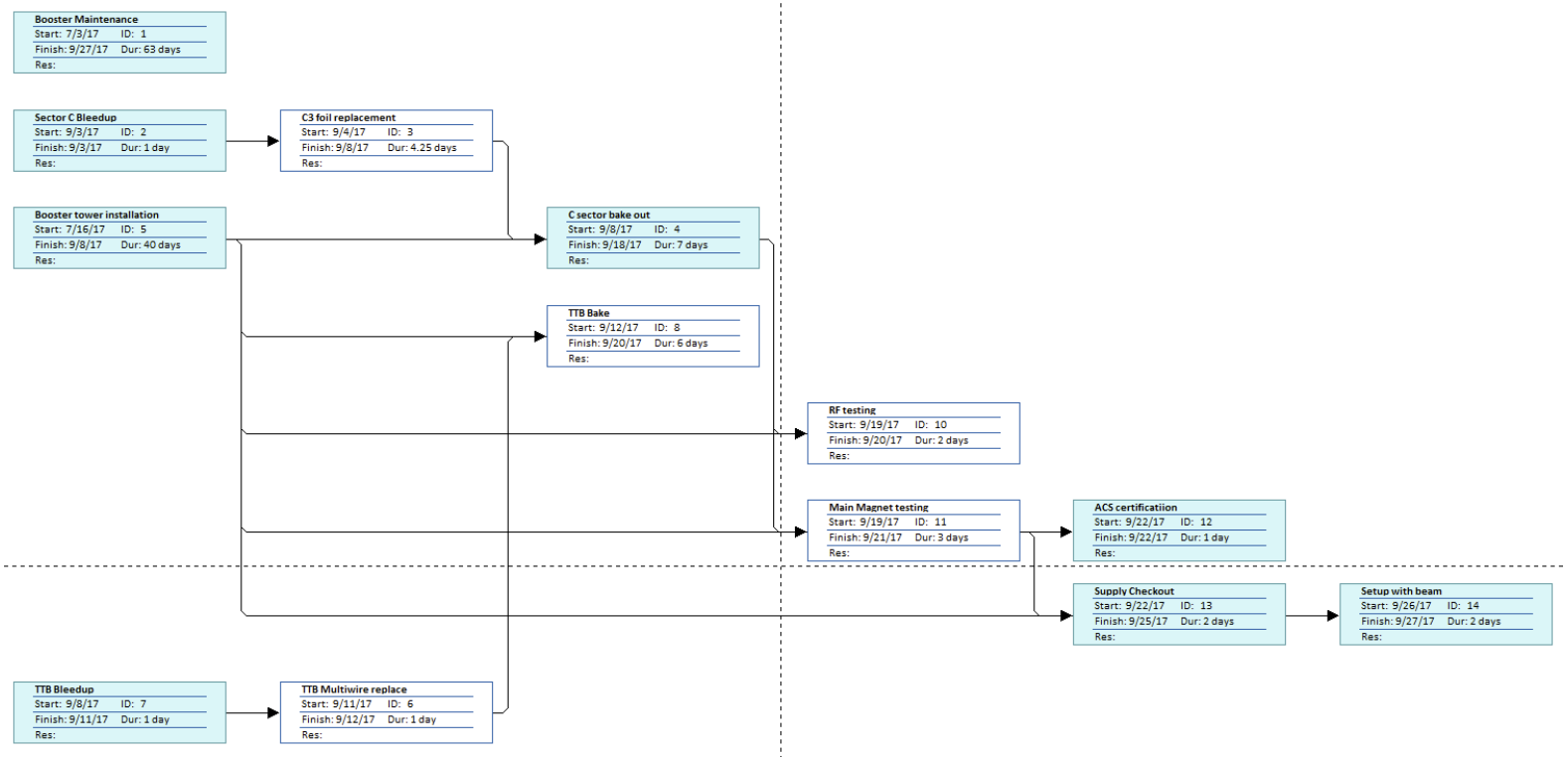
Status
Running
In Process
Off Line

Job Title	June 30	Sept 1	Sept 15	Sept 20	Sept 23	Sept 24	Sept 26
EBIS tests							Running Beam
Multiwire Repair		Bleed Up	Bakeout	Complete			
Cooling tower install				Complete			
ACS Certification						Complete	
BMMPS Tests					Tests begin		
RF testing							

Cr…path


C3 Foil Bakeout
TTB MW Bakeout
MMPS Tests
RF Testing
Xport Checkout
Instrumentation Checkout
ACS System checkout
Booster Tower

Complex Sequences



Construction and Major Upgrades

- Need to schedule outages, shutdowns and maintenance for minimal impact
- Schedule around testing and commissioning
  - Access
  - Systems availability
  - Impact minimization for Running facilities

Other facilities

- Facilities that are outside of the Accelerator Complex
- Indirect affects
  - Power
  - Personnel allocation
  - Scheduling of construction and maintenance

Bringing it all together

- Once a shutdown workload is determined:
  1. Top down view of requirements
  2. Assess dependency, contingency
  3. Plan and Schedule
  4. Execute

1. Repeat steps 2-4 as necessary

Communication

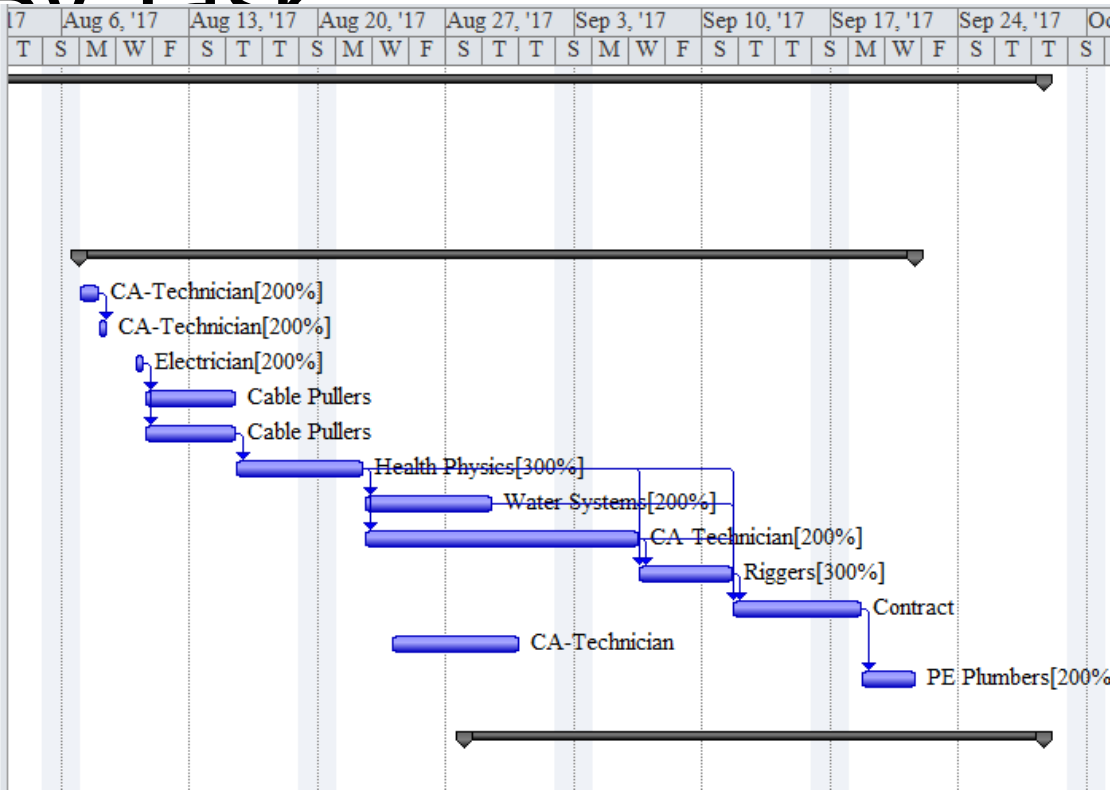
- Overall schedule
- Meetings
  - Task, facility
  - Group
  - Division
  - Department

Schedules

- Overall
- By task
- Monthly
- Weekly Daily

By Task

	Task Name	Exp - Proj
1	1 LINAC AHU 4	
2	1.1 Pre-Demo work	
3	1.1.1 Prep area for new AHU	
4	1.1.2 Rig in New AHU unit	
5	1.1.3 Mount New AHU unit	
6	1.2 Demo	
7	1.2.1 Prep and disconnect ALC board	
8	1.2.2 Move ALC board and mount in new location	
9	1.2.3 Disconnect Power from old unit	
10	1.2.4 Pull back signal cable for ALC	
11	1.2.5 Pull back power cable from old unit	
12	1.2.6 Asbestos Demo	
13	1.2.7 Disconnect Water from old Unit and "correct" pipe path	
14	1.2.8 Demo Sheet metal of unit	
15	1.2.9 Rig out Demo	
16	1.2.10 Concrete Pad Removal	
17	1.2.11 Prep area for new duct work (clear path)	
18	1.2.12 Remove Sprinkler	
19	1.3 Post Demo work	
26	2 UPW Room	



Sun	Mon	Tues	Weds	Thurs	Fri	Sat
					1 EBIS tests Complete Pre check NSRL PS and Mag checkout	2
3	4 EBIS Tests Booster foil Replacement completed	5 No EBIS Tests Bleed up EtB for MW replacement	6 DELAY BOOSTER COOLING TOWER NOT READY	7 No Access to Sector 2, Laser alignment 1700-2000	8 Bakeout delay(Booster Tower)	9
10	11 Begin Booster Startup Software, controls Instrument check	12 Startup (Awaiting BCT) No Access to Sector 2, Laser alignment 1700-2000	13 Startup	14 Booster Tower Available Bake EtB Sector C	15 Startup Bakeouts	16
17	18 Setup up TTB with Tandem beam ETB Bake complete	19 Booster vacuum leak detected … EBIS Tests Resume	20 MCR Checkout Begins	21 Booster leak Resolved	22	23
24	25 Begin Booster Beam setup Equipment checkout complete	26 Experiment Beam Setup	27 Booster Access NSRL Running	28 NSRL Running No Access to Sector 2, Laser alignment 1700-2000	29	30

Facilities & Experimental Support Group
Weekly work Schedule

Open Jobs

Week of:
Monday, October 09, 2017

Line	Days	Job Code	Phase	Serial Number	Description	Issue Date	Originator	Hours
Group:					Carpenter			
6	T	STAR	Construction	11681	Remove bridge	10/06/2017	Folz	
7	T T	LEReC	Construction	11595	Anchor stands	9/15/2017	Phillips	22
8	T	LINC	Construction	11597	Assist with duct installation	9/22/2017	Folz	0
10		ATF2	Construction	379	Build UED enclosure	9/09/2016	Folz	150
12	W T	SPNX	Construction	11584	Handrail and stairs	9/01/2017	Phillips	68
13	F	LNAC	Construction	10695	930 scaffold / work	7/28/2017	Streckenba	80
14		ATF	Construction	11662	Install tops - ATF 967	9/01/2017	Folz	0
15		LEReC	Construction	11590	Modify clean room	9/08/2017	Phillips	0
Group:					Survey			
22	W F	CAD	Construction	11604	Survey inspection	3/24/2017	Folz	84
23	T W T F	RHIC	Construction	10731	Control survey 4IR & 2IR	9/29/2017	Folz	30
24	T W F	RHIC	Construction	11635	ATR survey	8/11/2017	Folz	88
25		IRCMS	Construction	160219	Survey ACC coil and support	2/19/2016	Folz	466
26	T	SPNX	Construction	11592	Reposition magnet	9/15/2017	Phillips	16
27	W T	LEReC	Construction	11634	Beamline layout	8/11/2017	Phillips	234
28	T T	ATF	Construction	10728	Survey beam line	9/29/2017	Folz	30
30	T W T F	NSLS	Construction	1	NSLS-II Survey	2/06/2009	Folz	4665
31		LEReC	Construction	10705	Presurvey 9MHz / mark out stand	8/18/2017	Phillips	16

Daily (Hourly)

October 6th Schedule

Time	Task	Personnel
0700hrs	Apply CA LOTO to Booster	CAS
0800hrs	Begin CA Access to Booster HP escort: survey to C for instrumentation and A for RF. Call Tony C. and Nick L.	MCR/HP
1000hrs	Access complete, remove LOTO	CAS
1030hrs	Restore Booster to Operation	MCR

Summary thoughts

- Plans must be
  - Structured
  - Dynamic
  - Flexible
  - Contain contingency
  - And be adaptable

THANK YOU

MERCI