Maintenance Methods At CAD

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BROOKHAVEN NATIONAL LABORATORY

a passion for discovery

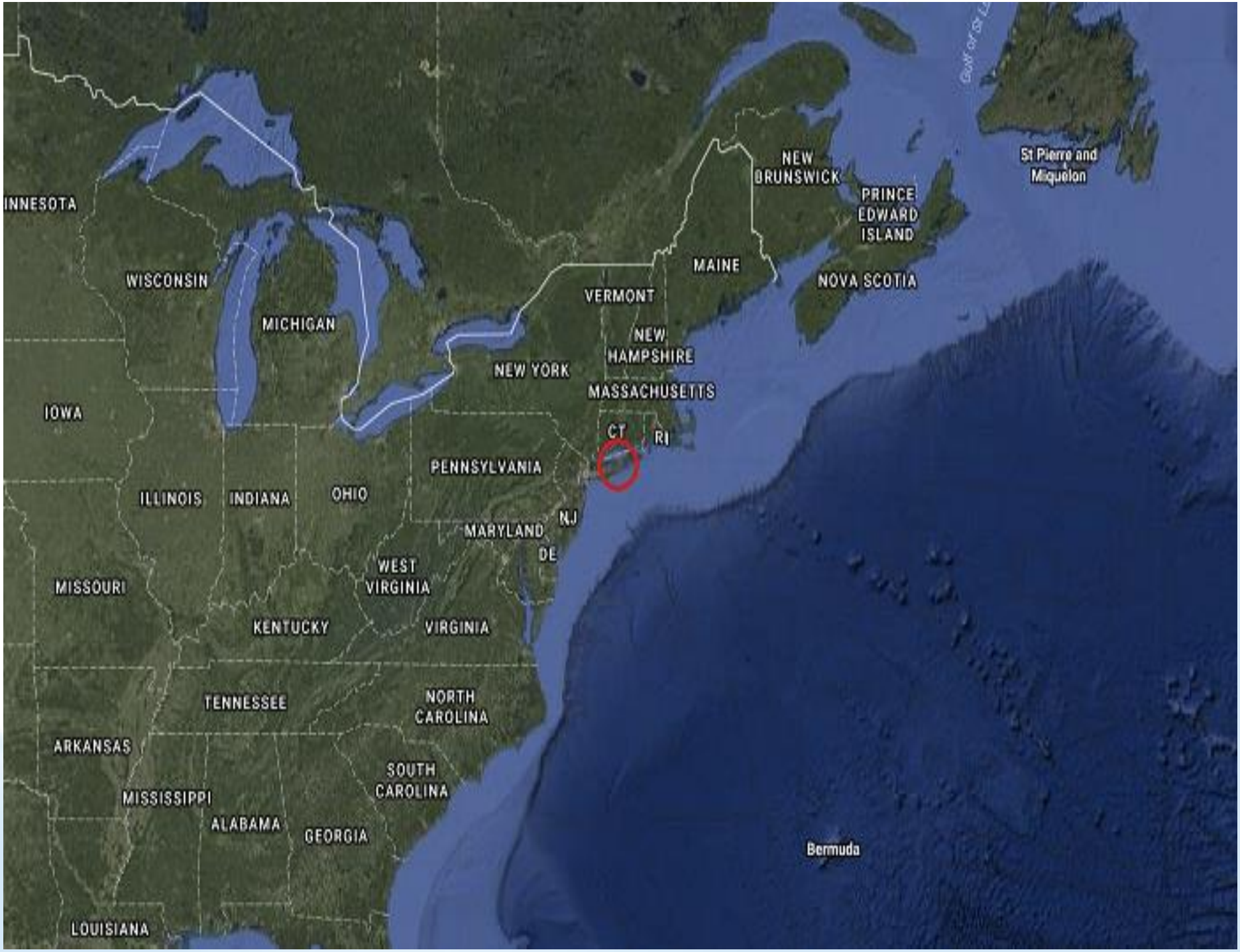
U.S. DEPARTMENT OF ENERGY | Office of Science

Intro

- BS in Physics 1986 Stony Brook University New York USA
- 30 Years in Operations of hadron accelerators at Brookhaven National Lab
- Operator, Crew Chief, Deputy Head MCR Group, Head of Accelerator Systems Maintenance and Support Group as well as member of RF group and eRHIC directorate
- Member Radiation safety, Energy Conservation, Experimental Safety, Legacy Hazard and Laboratory LOTO Work Practices committees

Introduction to CAD

- The Collider Accelerator Department at BNL in New York Long Island USA
  - Multi faceted facility
  - Annual Run for RHIC
  - Multiple Annual runs for other users
  - Many new systems and facilities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NORTH CAROLINA
ARKANSAS
SOUTH CAROLINA
MISSISSIPPI
ALABAMA
GEORGIA
LOUISIANA
NEW YORK
PENNSYLVANIA
MARYLAND
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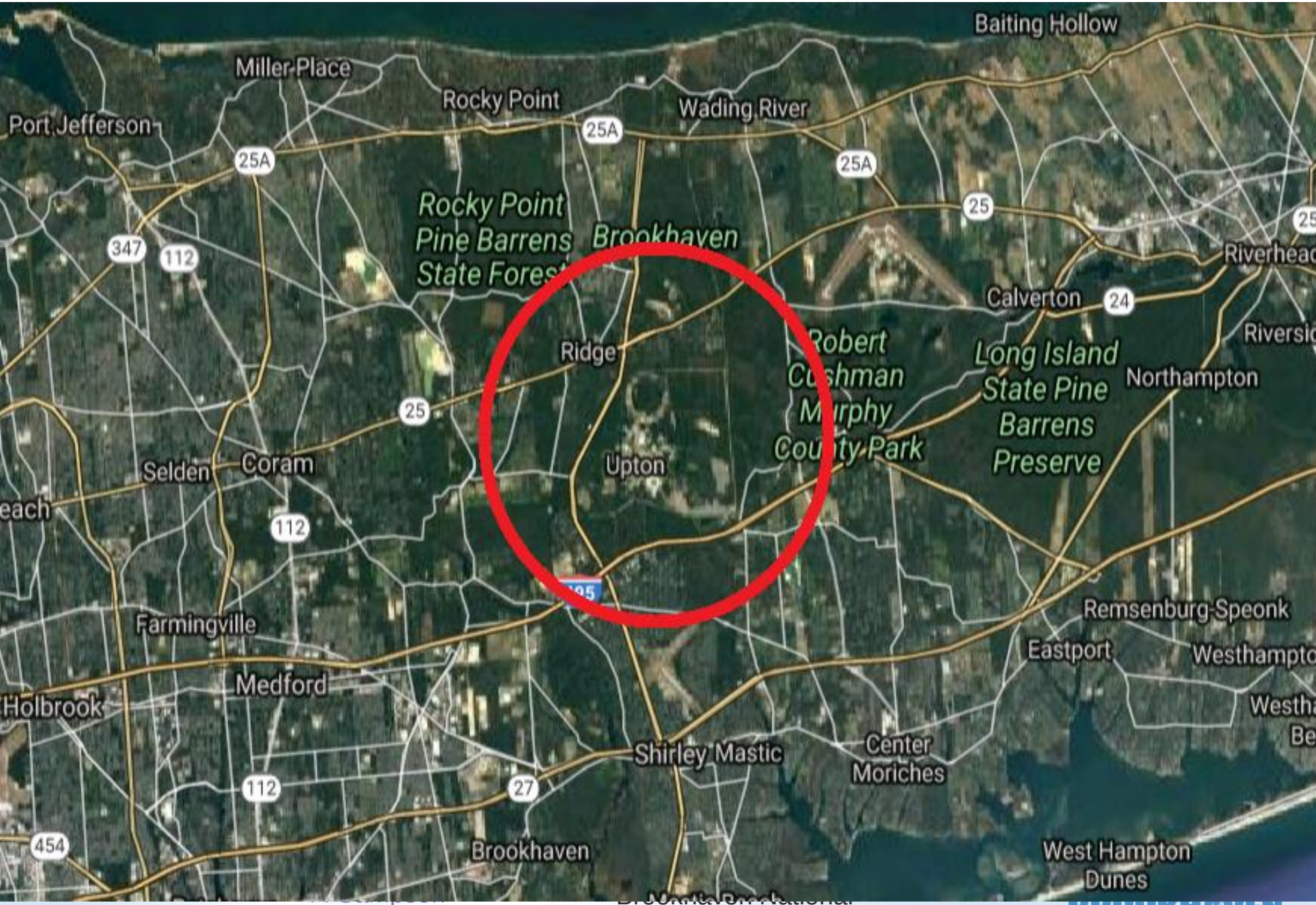
NEW HAMPSHIRE
MAINE
NEW BRUNSWICK
PRINCE EDWARD ISLAND
NOVA SCOTIA
St Pierre and Miquelon
Bermuda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Rocky Point
Wading River
Port Jefferson
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Pine Barrens
State Fores
Brookhaven
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Riverhead
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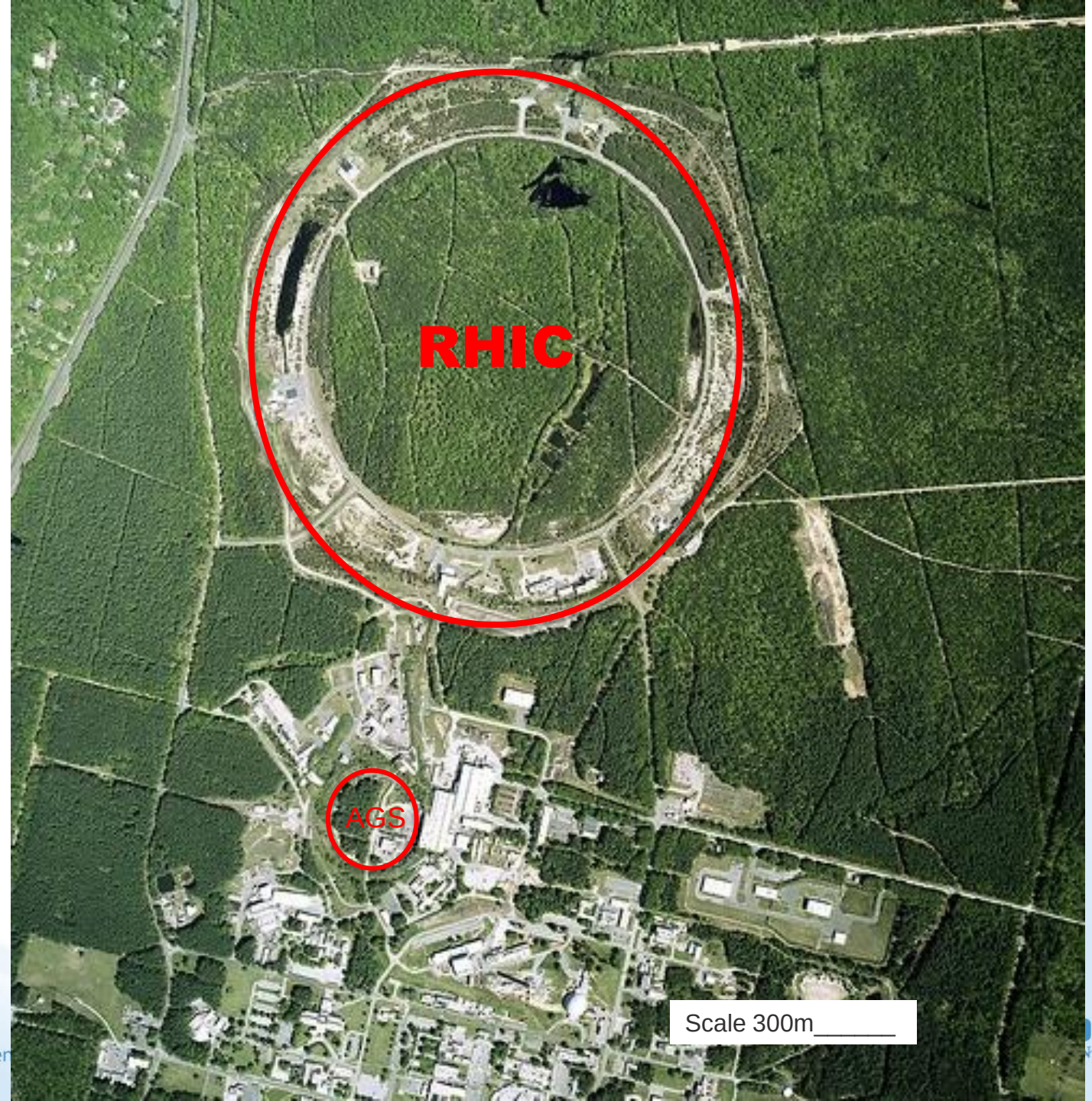
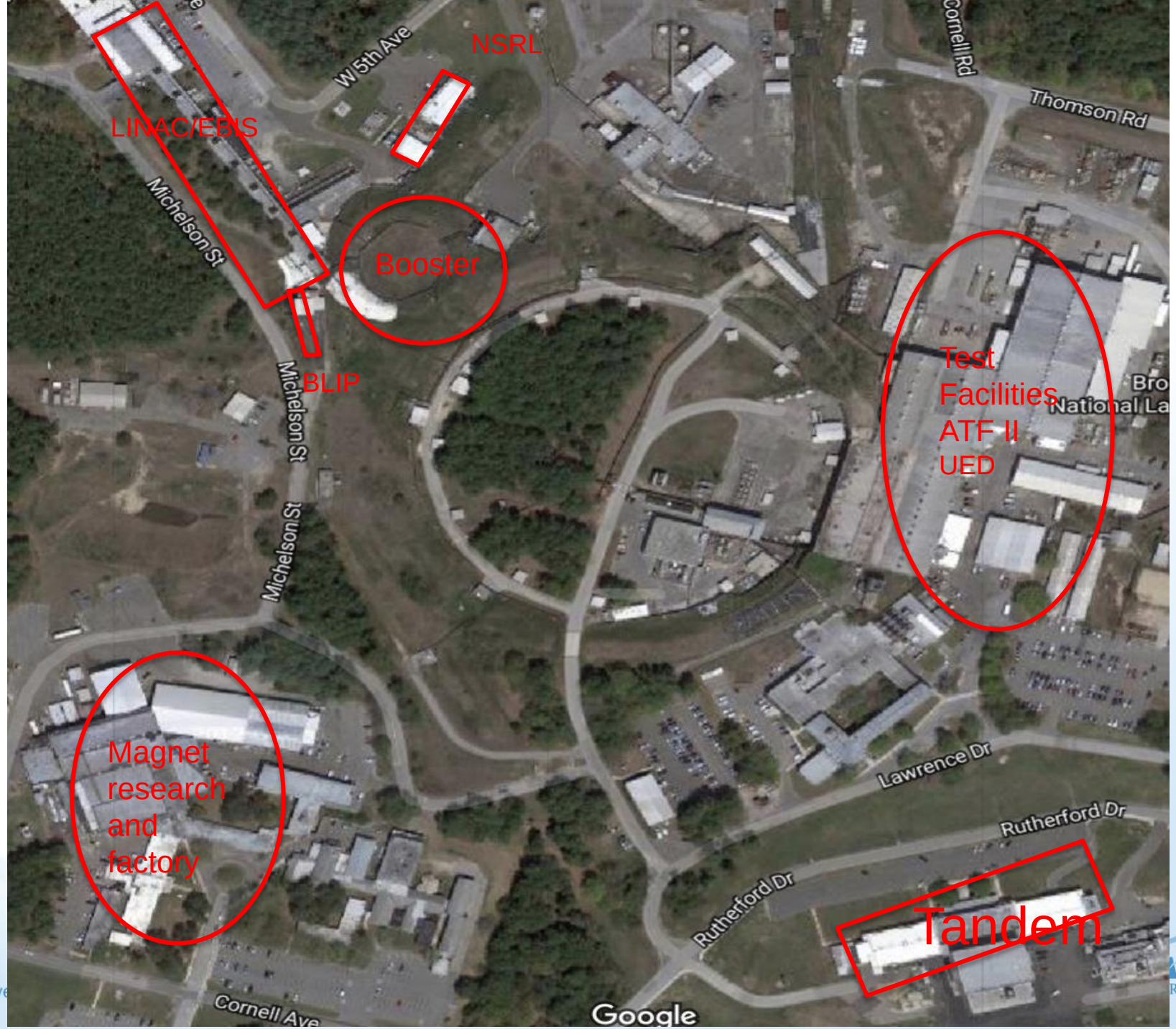

RHIC
AGS
Scale 300m_____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BLIP
Michelson St
Michelson St
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UED
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research
and
factory
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Tandem
Cornell Ave
Google

Introduction

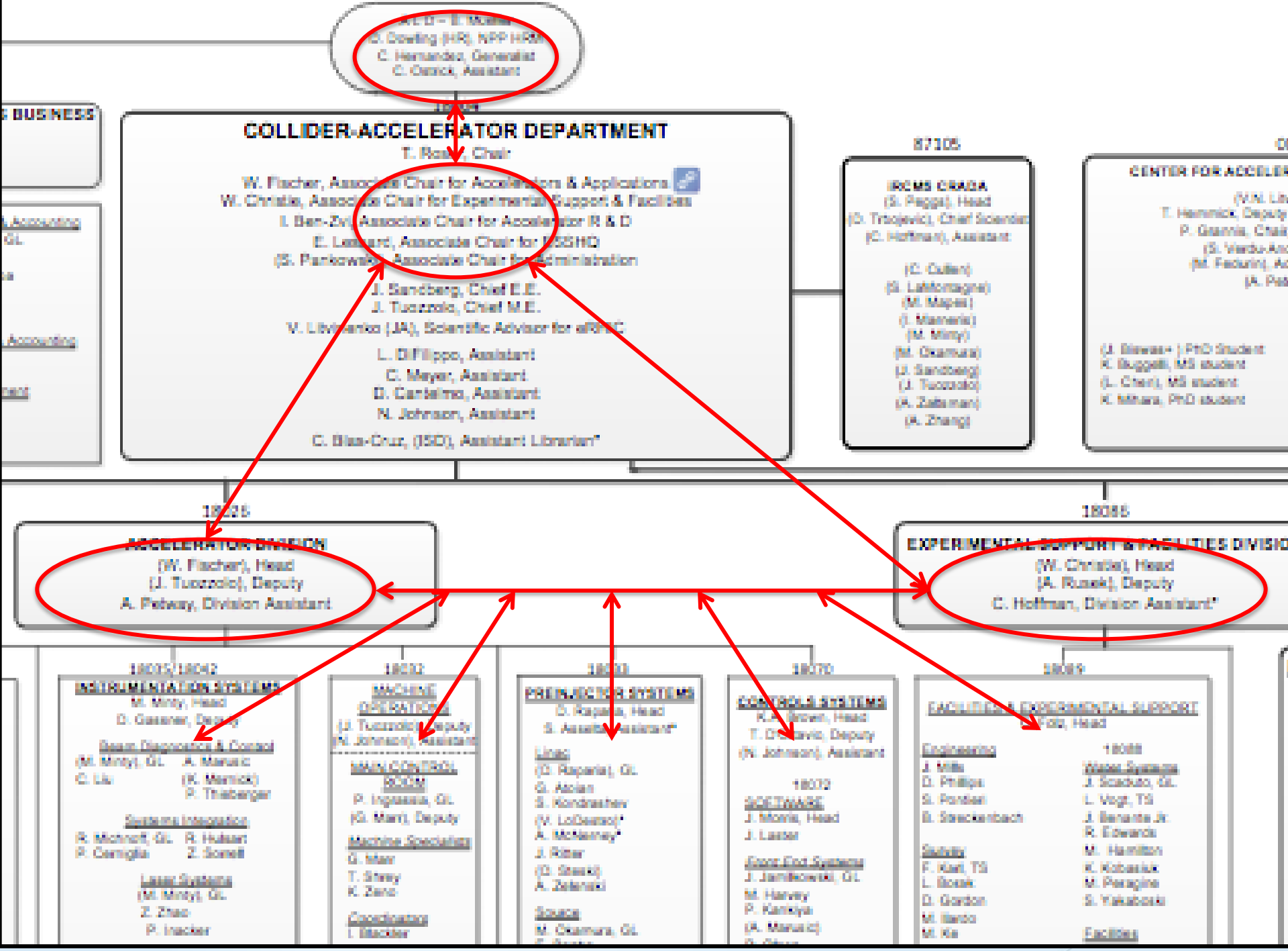
- Collider Accelerator Department at BNL:
  - Organization
  - Machines
  - Facilities
  - Disciplines

Discussion Topics

- Organization and authority
- Facility designations
- User and satellite facilities
- Global resource utilization
- Flow of information
- Job execution
- Summary

Organization and Authority

- CAD is a Top Down organization with ultimate authority residing with the Department Chair
- The Division Heads are assigned authority for their respective sub groups
- From Division, Group leaders but things get more involved...
  - Assignment to multiple groups and divisions
  - Common goal planning


C. Hernandez, Generalist
C. Garcia, Assistant
COLLIDER-ACCELERATOR DEPARTMENT
T. Roser, Chair
W. Fischer, Associate Chair for Accelerators & Applications
W. Christie, Associate Chair for Experimental Support & Facilities
I. Ben-Zvi, Associate Chair for Accelerator R & D
E. Lessard, Associate Chair for ESSHQ
(S. Pankowski), Associate Chair for Administration
J. Sandberg, Chief E.E.
J. Tuozzolo, Chief M.E.
V. Litvinenko (JA), Scientific Advisor for eRHIC
L. DiFilippo, Assistant
C. Meyer, Assistant
D. Cardelmo, Assistant
N. Johnson, Assistant
C. Blas-Cruz, (ISD), Assistant Librarian*
87105
IBCMS CRADA
(S. Peggs), Head
(D. Trbojevic), Chief Scientist
(C. Hoffman), Assistant
(C. Cullen)
(S. Lakhotiagine)
(M. Maple)
(I. Marneris)
(M. Minty)
(M. Okamura)
(J. Sandberg)
(J. Tuozzolo)
(A. Zaltsman)
(A. Zhang)
CENTER FOR ACCELER
(V.N. Li
T. Hemmick, Deputy
P. Giannis, Chair
(S. Verdu-An
(M. Fedurin), A
(A. Pat
(J. Biswas+), PhD Student
K. Buggelli, MS student
(L. Chen), MS student
K. Mihara, PhD student
18035
ACCELERATOR DIVISION
(W. Fischer), Head
(J. Tuozzolo), Deputy
A. Pebaay, Division Assistant
18085
EXPERIMENTAL SUPPORT & FACILITIES DIVISIO
(W. Christie), Head
(A. Rusek), Deputy
C. Hoffman, Division Assistant*
18035/18042
INSTRUMENTATION SYSTEMS
M. Minty, Head
G. Gassner, Deputy
Beam Diagnostics & Control
(M. Minty), Gl.
A. Marusic
C. Liu
(K. Mernick)
P. Thieberger
Systems Integration
R. Michnoff, Gl.
R. Hulsart
P. Cerniglia
Z. Sorrell
Laser Systems
(M. Minty), Gl.
Z. Zhao
P. Inacker
18032
MACHINE OPERATIONS
(J. Tuozzolo), Deputy
(N. Johnson), Assistant
MAIN CONTROL ROOM
P. Ingrassia, Gl.
(G. Marr), Deputy
Machine Specialists
G. Marr
T. Shrey
K. Zeno
Coordinators
I. Blacker
18033
PRE-INJECTOR SYSTEMS
D. Raparia, Head
S. Assistant Assistant*
Linac
(D. Raparia), Gl.
G. Atoian
S. Kondrashev
(V. LoDestro)*
A. McNerney*
J. Ritter
(Q. Shen)
A. Zelenski
Source
M. Okamura, Gl.
18070
CONTROLS SYSTEMS
R. Lee Brown, Head
T. Dimavic, Deputy
(N. Johnson), Assistant
18072
SOFTWARE
J. Morris, Head
J. Laster
Front End Systems
J. Jamilkowski, Gl.
M. Harvey
P. Kankiya
(A. Marusic)
18089
FACILITIES & EXPERIMENTAL SUPPORT
Foltz, Head
Engineering
J. Mills
D. Phillips
S. Pordes
B. Steckenbach
Safety
F. Karl, TSI
L. Bosak
D. Gordon
M. Ilardo
M. Kai
18088
Water Systems
J. Scaduto, Gl.
L. Vogt, TSI
J. Benante Jr.
R. Edwards
M. Hamilton
K. Kobasiuk
M. Peragine
S. Yakaboski
Facilities

Facility Designations

- Divisions Associated with Machines:
  - Experimental Support & Facilities (The Experiments)
  - Accelerator (The Machines)
- Machines are designated for responsibility:
  - LINAC, BLIP, Booster, AGS, RHIC- Operations
  - rLine (NSRL), AtR (PTR), STAR and RHIC- ES&F
- Other systems are divided among the divisions by utility (Cryo, AC, Water air...)

Accelerators and Accelerator facilities

- In addition to the facilities directly connected with the operation of the collider, the CAD department is responsible for other user facilities
- RPPL/MIRP (Isotope production and research)
- UED (Electron diffraction experiment)
- ATF (Accelerator Test Facility)
- ATF II (Construction projects)
- SRF facilities (VTF, SVTF, UPWS)
- Magnet assembly and testing facilities

Assigned Responsibilities

- Liaison Physicists (LP): defines the needs of systems and accelerators such as energy, number of species, optics in the context of the run. They author and maintain the Radiation Safety Committee checklist, which is the vehicle by which each facility is kept within it prescribed safety limits.
- Liaison Engineer(LE): ensures that work necessary to achieve the needs prescribed is defined, submitted for approval and completed on schedule.

Responsibilities

- Scheduling Physicist (SP) creates a global schedule for facilities for a given run using input from advisory committees, LEs, LPs, ESFGL and MGSL. During running periods, the SP also leads a weekly scheduling meeting. This meeting determines activities associated with the collider for the week.
- ES&F Group leader (ESFGL) generates and submits for a work list for Experimental, construction and commissioning projects.

Responsibilities

- Maintenance Support Group Leader (MSGL) collects and assesses work requests. Works with LP, LE and ESFGL to set priority, approve and schedule work.
- Main Control Room Group Leader (MSGL) schedules Operators and specialists as needed for work activities (Controlled Access, Testing, Startup...).
- Individual Group Leaders schedule work and deploy workforce as necessary.

Job Execution: Maintenance Days

- For an individual task, requestor submits a job for approval.
- MSGL reviews all submitted work and approves work for a maintenance day
- All work requests are discussed the weekly Supervisors Meeting, Chaired by the MSGL
- MSGL then determines a duration and schedule for execution of the maintenance day

Maintenance Day Job Execution

- Once a schedule has been completed for a maintenance day, the MSGL presents this to the SP's weekly scheduling meeting where adjustments and final approval are completed.
- MSGL posts (Web and CATV) and emails schedule to department and any others performing tasks.
- Requestors are informed that there work is scheduled
- A final work planning and scheduling meeting (1 day prior to the maintenance) resolves remaining conflict and ensures all parties are aware of the schedule.

Your Job Request:A3 PA troubleshoot, Has Been received and will be reviewed.
If this is a late submission, an email confirmation

Group	Job Title
Beam Components & Instrumentation	BLIP LPM Motor Temperature Monitor
Beam Components & Instrumentation	Chipmunk Calibrations and Recertification
Beam Components & Instrumentation	APD System - Motion Checkout
Beam Components & Instrumentation	Instrumentation Systems Equipment- Inspect Fan Trays & Repair/Replace as necessary
Beam Components & Instrumentation	Instrumentation Systems Equipment- Replace Rack Blower Air Filters(Fiberglass type)
Beam Components & Instrumentation	Dicom System Maintenance & Checkout
Beam Components & Instrumentation	BLIP Raster - Investigate & Troubleshoot LPM Motion Issues
Beam Components & Instrumentation	BLIP Raster- Inspection & Documentation of Cabling & Individual Devices
Beam Components & Instrumentation	CAD Video Systems - Cleanup of Video Area Above MCR

Your request has been approved: http://www.cadops.bnl.gov/AGS/Accel/Maintenance/Requests/view_job_request.php?Id_No=17811 for execution on 2017-02-01

Controls	Upgrade datacon controls for HEBT and BLIP
Controls	Separate EBIS event codes from LINAC to new Event EBIS system
Linac	Mod-4 7835 Power Supply T1 water leak
Linac	Rebuild vacuum valve IV H-
Linac	Dress in H- HV cable
Linac	Mod 4 Quadrapole Monitor Assembly
Linac	Repair H- gate valve
Linac	Replace Vac gauge TC-8
Linac	Relocate tank 1 valve control relay
Linac	Clear out old Lebt valve control racks
Linac	Replace HEBT beam stop air solenoid
Power Distribution	Repair Substation 1L and 2L 13.8 kV jumper cables

Approved jobs for Maintenance

Jobs for March 30, 2017

Priority Jobs

Group	Job Title	Time Required	Status	Ring Access
Controls	Datacon Readbacks unstable lex.pq049. Check chassis out for issues.	3 hrs	N	N/A

Linac/HEBT

Job #	Group	Job Title	Time Required
52	Controls	Datacon Readbacks unstable lex.pq049. Check chassis out for issues.	3 hrs
1	Linac	Replace LPT32 Tube in Mod-7	1 hr
2	Linac	Re-gen chopper cryopump	2.5 hrs
3	Linac	Booster User Inhibit Test	1 hr
4	Linac	HEBT 200 MeV Polarimeter	2 hrs
5	Power Supply (Booster/AGS)	Install new FDS in Linac for Future new BM1 power supply	8-10 hrs
6	RF	Replace analog amp and phase malfunction circuit	4 hrs
7	RF	Inspect LINAC Tanks	30 min
8	RF	Mod 6 + Mod 7 LPT 32 swap	3 hrs
58	RF	Add memory locations to PLC on Mod 1	1 hr
9	Water Systems	Switch Linac Cavity Pump #8	1 hr

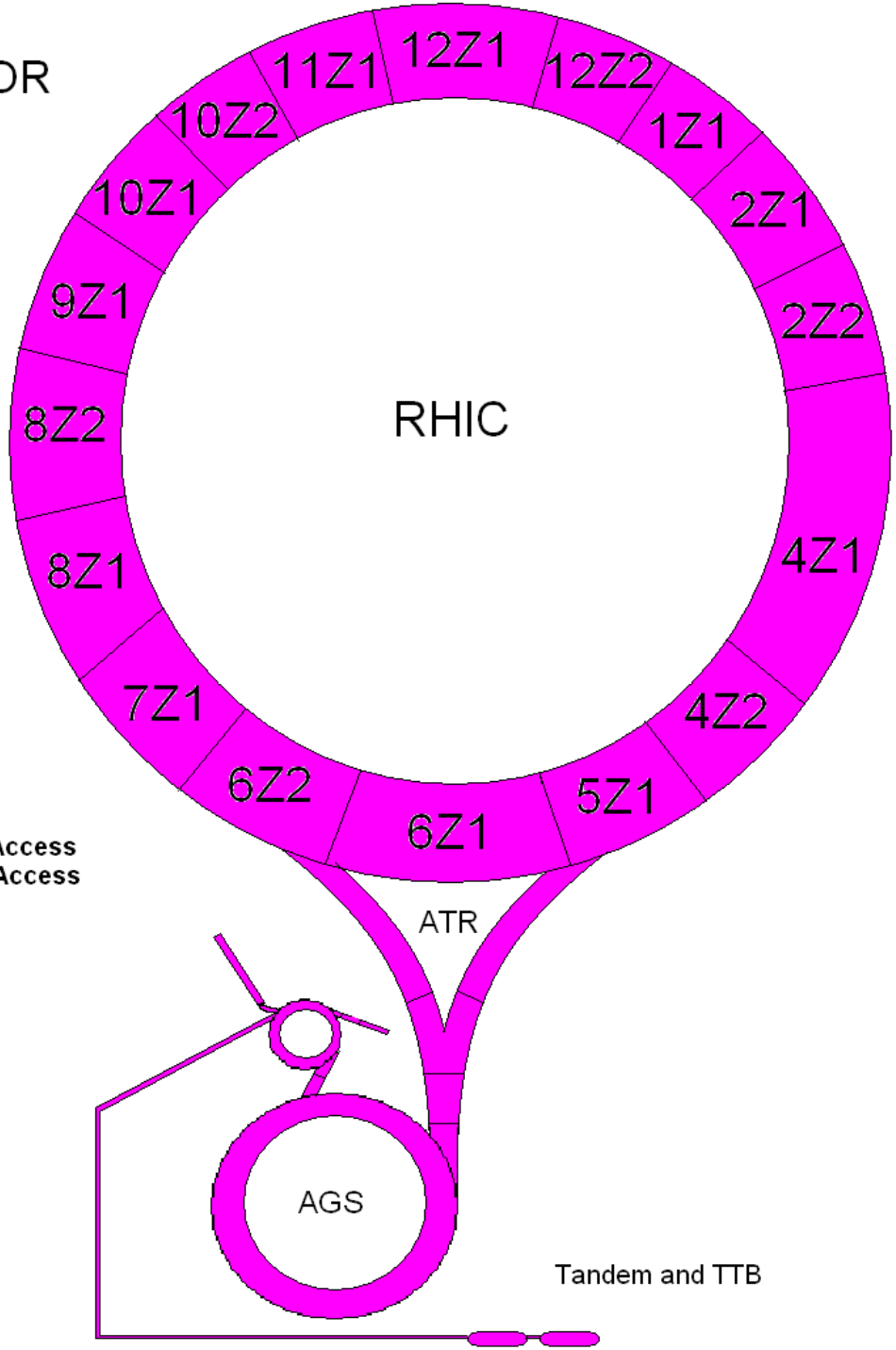
April 6th Schedule

Time	Task	Personnel
0500hrs	AGS and Booster to standby: Apply CA LOTO to Booster and AGS	MCR CAS
0700hrs	Begin CA Access to Booster and AGS: HP survey. Begin Approved Work in Booster and AGS	MCR/HP CAD
0800hrs	Dump RHIC beam, end Physics Begin RHIC Access: Sectors 2,8&12 CA Sector 10 survey dumps then RA Sector 4&6 RA Begin Approved Work in RHIC	MCR MSG/MCR CAD
1030hrs	Booster Access complete, remove LOTO	CAS
1100hrs	Restore Booster/NSRL to Operation	MCR/AP
1200hrs	AGS Access complete remove LOTO	CAS
1300hrs	Restore AGS to Operation	MCR/AP
1400hrs	Sweep secure sector 4	MCR/CAS
1500hrs	RFNA in sector 4, RF conditioning Begin sweeps, sector 10 then 6	MSG/RFG MCR/CAS
1530hrs	Hysteresis ramp after sector 6 secure	PSG
1600hrs	RHIC Secure, restore RHIC to Operation	AP/MCR
1700hrs	RHIC Physics	CAD

ACCELERATOR
ACCESS
Timetable

1500HRS

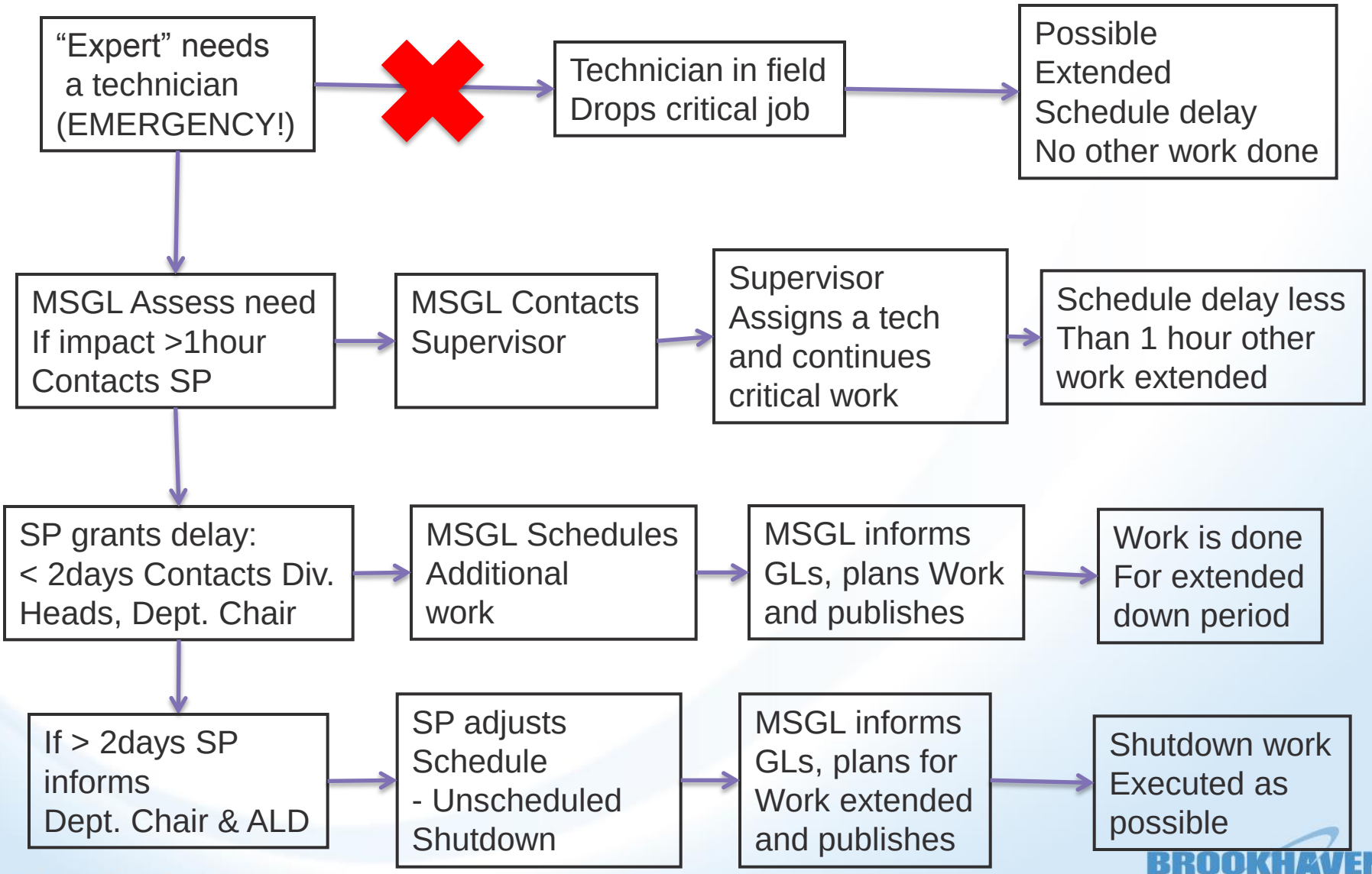
RESTORE
PHYSICS



Delays and complications:

- Factors contributing to schedule delays:
  - Work overage, underestimated duration
  - Blown sweeps
  - Failure, broken improper state of equipment
  - Change in scope of work
  - Unscheduled work

When issues arise and when the system breaks down



Shutdown Work

- Though similar in structure to Maintenance days, there are distinct differences between the two.
  - The LP no longer holds weekly scheduling meetings
  - Major projects are sub coordinated by assigned LEs
  - Maintenance items are coordinated with project, testing and startup schedules
  - Workforce allocation and deployment is determined in the weekly Supervisors meeting and ES&F scheduling meeting.
  - Management is apprised of progress and any issues in weekly Management Meetings (One for Accelerator Division and one for ES&F)
  - Major projects also hold regular meetings which are attended by MSGL and ESFGL

Roles during shutdown

- Management maintains the priority list
- ESFGL assigns trades and staff for deployment at the weekly meeting
- MSGL schedules maintenance activity, testing, commissioning, system outage and recovery as well as machine access and startup.

Multilevel Construction

- During shutdown, many additional complications may arise.
  - Late arrival of materials!
  - Changing scope of work
  - Emergent work
  - Personnel shortages and vacation
  - Conflict outside departments, user facilities or the power company

Maximizing efficiency

- Roles
  - MSGL maintains central repository of projects and work
  - LE or designee maintains status of work and job specific work plans
  - ES&F and Accelerator division maintain communications via daily interaction, work assignment and weekly scheduling and planning meetings
  - Management is apprised of progress and conflict when it cannot be resolved.
  - Management is immediately apprised of issues that may affect machine start up dates, project completion or user facilities.

Similar issues with larger impact

- As with maintenance, unscheduled or unapproved work or testing is a major source of headaches during she shutdown
- An emergent job requires major support and adversely affects work already planned and schedules

Summary

- A standardized system for work is a necessity for any complex
- At CAD, the system used has been developed for many years and continues to evolve
- When followed, the system has success
- Working outside the system brings rise to inefficiencies and delays
- Strong backing from management is critical to any such systems success

Input

- I am always looking for input from colleagues at all sorts of different organizations and look forward to hearing your input.

Danke