

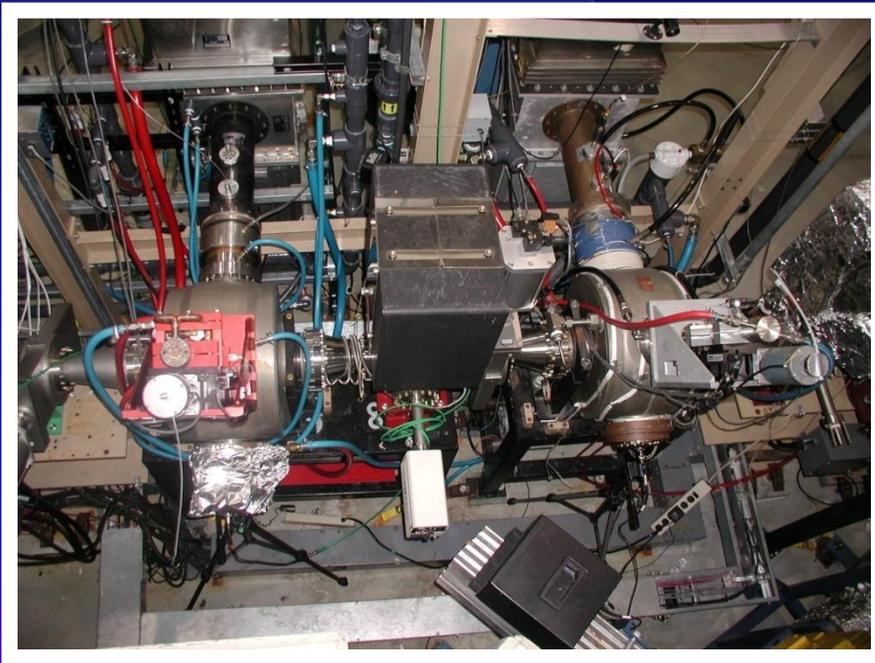
Upgrade Challenges at a 2nd Generation Light Source

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Outline: Challenges and Surprises

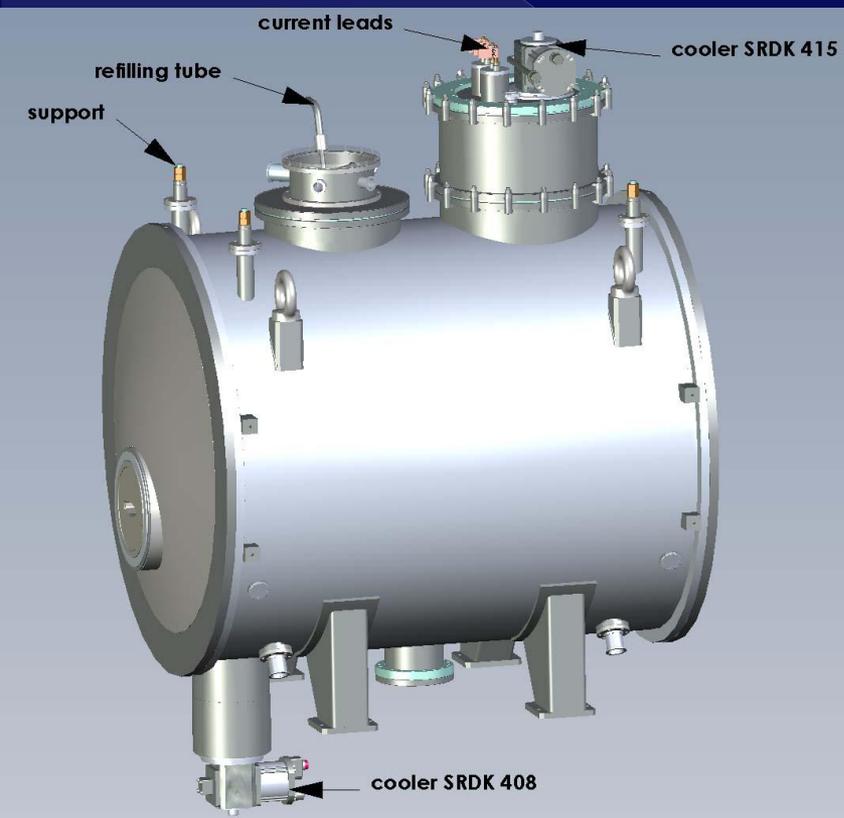
- A. 2nd RF cavity
- B. Removal of the Wiggler for new cryostat - Surprise
- C. Discovery of a bad coil and implications
- D. Upgrade of the Linac
 1. Changes in the Linac Tunnel
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A. 2nd RF cavity



- ❖ The 2nd RF cavity was installed adjacent to the first cavity in the existing long straight section.
- ❖ No radiation problems
- ❖ Initial upgrade in preparation for new Insertion Devices

B. Removal of the Wiggler for new cryostat - Surprise



- ❖ 7T wiggler was removed
- ❖ 20 cm shielding placed upstream of the wiggler
- ❖ Problem with radiation losses continued
- ❖ Verified loss source with use of exposed film with built-in ruler, then pinhole through 1.6mm sheet of lead to determine precise location.

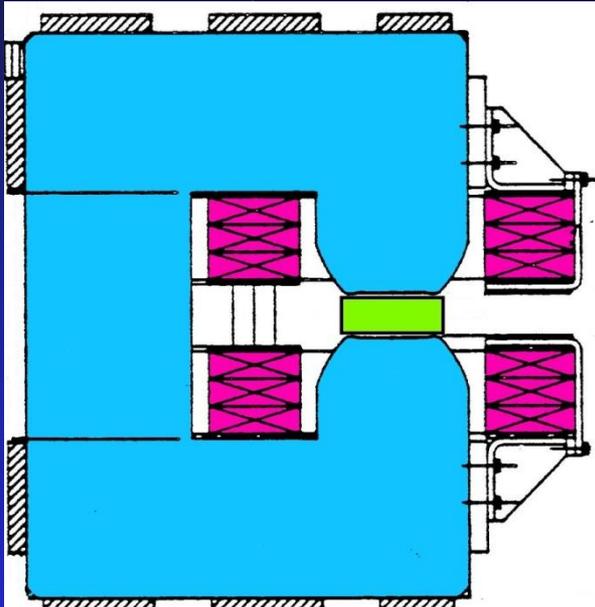
Surprise

Slight concave
BMP's failed to pick up



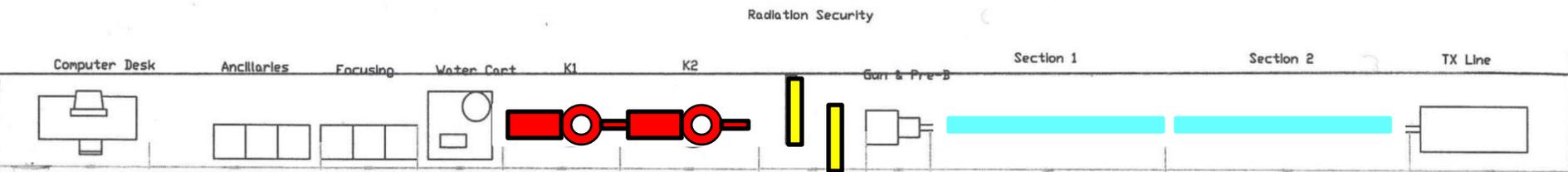
- ❖ Source point was identified
- ❖ BPM's indicated beam well-aligned
- ❖ Measurement indicated that beam pipe 9mm too low
- ❖ Beam gap 32 mm
- ❖ Beam hitting top of beampipe
- ❖ Realigned and 20 cm Pb added.
- ❖ **Inside** ring dose dropped from **70 and 72 mSv** to only **38 and 32 μ Sv**, respectively

C. Discovery of a bad coil and implications

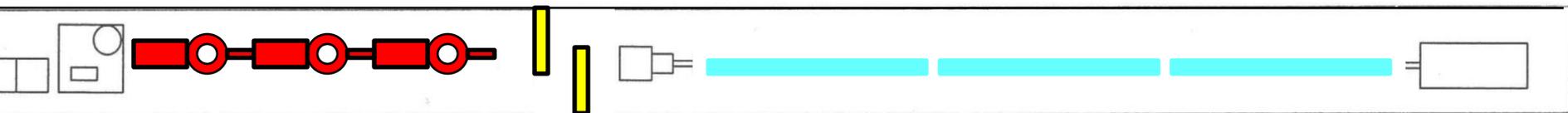


- ❖ Intermittent short
- ❖ Requires daily new orbit and correction
- ❖ Correction through long straight that housed Wiggler
- ❖ New Pb placement continues to offer adequate shielding despite multiple orbits.

D. Upgrade of the Linac from 200 to 300 MeV

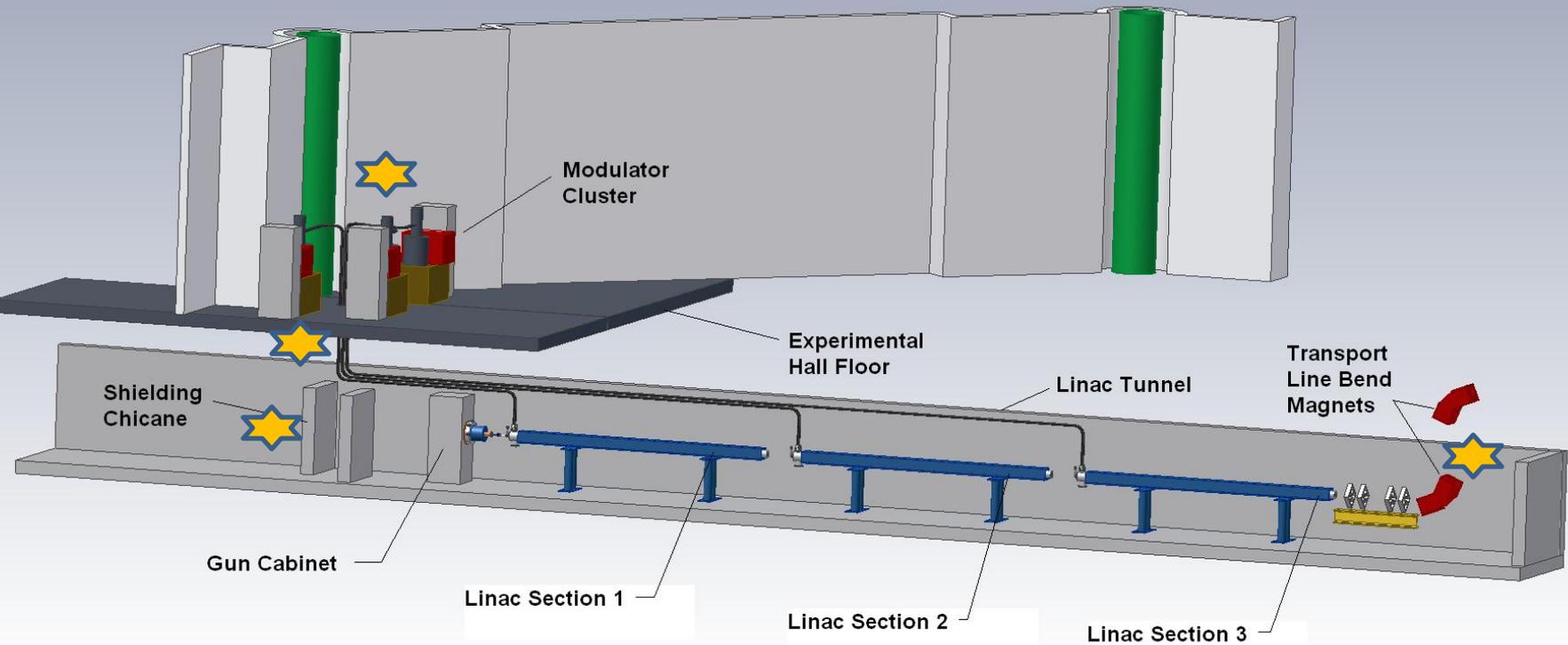


CAMD LINEAR ACCELERATOR - 200 MeV



CAMD LINEAR ACCELERATOR with HELIOS SECTION ADDED - 300 MeV

1. Changes in the Linac Tunnel

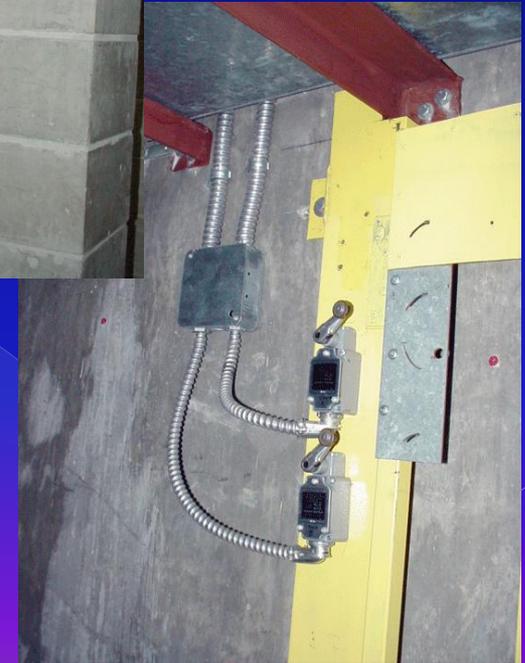


2. Current and Proposed Operating Conditions

Current Operational Parameters	New Parameters
180 MeV	Up to 300 MeV [275 operating]
Energy Spread % +/- 0.25	Energy Spread % +/- 0.25
RF Frequency (MHz) 2998.2/499.7	RF Frequency (MHz) 2998.2/499.7
Repetition Rate 1Hz	Repetition Rate 5 Hz
Pulse Length 150 ns	Pulse Length 184 ns
Current mA 15 - 30	Current mA 25
Current Stability (%) +/- 25	Current Stability (%) +/- 15

3. Interlock Considerations

- ❖ Move Chicane to accommodate new accelerating piece
- ❖ Rerun Linac RIS system
- ❖ New wiring required
- ❖ No broken links accepted
- ❖ Chain A and Chain B
- ❖ Individually armored
- ❖ Re-install rollerball micro-switches
- ❖ Re-commission Linac Radiation Interlock System



4. Energy and Power Calculations

[eV] x [Hz] x [sec] x [Amperes]	Watts
Current	0.405
Approved	1.1
Upgrade	6.9

5. Changes in Radiation Intensity due to Linac Upgrade

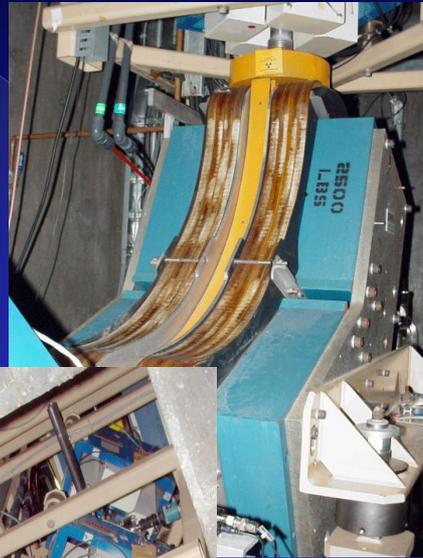
Item	Radiation Hazard estimate
Energy Increase	5 - 7.78
Frequency Increase	5
Time length increase	1.23
Tau	-3.38
Current Decrease	-0.2

6. Testing Constraints



- ❖ Accelerating portions must be tested before being moved into Linac
- ❖ These sections are being assembled on the experimental hall floor
- ❖ User area will have to be closed/ locked to mitigate radiation hazards
- ❖ Local shielding may have to be supplied during test phase

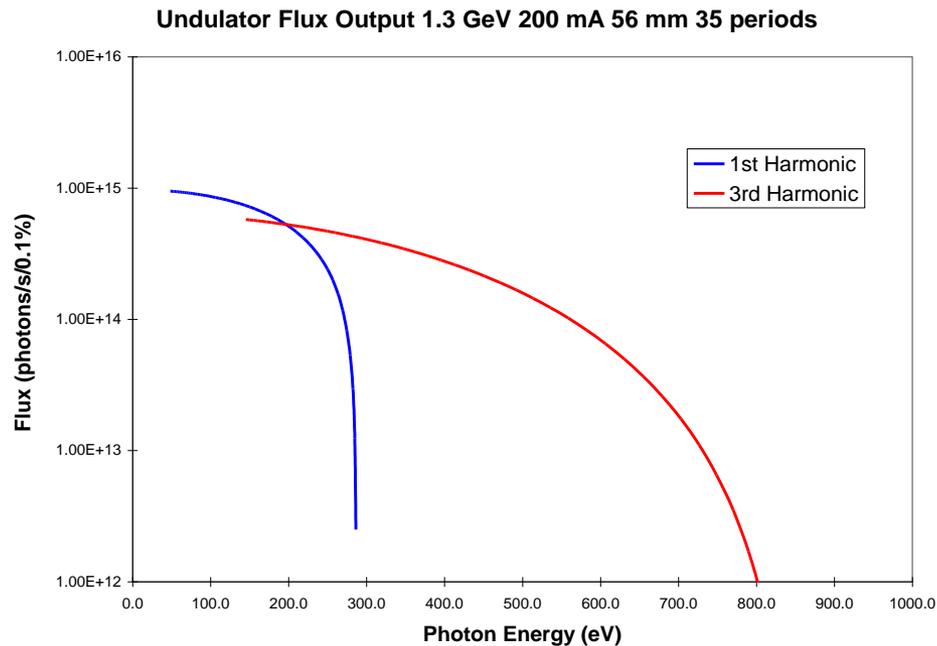
7. Additional Health Physics Concerns



- ❖ No shielding supplied for new klystron
- ❖ Custom shielding lead time
- ❖ May narrow gap in magnets, could change trajectory
- ❖ Additional 5.1 cm Pb required in vertical line
- ❖ New injection maximum of 412 mA

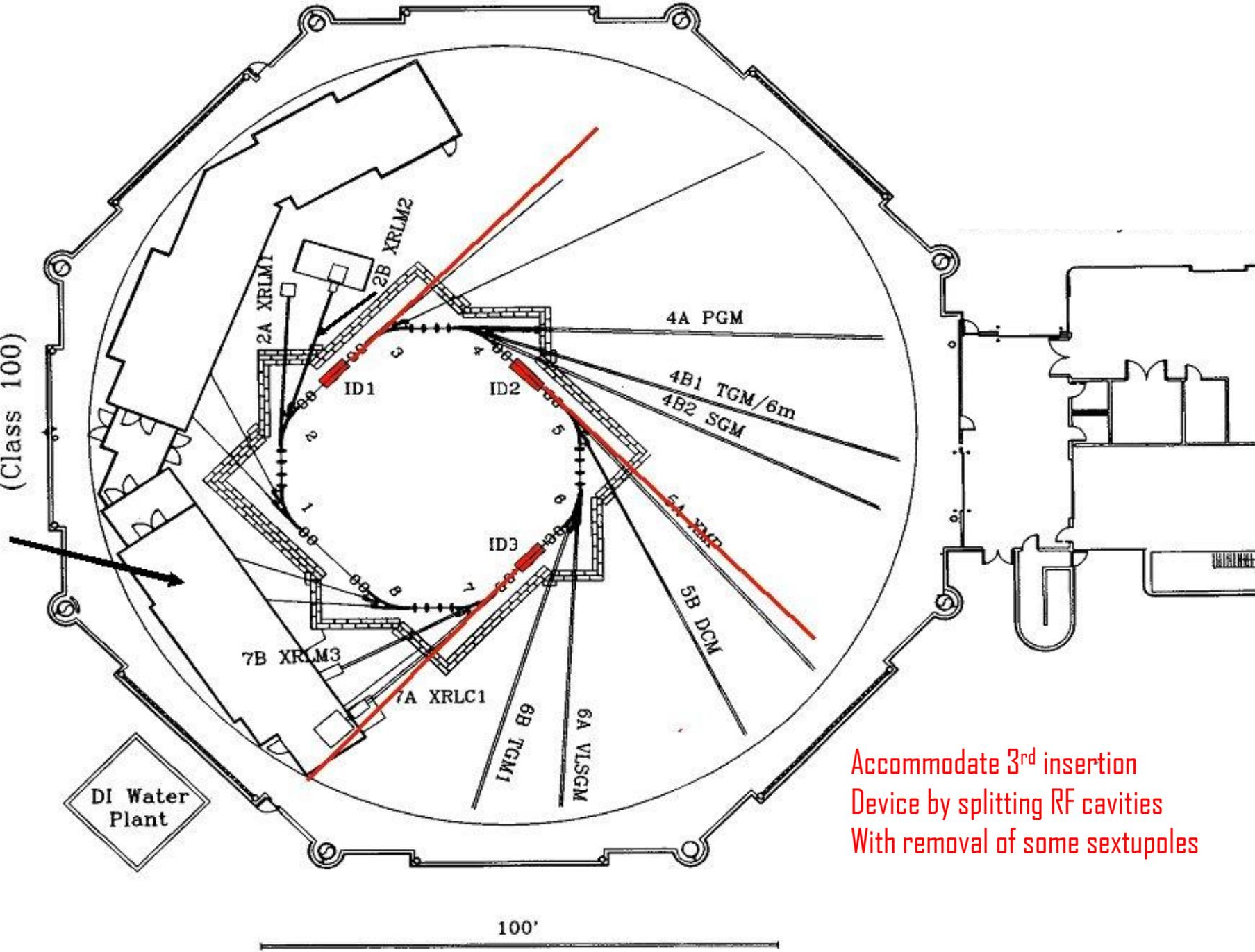
8. Proposed Insertion Devices

Insertion Device	Description	Beam Power @200 mA
7.5 T Multipole Wiggler	11 +2	18 kW
3.5 T Multipole Wiggler	25 + 4	2kW
VUV Undulator	35 periods of 56 mm	



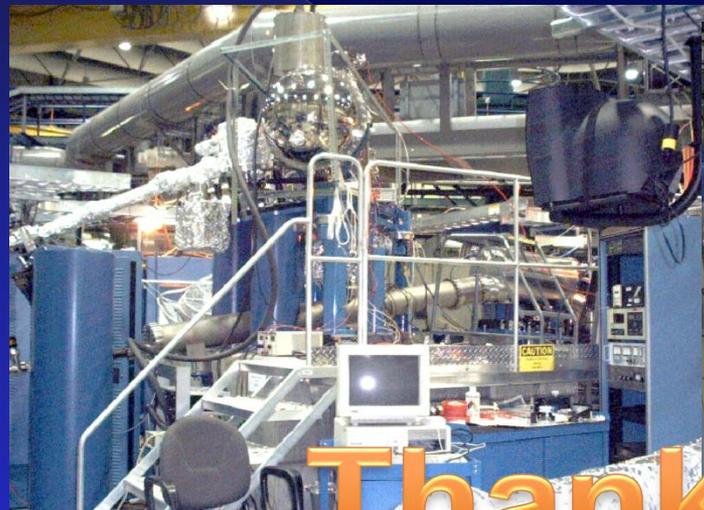
Microfabrication and Processing Laboratory

(Class 100)



Accommodate 3rd insertion Device by splitting RF cavities With removal of some sextupoles

So Much to do, so Little Time!



Wave-Length Shifter

Thank you



DCM
Hutch1
Beamstop

