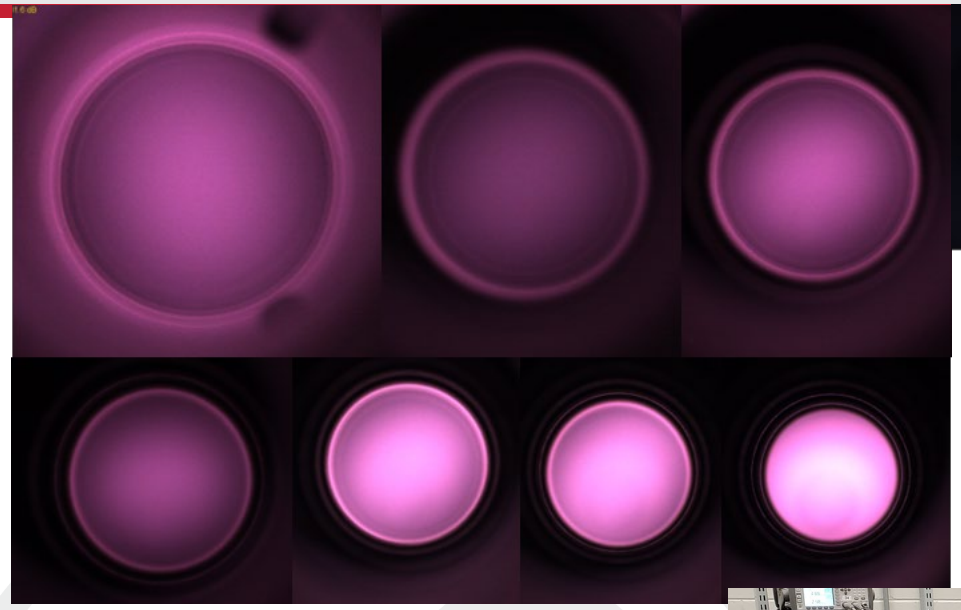
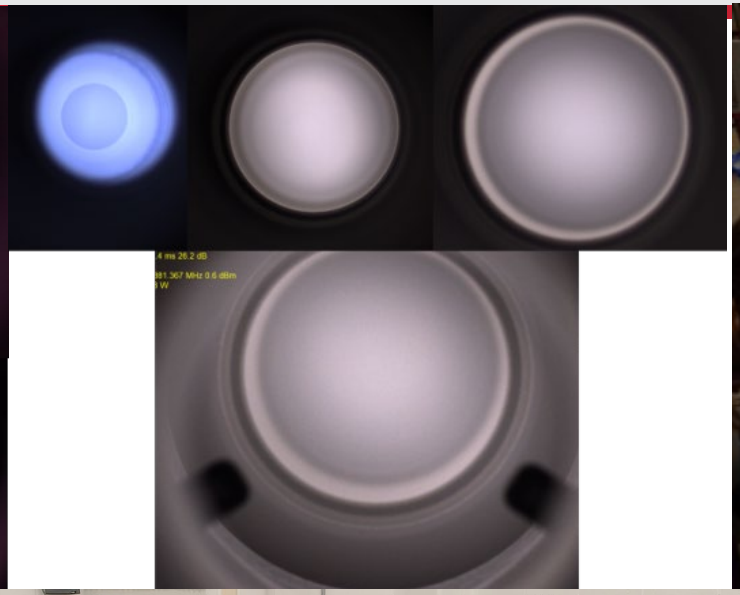
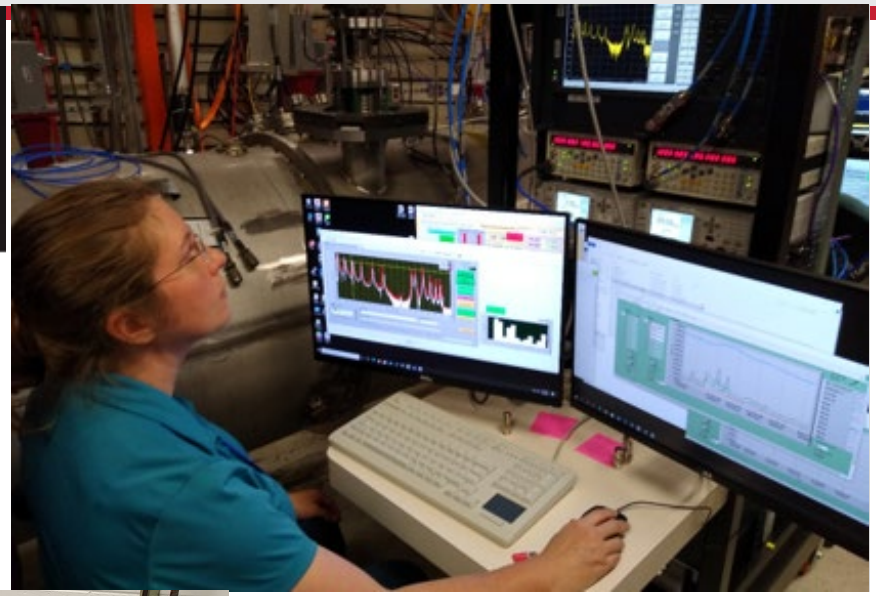
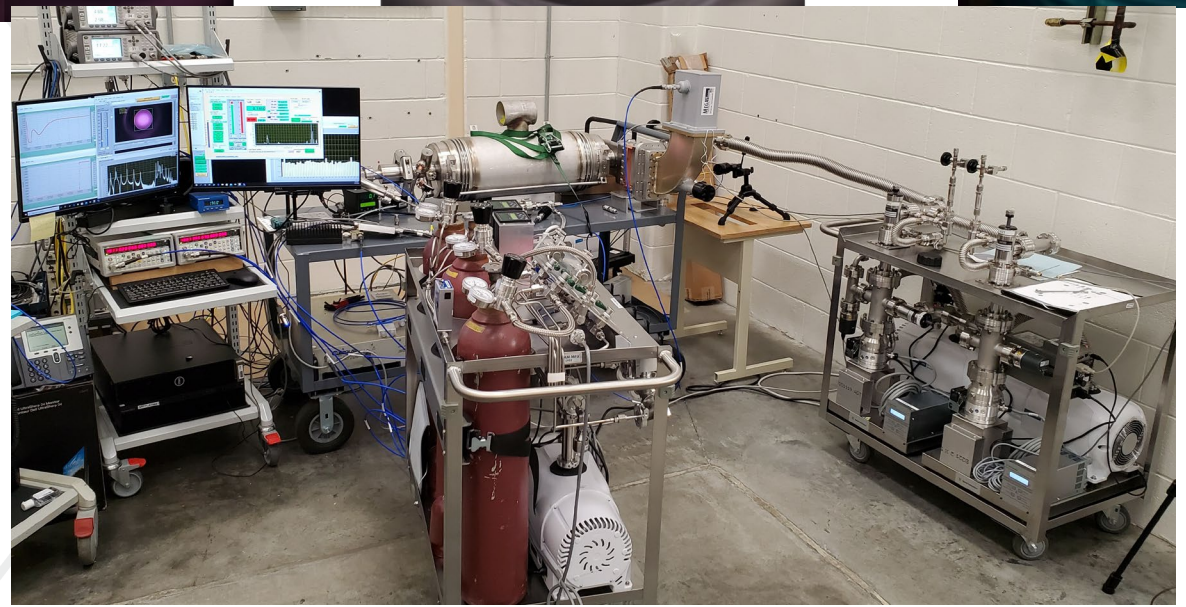
SCHEDULE AND RESOURCES









Tom Powers and Tiffany Ganey

Plasma Processing Readiness review
28 Feb. 2023

Jefferson Lab

Other contributors:

JLAB:	ORNL
Natalie Brock	Marc Doleans
Christiana Wilson	Chris Mahan
Kurt Macha	

Vertical Tests:	Clean room staff VTA staff
Cryomodule Processing and testing:	Mike Drury Frank Humphry Larry King CM assembly team

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Overview

- There will be a lot of SRF work in the tunnel during the upcoming SAD.
- Mike Drury with input from me on plasma processing came up with a project plan.
- I took his plan and expanded out the plasma work with specific tasks so that resources could be identified and allocated.
- The labor resources that were used were
  - Vacuum team 1 — Nominal vacuum group led by Frank Humphry
  - Vacuum team 2 — Staff from the cryomodule assembly group.
  - Plasma Team. — Tiffany Ganey, Natalie Brock, Christiana Wilson, Tom Powers
  - EES-RF — Technicians who will be making waveguide configuration changes
  - Cryo uTube — Needed for transitioning from 4K to 300K and from 300K to 4K
  - SRF ME techs. — Technician staff from cryomodule assembly group for waveguide support structures
  - Installation Crew — Neil Wilson's folks who will be drilling holes in the ceilings, doing crane lifts, etc.
- The original plan had one vacuum team. It had two many resource limitations.
- The final plan has
  - The plasma vacuum work done by vacuum team 2, with three exceptions* which will be vacuum team 1.
    - Changing beam line valves
    - Slow bleed-ups
    - Slow pump-downs.

  *Vacuum team 2 will support these activities but the lead (hands on) technicians are planned to be vacuum team 1.

Major tasks related to 2L22, 2L24, 2L25 and 2L26 by type

- **2 crane lift operations one to put the clean rooms into the tunnel and one to remove them from the tunnel. (7 April and sometime after 30 May.)**

- **Beam line valve changes. Assumes that valves installed last spring are still leak tight.**
  - **Girder 2L26 as part of CM 2L26 changeout (29 March to 4 April)**
  - **Girder 2L25 (28 April to 2 May)**
  - **Girder 2L22 (10 May to 12 May)**

- **Clean room setups and gas connections (not part of CM 2L26)**
  - **Clean room 2 over girder 2L26 for cryomodule installation and plasma processing (10 April – 12 May)**
  - **Move clean room 1 from girders 2L27 to 2L25 (in place 20 April - 24 May)**
  - **Setup clean room 3 and clean room 4 on girders 2L22 and 2L23 (in place 4 - 11 May)**
  - **Move clean room 2 from 2L26 to 2L24 (in place 12 - 25 May)**

- **Waveguide changes (remove one section install blanks and WR650 to Type-N adapters)**
  - **“Disconnect” 2L25 and 2L22 (18 April)**
  - **Reconnect waveguides 2L25 and disconnect 2L24 (11 May)**
  - **Reconnect waveguides 2L22 and 2L24 (after 26 May)**

Major tasks plasma processing specific.

- Transport processing system to the tunnel and stage in zone 2L24.
  - 4 RF racks
  - 2 gas supply carts
  - 2 vacuum carts
  - Table for remote control using (2 laptops and 4 monitors)
  - Requires either 4 CUE network connections or one connection for managed network switch.
- Set up and process each zone in order 2L25, 2L22, 2L24
  - Set up gas flow and oxygen mix
  - Measure S11 and S21 as a function of phase shifter position for all cavities.
  - Select phase shifter setting for each cavity and build mode files.
  - Calibrate the systems (each of 4 racks is only done once per rack)
  - Process each zone 4 cavities at once (process 8 cavities in one (10-12 hour) day wait a day then repeat)
  - Pump down the CM and down-stream girder (overnight)
  - Re-establish ion pump control
- Transport processing equipment out of the tunnel.

Schedule for plasma processing

SAD23_2C100_booster_C7503 and He process v3 22Feb tp1.mpp - Project Standard

	Task Name	Duration	Start	Finish	Predecessors
111	Post Processing Measurements	16 hrs	Wed 7/5/23	Thu 7/6/23	110
112	**C100 Plasma Processing**	**81 days?**	**Wed 3/15/23**	**Mon 7/10/23**	
113	2L24 to Room Temp	3 days	Mon 4/17/23	Wed 4/19/23	20
114	2L23 to Room Temp (if Gate Valves leak)	3 days	Mon 4/17/23	Wed 4/19/23	113SS
115	2L22 to Room Temp	3 days	Mon 4/24/23	Wed 4/26/23	114SS
116	2L21 to Room Temp (if VBV2L22B leaks)	5 days	Tue 4/25/23	Mon 5/1/23	115SS+1 day
117	Transport processing systems and stage in tunnel out of the way of 2L25 and 2L22 and set up networks	3 days	Tue 4/11/23	Thu 4/13/23	19SS+1 day
118	Disconnect waveguide 2L25, 2L22	1 day	Fri 4/14/23	Fri 4/14/23	19
119	Setup Clean room 2 on girder 2L25	2 days	Thu 4/20/23	Fri 4/21/23	118,113
120	Replace Valves 2L25A and 2L24B	2 days	Wed 4/26/23	Thu 4/27/23	119FS+2 days
121	and Slow pump down girder 2L25, CMs 2L24 and 2L25.	1 day?	Fri 4/28/23	Fri 4/28/23	120
122	Connect gas cart to 2L26A pump valve, connect pump cart to 2L25B pump valve	1 day?	Mon 5/1/23	Mon 5/1/23	121
123	Process 2L25	5 days	Tue 5/2/23	Mon 5/8/23	122,118
124	Reconnect waveguides for 2L25 and disconnnect WG 2L24	1 day?	Tue 5/9/23	Tue 5/9/23	123
125	Set up clean room 3 girder 2L22	2 days	Tue 5/2/23	Wed 5/3/23	116,122
126	Replace Valves 2L25A and 2L24B	2 days	Mon 5/8/23	Tue 5/9/23	125FS+2 days
127	and Slow pump down girder 2L25, CMs 2L24 and 2L25.	1 day?	Wed 5/10/23	Wed 5/10/23	126
128	Setup clean room 4 girder 2L23, connect Gas supply cart.	3 days?	Fri 5/5/23	Tue 5/9/23	125FS+1 day
129	2L21 4K Cool Down and Fill	1 day	Mon 5/8/23	Mon 5/8/23	125
130	Process 2L22	5 days	Wed 5/10/23	Tue 5/16/23	128,123
131	Move clean room 2 from girder 2L26 to girder 2L24 and hook up gas supply and vacuum cart to CM2L24	3 days	Wed 5/10/23	Fri 5/12/23	123,125,128
132	2L22 disconnect gas and vacuum carts take down clean rooms 3 and 4 for use in 2L07?	2 days?	Wed 5/17/23	Thu 5/18/23	130,131,128
133	Process 2L24	5 days	Wed 5/17/23	Tue 5/23/23	131,130
134	2L24 disconnect gas and vacuum carts take down clean rooms 1 and 2	2 days?	Wed 5/24/23	Thu 5/25/23	133
135	Reconnect waveguides 2L22 and 2L24	2 days	Wed 5/24/23	Thu 5/25/23	133
136	Transport Processing equipment out of tunnel	2 days	Thu 5/25/23	Fri 5/26/23	133FS+1 day
137	Prep for Cool downs 2L22, 2L24 and 2L25	5 days	Fri 5/26/23	Fri 6/2/23	134
138	2L22 4K Cool Down and Fill	1 day	Fri 5/26/23	Fri 5/26/23	137SS
139	2L23 4K Cool Down and Fill (if warmed up)	1 day	Mon 6/5/23	Mon 6/5/23	137
140	2L24 4K Cool Down and Fill	1 day	Mon 6/5/23	Mon 6/5/23	139SS
141	2L25 4K Cool Down and Fill	1 day	Tue 6/6/23	Tue 6/6/23	139SS+1 day

Mike, with my input on plasma processing did a detailed plan.

I added some clarifications relating to clean rooms usage, and general staffing requirements

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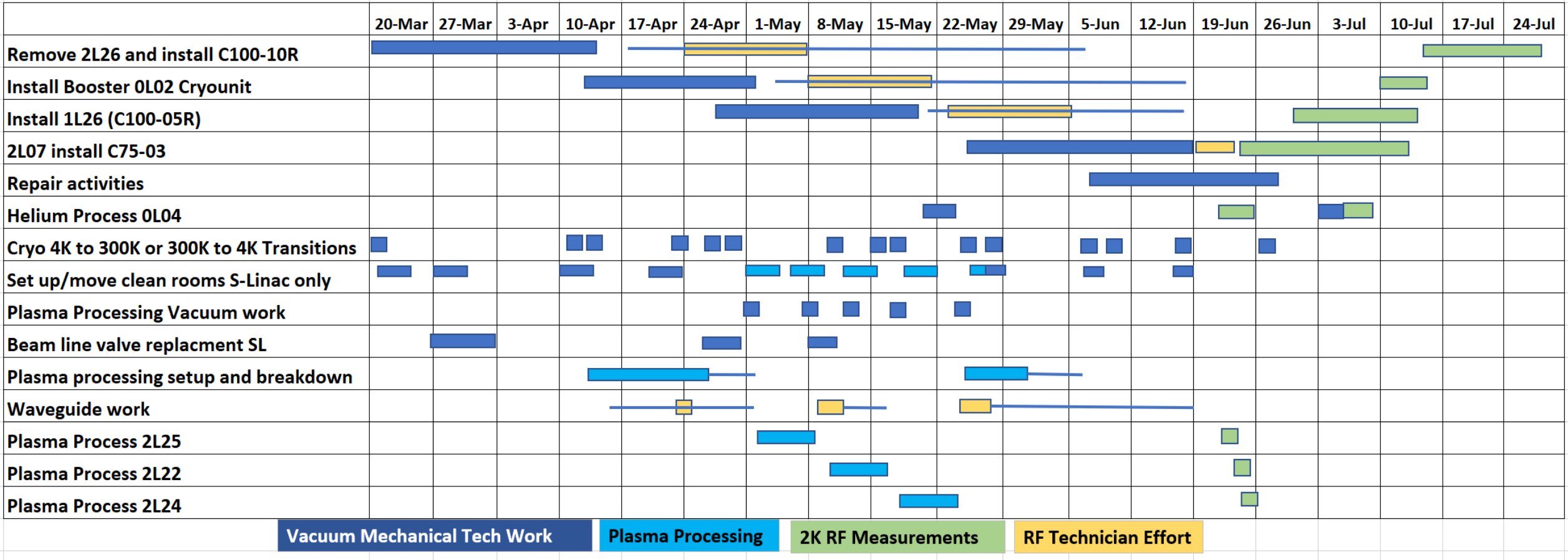
Big picture schedule (as best that I can determine)



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Summary

- We have a plan and have identified the resources necessary to do the plasma processing.
- One of the resource issues that was identified early on was vacuum technicians.
  - The current plan is to use the tunnel vacuum technicians and Frank Humphry to change the beam line valves and do the slow bleed-up and pump-down operations.
  - Technicians from the cryomodule group will put the clean rooms in place on girders, 2L22, 2L23, 2L24 and 2L25.
  - The clean room for girder 2L26 will be done as part of the 2L26 cryomodule and girder installation.
  - Cryomodule technicians will connect the plasma pumping carts and gas supply carts to the beam line ion pump valves.
  - At the end of processing we will pump the cryomodules down using the plasma turbo carts
  - After coordinating with the tunnel vacuum techs, we will turn on the ion pumps and the cryomodule technicians will disconnect the systems from the ion pump valves.
- Actual plasma processing of each cryomodule is scheduled for 5 days.
  - 1 day for setup and baseline RF measurements
  - 2 (long) days for processing 8 cavities (Process, wait a day process).
  - 1 day of float.
- Critical concern is the cryo team who are doing the 4K to 300K and 300K to 4K transitions. There is float at the end of plasma processing each cryomodule if there is space for the helium inventory.