

p19-0 ring tubes side up anatomy

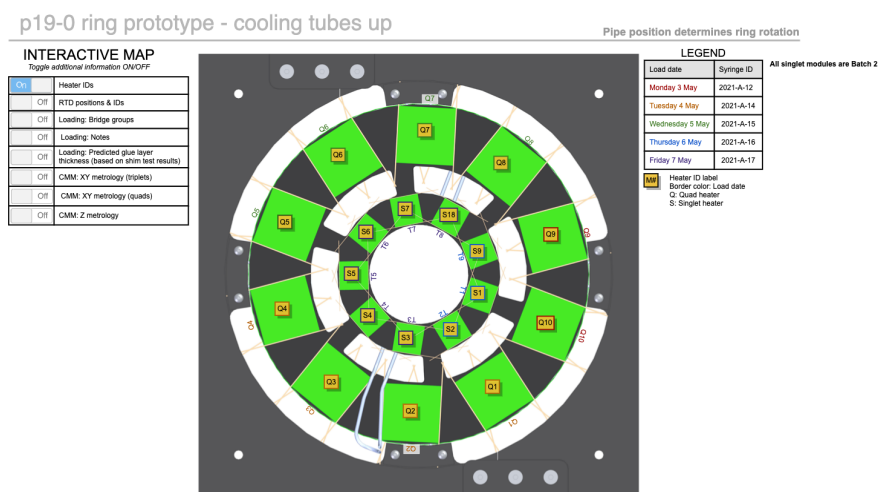
Table of Conents

- [p19-0 ring tubes up interactive map](#)
- [Screenshots from the Loading layers of the Interactive Map](#)
- [Observations, properties, and measurements by Heater ID](#)
 - [Properties](#)
 - [Quads](#)
 - [Triplets](#)
 - [Heater visual inspection](#)
 - [Quads](#)
 - [Loading experience](#)
 - [Quads](#)
 - [Triplets](#)
 - [Metrology](#)
 - [Thermal imaging](#)

p19-0 ring tubes up interactive map

Welcome to the interactive map of the first thermomechanical ring prototype at SLAC. You can visit the [Cooling Tubes Down map here](#).

To explore the ring map in interactive mode, use the buttons within the Gliffy diagram macro in the table on the left. **You may need to enter full screen.** Hover your mouse over the image to get the full screen menu option. Please note that the CMM measurements seem to take an especially long time to display.



Screenshots from the Loading layers of the Interactive Map

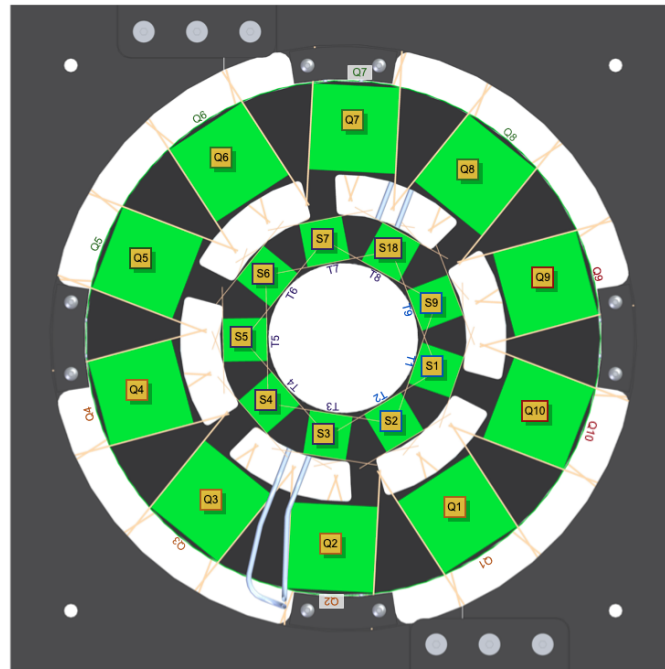
p19-0 ring prototype - cooling tubes up

Pipe position determines ring rotation

INTERACTIVE MAP

Toggle additional information ON/OFF

<input checked="" type="checkbox"/>	Heater IDs
<input type="checkbox"/>	RTD positions & IDs
<input type="checkbox"/>	Loading: Bridge groups
<input type="checkbox"/>	Loading: Notes
<input type="checkbox"/>	Loading: Predicted glue layer thickness (based on shim test results)
<input type="checkbox"/>	CMM: XY metrology (triplets)
<input type="checkbox"/>	CMM: XY metrology (quads)
<input type="checkbox"/>	CMM: Z metrology



LEGEND

Load date	Syringe ID
Monday 3 May	2021-A-12
Tuesday 4 May	2021-A-14
Wednesday 5 May	2021-A-15
Thursday 6 May	2021-A-16
Friday 7 May	2021-A-17

Heater ID label
Border color: Load date
Q: Quad heater
S: Singlet heater

All singlet modules are Batch 2

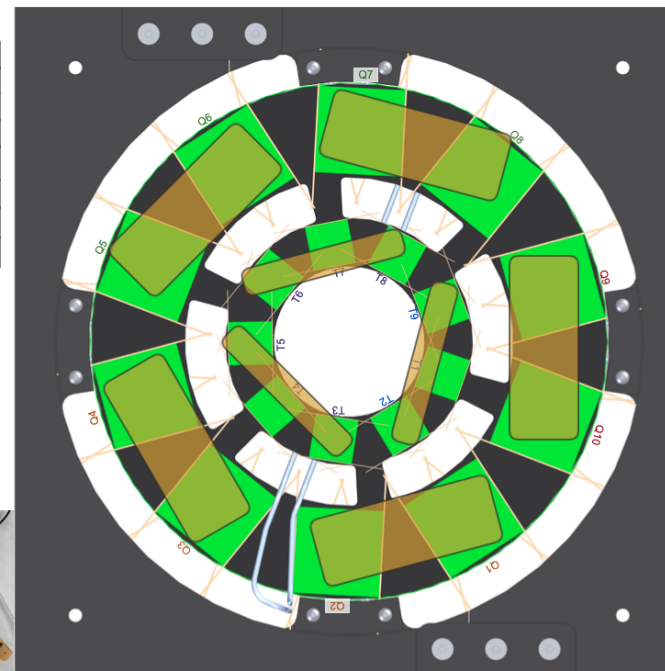
p19-0 ring prototype - cooling tubes up

Pipe position determines ring rotation

INTERACTIVE MAP

Toggle additional information ON/OFF

<input type="checkbox"/>	Heater IDs
<input type="checkbox"/>	RTD positions & IDs
<input checked="" type="checkbox"/>	Loading: Bridge groups
<input type="checkbox"/>	Loading: Notes
<input type="checkbox"/>	Loading: Predicted glue layer thickness (based on shim test results)
<input type="checkbox"/>	CMM: XY metrology (triplets)
<input type="checkbox"/>	CMM: XY metrology (quads)
<input type="checkbox"/>	CMM: Z metrology



LEGEND

Load date	Syringe ID
Monday 3 May	2021-A-12
Tuesday 4 May	2021-A-14
Wednesday 5 May	2021-A-15
Thursday 6 May	2021-A-16
Friday 7 May	2021-A-17

All singlet modules are Batch 2

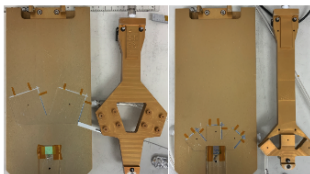
For the p19-0 ring loading, we have two bridges. One bridge loads 2 quads at a time, and the other loads 3 singlets at a time (a triplet).

Quad pair positions:

- Q9-Q10
- Q1-Q2
- Q3-Q4
- Q5-Q6
- Q7-Q8

Triplet set positions:

- T9-T11-T12
- T3-T4-T5
- T6-T7-T8



Quad loading bridge
(2 quad modules/load)

Triplet loading bridge
(3 singlet modules/load)

p19-0 ring prototype - cooling tubes up

Pipe position determines ring rotation

INTERACTIVE MAP

Toggle additional information ON/OFF

<input type="checkbox"/>	Off	Heater IDs
<input type="checkbox"/>	Off	RTD positions & IDs
<input checked="" type="checkbox"/>	On	Loading: Bridge groups
<input type="checkbox"/>	Off	Loading: Notes
<input checked="" type="checkbox"/>	On	Loading: Predicted glue layer thickness (based on shim test results)
<input type="checkbox"/>	Off	CMM: XY metrology (triplets)
<input type="checkbox"/>	Off	CMM: XY metrology (quads)
<input type="checkbox"/>	Off	CMM: Z metrology

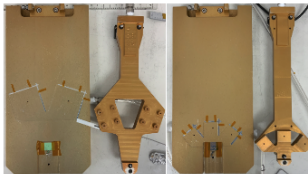
For the p19-0 ring loading, we have two bridges. One bridge loads 2 quads at a time, and the other loads 3 singlets at a time (a triplet).

Quad pair positions:

- Q9-Q10
- Q1-Q2
- Q3-Q4
- Q5-Q6
- Q7-Q8

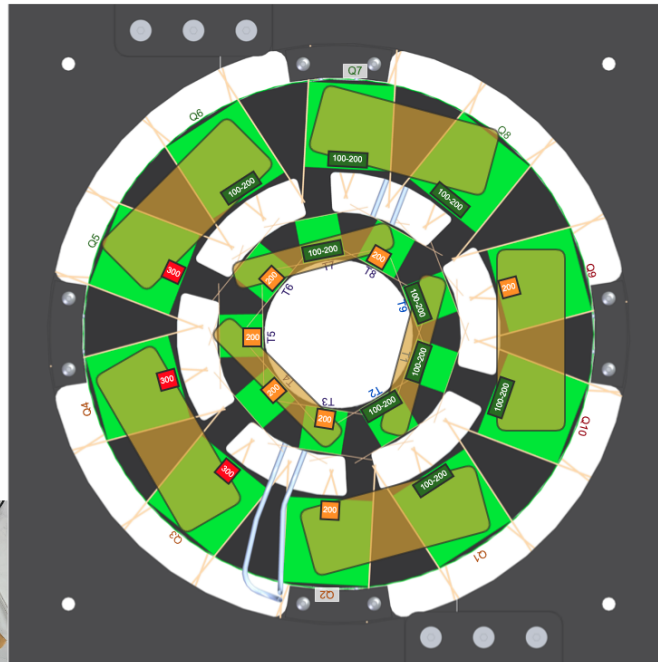
Triplet set positions:

- T9-T1-T2
- T3-T4-T5
- T6-T7-T8



Quad loading bridge (2 quad modules/load)

Triplet loading bridge (3 singlet modules/load)



LEGEND

Load date	Syringe ID
Monday 3 May	2021-A-12
Tuesday 4 May	2021-A-14
Wednesday 5 May	2021-A-15
Thursday 6 May	2021-A-16
Friday 7 May	2021-A-17

100-200 Expected glue thickness All singlet modules are Batch 2
Passed 100-um & 200-um shim tests at loading time

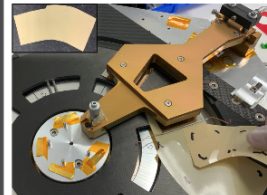
200 Expected thickness ~200 um

Passed 100-um test; almost blocks 200-um shim

X Expected thickness >200 um
Allowed 200-um shim between module & surface easily
X = best guess expected thickness derived from loading experience

Shim testing during Loading

100-um shim test passed = shim slipped into module-ring gap
200-um test passed = shim blocked and cannot enter gap



Shim test: Dry-load check with 2x 100-um shims to spot check expected glue layer thickness. One shim should slide underneath (pass 100-um test) while the second shim should get blocked (pass 200-um test).

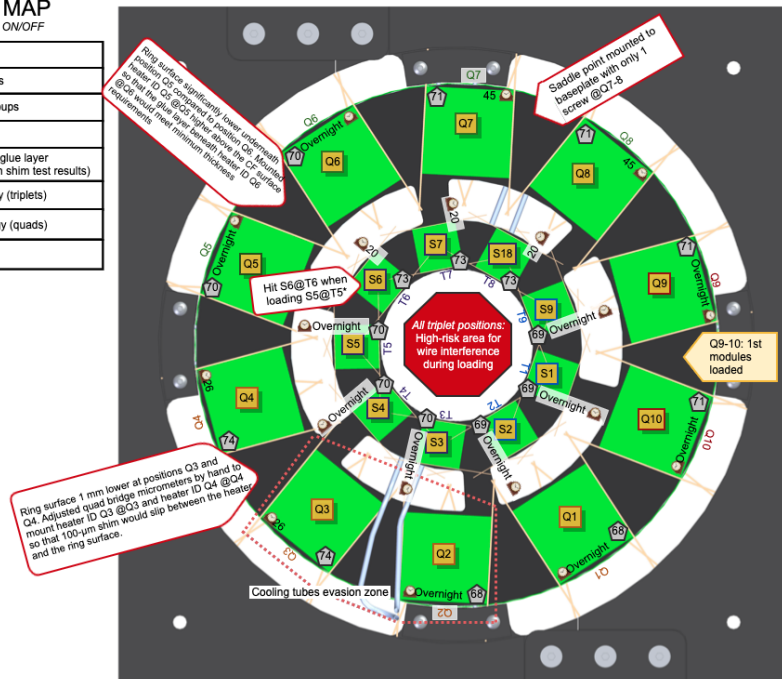
p19-0 ring prototype - cooling tubes up

Pipe position determines ring rotation

INTERACTIVE MAP

Toggle additional information ON/OFF

<input checked="" type="checkbox"/>	On	Heater IDs
<input type="checkbox"/>	Off	RTD positions & IDs
<input type="checkbox"/>	Off	Loading: Bridge groups
<input checked="" type="checkbox"/>	On	Loading: Notes
<input type="checkbox"/>	Off	Loading: Predicted glue layer thickness (based on shim test results)
<input type="checkbox"/>	Off	CMM: XY metrology (triplets)
<input type="checkbox"/>	Off	CMM: XY metrology (quads)
<input type="checkbox"/>	Off	CMM: Z metrology



LEGEND

Load date	Syringe ID
Monday 3 May	2021-A-12
Tuesday 4 May	2021-A-14
Wednesday 5 May	2021-A-15
Thursday 6 May	2021-A-16
Friday 7 May	2021-A-17

MH Heater ID label
Border color: Load date
Q: Quad heater
S: Singlet heater

m Glue mass, m, dispensed per star pattern extracted from mass tests [mg]
Target: 70 mg/star

o Time module held with the loading bridge under vacuum [overnight | minutes]

* We hit heater ID singlet S6 mounted at position T6 while flooding heater ID singlet S5 at position T5



Close up of central hub area showing wire interference risk.

Observations, properties, and measurements by Heater ID

Properties

Quads

Heater ID: Quads, batch	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	Uncertainty	Source
-------------------------	----	----	----	----	----	----	----	----	----	-----	-------------	--------

[illegible]

Triplets

[illegible]

Heater visual inspection

Quads

Heater ID	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
Before IPA wash & dry rag polish										
After IPA wash & dry rag polish										
Comments									Particles across its surface. Nico tried to blow them off with an ion gun. No effect	Noticed a peculiar speck artifact. Did not come off with a single IPA cleaning. Appears to be Cu

Triplets

[illegible]

Loading experience

Quads

[illegible]

Averaged mass tests									2, 3, 4, 5	2, 3, 4, 5
Time elapsed since syringe fully thawed									64	64
Minutes module held under vacuum (Hold time)									Overnight	Overnight

Triplets

Heater ID	#1	#2	#3	#4	#5	#6	#7	#18	#9
Load date									
Load position									
Shim testing results									
Expected glue layer thickness (m)									
100-m shim									
200-m shim									
Glue batch									
Syringe ID									
Date dispensed									
Dispensing									
Estimated glue mass per star (mg)									
Averaged mass tests									
Time elapsed since syringe fully thawed									
Minutes module held under vacuum (Hold time)									

Metrology

Here is the link to the z measurements of the tube-up side of the 19-0 ring: https://docs.google.com/spreadsheets/d/1-wvzPj9BKTd7p5U0iAwyJC_zR2qVB3EyFneJkcj2nHE/edit?usp=sharing

Thermal imaging