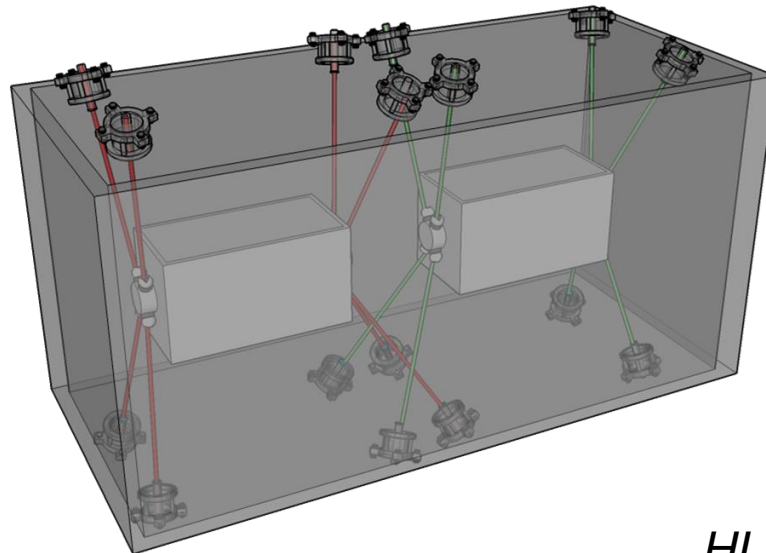




# Internal monitoring for Crab-cavities



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*HL-LHC Collaboration Triumpf-CERN*

# From Teddy Capelli

**Step 1**

1. Test the elements prepared in assembly step 1 (1/1) and 2.
2. Install the only one of the assembly ready in the cavity.
3. Assemble the cavity.
4. Check the cavity.

See assembly: UHCAF\_0000 - ST20000

**Step 2**

1. Assemble the FPC plate on the medium tank.
2. Install the FPC plate on the medium tank.

See assembly: UHCAF\_0000 - ST20000

**Step 3**

1. Positioning of the cooling line.
2. Welding of the cooling line on the medium tank.
3. Positioning of the support structure of the cooling line.
4. Welding of the support structure on the medium tank.
5. Positioning of the upper plate on the medium tank.
6. Welding of the upper plate on the medium tank.
7. Positioning of the cooling line on the upper plate.
8. Welding of the cooling line on the upper plate.
9. Positioning of the cooling line on the upper plate.
10. Welding of the cooling line on the upper plate.
11. Positioning of the cooling line on the upper plate.
12. Welding of the cooling line on the upper plate.

See assembly: UHCAF\_0000 - ST20000

**Step 4**

1. Positioning of the cooling line on the upper plate.
2. Welding of the cooling line on the upper plate.
3. Positioning of the cooling line on the upper plate.
4. Welding of the cooling line on the upper plate.
5. Positioning of the cooling line on the upper plate.
6. Welding of the cooling line on the upper plate.
7. Positioning of the cooling line on the upper plate.
8. Welding of the cooling line on the upper plate.
9. Positioning of the cooling line on the upper plate.
10. Welding of the cooling line on the upper plate.
11. Positioning of the cooling line on the upper plate.
12. Welding of the cooling line on the upper plate.

See assembly: UHCAF\_0000 - ST20000

**Step 5**

1. Positioning of the cooling line on the upper plate.
2. Welding of the cooling line on the upper plate.
3. Positioning of the cooling line on the upper plate.
4. Welding of the cooling line on the upper plate.
5. Positioning of the cooling line on the upper plate.
6. Welding of the cooling line on the upper plate.
7. Positioning of the cooling line on the upper plate.
8. Welding of the cooling line on the upper plate.
9. Positioning of the cooling line on the upper plate.
10. Welding of the cooling line on the upper plate.
11. Positioning of the cooling line on the upper plate.
12. Welding of the cooling line on the upper plate.

See assembly: UHCAF\_0000 - ST20000

**Step 6**

1. Positioning of the cooling line on the upper plate.
2. Welding of the cooling line on the upper plate.
3. Positioning of the cooling line on the upper plate.
4. Welding of the cooling line on the upper plate.
5. Positioning of the cooling line on the upper plate.
6. Welding of the cooling line on the upper plate.
7. Positioning of the cooling line on the upper plate.
8. Welding of the cooling line on the upper plate.
9. Positioning of the cooling line on the upper plate.
10. Welding of the cooling line on the upper plate.
11. Positioning of the cooling line on the upper plate.
12. Welding of the cooling line on the upper plate.

See assembly: UHCAF\_0000 - ST20000

**Step 7**

1. Positioning of the cooling line on the upper plate.
2. Welding of the cooling line on the upper plate.
3. Positioning of the cooling line on the upper plate.
4. Welding of the cooling line on the upper plate.
5. Positioning of the cooling line on the upper plate.
6. Welding of the cooling line on the upper plate.
7. Positioning of the cooling line on the upper plate.
8. Welding of the cooling line on the upper plate.
9. Positioning of the cooling line on the upper plate.
10. Welding of the cooling line on the upper plate.
11. Positioning of the cooling line on the upper plate.
12. Welding of the cooling line on the upper plate.

See assembly: UHCAF\_0000 - ST20000

**Step 8**

1. Positioning of the cooling line on the upper plate.
2. Welding of the cooling line on the upper plate.
3. Positioning of the cooling line on the upper plate.
4. Welding of the cooling line on the upper plate.
5. Positioning of the cooling line on the upper plate.
6. Welding of the cooling line on the upper plate.
7. Positioning of the cooling line on the upper plate.
8. Welding of the cooling line on the upper plate.
9. Positioning of the cooling line on the upper plate.
10. Welding of the cooling line on the upper plate.
11. Positioning of the cooling line on the upper plate.
12. Welding of the cooling line on the upper plate.

See assembly: UHCAF\_0000 - ST20000

**Step 9**

1. Positioning of the cooling line on the upper plate.
2. Welding of the cooling line on the upper plate.
3. Positioning of the cooling line on the upper plate.
4. Welding of the cooling line on the upper plate.
5. Positioning of the cooling line on the upper plate.
6. Welding of the cooling line on the upper plate.
7. Positioning of the cooling line on the upper plate.
8. Welding of the cooling line on the upper plate.
9. Positioning of the cooling line on the upper plate.
10. Welding of the cooling line on the upper plate.
11. Positioning of the cooling line on the upper plate.
12. Welding of the cooling line on the upper plate.

See assembly: UHCAF\_0000 - ST20000

**Step 10**

1. Positioning of the cooling line on the upper plate.
2. Welding of the cooling line on the upper plate.
3. Positioning of the cooling line on the upper plate.
4. Welding of the cooling line on the upper plate.
5. Positioning of the cooling line on the upper plate.
6. Welding of the cooling line on the upper plate.
7. Positioning of the cooling line on the upper plate.
8. Welding of the cooling line on the upper plate.
9. Positioning of the cooling line on the upper plate.
10. Welding of the cooling line on the upper plate.
11. Positioning of the cooling line on the upper plate.
12. Welding of the cooling line on the upper plate.

See assembly: UHCAF\_0000 - ST20000

**Step 11**

1. Positioning of the cooling line on the upper plate.
2. Welding of the cooling line on the upper plate.
3. Positioning of the cooling line on the upper plate.
4. Welding of the cooling line on the upper plate.
5. Positioning of the cooling line on the upper plate.
6. Welding of the cooling line on the upper plate.
7. Positioning of the cooling line on the upper plate.
8. Welding of the cooling line on the upper plate.
9. Positioning of the cooling line on the upper plate.
10. Welding of the cooling line on the upper plate.
11. Positioning of the cooling line on the upper plate.
12. Welding of the cooling line on the upper plate.

See assembly: UHCAF\_0000 - ST20000

**Step 12**

1. Positioning of the cooling line on the upper plate.
2. Welding of the cooling line on the upper plate.
3. Positioning of the cooling line on the upper plate.
4. Welding of the cooling line on the upper plate.
5. Positioning of the cooling line on the upper plate.
6. Welding of the cooling line on the upper plate.
7. Positioning of the cooling line on the upper plate.
8. Welding of the cooling line on the upper plate.
9. Positioning of the cooling line on the upper plate.
10. Welding of the cooling line on the upper plate.
11. Positioning of the cooling line on the upper plate.
12. Welding of the cooling line on the upper plate.

See assembly: UHCAF\_0000 - ST20000

**Technologies and contact**

<b>Radiofrequency</b> Contact: Ramon CALADA Eric MONTAUDO Beharior CALVO	<b>Survey/Alignment</b> Contact: Maroua SOUFI Vivien RUDE	<b>Cryogenic lines</b> Contact: Anthony BROZZINI Laurier DELPRAT	<b>Vacuum</b> Contact: Ramon PASQUINO Benoit FOU Vincent GARRON Claire DASSA	<b>Design</b> Contact: Shihua CAPATINA Rafael ARTAUD Yohdy CAPPELLI Luca DASSA	<b>Tuner</b> Contact: Kurt ARTOOS Pierre Minghelti
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**Manufacturing and contact**

<b>CERN Manufacturing</b> Contact: Marco GARLASCHE Simon BARRIÈRE	<b>STC</b> Contact: Mihail TENIULEA (STFC) Srikant PATELWARAY (STFC) Suzanne BOYD (CERN/STFC) Andrew JONES (STFC) Caroline GRILLERIE (STFC) Edward JORDAN (STFC)
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**WELDING ACTIVITY**

**WELD INSPECTOR - LEAK TEST**

**Transport**

See assembly: UHCAF\_0000 - ST20000

**Transport tooling**

- UHCAF\_0000 - Transport tooling
- UHCAF\_0000 - Transport tooling
- UHCAF\_0000 - Transport tooling
- UHCAF\_0000 - Transport tooling

**Lifting blocks**

- UHCAF\_0000 - Lifting blocks
- UHCAF\_0000 - Lifting blocks

**Covers**

- UHCAF\_0000 - Covers
- UHCAF\_0000 - Covers

**M7 tests**

See assembly: UHCAF\_0000 - ST20000

**Cryogenic safety extensions**

- UHCAF\_0000 - Cryogenic safety extensions
- UHCAF\_0000 - Cryogenic safety extensions

**Support jack**

- UHCAF\_0000 - Support jack
- UHCAF\_0000 - Support jack

**Inclinometer**

- UHCAF\_0000 - Inclinometer
- UHCAF\_0000 - Inclinometer

**Pump instrumentation box**

- UHCAF\_0000 - Pump instrumentation box
- UHCAF\_0000 - Pump instrumentation box

**LHC**

See assembly: UHCAF\_0000 - ST20000

**Beam extension lines**

- UHCAF\_0000 - Beam extension lines
- UHCAF\_0000 - Beam extension lines

**Cryogenic safety extensions**

- UHCAF\_0000 - Cryogenic safety extensions
- UHCAF\_0000 - Cryogenic safety extensions

**WPS**

- UHCAF\_0000 - WPS
- UHCAF\_0000 - WPS

**Jumper**

- UHCAF\_0000 - Jumper
- UHCAF\_0000 - Jumper

**Waveguides**

- UHCAF\_0000 - Waveguides
- UHCAF\_0000 - Waveguides

**Pump instrumentation box**

- UHCAF\_0000 - Pump instrumentation box
- UHCAF\_0000 - Pump instrumentation box

**WPS**

- UHCAF\_0000 - WPS
- UHCAF\_0000 - WPS

**Cryogenic safety extensions**

- UHCAF\_0000 - Cryogenic safety extensions
- UHCAF\_0000 - Cryogenic safety extensions

**Beam extension lines**

- UHCAF\_0000 - Beam extension lines
- UHCAF\_0000 - Beam extension lines

**PS RM/LX**

- UHCAF\_0000 - PS RM/LX
- UHCAF\_0000 - PS RM/LX



	Step	
Part 0 : CMM data	0	<i>Validation of trolley</i>
		<i>Position of the capacitive plates w.r.t. external references → CERN</i>
		<i>Valve plate measurement</i>
Part 1 : in clean room	1-2	<i>Alignment in ISO5 (before connection in ISO4)</i>
		<i>Alignment in ISO5 (after connection in ISO4)</i>
Part 2 : before cryostating	4-5	<i>Alignment of different equipment</i>
		<i>Installation of FSI supports</i>
		<i>Measurement of FSI supports</i>
		<i>Installation FSI targets</i>
Part 3 : cryostating (top plate)	6	<i>Alignment of the cavities before cryostating</i>
		<i>Measurement of the top plate cryomodule</i>
		<i>Alignment trolley and top plate</i>
Part 4 : cryostating (OVC cryomodule)	10	<i>Measurement of the OVC cryomodule</i>
		<i>Alignment top plate and OVC cryomodule</i>
Part 5 : after cryostating	10	<i>Installation of FSI heads on OVC and top plate</i>
		<i>Measurement of FSI heads on OVC and top plate</i>
		<i>FSI validation (comparison with a laser tracker)</i>
		<i>Alignment with adjustment system</i>
Part 6 : cold test at Triumf	12	<i>Measurement ambient pressure</i>
		<i>Measurement under vacuum</i>
		<i>Measurement at cold</i>
Part 7 : cold test at CERN		<i>Measurement ambient pressure</i>
		<i>Measurement under vacuum</i>
		<i>Measurement at cold</i>

**Thank you  
for your attention**