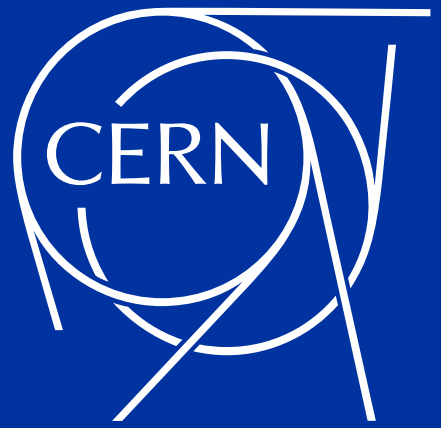

Weld design to join chambers – mechanical tolerances
Dust contamination

Manufacturing and welding options

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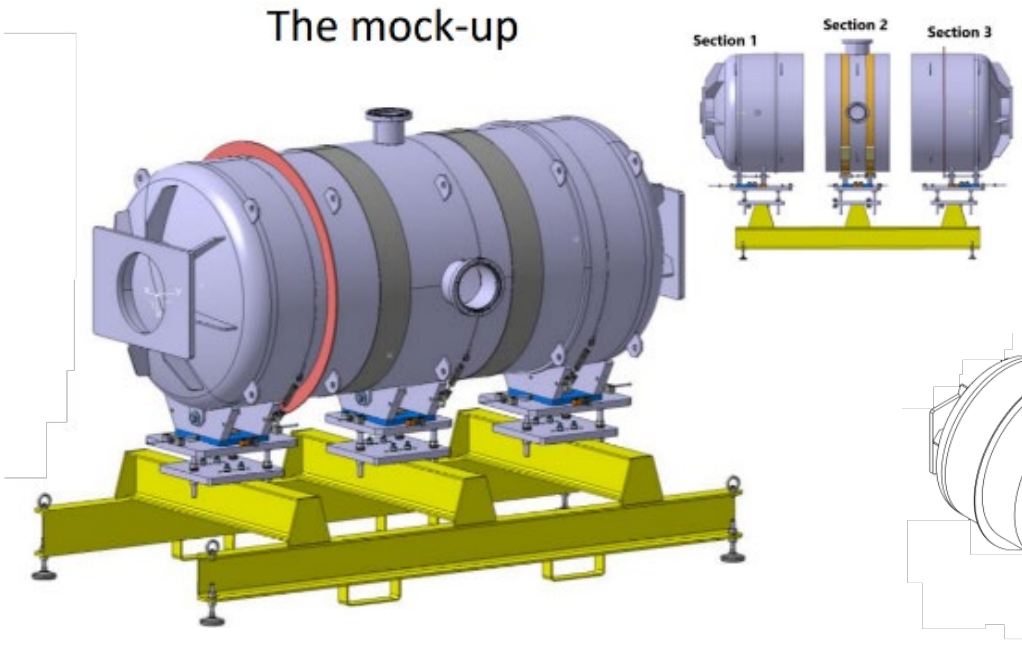
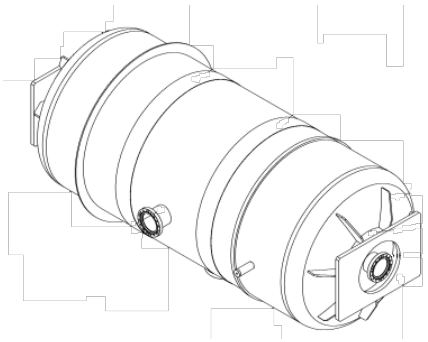
Gilles Favre

Weld design to join chambers – **1rst step mock-up**



Ø 850 mm
2 m length
4 mm thickness
3 parts
2 open sleeves



- Test the **forming process of material 441**,
- Evaluate the geometry of the component at a reduced scale,
- **Monitor dust contamination** during assembly + welding processes,
- **4 mm open sleeve** by manual fillet welds.
- **Detection of virtual leak**, and vacuum test

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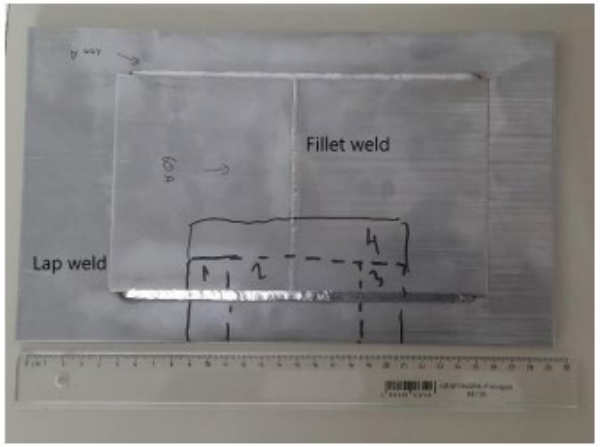
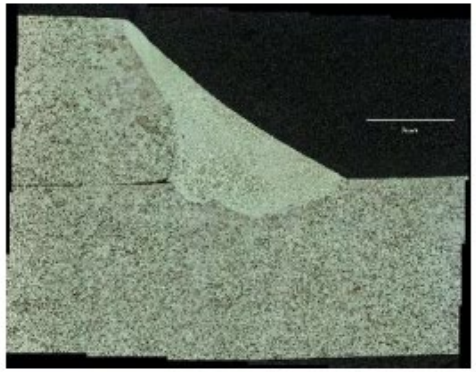
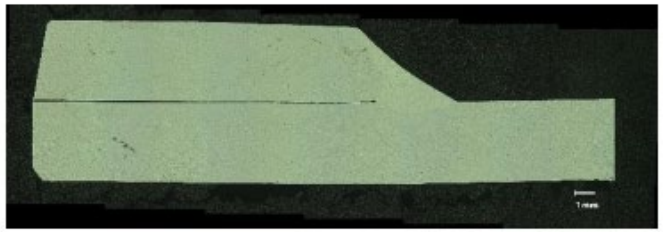
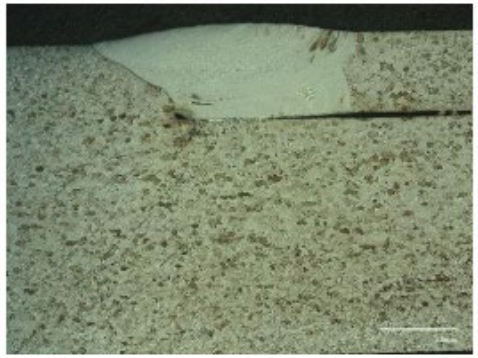
Weld design to join chambers – **1rst step mock-up**

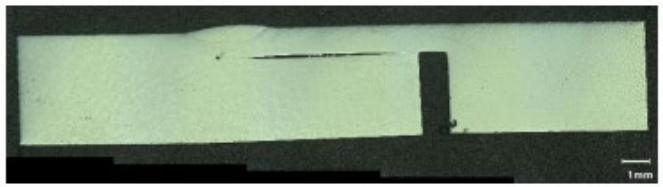
Metallography qualification of open sleeve

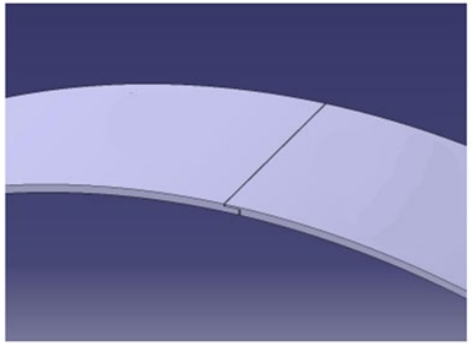


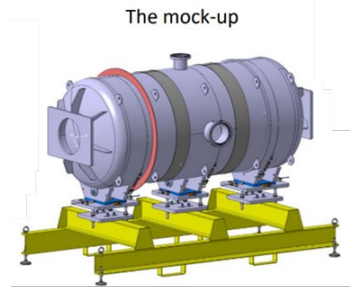


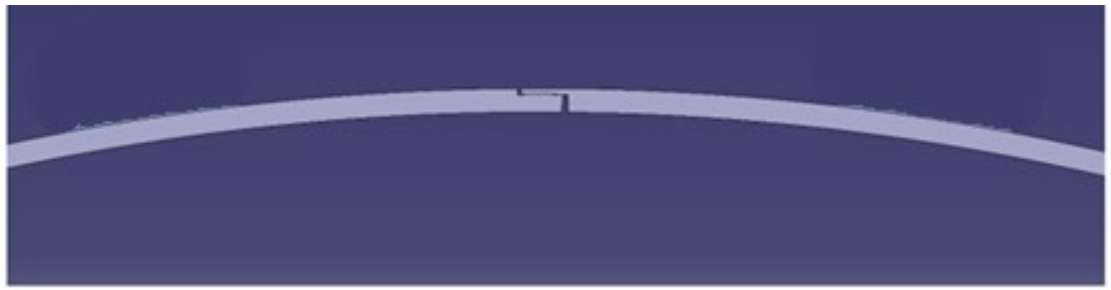












- **4 mm open sleeve** by manual fillet welds

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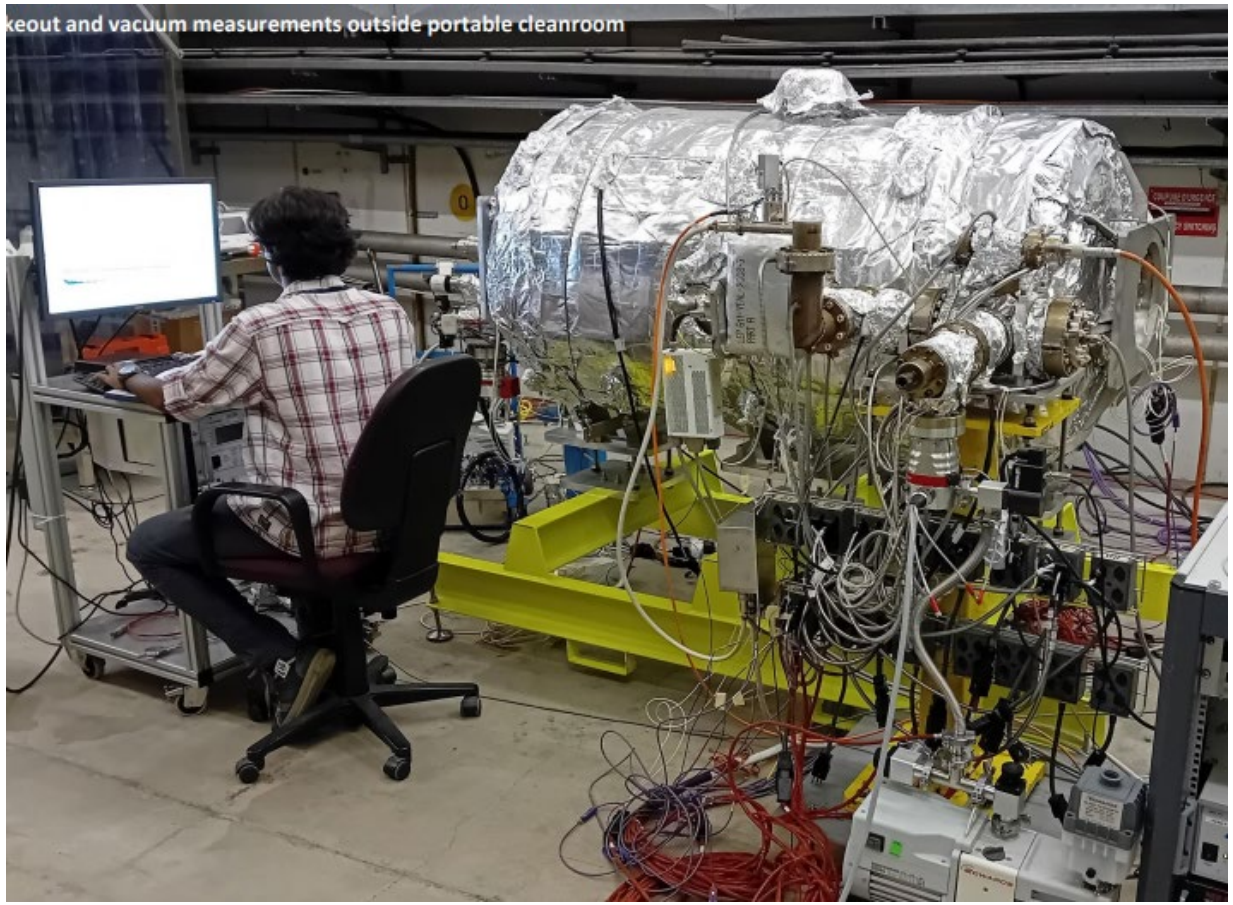
Weld design to join chambers – **1rst step mock-up**



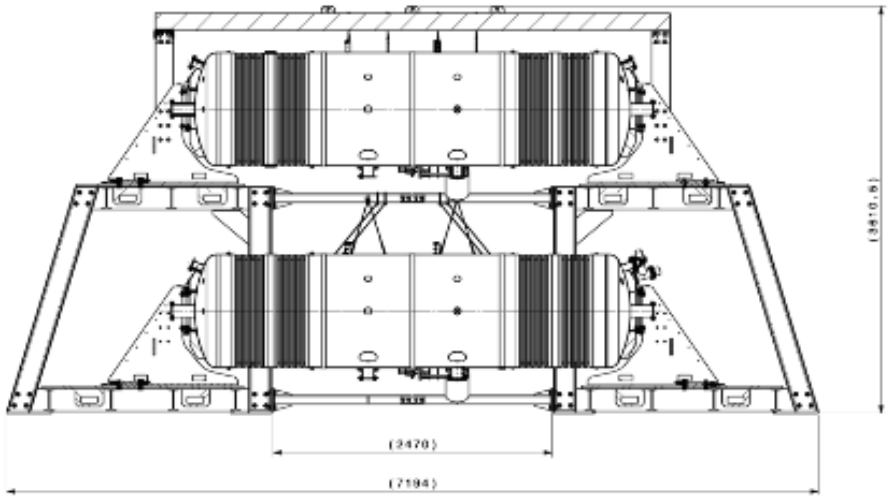
- 4 mm open sleeve by manual fillet welds : TIG (141M) with 317L filler
- Detection of virtual leak, and vacuum test.

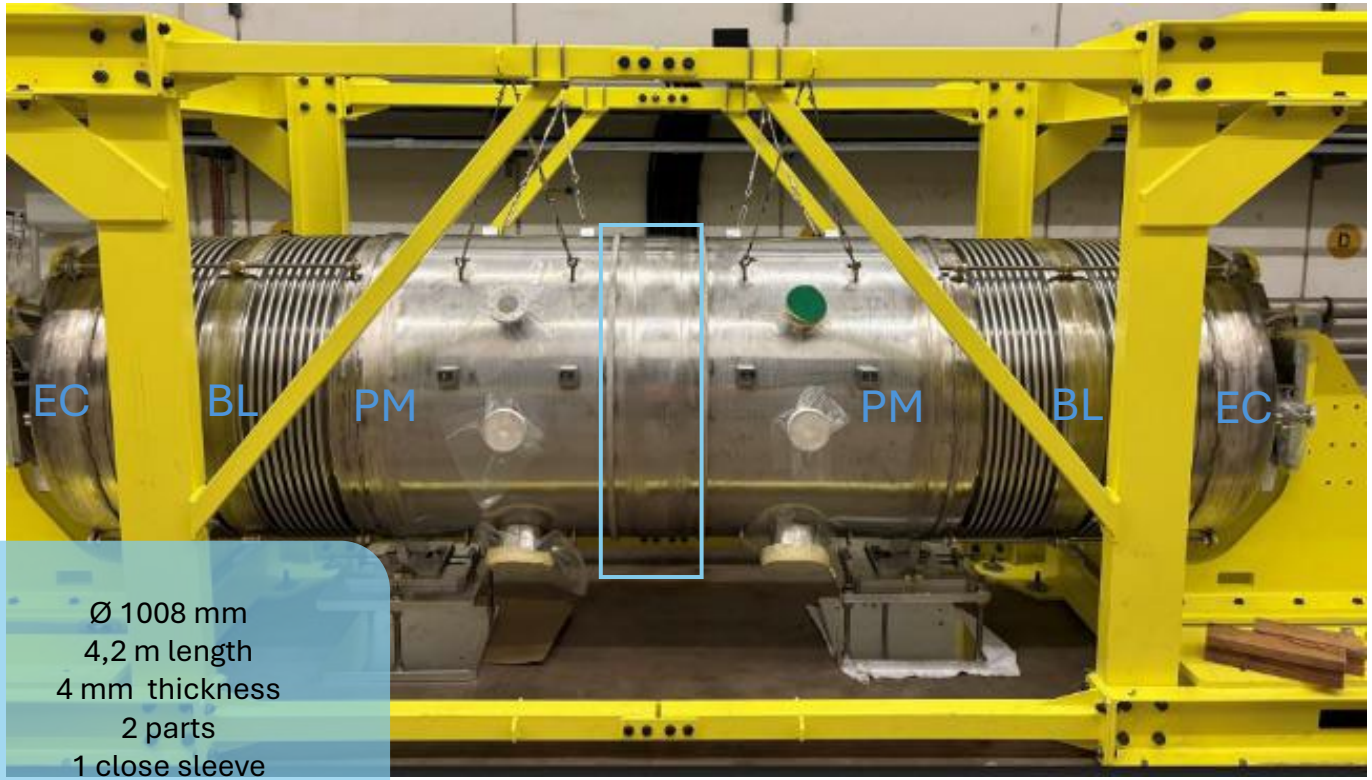
→ **Successful result**

Weld design to join chambers – **2nd background**

Background component :

- **End-cap** (EC): resists mechanical stresses during pumping
- **Bellow** (BL): absorbs stresses and compensates thermal expansi
- **Pumping module** (PM): ensures UHV is achieved.



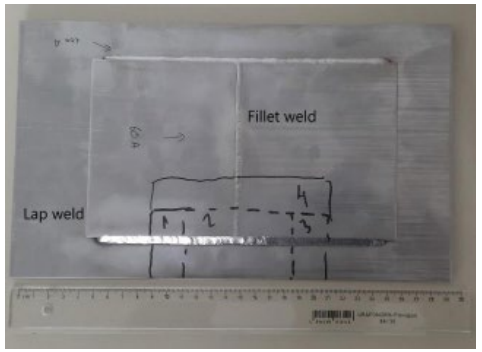


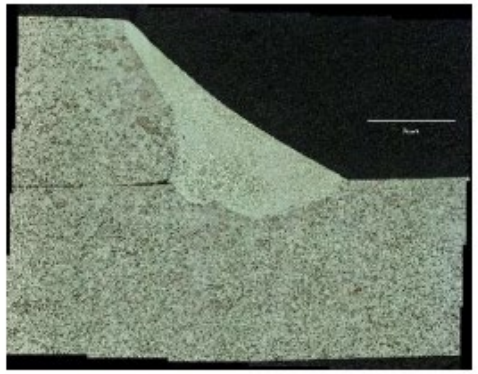
Ø 1008 mm
4,2 m length
4 mm thickness
2 parts
1 close sleeve

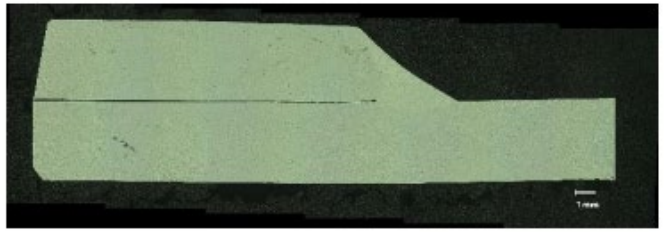
- Test and validate the mechanical strength of the complete assembly,
- ensure leak-tightness,
- **Closed sleeve with 2 mm thickness** by manual fillet welds,
- detection of virtual leaks and allowing for bakeout procedures.

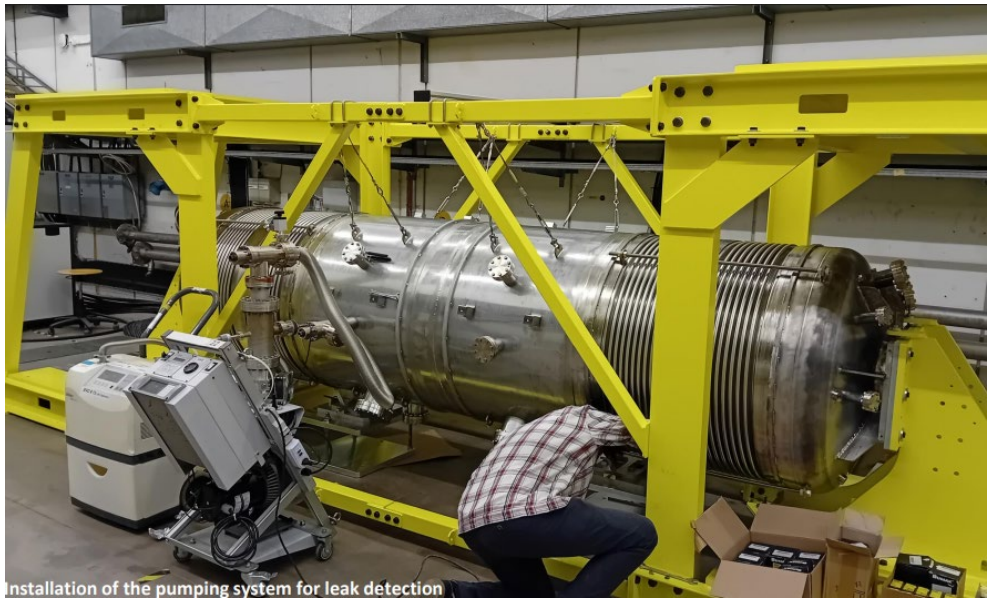
Weld design to join chambers – **2nd background**

Metallography qualification of close sleeve





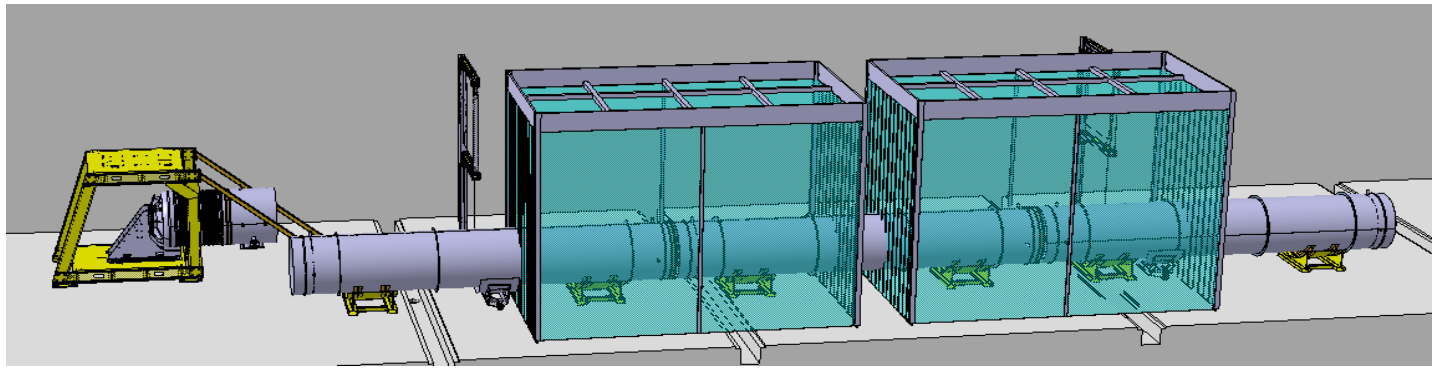


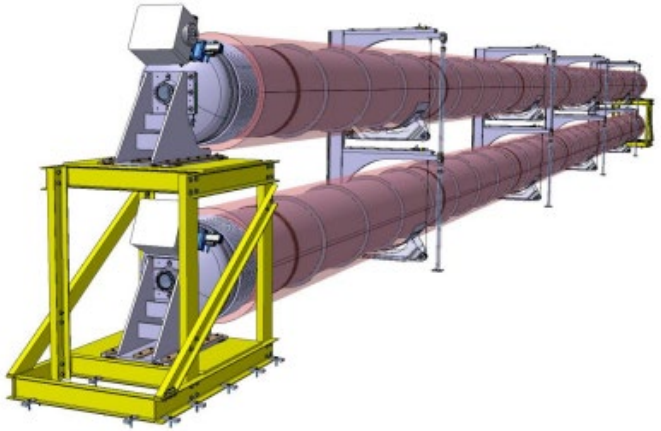


- Fitting the close sleeve with the roundness components
- 4 mm close sleeve by manual fillet welds : TIG (141M) with 317L filler .
- Detection of virtual leak, and vacuum test.

→ **Successful result : Better for close sleeve**

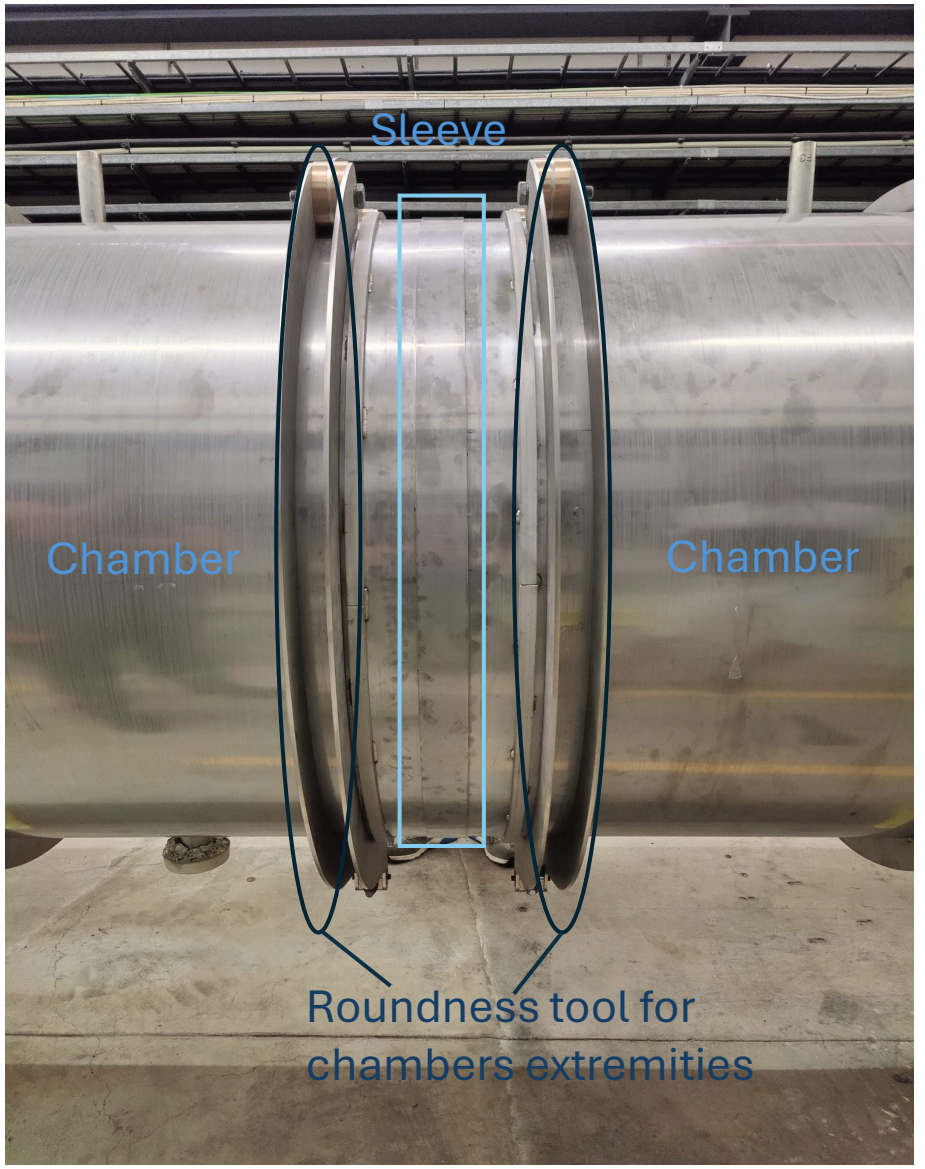
Weld design to join chambers – 3rd step Pilot sector





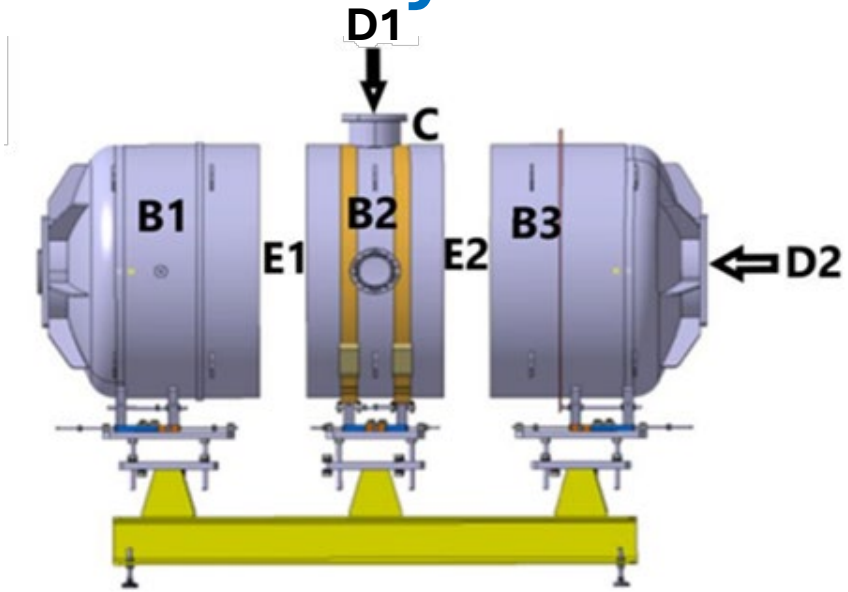
Ø 1008 mm
40 m length
4 mm thickness
8 parts / line
7 sleeves / line

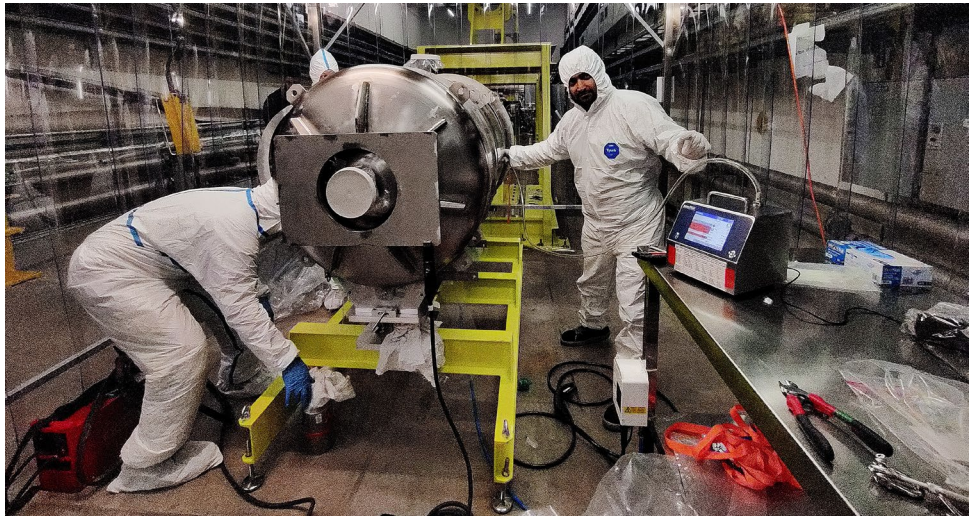
- currently in progress,
- **closed sleeve, 2 mm thickness with a 1 mm gap, joined by manual fillet welds.**



Dust monitoring during mock-up assembly

Activities	Balda quin	Mock-up surface				Inside mock-up		Between sections	
	A	B1	B2	B3	C	D1	D2	E1	E2
Only operators	ISO 6	ISO 6	ISO 6	ISO 6	ISO 6	ISO 6	ISO 6	ISO 6	ISO 6
Operator + welders (3 people)	ISO 6	ISO 6	ISO 6	ISO 6	ISO 6	ISO 6	ISO 6	ISO 6	ISO 6
Operator + welders +Equipment's	ISO 6	ISO 6	ISO 6	ISO 6	ISO 6	ISO 6	ISO 6	ISO 6	ISO 6
Plastic caps removal S1 (day1)	ISO 6	ISO 6	ISO 7	ISO 7	ISO 7	ISO 6	ISO 6	ISO 7	ISO 6
Sleeve positioning S1	ISO 6	ISO 6	ISO 7	ISO 7	ISO 7	ISO 6	ISO 6	ISO 7	ISO 6
Tack weld S1	ISO 6	ISO 6	ISO 7	ISO 7	ISO 7	ISO 7	ISO 6	ISO 7	ISO 6
Sleeve closure + tack weld S1	ISO 6	ISO 6	ISO 8	ISO 8	ISO 8	ISO 8	ISO 6	ISO 8	ISO 6
Plastic caps removal S2 (day 2)	ISO 6	ISO 7	ISO 7	ISO 7	ISO 7	ISO 6	ISO 7	ISO 7	ISO 7
Sleeve positioning S2	ISO 6	ISO 7	ISO 7	ISO 7	ISO 7	ISO 7	ISO 7	ISO 7	ISO 7
Tack weld S2	ISO 6	ISO 8	ISO 8	ISO 8	ISO 8	ISO 8	ISO 8	ISO 8	ISO 8
Sleeve closure + tack weld S2	ISO 6	ISO 8	ISO 8	ISO 8	ISO 8	ISO 8	ISO 8	ISO 8	ISO 8
Assembly completed + settling down(~2hrs)	ISO 6	-	-	-	-	ISO 7	ISO 7	-	-
Final welding outside baldaquine	-	-	-	-	-	ISO 8	ISO 8	-	-
1 day after welding	ISO 6	-	-	-	-	ISO 8	ISO 8	-	-
2 days after welding	ISO 6	-	-	-	-	ISO 8	ISO 8	-	-
5 days after welding	ISO 6	-	-	-	-	ISO 7	ISO 7	-	-
Before leak detection	ISO 6	-	-	-	-	ISO 7	ISO 7	-	-





Dust monitoring during mock-up assembly

Dust assessment

Summary:

- Conditioning of the mock-up done inside baldaquin
- Dust assessment before assembly → ISO 6 measured Inside & outside of mock-up
- Sleeve assembly → ISO 6 (Inside the mock-up)
- Tack welding → ISO 7 (High in 0.3 to 1 µm particles)
- Final assembly → ISO 7 (High in 0.3 to 1 µm particles)
- Final welding → ISO 8 (Very high 0.3 to 1 µm particles)
- Measurement after 2 days of welding → ISO 7 (High in 0.3 to 1 µm particles)
- Measurement after 5 days of welding → IS0 7(Better than before, slightly higher 0.3 µm particles)

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