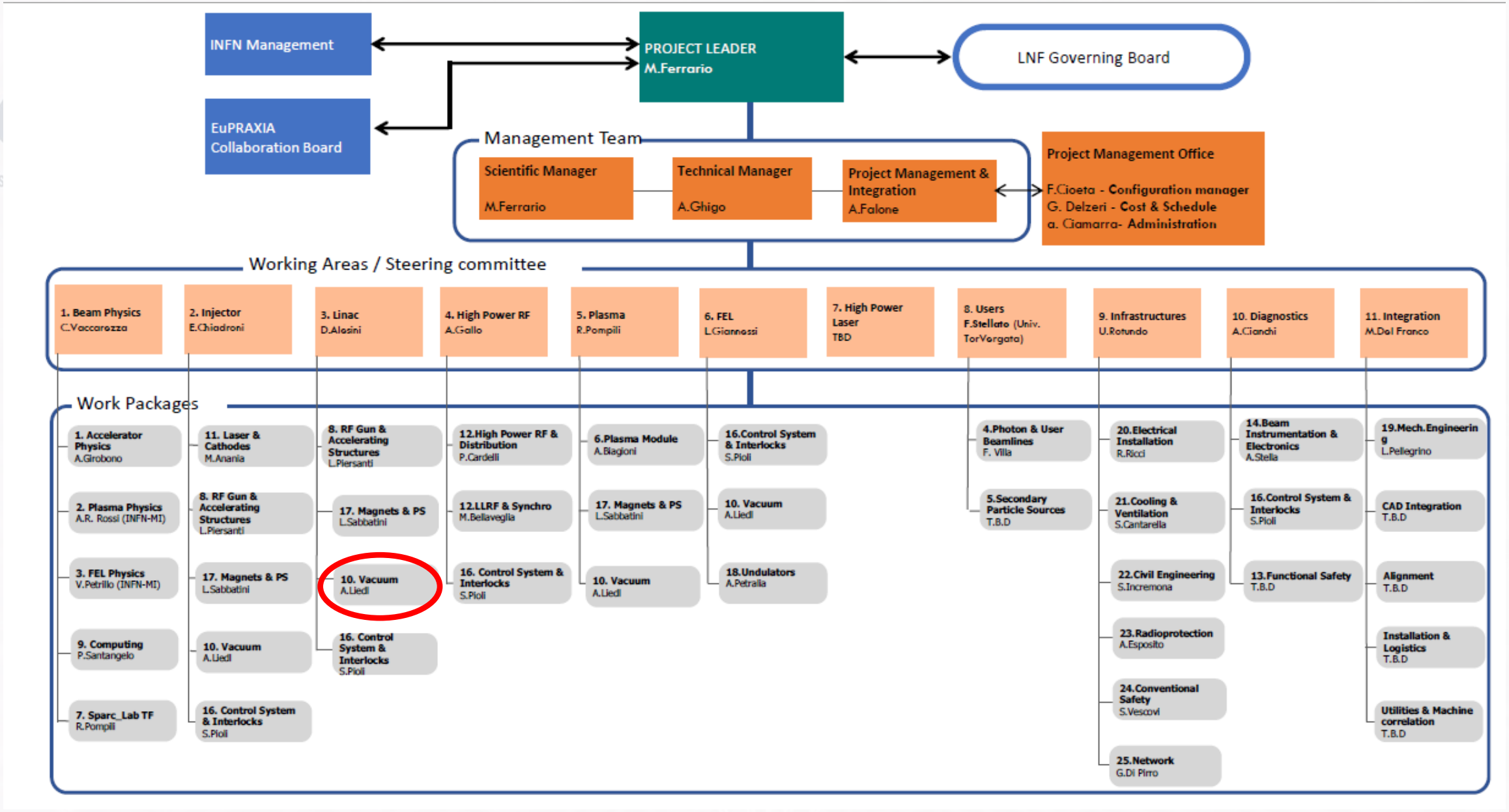
TDR Status: Vacuum System

8th EuPRAXIA@SPARC_LAB TDR Review Committee

WP10 – Vacuum Andrea Liedl

Work Package 10 – Vacuum - within the EuPRAXIA - OBS



Work Package 10 – Vacuum - within the EuPRAXIA – Responsibility Assignment Matrix

		WA 1	WA 2	WA 3	WA 4	WA 5	WA 6	WA 7	WA 8	WA 9	WA10
		Beam Physics	Injector	Linac	RF	Plasma	FEL	High Power Laser	Users	Infrastr ucture	Diag.
WP1	Accelerator Physics	x	x	x		x	x	x			x
WP2	Plasma Physics	x				x		x			x
WP3	FEL Physics	x					x	x			x
WP4	Photon & User Beamlines	x					x	x	x		x
WP5	Secondary Part.Source							x	x		x
WP6	Plasma module	x				x		x			x
WP7	Sparc_lab TF					x					x
WP8	RF Gun & Acc.Structure	x	x	x							x
WP9	Computing	x									x
WP10	Vacuum		x	x	x	x		x			x
WP11	Laser & Cathodes		x					x			x
WP12	High Power RF & Distribution		x	x	x						

Work Package 10 – Vacuum – Structure/Strategy for the TDR

		WA 1	WA 2	WA 3	WA 4	WA 5	WA 6	WA 7	WA 8	WA 9	WA10
		Beam Physics	Injector	Linac	RF	Plasma	FEL	High Power Laser	Users	Infrastr ucture	Diag.
WP1	Accelerator Physics	x	x	x		x	x	x			x
WP2	Plasma Physics	x				x		x			x
WP3	FEL Physics	x					x	x			x
WP4	Photon & User Beamlines	x					x	x	x		x
WP5	Secondary Part.Source							x	x		x
WP6	Plasma module	x				x		x			x
WP7	Sparc_lab TF					x					x
WP8	RF Gun & Acc.Structure	x	x	x							x
WP9	Computing	x									x
WP10	Vacuum		x	x	x	x		x			x
WP11	Laser & Cathodes		x					x			x
WP12	High Power RF & Distribution		x	x	x						

"WA Chapter"

- A paragraph containing details (Technical choices, Prototypes, Results…etc…) specifically for that Area

"Vacuum System Chapter "

- Technical Approches for the Vacuum Systems
- Procedures
- Devices
- ….

[…] Workpackages must be intended as the INFNLNF services that provide resources and technologies in order to implement the tasks related to the WA […]

SERVIZIO VUOTO

Responsabile:
A. Liedl

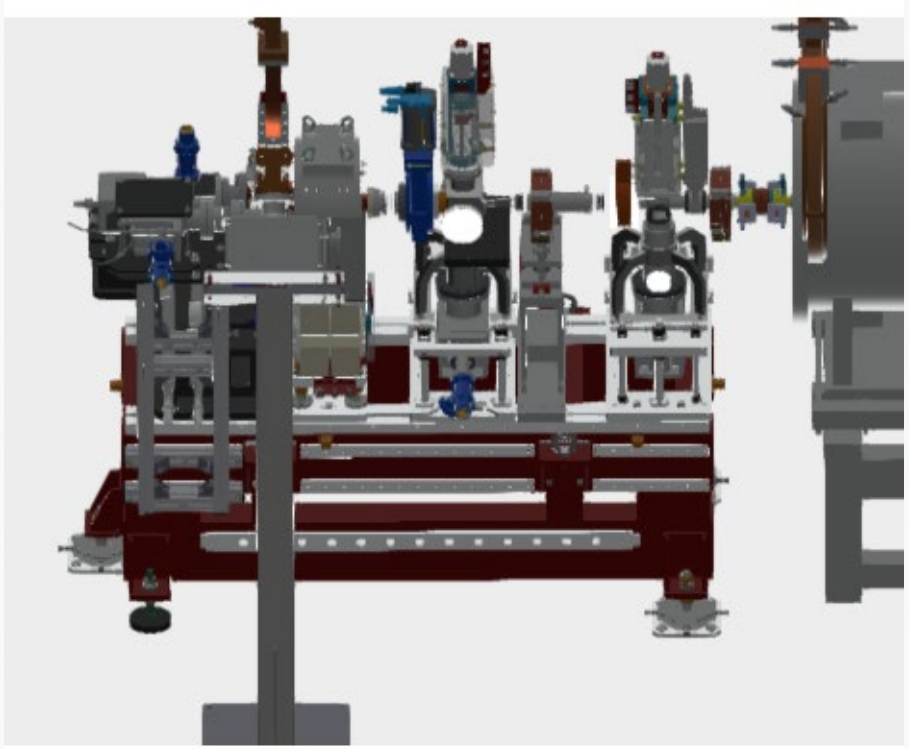
STAFF
Bini S.
Spallino L. °

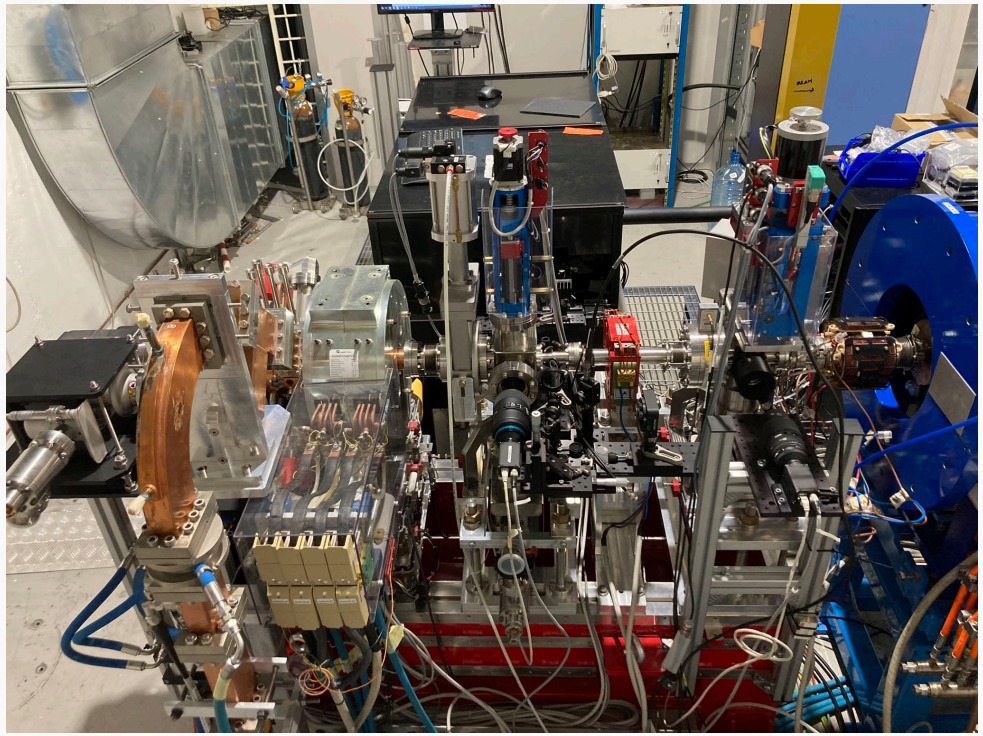
REPARTO PROGETTAZIONE E REALIZZAZIONE COMPONENTI UHV
◊ De Biase S.
Di Raddo G.
Lollo V.
Zottola M. •

REPARTO TECNOLOGIE MECCANICHE UHV E BRASATURE
Chimenti P.
Di Raddo R.

Achievements and present Design Choices are direct consequences of sinergies with other projects, dedicated R&D or pasts experiences

Injector





Ion Pumps + NEG Pumps
Sectioning All Metal Gate Valve + Fast Gate Valve

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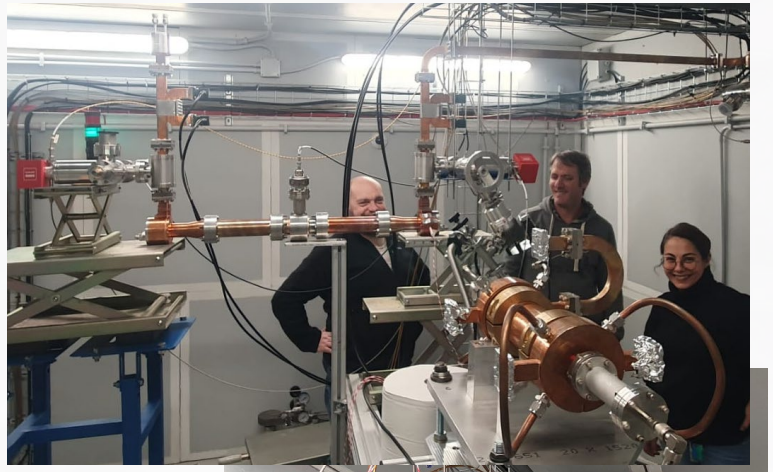
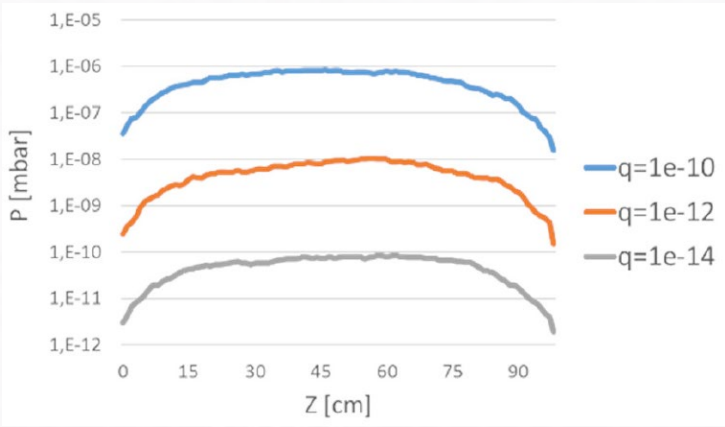
X-Band Linac



- Brazing Cycle
- Pumping distribution
- NEG Pumps
- Installing-storaging procedure



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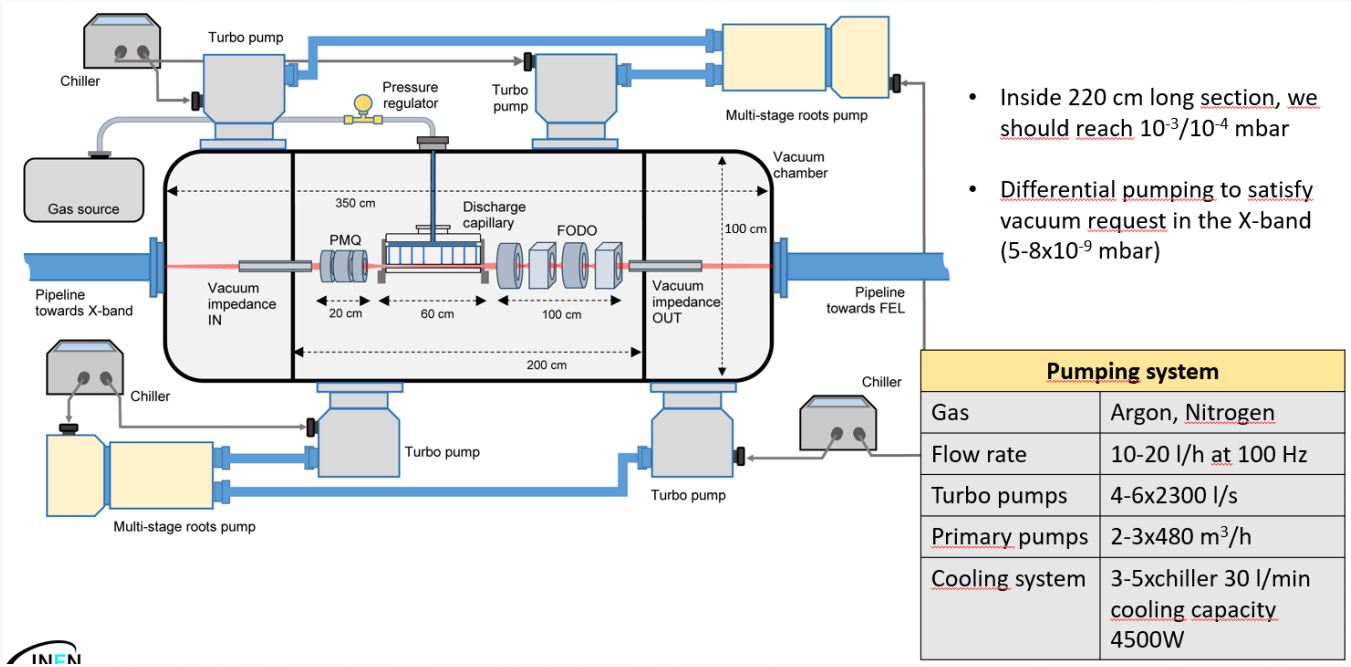
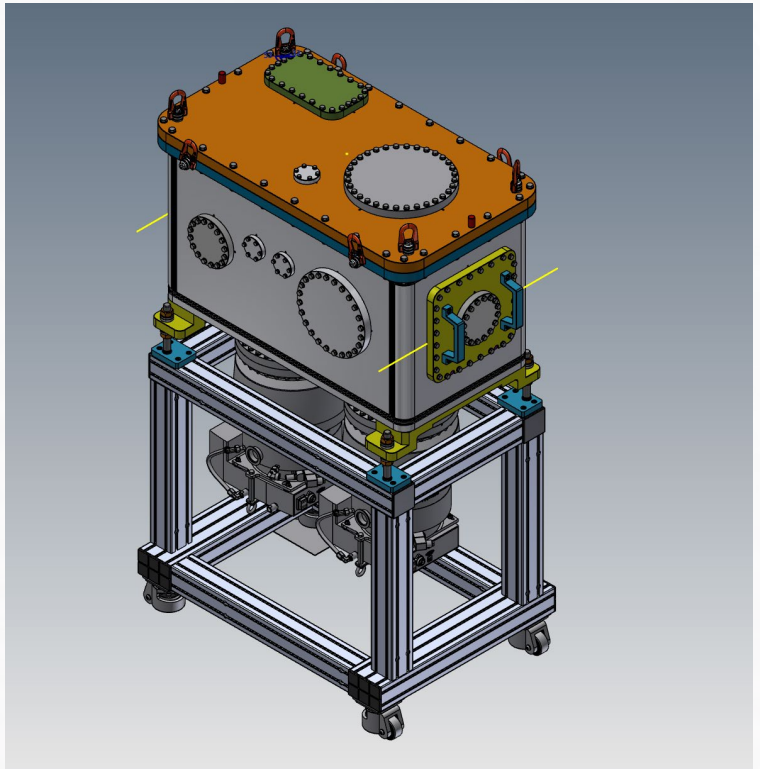
Plasma Chamber



- Inside 220 cm long section, we should reach $10^{-3}/10^{-4}$ mbar
- Differential pumping to satisfy vacuum request in the X-band ($5\text{-}8\times10^{-9}$ mbar)

Pumping system	
Gas	Argon, Nitrogen
Flow rate	10-20 l/h at 100 Hz
Turbo pumps	4-6x2300 l/s
Primary pumps	2-3x480 m^3/h
Cooling system	3-5xchiller 30 l/min cooling capacity 4500W

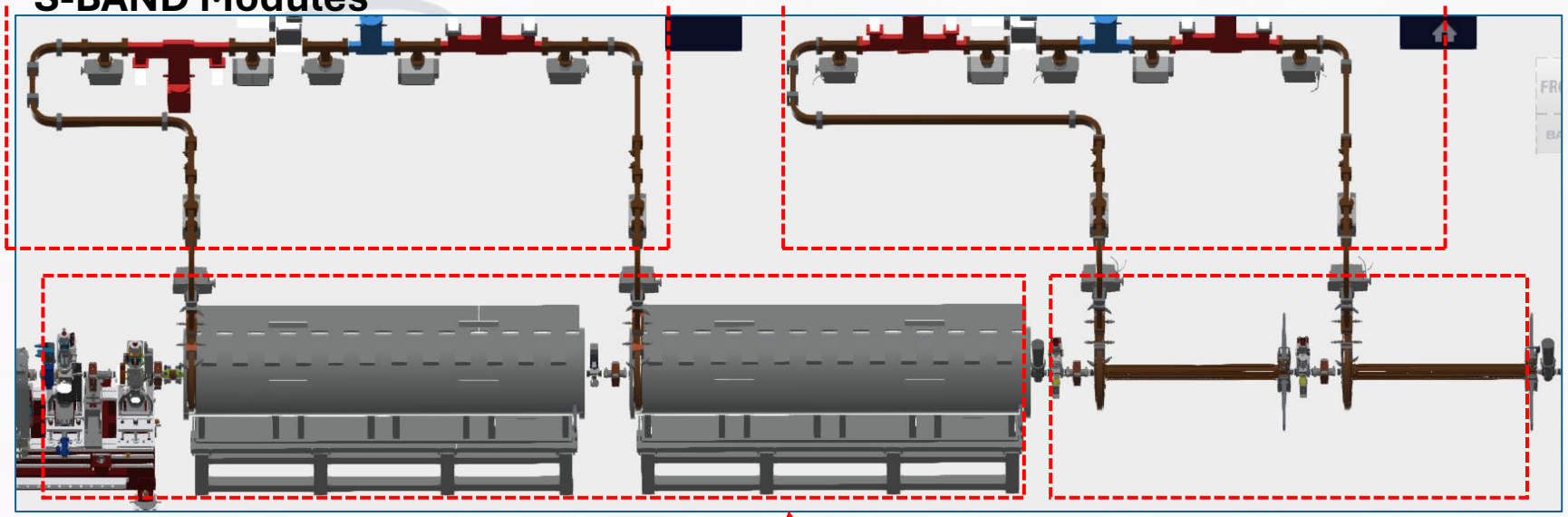


Test Chamber: Preliminary design

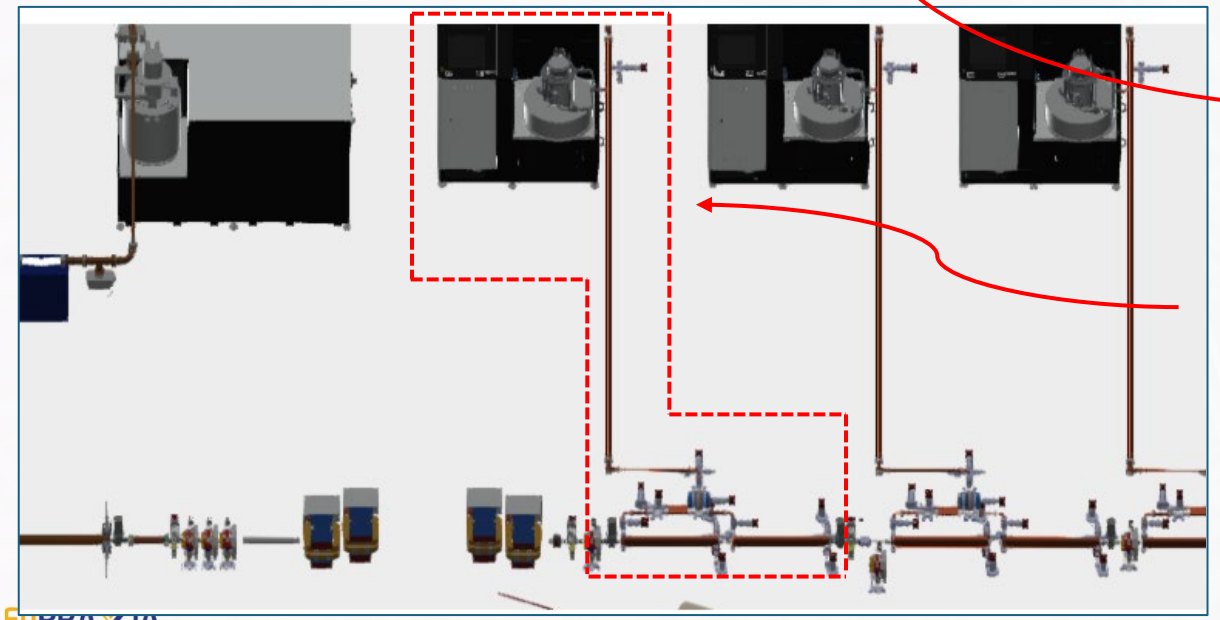
Differential Pumping
Choice of Pumping System

LINAC Vacuum System - Layout Principles

S-BAND Modules



X-BAND Modules



Flanges generally based on metal, Cu OFHC, Gaskets:

- S Band - LIL Flange
- Xband - International Flange
- - Circular Flange
- Linac beam pipe - QCF40

Sectioning Valve

- All metal UHV Sectioning Gate Valve

Pumping System

- Ion Pumps
- NEG Pumps

Vacuum Sensor

- Cold Cathode Gauges

LINAC Vacuum System - Layout Principles

Design Constraints:

- Conductance Limited Areas
- Dust, contamination sensitive AREA
- Different Pumping System
- …

Cleaning and Heat Treatment

- Specific acceptance Test after production
- UHV Cleaning Procedure
- Ex-Situ Bake-out

Storaging

- Internal Nitrogen/controlled Vacuum condition between production and installation
- Close and Dust reduced storage areas/rooms

Installation

- Reduce air exposure time
- Local “clean room” for installation of sensitive devices

Pumping System and Pumping Down

- Different procedures for the different areas

Reduction of specific outgassing rate of components

CONCLUSION AND TDR WRITING STATUS

TDR Writing status is

- advanced for a “WA chapter”,
- at quite starting point for the others and for the general vacuum system chapter

The R&D and other strategy approaches for the vacuum systems are in advanced phase due to the specific work or well based previous experience

Thank You for Your attention!