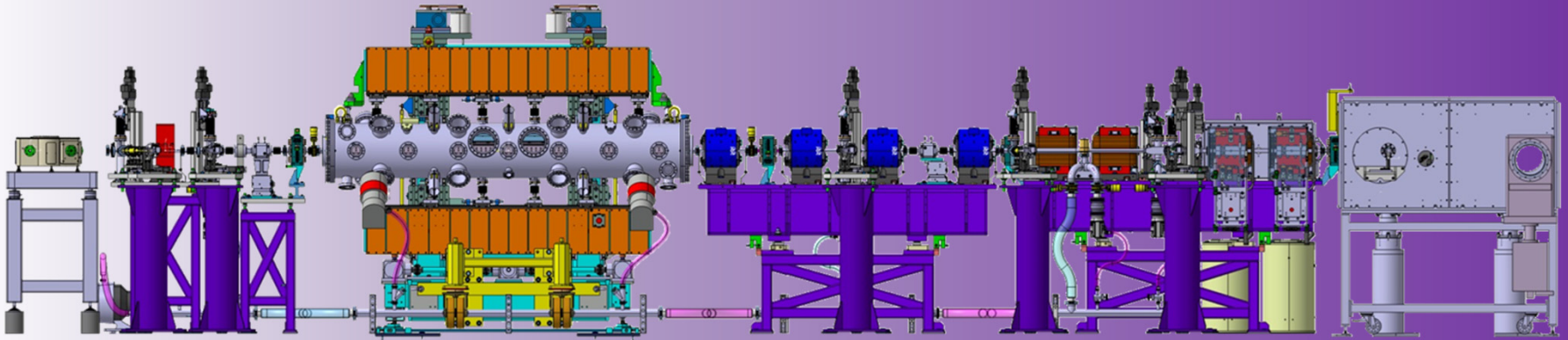


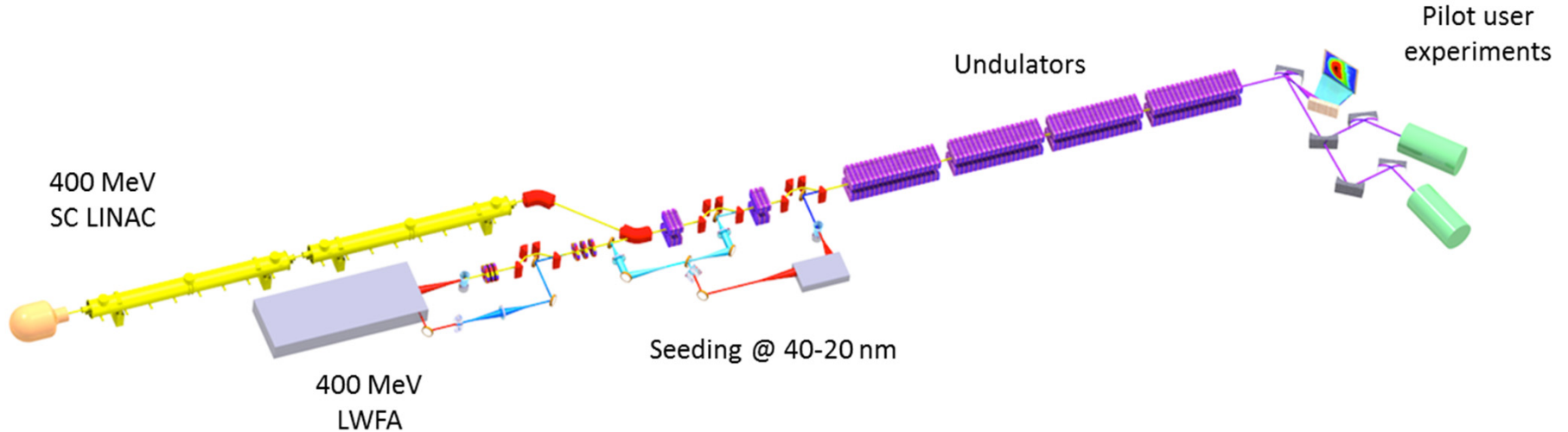
Mechanical Engineering Solutions for COXINEL project



Keihan TAVAKOLI
Daniel ZERBIB

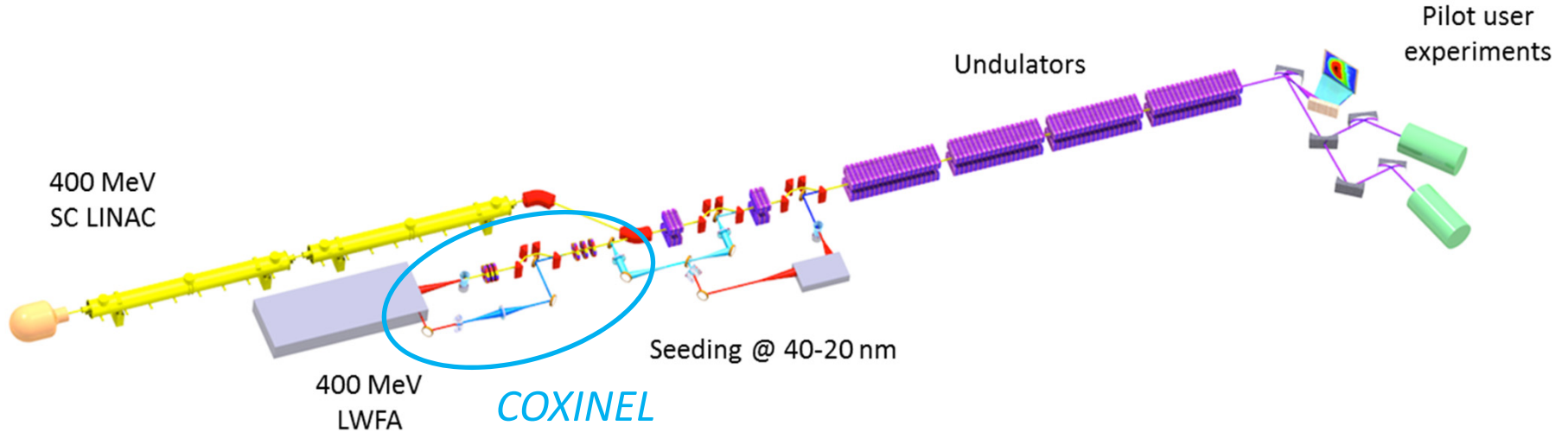


LUNEX5 PROJECT



**LUNEX5: free electron Laser Using a New accelerator
for the Exploitation of X-ray radiation of 5th generation**

LUNEX5 PROJECT



LUNEX5: free electron Laser Using a New accelerator for the Exploitation of X-ray radiation of 5th generation

COXINEL PROJECT



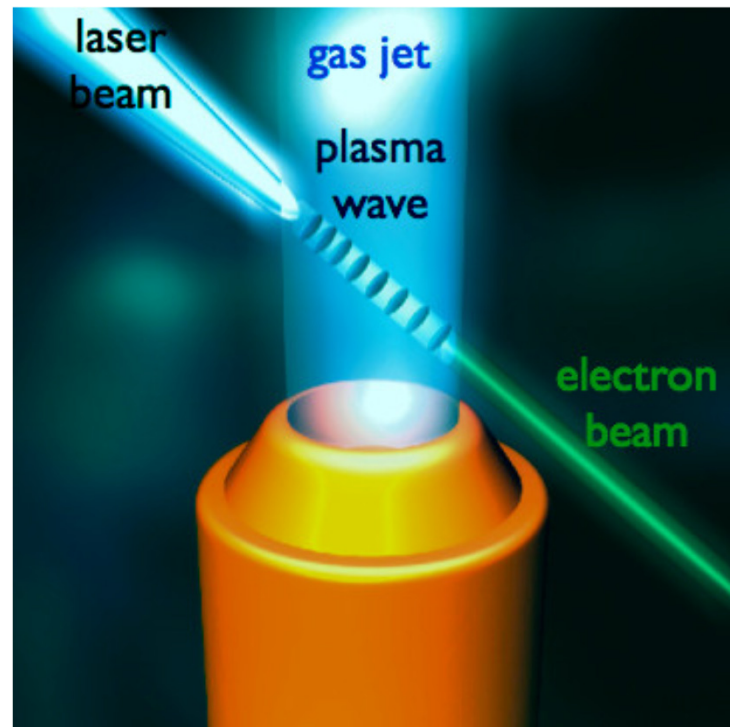
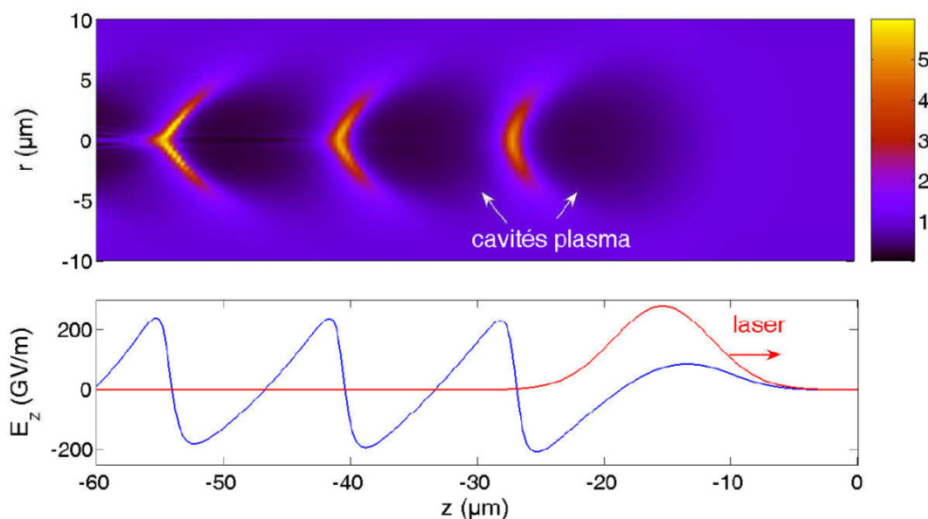
**COXINEL: COherent Xray source INferred from
Electrons accelerated by Laser**



Laser Plasma Acceleration

Laser Plasma Accelerators

- Electron energies $\varepsilon_e \sim 0.1 - 1$ GeV
- Acceleration length **1-10 cm**



Laser Plasma Acceleration

SOLEIL superconducting cavity:

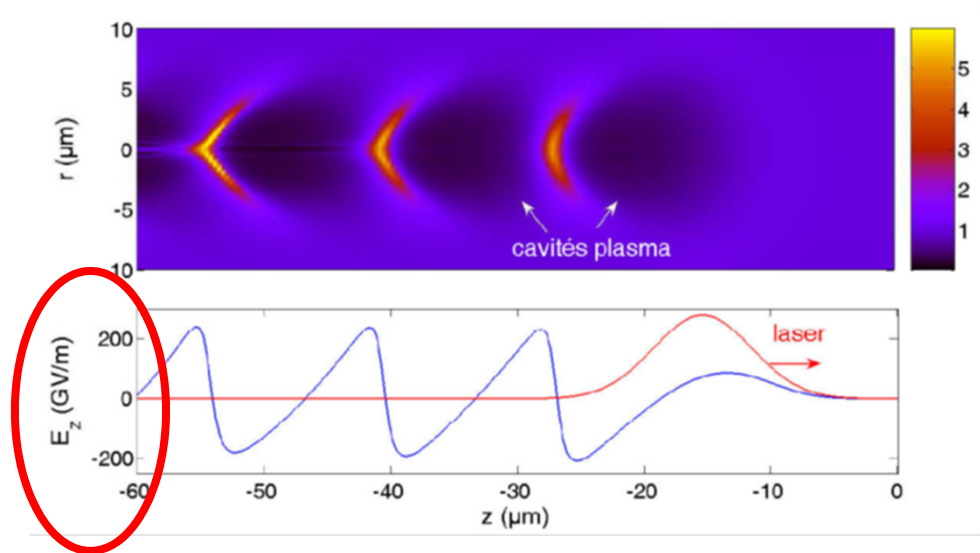
- Length: $\sim 4 \times 1.5$ m
- Diameter: ~ 0.8 m
- Gradient: 2 MV/m



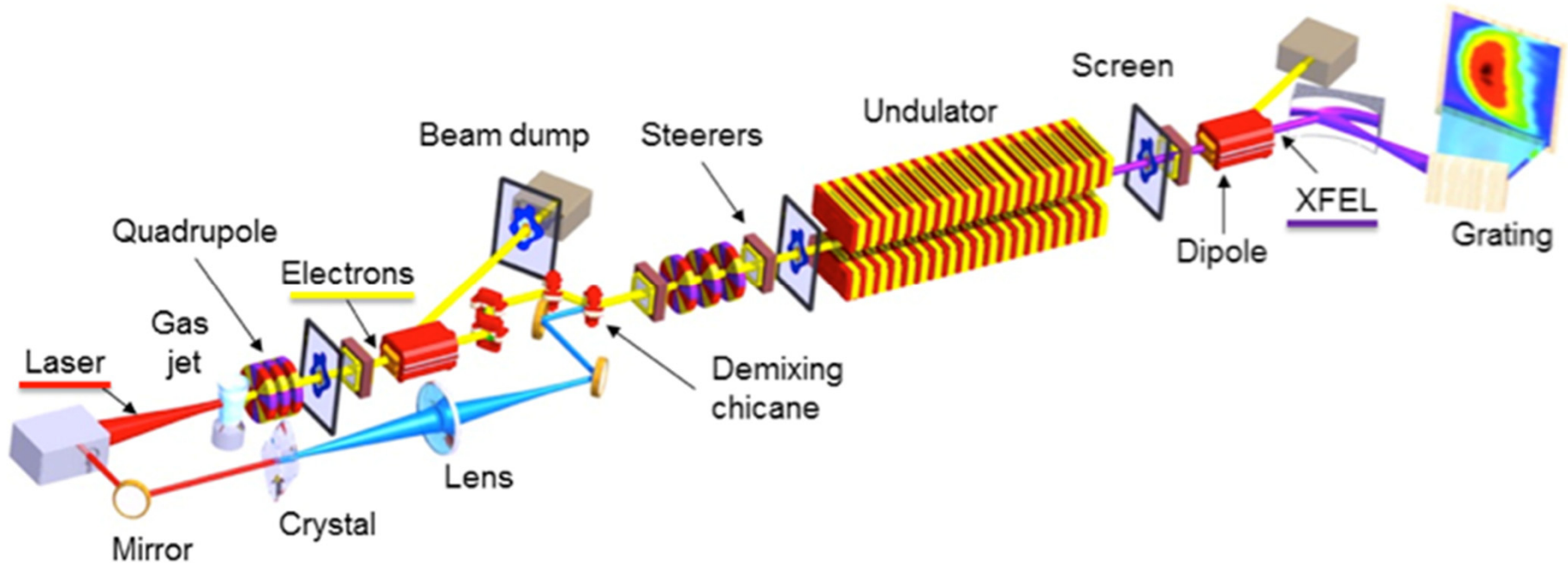
Laser Plasma Acceleration

SOLEIL superconducting cavity:

- Length: $\sim 4 \times 1.5$ m
- Diameter: ~ 0.8 m
- Gradient: 2 MV/m



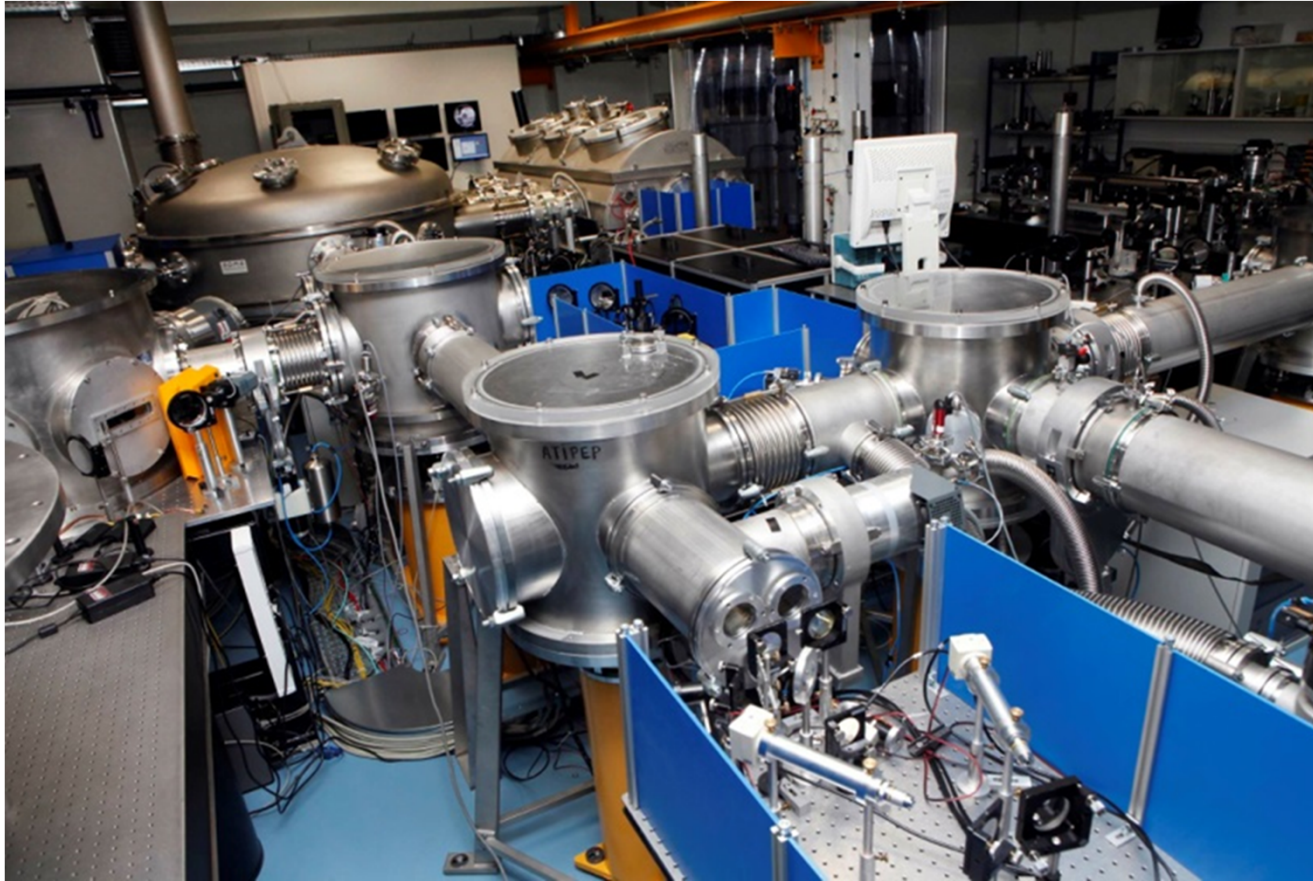
COXINEL Layout



- Electrons accelerated up to 200 MeV
- Funding Scheme : ERC advanced grant

Experiment Hall

Before:



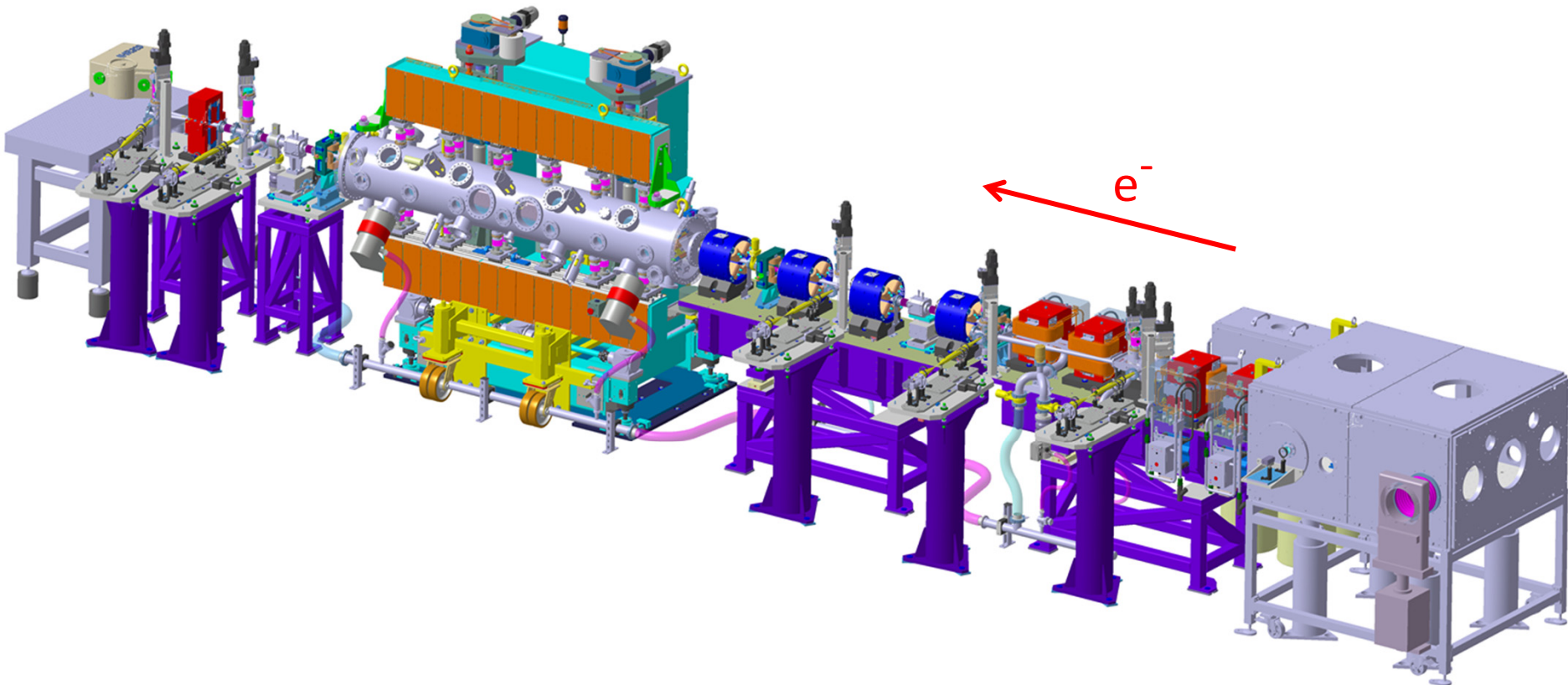
Experiment Hall

Before:

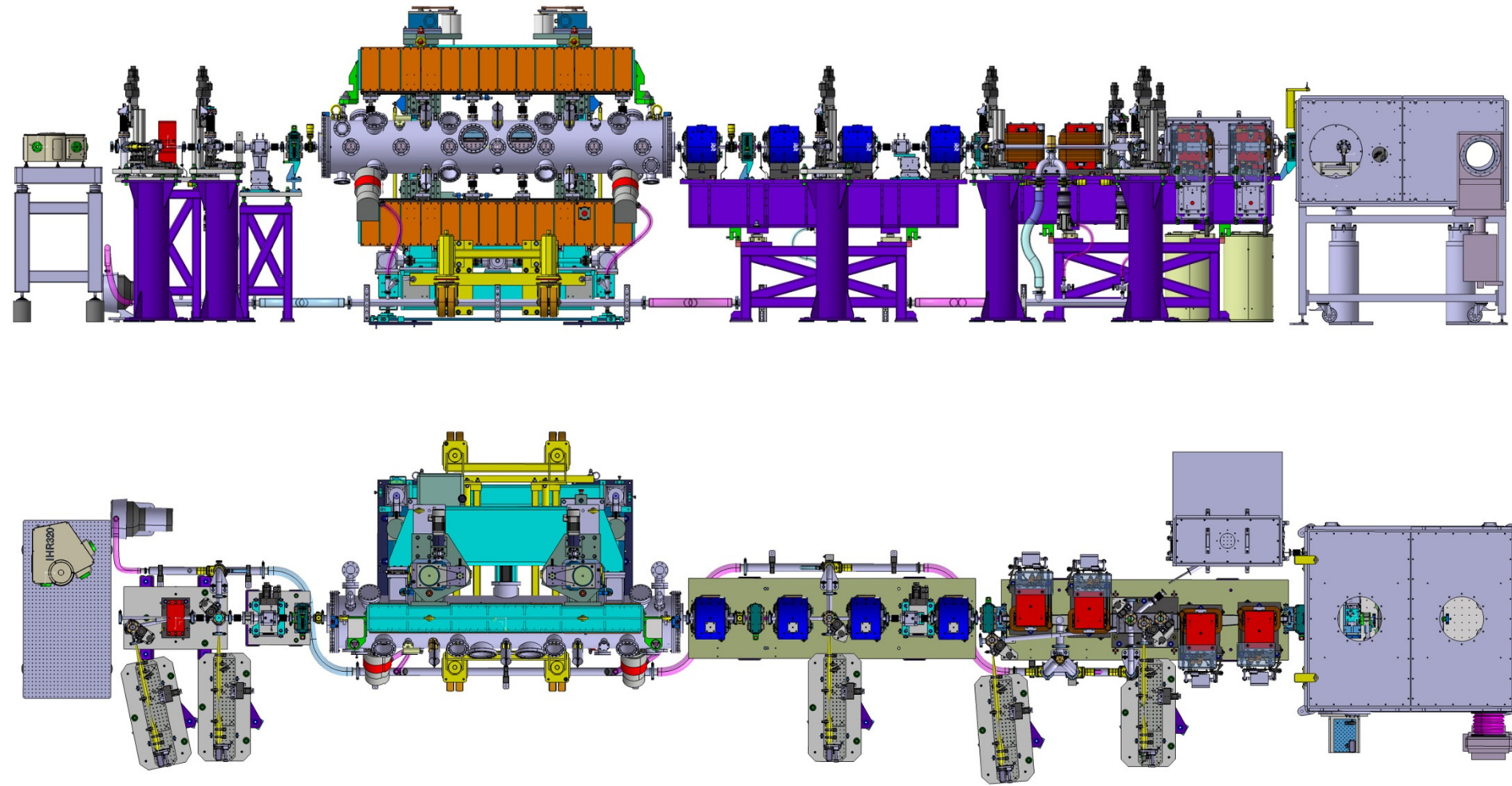


After

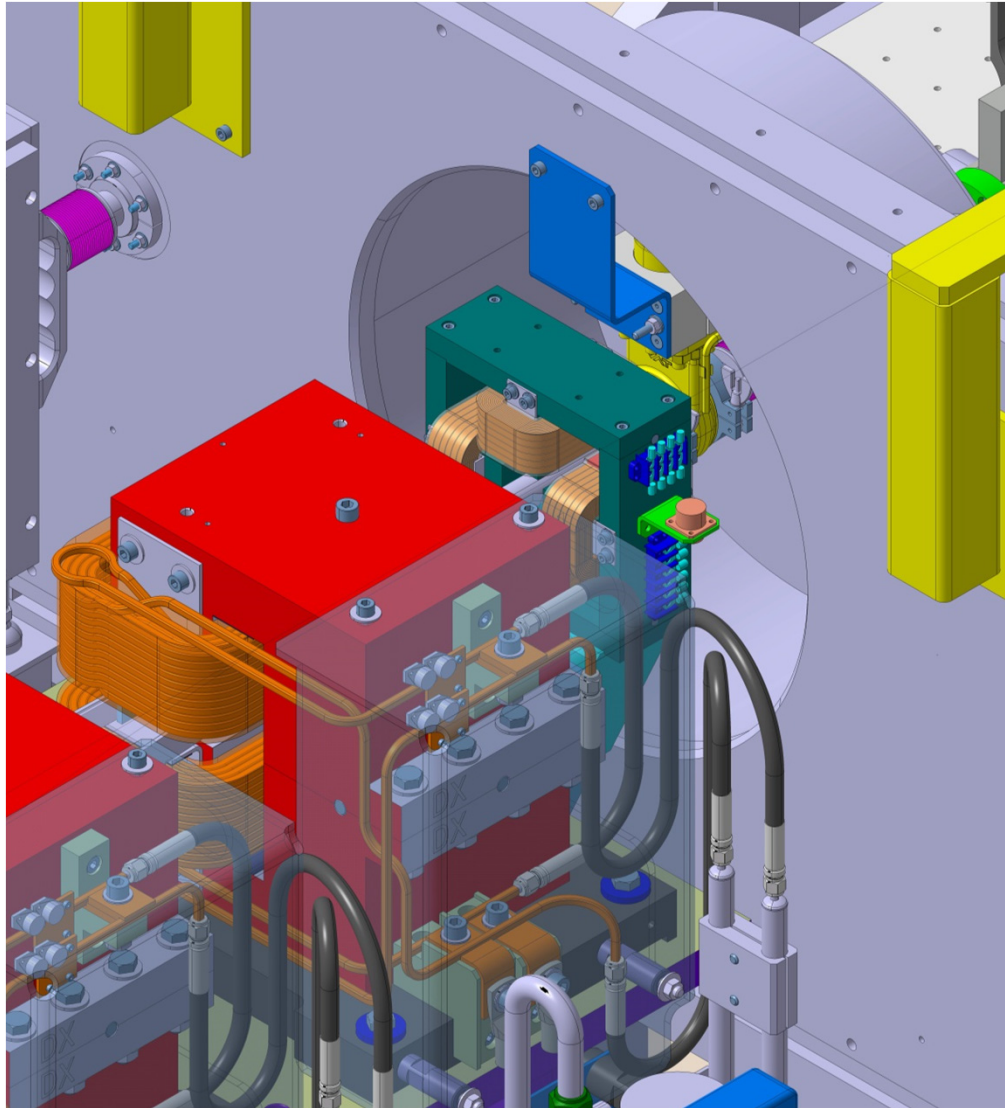
COXINEL Layout



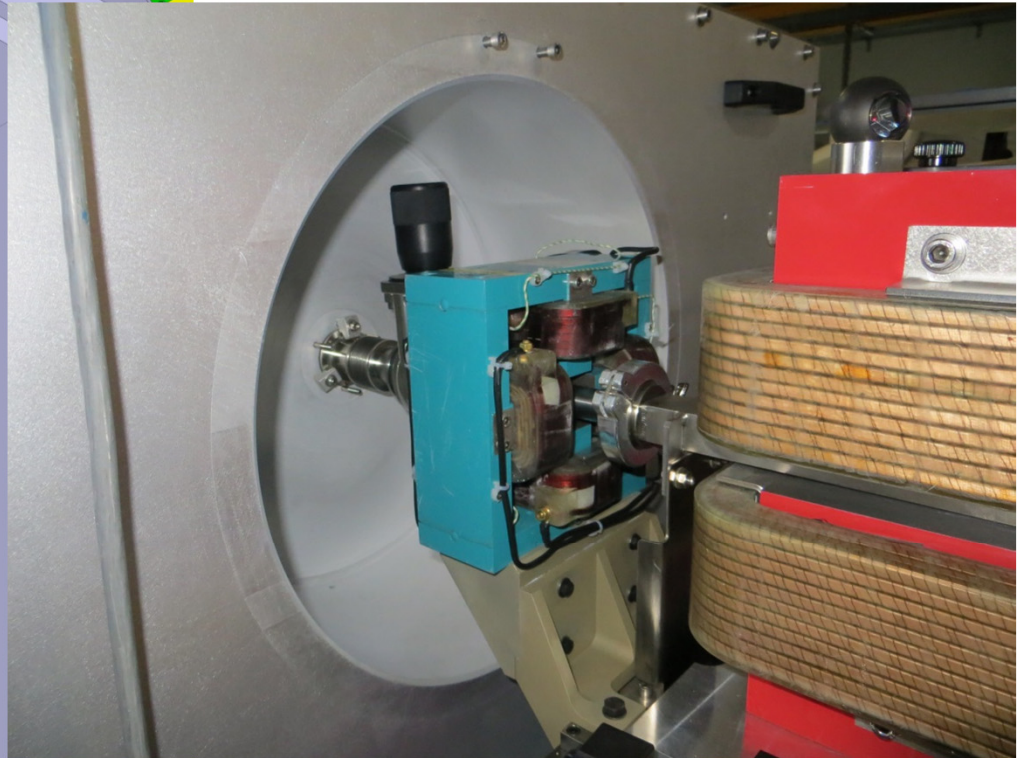
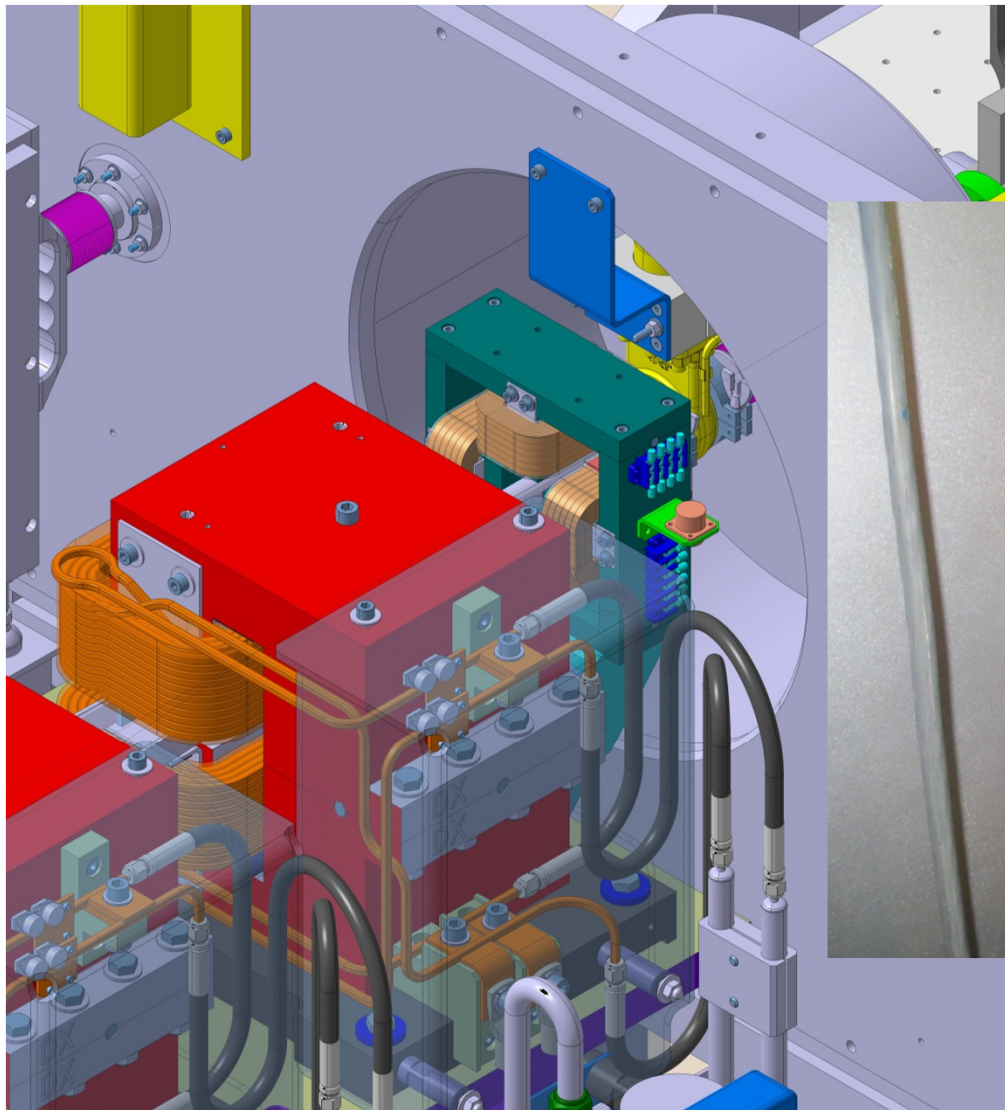
COXINEL Layout



LWFA Vacuum Chamber



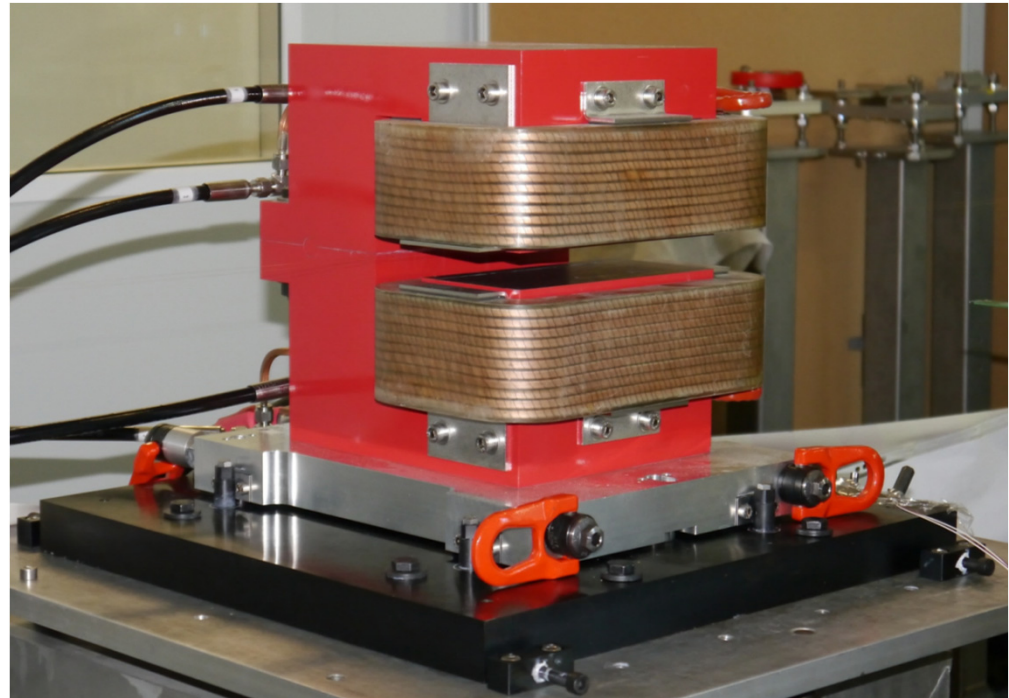
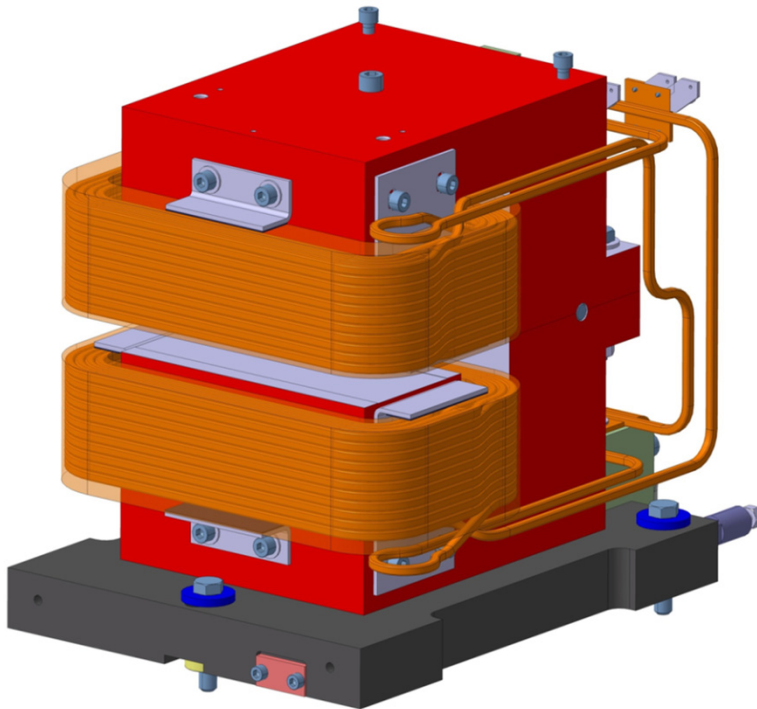
LWFA Vacuum Chamber



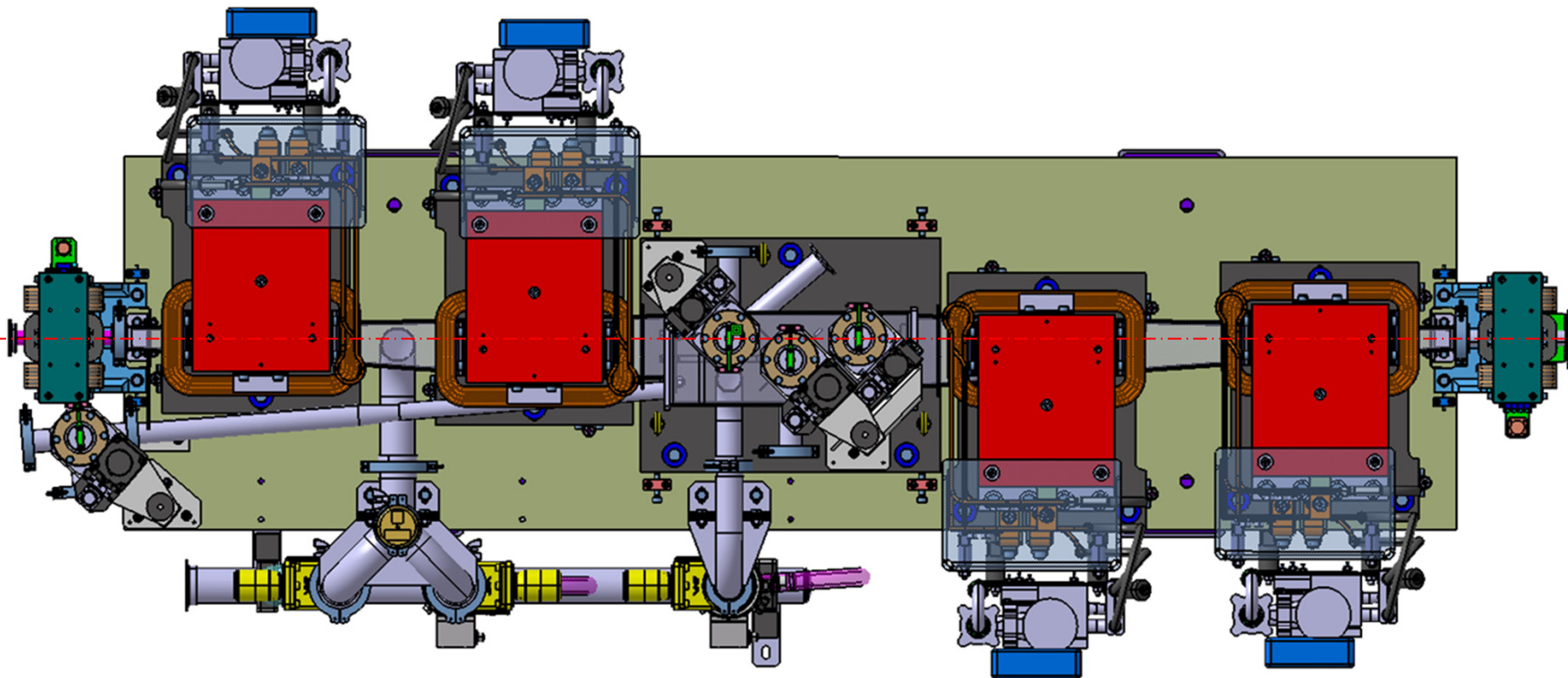
Tuytyuty yuy

Magnetic Chicane

Parameter	Unit	Value
Gap	mm	25
Yoke length	mm	200
Magnetic field @ 150 A	T	0.55
Technology	Water cooled	

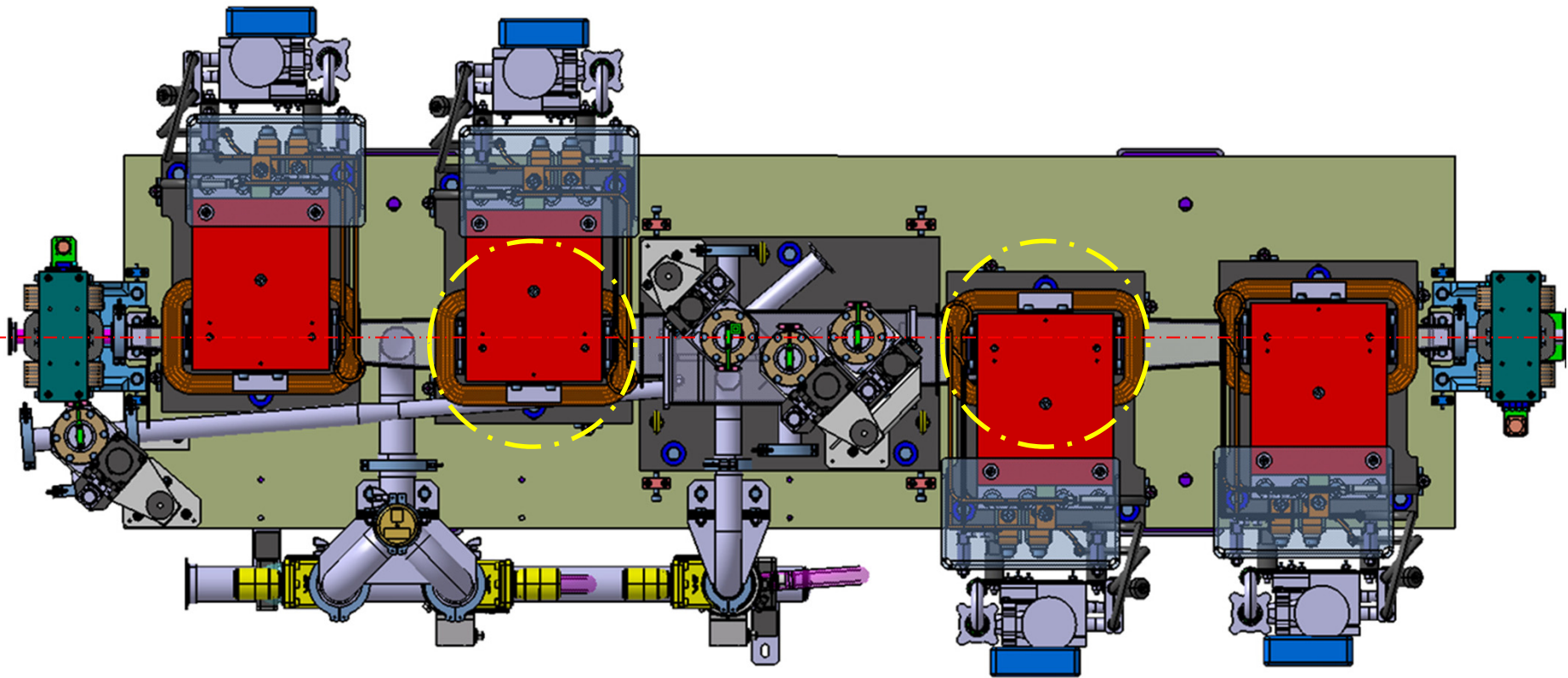


Magnetic Chicane



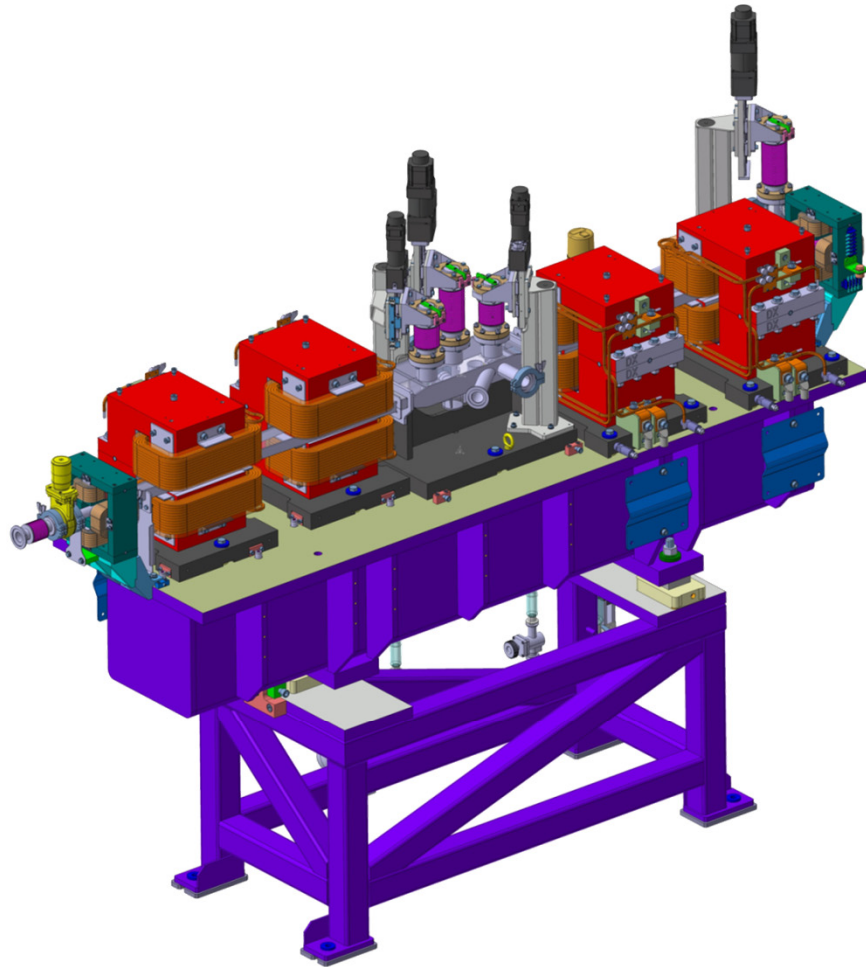
- Face to face chicane configuration
- Dipole 2 & 3 off-axis of 16mm

Magnetic Chicane

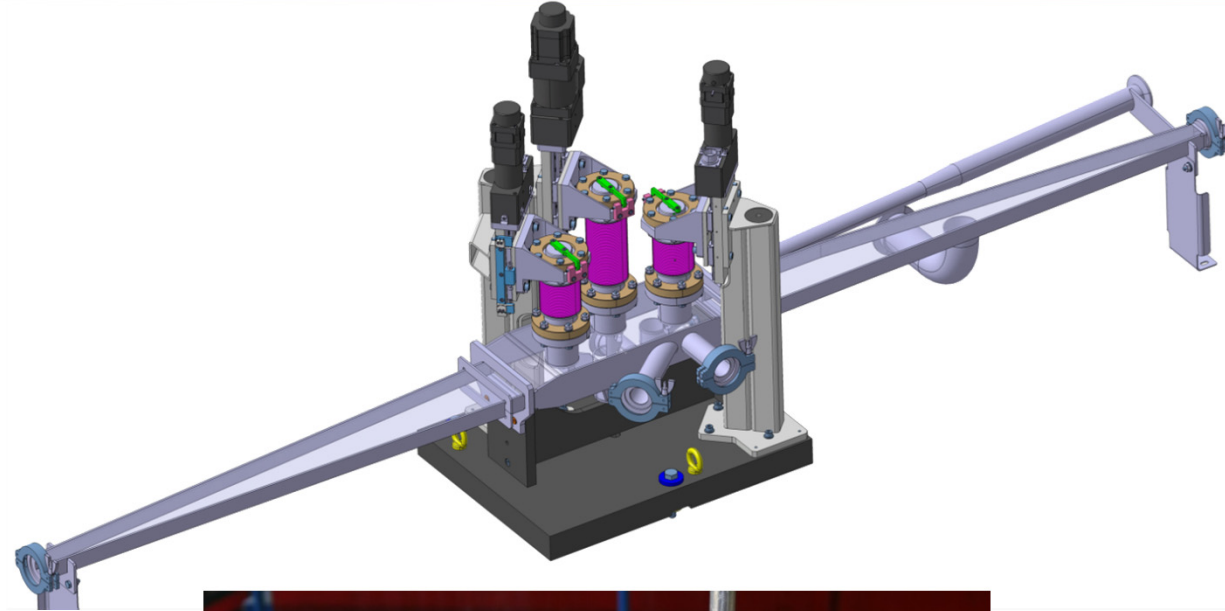


- Face to face chicane configuration
- Dipole 2 & 3 off-axis of 16mm

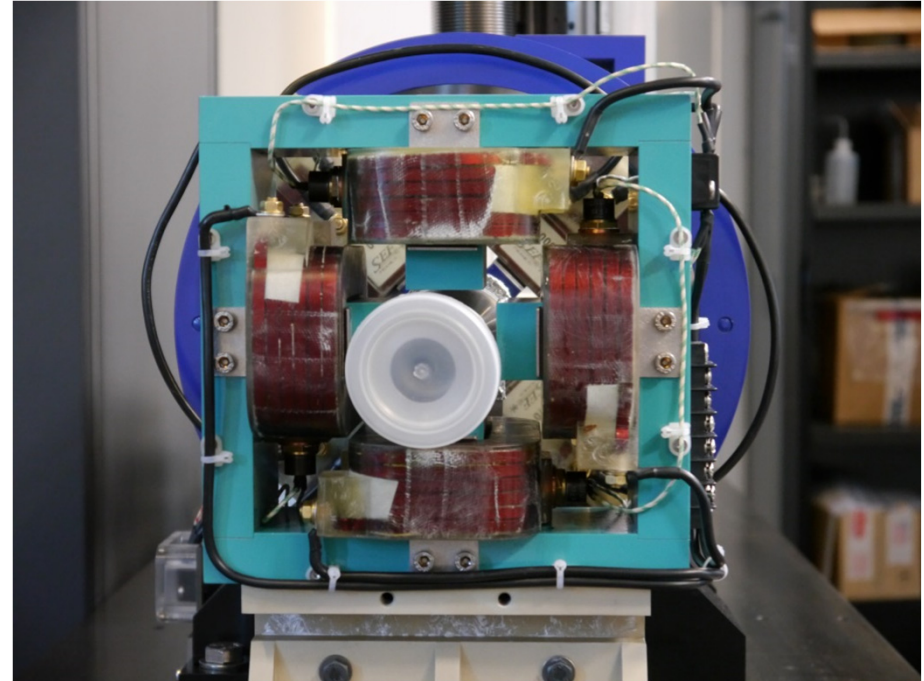
Magnetic Chicane



Chicane Vacuum Chamber

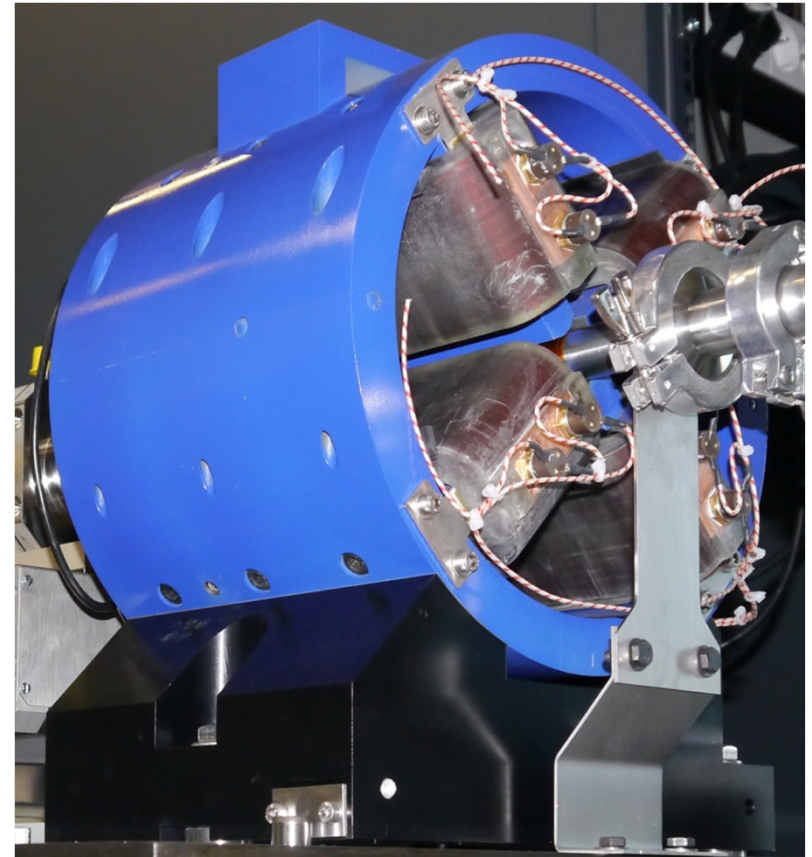
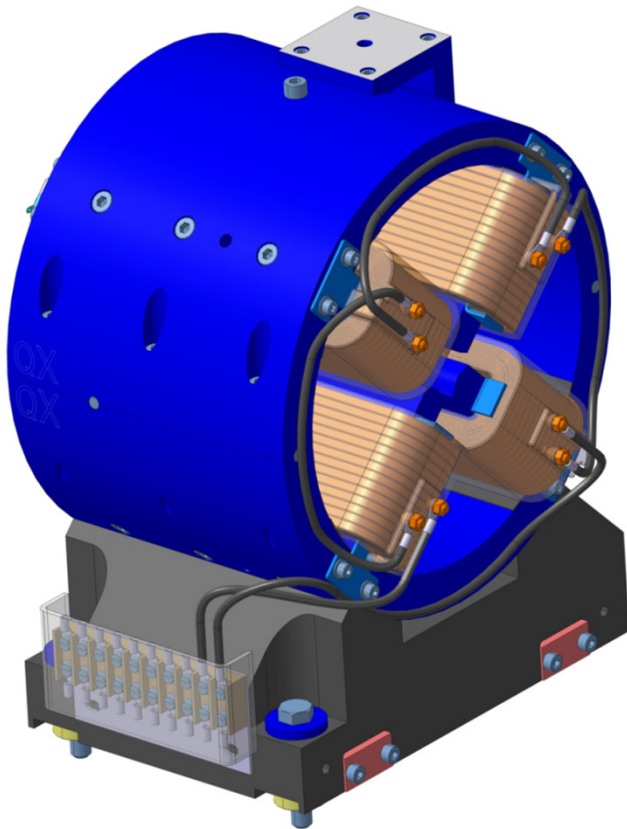


Steerers

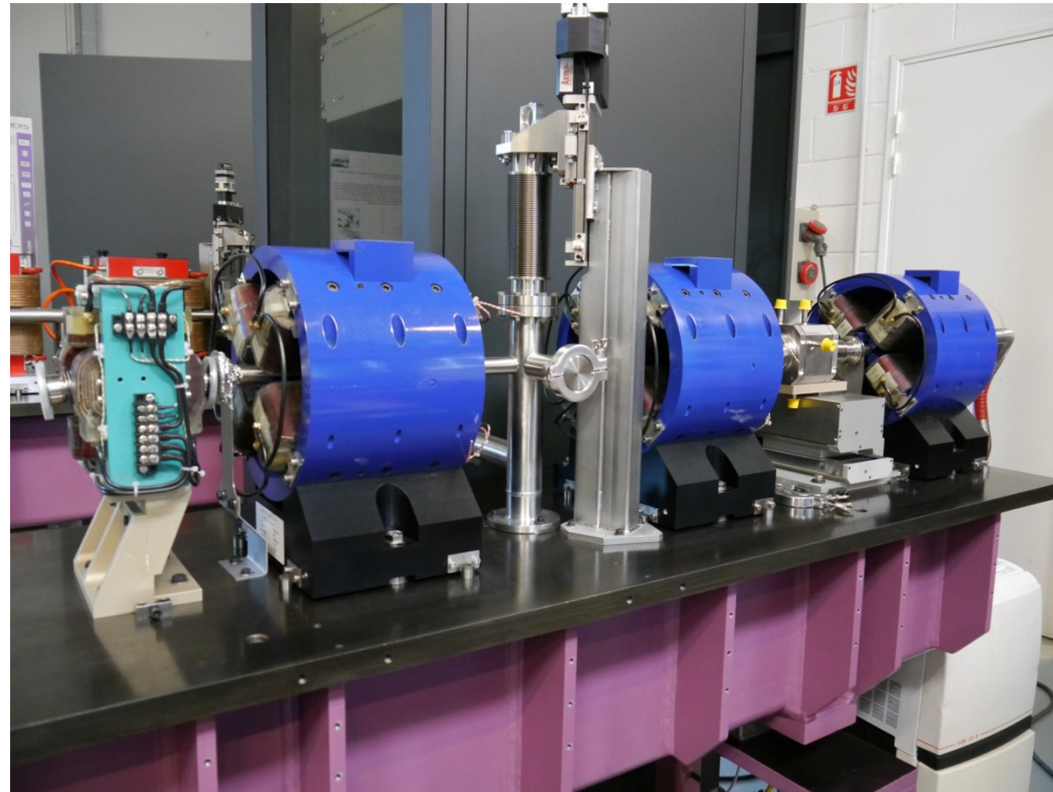
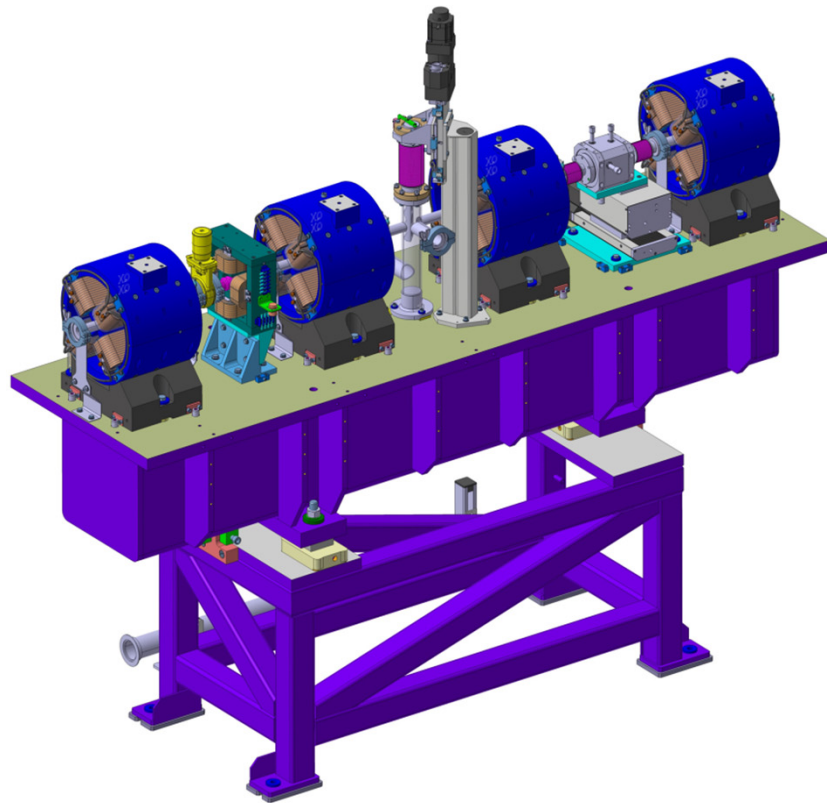


Quadrupoles

Parameter	Unit	Value
Bore diameter	mm	24
Yoke length	mm	200
Maximum gradient	T/m	20
Technology		Water cooled



Quadrupoles' Girder



Quadrupoles' Girder

Tridimensional
control of
girders



On site installation



On site installation



U20 In-Vacuum Undulator

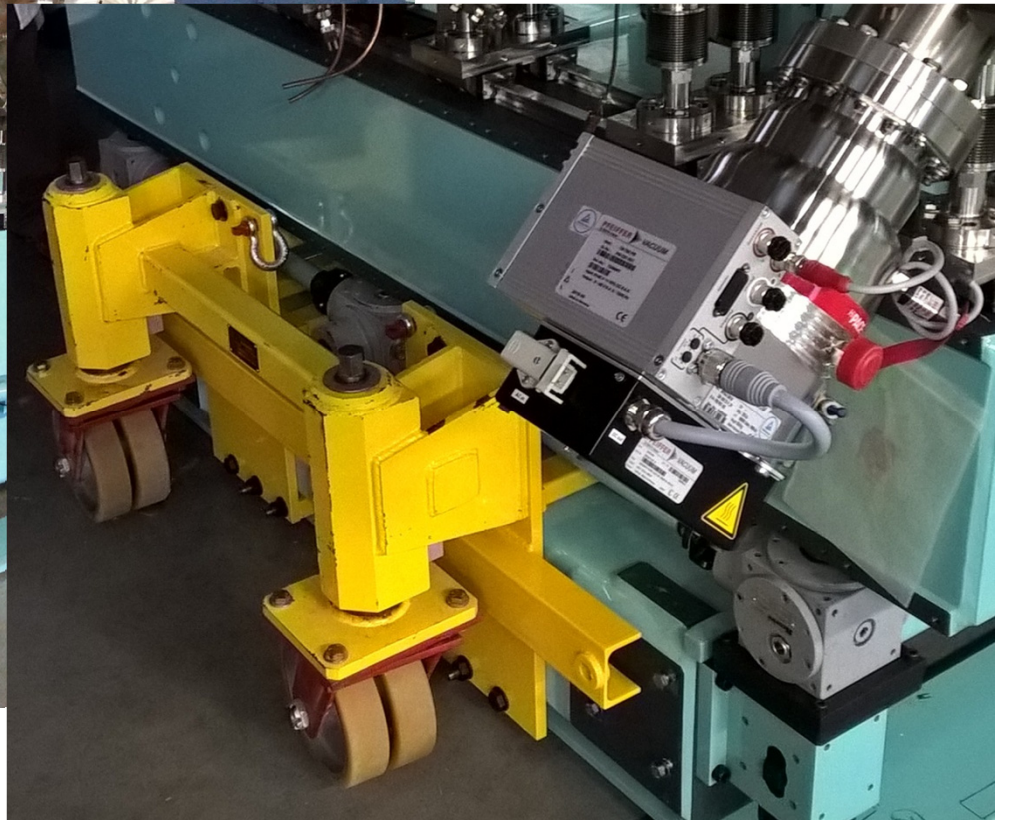


Parameter	Unit	Value
Magnetic period	mm	20
Magnetic length	mm	1950
Minimum gap	mm	5.5
Peak field	T	1.5
Magnet technology	-	Nd ₂ Fe ₁₄ B

U20 In-Vacuum Undulator



Parameter	Unit	Value
Magnetic period	mm	20
Magnetic length	mm	1950
Minimum gap	mm	5.5
Peak field	T	1.5
Magnet technology	-	Nd ₂ Fe ₁₄ B



Special tooling with retractable wheels

On site installation



On site installation



On site installation



On site installation



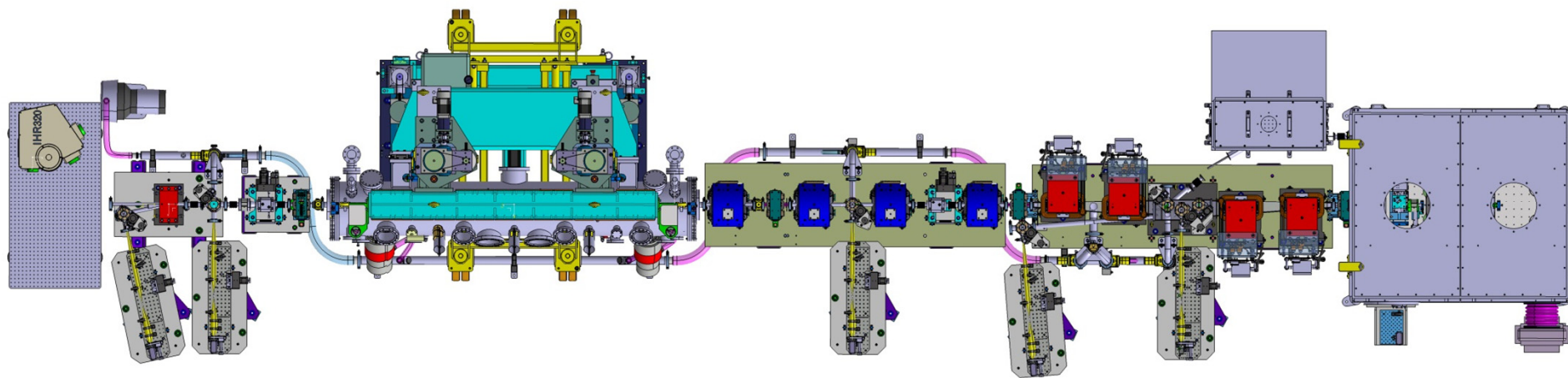
On site installation



On site installation

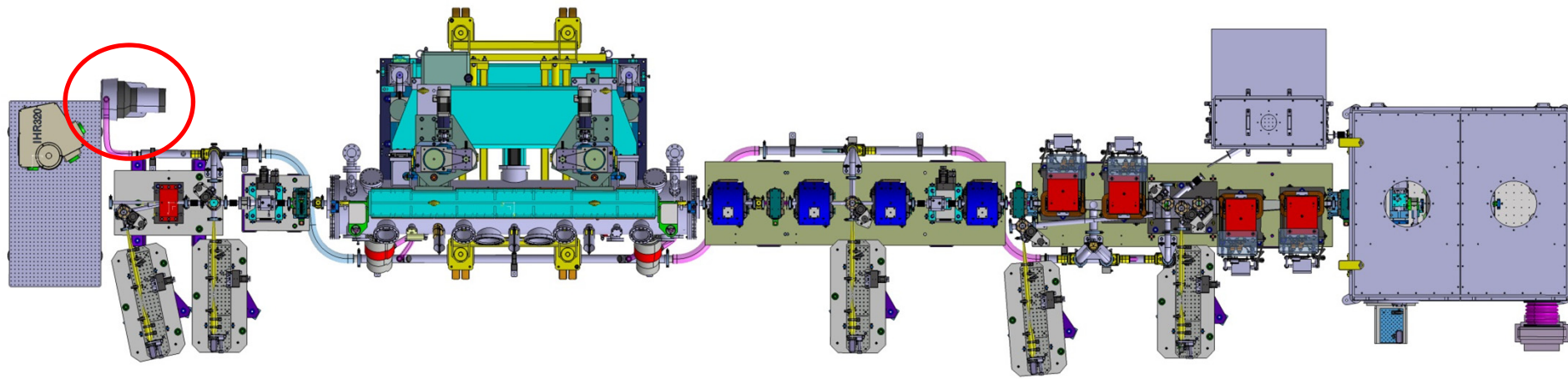


Vacuum system



Vacuum system

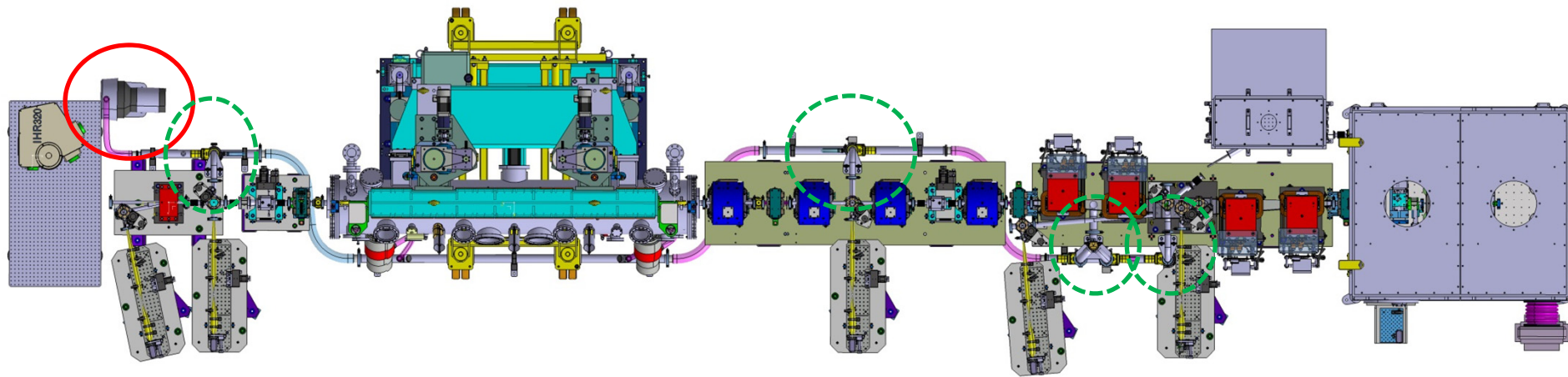
1 x 20 m³/h primary pump (EDWARDS)



Vacuum system

1 x 20 m³/h primary pump (EDWARDS)

4 x 80 l/s Turbo pump (PFEIFFER)

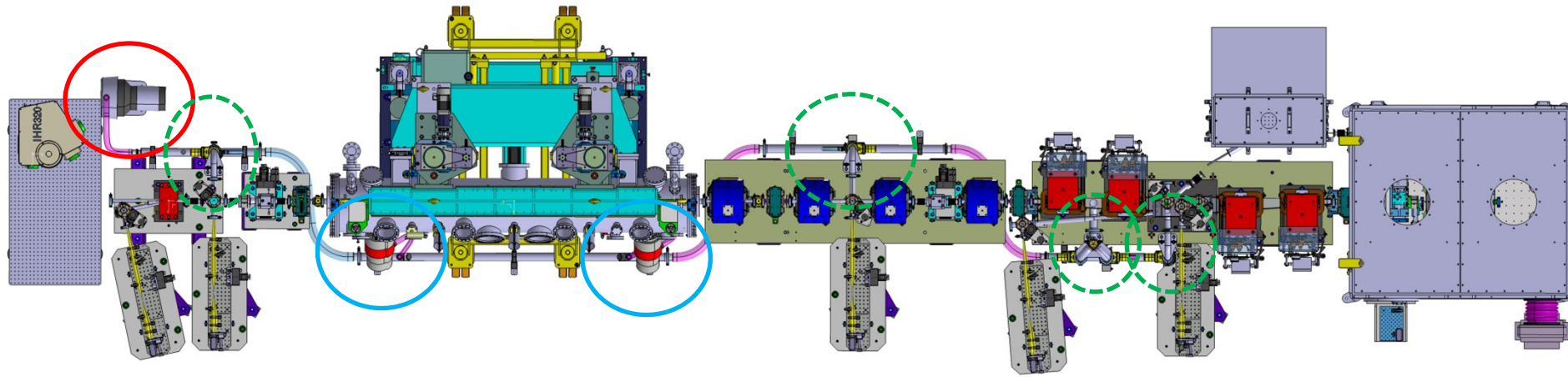


Vacuum system

1 x 20 m³/h primary pump (EDWARDS)

4 x 80 l/s Turbo pump (PFEIFFER)

2 x 300 l/s Turbo pump (PFEIFFER)

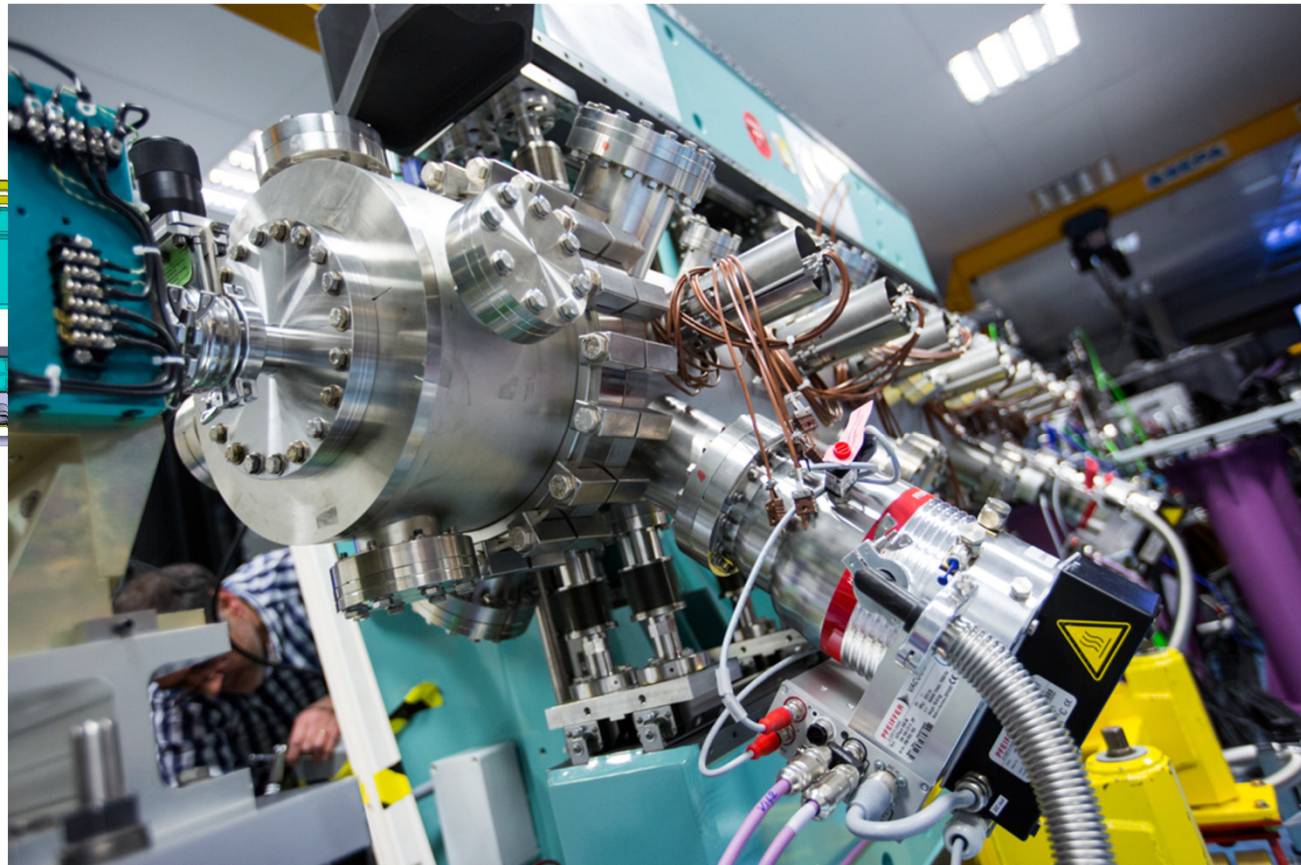
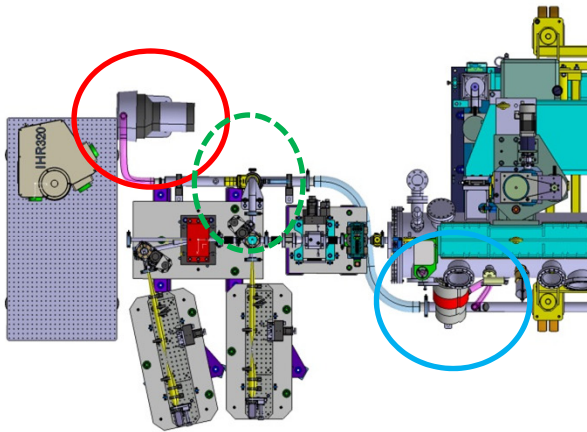


Vacuum system

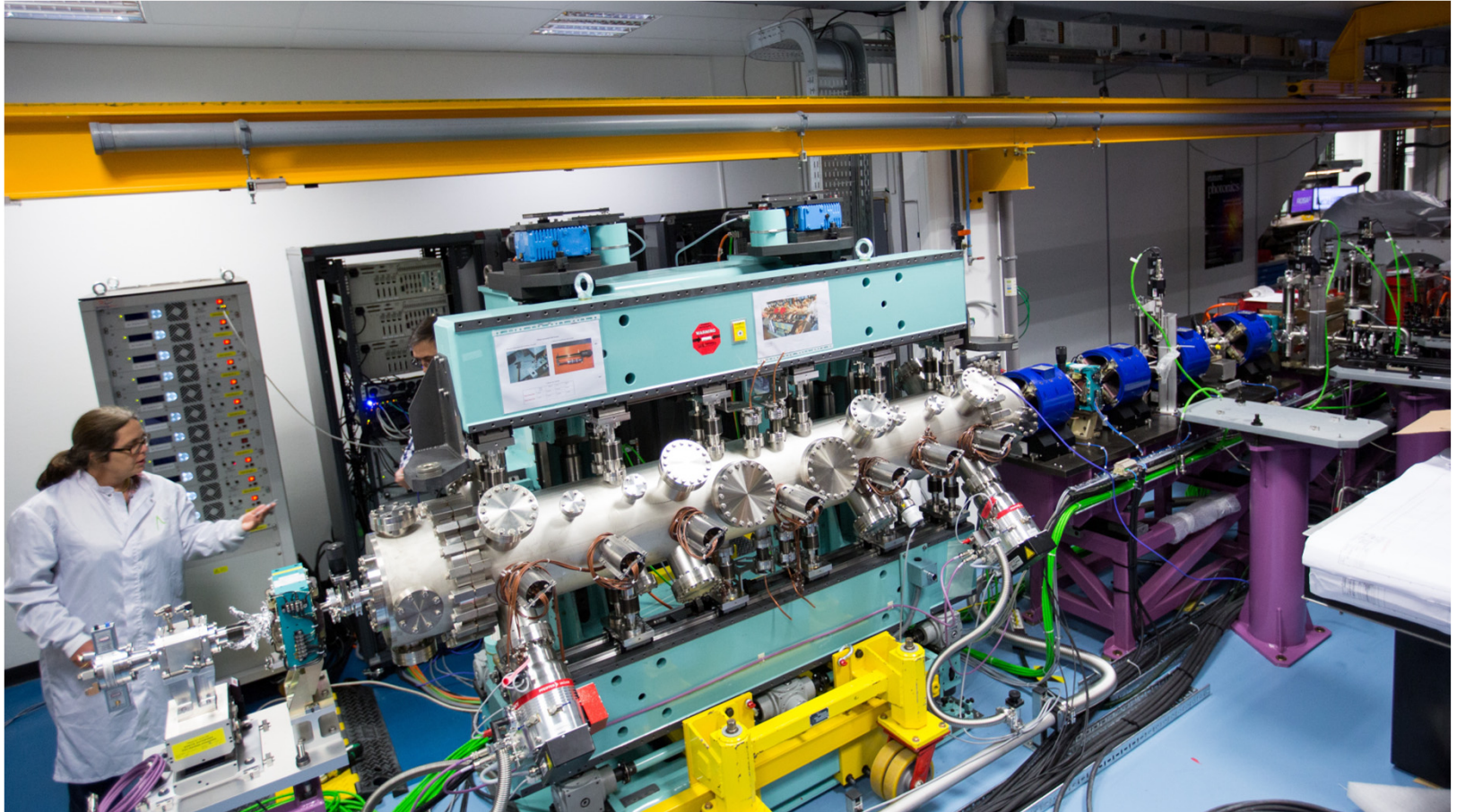
1 x 20 m³/h primary pump (EDWARDS)

4 x 80 l/s Turbo pump (PFEIFFER)

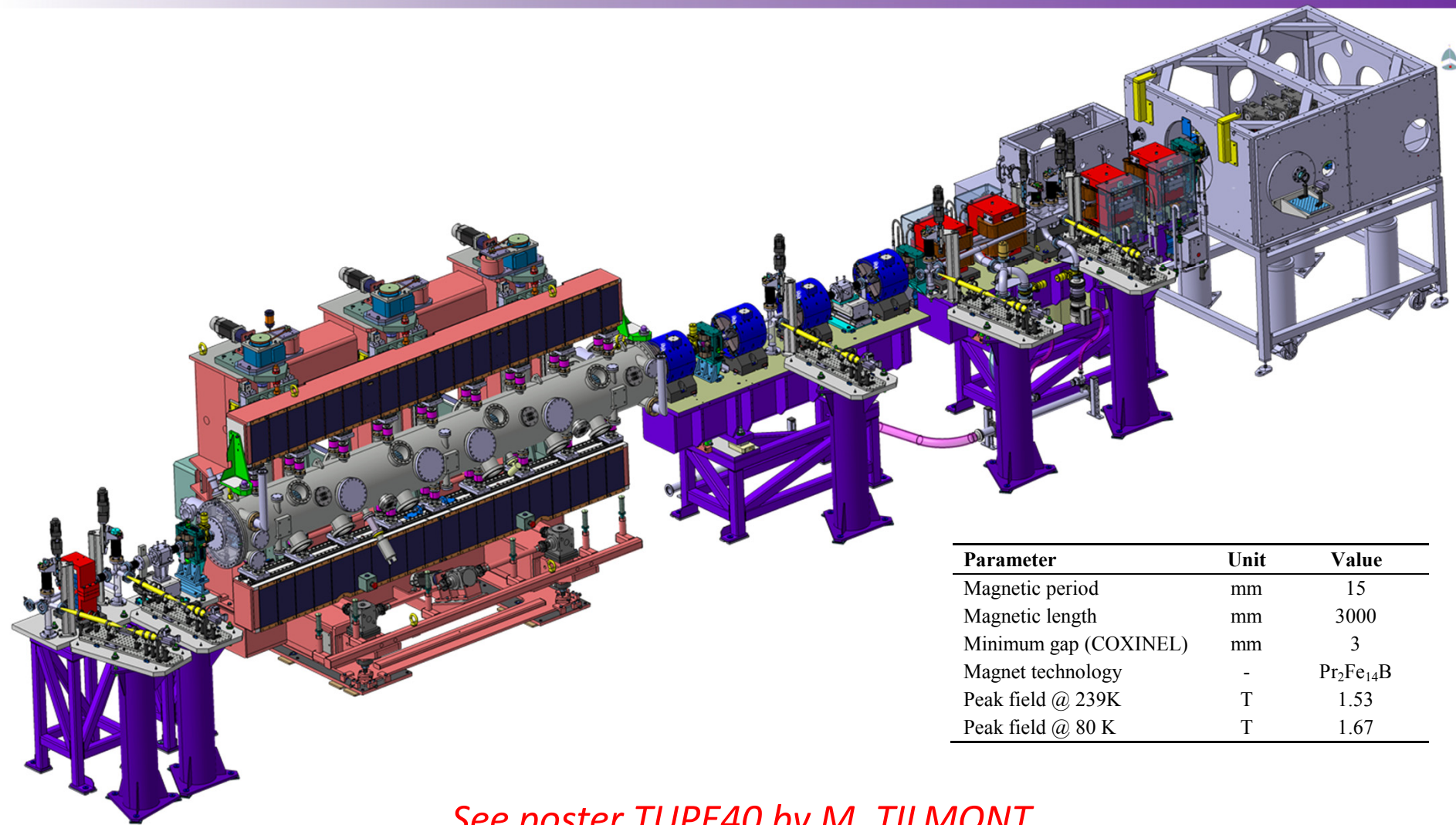
2 x 300 l/s Turbo pump (PFEIFFER)



On site installation



Future developments



Parameter	Unit	Value
Magnetic period	mm	15
Magnetic length	mm	3000
Minimum gap (COXINEL)	mm	3
Magnet technology	-	Pr ₂ Fe ₁₄ B
Peak field @ 239K	T	1.53
Peak field @ 80 K	T	1.67

See poster TUPE40 by M. TILMONT

Thanks for your attention

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