Leadscrews CERN applications

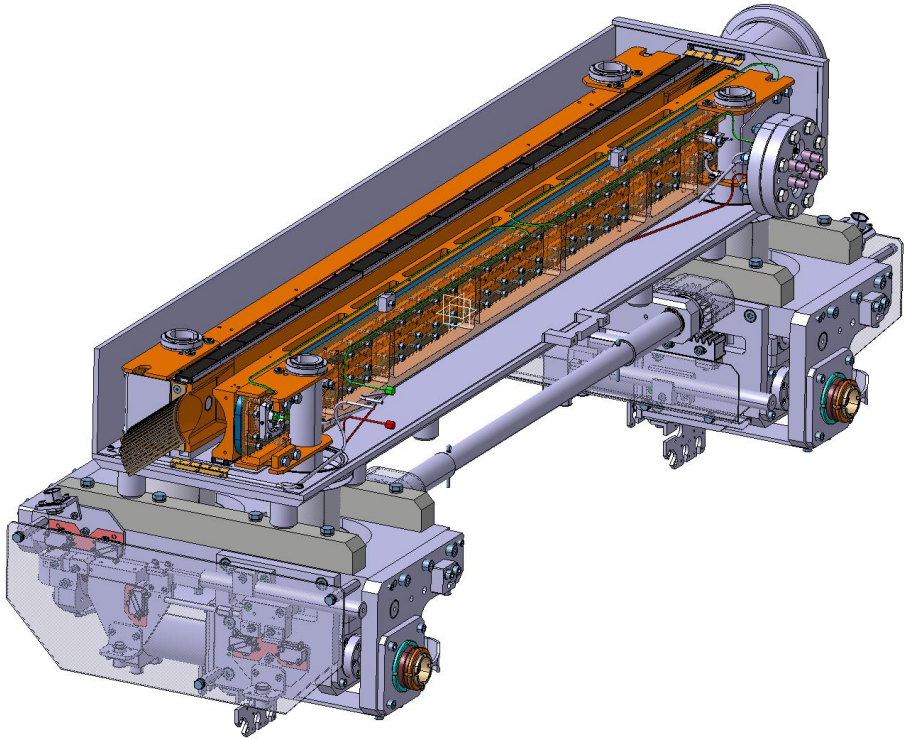
ROLLVIS at CERN

L. Gentini

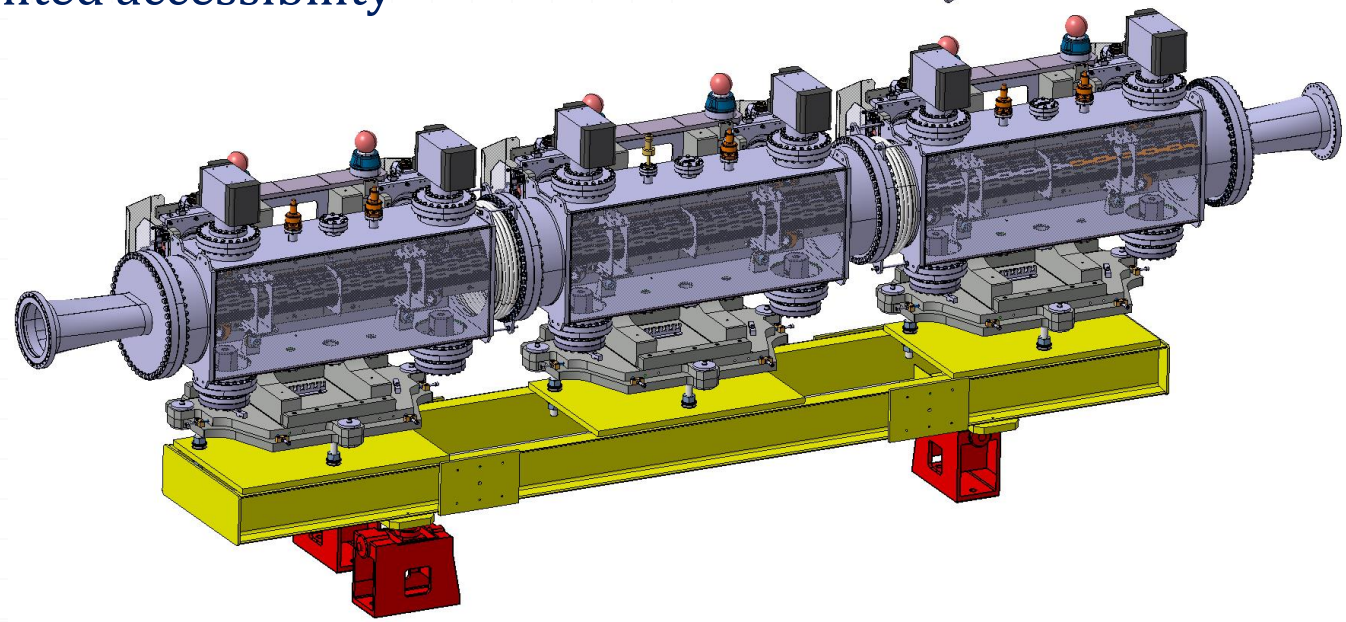
Collimators

Dumpers

Several others projects



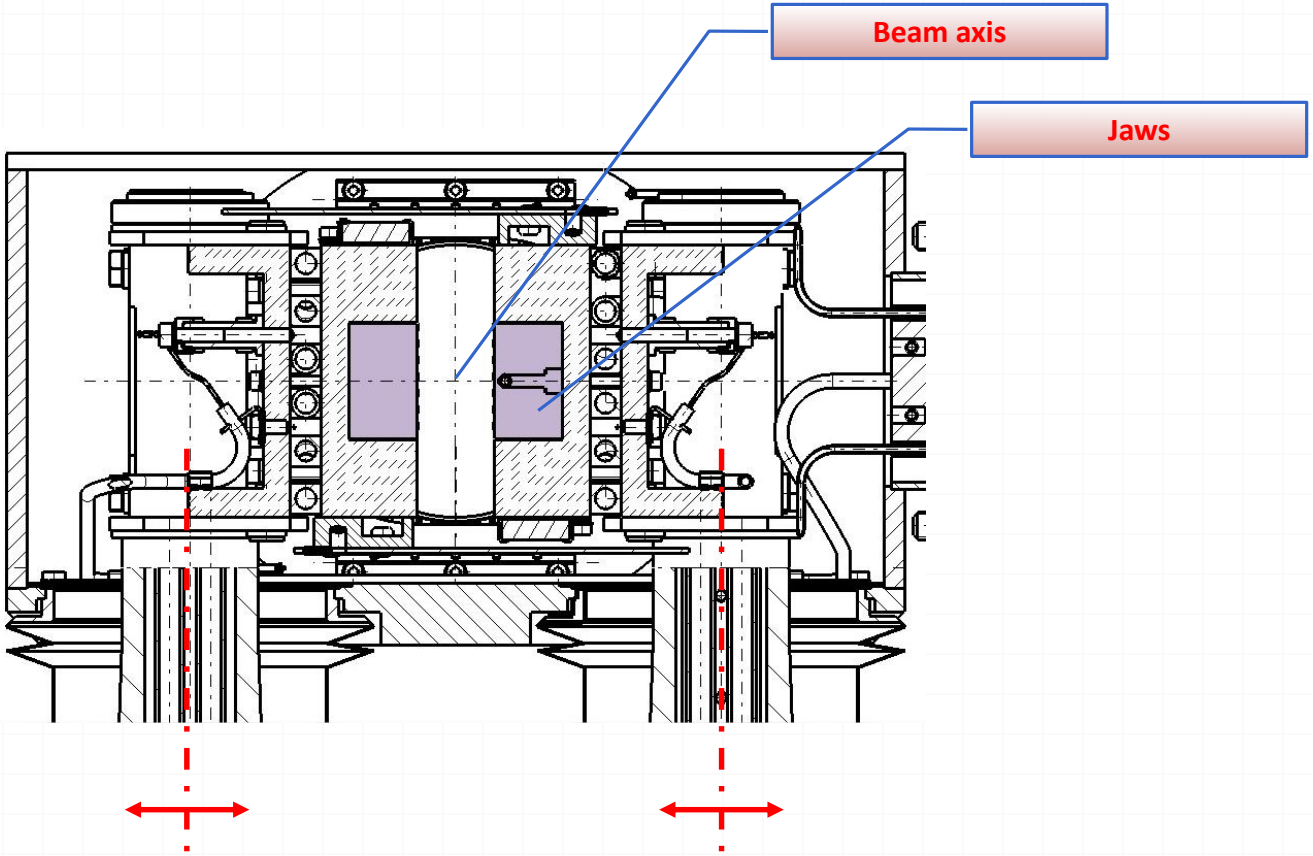
- Very long lifetime: ~20 years
- Environment: dust and humidity
- Radiation: up to 10MGy
  Limited accessibility



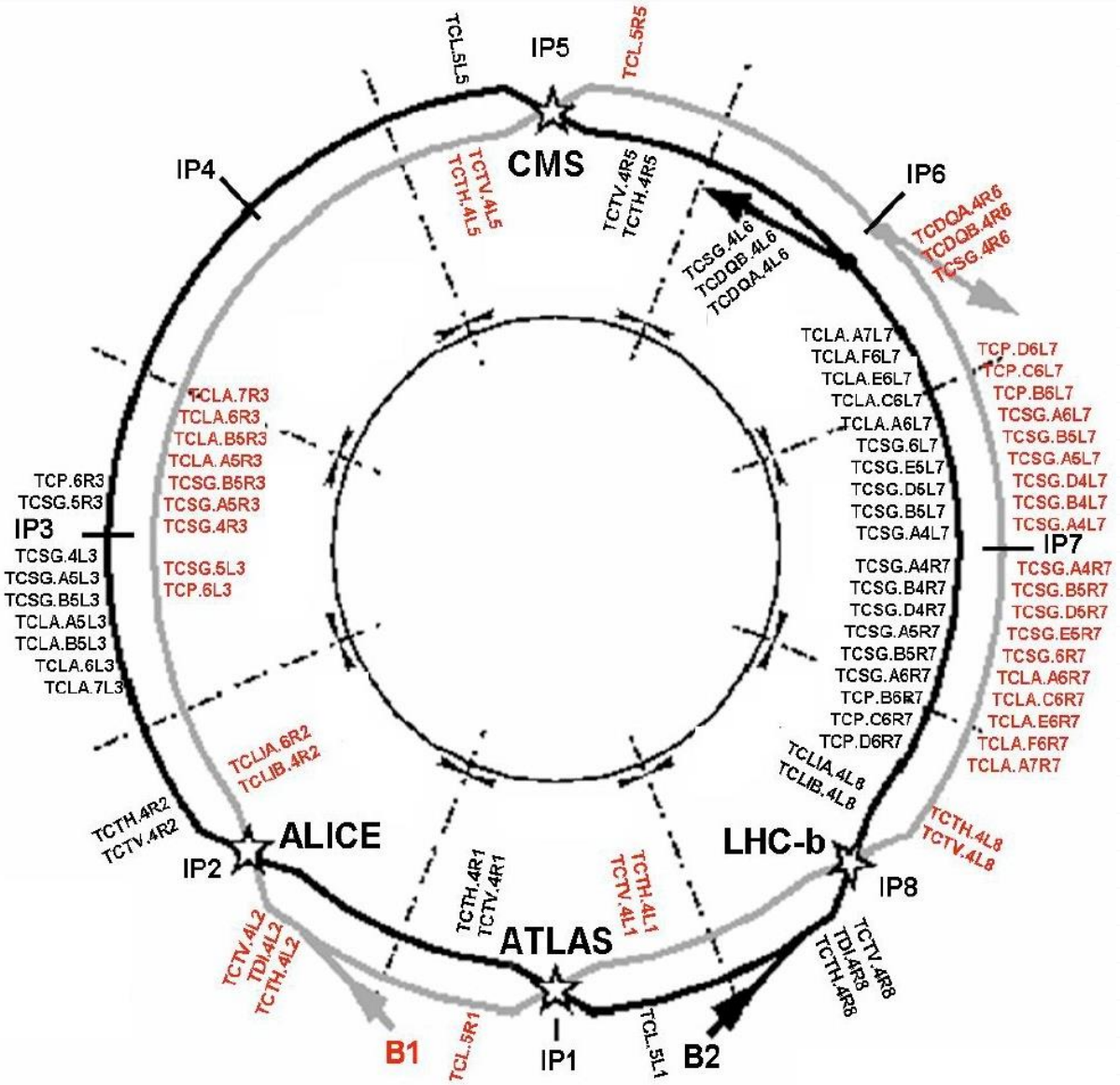
Functionality of a collimator

1. Cleaning of the beam halo
2. Protection of the machine

How it works ?

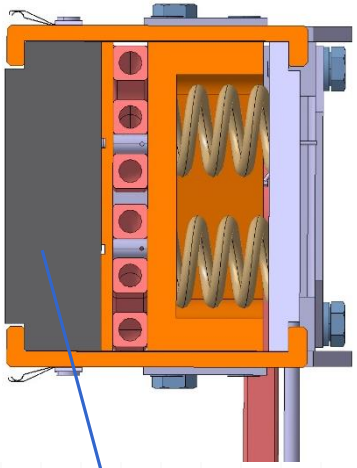


Where are the collimators placed?



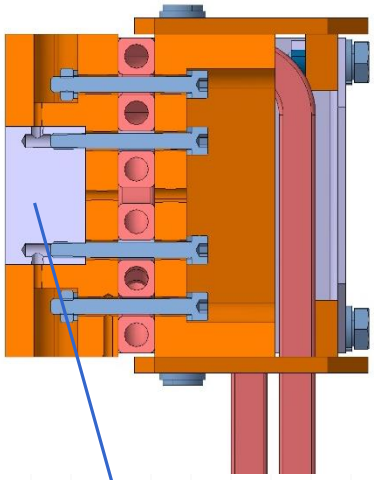
More than 120 collimators installed

TCPP / TCSP



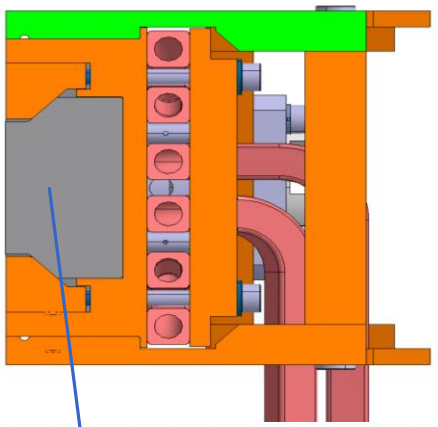
Graphite

TCTP

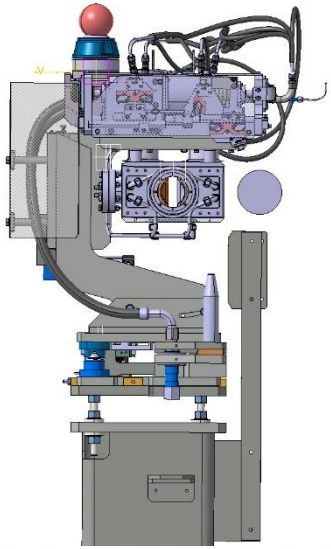


Tungsten

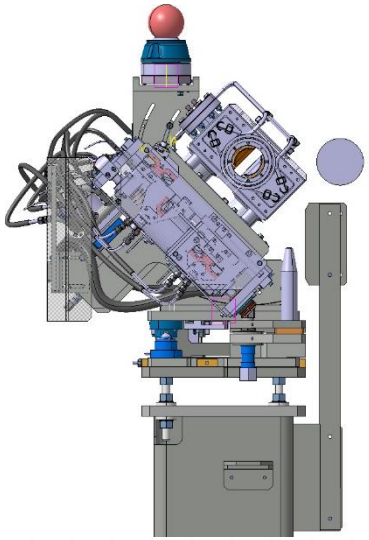
TCSPM



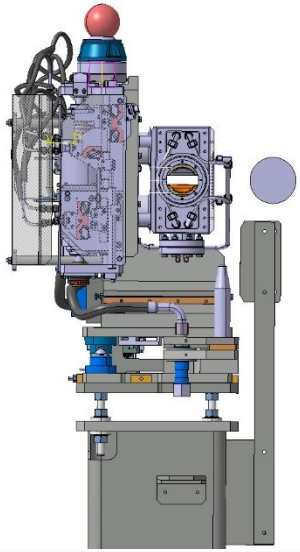
MoGr



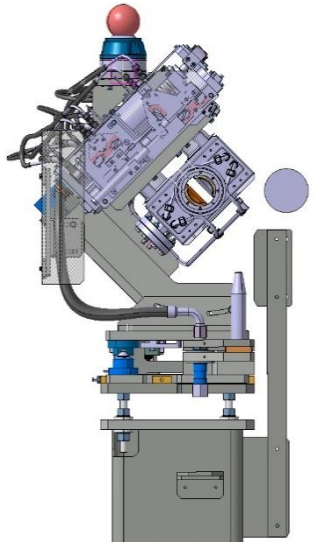
0°



45°



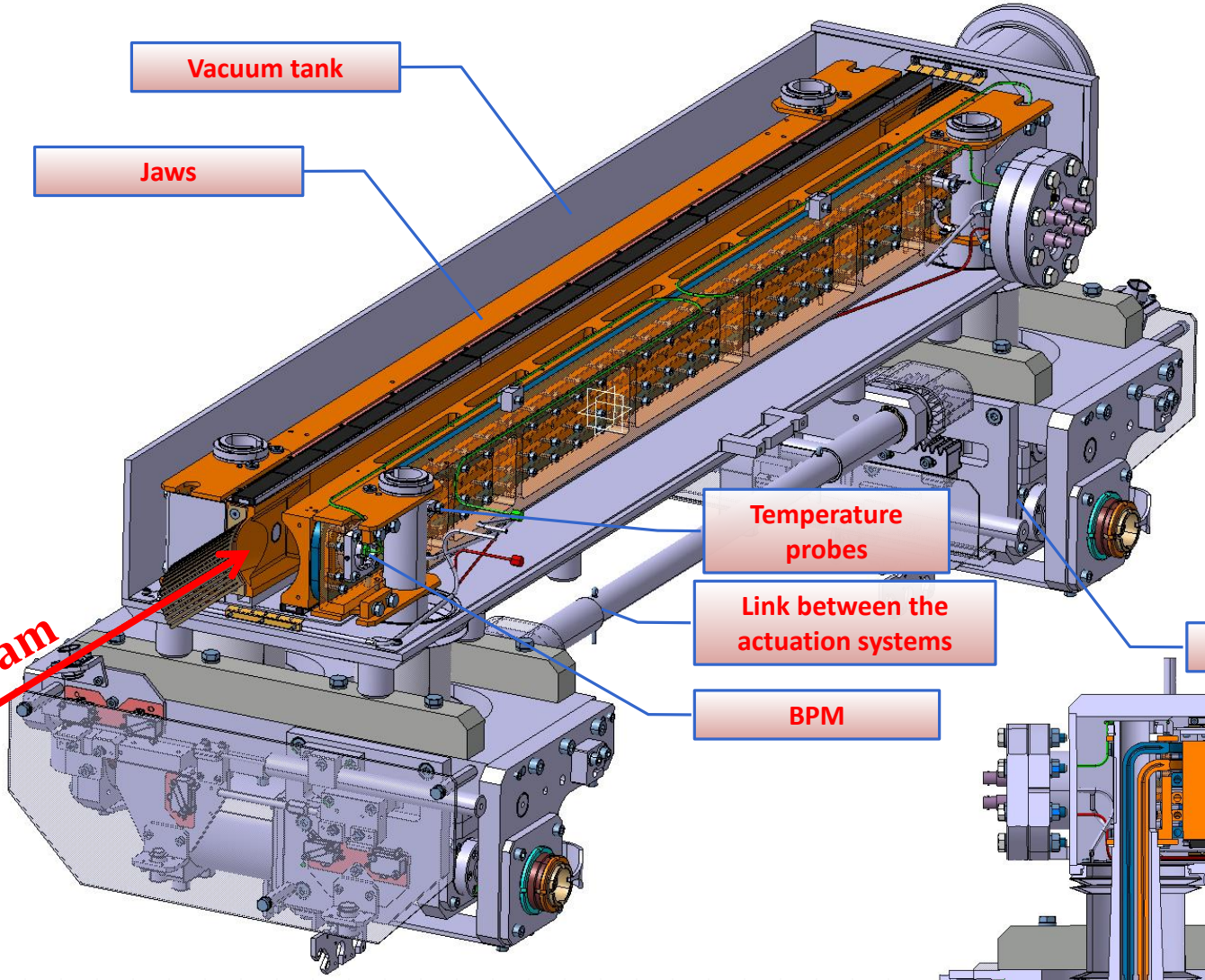
90°

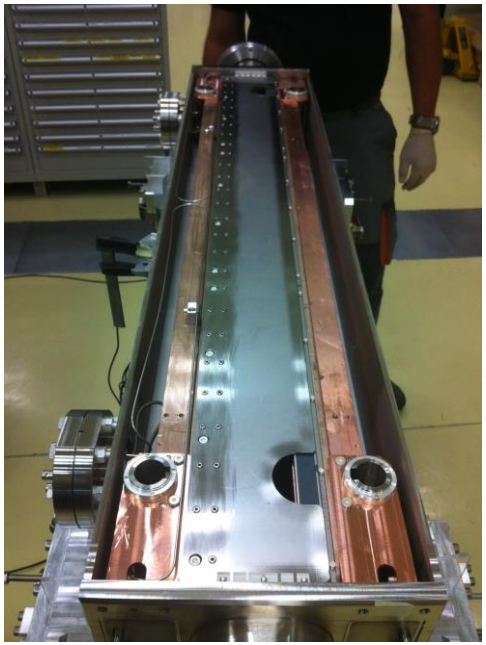


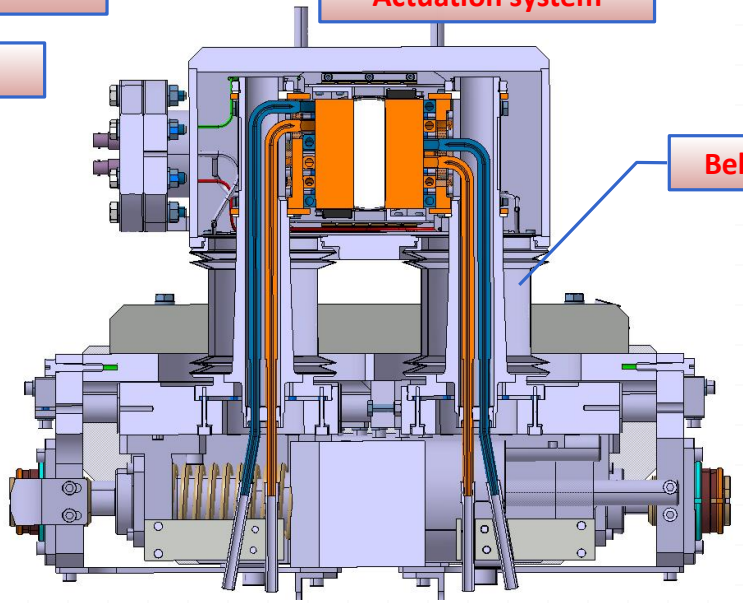
135°

STANDARD SPECIFICATIONS

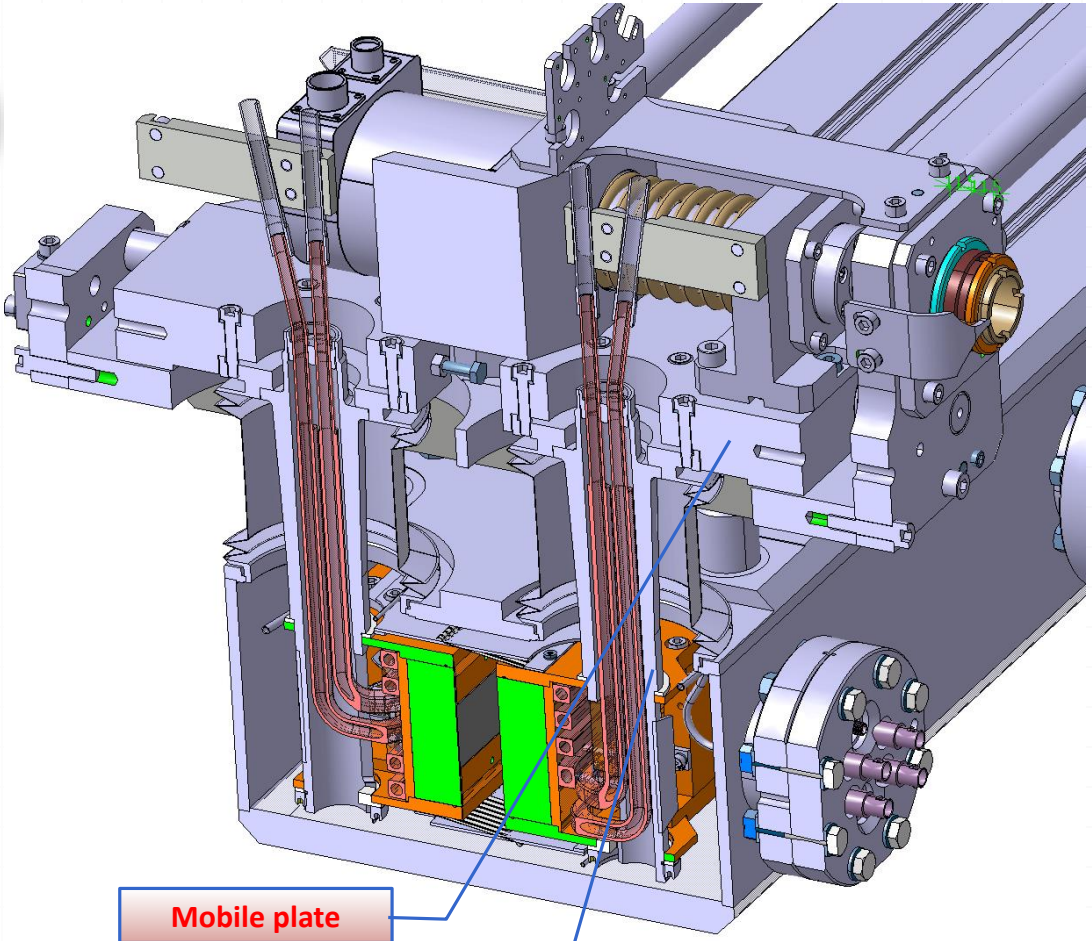
- **Jaw material :** Different materials
- RF screen material: St. Steel 304L (no coating)
- **Active length :** 600 ÷ 2000 mm (without tapering)
- Tapering length : 2x 100 mm (just on the extremities)
- Jaw length: 1200 mm
- Absorber block width: various
- Absorber block height: various
- RF contacts : Yes
- RF ferrite tiles: Yes
- Jaw cooling : yes (Brazed CuNi pipes)
- Tank cooling : No
- Tank length : 1080 ÷ 1580 mm
- Jaw temperature monitors : 2x PT 100 (each jaw)
- Jaw position control : 2 LVDT each jaw + 2 LVDT anti-collision
- Jaw beam position monitor: yes
- Jaw angle : 5 mrad max (2 motors per jaw)
- Centre across zero : 5 mm
- **Jaw surface flatness :** 0.1 mm (in operation) ; 0.04 mm without load
- Minimum gap opening (anti-collision):0.4 mm ±0.1 mm
- Maximum gap opening : 60 mm ±0.1 mm
- Extreme jaw positions : -5 / +30 mm
- **Jaw stroke :** 35 mm
- **Jaw position reproducibility accuracy** ±0.01 mm
- Jaw movement speed : 2 mm/s
- **Minimum step size:** 0.01 mm
- Jaw position to be maintained in the event of power / control off.
- Automatic electrical plug-in: yes
- Automatic water connection: yes
- Alignment tanks/machine axis: ±0.1 mm
- Jaws / tank axis positioning: ±0.02 mm

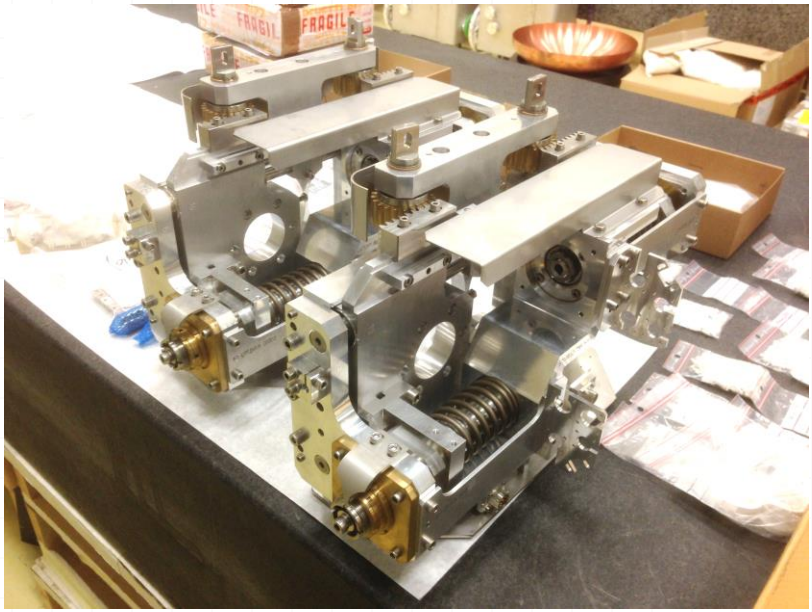

Vacuum tank
Jaws
Temperature probes
Link between the actuation systems
BPM
Beam

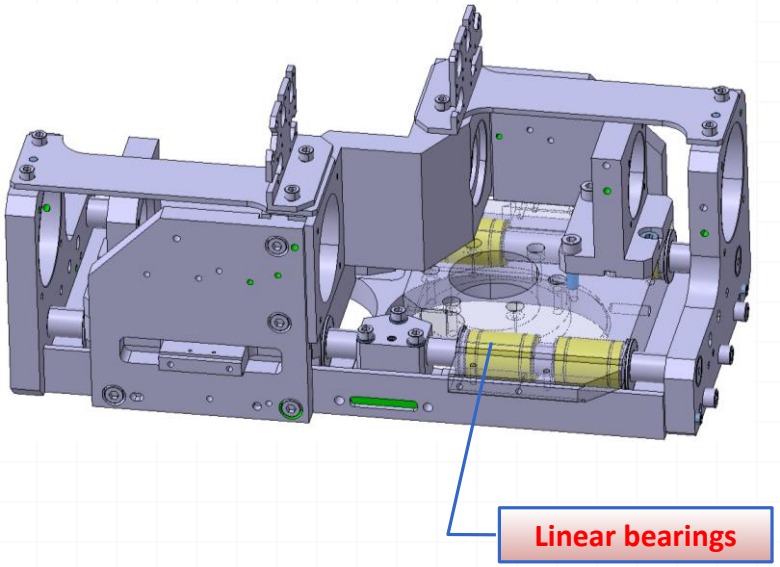



Actuation system
Bellows

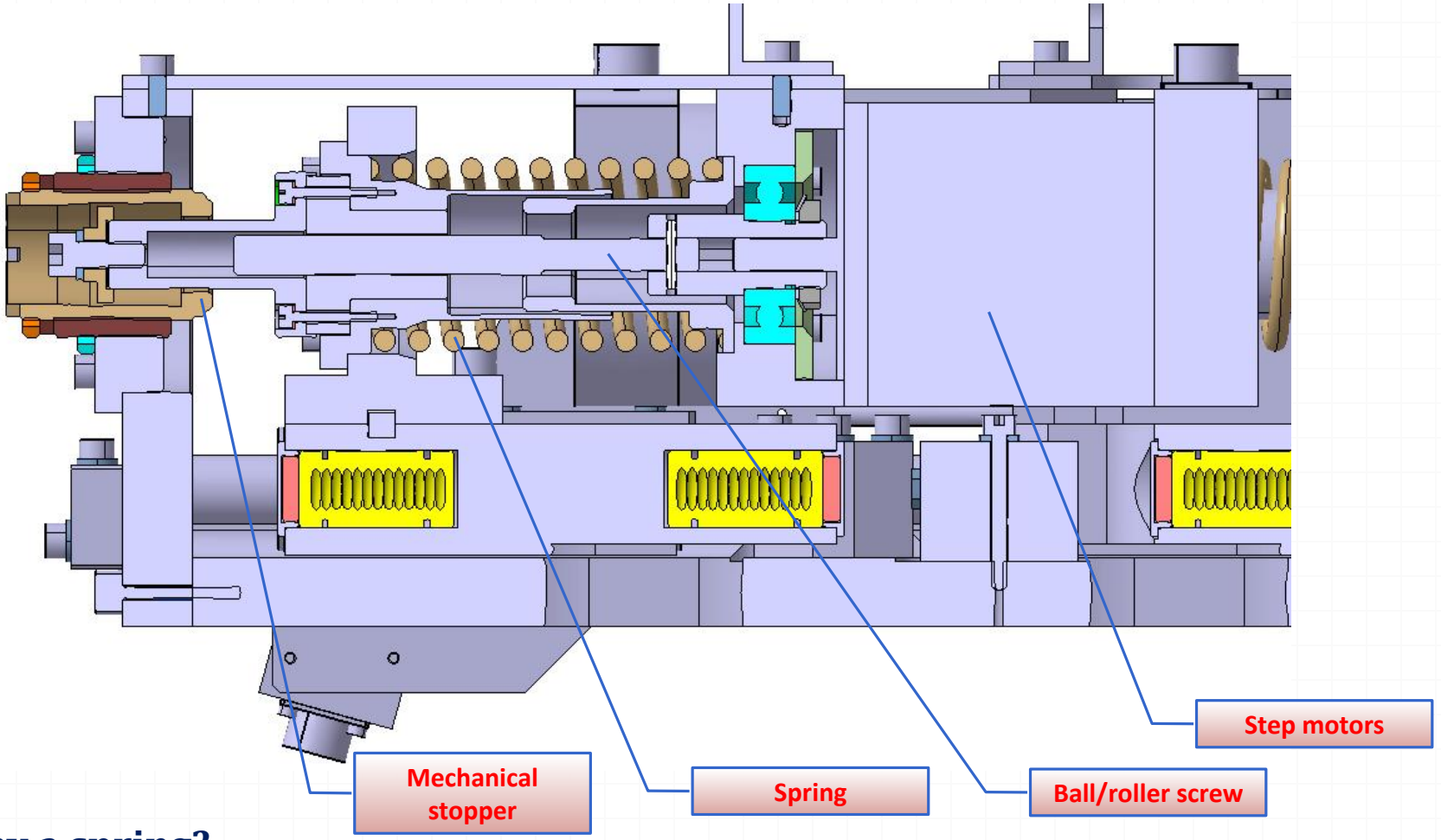
Collimator mechanical table







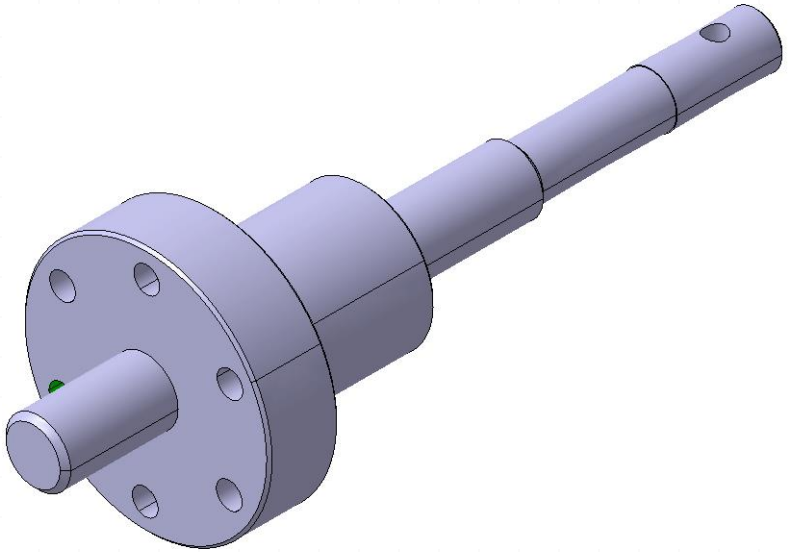
Collimator mechanical table



Why a spring?

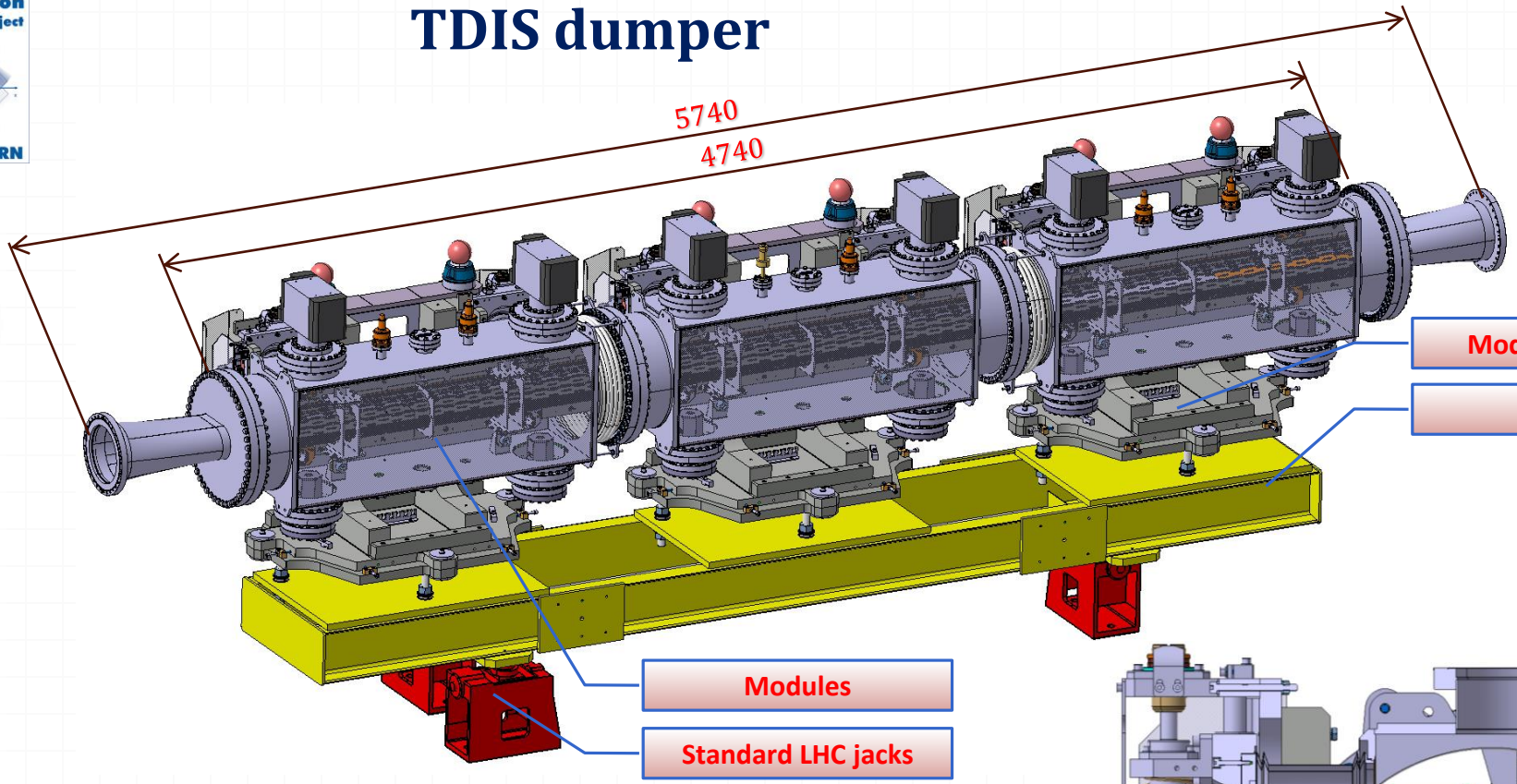
- In case of power lost, the jaw cannot go in beam direction.
- The screw works always in traction.

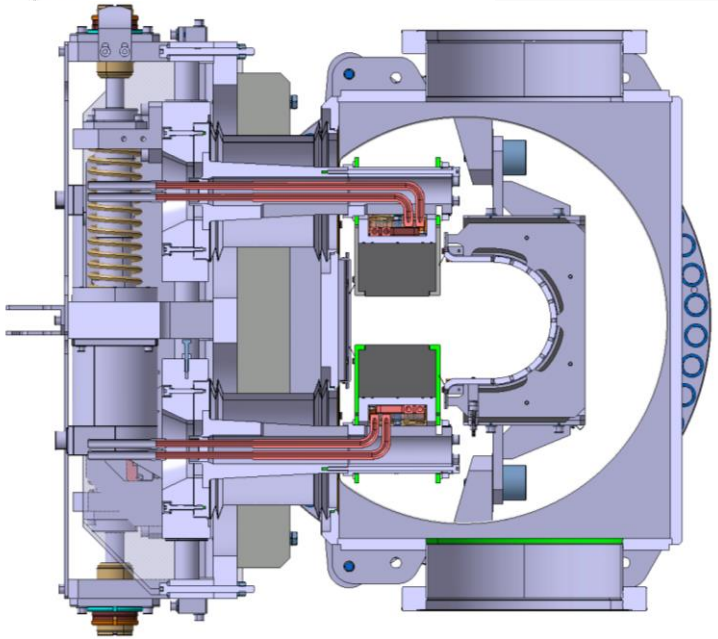
Lead screw specifications



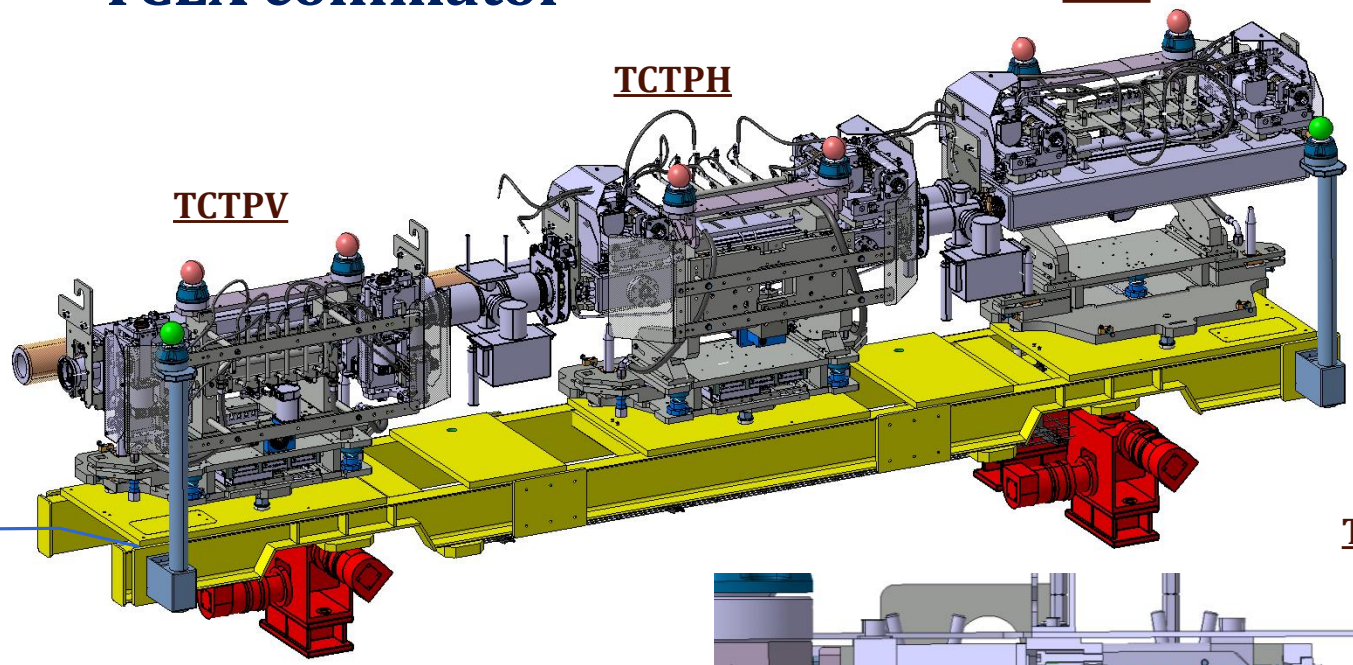
Longueur totale	: 135mm
Longueur filetée	: 90mm
Diamètre de la vis	: 12mm
Avance	: 2mm
Course utile	: 35mm
Précision de pas	: G1
Radiation min	: 10 Mgray
Pré-charge	: sans
Matière	: Acier inoxydable martensitique X30Cr13 pour tous les composants
Dureté de la vis	: à cœur pré-traitée 880/1030 MPa
	: trempe induction sur le filetage Transrol pour 550Hv30
Dureté des éléments	: trempe sous vide pour 550Hv30
Capacité dynamique	: 6.4 KN
Capacité statique	: 6.8 KN
Durée de vie	: L10>> 1.5 10^6 révolutions au sens de la fatigue en sous couche.
Lubrification	: dépôt de graphite (lubodry G) sur filetage vis, rouleaux et cage + graissage avec graisse SANTOVAC 5GB.
Effort maxi admissible	: Il doit être inférieur à la capacité statique de la vis 6.8KN , valeur à partir de laquelle on observe des micros déformations plastiques pouvant endommager le dépôt. Il ne faut donc pas dépasser la capacité dynamique de 6.4KN même pour ce cas exceptionnel.
Masse de l'écrou	: 0.21 kg
Masse de la vis	: 0.11 kg
Inertie vis tournante	: 2 kgmm²

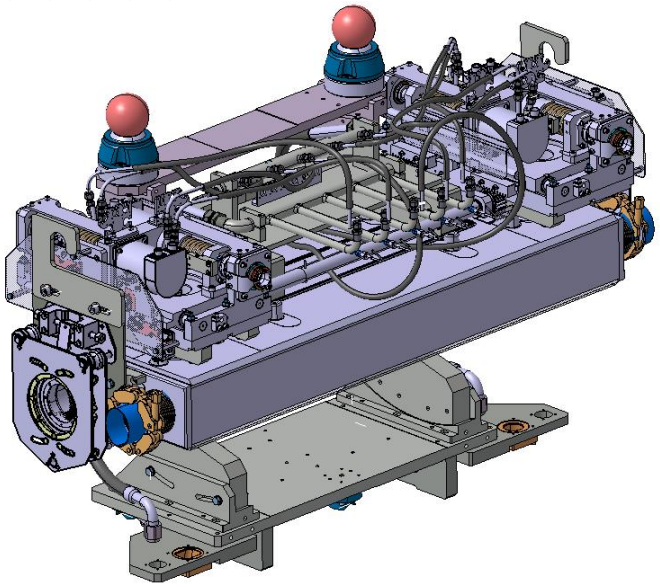
TDIS dumper


5740
4740
Module support
Girder
Modules
Standard LHC jacks

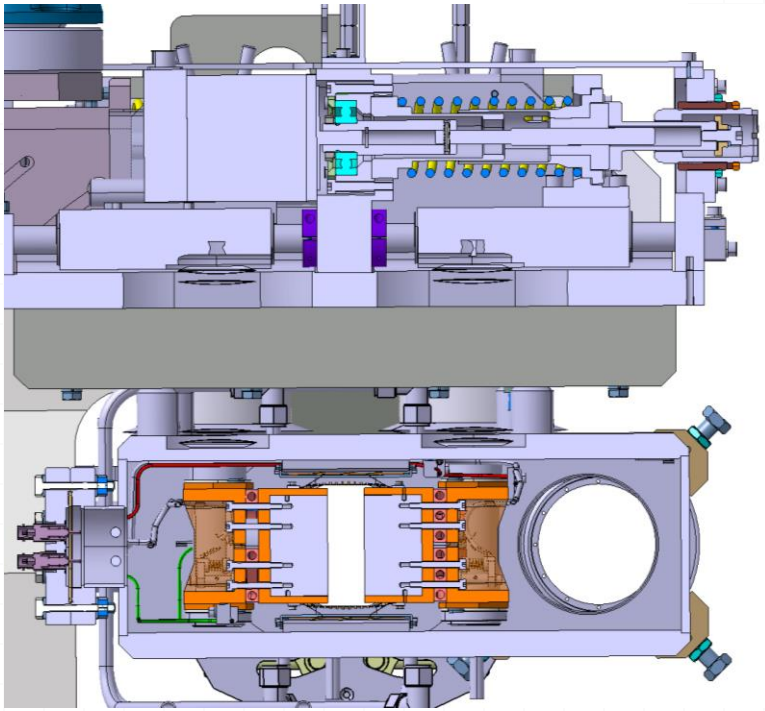


TCLX collimator

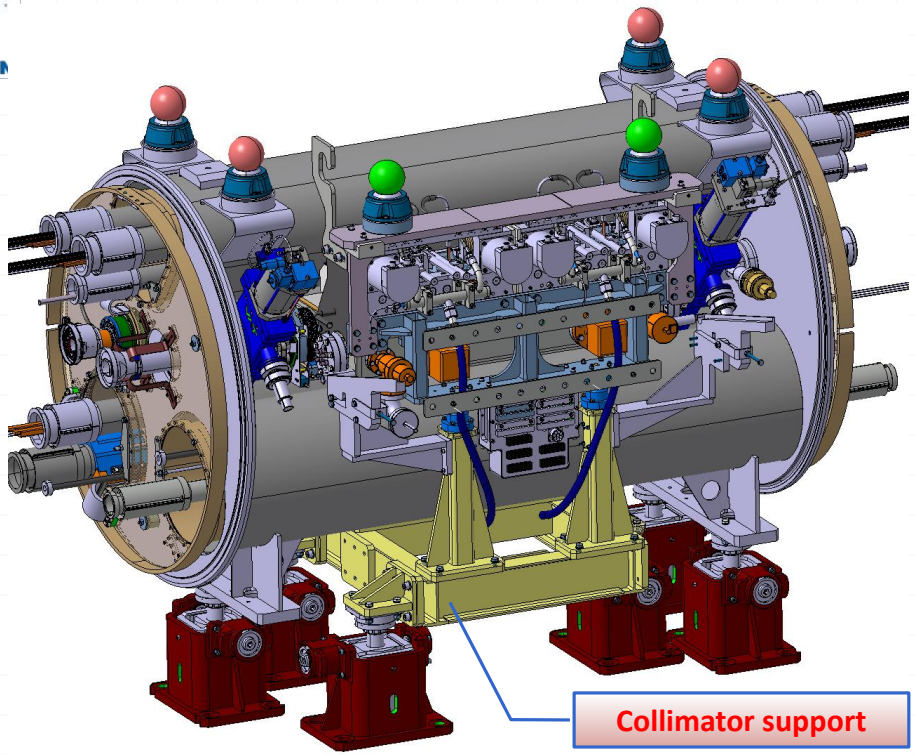


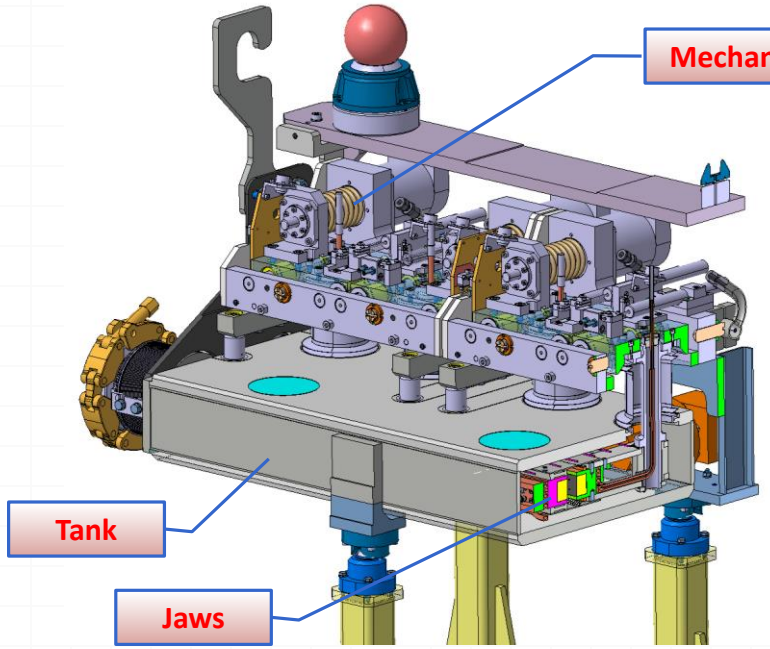


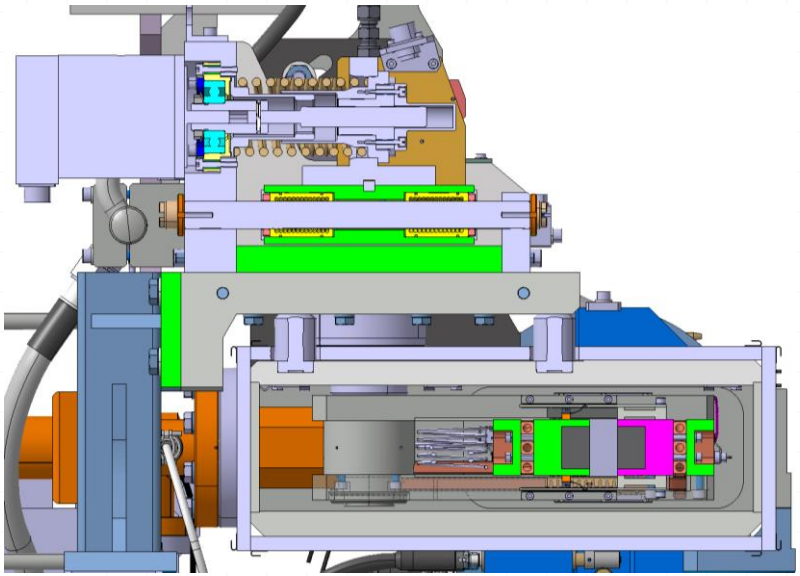
TCLX



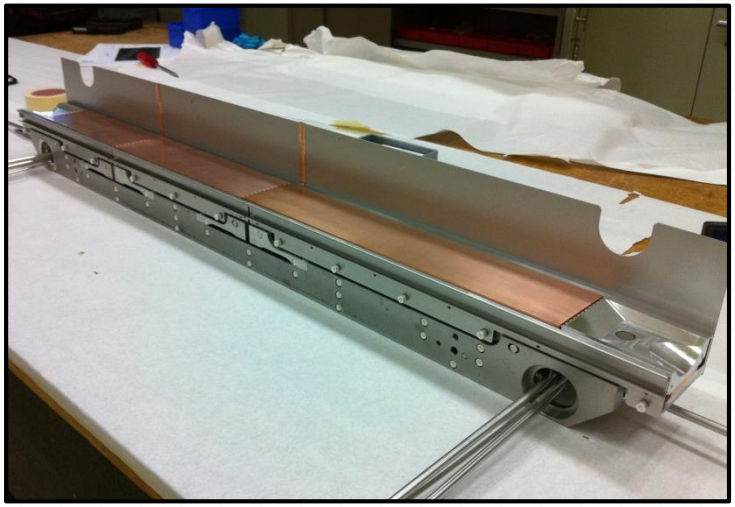
TCLD



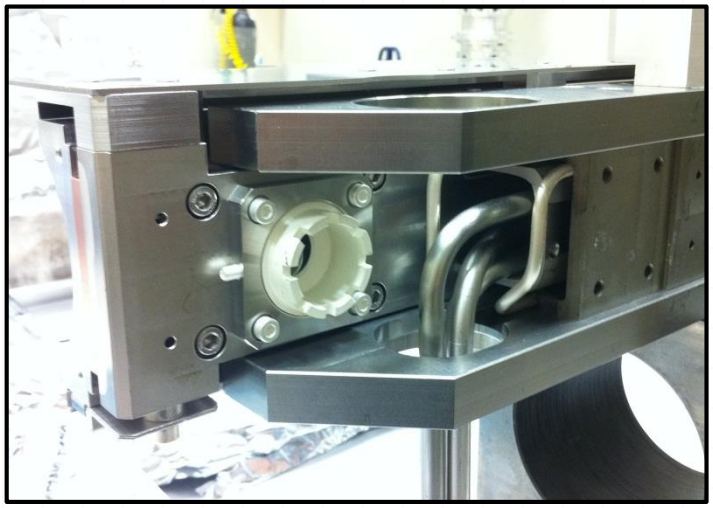




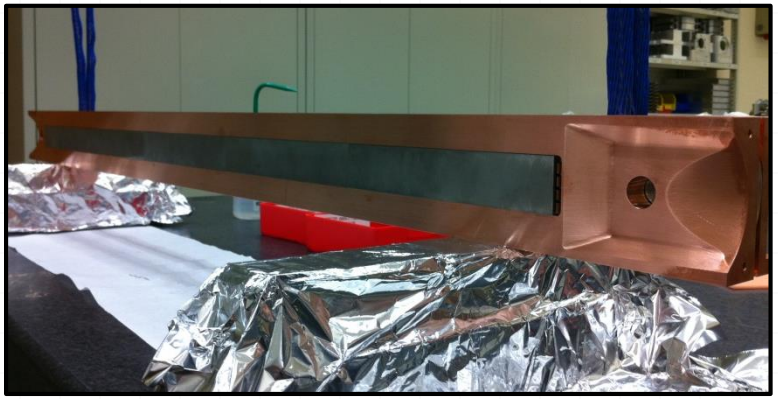
Collimator mechanical table



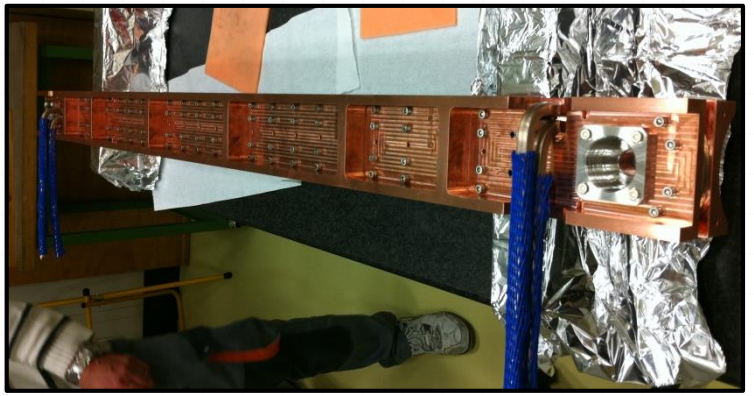
First phase II collimator prototype
Front side



First phase II collimator prototype
BPM support detail



First TCTP collimator prototype
Front side



First TCTP collimator prototype
Back side

Thank you for your attention!