cERL周回部真空系の進捗状況

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KEK 加速器第七研究系

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Outline

1. Design of the cERL Vacuum System

2. Layout of the Vacuum Components

3. Summary of the Progress

1. Design of the cERL Vacuum System

cERL Vacuum System

Low-impedance Vacuum Components

- need to be developed to accommodate high current (10~100 mA), low emittance (0.1~1 mm•mrad), and short pulse (0.1~3 ps) beams
- adopt gap-less and step-less structures in flanges, monitors, etc. to reduce resistive wall wake fields, aiming at mitigation of BBU and chamber heating

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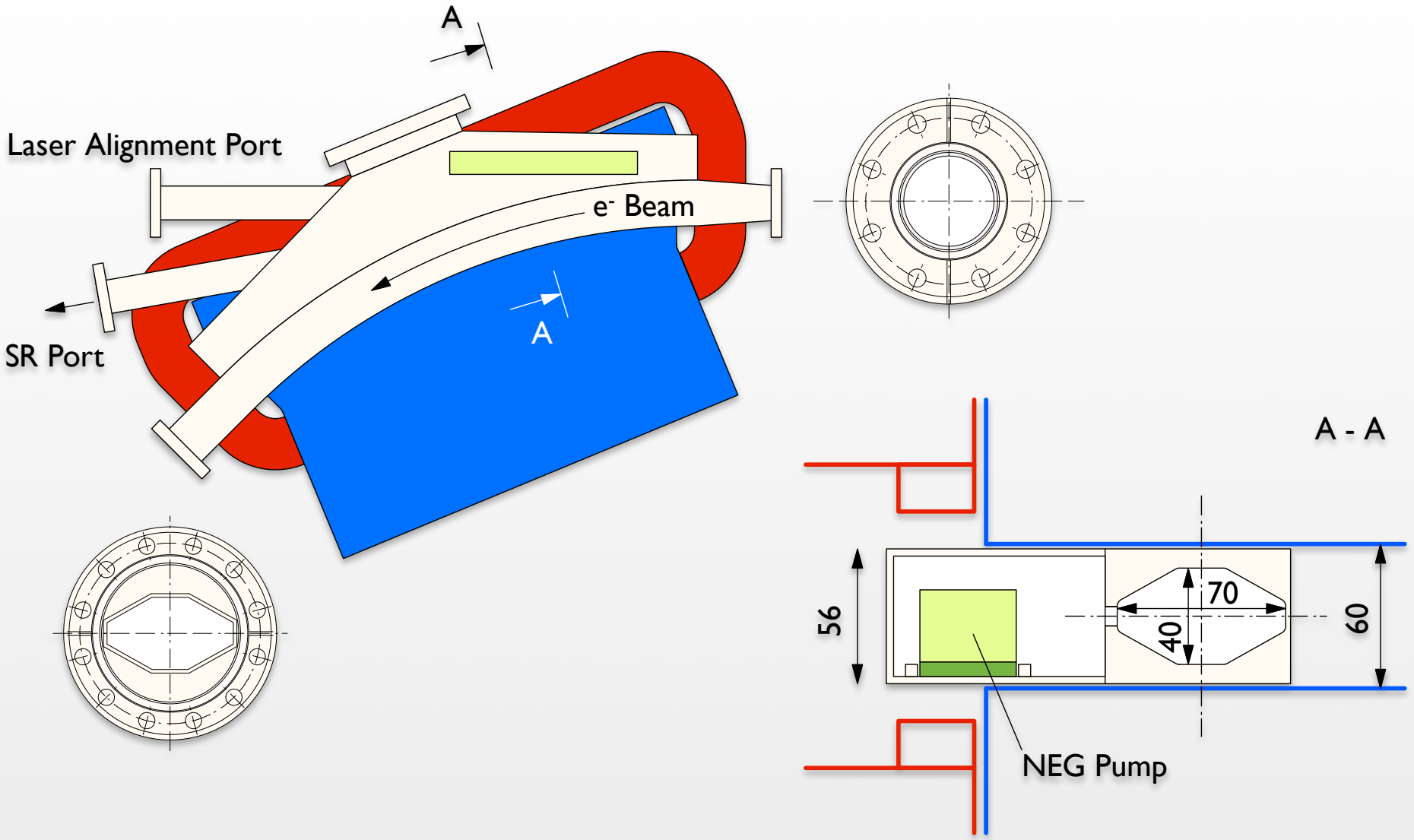
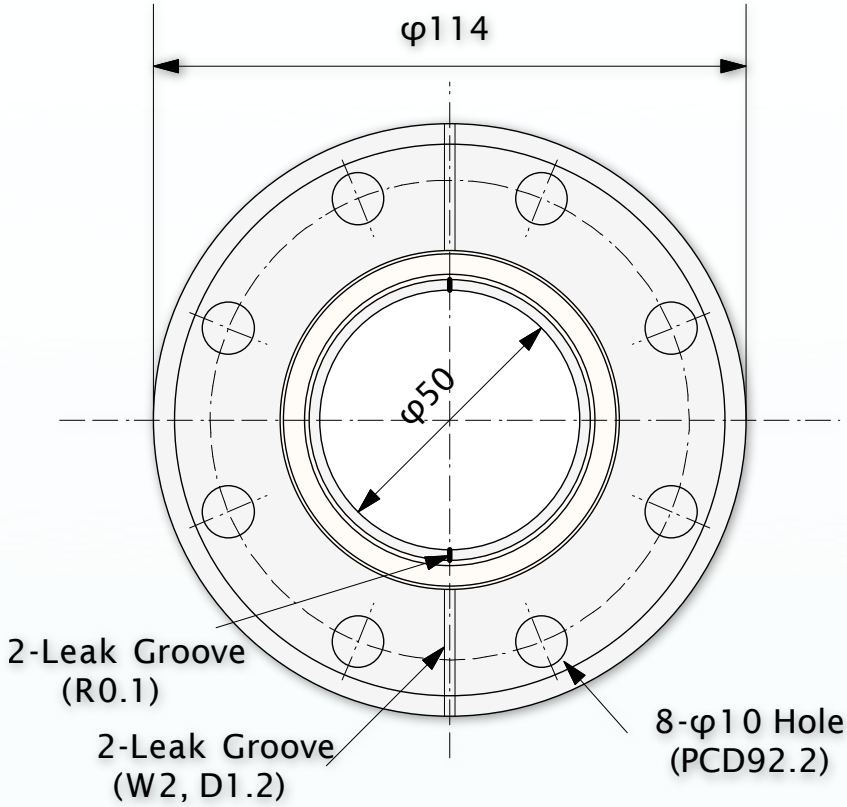
High-power Beam Dump

- Max power load: initially 60 kW (6 MeV, 10 mA), finally 600 kW (6 MeV 100 mA)

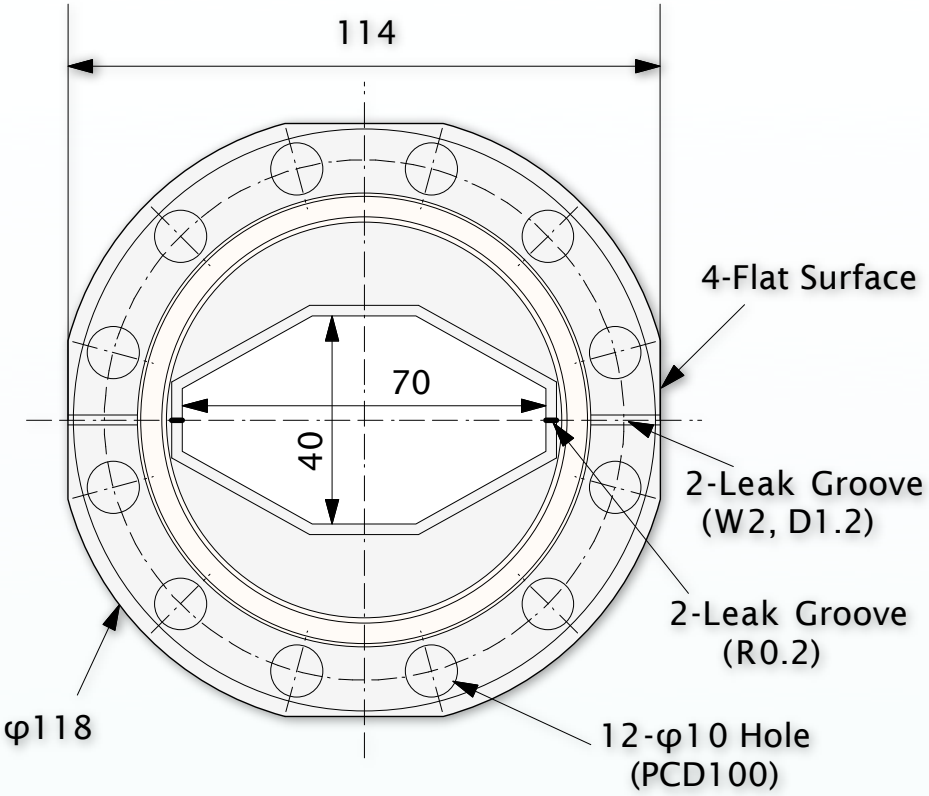
Dipole Chamber



Special Flange for cERL



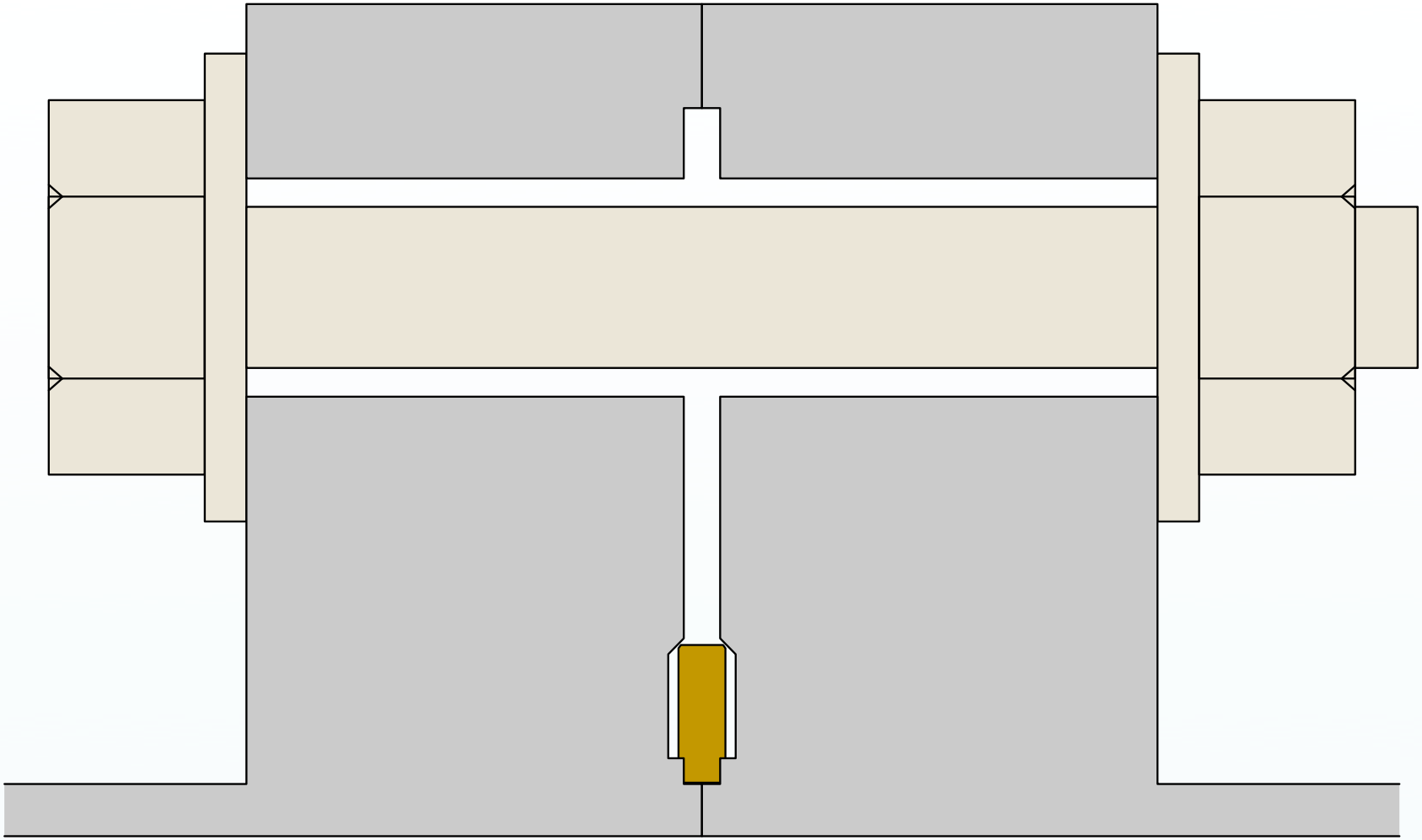
Straight Section
(Type A, φ114)



Arc Section
(Type B, φ118)

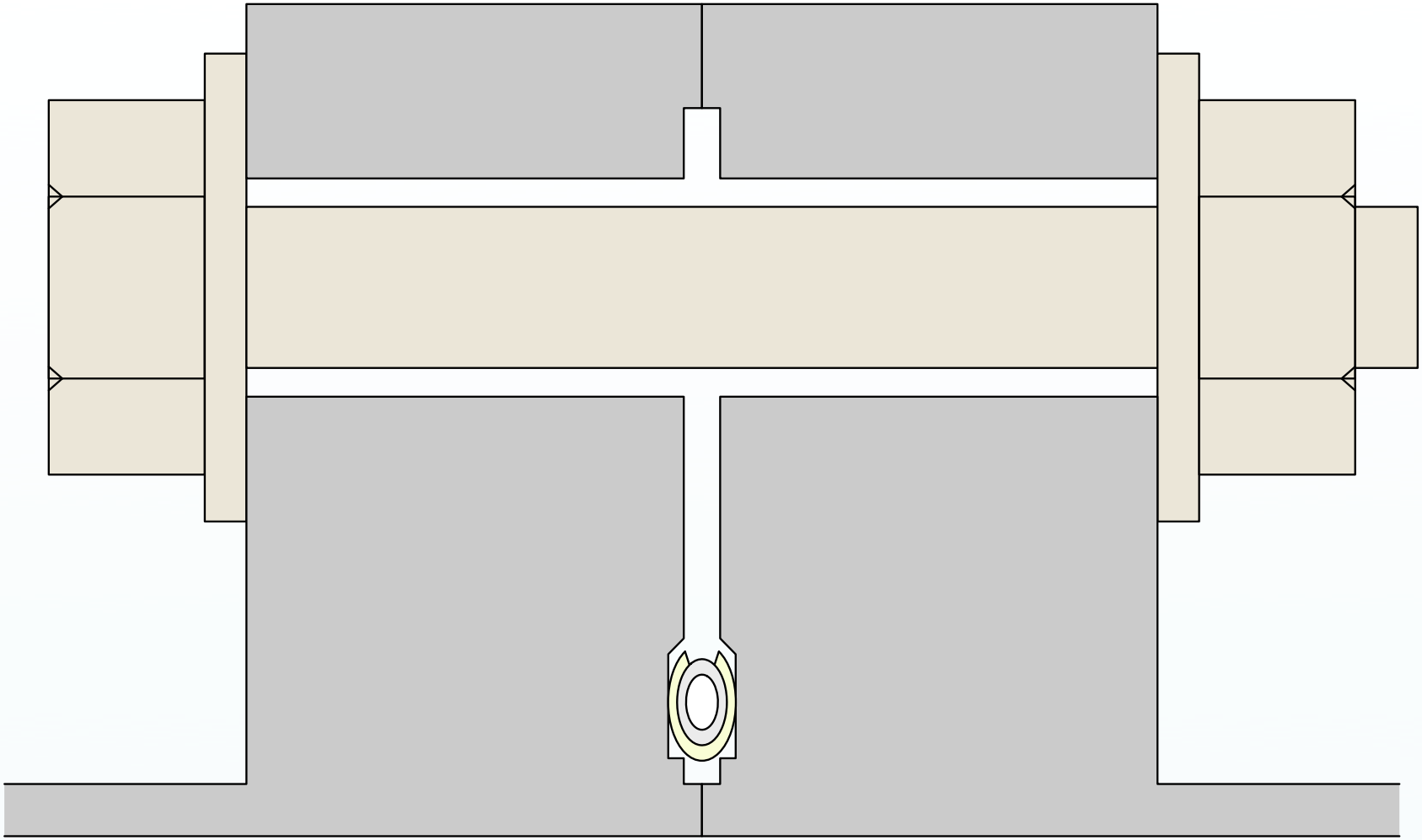
Special Flange for cERL

(Cu gasket)

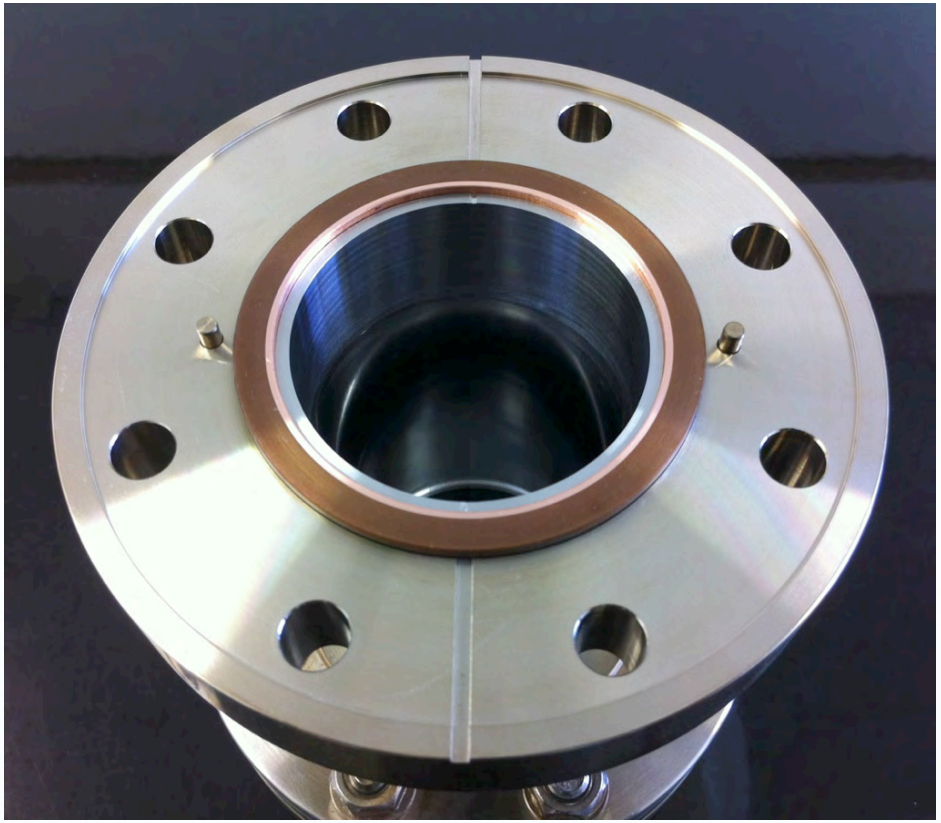


Special Flange for cERL

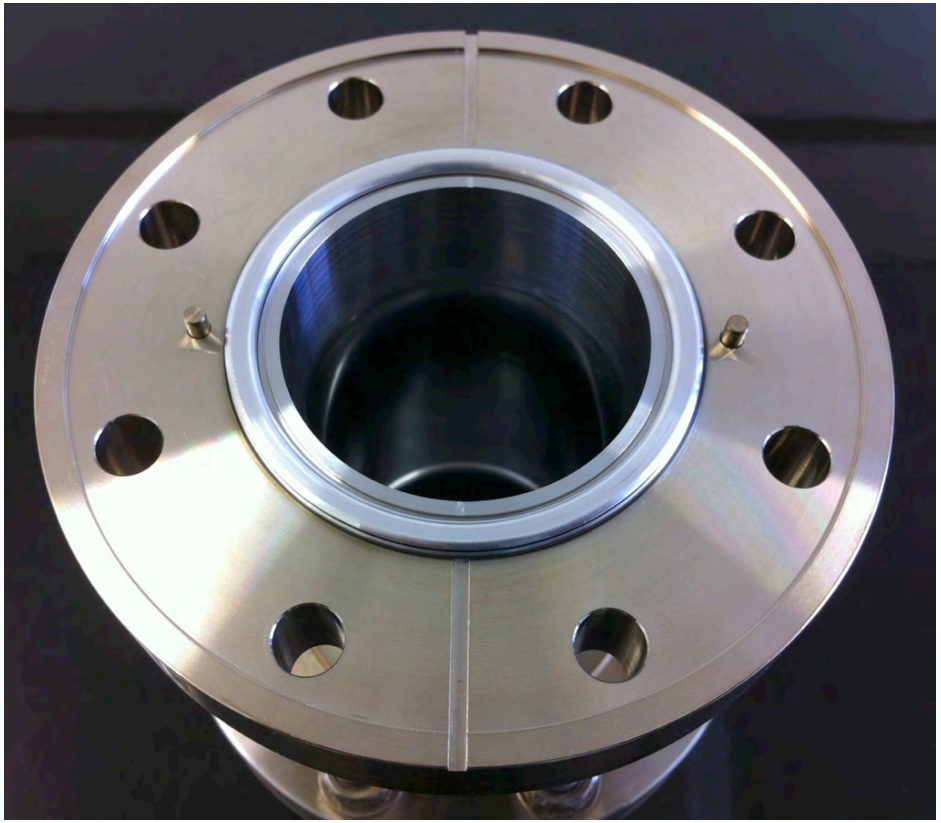
(U-tightseal or Helicoflex)



Special Flange for cERL
(φ114, straight section)

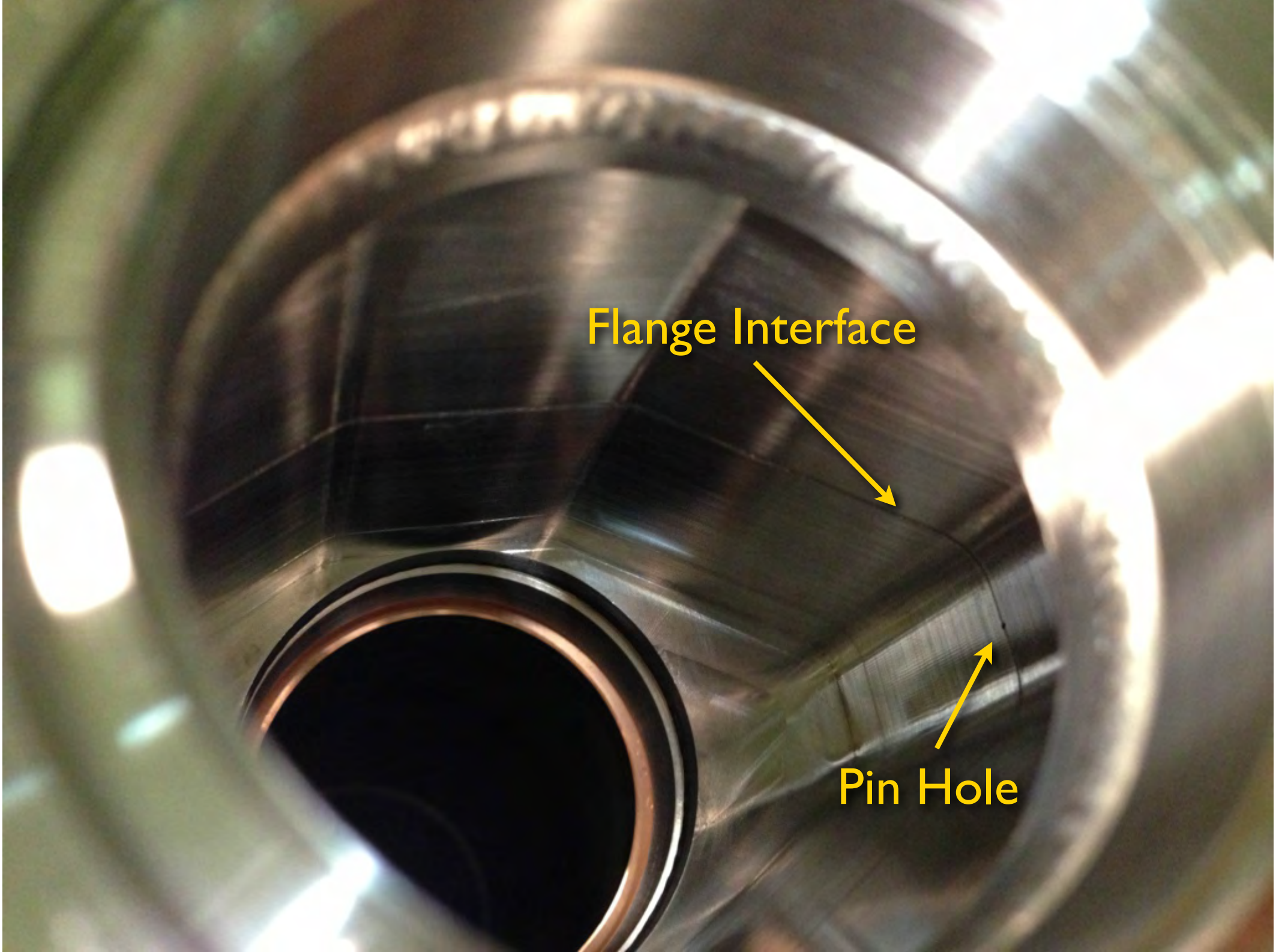


Cu Gasket

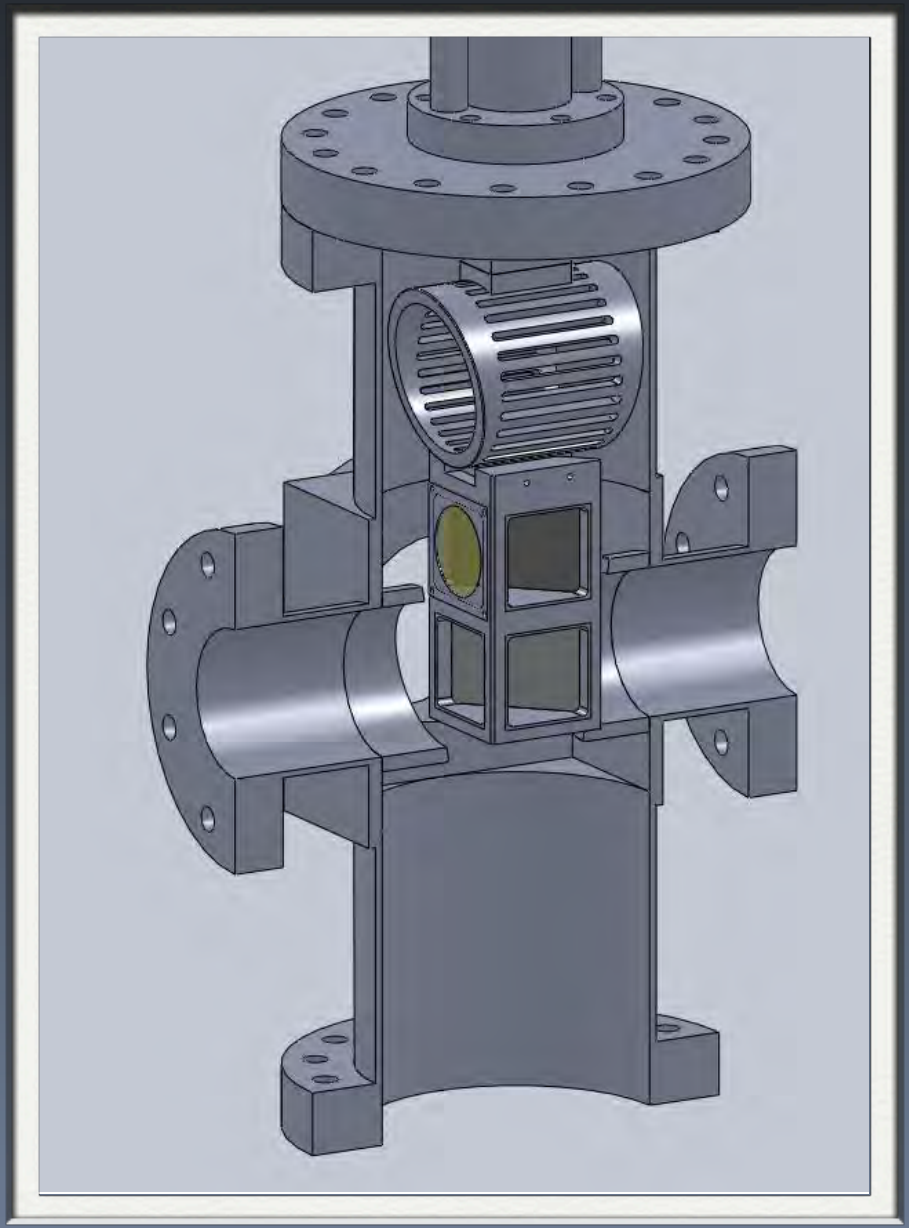


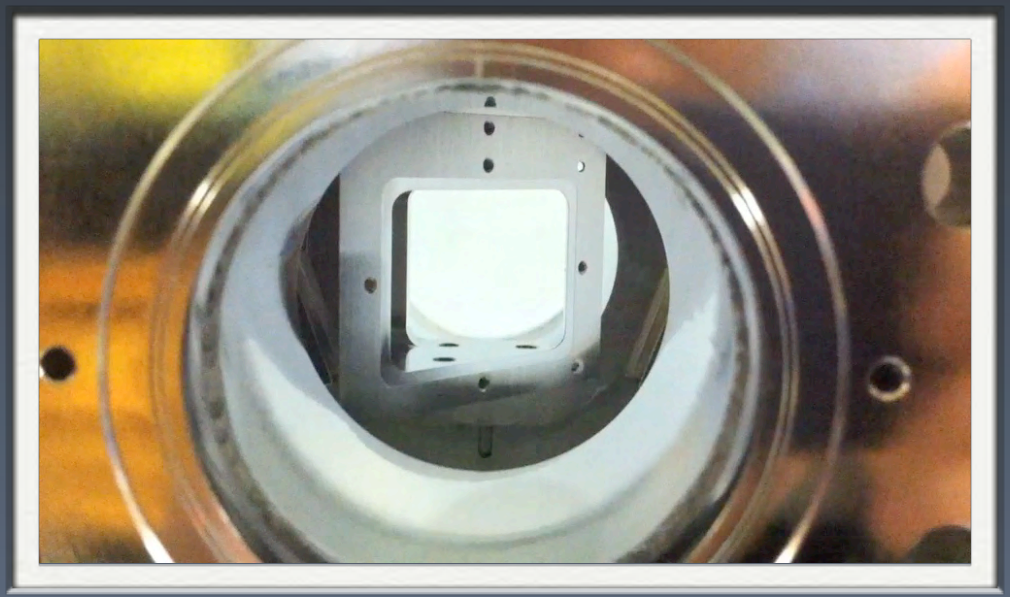
U-tightseal or Helicoflex

Good leak tightness - after 180°C, 24h bakeout, pressure reached 2×10^{-8} Pa by TMP

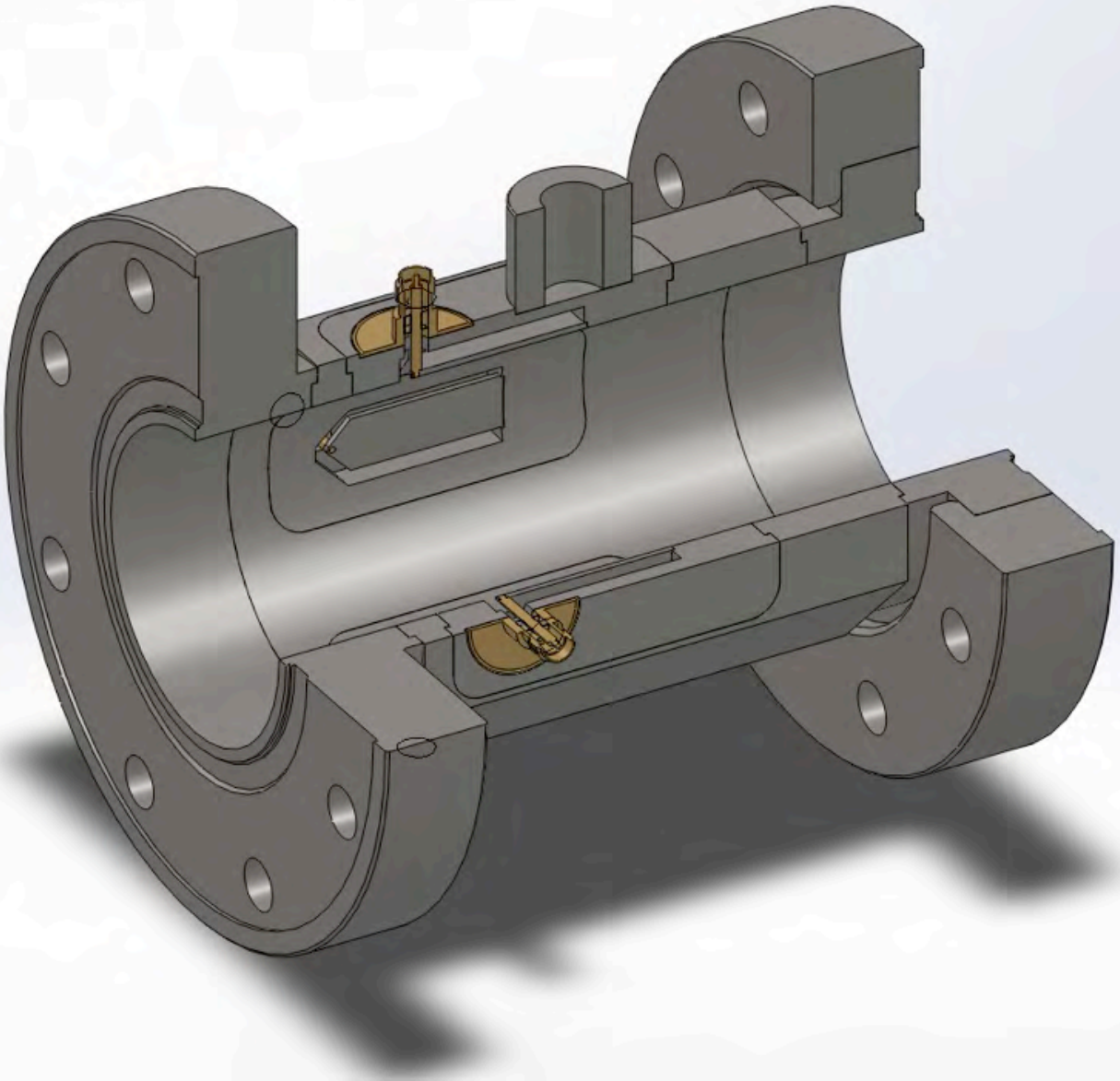

Flange Interface
Pin Hole

Screen Monitor (OTR, YAG)

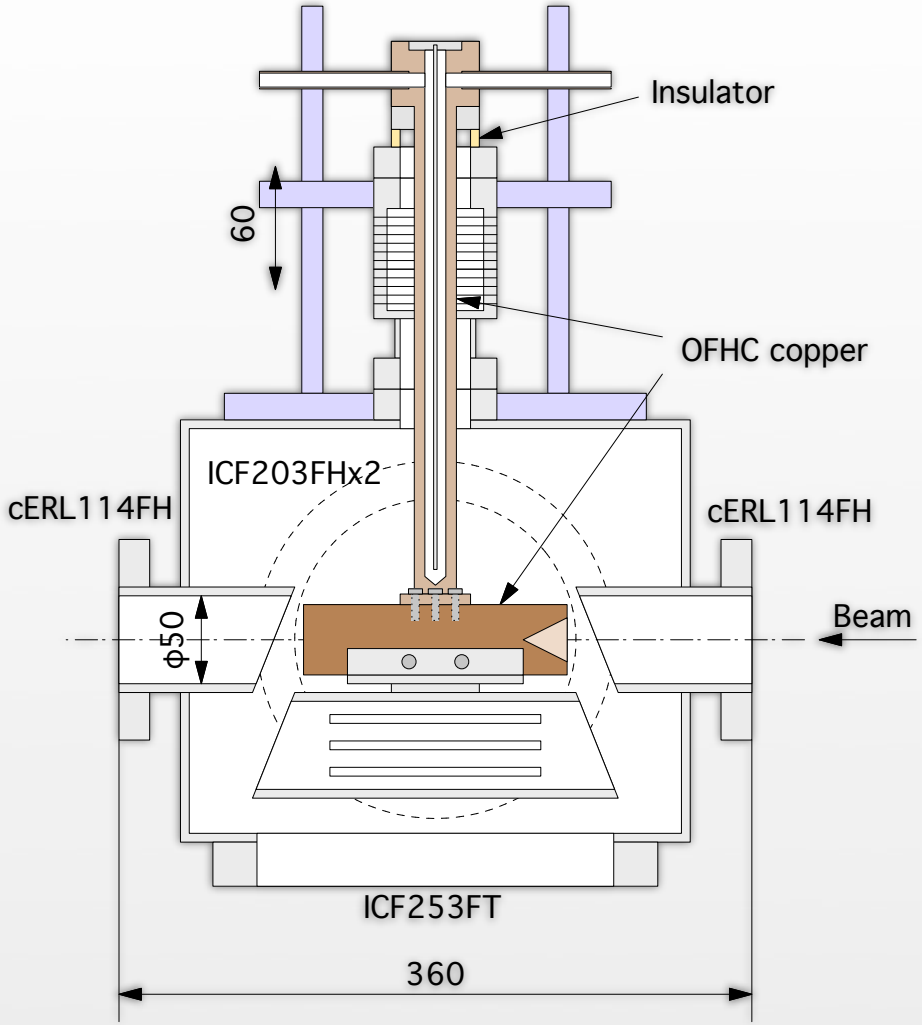


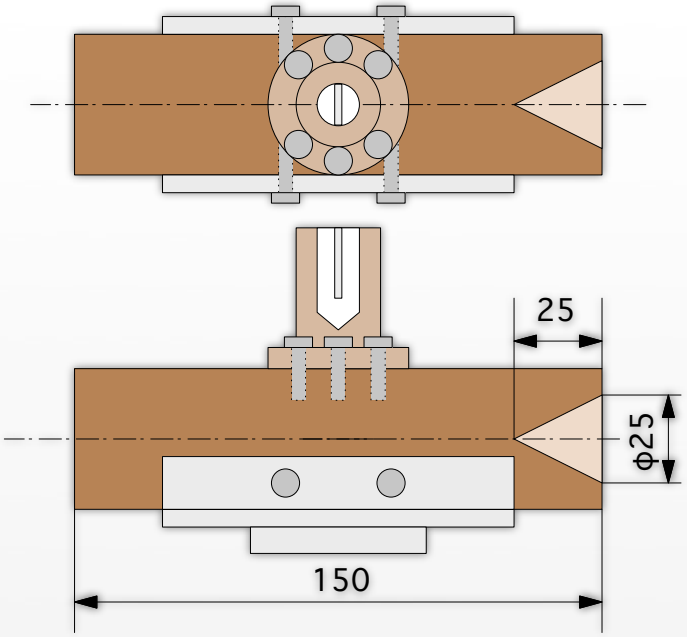


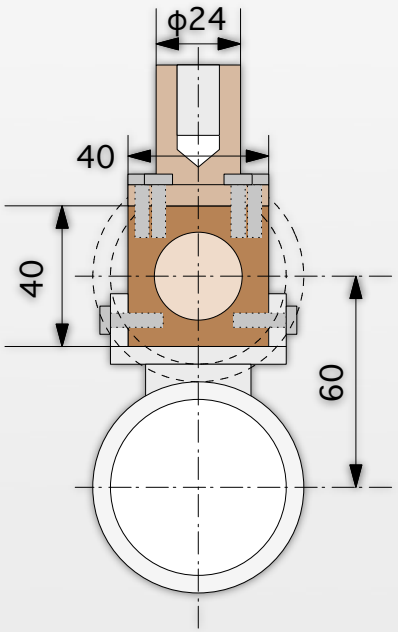
Beam Position Monitor



Movable Beam Dump







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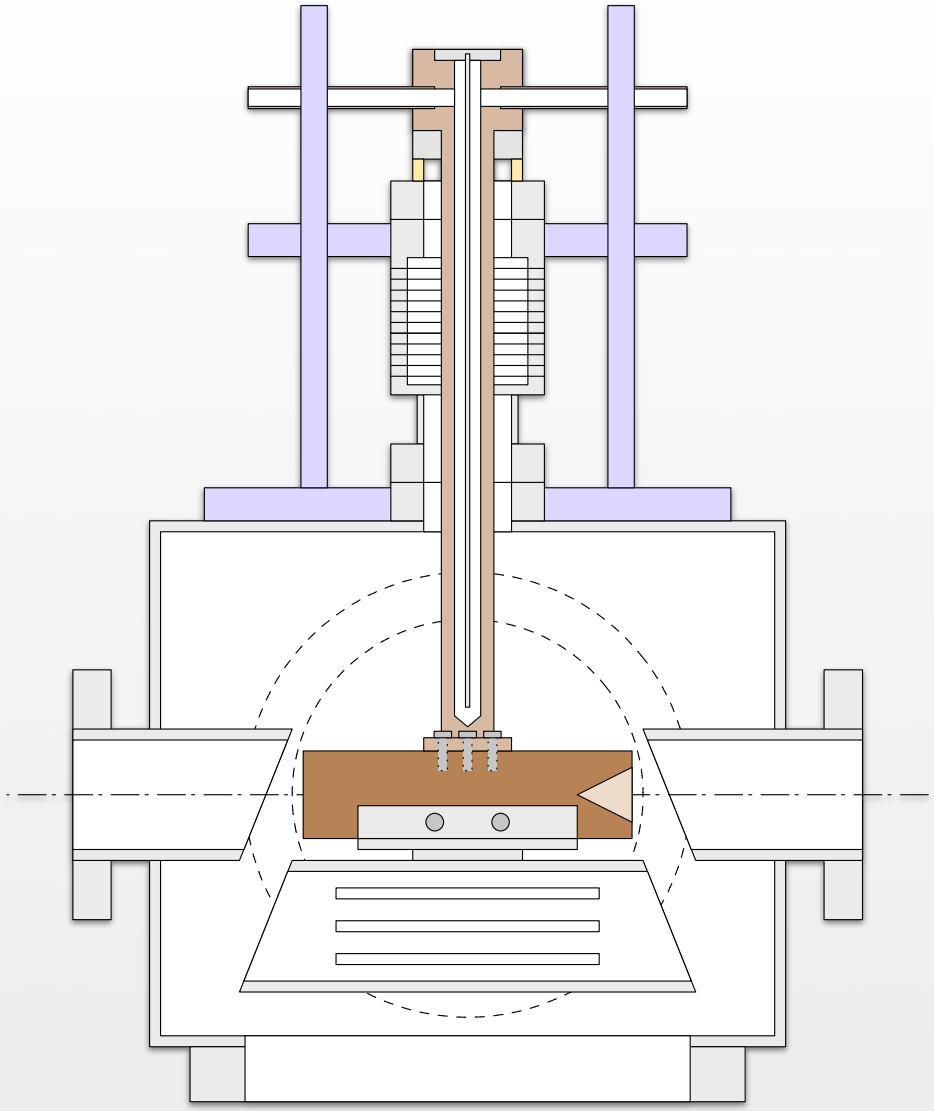

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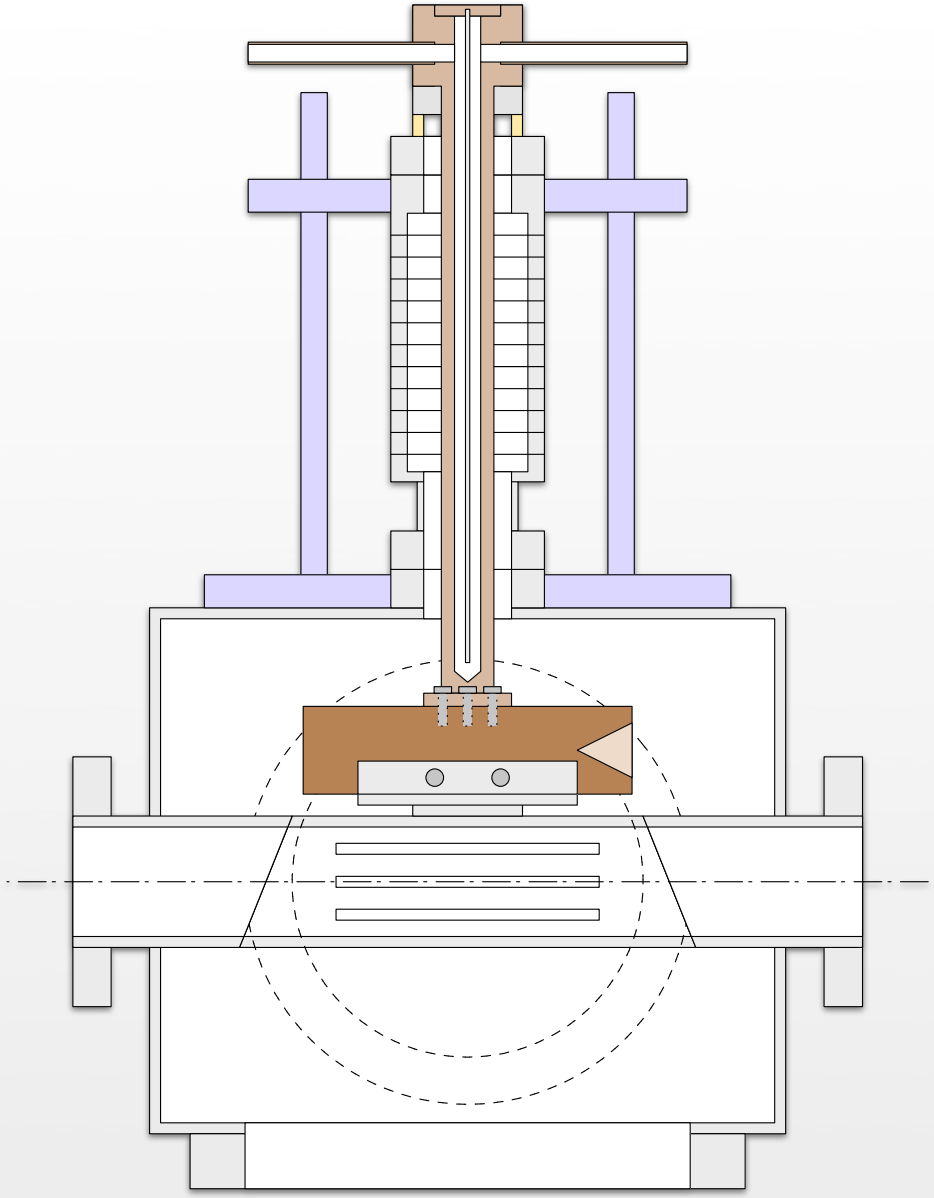
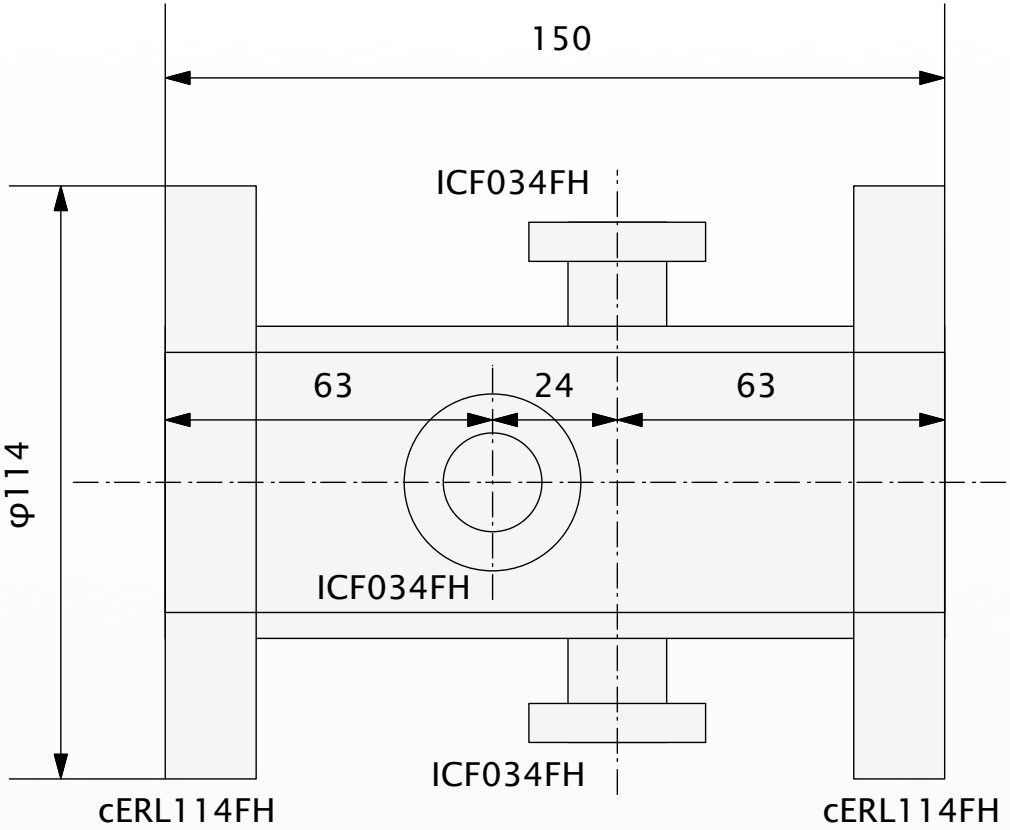
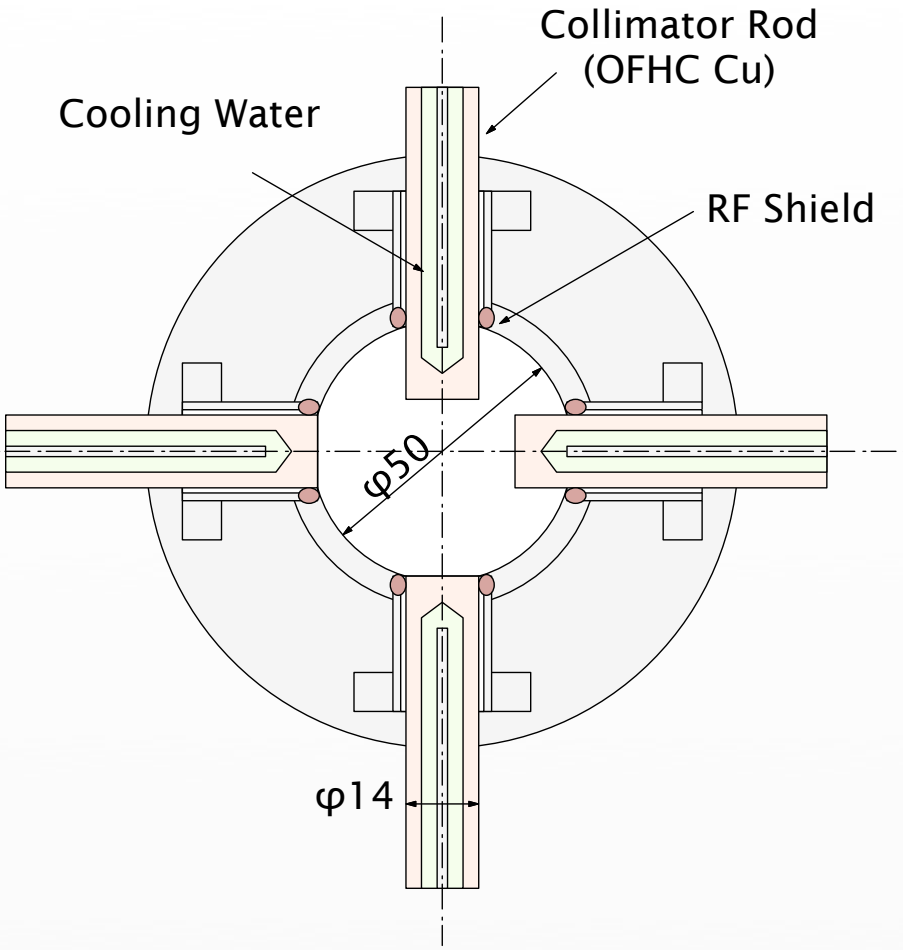
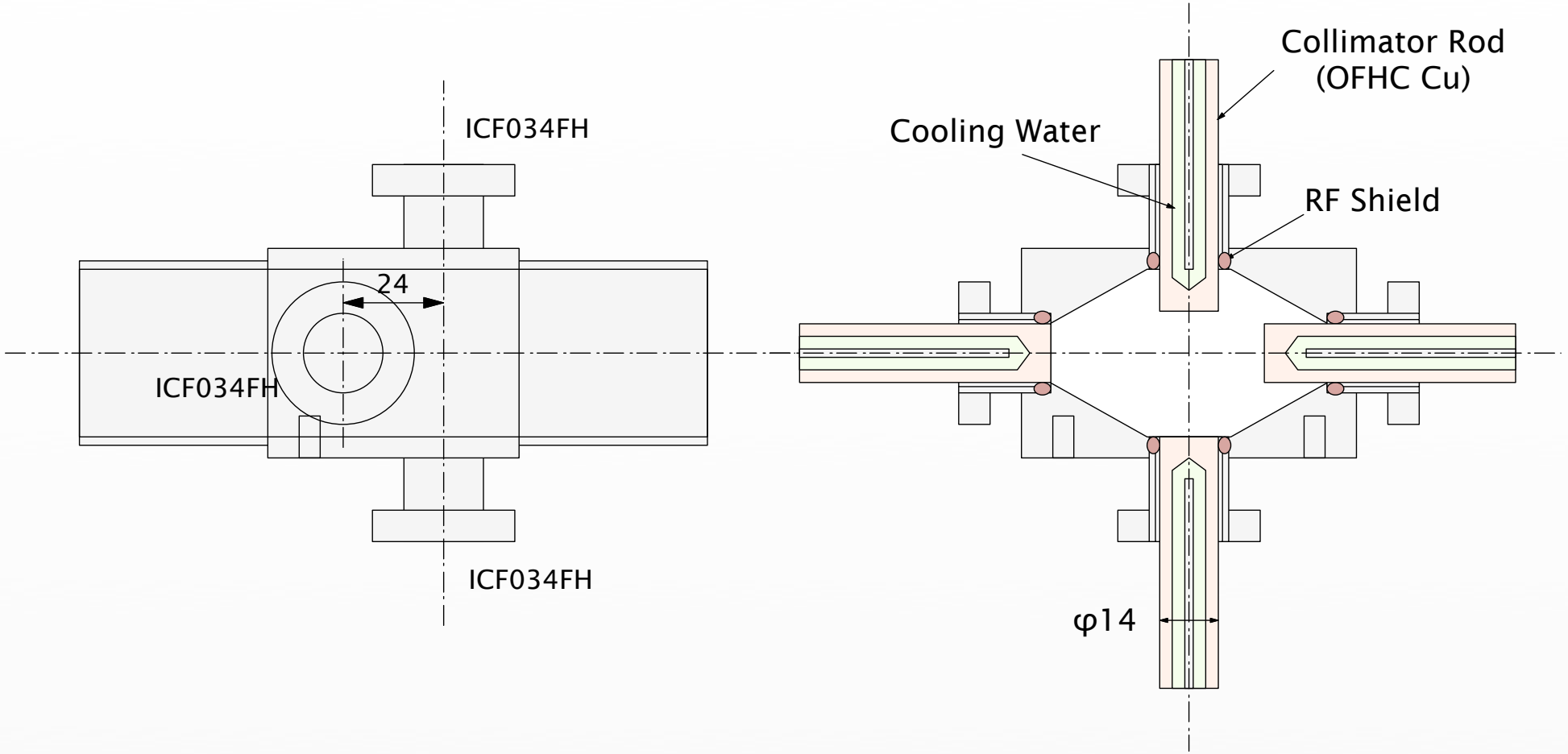


Beam Collimator
(Straight Section)





Beam Collimator
(Arc Section)



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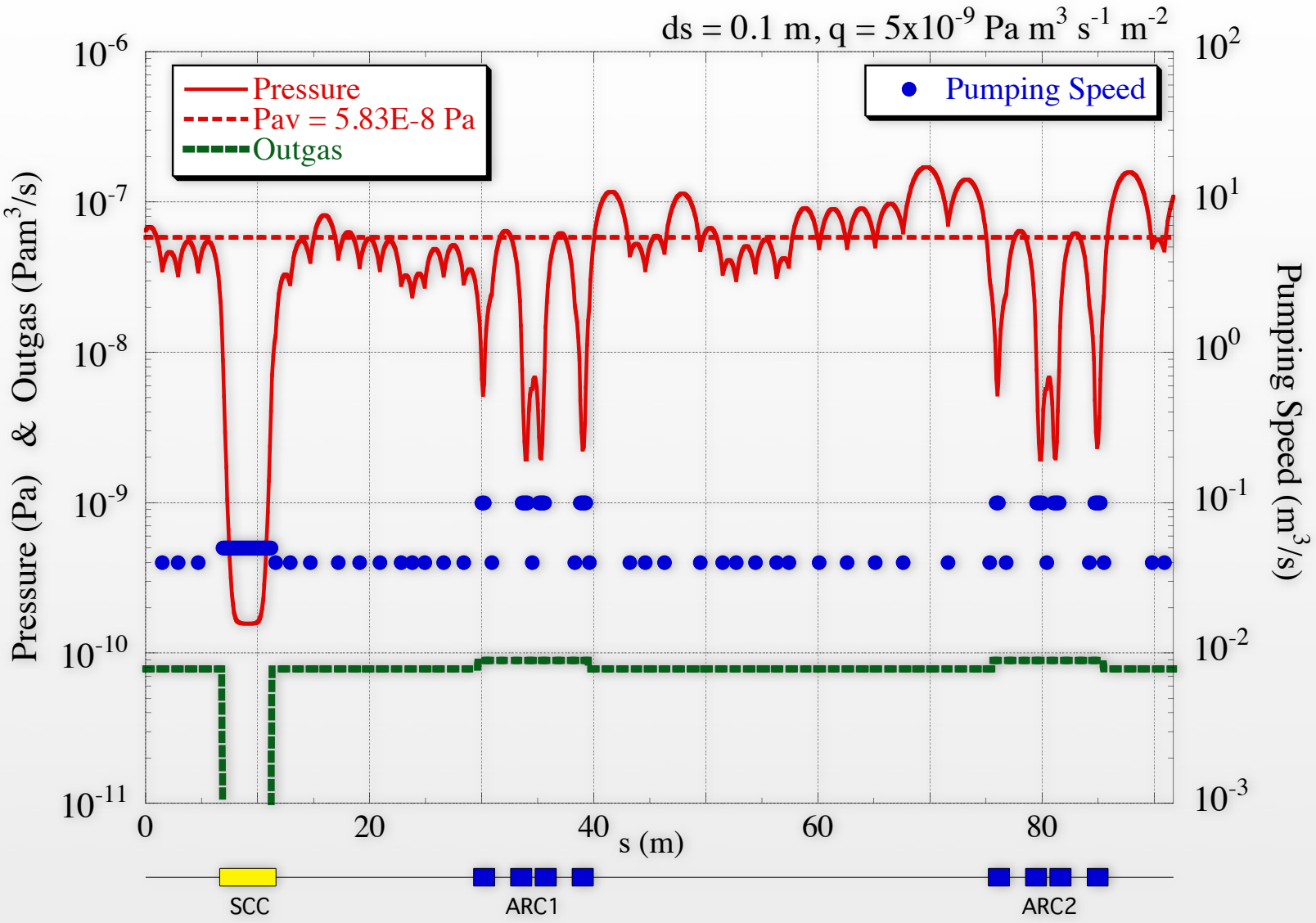

Calculated Pressure Distribution
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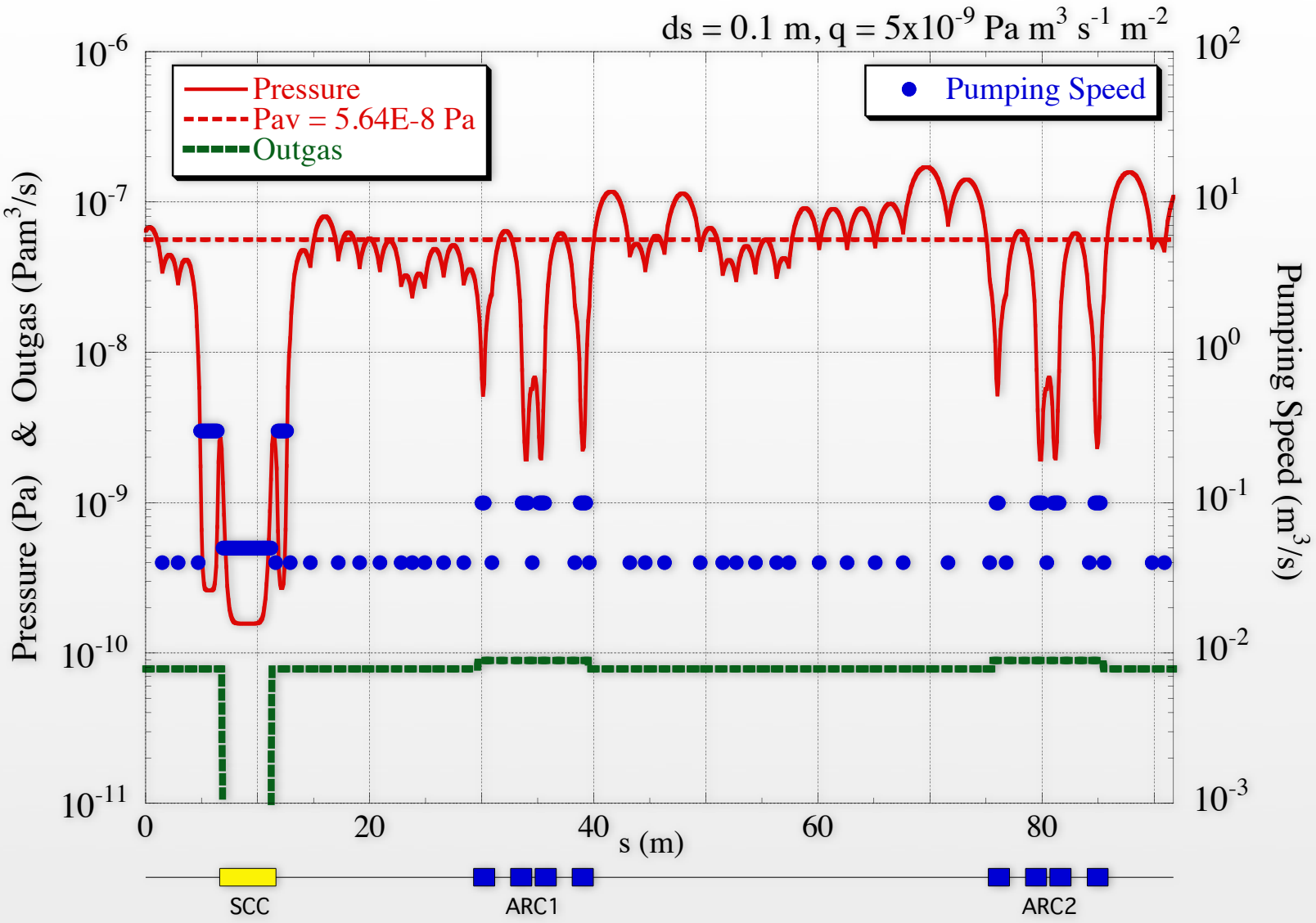

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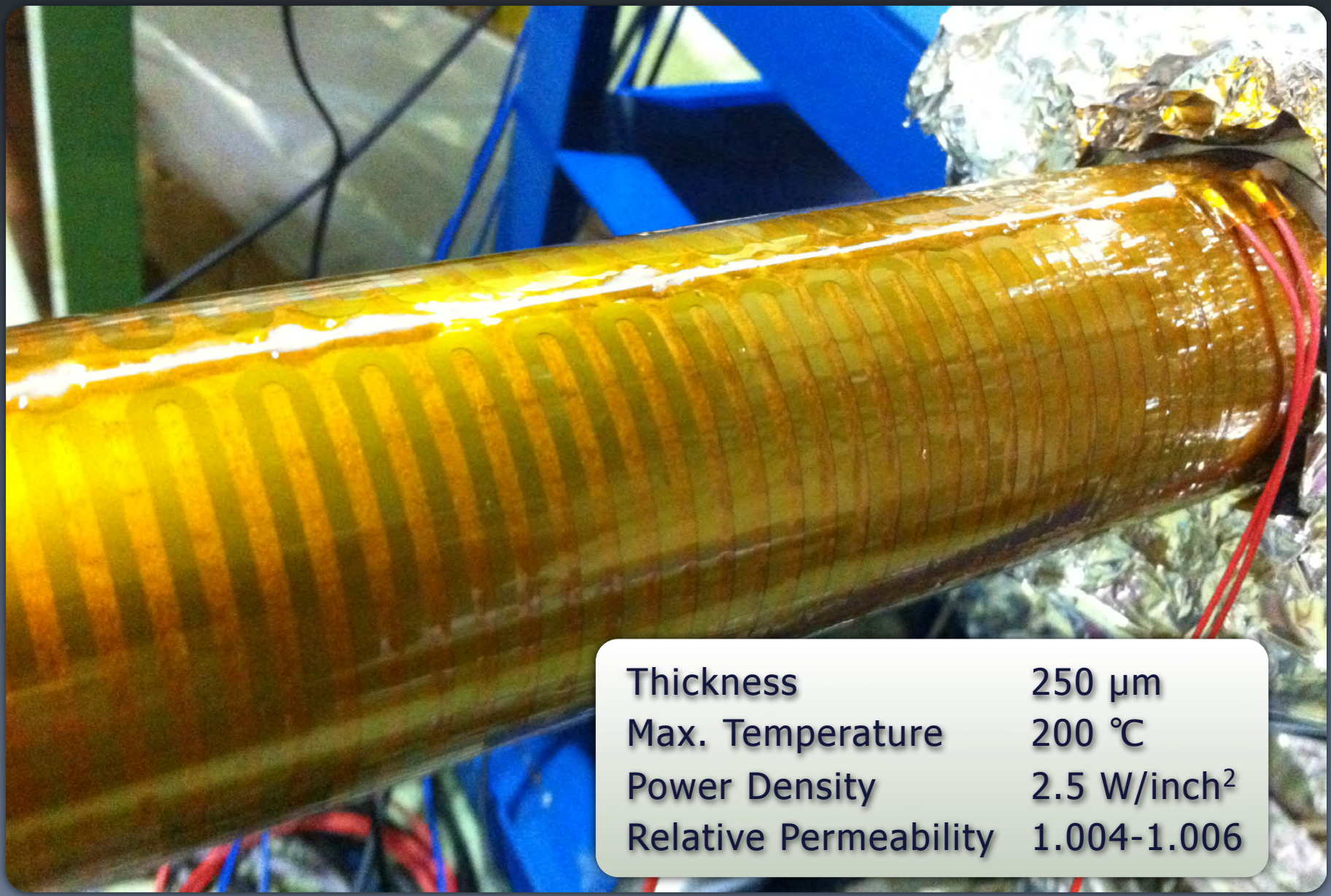
Kapton Film Heater



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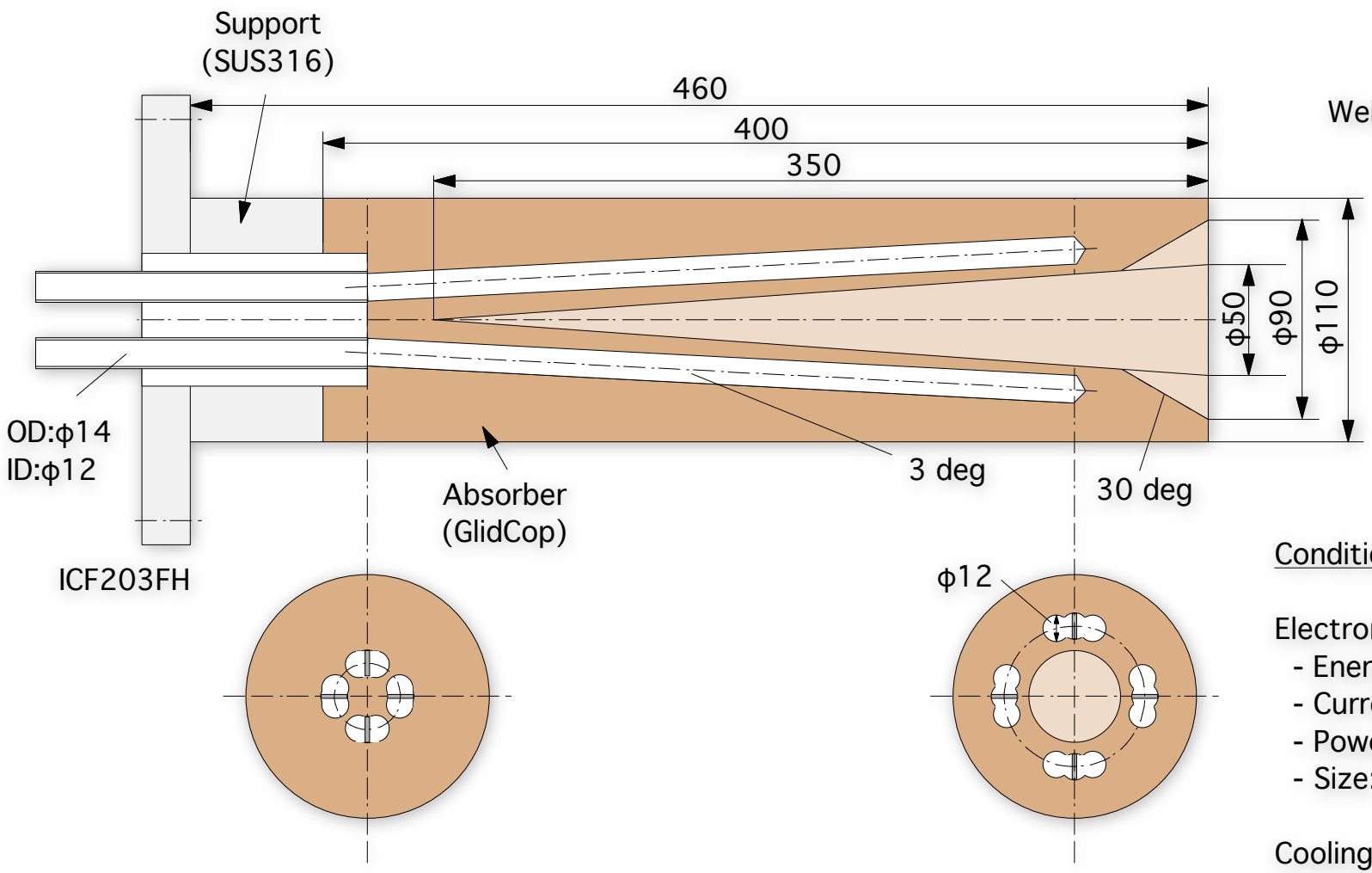


Conditions

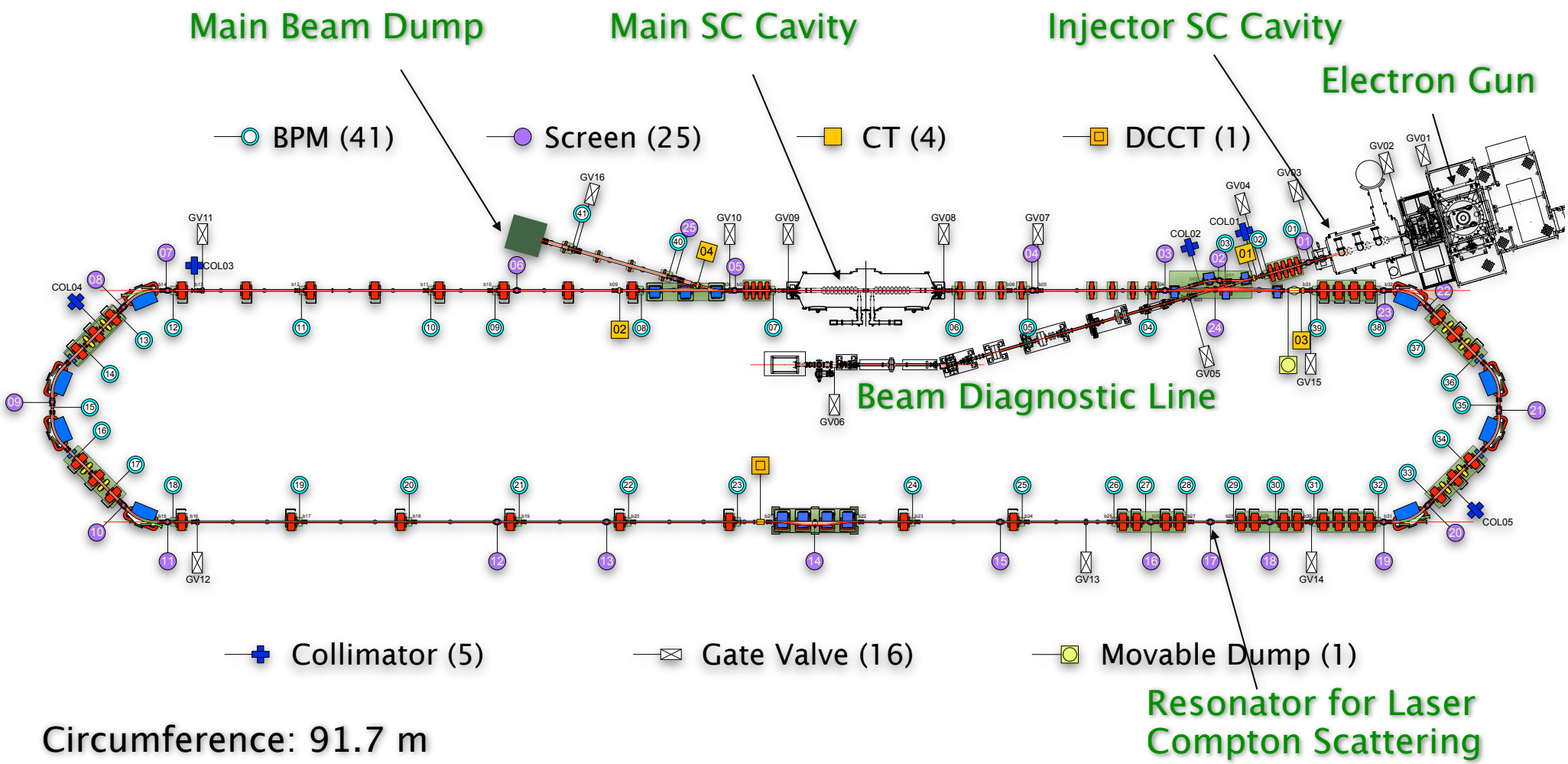
Electron Beam:
- Energy: 6 MeV
- Current: 10 mA
- Power: 60 kW
- Size: ϕ20 or ϕ30mm (uniform)

Cooling Water:
- Diff. Pressure: 0.5 MPa
- Flow Rate: below 30 l/min
  (ΔT=28.7 °C @ 60 kW)
- Flow Speed: below 10 m/s

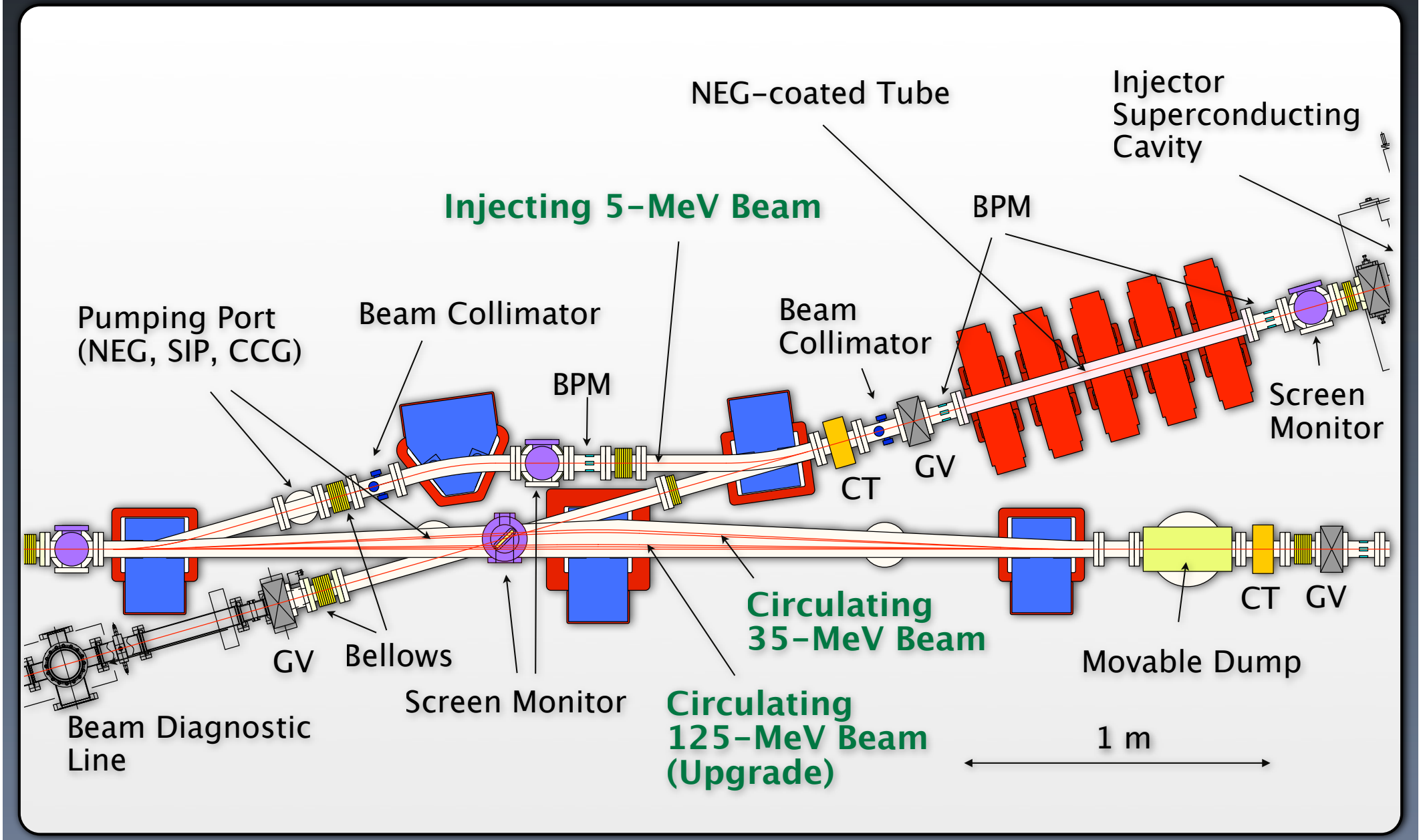
Main Beam Dump for cERL

2. Layout of the Vacuum Components

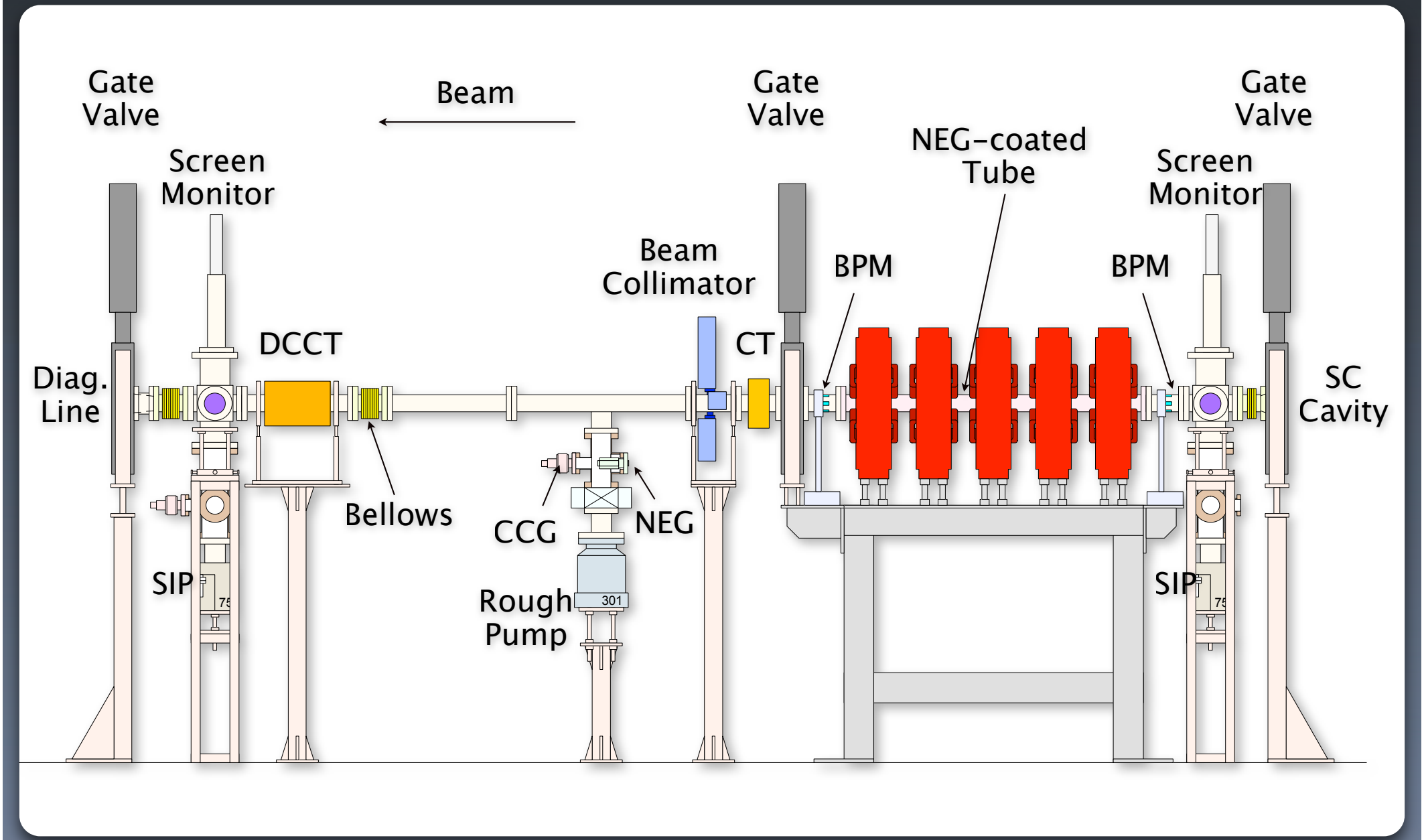
Schematic Layout of the cERL



Merger Section



Injector Commissioning
(April ~ July 2013)



3. Summary of the Progress

進捗状況のまとめ

- JAEA予算での周回部ダクト一式は3月22日納期に向けて製作中

  （一部、入射器コミッショニングに必要な機器は3月上旬に先行納品予定）

- NEGコーティングダクト、可動ダンプ、スクリーンモニタ2台も3月納品予定

- 残りのスクリーンモニタ20台は来年度製作（担当: 高井）

- 主ビームダンプは今年度設計（熱構造解析）を行い、来年度に製作

- ポンプや真空計、制御機器類は概ね調達済み

- 真空制御系は現在構築中（担当: 野上）

  電子銃、超伝導空胴、診断ラインのゲートバルブも真空Grのインターロックに入れる方針