



Cryomodule Interface Definition (FNAL-GDE-Meeting)

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Interface with cavity package -1

- Helium jacket
 - **Connection between helium supply pipe and helium jacket**
 - Helium supply pipe : cryomodule
 - Pipe on the helium jacket : cavity package
 - Connection (welding or bimetel junction) : cryomodule
 - **Connection between precooling pipe and helium jacket**
 - Precooling pipe : cryomodule
 - Pipe of the helium jacket : cavity package
 - Connection (flange, welding or bimetel junction) : cryomodule
 - **Connection flange between jacket and bellows**
 - Flange on the cavity package : cavity package
 - Flange on the bellows and bellows : cryomodule
 - **Between cavity package and beam pipe between cryomodules**
 - Flange on the cavity package : cavity package
 - Flange on the beam pipe and beam pipe : cryomodule
 - Gate valve : cryomodule
 - HOM absorber : ML integration and cryomodule



Interface with cavity package -2

- **Sliding support**

- Support tab on the helium jacket : cavity package
- Sliding support component : cryomodule

- **Connection to invar rod**

- Connection component on the helium jacket : cavity package
- Invar rod and connection fixture : cryomodule

- **Input coupler**

- **Connection flanges between warm-coupler and vacuum vessel**

- Flange on the coupler : cavity package
- Flange on the vacuum vessel : cryomodule

- **Connection to thermal interceptor**

- Connection fixture on the coupler : cavity package
- Connection fixture on the interceptor : cryomodule



Interface with cavity package -3

- Tuner (which has the drive motor outside the vacuum vessel)
 - **Connection flanges between drive motor and vacuum vessel**
 - Flange on the drive motor : cavity package
 - Flange on the vacuum vessel : cryomodule
 - **Connection to thermal interceptor**
 - Connection fixture on the tuner : cavity package
 - Connection fixture on the interceptor : cryomodule
 - **Cabling**
 - Flexible cabling : cryomodule



Interface with quadrupole package -1

- Quadrupole package
 - **Connection to the cooling pipe**
 - Pipe on the helium jacket : magnet
 - Cooling pipe and connection (welding) : cryomodule
 - **Support fixture**
 - Support fixture on the helium jacket : magnet
 - Support fixture under the support post : cryomodule
 - **Current leads**
 - Specification of current leads : magnet
 - Lead routing and feed-through to outside the vacuum vessel: cryomodule
 - Port flange of the feed-through on the vacuum vessel: cryomodule
 - **Thermal interceptor**
 - Thermal interceptor : cryomodule
 - Connection fixture on the quadrupole package : magnet

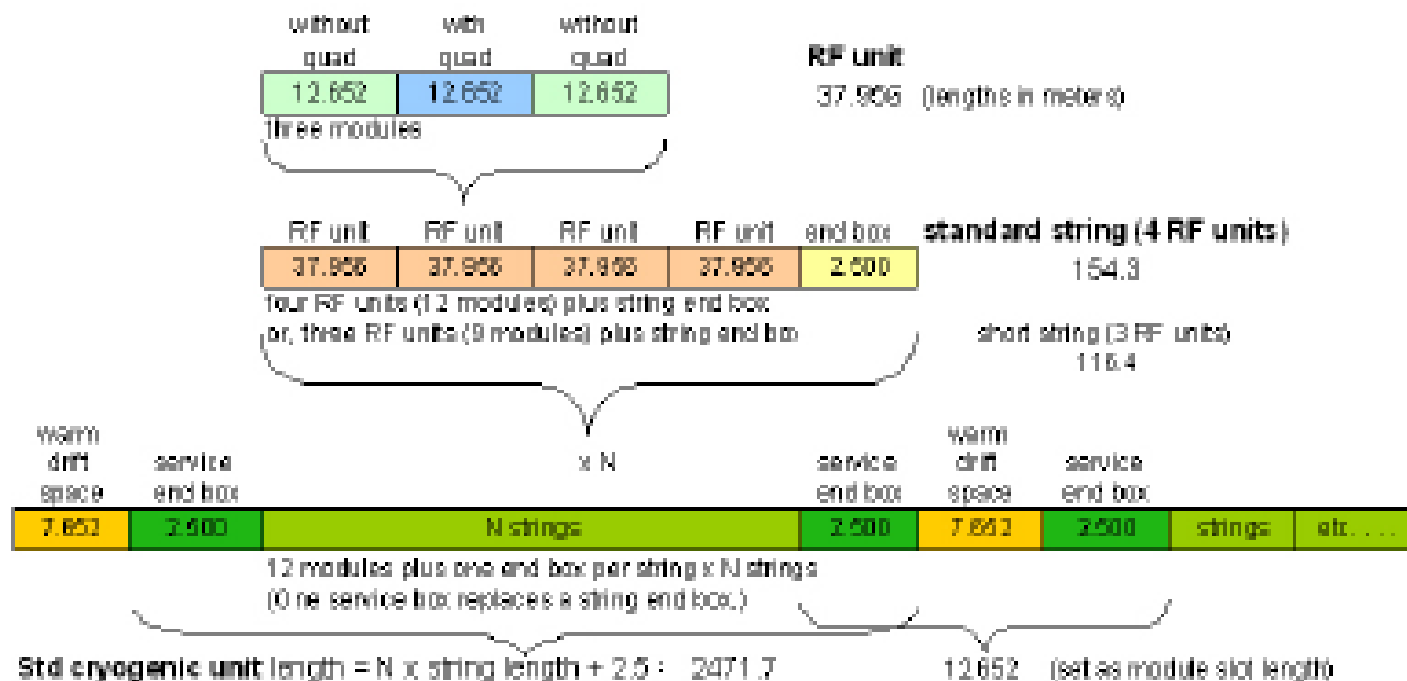


Interface with cryogenics

- Connection to the cryogenic components

- End box and service end box

- Connection between the cooling pipes in the cryomodule and the end box
 - Connection between the cooling pipes in the cryomodule and the service end box
 - Connection work : cryomodule





Interface with cryogenics and vacuum -1

- Beam line vacuum system
 - **Vacuum and thermal design of the system : 3 groups**
 - Vacuum ports on the beam line and vacuum vessels : cryomodule
 - Valves and pump system : vacuum
- Insulating vacuum break
 - **Thermal and mechanical design of the system : 3 groups**
 - Vacuum breaks : cryomodule
 - Bypass valve : vacuum

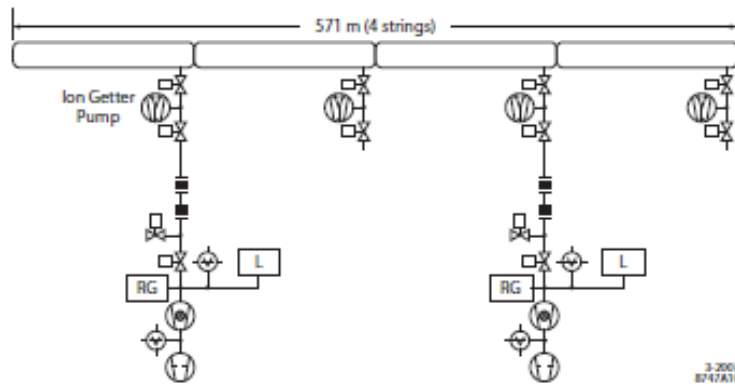


FIGURE 3.2-1. Beamline vacuum system – 2 turbo-molecular pumps (TMP) with high sensitivity leak detector (LD) and residual gas analyzer (RGA), safety, clean venting system, slow start pumping etc.

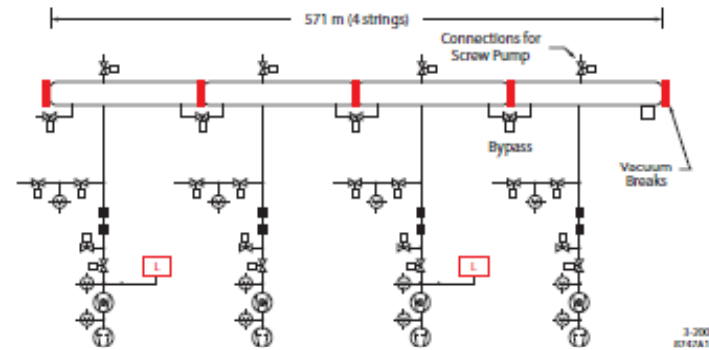


FIGURE 3.2-3. Insulating vacuum system – 4 TMP pumping units: 2 with LD (leak detector) + 2 large screw pump for fore pumping.



Interface with cryogenics and vacuum -2

- Coupler vacuum system

- **System design : cavity package, vacuum and cryomodule**

- Coupler vacuum port : cavity package
 - Pumping pipe : cryomodule
 - Pumping system : vacuum

- Fast acting cold gate valve

- **Cold gate valve design in the cryomodule : vacuum, cryomodule and cryogenics**

- Gate valve : vacuum
 - Connection to the beam pipe : cryomodule

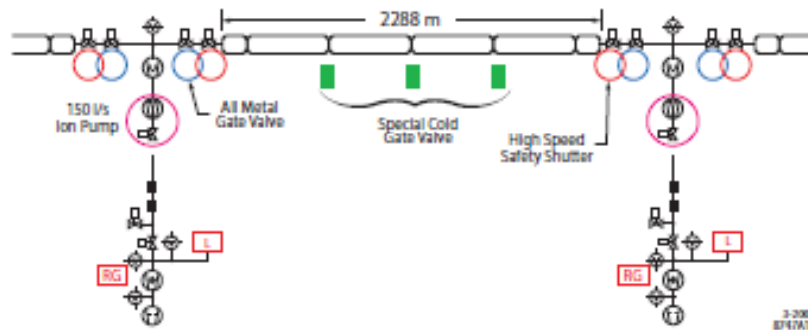


FIGURE 3.2-2. Beamline vacuum system gates and valves.

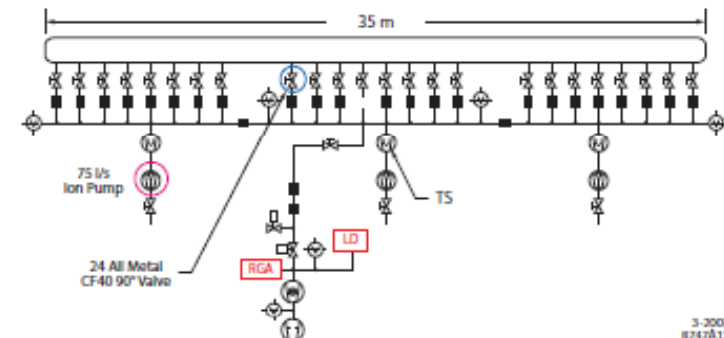


FIGURE 3.2-4. Waveguide and coupler vacuum system.