

## SEQUENCE OF WORK:

- 1 Test for beam vacuum line
- 2 Test for cryogenics lines
- 3 Test for ISO-VAC
- 4 Cool down
- 5 Warm up
- 6 Test for beam vacuum line (RGA)

Activities to do before cool down and minimum estimation time with assumption, that all the vacuum staff will be prepared and everything will go smoothly:

### For the beam vacuum line

#### Connection of the pump station to the beam vacuum line

- spread out of the clean box unit – **est. 1 hour**
- clean air flow before connection – **est. 30 min**  
(in the meantime preparing the screws and gasket for connection)
- connection – **est. 30 min**

#### Before opening the gate valve:

- pump and purge three times?? – **est. 1.5 hour**
- pumping down of the connection and roughly leak check in the meantime
- continuation of the pumping up to pressure below **1.0e-7 mbar** (gauge on the pump station) – **est. 4/8 hours**
- RGA filaments outgassing, mass scan and saving data – **est. 1 hour**
- leak check with background of helium below **1.0e-9 mbar\*/s** – **est. 10 min**
- venting the line up to almost atmospheric pressure with nitrogen – **est. 10 min**
- opening the valve

#### After opening the gate valve:

- pumping down of the beam vacuum line up to pressure below **1.0e-7 mbar** (gauge on the pump station) and background of helium below **1.0e-9 mbar\*/s** – **est. 16 hours** (recommended longer time of pumping)
- RGA filaments outgassing, mass scan and saving data – **est. 1 hour**

### For the ISO-VAC

- connection of the pump station to the ISO-VAC – **est. 10 min**
- assembly of the Full Range Gauge at the ISO-VAC – **est. 10 min**
- start pumping of the ISO-VAC pump and purge 3 times, with venting with nitrogen (pumping up to 1 mbar of pressure at Full Range Gauge) (limitation flow during pumping and venting) – **est. 1.5 hour**
- roughly leak check for connection of the pump station – **10 min**

- continuation of pumping up to **1.0e-4 mbar** at Full Range Gauge and until background of helium for ISO-VAC below **1.0e-9 mbar\*l/s** for option 1, or **1.0e-8 mbar\*l/s** for option 2 – **est. 2/3 days**
- final leak check for connection of the pump station – **est. 10 min**
- pressure and leak test for cryogenic line
- leak check for the ISO-VAC with background of helium **1.0e-9 mbar\*l/s** (with assumption, that leak detector is connected in front of pumping group) – **est. 1.5 hours**

#### **For the cryogenic line pressure and leak test**

- connection of the cryogenic lines – **est.??**
- filling with helium cryogenic lines (each circuit separately) and keep the pressure over next **15 or 30 min**; leak rate observation at the ISO-VAC– **est. ??**

Before cooling down activation of the Ionic Getter Pump and after pressure stabilisation closing of the valve to the pump station

#### **COOLING DOWN, 2K STATE AND WARMING UP PROCESS**

Activities during cool down, 2K state and warm up process concerning vacuum point of view

- pressure at the beam line monitoring and data saving
- pressure at Full Range Gauge at ISO-VAC monitoring and data saving
- background of helium for ISO-VAC monitoring and data saving

Activities after warm up of the cryomodule

- opening of the valve to the pump station
- deactivation of the Ionic Getter Pump
- waiting for pressure stabilisation – **est. 30 min**
- outgassing of the filament for RGA and mass scan for beam line, saving data – **est. 1 hour**
- venting of the ISO-VAC – **est. 15 min**
- disconnection of the pump station from the ISO-VAC – **est. 10 min**
- RGA scan for beamline, saving data – **est. 10 min**
- closing of the gate valve to the beamline
- venting of the connection with nitrogen – **est. 15 min**
- preparing clean box unit – **est. 1 hour**
- clean air flow before disconnection – **est. 30 min**  
(in the meantime preparing the screws, gaskets and blank flanges for disconnection)
- disconnection – **est. 30 min**