PCTS Procedure

# INSPECTION

1. **VACUUM CLEAN** sealed bags w/ ‘cold’ & ‘warm’ assemblies in Prep Area of Clean Room -> wipe w/ paper
2. **OPEN BAGS** in Clean Room (Class 100)
3. **VISUAL CHECK** of parts :
   1. Copper plating @ inner surfaces
   2. RF windows surfaces
   3. Flanges; surface condition, geometry
4. **RECORDS** in VWP3032 Inspection Data Sheet
5. **PHOTO** deficiencies
6. **PUT BACK** assemblies into the bag -> **FILL BAGS** w/ N2 gas -> **SEAL**
7. **STORE** assemblies

# COLD ASSEMBLY (Class 10)

1. **CHECK** and **TAKE PHOTOS**
2. **CLEAN PARTS** w/ filtered N2 gas **-> MONITOR** environment around assembly w/ Particle Counter
3. **MOUNT** cold assembly to Support Frame and to Waveguide Box.
4. **REMOVE** ‘cold’ bellow supporter and add Protection Aluminum Block between **bellow slider ⇔ 80 K flange.**
5. **PUMP** vacuum
6. **LEACK CHECK** @ P < 10 mTorr
7. **KEEP PUMPING** to 1e-4 Torr
8. **COVER** ceramic `cold` window w/ plastic film or paper (for class 10)
9. **STOP PUMP** -> **CLOSE VALVE** -> **MOVE PCTS** to class 100.

# WARM ASSEMBLY (Class 1000)

1. CHECK & PHOTOS
   1. ‘Warm’ section of Inner Conductor. Flange ⊥ Conductor Axis
   2. Inner Surface
2. PREPARE Ba1 Seal spring RF contact O-rings for ‘cold’ window groove (large Ba1 Seal) and for ‘warm’ window groove (small Ba1 seal).
3. MOUNT Inner Conductor Cone Flange to ‘cold’ window
4. EXTEND Support Rods with two additional tracks -> ENSURE joint is smooth & outer conductor can easily slide
5. INSTALL Sliders for outer conductor on the end of inner conductor and INSERT cables in the Teflon Holder

* **PUT** 2 Long Indexing Rods through Outer Conductor -> SCREW them to end face of the inner conductor -> ADJUST inner conductor w/ indexing rods.
* **PREPARE** Washers w/ Copper Clips to hold RF Contact Ring in the groove.
* **SLIDE** outer conductor over the tracks towards the cold window.
* **BOLT** 80 K flange to outer conductor flange.

1. INSTALL all vacuum flanges
2. PUMP and LEAK CHECK ‘warm’ assembly @ < 10mTorr
3. STOP PUMP
4. VENT ‘warm’ vacuum volume w/ filtered N2
5. MOVE PCTS to VECC Area for Conditioning

# BAKING

* Only Bake ‘cold’ assembly. Don’t accidentally bake RF Box Aluminum Gasket.
* Outer Conductor and ‘warm’ window wrapped w/ heater tapes. Inner conductor heating w/ filtered hot air.
* Protect Ceramic Surface of ‘warm’ window from contamination w/ aluminum foil before heater tape.
* Protect ‘warm’ window & RF contacts w/ filtered N2 gas flow under shroud.

## Preparation

1. INSTALL Heaters for ‘warm’ outer conductor baking (Fig 16)

* Heat for Inner Cond is provided from hot filtered air flow
* Heat for Outer Cond is from Two Heater Tapes
* Heat for `Warm` Window is from Heater Tape w/ programmable controller

1. ASSEMBLE Protecting Shroud (Fig. 17)
2. 1st Layer -> Aluminum Foil
3. 2nd Layer -> Heater Tape & Temp. Sensor
4. 3rd Layer -> Aluminum Foil
5. 4th Layer -> Protection Shroud & N2 Gas Supply
6. PUMPING
7. CONNECT cables for Vacuum Gauges & Ion Pumps
8. START Turbo Pumps
9. OPEN valves for ‘warm’ assembly
10. PUMP ‘cold’ assembly

* If it doesn’t start -> OPEN Cold-Warm Valve (‘cold’ turbo pumping) -> RESUME PUMPING of ‘cold’ with Ion Pump -> SHUT-OFF Cold-Warm Valve

1. PROGRAM Temp Controller for ‘Warm’ Window

* 3 Stages : T increase, baking, and T decrease (~1 week in total)
* T-raise speed ~ 10C/h , from Room Temp to 100 celcius
* T-decrease speed <10C/h from 100 to Room Temp.

1. TURN ON filtered N2 gas supply valve to protect ‘warm’ window

* ENSURE warm windows surrounded by N2 gas flow
* SETUP EPICS page (strip tool) for vacuum data

1. TURN ON heaters step by step

* TURN ON ‘warm’ window programmable heater controller
* +4hrs : TURN ON Inner Conductor heater (T-set point 100C)
* +1hrs : TURN ON Outer Conductor heater close to ‘warm’ window (T-set point 80C)
* +1hrs:TURN ON Outer Conductor heater close to ‘cold’ window (T-set point 80C)
* MEASURE temp on Outer Conductor & ADJUST temp relays for T-set 100 C.

1. +1 Week Baking: TURN OFF heaters

* DECREASE Temp on ‘warm’ window from Programmable Controller
* TURN OFF Air Supply for Inner Conductor & TURN OFF Heater Tape for Inner Conductor
* DECREASE Temp on other locations step by step : 20C/h

1. CHECK after baking -> NO OXIDATION near ‘warm’ window
2. START Ion Pump for ‘warm’ assembly

# RF CONDITIONING PREP

1. RF Matching
2. INSTALL Waveguide Transformer & Capacitor for DC bias.
3. PREPARE Network Analyzer and RF Jigs for S-parameter measurements
4. MEASURE S-parameters

* S11,S22
* VSWR
* Matching or Not

1. ADJUST Coupler Antennas positions

* RELEASE Inner Conductor ⇔ 80 K Flange.
* ADJUST Input Coupler Antenna (by 0.5 mm) -> Measure S11 : If S11 ↑, change direction.
* ADJUST Output Coupler Antenna (by 0.5 mm) -> Measure S22 : If S22 ↑, change direction

1. INSTALL RF Waveguide Load to Output Coupler
2. INSTALL Diagnostics & Cooling Loops
3. INSTALL Air Cooling Loop -> Inner Conductors & Warm Windows Cooling Gas
4. INSTALL Water Cooling Loop
5. INSTALL Temp Sensors @ : Close to ‘cold’ window, On Waveguide Box, On Warm Bellow
6. INSTALL RF Power Detector
7. INSTALL PMT and IR detectors
8. SETUP RF Power Meter for : Calibration & Check RF measurements with Signl Gen.
9. CALIBRATE pickup for oscilloscope RF power measurements
10. CHECK :

* PMT Voltage
* Temp Sensors
* Setup EPICS page (strip tool) for Temp and Vacuum

1. INSTALL 5 fans for coupler cooling
2. SETUP HV Source; DON’T TURN ON

* SET HV Source to 0V
* CONNECT HV Source ⇔ Inner Conductor Terminals

1. IOT RF Source Prep
2. TURN ON Cooling Water
3. POWER UP IOT

* ENSURE Nobody in HV Area
* UNLOCK Ground Switch –> key C
* POSITION Ground Switch @ “NORMAL OPERATION” -> Ready = PNOZ light indicator ON & Ion Pump starts (@3500V).
* UNLOCK Breaker MCB1 -> key A
* POSITION Breaker MCB1 @ ON
* IOT RF is ready to operate

1. KEEP IT ON for 2 days : IOT pumping

# RF CONDITIONING

Two regimes :

1. Pulsed in Standing Wave (SW) -> PCTS Loaded on variable Shorting Plate Reactance
2. CW in Travelling Wave (TW)