|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Traveler Title | SNSPPU Cryomodule Acceptance Testing | | | | |
| Traveler Abstract | Outlines the acceptance testing of the SNSPPU Style Cryomodules in the CMTF Test Cave | | | | |
| Traveler ID | SNSPPU-CP-CMTF-CM-ACTS | | | | |
| Traveler Revision | R1 | | | | |
| Traveler Author | Matthew Weaks | | | | |
| Traveler Date | 29-Oct-21 | | | | |
| NCR Informative Emails | jharris | | | | |
| NCR Dispositioners | Drury,edaly,huque | | | | |
| D3 Emails | Drury,edaly,huque | | | | |
| Approval Names | Matthew Weaks | Naeem Huque | Larry King | M. Drury | Ed Daly |
| Approval Signatures |  |  |  |  |  |
| Approval Dates |  |  |  |  |  |
| Approval Title | Author | Reviewer | Reviewer | Reviewer | Project Manager |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| References | List and Hyperlink all documents related to this traveler. This includes, but is not limited to: safety (THAs, SOPs, etc), drawings, procedures, and facility related documents. | | | |
| [SNSPPU CMTF P&ID](https://misportal.jlab.org/jlabDocs/items/130790) | SNSPPU-CP-CMTF-CM-WARMUP | SNSPPU-CP-CMTF-CM-CD | SRFOPS-PR-CMTF-CM-EPICS | [SNSPPU-PR-CMTF-CM-RUN](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-251774/SNSPPU-PR-CMTF-CM.docx) |
|  |  |  |  |  |

|  |  |
| --- | --- |
| Revision Note |  |
| R1 | Initial release of this Traveler. |

|  |  |  |
| --- | --- | --- |
| **Step No.** | **Instructions** | **Data Input** |
| 1 | Record the Cavity SN’s for each cavity position. | [[CMSN]] <<CMSN>>  [[Cav1SN]]<<CAVSN>>  [[Cav2SN]]<<CAVSN>>  [[Cav3SN]]<<CAVSN>>  [[Cav4SN]]<<CAVSN>>  [[IDsRecordedBy]]<<SRF>>  [[TimeIDsRecorded]]<<TIMESTAMP>>  [[PullCavSNsfromCMSN]]<<NOTE>> |
| 2 | Attach ground cable to the Cryomodule.  Record username and time of completion.  **\*Note - Failure to properly attach the ground cable can result in damage to equipment, and injury to personnel\*** | [[GroundCableTech]] <<SRF>>  [[GroundCableTime]] <<TIMESTAMP>>  [[GroundCableComm]] <<COMMENT>> |

|  |  |  |
| --- | --- | --- |
| **Step No.** | **Instructions** | **Data Input** |
| 3 | Verify that the Insulating Vacuum signal is connected to the data acquisition system, and is reading back correctly in EPICS.  **Verify the Insulating Vacuum is <1x10-4 Torr, if the Insulating Vacuum cannot be maintained below 1x10-4 Torr, generate an NCR.**  Record the Insulating Vacuum (In Torr) from both Cold Cathode gauges and the convectron gauge.  Note any problems/issues in the comment box. | [[WarmInsVacTech]] <<SRF>>  [[WarmInsVacTime]] <<TIMESTAMP>>  [[WarmInsVacPres1]]<<SCINOT>> (Torr)  [[WarmInsVacPres2]]<<SCINOT>> (Torr)  [[WarmInsVacConv]]<<SCINOT>> (Torr)  [[WarmInsVacComm]] <<COMMENT>> |
| 4 | Verify that the Beamline Vacuum signal is connected to the data acquisition system, and is reading back correctly in EPICS.  **Verify the Beamline Vacuum is <1x10-8 Torr, if the Beamline Vacuum cannot be maintained below 1x10-8 Torr, generate an NCR.**  Record the Beamline Vacuum pressure (In Torr).  Note any problems/issues in the comment box. | [[WarmBLVacTech]] <<SRF>>  [[WarmBLVacTime]] <<TIMESTAMP>>  [[WarmBLVacPressure]]<<SCINOT>> (Torr)  [[WarmBLVacComm]] <<COMMENT>> |

|  |  |  |
| --- | --- | --- |
| **Step No.** | **Instructions** | **Data Input** |
| 5 | Verify that the Coupler Vacuum signals are connected to the data acquisition system, and are reading back correctly in EPICS.  **Verify the Coupler Vacuum is <1x10-8 Torr, if the Coupler Vacuum cannot be maintained below 1x10-8 Torr, generate an NCR**  Record the Coupler Vacuum pressures (In Torr).  Note any problems/issues in the comment box. | [[WarmCoupVacTech]] <<SRF>>  [[WarmCoupVacTime]] <<TIMESTAMP>>  [[WarmCoup1VacPress]]<<SCINOT>> (Torr)  [[WarmCoup2VacPress]]<<SCINOT>> (Torr)  [[WarmCoup3VacPress]]<<SCINOT>> (Torr)  [[WarmCoup4VacPress]]<<SCINOT>> (Torr)  [[WarmCoup5VacPress]]<<SCINOT>> (Torr)  [[WarmCoup6VacPress]]<<SCINOT>> (Torr)  [[WarmCoup7VacPress]]<<SCINOT>> (Torr)  [[WarmCoup8VacPress]]<<SCINOT>> (Torr)  [[WarmCoupVacComm]] <<COMMENT>> |

|  |  |  |
| --- | --- | --- |
| **Step No.** | **Instructions** | **Data Input** |
| 6 | Connect Stepper Motors to DAQ and Controls, verify that the instrumentation reads back correctly.  **If any of the Stepper Motors fails to read back correctly, generate an NCR.**  Note any problems/issues in the comment box. | [[StepperTech]]<<SRF>>  [[StepperTime]]<<TIMESTAMP>>  [[StepperComments]]<<COMMENT>> |
| 7 | Connect Helium Vessel Temperature Sensors to the data acquisition system, and verify that each is reading back correctly in EPICS.  Verify Helium Vessel Temperature Sensors are reading back from the correct CryoCons, and reporting to the correct PVs in EPICS before proceeding.  **If any Temperature Sensor is determined to be non-functional, generate an NCR.**  Note any problems/issues in the comment box. | [[HVTempSensTech]]<<SRF>>  [[HVTempSensTime]]<<TIMESTAMP>>  [[HVTempSensComments]]<<COMMENT>> |
| 8 | Connect End Can Temperature Sensors to the data acquisition system, and verify that each is reading back correctly in EPICS.  Verify End Can Temperature Sensors are reading back from the correct CryoCons, and reporting to the correct PVs in EPICS before proceeding.  **If any Temperature Sensor is determined to be non-functional, generate an NCR.**  Note any problems/issues in the comment box. | [[ECTempSensTech]]<<SRF>>  [[ECTempSensTime]]<<TIMESTAMP>>  [[ECTempSensComments]]<<COMMENT>> |

|  |  |  |
| --- | --- | --- |
| **Step No.** | **Instructions** | **Data Input** |
| 9 | Connect Beam Tube Temperature Sensors to the data acquisition system, and verify that each is reading back correctly in EPICS.  Verify Beam Tube Temperature Sensors are reading back from the correct CryoCons, and reporting to the correct PVs in EPICS before proceeding.  **If any Temperature Sensor is determined to be non-functional, generate an NCR.**  Note any problems/issues in the comment box. | [[BTTempSensTech]]<<SRF>>  [[BTTempSensTime]]<<TIMESTAMP>>  [[BTTempSensComments]]<<COMMENT>> |
| 10 | Connect 50K Shield Temperature Sensors to the data acquisition system, and verify that each is reading back correctly in EPICS.  Verify 50K Shield Temperature Sensors are reading back from the correct CryoCons, and reporting to the correct PVs in EPICS before proceeding.  **If any Temperature Sensor is determined to be non-functional, generate an NCR.**  Note any problems/issues in the comment box. | [[50KTempSensTech]]<<SRF>>  [[50KTempSensTime]]<<TIMESTAMP>>  [[50KTempSensComments]]<<COMMENT>> |
| 11 | Connect both Liquid Level Probes to the data acquisition system, and verify that each is reading back correctly in EPICS.  Once LL Probes have been verified operational, ensure the probes are switched off, and remain de-energized until cooldown.  **If either LL Probe is determined to be non-functional, generate an NCR.**  Note any problems/issues in the comment box. | [[LLProbe1]]<<CHECKBOX>>  [[LLProbe2]]<<CHECKBOX>>  [[LLProbeTech]]<<SRF>>  [[LLCompleteTime]]<<TIMESTAMP>>  [[LLComments]]<<COMMENT>> |

|  |  |  |
| --- | --- | --- |
| **Step No.** | **Instructions** | **Data Input** |
| 12 | Verify that Pressure Transducers (100 Torr, 5000 Torr Primary Circuit, and 5000 Torr Secondary Circuit) are connected properly, and that each is reading back correctly in EPICS.  If necessary, isolate and calibrate the Pressure Transducers.  Check off each connection as it is completed.  **If any Pressure Transducer is determined to be non-functional, replace the Transducer, and verify function of the replacement.**  Note any problems/issues in the comment box. | [[PT100]]<<CHECKBOX>>  [[PT5KPrimary]]<<CHECKBOX>>  [[PT5KSecondary]]<<CHECKBOX>>  [[PTInstTech]]<<SRF>>  [[PTTimeComplete]]<<TIMESTAMP>>  [[PTComments]]<<COMMENT>> |

|  |  |  |
| --- | --- | --- |
| **Step No.** | **Instructions** | **Data Input** |
| 13 | Verify the Primary and Secondary JT Valve as well as the Primary Circuit CD valve actuators are installed and set up properly.  Verify each LVDT is set up correctly, and reading back properly in EPICS.  Run the valves through their full range, verify proper operation and readback.  **\*Note: This step must be completed before U-Tubes are stabbed. If any of the primary U-Tubes are in place, the JT Valves and CD Valve must remain closed until cool-down.**  **If either JT Valve, CD Valve, or any LVDT is determined to be non-functional, generate an NCR.**  Note any problems/issues in the comment box. | [[ValveCheckTech]]<<SRF>>  [[ValveCheckTime]]<<TIMESTAMP>>  [[ValveCheckComments]]<<COMMENT>> |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Step No.** | | | **Instructions** | | | | | **Data Input** | |
| 14 | | | Use a network analyzer to measure the Warm Cavity Passband Frequencies.  Enter the frequency data as measurements are taken.  **\*Note: This measurement must be completed prior to the cooldown, and prior to any movement of the tuners** | | | | | [[WarmPassBandTech]]<<USERNAME>>  [[WarmPassBandTime]]<<TIMESTAMP>>  [[WarmPassBandComments]]<<COMMENT>> | |
| **Cavity** | **1/5 pi (MHz)** | | | **2/5 pi (MHz)** | **3/5 pi (MHz)** | **4/5 pi (MHz)** | | | **Pi (MHz)** |
| **1** | [[Cav1Warm15Pi]]  <<FLOAT>> | | | [[Cav1Warm25Pi]]  <<FLOAT>> | [[Cav1Warm35Pi]]  <<FLOAT>> | [[Cav1Warm45Pi]]  <<FLOAT>> | | | [[Cav1WarmPi]]  <<FLOAT>> |
| **2** | [[Cav2Warm15Pi]]  <<FLOAT>> | | | [[Cav2Warm25Pi]]  <<FLOAT>> | [[Cav2Warm35Pi]]  <<FLOAT>> | [[Cav2Warm45Pi]]  <<FLOAT>> | | | [[Cav2WarmPi]]  <<FLOAT>> |
| **3** | [[Cav3Warm15Pi]]  <<FLOAT>> | | | [[Cav3Warm25Pi]]  <<FLOAT>> | [[Cav3Warm35Pi]]  <<FLOAT>> | [[Cav3Warm45Pi]]  <<FLOAT>> | | | [[Cav3WarmPi]]  <<FLOAT>> |
| **4** | [[Cav4Warm15Pi]]  <<FLOAT>> | | | [[Cav4Warm25Pi]]  <<FLOAT>> | [[Cav4Warm35Pi]]  <<FLOAT>> | [[Cav4Warm45Pi]]  <<FLOAT>> | | | [[Cav4WarmPi]]  <<FLOAT>> |
| 15 | | Verify that all preceeding Cool Down Preparation steps have been completed, and that all requested information has been input into the appropriate fields.  This step must be completed before the cooldown operation can begin. | | | | | [[FieldName]] {{drury,weaksmc,dsavr,king}} <<HOLDPOINT>> | | |

|  |  |  |
| --- | --- | --- |
| **Step No.** | **Instructions** | **Data Input** |
| 16 | Record the date and time when the U-Tube installation was completed.  Note any issues or observations in the comment box. | [[UTubeTech]]<<SRF>>  [[UTubeInstallCompleteTime]]<<TIMESTAMP>>  [[UTubeInstallComments]]<<COMMENT>> |
| 17 | Record the date and time when the Primary and Secondary circuits have completed 4K cool down as described in SNSPPU-CR-CMTF-CM-CD.  Record the date and time when the Liquid Level reaches 90%  Record the LL Reading for both LL Probes, verify that both probes are within 5% of eachother.  Note any issues or observations in the comment box. | [[4KCooldownOperator]] <<SRF>>  [[4KPrimaryCDCompleteTime]]<<TIMESTAMP>>  [[4KSecondaryCDCompleteTime]]<<TIMESTAMP>>  [[4KCooldownComments]]<<COMMENT>>  [[4KFillOperator]] <<SRF>>  [[4KFillCompleteTime]] <<TIMESTAMP>>  [[4KLLReadback1]]<<FLOAT>> %  [[4KLLReadback2]]<<FLOAT>> %  [[4KWithin5Percent]]<<CHECKBOX>>  [[4KFillComments]] <<COMMENT>> |
| 18 | Record the date and time when the Pumpdown to 2K has been completed.  Note any issues or observations in the comment box.  Record the date and time when the Liquid Level reaches 90%  Record the final pressure in the primary helium circuit as measured by the 100 Torr pressure transducer.  Record the LL Reading for both LL Probes, verify that both probes are within 5% of eachother.  Note any issues or observations in the comment box. | [[2KPumpdownTime]] <<TIMESTAMP>>  [[2KPumpdownComments]] <<COMMENT>>  [[2KFillOperator]] <<SRF>>  [[2KFillCompleteTime]] <<TIMESTAMP>>  [[PrimaryCircuitPressure]] <<FLOAT>> (Torr)  [[2KLLReadback1]]<<FLOAT>> %  [[2KLLReadback2]]<<FLOAT>> %  [[2KWithin5Percent]]<<CHECKBOX>>  [[2KFillComments]] <<COMMENT>> |
| 19 | Once the liquid level and primary circuit pressure have stabilized, make a record of all Temperature Sensors and Liquid Level sensors.  Upload the logfile containing these measurements. | [[TempRecordTech]]<<SRF>>  [[TempRecordTime]]<<TIMESTAMP>>  [[TempRecordComments]]<<COMMENT>>  [[TempRecordFile]]<<FILEUPLOAD>> |

|  |  |  |
| --- | --- | --- |
| **Step No.** | **Instructions** | **Data Input** |
| 20 | Measure resistance of each of the Helium Vessel heaters and verify there is no open/short.  Activate Helium Vessel Heaters one at a time and verify correct operation by change in helium circuit pressure and/or Liquid Level.  **\*Note –** The module must have stable liquid levels and pressure prior to beginning the heater response test.  **If any vessel heater appears to be inoperative, generate an NCR**  Note any issues or observations in the comment box. | [[VesselHeaterTestTech]]<<SRF>>  [[VesselHeaterTestTime]]<<TIMESTAMP>>  [[VesselHeater1Resistance]]<<FLOAT>> Ohms  [[VesselHeater2Resistance]]<<FLOAT>> Ohms  [[VesselHeater3Resistance]]<<FLOAT>> Ohms  [[VesselHeater4Resistance]]<<FLOAT>> Ohms  [[HeatersOperational]]<<YESNO>>  [[VesselHeaterTestComments]]<<COMMENT>> |
| 21 | Measure resistance of each of the Window Heaters, and verify there is no open/short.  **If any window heater appears to be inoperative, generate an NCR**  Note any issues or observations in the comment box. | [[WindowHeaterTestTech]]<<SRF>>  [[WindowHeaterTestTime]]<<TIMESTAMP>>  [[WindowHeater1Resistance]]<<FLOAT>> Ohms  [[WindowHeater2Resistance]]<<FLOAT>> Ohms  [[WindowHeater3Resistance]]<<FLOAT>> Ohms  [[WindowHeater4Resistance]]<<FLOAT>> Ohms  [[WindowHeaterTestComments]]<<COMMENT>> |

|  |  |  |
| --- | --- | --- |
| **Step No.** | **Instructions** | **Data Input** |
| 22 | Verify the Insulating Vacuum at 2K is <1x10-6 Torr.  **If the Insulating Vacuum cannot be maintained below 1x10-6 Torr at 2K, generate an NCR.**  Record the 2K Insulating Vacuum (In Torr) as read by both Cold Cathode gauges, and the Convectron gauge.  Note any problems/issues in the comment box. | [[2KInsVacTech]] <<SRF>>  [[2KInsVacTime]] <<TIMESTAMP>>  [[2KInsVacPres1]]<<SCINOT>> (Torr)  [[2KInsVacPres2]]<<SCINOT>> (Torr)  [[2KInsVacConv]]<<SCINOT>> (Torr)  [[2KInsVacComm]] <<COMMENT>> |
| 23 | Verify the Beamline Vacuum at 2K is <1x10-9 Torr.  **If the Beamline Vacuum cannot be maintained below 1x10-9 Torr at 2K, generate an NCR.**  Record the 2K Beamline Vacuum pressure (In Torr).  Note any problems/issues in the comment box. | [[2KBLVacTech]] <<SRF>>  [[2KBLVacTime]] <<TIMESTAMP>>  [[2KBLVacPressure]]<<SCINOT>> (Torr)  [[2KBLVacComm]] <<COMMENT>> |
| 24 | Verify the Coupler Vacuum at 2K is <1x10-8 Torr.  **If the Coupler Vacuum cannot be maintained below 1x10-8 Torr at 2K, generate an NCR**  Record the 2K Coupler Vacuum pressures (In Torr).  Note any problems/issues in the comment box. | [[2KCoupVacTech]] <<SRF>>  [[2KCoupVacTime]] <<TIMESTAMP>>  [[2KCoup1VacPress]]<<SCINOT>> (Torr)  [[2KCoup2VacPress]]<<SCINOT>> (Torr)  [[2KCoup3VacPress]]<<SCINOT>> (Torr)  [[2KCoup4VacPress]]<<SCINOT>> (Torr)  [[2KCoup5VacPress]]<<SCINOT>> (Torr)  [[2KCoup6VacPress]]<<SCINOT>> (Torr)  [[2KCoup7VacPress]]<<SCINOT>> (Torr)  [[2KCoup8VacPress]]<<SCINOT>> (Torr)  [[2KCoupVacComm]] <<COMMENT>> |

|  |  |  |
| --- | --- | --- |
| **Step No.** | **Instructions** | **Data Input** |
| 25 | Upload any Logfiles containing data from the cooldown. | [[CoolDownFiles]]<<FILEUPLOAD>> |
| 26 | Isolate the insulating vacuum and valve out any active pumps on the insulating vacuum after the cooldown is complete, and the module is stable. Monitor the insulating vacuum for at least one week.  Record start time, finish time, and vacuum pressure (in torr)  Note any problems/issues in the comment box. | [[ValveOutTech]]<<SRF>>  [[ValveOutStartTime]]<<TIMESTAMP>>  [[StartingInsVac]]<<SCINOT>> (Torr)  [[ValveOutEndTime]]<<TIMESTAMP>>  [[EndingInsVac]]<<SCINOT>> (Torr)  [[ValveOutComments]]<<COMMENT>> |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Step No.** | | **Instructions** | | | | | **Data Input** | | |
| 27 | | Use a network analyzer to measure the Cold Cavity Passband Frequencies and Qext’s.  Enter the frequency and Qext data in the table below as measurements are taken. | | | | | [[ColdPassBandTech]]<<USERNAME>>  [[ColdPassBandTime]]<<TIMESTAMP>>  [[ColdPassBandComments]]<<COMMENT>> | | |
| **Cavity** | **1/5 pi (MHz)** | | **2/5 pi (MHz)** | | **3/5 pi (MHz)** | **4/5 pi (MHz)** | | | **Pi (MHz)** |
| **1** | [[Cav1Cold15Pi]]  <<FLOAT>> | | [[Cav1Cold25Pi]]  <<FLOAT>> | | [[Cav1Cold35Pi]]  <<FLOAT>> | [[Cav1Cold45Pi]]  <<FLOAT>> | | | [[Cav1ColdPi]]  <<FLOAT>> |
| **2** | [[Cav2Cold15Pi]]  <<FLOAT>> | | [[Cav2Cold25Pi]]  <<FLOAT>> | | [[Cav2Cold35Pi]]  <<FLOAT>> | [[Cav2Cold45Pi]]  <<FLOAT>> | | | [[Cav2ColdPi]]  <<FLOAT>> |
| **3** | [[Cav3Cold15Pi]]  <<FLOAT>> | | [[Cav3Cold25Pi]]  <<FLOAT>> | | [[Cav3Cold35Pi]]  <<FLOAT>> | [[Cav3Cold45Pi]]  <<FLOAT>> | | | [[Cav3ColdPi]]  <<FLOAT>> |
| **4** | [[Cav4Cold15Pi]]  <<FLOAT>> | | [[Cav4Cold25Pi]]  <<FLOAT>> | | [[Cav4Cold35Pi]]  <<FLOAT>> | [[Cav4Cold45Pi]]  <<FLOAT>> | | | [[Cav4ColdPi]]  <<FLOAT>> |
| **Cavity** | **Qext Range Lower** | | | **Qext Range Upper** | | | | **Qext Final Tuned Value** | |
| **1** | [[Cav1QextLo]]<<SCINOT>> | | | [[Cav1QextUp]]<<SCINOT>> | | | | [[Cav1QextFin]]<<SCINOT>> | |
| **2** | [[Cav2QextLo]]<<SCINOT>> | | | [[Cav2QextUp]]<<SCINOT>> | | | | [[Cav2QextFin]]<<SCINOT>> | |
| **3** | [[Cav3QextLo]]<<SCINOT>> | | | [[Cav3QextUp]]<<SCINOT>> | | | | [[Cav3QextFin]]<<SCINOT>> | |
| **4** | [[Cav4QextLo]]<<SCINOT>> | | | [[Cav4QextUp]]<<SCINOT>> | | | | [[Cav4QextFin]]<<SCINOT>> | |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Step No.** | | **Instructions** | | | | **Data Input** | | |
| 28 | | Tune all 4 cavities to 805MHz, and +/- 0.200MHz using a network analyzer and local tuner control box.  Confirm the network analyzer and local tuner box are connected to the correct ports before proceeding.  If a cavity does not appear to change tune during tuner movement, immediately halt the test until the issue can be resolved.  Note any problems/issues in the comment box. | | | | [[TunerTech]]<<SRF>>  [[TunerTime]]<<TIMESTAMP>>  [[TunerComments]]<<COMMENT>> | | |
| **Cavity** | **Initial frequency (MHz)** | | **Min Frequency (MHz)** | **Low Limit Switch Activated?** | **Max Frequency (MHz)** | | **High Limit Switch Activated?** | **Tuner Range (kHz)** |
| **1** | [[Cav1InitFreq]] <<FLOAT>> | | [[Cav1MinFreq]] <<FLOAT>> | [[Cav1LowLimit]] <<YESNO>> | [[Cav1MaxFreq]] <<FLOAT>> | | [[Cav1HighLimit]] <<YESNO>> | [[Cav1TunRange]] <<FLOAT>> |
| **2** | [[Cav2InitFreq]] <<FLOAT>> | | [[Cav2MinFreq]] <<FLOAT>> | [[Cav2LowLimit]] <<YESNO>> | [[Cav2MaxFreq]] <<FLOAT>> | | [[Cav2HighLimit]] <<YESNO>> | [[Cav2TunRange]] <<FLOAT>> |
| **3** | [[Cav3InitFreq]] <<FLOAT>> | | [[Cav3MinFreq]] <<FLOAT>> | [[Cav3LowLimit]] <<YESNO>> | [[Cav3MaxFreq]] <<FLOAT>> | | [[Cav3HighLimit]] <<YESNO>> | [[Cav3TunRange]] <<FLOAT>> |
| **4** | [[Cav4InitFreq]] <<FLOAT>> | | [[Cav4MinFreq]] <<FLOAT>> | [[Cav4LowLimit]] <<YESNO>> | [[Cav4MaxFreq]] <<FLOAT>> | | [[Cav4HighLimit]] <<YESNO>> | [[Cav4TunRange]] <<FLOAT>> |
| 29 | | Verify that all preceeding Testing and Verification steps have been completed, and that all requested information has been input into the appropriate fields.  This step must be completed before the warmup operation can begin. | | | | [[FieldName]] {{drury,weaksmc,dsavr}} <<HOLDPOINT>> | | |

|  |  |  |
| --- | --- | --- |
| **Step No.** | **Instructions** | **Data Input** |
| 30 | Begin warming the module as per SNSPPU-PR-CMTF-CM-WARMUP.  Note whether the module is undergoing a passive or active warm up  Record the time at which the heaters are activated, if heaters are being used.  Note any problems/issues in the comment box. | [[WarmUpTech]]<<SRF>>  [[WarmUpTime]]<<TIMESTAMP>>  [[WarmUpType]]{{Active,Passive}} <<RADIO>>  [[HeatersUsed]]<<YESNO>>  [[HeatersOn]]<<TIMESTAMP>>  [[WarmUpComments]]<<COMMENT>> |
| 31 | If heaters are utilized, ensure they are all de-energized before all liquid is boiled out of the helium vessels.  If the pressure of the Insulating Vacuum is raised during the warmup (As described in SNSPPU-PR-CMTF-CM-WARMUP) record the time, lowest Helium Vessel Temperature, and insulating vacuum pressure.  Record the time when the lowest temperature Temperature Sensor reads 285K  Note any problems/issues in the comment box. | [[InsVacBump1Time]]<<TIMESTAMP>>  [[InsVacBump1Temp]]<<FLOAT>> K  [[InsVacBump1Pres]]<<FLOAT>> Torr  [[InsVacBump2Time]]<<TIMESTAMP>>  [[InsVacBump2Temp]]<<FLOAT>> K  [[InsVacBump2Pres]]<<FLOAT>> Torr  [[InsVacBump3Time]]<<TIMESTAMP>>  [[InsVacBump3Temp]]<<FLOAT>> K  [[InsVacBump3Pres]]<<FLOAT>> Torr  [[WarmEndTech]]<<SRF>>  [[WarmEndTime]]<<TIMESTAMP>>  [[WarmEndComments]]<<COMMENT>> |
| 32 | Record the time when U-Tube removal is complete.  Upload any files related to the warmup.  Note any problems/issues in the comment box. | [[UTubePullTech]]<<SRF>>  [[UTubePullTime]]<<TIMESTAMP>>  [[UTubePullComments]]<<COMMENT>>  [[WarmUpFiles]]<<FILEUPLOAD>> |