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| Traveler Title | LCLS-HE Cryomodule Acceptance Testing in the LERF | | | |
| Traveler Abstract | LCLS-HE Cryomodule Testing. This traveler covers testing of the cryomodule after installation in the Low Energy Recirculator Facility. Assumes that the CM is cold at 2K. | | | |
| Traveler ID | L2HE-LERF-CM-ACTS | | | |
| Traveler Revision | R4 | | | |
| Traveler Author | M. Drury | | | |
| Traveler Date | 23-Sep-21 | | | |
| NCR Informative Emails | areilly,adamg | | | |
| NCR Dispositioners | drury,fischer,forehand,powen,huque,hannesv,mbevins | | | |
| D3 Emails | adamg,drury,mbevins | | | |
| Approval Names | M. Drury | G. Ciovati | J. Vennekate | M. Bevins |
| Approval Signatures |  |  |  |  |
| Approval Dates |  |  |  |  |
| Approval Title | Author | Reviewer | Reviewer | Project Manager |

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| 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. | | | |
| [Accelerator Operations Directive](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-244027/accel_ops_directives.pdf) | [OSP LCLS-II Acceptance Testing in the LERF](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-270514/LERF%20OSP%20146693.pdf) | [Minimum Acceptance Criteria](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-248266/LCLSII-HE-1.2-PP-0255.pdf) |  |  |
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| Revision Note |  |
| R1 | Initial release of this Traveler. |
| R2 | Added numeric fields to bring traveler into Minimum Acceptance Criteria compliance for HE. |
| R3 | Added steps to capture Fast Cool Down data. Updated version of LERF OSP linked |
| R4 | Added fields to cover RadCon checklist. Added YESNO fields for piezos and FEOnset |

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| Step No. | Instructions | Data Input |
| 1 | Record the Cryomodule serial number | [[CMSN]] <<CMSN>> |
| 2 | Record the Cavity SN's for each cavity position. (Note: Cavity 1-Supply side, Cavity 8-Return side) | [[CavSN1]] <<CAVSN>>  [[CavSN2]] <<CAVSN>>  [[CavSN3]] <<CAVSN>>  [[CavSN4]] <<CAVSN>>  [[CavSN5]] <<CAVSN>>  [[CavSN6]] <<CAVSN>>  [[CavSN7]] <<CAVSN>>  [[CavSN8]] <<CAVSN>>  [[Pull the CAVSNs from the CST ASSY traveler]] <<NOTE>>  [[IDsRecordedBy]] <<SRF>>  [[TimeIDsRecorded]] <<TIMESTAMP>>  [[TravOpenDate]] <<TIMESTAMP>>  [[TravOpenBy]] <<SRF>>  [[TestSummaries]] <<FILEUPLOAD>> |

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| **Step No** | **Instructions** | **Data Inputs** |
| 3 | Record the Insulating Vacuum pressure as displayed in epics. Note any problems or concerns relating to the insulating vacuum in the comment block.  **If insulating vacuum pressure is greater than 1E-6 torr, create an NCR.** | [[InsulatingVacInspector]] <<SRF>>  [[InsulatingVacPreTestTime]] <<TIMESTAMP>>  [[InsulatingVacPreTest]] <<SCINOT>>  [[InsulatingVacComments]] <<COMMENT>> |
| 4 | Record the Beam Line Vacuum pressure as displayed in epics. Note any problems or concerns relating to the beamline vacuum in the comment block.  **If beamline vacuum pressure is greater than 1E-9 torr, create an NCR.** | [[BLVacInspector]] <<SRF>>  [[BLVacPreTestTime]] <<TIMESTAMP>>  [[BLVacPreTest]] <<SCINOT>>  [[BLVacComments]] <<COMMENT>> |
| 5 | Record the Coupler Vacuum Pressure as displayed in epics. Note any problems or concerns relating to the waveguide vacuums in the comment block.  **If coupler vacuum pressure is greater than 5E-8 torr, create an NCR.** | [[CplrVacInspector]] <<SRF>>  [[CplrVacPreTestTime]] <<TIMESTAMP>>  [[CplrVacPreTest]] <<SCINOT>>  [[WGVacComments]] <<COMMENT>> |

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| **Step No** | **Instructions** | **Data Inputs** |
| 6 | **Insulating Vacuum Leak Check:**  Isolate the insulating vacuum from the pumping station after the cool down is complete and the cryomodule is stable in terms of pressure and liquid level. Monitor the insulating vacuum pressure for at least 1 week. Record start time, completion time and the vacuum pressure (in torr) at start and finish.  **If, at the end of this test, the insulating Vacuum pressure is higher than 1E-6 torr, createe an NCR.** | [[InsVacTech1]] <<SRF>>  [[InsVacLeakTstStartTime]] <<TIMESTAMP>>  [[InsVacLeakTstStartPress]] <<SCINOT>> (torr)  [[InsVacTech2]] <<SRF>>  [[InsVacLeakTstStopTime]] <<TIMESTAMP>>  [[InsVacLeakTstFinalPress]] <<SCINOT>> (torr)  [[ElapseTimeInsVacLeakTst]] <<FLOAT>> (days)  [[InsVacDelta]] <<SCINOT>>  [[InsVacLeakTestComments]] <<COMMENT>> |

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| **Step No** | **Instructions** | **Data Inputs** |
| **High Power Checklist** | | |
| 7 | **Inspect all waveguide connections in the LERF Vault.** All waveguide / sections must be in place with all connections secured. All bolt-holes on waveguide flanges must be secured. Each leg of the 1300 MHz system must be connected to an SSA output on the upstream end and to a FPC on the downstream end.  Note any problems in the comment box.  **\*\*No waveguide that is capable of delivering RF power into the cave may be open. Waveguide must be terminated either by connection to cryomodule or by shorting plate or an appropriate load.**  **The Vault must not be safed unless this step has been completed.\*\*** | [[WGInspector]] <<SRF>>  [[WGInspectComp]] <<TIMESTAMP>>  [[WGComments]] <<COMMENT>>  [[WaveguideInspectPassed]] <<YESNO>> |
| 8 | **Inspect all RF heliax cable connections.** A proper connection means at least hand tightened and connected to the appropriate connector. Note any problems in the comment block.   * All eight Ptrans cables are properly connected to the appropriate field probe connectors. * All RF Heliax cables hanging from RF patch panels 1A, 2A, 3A, 4A are properly connected. * All eight pairs of cable coming from the directional couplers are properly connected.   **\*\* The Vault must not be safed until this inspection has been successfully completed.\*\*** | [[RFCableInspector]] <<SRF>>  [[RFCableInspectComp]] <<TIMESTAMP>>  [[RFCableComments]] <<COMMENT>>  [[RFCableInspectPassed]] <<CHECKBOX>> |
| 9 | Verify that Decarad chassis is in place and connected Ensure that Geiger-Mueller tubes are connected and correctly positioned around cryomodule. Verify that all Decarad signals are live and updating in epics.  Stanndard arrangement for this type of cryomodule:   * Channel 1 at Coupler for Cavity 1 * Channel 2 at Coupler for Cavity 2 * Channel 3 at Coupler for Cavity 3 * Channel 4 at Coupler for Cavity 4 * Channel 5 at Coupler for Cavity 5 * Channel 6 at Coupler for Cavity 6 * Channel 7 at Coupler for Cavity 7 * Channel 8 at Coupler for Cavity 8 * Channel 9 at Supply Side of Beamline as close to beam pipe as possible. * Channel 10 at Return Side of Beamline as close to beam pipe as possible. | [[DecaRadInspector]] <<SRF>>  [[DecaRadTime]]<<TIMESTAMP>>  [[DecaRadComments]] <<COMMENT>> |
| 10 | Record the **Cable, Coupler and Other Attenuation** values listed on the SRF Signal Calibration Screens for each cavity at the beginning of HPRF testing on a given cavity in a spreadsheet. Include Total Attenuation and Final Calibration Scale Factor. Revisit at any time a cavity is powered up.  If any values change, record changes with dates | [[RFCableCalTech]] <<SRF>>  [[RFCableCalComplete]] <<TIMESTAMP>>  [[RFCableCalComments]] <<COMMENT>>  [[RFCableCalibrationFile]] <<FILEUPLOAD>> |

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| **Step No** | **Instructions** | **Data Inputs** |
|  | **High Power Checklist** |  |
| 11 | **Contact RadCon** and requestthat a pre-operation radiation safety checklist be issued. Upload a copy of checklist.  **\*High Power Testing must not proceed until issuance of the safety checklist\*** | [[LERFOpsCoordinator]] <<SRF>>  [[ChecklistIssueTime]] <<TIMESTAMP>>  [[RADCONChecklist]] <<FILEUPLOAD>> |

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| **Step No** | **Instructions** | **Data Inputs** |
|  | **High Power Checklist** |  |
| 12 | Test the Beamline Vacuum Interlock. Verify that a fault is generated and RF is disabled. Record whether the interlock is working correctly **Good (Yes)** or not **(No)**.  **\*\* Do Not Attempt to Supply High Power RF to any Cavity if the Beamline Vacuum Interlock is Not Working Properly \*\*** | [[BLVacIntlkInspector]] <<SRF>>  [[BLVacIntlkInspectTime]] <<TIMESTAMP>>  [[BLVacIntlkPassed]] <<YESNO>> |
| 13 | Test the Coupler Vacuum Interlock. Verify that a fault is generated and RF is disabled. Record whether the interlock is working correctly **Good (Yes)** or not **(No)**.  **\*\* Do Not Attempt to Supply High Power RF to Cavity if the Waveguide Vacuum Interlock is Not Working Properly \*\*** | [[CplrVacIntlkInspector]] <<SRF>>  [[CplrVacIntlkInspectTime]] <<TIMESTAMP>>  [[CplrVacIntlkPassed]] <<YESNO>> |
| 14 | Use the Comment block to list any problems associated with vacuum interlocks. | [[VacuumIntlkComments]] <<COMMENT>> |

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| **Step No** | **Instructions** | **Data Inputs** |
|  | **High Power Checklist** |  |
| 15 | **Test the Stepper Motor Temperature Interlocks** for Cavities 1-8. Ensure that each temperature sensor is functioning correctly. Verify that each interlock will generate a fault and disable tuner operation. Check off each working coupler temp interlock.  **If any RTD is determined to be non-functional, generate an NCR.**  **\*\*Do Not Attempt to operate a mechanical tuner if the temperature sensor and Interlock are not functioning correctly!\*\*** | [[StpMotorTempInspector]] <<SRF>>  [[StpMtrTempIntlkChkTime]] <<TIMESTAMP>>  [[C1StpMtrTempIntlkPassed]] <<YESNO>>  [[C2StpMtrTempIntlkPassed]] <<YESNO>>  [[C3StpMtrTempIntlkPassed]] <<YESNO>>  [[C4StpMtrTempIntlkPassed]] <<YESNO>>  [[C5StpMtrTempIntlkPassed]] <<YESNO>>  [[C6StpMtrTempIntlkPassed]] <<YESNO>>  [[C7StpMtrTempIntlkPassed]] <<YESNO>>  [[C8StpMtrTempIntlkPassed]] <<YESNO>> |
| 16 | Use the Comment block to list any problems associated with the stepper motor temperature interlocks. | [[StpMtrTempIntlkComments]] <<COMMENT>> |
| 17 | **Test the Fundamental Power Coupler Temperature Interlocks** for Cavities 1-8. Ensure that each temperature sensor is functioning correctly. Verify that each of the two interlock channels will generate a fault and disables RF. Check off each working coupler temp interlock. Note any problems in the comment block.  **If any RTD is determined to be non-functional, generate an NCR.**  **\*\*Do Not Attempt to Supply High Power RF to a cavity unless at least one of the Temperature Interlocks are functioning correctly!\*\*** | [[FPCTempInspector]] <<SRF>>  [[CplrTempIntlkChkTime]] <<TIMESTAMP>>  [[CplrTempIntlkComments]] <<COMMENT>>  [[C1CplrTemp1IntlkPassed]] <<YESNO>>  [[C1CplrTemp2IntlkPassed]] <<YESNO>>  [[C2CplrTemp1IntlkPassed]] <<YESNO>>  [[C2CplrTemp2IntlkPassed]] <<YESNO>>  [[C3CplrTemp1IntlkPassed]] <<YESNO>>  [[C3CplrTemp2IntlkPassed]] <<YESNO>>  [[C4CplrTemp1IntlkPassed]] <<YESNO>>  [[C4CplrTemp2IntlkPassed]] <<YESNO>>  [[C5CplrTemp1IntlkPassed]] <<YESNO>>  [[C5CplrTemp2IntlkPassed]] <<YESNO>>  [[C6CplrTemp1IntlkPassed]] <<YESNO>>  [[C6CplrTemp2IntlkPassed]] <<YESNO>>  [[C7CplrTemp1IntlkPassed]] <<YESNO>>  [[C7CplrTemp2IntlkPassed]] <<YESNO>>  [[C8CplrTemp1IntlkPassed]] <<YESNO>>  [[C8CplrTemp2IntlkPassed]] <<YESNO>> |
| 18 | Use the Comment block to list any problems associated with the Coupler temperature interlocks. | [[CplrTempIntlkProbComments]] <<COMMENT>> |

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| **Step No** | **Instructions** | **Data Inputs** |
| 19 | Complete the **Mechanical Tuner Range and Hysteresis** test for Cavities 1-8. Note any problems in the comment blocks. | [[C1StepperTestTech]] <<SRF>>  [[C1StepperTestCompTime]] <<TIMESTAMP>>  [[C2StepperTestTech]] <<SRF>>  [[C2StepperTestCompTime]] <<TIMESTAMP>>  [[C3StepperTestTech]] <<SRF>>  [[C3StepperTestCompTime]] <<TIMESTAMP>>  [[C4StepperTestTech]] <<SRF>>  [[C4StepperTestCompTime]] <<TIMESTAMP>>  [[C5StepperTestTech]] <<SRF>>  [[C5StepperTestCompTime]] <<TIMESTAMP>>  [[C6StepperTestTech]] <<SRF>>  [[C6StepperTestCompTime]] <<TIMESTAMP>>  [[C7StepperTestTech]] <<SRF>>  [[C7StepperTestCompTime]] <<TIMESTAMP>>  [[C8StepperTestTech]] <<SRF>>  [[C8StepperTestCompTime]] <<TIMESTAMP>> |
| 20 | Use the Comment block to list any problems associated with the mechanical tuners | [[StepperTestComments]] <<COMMENT>> |

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| **Step No** | **Instructions** | | | | **Data Inputs** | | | | |
| 21 | Record the requested information from the **Mechanical Tuner Range Test** in the table below.This data must also be recorded in the paper logbook. Use comment block on preceding page for details.  Verify that all tuners can be tuned to **1300.000 MHz**.  Verify that the mechanical tuner for cavity 1 will tune through the range, **1300.000 MHz** +/- **20 kHz.**  Verify that the mechanical tuners for cavities 2 - 8 will tune through the range, from **1299.535 MHz to 1300.020 MHz.**  Record the frequency for each cavity at the beginning of test.  Record minimum and maximum frequencies for each cavity  Record any limit switch activation.  Record final tuned frequency  **If any cavity cannot be tuned to 1300.000 MHz, create an NCR.**  **If Cavity 1 cannot be tuned through the entire range (1300.000 MHz** +/- **20 kHz), create an NCR.**  **If Cavities 2 - 8 cannot be tuned through the entire range (1299.535 MHz - 1300.020 MHz), create an NCR.** | | | |  | | | | |
| **Cavity** | **Initial Frequency**  **(MHz)** | **Min Frequency**  **(MHz)** | **Low Limit Switch**  **Activated?** | **Max Frequency**  **(MHz)** | | **High Limit Switch**  **Activated?** | **Tuner Range**  **(kHz)** | **Final Frequency (MHz)** | **File Upload** |
| **1** | [[C1InitFreq]] <<FLOAT>> | [[C1StepMinFreq]] <<FLOAT>> | [[C1StepLoLimit]] <<YESNO>> | [[C1StepMaxFreq]] <<FLOAT>> | | [[C1StepHiLimit]] <<YESNO>> | [[C1StepRange]] <<FLOAT>> | [[C1StepFinalFreq]] <<FLOAT>> | [[C1StepFile]] <<FILEUPLOAD>> |
| **2** | [[C2InitFreq]] <<FLOAT>> | [[C2StepMinFreq]] <<FLOAT>> | [[C2StepLoLimit]] <<YESNO>> | [[C2StepMaxFreq]] <<FLOAT>> | | [[C2StepHiLimit]] <<YESNO>> | [[C2StepRange]] <<FLOAT>> | [[C2StepFinalFreq]] <<FLOAT>> | [[C2StepFile]] <<FILEUPLOAD>> |
| **3** | [[C3InitFreq]] <<FLOAT>> | [[C3StepMinFreq]] <<FLOAT>> | [[C3StepLoLimit]] <<YESNO>> | [[C3StepMaxFreq]] <<FLOAT>> | | [[C3StepHiLimit]] <<YESNO>> | [[C3StepRange]] <<FLOAT>> | [[C3StepFinalFreq]] <<FLOAT>> | [[C3StepFile]] <<FILEUPLOAD>> |
| **4** | [[C4InitFreq]] <<FLOAT>> | [[C4StepMinFreq]] <<FLOAT>> | [[C4StepLoLimit]] <<YESNO>> | [[C4StepMaxFreq]] <<FLOAT>> | | [[C4StepHiLimit]] <<YESNO>> | [[C4StepRange]] <<FLOAT>> | [[C4StepFinalFreq]] <<FLOAT>> | [[C4StepFile]] <<FILEUPLOAD>> |
| **5** | [[C5InitFreq]] <<FLOAT>> | [[C5StepMinFreq]] <<FLOAT>> | [[C5StepLoLimit]] <<YESNO>> | [[C5StepMaxFreq]] <<FLOAT>> | | [[C5StepHiLimit]] <<YESNO>> | [[C5StepRange]] <<FLOAT>> | [[C5StepFinalFreq]] <<FLOAT>> | [[C5StepFile]] <<FILEUPLOAD>> |
| **6** | [[C6InitFreq]] <<FLOAT>> | [[C6StepMinFreq]] <<FLOAT>> | [[C6StepLoLimit]] <<YESNO>> | [[C6StepMaxFreq]] <<FLOAT>> | | [[C6StepHiLimit]] <<YESNO>> | [[C6StepRange]] <<FLOAT>> | [[C6StepFinalFreq]] <<FLOAT>> | [[C6StepFile]] <<FILEUPLOAD>> |
| **7** | [[C7InitFreq]] <<FLOAT>> | [[C7StepMinFreq]] <<FLOAT>> | [[C7StepLoLimit]] <<YESNO>> | [[C7StepMaxFreq]] <<FLOAT>> | | [[C7StepHiLimit]] <<YESNO>> | [[C7StepRange]] <<FLOAT>> | [[C7StepFinalFreq]] <<FLOAT>> | [[C7StepFile]] <<FILEUPLOAD>> |
| **8** | [[C8InitFreq]] <<FLOAT>> | [[C8StepMinFreq]] <<FLOAT>> | [[C8StepLoLimit]] <<YESNO>> | [[C8StepMaxFreq]] <<FLOAT>> | | [[C8StepHiLimit]] <<YESNO>> | [[C8StepRange]] <<FLOAT>> | [[C8StepFinalFreq]] <<FLOAT>> | [[C8StepFile]] <<FILEUPLOAD>> |

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| **Step No** | **Instructions** | **Data Inputs** |
| 22 | Complete the **Piezo Tuner Range and Hysteresis Test.**  Record results in logbook.  **If any piezo tuner has a tuning range of less than 500 Hz, an NCR must be generated.** | [[C1PztTestTech]] <<SRF>>  [[C1PztTestCompleteTime]] <<TIMESTAMP>>  [[C1PztTestRange]] <<FLOAT>> (Hz)  [[C1PztWorks]] <<YESNO>>  [[C2PztTestTech]] <<SRF>>  [[C2PztTestCompleteTime]] <<TIMESTAMP>>  [[C2PztTestRange]] <<FLOAT>> (Hz)  [[C2PztWorks]] <<YESNO>>  [[C3PztTestTech]] <<SRF>>  [[C3PztTestCompleteTime]] <<TIMESTAMP>>  [[C3PztTestRange]] <<FLOAT>> (Hz)  [[C3PztWorks]] <<YESNO>>  [[C4PztTestTech]] <<SRF>>  [[C4PztTestCompleteTime]] <<TIMESTAMP>>  [[C4PztTestRange]] <<FLOAT>> (Hz)  [[C4PztWorks]] <<YESNO>>  [[C5PztTestTech]] <<SRF>>  [[C5PztTestCompleteTime]] <<TIMESTAMP>>  [[C5PztTestRange]] <<FLOAT>> (Hz)  [[C5PztWorks]] <<YESNO>>  [[C6PztTestTech]] <<SRF>>  [[C6PztTestCompleteTime]] <<TIMESTAMP>>  [[C6PztTestRange]] <<FLOAT>> (Hz)  [[C6PztWorks]] <<YESNO>>  [[C7PztTestTech]] <<SRF>>  [[C7PztTestCompleteTime]] <<TIMESTAMP>>  [[C7PztTestRange]] <<FLOAT>> (Hz)  [[C7PztWorks]] <<YESNO>>  [[C8PztTestTech]] <<SRF>>  [[C8PztTestCompleteTime]] <<TIMESTAMP>>  [[C8PztTestRange]] <<FLOAT>> (Hz)  [[C8PztWorks]] <<YESNO>>  [[PztTestFile]] <<FILEUPLOAD>> |
| 23 | Use the Comment block to list any problems associated with the piezo tuners. | [[PztTunerTestComments]] <<COMMENT>> |

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| **Step No** | **Instructions** | | | | | | **Data Inputs** | | | |
| 24 | **Tune each of the Fundamental Power Coupler Qext's to 6E7.**  Verify that the tunable range for each coupler is **1E7 - 8E7**, then tune to 6E7.  **This measurement must be completed only after the Mechanical Tuner Range and Hysteresis Test is complete.** | | | | | | [[FPCTuneTech]] <<SRF>>  [[TunedQextComplete]] <<TIMESTAMP>>  [[TunedQextComments]] <<COMMENT>> | | | |
|  |  | **CAV1** | **CAV2** | **CAV3** | **CAV4** | **CAV5** | | **CAV6** | **CAV7** | **CAV8** |
|  | **FPC Qext Minimum** | [[FPCQEXT1L]] <<SCINOT>> | [[FPCQEXT2L]] <<SCINOT>> | [[FPCQEXT3L]] <<SCINOT>> | [[FPCQEXT4L]] <<SCINOT>> | [[FPCQEXT5L]] <<SCINOT>> | | [[FPCQEXT6L]] <<SCINOT>> | [[FPCQEXT7L]] <<SCINOT>> | [[FPCQEXT8L]] <<SCINOT>> |
|  | **FPC Qext Maximum** | [[FPCQEXT1U]] <<SCINOT>> | [[FPCQEXT2U]] <<SCINOT>> | [[FPCQEXT3U]] <<SCINOT>> | [[FPCQEXT4U]] <<SCINOT>> | [[FPCQEXT5U]] <<SCINOT>> | | [[FPCQEXT6U]] <<SCINOT>> | [[FPCQEXT7U]] <<SCINOT>> | [[FPCQEXT8U]] <<SCINOT>> |
|  | **FPC Qext Final** | [[FPCQEXT1F]] <<SCINOT>> | [[FPCQEXT2F]] <<SCINOT>> | [[FPCQEXT3F]] <<SCINOT>> | [[FPCQEXT4F]] <<SCINOT>> | [[FPCQEXT5F]] <<SCINOT>> | | [[FPCQEXT6F]] <<SCINOT>> | [[FPCQEXT7F]] <<SCINOT>> | [[FPCQEXT8F]] <<SCINOT>> |
| 25 | Measure the **Cold Cavity Passband Frequencies** (in MHz). Measure the frequencies and Qext's for all nine passbands after tuning of the FPC Qext's.  Record the frequency and Qext data in the logbook and in a spreadsheet. Upload the spreadsheet here.  **This measurement should be completed only after the Mechanical Tuner Range and Hysteresis Test is complete and after the FPC's are tuned.** | | | | | | [[PassBandTech]] <<SRF>>  [[ColdTunedPassbandComp]] <<TIMESTAMP>>  [[ColdTunedPassbandFile]] <<FILEUPLOAD>>  [[ColdTunedPassbandComm]] <<COMMENT>> | | | |

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| **Step No** | **Instructions** | **Data Inputs** |
| 26 | **Complete the Electrical Verification of the Beam Position Monitor (BPM)**  Check off each step as completed.  Create a file containing test results and upload the file.  **If any shorts or opens are detected, an NCR must be generated.**  **If crosstalk between electrodes is > -30 dB, an NCR must be generated.**  **If the difference in S21 between electrodes is > 1 dB over a frequency range of 0.5GHz to 2.5 GHz, an NCR must be generated.** | [[BPMTestTech]] <<SRF>>  [[BPMTestTDRPassed]] <<YESNO>>  [[BPMTestCrossTalkPassed]] <<YESNO>>  [[S21TopBottomPassed]] <<YESNO>>  [[S21TopRightPassed]] <<YESNO>>  [[S21TopLeftPassed]] <<YESNO>>  [[S21RightLeftPassed]] <<YESNO>>  [[S21RightBottomPassed]] <<YESNO>>  [[S21BottomLeftPassed]] <<YESNO>>  [[BPMTestComplete]] <<TIMESTAMP>>  [[BPMTestFile]] <<FILEUPLOAD>>  [[BPMTestComments]] <<COMMENT>> |

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| **Step No** | **Instructions** | **Data Inputs** |
| 27 | **Verify that the Magnets are without Shorts or Opens**.  Hipot at 500V with <1uA under insulating vacuum, <5uA in ambient pressure.  **An NCR must be generated for any magnet that does not pass this test.** | [[MagnetHipotTech]] <<SRF>>  [[MagnetTestHiPotPass]] <<YESNO>>  [[MagnetTestHiPotComments]] <<COMMENT>> |
| 28 | **Complete the Magnet Test Procedure for the Quad, XCOR and YCOR magnets.**  Check off each step as completed. Record the elapsed time for the 18A soak. Note any problems in the comment block  **An NCR must be generated for any magnet that quenches before completing a 30 minute soak at 18A.** | [[MagnetTestTech]] <<SRF>>  [[QuadMagSoak18AOneHrComp]] <<YESNO>>  [[XCorMagSoak18AOneHrComp]] <<YESNO>>  [[YCorMagSoak18AOneHrComp]] <<YESNO>>  [[QuadSoakTime18A]] <<FLOAT>> (hrs)  [[XCorSoakTime18A]] <<FLOAT>> (hrs)  [[YCorSoakTime18A]] <<FLOAT>> (hrs)  [[MagnetTestComplete]] <<TIMESTAMP>>  [[MagnetTestFile]] <<FILEUPLOAD>>  [[MagnetTestComments]] <<COMMENT>> |

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| **Step No** | **Instructions** | **Data Inputs** |
| **Fast Cool Down** | | |
| 29 | A Fast Cool Down must be completed after the Emax determinations and One Hour Runs are completed and before starting Q0 measurements**.**  The first step is to complete a 40 K warm up in accordance with the **LCLS-II HE Fast Cooldown (LERF) procedure, L2HE-PR-LERF-CM-FCD.** | [[WarmUpOperator40K]] <<SRF>>  [[WarmUpStartTime40K]] <<TIMESTAMP>>  [[WarmUpCompleteTime40K]] <<TIMESTAMP>>  [[WarmUpComments40K]] <<COMMENT>> |
| 30 | Perform the Fast Cool Down in accordance with the **LCLS-II HE Fast Cooldown (LERF) procedure, L2HE-PR-LERF-CM-FCD.**  Record the Starting time for the Fast Cool Down.  Record the starting temperatures at all eight of the HOM Tuner Clamps **(CTE:CM03:1\*18:UH:TEMP - \* = 1 - 8)**  Use the Comments block to record any issues related to temperature measurement at the HOM Tuner Clamps | [[FastCoolDownOperator]] <<SRF>>  [[FastCoolDownStartTime]] <<TIMESTAMP>>  [[HOMTunerClampStartTemp1]] <<FLOAT>> (K)  [[HOMTunerClampStartTemp2]] <<FLOAT>> (K)  [[HOMTunerClampStartTemp3]] <<FLOAT>> (K)  [[HOMTunerClampStartTemp4]] <<FLOAT>> (K)  [[HOMTunerClampStartTemp5]] <<FLOAT>> (K)  [[HOMTunerClampStartTemp6]] <<FLOAT>> (K)  [[HOMTunerClampStartTemp7]] <<FLOAT>> (K)  [[HOMTunerClampStartTemp8]] <<FLOAT>> (K)  [[FCDStartTEmpComments]] <<COMMENT>> |
| 31 | Once all eight HOM Tuner Clamp temperatures are below 9K, the fast cooldown is considered to be complete.  Record the Completion Time for the Fast Cool Down. | [[FastCoolDownOperator2]] <<SRF>>  [[FastCoolDownCompleteTime]] <<TIMESTAMP>> |
| 32 | Record the Cool Down Rates in K/hr of for each cavity based on the HOM Tuner Clamp temperatures.  Record the Average Cool Down Rate in K/hr for the cryomodule based on the eight HOM Tuner Clamp temperatures.  **If any Cool Down Rate is lower than 15 K/hr in the region between 10K and 15K as measured by the HOM Tuner Clamp temperature sensors, generate an NCR.** | [[HOMTunerClampAvgCoolDownRate1]] <<FLOAT>> (K/hr)  [[HOMTunerClampAvgCoolDownRate2]] <<FLOAT>> (K/hr)  [[HOMTunerClampAvgCoolDownRate3]] <<FLOAT>> (K/hr)  [[HOMTunerClampAvgCoolDownRate4]] <<FLOAT>> (K/hr)  [[HOMTunerClampAvgCoolDownRate5]] <<FLOAT>> (K/hr)  [[HOMTunerClampAvgCoolDownRate6]] <<FLOAT>> (K/hr)  [[HOMTunerClampAvgCoolDownRate7]] <<FLOAT>> (K/hr)  [[HOMTunerClampAvgCoolDownRate8]] <<FLOAT>> (K/hr)  [[CryomoduleAvgCoolDownRate]] <<FLOAT>> (K/hr) |
| 33 | Create a .csv text file that contains data covering the Fast Cooldown from 40K to below 10K. Include data for all 8 HOM Tuner Clamps, Cavity 1 & 5 Helium Vessel Upper/Lower Temps, Inlet Temperature, JT Position, CD Position, and Fluxgate Outputs. Upload the file here.  Enter any comments about the Fast Cool Down in the comment block. | [[FastCoolDownFile]] <<FILEUPLOAD>>  [[FCDComments]] <<COMMENT>> |
| 34 | Record the start and end times for the 2K pump down and fill after completion of the Fast Cool Down procedure. | [[FCD2KPumpDownStartTime]] <<TIMESTAMP>>  [[FCD2KPumpDownCompleteTime]] <<TIMESTAMP>> |

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| **Cavity 1** | | |
| **Step No** | **Instructions** | **Data Inputs** |
| 35 | Record QextFPC, QextFP, QextHOM1, and QextHOM2 for Cavity 1. Record the gradient at which these measurements were completed.  **An NCR must be generated if either HOM coupler has a Qext lower than 2E11.**  **If the RF power out of any HOM coupler is greater than 1.7 W at 20.8 MV/m, create an NCR.** | [[Cav1QextOperator]] <<SRF>>  [[Cav1QextMeasTime]] <<TIMESTAMP>>  [[Cav1QextFPC]] <<SCINOT>>  [[Cav1QextFP]] <<SCINOT>>  [[Cav1QextHOM1]] <<SCINOT>>  [[Cav1QextHOM2]] <<SCINOT>>  [[Cav1QextMeasGradient]] <<FLOAT>> |
| 36 | Record the Maximum Gradient (Emax) for Cavity 1 and the gradient limiting condition. | [[Cav1EmaxOperator]] <<SRF>>  [[Cav1EmaxMeasTime]] <<TIMESTAMP>>  [[Cav1Emax]] <<FLOAT>> (MV/m)  [[Cav1EmaxLimit]] {{Admin Limit,Quench,FE related,Arc Fault,Window Temp Fault,BL Vacuum Fault,Coupler Vacuum Fault,RF Power,Heat Load,End Group Quench}} <<SELECT>> |
| 37 | Record the gradient at which a successful One Hour Run was completed for Cavity 1. Upload spreadsheet containing data on the One Hour run. | [[Cav1OneHourRunOperator]] <<SRF>>  [[Cav1OneHourRunComplete]] <<TIMESTAMP>>  [[Cav1Emaxop]] <<FLOAT>> (MV/m)  [[Cav1OneHourRunFile]] <<FILEUPLOAD>> |
| 38 | Record the Field Emission Onset gradient for Cavity 1. Upload the file containing Field emission data. | [[Cav1FEOperator]] <<SRF>>  [[Cav1FEMeasTime]] <<TIMESTAMP>>  [[Cav1FEOnset]] <<FLOAT>> (MV/m)  [[Cav1FEOnsetYN]] <<YESNO>>  [[Cav1FE50mR]] <<FLOAT>>  [[Cav1FEMaxDoseRate]] <<FLOAT>> (R/hr)  [[Cav1FEFile]] <<FILEUPLOAD>> |
| 39 | The Maximum Useable Gradient is the highest available gradient that meets the following criteria:   * Cavity can operate in a stable manner for at least one hour. * Cavity is operating at least 0.5 MV/m below any quench gradient. * Radiation is less than 50 mR/hr during individual cavity operation.   Determine and record the Maximum Useable Gradient for Cavity 1 using measurements made in the above steps.  **If a cavity has a Maximum Useable Gradient lower than 16.0 MV/m under these three conditions, create an NCR.** | [[Cav1MaxUseGradient]] <<FLOAT>>  [[Cav1MaxUse16OrGreater]] <<YESNO>>  [[Cav1MaxUse20Point8OrGreater]] <<YESNO>> |
| 40 | If the Cavity has a Maximum Useable Gradient higher than 20.8 MV/m, complete an additional One Hour Run at 20.8 MV/m.  **If a cavity is unable to demonstrate stable operation at a gradient of at least 20.8 MV/m and meet all three conditions for Maximum Useable Gradient at 20.8 MV/m, create an NCR.** | [[Cav1Twenty8OneHourRunOperator]] <<SRF>>  [[Cav1Twenty8OneHourRunComplete]] <<TIMESTAMP>>  [[Cav1Twenty8Stable]] <<YESNO>>  [[Cav1Twenty8OneHourRunFile]] <<FILEUPLOAD>> |
| 41 | After completing the Q0 measurement sequence for Cavity 1, record the values of Q0 at 20.8 MV/m or at the Maximum Useable Gradient. Upload the Q0 measurement file. | [[Cav1QoOperator]] <<SRF>>  [[Cav1QoMeasTime]] <<TIMESTAMP>>  [[Cav1QoDesignGradient]] <<SCINOT>>  [[Cav1RFHeatDesignGradient]] <<FLOAT>> (W)  [[Cav1QoMaxUseable]] <<SCINOT>>  [[Cav1RFHeatMaxUseable]] <<FLOAT>> (W)  [[Cav1QoFile]] <<FILEUPLOAD>> |
| 42 | Record the Pressure Sensitivity data collected during the Q0 measurement sequence. | [[Cav1PressureSensOperator]] <<SRF>>  [[Cav1PressureSensTime]] <<TIMESTAMP>>  [[Cav1PressureSensitivity]] <<FLOAT>>  [[Cav1PressureSensFile]] <<FILEUPLOAD>> |
| 43 | Record the Static Lorentz coefficient calculated from data gathered during field emission measurements or other automated gradient ramping exercise. | [[Cav1StaticLorentzOperator]] <<SRF>>  [[Cav1StaticLorentzTime]] <<TIMESTAMP>>  [[Cav1StaticLorentzCoeff]] <<FLOAT>>  [[Cav1StaticLorentzFile]] <<FILEUPLOAD>> |
| 44 | Collect microphonics date for an hour with cavity in SELAP mode and operating at Max Useable Gradient. During the one hour period, the JT Valve must be regulating the liquid level (not locked). Upload files containing any microphonics measurements for Cavity 1.  **If microphonics detuning is greater than 10 Hz peak to peak, generate an NCR.** | [[Cav1MicrophonicsOperator]] <<SRF>>  [[Cav1MicrophonicsTime]] <<TIMESTAMP>>  [[Cav1MicrophonicsPass]] <<YESNO>>  [[Cav1MicrophonicsFile]] <<FILEUPLOAD>> |
| 45 | Use the comment box to list any problems or anything unusual about the performance of Cavity 1. | [[Cav1HPRFComments]] <<COMMENT>> |

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| **Cavity 2** | | |
| **Step No** | **Instructions** | **Data Inputs** |
| 46 | Record QextFPC, QextFP, QextHOM1, and QextHOM2 for Cavity 2. Record the gradient at which these measurements were completed.  **An NCR must be generated if either HOM coupler has a Qext lower than 2E11.**  **If the RF power out of any HOM coupler is greater than 1.7 W at 20.8 MV/m, create an NCR.** | [[Cav2QextOperator]] <<SRF>>  [[Cav2QextMeasTime]] <<TIMESTAMP>>  [[Cav2QextFPC]] <<SCINOT>>  [[Cav2QextFP]] <<SCINOT>>  [[Cav2QextHOM1]] <<SCINOT>>  [[Cav2QextHOM2]] <<SCINOT>>  [[Cav2QextMeasGradient]] <<FLOAT>> |
| 47 | Record the Maximum Gradient (Emax) for Cavity 2 and the gradient limiting condition. | [[Cav2EmaxOperator]] <<SRF>>  [[Cav2EmaxMeasTime]] <<TIMESTAMP>>  [[Cav2Emax]] <<FLOAT>> (MV/m)  [[Cav2EmaxLimit]] {{Admin Limit,Quench,FE related,Arc Fault,Window Temp Fault,BL Vacuum Fault,Coupler Vacuum Fault,RF Power,Heat Load,End Group Quench }} <<SELECT>> |
| 48 | Record the gradient at which a successful One Hour Run was completed for Cavity 2. Upload spreadsheet containing data on the One Hour run. | [[Cav2OneHourRunOperator]] <<SRF>>  [[Cav2OneHourRunComplete]] <<TIMESTAMP>>  [[Cav2Emaxop]] <<FLOAT>> (MV/m)  [[Cav2OneHourRunFile]] <<FILEUPLOAD>> |
| 49 | Record the Field Emission Onset gradient for Cavity 2. Upload the file containing Field emission data. | [[Cav2FEOperator]] <<SRF>>  [[Cav2FEMeasTime]] <<TIMESTAMP>>  [[Cav2FEOnset]] <<FLOAT>> (MV/m)  [[Cav2FEOnsetYN]] <<YESNO>>  [[Cav2FE50mR]] <<FLOAT>>  [[Cav2FEMaxDoseRate]] <<FLOAT>> (R/hr)  [[Cav2FEFile]] <<FILEUPLOAD>> |
| 50 | The Maximum Useable Gradient is the highest available gradient that meets one or more of the following criteria:   * Cavity can operate in a stable manner for at least one hour. * Cavity is operating at least 0.5 MV/m below any quench gradient * Radiation is less than 50 mR/hr during individual cavity operation.   Determine and record the Maximum Useable Gradient for Cavity 2 using measurements made in the above steps.  **If a cavity has a Maximum Useable Gradient lower than 16.0 MV/m under these three conditions, create an NCR.** | [[Cav2MaxUseGradient]] <<FLOAT>>  [[Cav2MaxUse16OrGreater]] <<YESNO>>  [[Cav2MaxUse20Point8OrGreater]] <<YESNO>> |
| 51 | If the Cavity has a Maximum Useable Gradient higher than 20.8 MV/m, complete an additional One Hour Run at 20.8 MV/m.  **If a cavity is unable to demonstrate stable operation at a gradient of at least 20.8 MV/m and meet all three conditions for Maximum Useable Gradient at 20.8 MV/m, create an NCR.** | [[Cav2Twenty8OneHourRunOperator]] <<SRF>>  [[Cav2Twenty8OneHourRunComplete]] <<TIMESTAMP>>  [[Cav2Twenty8Stable]] <<YESNO>>  [[Cav2Twenty8OneHourRunFile]] <<FILEUPLOAD>> |
| 52 | After completing the Q0 measurement sequence for Cavity 2, record the values of Q0 at 20.8 MV/m or at the Maximum Useable Gradient. Upload the Q0 measurement file.  **An NCR must be generated for any cavity that has a Q0 lower than 2.7E10 at either 20.8 MV/m or at the Maximum Useable Gradient.** | [[Cav2QoOperator]] <<SRF>>  [[Cav2QoMeasTime]] <<TIMESTAMP>>  [[Cav2QoDesignGradient]] <<SCINOT>>  [[Cav2RFHeatDesignGradient]] <<FLOAT>> (W)  [[Cav2QoMaxUseable]] <<SCINOT>>  [[Cav2RFHeatMaxUseable]] <<FLOAT>> (W)  [[Cav2QoFile]] <<FILEUPLOAD>> |
| 53 | Record the Pressure Sensitivity data collected during the Q0 measurement sequence. | [[Cav2PressureSensOperator]] <<SRF>>  [[Cav2PressureSensTime]] <<TIMESTAMP>>  [[Cav2PressureSensitivity]] <<FLOAT>>  [[Cav2PressureSensFile]] <<FILEUPLOAD>> |
| 54 | Record the Static Lorentz coefficient calculated from data gathered during field emission measurements or other automated gradient ramping exercise. | [[Cav2StaticLorentzOperator]] <<SRF>>  [[Cav2StaticLorentzTime]] <<TIMESTAMP>>  [[Cav2StaticLorentzCoeff]] <<FLOAT>>  [[Cav2StaticLorentzFile]] <<FILEUPLOAD>> |
| 55 | Collect microphonics date for an hour with cavity in SELAP mode and operating at Max Useable Gradient. During the one hour period, the JT Valve must be regulating the liquid level (not locked). Upload files containing any microphonics measurements for Cavity 2.  **If microphonics detuning is greater than 10 Hz peak to peak, generate an NCR.** | [[Cav2MicrophonicsOperator]] <<SRF>>  [[Cav2MicrophonicsTime]] <<TIMESTAMP>>  [[Cav2MicrophonicsPass]] <<YESNO>>  [[Cav2MicrophonicsFile]] <<FILEUPLOAD>> |
| 56 | Use the comment box to list any problems or anything unusual about the performance of Cavity 2. | [[Cav2HPRFComments]] <<COMMENT>> |

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| **Cavity 3** | | |
| **Step No** | **Instructions** | **Data Inputs** |
| 57 | Record QextFPC, QextFP, QextHOM1, and QextHOM2 for Cavity 3. Record the gradient at which these measurements were completed.  **An NCR must be generated if either HOM coupler has a Qext lower than 2E11.**  **If the RF power out of any HOM coupler is greater than 1.7 W at 20.8 MV/m, create an NCR.** | [[Cav3QextOperator]] <<SRF>>  [[Cav3QextMeasTime]] <<TIMESTAMP>>  [[Cav3QextFPC]] <<SCINOT>>  [[Cav3QextFP]] <<SCINOT>>  [[Cav3QextHOM1]] <<SCINOT>>  [[Cav3QextHOM2]] <<SCINOT>>  [[Cav3QextMeasGradient]] <<FLOAT>> |
| 58 | Record the Maximum Gradient (Emax) for Cavity 3 and the gradient limiting condition. | [[Cav3EmaxOperator]] <<SRF>>  [[Cav3EmaxMeasTime]] <<TIMESTAMP>>  [[Cav3Emax]] <<FLOAT>> (MV/m)  [[Cav3EmaxLimit]] {{Admin Limit,Quench,FE related,Arc Fault,Window Temp Fault,BL Vacuum Fault,Coupler Vacuum Fault,RF Power,Heat Load,End Group Quench}} <<SELECT>> |
| 59 | Record the gradient at which a successful One Hour Run was completed for Cavity 3. Upload spreadsheet containing data on the One Hour run. | [[Cav3OneHourRunOperator]] <<SRF>>  [[Cav3OneHourRunComplete]] <<TIMESTAMP>>  [[Cav3Emaxop]] <<FLOAT>> (MV/m)  [[Cav3OneHourRunFile]] <<FILEUPLOAD>> |
| 60 | Record the Field Emission Onset gradient for Cavity 3. Upload the file containing Field emission data. | [[Cav3FEOperator]] <<SRF>>  [[Cav3FEMeasTime]] <<TIMESTAMP>>  [[Cav3FEOnset]] <<FLOAT>> (MV/m)  [[Cav3FEOnsetYN]] <<YESNO>>  [[Cav3FE50mR]] <<FLOAT>>  [[Cav3FEMaxDoseRate]] <<FLOAT>> (R/hr)  [[Cav3FEFile]] <<FILEUPLOAD>> |
| 61 | The Maximum Useable Gradient is the highest available gradient that meets one or more of the following criteria:   * Cavity can operate in a stable manner for at least one hour. * Cavity is operating at least 0.5 MV/m below any quench gradient * Radiation is less than 50 mR/hr during individual cavity operation.   Determine and record the Maximum Useable Gradient for Cavity 3 using measurements made in the above steps.  **If a cavity has a Maximum Useable Gradient lower than 16.0 MV/m under these three conditions, create an NCR.** | [[Cav3MaxUseGradient]] <<FLOAT>>  [[Cav3MaxUse16OrGreater]] <<YESNO>>  [[Cav3MaxUse20Point8OrGreater]] <<YESNO>> |
| 62 | If the Cavity has a Maximum Useable Gradient higher than 20.8 MV/m, complete an additional One Hour Run at 20.8 MV/m.  **If a cavity is unable to demonstrate stable operation at a gradient of at least 20.8 MV/m and meet all three conditions for Maximum Useable Gradient at 20.8 MV/m, create an NCR.** | [[Cav3Twenty8OneHourRunOperator]] <<SRF>>  [[Cav3Twenty8OneHourRunComplete]] <<TIMESTAMP>>  [[Cav3Twenty8Stable]] <<YESNO>>  [[Cav3Twenty8OneHourRunFile]] <<FILEUPLOAD>> |
| 63 | After completing the Q0 measurement sequence for Cavity 3, record the values of Q0 at 20.8 MV/m or at the Maximum Useable Gradient. Upload the Q0 measurement file. | [[Cav3QoOperator]] <<SRF>>  [[Cav3QoMeasTime]] <<TIMESTAMP>>  [[Cav3QoDesignGradient]] <<SCINOT>>  [[Cav3RFHeatDesignGradient]] <<FLOAT>> (W)  [[Cav3QoMaxUseable]] <<SCINOT>>  [[Cav3RFHeatMaxUseable]] <<FLOAT>> (W)  [[Cav3QoFile]] <<FILEUPLOAD>> |
| 64 | Record the Pressure Sensitivity data collected during the Q0 measurement sequence. | [[Cav3PressureSensOperator]] <<SRF>>  [[Cav3PressureSensTime]] <<TIMESTAMP>>  [[Cav3PressureSensitivity]] <<FLOAT>>  [[Cav3PressureSensFile]] <<FILEUPLOAD>> |
| 65 | Record the Static Lorentz coefficient calculated from data gathered during field emission measurements or other automated gradient ramping exercise. | [[Cav3StaticLorentzOperator]] <<SRF>>  [[Cav3StaticLorentzTime]] <<TIMESTAMP>>  [[Cav3StaticLorentzCoeff]] <<FLOAT>>  [[Cav3StaticLorentzFile]] <<FILEUPLOAD>> |
| 66 | Collect microphonics date for an hour with cavity in SELAP mode and operating at Max Useable Gradient. During the one hour period, the JT Valve must be regulating the liquid level (not locked). Upload files containing any microphonics measurements for Cavity 3.  **If microphonics detuning is greater than 10 Hz peak to peak, generate an NCR.** | [[Cav3MicrophonicsOperator]] <<SRF>>  [[Cav3MicrophonicsTime]] <<TIMESTAMP>>  [[Cav3MicrophonicsPass]] <<YESNO>>  [[Cav3MicrophonicsFile]] <<FILEUPLOAD>> |
| 67 | Use the comment box to list any problems or anything unusual about the performance of Cavity 3. | [[Cav3HPRFComments]] <<COMMENT>> |

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| **Cavity 4** | | |
| **Step No** | **Instructions** | **Data Inputs** |
| 68 | Record QextFPC, QextFP, QextHOM1, and QextHOM2 for Cavity 4. Record the gradient at which these measurements were completed.  **An NCR must be generated if either HOM coupler has a Qext lower than 2E11.**  **If the RF power out of any HOM coupler is greater than 1.7 W at 20.8 MV/m, create an NCR.** | [[Cav4QextOperator]] <<SRF>>  [[Cav4QextMeasTime]] <<TIMESTAMP>>  [[Cav4QextFPC]] <<SCINOT>>  [[Cav4QextFP]] <<SCINOT>>  [[Cav4QextHOM1]] <<SCINOT>>  [[Cav4QextHOM2]] <<SCINOT>>  [[Cav4QextMeasGradient]] <<FLOAT>> |
| 69 | Record the Maximum Gradient (Emax) for Cavity 4 and the gradient limiting condition. | [[Cav4EmaxOperator]] <<SRF>>  [[Cav4EmaxMeasTime]] <<TIMESTAMP>>  [[Cav4Emax]] <<FLOAT>> (MV/m)  [[Cav4EmaxLimit]] {{Admin Limit,Quench,FE related,Arc Fault,Window Temp Fault,BL Vacuum Fault,Coupler Vacuum Fault,RF Power,Heat Load,End Group Quench }} <<SELECT>> |
| 70 | Record the gradient at which a successful One Hour Run was completed for Cavity 4. Upload spreadsheet containing data on the One Hour run. | [[Cav4OneHourRunOperator]] <<SRF>>  [[Cav4OneHourRunComplete]] <<TIMESTAMP>>  [[Cav4Emaxop]] <<FLOAT>> (MV/m)  [[Cav4OneHourRunFile]] <<FILEUPLOAD>> |
| 71 | Record the Field Emission Onset gradient for Cavity 4. Upload the file containing Field emission data. | [[Cav4FEOperator]] <<SRF>>  [[Cav4FEMeasTime]] <<TIMESTAMP>>  [[Cav4FEOnset]] <<FLOAT>> (MV/m)  [[Cav4FEOnsetYN]] <<YESNO>>  [[Cav4FE50mR]] <<FLOAT>>  [[Cav4FEMaxDoseRate]] <<FLOAT>> (R/hr)  [[Cav4FEFile]] <<FILEUPLOAD>> |
| 72 | The Maximum Useable Gradient is the highest available gradient that meets one or more of the following criteria:   * Cavity can operate in a stable manner for at least one hour. * Cavity is operating at least 0.5 MV/m below any quench gradient * Radiation is less than 50 mR/hr during individual cavity operation.   Determine and record the Maximum Useable Gradient for Cavity 4 using measurements made in the above steps.  **If a cavity has a Maximum Useable Gradient lower than 16.0 MV/m under these three conditions, create an NCR.** | [[Cav4MaxUseGradient]] <<FLOAT>>  [[Cav4MaxUse16OrGreater]] <<YESNO>>  [[Cav4MaxUse20Point8OrGreater]] <<YESNO>> |
| 73 | If the Cavity has a Maximum Useable Gradient higher than 20.8 MV/m, complete an additional One Hour Run at 20.8 MV/m.  **If a cavity is unable to demonstrate stable operation at a gradient of at least 20.8 MV/m and meet all three conditions for Maximum Useable Gradient at 20.8 MV/m, create an NCR.** | [[Cav4Twenty8OneHourRunOperator]] <<SRF>>  [[Cav4Twenty8OneHourRunComplete]] <<TIMESTAMP>>  [[Cav4Twenty8Stable]] <<YESNO>>  [[Cav4Twenty8OneHourRunFile]] <<FILEUPLOAD>> |
| 74 | After completing the Q0 measurement sequence for Cavity 4, record the values of Q0 at 20.8 MV/m or at the Maximum Useable Gradient. Upload the Q0 measurement file. | [[Cav4QoOperator]] <<SRF>>  [[Cav4QoMeasTime]] <<TIMESTAMP>>  [[Cav4QoDesignGradient]] <<SCINOT>>  [[Cav4RFHeatDesignGradient]] <<FLOAT>> (W)  [[Cav4QoMaxUseable]] <<SCINOT>>  [[Cav4RFHeatMaxUseable]] <<FLOAT>> (W)  [[Cav4QoFile]] <<FILEUPLOAD>> |
| 75 | Record the Pressure Sensitivity data collected during the Q0 measurement sequence. | [[Cav4PressureSensOperator]] <<SRF>>  [[Cav4PressureSensTime]] <<TIMESTAMP>>  [[Cav4PressureSensitivity]] <<FLOAT>>  [[Cav4PressureSensFile]] <<FILEUPLOAD>> |
| 76 | Record the Static Lorentz coefficient calculated from data gathered during field emission measurements or other automated gradient ramping exercise. | [[Cav4StaticLorentzOperator]] <<SRF>>  [[Cav4StaticLorentzTime]] <<TIMESTAMP>>  [[Cav4StaticLorentzCoeff]] <<FLOAT>>  [[Cav4StaticLorentzFile]] <<FILEUPLOAD>> |
| 77 | Collect microphonics date for an hour with cavity in SELAP mode and operating at Max Useable Gradient. During the one hour period, the JT Valve must be regulating the liquid level (not locked). Upload files containing any microphonics measurements for Cavity 4.  **If microphonics detuning is greater than 10 Hz peak to peak, generate an NCR.** | [[Cav4MicrophonicsOperator]] <<SRF>>  [[Cav4MicrophonicsTime]] <<TIMESTAMP>>  [[Cav4MicrophonicsPass]] <<YESNO>>  [[Cav4MicrophonicsFile]] <<FILEUPLOAD>> |
| 78 | Use the comment box to list any problems or anything unusual about the performance of Cavity 4. | [[Cav4HPRFComments]] <<COMMENT>> |

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| **Cavity 5** | | |
| **Step No** | **Instructions** | **Data Inputs** |
| 79 | Record QextFPC, QextFP, QextHOM1, and QextHOM2 for Cavity 5. Record the gradient at which these measurements were completed.  **An NCR must be generated if either HOM coupler has a Qext lower than 2E11.**  **If the RF power out of any HOM coupler is greater than 1.7 W at 20.8 MV/m, create an NCR.** | [[Cav5QextOperator]] <<SRF>>  [[Cav5QextMeasTime]] <<TIMESTAMP>>  [[Cav5QextFPC]] <<SCINOT>>  [[Cav5QextFP]] <<SCINOT>>  [[Cav5QextHOM1]] <<SCINOT>>  [[Cav5QextHOM2]] <<SCINOT>>  [[Cav5QextMeasGradient]] <<FLOAT>> |
| 80 | Record the Maximum Gradient (Emax) for Cavity 5 and the gradient limiting condition. | [[Cav5EmaxOperator]] <<SRF>>  [[Cav5EmaxMeasTime]] <<TIMESTAMP>>  [[Cav5Emax]] <<FLOAT>> (MV/m)  [[Cav5EmaxLimit]] {{Admin Limit,Quench,FE related,Arc Fault,Window Temp Fault,BL Vacuum Fault,Coupler Vacuum Fault,RF Power,Heat Load,End Group Quench }} <<SELECT>> |
| 81 | Record the gradient at which a successful One Hour Run was completed for Cavity 5. Upload spreadsheet containing data on the One Hour run.  **An NCR must be generated for any cavity that cannot complete a One Hour Run at or above 16 MV/m.** | [[Cav5OneHourRunOperator]] <<SRF>>  [[Cav5OneHourRunComplete]] <<TIMESTAMP>>  [[Cav5Emaxop]] <<FLOAT>> (MV/m)  [[Cav5OneHourRunFile]] <<FILEUPLOAD>> |
| 82 | Record the Field Emission Onset gradient for Cavity 5. Upload the file containing Field emission data. | [[Cav5FEOperator]] <<SRF>>  [[Cav5FEMeasTime]] <<TIMESTAMP>>  [[Cav5FEOnset]] <<FLOAT>> (MV/m)  [[Cav5FEOnsetYN]] <<YESNO>>  [[Cav5FE50mR]] <<FLOAT>>  [[Cav5FEMaxDoseRate]] <<FLOAT>> (R/hr)  [[Cav5FEFile]] <<FILEUPLOAD>> |
| 83 | The Maximum Useable Gradient is the highest available gradient that meets one or more of the following criteria:   * Cavity can operate in a stable manner for at least one hour. * Cavity is operating at least 0.5 MV/m below any quench gradient * Radiation is less than 50 mR/hr during individual cavity operation.   Determine and record the Maximum Useable Gradient for Cavity 5 using measurements made in the above steps.  **If a cavity has a Maximum Useable Gradient lower than 16.0 MV/m under these three conditions, create an NCR.** | [[Cav5MaxUseGradient]] <<FLOAT>>  [[Cav5MaxUse16OrGreater]] <<YESNO>>  [[Cav5MaxUse20Point8OrGreater]] <<YESNO>> |
| 84 | If the Cavity has a Maximum Useable Gradient higher than 20.8 MV/m, complete an additional One Hour Run at 20.8 MV/m.  **If a cavity is unable to demonstrate stable operation at a gradient of at least 20.8 MV/m and meet all three conditions for Maximum Useable Gradient at 20.8 MV/m, create an NCR.** | [[Cav5Twenty8OneHourRunOperator]] <<SRF>>  [[Cav5Twenty8OneHourRunComplete]] <<TIMESTAMP>>  [[Cav5Twenty8Stable]] <<YESNO>>  [[Cav5Twenty8OneHourRunFile]] <<FILEUPLOAD>> |
| 85 | After completing the Q0 measurement sequence for Cavity 5, record the values of Q0 at 20.8 MV/m or at the Maximum Useable Gradient. Upload the Q0 measurement file. | [[Cav5QoOperator]] <<SRF>>  [[Cav5QoMeasTime]] <<TIMESTAMP>>  [[Cav5QoDesignGradient]] <<SCINOT>>  [[Cav5RFHeatDesignGradient]] <<FLOAT>> (W)  [[Cav5QoMaxUseable]] <<SCINOT>>  [[Cav5RFHeatMaxUseable]] <<FLOAT>> (W)  [[Cav5QoFile]] <<FILEUPLOAD>> |
| 86 | Record the Pressure Sensitivity data collected during the Q0 measurement sequence. | [[Cav5PressureSensOperator]] <<SRF>>  [[Cav5PressureSensTime]] <<TIMESTAMP>>  [[Cav5PressureSensitivity]] <<FLOAT>>  [[Cav5PressureSensFile]] <<FILEUPLOAD>> |
| 87 | Record the Static Lorentz coefficient calculated from data gathered during field emission measurements or other automated gradient ramping exercise. | [[Cav5StaticLorentzOperator]] <<SRF>>  [[Cav5StaticLorentzTime]] <<TIMESTAMP>>  [[Cav5StaticLorentzCoeff]] <<FLOAT>>  [[Cav5StaticLorentzFile]] <<FILEUPLOAD>> |
| 88 | Collect microphonics date for an hour with cavity in SELAP mode and operating at Max Useable Gradient. During the one hour period, the JT Valve must be regulating the liquid level (not locked). Upload files containing any microphonics measurements for Cavity 5.  **If microphonics detuning is greater than 10 Hz peak to peak, generate an NCR.** | [[Cav5MicrophonicsOperator]] <<SRF>>  [[Cav5MicrophonicsTime]] <<TIMESTAMP>>  [[Cav5MicrophonicsPass]] <<YESNO>>  [[Cav5MicrophonicsFile]] <<FILEUPLOAD>> |
| 89 | Use the comment box to list any problems or anything unusual about the performance of Cavity 5. | [[Cav5HPRFComments]] <<COMMENT>> |

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| **Cavity 6** | | |
| **Step No** | **Instructions** | **Data Inputs** |
| 90 | Record QextFPC, QextFP, QextHOM1, and QextHOM2 for Cavity 6. Record the gradient at which these measurements were completed.  **An NCR must be generated if either HOM coupler has a Qext lower than 2E11.**  **If the RF power out of any HOM coupler is greater than 1.7 W at 20.8 MV/m, create an NCR.** | [[Cav6QextOperator]] <<SRF>>  [[Cav6QextMeasTime]] <<TIMESTAMP>>  [[Cav6QextFPC]] <<SCINOT>>  [[Cav6QextFP]] <<SCINOT>>  [[Cav6QextHOM1]] <<SCINOT>>  [[Cav6QextHOM2]] <<SCINOT>>  [[Cav6QextMeasGradient]] <<FLOAT>> |
| 91 | Record the Maximum Gradient (Emax) for Cavity 6 and the gradient limiting condition. | [[Cav6EmaxOperator]] <<SRF>>  [[Cav6EmaxMeasTime]] <<TIMESTAMP>>  [[Cav6Emax]] <<FLOAT>> (MV/m)  [[Cav6EmaxLimit]] {{Admin Limit,Quench,FE related,Arc Fault,Window Temp Fault,BL Vacuum Fault,Coupler Vacuum Fault,RF Power,Heat Load,End Group Quench }} <<SELECT>> |
| 92 | Record the gradient at which a successful One Hour Run was completed for Cavity 6. Upload spreadsheet containing data on the One Hour run. | [[Cav6OneHourRunOperator]] <<SRF>>  [[Cav6OneHourRunComplete]] <<TIMESTAMP>>  [[Cav6Emaxop]] <<FLOAT>> (MV/m)  [[Cav6OneHourRunFile]] <<FILEUPLOAD>> |
| 93 | Record the Field Emission Onset gradient for Cavity 6. Upload the file containing Field emission data. | [[Cav6FEOperator]] <<SRF>>  [[Cav6FEMeasTime]] <<TIMESTAMP>>  [[Cav6FEOnset]] <<FLOAT>> (MV/m)  [[Cav6FEOnsetYN]] <<YESNO>>  [[Cav6FE50mR]] <<FLOAT>>  [[Cav6FEMaxDoseRate]] <<FLOAT>> (R/hr)  [[Cav6FEFile]] <<FILEUPLOAD>> |
| 94 | The Maximum Useable Gradient is the highest available gradient that meets one or more of the following criteria:   * Cavity can operate in a stable manner for at least one hour. * Cavity is operating at least 0.5 MV/m below any quench gradient * Radiation is less than 50 mR/hr during individual cavity operation.   Determine and record the Maximum Useable Gradient for Cavity 6 using measurements made in the above steps.  **If a cavity has a Maximum Useable Gradient lower than 16.0 MV/m under these three conditions, create an NCR.** | [[Cav6MaxUseGradient]] <<FLOAT>>  [[Cav6MaxUse16OrGreater]] <<YESNO>>  [[Cav6MaxUse20Point8OrGreater]] <<YESNO>> |
| 95 | If the Cavity has a Maximum Useable Gradient higher than 20.8 MV/m, complete an additional One Hour Run at 20.8 MV/m.  **If a cavity is unable to demonstrate stable operation at a gradient of at least 20.8 MV/m and meet all three conditions for Maximum Useable Gradient at 20.8 MV/m, create an NCR.** | [[Cav6Twenty8OneHourRunOperator]] <<SRF>>  [[Cav6Twenty8OneHourRunComplete]] <<TIMESTAMP>>  [[Cav6Twenty8Stable]] <<YESNO>>  [[Cav6Twenty8OneHourRunFile]] <<FILEUPLOAD>> |
| 96 | After completing the Q0 measurement sequence for Cavity 6, record the values of Q0 at 20.8 MV/m or at the Maximum Useable Gradient. Upload the Q0 measurement file. | [[Cav6QoOperator]] <<SRF>>  [[Cav6QoMeasTime]] <<TIMESTAMP>>  [[Cav6QoDesignGradient]] <<SCINOT>>  [[Cav6RFHeatDesignGradient]] <<FLOAT>> (W)  [[Cav6QoMaxUseable]] <<SCINOT>>  [[Cav6RFHeatMaxUseable]] <<FLOAT>> (W)  [[Cav6QoFile]] <<FILEUPLOAD>> |
| 97 | Record the Pressure Sensitivity data collected during the Q0 measurement sequence. | [[Cav6PressureSensOperator]] <<SRF>>  [[Cav6PressureSensTime]] <<TIMESTAMP>>  [[Cav6PressureSensitivity]] <<FLOAT>>  [[Cav6PressureSensFile]] <<FILEUPLOAD>> |
| 98 | Record the Static Lorentz coefficient calculated from data gathered during field emission measurements or other automated gradient ramping exercise. | [[Cav6StaticLorentzOperator]] <<SRF>>  [[Cav6StaticLorentzTime]] <<TIMESTAMP>>  [[Cav6StaticLorentzCoeff]] <<FLOAT>>  [[Cav6StaticLorentzFile]] <<FILEUPLOAD>> |
| 99 | Collect microphonics date for an hour with cavity in SELAP mode and operating at Max Useable Gradient. During the one hour period, the JT Valve must be regulating the liquid level (not locked). Upload files containing any microphonics measurements for Cavity 6.  **If microphonics detuning is greater than 10 Hz peak to peak, generate an NCR.** | [[Cav6MicrophonicsOperator]] <<SRF>>  [[Cav6MicrophonicsTime]] <<TIMESTAMP>>  [[Cav6MicrophonicsPass]] <<YESNO>>  [[Cav6MicrophonicsFile]] <<FILEUPLOAD>> |
| 100 | Use the comment box to list any problems or anything unusual about the performance of Cavity 6. | [[Cav6HPRFComments]] <<COMMENT>> |

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| **Cavity 7** | | |
| **Step No** | **Instructions** | **Data Inputs** |
| 101 | Record QextFPC, QextFP, QextHOM1, and QextHOM2 for Cavity 7. Record the gradient at which these measurements were completed.  **An NCR must be generated if either HOM coupler has a Qext lower than 2E11.**  **If the RF power out of any HOM coupler is greater than 1.7 W at 20.8 MV/m, create an NCR.** | [[Cav7QextOperator]] <<SRF>>  [[Cav7QextMeasTime]] <<TIMESTAMP>>  [[Cav7QextFPC]] <<SCINOT>>  [[Cav7QextFP]] <<SCINOT>>  [[Cav7QextHOM1]] <<SCINOT>>  [[Cav7QextHOM2]] <<SCINOT>>  [[Cav7QextMeasGradient]] <<FLOAT>> |
| 102 | Record the Maximum Gradient (Emax) for Cavity 7 and the gradient limiting condition. | [[Cav7EmaxOperator]] <<SRF>>  [[Cav7EmaxMeasTime]] <<TIMESTAMP>>  [[Cav7Emax]] <<FLOAT>> (MV/m)  [[Cav7EmaxLimit]] {{Admin Limit,Quench,FE related,Arc Fault,Window Temp Fault,BL Vacuum Fault,Coupler Vacuum Fault,RF Power,Heat Load,End Group Quench }} <<SELECT>> |
| 103 | Record the gradient at which a successful One Hour Run was completed for Cavity 7. Upload spreadsheet containing data on the One Hour run. | [[Cav7OneHourRunOperator]] <<SRF>>  [[Cav7OneHourRunComplete]] <<TIMESTAMP>>  [[Cav7Emaxop]] <<FLOAT>> (MV/m)  [[Cav7OneHourRunFile]] <<FILEUPLOAD>> |
| 104 | Record the Field Emission Onset gradient for Cavity 7. Upload the file containing Field emission data. | [[Cav7FEOperator]] <<SRF>>  [[Cav7FEMeasTime]] <<TIMESTAMP>>  [[Cav7FEOnset]] <<FLOAT>> (MV/m)  [[Cav7FEOnsetYN]] <<YESNO>>  [[Cav7FE50mR]] <<FLOAT>>  [[Cav7FEMaxDoseRate]] <<FLOAT>> (R/hr)  [[Cav7FEFile]] <<FILEUPLOAD>> |
| 105 | The Maximum Useable Gradient is the highest available gradient that meets one or more of the following criteria:   * Cavity can operate in a stable manner for at least one hour. * Cavity is operating at least 0.5 MV/m below any quench gradient * Radiation is less than 50 mR/hr during individual cavity operation.   Determine and record the Maximum Useable Gradient for Cavity 7 using measurements made in the above steps.  **If a cavity has a Maximum Useable Gradient lower than 16.0 MV/m under these three conditions, create an NCR.** | [[Cav7MaxUseGradient]] <<FLOAT>>  [[Cav7MaxUse16OrGreater]] <<YESNO>>  [[Cav7MaxUse20Point8OrGreater]] <<YESNO>> |
| 106 | If the Cavity has a Maximum Useable Gradient higher than 20.8 MV/m, complete an additional One Hour Run at 20.8 MV/m.  **If a cavity is unable to demonstrate stable operation at a gradient of at least 20.8 MV/m and meet all three conditions for Maximum Useable Gradient at 20.8 MV/m, create an NCR.** | [[Cav7Twenty8OneHourRunOperator]] <<SRF>>  [[Cav7Twenty8OneHourRunComplete]] <<TIMESTAMP>>  [[Cav7Twenty8Stable]] <<YESNO>>  [[Cav7Twenty8OneHourRunFile]] <<FILEUPLOAD>> |
| 107 | After completing the Q0 measurement sequence for Cavity 7, record the values of Q0 at 20.8 MV/m or at the Maximum Useable Gradient. Upload the Q0 measurement file. | [[Cav7QoOperator]] <<SRF>>  [[Cav7QoMeasTime]] <<TIMESTAMP>>  [[Cav7QoDesignGradient]] <<SCINOT>>  [[Cav7RFHeatDesignGradient]] <<FLOAT>> (W)  [[Cav7QoMaxUseable]] <<SCINOT>>  [[Cav7RFHeatMaxUseable]] <<FLOAT>> (W)  [[Cav7QoFile]] <<FILEUPLOAD>> |
| 108 | Record the Pressure Sensitivity data collected during the Q0 measurement sequence. | [[Cav7PressureSensOperator]] <<SRF>>  [[Cav7PressureSensTime]] <<TIMESTAMP>>  [[Cav7PressureSensitivity]] <<FLOAT>>  [[Cav7PressureSensFile]] <<FILEUPLOAD>> |
| 109 | Record the Static Lorentz coefficient calculated from data gathered during field emission measurements or other automated gradient ramping exercise. | [[Cav7StaticLorentzOperator]] <<SRF>>  [[Cav7StaticLorentzTime]] <<TIMESTAMP>>  [[Cav7StaticLorentzCoeff]] <<FLOAT>>  [[Cav7StaticLorentzFile]] <<FILEUPLOAD>> |
| 110 | Collect microphonics date for an hour with cavity in SELAP mode and operating at Max Useable Gradient. During the one hour period, the JT Valve must be regulating the liquid level (not locked). Upload files containing any microphonics measurements for Cavity 7.  **If microphonics detuning is greater than 10 Hz peak to peak, generate an NCR.** | [[Cav7MicrophonicsOperator]] <<SRF>>  [[Cav7MicrophonicsTime]] <<TIMESTAMP>>  [[Cav7MicrophonicsPass]] <<YESNO>>  [[Cav7MicrophonicsFile]] <<FILEUPLOAD>> |
| 111 | Use the comment box to list any problems or anything unusual about the performance of Cavity 7. | [[Cav7HPRFComments]] <<COMMENT>> |

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| **Cavity 8** | | |
| **Step No** | **Instructions** | **Data Inputs** |
| 112 | Record QextFPC, QextFP, QextHOM1, and QextHOM2 for Cavity 8. Record the gradient at which these measurements were completed.  **An NCR must be generated if either HOM coupler has a Qext lower than 2E11.**  **If the RF power out of any HOM coupler is greater than 1.7 W at 20.8 MV/m, create an NCR.** | [[Cav8QextOperator]] <<SRF>>  [[Cav8QextMeasTime]] <<TIMESTAMP>>  [[Cav8QextFPC]] <<SCINOT>>  [[Cav8QextFP]] <<SCINOT>>  [[Cav8QextHOM1]] <<SCINOT>>  [[Cav8QextHOM2]] <<SCINOT>>  [[Cav8QextMeasGradient]] <<FLOAT>> |
| 113 | Record the Maximum Gradient (Emax) for Cavity 8 and the gradient limiting condition. | [[Cav8EmaxOperator]] <<SRF>>  [[Cav8EmaxMeasTime]] <<TIMESTAMP>>  [[Cav8Emax]] <<FLOAT>> (MV/m)  [[Cav8EmaxLimit]] {{Admin Limit,Quench,FE related,Arc Fault,Window Temp Fault,BL Vacuum Fault,Coupler Vacuum Fault,RF Power,Heat Load,End Group Quench }} <<SELECT>> |
| 114 | Record the gradient at which a successful One Hour Run was completed for Cavity 8. Upload spreadsheet containing data on the One Hour run. | [[Cav8OneHourRunOperator]] <<SRF>>  [[Cav8OneHourRunComplete]] <<TIMESTAMP>>  [[Cav8Emaxop]] <<FLOAT>> (MV/m)  [[Cav8OneHourRunFile]] <<FILEUPLOAD>> |
| 115 | Record the Field Emission Onset gradient for Cavity 8. Upload the file containing Field emission data. | [[Cav8FEOperator]] <<SRF>>  [[Cav8FEMeasTime]] <<TIMESTAMP>>  [[Cav8FEOnset]] <<FLOAT>> (MV/m)  [[Cav8FEOnsetYN]] <<YESNO>>  [[Cav8FE50mR]] <<FLOAT>>  [[Cav8FEMaxDoseRate]] <<FLOAT>> (R/hr)  [[Cav8FEFile]] <<FILEUPLOAD>> |
| 116 | The Maximum Useable Gradient is the highest available gradient that meets one or more of the following criteria:   * Cavity can operate in a stable manner for at least one hour. * Cavity is operating at least 0.5 MV/m below any quench gradient * Radiation is less than 50 mR/hr during individual cavity operation.   Determine and record the Maximum Useable Gradient for Cavity 8 using measurements made in the above steps.  **If a cavity has a Maximum Useable Gradient lower than 16.0 MV/m under these three conditions, create an NCR.** | [[Cav8MaxUseGradient]] <<FLOAT>>  [[Cav8MaxUse16OrGreater]] <<YESNO>>  [[Cav8MaxUse20Point8OrGreater]] <<YESNO>> |
| 117 | If the Cavity has a Maximum Useable Gradient higher than 20.8 MV/m, complete an additional One Hour Run at 20.8 MV/m.  **If a cavity is unable to demonstrate stable operation at a gradient of at least 20.8 MV/m and meet all three conditions for Maximum Useable Gradient at 20.8 MV/m, create an NCR.** | [[Cav8Twenty8OneHourRunOperator]] <<SRF>>  [[Cav8Twenty8OneHourRunComplete]] <<TIMESTAMP>>  [[Cav8Twenty8Stable]] <<YESNO>>  [[Cav8Twenty8OneHourRunFile]] <<FILEUPLOAD>> |
| 118 | After completing the Q0 measurement sequence for Cavity 8, record the values of Q0 at 20.8 MV/m or at the Maximum Useable Gradient. Upload the Q0 measurement file. | [[Cav8QoOperator]] <<SRF>>  [[Cav8QoMeasTime]] <<TIMESTAMP>>  [[Cav8QoDesignGradient]] <<SCINOT>>  [[Cav8RFHeatDesignGradient]] <<FLOAT>> (W)  [[Cav8QoMaxUseable]] <<SCINOT>>  [[Cav8RFHeatMaxUseable]] <<FLOAT>> (W)  [[Cav8QoFile]] <<FILEUPLOAD>> |
| 119 | Record the Pressure Sensitivity data collected during the Q0 measurement sequence. | [[Cav8PressureSensOperator]] <<SRF>>  [[Cav8PressureSensTime]] <<TIMESTAMP>>  [[Cav8PressureSensitivity]] <<FLOAT>>  [[Cav8PressureSensFile]] <<FILEUPLOAD>> |
| 120 | Record the Static Lorentz coefficient calculated from data gathered during field emission measurements or other automated gradient ramping exercise. | [[Cav8StaticLorentzOperator]] <<SRF>>  [[Cav8StaticLorentzTime]] <<TIMESTAMP>>  [[Cav8StaticLorentzCoeff]] <<FLOAT>>  [[Cav8StaticLorentzFile]] <<FILEUPLOAD>> |
| 121 | Collect microphonics date for an hour with cavity in SELAP mode and operating at Max Useable Gradient. During the one hour period, the JT Valve must be regulating the liquid level (not locked). Upload files containing any microphonics measurements for Cavity 8.  **If microphonics detuning is greater than 10 Hz peak to peak, generate an NCR.** | [[Cav8MicrophonicsOperator]] <<SRF>>  [[Cav8MicrophonicsTime]] <<TIMESTAMP>>  [[Cav8MicrophonicsPass]] <<YESNO>>  [[Cav8MicrophonicsFile]] <<FILEUPLOAD>> |
| 122 | Use the comment box to list any problems or anything unusual about the performance of Cavity 8. | [[Cav8HPRFComments]] <<COMMENT>> |

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| **Step No** | **Instructions** | | | | **Data Inputs** | |
| 123 | **Eight Cavity Extended Run:**   * Set up and operate all eight cavities in SELAP mode.   + Set gradients to at least 20.8 MV/m or the Maximum Useable Gradient if lower.   + Total CW Voltage for this test must be at least 173 MV.   + Individual cavity gradients may be adjusted above 20.8 MV/m, if possible, to compensate for lower performing cavities.   + Magnet must be powered at nominal current. * Operate all eight cavities in this configuration until the coupler temperatures reach equilibrium or until at least 10 hours have elapsed with at least 90% operating time (cavities in RF On at the target gradient). * Record the requested information in the table below.   + Record the maximum operating gradients set for each cavity at the completion of the Extended Run.   + Record the maximum coupler temperatures indicated by the two temperature sensors on each coupler. * Extended Run begins when all eight cavities are in RF ON at the desired gradients. * Extended Run ends when all Coupler Temperatures have reached their maximum temperatures or ten hours have elapsed.   **It is expected that the set up and execution of the Extended Run will require up to two shifts to complete.**  **Complete the Dark Current measurements described below before ending the Extended Run.** | | | | [[ExtendedRunOperator1]] <<SRF>>  [[ExtendedRunStartTime]] <<TIMESTAMP>>  [[ExtendedRunQuadMagnetCurrent]] <<FLOAT>>  [[ExtendedRunTotalRunTime]] <<FLOAT>> (hours)  [[ExtendedRunFiles]] <<FILEUPLOAD>>  [[MinimumUseableCWVoltage173MV]]<<YESNO>> | |
| **Cavity** | **Gradient**  **(MV/m)** | **Forward Power**  **(kW)** | | **Maximum Coupler 1 Temperature (K)** | | **Maximum Coupler 2 Temperature (K)** |
| **1** | [[Cav1EightCavGradient]] <<FLOAT>> (MV/m) | [[Cav1EightCavFwdPwr]] <<FLOAT>> (kW) | | [[Cav1EightCavCplr1MaxTemp]] <<FLOAT>> (K) | | [[Cav1EightCavCplr2MaxTemp]] <<FLOAT>> (K) |
| **2** | [[Cav2EightCavGradient]] <<FLOAT>> (MV/m) | [[Cav2EightCavFwdPwr]] <<FLOAT>> (kW) | | [[Cav2EightCavCplr1MaxTemp]] <<FLOAT>> (K) | | [[Cav2EightCavCplr2MaxTemp]] <<FLOAT>> (K) |
| **3** | [[Cav3EightCavGradient]] <<FLOAT>> (MV/m) | [[Cav3EightCavFwdPwr]] <<FLOAT>> (kW) | | [[Cav3EightCavCplr1MaxTemp]] <<FLOAT>> (K) | | [[Cav3EightCavCplr2MaxTemp]] <<FLOAT>> (K) |
| **4** | [[Cav4EightCavGradient]] <<FLOAT>> (MV/m) | [[Cav4EightCavFwdPwr]] <<FLOAT>> (kW) | | [[Cav4EightCavCplr1MaxTemp]] <<FLOAT>> (K) | | [[Cav4EightCavCplr2MaxTemp]] <<FLOAT>> (K) |
| **5** | [[Cav5EightCavGradient]] <<FLOAT>> (MV/m) | [[Cav5EightCavFwdPwr]] <<FLOAT>> (kW) | | [[Cav5EightCavCplr1MaxTemp]] <<FLOAT>> (K) | | [[Cav5EightCavCplr2MaxTemp]] <<FLOAT>> (K) |
| **6** | [[Cav6EightCavGradient]] <<FLOAT>> (MV/m) | [[Cav6EightCavFwdPwr]] <<FLOAT>> (kW) | | [[Cav6EightCavCplr1MaxTemp]] <<FLOAT>> (K) | | [[Cav6EightCavCplr2MaxTemp]] <<FLOAT>> (K) |
| **7** | [[Cav7EightCavGradient]] <<FLOAT>> (MV/m) | [[Cav7EightCavFwdPwr]] <<FLOAT>> (kW) | | [[Cav7EightCavCplr1MaxTemp]] <<FLOAT>> (K) | | [[Cav7EightCavCplr2MaxTemp]] <<FLOAT>> (K) |
| **8** | [[Cav8EightCavGradient]] <<FLOAT>> (MV/m) | [[Cav8EightCavFwdPwr]] <<FLOAT>> (kW) | | [[Cav8EightCavCplr1MaxTemp]] <<FLOAT>> (K) | | [[Cav8EightCavCplr2MaxTemp]] <<FLOAT>> (K) |
| 124 | Record the **Total Integrated Voltage** for this cryomodule. This is the sum of the Maximum Useable Gradients multiplied by the cavity length (1.038 m). Any reductions in gradient that were necessary in order to complete the Extended Run and that were due to cavity performance issues should be taken into consideration.  **An NCR must be generated if any of the 50 K coupler flange temperatures exceed 200 K at the conclusion of ten hours of running.**  **An NCR must be generated if any of the coupler warm section temperatures exceed 450 K at the conclusion of ten hours of running.**  **An NCR must be generated if the Total Integrated Voltage is less than 173 MV.** | | | | [[CMTotalVoltage]] <<FLOAT>> (MV) | |
| 125 | Use the comment block to document any problems or unusual behavior encountered in completing the Extended Run. Explain any reductions in gradient from what is specified for this test. | | | | [[ExtendedRunComments]] <<COMMENT>> | |
| 126 | Record the maximum **Dark Currents** as measured using the Faraday Cups at either end of the cryomodule during the Eight Cavity Run.  Relative phases of the cavities should be set to maximize the dark current as measured at the Faraday Cups.  **If the dark current seen at either Faraday Cup exceeds 30 nA, generate an NCR.** | | | | [[DarkCurrentPass]]<<YESNO>> | |
| **Cavity** | **Phase (maximize Supply End Current)** | | **Phase (maximize Return End Current)** | | [[ExtendedRunOperator2]] <<SRF>>  [[SupplyEndDarkCurrent]] <<FLOAT>> (nA)  [[ReturnEndDarkCurrent]] <<FLOAT>> (nA)  [[DarkCurrentFile]] <<FILEUPLOAD>>  [[DarkCurrentComments]] <<COMMENT>> | |
| **1** | [[Cav1MaxSupplyCurrentPhase]] <<FLOAT>> | | [[Cav1MaxReturnCurrentPhase]] <<FLOAT>> | |
| **2** | [[Cav2MaxSupplyCurrentPhase]] <<FLOAT>> | | [[Cav2MaxReturnCurrentPhase]] <<FLOAT>> | |
| **3** | [[Cav3MaxSupplyCurrentPhase]] <<FLOAT>> | | [[Cav3MaxReturnCurrentPhase]] <<FLOAT>> | |
| **4** | [[Cav4MaxSupplyCurrentPhase]] <<FLOAT>> | | [[Cav4MaxReturnCurrentPhase]] <<FLOAT>> | |
| **5** | [[Cav5MaxSupplyCurrentPhase]] <<FLOAT>> | | [[Cav5MaxReturnCurrentPhase]] <<FLOAT>> | |
| **6** | [[Cav6MaxSupplyCurrentPhase]] <<FLOAT>> | | [[Cav6MaxReturnCurrentPhase]] <<FLOAT>> | |
| **7** | [[Cav7MaxSupplyCurrentPhase]] <<FLOAT>> | | [[Cav7MaxReturnCurrentPhase]] <<FLOAT>> | |
| **8** | [[Cav8MaxSupplyCurrentPhase]] <<FLOAT>> | | [[Cav8MaxReturnCurrentPhase]] <<FLOAT>> | |

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| **Step No** | **Instructions** | **Data Inputs** |
| 127 | Calculate the expected 2K dynamic heat load while operating at at a Total Voltage of 173 MV.  Calculations should be based on individual Qo measurements.  **An NCR must be generated if the 2K dynamic heat load is greater than 137 W.** | [[CMTotalRFHeatLoad]] <<FLOAT>> (W) |
| 128 | All installed cryomodule thermometry must be verified functional by observing consistency in output with operational conditions.  For sensors measuring identical locations on components within a cryomodule there shall be variation of no more than 0.2 Kelvin under the same conditions at each component and under static load with no power applied to the cavities or magnets.  Upload any supporting files. Describe thermometry problems in Comments.  **An NCR must be generated if any thermometry is deemed non-functional.** | [[ThermometryTech]] <<SRF>>  [[ThermometryCheckComplete]] <<TIMESTAMP>>  [[ThermometryFunctional]] <<YESNO>>  [[ThermometryFiles]] <<FILEUPLOAD>>  [[ThermometryComments]] <<COMMENT>> |
| 129 | Liquid level sensors shall be verified functional by observing liquid levels and changes therein consistent with liquid supply rates and estimated boil-off rates  Upload any supporting files. Describe any liquid level sensor problems in Comments.  **An NCR must be generated if either liquid level sensor is deemed non-functional.** | [[LiquidLevelSensorTech]] <<SRF>>  [[LiquidLevelSensorCheckComplete]] <<TIMESTAMP>>  [[LiquidLevelSensorsFunctional]] <<YESNO>>  [[LiquidLevelSensorFiles]] <<FILEUPLOAD>>  [[LiquidLevelSensorComments]] <<COMMENT>> |
| 130 | The JT valve, Cool Down/Warm up valve, and Bypass valve shall all be verified functional during cryomodule operations by checking for consistency with expectations for operational performance of those valves.  No valve or actuator is to have ice form on the room temperature components.  Upload any supporting files. Describe any cryogenic valve problems in Comments.  **An NCR must be generated if any cryogenic valve is deemed non-functional.**  **An NCR must be generated if any of the cryogenic valves has ice form on room temperature components.** | [[CryoValveTech]] <<SRF>>  [[CryoValveCheckComplete]] <<TIMESTAMP>>  [[JTValveFunctional]] <<YESNO>>  [[CDValveFunctional]] <<YESNO>>  [[BypassValveFunctional]] <<YESNO>>  [[IceOnValves]] <<YESNO>>  [[ValveFiles]] <<FILEUPLOAD>>  [[ValveComments]] <<COMMENT>> |
| 131 | All installed heaters shall be verified functional by measuring resistance of 45+/-6 Ω at 2 Kelvin. Heaters must be demonstrated functional in a cryomodule as verified by heating of the helium:   * Six of the eight heaters on the helium vessels * Two of the three heaters on fill lines * Both of the liquid level heaters   Upload any supporting files. Describe any heater problems in Comments.  **An NCR must be generated if more than two helium vessel heaters are deemed non-functional.**  **An NCR must be generated if more than one Fill line heaters are deemed non-functional.**  **An NCR must be generated if either liquid level heaters are deemed non-functional.** | [[HeaterTech]] <<SRF>>  [[HeaterCheckComplete]] <<TIMESTAMP>>  [[HeliumVesselHeatersFunctional]] <<YESNO>>  [[FillLineHeatersFunctional]] <<YESNO>>  [[LiquidLevelHeatersFunctional]] <<YESNO>>  [[HeaterFiles]] <<FILEUPLOAD>>  [[HeaterComments]] <<COMMENT>> |
| 132 | Record the **Static Heat Load** (in Watts) to the primary (2K) helium circuit. The average heat load is calculated across all of the measurements made during the Qo measurement procedure. Upload the data in a spreadsheet file. Enter any requested information to the right.  **An NCR must be generated if the Static Heat Load is greater than 7 W.** | [[StaticHeatLoadCalcDate]] <<TIMESTAMP>>  [[StaticHeatLoadComments]] <<COMMENT>>  [[StaticHeatLoad]] <<FLOAT>> (W)  [[StaticHeatLoadFile]] <<FILEUPLOAD>> |

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| **Step No** | **Instructions** | **Data Inputs** |
| 133 | Record the **beamline vacuum**, **coupler vacuum,** and the **insulating vacuum** (in torr) prior to beginning warm up. Note any problems in comment block.  Minimum Acceptance Criteria for Vacuums:  Cryomodule Beamline Vacuum at 2K - 1E-9 torr  Cryomodule Insulating Vacuum at 2K - 1E-6 torr  Cryomodule Coupler Vacuum at 2K - 5E-8 torr  **If, at the end of Acceptance Testing, the vacuum pressure for a vacuum space exceeds its listed value above, generate an NCR.** | [[VacTech]] <<SRF>>  [[FinalVacCheckComplete]] <<TIMESTAMP>>  [[FinalVacCheckComments]] <<COMMENT>>  [[FinalInsVac]] <<SCINOT>> (torr)  [[FinalBeamLineVac]] <<SCINOT>> (torr)  [[FinalCplrVac]] <<SCINOT>> (torr) |
| 134 | Detune all cavities using the mechanical tuners. Detune to approximate initial untuned frequencies. Check off each cavity that has been detuned. Enter requested information. | [[DetuneOperator]] <<SRF>>  [[DetuneComplete]] <<TIMESTAMP>>  [[DetuneComments]] <<COMMENT>>  [[C1Detuned]] <<YESNO>>  [[C2Detuned]] <<YESNO>>  [[C3Detuned]] <<YESNO>>  [[C4Detuned]] <<YESNO>>  [[C5Detuned]] <<YESNO>>  [[C6Detuned]] <<YESNO>>  [[C7Detuned]] <<YESNO>>  [[C8Detuned]] <<YESNO>> |
| 135 | Begin the cryomodule warm up procedure. Record the start time for the warm up to the right. | [[WarmUpCryoOperator]] <<SRF>>  [[WarmStartTime]] <<TIMESTAMP>>  [[WarmUpComments]] <<COMMENT>> |
| 136 | Record any additional information and notes from cryomodule testing. | [[ReportFiles]] <<FILEUPLOAD>>  [[ReportComments]] <<COMMENT>> |