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| Traveler Title | AUPCAV Cavity RF Incoming Inspection | | | |
| Traveler Abstract | RF Incoming Inspection of AUPCAV Jacketed Cavity | | | |
| Traveler ID | AUPCAV-TUNE-CAV-RFIN-DRSDC | | | |
| Traveler Revision | R1 | | | |
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| Traveler Date | 30-Jun-25 | | | |
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| 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. | | | |
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| Revision Note |  |
| R1 | Initial release of this Traveler. |

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| **RF Inspection Goals:**  This traveler outlines the RF acceptance inspections required for incoming AUP RFD jacketed cavities.  **Inspection Location and Timing:**   * Conduct inspections in the RF tuning area immediately after the initial receipt inspection.   **Equipment Required:**   * Vector Network Analyzer * 50 Ohm RF cables with Type-N connectors * RF amplifier * Digital multimeter * Weather station or electronic data logger (available in RF tuning area) to record ambient conditions (temperature, pressure, relative humidity).   **Inspection Objectives:**   * Measure the cavity's warm fundamental mode frequency as received (backfilled with N₂ at 1 atm). * Record and store the fundamental mode transmission spectrum. * Check electrical integrity of all RF antennas. * Save and upload all measurement data in an Excel spreadsheet to the designated M-drive location.   **Post-Inspection Actions:**   * After the RF inspection, transfer the cavity carefully to visual inspection. * Handle the cavity carefully during inspections and transfers.   **Additional Information:**   * Prior to delivery, cavities have undergone complete post-processing, including main and final BCP. * Cavities are pre-tuned to a warm target frequency (~400.19 MHz +/-50 kHz). * Field flatness measurements are unnecessary for single-cell cavities. * Frequency measurements before and after shipment determine if the cavity integrity has been compromised during transit. * Cavities are delivered jacketed with helium vessels, backfilled with N₂ at 1 atm, and are not yet in a "ready to test" state upon arrival. * Opening the cavity to atmosphere (e.g., to install temporary antennas) is permitted if needed. * Vendor-recorded frequency data, taken just before shipment under identical conditions, is the reference for comparison.   The delivered cavity includes the same qualification hardware used during the bare cavity's vertical cold tests. This setup consists of a high-Q fixed antenna (SST) mounted on the FPC coupler port, and a pickup antenna feedthrough on the opposite pickup port. The beam tube flange on the FPC side has a right-angle valve (VAT), and a burst disc is installed on the HHOM coupler port. Unless otherwise indicated by the PI, all the hardware will be removed to be cleaned according to the AUP procedures following this RF inspection step. The figure below shows the hardware configuration present at delivery.    Input antenna  Pickup antenna | | |
| Step No. | Instructions | Data Inputs |
| 1 | **RF Inspection Basic Data**  **Recipient of cavity for RF inspection**  **Cavity Serial Number**  **Date of Arrival for RF inspection** | [[RFInspPrepTech]] <<SRFCVP>>  [[CAVSN]] <<CAVSN>>  **[[InspectionDateTime]] <<TIMESTAMP>>** |
| 2 | **Measure and record transmission of the fundamental mode at room temperature (under 1 atm) using the VNA connected to a PC. Leave cable connected as in Step 3.**  Preparation:  Set Center Frequency to 400.7 MHz  Set Span to 600 kHz  Use maximum points per sweep (20001 if possible) when applicable. Set IFBW to 50 Hz.  **Capture spectral data (S21) in new Excel spreadsheet (name worksheet: Spectrum).**  **Has spectrum been recorded?**  Other Comments | [[SpektrumRecorded]] <<YESNO>>  [[Passband\_Comment]] <<COMMENT>> |

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| Step No. | Instructions | Data Inputs |
| 3 | **Record the Fundamental Mode Frequency in Transmission (S21) using a Vector Network Analyzer (VNA). It is recommended to use an Agilent VNA with up to 20001 data point per sweep.**  Preparation: Attach cable 1 from VNA port 1 to main coupler port antenna (high-Q fixed antenna, SST Inc.) and cable 2 from VNA port 2 to field probe port antenna (Kyocera). Use amplifier in the return path (cable 2) if required to capture modes with low signal transmission.  **Technician performing RF measurements**  **Create a new worksheet (name: 'Fundamental').** **Record data with at least 3 significant digits behind comma** (xxxx.xxx MHz) **and store results in Excel. S**et span width of VNA appropriately for best accuracy (IFBW ~ 50 Hz, at least 1601 points per sweep)  Fundamental frequency (~400.7 MHz)  Was amplifier required?  Were temporary antennas needed?  **Enter the frequencies in Spreadsheet 'Fundamental'**  table header in cell A1 is "frequency (MHz)" | **[[FreqPrepTech]] <<SRFCVP>>**  [[Freq]] <<FLOAT>>  [[AmplifierUsed]] <<YESNO>>  [[TempAntennaUsed]] <<YESNO>> |

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| Step No. | Instructions | Data Inputs |
| 4 | **Record Ambient Conditions in Tuning Area**  **(use weather station or existing electronic data logger and convert units to units given below)**  Temperature (Units in K)  Pressure (Unit in mbar)  Relative Humidity (Units in %)  Denote ambient conditions in same Excel worksheet "Modes":  Cell E2 = temperature,  Cell F2 = pressure and  Cell G2 = relative humidity with table headers in  E1 = Temperature (K)  F1 = Pressure (mbar)  G1 = Relative Humidity (%)  Note that the fundamental mode frequency at ambient conditions must have been pre-tuned to 400.7MHz +/- 150 kHz by the vendor (warm frequency at 22 deg. C with cavity under vacuum).  Other Comments | **[[AmbiTemp]]** <<FLOAT>>  **[[AmbiPressure]]** <<FLOAT>>  **[[rHumidity]]** <<FLOAT>>  [[Worksheet\_Comment]] <<COMMENT>> |

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| Step No. | Instructions | Data Inputs |
| 5 | **Upload Excel spreadsheet to M-drive for documentation and storage**  **Folder link is:**  M:\asd\asddata\CavityTuning\AUP\FM\_Spectra\  **Preparation:**   1. **Save Excel spreadsheet with spectral and all fundamental mode data to M-drive (store locally if required)** 2. **Name Excel spreadsheet referring to date and serial number of cavity:**   **Naming Convention: YYYY-MM-DD-CAVSN.xlsx**  (M:\asd\asddata\CavityTuning\AUP\FM\_Spectra\YYYY-MM-DD-CAVSN.xlsx)  **Has the Excel Spreadsheet been uploaded to M-Drive?**  **Other Comments** | [[ExcelUpload]] <<FILEUPLOAD>>  [[ExcelDataUploaded]] <<YESNO>>  [[Excel\_Comment]] <<COMMENT>> |
| 6 | **Status and RF Antenna Inner Conductors (Pins)**  Carefully remove protection caps from RF antennas (at field probe (FP) port, main coupler (MC) port)  Check if pins are loose by gently trying to move the inner pin laterally (no excess force allowed).  Which connector pins are OK/Not OK?  MC Pin OK?  FP Pin OK?  Other Comments | [[MC\_PinStatus]] {{OK,NOTOK}} <<RADIO>>  [[FP\_PinStatus]] {{OK,NOTOK}} <<RADIO>>  [[Pin\_Comment]] <<COMMENT>> |

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| Step No. | Instructions | Data Inputs |
| 7 | **Check of Electrical Short in all Connectors**  Use a digital multimeter and measure the resistance between the outer and inner conductor. The conductors should be isolated. A small resistance indicates a short.  Are connectors OK (isolated)?  MC Connector OK?  FP Connector OK?  Other Comments | [[MC\_ConStatus]] {{OK,NOTOK}} <<RADIO>>  [[FP\_ConStatus]] {{OK,NOTOK}} <<RADIO>>  [[Connectors\_Comment]] <<COMMENT>> |
| 8 | **Results of inspections**  **The cavity has been accepted to proceed to visual inspection. If not, inform SOTR or representative and issue NCR. If vendor documents are present, provide all documents to SOTR or representative as soon as possible.**  Other Comments | **[[**RF\_Inspection**]] <<YESNO>>**  [[RF\_Inspection\_Comment]] <<COMMENT>> |