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| Traveler Title | AUPCAV Cavity RF Incoming Inspection |
| Traveler Abstract | RF Incoming Inspection of AUPCAV Bare Cavities |
| Traveler ID | AUPCAV-TUNE-CAV-RFIN-BAREC |
| Traveler Revision  | R2 |
| Traveler Author | Roland Overton |
| Traveler Date | 30-Jun-25 |
| NCR Informative Emails | Areilly,forehand |
| NCR Dispositioners | Kdavis,acastill,huque |
| D3 Emails | acastill,huque,forehand |
| Approval Names | Roland Overton | Danny Forehand | Kirk Davis | Naeem Huque |
| 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. |
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| Revision Note |  |
| R1 | Initial release of this Traveler. |
| R2 | Minor inconsistencies addressed |

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| **RF Inspection Goals:**This traveler outlines the RF acceptance inspections required for incoming AUP RFD 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)

**RF Inspection Procedure:*** Perform RF measurements with the cavity in its delivered state (under vacuum unless otherwise noted by the vendor).
* Measure the warm fundamental mode frequency and record the transmission spectrum.
* Check the electrical integrity of all RF antennas.
* Save all data in an Excel spreadsheet and upload it to the designated M-drive location.

**Post-Inspection Actions:*** After the RF inspection, transfer the cavity carefully to visual inspection.
* Handle the cavity with care at all times, including during workstation transfers.

**Hardware Configuration on Delivery:*** The cavity is delivered with the same qualification hardware used during bare cavity vertical cold tests. This includes a high-Q fixed antenna (SST) on the FPC coupler port, a pickup antenna feedthrough on the opposite port, a right-angle valve (VAT) on the FPC-side beam tube flange, and a burst disc on the HHOM coupler port. The figure below shows the hardware configuration at delivery.

**Additional Information:*** Prior to delivery, the cavity is fully post-processed, including main and final BCP.
* It is tuned to a warm target frequency (~400.06 MHz ±50 kHz).
* Field flatness is not evaluated for single-cell cavities like the AUP RFD.
* The cavity is delivered under vacuum and without a helium vessel, unless specified otherwise, and has cleared all hold points for shipment to JLab.
* The vendor records the fundamental mode frequency immediately before shipment under the same conditions.
* Repeat the same measurement after delivery to check for any frequency shift, which may indicate deformation from handling or shipping. Pay particular attention to changes caused by potential damage to the cavity walls or poles.

**The as-delivered cavity is also equipped with qualification hardware ready for vertical cold tests, which includes one high-Q fixed antenna attached to the FPC coupler port, one pickup antenna feedthrough attached to the pickup port on the opposite side of the main coupler port. The beam tube flange on the FPC side carries a right-angle valve (RAV). A Burst disc is attached to the HHOM coupler port. The figure below highlights the hardware accessories assembled at the time of delivery.** Pickup antennaInput 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** | [[PrepTech1]] <<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 MHzSet Span to 600 kHzUse 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\_Comment1]] <<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?**Enter the frequencies in Spreadsheet 'Fundamental'**table header in cell A1 is "frequency (MHz)" | **[[PrepTech2]] <<SRFCVP>>**[[Freq]] <<FLOAT>>[[AmplifierUsed]] <<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 inE1 = 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 | **[[Temp]]** <<FLOAT>>**[[Pressure]]** <<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>>[[DataUploaded]] <<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>> |