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| Traveler Title | PLACLN (CEBAF 12 GeV Cryomodule Upgrade) Vertical cavity Testing |
| Traveler Abstract | Cryogenic RF testing of cavities for PLACLN |
| Traveler ID | PLACLN-VTA-CAV-VTRF |
| Traveler Revision  | R1 |
| Traveler Author | T. Ganey |
| Traveler Date | 6-Nov-18 |
| NCR Informative Emails | Areilly,kdavis |
| NCR Dispositioners | Powers,ganey |
| D3 Emails | kdavis,areilly,power,ganey |
| Approval Names | T. Ganey | K. Davis | T. Powers | A. Reilly |
| Approval Signatures |  |  |  |  |
| Approval Dates |  |  |  |  |
| Approval Title | Author | Reviewer | Project Manager | SRF Department Head |

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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. |
| [VTA SOP](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-48111/A-09-001-SOP-21542%5B1%5D.pdf) | [1497 MHz VTA RF Testing Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-48113/CP-C100-CAV-VTRF-R2.docx) | [Excel spreadsheet template for VTA RF measurements](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-48114/SpreadsheetTemplate%20for%20C100-CAV-VTRF.xlsx) |  |  |
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| Revision Note |  |
| R1 | Initial release of this Traveler. |

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| Step No. | Instructions | Data Input |
| 1 | Input C100 CEBAF 7-cells cavity ID.Note any special handling, processing (chemistry or bake) or off-normal conditions associated with this cavity before test. | [[CAVSN]] <<CAVSN>>[[SpecialHandling]] <<COMMENT>> |
| 2 | Record if cavity has Helium vessel. | [[HeliumVessel]] <<YESNO>> |
| 3 | Record if cavity is mechanically constrained (i.e. tuner attached, etc.). | [[TunerAttached]] <<YESNO>> |
| 4 | Does this cavity have HOM coupler probes installed and connected to the test system? Indicate how many. | [[HOMsConnected]] {{2,0}} <<SELECT>> |
| 5 | Enter the LabView file name, without special characters. (Valid example: C100\_RI\_045). | [[LabviewFile]] <<TEXT>> |
| 6 | Record Test Date, Dewar No, Top Plate ID and Operator(s). | [[TestDate]] <<TIMESTAMP>>[[Dewar]]{{8,4,7,3}} <<SELECT>>[[VTATSSN]]<<TEXT>>[[TestOperator1]] <<VTAOPS>>[[TestOperator2]] <<VTAOPS>> |
| 7 | Record cavity vacuum pressure, if so instrumented. If during cooling down a lambda leak of 5x10-6 mbar or greater at 2.07K is identified:* choose option No for Cavity Vacuum OK
* record pertinent information in the Cavity Vacuum Comment
* abort RF power test
* launch NCR
 | [[CavityVacuum]] <<SCINOT>> (mbar)[[CavityVacuumOK]] <<YESNO>>[[CavityVacuumComment]] <<COMMENT>> |
| 8 | Record Dewar helium bath liquid level, temperature and baratron pressure. Do not continue unless Dewar LHe level is above the end group. Start cavity testing at (29+/-0.1) Torr which correspond to about 2.07K. | [[DewarLHeLevelcm]] <<FLOAT>>(cm)[[DewarTempK]] <<FLOAT>>(K)[[DewarPressureTorr]] <<FLOAT>>(Torr) |
| 9 | Zero power meters then calibrate cables at cavity fundamental frequency as specified in [1497 MHz VTA RF Testing Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-48113/CP-C100-CAV-VTRF-R2.docx). If NO option is chosen launch D3 and record pertinent information. | [[PowermetersZeroed]] <<YESNO>>[[CableCalibrationOK]] <<YESNO>>[[CableCalibrationComment]] <<COMMENT>> |

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| Step No. | Instructions | Data Input |
| 10 | Perform decay measurements and record Eacc, Qo, Qext2, Qext1, %error, radiation, QextHOMaand QextHOMb**.** chosen for CW high power tests as specified in: [1497 MHz VTA RF Testing Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-48113/CP-C100-CAV-VTRF-R2.docx). More information regarding these parameters can be found in CavID raw data.txt or CavID processed data.xlsx.Typical values during decay measurements for:  |  |
| Eacc : (5+/-1) MV/m | [[Eacc]] <<FLOAT>> (MV/m)  |
| Qo : 1.2-1.6 e10 | [[Qo]]<<SCINOT>> |
| Qext1 : 0.8-1.2 e10 | [[Qextin]]<<SCINOT>> |
| Qext2 : 0.8-1.8 e12 | [[Qextfp]]<<SCINOT>> |
| %error : 8-13 | [[Qextfperror]]<<FLOAT>> (%) |
| Radiation : 1 e-3 mR/hr | [[Rad]]<<SCINOT>> (mR/hr)  |
| QextHOMa : >= 3e12 | [[QextHOMa]]<<SCINOT>> |
| QextHOMb : >=3e12 | [[QextHOMb]]<<SCINOT>> |

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| Step No. | Instructions | Data Input |
| 11 | In Pi mode, test the cavity performance over its full dynamic range at 2.07K observing the administrative limits as specified in [1497 MHz VTA RF Testing Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-29949/CP-C100-CAV-VTRF-R2.docx). Be sure to capture a clean final-state data set from which to generate the post-processing Qo-vs-Eacc , Rad-vs-Eacc and f-vs-Eacc2 curves. |  |
| 12 | At 2.07K record:  |  |
| Final Maximum cavity gradient achieved Emax. | [[EmaxMVm]] <<FLOAT>>(MV/m) |
| Final Qo value at maximum cavity gradient. | [[QoAtEmax]] <<SCINOT>> |
| Final Qo at (20+/-0.3) MV/m. Acceptance criteria Qo >= 8e9. | [[QoAt20MVm]]<<SCINOT>>(MV/m)  |
| Initial value for Radiation at (20+/-0.3) MV/m. | [[Init\_RadAt20MVm]] <<SCINOT>>(mR/h)  |
| InitialFEonset: onset of field emission (FE onset, defined to be the first measured gradient where measured radiation is >= 1e-2 mR/hr). If no field emission is detected, insert a value of 50 MV/m. | [[Init\_FEonsetMVm]] <<FLOAT>>(MV/m) |
| Initial Rmax value for the highest radiation level inside Dewar lid. If Rmax is background, insert 1e-3 mR/m for this parameter. | [[Radmax]] <<SCINOT>>(mR/h) |
| Final Qo at Eacc= (4 +/-0.3) MV/m.  | [[QoAt4MVm]] <<SCINOT>> |
| 13 | Record performance limitation at 2.07K.If cavity PerformanceLimitAt2\_07K is selected Other, record pertinent information in the Comment box at the right. | [[PerformanceLimitAt2\_07K]] {{RF power, FE, Quench (non FE),Cable, Operator, Other}} <<SELECT>>[[PerformanceLimitAt2\_07K\_Other]] <<COMMENT>> |
| 14 | At 2.07K, was cavity RF processed (conform specifications in [1497 MHz VTA RF Testing Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-48113/CP-C100-CAV-VTRF-R2.docx)) to achieve performances over 25 MV/m? Record pertinent information at the right. | [[RFProcessing]] <<YESNO>>[[RFProcessingComment]] <<COMMENT>> |
| 15 | Final Record Lorentz detuning coefficient (slope of the linear fit frequency vs Eacc2) KLoren.Lorentz detuning coefficient specifications:  Low: -4.0 High: -6.0If option NO is checked, launch NCR. | [[KLOREN]] <<FLOAT>> (Hz/MVm2)[[KLORENMeetsSpec]] <<YESNO>>[[KLORENComment]] <<COMMENT>> |
| 16 | Record post-processing data: |  |
| Post-procession Radiation at (20+/-0.3) MV/m. | [[PP\_RadAt20MVm]] <<SCINOT>>(mR/h) |
| Post-procession FEonset: onset of field emission (FE onset, defined to be the first measured gradient where measured radiation is >= 1e-2 mR/hr). If no field emission is detected, insert a value of 50 MV/m. | [[PP\_FEonsetMVm]] <<FLOAT>>(MV/m) |
| Post-procession Rmax value for the highest radiation level inside Dewar lid. If Rmax is background, insert 1e-3 mR/m for this parameter. | [[PP\_Radmax]] <<SCINOT>>(mR/h) |

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| Step No. | Instructions | Data Input |
| 17 | 29 +/-0.1  | 2.07 | 1.0 e10 | [[QoAt20MVm\_2\_07K]] <<SCINOT>>[[QoAt20MVm\_2\_02K]] <<SCINOT>>[[QoAt20MVm\_1\_99K]] <<SCINOT>>[[QoAt20MVm\_1\_93K]] <<SCINOT>>[[CavityPerformance]] <<COMMENT>> |
| 25 +/-0.1  | 2.02 | 1.2 e10 |
| 23 +/-0.1  | 1.99  | 1.5 e10 |
| 19 +/-0.1  | 1.93 (optional) | 1.9 e10 |
| Performance note: record information about cavity performance, limitations and other pertinent observations. |
| 18 | Conform specifications in [1497 MHz VTA RF Testing Procedure](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-48113/CP-C100-CAV-VTRF-R2.docx) process and upload the VTA RF testing results, using the [Excel file template](https://jlabdoc.jlab.org/docushare/dsweb/Get/Document-48114/SpreadsheetTemplate%20for%20C100-CAV-VTRF.xlsx). |  |
| 19 | Upload the raw data file with VTA RF testing results using file name: CavID raw data.txt. | [[RF\_TestRawData]] <<FILEUPLOAD>> |
| 20 | Upload processed (Excel) data file results using file name: CavID processed data.xlsx | [[RF\_TestProcessed]] <<FILEUPLOAD>> |
| 21 | Upload processed Qo and Rad-vs-Eacc graph (in PDF format) using file name: CavID\_ QoAndRadvsEacc.pdf. Upload processed HOMa and HOMb vs Eacc graph (in PDF format) using file name: CavID\_HOMaHOMbvsEacc.pdfUpload processed f-vs-Eacc2 graph (in PDF format) using file name: CavID\_FreqvsEacc2.pdf.  | [[QoAndRadvsEacc]] <<FILEUPLOAD>>[[HOMaAndHOMbvsEacc]] <<FILEUPLOAD>>[[fvsEacc2]] <<FILEUPLOAD>> |
| 22 | Upload any additional processed data files collected during this test, in the test at the right (e.g. HOM power as a function of gradient, data mining) using file name: CavID\_QoandRvsEacc.pdf or any other file name properly describing the CavID and the graph content. | [[UploadFiles]] <<FILEUPLOAD>> |