LCLS-II High Energy (HE) 1.3 GHz Nine Cell Dressed and Undressed Cavity 2K VTS Testing (RFCHE)

464504 Rev. B

Series	Serial No.	Job No.	Task No.	Released By	Released Date	Status
RFCHE	CAVR090-1	584	See Job Page	Andrew Cravatta	11/30/2022 2:58:00 PM	Closed

1.0 Abstract Top

1.1 This traveler is to be used during the Nine Cell Dressed or Undressed Cavity 2K VTS Testing for the LCLS-II High Energy (HE).

2.0 General Notes Top

2.1 Follow the requirements in the appropriate General Cavity Procedures.

3.0 Supporting Documentation Top

3.1 Electronically attach all appropriate memos, specific instructions, digital photographs, discrepancy reports and other documentation in the appropriate step in this traveler.

Note: Additional files can be attached to a traveler by clicking on the step number, then selecting Insert Attachment from the Traveler's Step Tools Menu

4.0 Process Readiness Verification Top

4.1 Verify the current location of the cavity.

Cavity Location:

○ *VTS 1* ○ *VTS 2* ○ *VTS 3*

Technician: *Date:*

4.2 Responsible Authority MUST verify the following process has been completed and signed-off by the process Authority.

Verify the cavity process has been completed in Traveler 464240 and signed-off by the process Authority.

☐ *Verified*

Comments:

Responsible Authority/Designee: *Date:*

4.3 Is this a re-test?

○ *Yes* ○ *No*

If yes explain in comment box.

Comment:

5.0 Testing and Results Top

5.1 Test Operator, and Date.

Principal Test Operator: ***Andrew Cravatta***

Test Date: ***11/30/2022***

5.2 Cool down Parameters.

Enter the temperature gradient between top and bottom when bottom transitions trough Tc.

Temperature Gradient **K**

5.3 Test Parameters.

Dewar Number ***VTS-2***

Top Plate Number: ***TP-1***

Top Plate Ports: Pi ***PI-4***

Pt ***SMA-1***

HOM A ***N-1***

HOM B ***N-2***

Dewar Bath Temperature is 2K ☑

Dewar Bath Temperature if different from 2K: **K**

Isolated from stand?	*HOM Feedthroughs?*	*He vessel?*
○ *Yes*	◉ *Yes*	◉ *Yes*

(●) *No*	( ) *No*	( ) *No*

Cavity Flange type:

Flange at FP side	Flange at FPC side
(●) *NbTi*	(●) *NbTi*
( ) *SS*	( ) *SS*

Magnetic Fluxgate:

Standard location of Fluxgates ☑

If not comment:

Maximum field at room temperature before cool-down **mG**

5.4 Network Analyzer.

Cavity Frequency: ***1300.214442 MHz***
8/9 Cavity Frequency: ***1299.452954 MHz***
7/9 Cavity Frequency: ***1297.221007 MHz***
6/9 Cavity Frequency: ***1293.842451 MHz***
5/9 Cavity Frequency: ***1289.71116 MHz***
4/9 Cavity Frequency: ***1285.326079 MHz***
3/9 Cavity Frequency: ***1280.317287 MHz***
2/9 Cavity Frequency: ***1277.985839 MHz***
1/9 Cavity Frequency: ***1275.821313 MHz***

5.5 Calibration.

Calibration constants:
Ci: ***3487.4***

Cr: ***15218.5***

Ct: ***195.2***

CHOMA ***750.9***

CHOMB ***811***

Comment if Ci, Cr, Ct were re-measured during the test:

5.6 Decay Measurement.

If BETA>1 cavity is overcoupled. If BETA<1 cavity is undercoupled.

Cavity Coupling:

◉ *Overcoupled*

○ *Undercoupled*

Qext1 ***1.50E10***

Qext2 ***1.42E12***

Q HOM A ***1.46E13***

Q HOM B ***1.03E14***

Comment if Qext1, Qext2, Q HOM A, Q HOM B were remeasured during the test:

The accepted ranges for antennas Q-factors are:
o 1.1e10 <= Q1 <= 1.9e10
o 7.5e11 <= Q2 <= 2.5e12
o QHOM >= 2.7e11

5.7 CW Measurement. at 2K.

Check if radiation was detected ☑

Select all that applies:

• *Field emission* ☐

Eacc @ FE onset: **MV/m**

• *Multipacting* ☑

Eacc @ MP onset: ***24 MV/m***

Check if measurement was stopped because radiation could not be processed away ☑

NOTE: No field-emission-induced radiation should be detected up to the maximum gradient. Any multipacting must be fully processed before the final Q vs Eacc measurement.

E_{acc} @ quench ***25 MV/m***

Highest Eacc @ Q = 2.5e10 ***26 MV/m***

The usable gradient (the lowest of the above E_{acc} ***25 MV/m***

NOTE: Max gradient must be >= 23 MV/m

Q_0 , 10^{10}

Maximum ***3.26***

Eacc at Maximum Q0 ***18***

At E_{acc} of 20.8 MV/m ***3.23***

P_HOM_A When E_{acc} = 20.8 MV/m ***0.0315***

P_HOM_B When E_{acc} = 20.8 MV/m ***0.00431***

NOTE: The accepted values @ Eacc = 20.8 MV/m are:
• Q0 >= 2.5e10
• PHOM <= 1.7 W

5.8 Cavity Performance Summary.

Maximum radiation *(after all processing):*

Rad_{max}: ***2400 mR/hr***

Comment on Performance Limitation: ***7pi/9 excitation beginning at 24 MV/m along with multipacting [MP].***
Quench at 25 MV/m and MP.
Small rad spike (0.08 mR/hr) at 27 MV/m.
Quench at 28.3 MV/m.
After sitting at 28 MV/m for some time, with the cavity repeatedly quenching, there was a a large (> 2.4 R/hr) rad spike - the test was then stopped.

Comment on Multipacting, if Applicable:

5.9 Upload Files.

RF data (text file): Link
AUX Data File 1: Upload File
AUX Data File 2: Upload File
AUX Data File 3: Upload File

Responsible Authority/Designee: ***Andrew Cravatta*** *Date:* ***11/30/2022***

6.0 Process Completeness Verification Top

6.1 Responsible Authority MUST ensure this Traveler is complete, all specifications are met and the device is ready for the next process.

○ *Qualified* ◉ *Need reproccessing* ○ *Rejected*

Comment ***Cavity sent for full re-HPR***

Responsible Authority/Designee: ***Daniel Bafia*** *Date:* ***11/30/2022***

6.2 Select the next destination for the cavity. If the option "Other" is chosen from the drop box, please type the location in the text field below the drop box.

Cavity Destination:
Other
Technician: *Date:*

7.0 Process/Production Complete Top

Note: This section to be filled out by Process Engineering.

7.1 Verify the Traveler is accurate and complete. Personnel shall conduct a review of all steps to ensure all operations required have been completed/signed off by required personnel. Ensure all Discrepancy Reports, Non-Conformance Reports , Repair/Rework forms, Deviation Index and dispositions have been reviewed and followed by the Responsible Authority before being approved/completed.

Comments: ***-***

Process Engineering/Designee: ***Richard Motill*** *Date:* ***12/1/2022***