LCLS-II-HE Record of Decision

TITLE	
Maximum Pressure Threshold for Cavity String Assembly	**No.** LCLSII-HE-1.2-PM-0948
Description of Decision: Definition of the highest allowable pressure measured at the venting manifold before cavity backfilling in preparation to string assembly.	

ORIGINATOR	Signature	Date
Mattia Checchin Deputy Cryomodule Systems Manager		8/22/2023

SME Concurrence	Signature
James Maniscalco LCLS-II-HE SLAC Cavity Technical Board Member	James T Maniscalco James T Maniscalco (Aug 22, 2023 09:03 PDT)
Sebastian Aderhold LCLS-II-HE SLAC Cavity Technical Board Member	S. Aderhold S. Aderhold (Aug 22, 2023 09:27 PDT)
John Vennekate LCLS-II-HE JLab Cavity Technical Board Member	J. Vennekate (Aug 22, 2023 14:31 EDT)
Gianluigi Ciovati LCLS-II-HE JLab Cavity Technical Board Member	
Daniel Bafia LCLS-II-HE FNAL Cavity Technical Board Member	Daniel Bafia Daniel Bafia (Aug 22, 2023 11:45 CDT)
Sam Posen LCLS-II-HE FNAL Cavity Technical Board Member	Sam Posen Sam Posen (Aug 22, 2023 15:12 CDT)

APPROVER	Approval Signature
John Hogan LCLS-II-HE Cryogenic Systems Manager	John Hogan John Hogan (Aug 22, 2023 10:42 PDT)
Tug Arkan LCLS-II-HE Senior Team Lead, FNAL	TUG ARKAN TUG ARKAN (Aug 22, 2023 16:24 PDT)
Michael Bevins LCLS-II-HE Senior Team Lead, JLab	Michael E. Bevins Michael E. Bevins (Aug 30, 2023 13:48 EDT)

IMPLEMENTOR	Signature
Josh Kaluzny LCLS-II-HE CAM, FNAL	Joshua Kaluzny Joshua Kaluzny (Aug 22, 2023 15:24 CDT)
Adam Grabowski LCLS-II-HE CAM, JLab	Adam J Grabowski Adam J Grabowski (Aug 22, 2023 16:32 EDT)

1. DESCRIPTION

The superconducting radio frequency cavities for the LCLS-II-HE project are produced industrially at the cavity vendor and are shipped to the partners labs under vacuum (nominally in the 1e-5 torr range). Once at the partner labs, these cavities are vertically tested to verify they meet the minimum acceptable performance and, if qualified, they are then assembled into a string of eight (8) cavities in a class 10 cleanroom.

Before being assembled to the string, each cavity is vented through a low-flow venting manifold. The vacuum level inside the cavity is measured at the manifold side once the two volumes are connected and then the cavity is vented to atmospheric pressure. The typical vacuum level is measured to be in the 1e-4 torr range or lower.

Recently, several cavities that were brought into the clean room and connected to the manifold showed soft vacuum to the level of 1e-2 – 1e-1 torr. This issue was brought to the Cavity Technical Board (CTB) that concluded the measured pressures were too high for these cavities to proceed with string assembly due to the high risk of contamination.

After concurrence by the partners labs' SMEs, the CTB also agreed on the following:

- If the pressure measured at the manifold after the cavity volume is opened to it is **LOWER or EQUAL to 1e-3 torr**, then the **cavity can be assembled to the string**
- If the pressure measured at the manifold after the cavity volume is opened to it is **HIGHER than 1e-3 torr**, then the **cavity cannot be assembled to the string**

If the latter is true, the cavity shall then be isolated from the manifold, removed from the cleanroom, and set aside waiting for CTB disposition. Each instance will be independently examined.

2. WHAT ELSE DO WE NEED TO DO

This decision does not impact the string assembly procedures at the partner labs.
Investigations into the origin of the soft vacuum problem are in progress. Preliminary tests suggest that the likely cause are leaks at the right-angle valve used to pull vacuum in the cavity volume.