

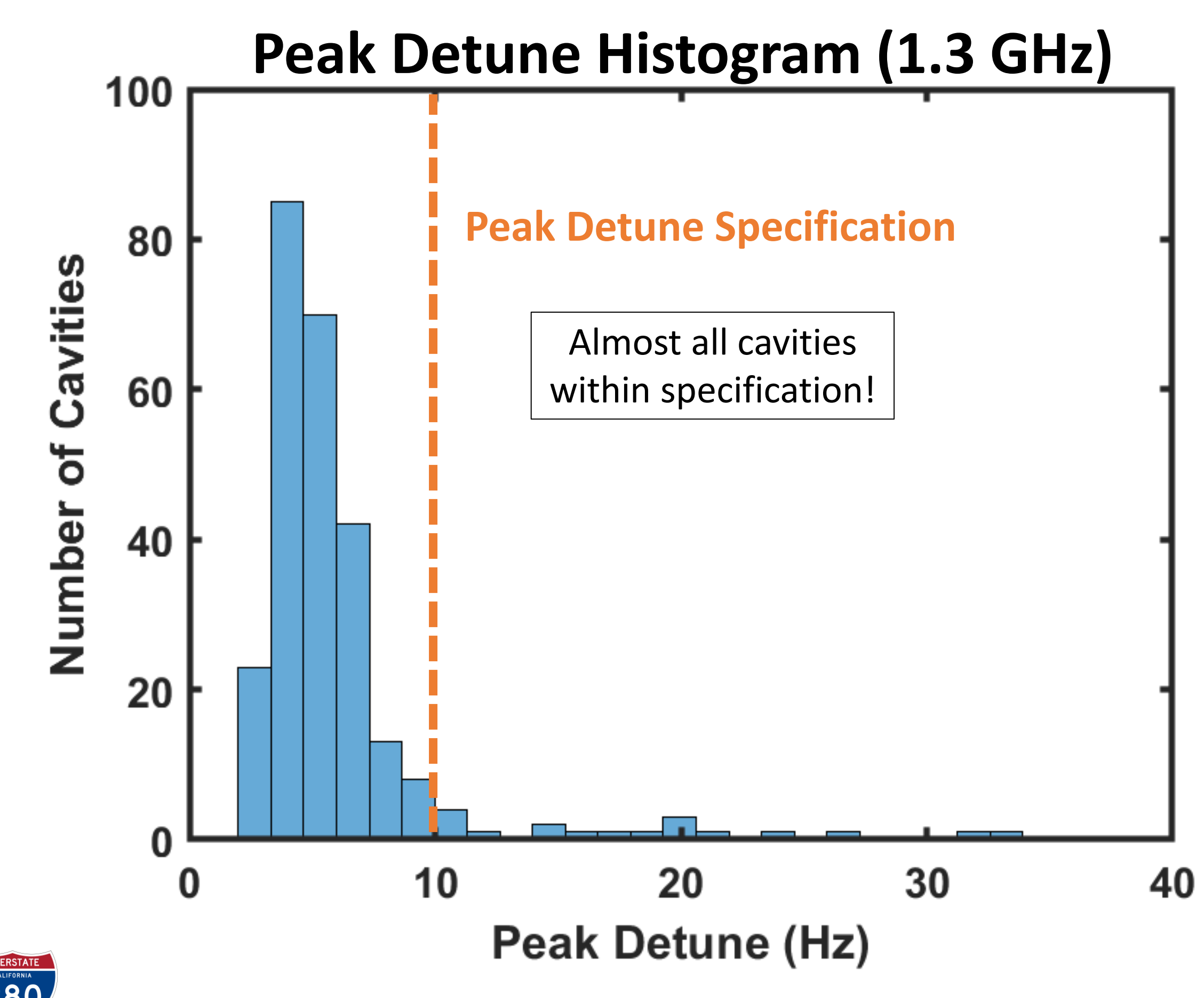
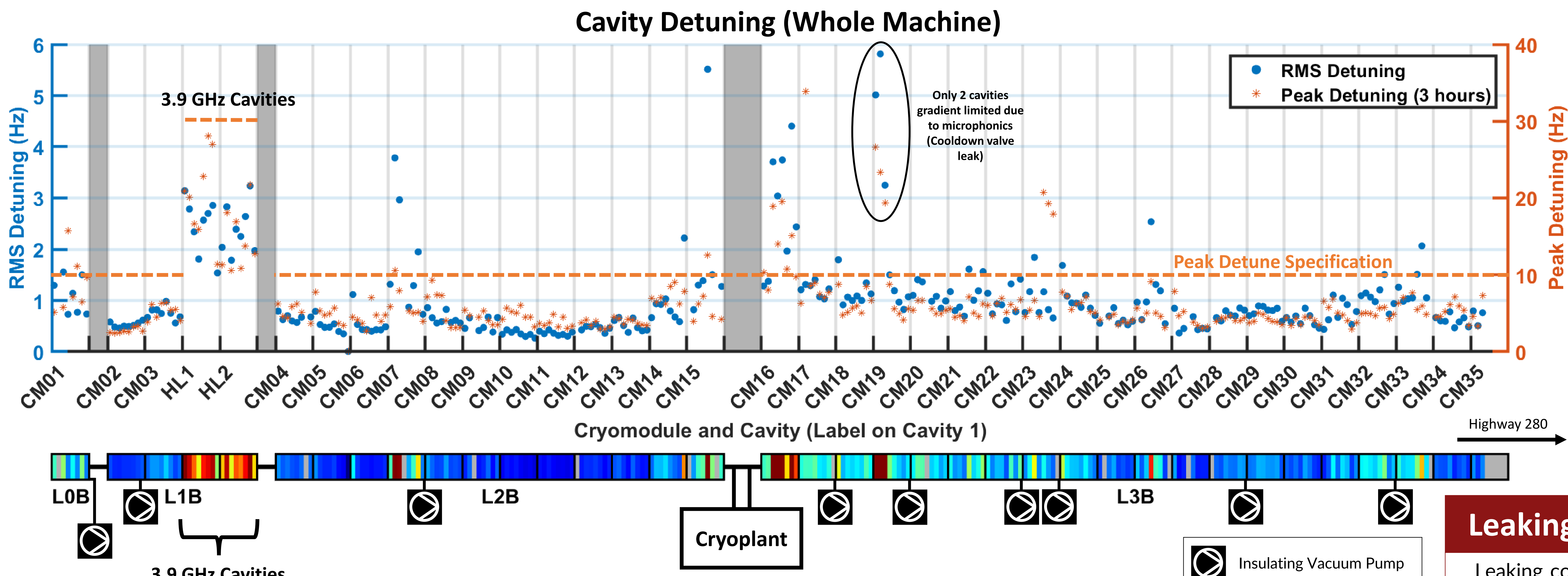
Microphonics in the LCLS-II Superconducting Linac

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Introduction:

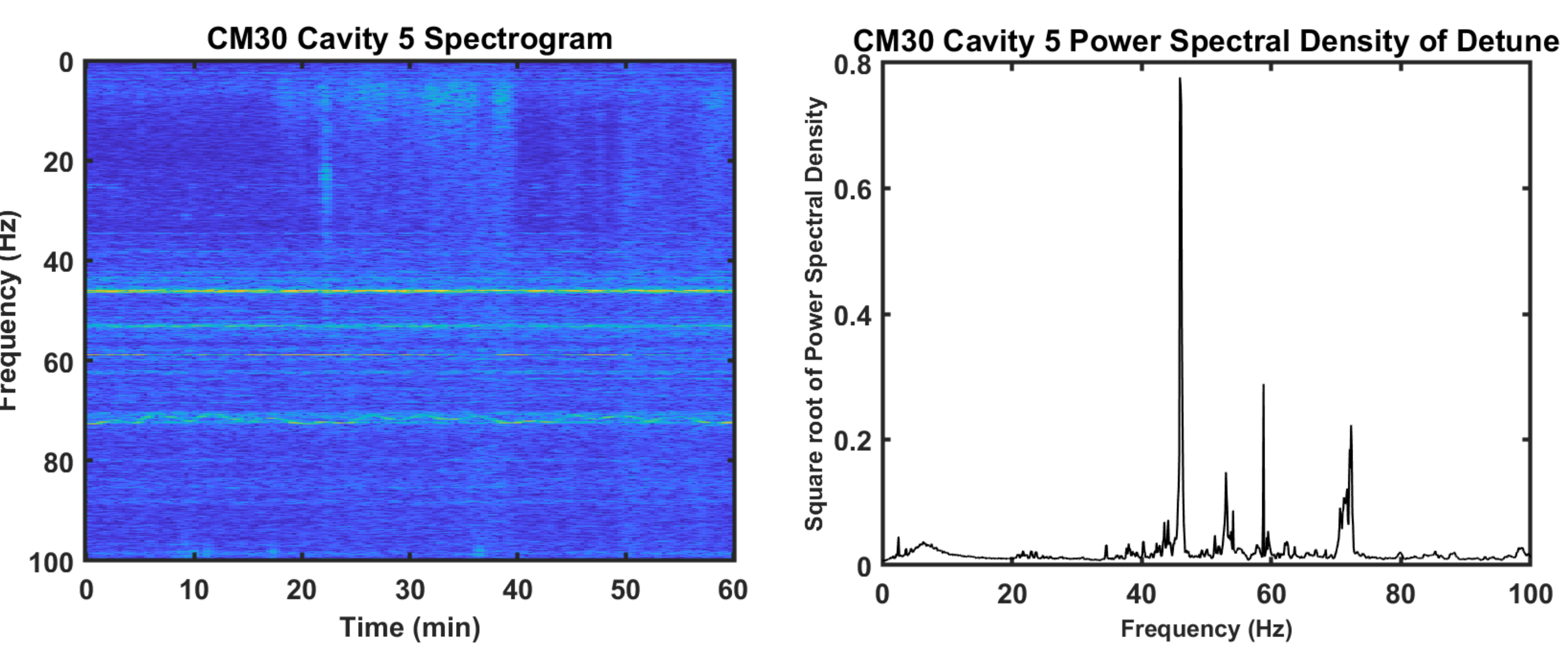
Microphonics can be a serious issue for superconducting accelerators. Small vibrations can cause the cavities to detune and if the detuning is too large it causes the cavities to lose amplitude and phase lock with the beam. Considerable R&D was invested into the LCLS-II cryomodule design to minimize microphonics. Here we show preliminary microphonics/detuning measurements from the installed LCLS-II cryomodules.

- 94% of cavities are within the detuning specification (10 Hz)
- Only two cavities are gradient limited due to microphonics (fixable)
- Largest source of excessive microphonics is cooldown valve leaks



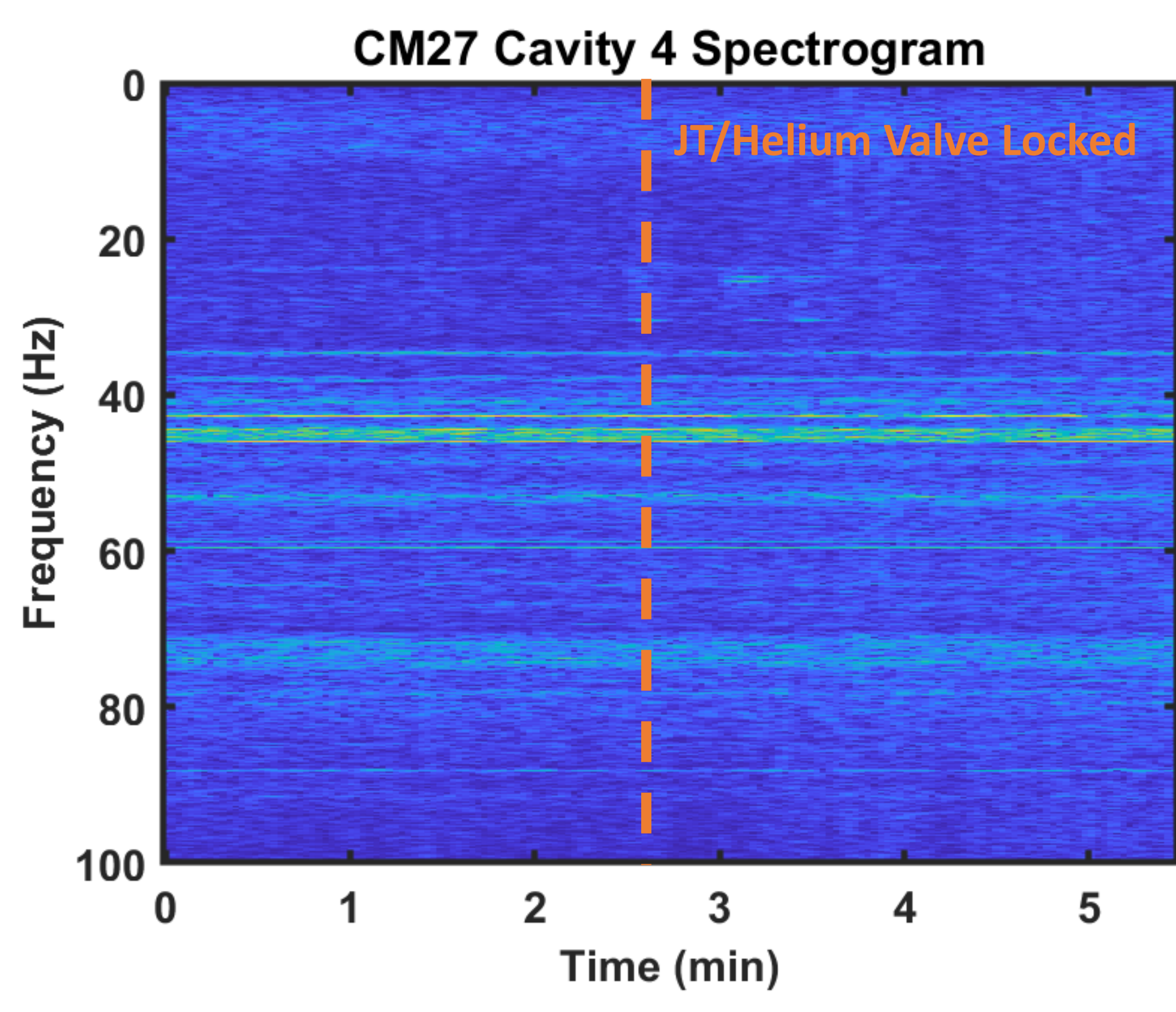
Microphonics Characterization

For most cavities, the dominant contribution to the detune is an acoustic mode in helium vessel 'chimney' (like blowing on a jug), followed by 60 Hz noise.



JT Valve Regulation

Microphonics generated by JT/Helium valve movement was a concern. JT valve regulation does not impact microphonics in the installed linac.



Leaking Cooldown Valve

Leaking cooldown valves are the leading cause of excessive microphonics in the LCLS-II linac.

Several modules show signs of leaking cooldown valves.

Only two cavities are currently gradient limited (12 MV) due to microphonics—both are due to leaking cooldown valves.

The figure on the right shows the impact of a cooldown valve opening "just a crack" on one cavity.

Curiously, the most impacted cavities are not consistent between cryomodules with leaking valves.

