LLRF9 in SPEAR3

First Day

D. Teytelman

Dimtel, Inc., San Jose, CA, USA

January 28, 2021

Current Status

- Unit installed and powered;
- On the network Tuesday morning;
- Master oscillator reference level adjusted Tuesday afternoon;
- Coupling factors adjusted Wednesday to match RF readouts;
- Temporarily modified top-level IOC code to calculate the vector sum of 4 cavities instead of 2.

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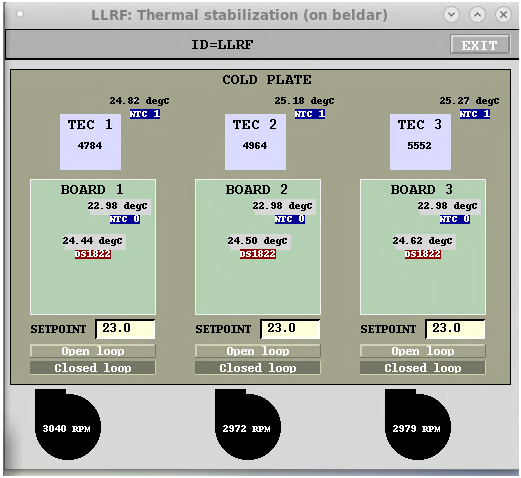
Some Panels



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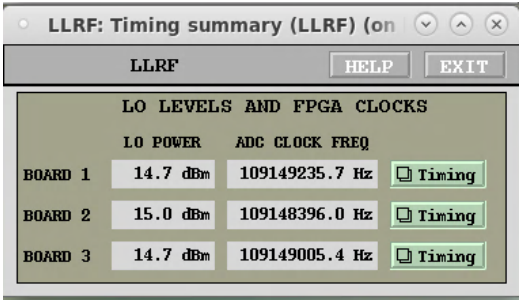

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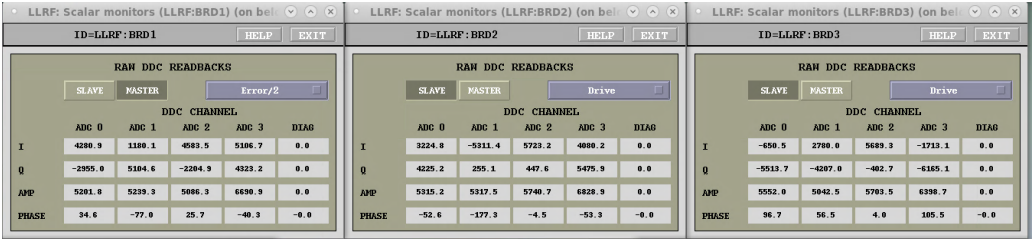

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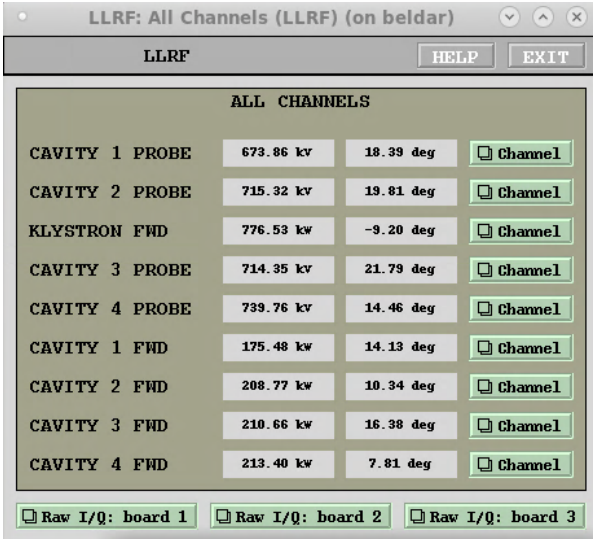

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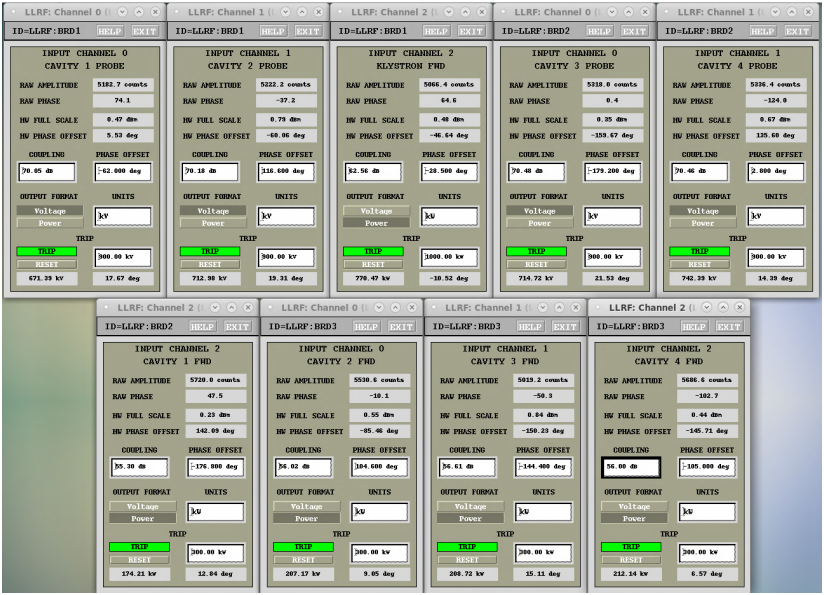

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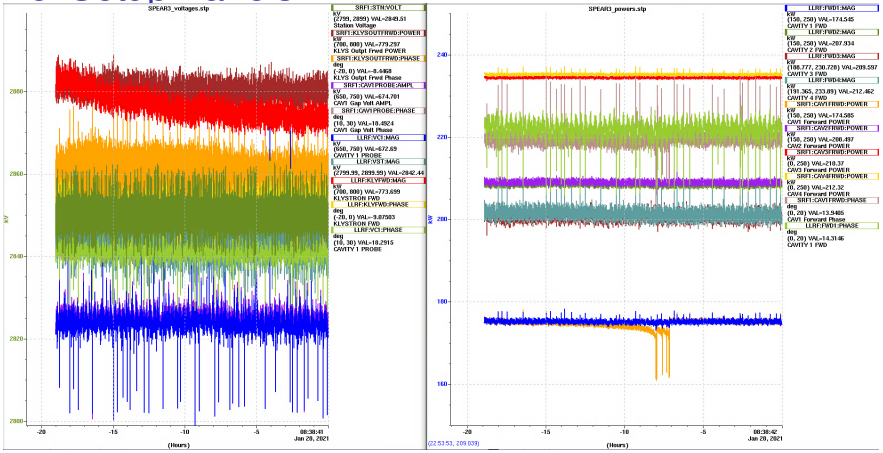

- Ran two strip tools for roughly 20 hours;
- The first StripTool: capturing forward power for all cavities, cavity 1 phases;
- The second StripTool: capturing station voltage, klystron forward, cavity 1 voltage and phase.

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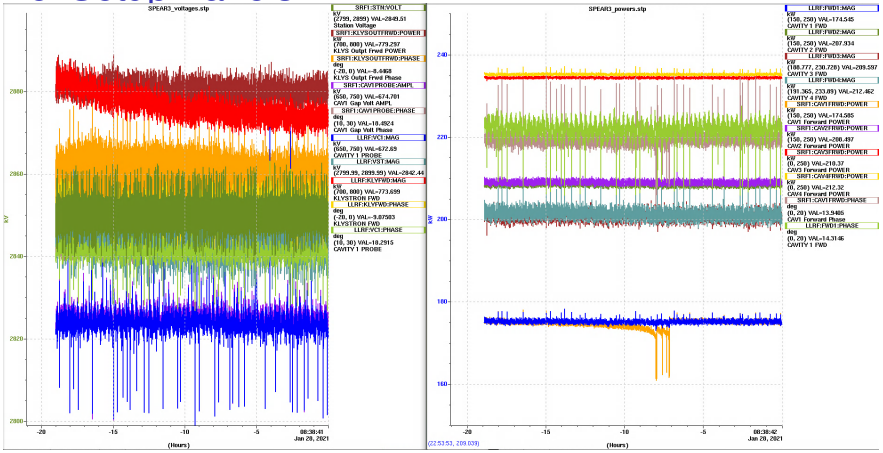

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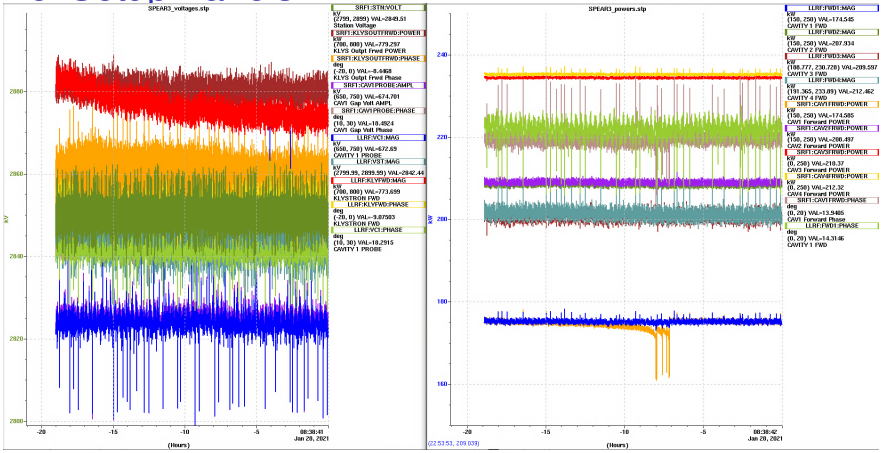

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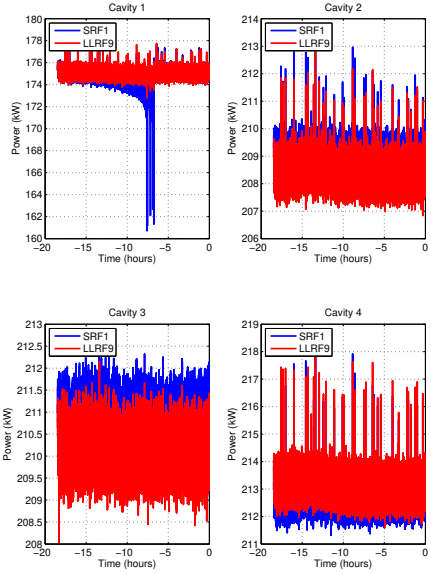

- Several interesting points:
  - Common glitches in cavities 1, 2, and 4;
  - Readout drops in cavity 1 (SRF1 only) between -10 and -5 hours;
  - Near absence of glitches in cavity 3.
- Zooming in;
- Periodic pattern — top-up?
- Zooming in again.

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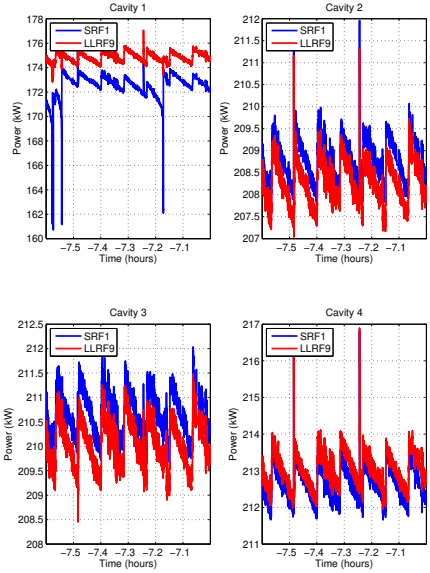

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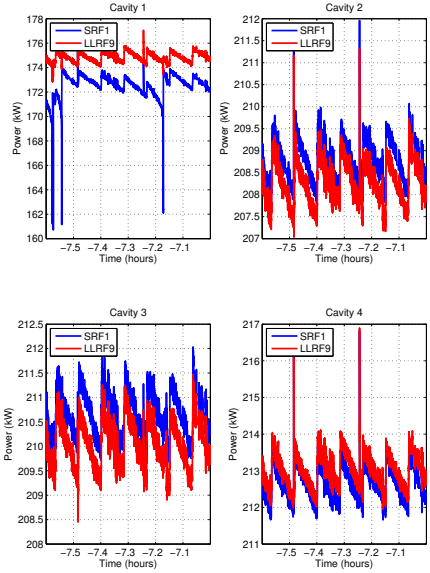

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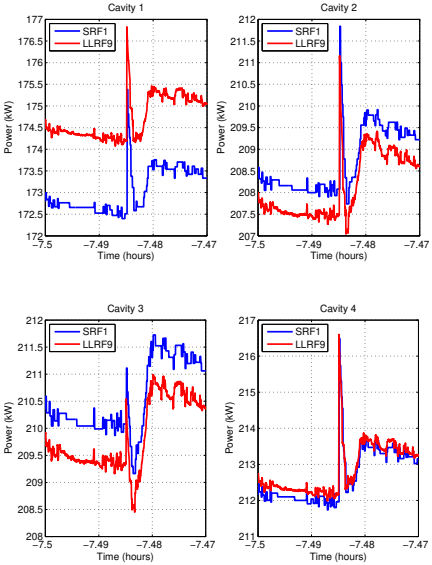

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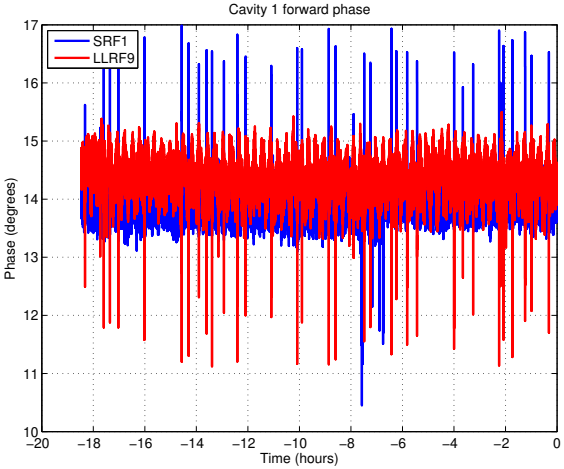

- Glitches show up in phase as well;
- Those seen in both systems are real, unique to SRF1 — readout/connector problems;
- Zooming in;
- Zooming in again;
- SRF1 and LLRF9 have opposing conventions of phase...

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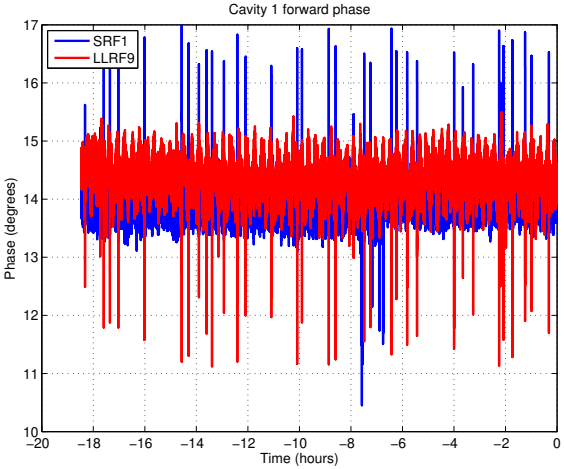

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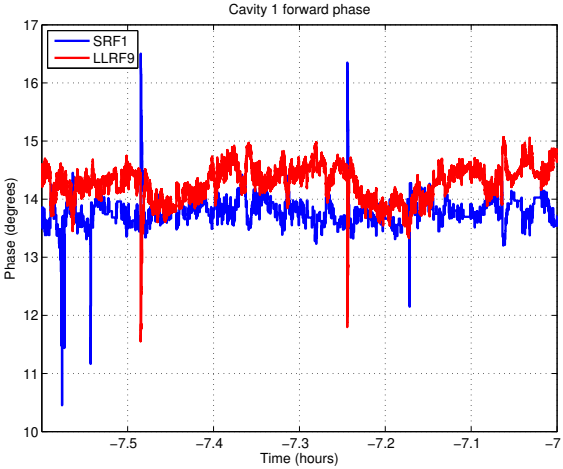

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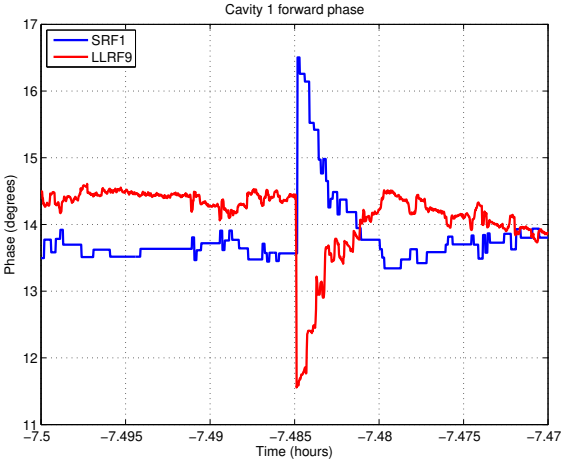

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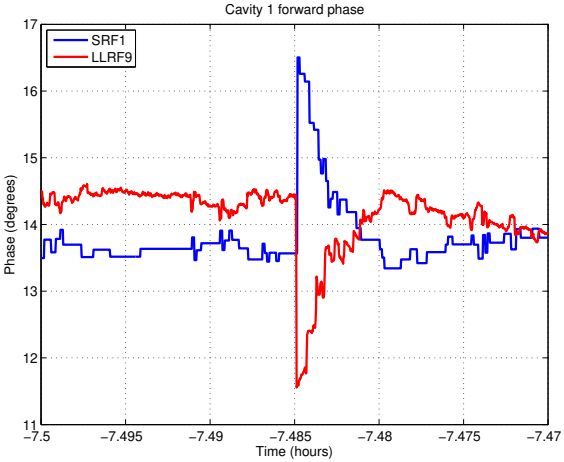

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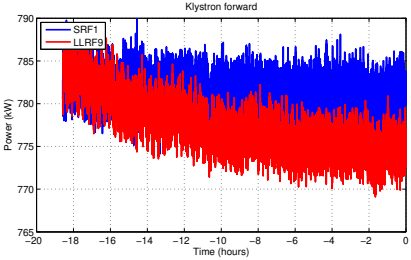

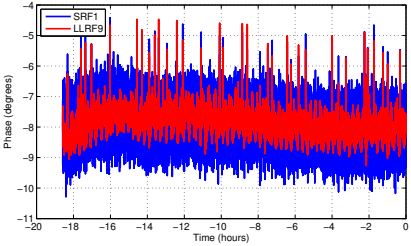

- Curious drift in LLRF9 amplitude;
- Will monitor over the next few days;
- Zooming in;
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- Phase from LLRF9 is inverted and matched to SRF1 in average sense;
- Glitches in phase — tuner motion with deadband?

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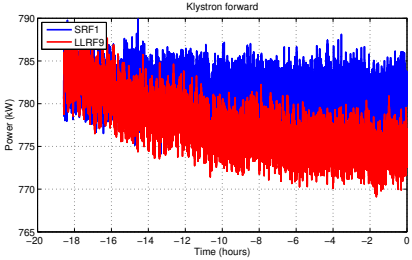

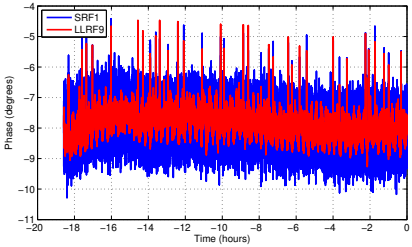

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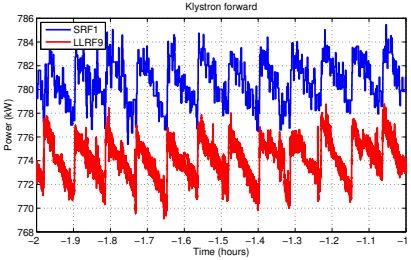

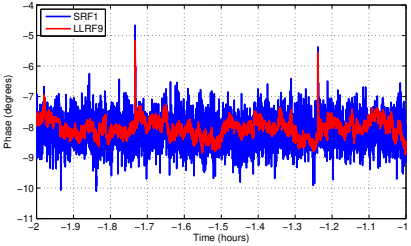

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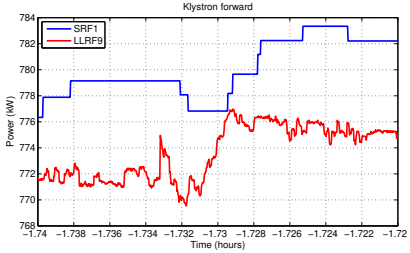

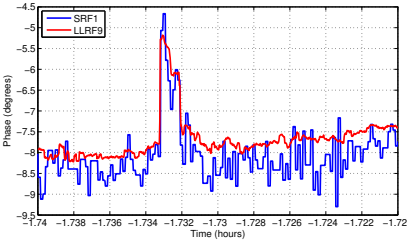

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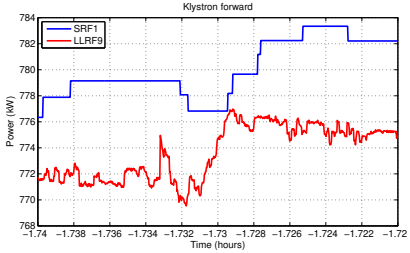

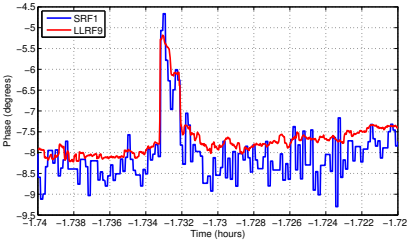

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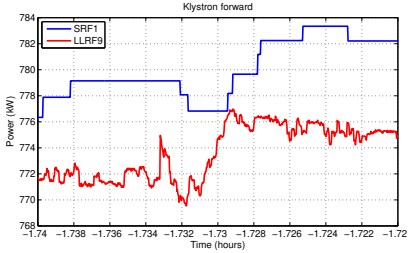

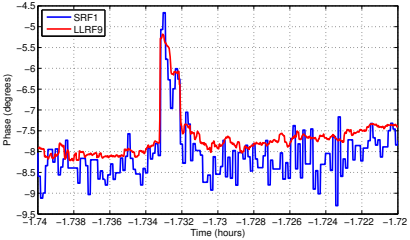

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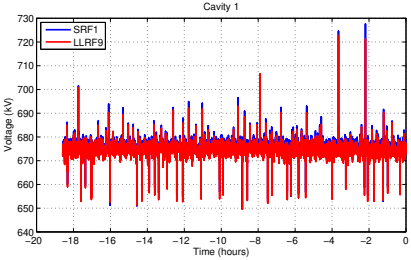

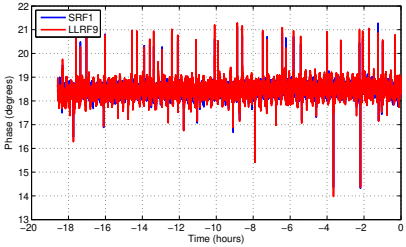

- Reasonable agreement;
- Sigmas 1.68 and 1.7 for SRF1 and LLRF9 respectively;
- Zooming in we see higher resolution and lower latency of LLRF9 readings.

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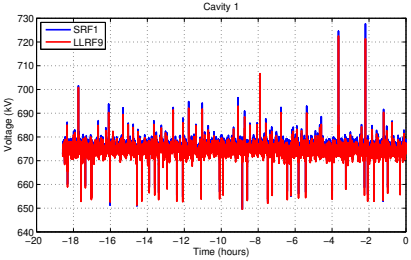

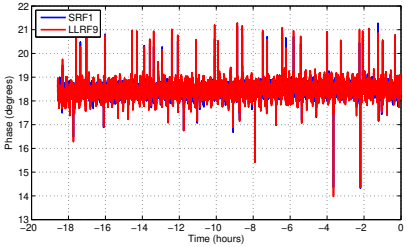

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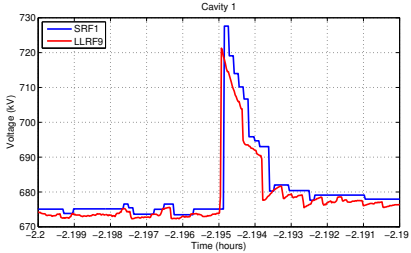

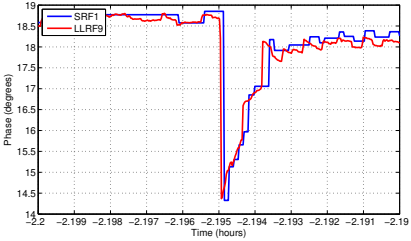

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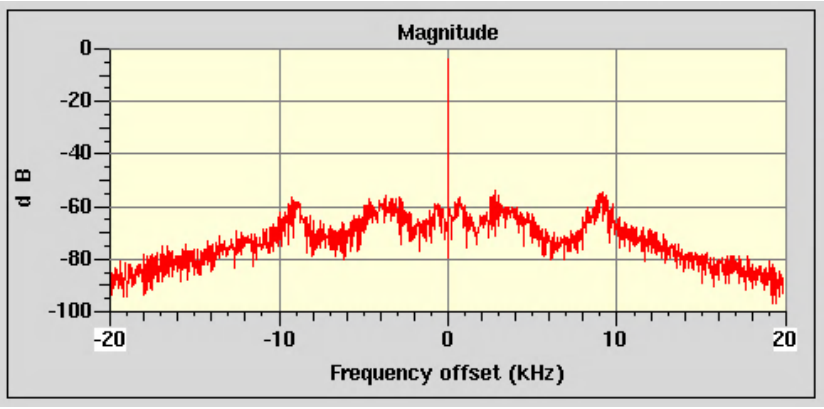

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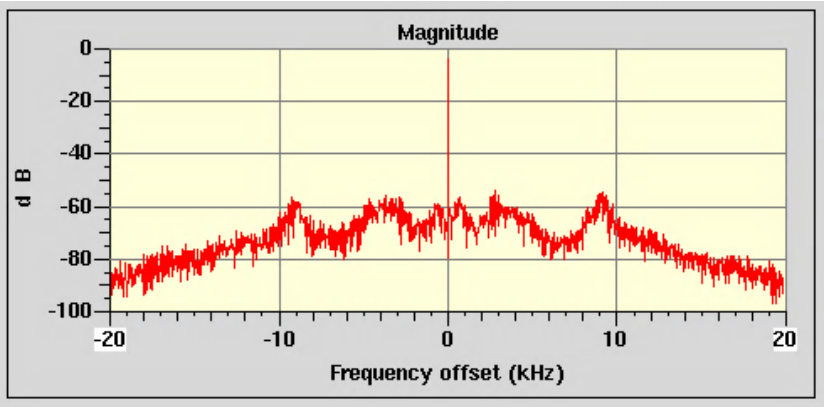

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- LLRF9 demo unit is in place;
- Operating as expected and parasitically monitoring all 9 signals;
- Next:
  - Top-level panel;
  - Tuner loop;
  - Interlock testing;
  - Installing Matlab tools and checking their operation;
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