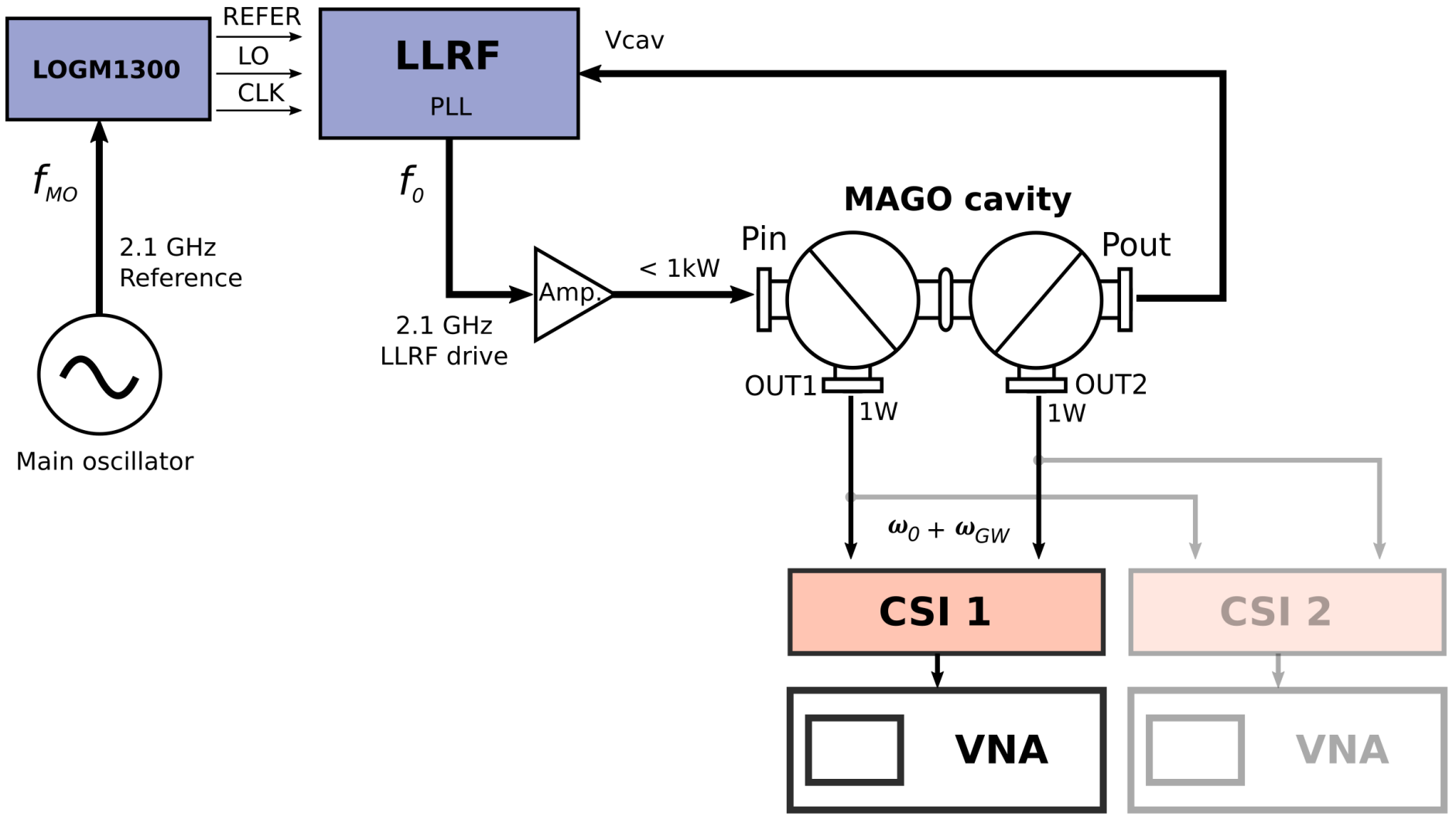
Follow-Up:
Discussion about CSI for MAGO

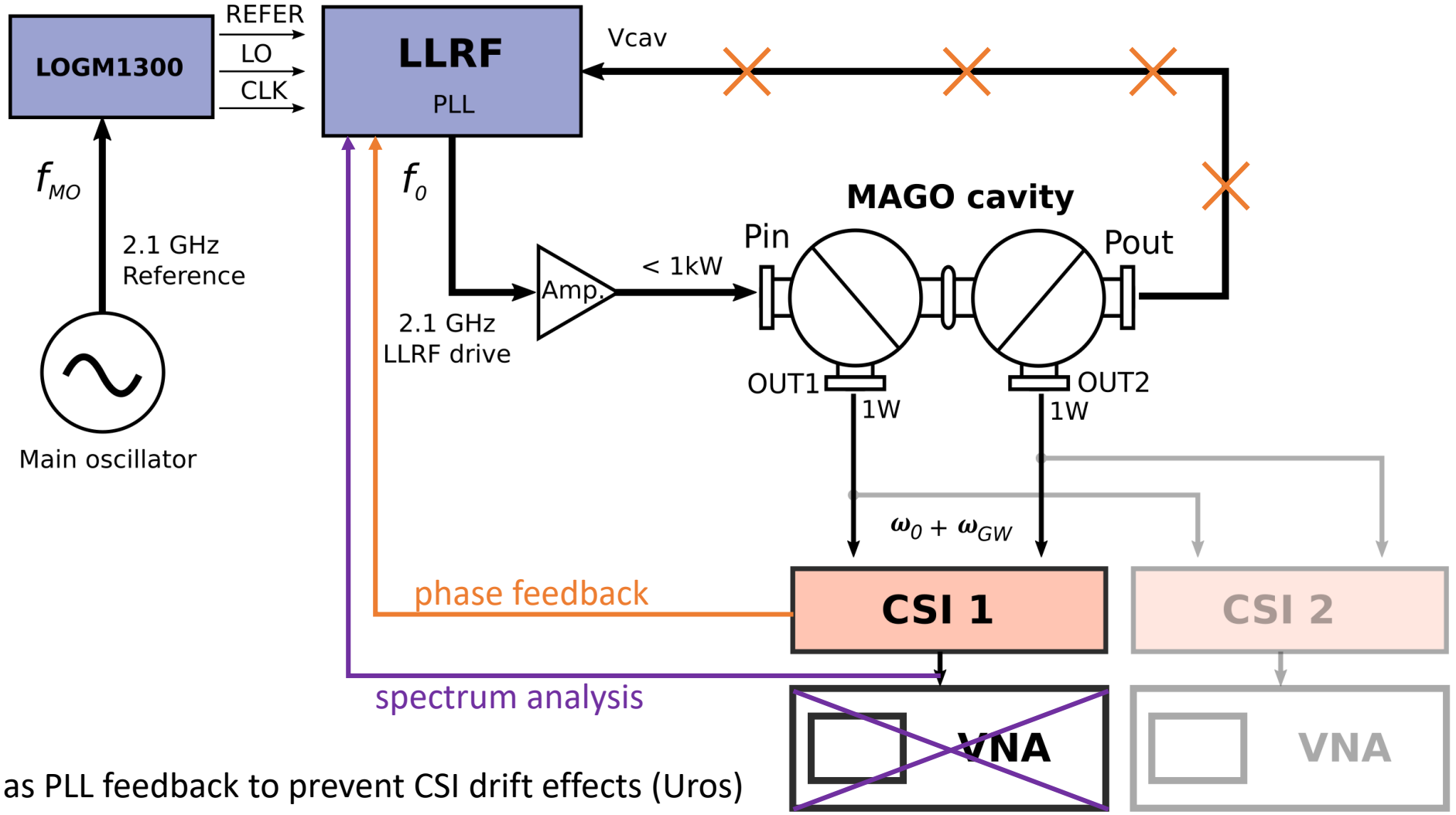
1. **New block diagram**
2. **SEL / GDR ?**

21.02.2024

Latest Block Diagram

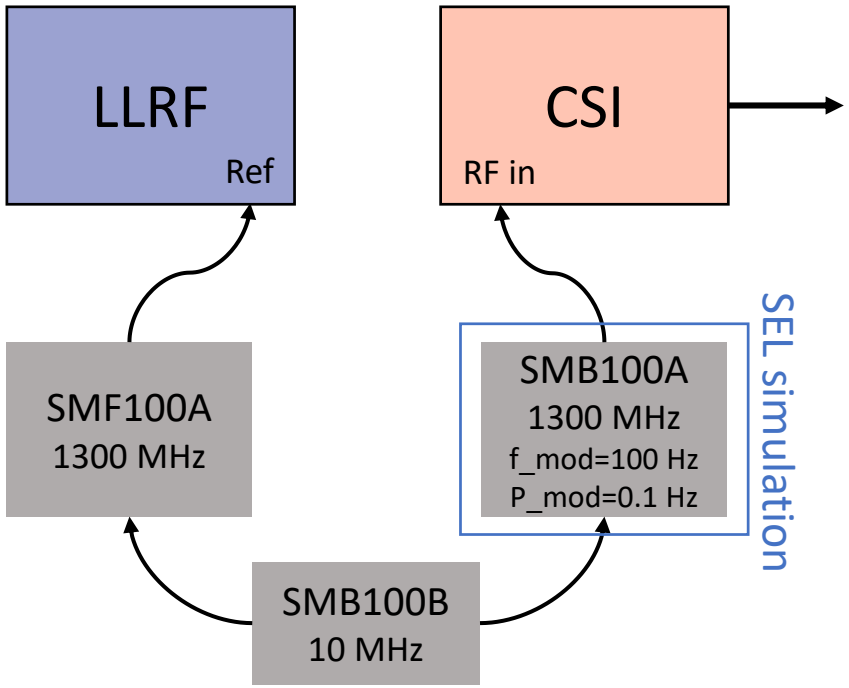


Block diagram suggestions/questions

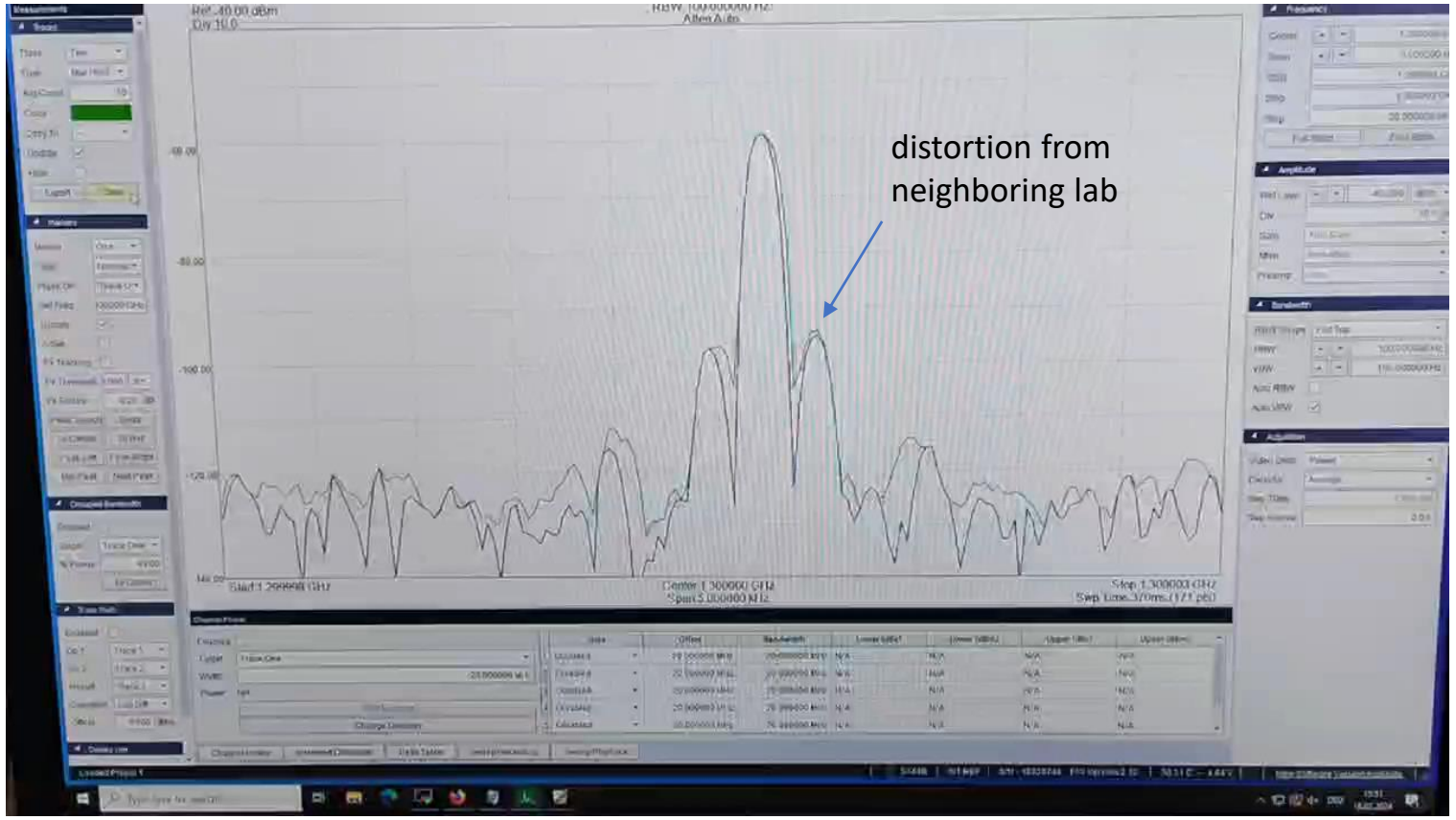


- use phase from CSI as PLL feedback to prevent CSI drift effects (Uros)
- Carrier is missing at CSI output –> commercial devices will not work, use LLRF for spectrum analysis
- CSI is not part of the control loop -> wasted potential?

CSI with SEL?

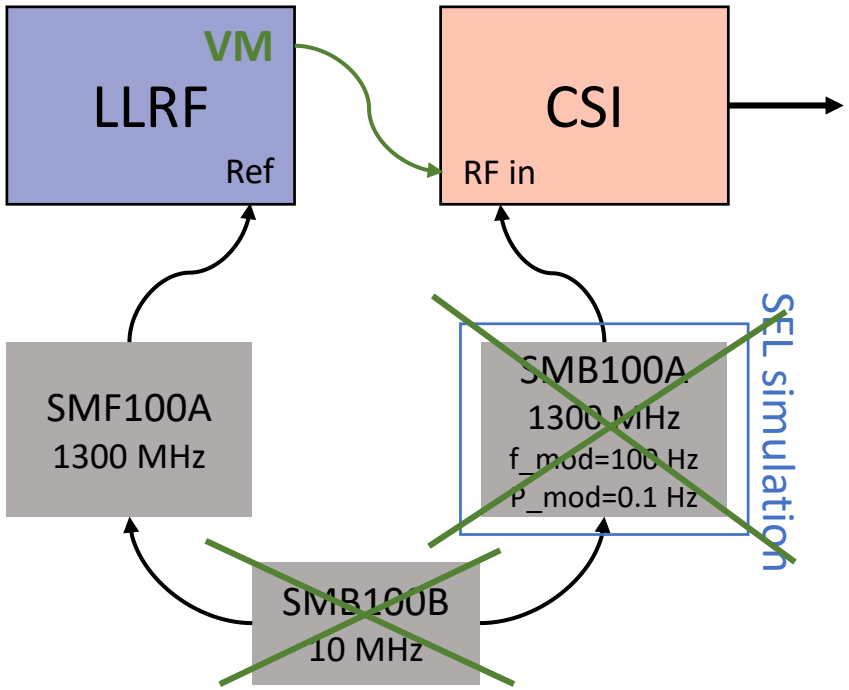


Spectrum Analyzer, Span 5 kHz

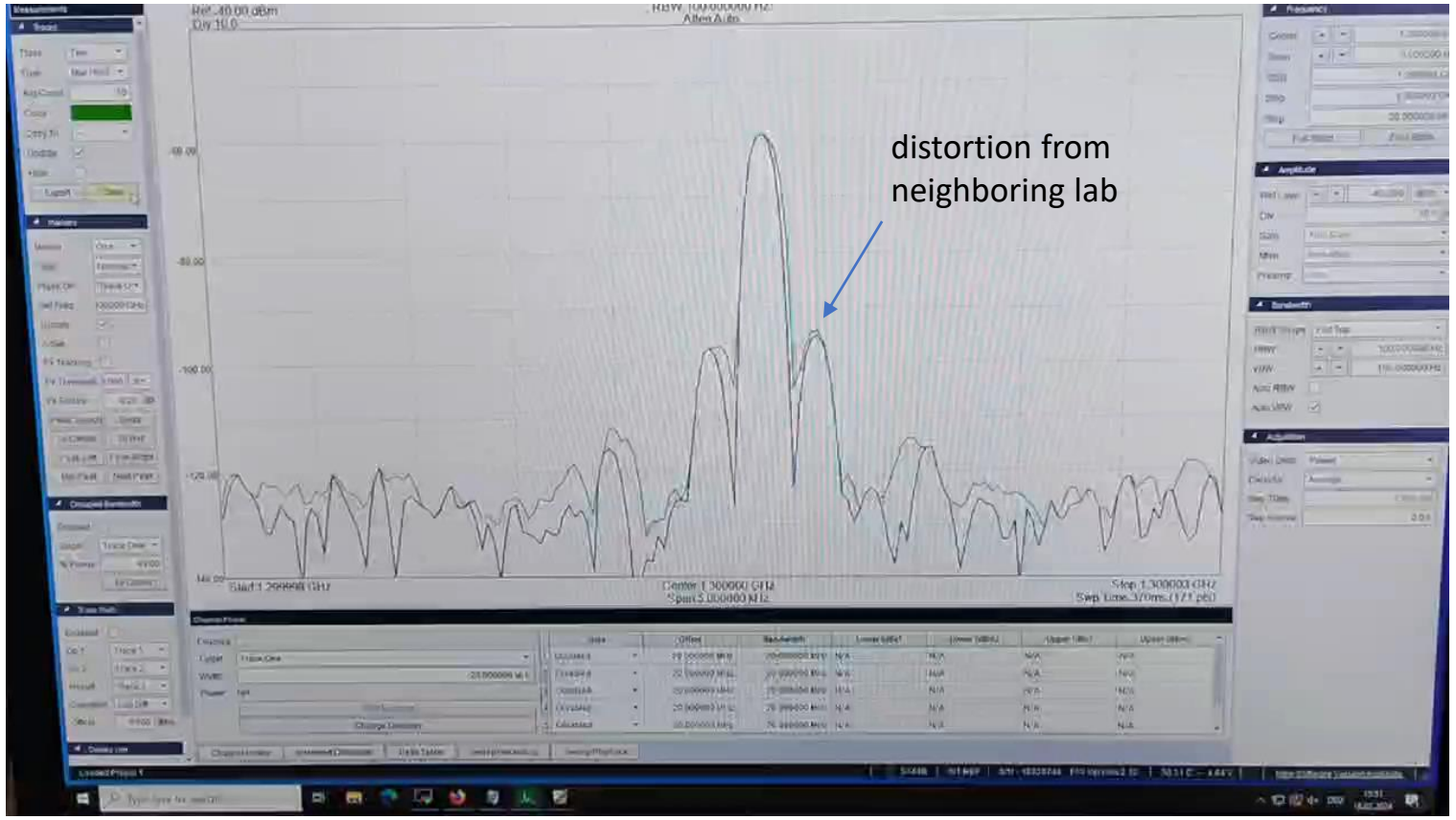


- Check carrier suppression behavior -> setup shows slight frequency dependency
- Measurements show questionable results without active modulation -> too many signal sources?
- With modulation no measurement results achievable at the moment -> calibration routines fail

CSI with SEL?

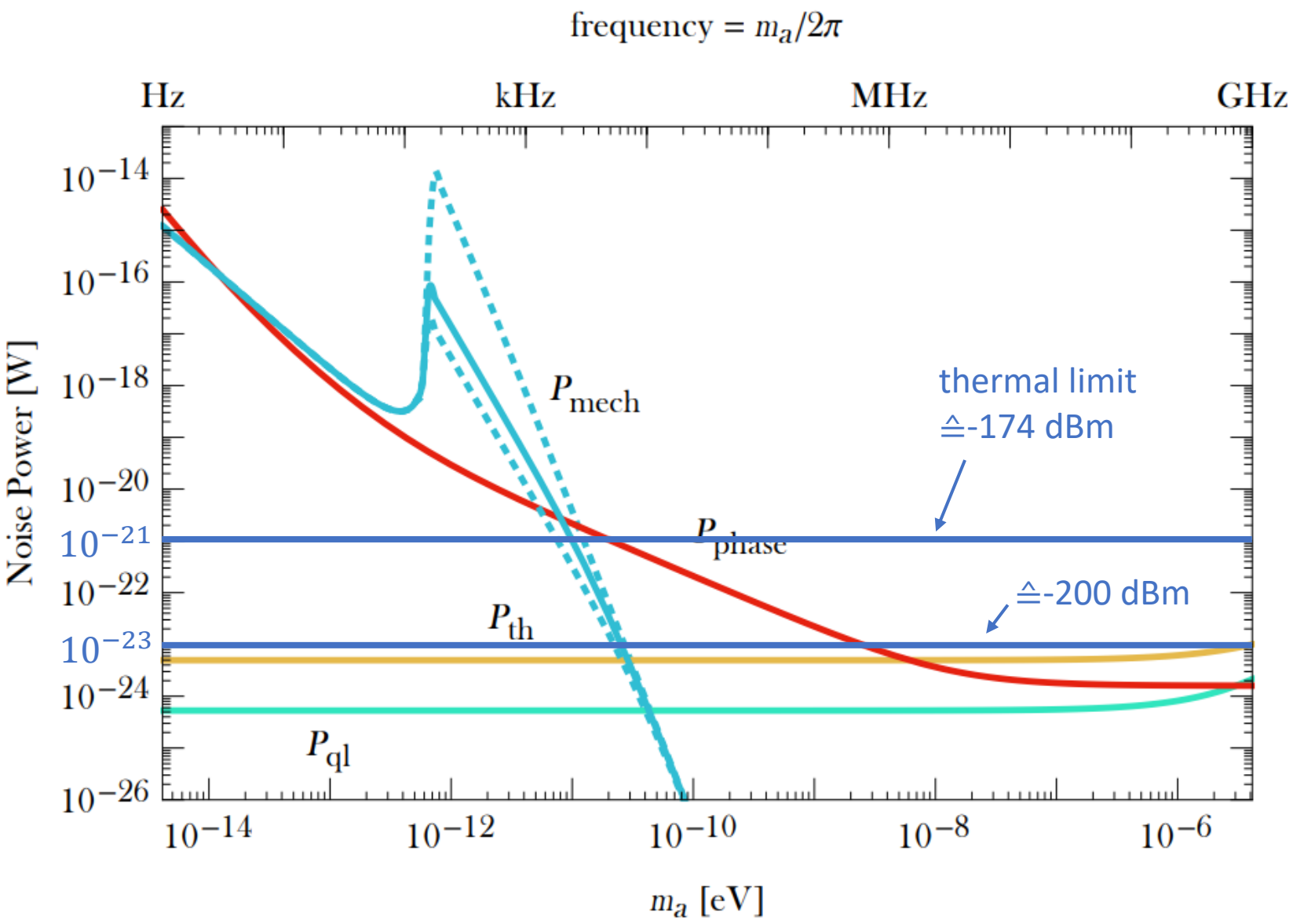


Spectrum Analyzer, Span 5 kHz



- Check carrier suppression behavior -> setup shows slight frequency dependency
- Measurement result show questionable results without active modulation -> too many signal sources?
- With modulation no measurement results achievable at the moment
- Vector modulator output with modulation as probe and reference signal

Back-Up



(b) $\epsilon_{1\mathrm{d}} = 10^{-5}$, $Q_{\mathrm{int}} = 10^{10}$

$$P_{dBm} = 10\log_{10}(1000 * P_W \,/\, 1W)$$

For frequency resolution:

$$\tan\varphi \approx 2\,Q_L\frac{\Delta\omega}{\omega}$$

-> $\Delta f \approx$ 2e-5 Hz (with $Q_L = 10e7$)

Source: Axion Dark Matter Detection by Superconducting Resonant Frequency Conversion, Berlin et. al