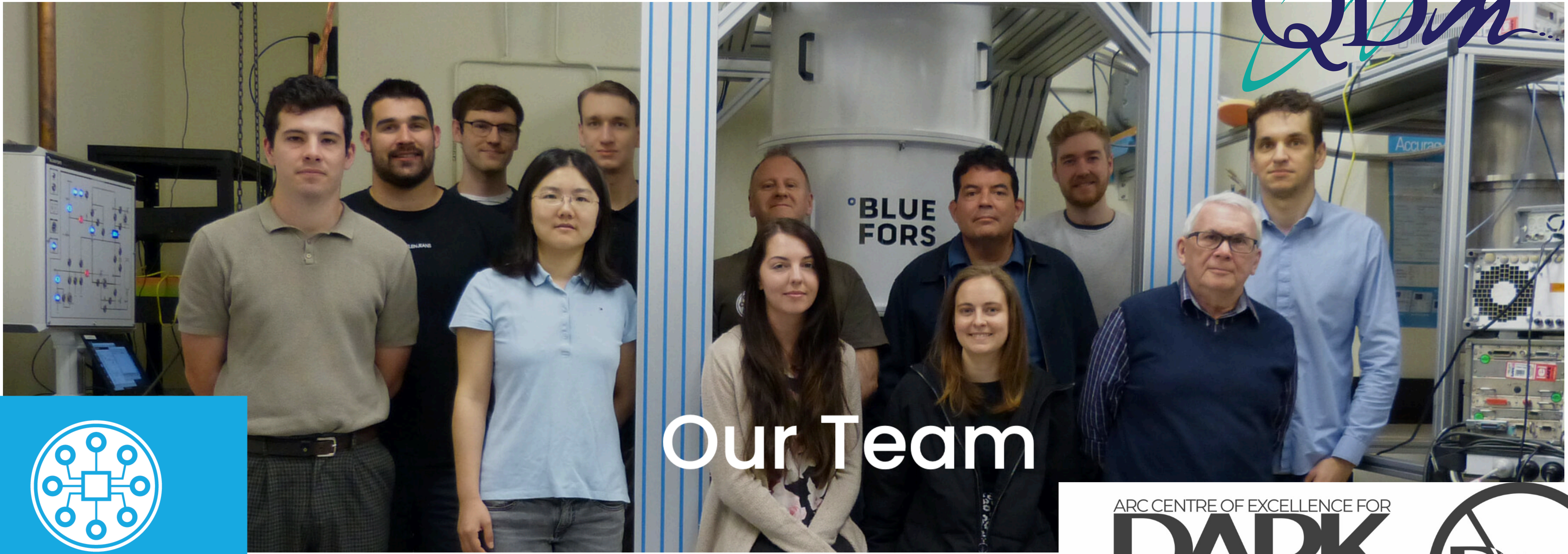
First results from Phase 1a of The ORGAN Experiment



Aaron Quiskamp

EQUS
Australian Research Council
Centre of Excellence for
Engineered Quantum Systems

ARC CENTRE OF EXCELLENCE FOR
DARK MATTER
PARTICLE PHYSICS

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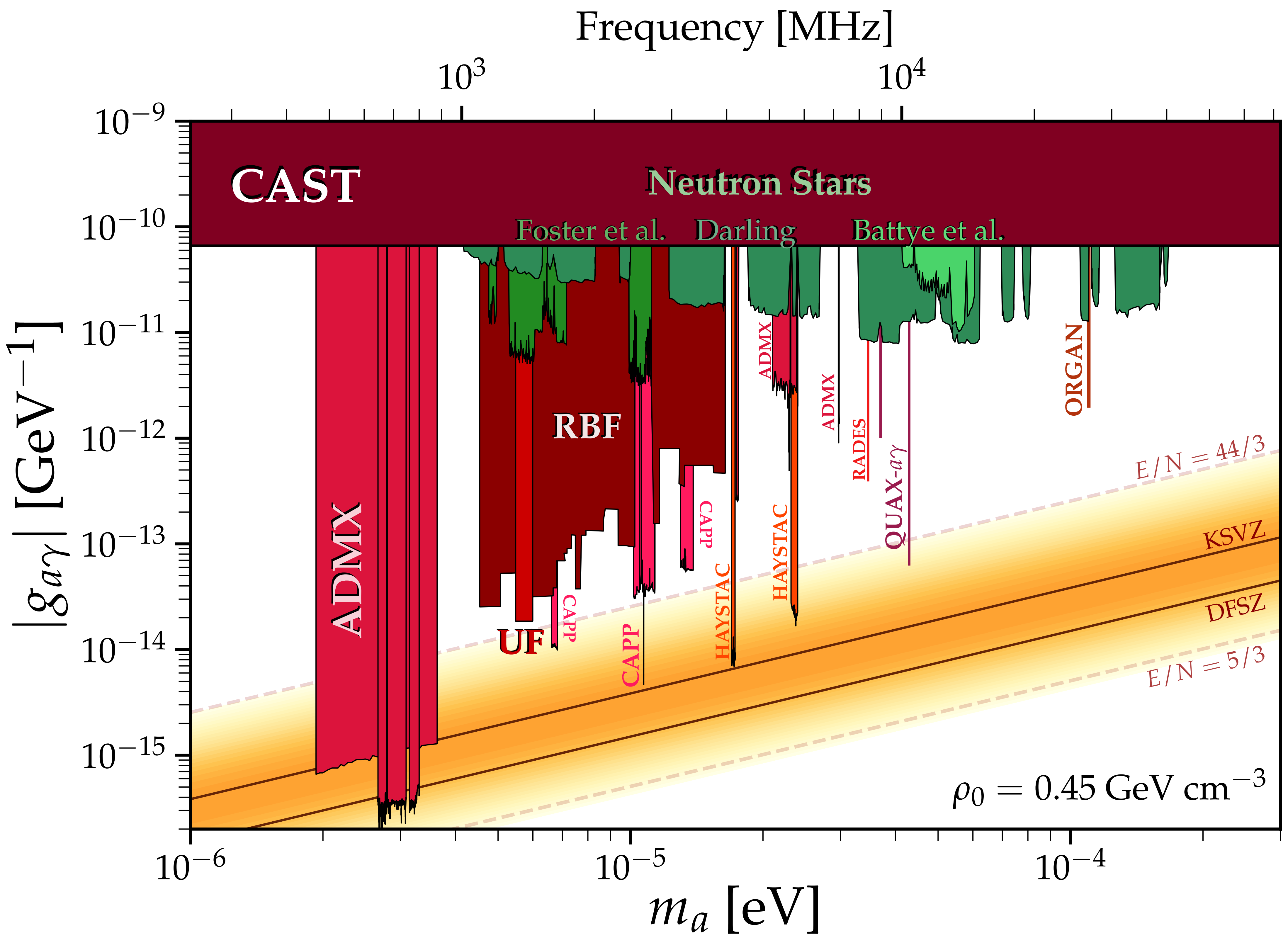

cajohare.github.io/AxionLimits

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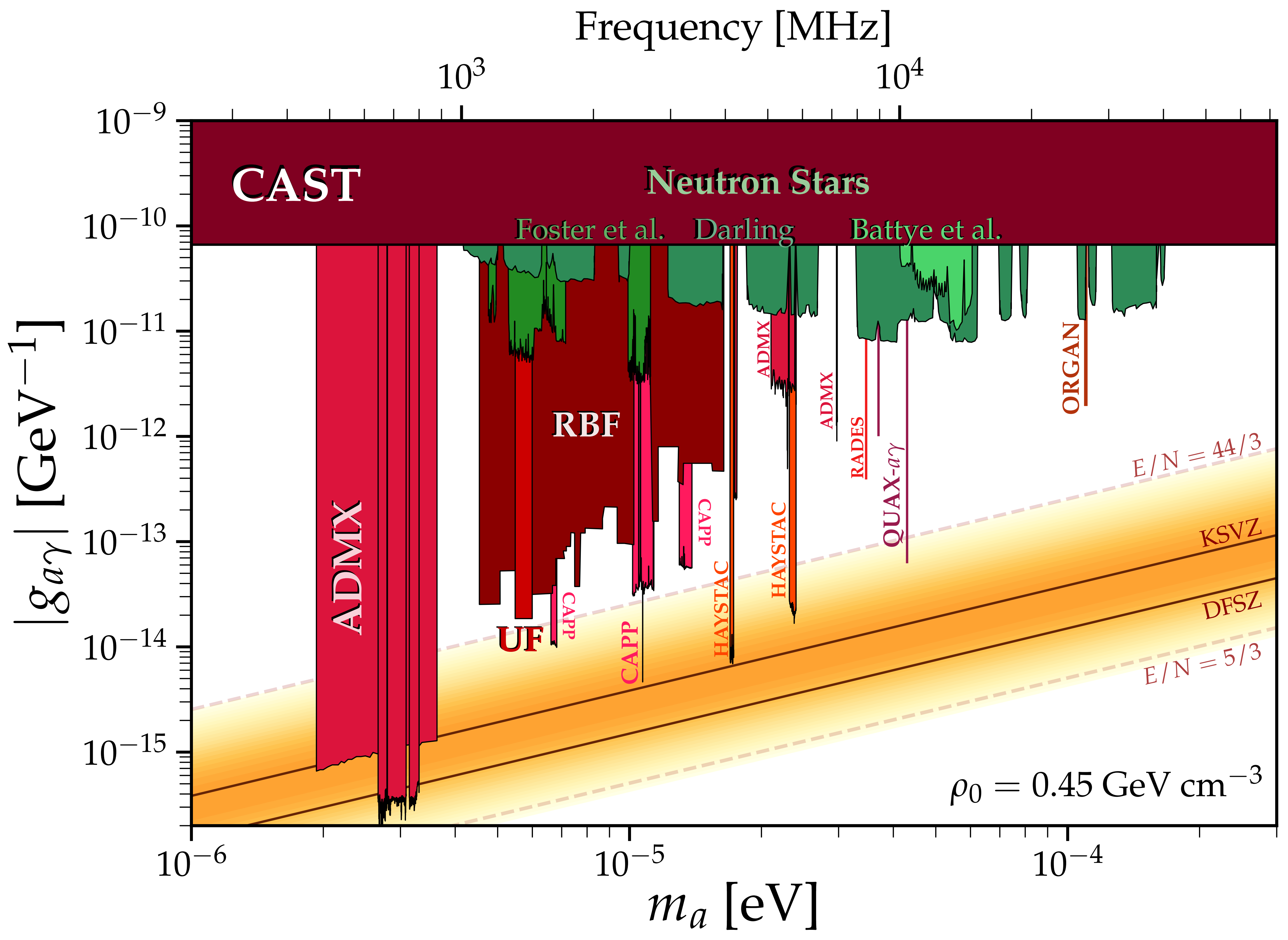

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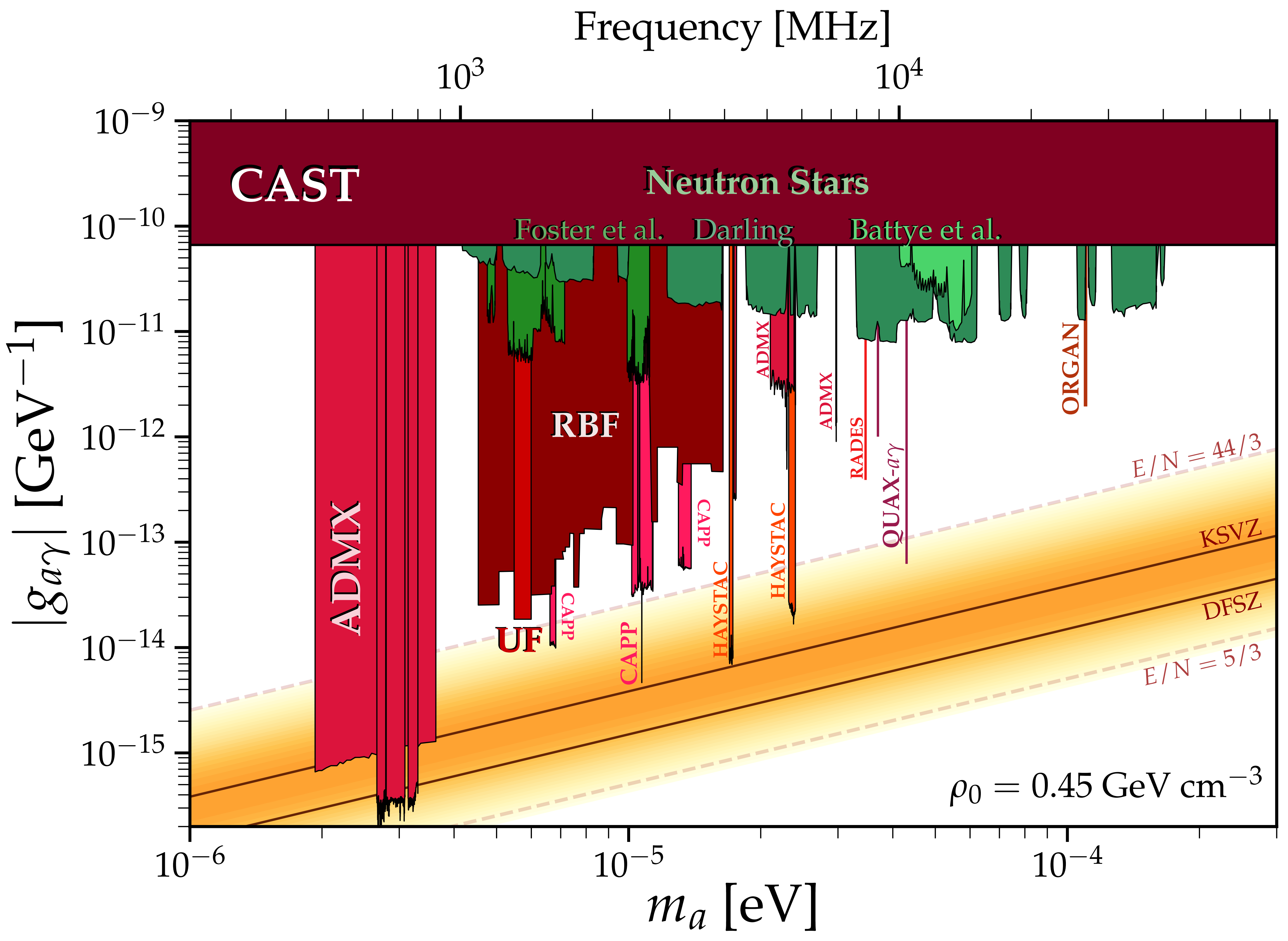

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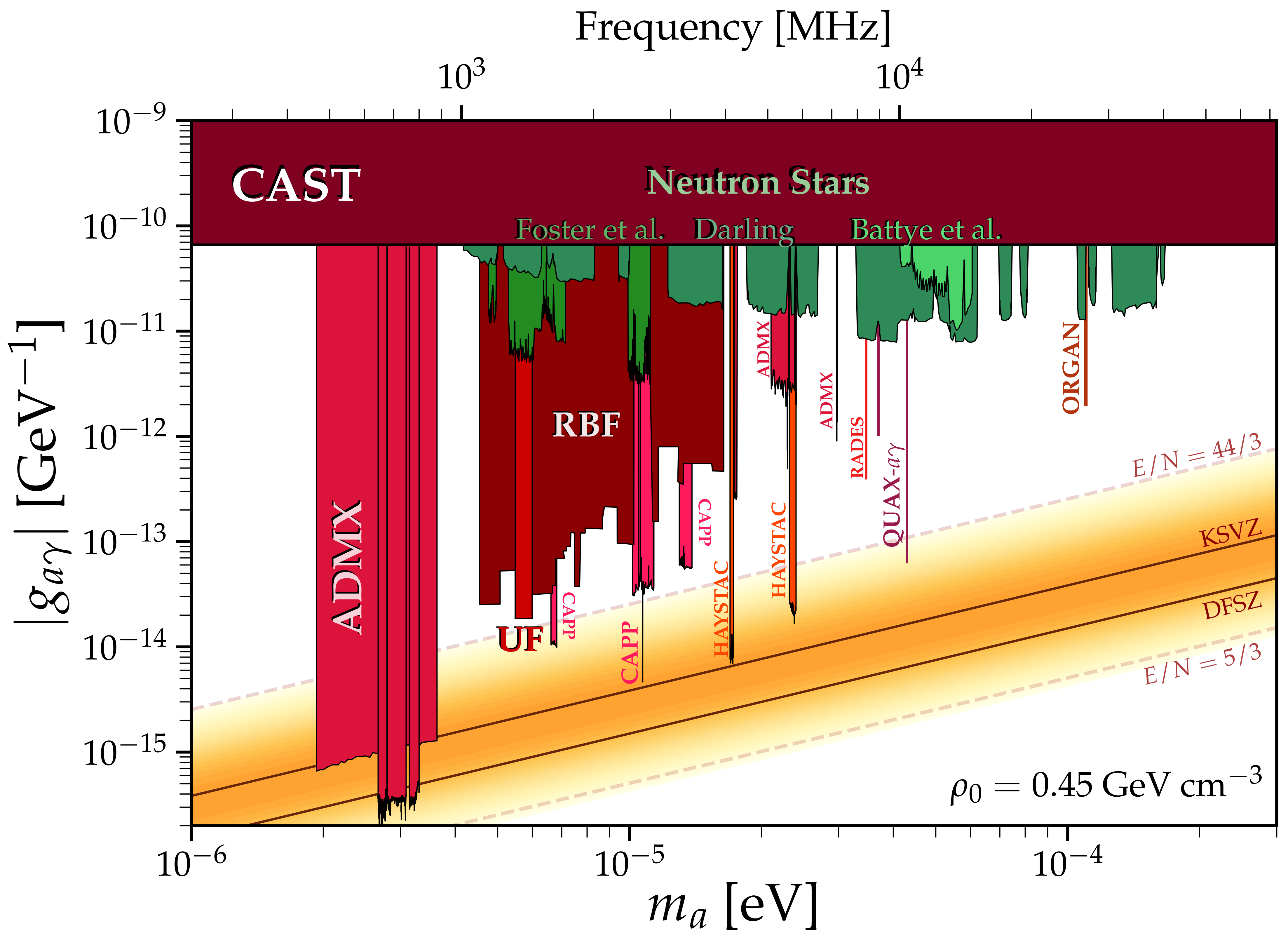

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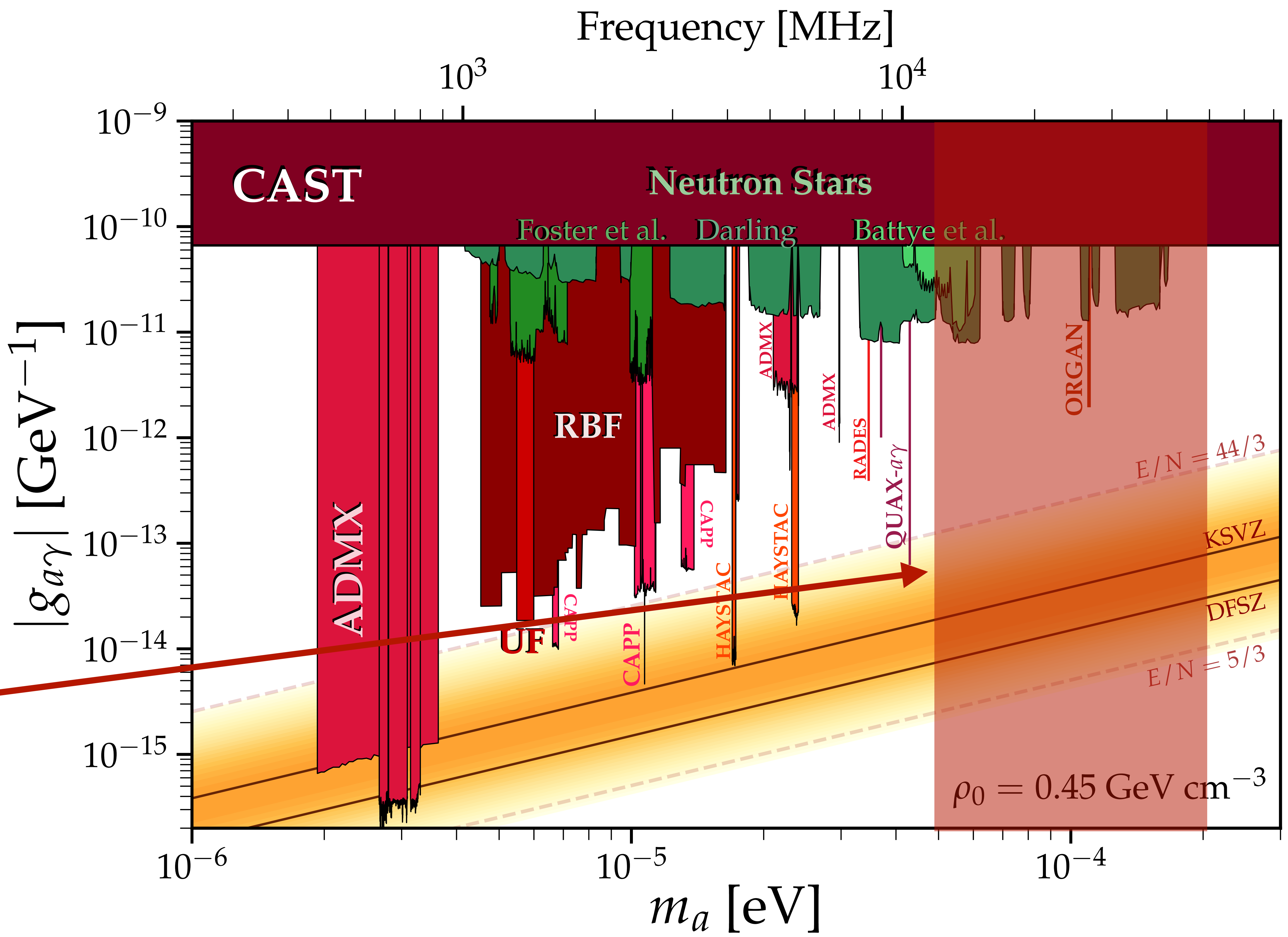

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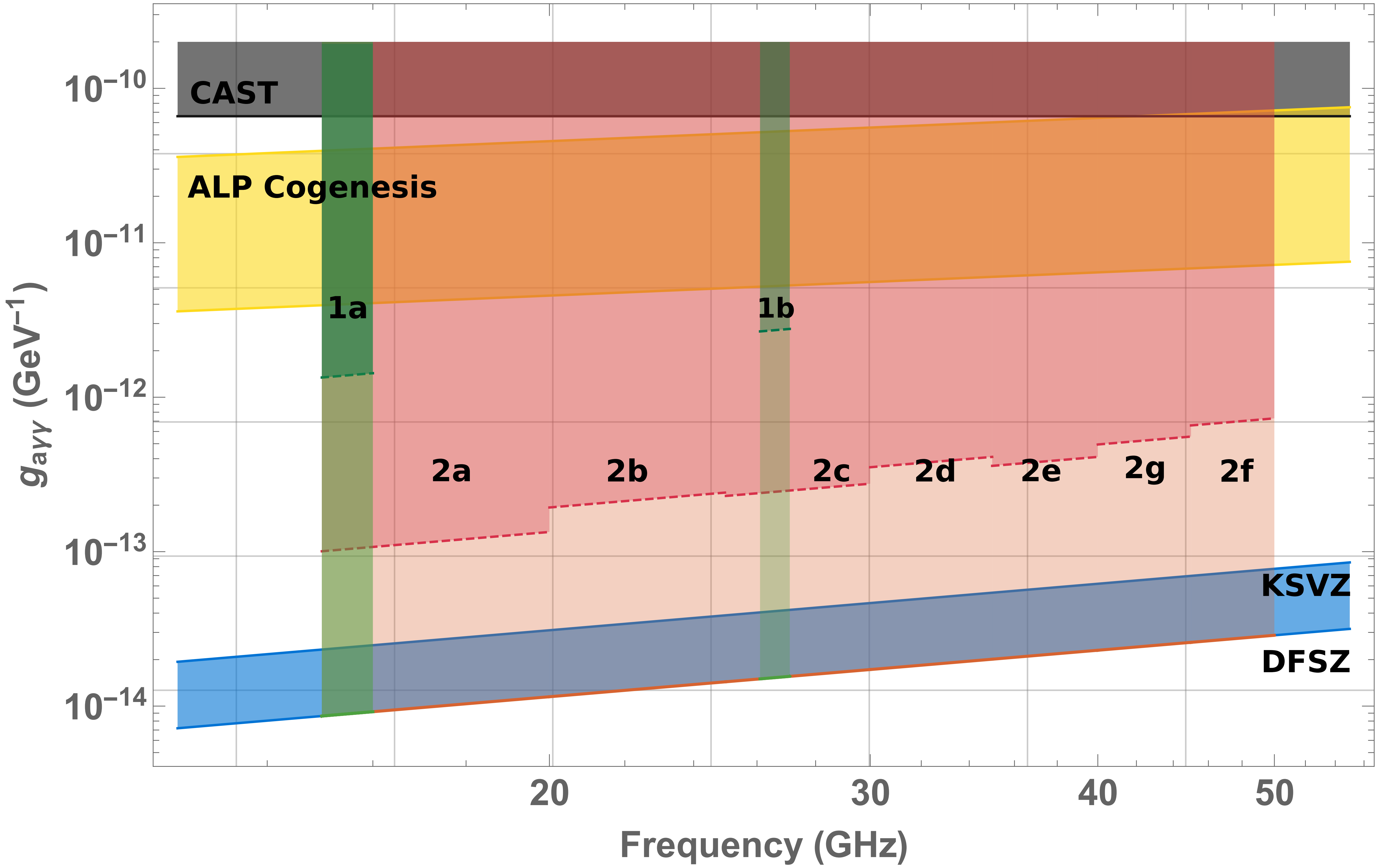

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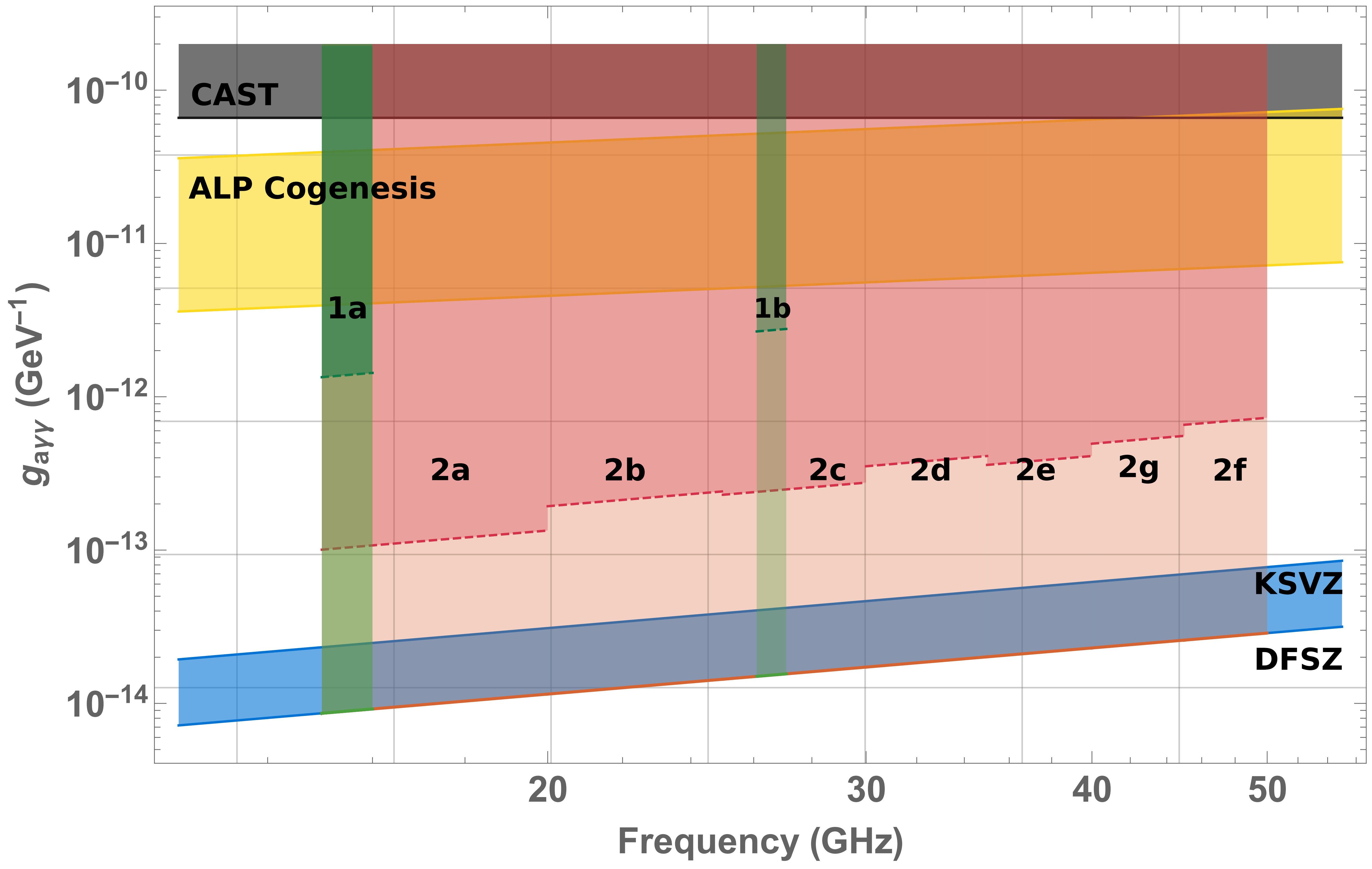

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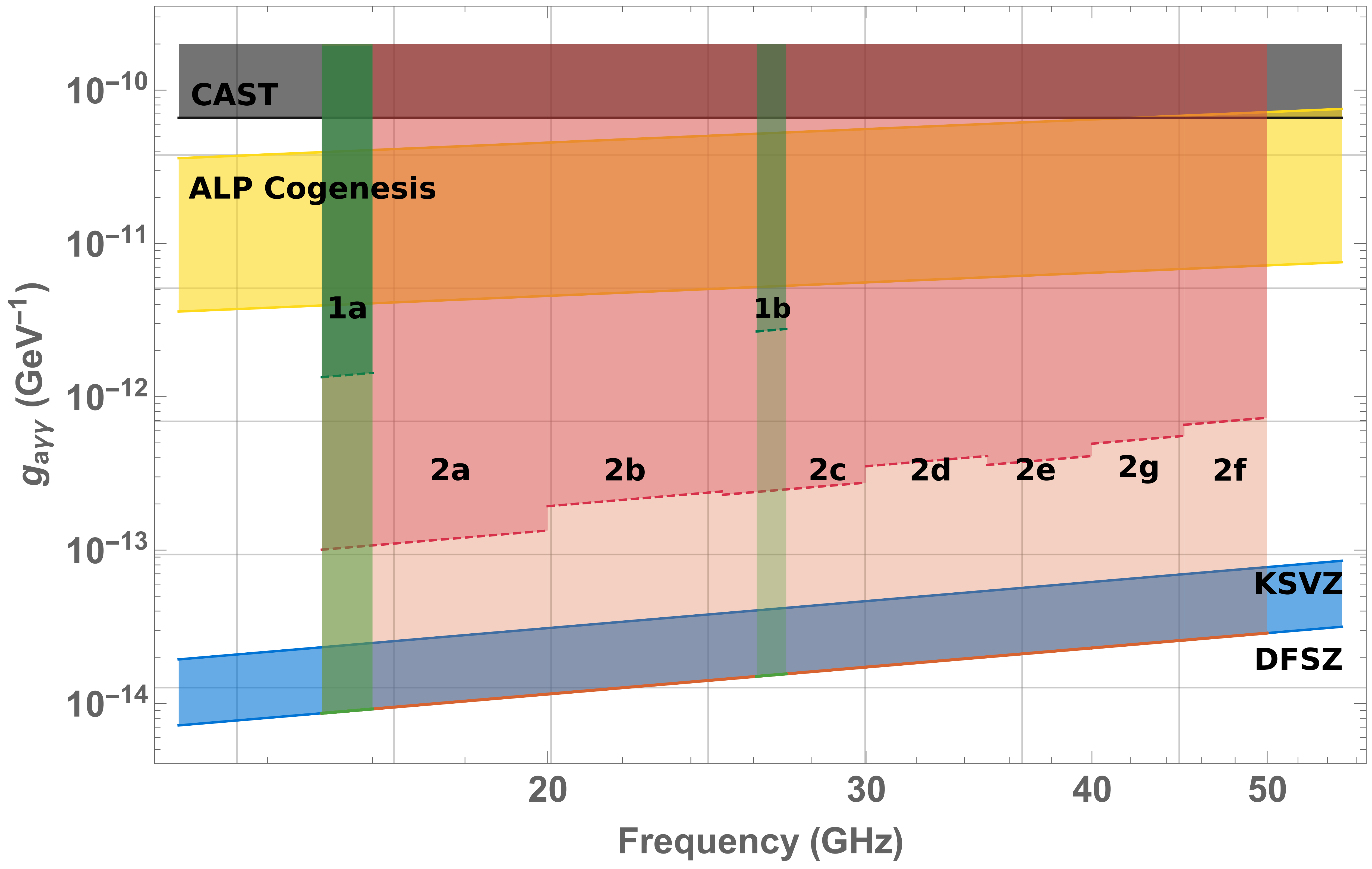

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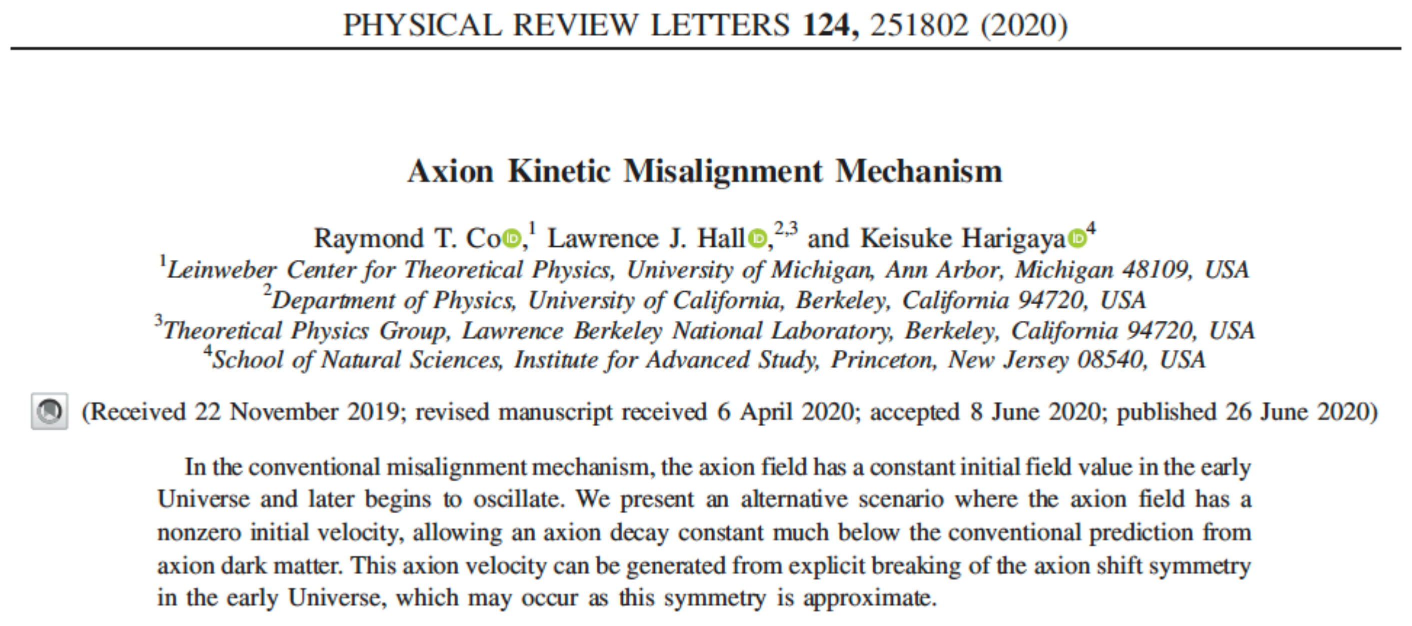
PHYSICAL REVIEW LETTERS 124, 251802 (2020)

Axion Kinetic Misalignment Mechanism

Raymond T. Co,[1] Lawrence J. Hall,[2,3] and Keisuke Harigaya[4]
[1]Leinweber Center for Theoretical Physics, University of Michigan, Ann Arbor, Michigan 48109, USA
[2]Department of Physics, University of California, Berkeley, California 94720, USA
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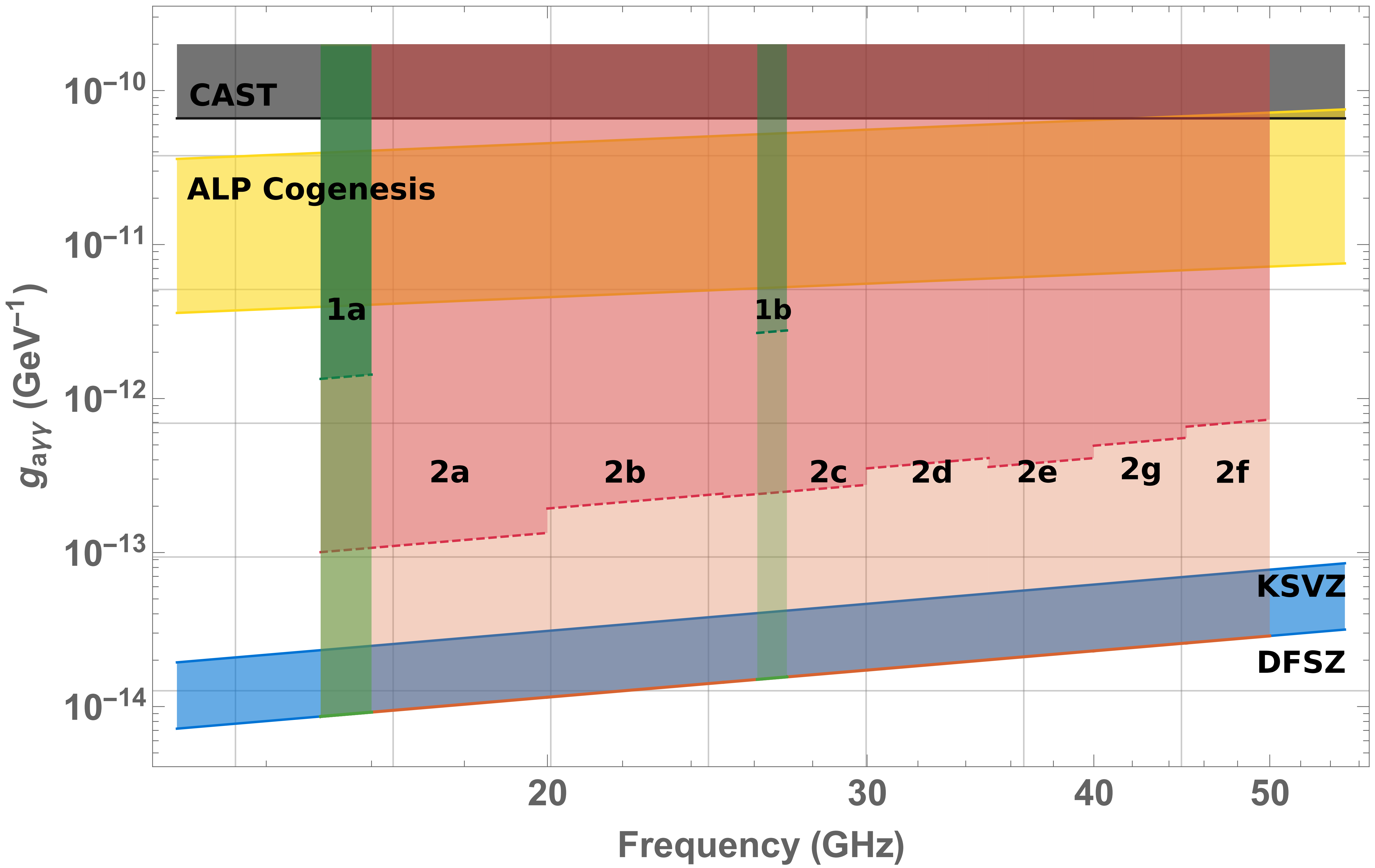

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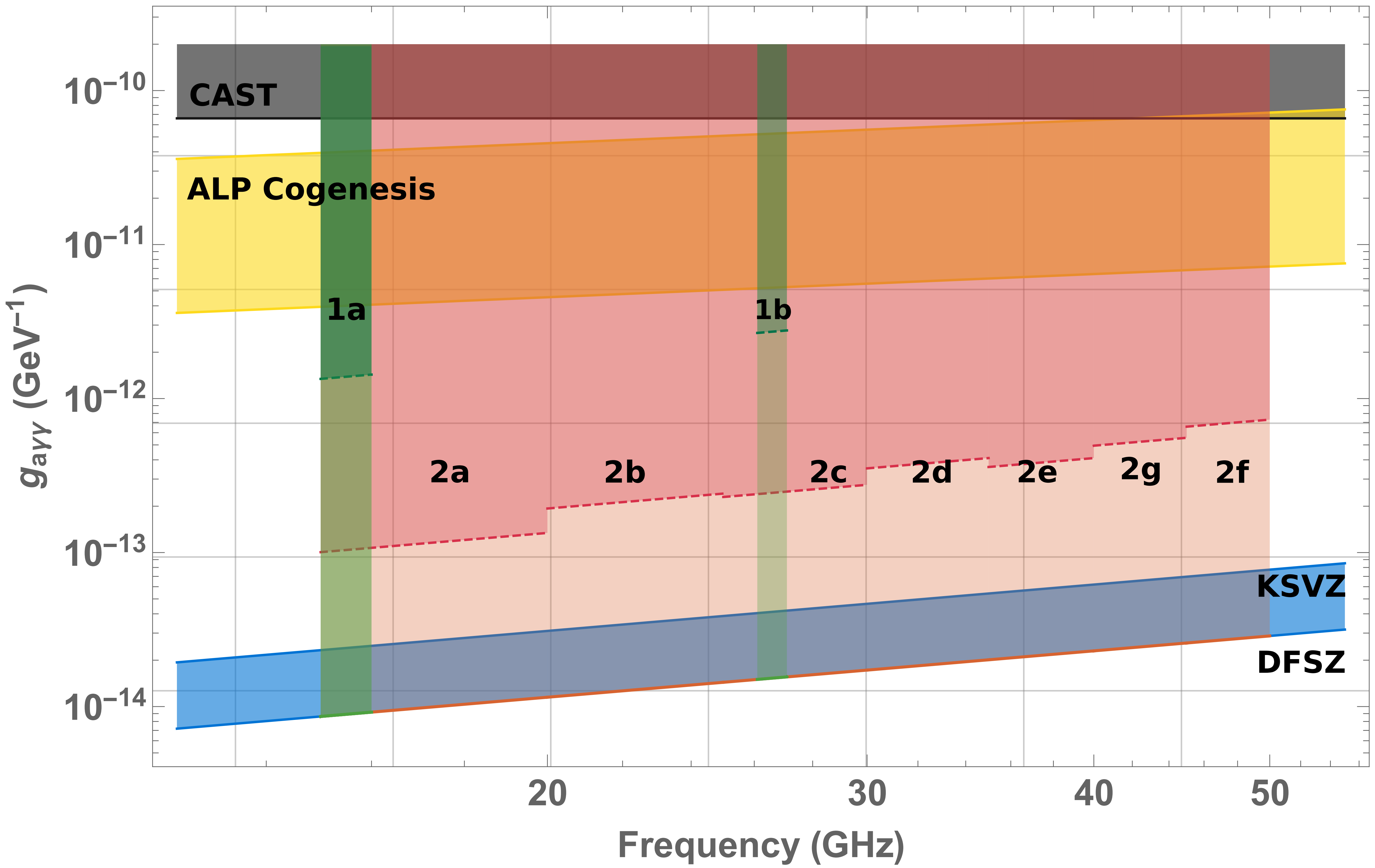

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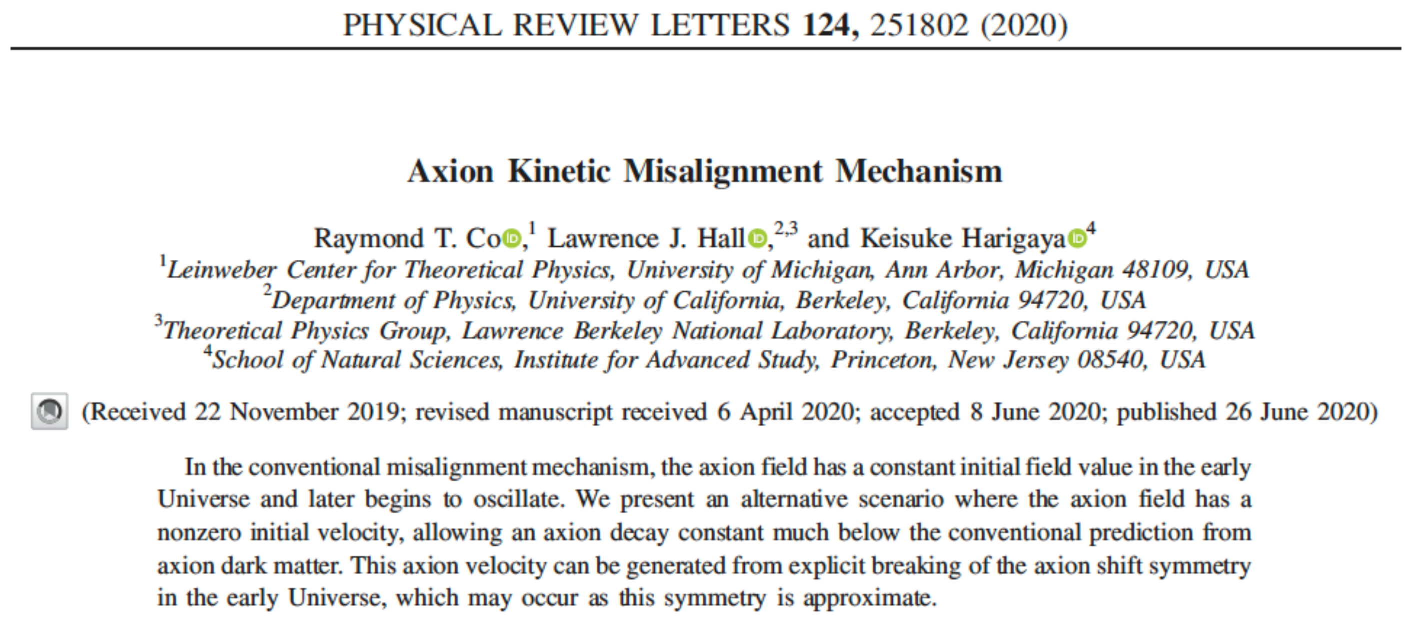

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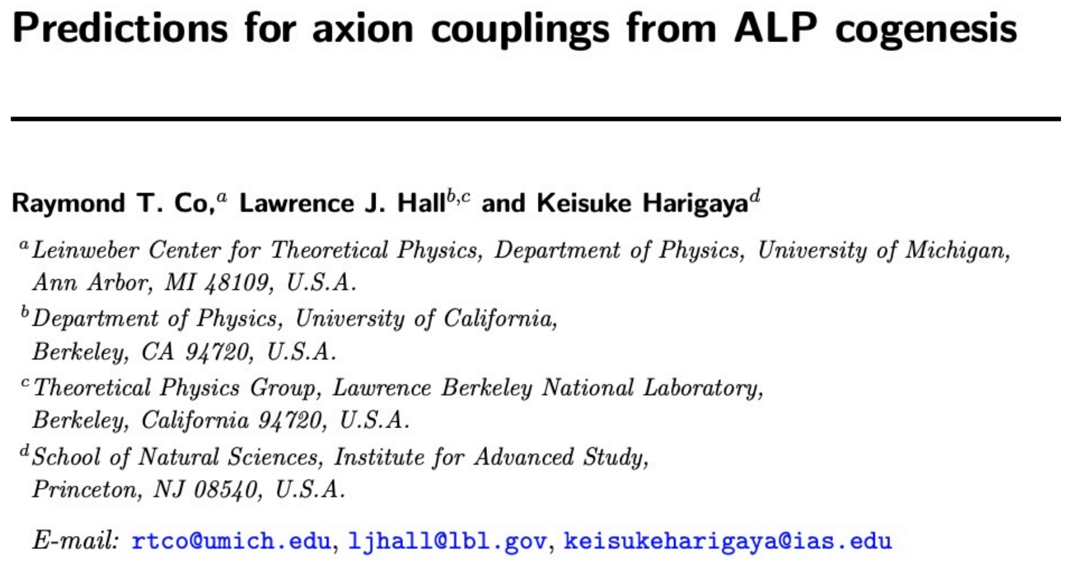

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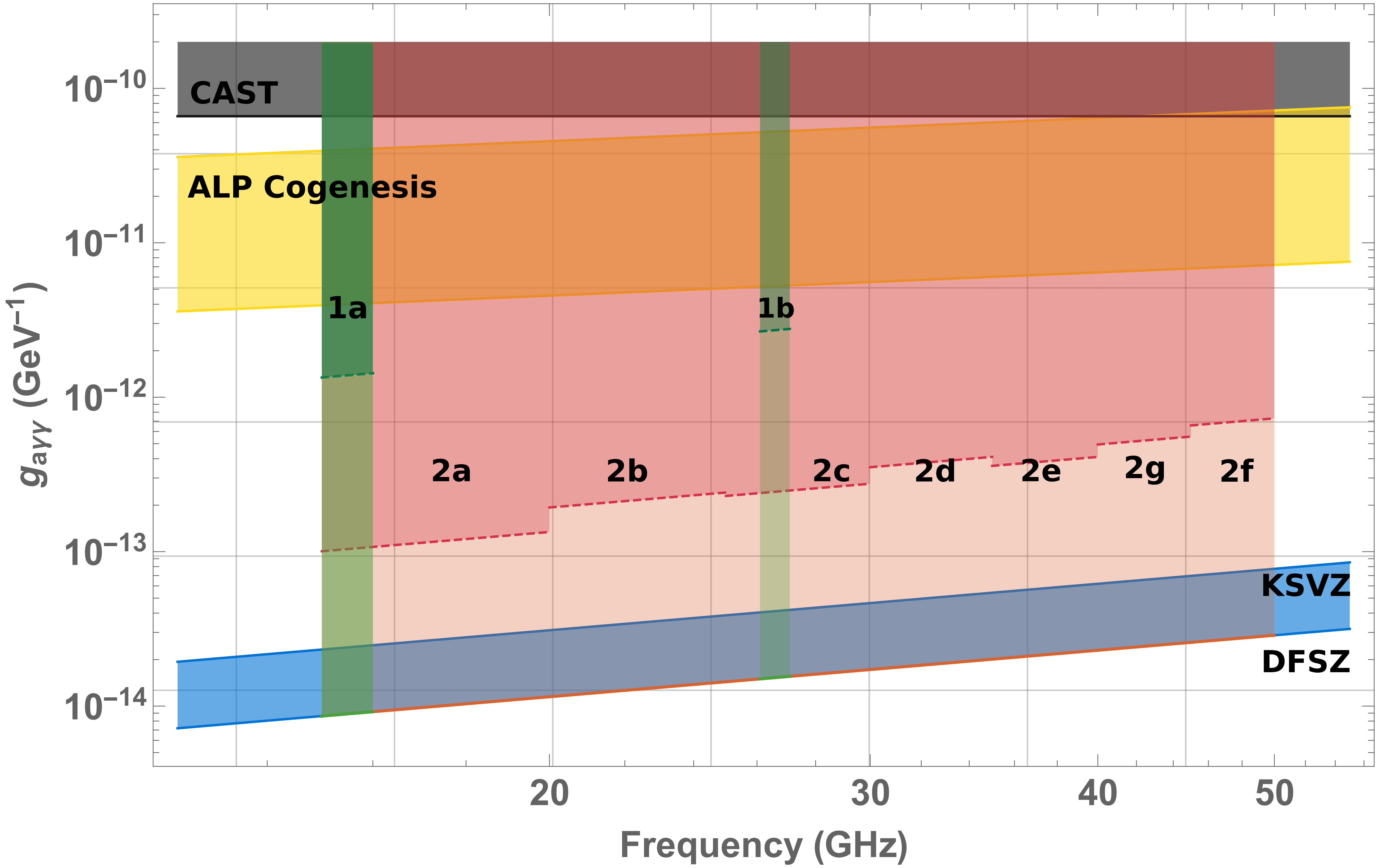

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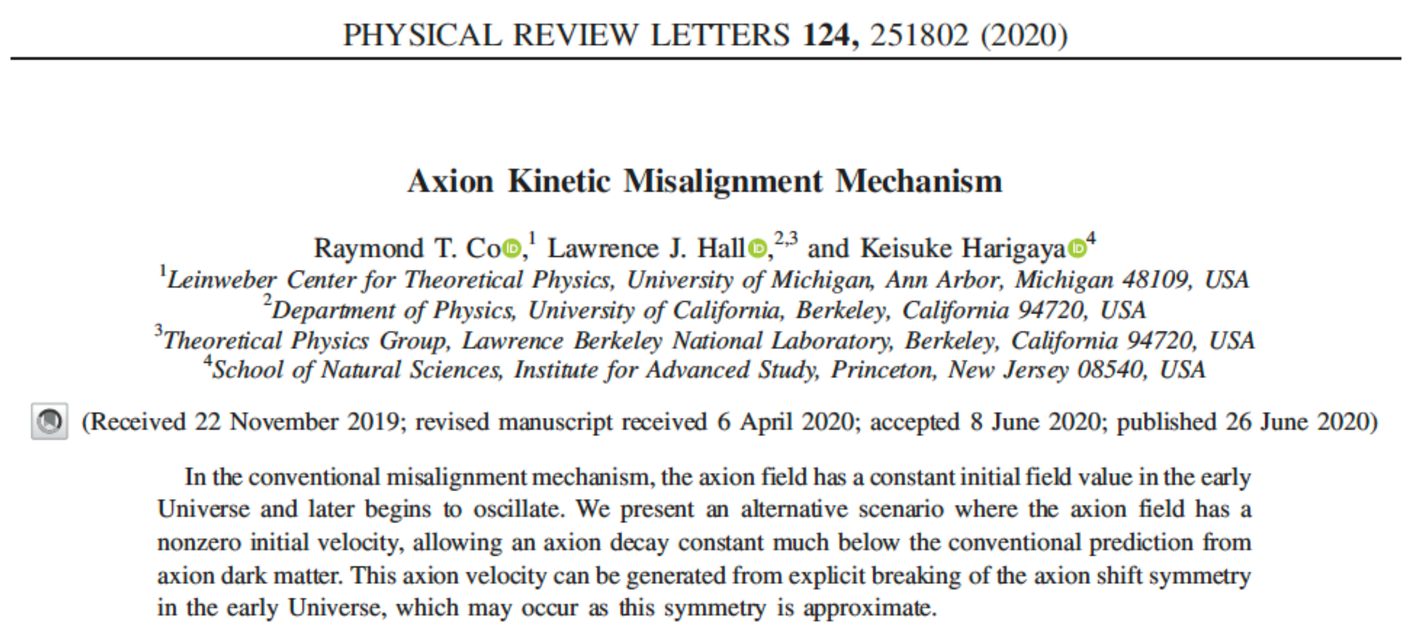
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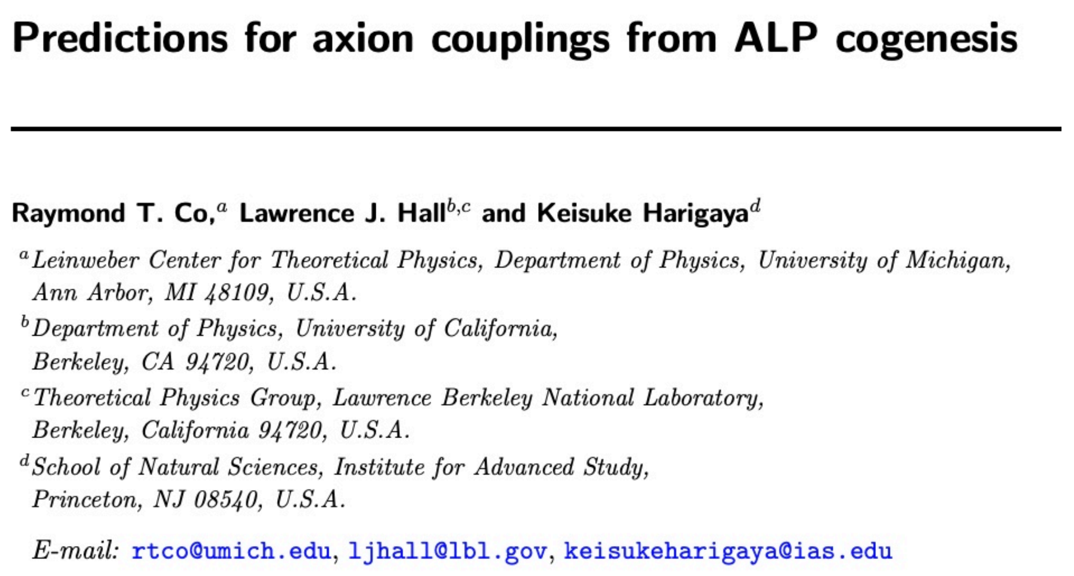
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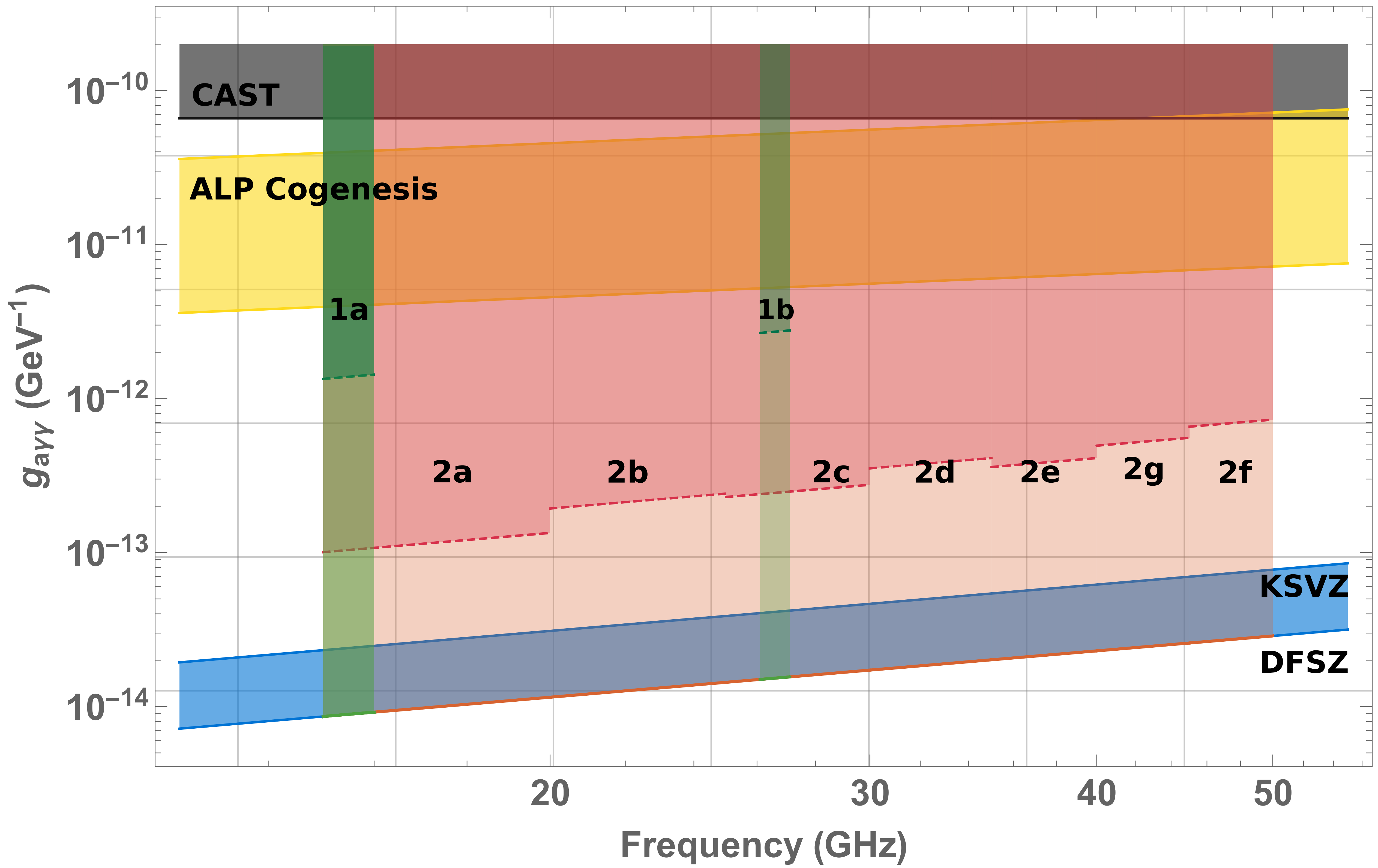

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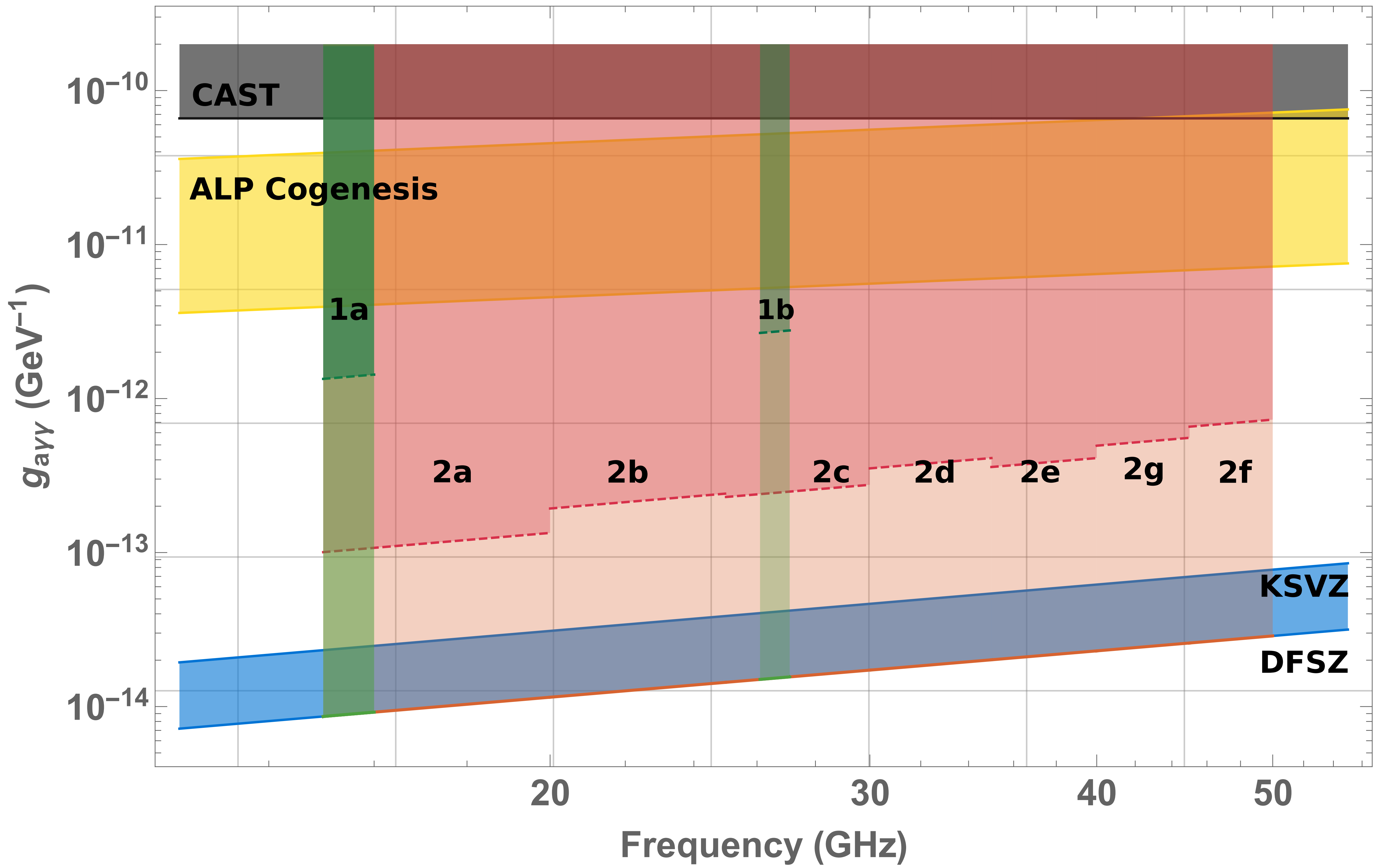

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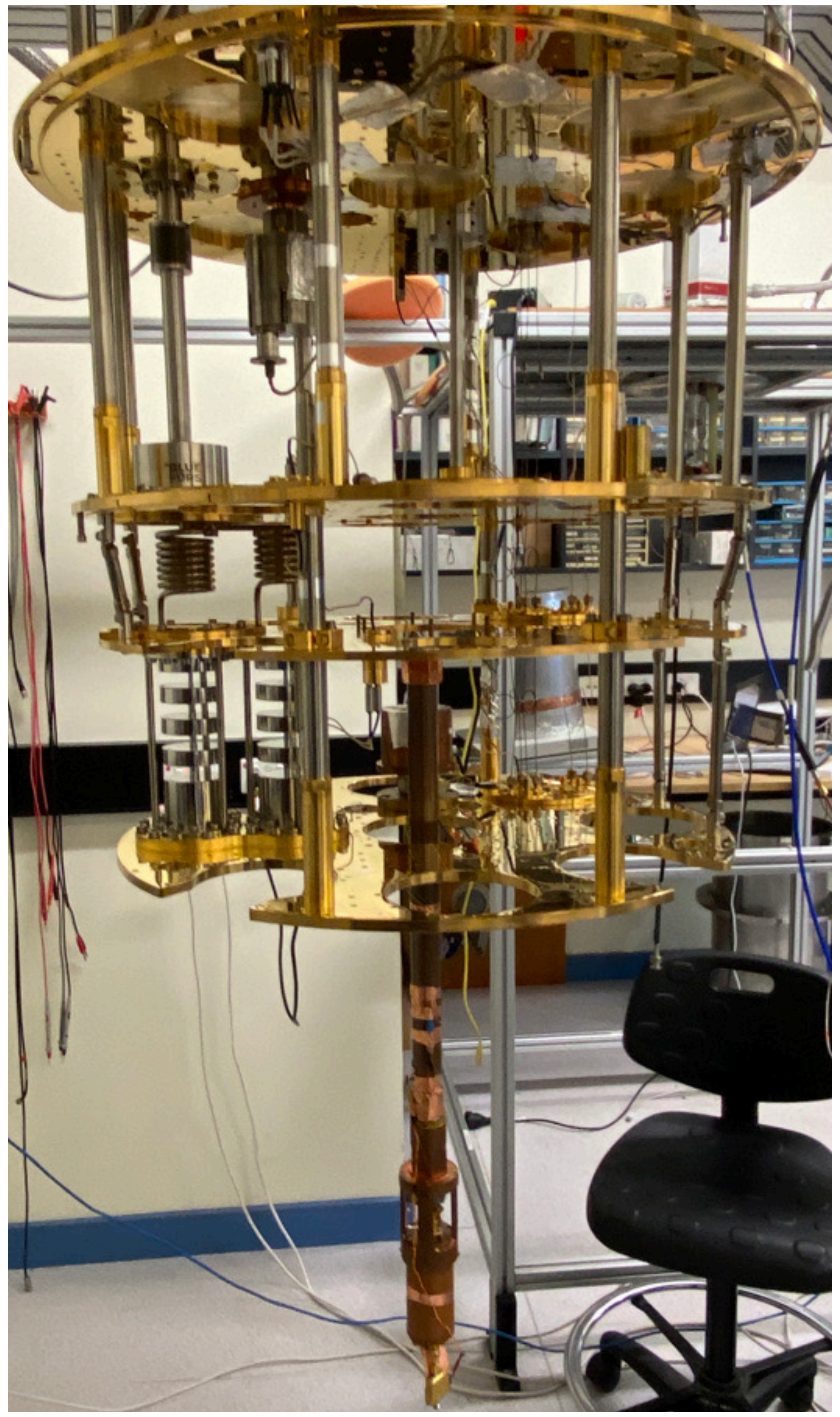

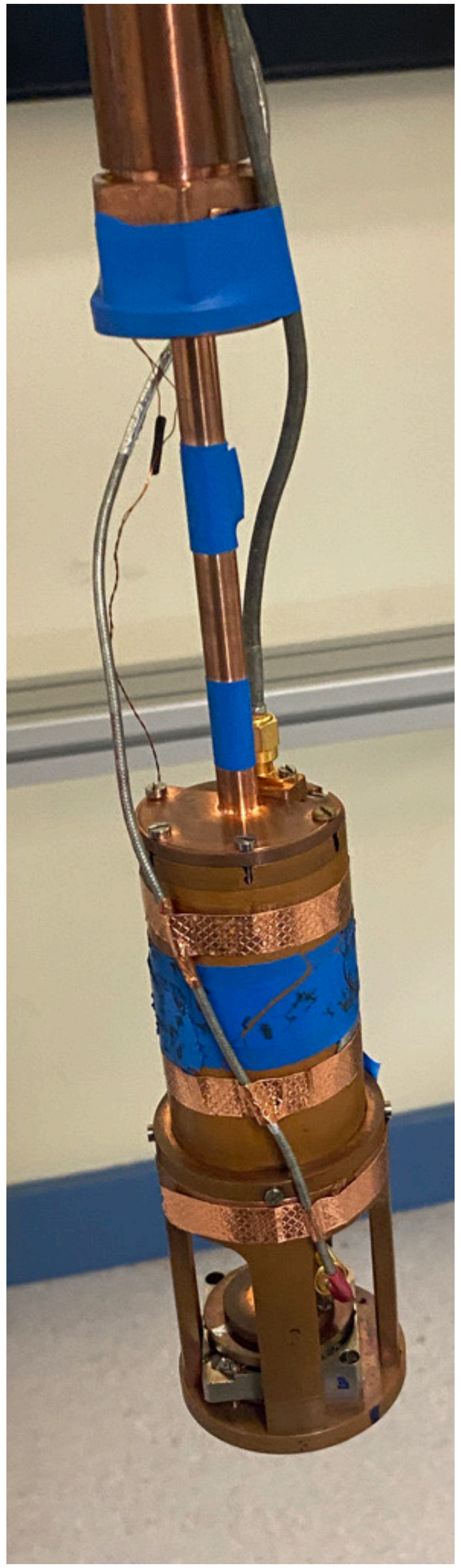

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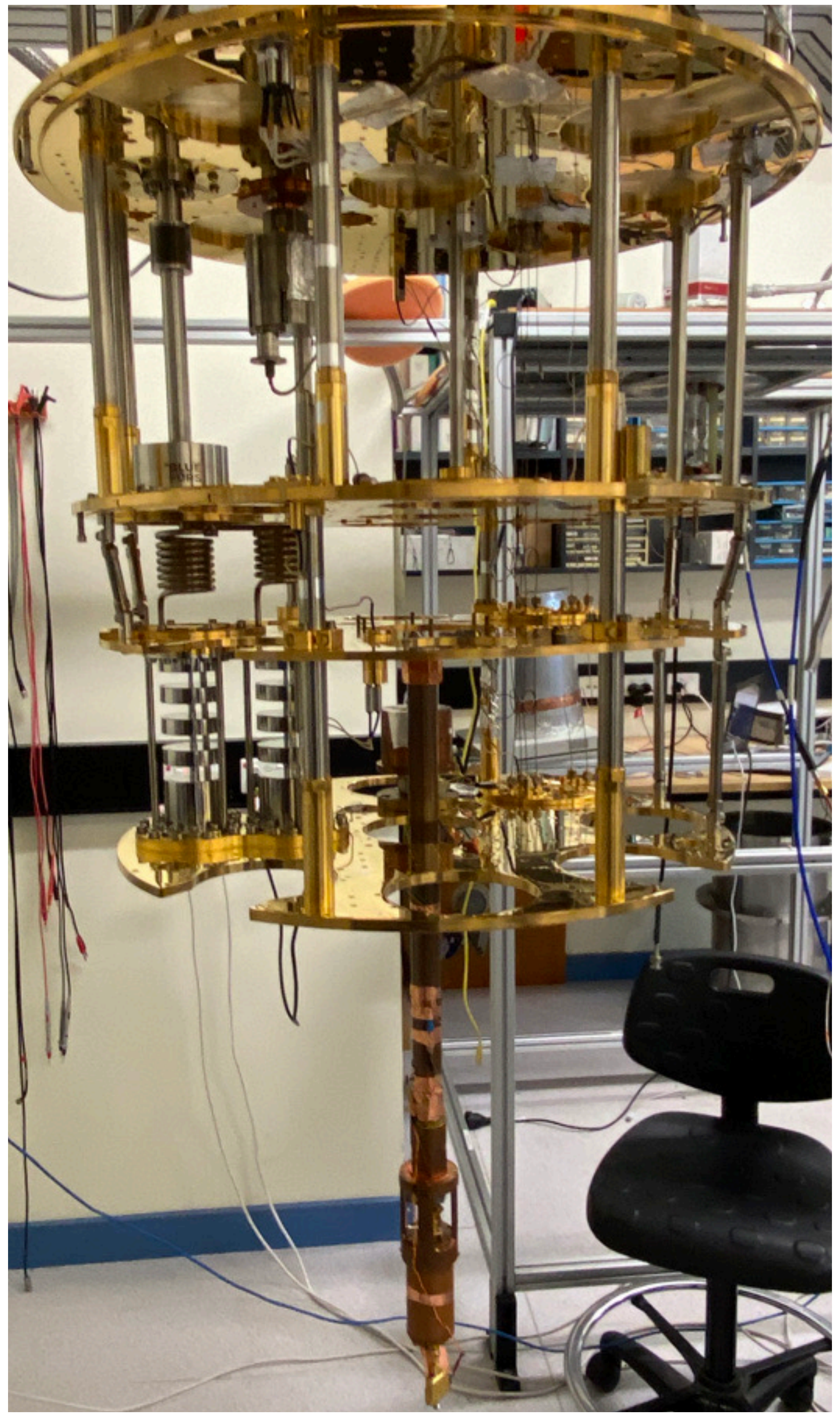

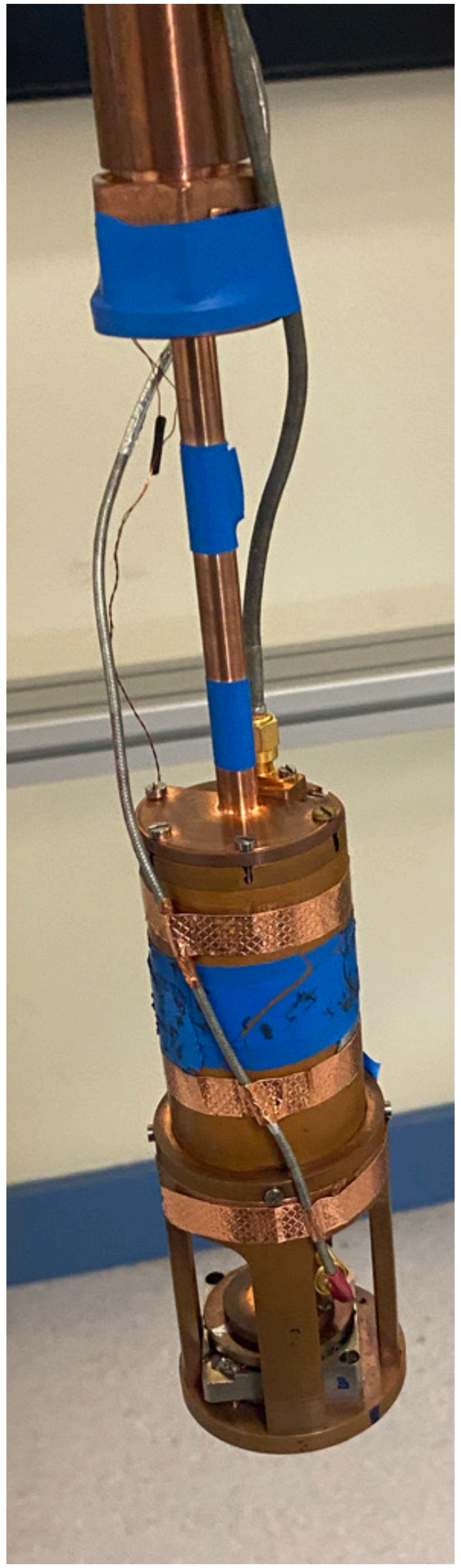

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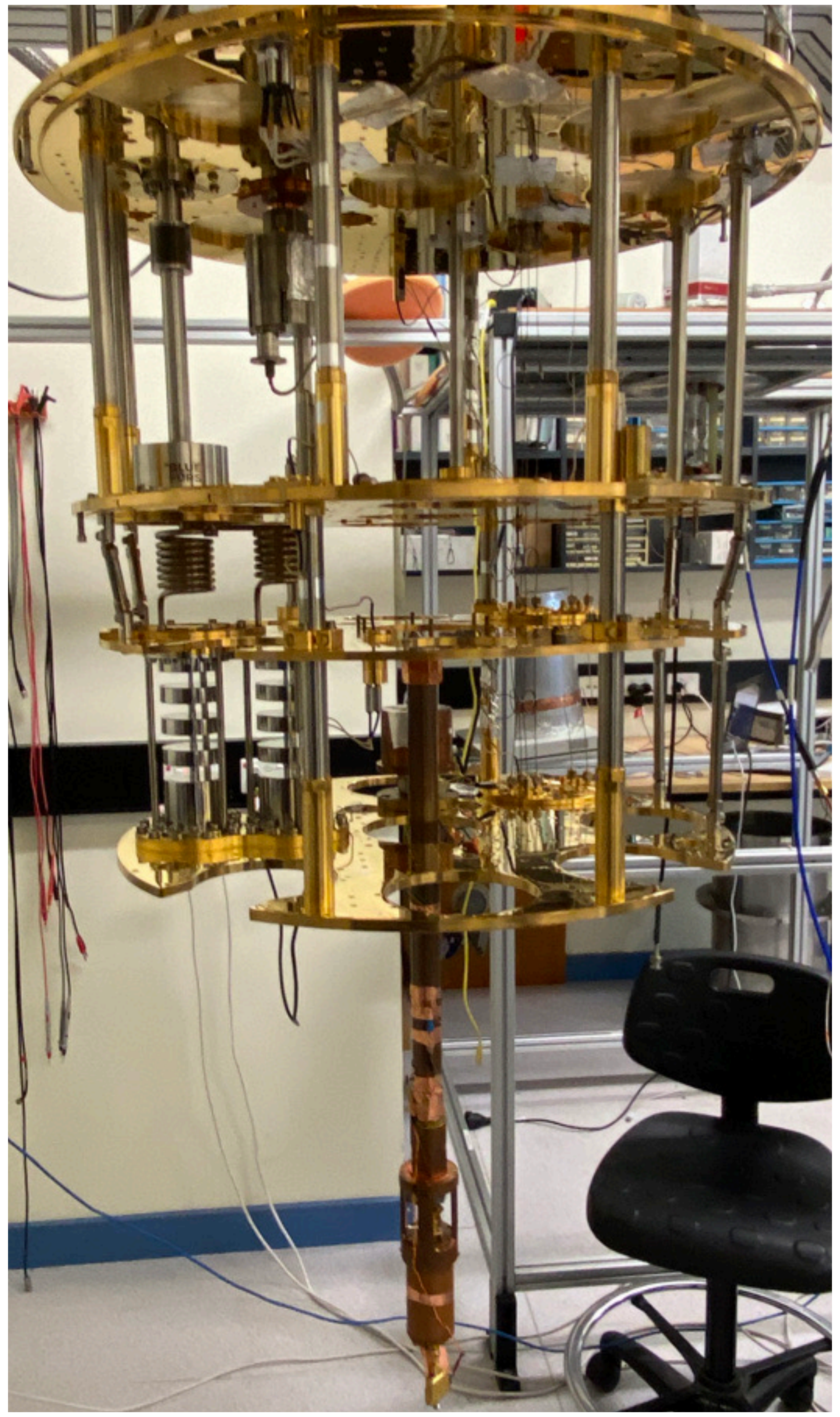

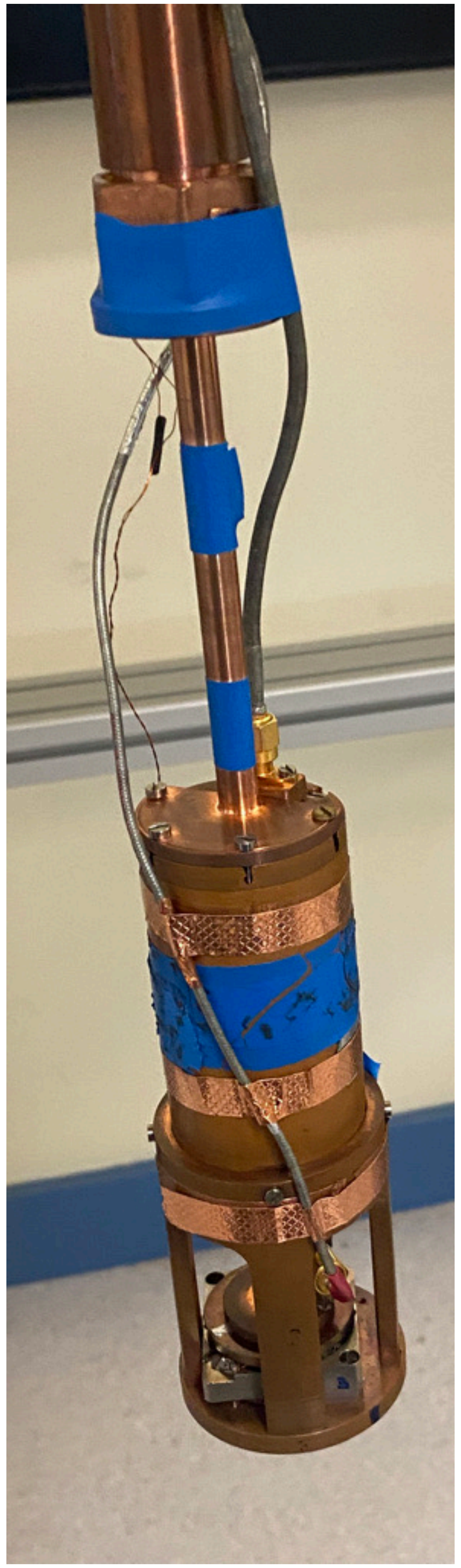

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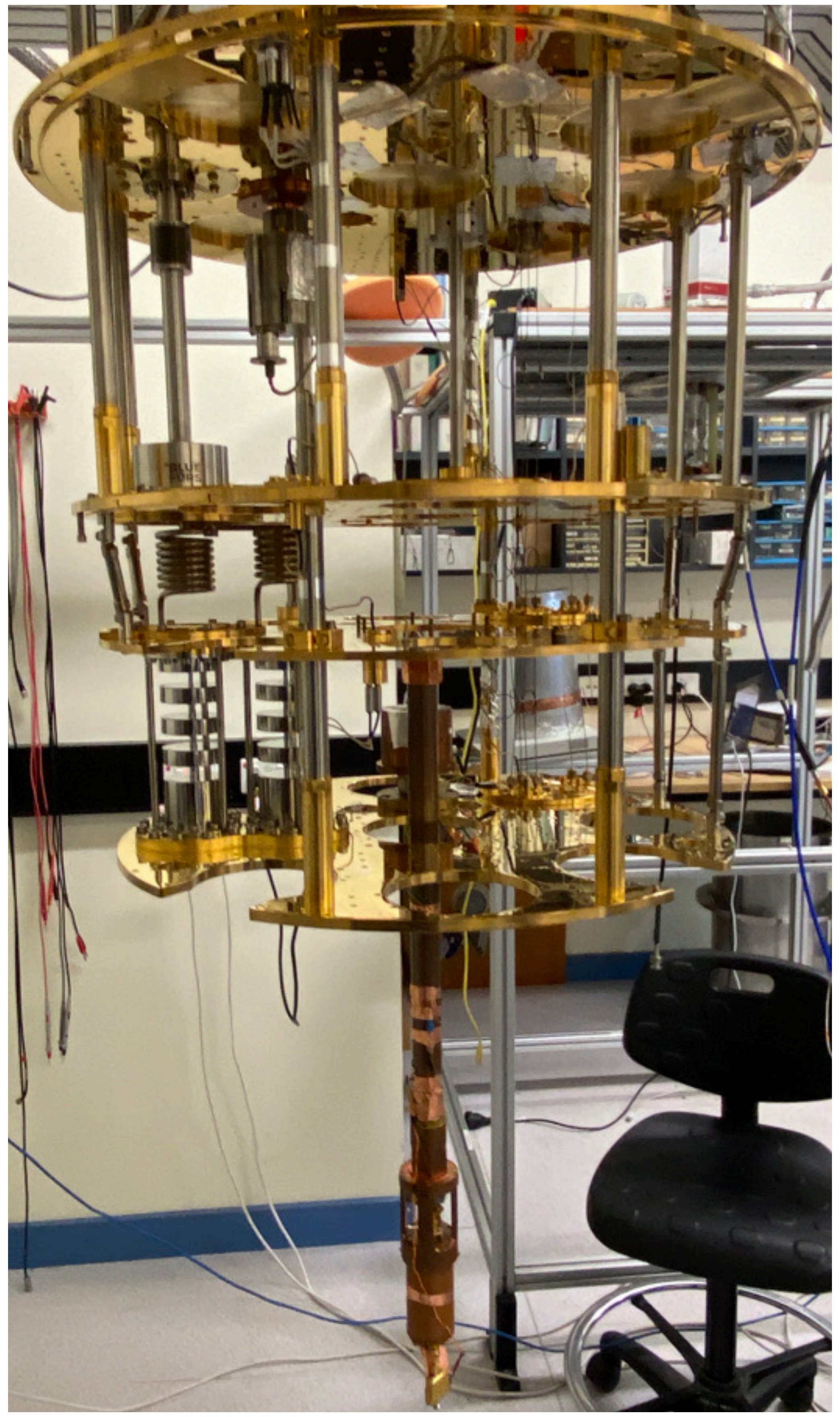

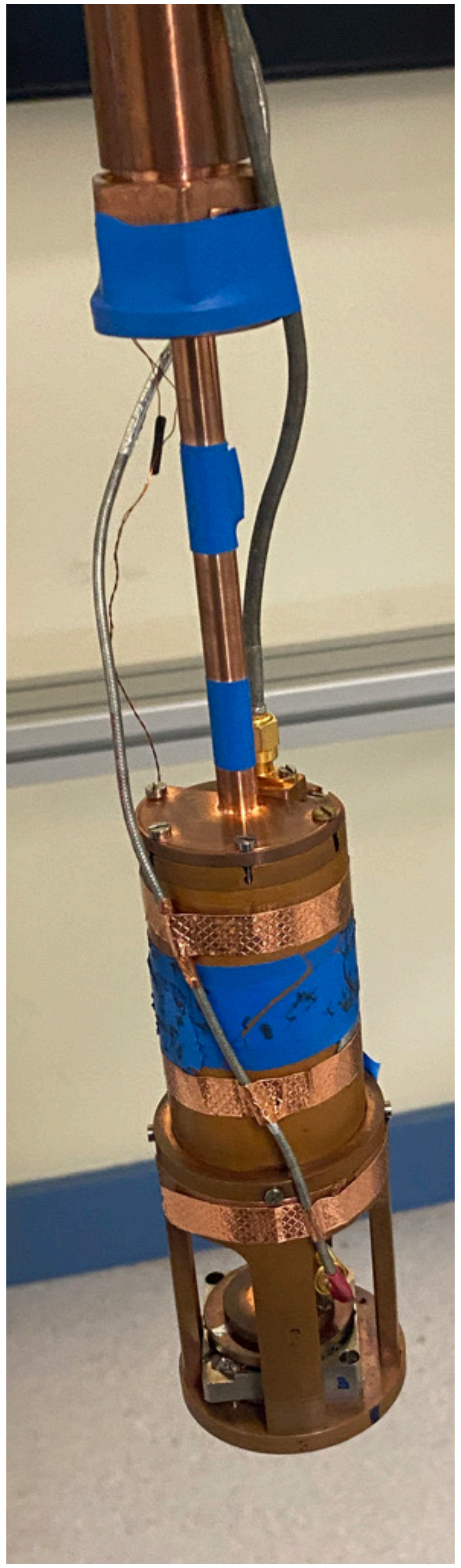

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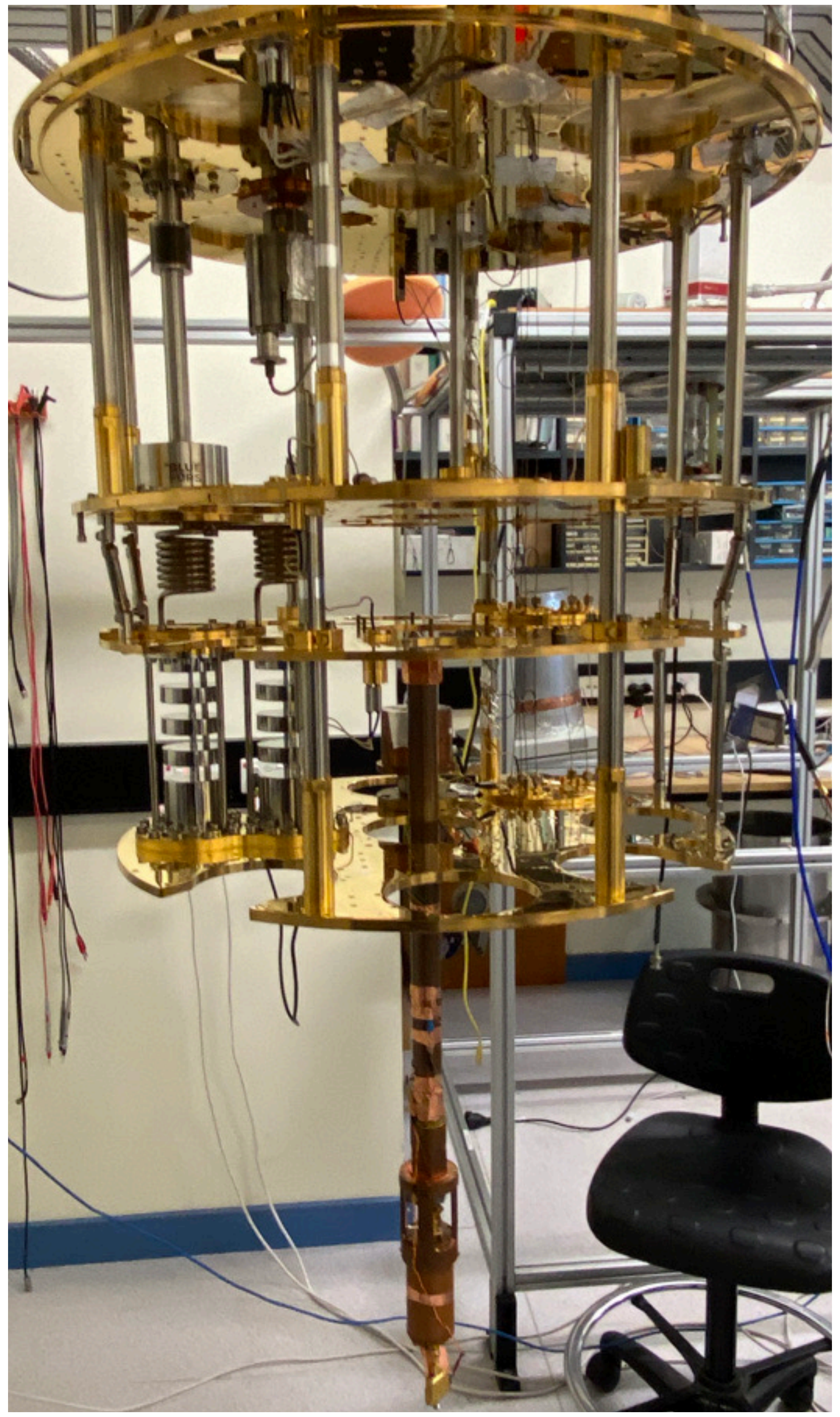

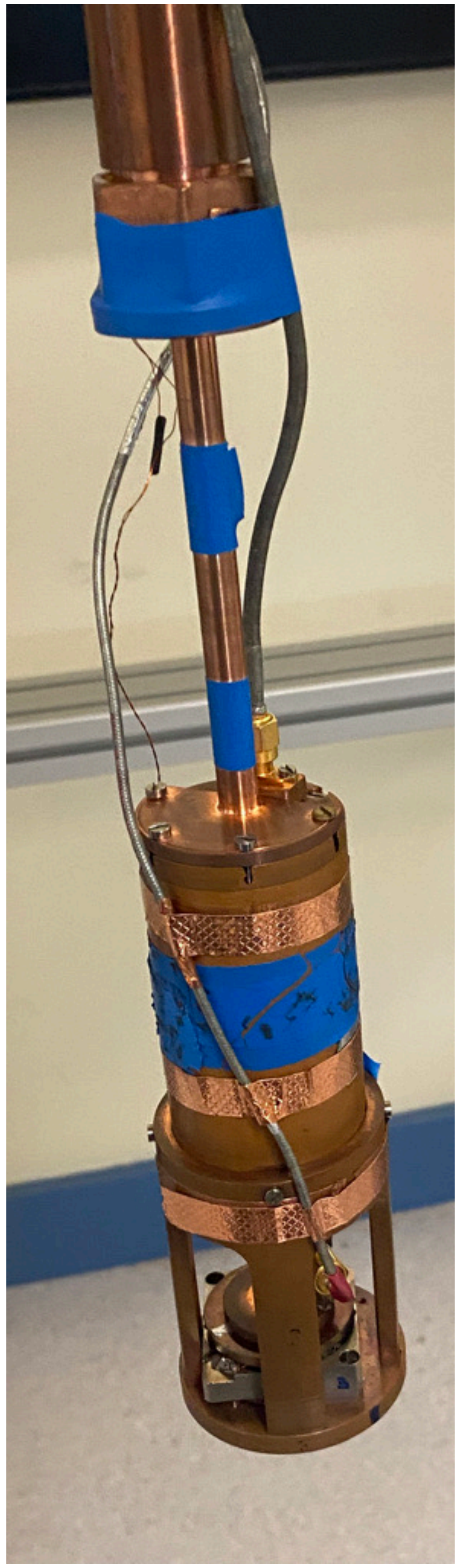

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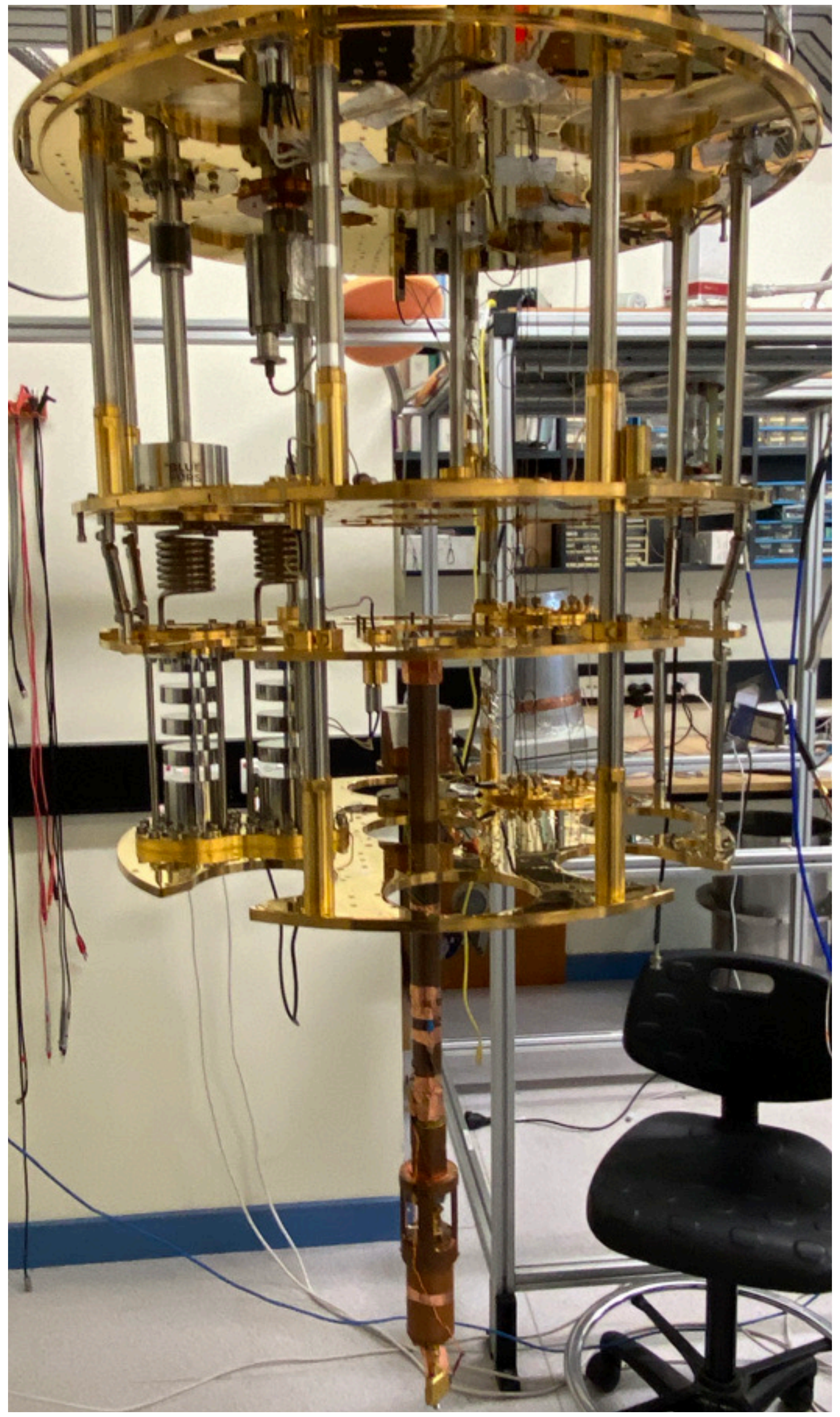

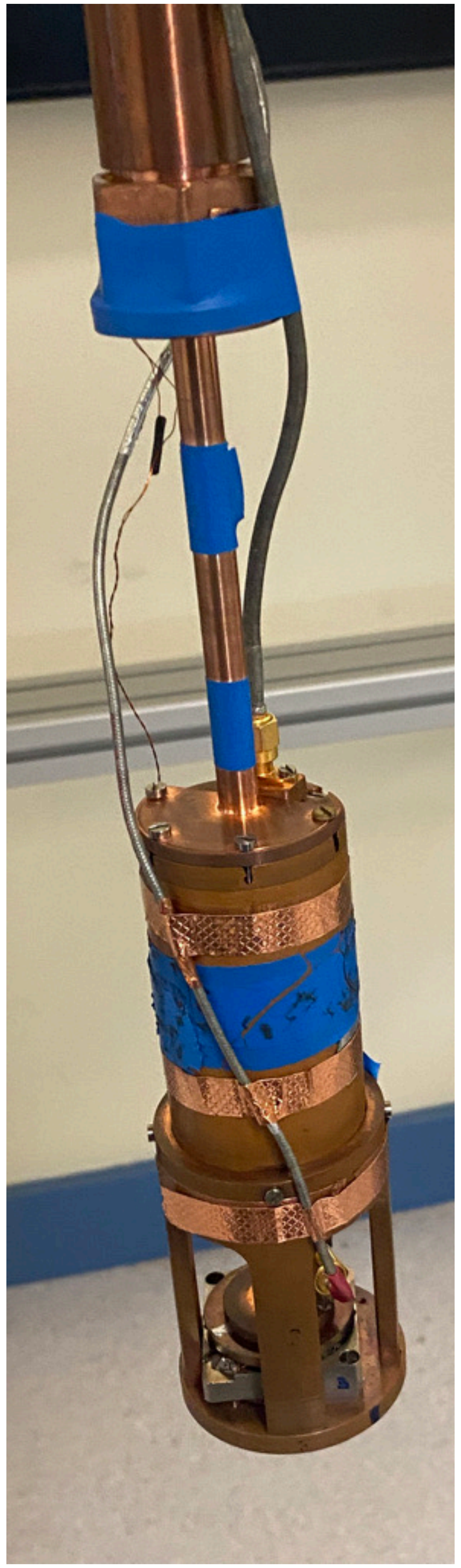

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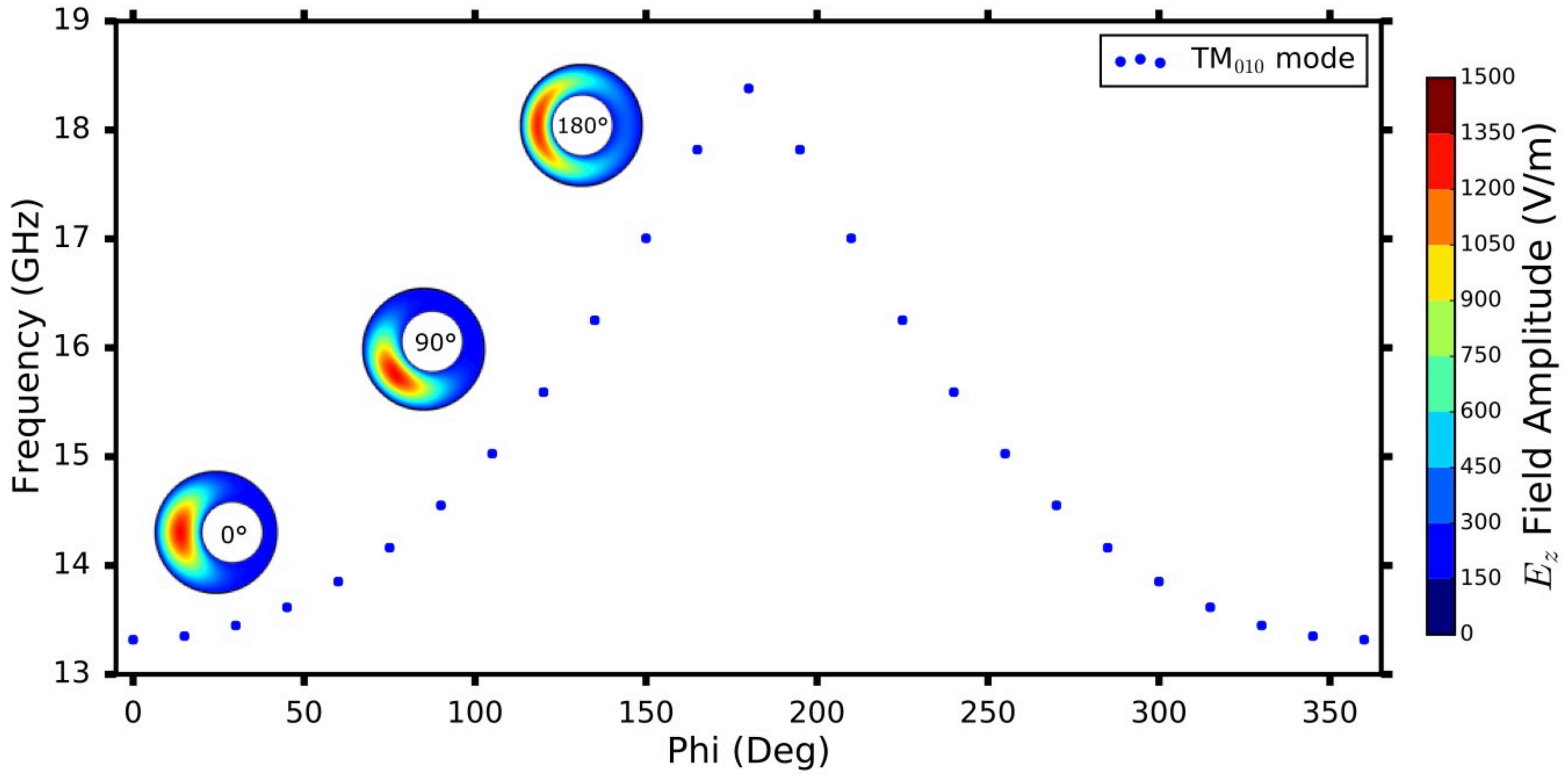

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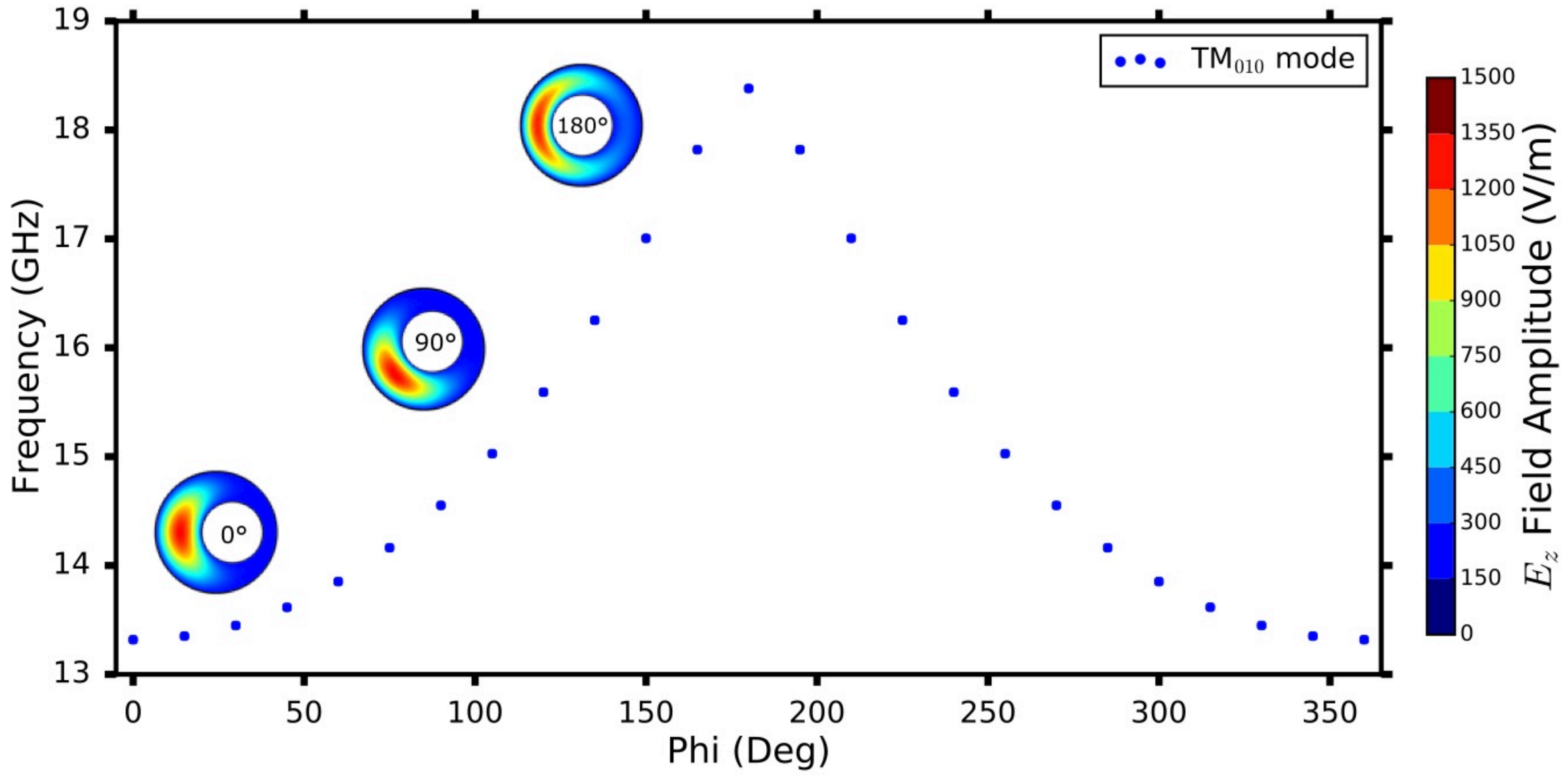

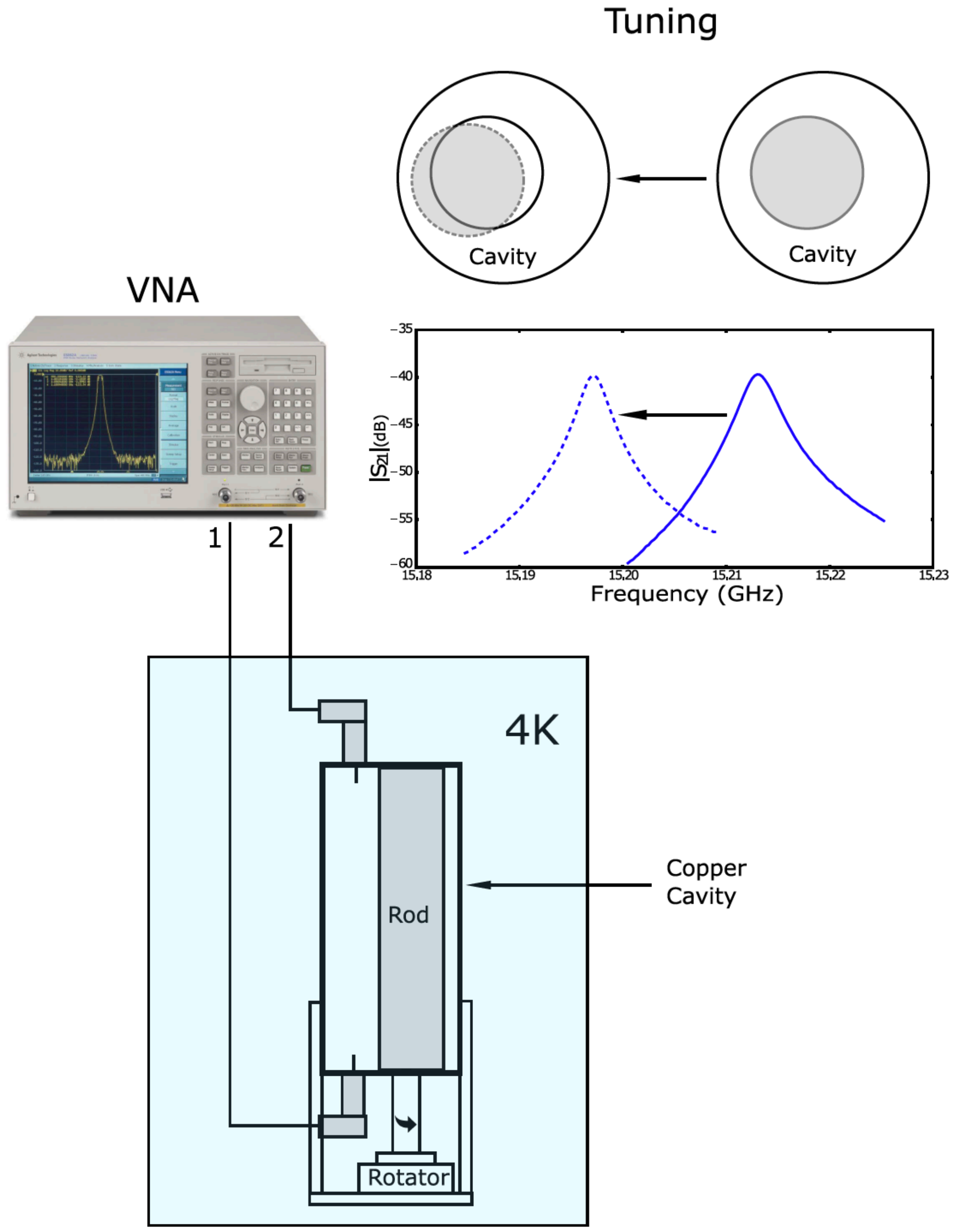

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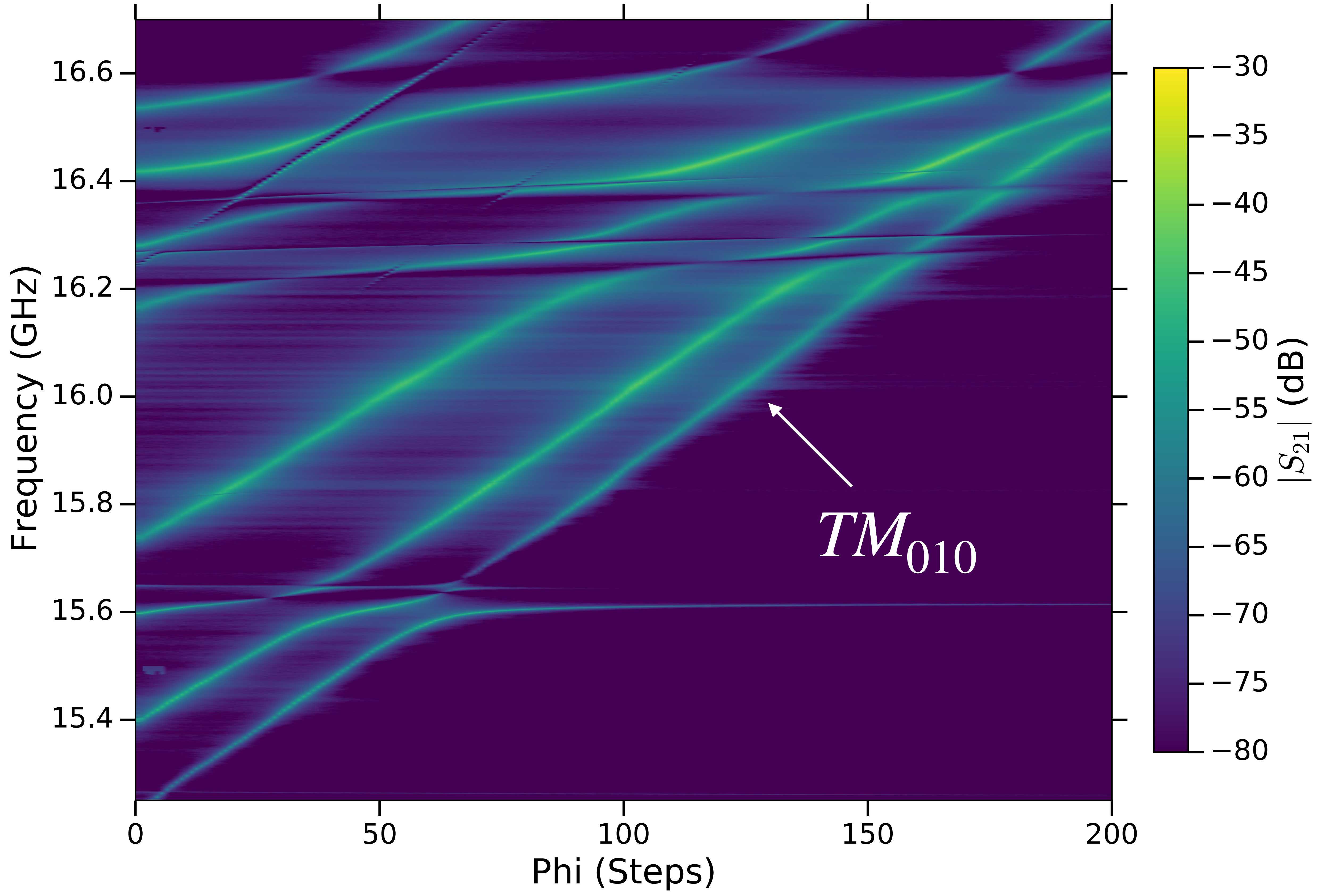

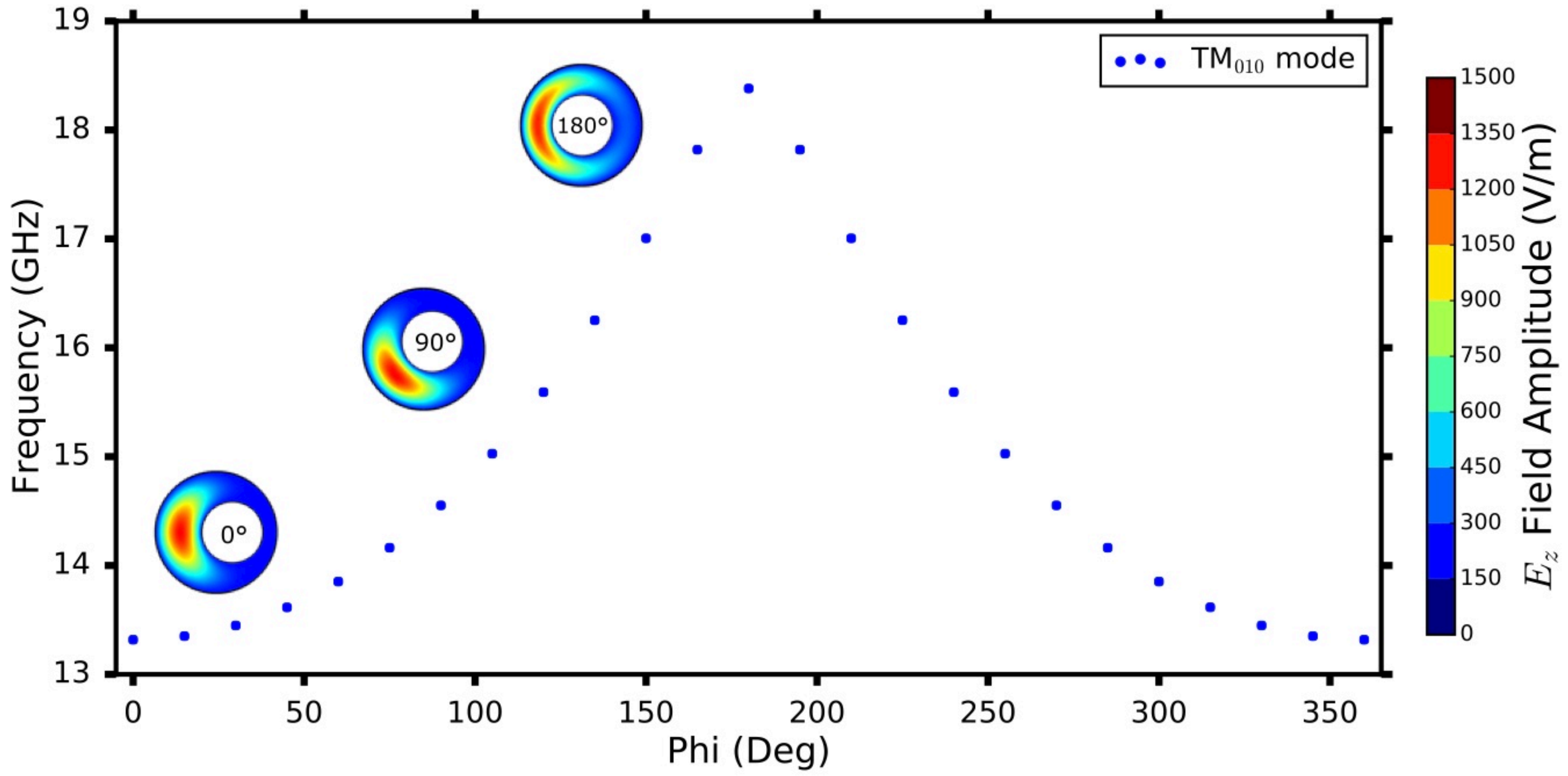

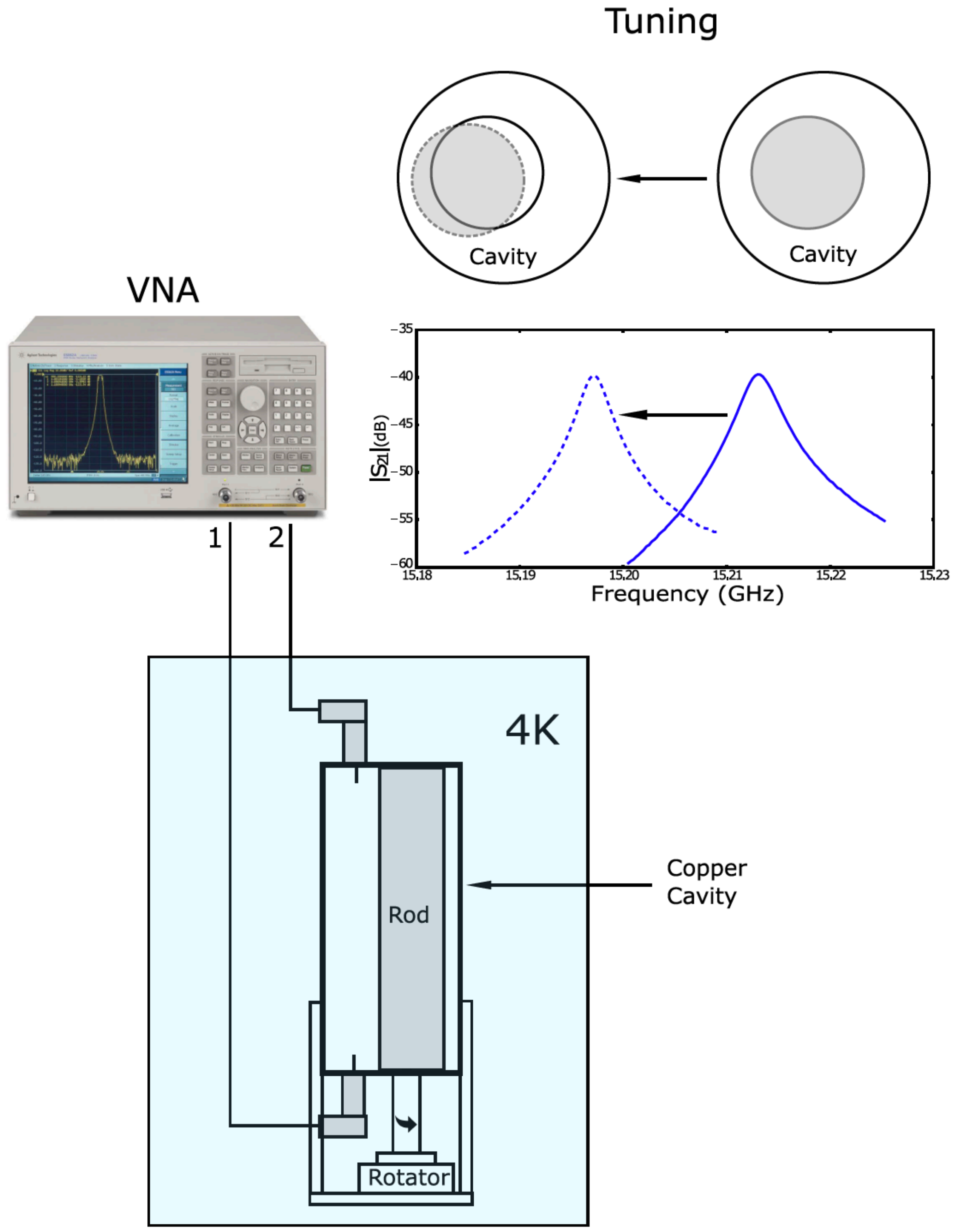

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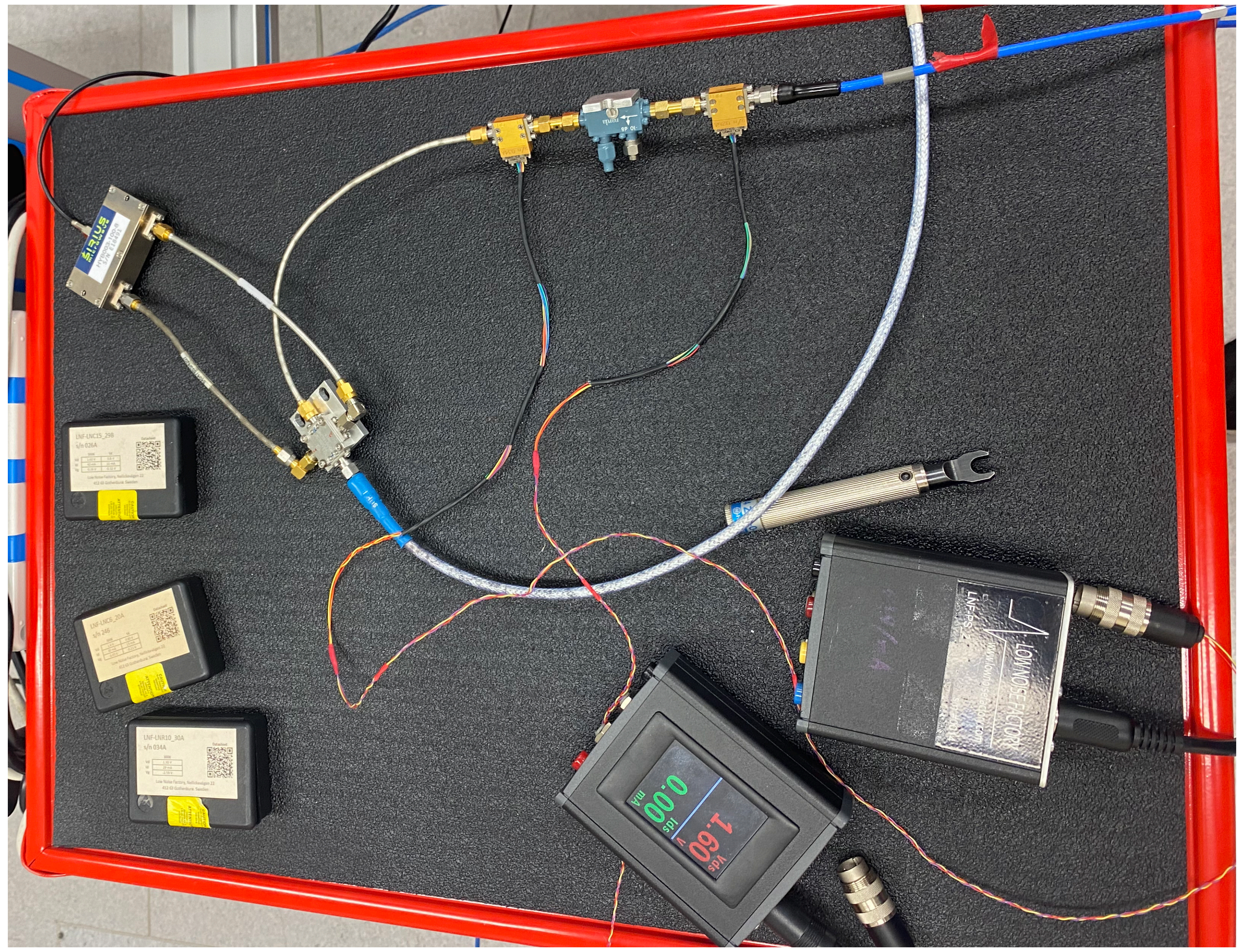

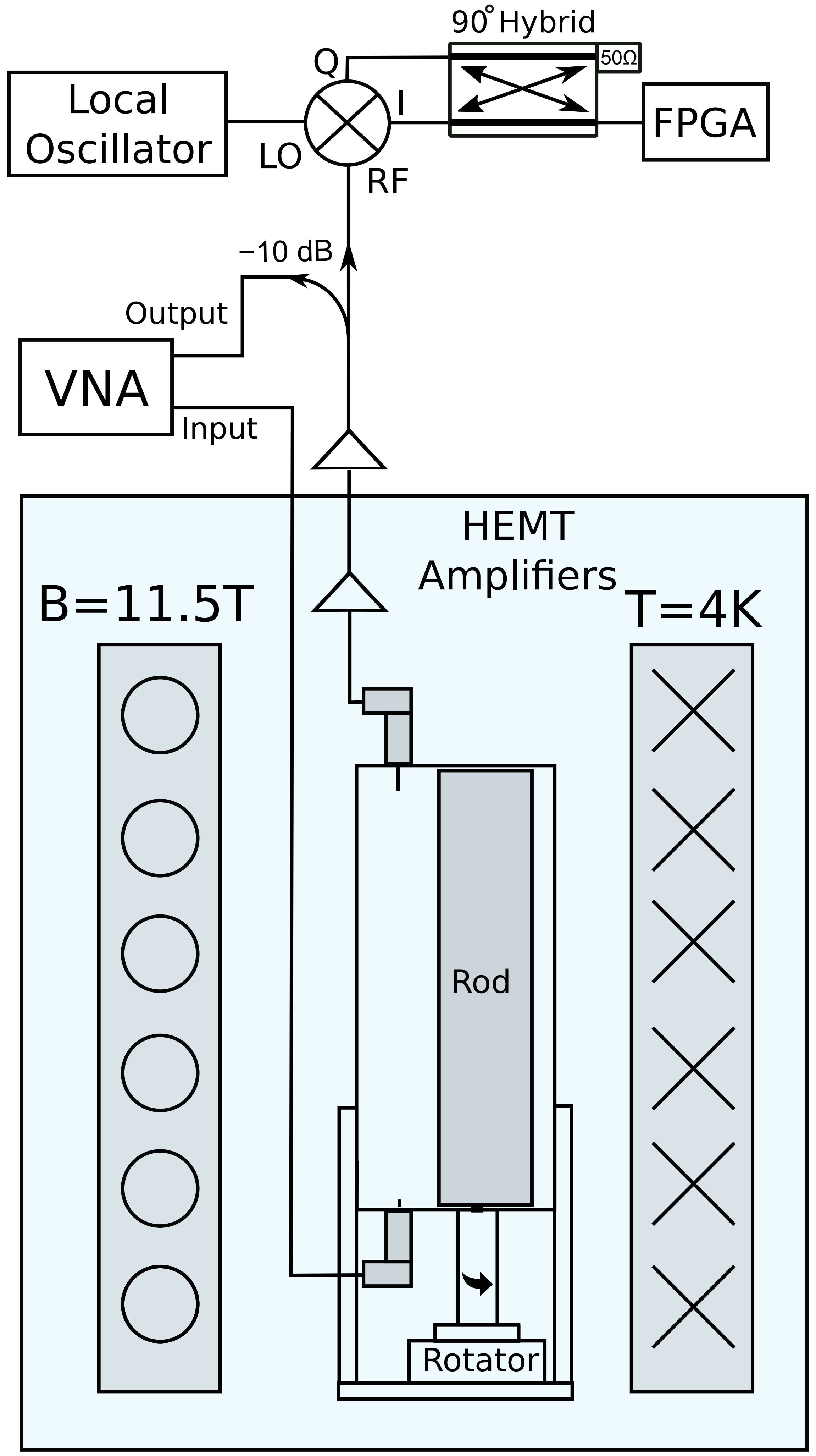

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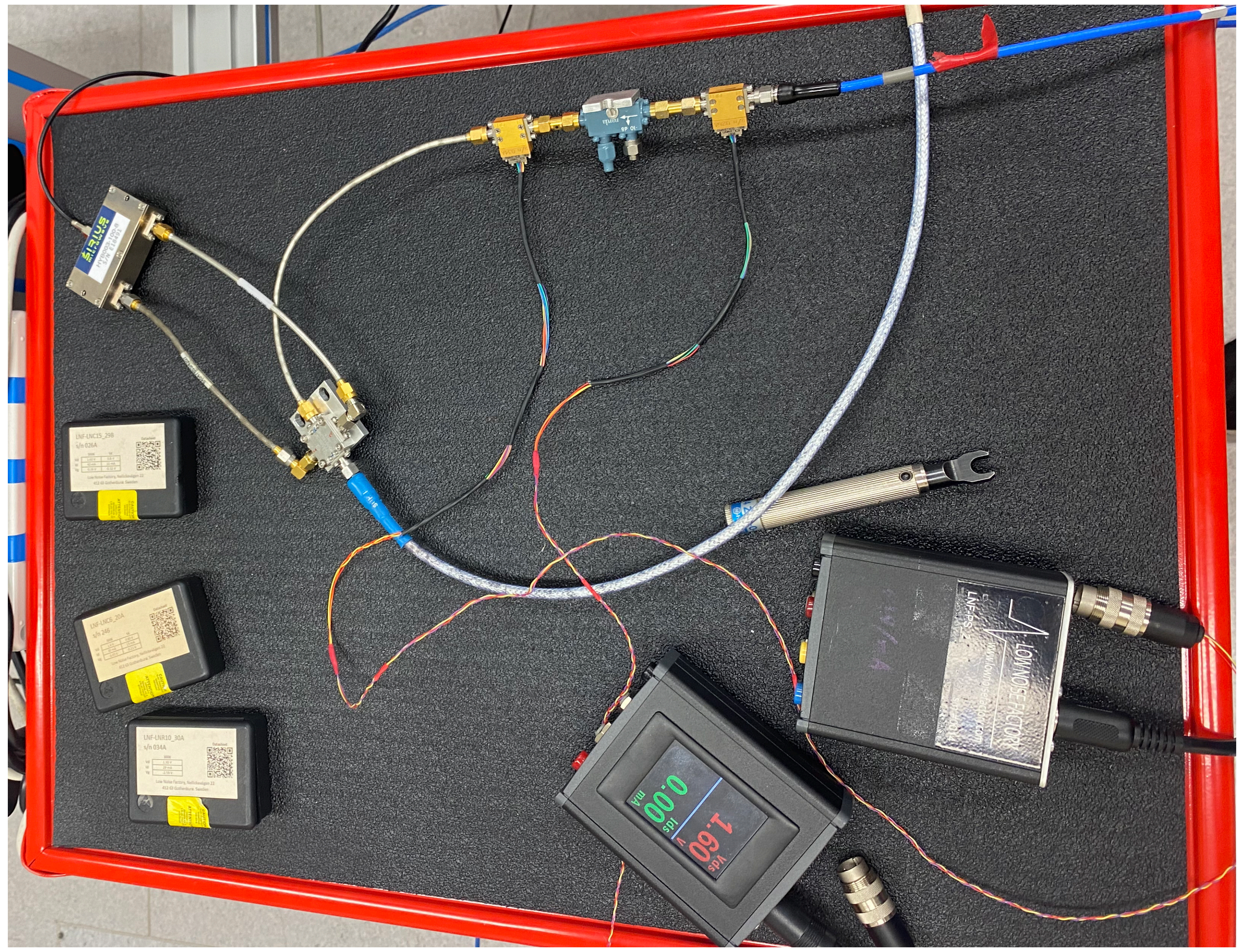

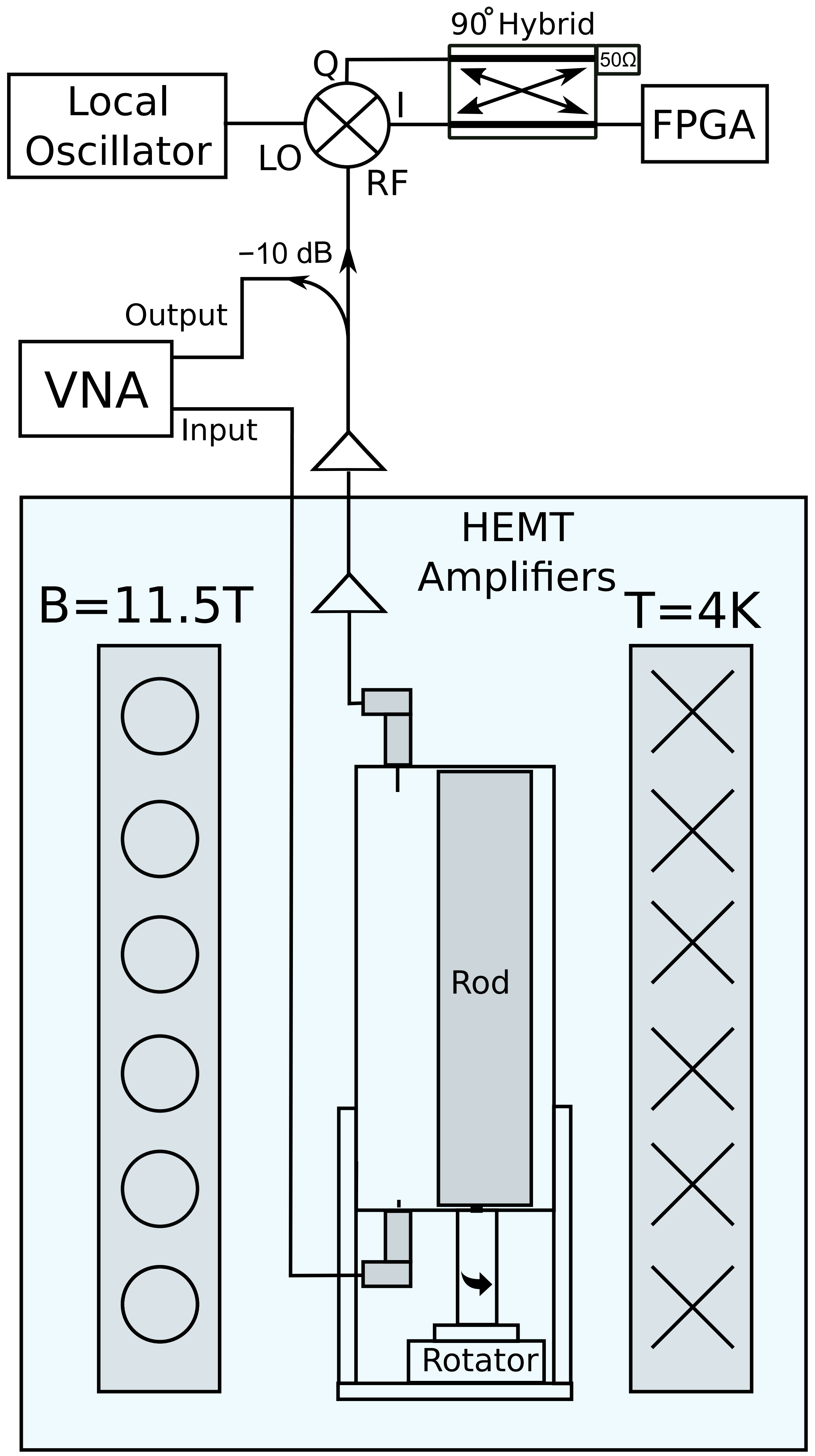

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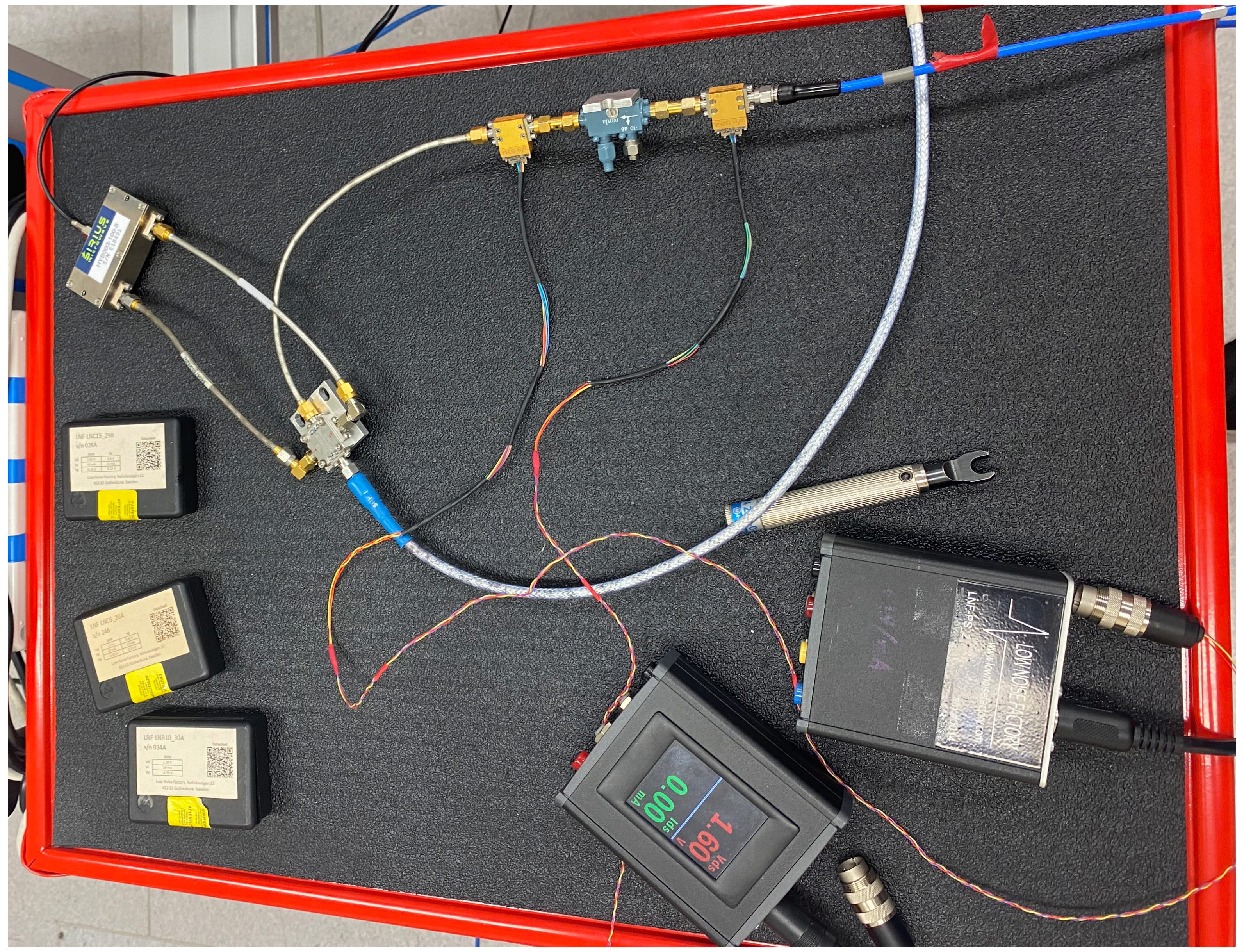

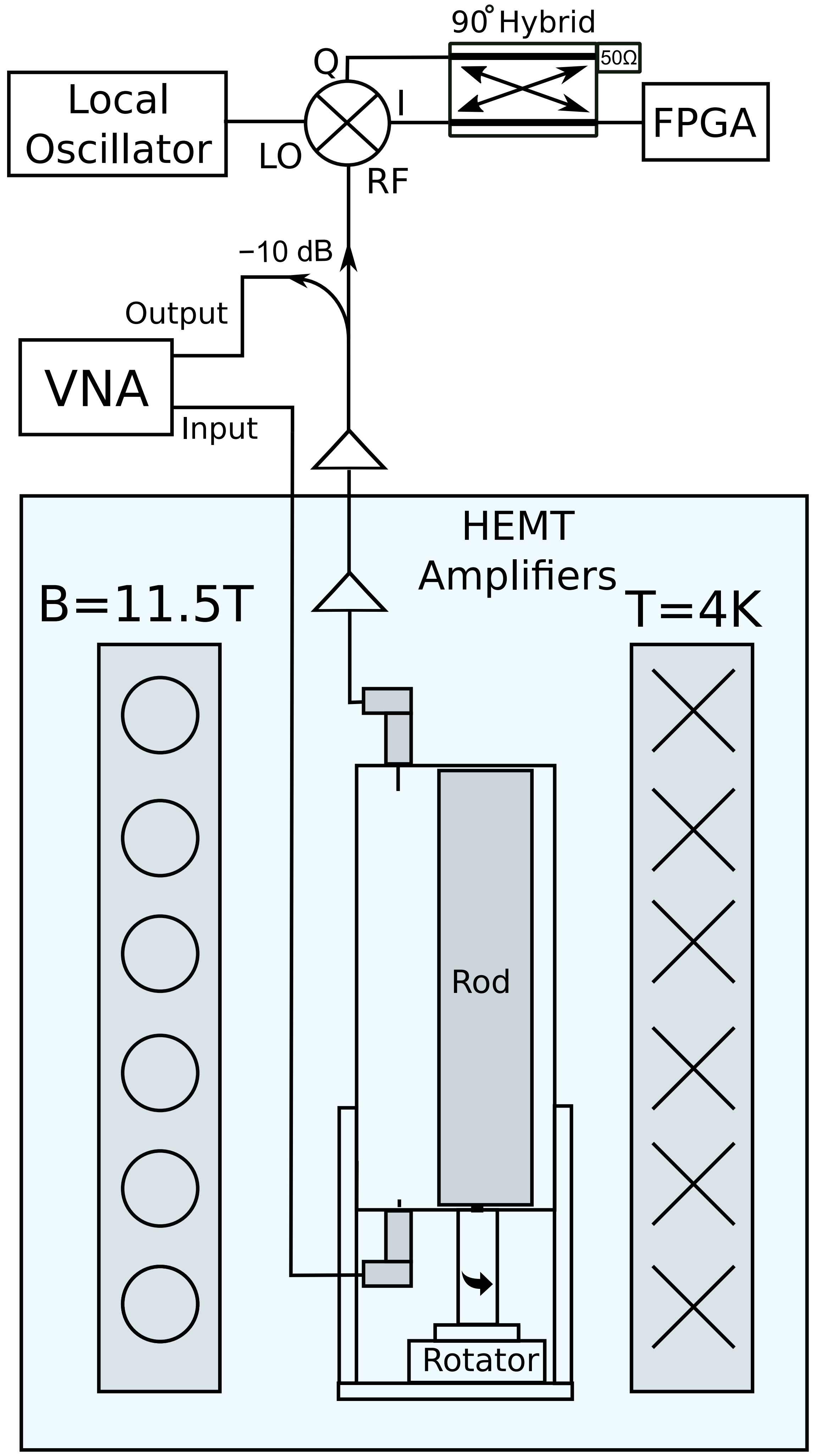

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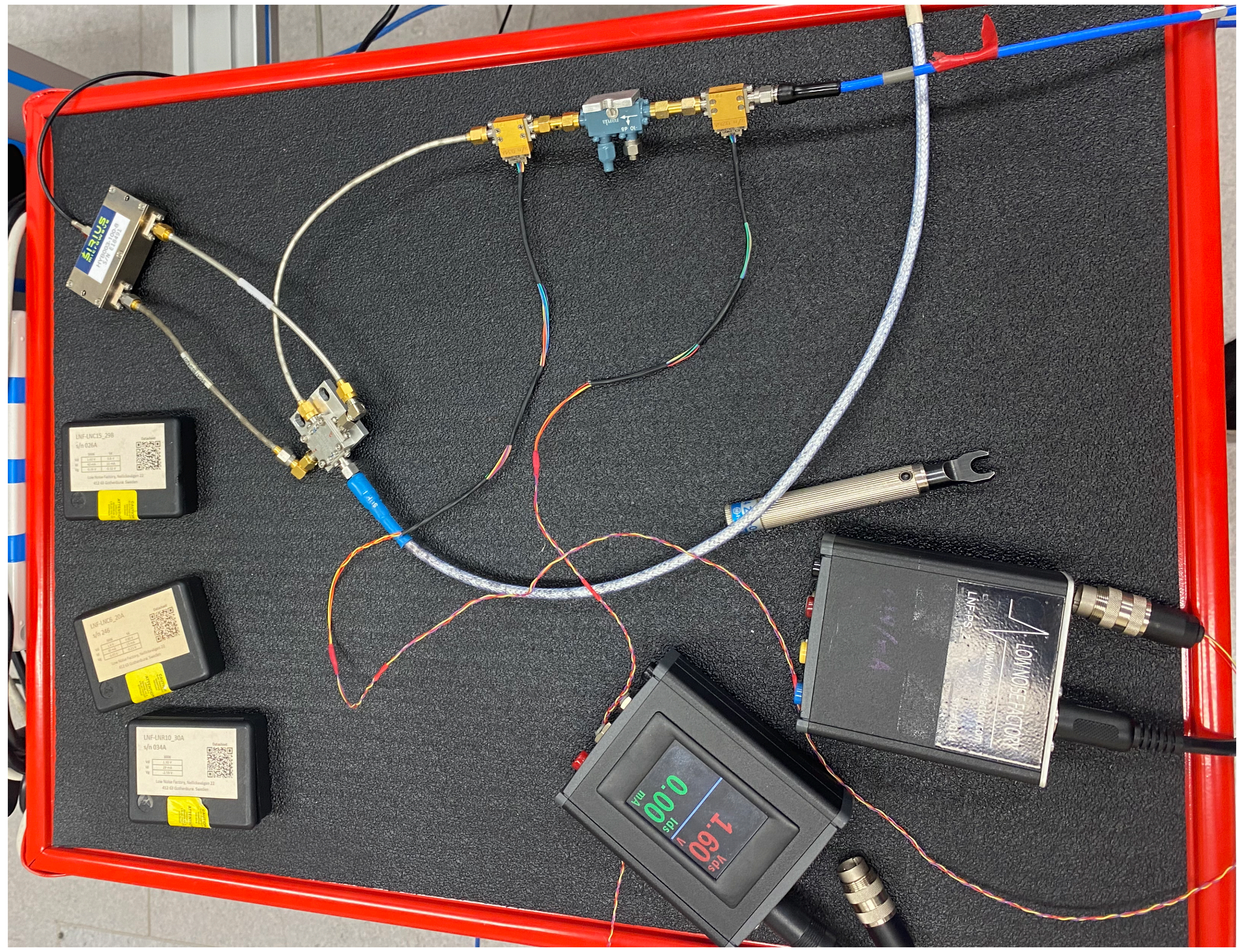
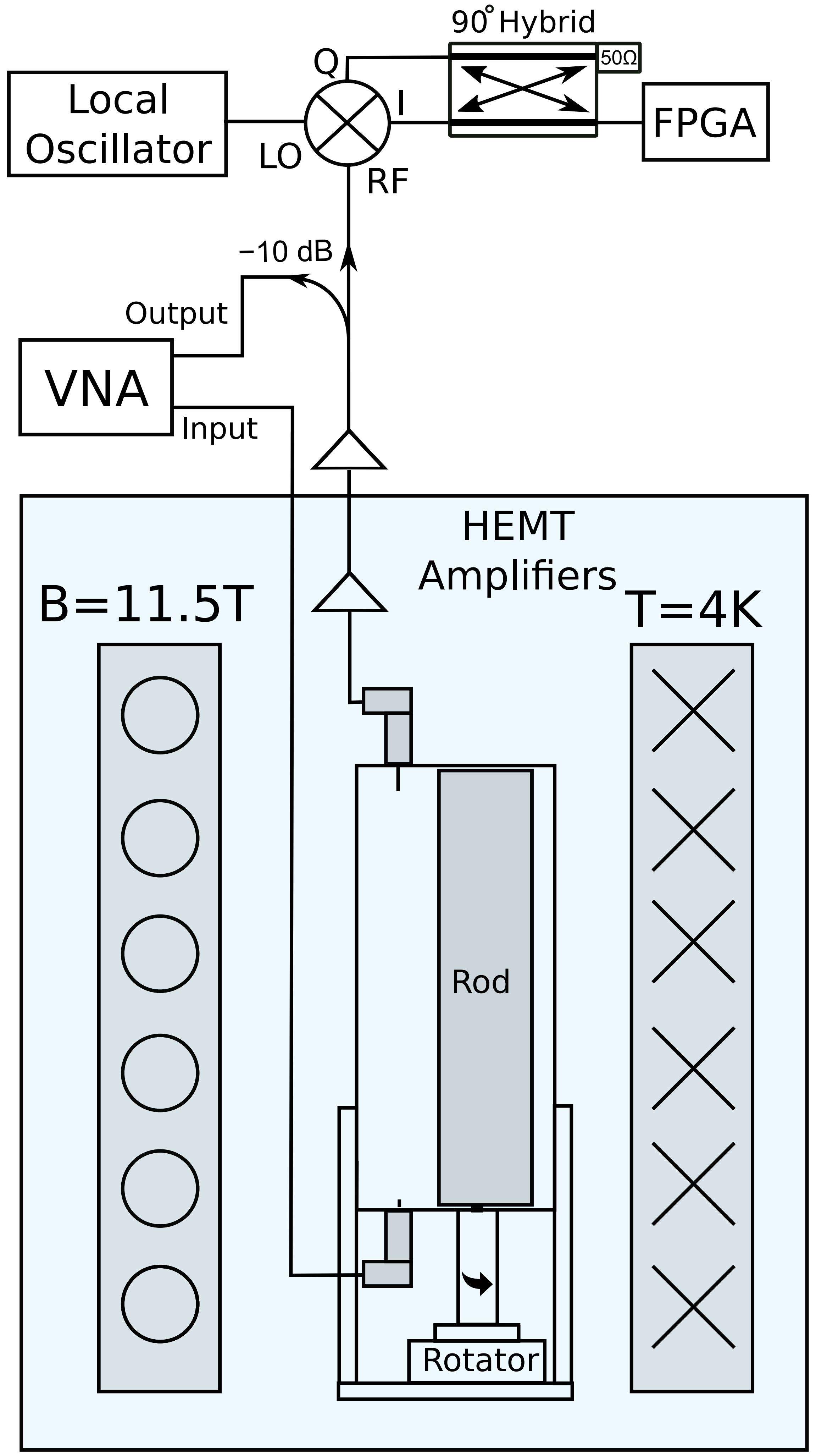


Step motor



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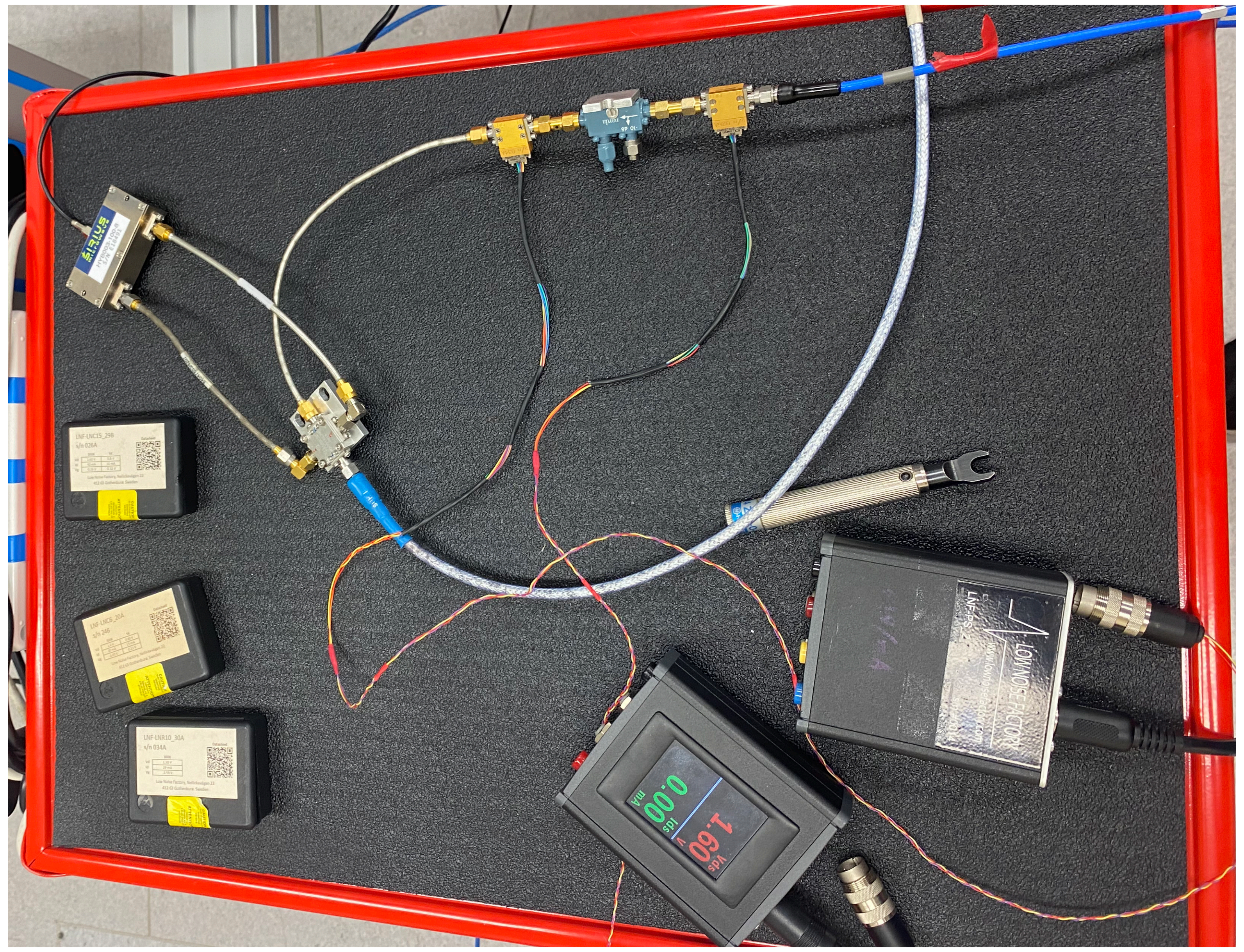
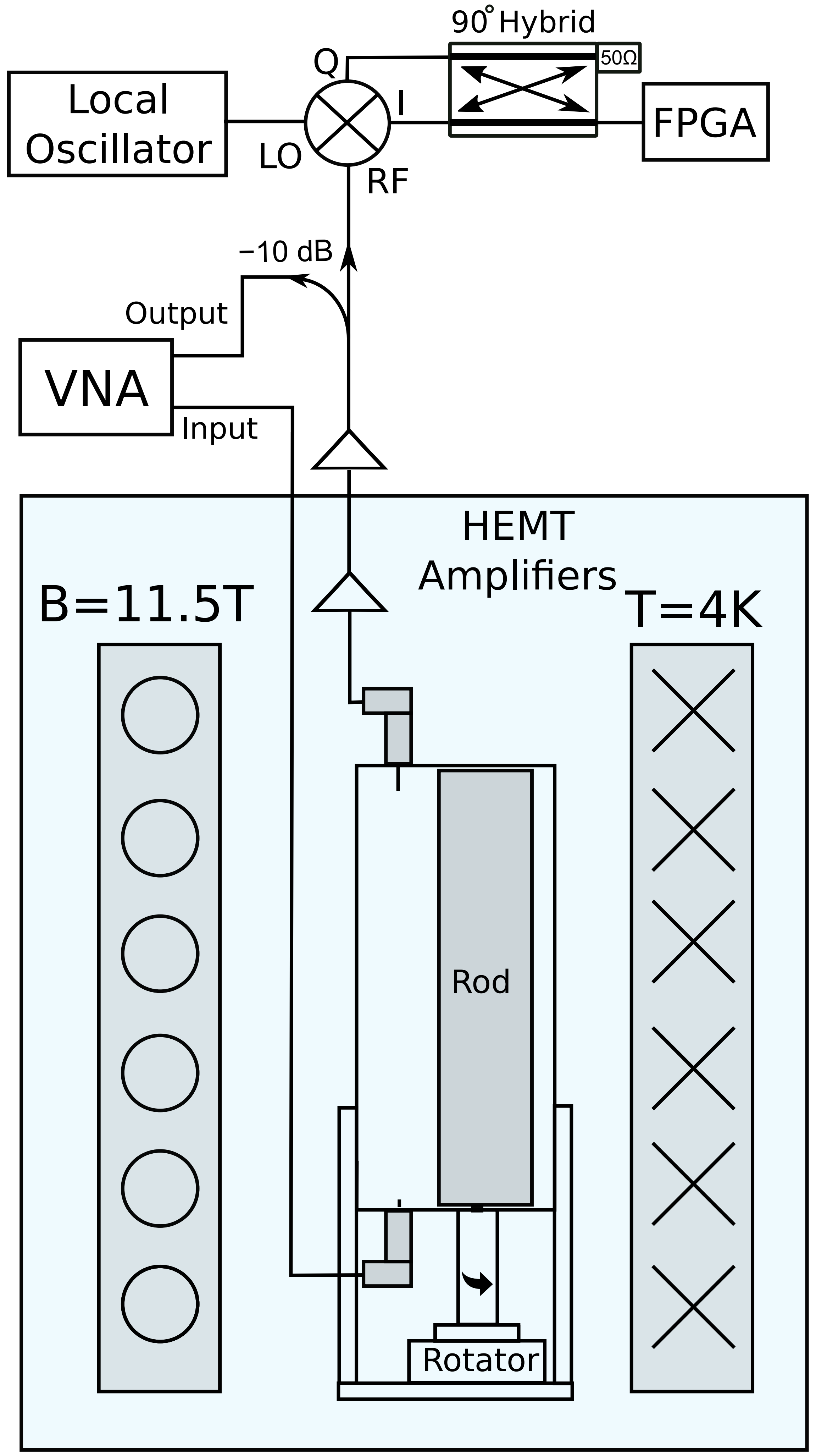


Step motor

↓

Sweep VNA for Q and f_c



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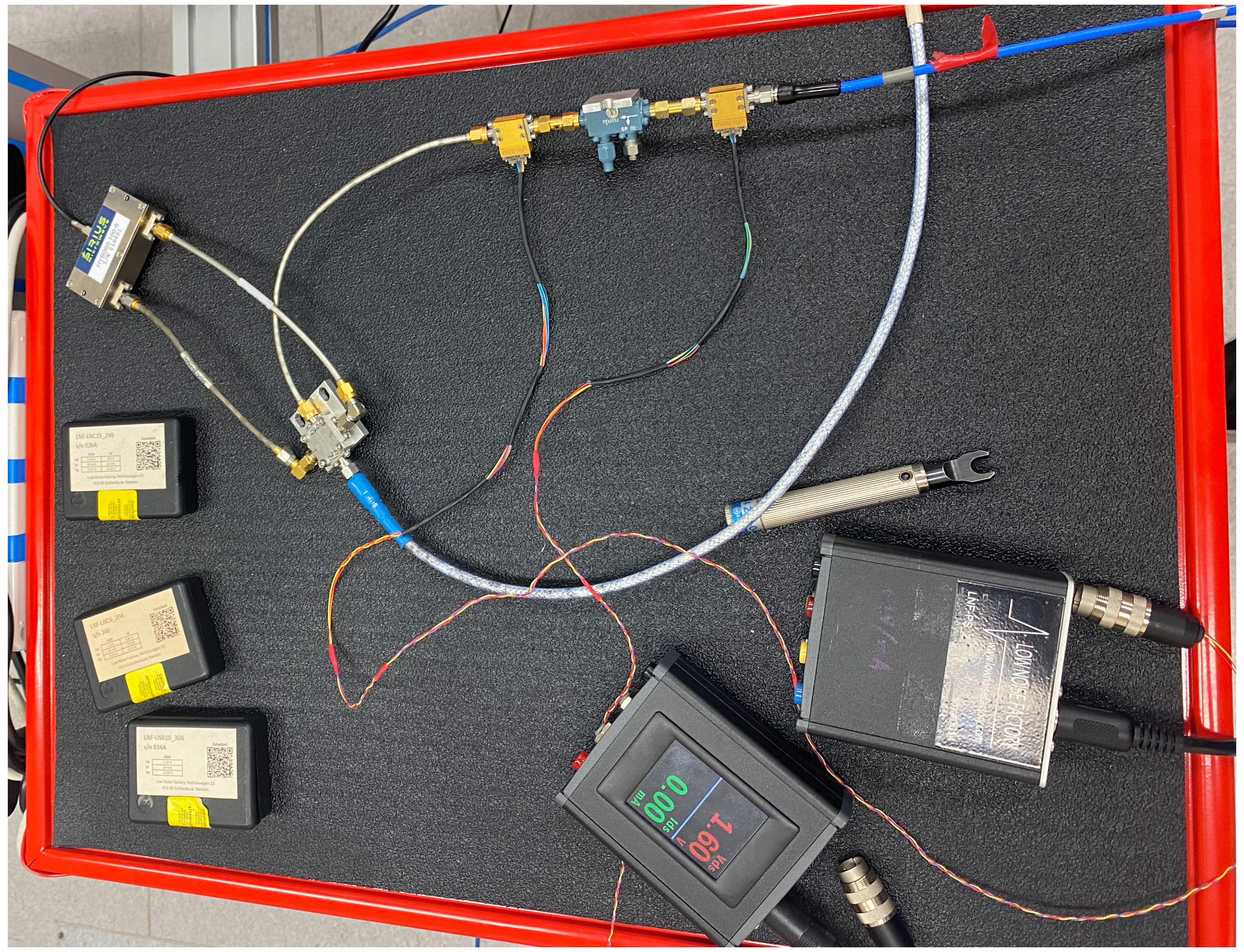

Step motor

↓

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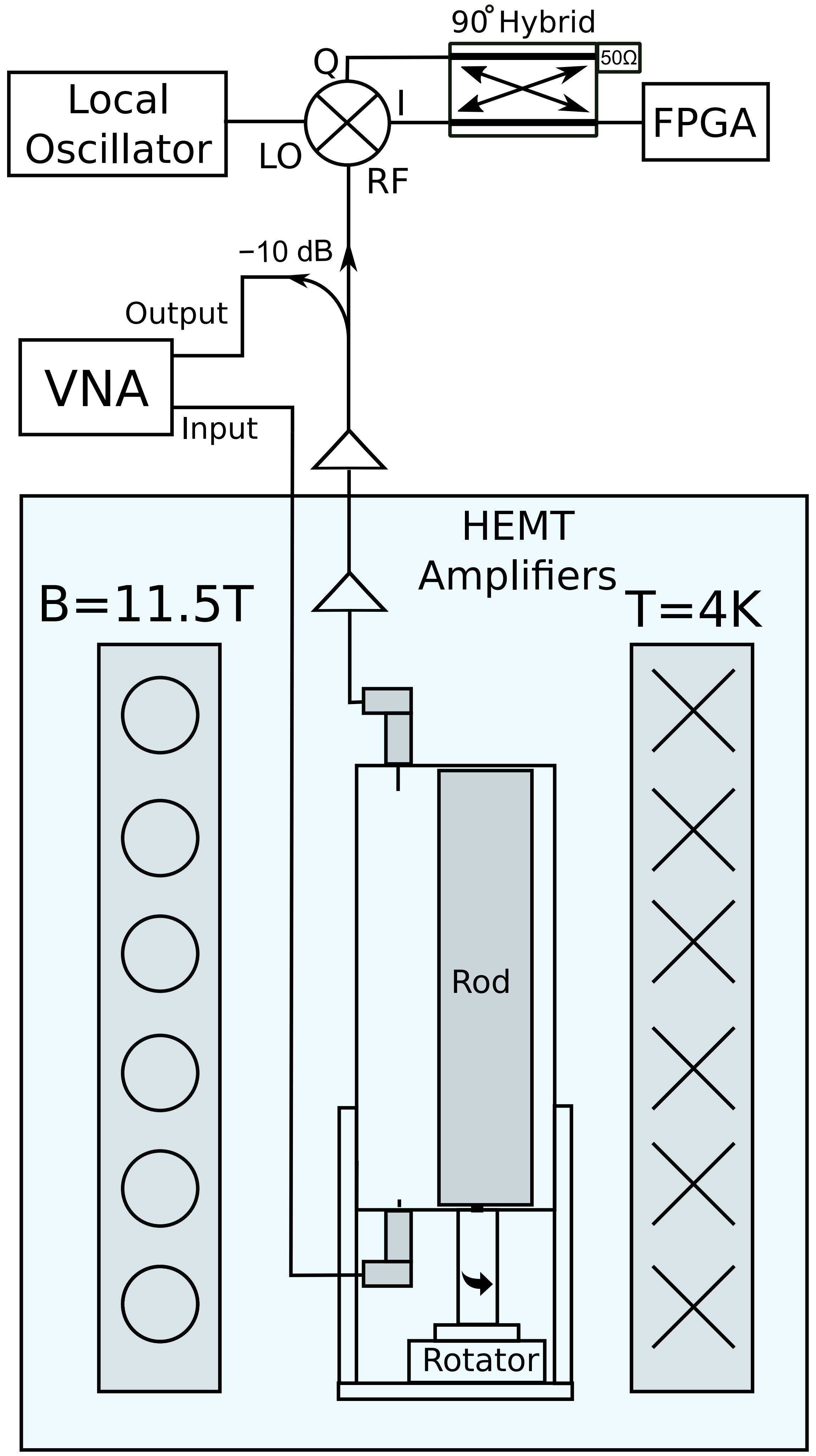
↓

Set demodulation frequency f_{LO}



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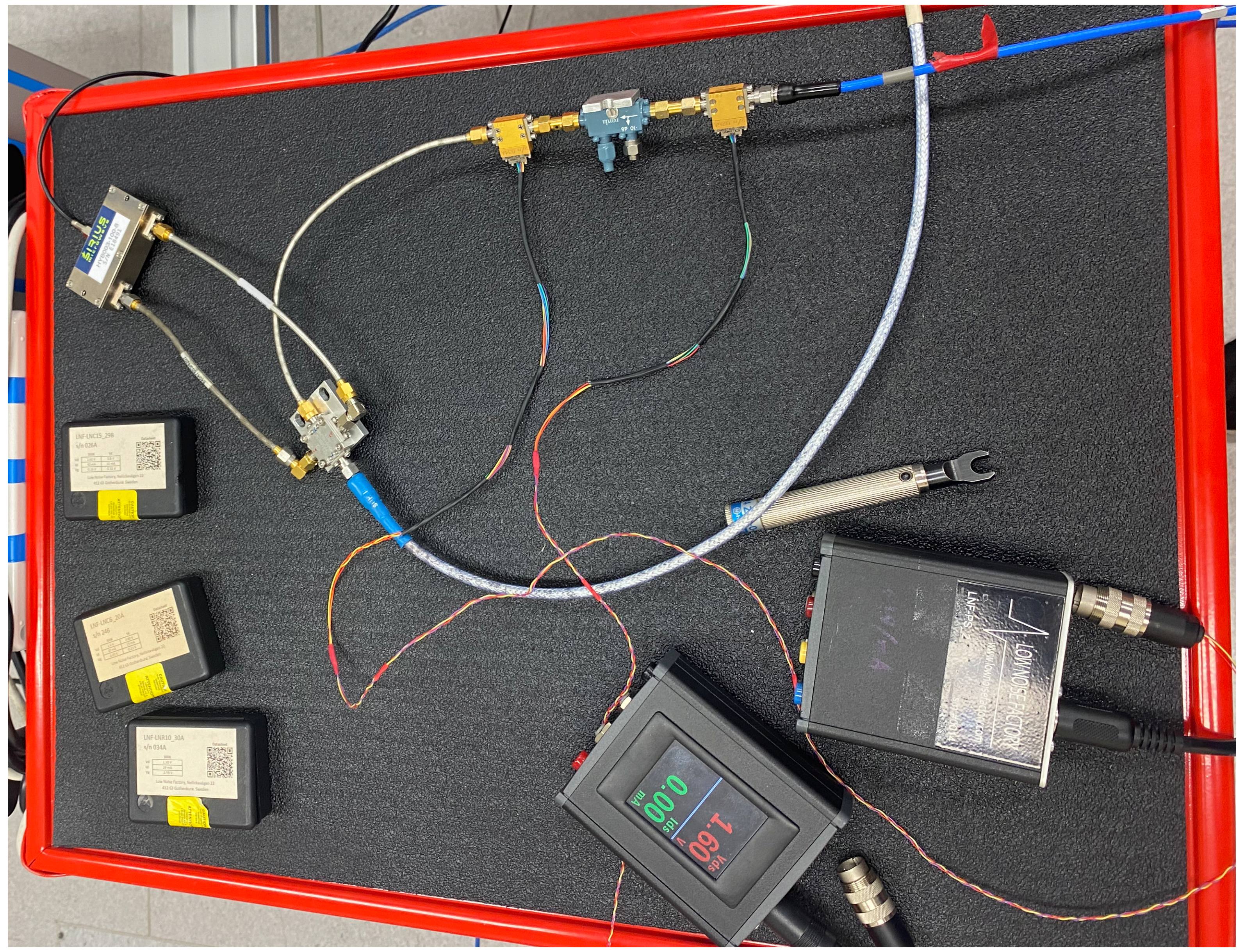
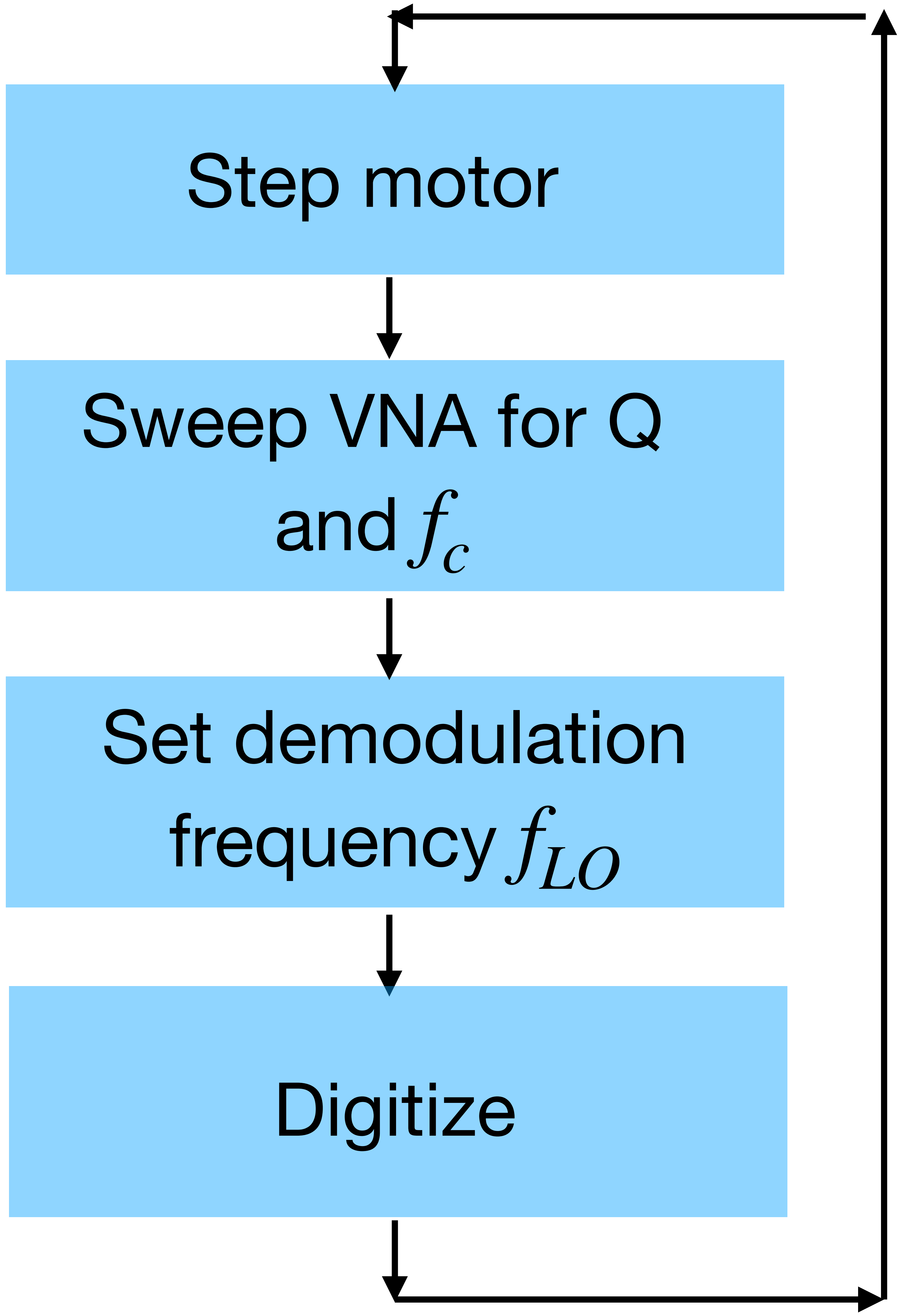
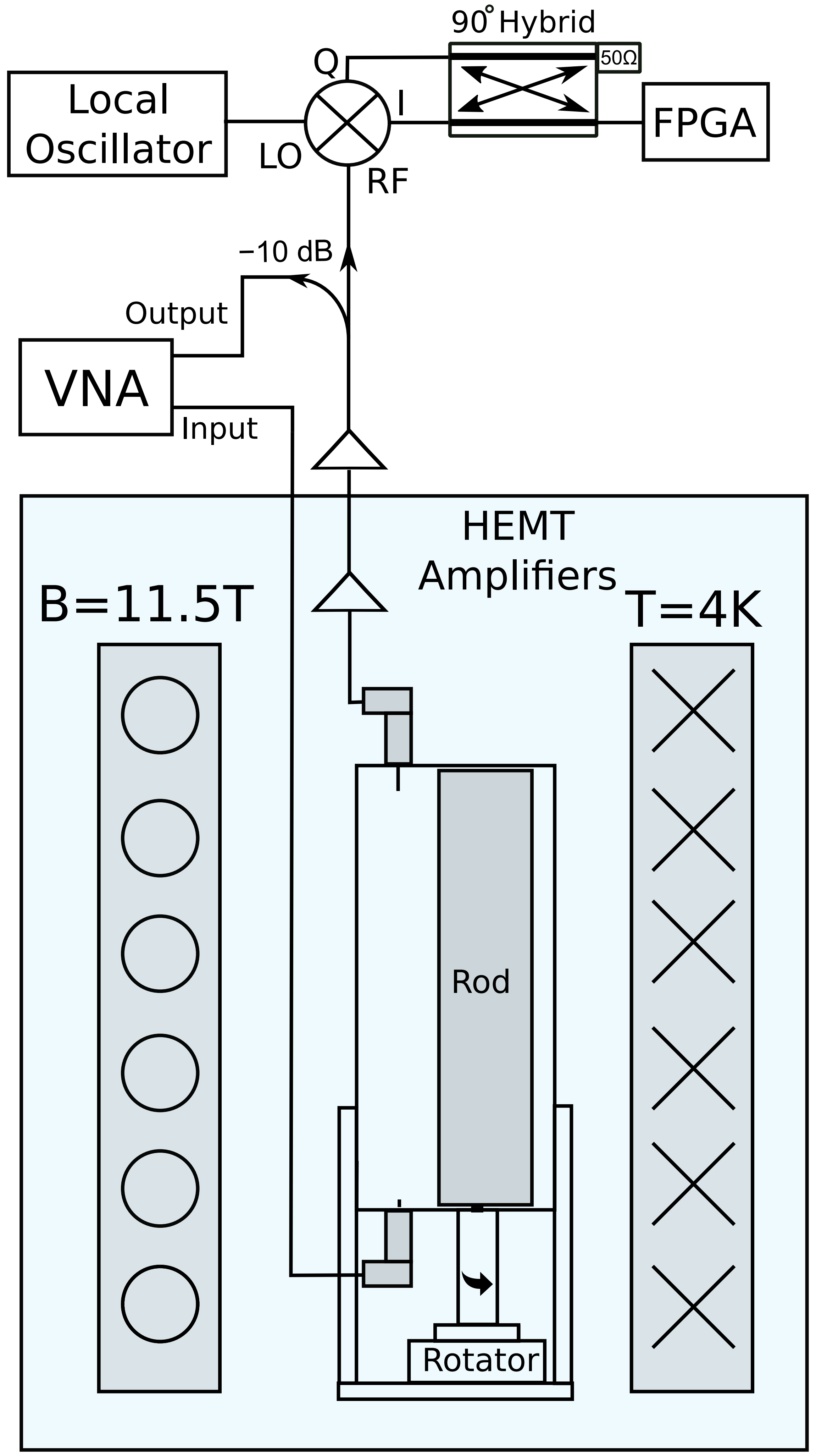
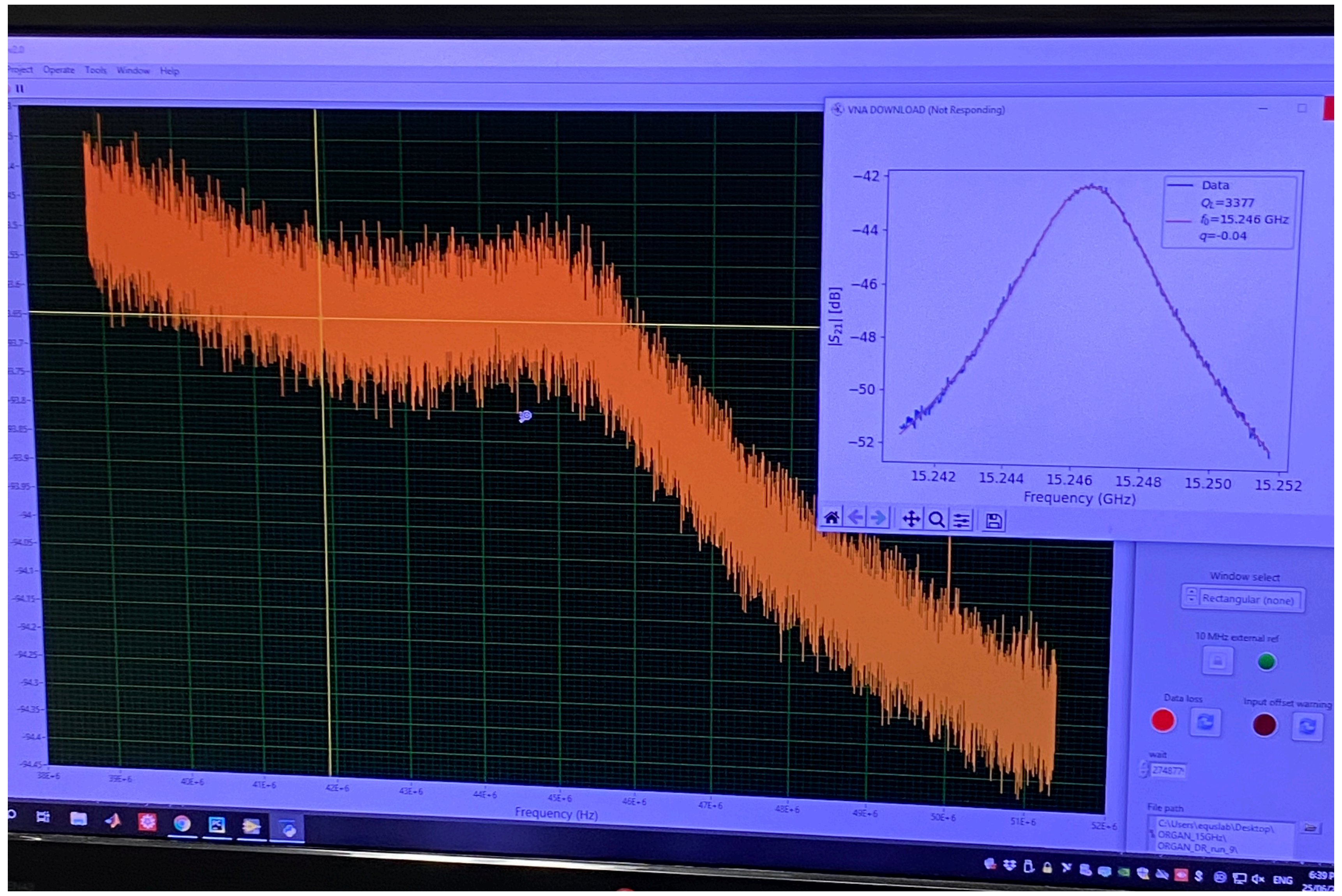






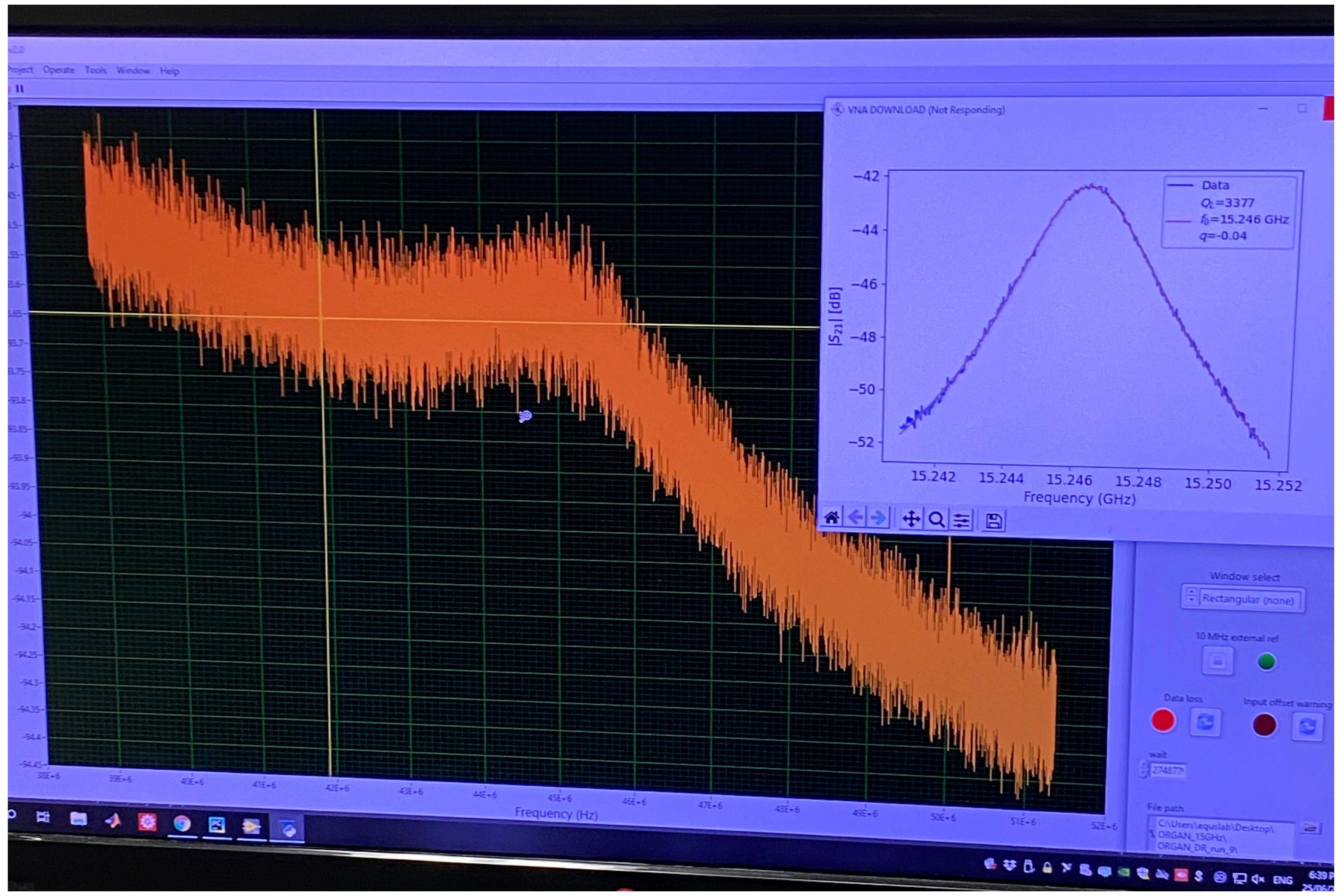
Data Taking



VNA DOWNLOAD (Not Responding)
Data
Q_L=3377
f_0=15.246 GHz
q=-0.04
$|S_{21}|$ [dB]
Frequency (GHz)
Frequency (Hz)

Data Taking

- ~12.5 MHz span, 26,214 point FFT, $\Delta\nu_{bin} \approx 477$ Hz



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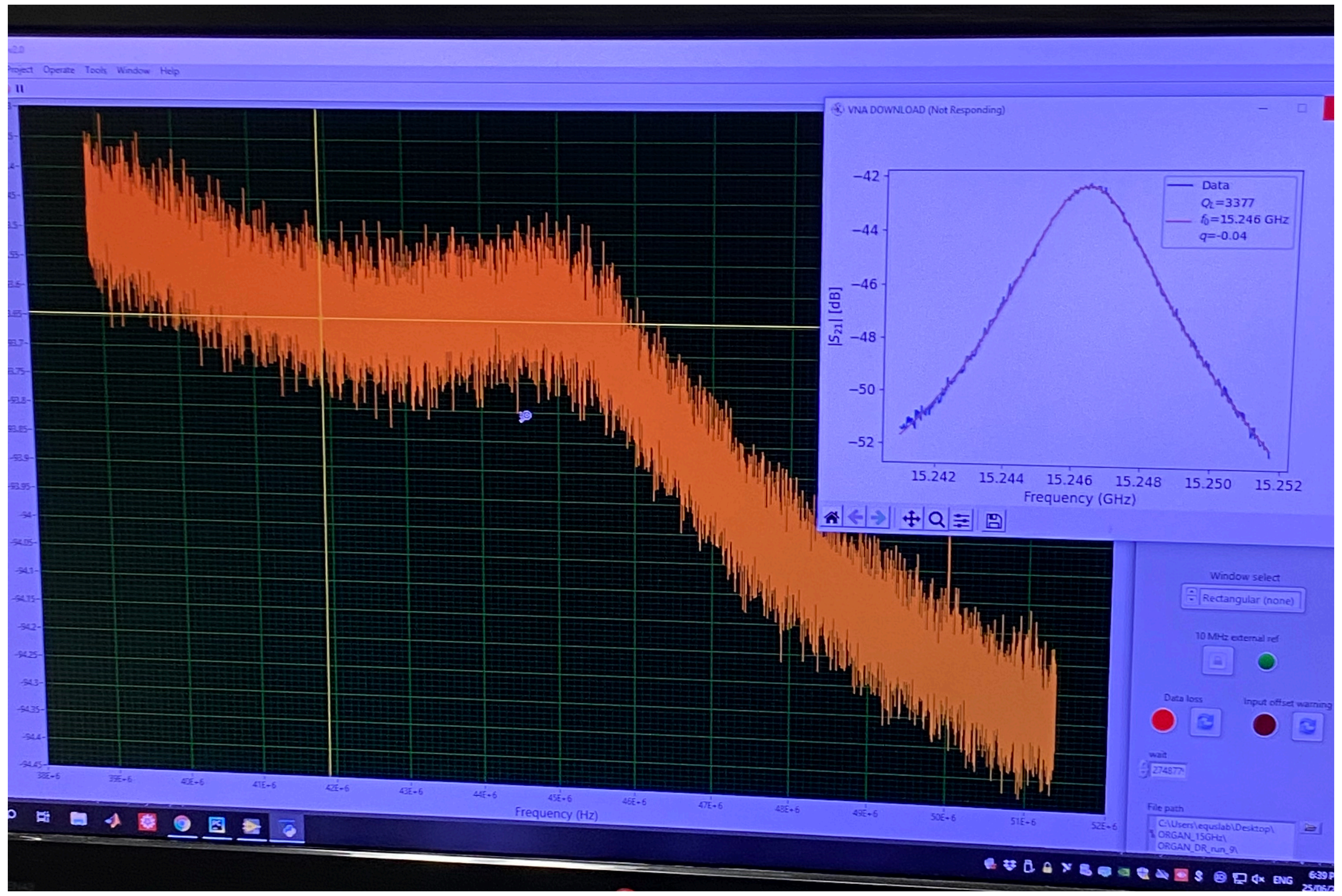

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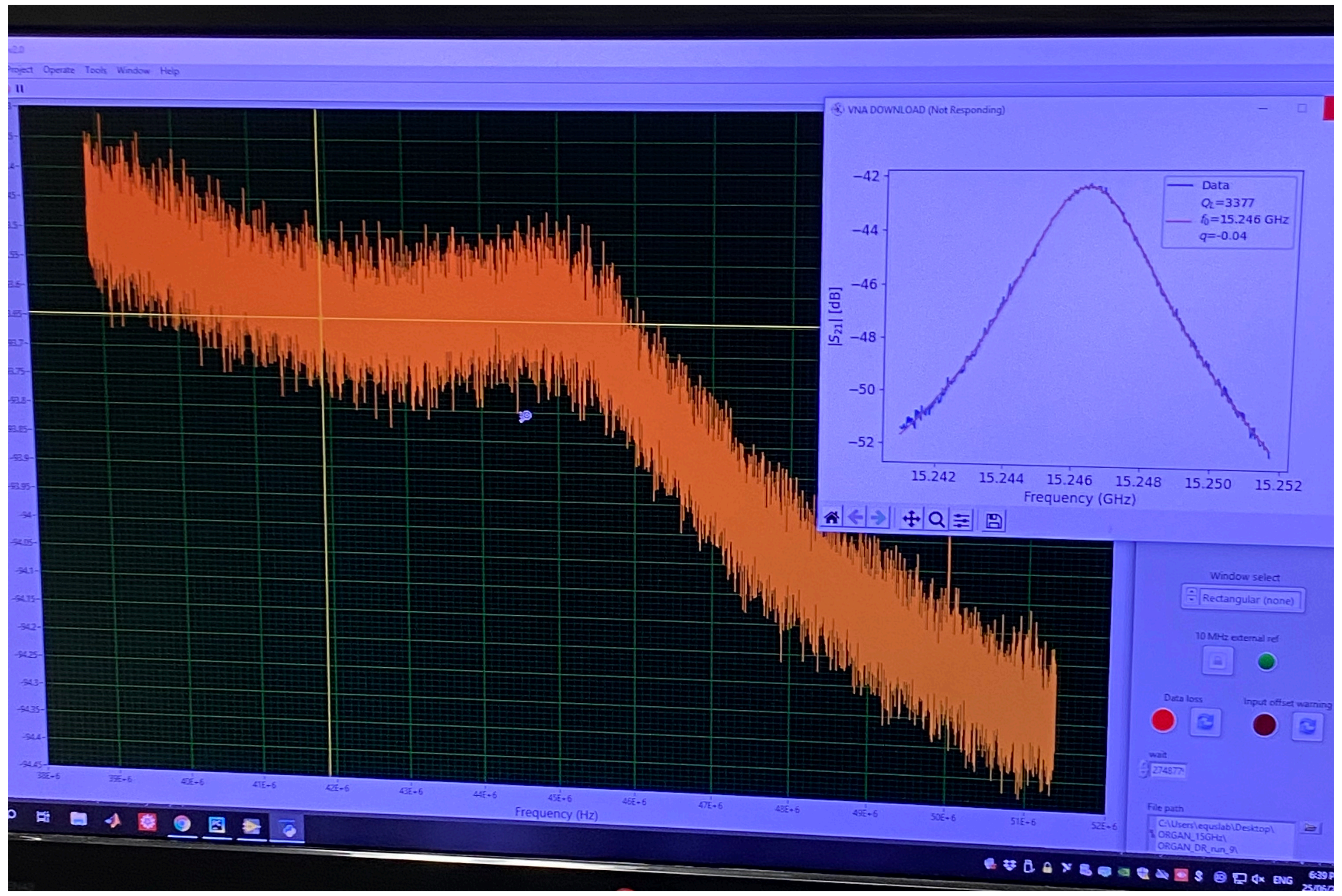

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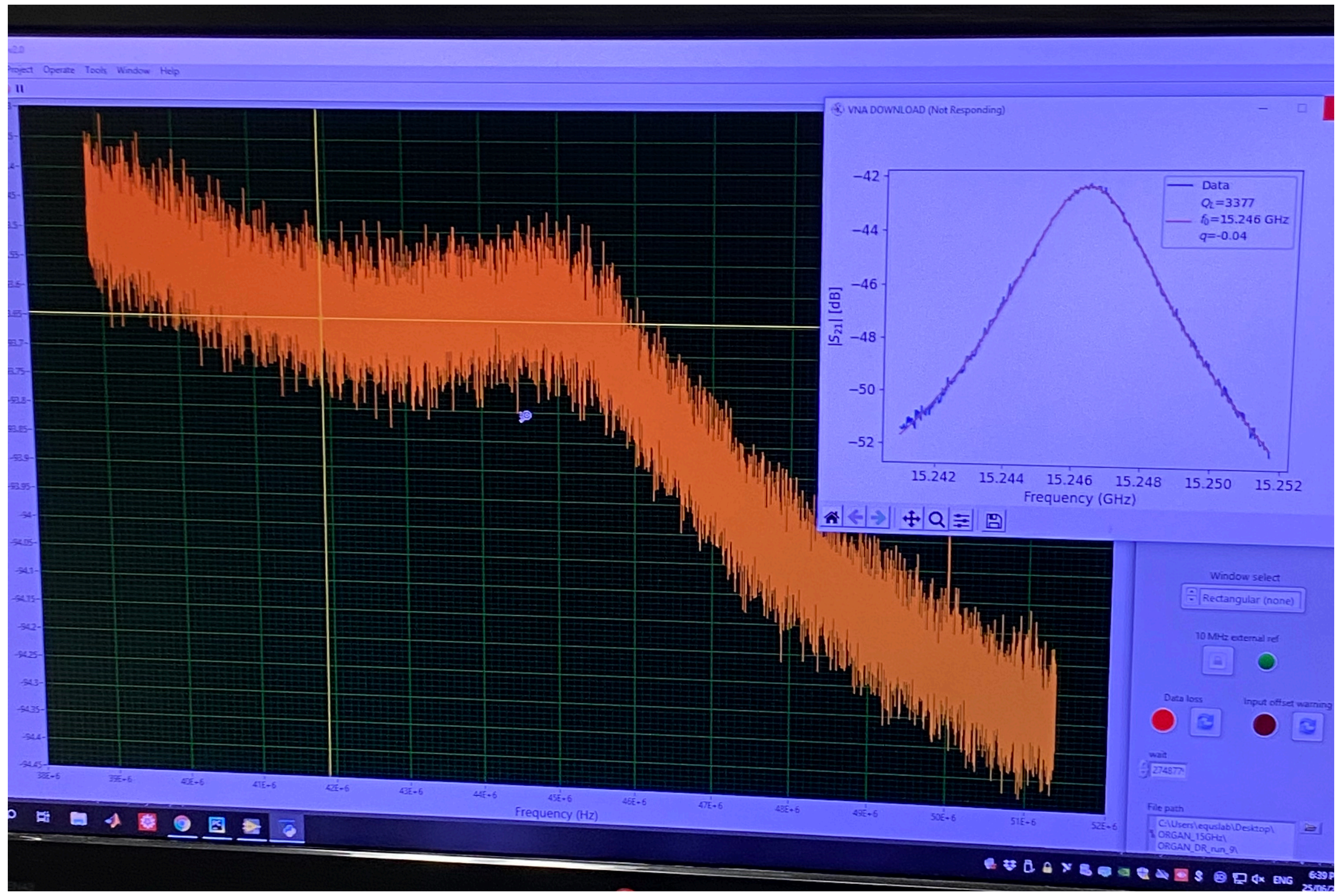

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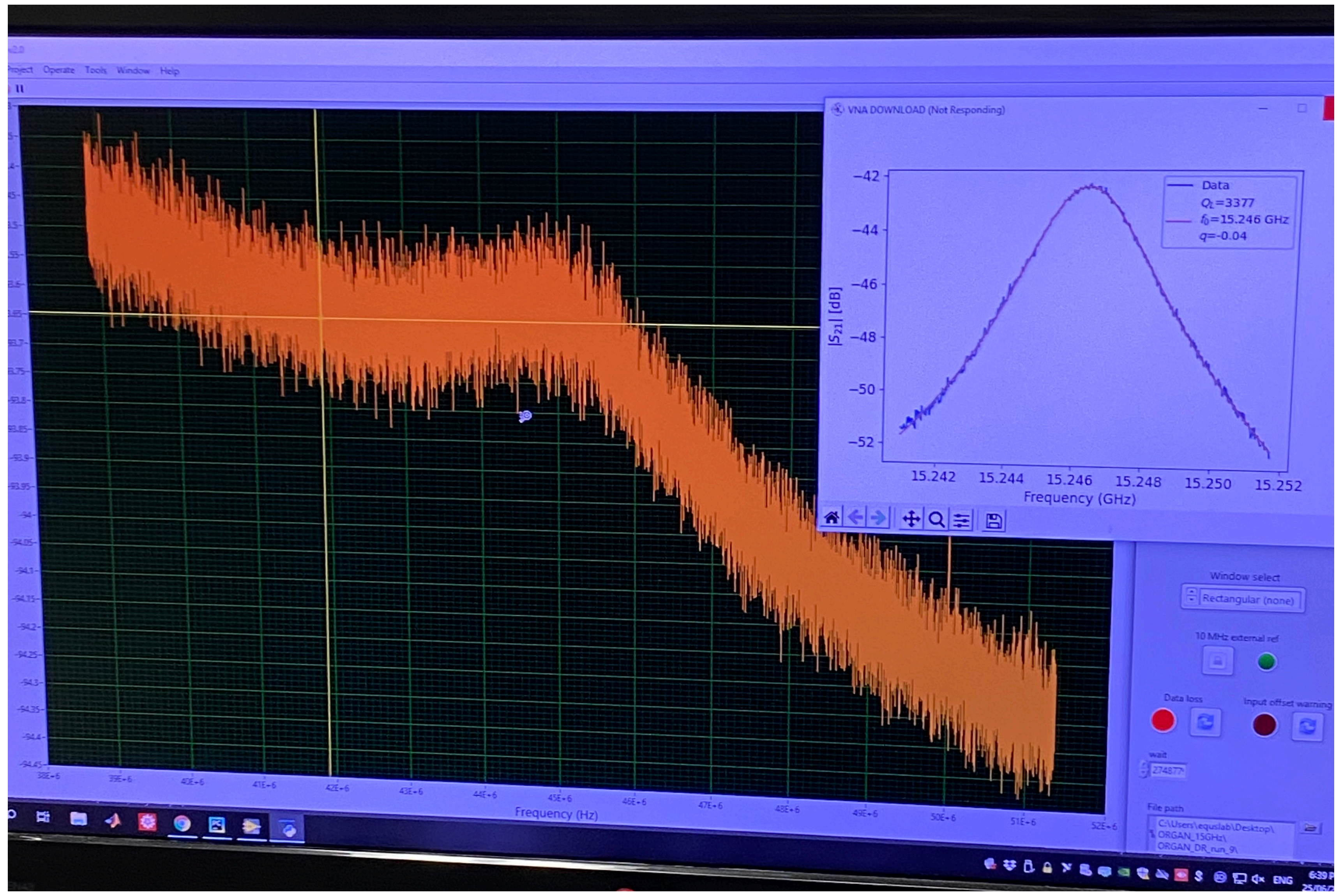

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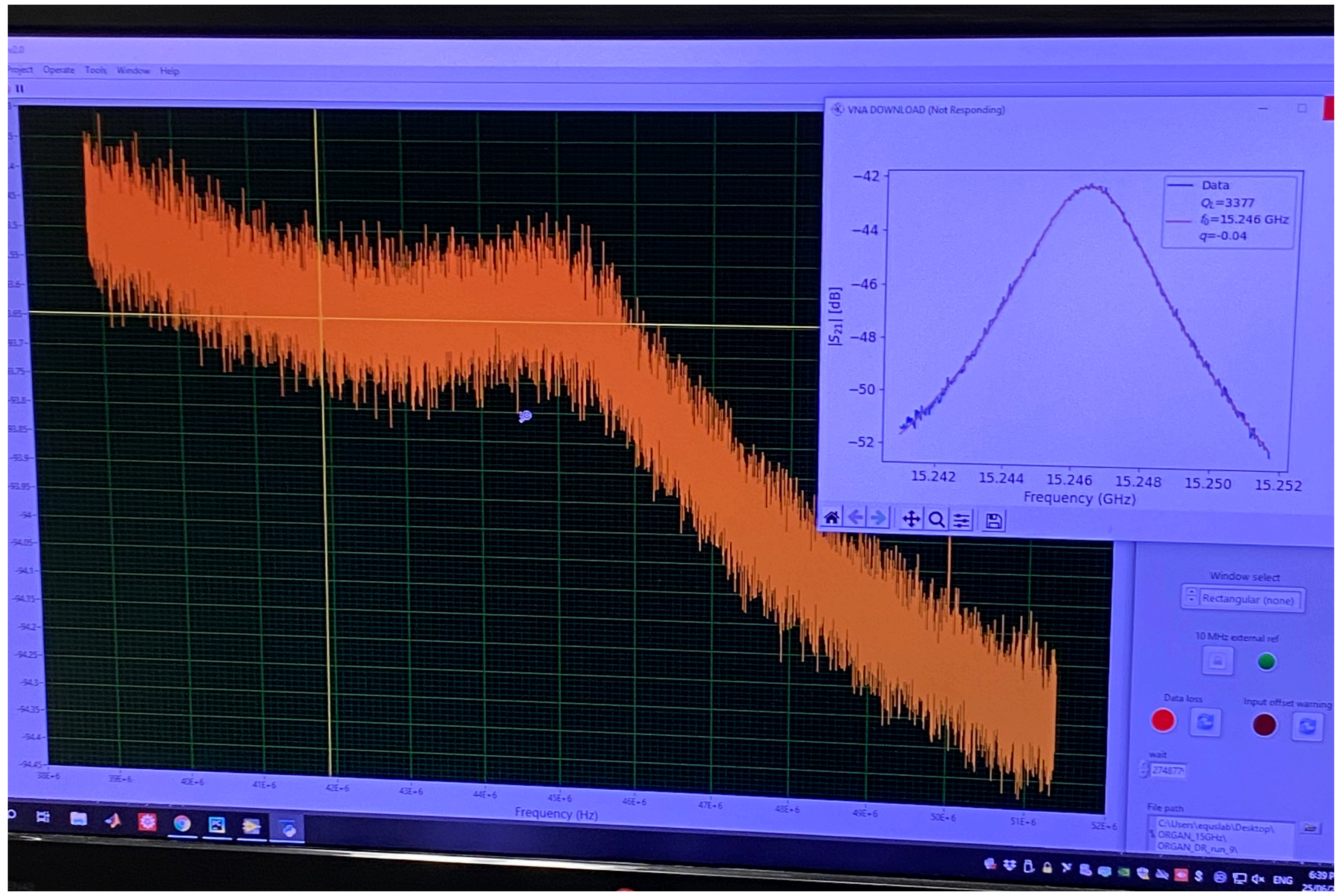

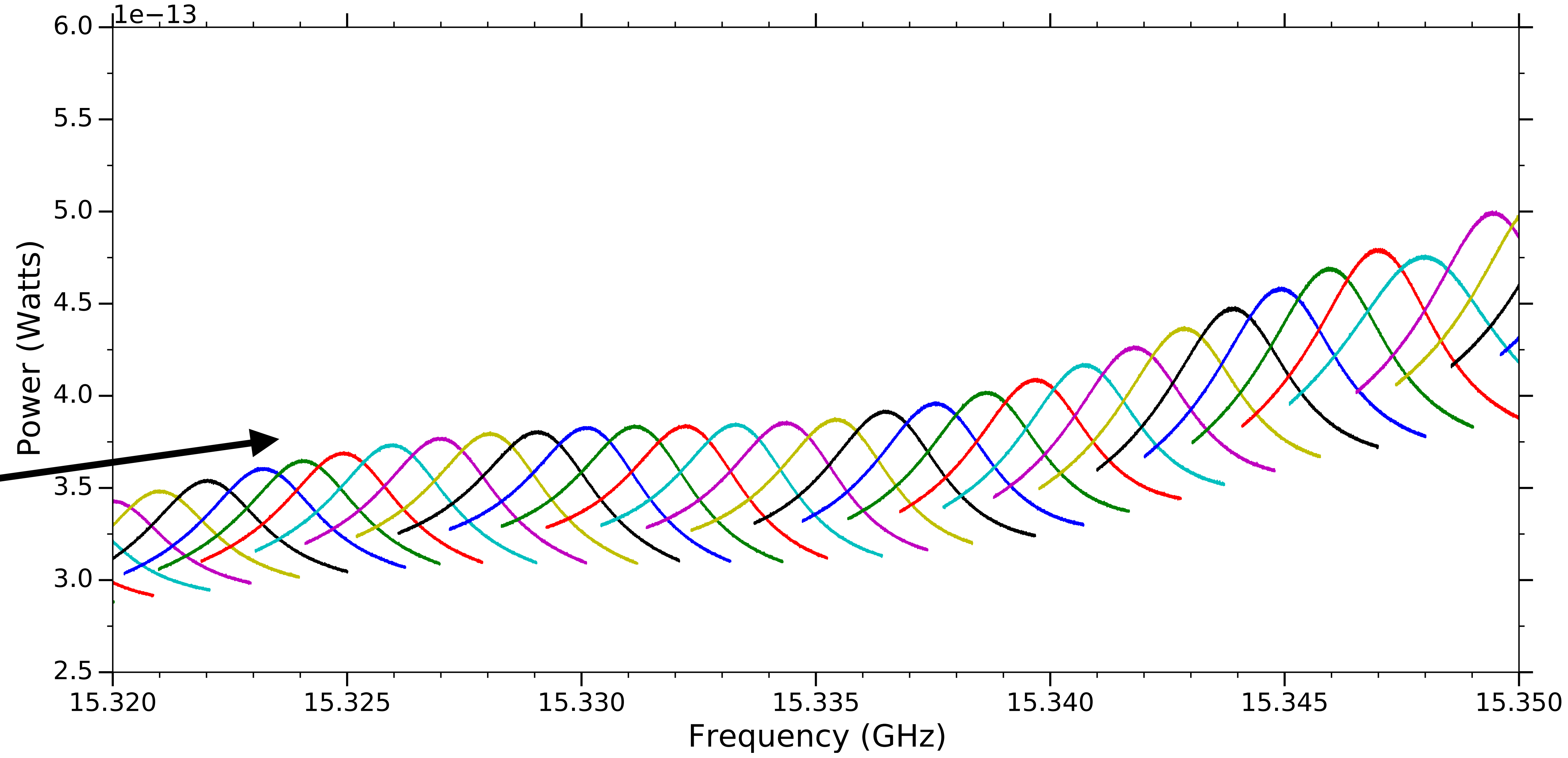

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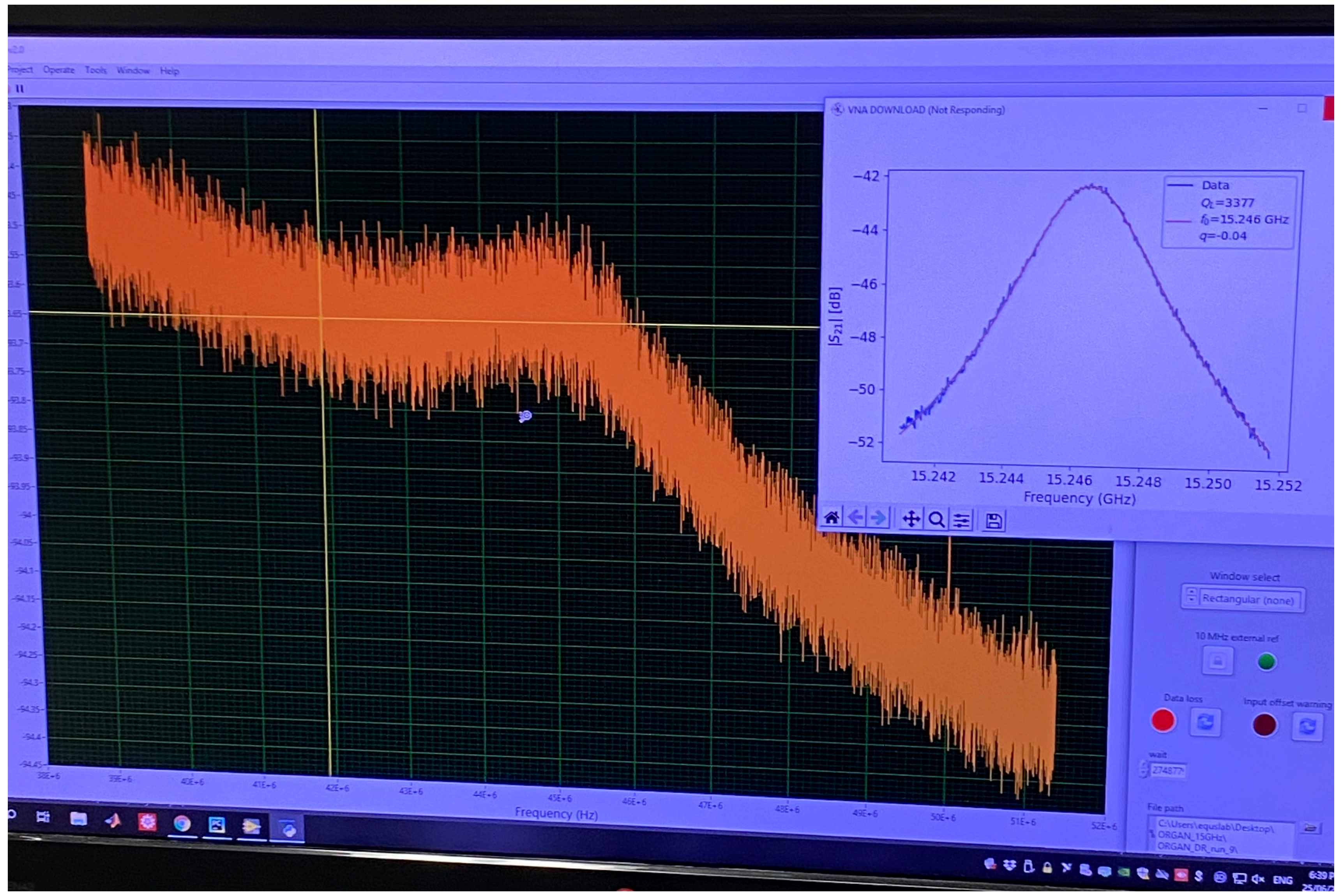

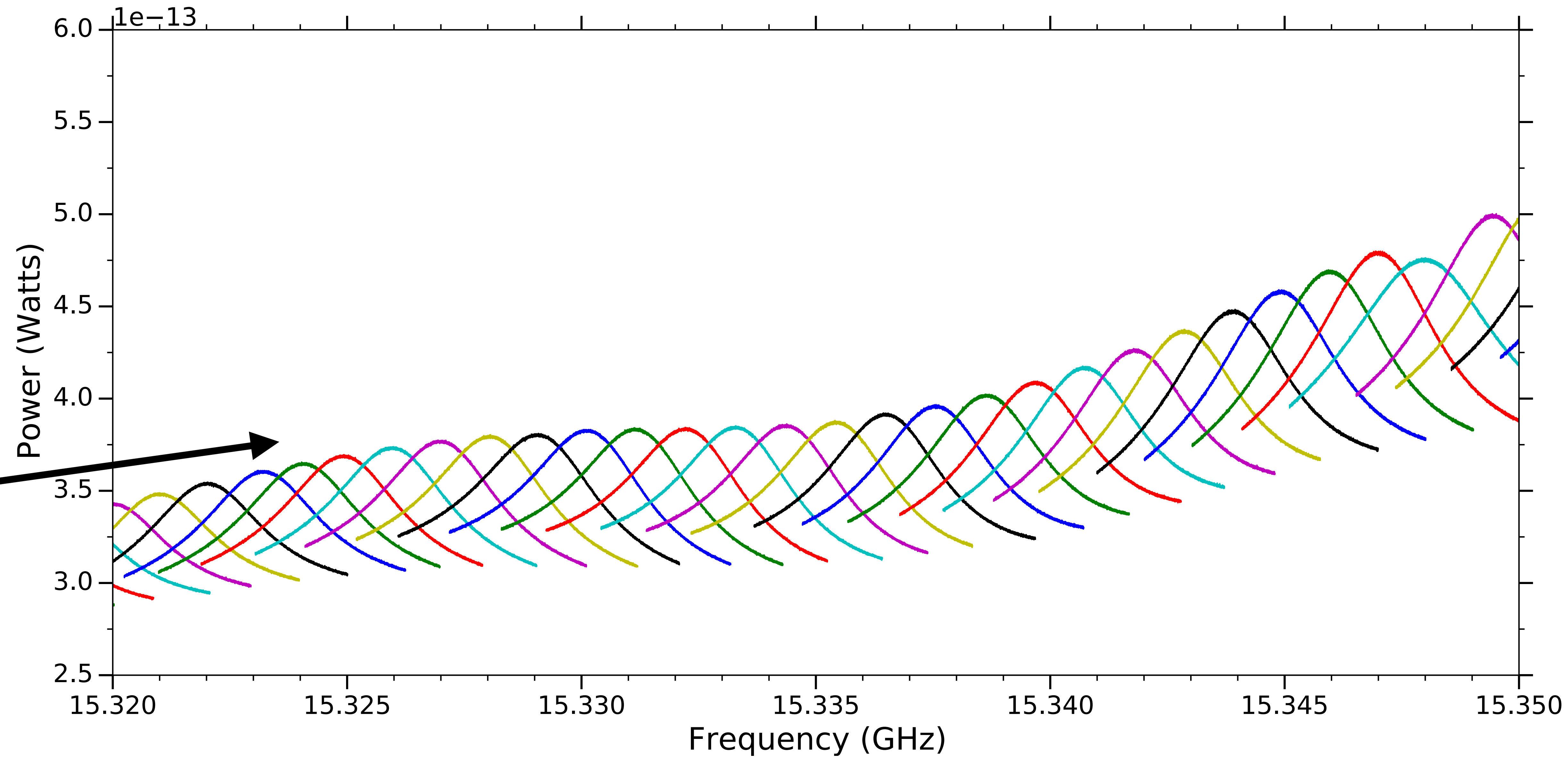

Savitzky-Golay Filter

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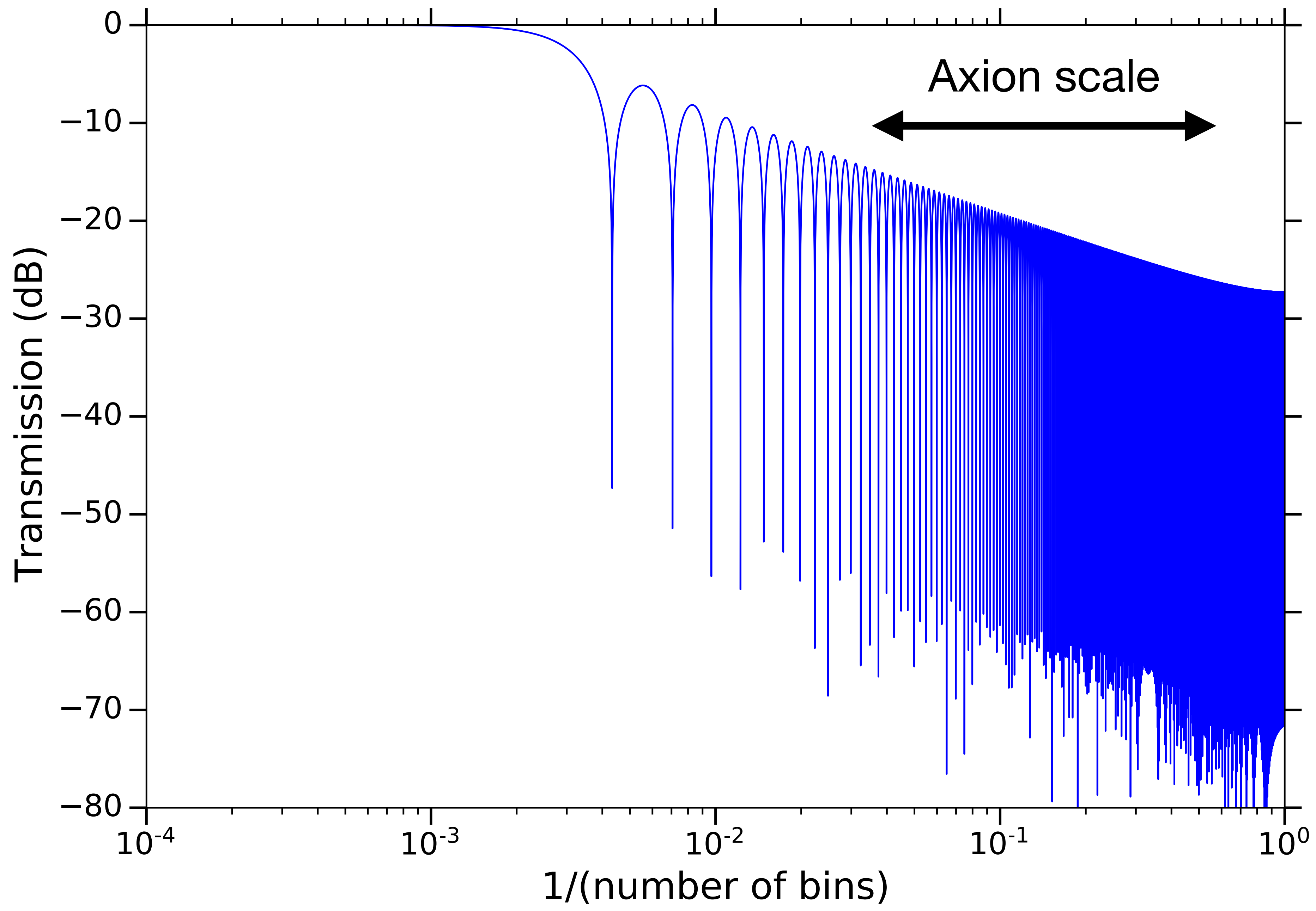

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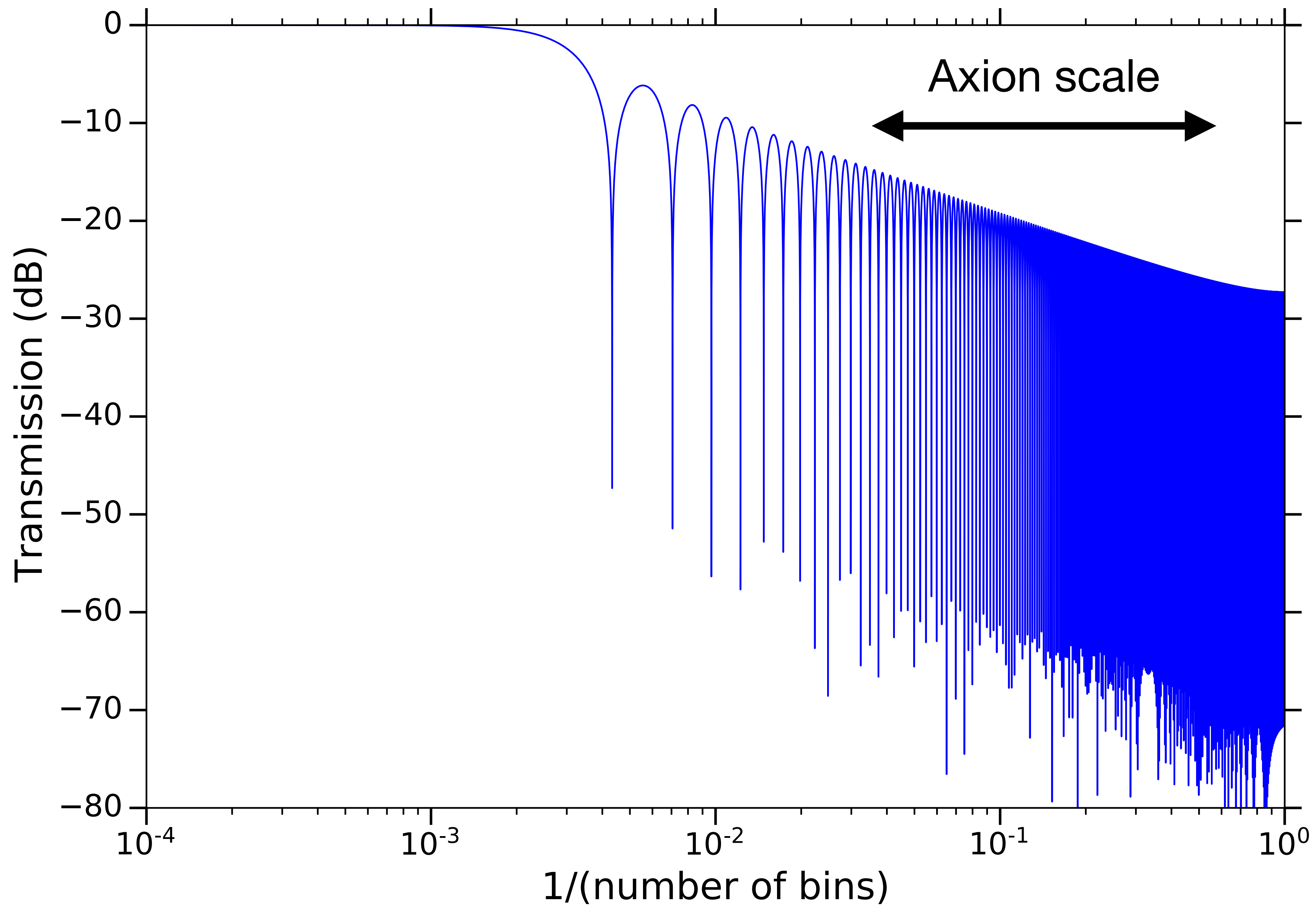

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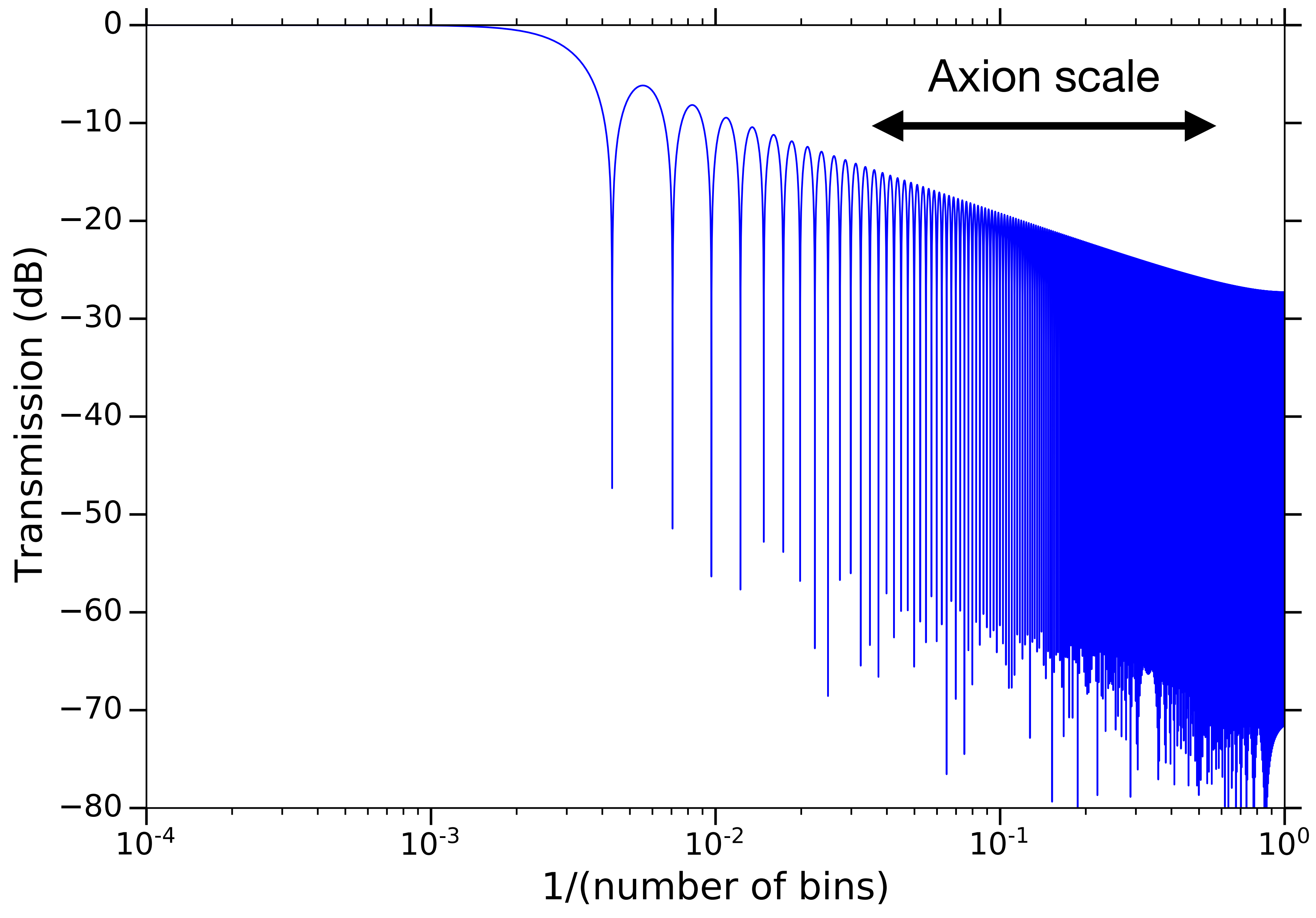

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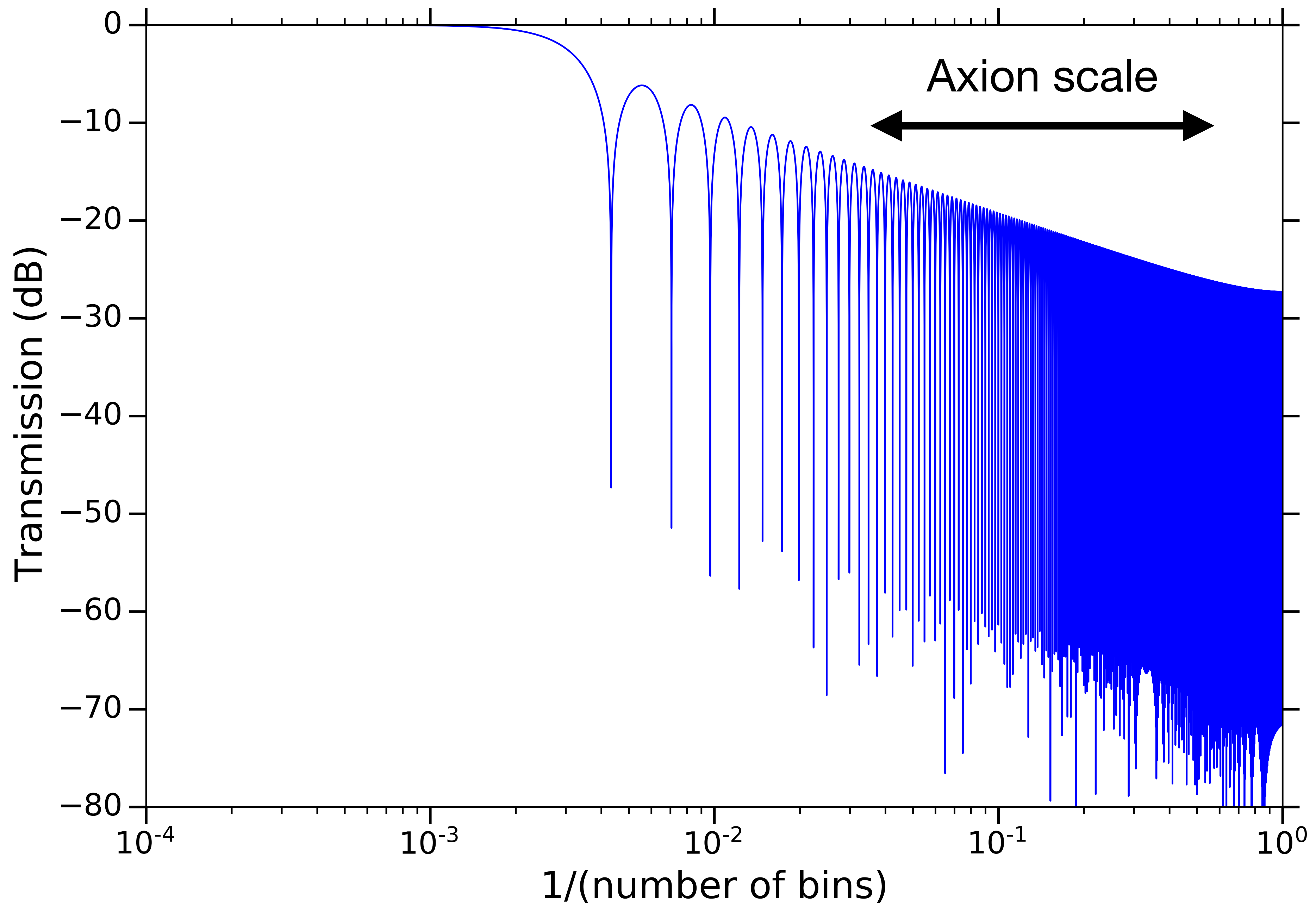

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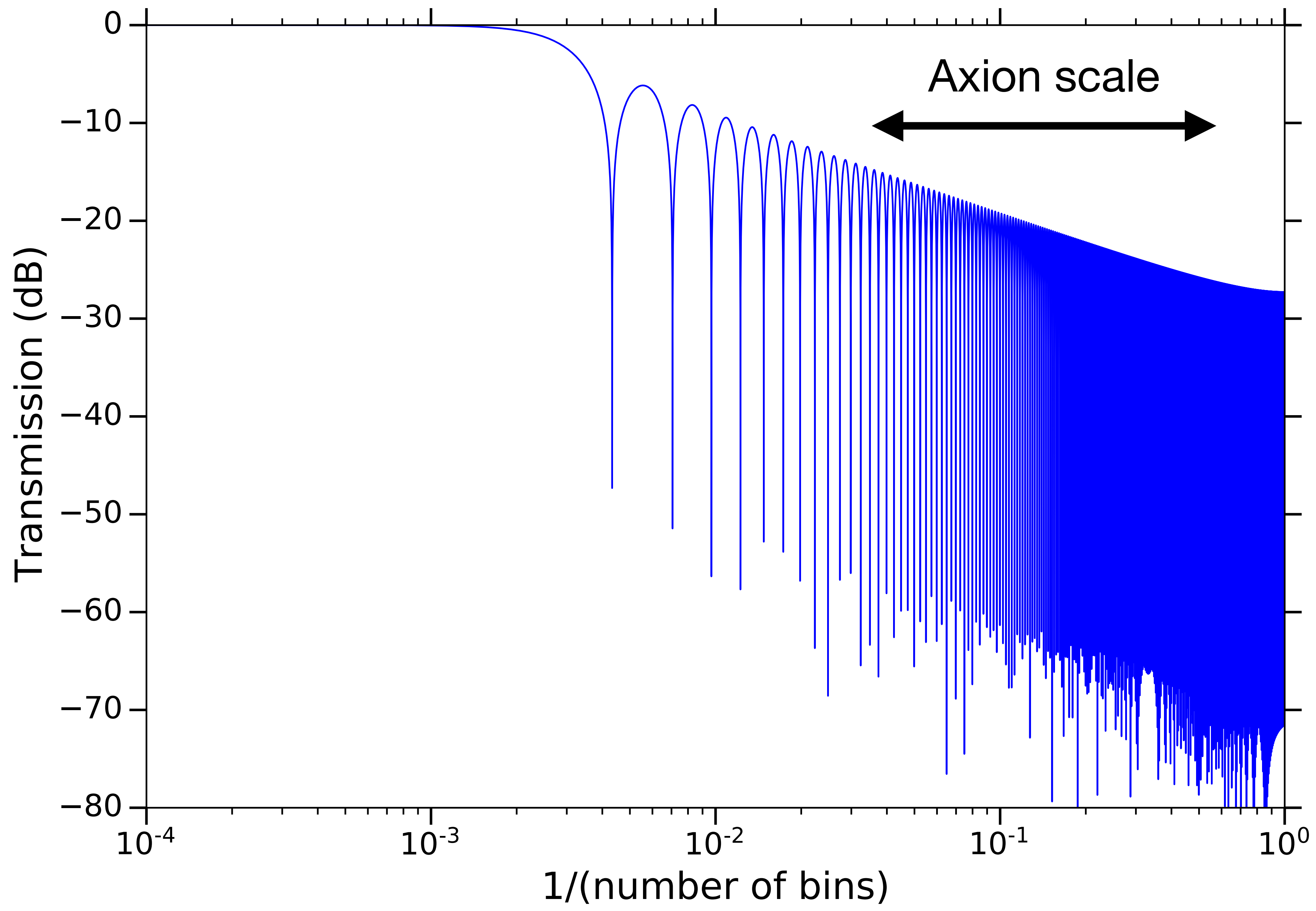

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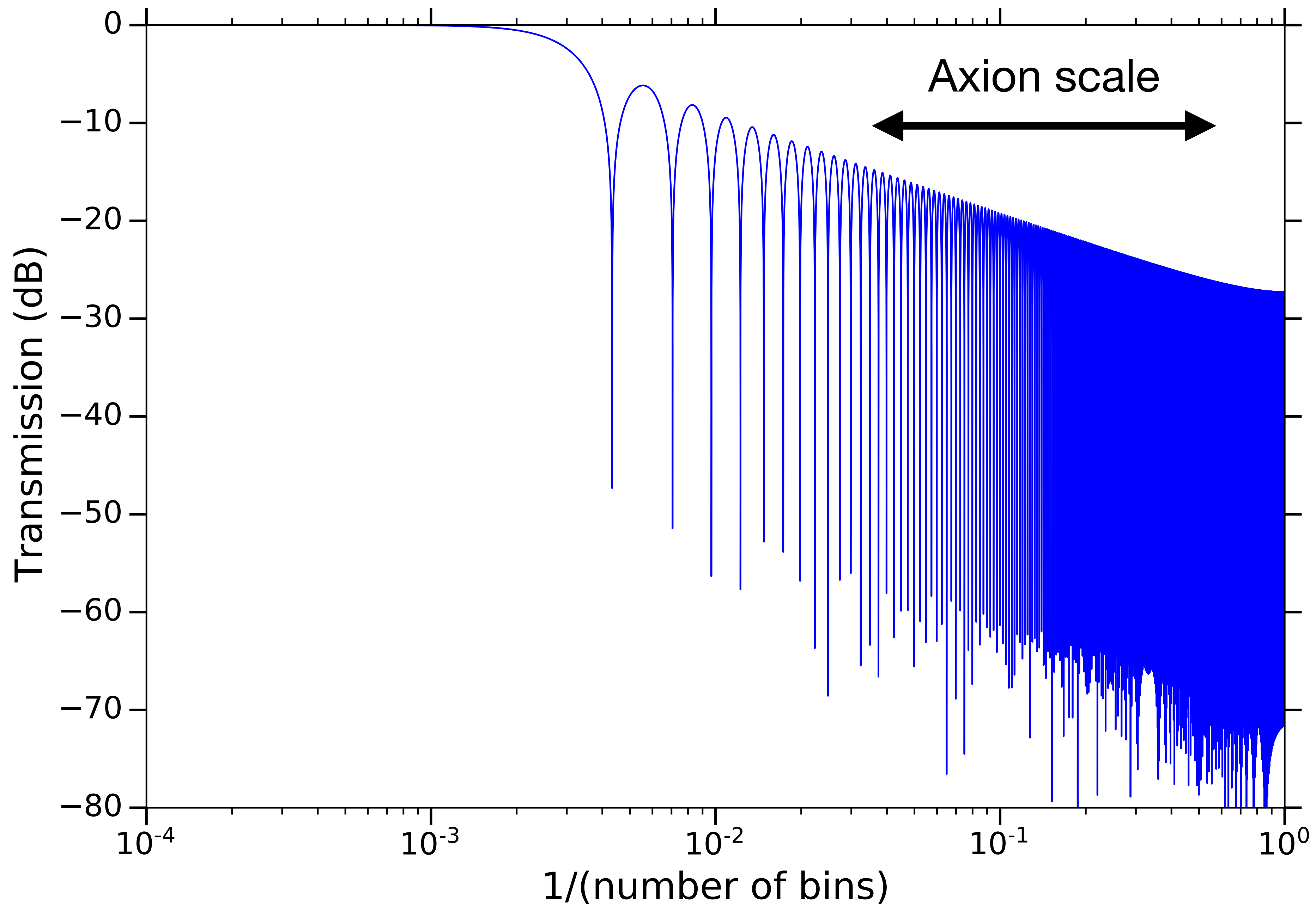

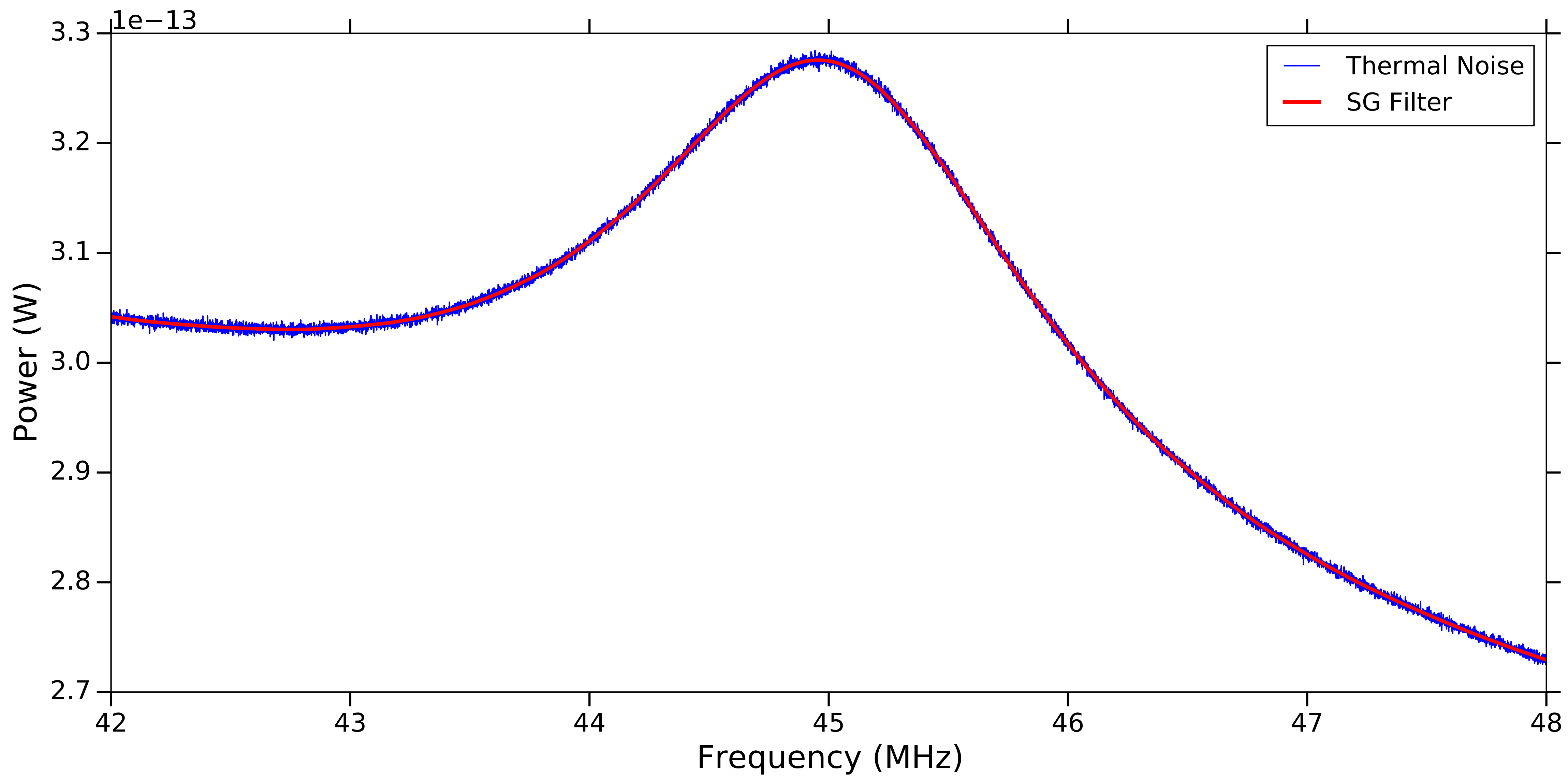

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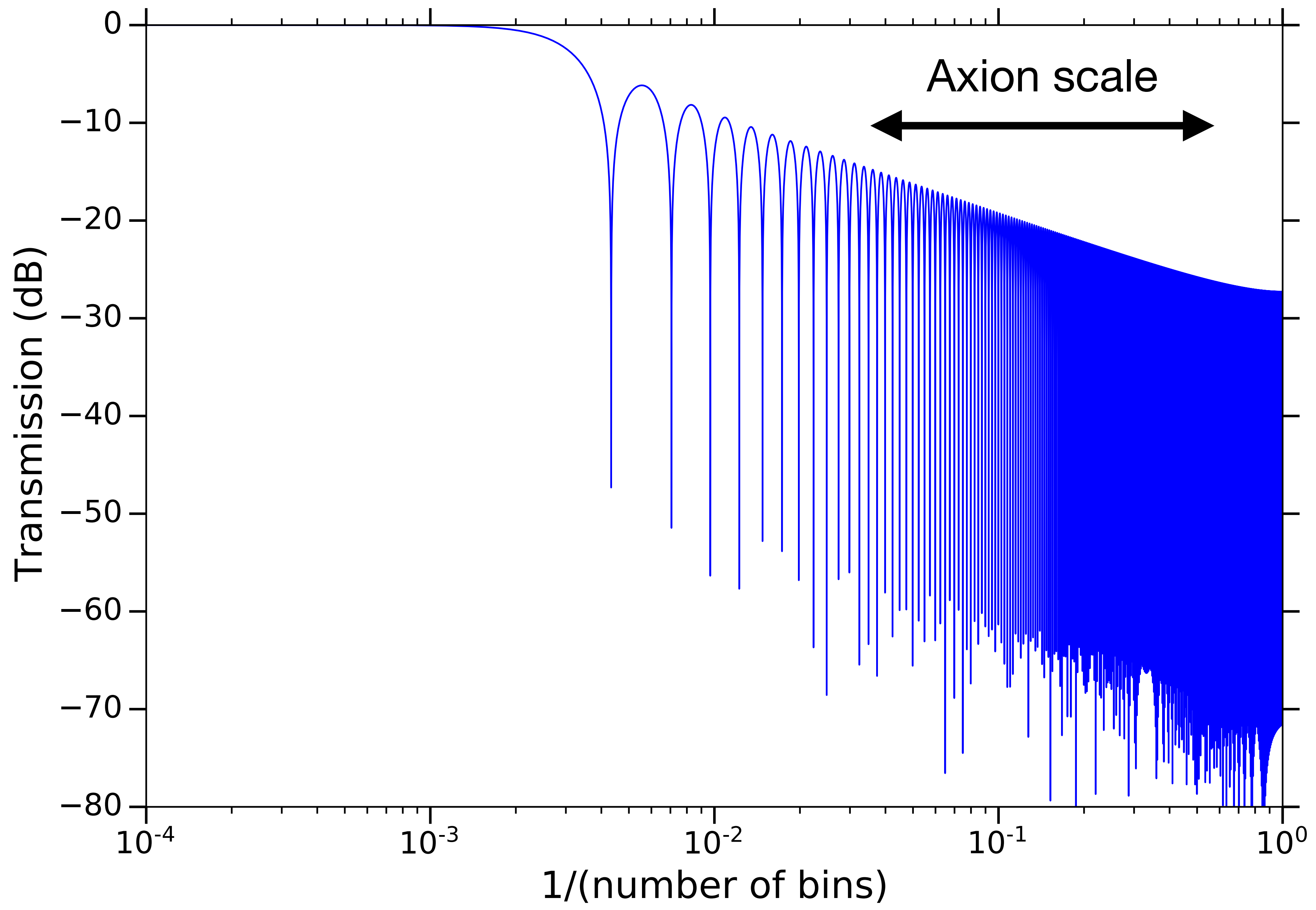

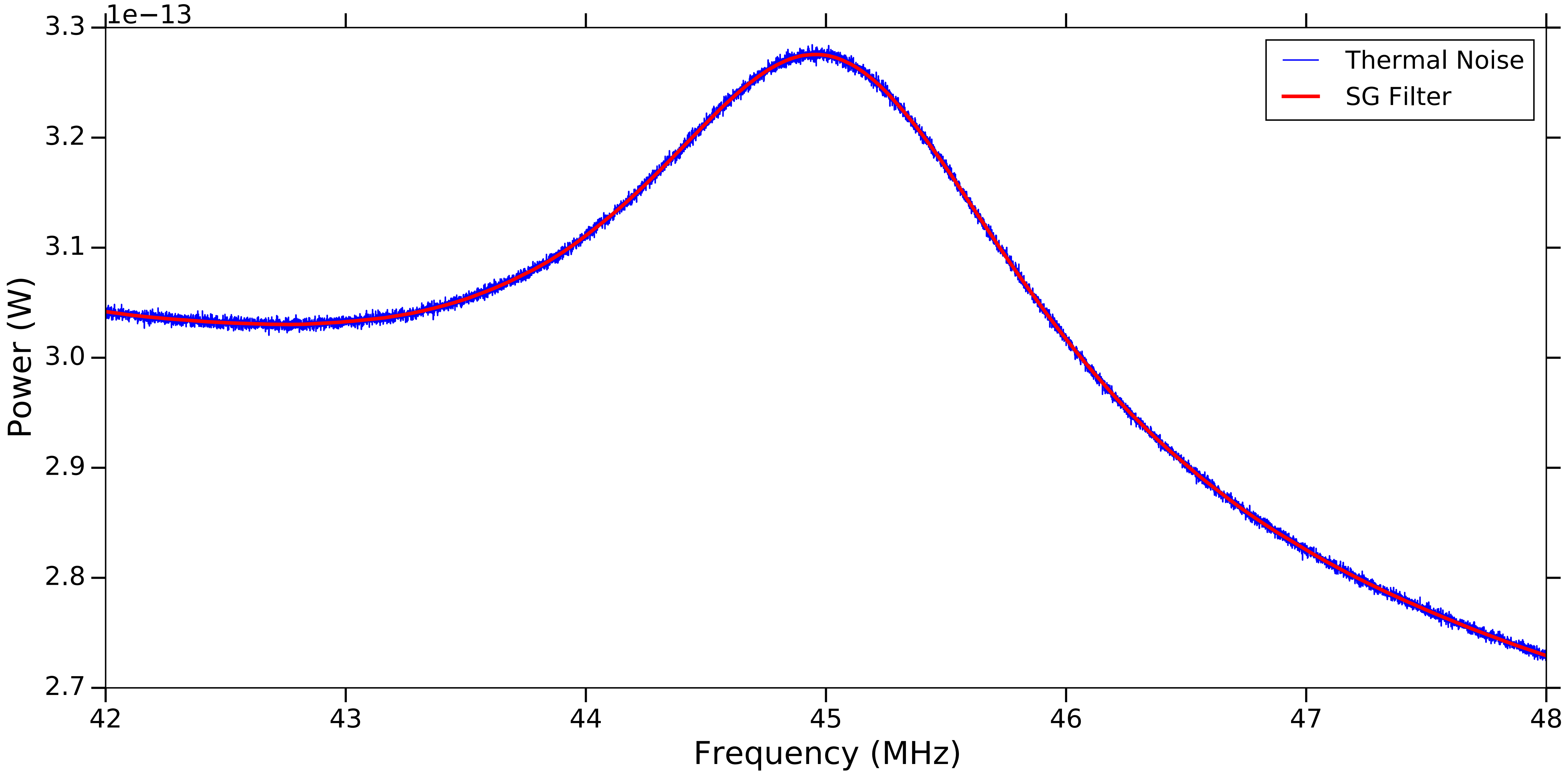

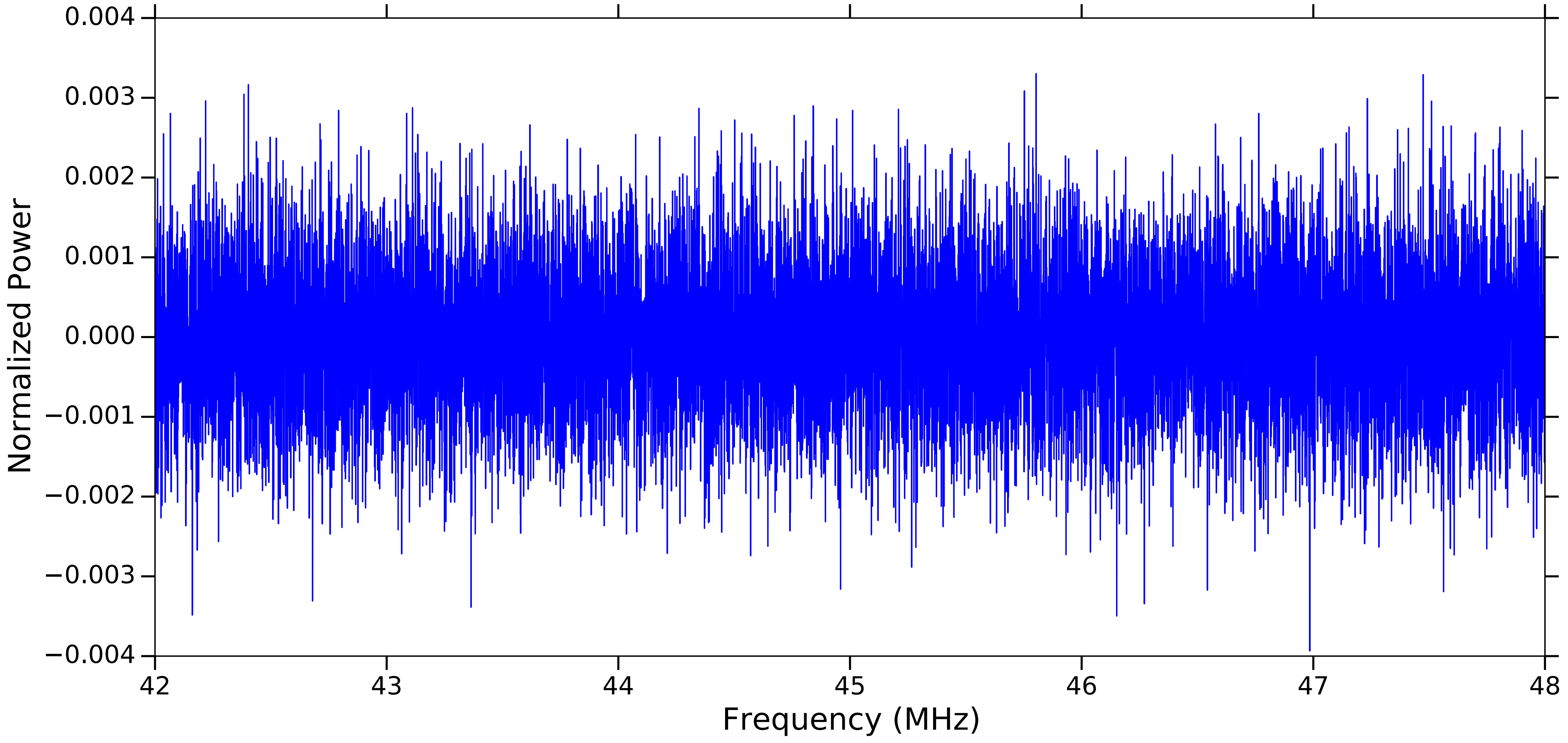

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PHYSICAL REVIEW D **96,** 123008 (2017)

HAYSTAC axion search analysis procedure

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DOI: 10.1103/PhysRevD.96.123008

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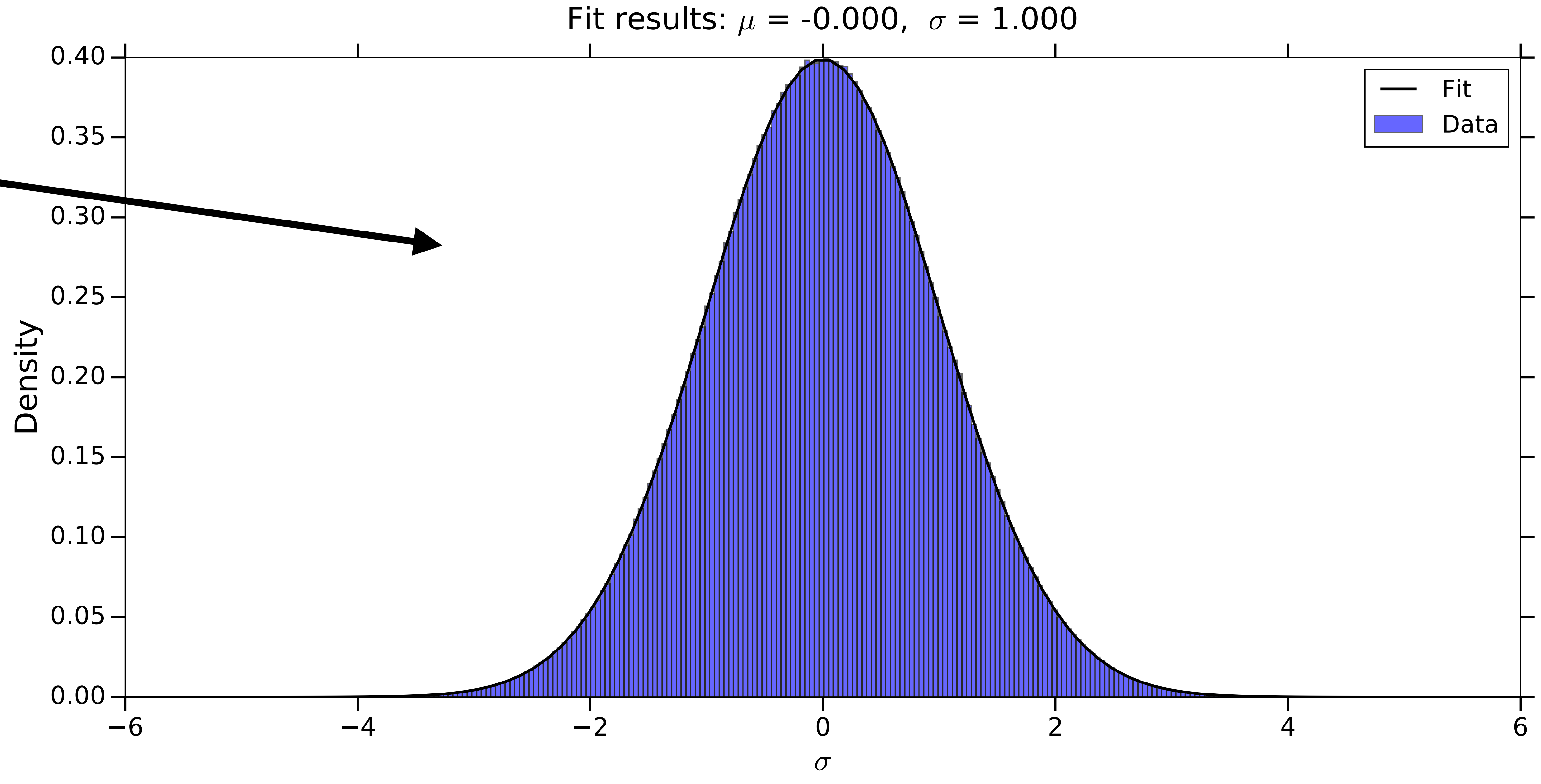

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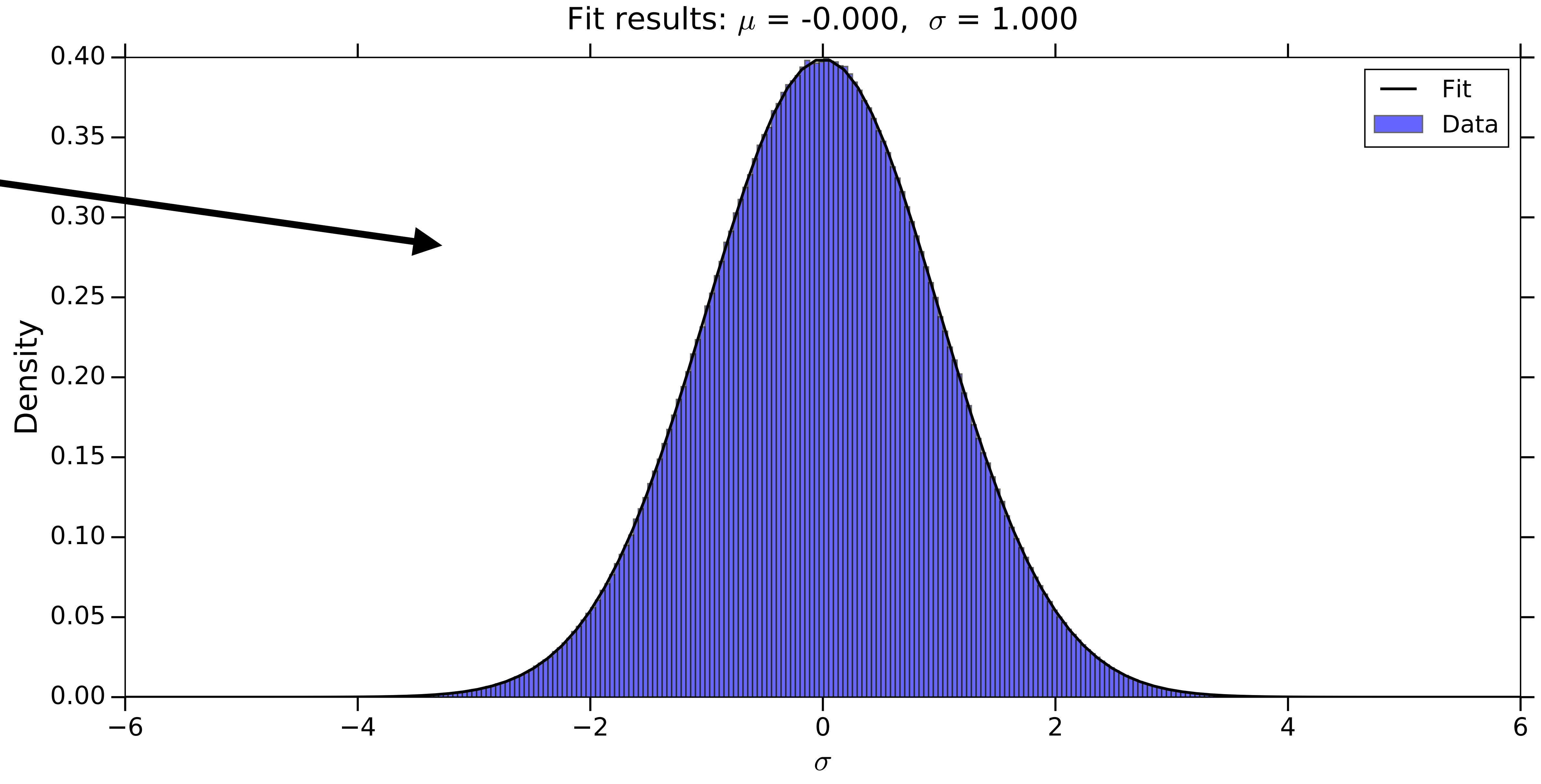

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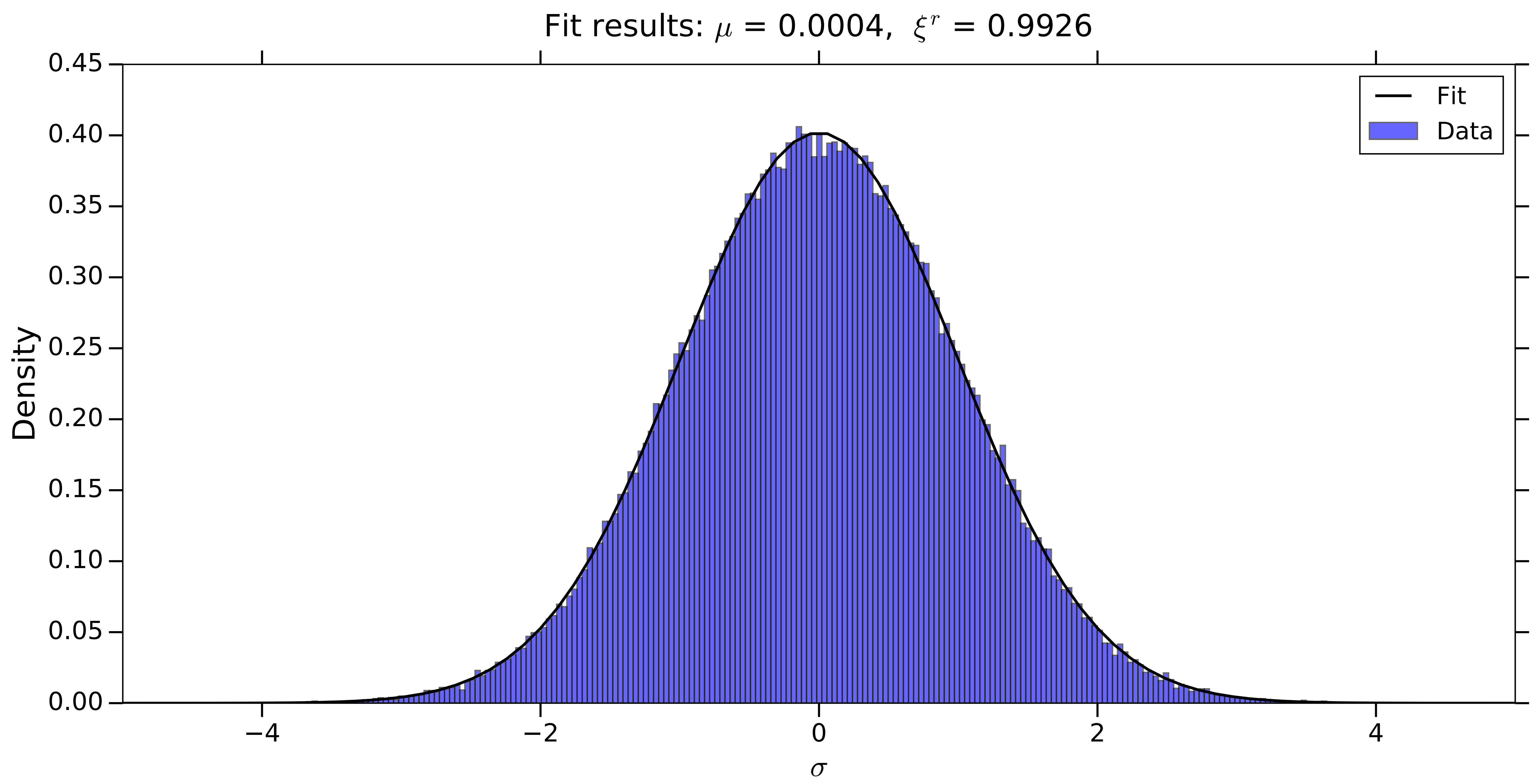
$$\xi^r = 0.99$$



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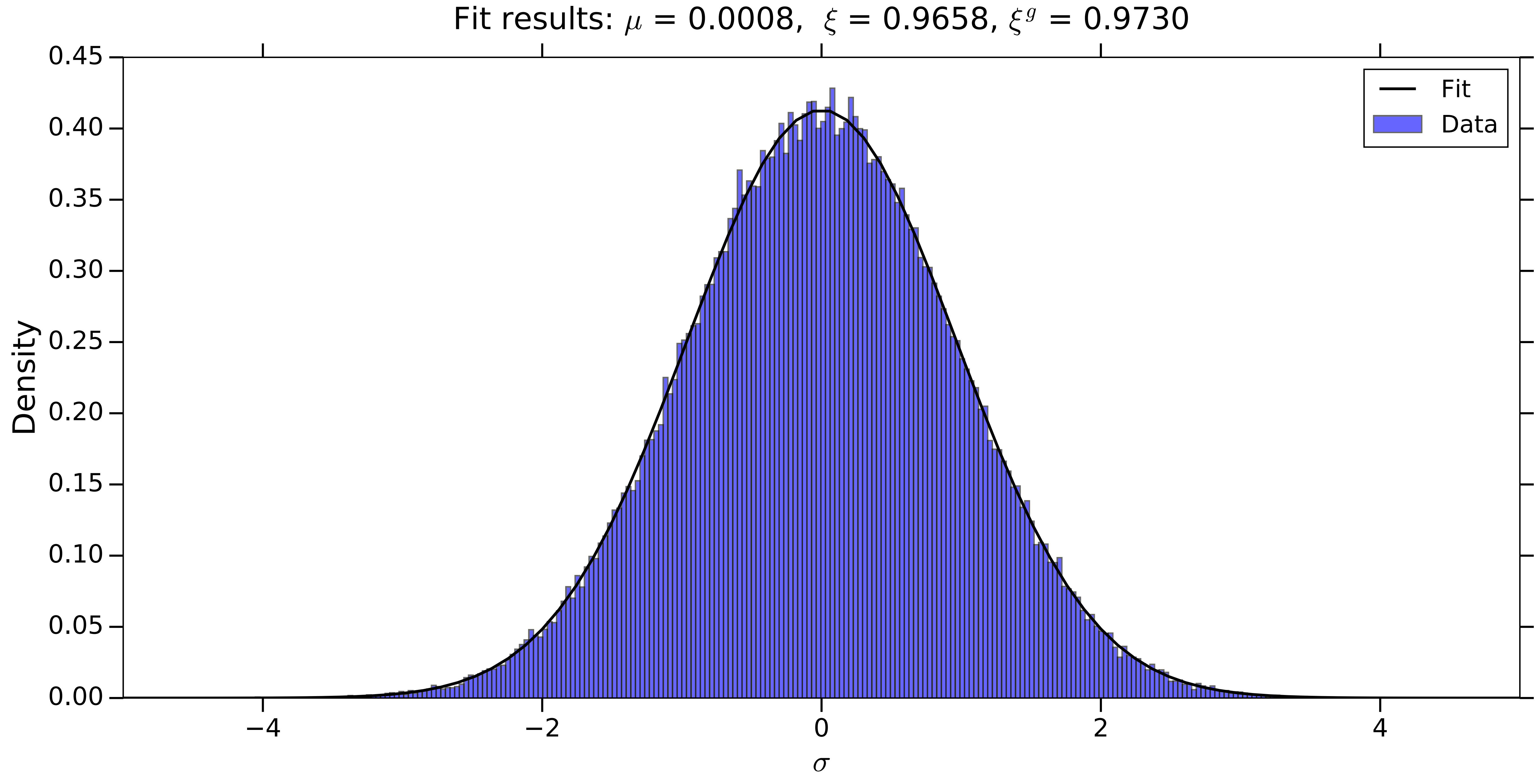
$$\xi^g = \frac{\xi^r}{\xi} = 0.97$$



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- We find $\hat{\sigma}_l^r / \sigma_l^r \sim 0.99$

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- $\hat{\sigma}_l^r$ is the variance using the full covariance matrix

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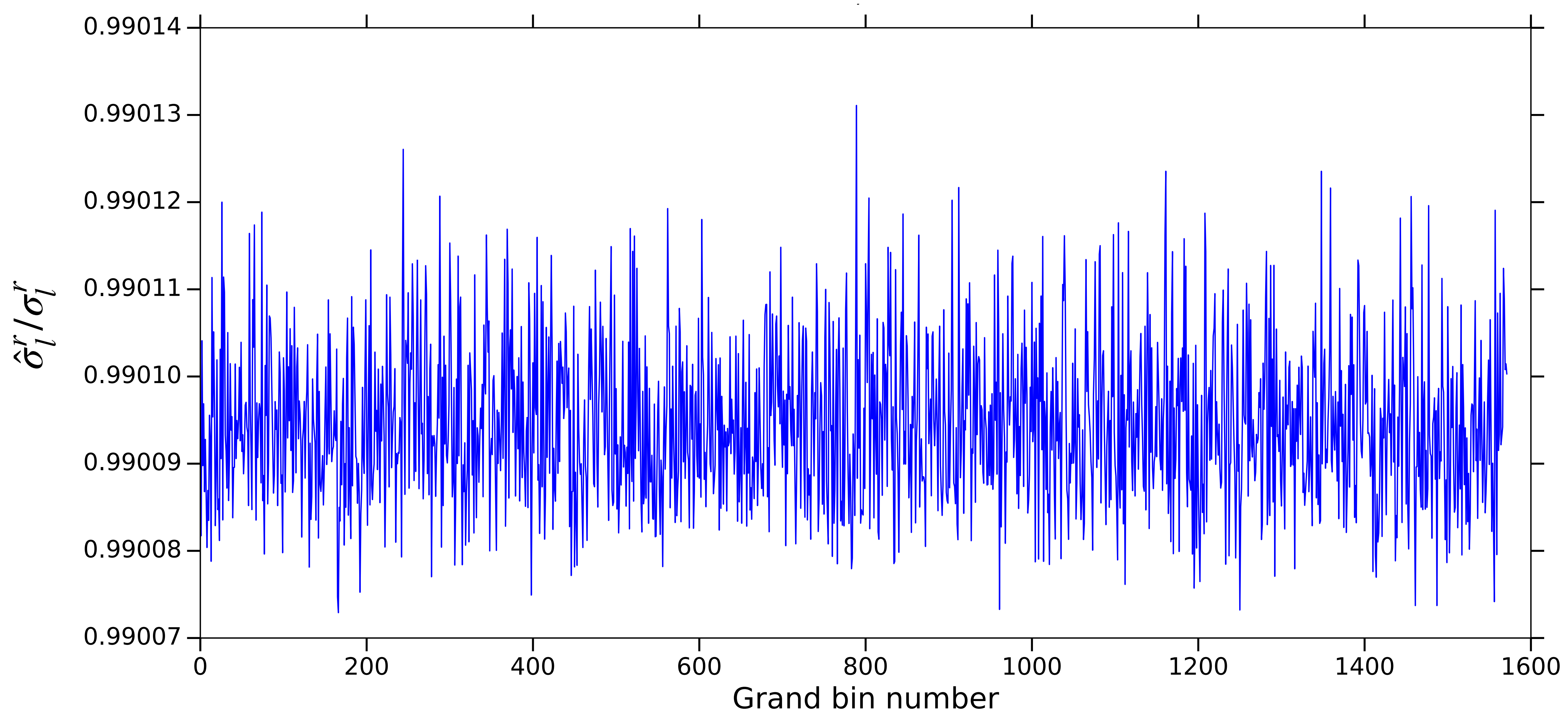

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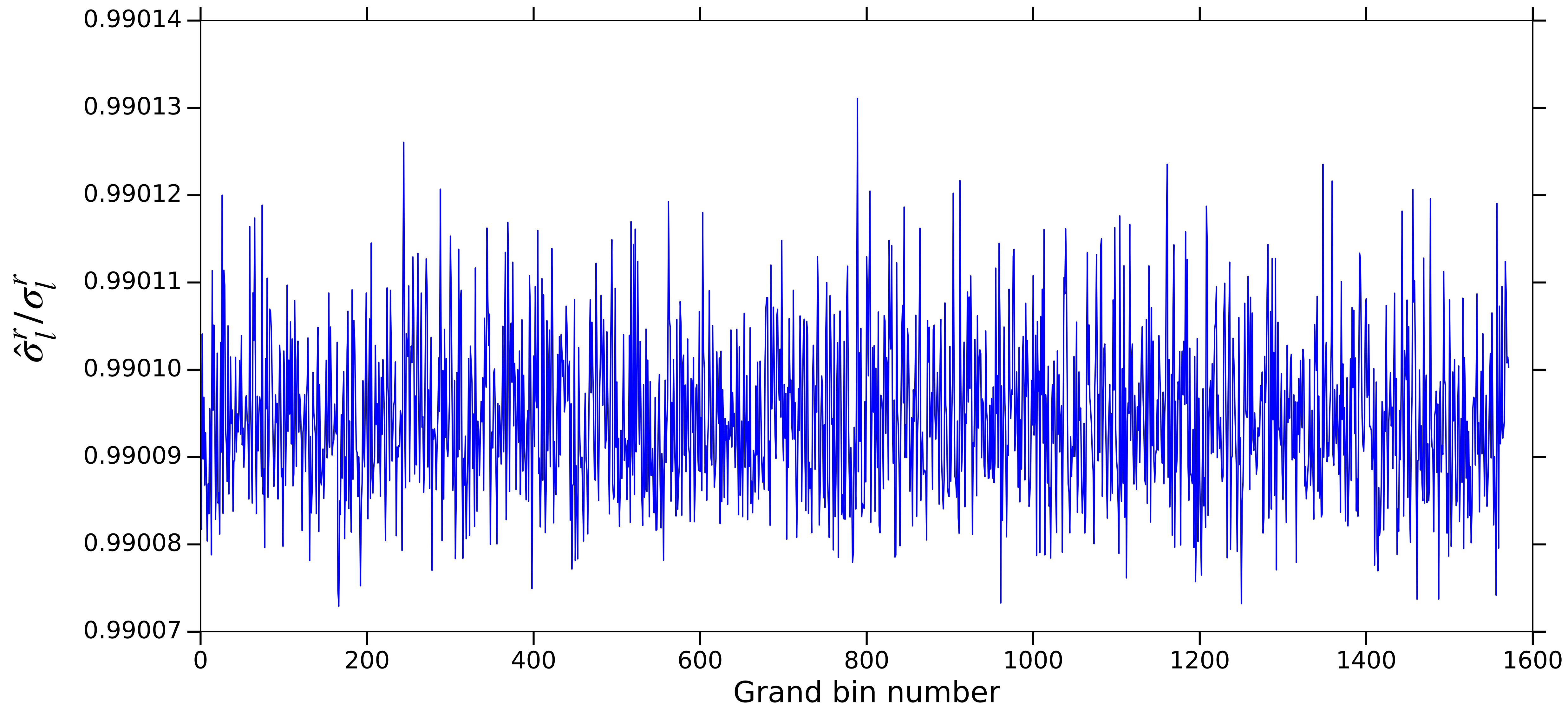

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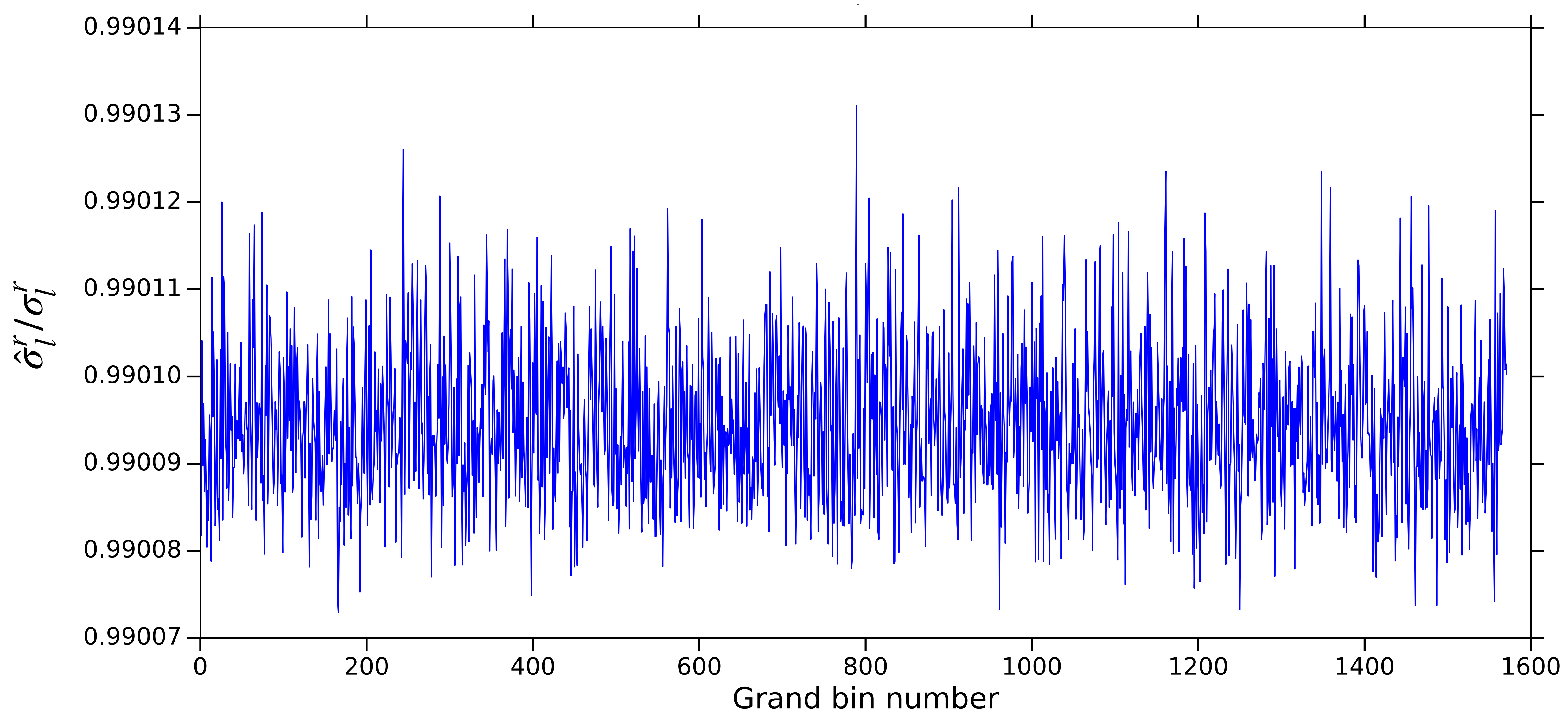

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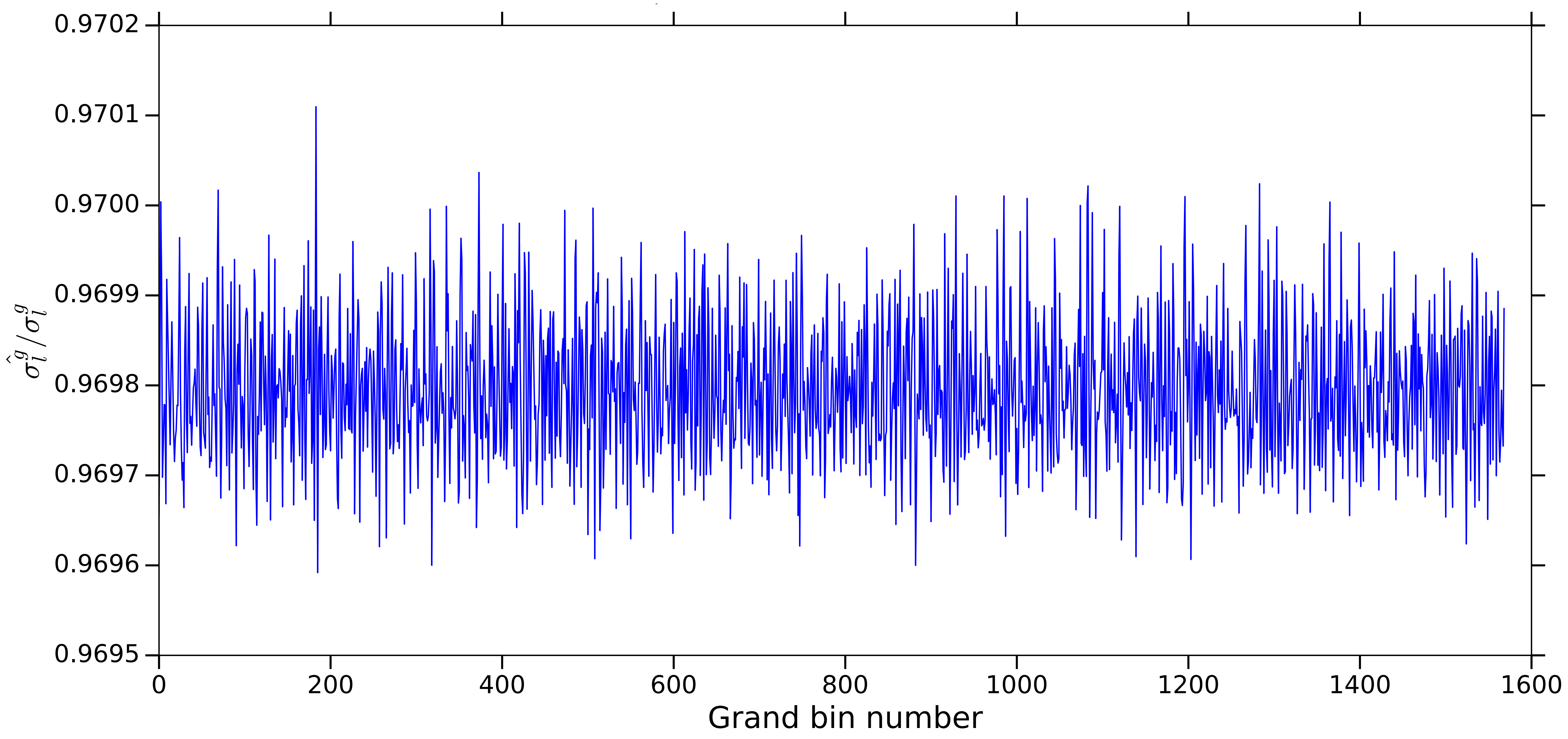

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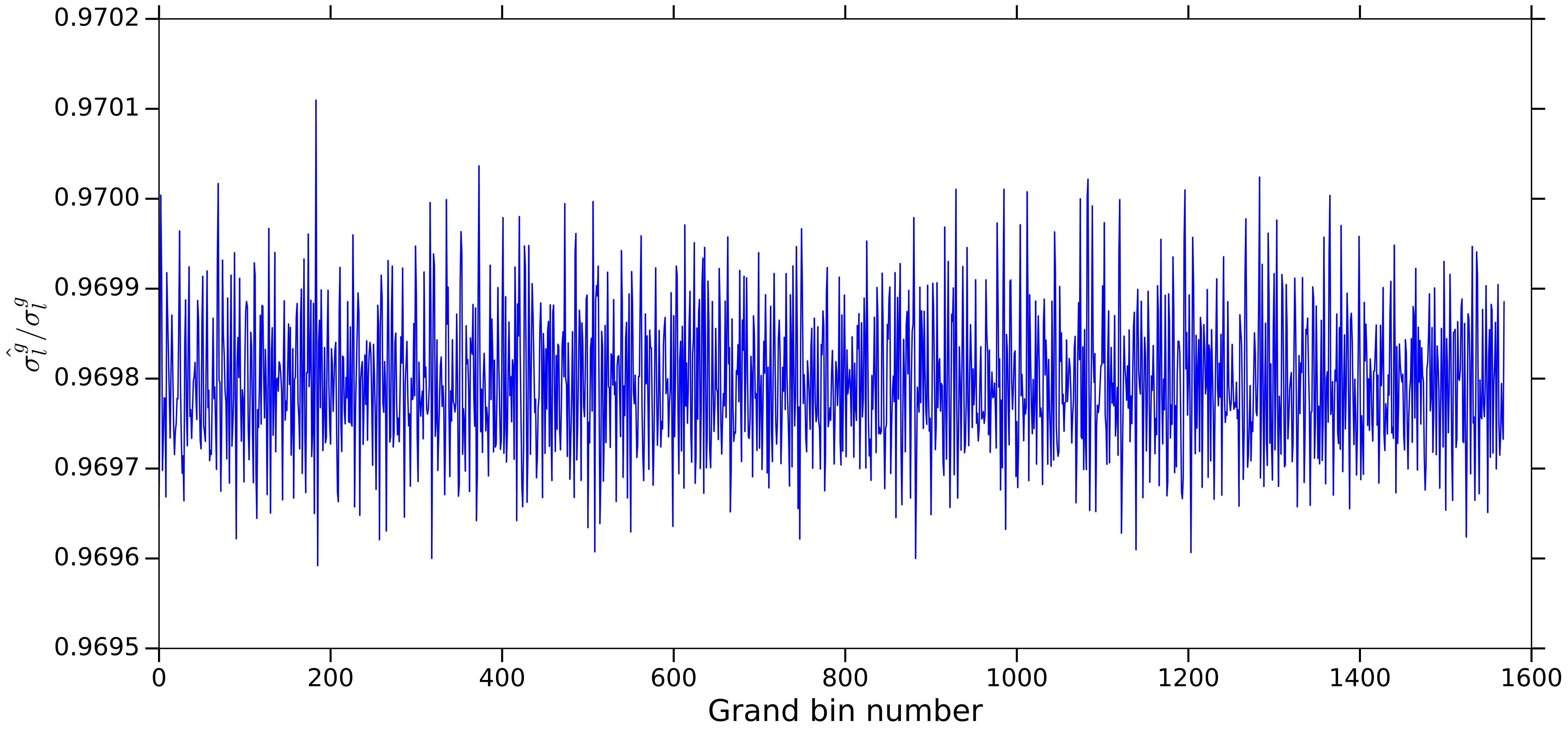

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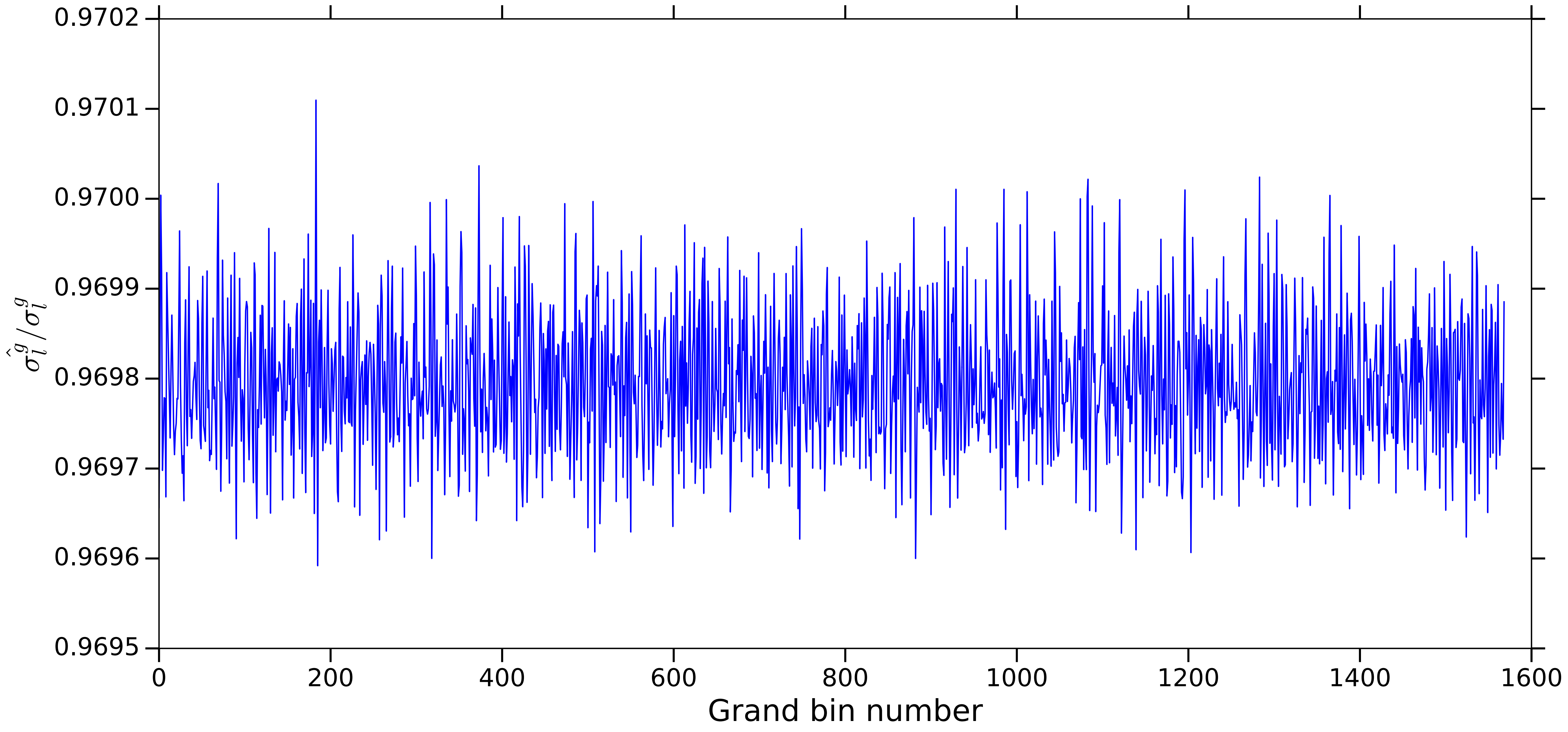

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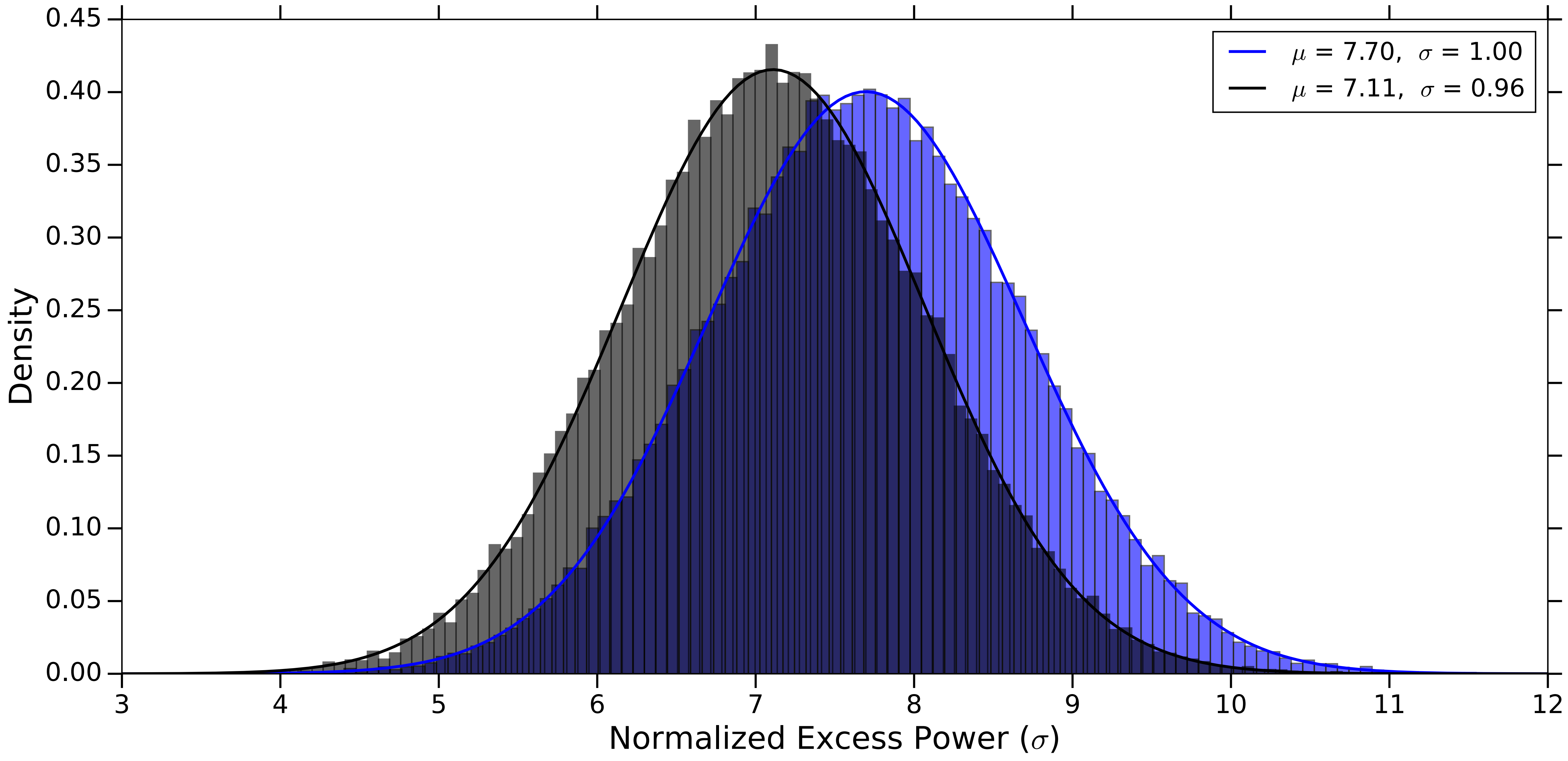

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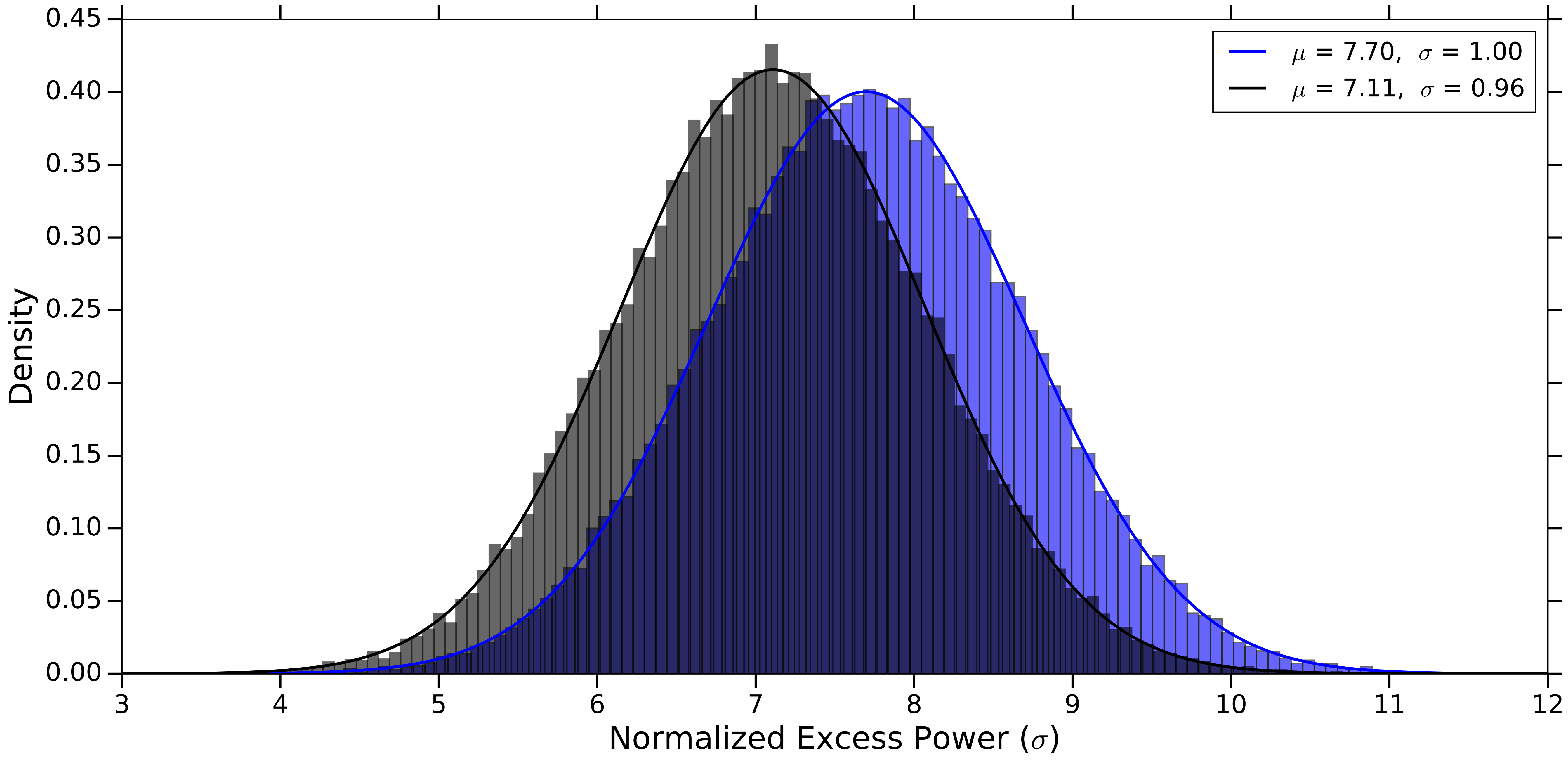

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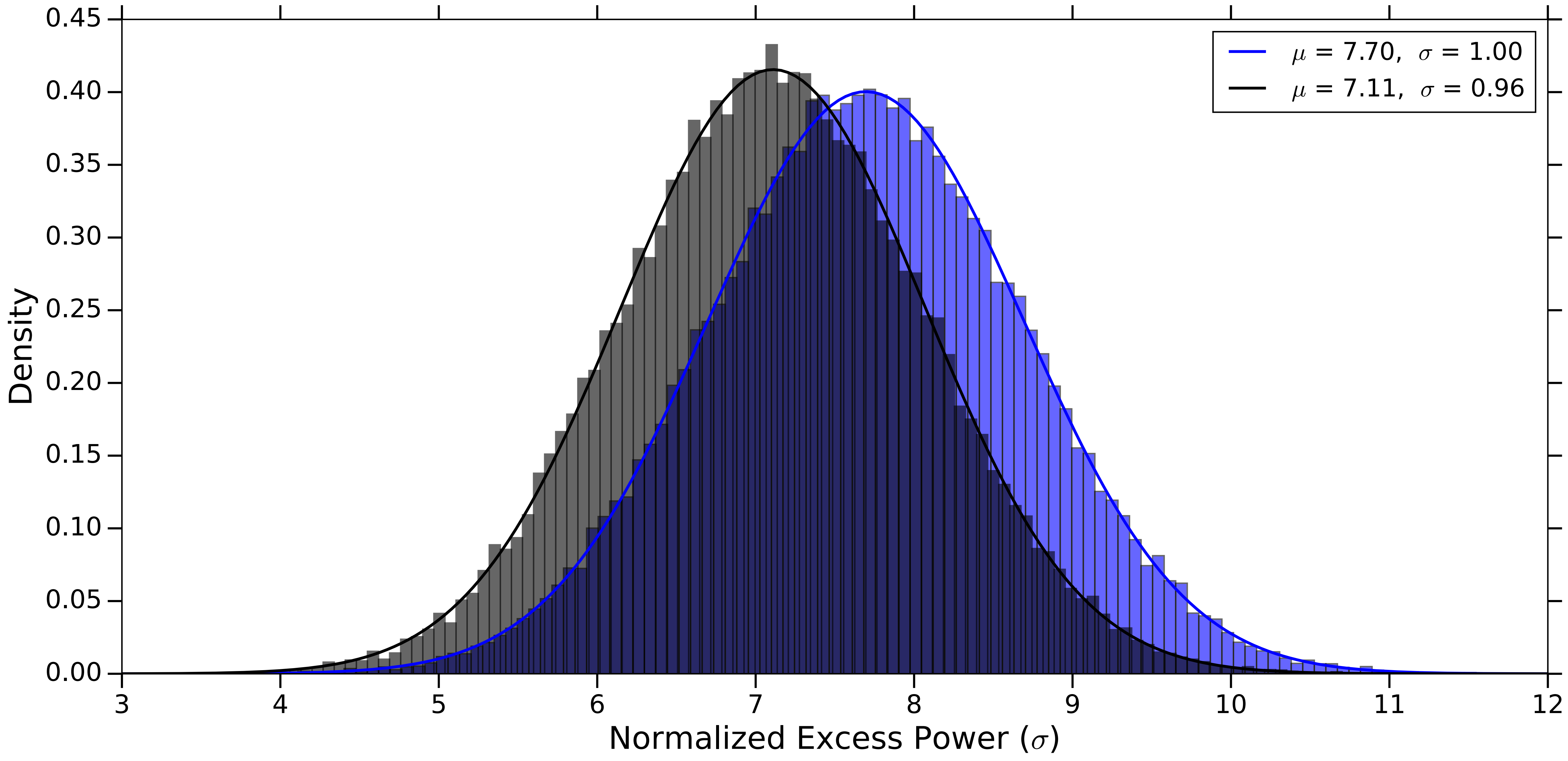

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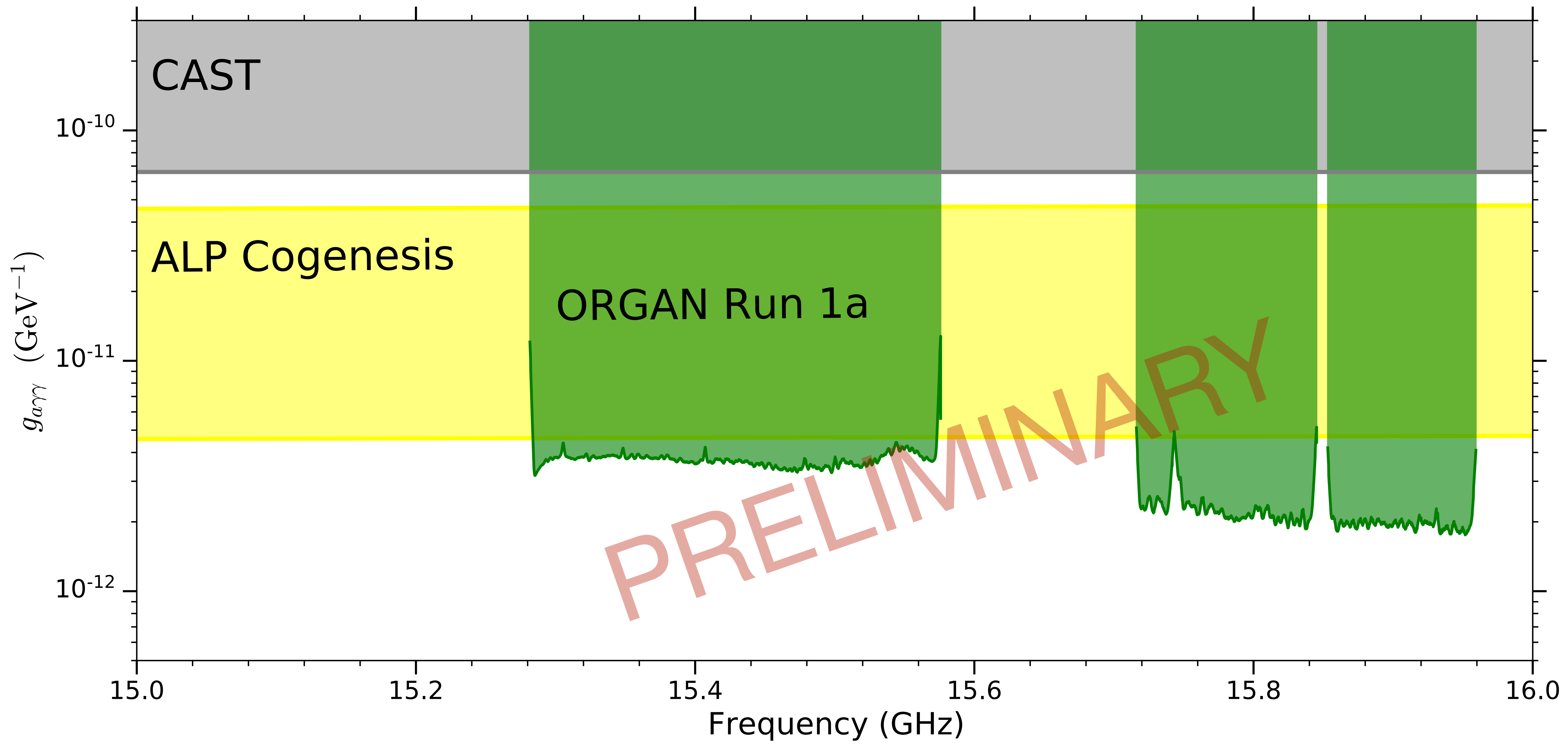

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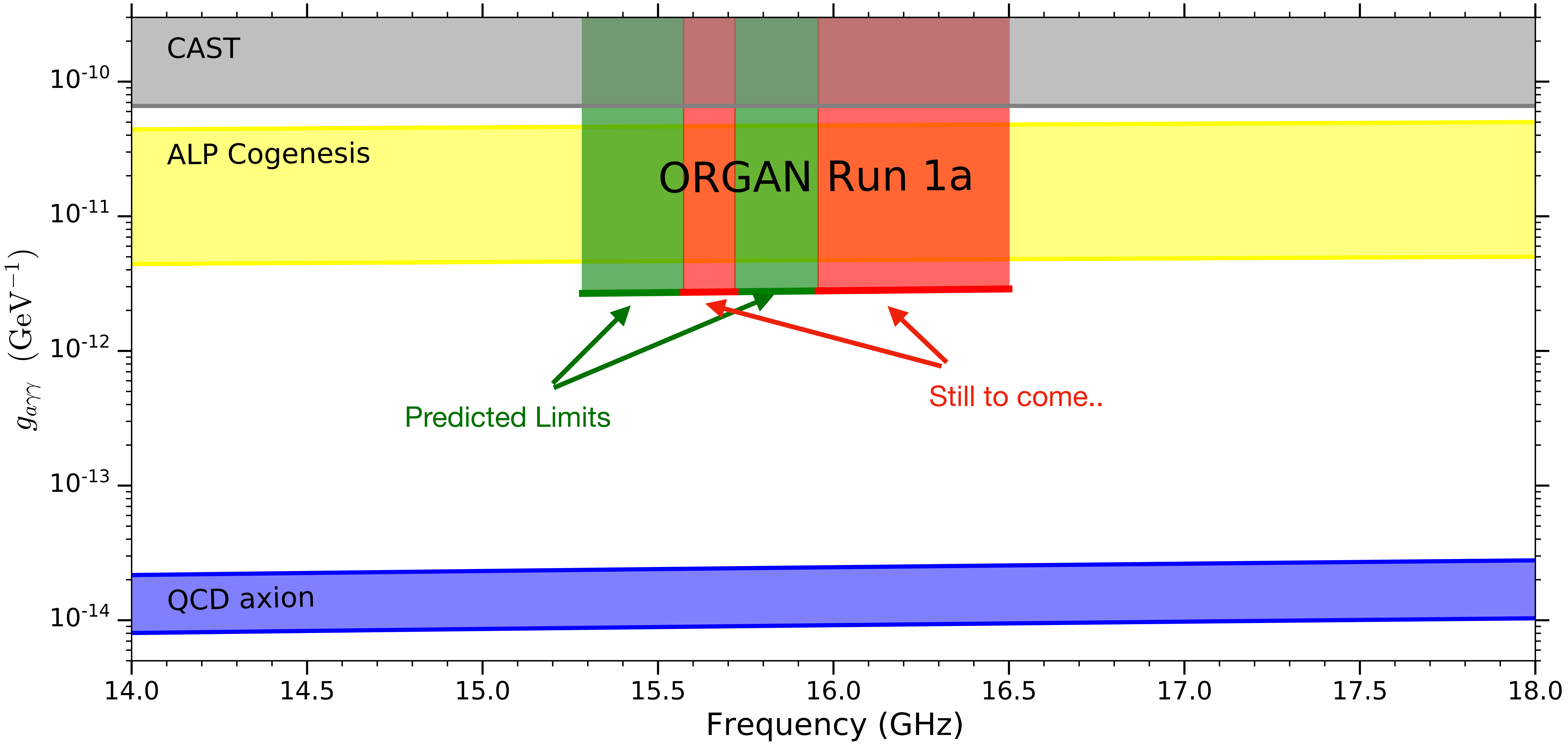

Questions?