

ORGAN: Phase 1, and Future Plans

Aaron Quiskamp

Supervisors: Michael Tobar, Ben McAllister, Maxim Goryachev



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Australian Research Council



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Axions



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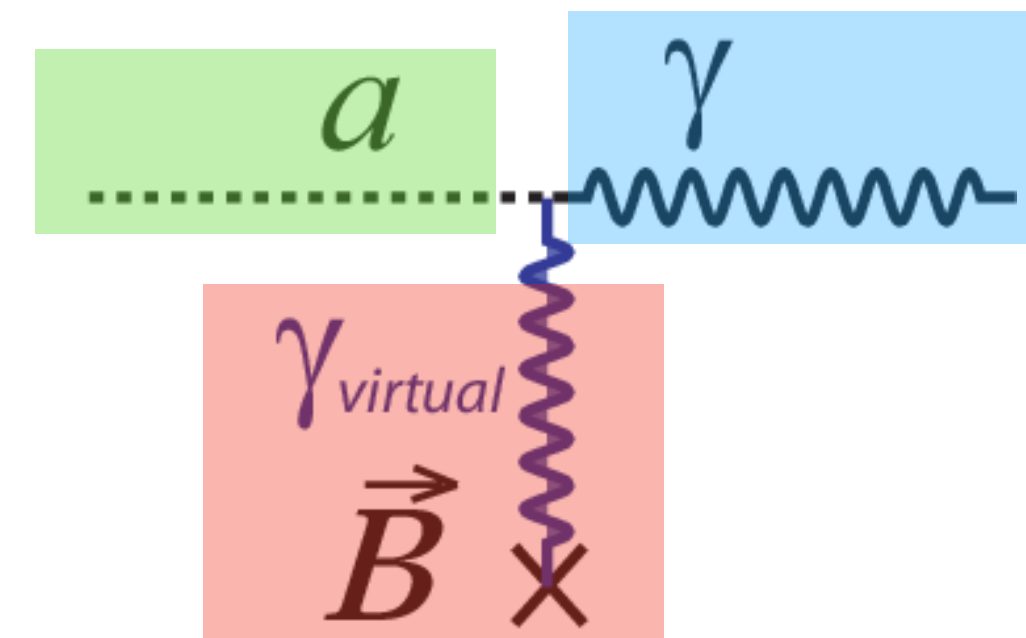
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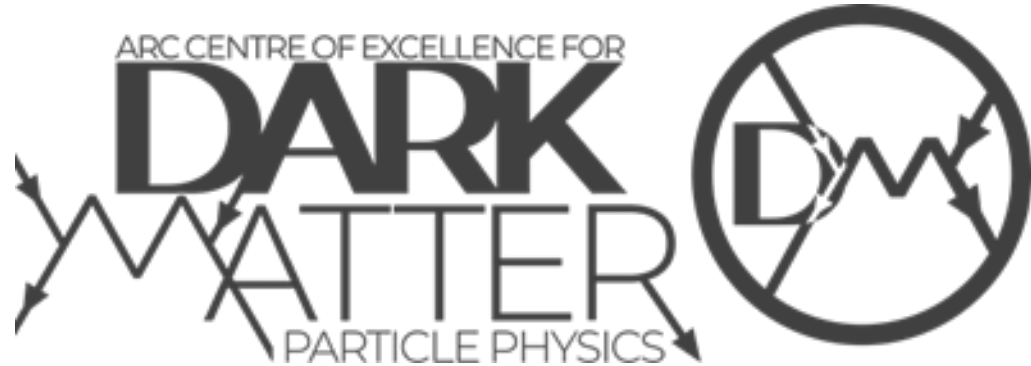
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- **Axions** may interact with a **strong B field** to produce a **photon** with frequency related to m_a





How to detect axions?



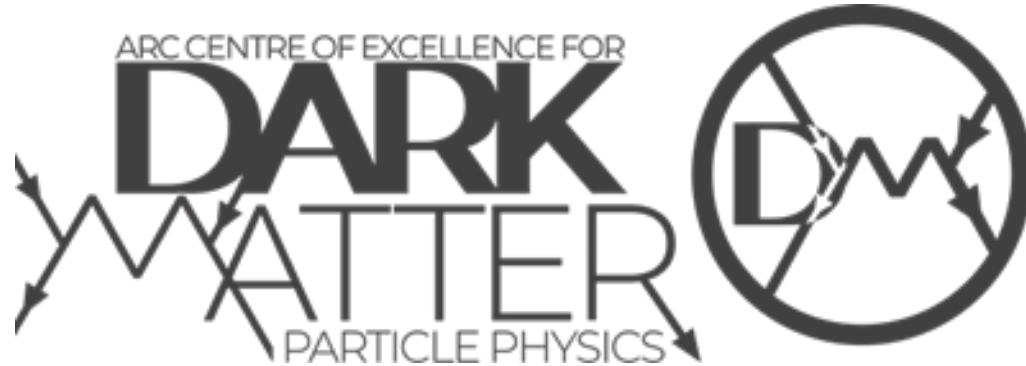


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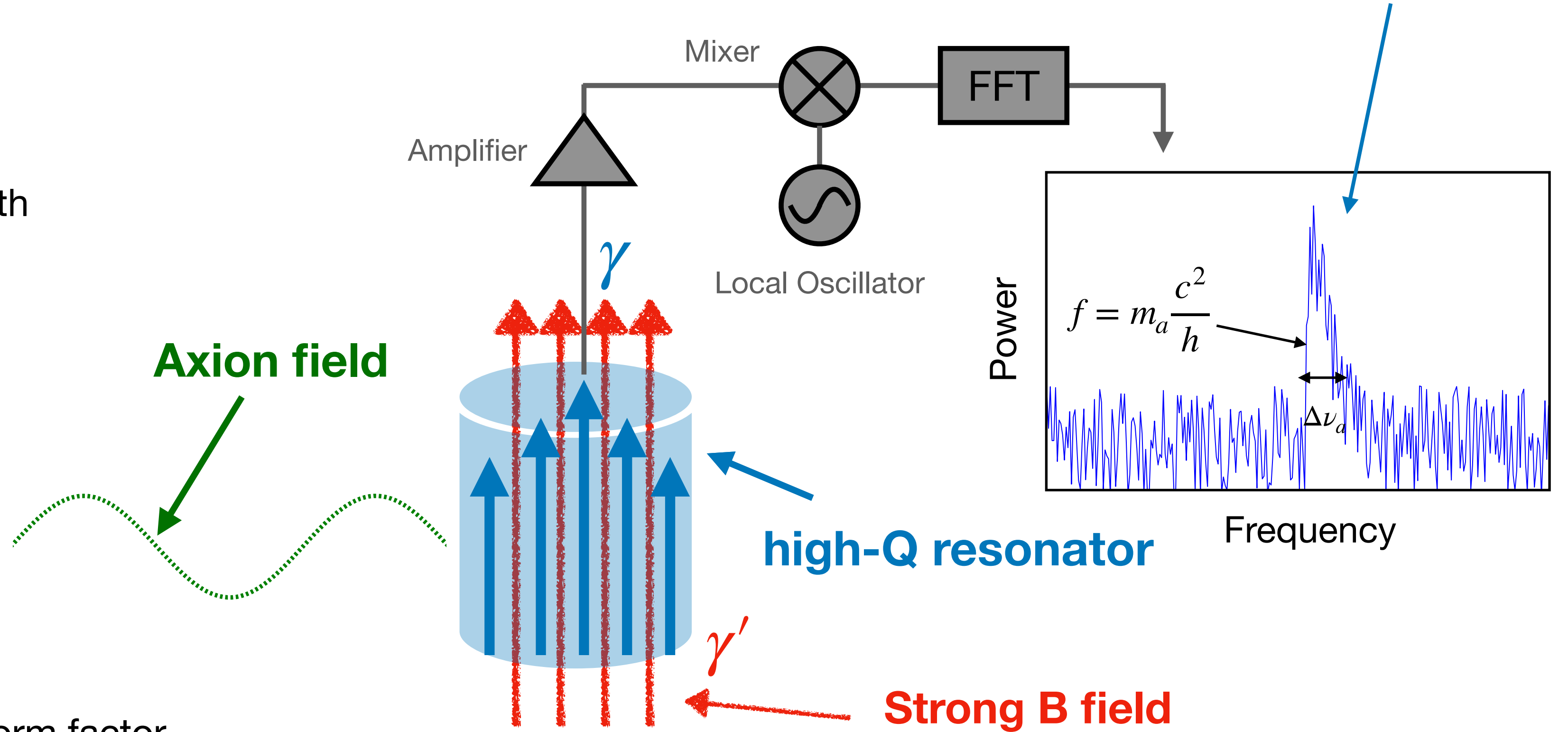
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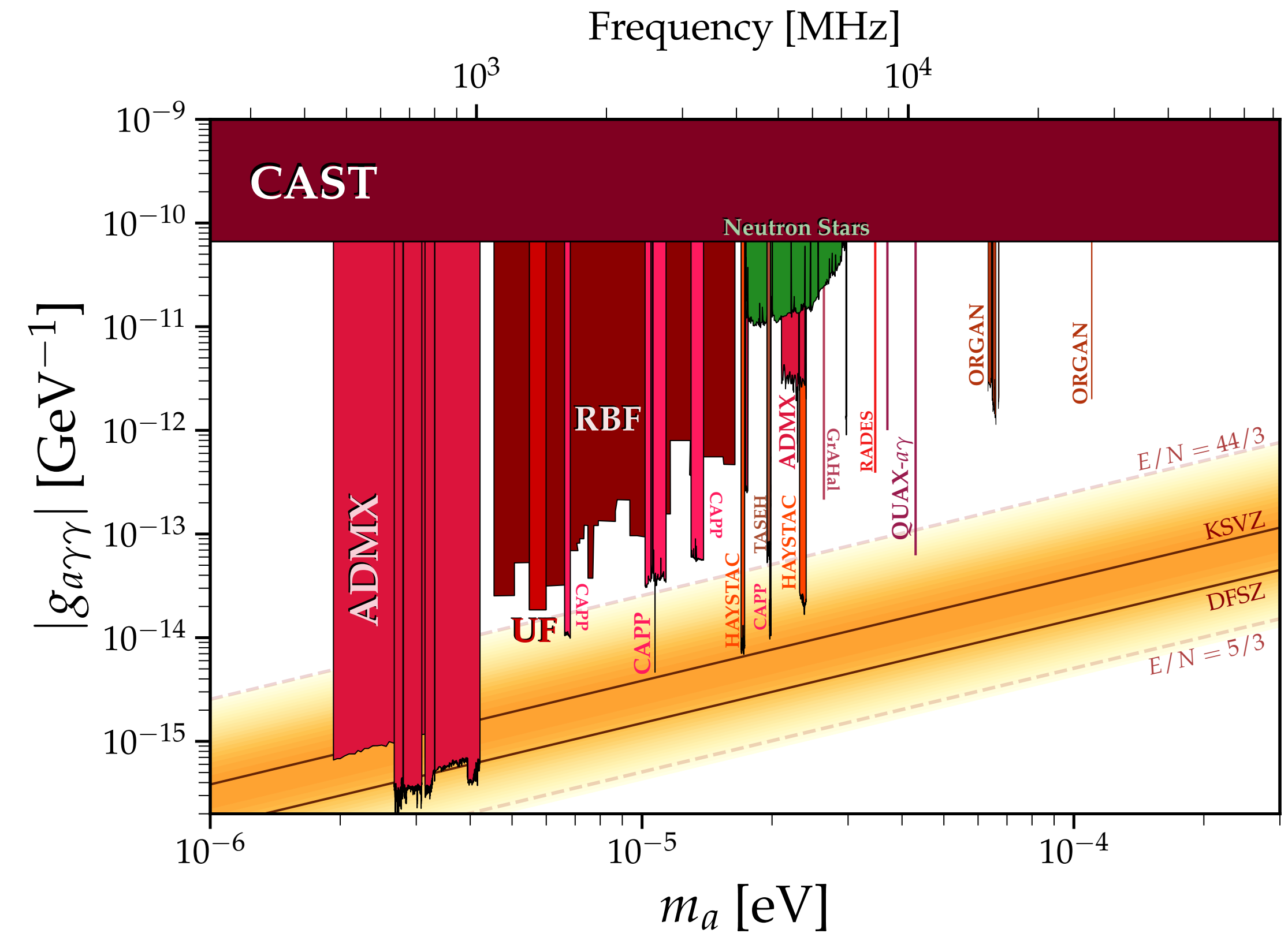
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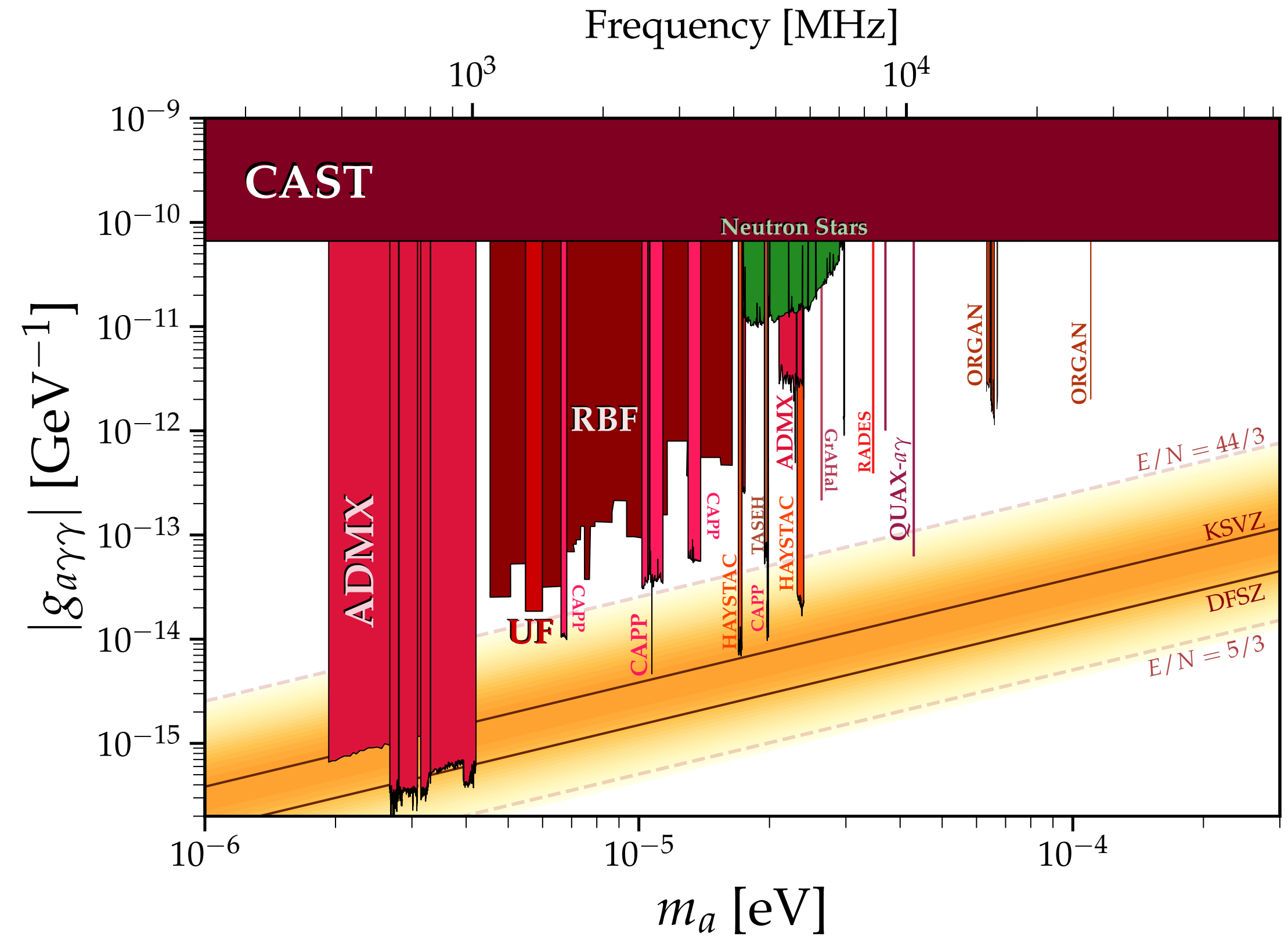
ORGAN: Oscillating Resonant Group AxioN Experiment



cajohare.github.io/AxionLimits

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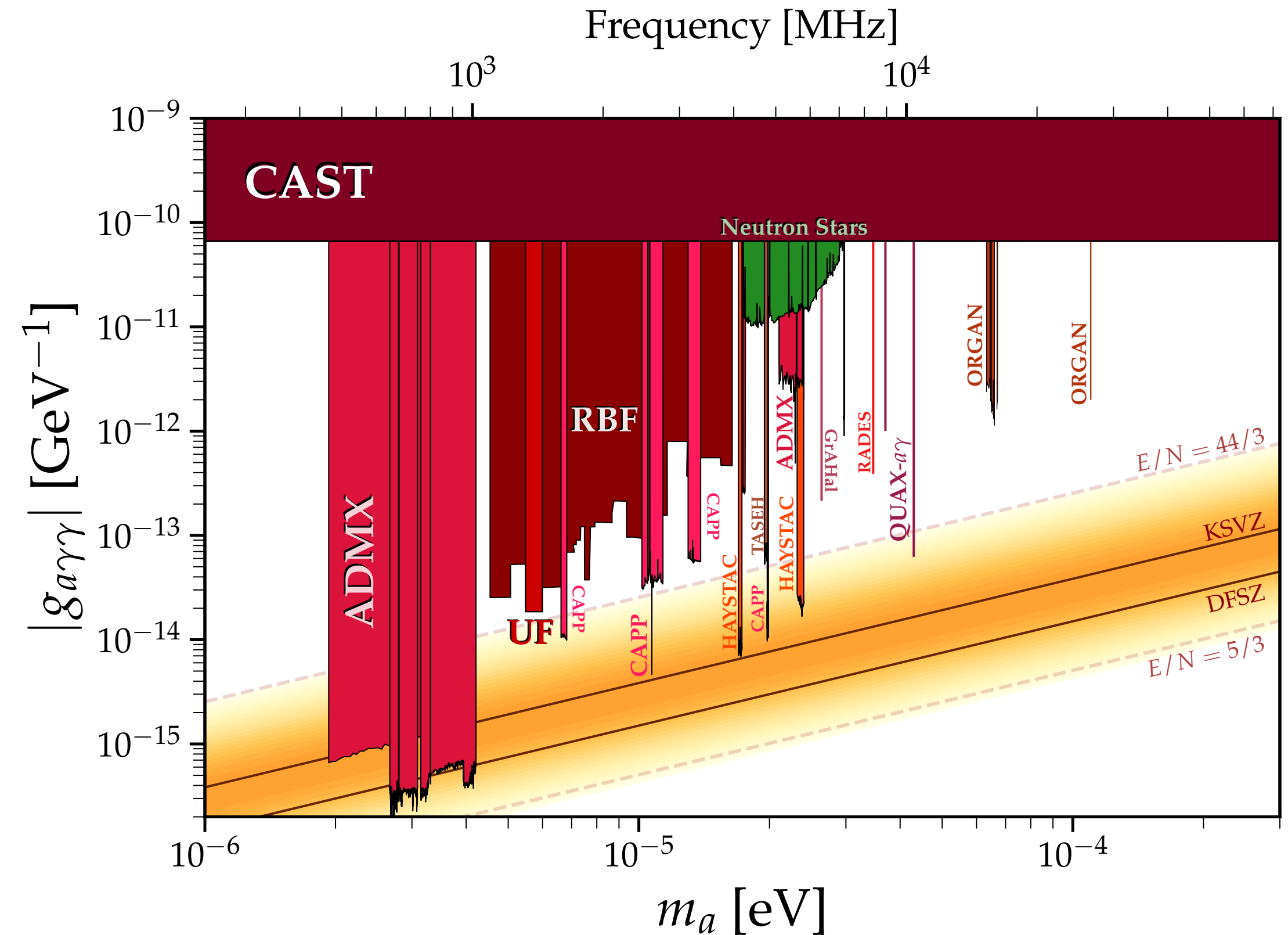
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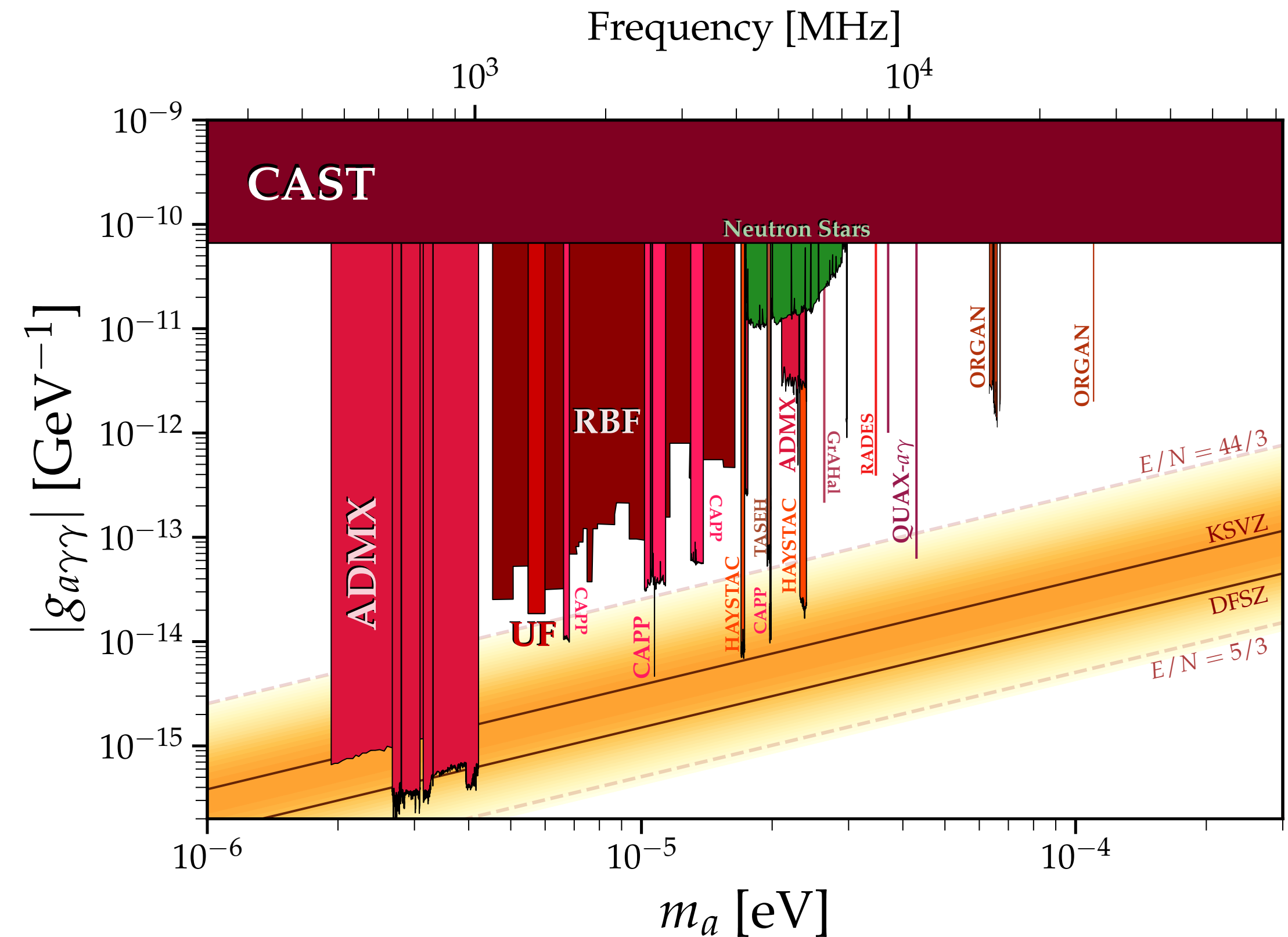
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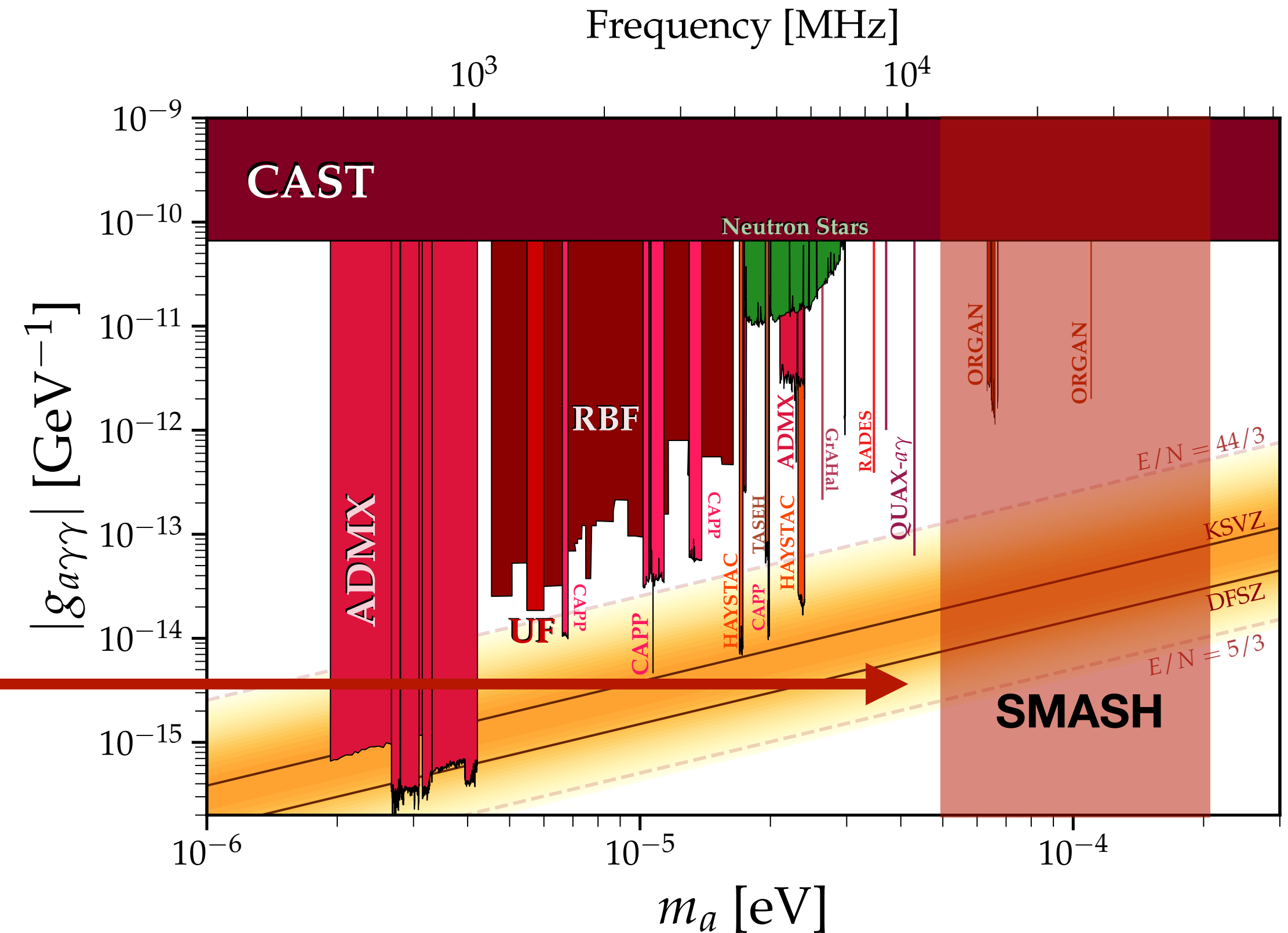
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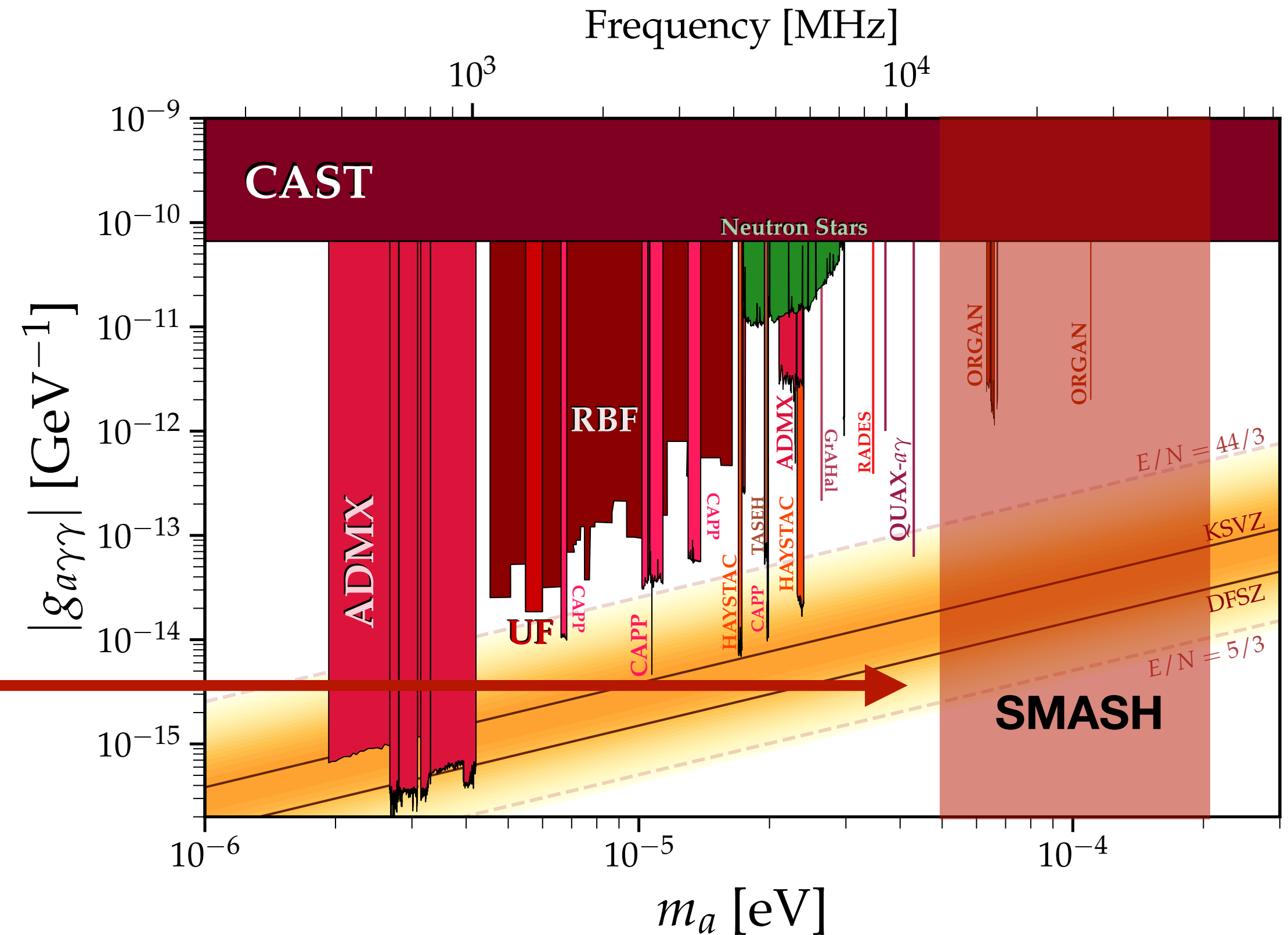
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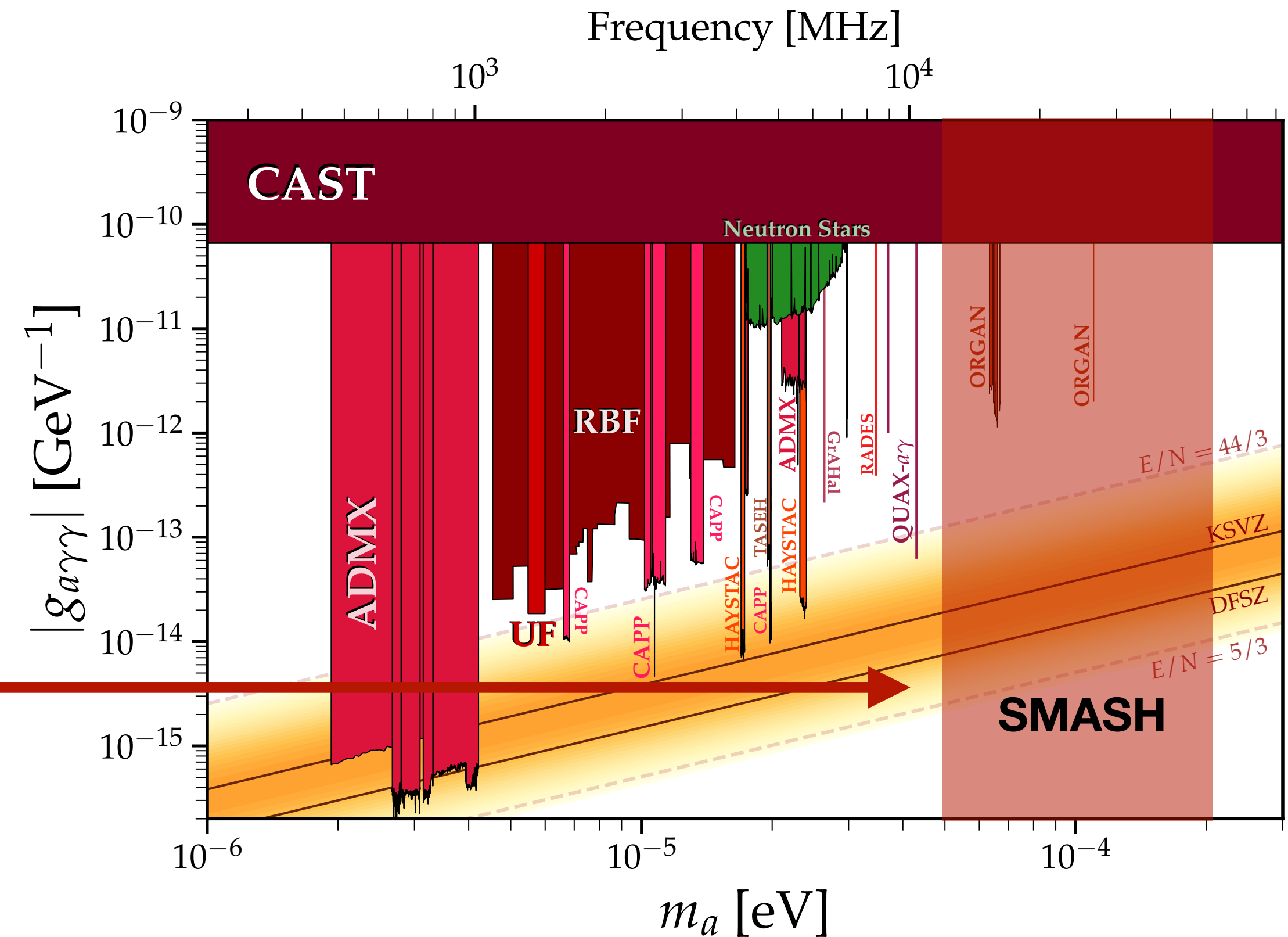
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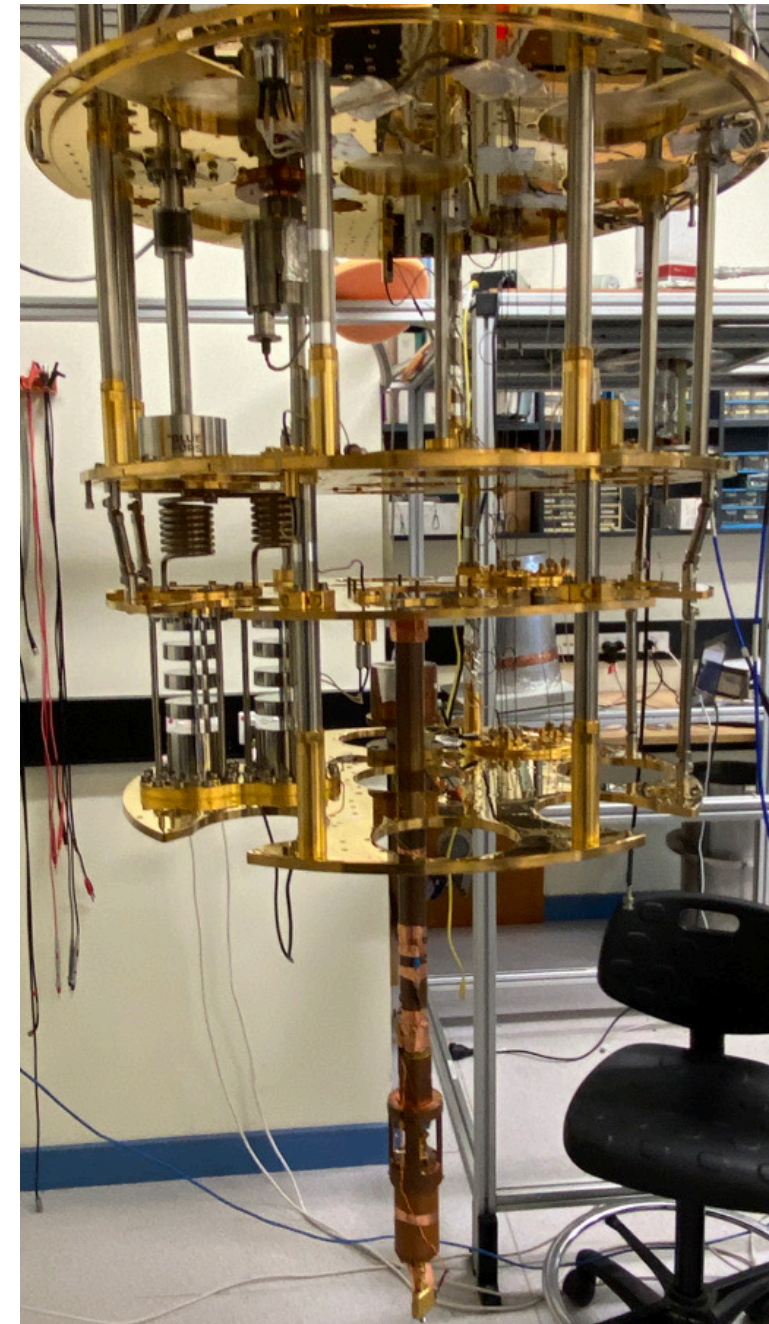
Phase 1a



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Dilution fridge



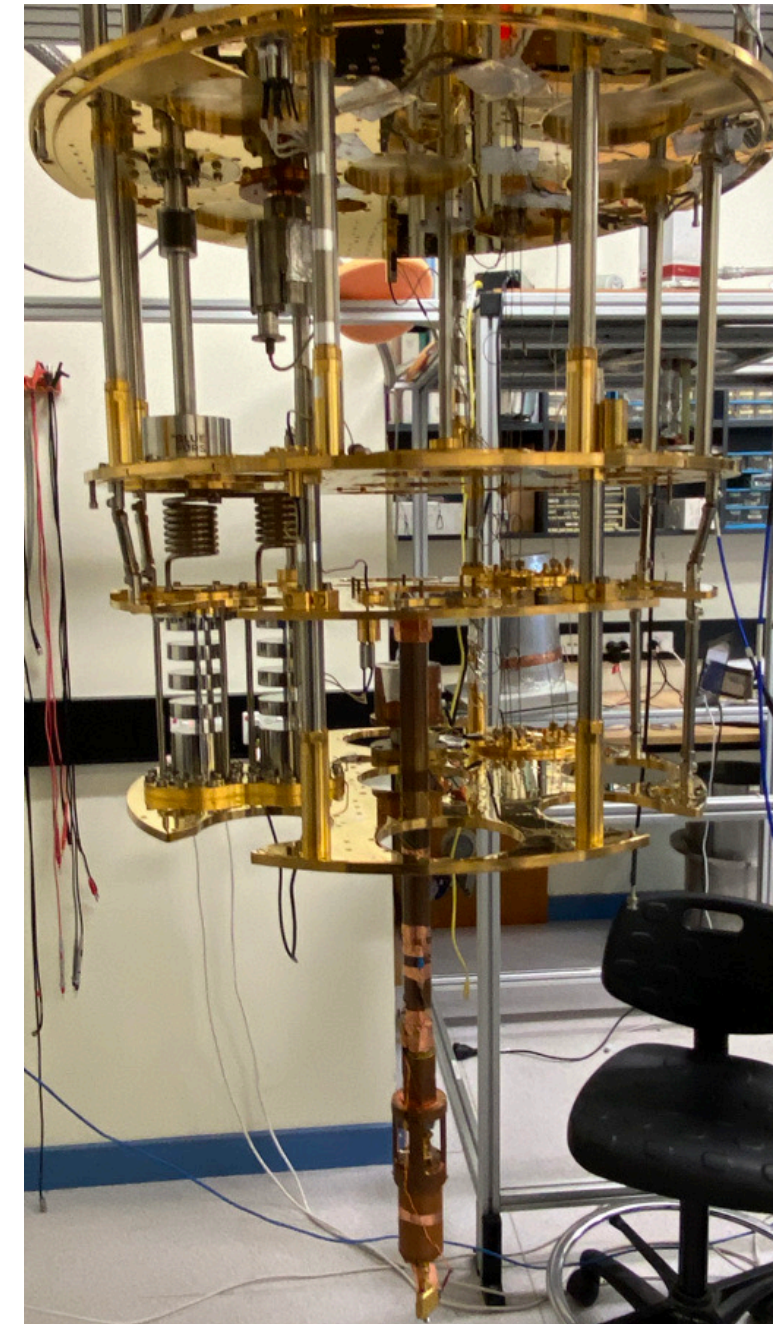
Rotation stage



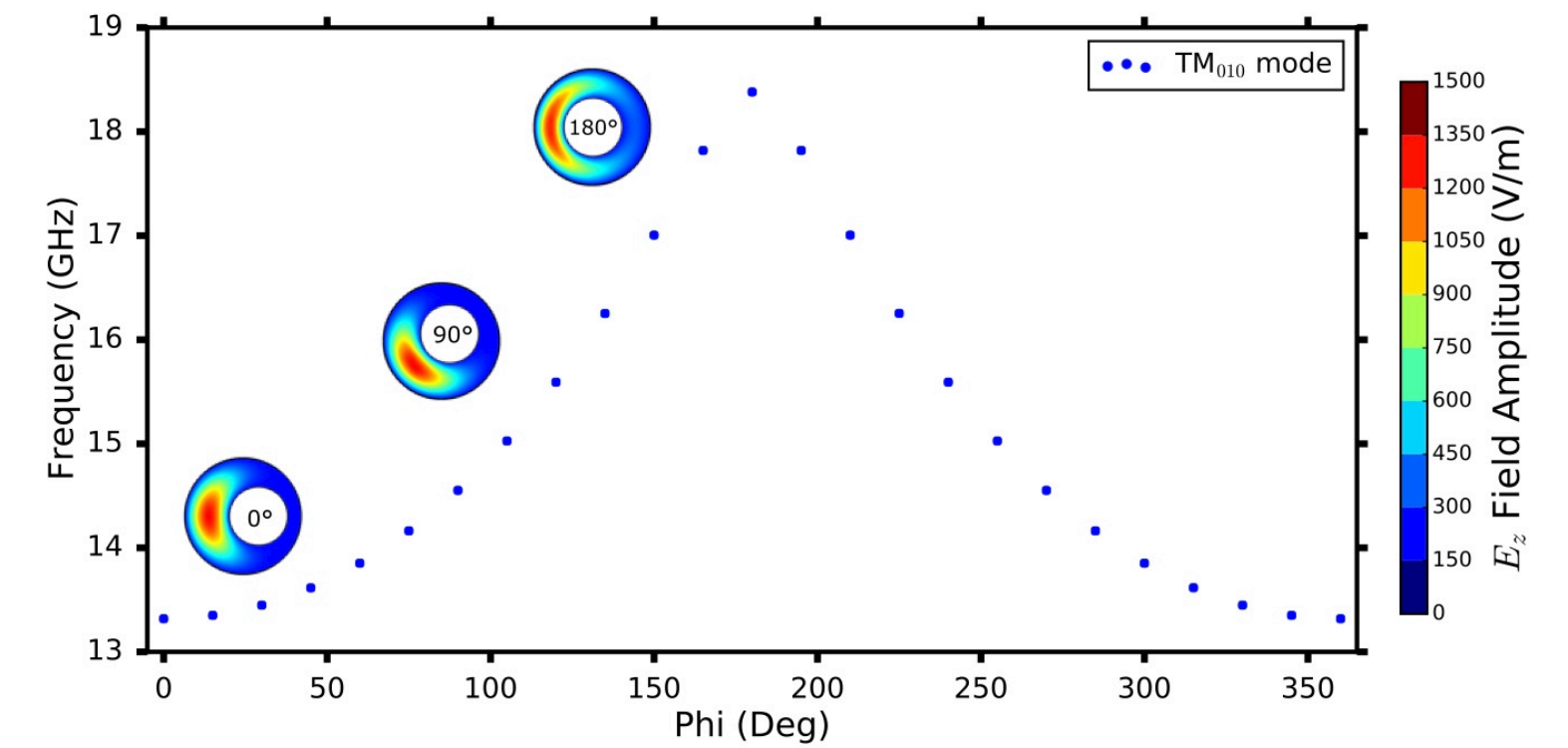
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By moving the rod radially the mode is perturbed, shifting the frequency

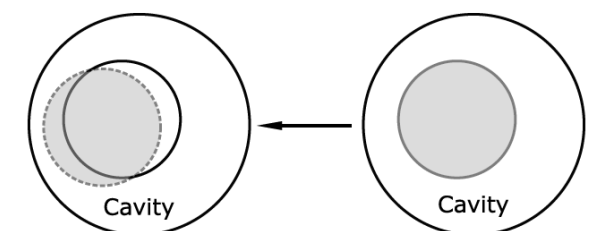
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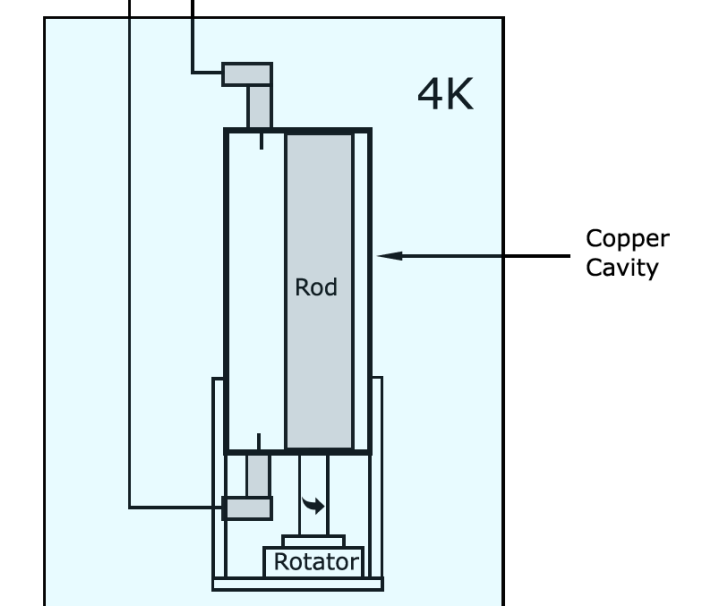
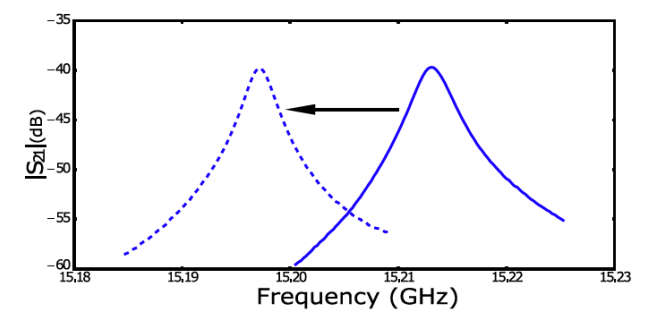
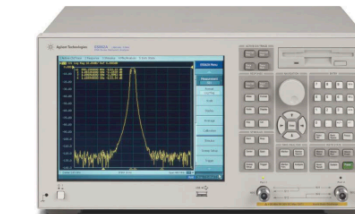
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Tuning

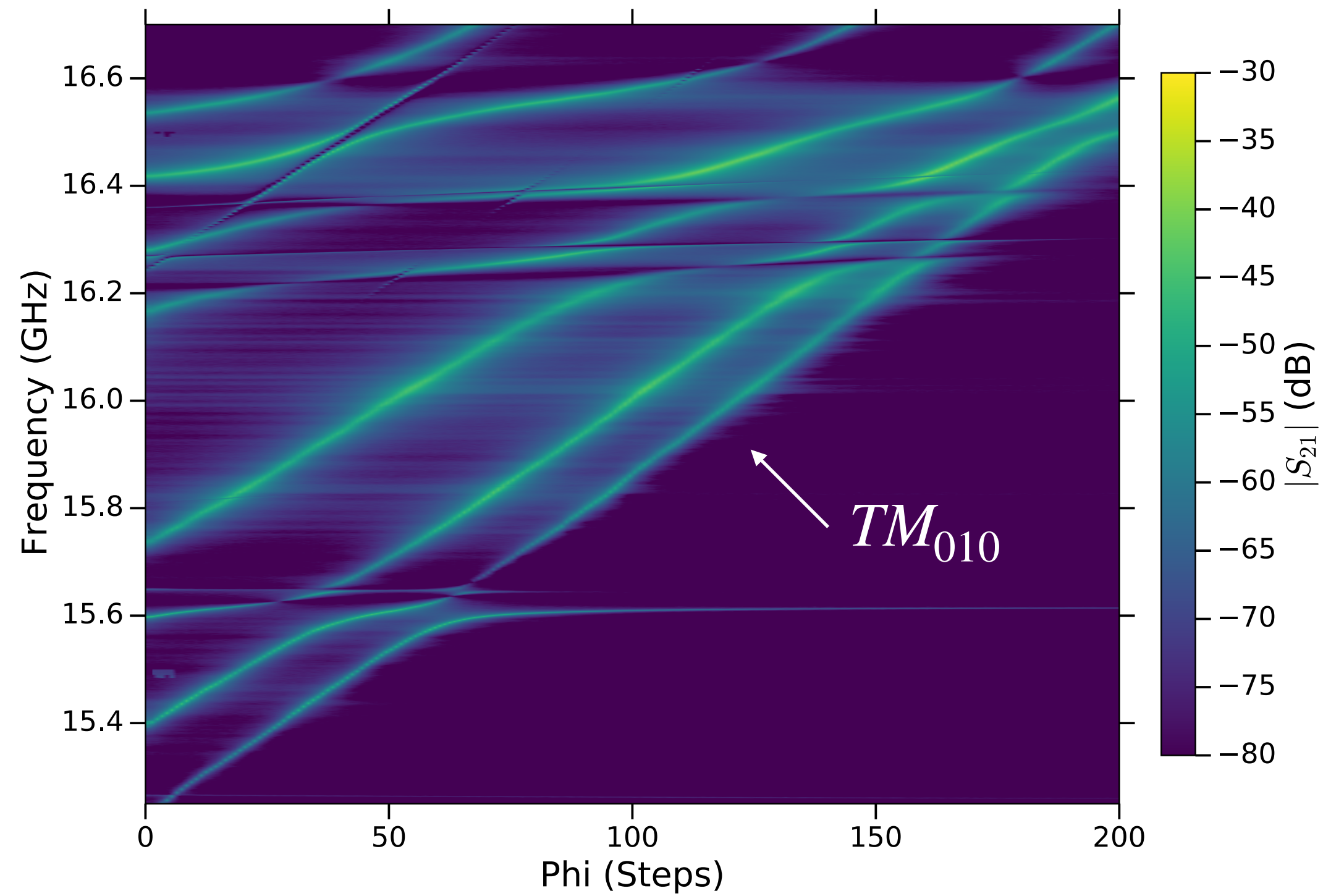


VNA

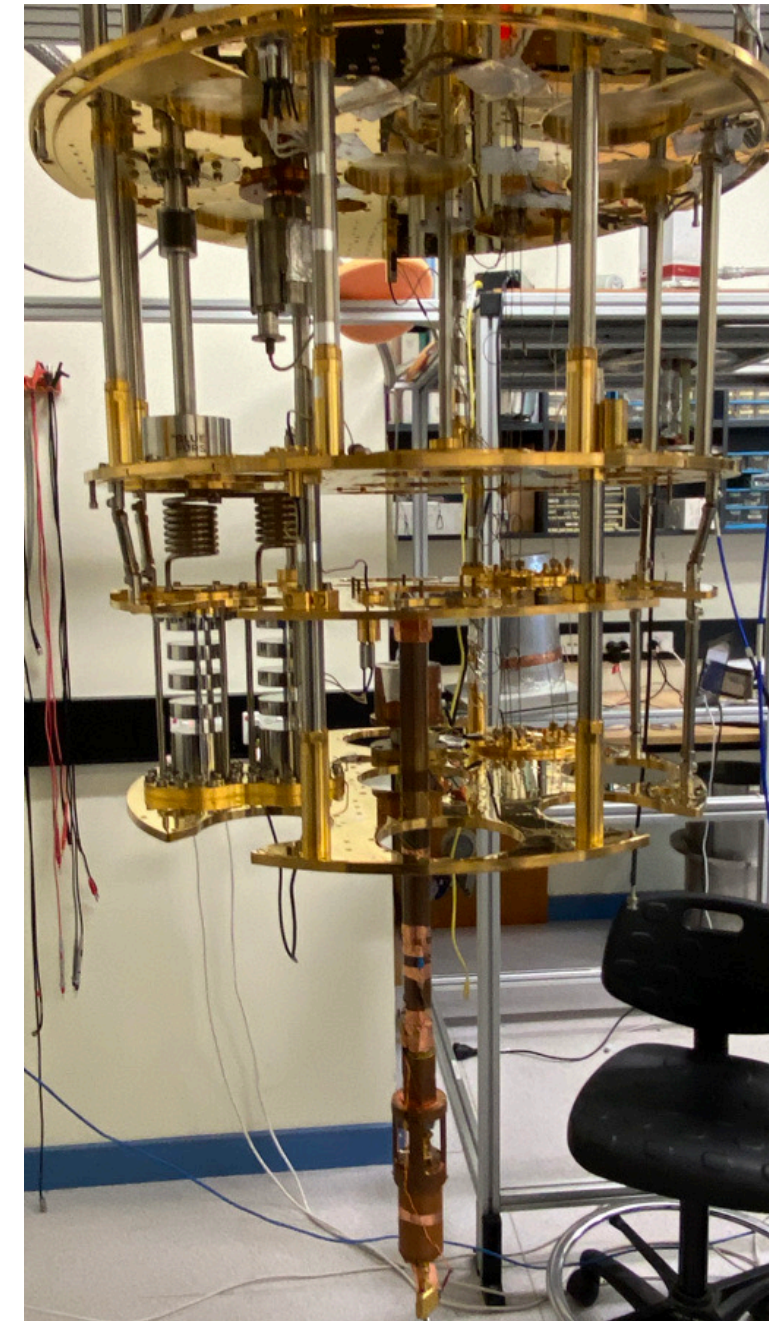


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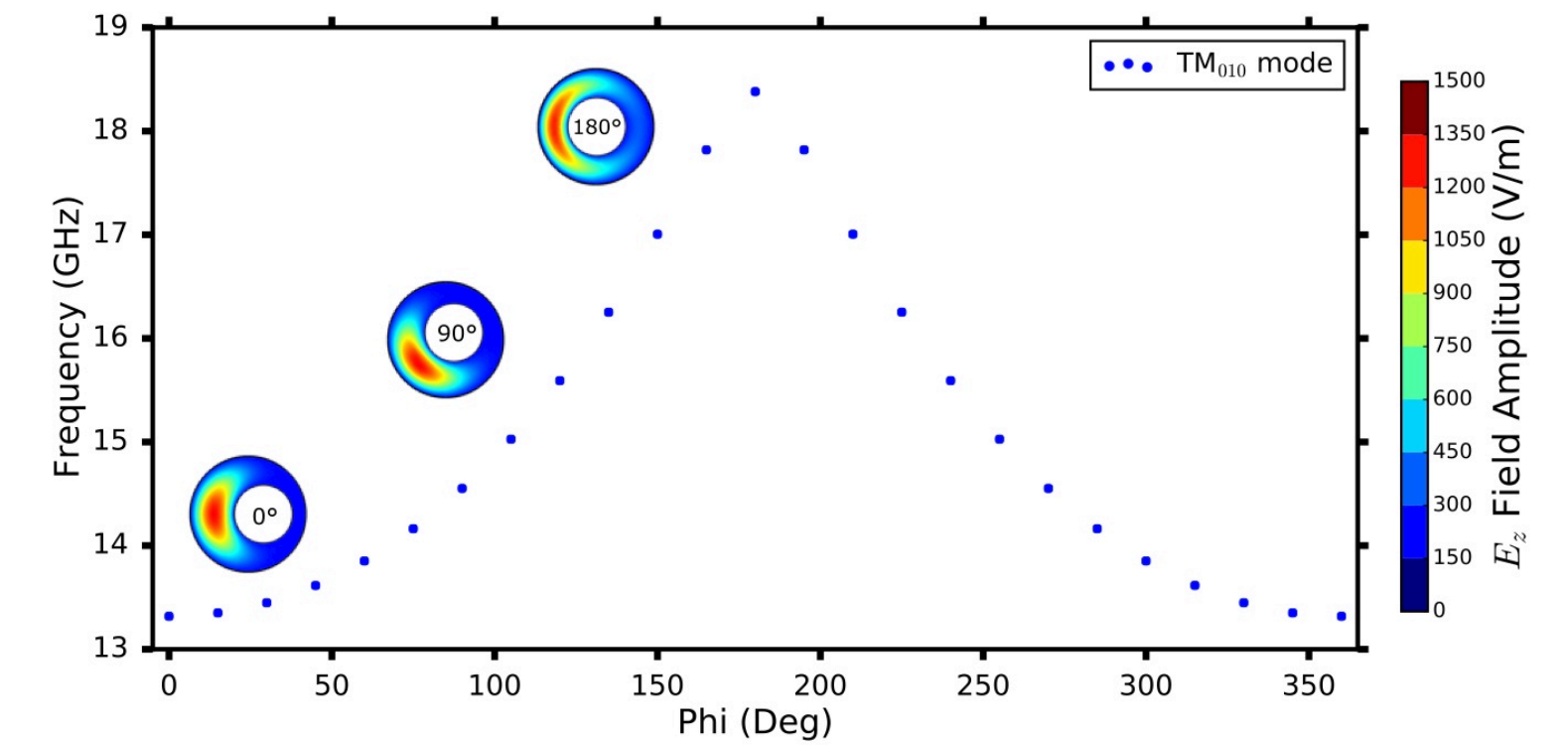
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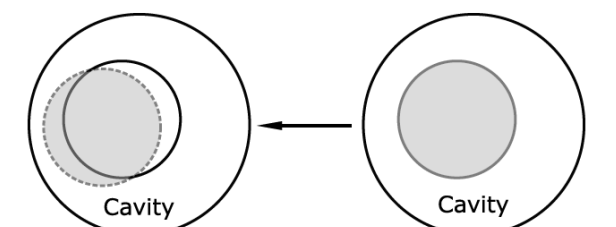
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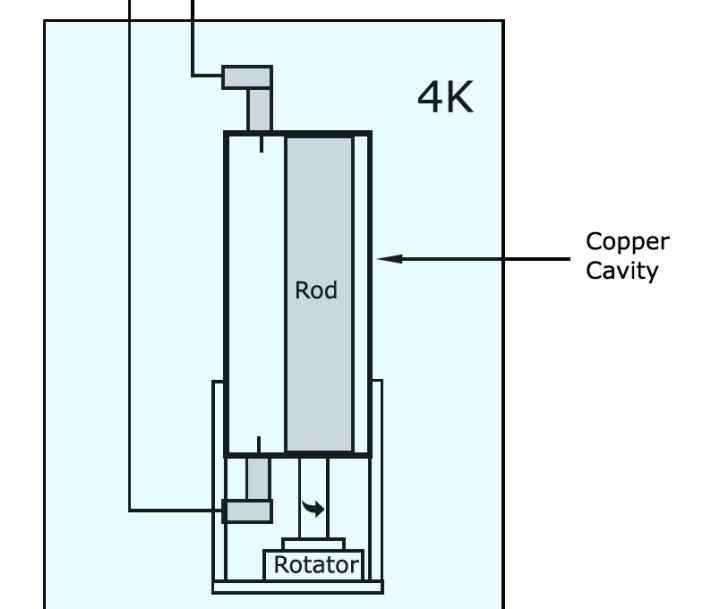
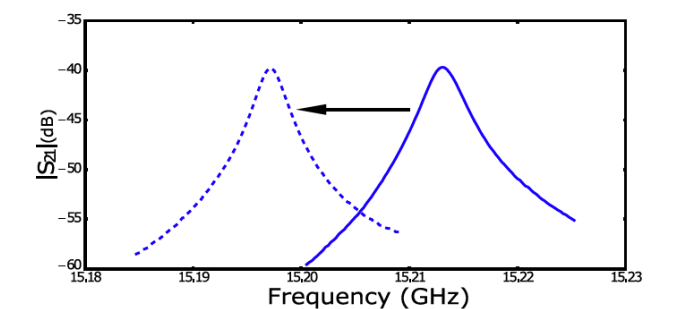
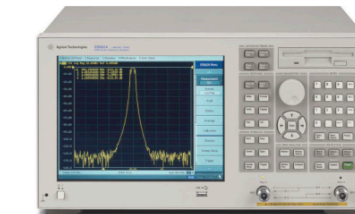
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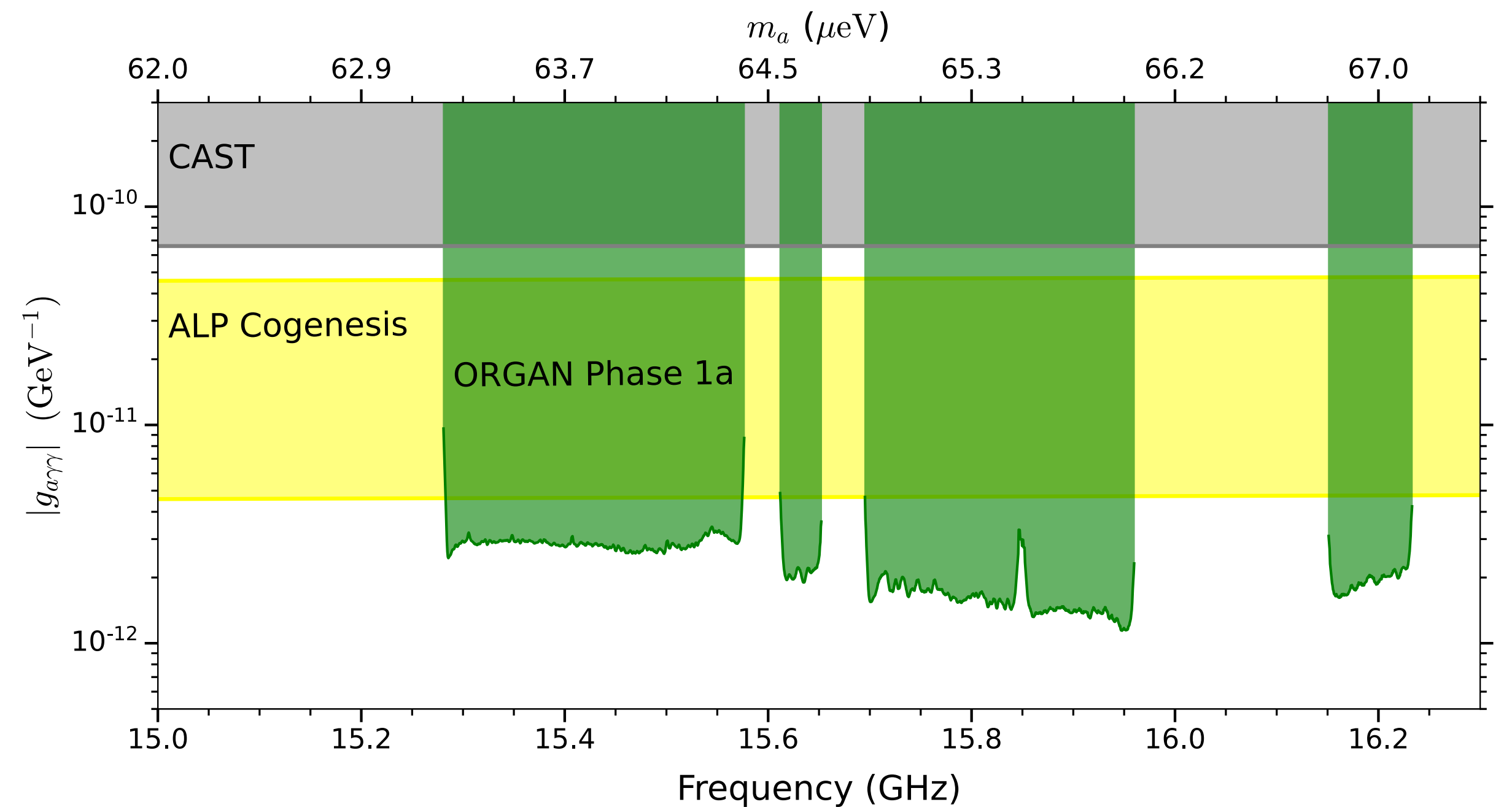
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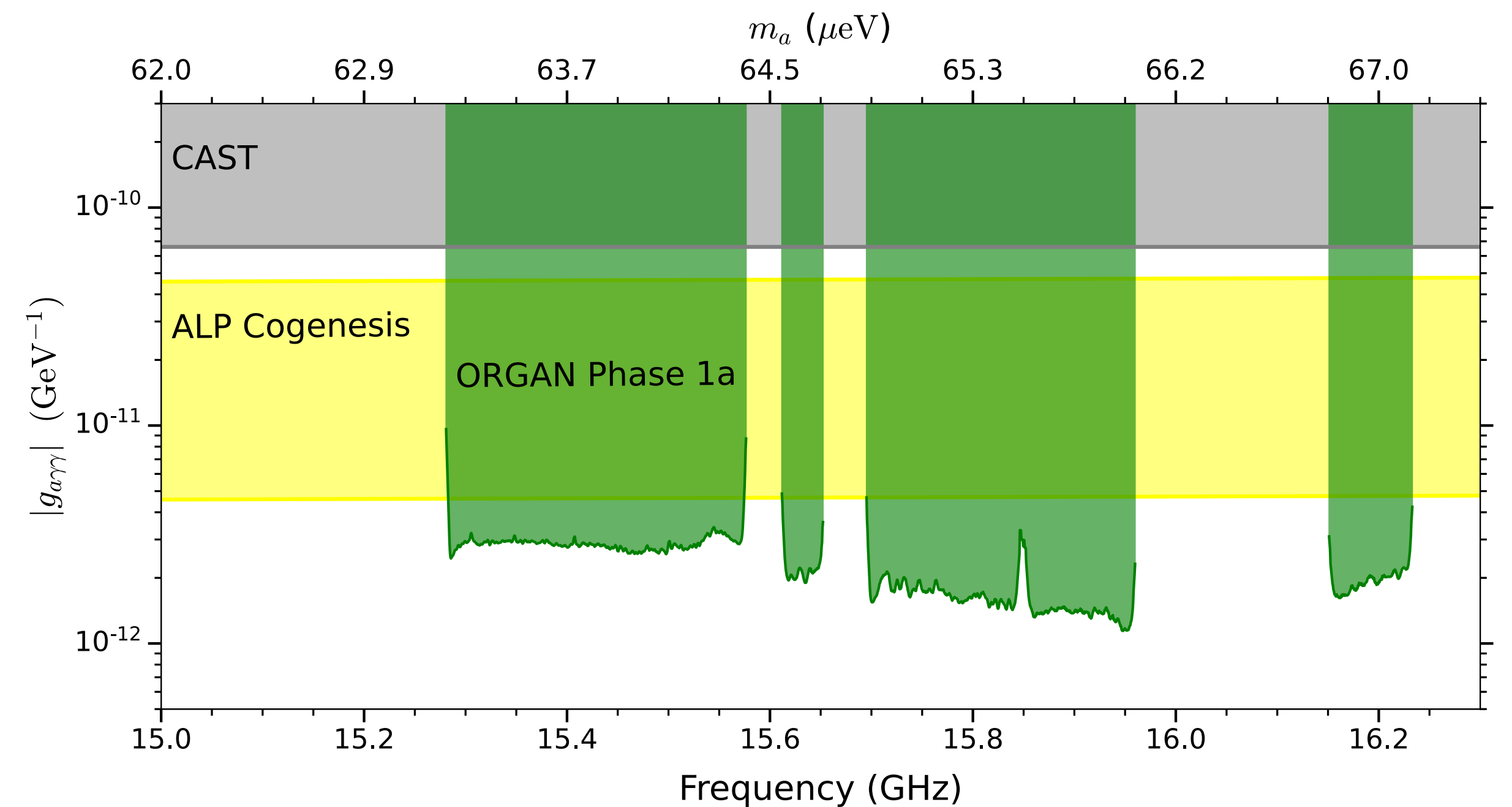
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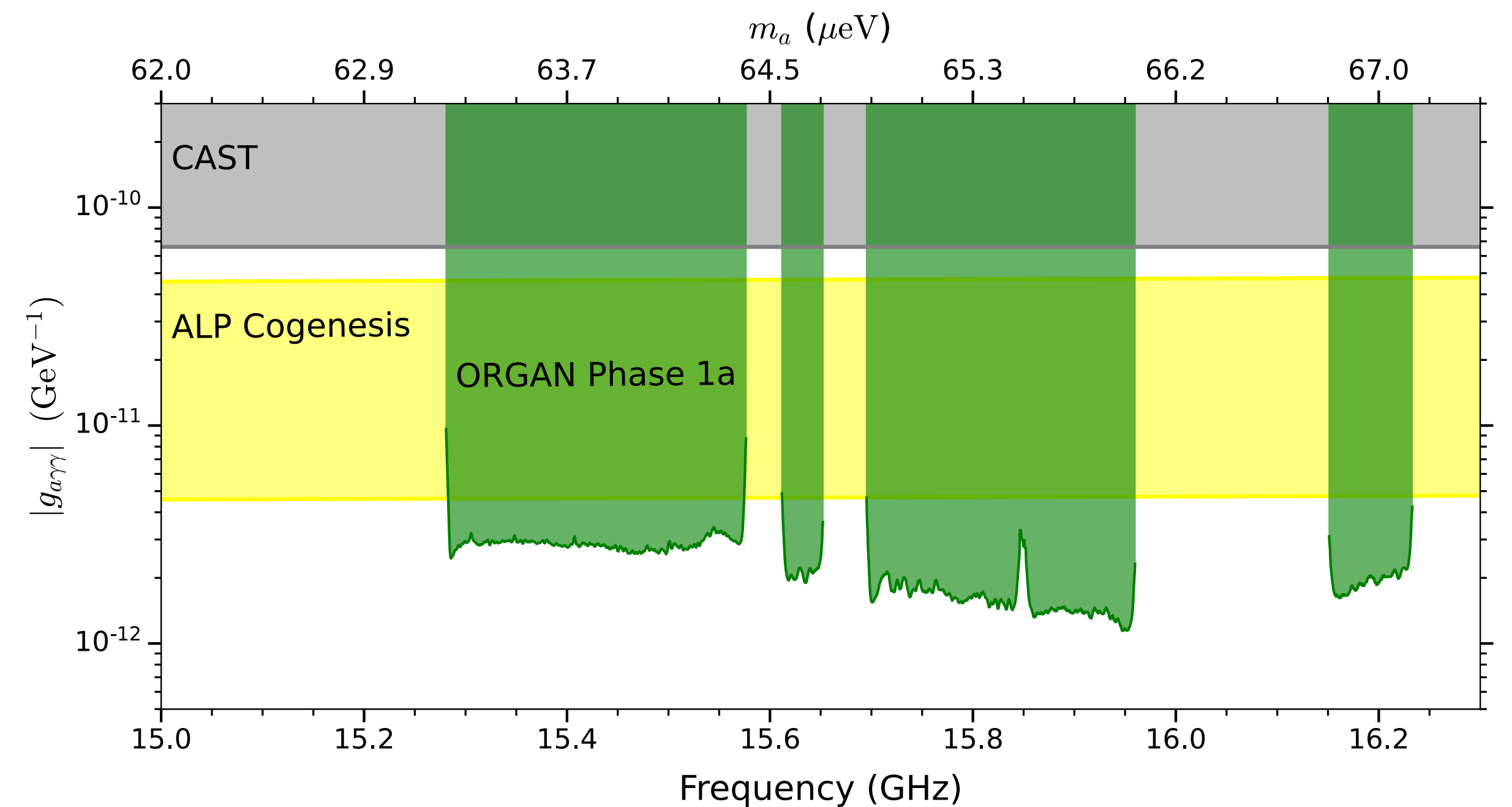
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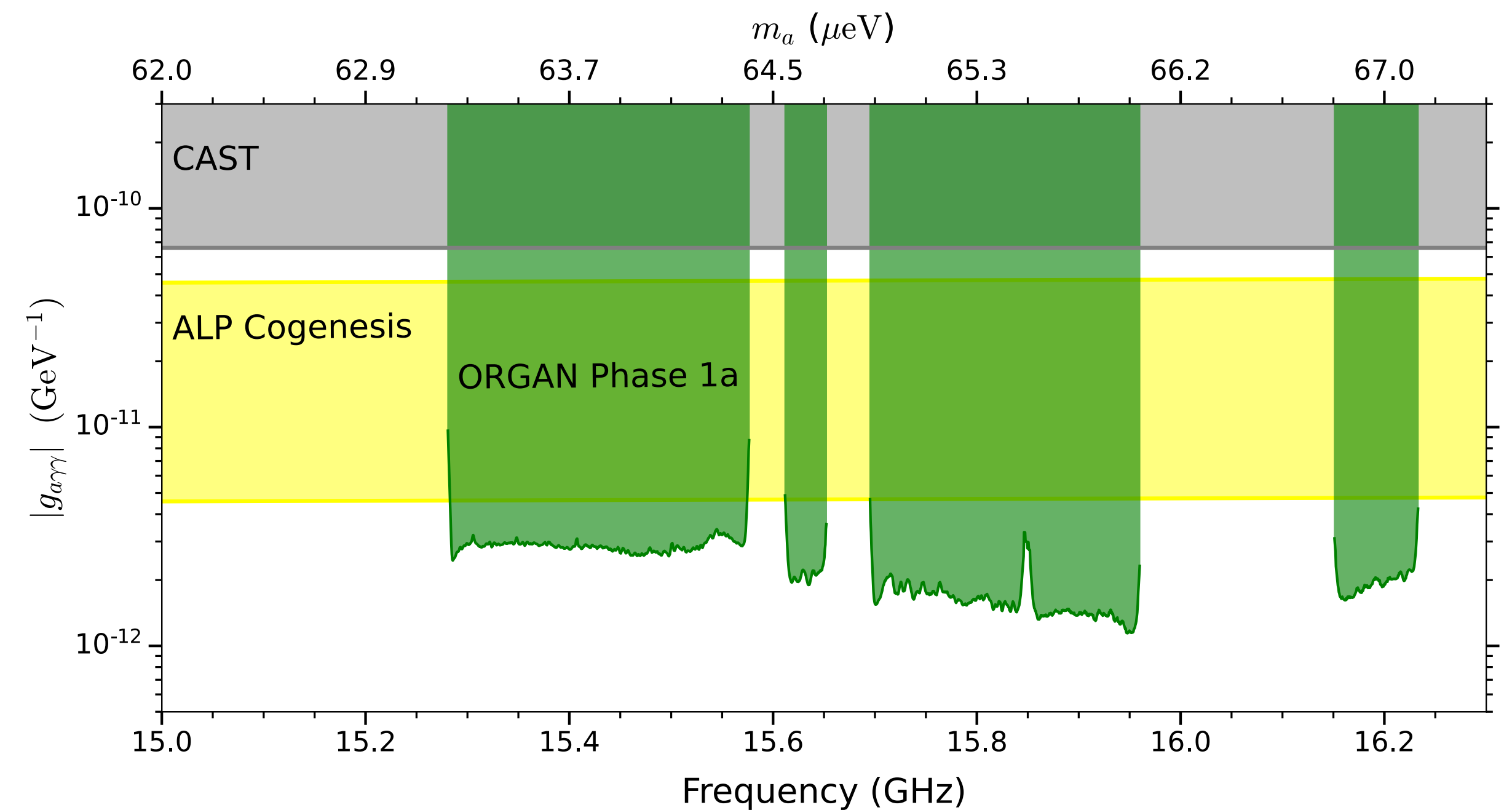
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- Published now in Science Advances

SCIENCE ADVANCES | RESEARCH ARTICLE

PHYSICS

Direct search for dark matter axions excluding ALP co genesis in the 63- to 67- μeV range with the ORGAN experiment

Aaron Quiskamp^{1*}, Ben T. McAllister^{1,2*}, Paul Altin³, Eugene N. Ivanov¹, Maxim Goryachev¹, Michael E. Tobar^{1*}



Phase 1b

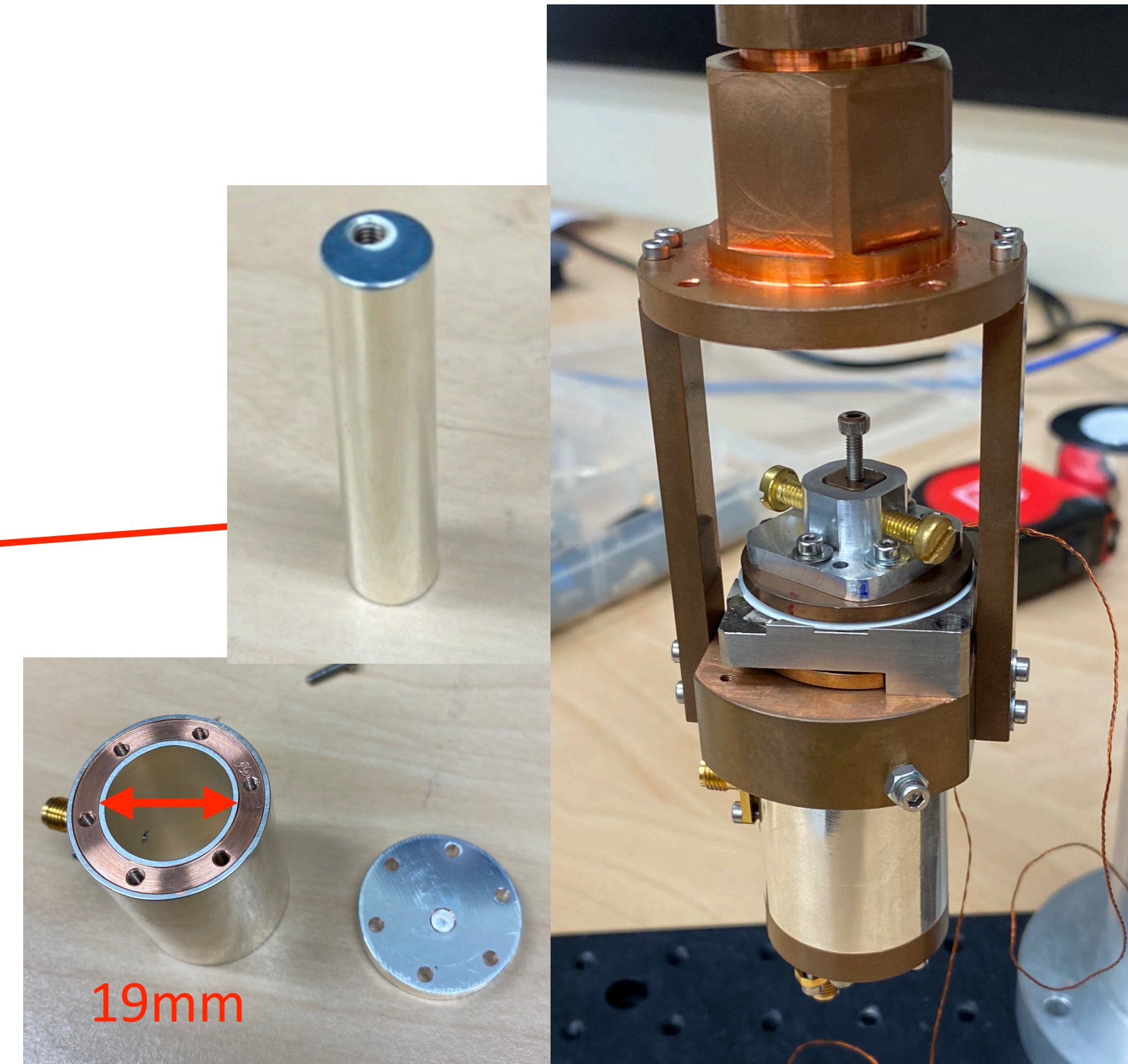


Phase 1b

- Targeted 1GHz search between ~26-27GHz

Phase 1b

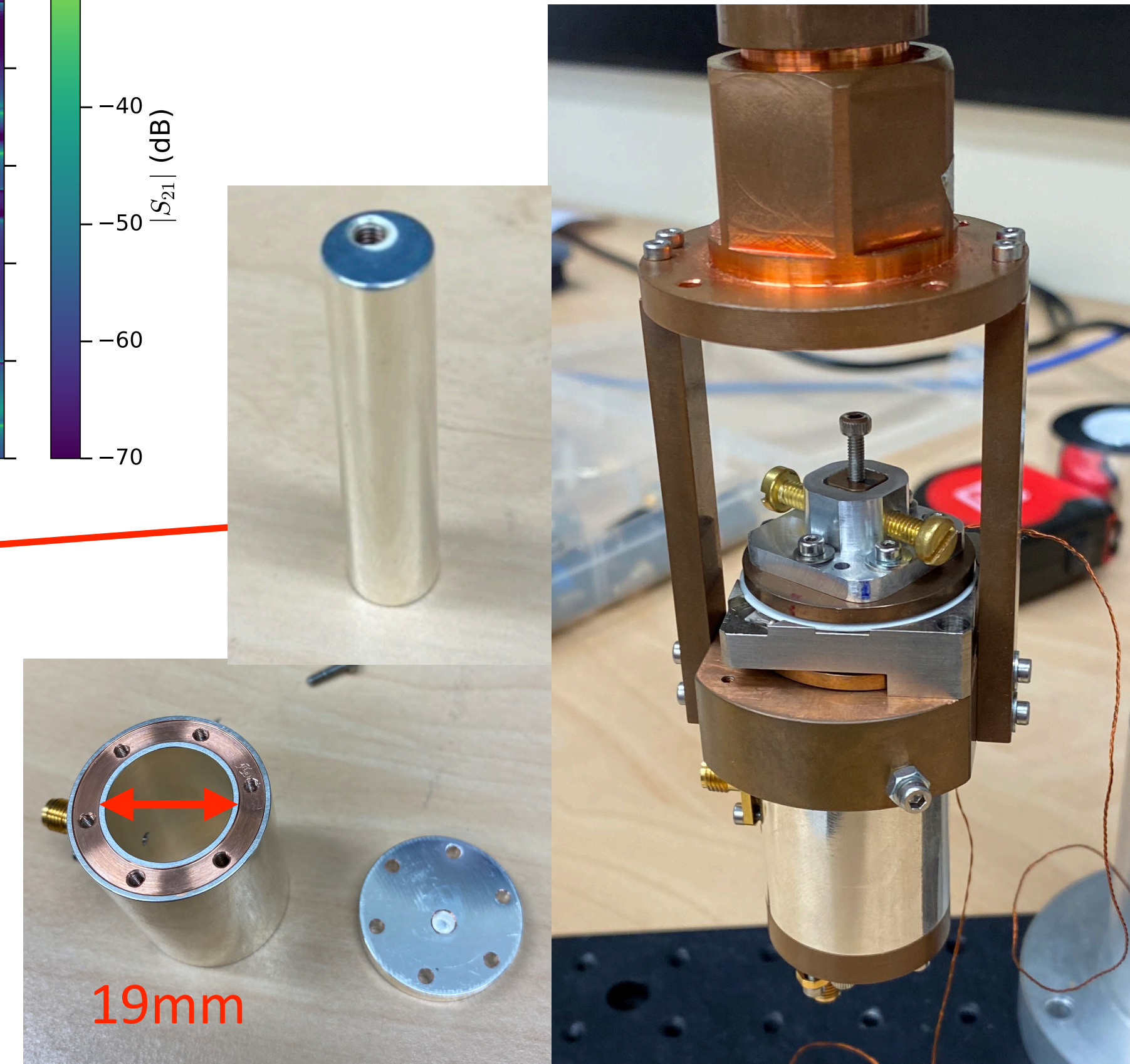
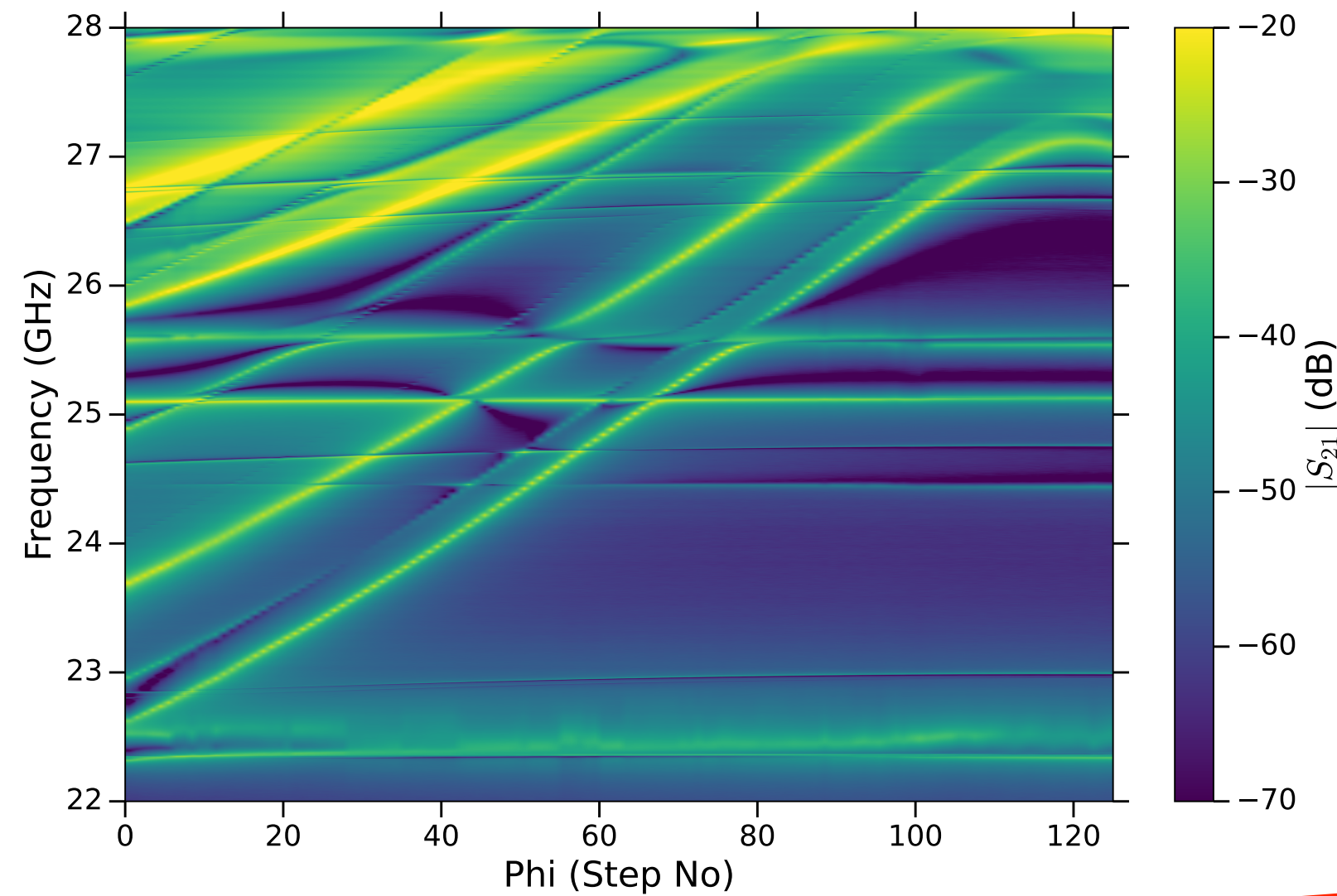
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26GHz tuning rod resonator

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- Extremely sensitive to alignment and rod tilt



26GHz tuning rod resonator

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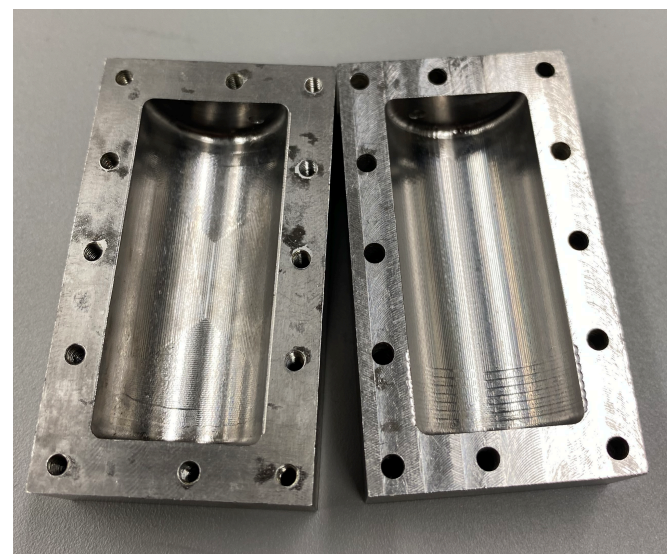
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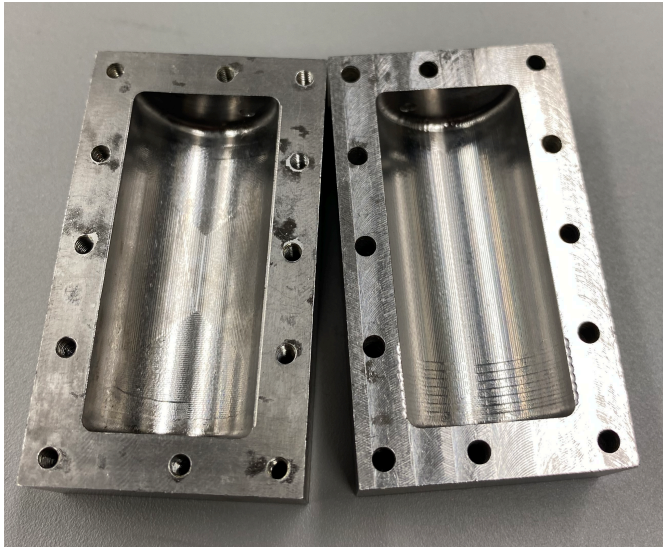
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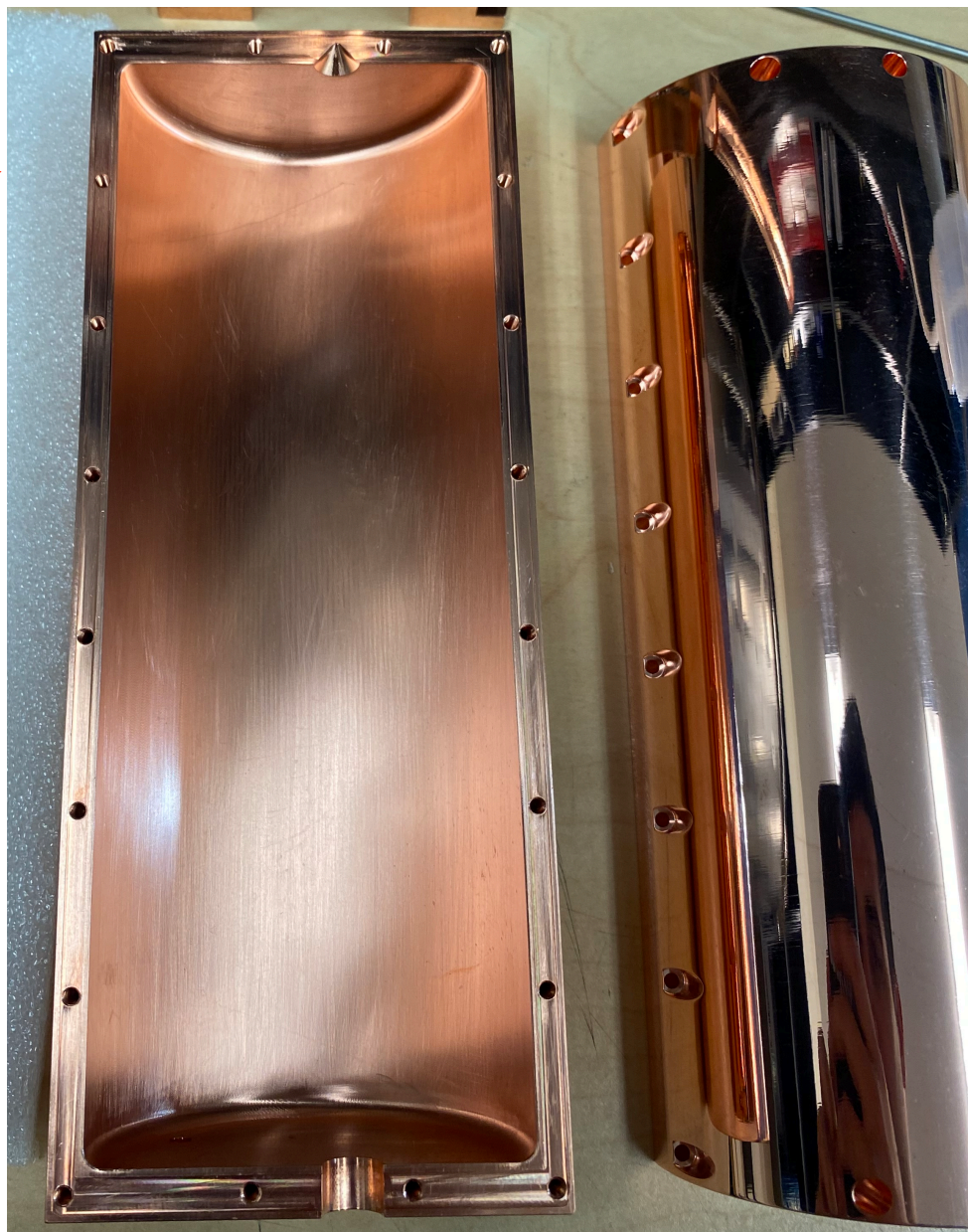
Sputtered Nb₃Sn

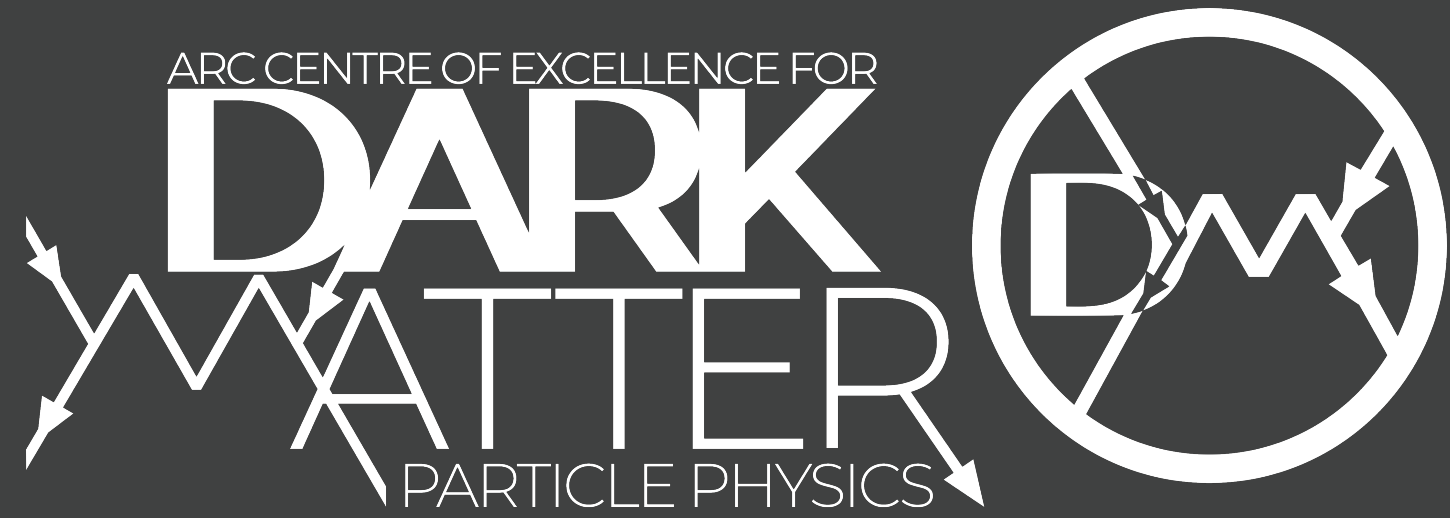


Bulk NbTi

ORGAN Q

- 6-7 GHz clamshell cavity
- Using a JPA at mK
- Plan 5-10 x KSVZ sensitivity
- Commence in 2023 in 7 T Magnet





Questions?



Australian Government
Australian Research Council

National Partners



International Partners

