DARK PHOTONS & AXION LIKE PARTICLES INTERFEROMETER

Javier De Miguel for the DALI Collaboration

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Experimental Tests of the "Invisible" Axion

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(Received 13 July 1983)

Experiments are proposed which address the question of the existence of the "invisible" axion for the whole allowed range of the axion decay constant. These experiments exploit the coupling of the axion to the electromagnetic field, axion emission by the sun, and/or the cosmological abundance and presumed clustering of axions in the halo of our galaxy.

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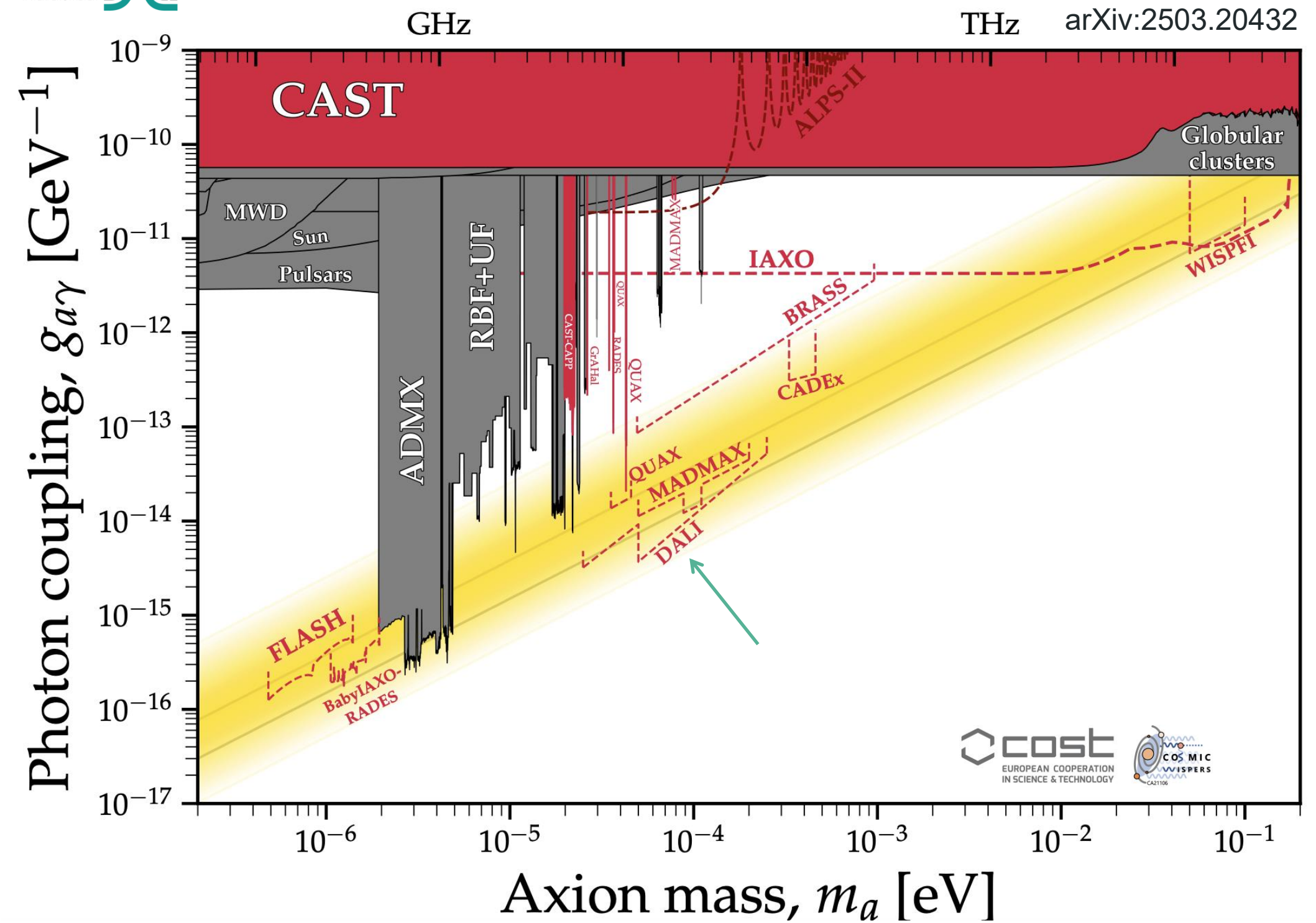

DALI
COLLABORATION

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RIKEN

SENDAI, JAPAN

DARK PHOTONS &
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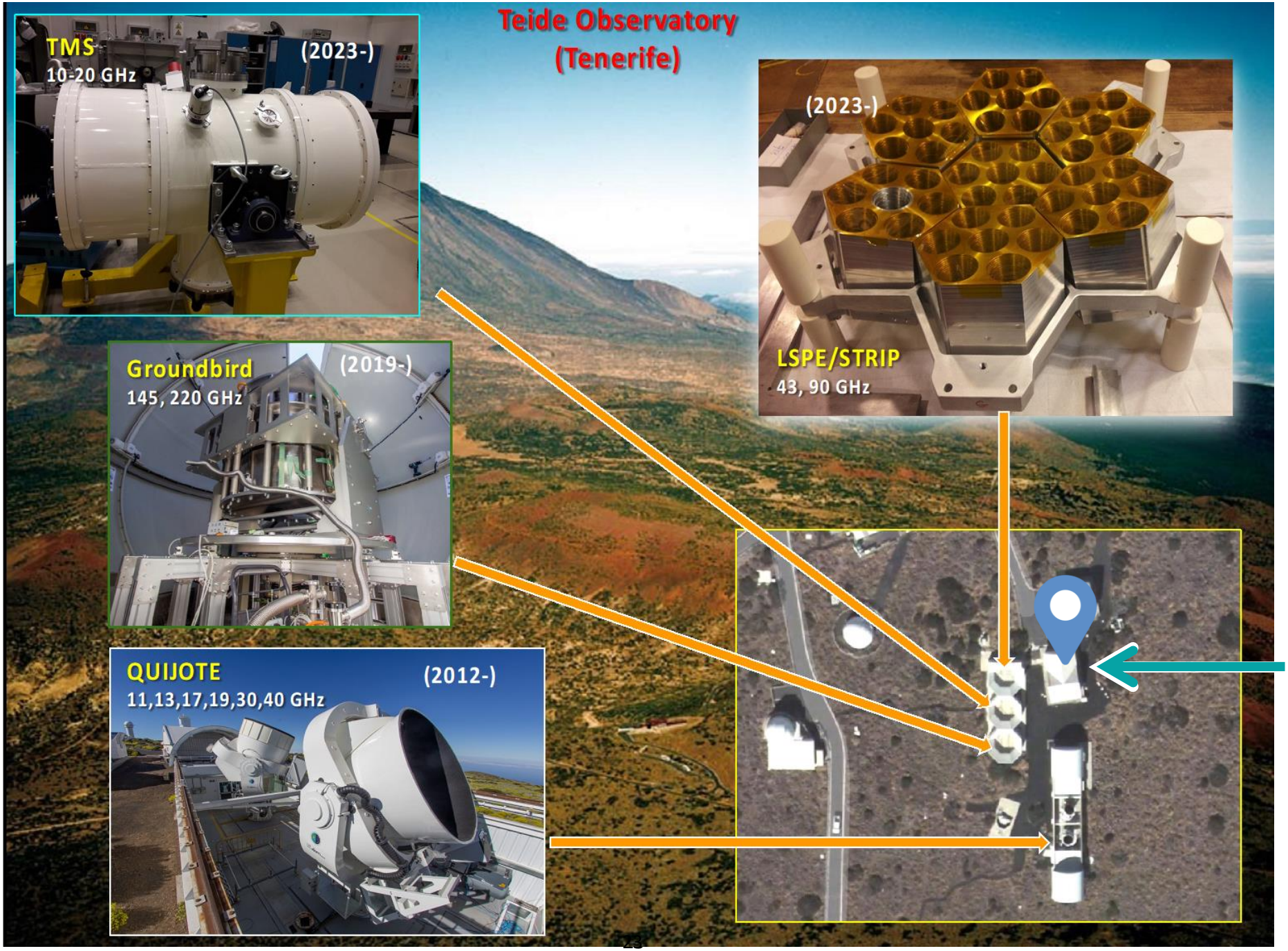
INTERFEROMETER
DALI


Teide Observatory
(Tenerife)
TMS
10-20 GHz
(2023-)
(2023-)
LSPE/STRIP
43, 90 GHz
Groundbird
145, 220 GHz
(2019-)
QUIJOTE
11,13,17,19,30,40 GHz
(2012-)
28°18'00"N 16°30'35"W

DALI
CONCEPT

“PHASED ARRAY” TELESCOPES

Planck LFI (27-77 GHz)

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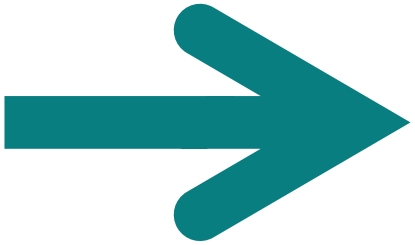
CMB

"PHASED ARRAY" TELESCOPES



DM & GWs

"**MAGNETIZED PHASED ARRAY**" HALOSCOPE

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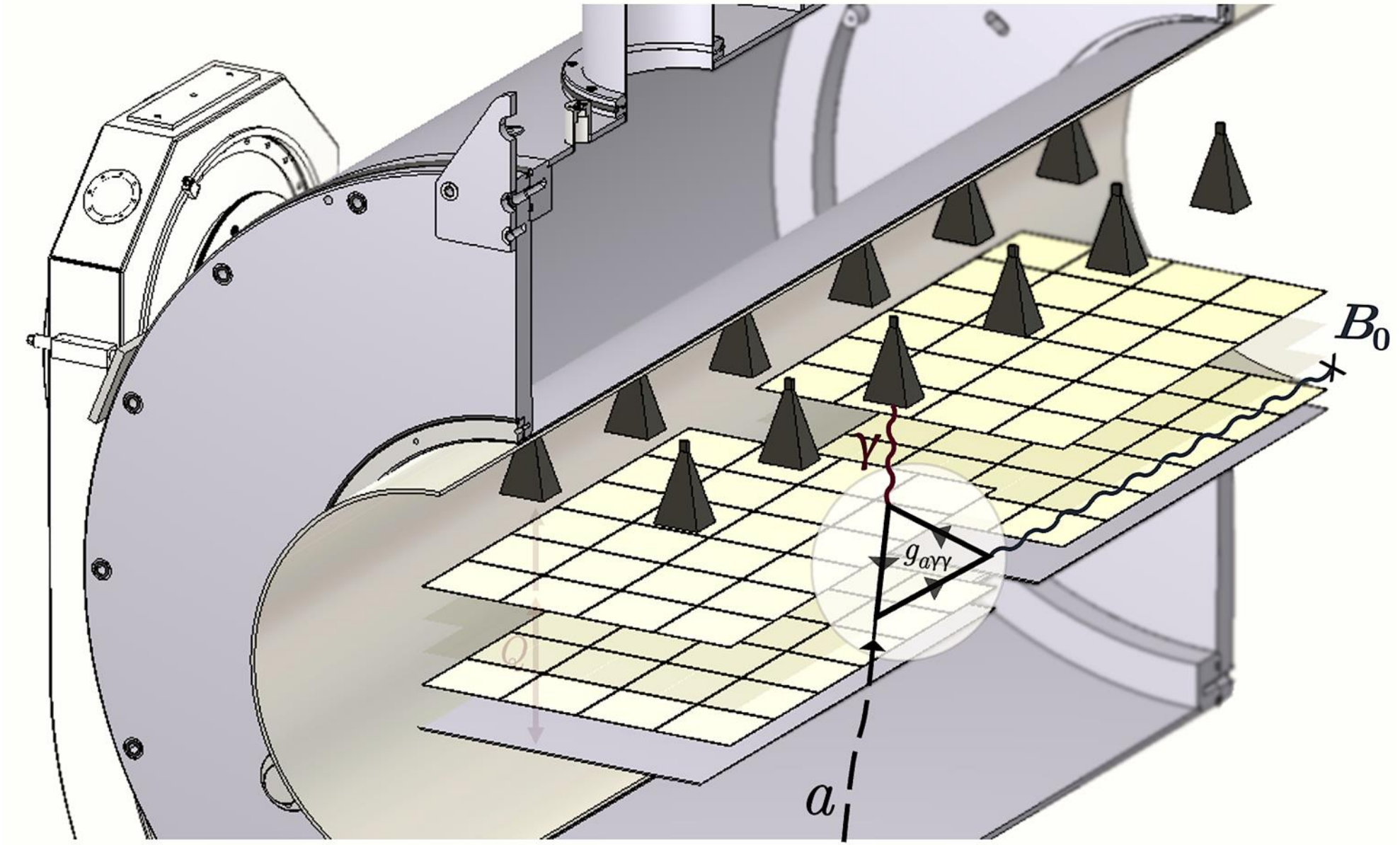
“MAGNETIZED PHASED ARRAY”



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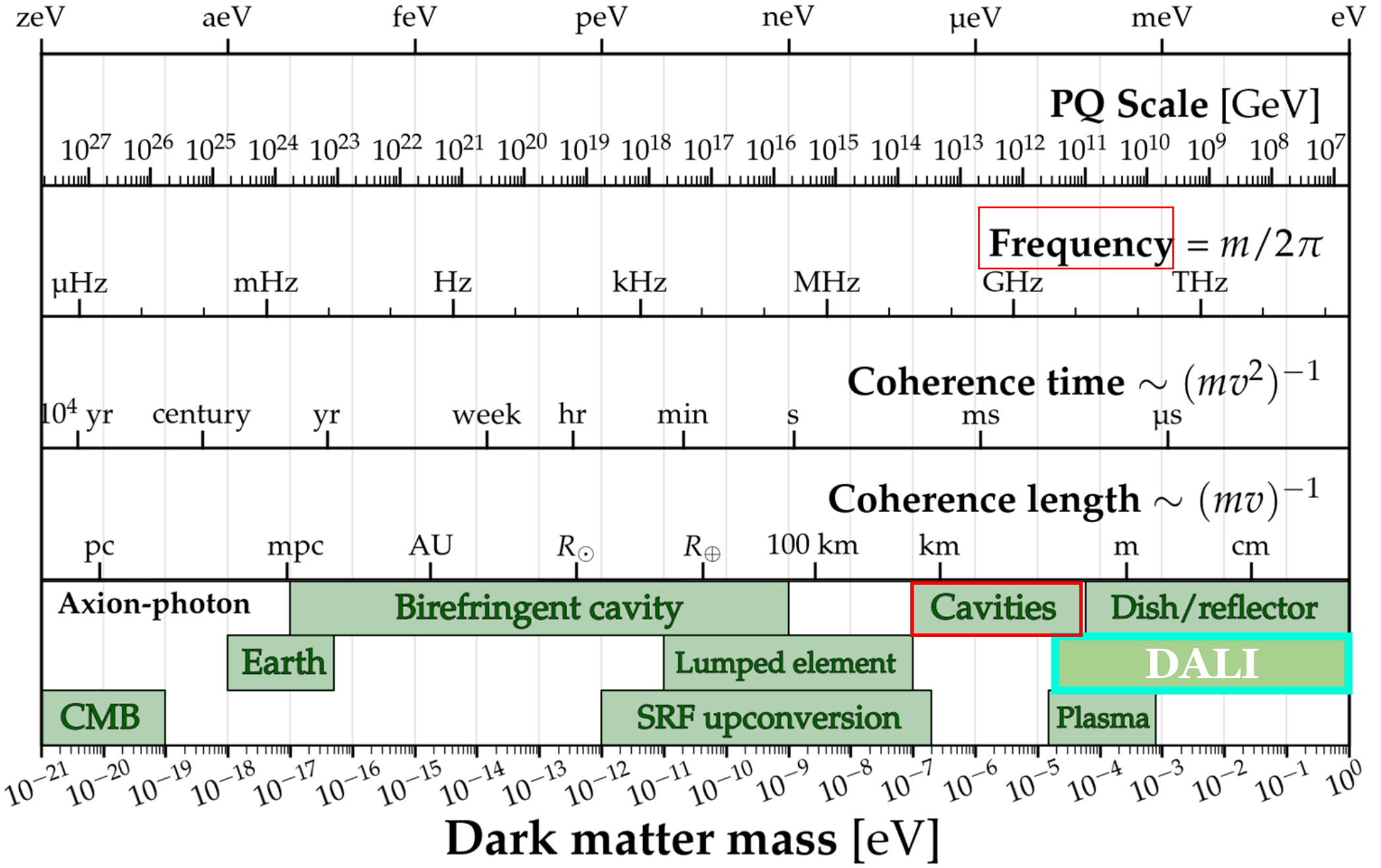
Dark matter mass

Credits C. O'Hare



Dark matter mass [eV]

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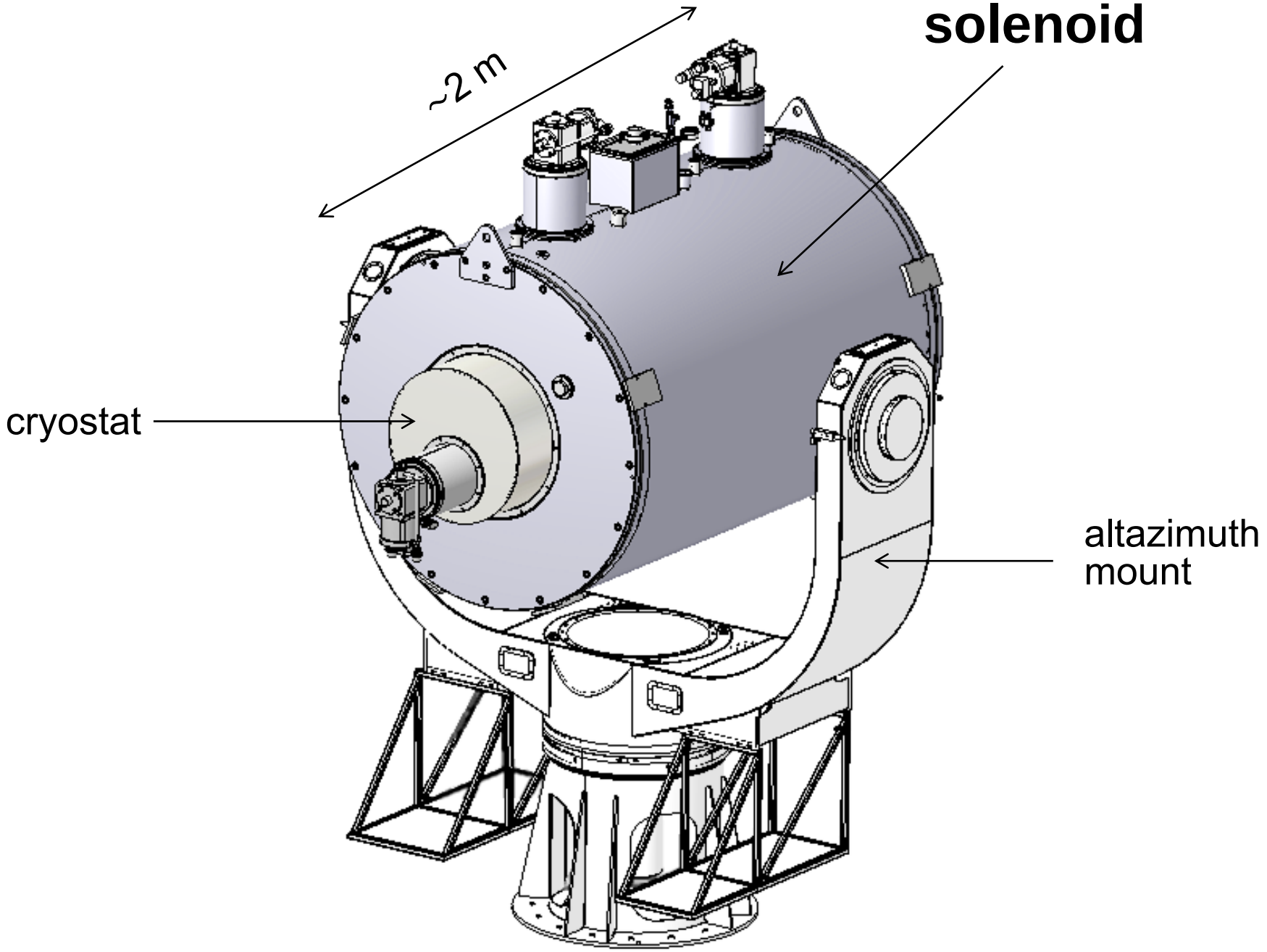

NEW DEVELOPMENTS

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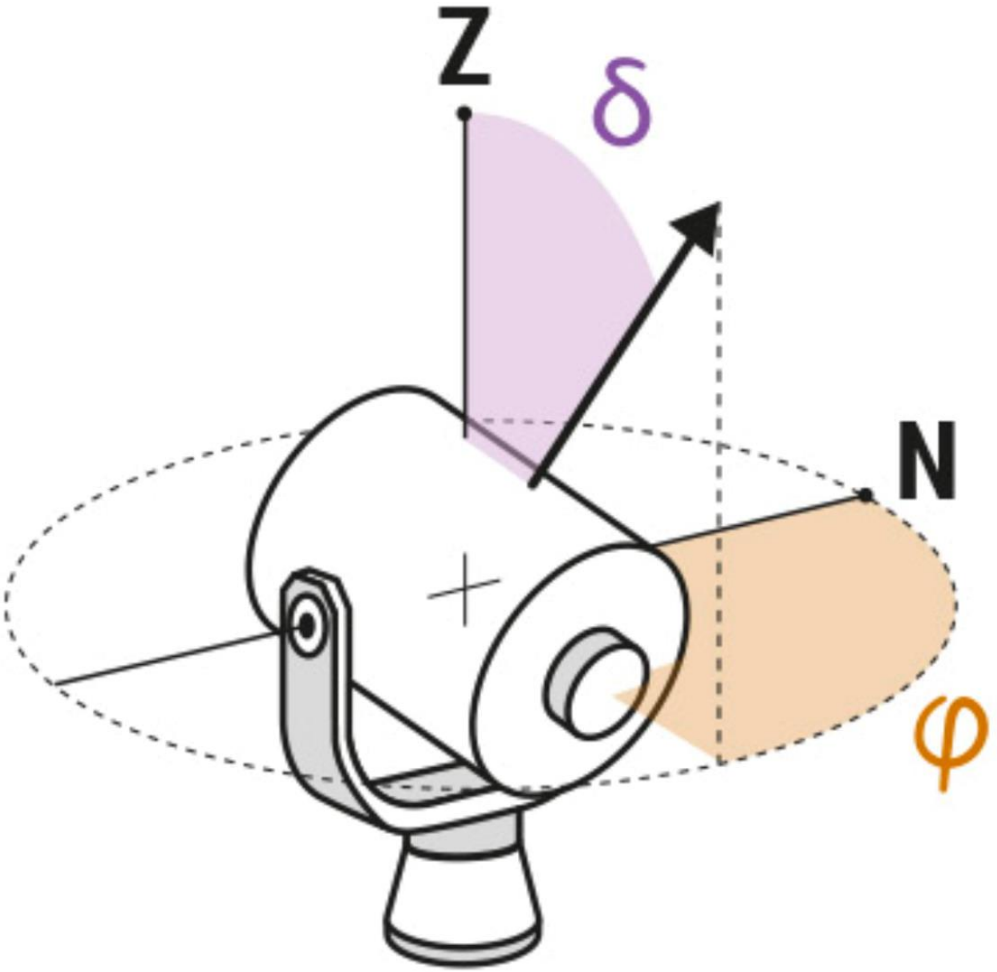
1) Directionality



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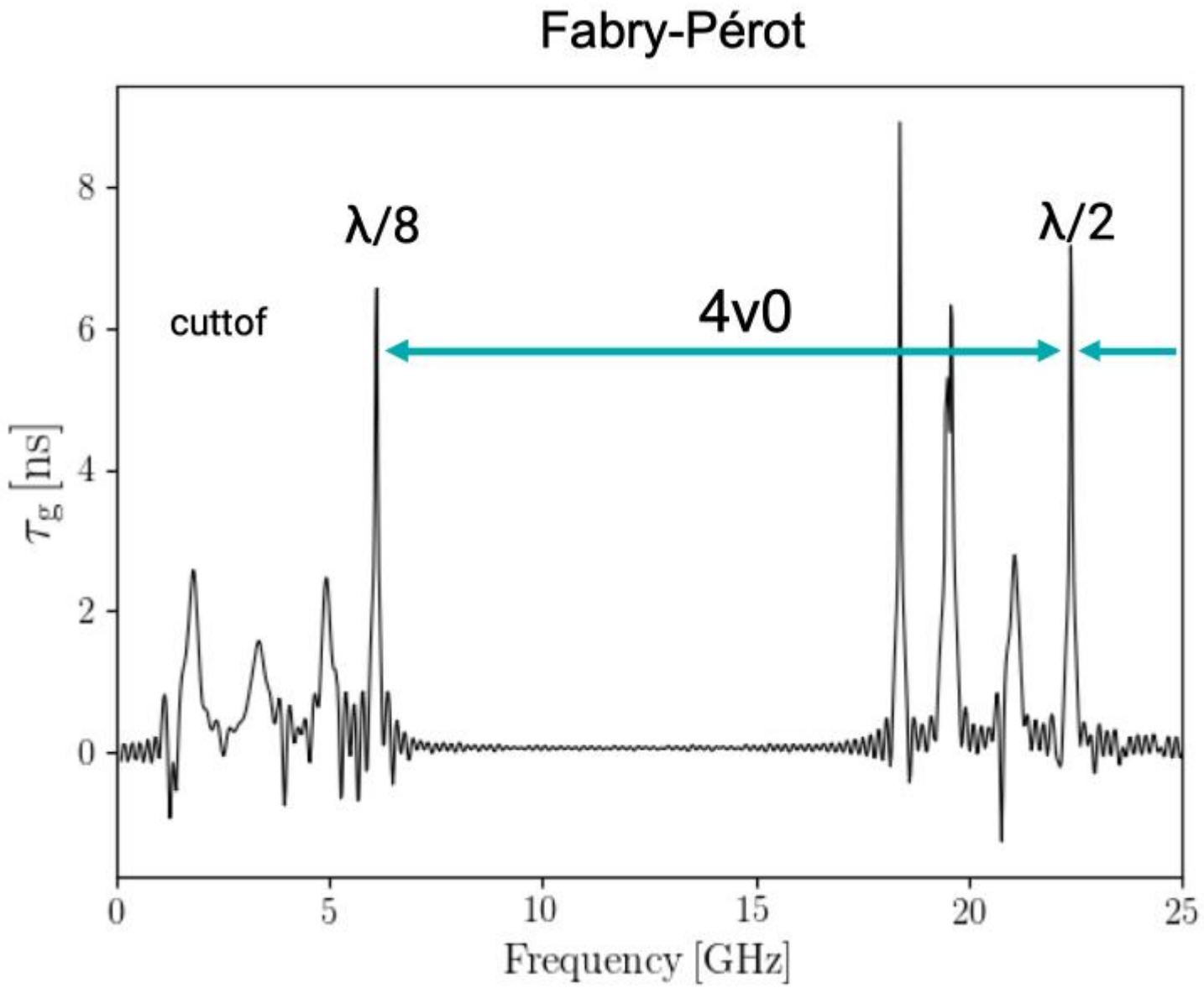
2) Multi-resonance



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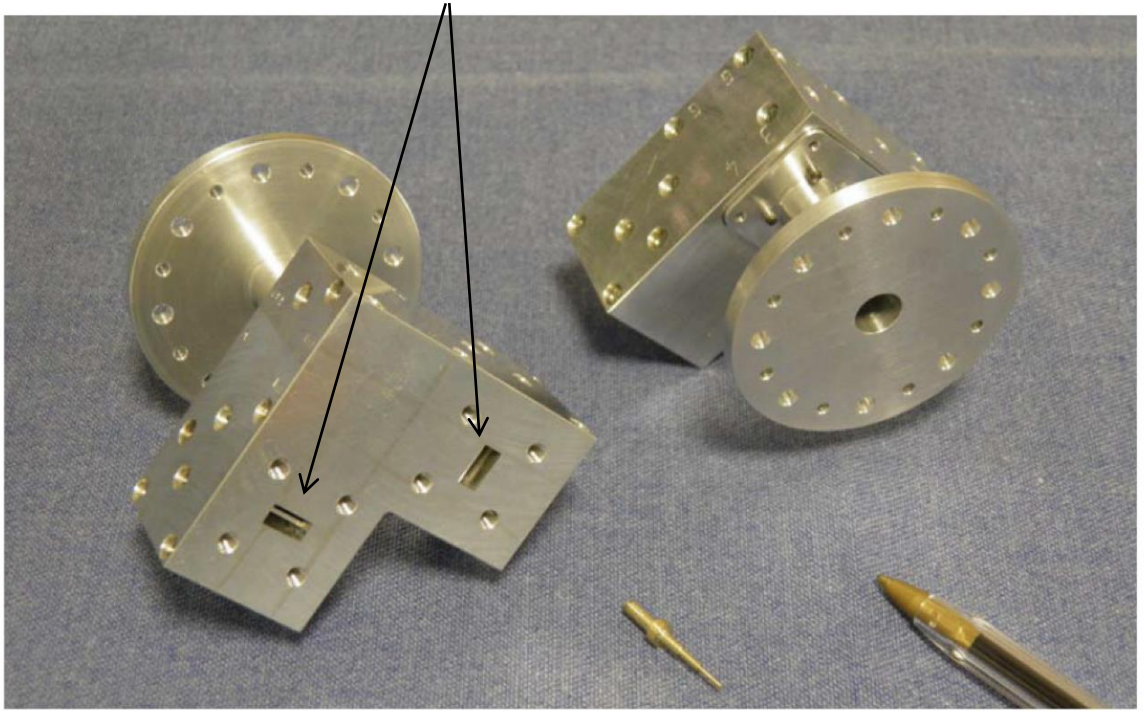
3) Polarization

2-dual linear polarization



$$\begin{pmatrix} E_x(t) \\ E_y(t) \end{pmatrix} = E_0 \begin{pmatrix} E_{0x}\, e^{i(kz-\omega t+\phi_x)} \\ E_{0y}\, e^{i(kz-\omega t+\phi_y)} \end{pmatrix} = E_0\, e^{i(kz-\omega t)} \begin{pmatrix} E_{0x}\, e^{i\phi_x} \\ E_{0y}\, e^{i\phi_y} \end{pmatrix}$$

DISCOVERY PROSPECTS

$$\mathcal{L}_{g\gamma} \supset -\frac{1}{2}\kappa\, h_{\mu\nu}\, \mathrm{B}^{\mu}\, \mathrm{B}^{\nu}$$

$$h_c \gtrsim 9.2 \times 10^{-12} \times \left(\frac{\mathrm{SNR}}{Q}\right)^{1/2} \times \left(\frac{\mathrm{m}^2}{A}\right)^{1/2} \times \left(\frac{\mathrm{Hz}}{\nu}\right)^{1/2} \times \left(\frac{1\ \mathrm{s}}{t}\right)^{1/4} \times \left(\frac{\mathrm{Hz}}{\Delta\nu}\right)^{1/4} \times \left(\frac{T_{\mathrm{sys}}}{\mathrm{K}}\right)^{1/2} \times \frac{1\ \mathrm{T}}{B_0} \times \frac{1\ \mathrm{m}}{L}$$

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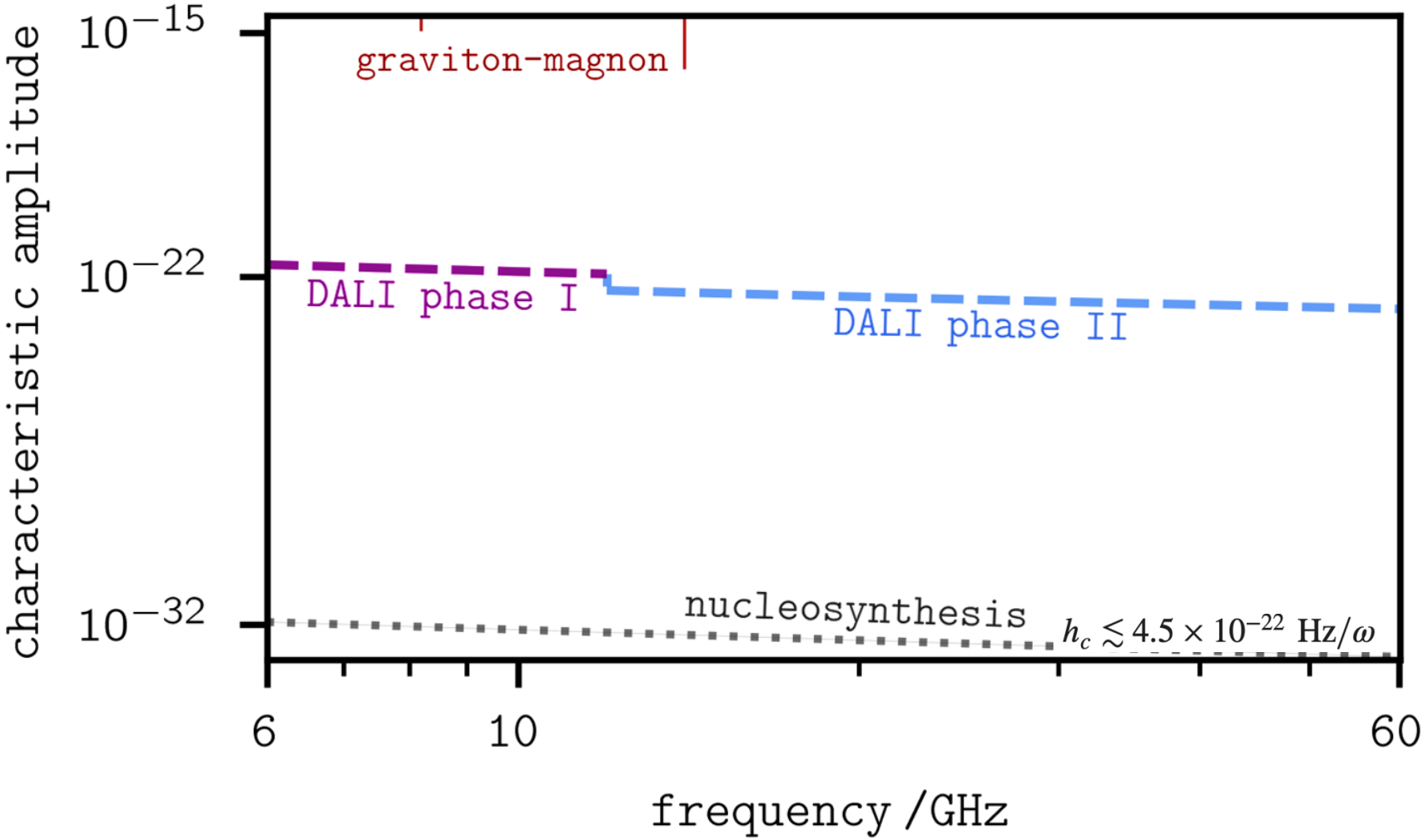
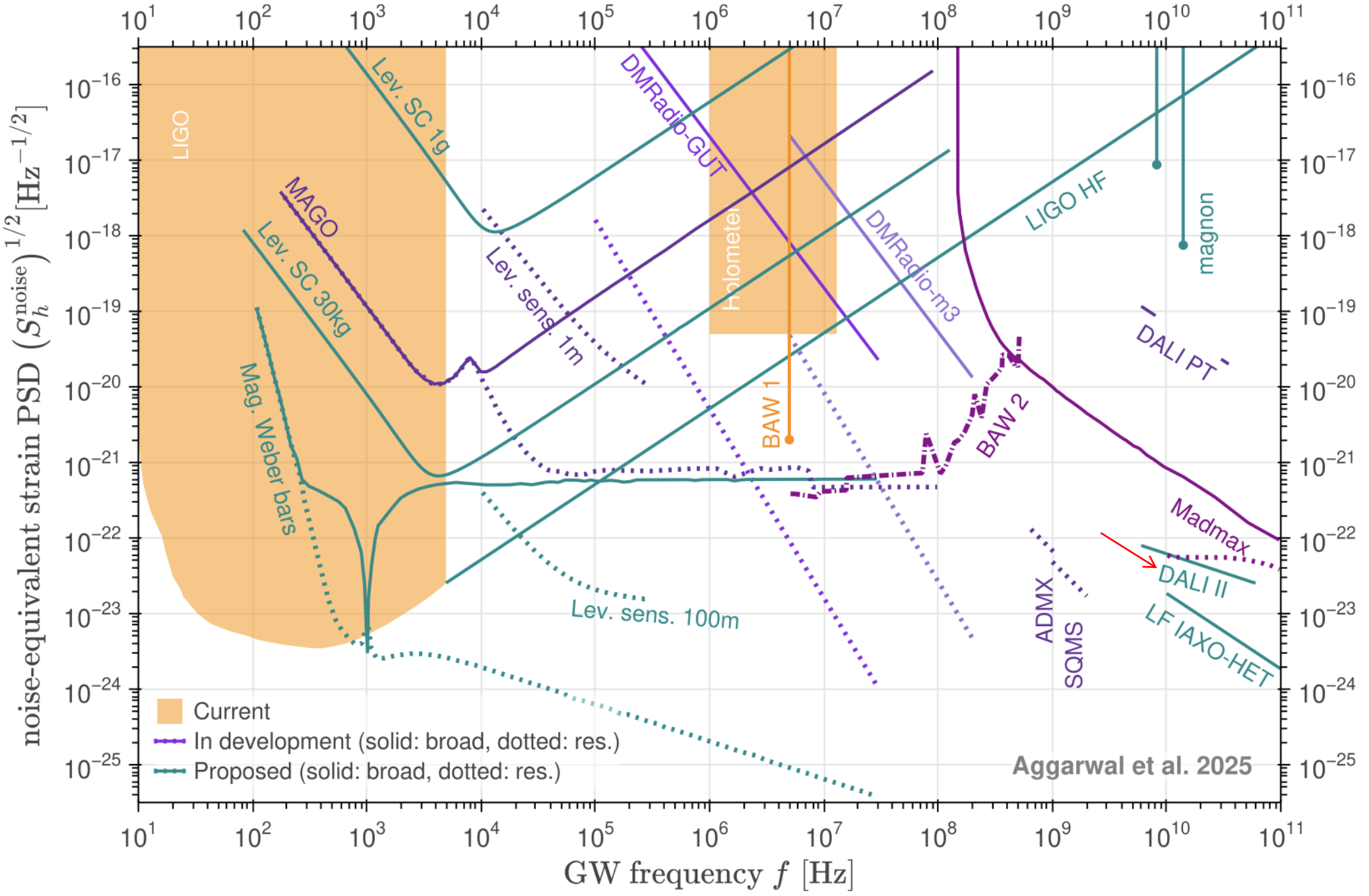


arXiv:2501.11723



PROTOTYPE

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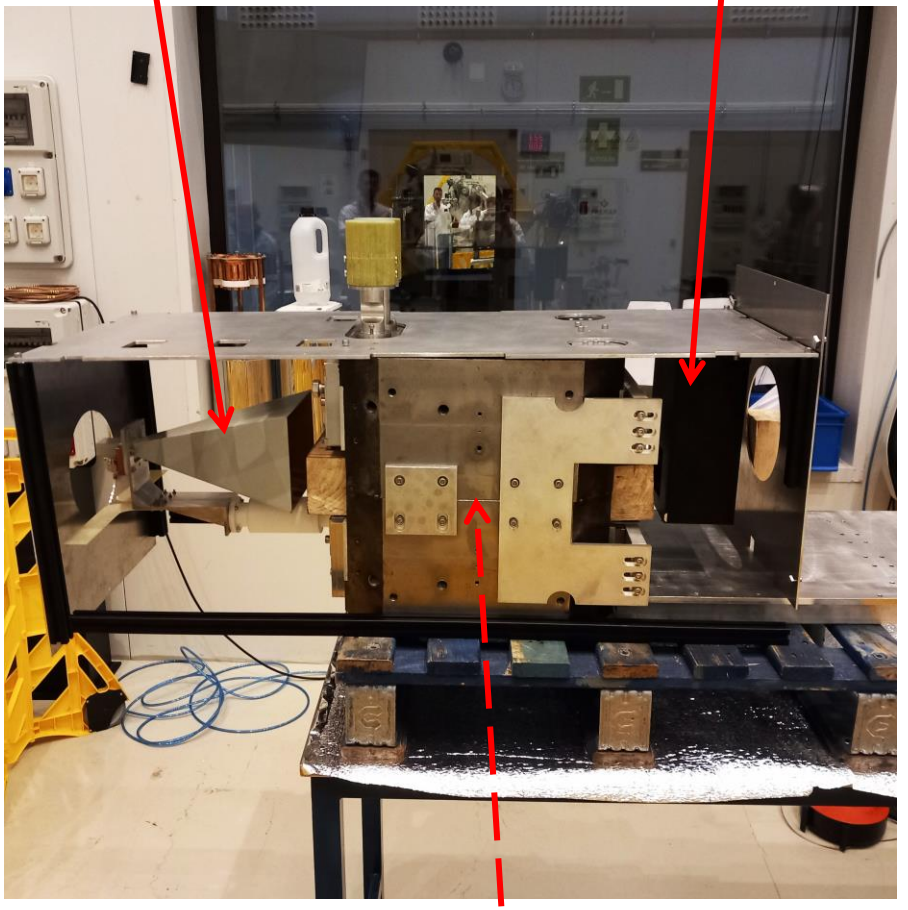
$$B_0 \approx 6000\,\mathrm{G} \sim 2 \times B_\odot$$

cryostat

pixel

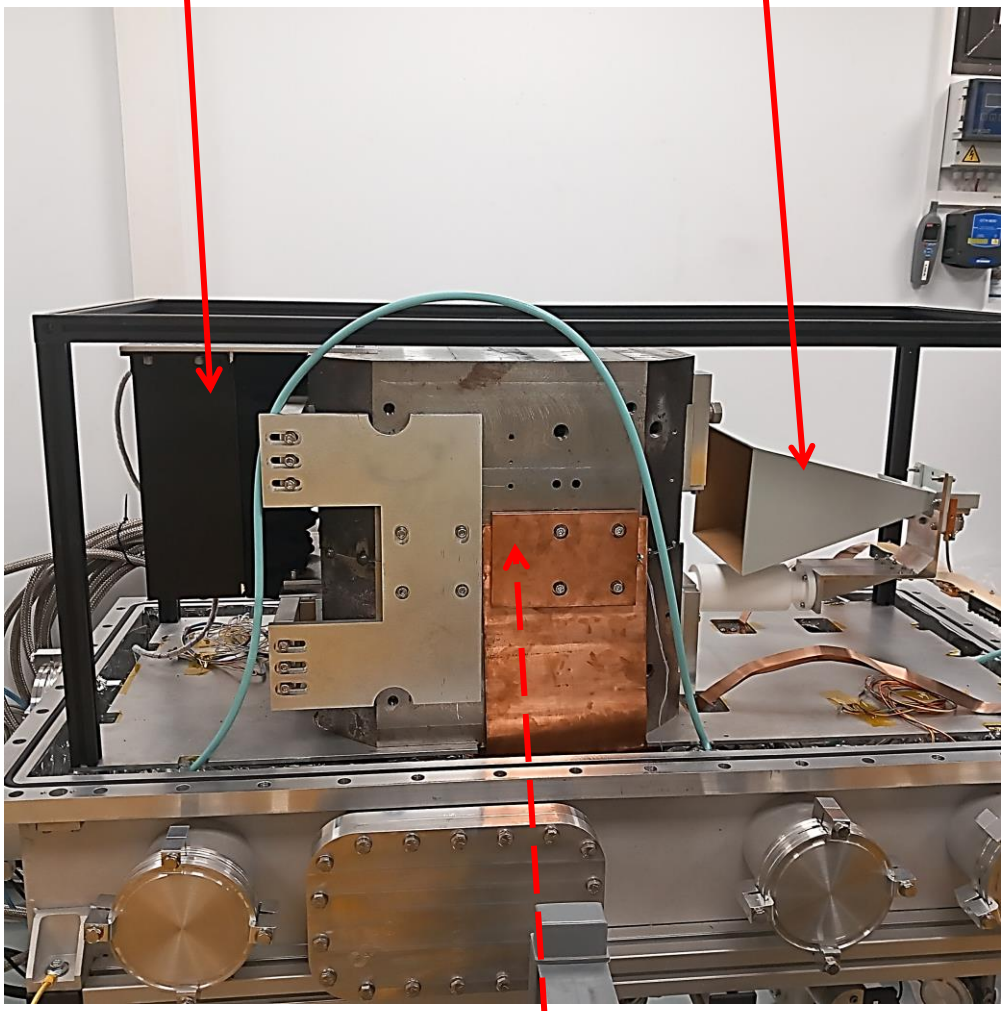
black-body



(resonator)

DARK PHOTONS & AXION LIKE PARTICLES INTERFEROMETER DALI

$$B_0 \approx 6000\,\mathrm{G} \sim 2 \times B_\odot$$



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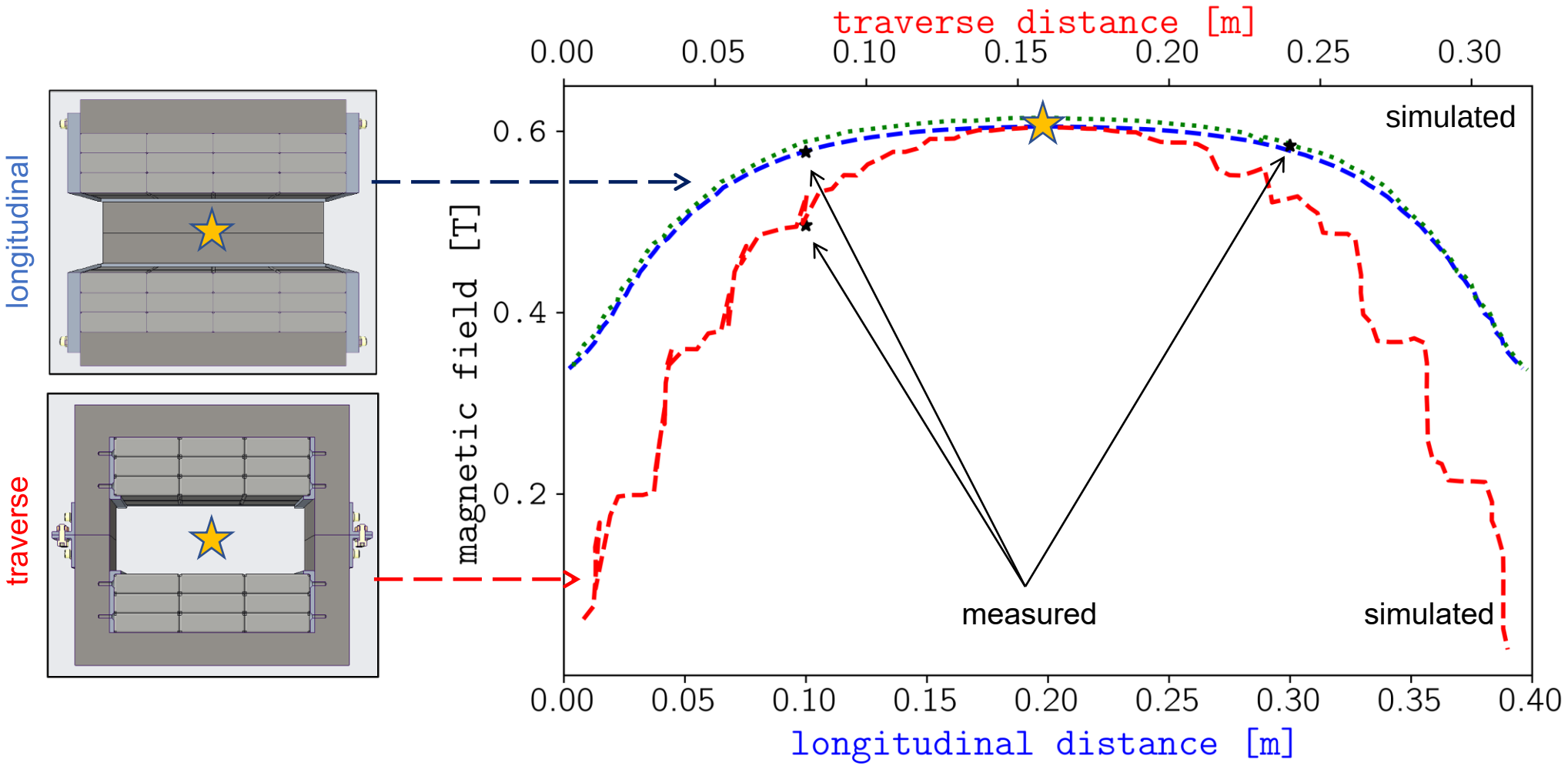

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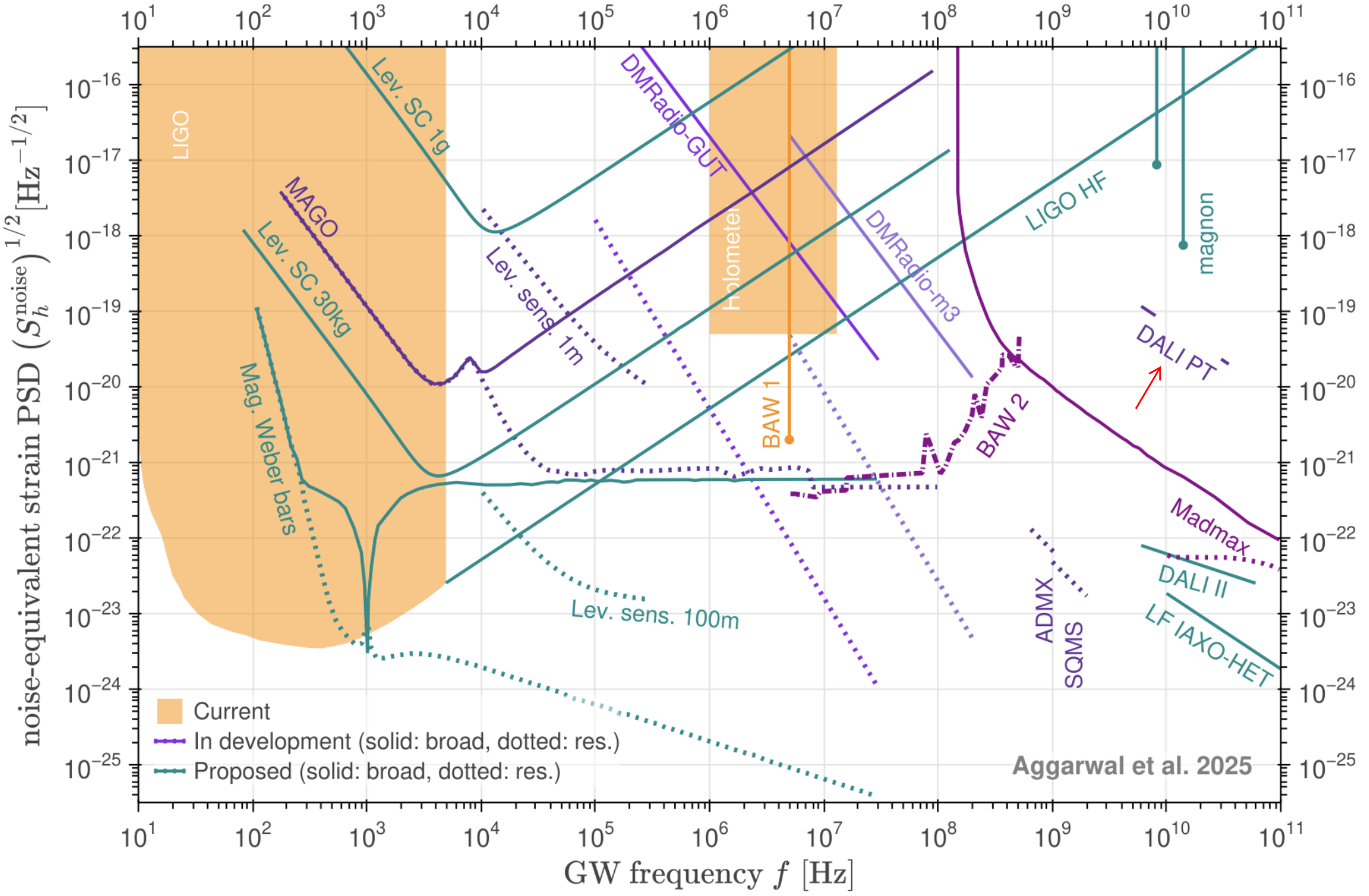

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