Higher Axions

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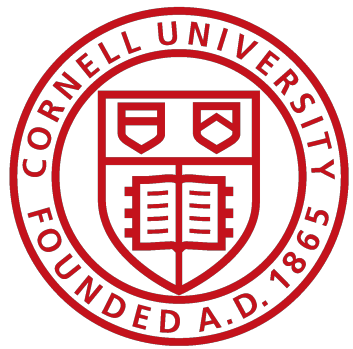


[2503.18707] work with Vazha Loladze & Mario Reig

Motivation

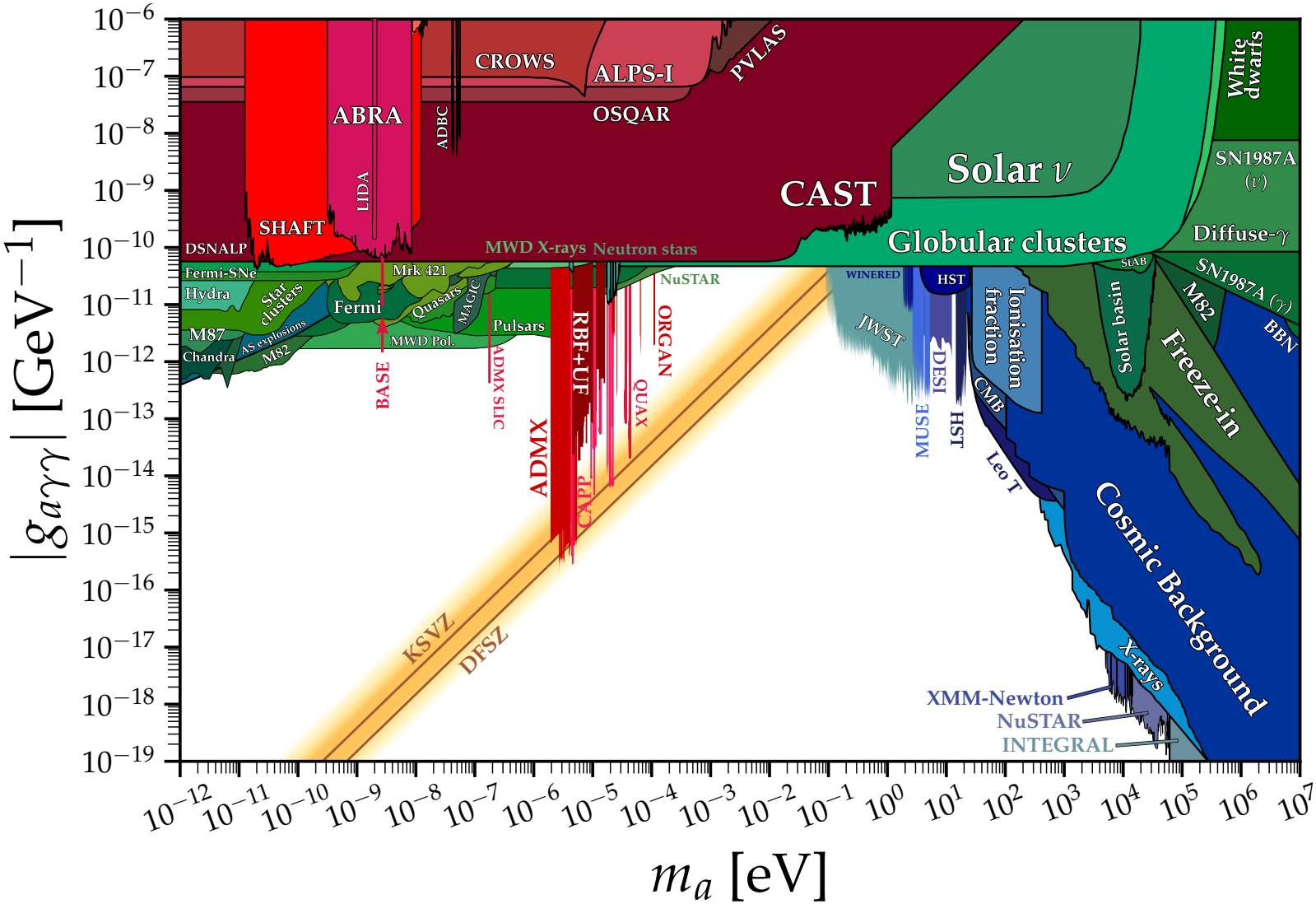


Figure: Credit: Ciaran O'Hare

Motivation

Axion Energy Density:

$$\Omega_{\text{axion}} \sim \left(\frac{\mu\text{eV}}{m_a}\right)^{\frac{7}{6}} < a^2_{\text{initial}} > \stackrel{?}{=} \Omega_{\text{DM}}$$

Most Predictive QCD Axion Requires:

- High Quality
- Predictive Cosmological History

Extra-Dimensional Axions

Extra-Dimensional Axions:

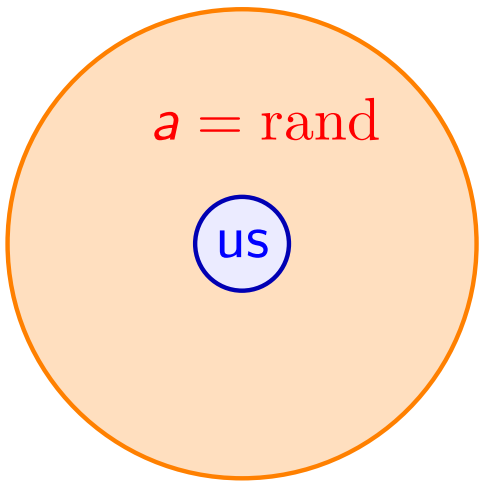
$$a = \int A$$

Exponentially Good Quality:

$$e^{-S} \qquad \text{with} \qquad S \geq MR$$

Unpredictive Cosmology,

$$< a^2_{\text{initial}} > \; = \left\langle \right. \qquad \left. \right\rangle^2 \; = \; ?$$



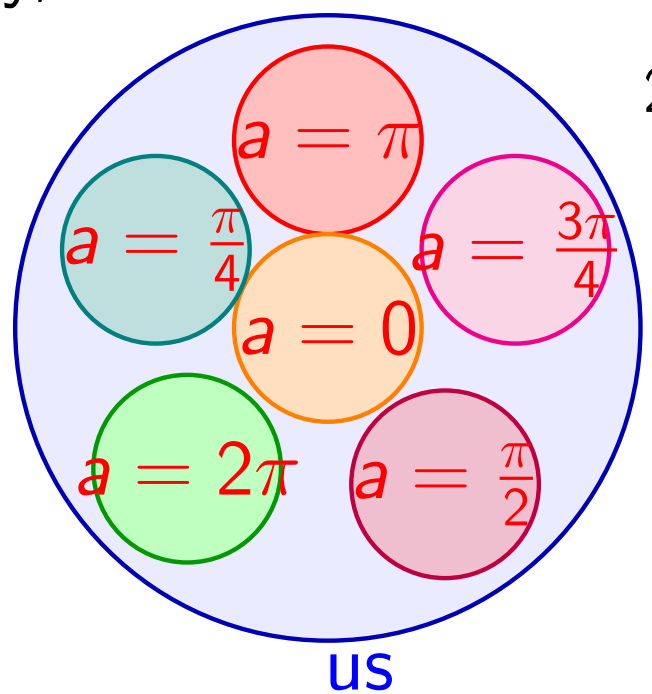
Higher Axions

Best of both worlds,

$$\boxed{e^{ia} = \Phi\ e^{i\int A}} \qquad \text{below s.s.b.}$$

Predictive Cosmology,

$$< a^2_{\text{initial}} > \quad = \quad \left\langle \quad \right\rangle^2 \quad = \quad \frac{\pi^2}{3}$$



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Higher Axions [2503.18707]

$$\boxed{e^{ia} = \Phi \; e^{i \int A}} \qquad \text{below s.s.b.}$$

Require:

- Green-Schwarz Mechanism

Future Directions?

- Signatures?
- String Theory

Thank you for listening!