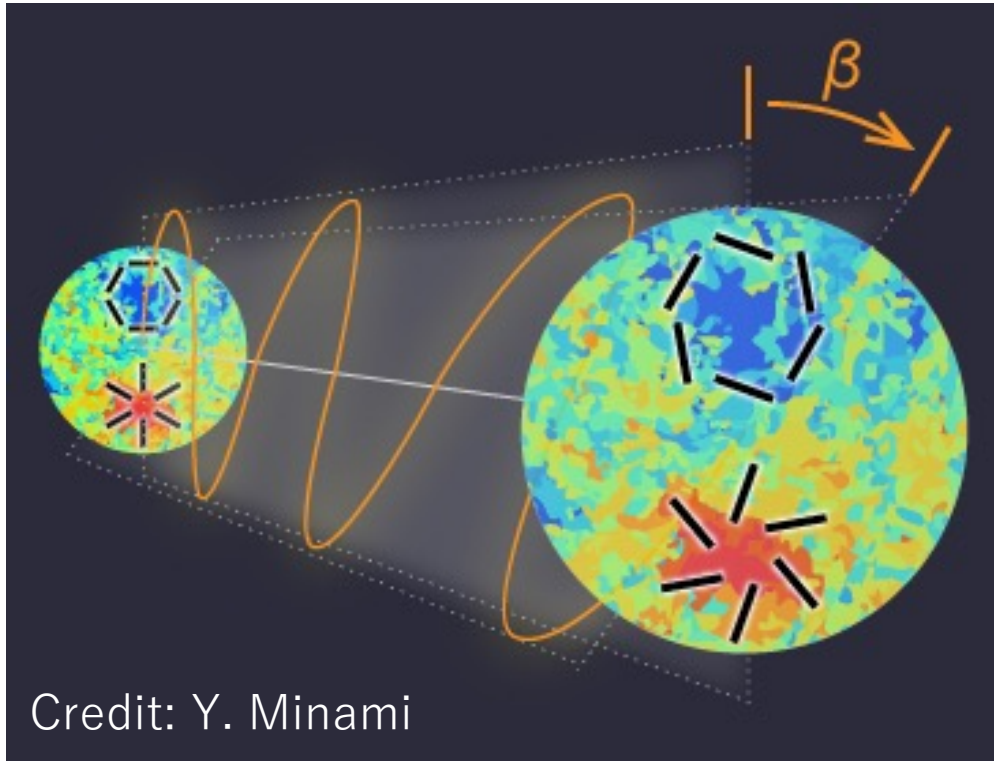
Implications of the cosmic birefringence measurement for the axion dark matter search

Ippei Obata (Max-Planck-Institute for Astrophysics, JSPS fellow)

Non-zero birefringence angle ($3.6\,\sigma$) has been measured in CMB!



Minami & Komatsu (2020.11)

$$\beta = 0.35 \pm 0.14 \text{ deg } (2.4\sigma)$$ **(Planck PR3)**

Diego-Palazuelos+ (2022.1)

$$\beta = 0.36 \pm 0.11 \text{ deg } (3.3\sigma)$$ **(Planck PR4)**

Eskilt & Komatsu (2022.5)

$$\beta = 0.34 \pm 0.09 \text{ deg } (3.6\sigma)$$ **(Planck + WMAP)**

Hint for parity-violating physics! (axion)

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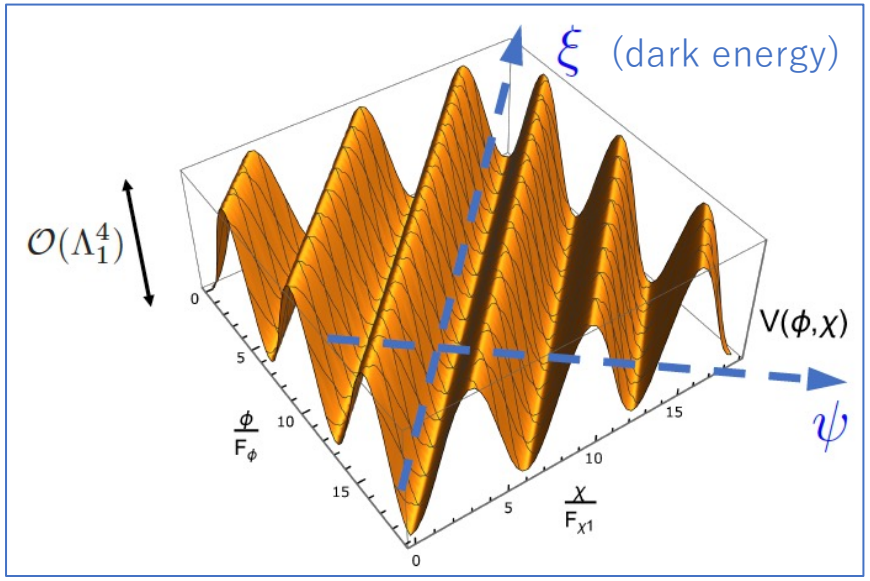
Two-axions can generate a flat potential for axion as dark energy (birefringence)



$$V(\phi,\chi)=\Lambda_1^4\left[1-\cos\left(\frac{\phi}{F_{\phi 1}}+\frac{\chi}{F_{\chi 1}}\right)\right]+\Lambda_2^4\left[1-\cos\left(\frac{\phi}{F_{\phi 2}}+\frac{\chi}{F_{\chi 2}}\right)\right]$$

This scenario also predicts the constraint on the axion as dark matter!