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Photon-Axion Conversion and Magnetic Field Configuration

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Photon-Axion Conversion

$$\mathscr{L}_{a\gamma\gamma} = g_{a\gamma\gamma}\, a\, \boldsymbol{E} \cdot \boldsymbol{B}$$

conversion   background

● Assuming magnetic field B as a background,
the component parallel to B of photon
can be converted into axions and *vice versa.*

➡ The intensity and polarization of photon
is influenced by conversion.

Cosmological Magnetic Field

● **InterGalactic Magnetic Fields**

Origin   Astrophysical v.s. Primordial

There exists no convincing mechanism
for producing cosmological magnetic fields.

Intensity

$$10^{-15}\,\mathrm{G} \lesssim \mathrm{IGMF} \lesssim 1\,\mathrm{nG}$$

Gamma-Ray   CMB
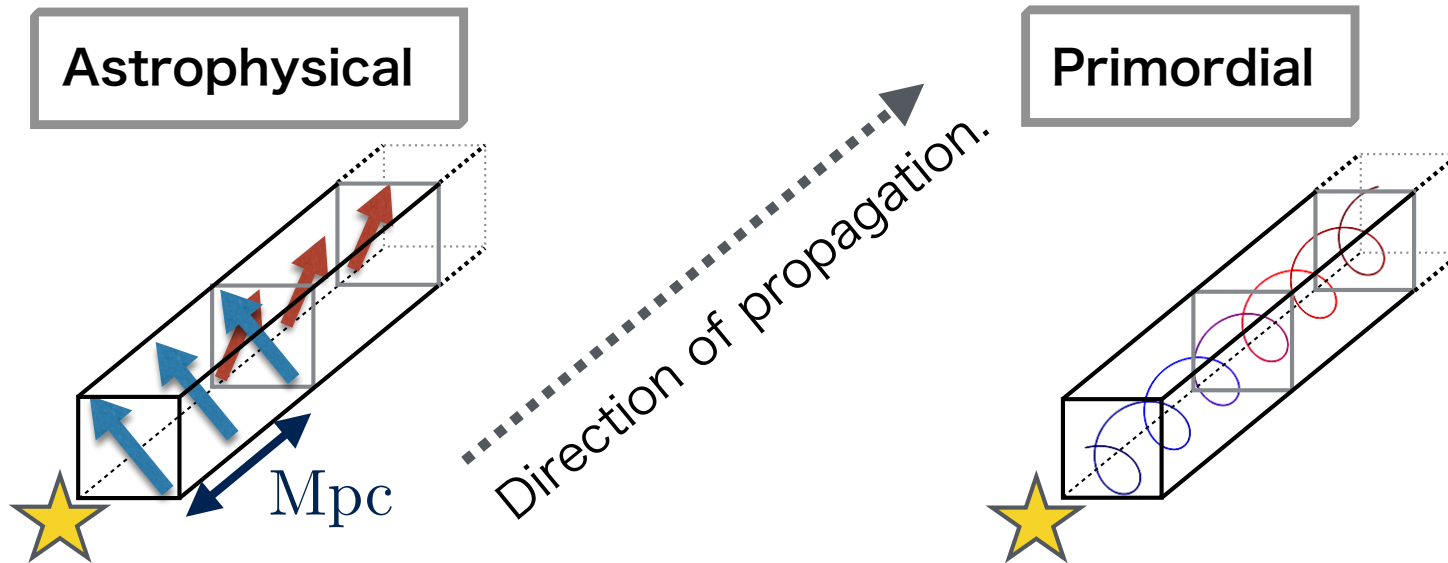
Configuration

The magnetic field configuration must be inseparable
from its production mechanism.

➡ We tried to approach magnetic field configuration
by using photon-axion conversion.

Our Study

● **Configuration Dependence of Photon-Axion Conversion**

Astrophysical

Primordial

Direction of propagation.

Mpc

We focus on configuration dependence of photon polarization which is induced by photon-axion conversion.

→ Similar behavior

Different behavior

of mean-square values of polarization

Application to Constraint Physical Parameters

Our Study