We showed x8 higher isolation ratio is possible by using slow light photonic crystal waveguide with integrated magneto-optical material. A modified FDTD is made to model the propagation of light in off-diagonal permittivity material. It is used to study the isolation behavior of a photonic crystal waveguide where circular dichroism dependent material is integrated at the side of the waveguide. Our result shows the possibility on using slow light devices to enhance the magneto-optical effects.

**Background**

- **Magnetooptical effects isolator**
- **Non-reciprocal propagation w/dichroic circular polarization absorber**
- **Slow light w/PhC WG**

**Isolation principle**

- Right circular dichroism (RCD) materials absorb more RCP light than LCP.
- When TE mode light propagates the polarization of the evanescent electric fields $E_{xy}$ rotates at both sides of waveguide in opposite directions.
- Circular polarization direction dependent absorber (circular dichroism:CD) (i.e. magneto-optical material) at the side of a WG works as non-reciprocal attenuator.

**Motivation**

- Slow light effect can enhance magneto-optical effect?

**Calculated Results**

- Pulse propagation
  - No circular dichroism ($\varepsilon_{xy} = 0.0$)
  - Circular dichroism ($\varepsilon_{xy} = 0.4$)

- **Conclusion & Future plan**
  - **Conclusion**
    - Circular dichroism based isolator was numerically demonstrated by FDTD calculation.
    - Slow light effect is confirmed to enhance magneto-optical effect.
  - **Future Plan**
    - $\varepsilon_{xy}$ works as non-reciprocal absorption.
    - $\sigma_{xy}$ works as non-reciprocal phase shift (NRPS).