

# Faraday effect

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*Lecture presented at APS, Nankai University, China*

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magnetic field

Drude model

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Faraday  
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devices

# Overview

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- optical medium in an external magnetic field

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- **linear magneto-optics**

$$\epsilon_{ij} = n^2 \delta_{ij} + f_{ijk} \mathcal{B}_k + \dots$$

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- **Faraday coefficients**  $f_{ijk}$  describe effect of external electric field
- there are restrictions on  $f_{ijk}$

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# Drude model

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- solution is easy with **circularly polarized** light

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Paul Drude, German physicist, 1863-1906

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# Circular polarization



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- right and left handed circular polarization

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- physical dimensions ok.

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- $K$  in  $\Delta\chi_{ij} = iK\epsilon_{ijk}\mathcal{B}_k$  the same as in Drude model!

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# Faraday rotation

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- specific Faraday rotation

$$\Phi_F = \frac{2\pi}{\lambda} \frac{K\mathcal{B}}{2n}$$

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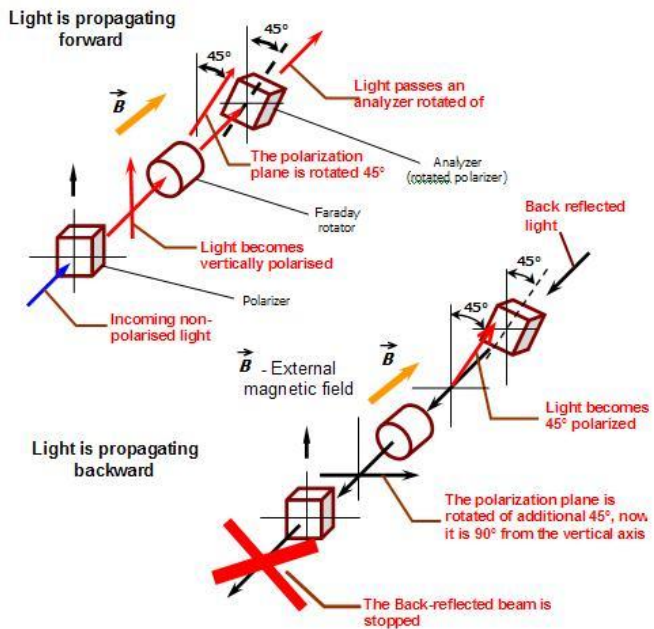
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Michael Faraday, English physicist, 1791-1867



polarizer - Faraday rotation by 45 degrees - polarizer chain

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# Yttrium iron garnet

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- an ongoing effort

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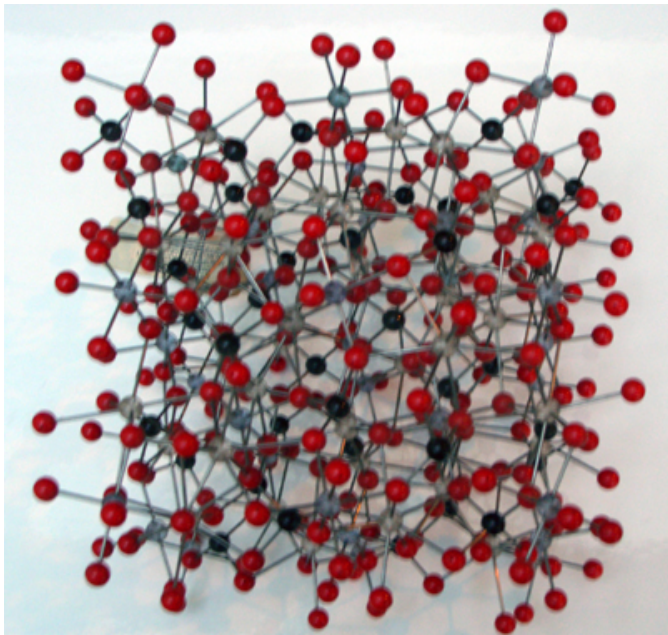
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The YIG crystal

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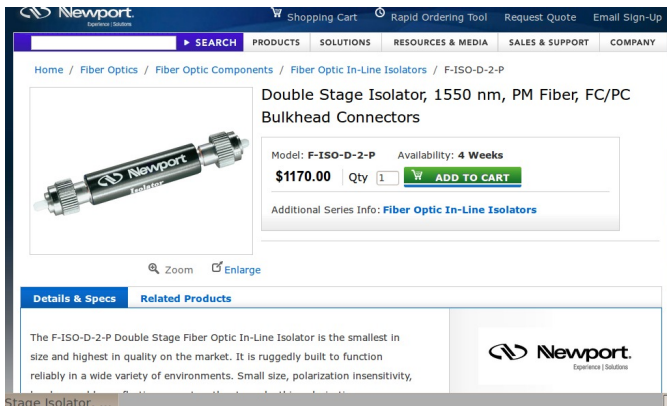
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The screenshot shows the Newport website's product page for a Double Stage Isolator. The page features a navigation bar with links for Shopping Cart, Rapid Ordering Tool, Request Quote, and Email Sign-Up. Below the navigation bar is a search bar and a menu with options like PRODUCTS, SOLUTIONS, and RESOURCES & MEDIA. The main content area displays the product name, a detailed image of the isolator, and key specifications such as the model number (F-ISO-D-2-P) and availability (4 Weeks). The price is listed as \$1170.00, and there is an 'ADD TO CART' button. The page also includes a 'Details & Specs' section and a 'Related Products' section.

Home / Fiber Optics / Fiber Optic Components / Fiber Optic In-Line Isolators / F-ISO-D-2-P

**Double Stage Isolator, 1550 nm, PM Fiber, FC/PC Bulkhead Connectors**

Model: **F-ISO-D-2-P** Availability: **4 Weeks**

**\$1170.00** Qty  [ADD TO CART](#)

Additional Series Info: [Fiber Optic In-Line Isolators](#)

**Details & Specs** **Related Products**

The F-ISO-D-2-P Double Stage Fiber Optic In-Line Isolator is the smallest in size and highest in quality on the market. It is ruggedly built to function reliably in a wide variety of environments. Small size, polarization insensitivity,

Stage Isolator, ...

A micro-optical isolator. You may buy it.

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This one is made in China and costs a few hundred dollars.