Fun Ways to Present Diffraction Grating Patterns in the Classroom

CSAAPT Spring 2025 at George Mason University

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Wave Optics in Classroom

GOAL:

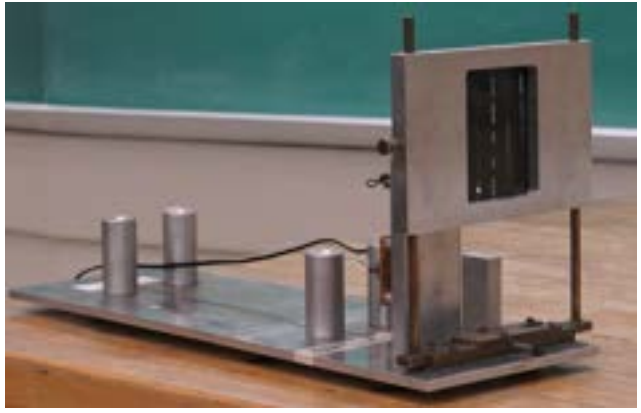
- demonstrate the fringe patterns that result from the diffraction and interference of light that shines thru various slit combinations

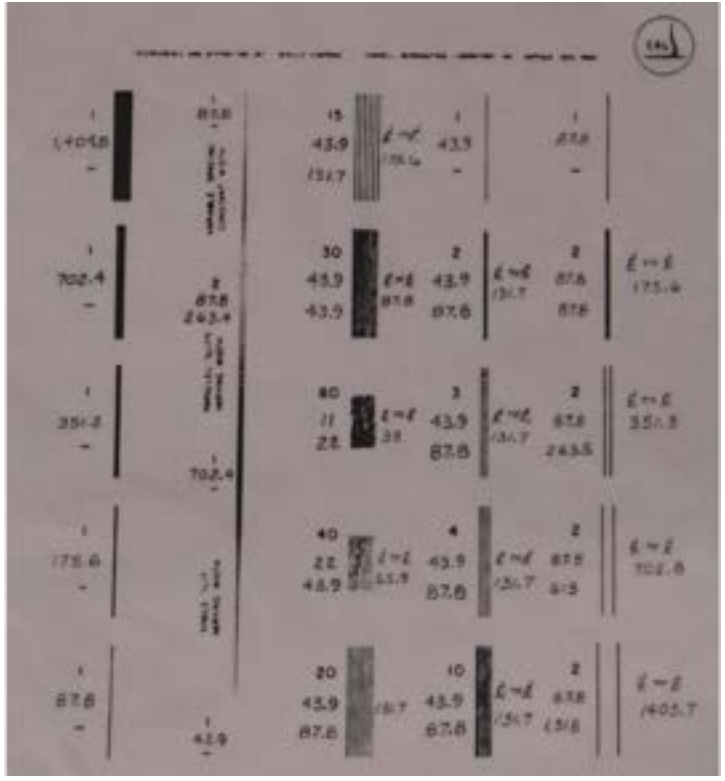
STRATEGIES:

- smaller classes, pass out slits / gratings to students and supervise their use to make sure they view sources of light correctly with grating at their eye
- larger classes, avoid passing out slits / gratings and show them light sources that pass thru them by projecting the resultant fringe patterns on a monitor, wall or screen
- go beyond the basic physics lesson and have some fun with it

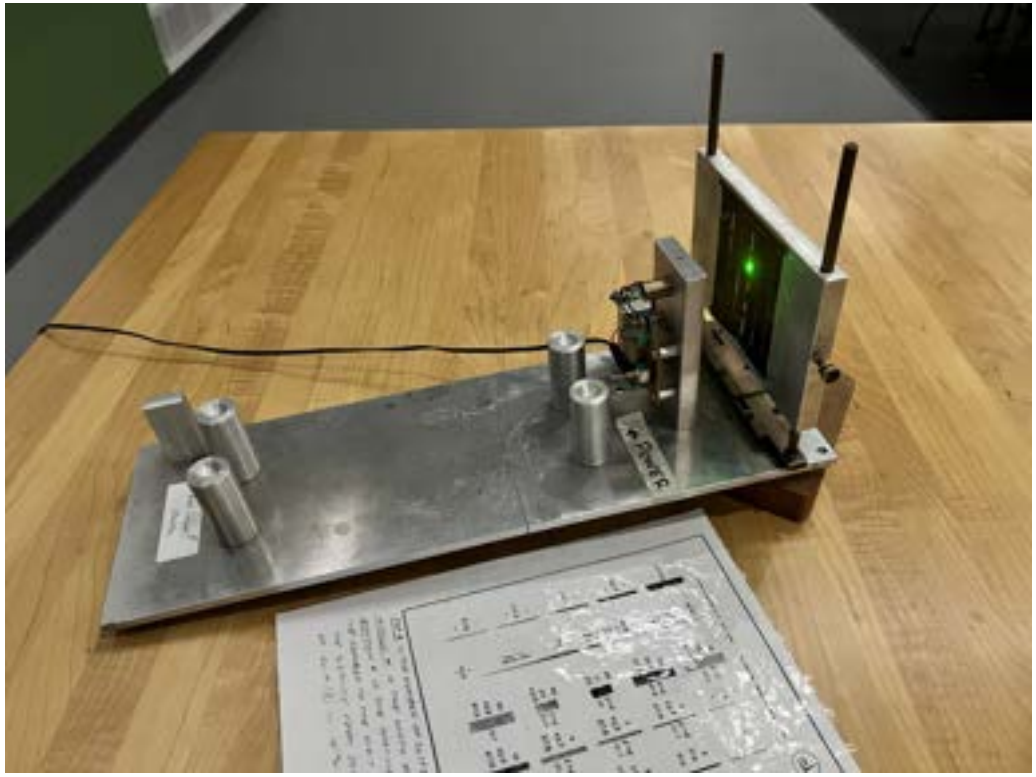
Cornell Slits Plate

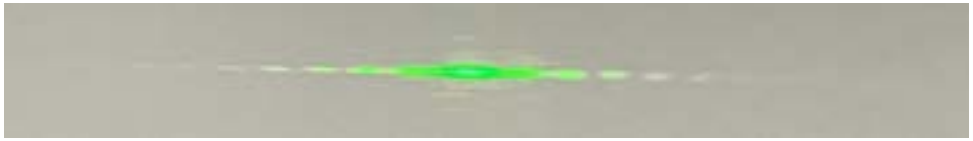
- single, double and multiple slits with various widths and separations
- numbers to the left of each slit are:
  - # of slits
  - width in 10^{-6}m
  - separation in 10^{-6}m



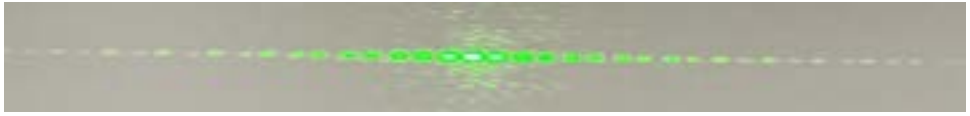


Cornell Slits Plate

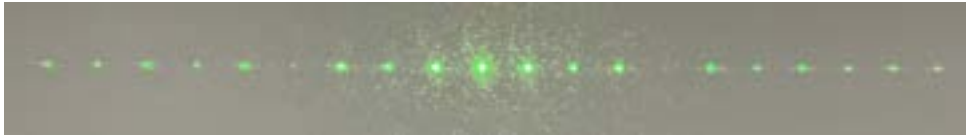




Single Slit Diffraction



Double Slit Interference



Thirty Slit Interference

Diffraction Grating

- approaching infinite slits defined by number of slits per mm
- as number of slits increases, separation of slits decreases & separation of fringes increases
- 500 slits/mm $d = 2 \times 10^{-6}$m
- 1000 slits/mm $d = 1 \times 10^{-6}$m

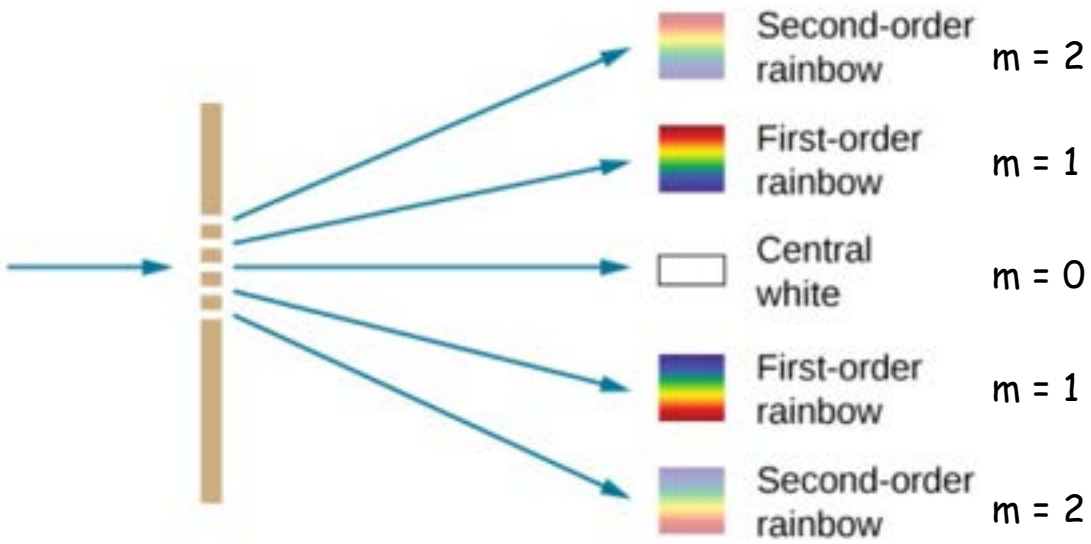
Diffraction Grating

$$\sin(\theta_m) = \frac{m\lambda}{d}$$

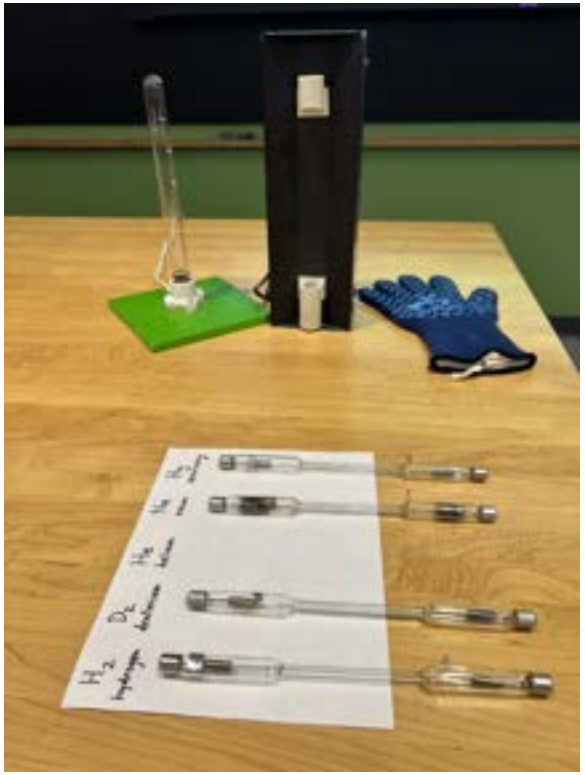
θ_m - angle of mth band
m = 0, 1, 2, ...

λ - wavelength of light (nm)

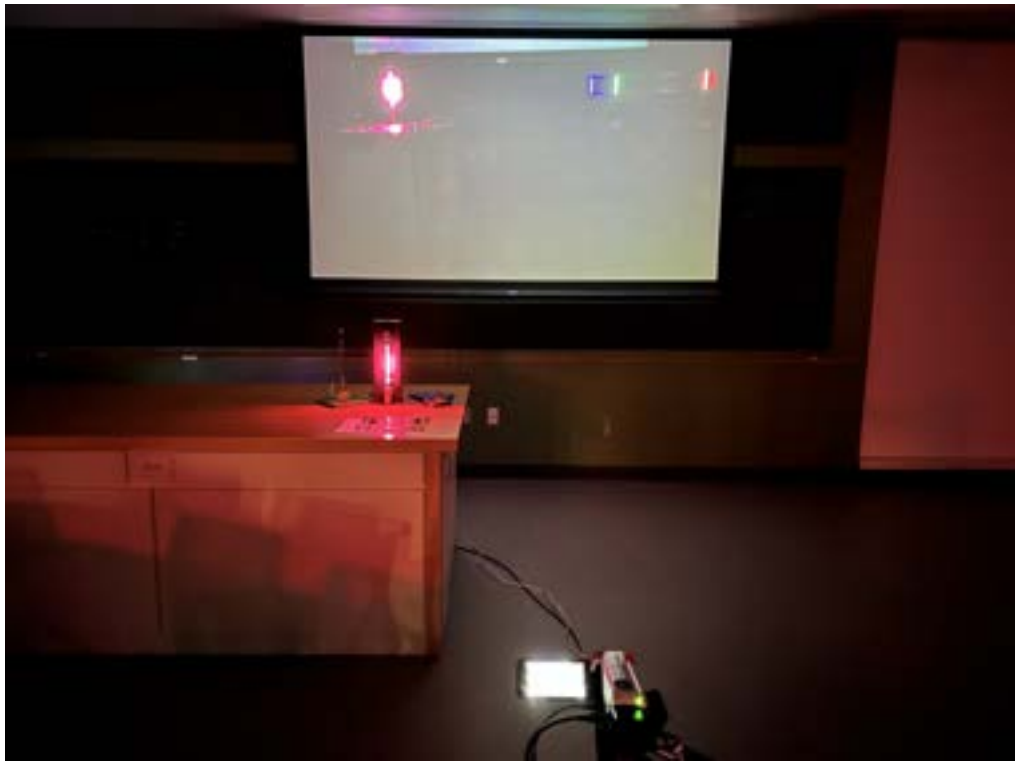
d - distance between slits in grating, 1mm/lines

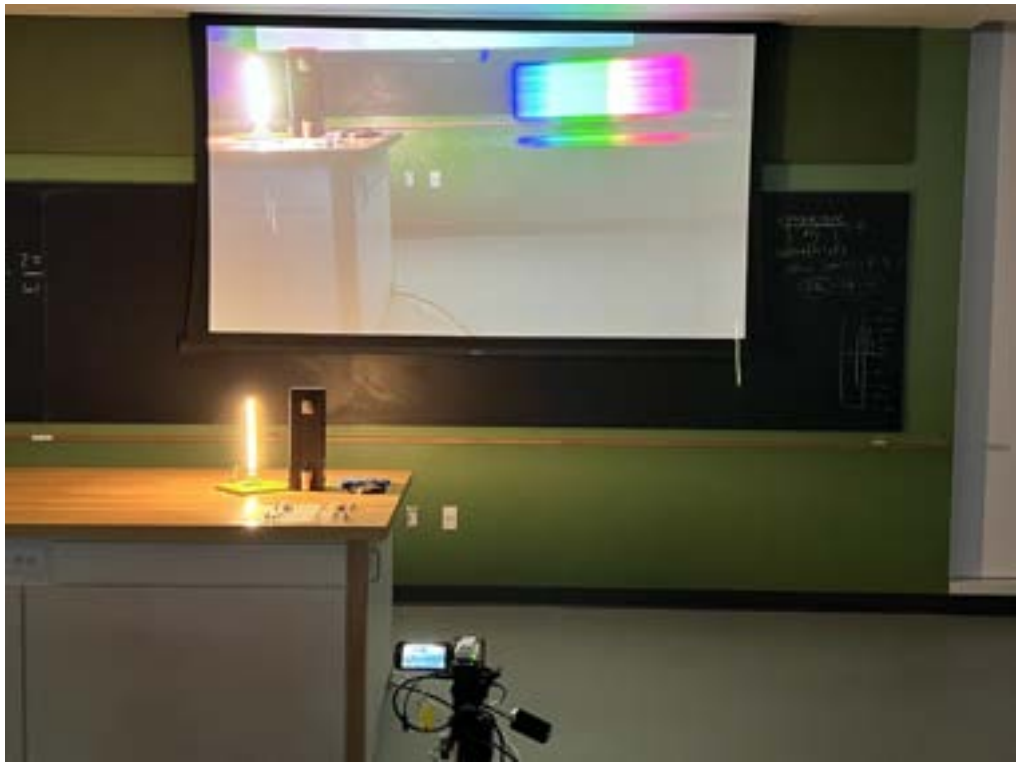


Video Camera

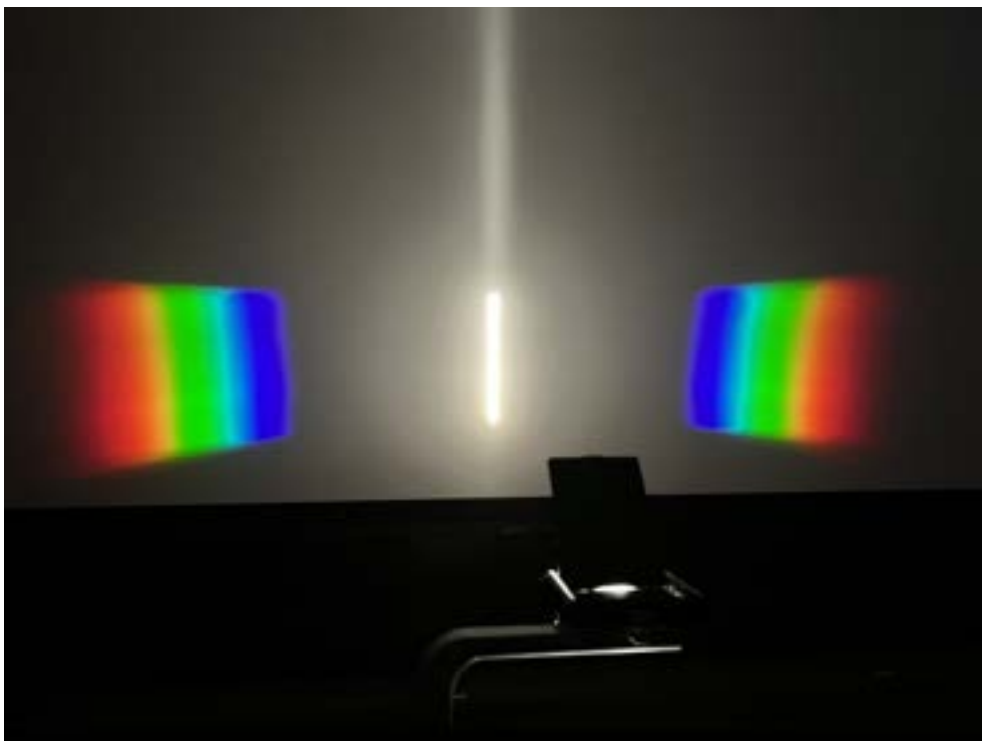


Video Camera





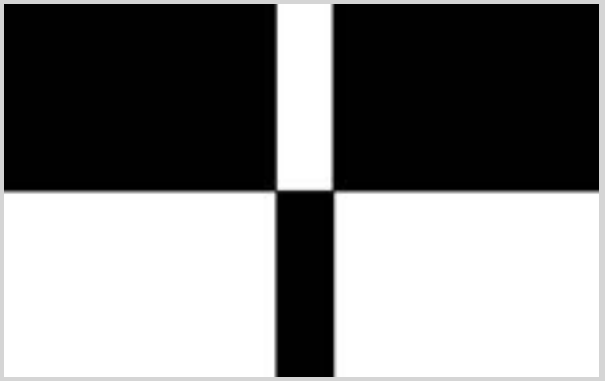
Overhead Projector

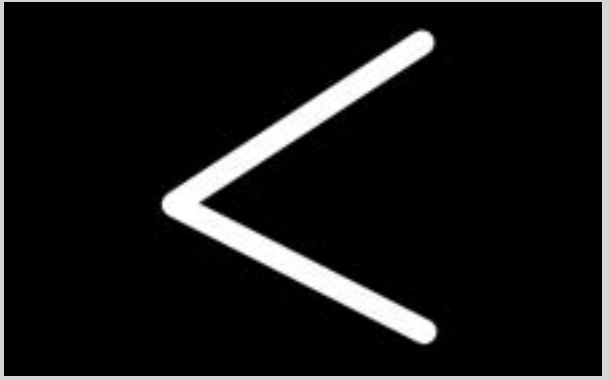


Video Projector

Sample Patterns





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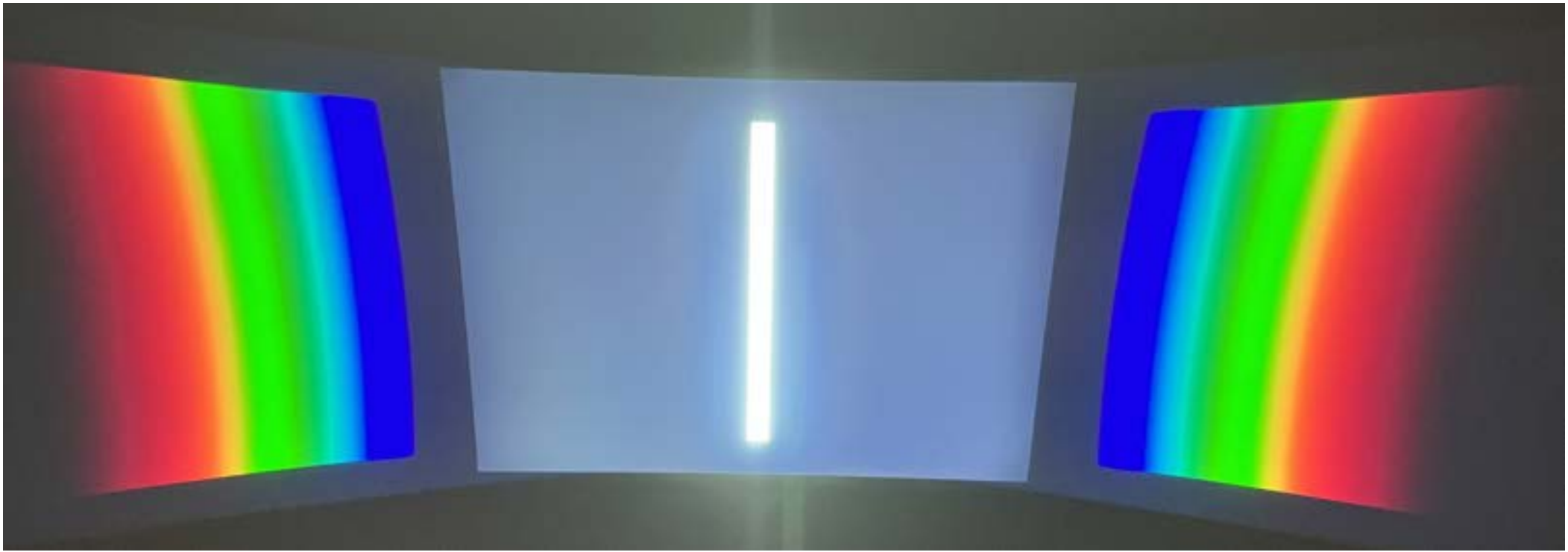

Video Projector

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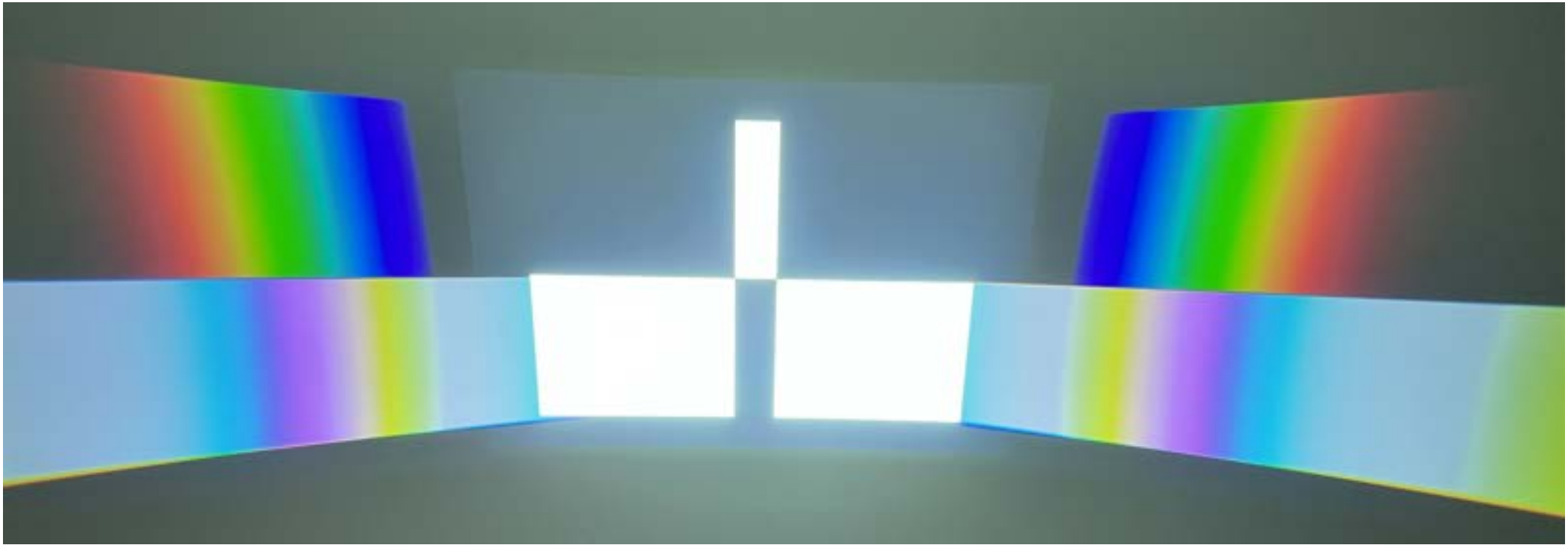

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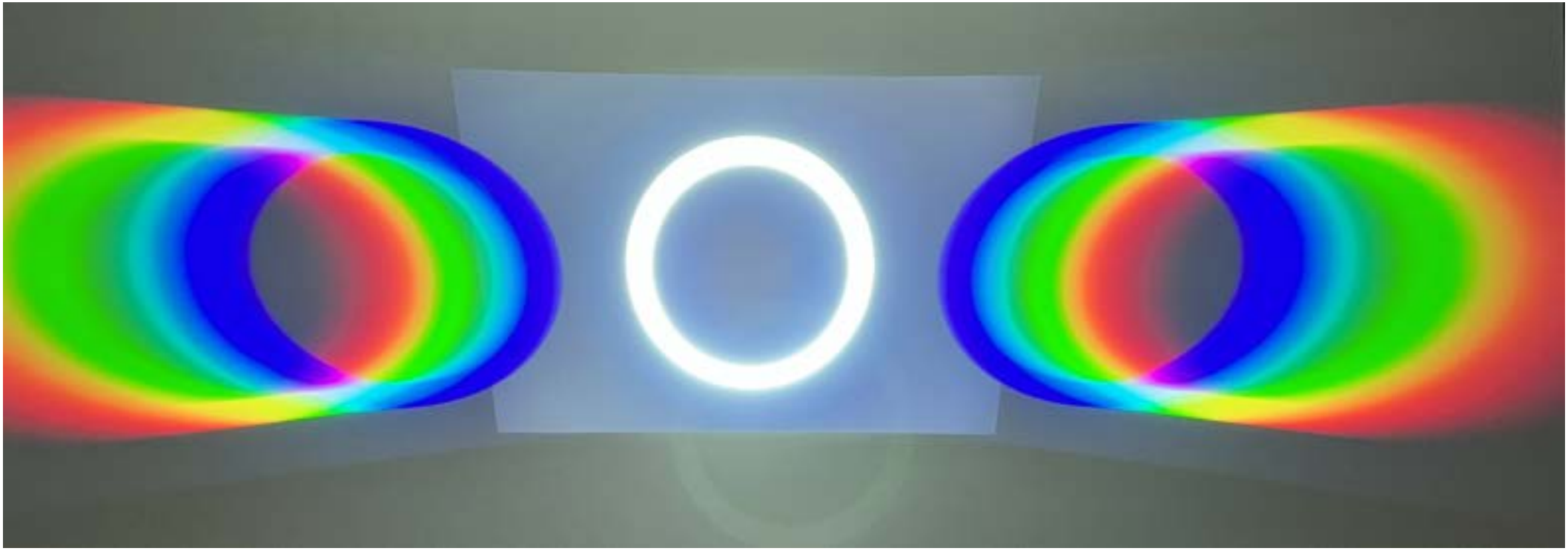

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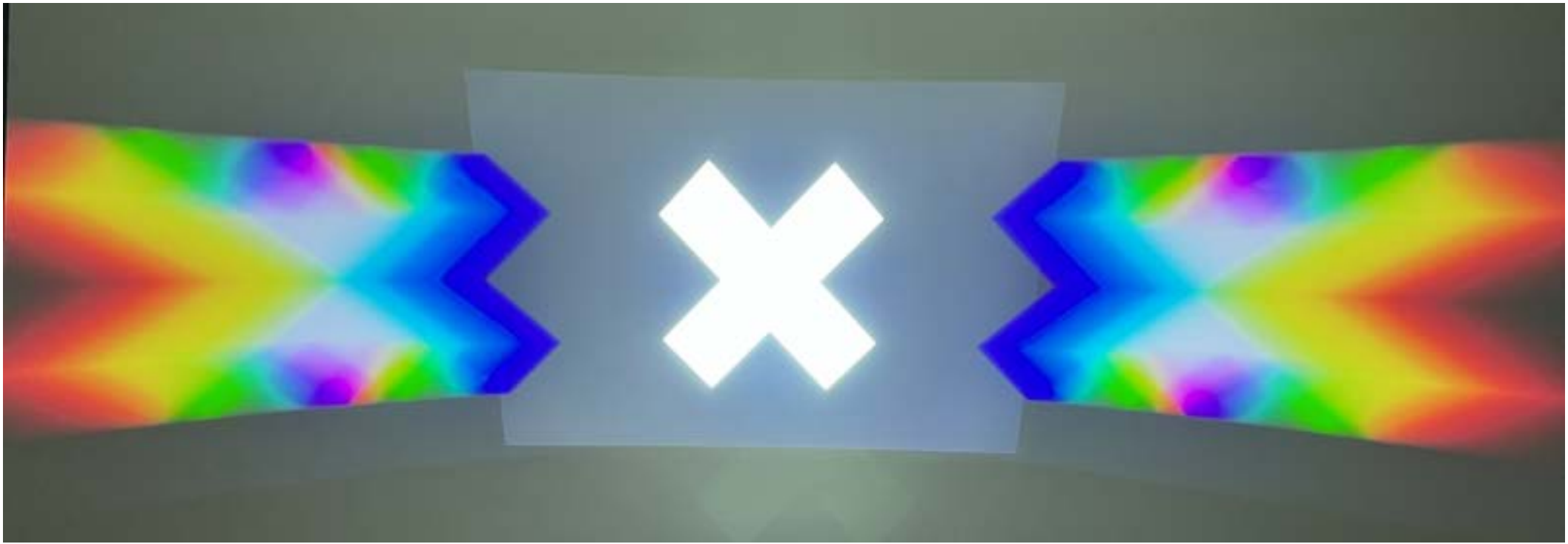

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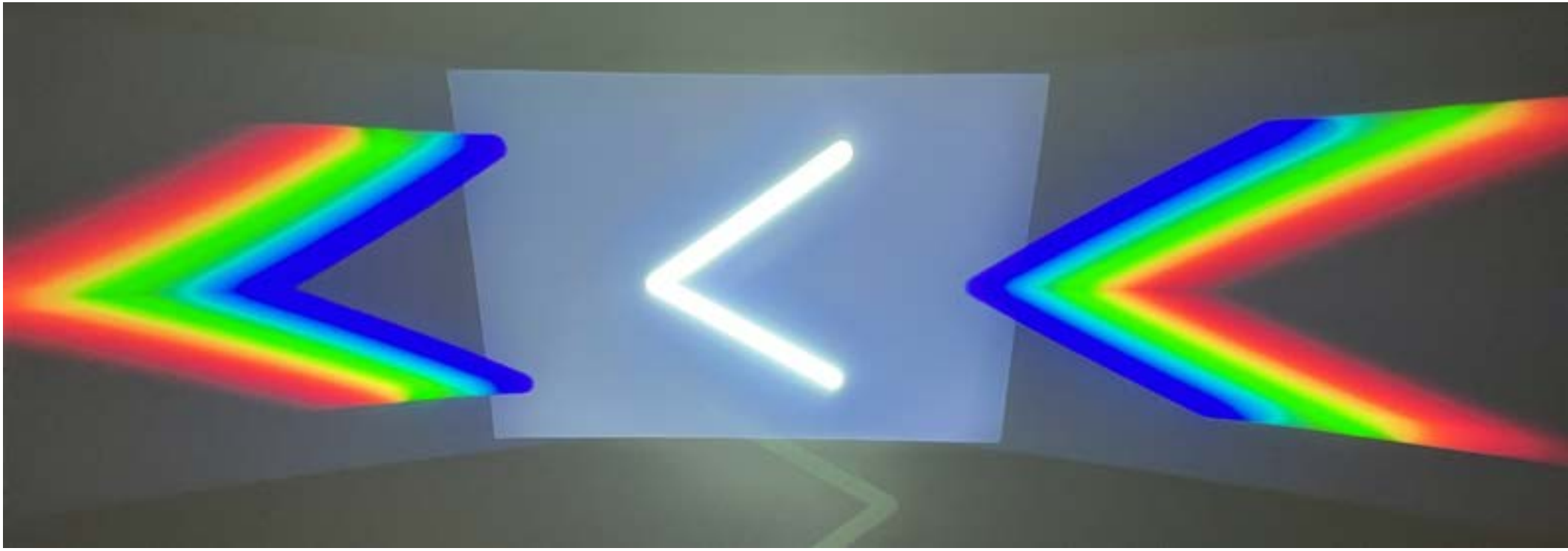

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