

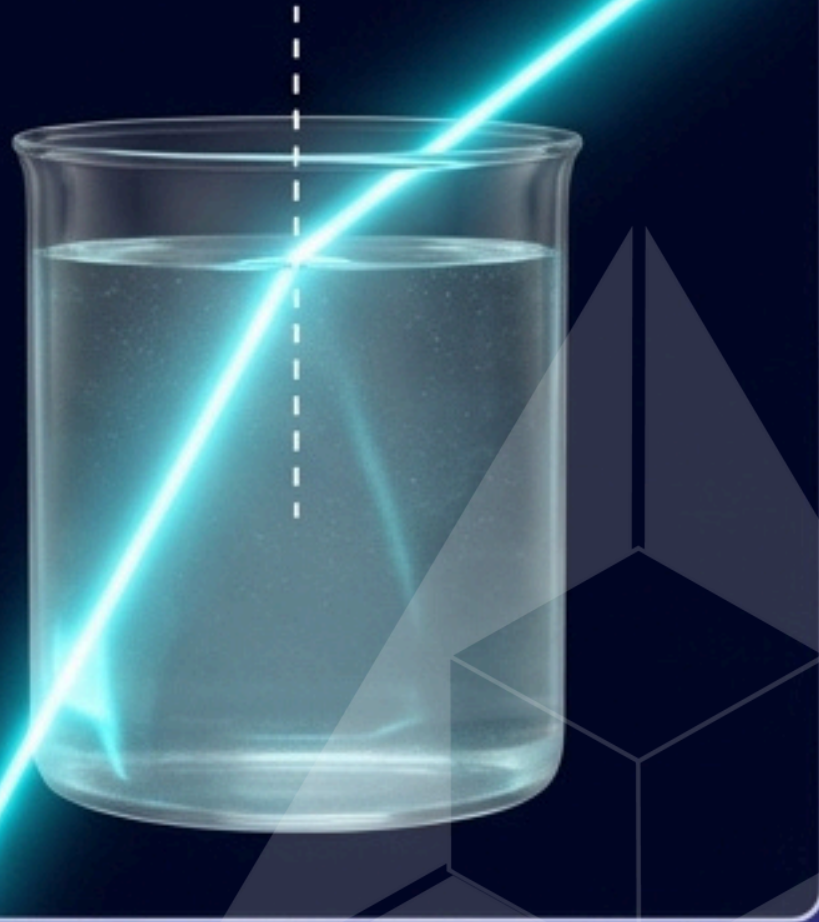
Class 12 Physics | NEET Objective

SECTION 9.4.1

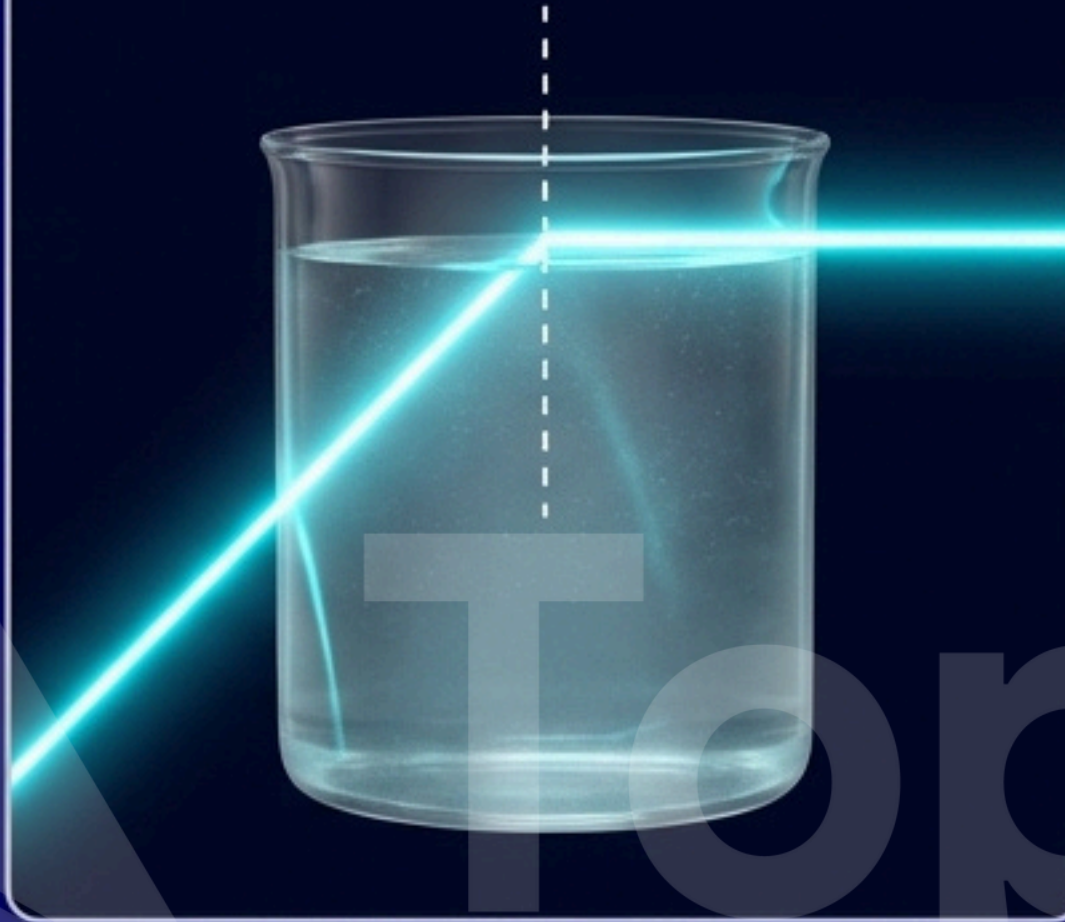
Total Internal Reflection

From Natural Phenomena to Global Telecommunications.

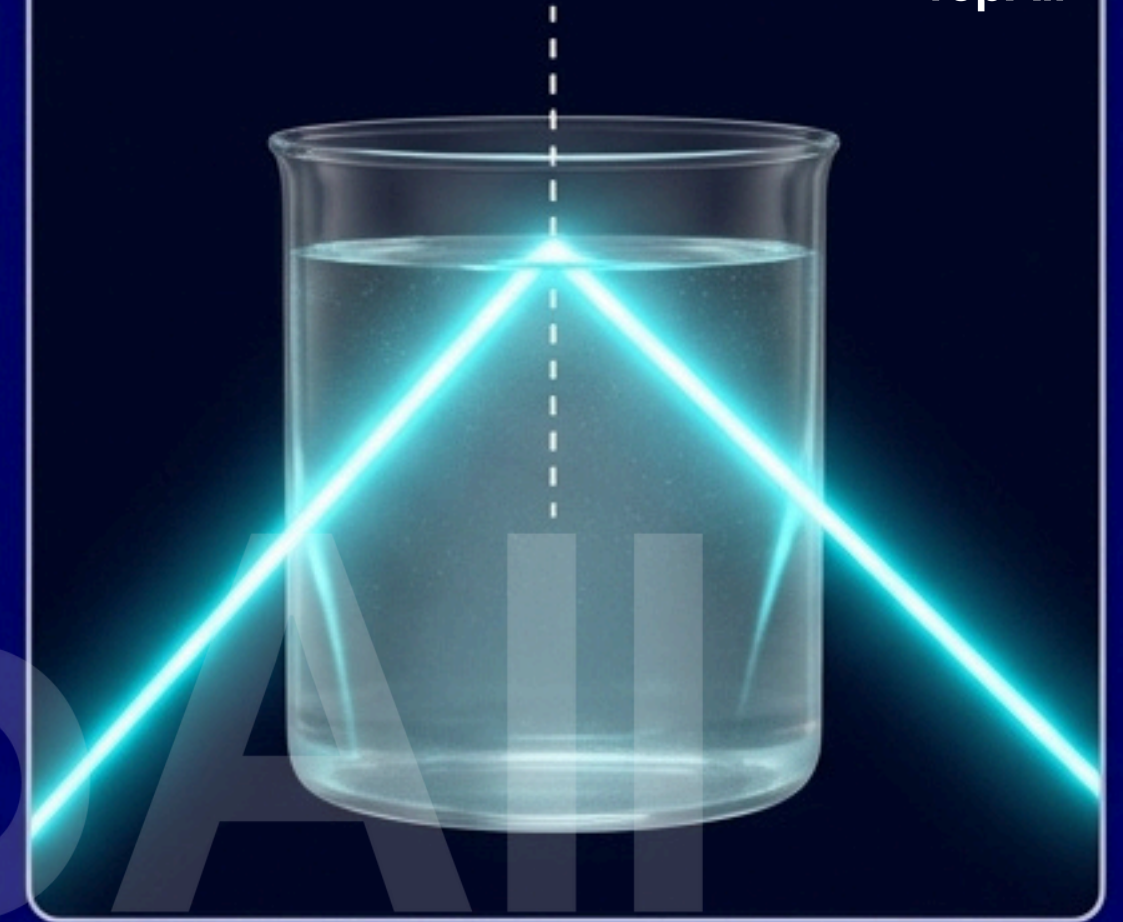
Refraction



Critical Grazing



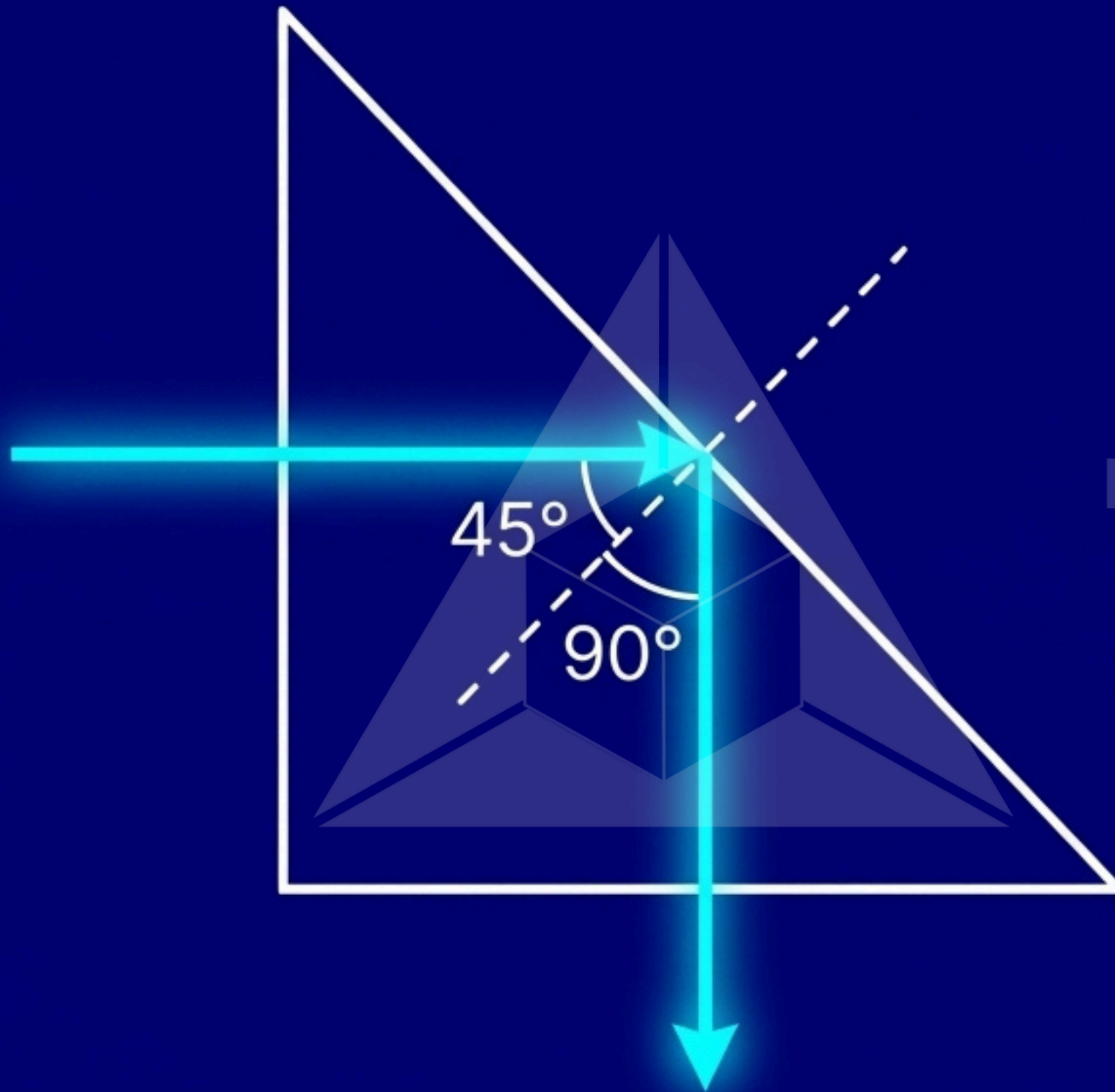
TIR



The Absolute Rules of TIR

Rule 1: Light must travel from an optically denser medium to a rarer medium.

Rule 2: Angle of incidence must exceed the critical angle ($i > i_c$)



Bending Light by 90°

- The ray strikes the internal face at exactly 45°.
- The critical angle (i_c) for crown glass is $\approx 41.1^\circ$ and dense flint glass is $\approx 37.3^\circ$.

Since $45^\circ > i_c$, Total Internal Reflection is guaranteed.



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Let's Test Them Now.**

$$E=mc^2$$



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Key Highlights

- » Free Study Material, Videos & Infographics
- » Push Your Limits with Level-Based Challenges
- » Climb the Leaderboard Among Fellow Aspirants
- » Practice Unlimited MCQs for NEET & JEE
- » Get Clear Explanations, Not Just Marks
- » Track Your Performance Smarter





180° Bend

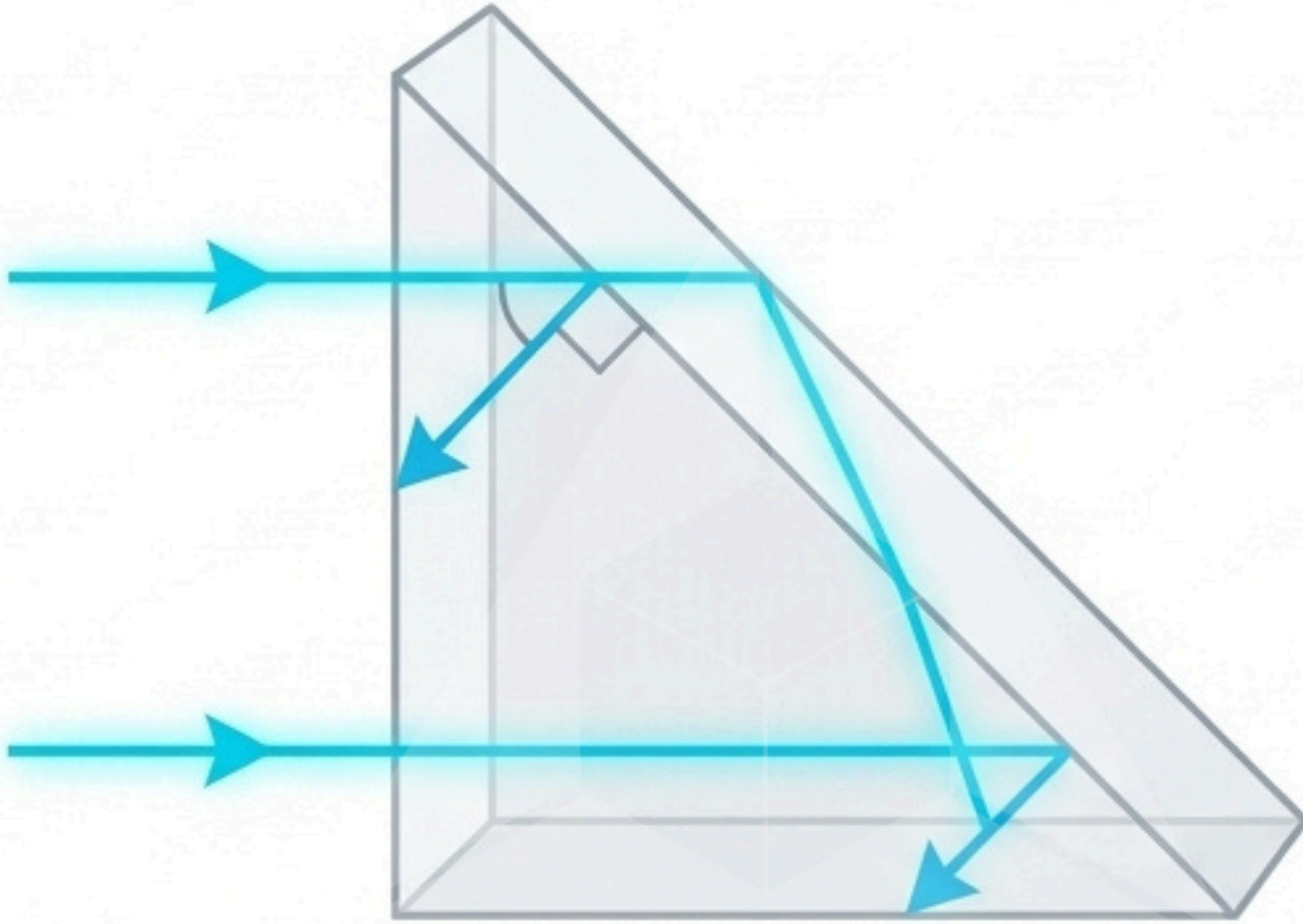
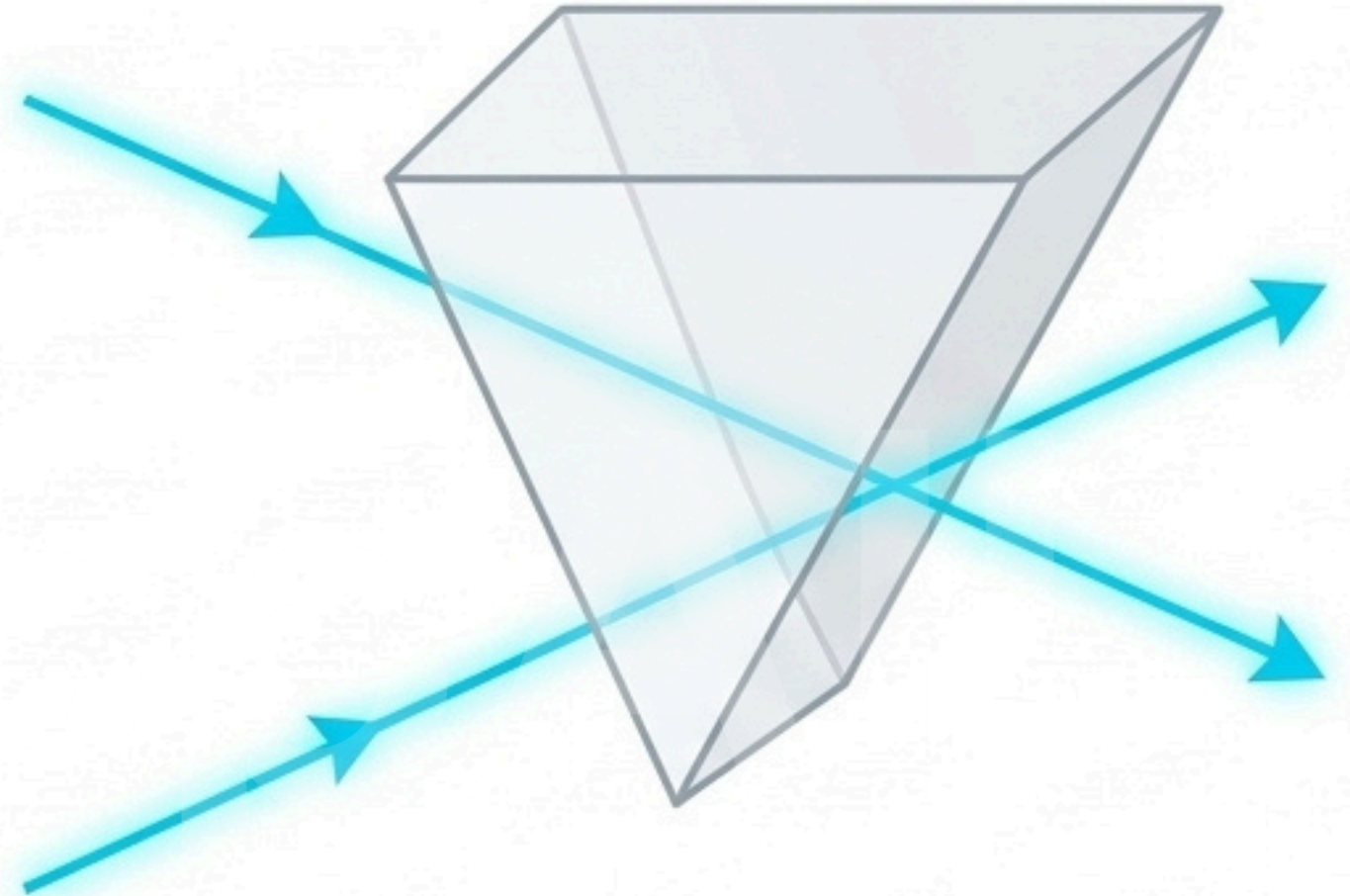
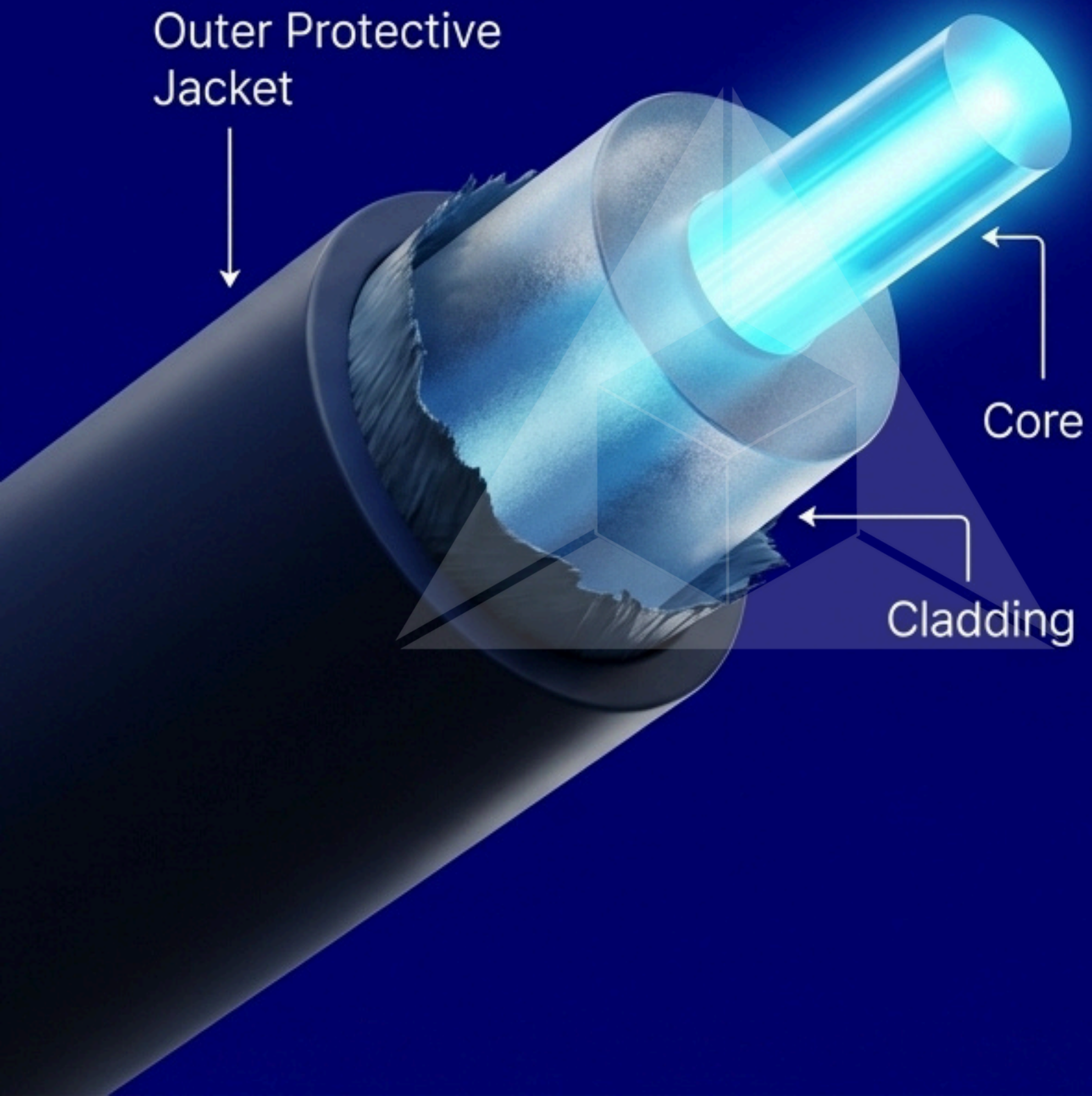


Image Inversion



Key Takeaways: Prisms invert images without changing their size, making them vastly superior to mirrors which absorb light and to lenses which alter magnification.



$\mu_{\text{core}} > \mu_{\text{cladding}}$
(The fundamental requirement for TIR)

CORE	CLADDING
- Material: High-quality composite glass/quartz - Property: Optically denser - Refractive Index: μ_{core} (Higher)	- Material: Specialized glass/plastic coating - Property: Optically rarer - Refractive Index: μ_{cladding} (Lower)

Source Boundary

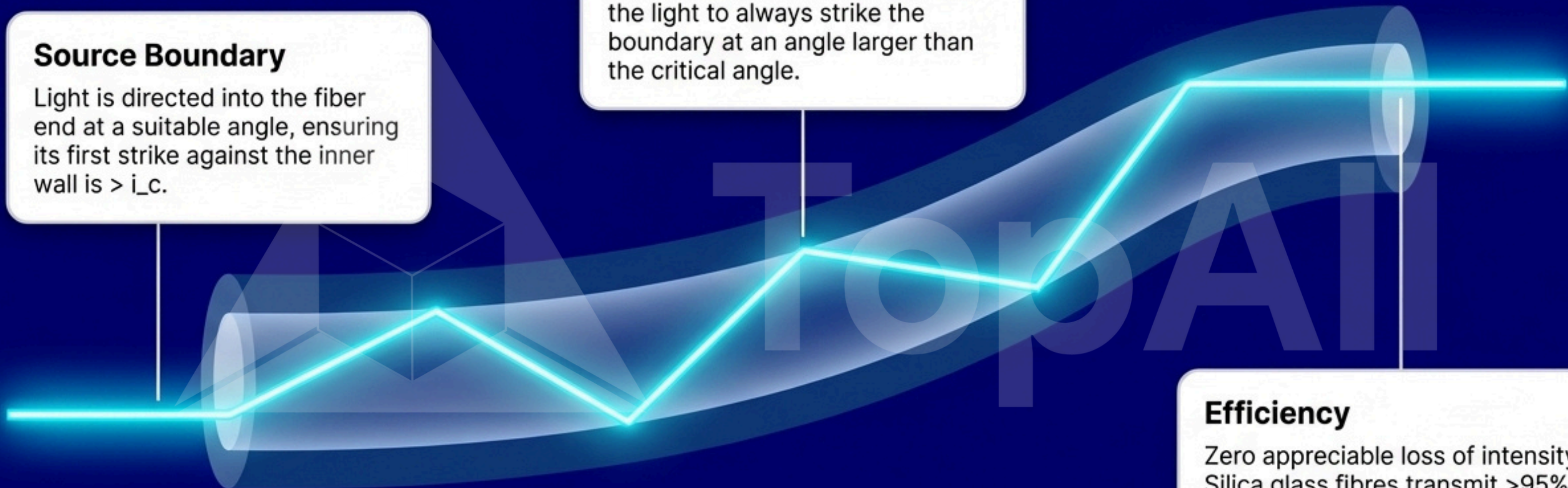
Light is directed into the fiber end at a suitable angle, ensuring its first strike against the inner wall is $> i_c$.

The Bounce

Repeated TIR occurs. Even if the fibre is bent, the geometry forces the light to always strike the boundary at an angle larger than the critical angle.

Efficiency

Zero appreciable loss of intensity. Silica glass fibres transmit $>95\%$ of light over a 1 km length.



Technological Applications of TIR



Telecommunications

Transmitting audio and video signals across massive distances. Electrical signals are converted to light via transducers, acting as the backbone of global internet.



Medical Diagnostics

Acting as 'light pipes' in endoscopy. Doctors can visually examine internal organs (esophagus, stomach, intestines) without invasive surgery.



Everyday Technology

Decorative lamps featuring fine plastic fibres that carry light from a hidden bottom bulb to appear as glowing dots at their free ends.



You've Learned the Theory.

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