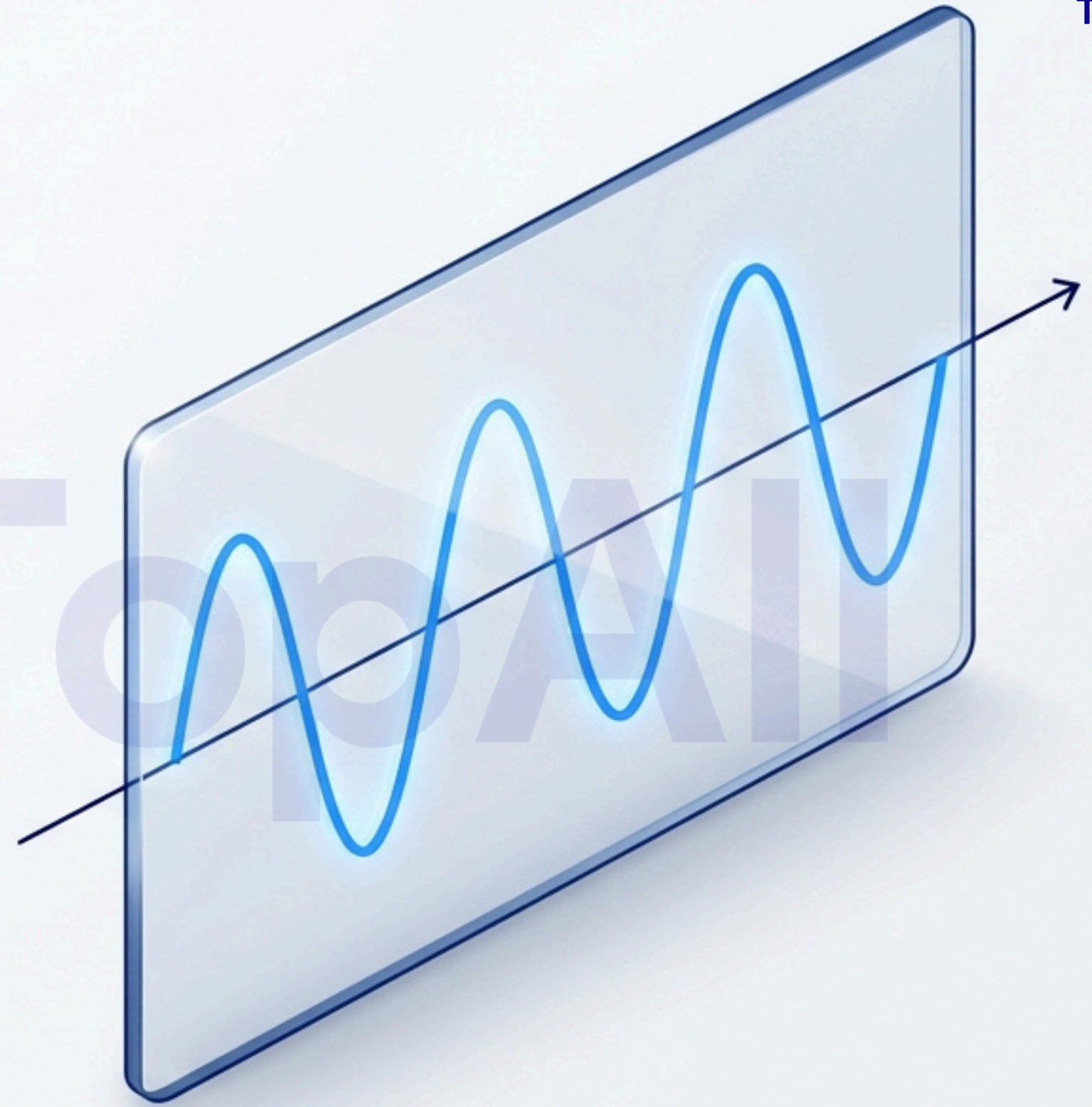


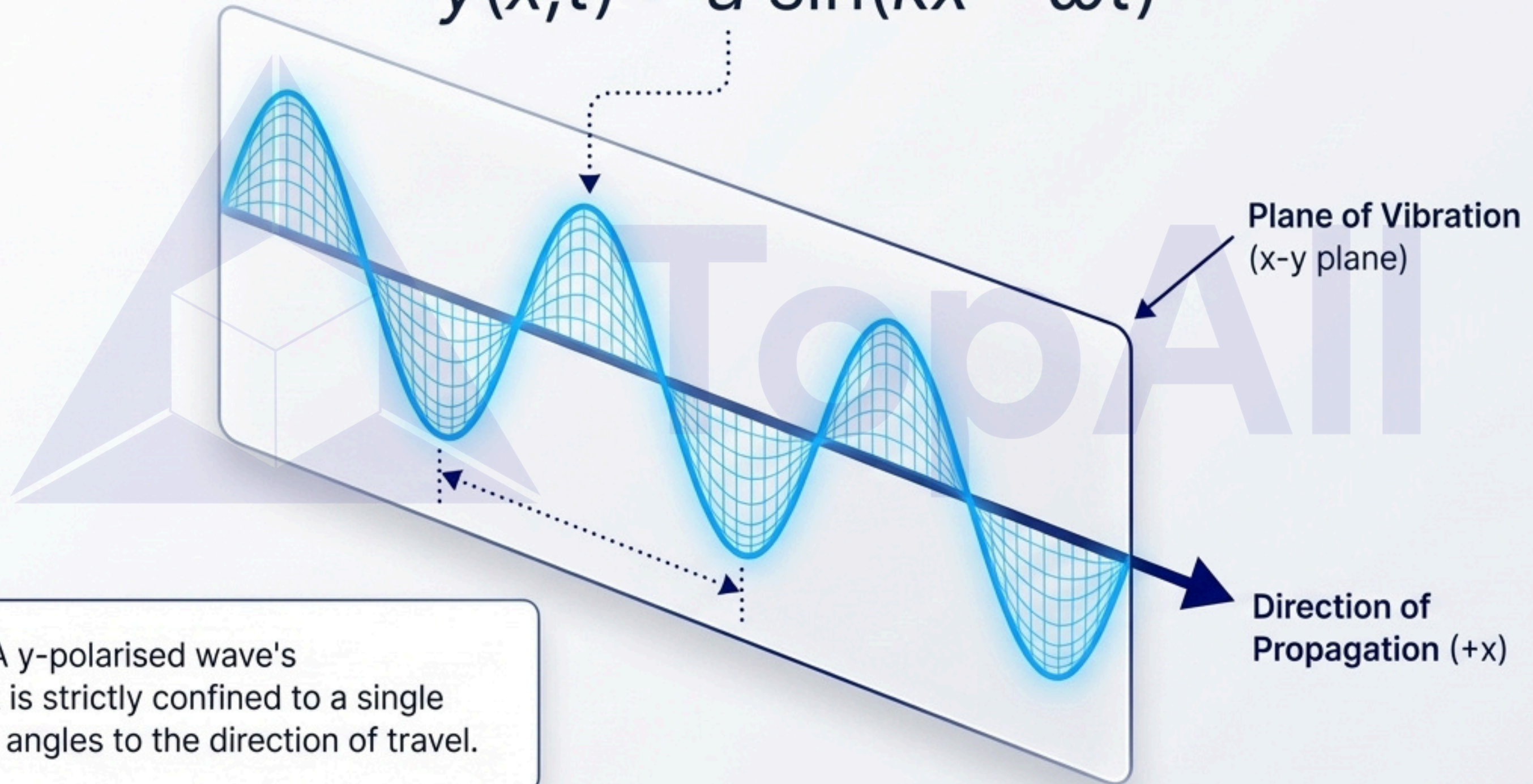
Polarisation

The definitive proof that light is a transverse wave.



The Mechanical Analogy: Transverse Waves

$$y(x,t) = a \sin(kx - \omega t)$$



Key Insight: A y-polarised wave's displacement is strictly confined to a single plane at right angles to the direction of travel.

Chaos vs. Order in Light Waves

Unpolarised Light



The plane of vibration changes randomly and rapidly in very short intervals of time (e.g., light from a sodium lamp or the sun).

Linearly Polarised Light



The electric field vector is restricted to oscillate in one single, constant direction perpendicular to propagation.



**You've Learned the Theory.
Let's Test Them Now.**

$$E=mc^2$$



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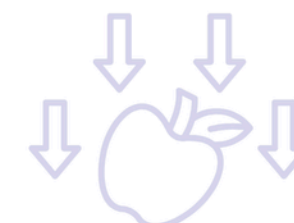
Practice Now



[At prep.topall.app](https://prep.topall.app)



Key Highlights

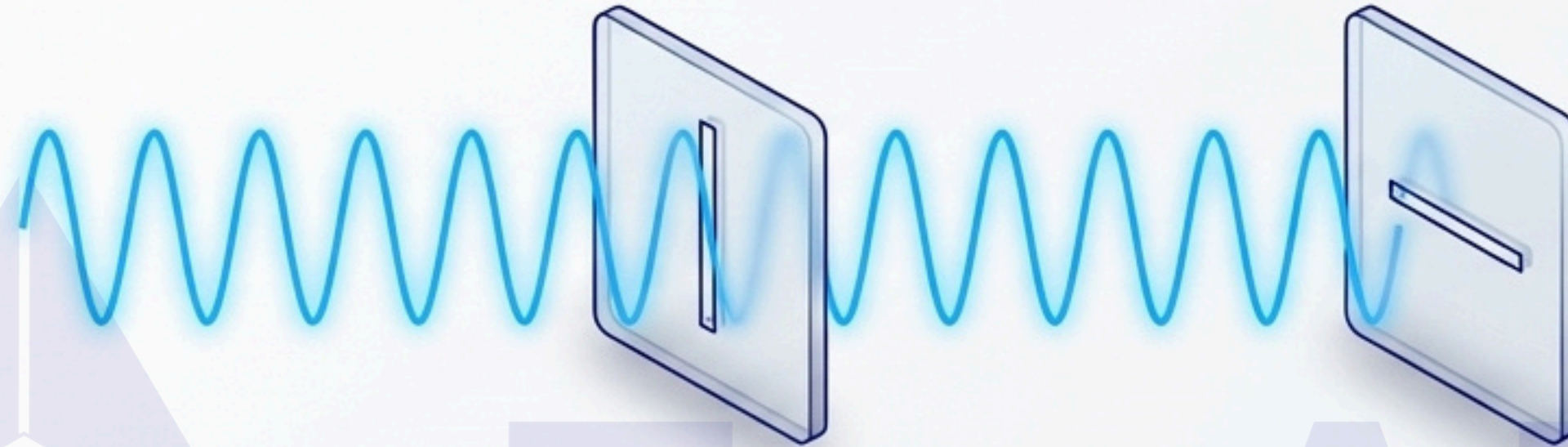


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The Definitive Proof of Transverse Waves

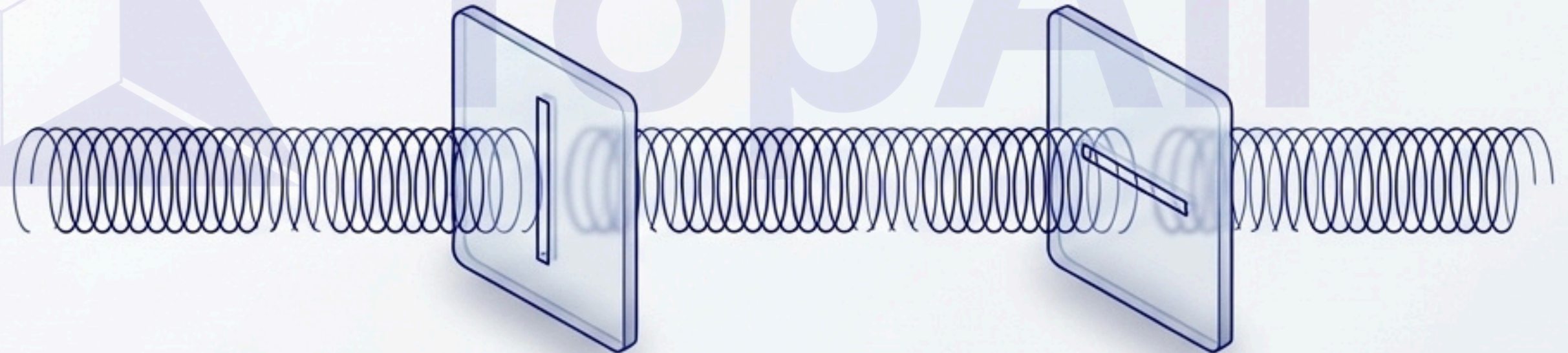


Transverse Waves
(e.g., Light, String)



Can be blocked by a perpendicular filter because oscillations occur radially outward from the travel path.

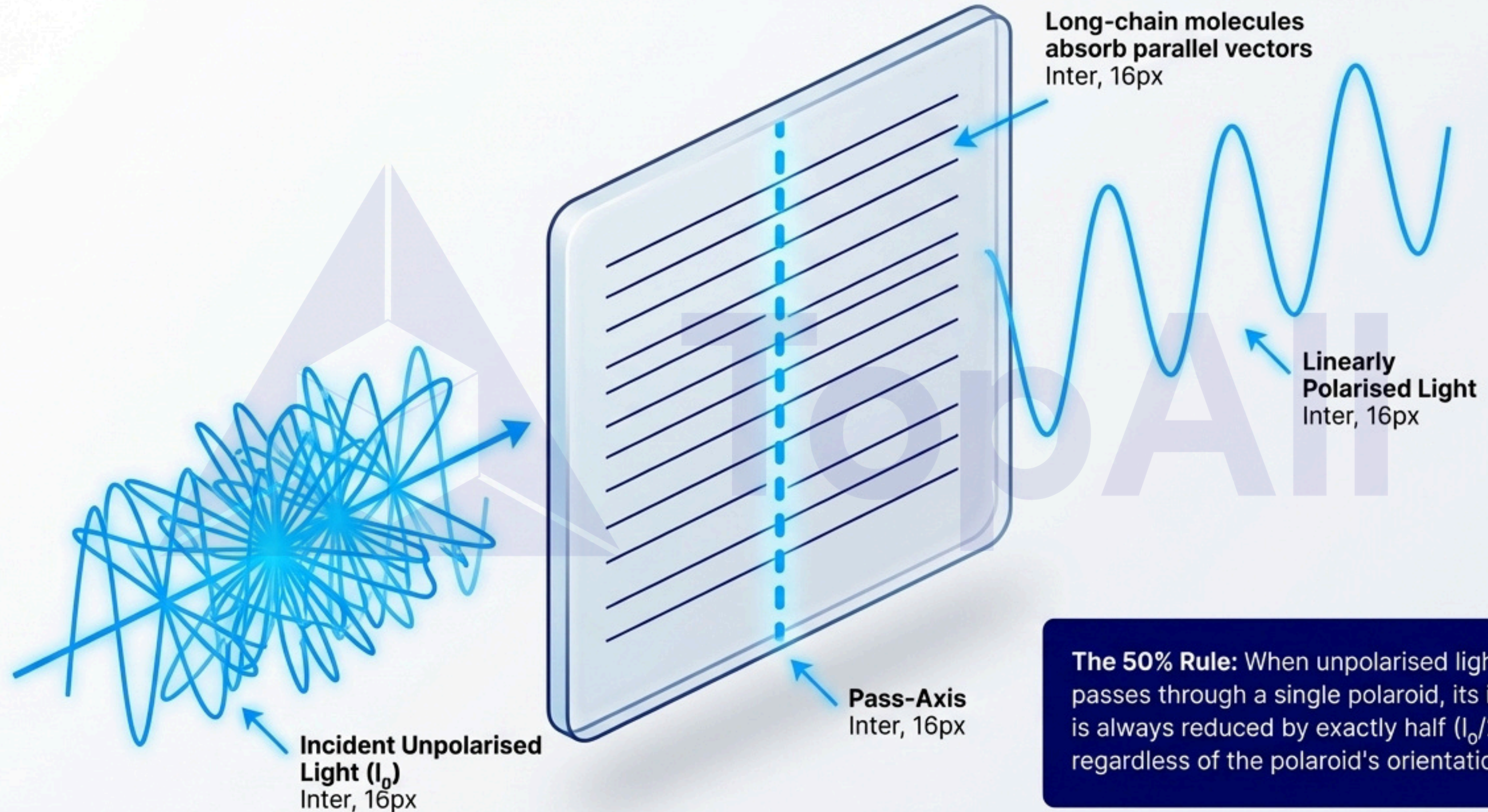
Longitudinal Waves
(e.g., Sound)



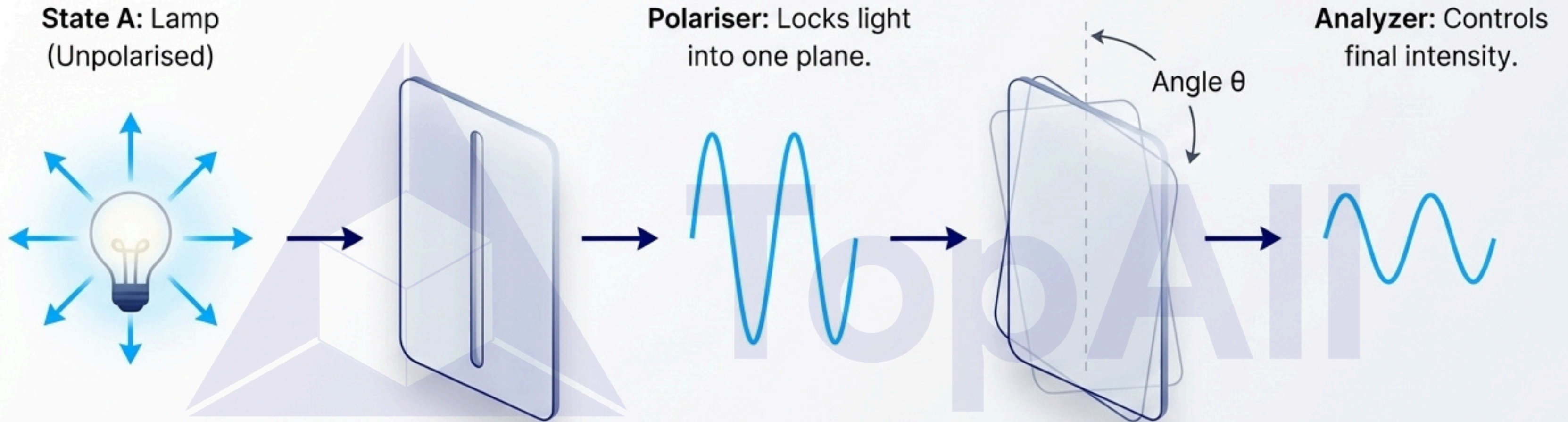
Microscopy: Cannot be polarised. Oscillations are parallel to travel, meaning no filter orientation can block them.

Because light can be polarised, it must be a transverse electromagnetic wave.

Filtering Chaos: The Polaroid



The Polariser and the Analyzer



Maximum Transmission ($\theta = 0^\circ$)

Zero Transmission ($\theta = 90^\circ$)

Rotating P_1 alone has no effect on intensity. But once light is polarised by P_1 , rotating the analyzer (P_2) perfectly controls the transmission from 100% to 0%.

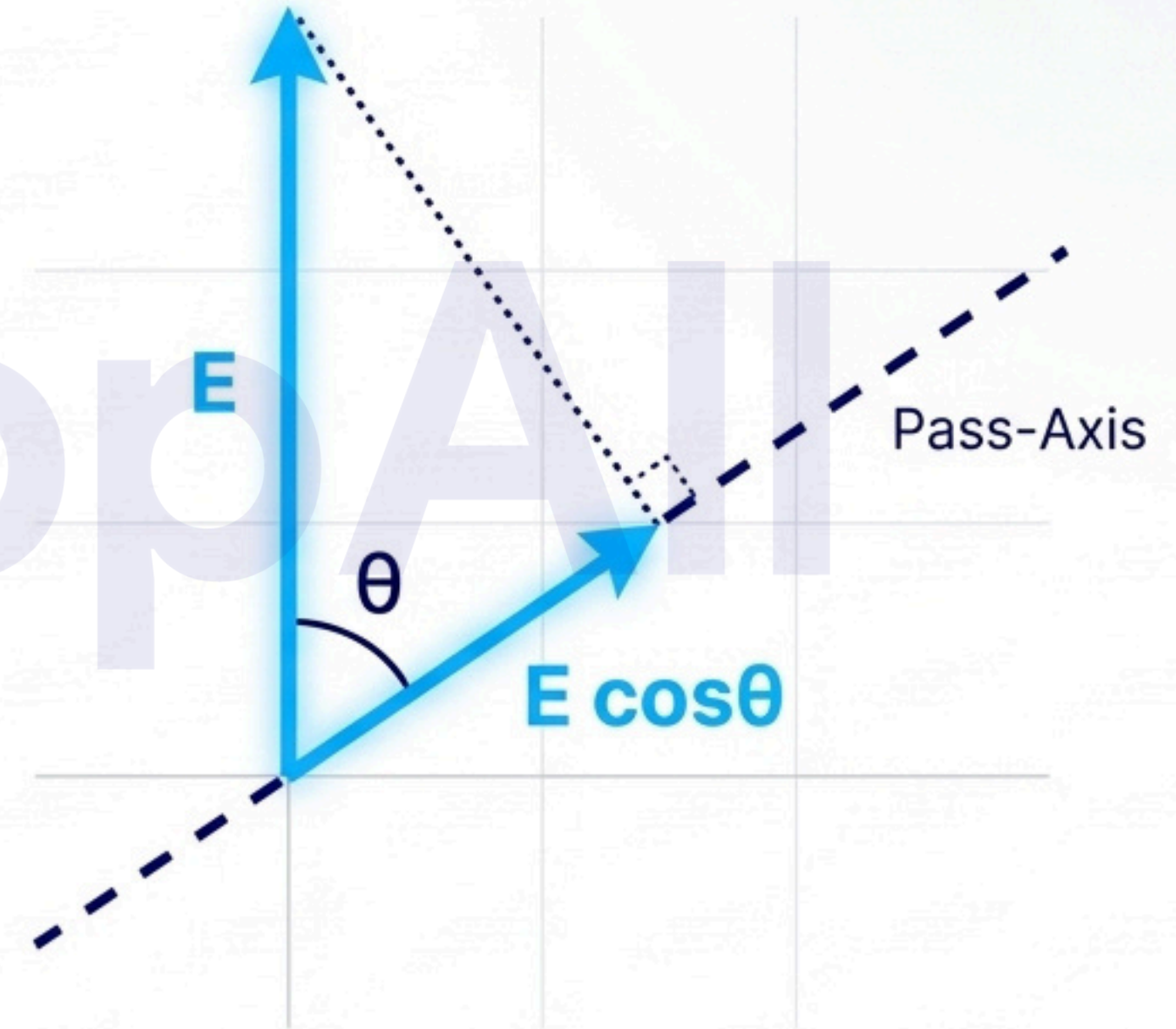
Malus' Law: Predicting Intensity

$$I = I_0 \cos^2 \theta$$

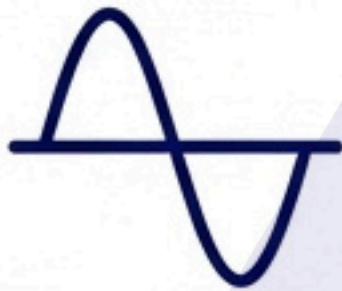
Intensity of light emerging from the Analyzer.

Explanation Box

Why squared? The polaroid passes the vector component $E \cos \theta$. Because the energy (Intensity) of a wave is strictly proportional to the square of its amplitude ($I \propto E^2$), the transmitted intensity becomes $I_0 \cos^2 \theta$.



The Invisible Made Visible: Key Takeaways



Transverse Proof

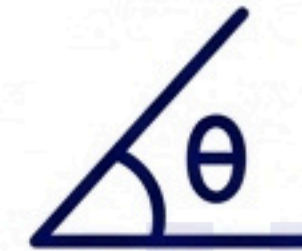
Polarisation is the definitive physical proof that light is a transverse electromagnetic wave, not a longitudinal one.



Polaroid Action

Polaroids absorb electric vectors parallel to their molecular chains.

Unpolarised light loses exactly 50% of its intensity through a single polaroid.



Malus' Law

The intensity through an analyzer is $I = I_0 \cos^2\theta$. This principle powers modern applications like 3D movie cameras, LCD screens, and glare-reducing sunglasses.



You've Learned the Theory.

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