Waves – Repetition – Seminar

 $a = A(\vec{r},t) \ell$ Wave

illin-ut) (a, A)

Amplitude slowly varying

≅ constant

9= To -at y= cont

wavefront

E = 26 2 79 [

 $\varphi = \text{const.}$ $\varphi = \text{const.}$ 1V4/ 2 00

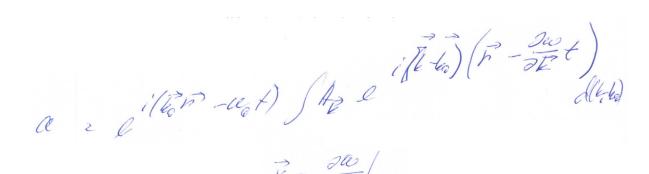
Group velocity – how a signal propagates – plane wave brings no information

az Steller-alest dk

Wave packet

Lets assume a narrow spectrum around ω_0 , \mathcal{L}_0 , where $\omega_0 = \omega(\mathcal{L}_0)$

a = $e^{i(\vec{k}_0 \cdot \vec{k}_0 - a_0 t)} \int_{\mathbb{R}^2} \int_{\mathbb{R}^2} \frac{i(\vec{k} - \vec{k}_0)\vec{h}}{envelope}$ $e^{i(\vec{k}_0 \cdot \vec{k}_0 - a_0 t)} \int_{\mathbb{R}^2} \int_{\mathbb{R}^2} \frac{i(\vec{k} - \vec{k}_0)\vec{h}}{envelope}$ $e^{i(\vec{k}_0 \cdot \vec{k}_0 - a_0 t)} \int_{\mathbb{R}^2} \int_{\mathbb{R}^2} \frac{i(\vec{k} - \vec{k}_0)\vec{h}}{envelope}$



Envelope moves with velocity $\sqrt{g} = \sqrt{\frac{2}{2}} \sqrt{\frac{1}{2}} \sqrt{\frac{1}{2}}$ (need not be parallel to v_{ϕ}) and group velocity is less than or equal to the speed of light c.

In non-dispersive media, v_{ϕ} does not depend on $\overrightarrow{L} \Rightarrow \overrightarrow{J} = \overrightarrow{J}$

Group velocity and energy transport

For electromagnetic waves, plasma is a medium with temporal dispersion

Poynting vector (energy flux density)

Phase and group velocity

$$V_{q} \geq \frac{l_{0}}{k} \geq \frac{c}{V_{e_{n}}} > c$$

$$V_{q^{2}} \frac{d}{dk} \geq \frac{c}{dk} \geq \frac{c}{dk} = \frac{cV_{e_{n}}}{dk} = \frac{cV_{e_{n}}}{dk} = \frac{cV_{e_{n}}}{dk} = c$$

Speed of energy transport

$$S = \frac{1}{2} \frac{d}{dw} (we) |R_0|^2 + \frac{1}{2} |A_0|^2 |R_0|^2 |R_0|^2 + \frac{1}{2} |A_0|^2 |R_0|^2 |R_0|^$$