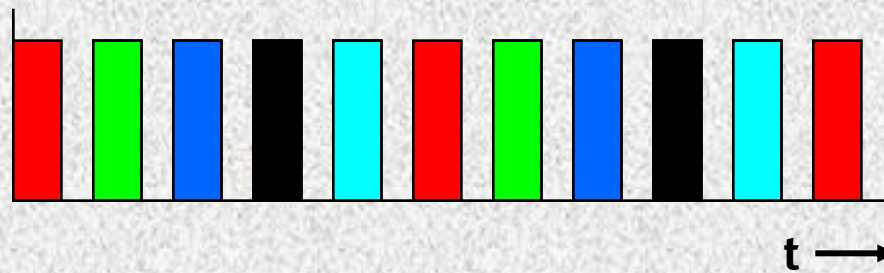


With High Speed Optical Fibre Networks and Slow Light into the “Photonic Century”

**Prof. Dr.-Eng.habilitas
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Multiplexing Technologies:

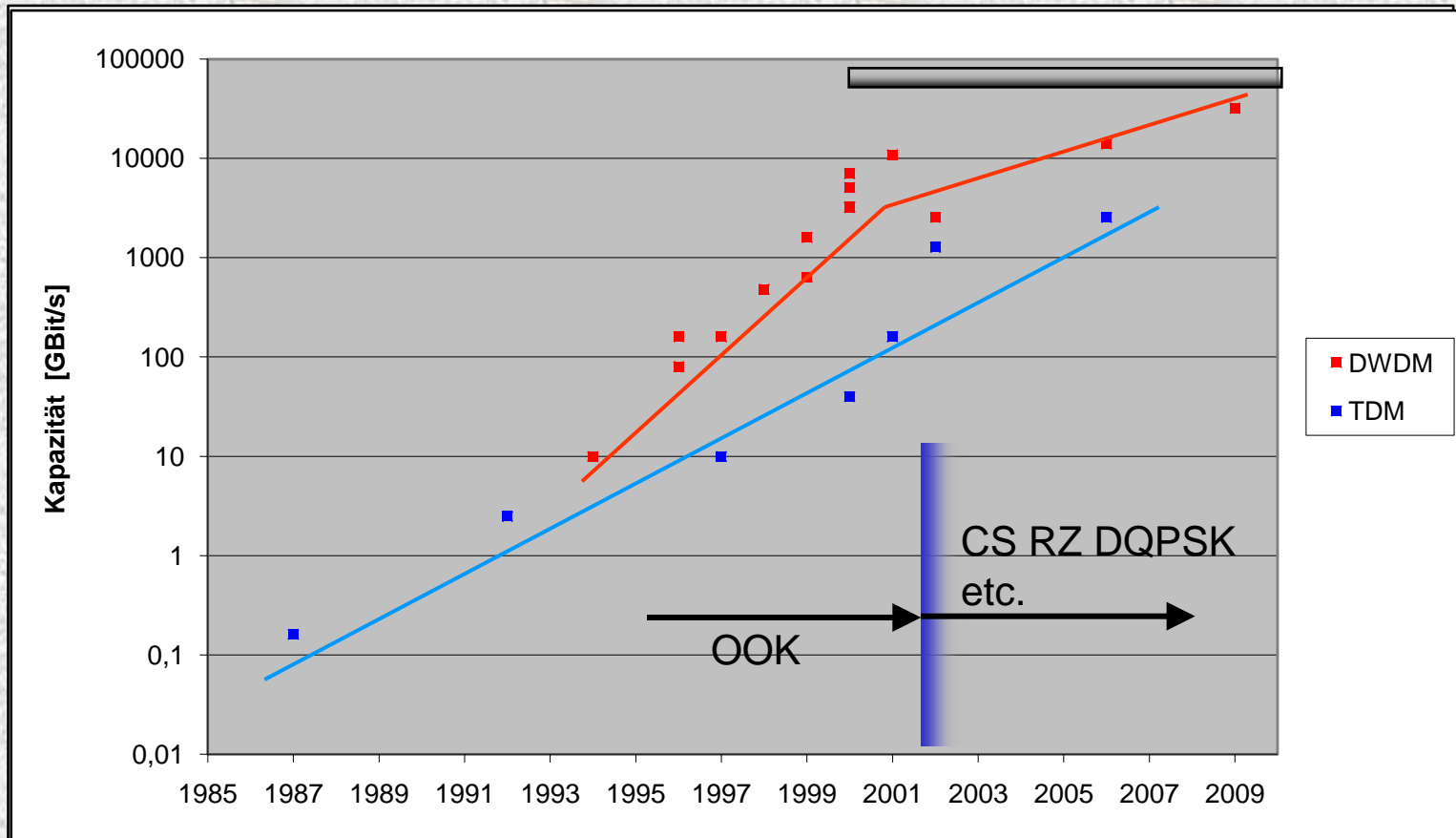
TDM



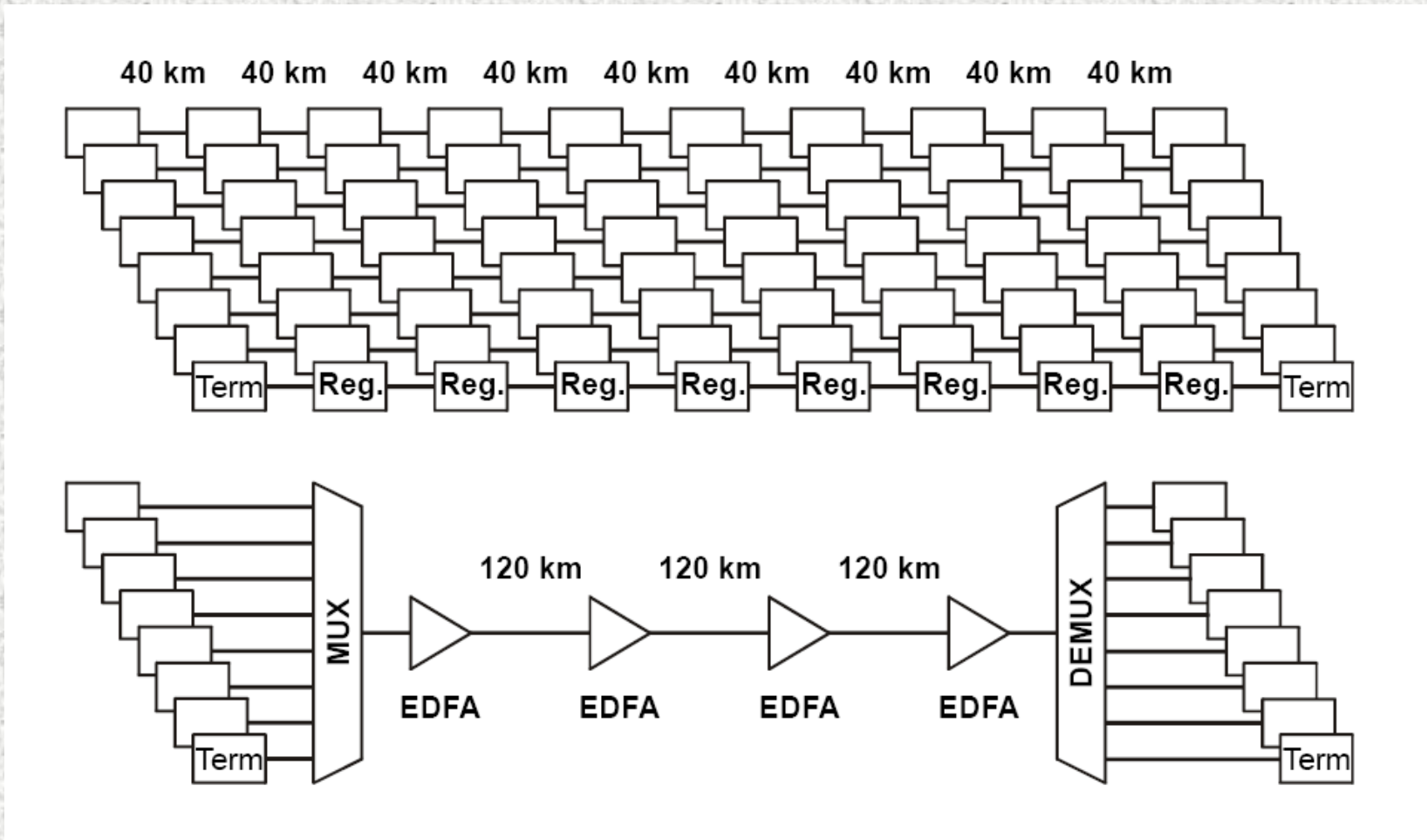
WDM



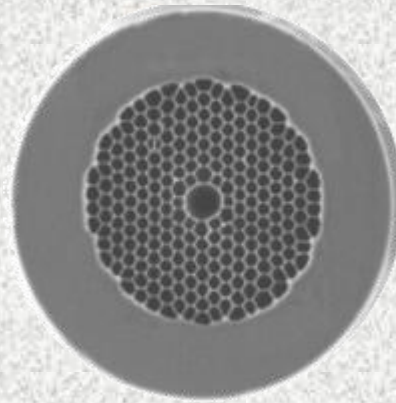
Evolution of Transmission Bandwidth



Efficiency of DWDM



Evolution of Optical Fibres



Photonic Crystal Fibre

SI



GI



SM



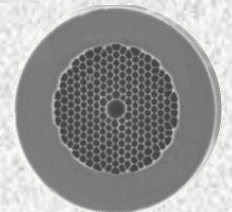
DS/DC



NZ-DS



PC



Outlook into the „Photonic Century“

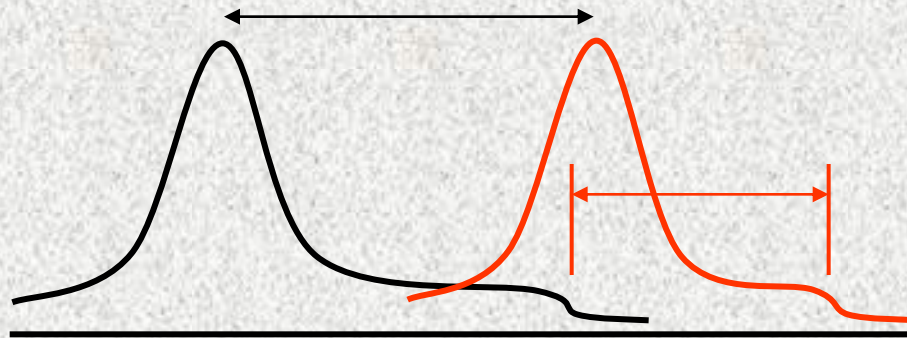
- Optical switching (spatial)
- Wavelength division switching
- High bit rate systems (Giga- and Tera-Bit/s) in MANs and LANs
- FTH as wide spread infrastructure
-
-
-
- ‚Slow‘ Light for:
 - optical Retiming (3R-Repeater)
 - delay control for synthetic apertur radar
 - optical buffers for packet switching

Transmission Speed of Signals?

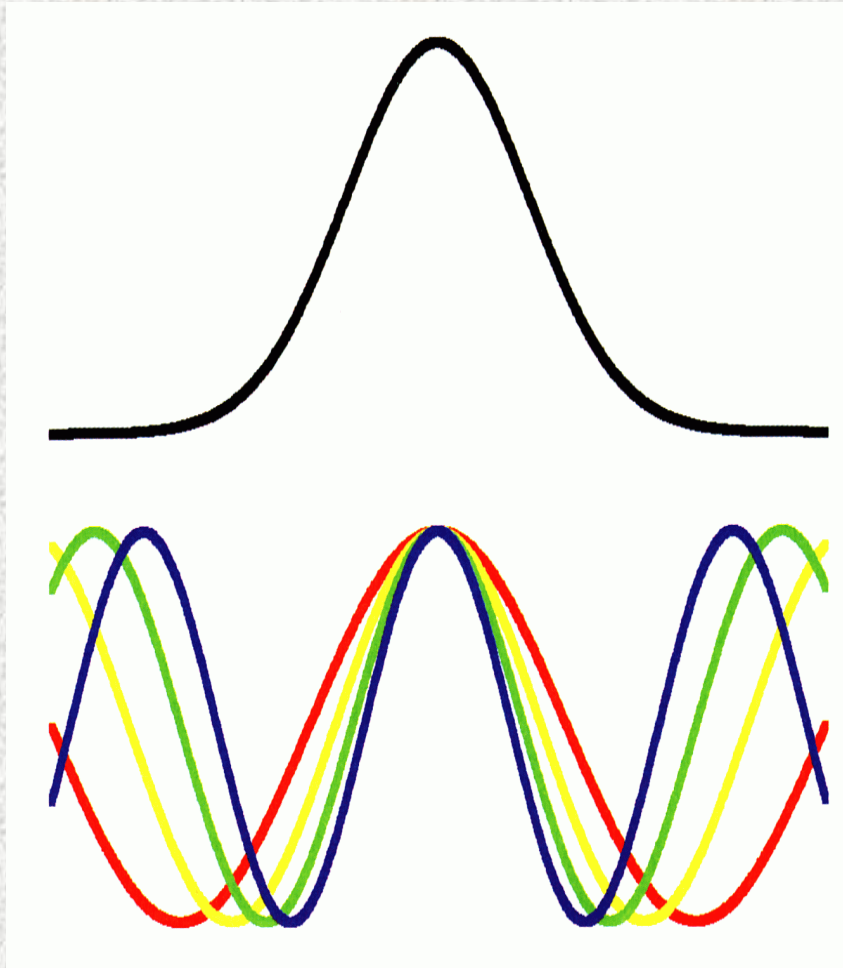
- Phase velocity
- Group velocity in dispersive media

$$v_{group} = \frac{c}{n(\omega) + \omega \frac{dn(\omega)}{d\omega}} \Bigg|_{\omega=\omega_c} = \frac{c}{N_{group}}$$

- ‚Precursor‘ velocity ?



Sinusoidal Components of an Impulse



In dispersive media:

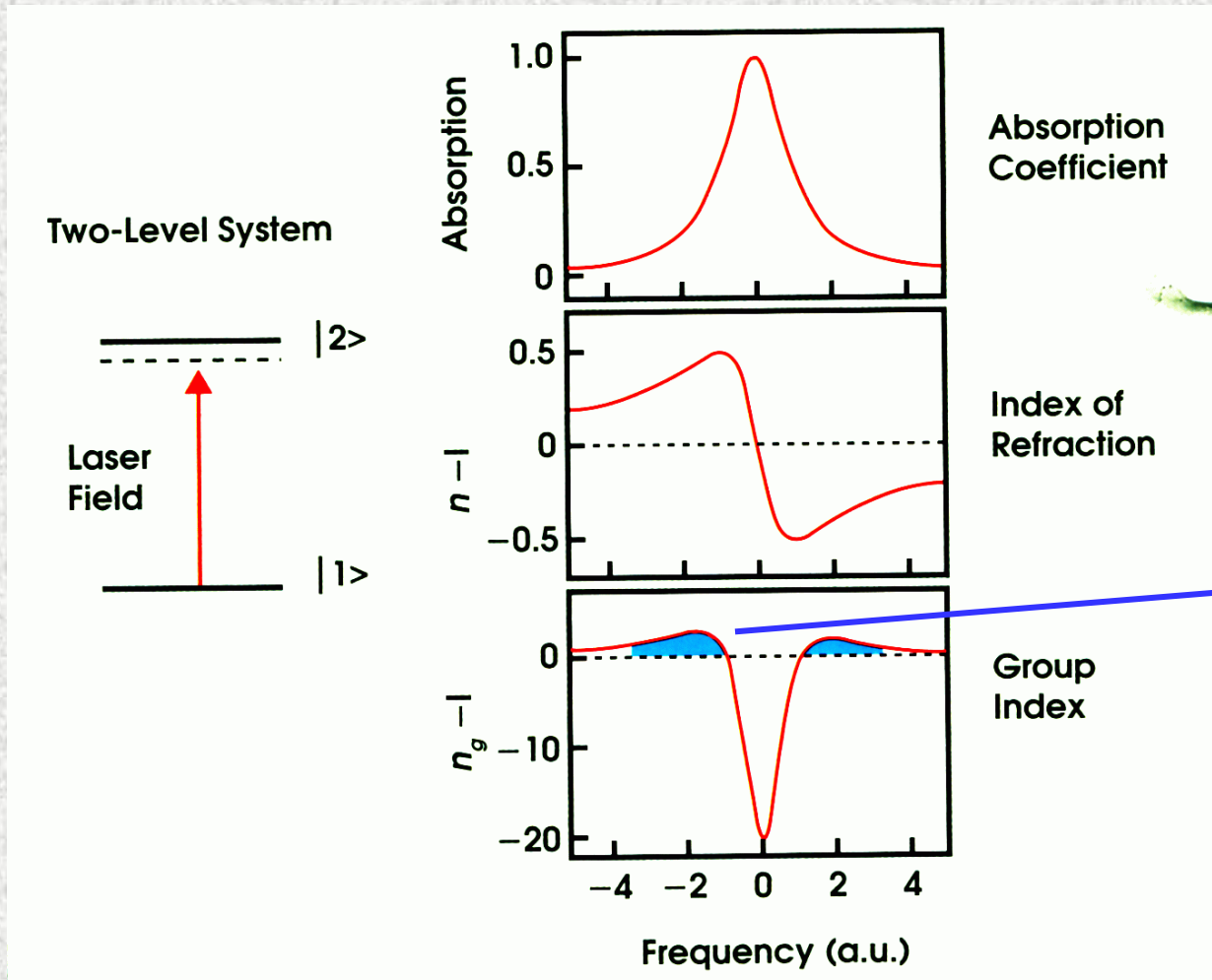
$$v_{phase} = \frac{c}{n(\omega)}$$



Therefore the speed of the envelope is different:

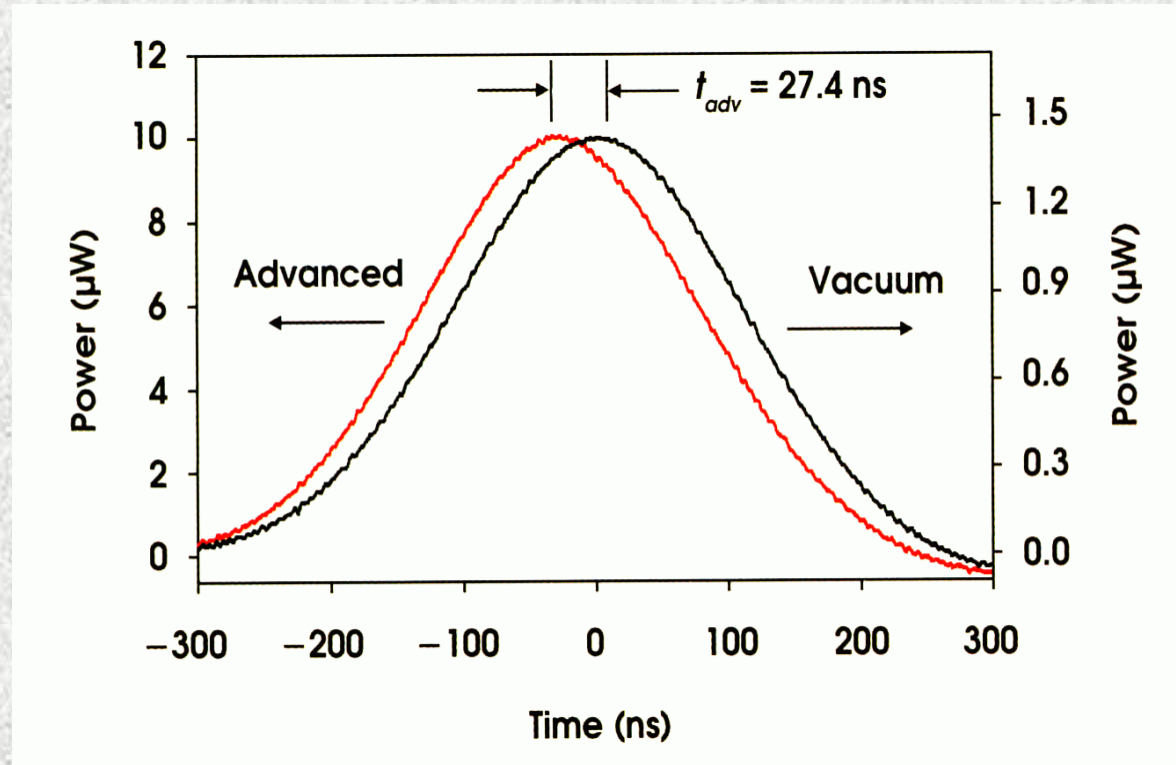
$$v_{group} = \frac{c}{n(\omega) + \omega \frac{dn(\omega)}{d\omega}} \Big|_{\omega=\omega_c} = \frac{c}{N_{group}}$$

Group Refractive Index of Laser Pumped Gases



$V_g = 300 \text{ m/s}$
[8 m/s]

Experimental Result of ‚Fast‘ Light



/ Stenner (10/2003) /

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