

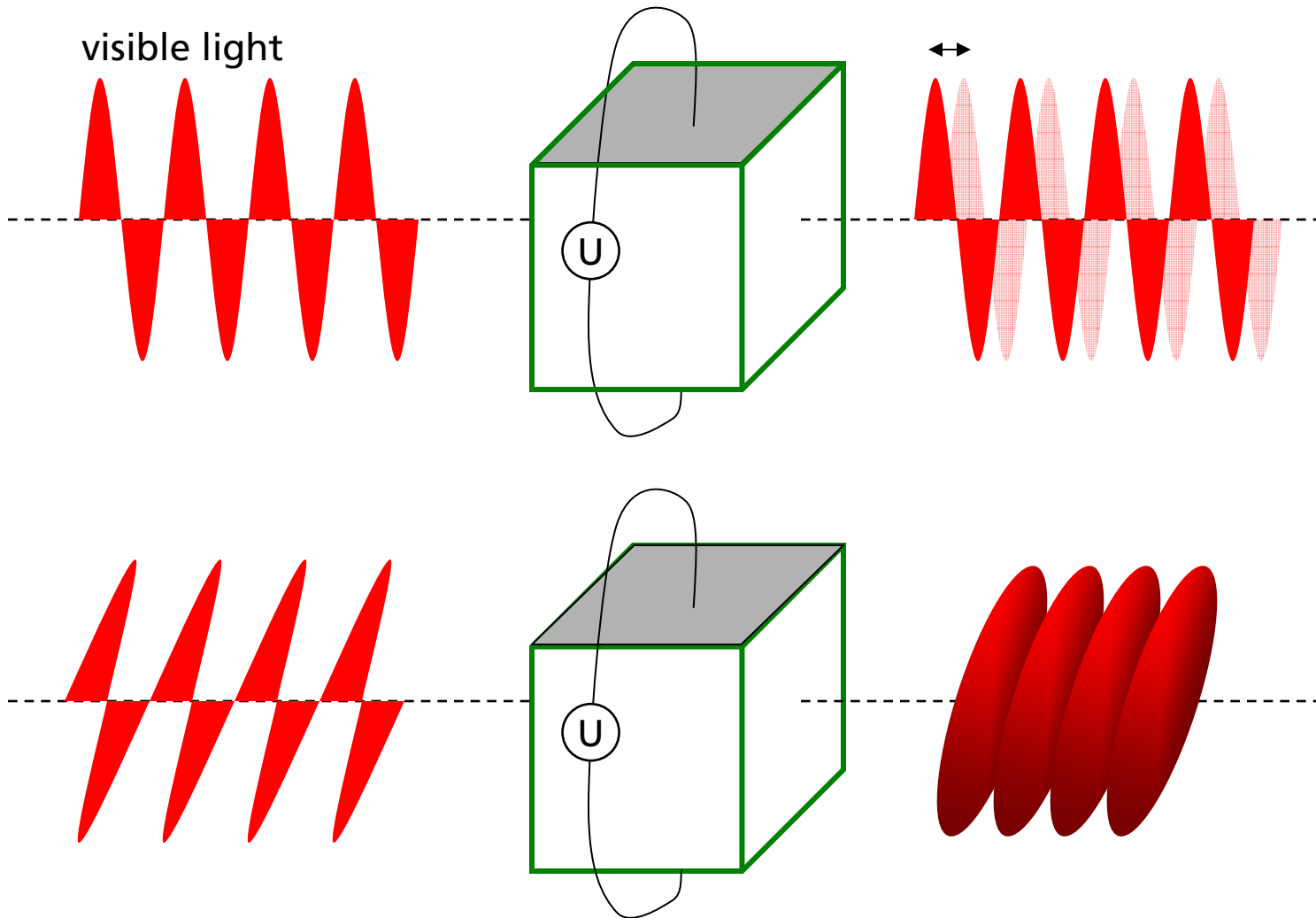


Measuring electromagnetic fields at THz frequencies through electro-optic detection methods

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Electro-optic effect



Electro-optic effect

refractive index tensor

$$\frac{1}{n_{ij}^2(\mathbf{E})} = \frac{1}{n_{ij}^2(0)} + \sum_k r_{ijk} E_k + \sum_{k,l} p_{ijkl} E_k E_l + \dots$$

no field

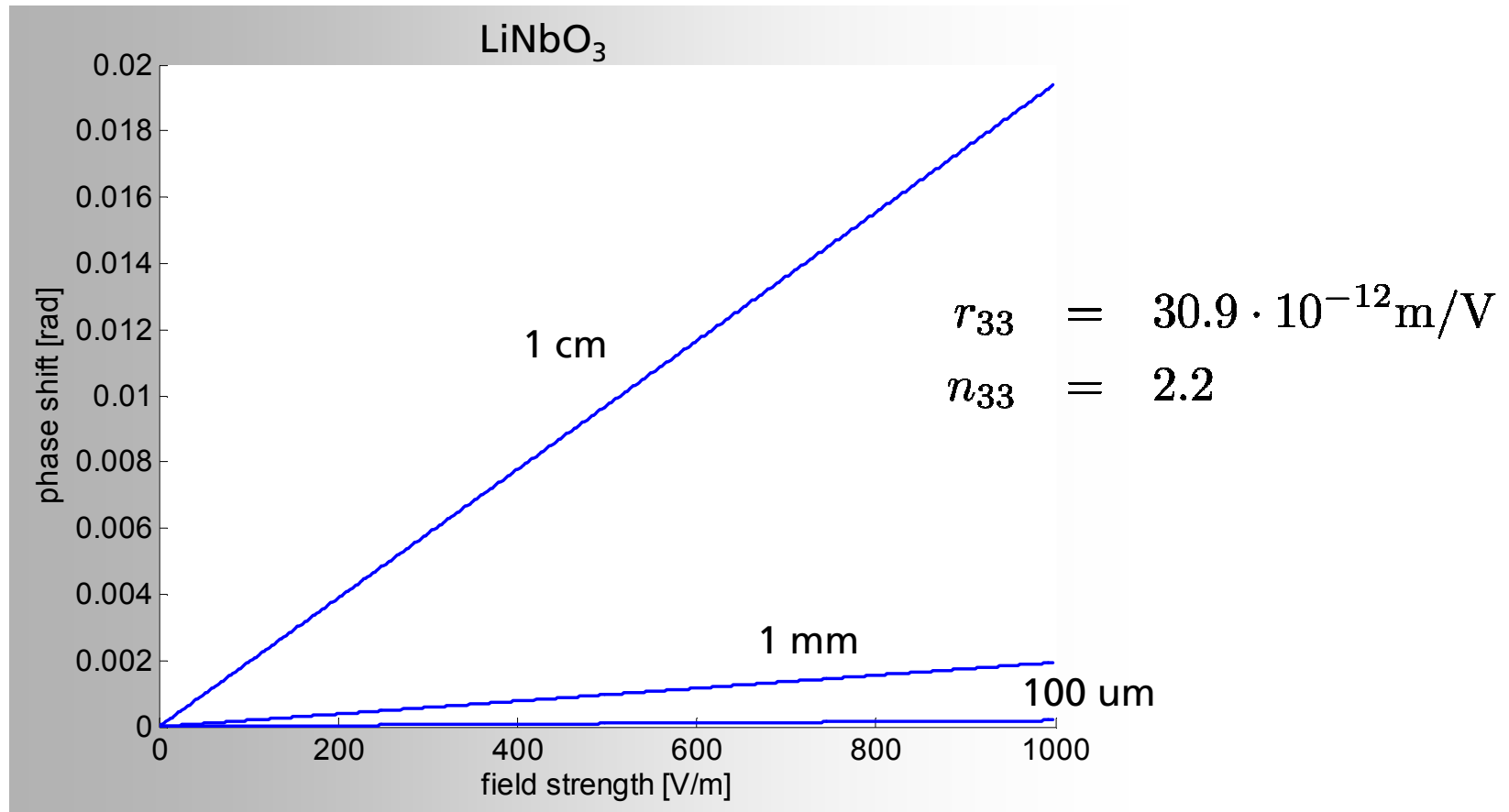
Pockel's effect

dc Kerr effect

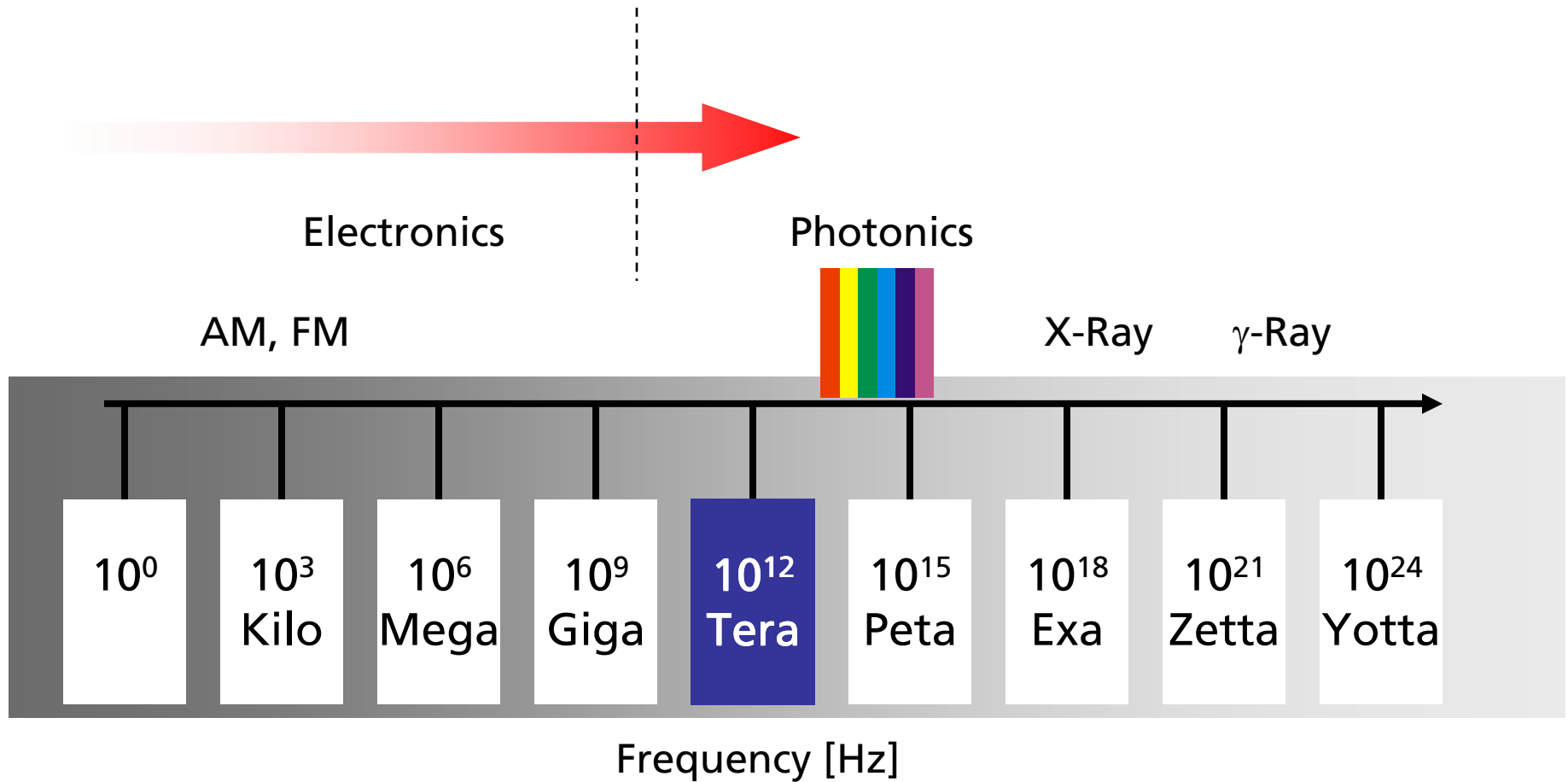
linear electro-optical tensor

quadratic electro-optical tensor

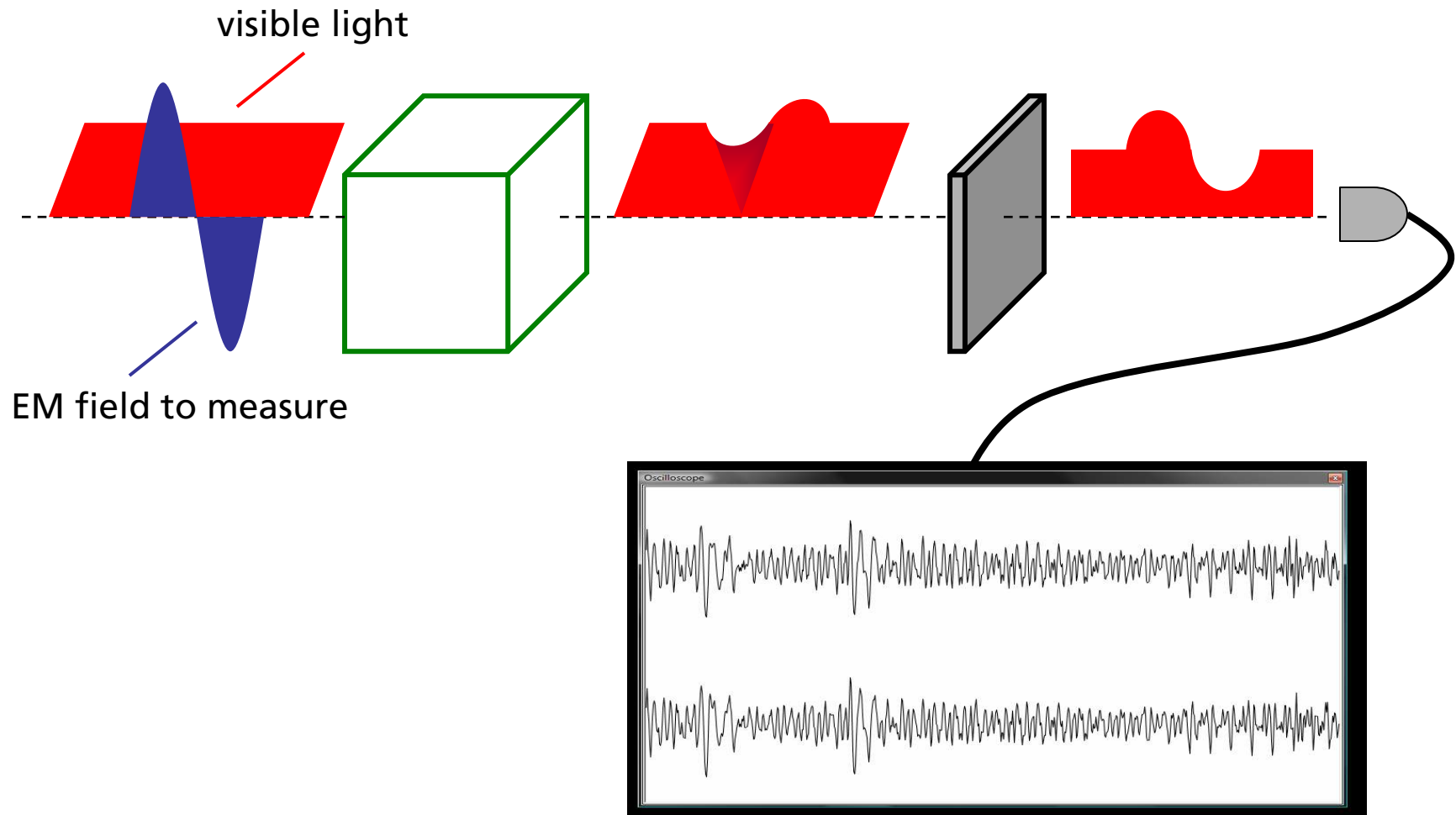
Example



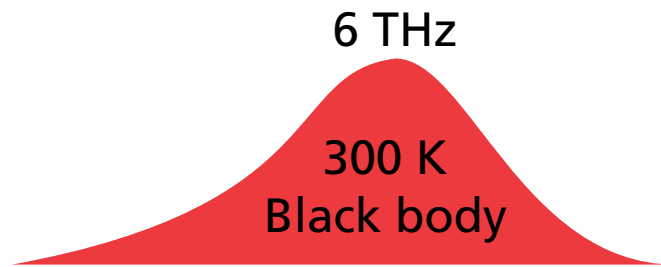
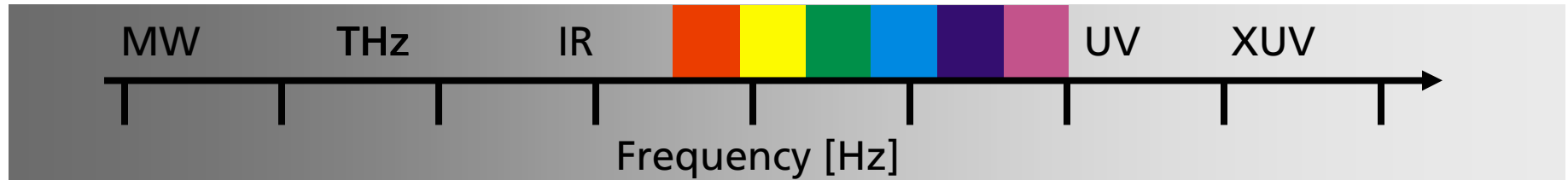
Frequency range



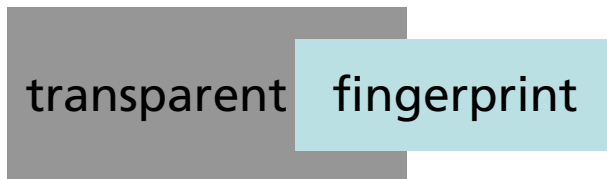
Up to a few GHz



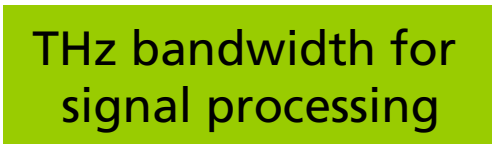
THz in technology



Maximum of black body radiation at room temperature is 6 THz.

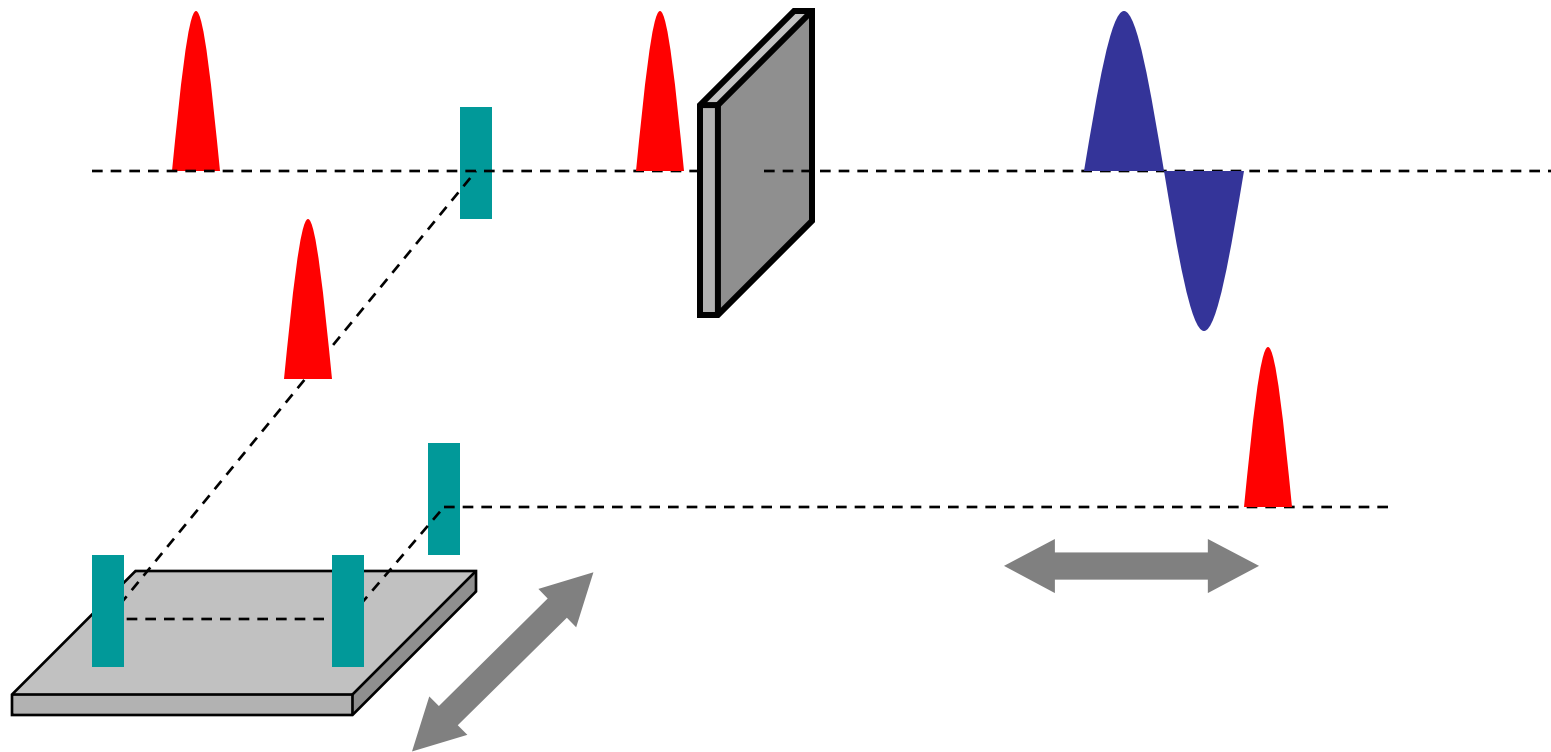


Many in-/organic materials are transparent in the fingerprint region of organic material.

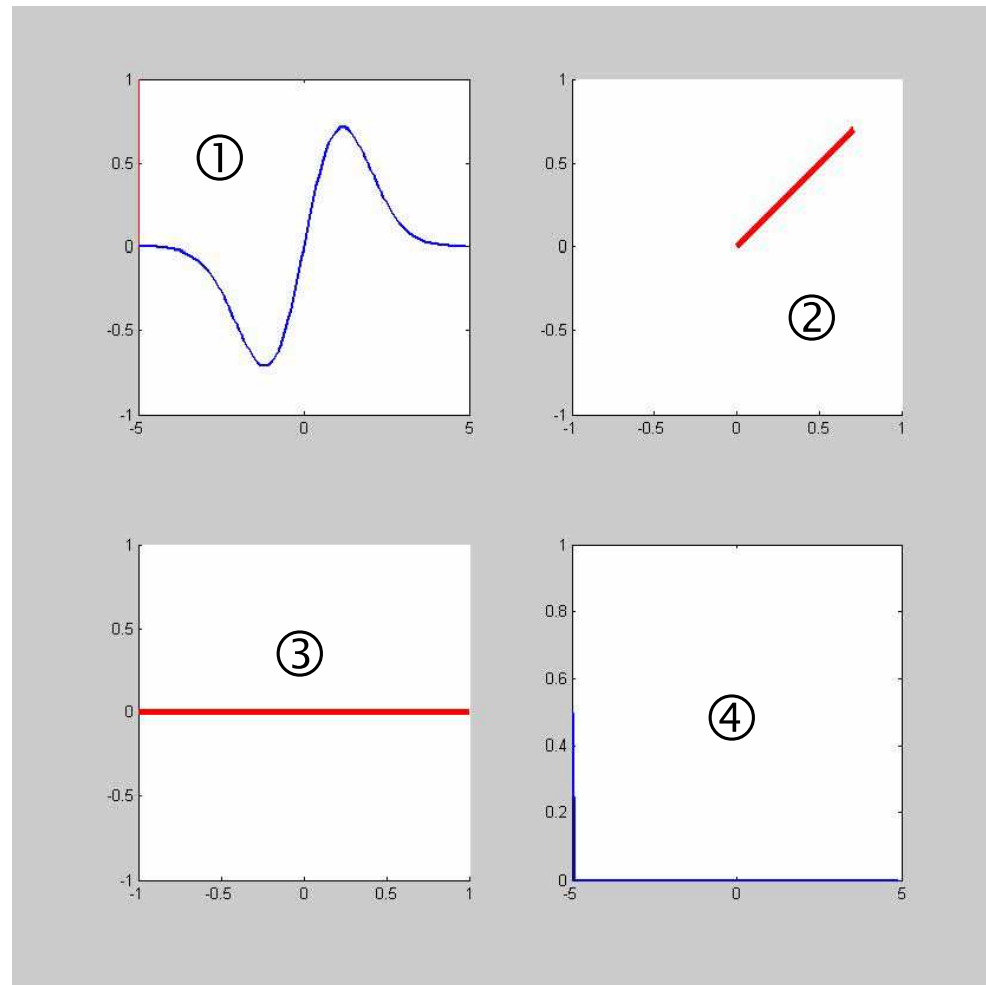
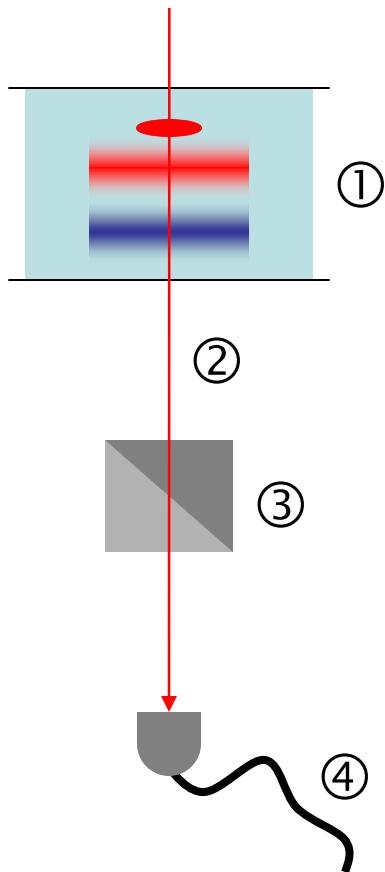


Signal processing and transportation are approaching THz carrier frequencies and bandwidths.

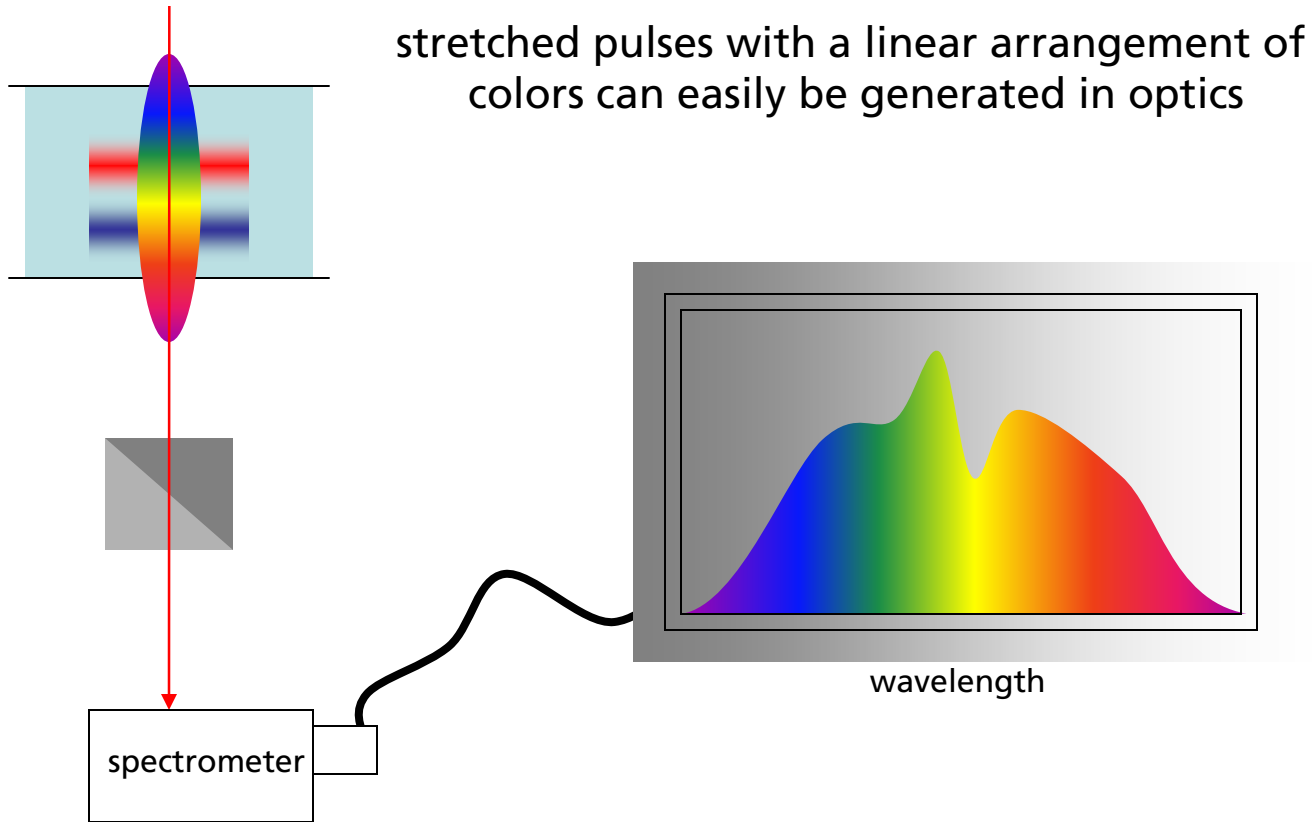
The concept of pump and probe



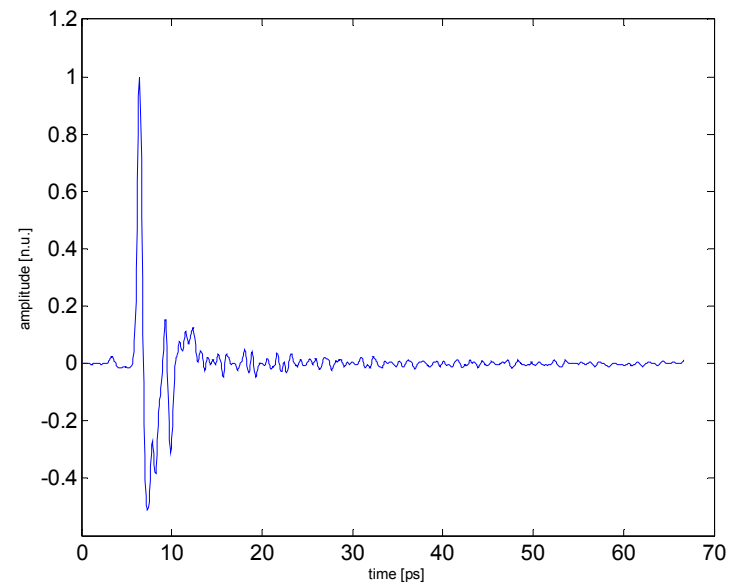
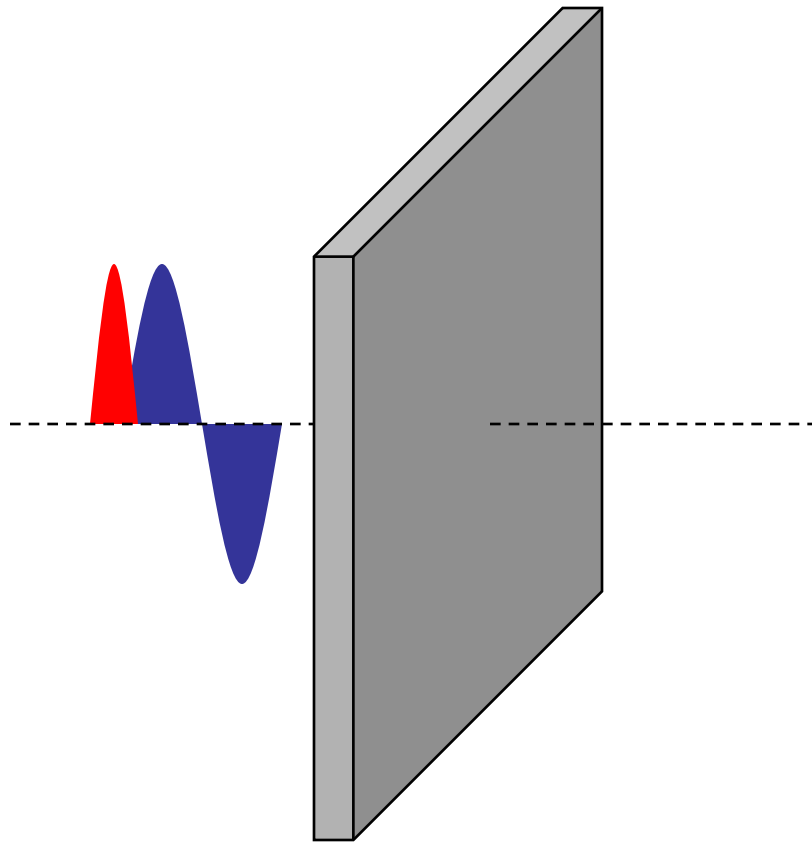
Coherent electro-optic detection



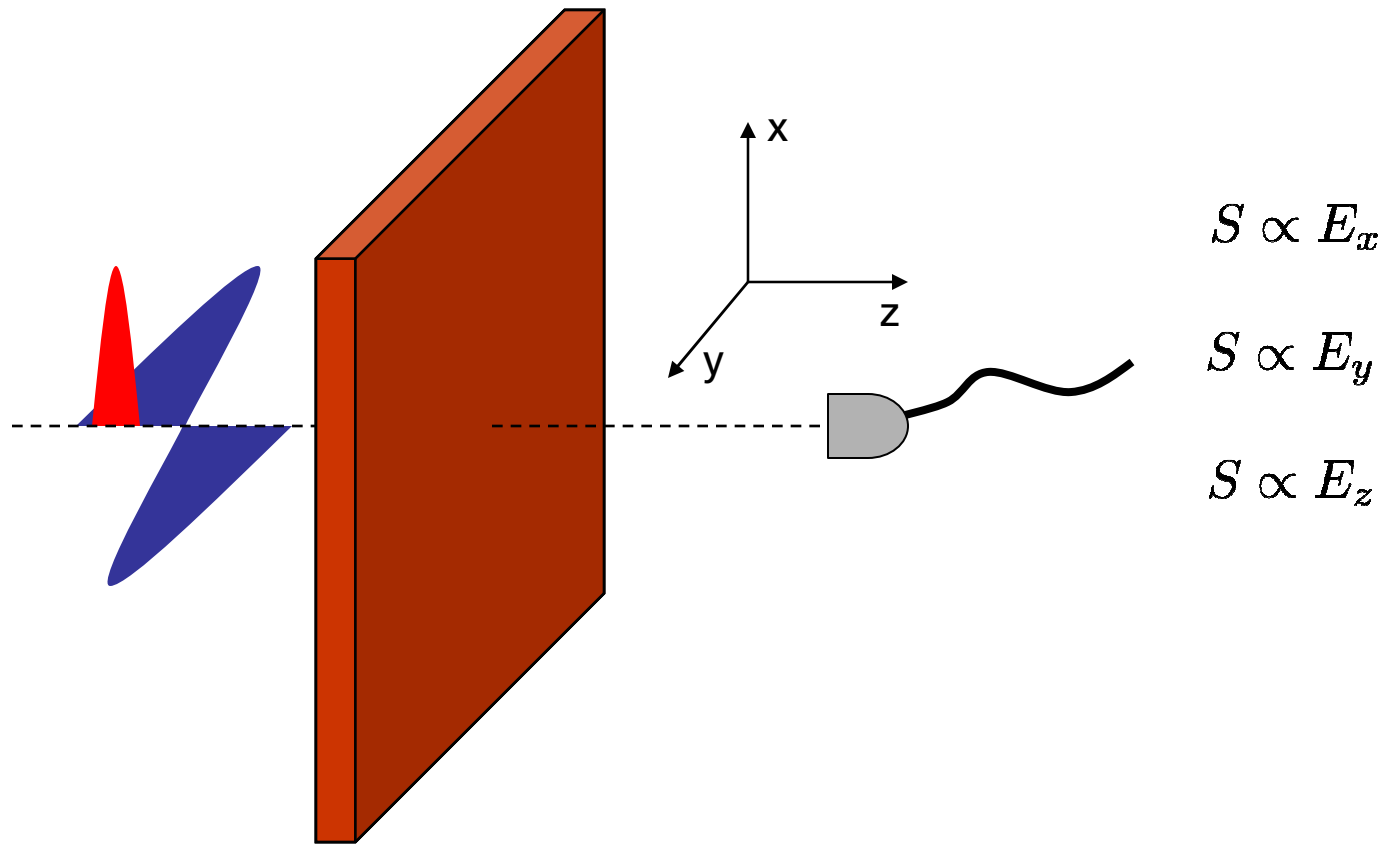
Coherent electro-optic detection



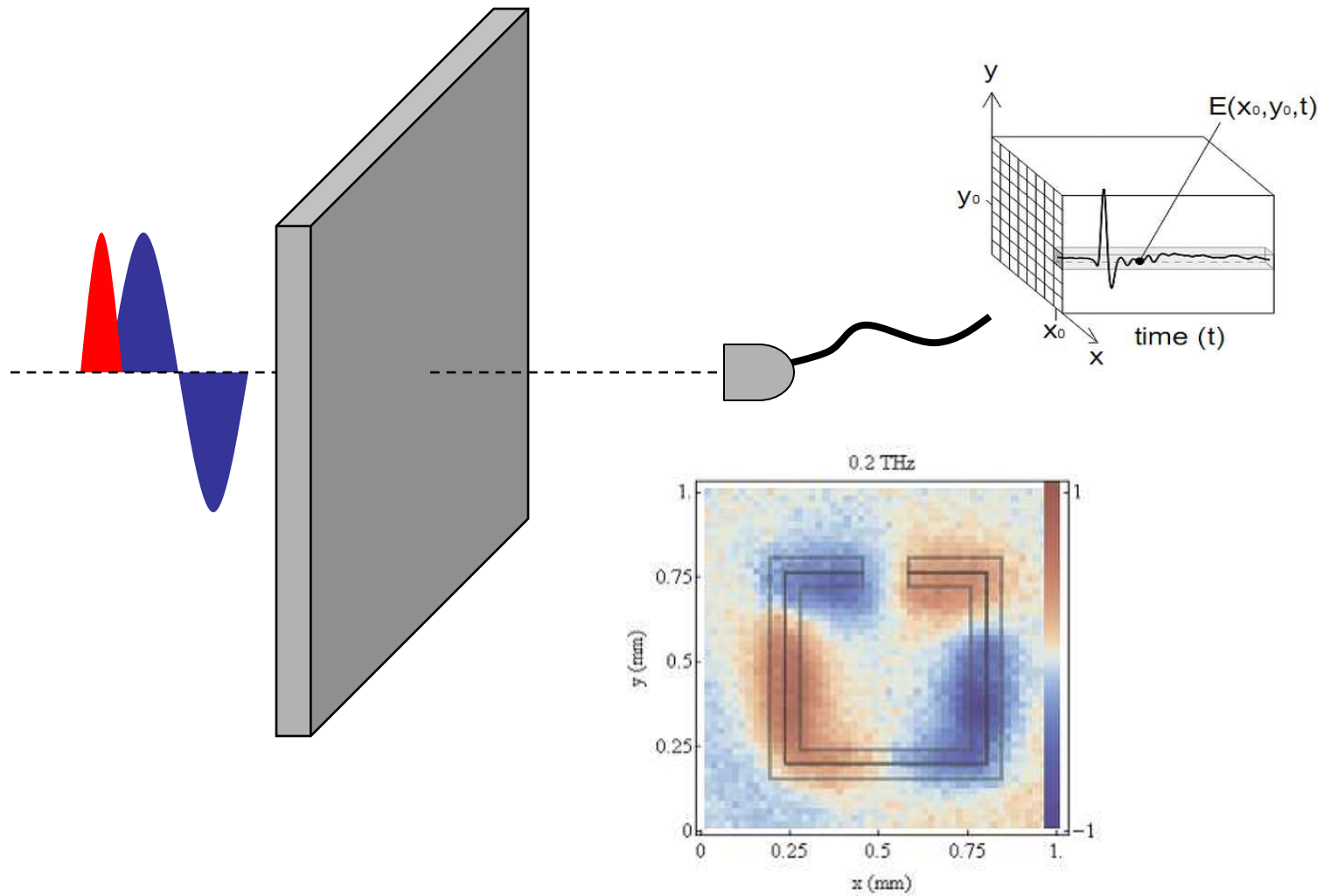
A single time scan



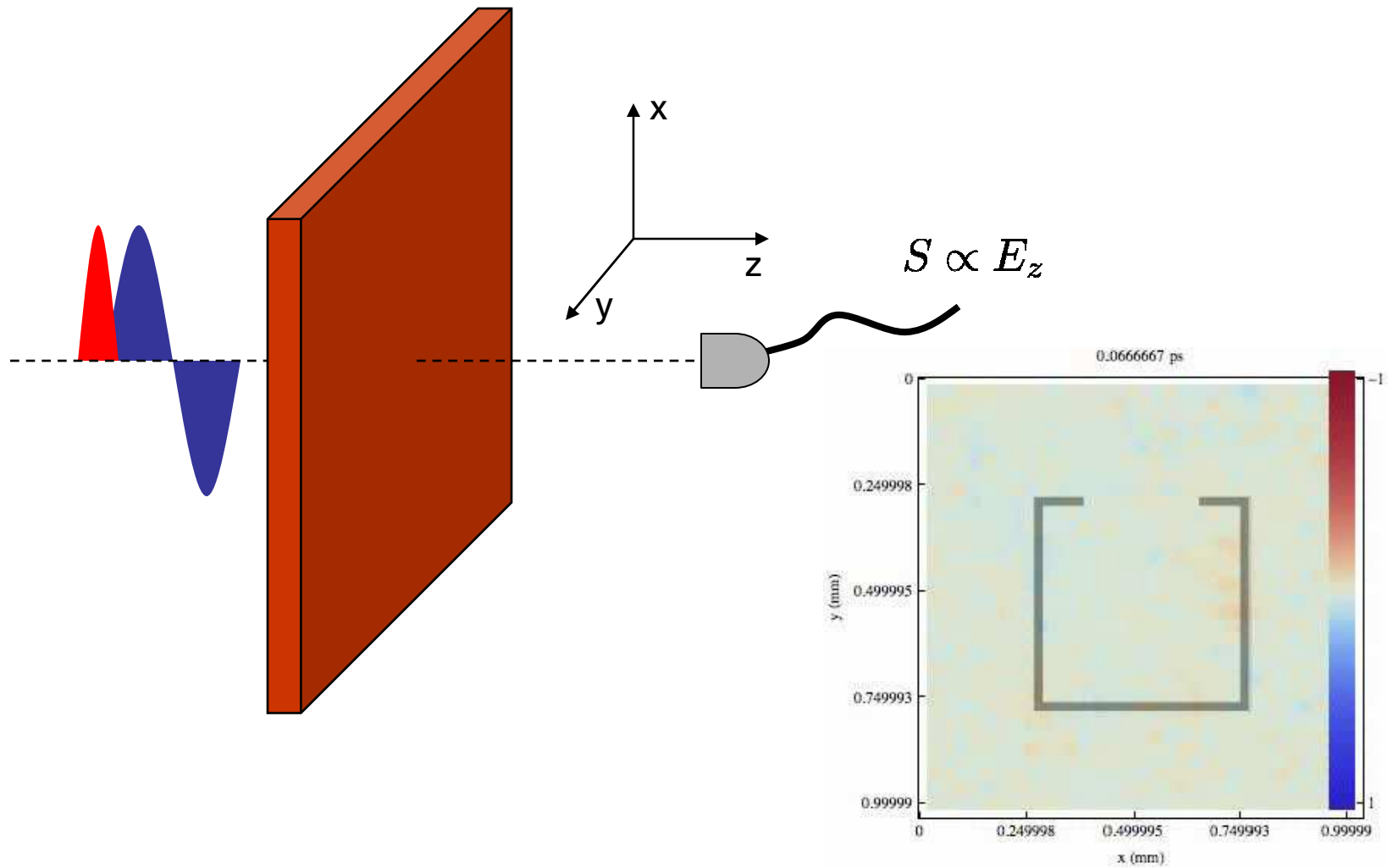
Electric field vector components



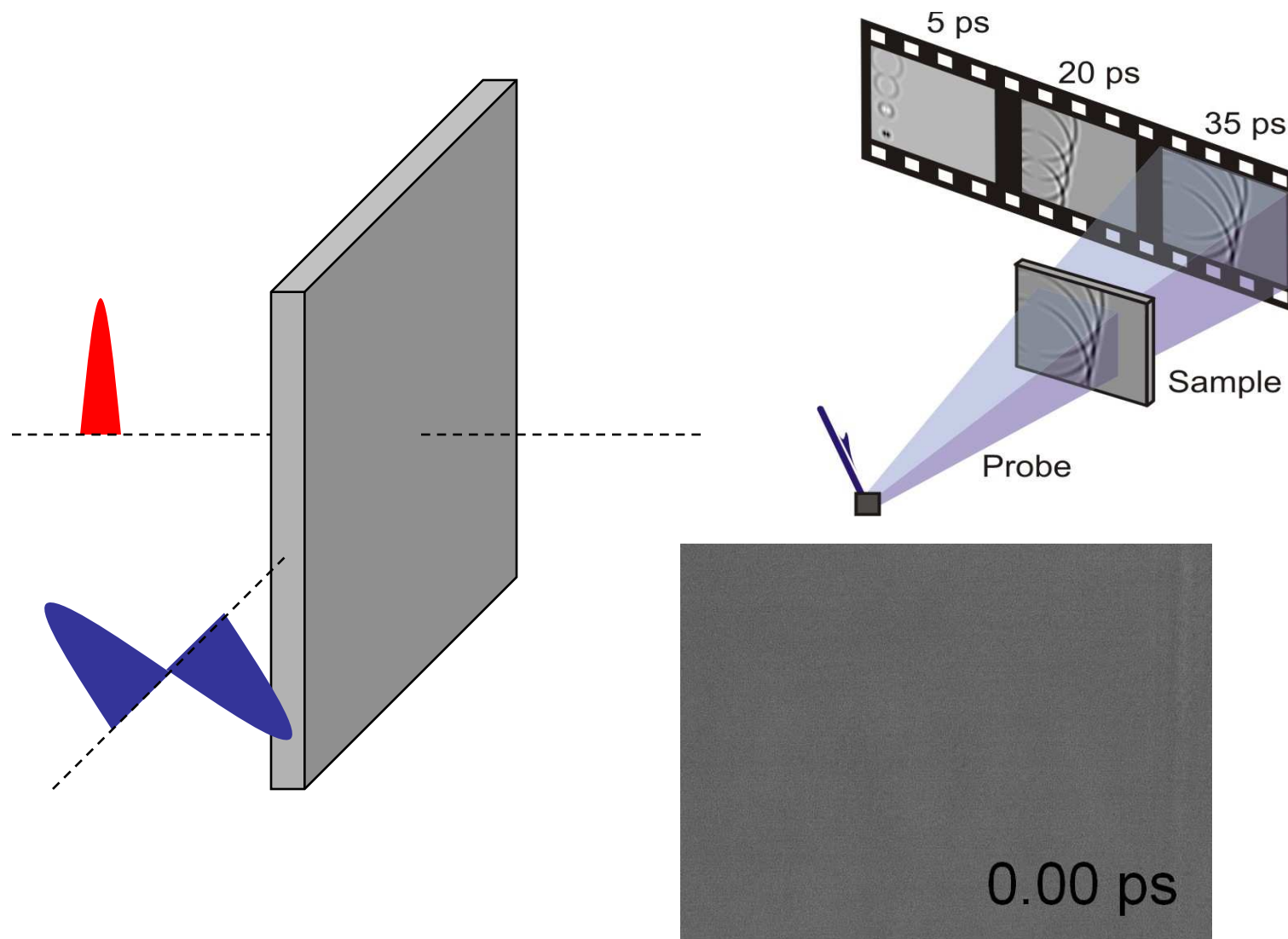
Spatially resolved imaging



Monitoring surface plasmons



Single shot spatially resolve detection





Thank you for your attention