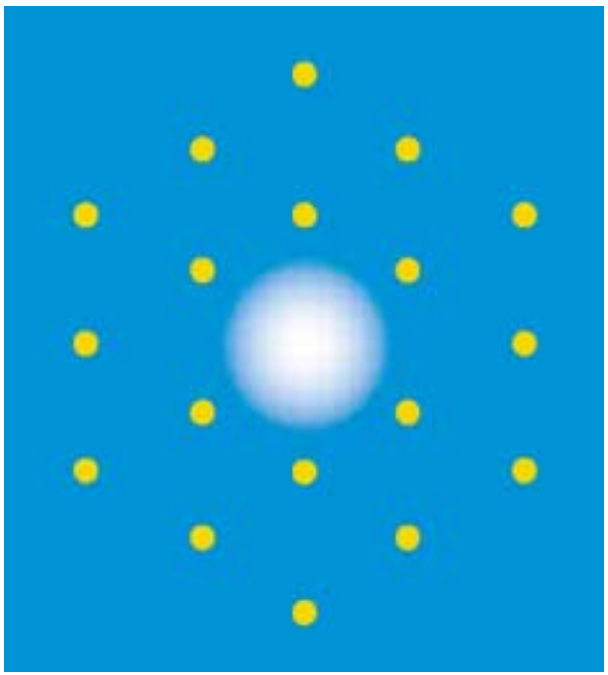
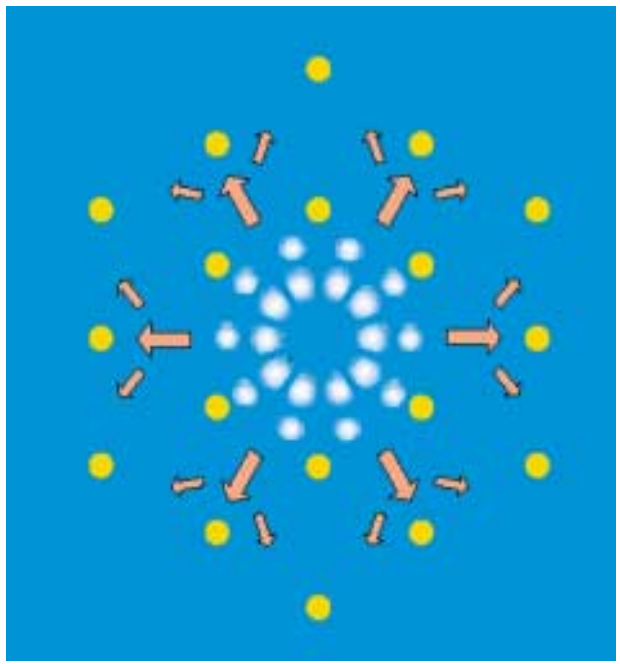
Light in microstructure fibers: guided or lost?

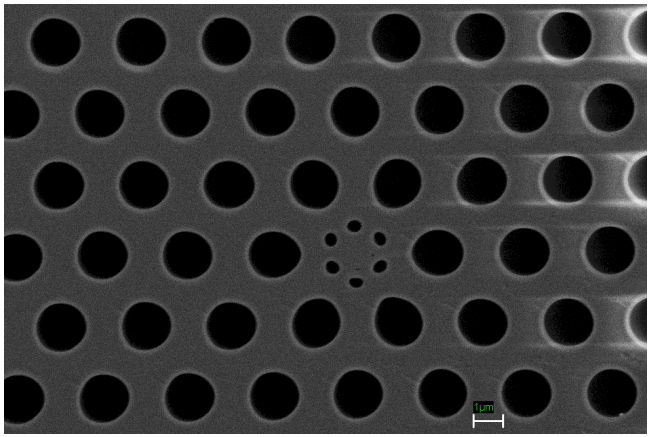
It's guided!

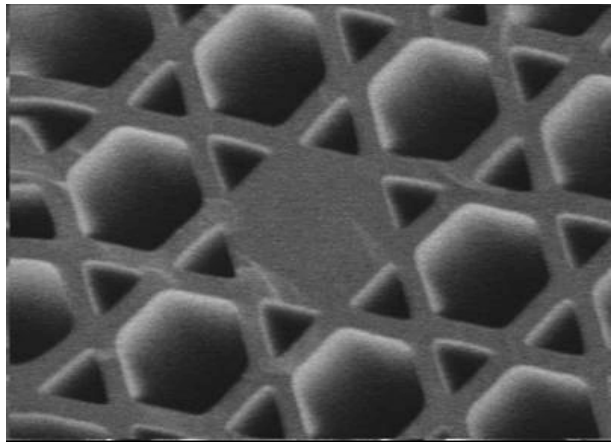


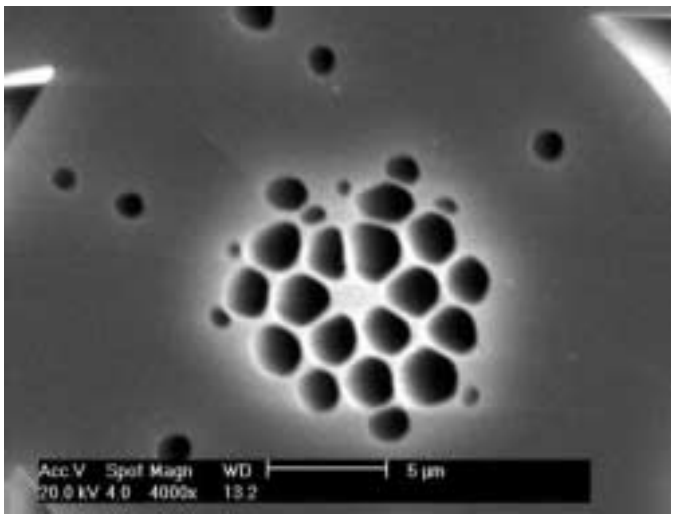
Everything is lost

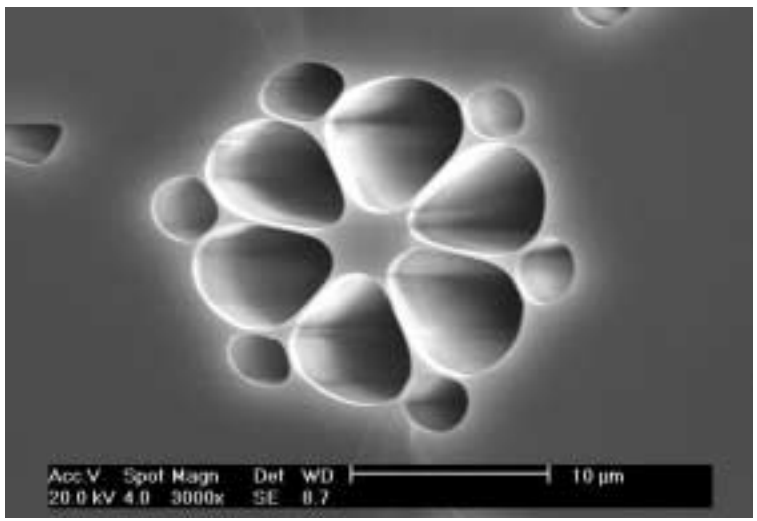


Photonic-crystal fibers

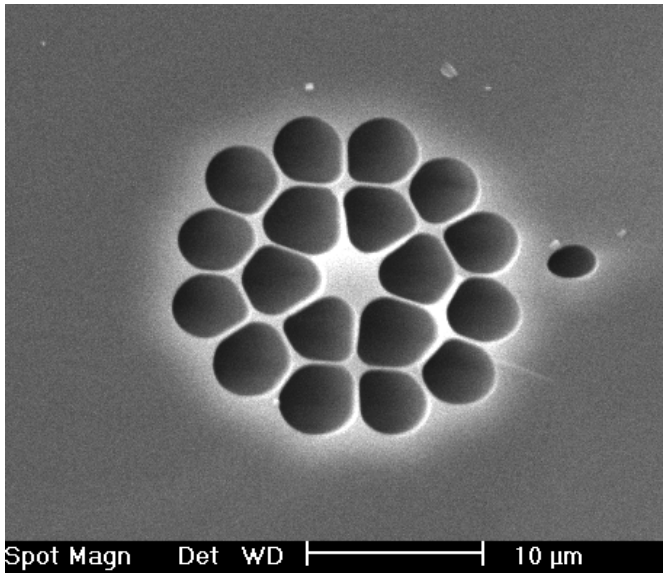


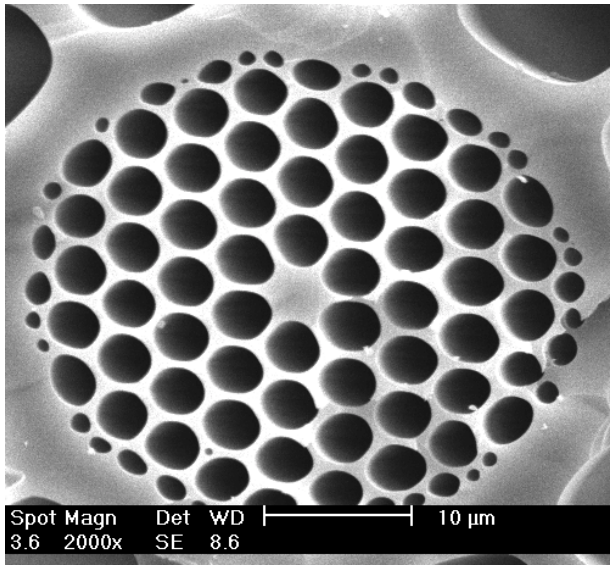


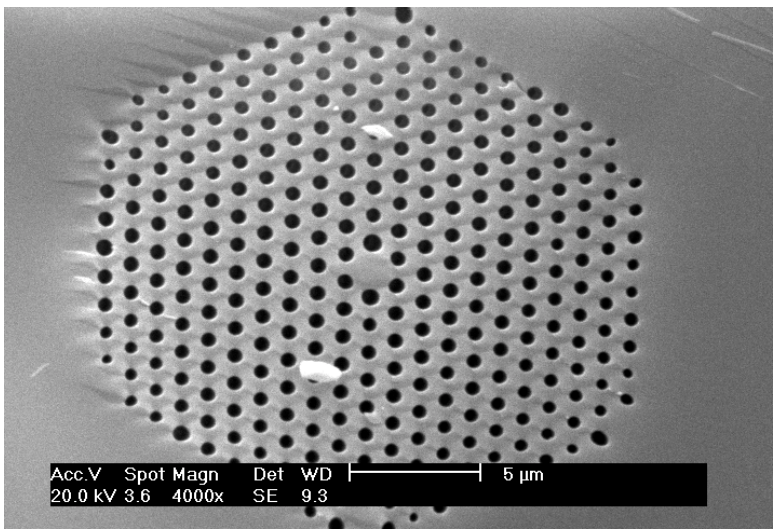


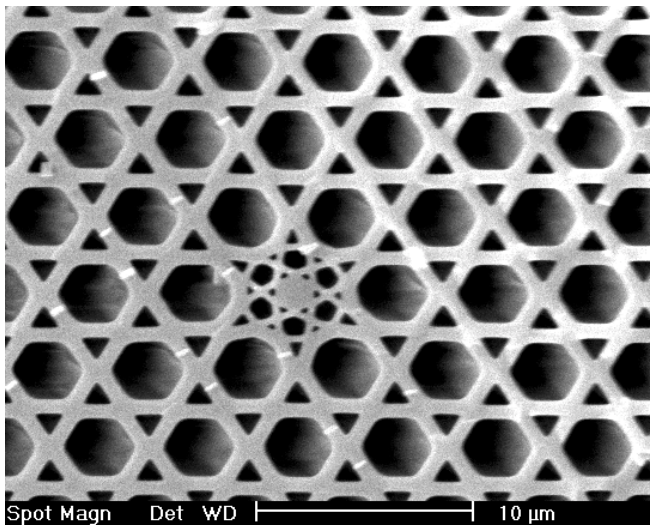


PCF gallery

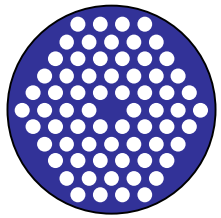

Spot Magn Det WD 10 µm


Spot Magn Det WD 10 µm
3.6 2000x SE 8.6


Acc.V Spot Magn Det WD 5 µm
20.0 kV 3.6 4000x SE 9.3


Spot Magn Det WD 10 µm

Holey Fiber Losses



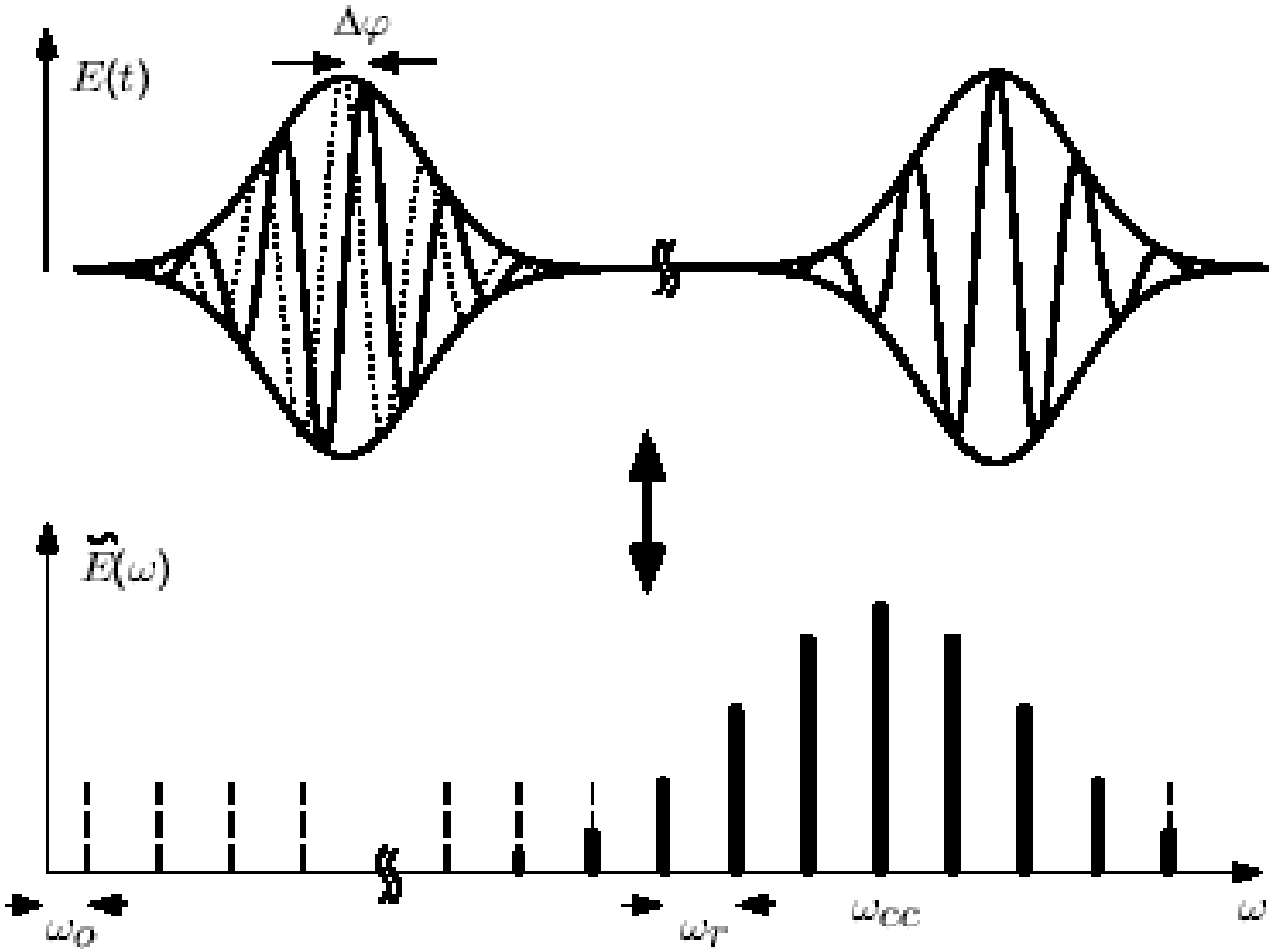
Best reported results:

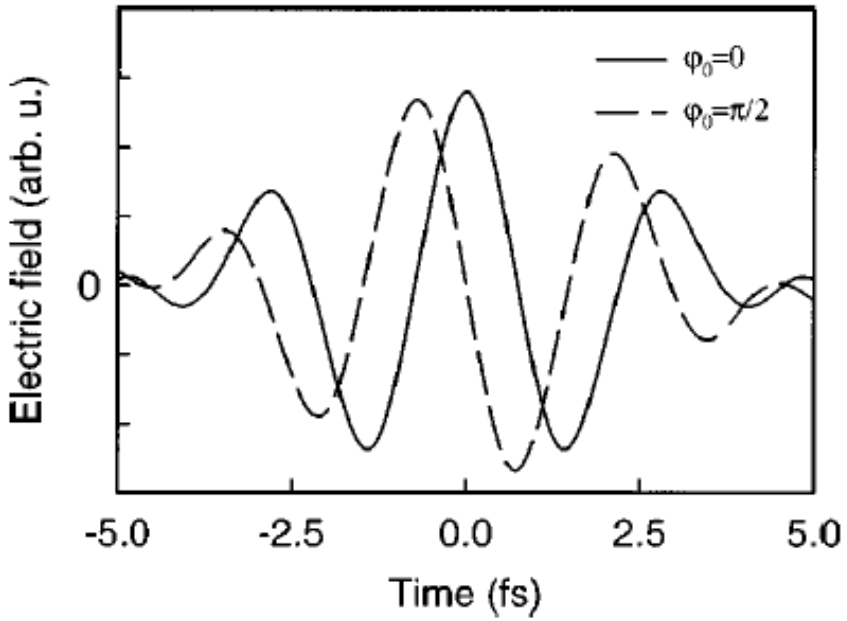
0.28 dB/km @1.55μm

[Tajima, ECOC 2003]

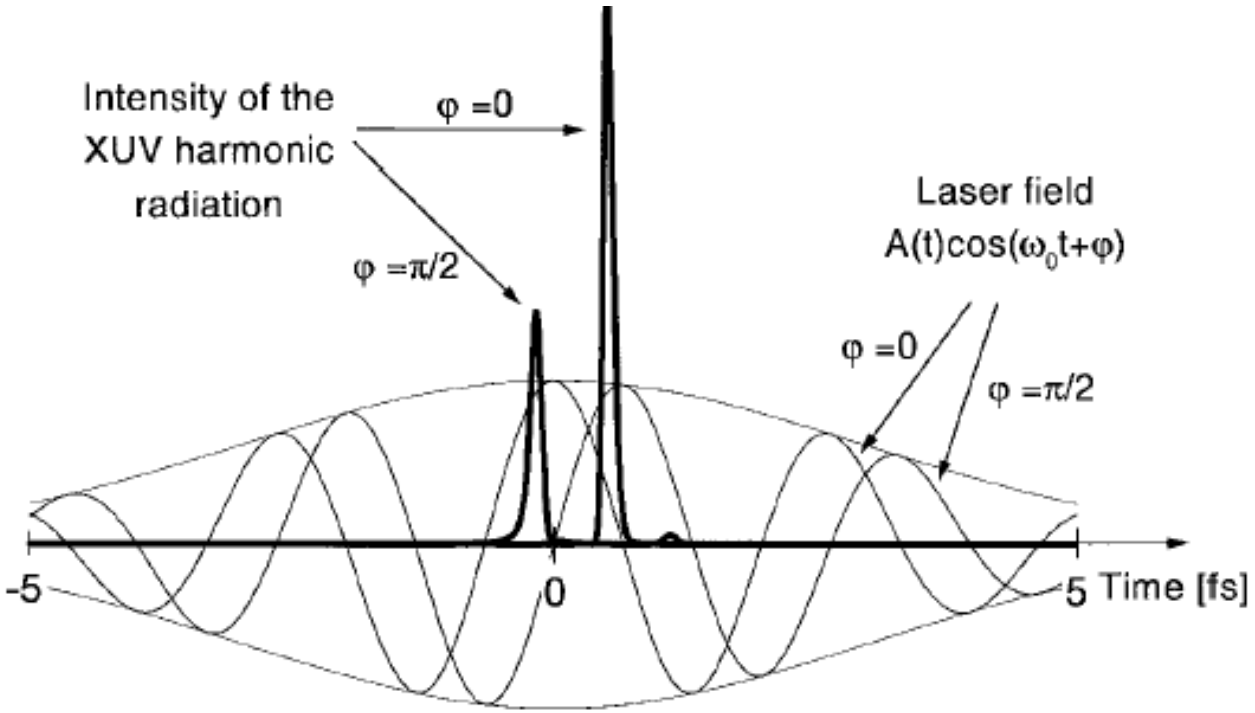
Сверхкороткие импульсы и оптическая метрология

Carrier envelope frequency offset





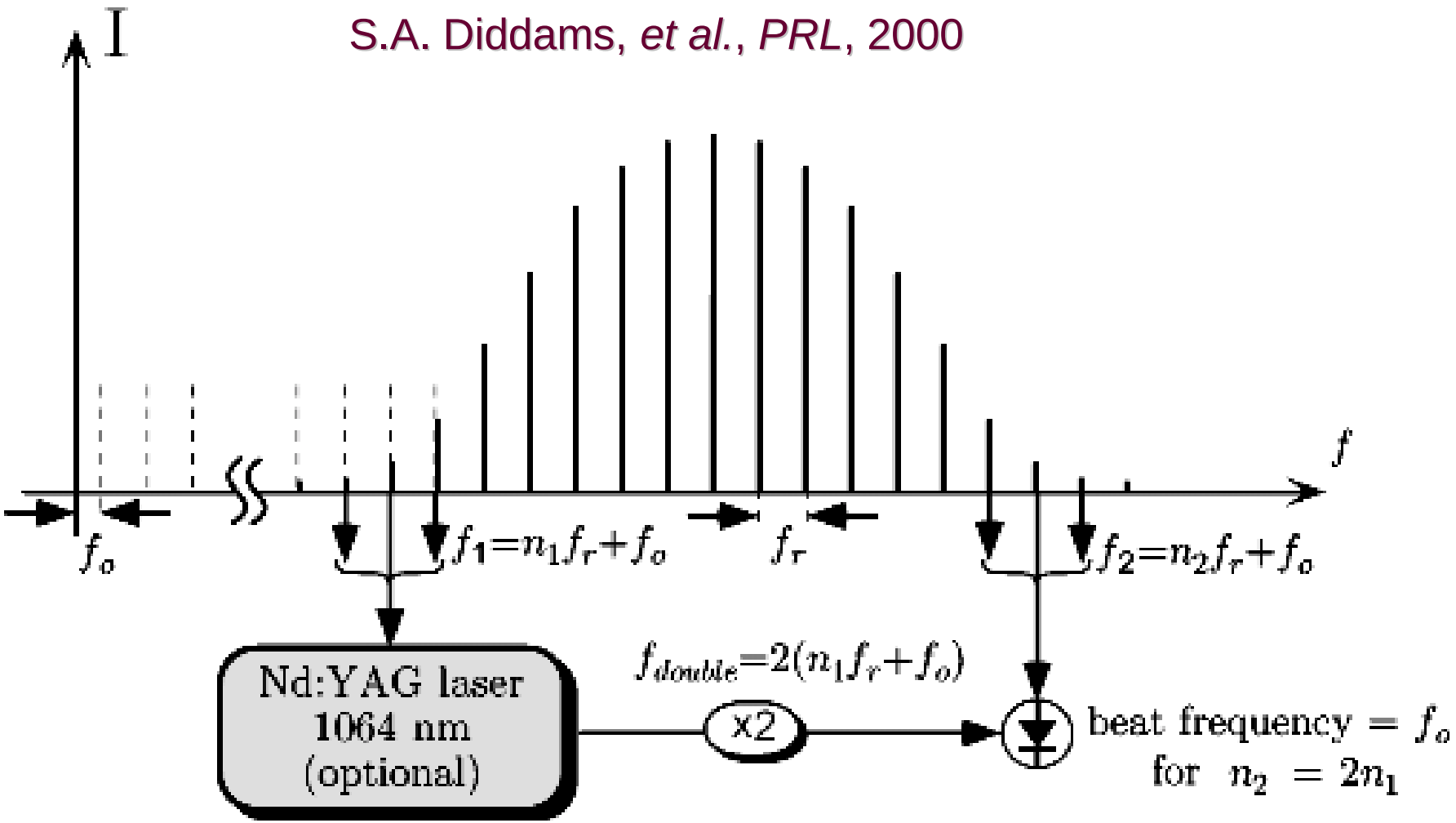
Absolute phase in ultrafast optics



Supercontinua in optical metrology

R. Holzwarth *et al.*, *PRL*, 2000

S.A. Diddams, *et al.*, *PRL*, 2000



Supercontinua in optical metrology

R. Holzwarth *et al.*, *PRL*, 2000

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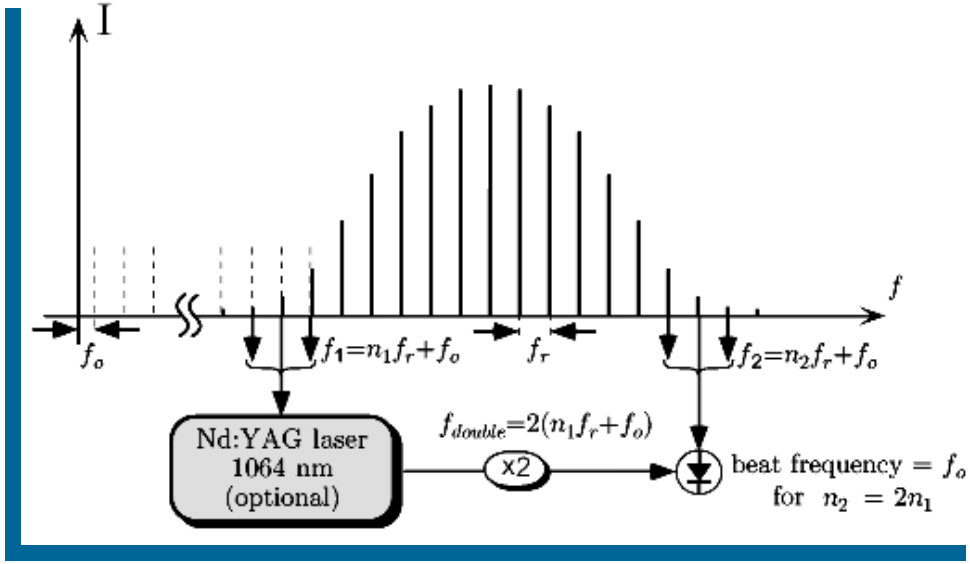
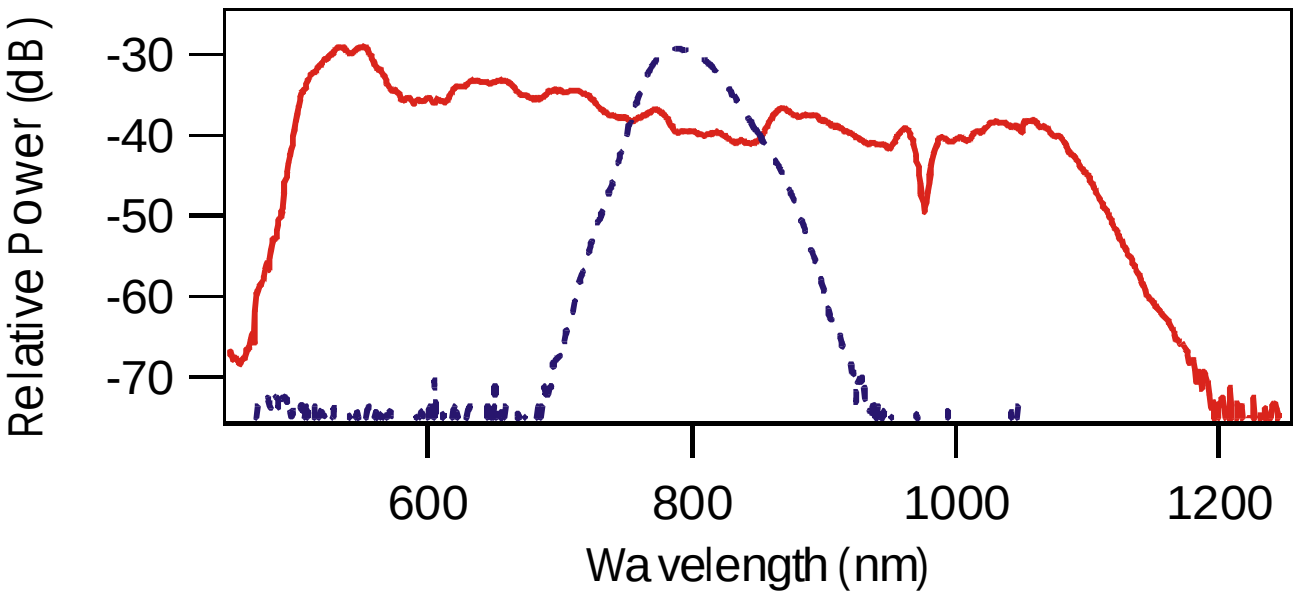
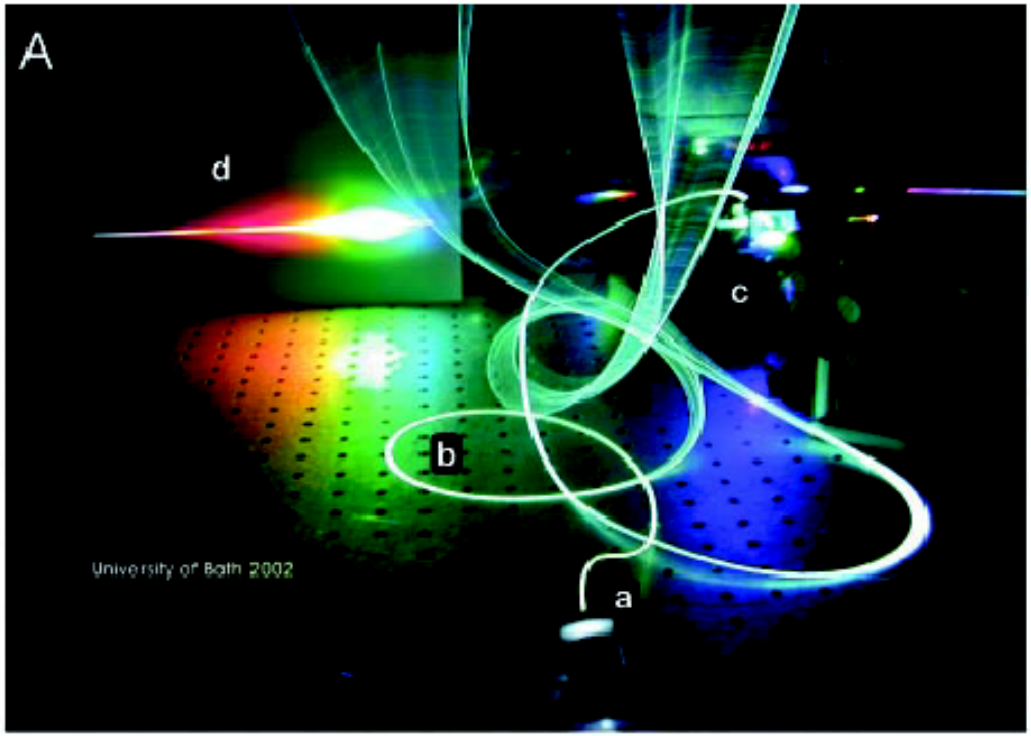
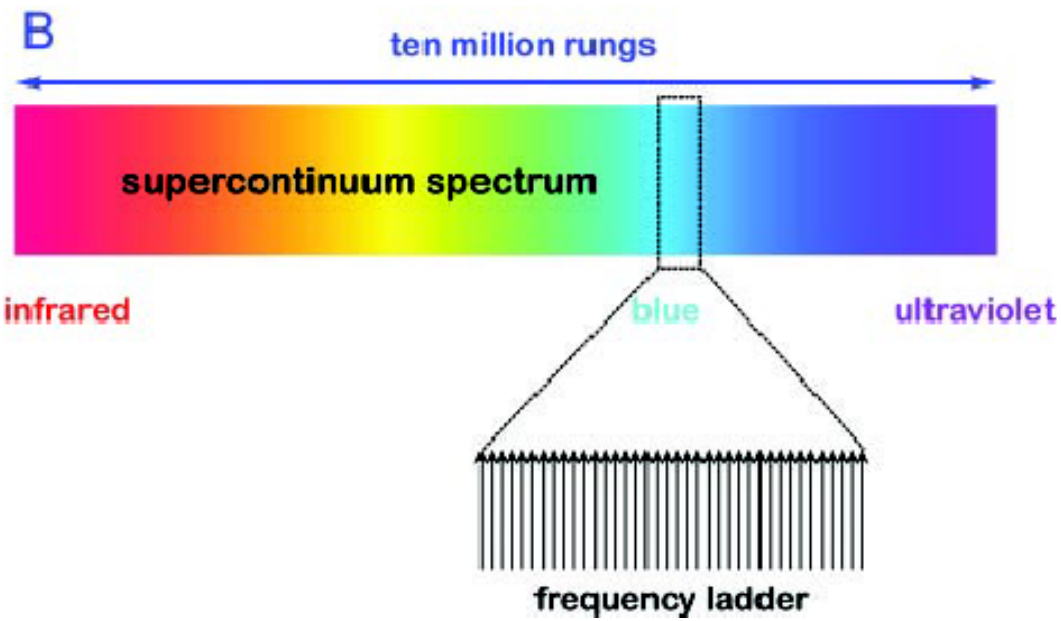


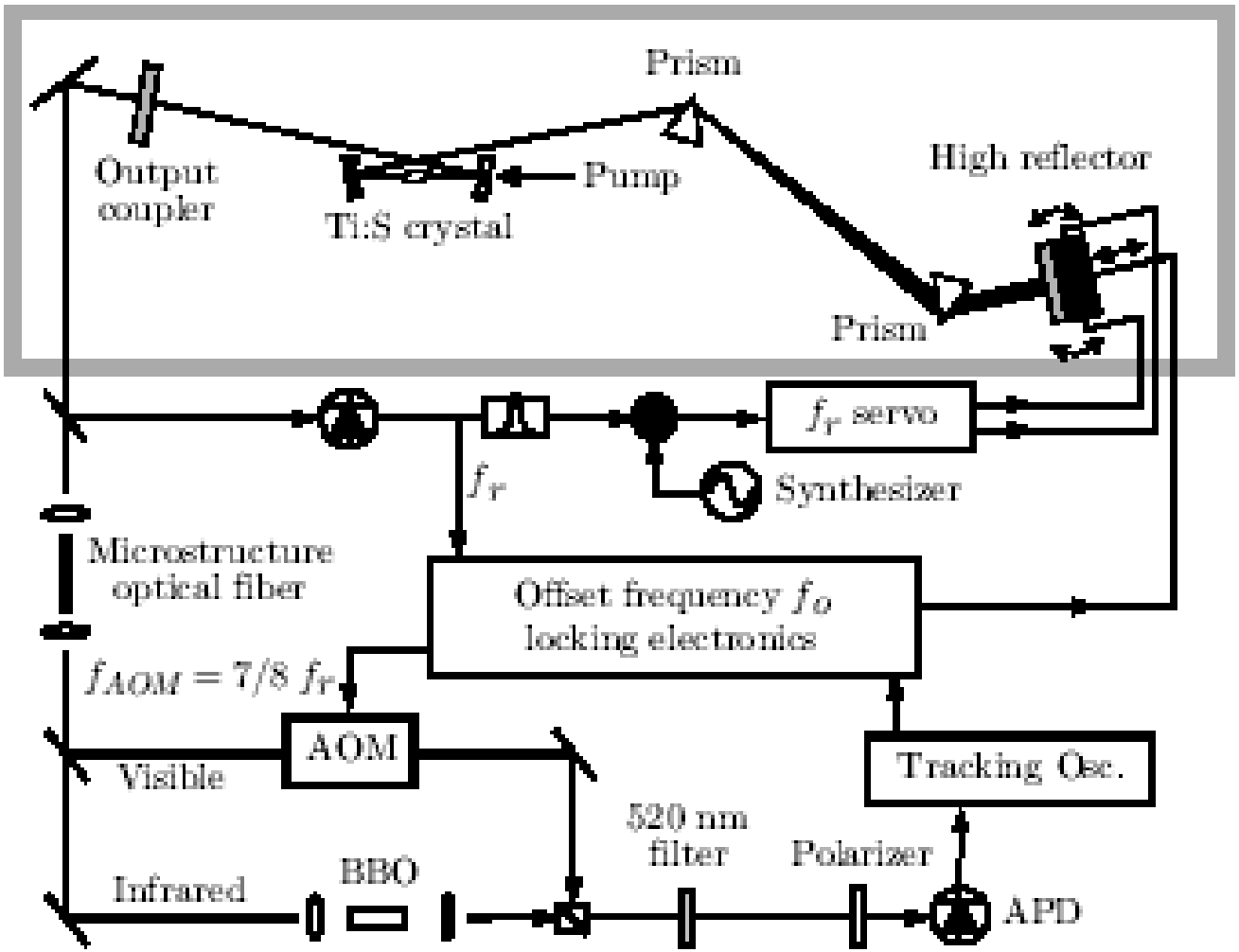


Photonic-crystal fibers: a missing link in the femtosecond clockwork



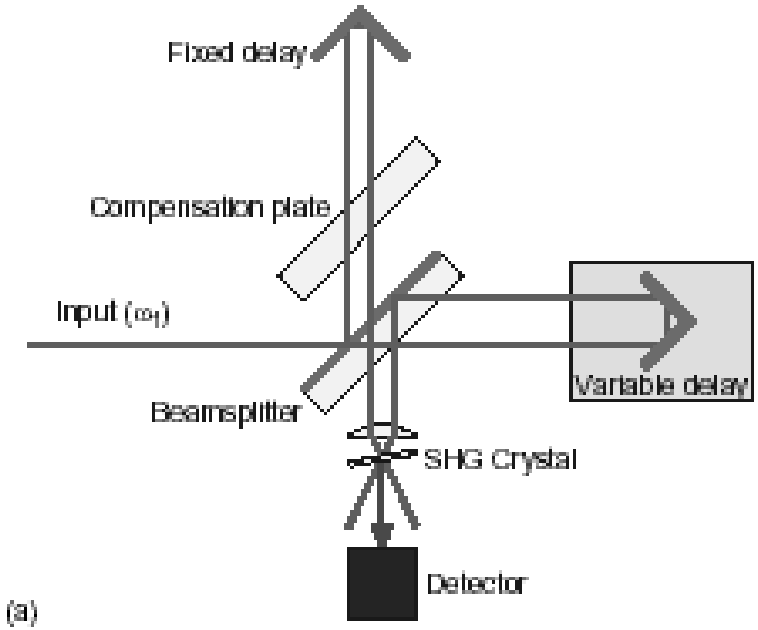


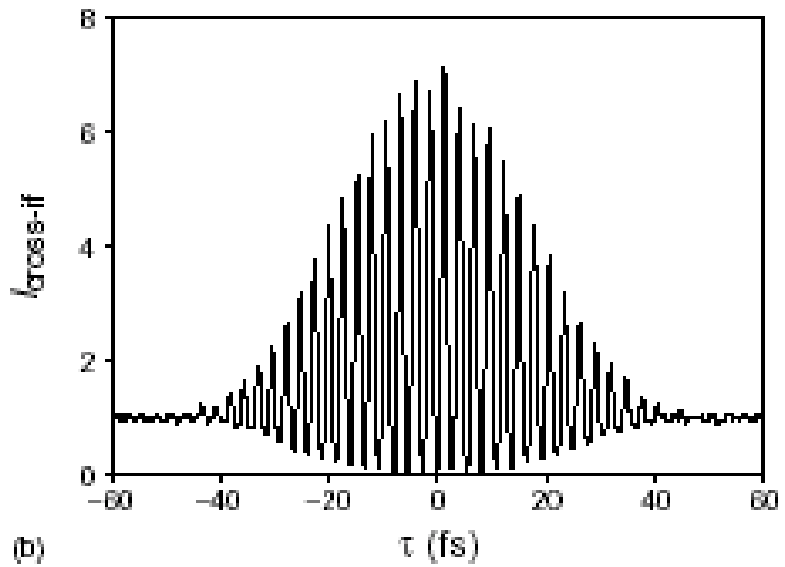
Femtosecond frequency metrology



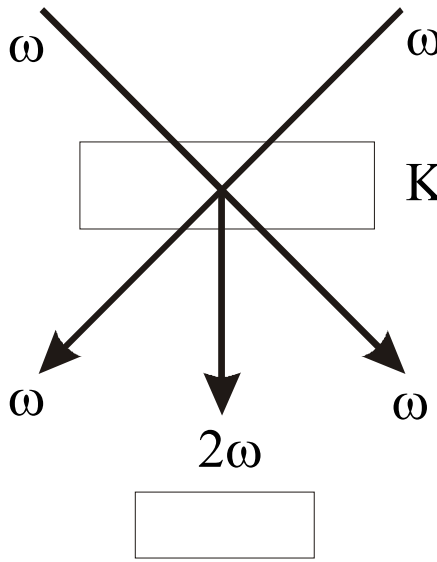
Измерение параметров сверхкоротких импульсов

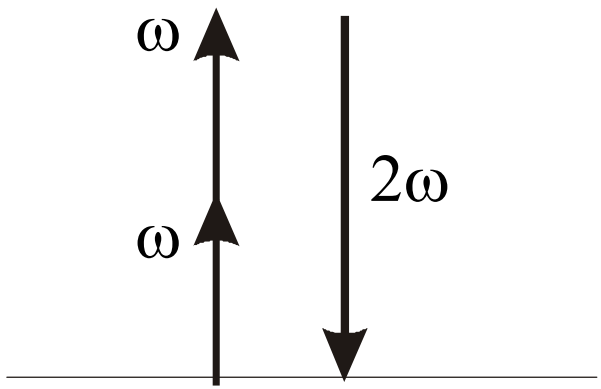
Auto- and cross-correlation



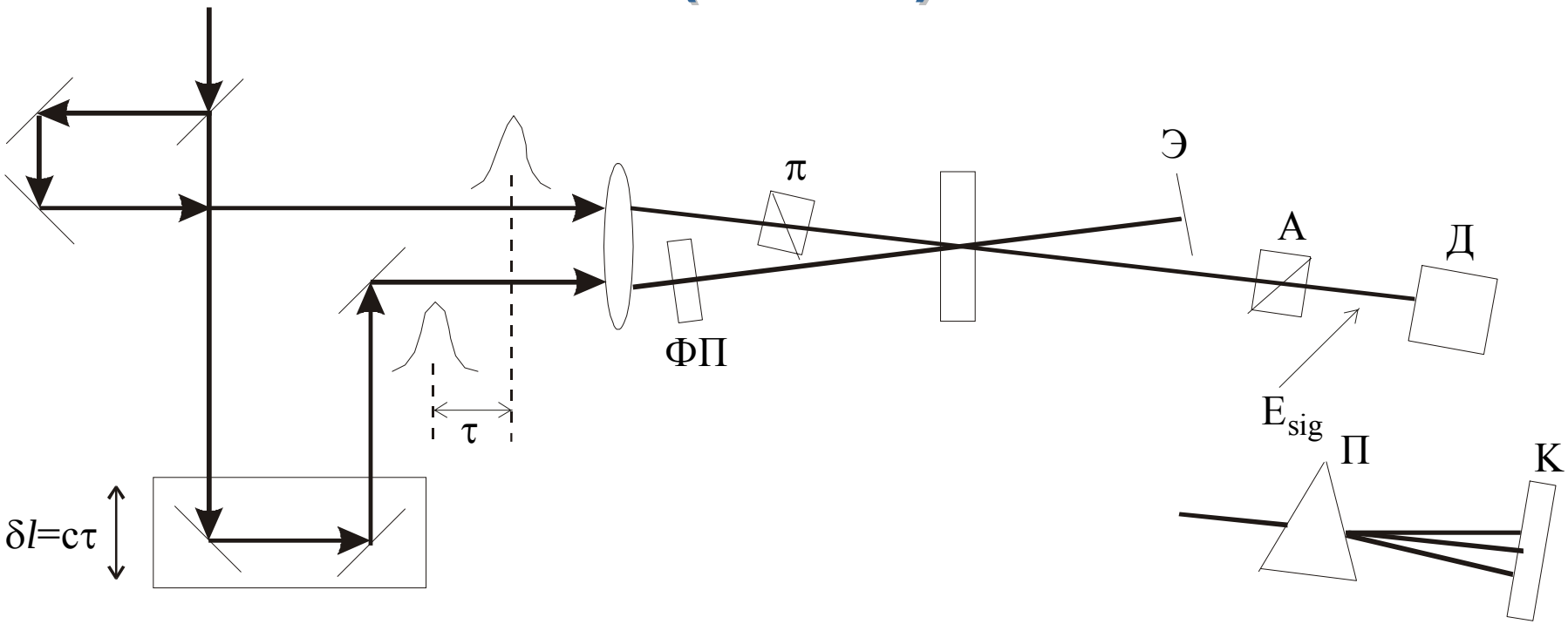


$$S(\tau) \propto \int I_1(t) I_2(t-\tau) dt$$



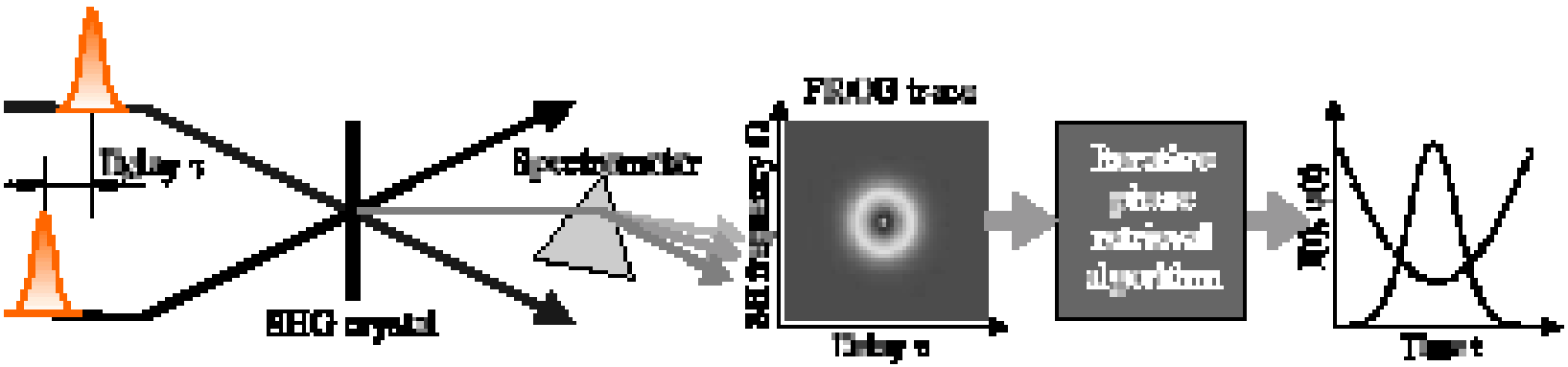


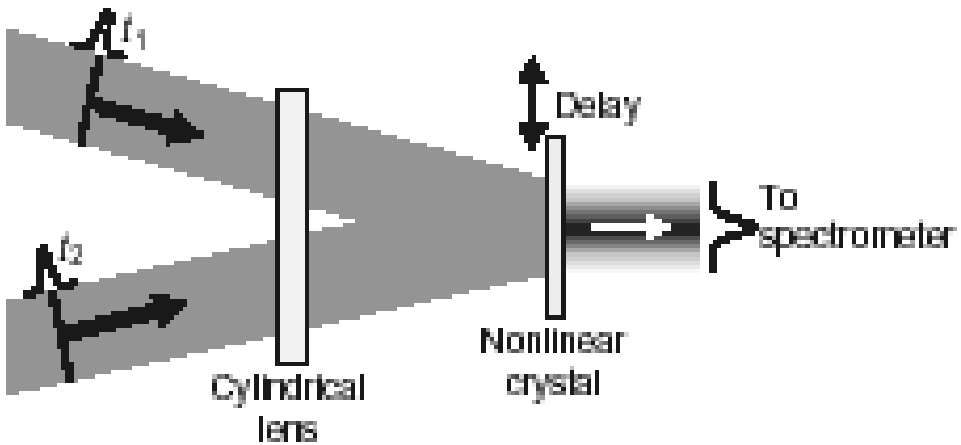
Frequency-Resolved Optical Gating (FROG)



$$E_{sig}(t,\tau) \propto E_1(t)\left|E_2(t-\tau)\right|^2$$

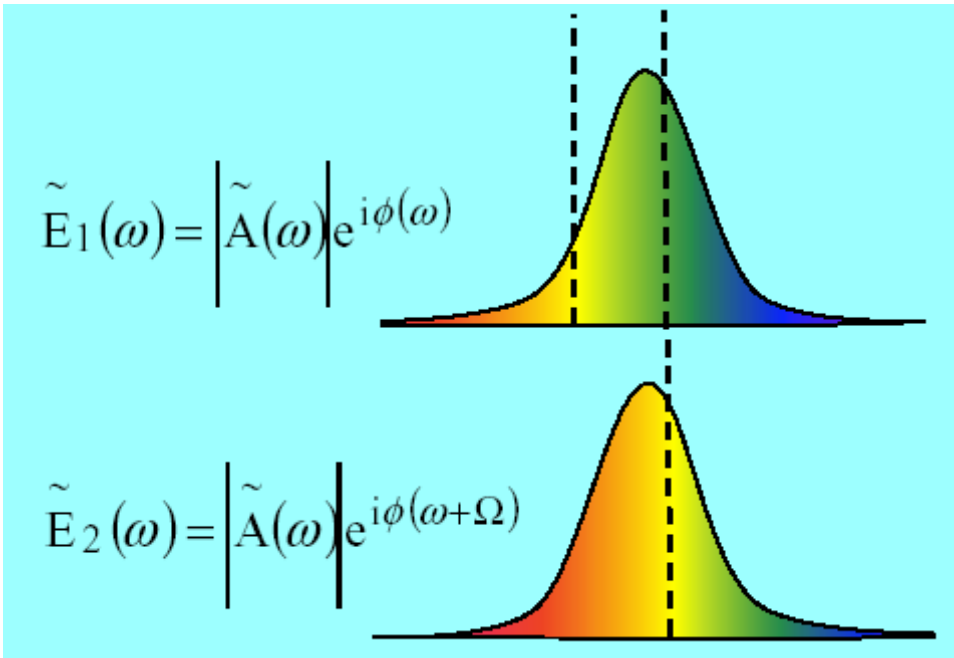
$$I_{FROG}(\omega,\tau) \propto \left|\int E_1(t)\left|E_2(t-\tau)\right|^2 \exp(i\omega t)dt\right|^2$$


FROG trace


t_1
t_2
Delay
To
spectrometer
Cylindrical
lens
Nonlinear
crystal

Spectral Phase Interferometry for Direct Electric field Reconstruction (SPIDER)

$$S(\omega_c) = |E(\omega_c)|^2 + |E(\omega_c + \delta\omega)|^2$$
$$+ 2|E(\omega_c)E(\omega_c + \delta\omega)|\cos[\varphi_\omega(\omega_c + \delta\omega) - \varphi_\omega(\omega_c) + \omega_c\tau]$$



SPIDER put to work