BATOP optoelectronics

FC-PCA: fiber coupled photoconductive antenna

The FC-PCA is a single mode fiber coupled head for photoconductive emitter and detector antennas with a small gap up to 6 µm and FC/PC or FC/APC connector for optical supply.

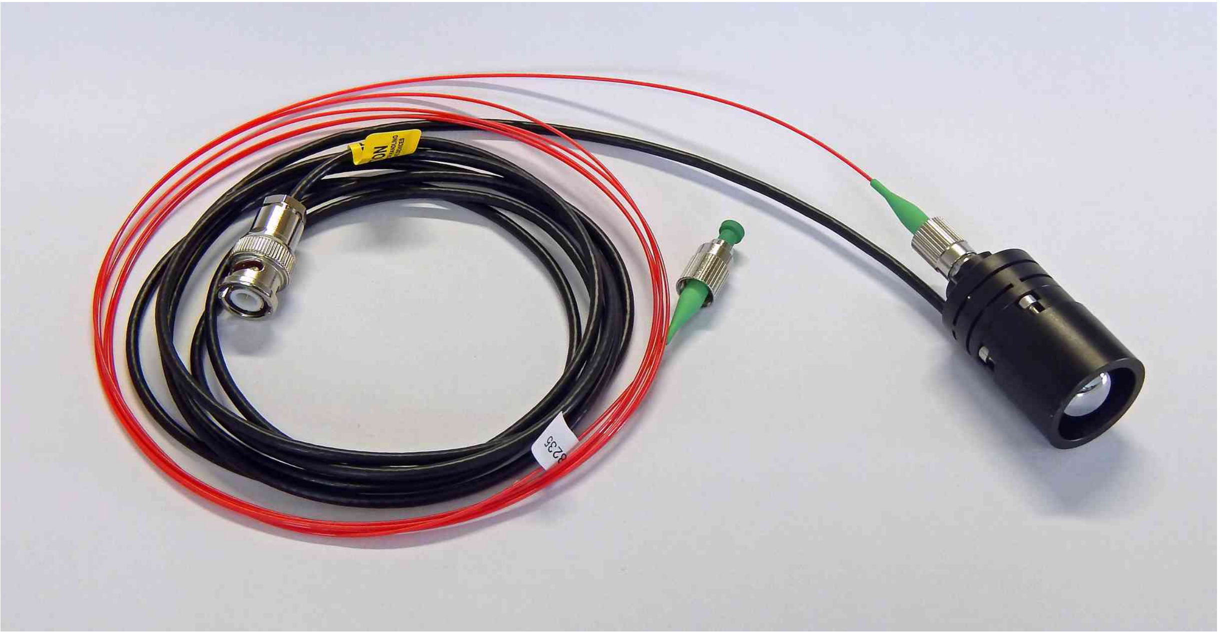

Fig. 1: fiber coupled antenna head with elliptic collimating silicon lens, polarization maintaining fiber and coaxial cable.

The following options are available:

- PCA chips: parallel-line, bow-tie, butterfly, spiral
- Optical excitation wavelengths: ~ 800 nm, ~ 1060 nm, ~ 1550 nm
- THz silicon substrate lens: collimating or focusing lens available
  - elliptic collimating Si lens delivers 20 mm THz beam ∅
  - focusing Si lens with 20 mm ∅ and 53 mm focal length
- Optical connector type:
  - FC/APC on antenna head
  - on second fiber end FC/APC (recommended) or FC/PC
- Single mode fiber type @ 800 nm: 780 HP, PM 780 HP (Panda)
  @ 1060 nm: HI 1060, 1060 XP or PM980-XP (Panda)
  @ 1550 nm: SMF 28, PM 1550 HP (Panda), DCF3
  Polarization maintaining Panda fiber is recommended
- Fiber length: 1 m standard, other length available
- Electrical connector type: BNC or SMA
- Standard coaxial cable length: 1 m standard, other length available

Fig. 2: FC-PCA: front few

FC-PCA rear side with FC/APC connector, optical fiber and electrical coaxial cable

Dimensions:

- Diameter 25.4 mm (1”)
- Length (distance front ring – FC/APC connector) 50 mm

Remark: A fiber dispersion compensation is not included.

Fiber dispersion:

The dispersion of the optical fiber must be compensated to avoid a non acceptable optical pulse prolongation. This problem increases with shorter pulse duration (increasing bandwidth). The dispersion of standard single mode fiber and Panda fiber is mainly determined by the material dispersion of the fiber core (fused silica) with the following values:

Working wavelength	Standard fiber types	Group Velocity Dispersion	
λ [nm]		$GVD = \frac{\partial^2 k}{\partial \omega^2}$ [fs²/m]	$GVD_\lambda = -\frac{2\pi c}{\lambda^2} GVD$ [fs/(nm*m)]
800	780 HP, PM 780 HP	36 000	- 106
1060	HI1060, PM980	17 000	- 28
1550	SMF28, PM 1550	− 26 000	22

The dispersive temporal pulse broadening increases with shorter pulses (larger spectral width).

In fig. 3 the wavelength dependent group delay dispersion (GVD_λ) of fused silica is shown which gives the dispersive temporal pulse broadening in femtoseconds per spectral pulse width in nanometers and fiber length in meters.

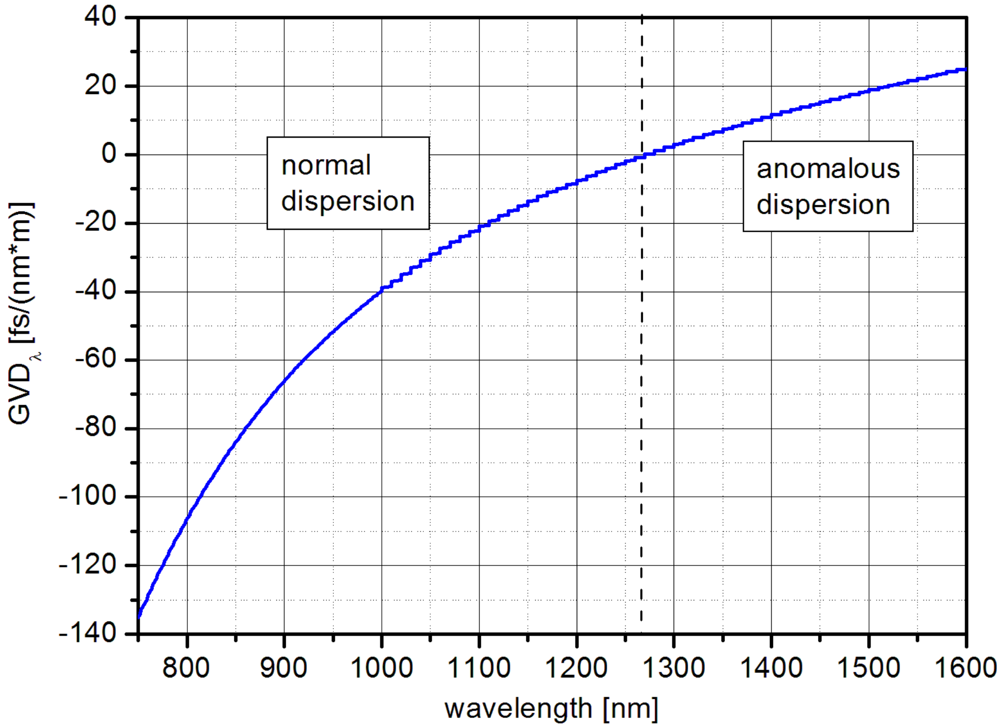

Fig. 3: Group delay dispersion (GVD$_\lambda$) of fused silica

Methods of dispersion compensation

The **normal fiber dispersion** @ 800 nm and 1060 nm can be compensated using a pulse stretcher in front of the optical fiber . Such a pulse stretcher consists mainly of two diffraction gratings..

We offer a pre-aligned pulse stretcher for dispersion compensation at wavelengths ~ 800 nm or ~ 1060 nm. It comes pre-aligned and must be fine adjusted with the laser beam using an auto-correlator or the THz spectrometer itself.

The **anomalous fiber dispersion** @1550 can be compensated by using the combination of a non-zero dispersion compensating fiber DCF3 (GVD ~ -3 ps/(nm*km)) on the antenna (about 3 m) and 50 cm standard fiber SMF28. We can deliver the fiber coupled antenna with DCF3 fiber.