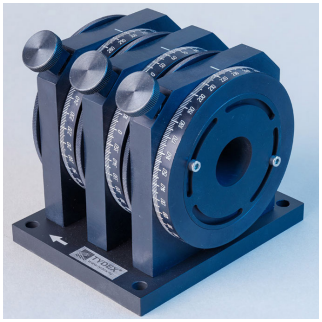
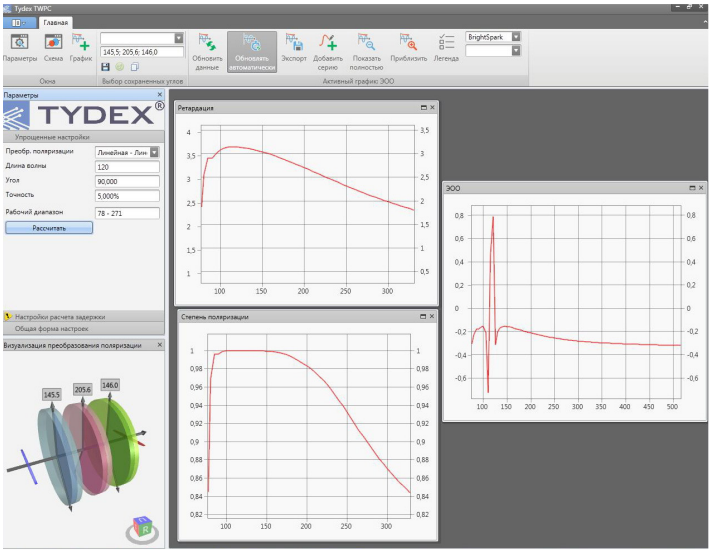
Tunable THz Polarization Converter



Monochromatic waveplates are used to convert polarization of a fixed wavelength radiation. As these waveplates operate only at the single wavelength, in some cases they may be inconvenient to use, for example, with tunable lasers. The reasoned choice is tunable polarization converter (TWPC).

TYDEX has developed TWPC for converting polarization of radiation of any wavelength within a wide range. The special software supplied with the instrument can calculate conversion parameters and limits.



A TWPC unit consists of three crystalline quartz birefringent plates. Each plate is placed in a rotator that allows a full circle rotation. The three rotators are rigidly fixed on a common base. The plate is to be rotated to a specific angle for achieving the required conversion of polarization. The angles are calculated in the provided software. Besides plate angles, the software can calculate retardation, effective optical axis and degree of polarization versus wavelength.
The tuning range depends on TWPC parameters. The entire THz range can be covered with the several TWPCs.

TYDEX standart TWPC can operate in following modes:

- half-wave monochromatic plate for any wavelength within 80-160 μm range,
- quarter-wave monochromatic plate for any wavelength within 150-300 μm range,
- 120 μm birefringent filter.

The TWPC operation modes were tested by measuring the transmission spectra of TWPC placed between two polarizers with an FT spectrometer Bruker Vertex 70.

The examples of TWPC operating in different modes are given below.
1. TWPC as a half-wave monochromatic plate for any wavelength within 80-160 μm range. The TWPC was tested as a 120 μm half-wave plate. Fig. 1 shows the comparison of calculated and measured TWPC transmission spectra using parallel polarizers. Nearly zero transmittance at 120 μm confirms a proper polarization conversion at the selected wavelength.

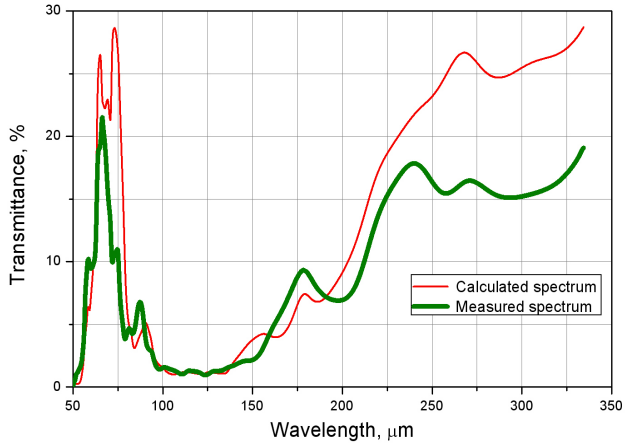


Fig. 1 Calculated and measured TWPC transmission spectra used as λ/2 at 120 μm with parallel polarizers

2. TWPC as a quarter-wave monochromatic plate for any wavelength within 150-300 μm range. TWPC operation was tested in quarter-wave plate mode at 220 μm. Fig. 2 shows the comparison of calculated and measured TWPC transmission spectra at different orientations of the downstream polarizer.

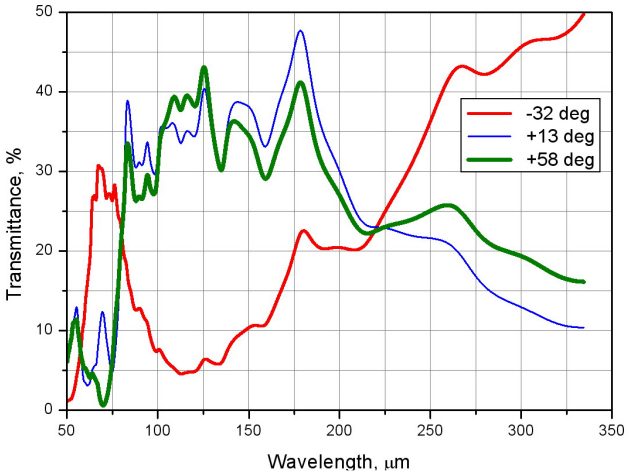


Fig. 2a. Calculated TWPC transmission spectra used as λ/4 at 220 μm at different orientations of the downstream polarizer

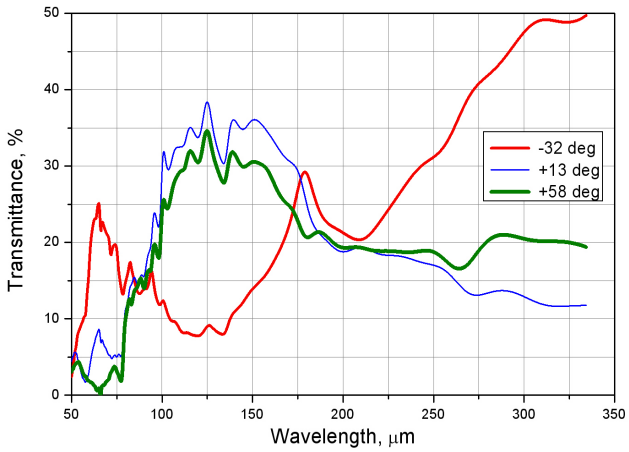


Fig. 2b. Measured TWPC transmission spectra used as λ/4 at 220 μm at different orientations of the downstream polarizer

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Neither calculated, nor measured transmittance depends on downstream polarizer angle (slight results variation is due to measurement procedure). That means that the radiation after the TWPC has circular polarization that confirms a proper operation of the instrument as a quarter-wave plate at 220 μm.

3. TWPC used as a 120 μm birefringent filter. TWPC is placed between crossed polarizers to operate in birefringent filter mode. The matching peaks at 120 μm of the calculated and measured spectra (fig. 3) confirm the TWPC operates as a birefringent filter at specified wavelength.

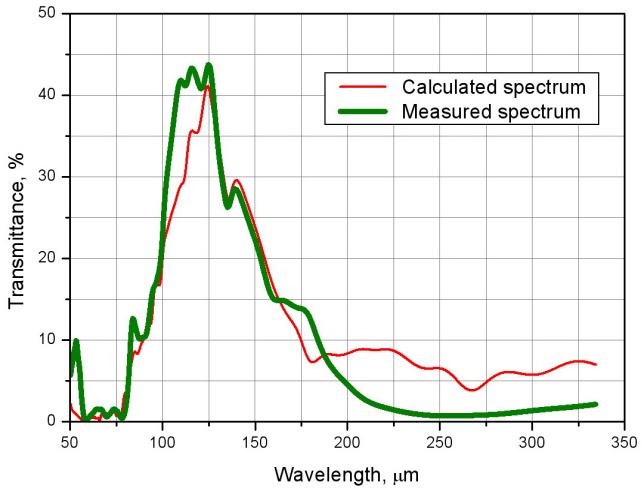

Fig. 3. Calculated and measured TWPC transmission spectra between crossed polarizers

Please note that the polarizers are not included in TWPC and can be provided separatly.

The results confirm that TWPC demonstrates the essential properties of the aforementioned devices.

Standart specification:

Modes	Operating range
Half-wave monochromatic plate	Any wavelength within 80-160 μm range
Quarter-wave monochromatic plate	Any wavelength within 150-300 μm range
Birefringent filter	120 μm
Aperture: 24 mm	

Standard TWPCs are available from stock. Customer specified TWPC can be manufactured by request.

For price quotation and delivery please fill in our request form at the web site or send us a letter.

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