

THz Lenses

For THz beam guiding between the emitter and detector we offer hyperhemispherical and elliptic silicon lenses and aspheric TPX lenses with different diameter and focal length.

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1. Silicon Lenses

1.1 STB-HSL-12-7.1 Hyperhemispherical Silicon Lens with diameter 12 mm and height 7.1 mm

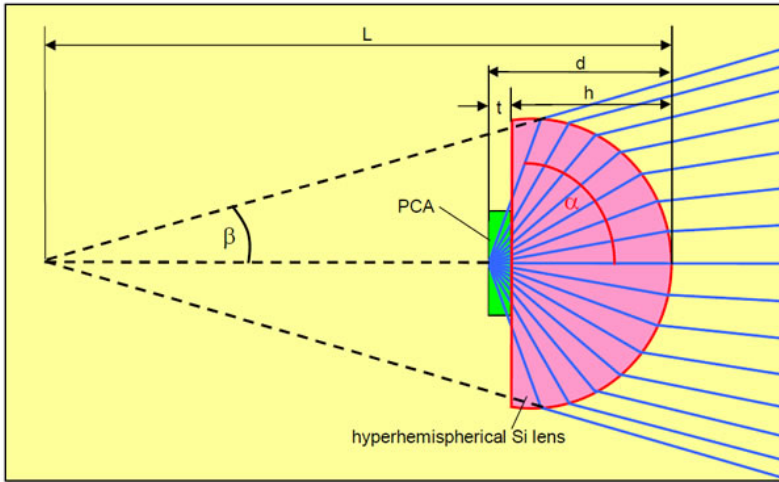
Hyperhemispherical silicon lens

- Material: undoped HRFZ-silicon
- Specific resistance: $>10 \text{ k } \Omega \text{ cm}$
- Refractive index: 3.41
- Diameter: 12 mm ± 0.01 mm
- Height (h): 7.1 ± 0.01 mm
- Distance (d): 7.7 mm
- Surface: polished
- PCA chip thickness (t): 0.6 mm

Terahertz beam

- Collection angle: 73°
- Divergence angle: 17°
- Virtual focus length: 26.5 mm

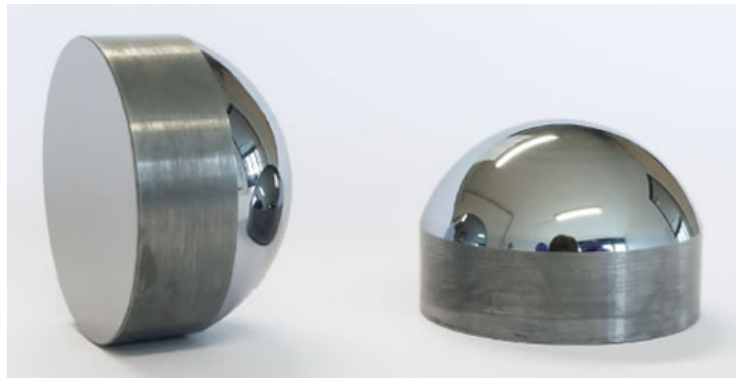




1.2 STB-CL-20 - Collimating elliptic silicon substrate Lens with 20 mm diameter

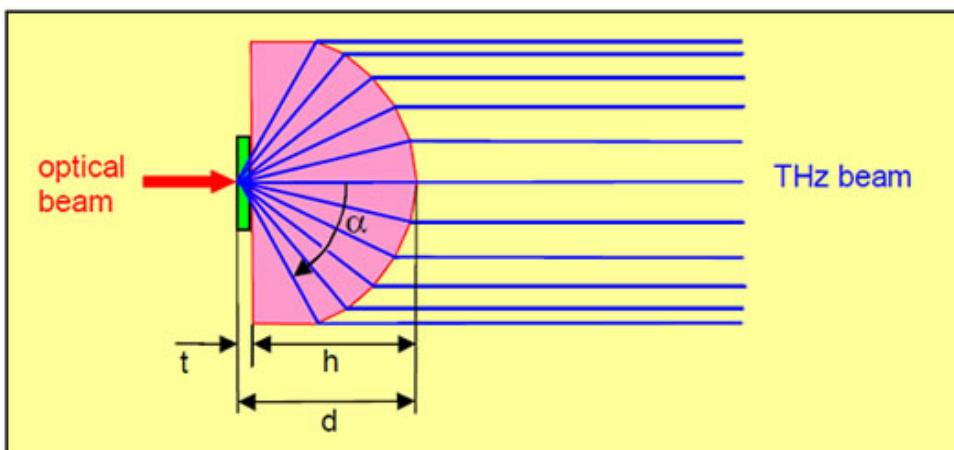
Elliptic collimating lens

- Material: undoped HRFZ-silicon
- Specific resistance: >10 k Ω cm
- Refractive index: 3.41
- Diameter: 20 mm \pm 0.01 mm
- Height (h): 13.8 mm \pm 0.01 mm
- Distance (d): 14.4 mm
- Flat surface: polished
- Elliptic surface: polished
- PCA chip thickness (t): 0.6 mm



Terahertz beam

- collimated with 20 mm diameter
- collection angle: 54.6°

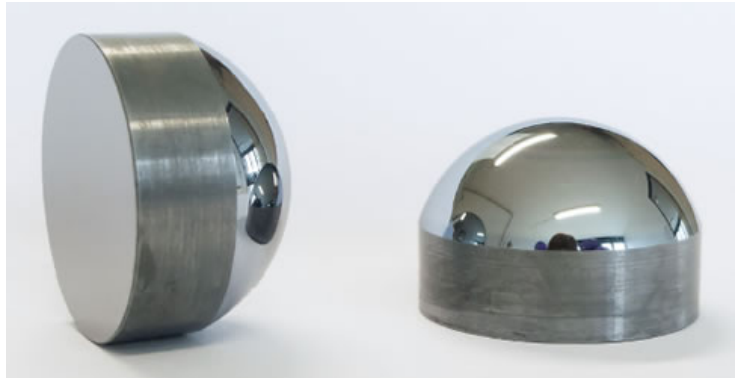


1.3 Focusing elliptic Silicon substrate Lens STB-FSL-D20-f50

20 mm diameter, 50 mm focal length

Elliptic focusing silicon lens

Material: undoped HRZ-silicon
 Specific resistance: >10 kΩ cm
 Refractive index: 3.4
 Diameter: 20 mm
 Focal length: 50 mm
 Height (h): 14 mm
 Distance (d): 14.6 mm
 Flat surface: polished
 Elliptic surface: polished
 PCA chip thickness (t): 0.6 mm

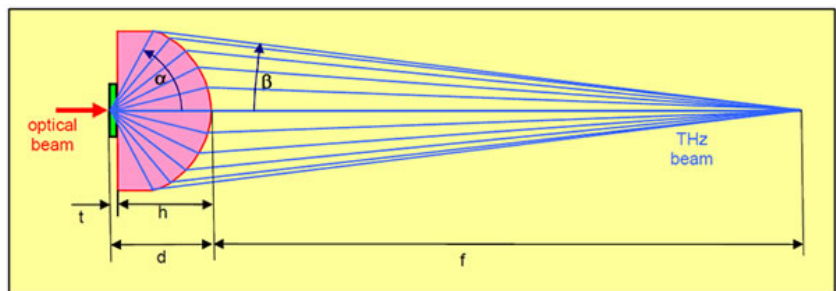


Terahertz beam

focal length (f): 50 mm
 Collection angle (α): 52.7°
 Convergence angle (β): 10°

Airy disc diameter

at 300 GHz: 3.6 mm
 at 1 THz: 1.1 mm
 at 3 THz: 0.36 mm



2. Special TPX Lenses for PCA

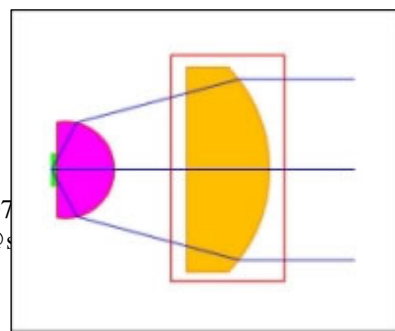
- Using highly transmissive TPX (Polymethylpentene) lenses the THz beam can be shaped.
- One TPX lens can collimate the divergent THz beam coming from a hyperhemispherical substrate lens.
- With a second TPX lens a sharp THz focus can be realized.
- 1" diameter TPX lenses can be mounted easily onto a PCA with hyperhemispherical silicon lens.

2.1 STB-CTL-D25mm mounted collimating TPX lens for PCA with diameter 25 mm

STB-CTL-D25mm is an accessory for photoconductive antennas (PCA) that are mounted on a 25.4 mm diameter Al heat sink and are equipped with our hyperhemispherical silicon substrate lenses. The divergent THz beam of such an antenna is in a first step slightly collected by the hyperhemispherical silicon lens. In a second step the THz beam is collimated by a 1" diameter TPX (Polymethylpentene) lens, which is also transparent in the visible spectral region. This collimated terahertz beam exits the STB-CTL-D25mm with a diameter of 22 mm. The same configuration can be used to measure a collimated THz beam. An additional focusing TPX lens can be mounted in front of the first TPX lens to obtain a focused THz beam with a focal length of 30 mm.

Collimating TPX lens

Material: TPX (Polymethylpentene)
 Refractive index: 1.45 @ 1 THz
 Absorption coeff. (α): 0.3 cm⁻¹
 Diameter: 25.4 mm
 Thickness: 10.3 mm



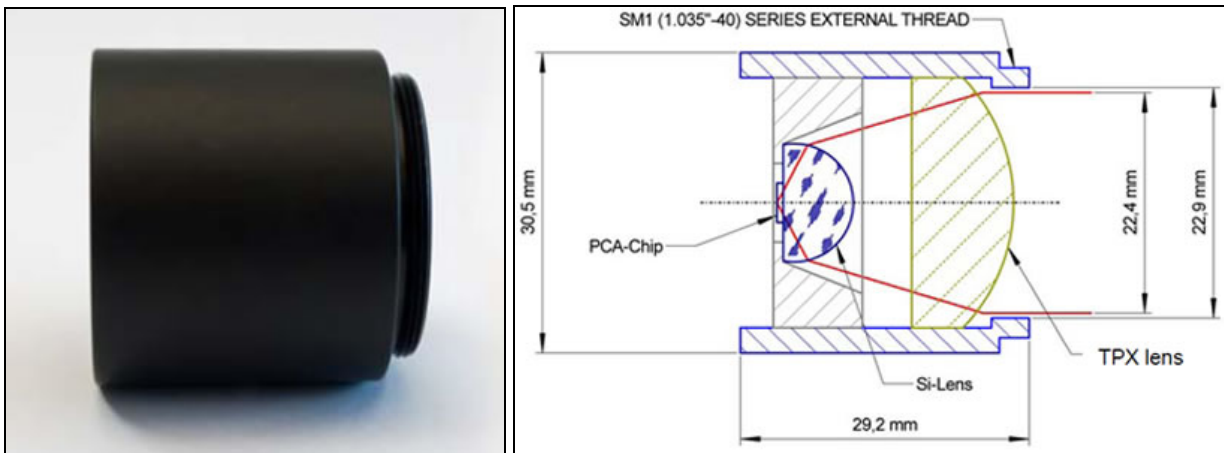
Design focal length: 42 mm
 Back focal length: 35 mm (from flat surface)

Collimated THz beam
 beam diameter: 22,4 mm

Lens Tube
 Outer diameter: 30.5 mm
 Total length: 29.2 mm

Compatible PCAs

The STB-CTL-D25mm can be used as housing for a PCA, which is mounted on a 25.4 mm diameter Al heat sink. The electrical cable needs to point towards the front side (laser or chip side) of the PCA. Further the PCA needs to be equipped with one of our hyperhemispherical silicon substrate lenses.

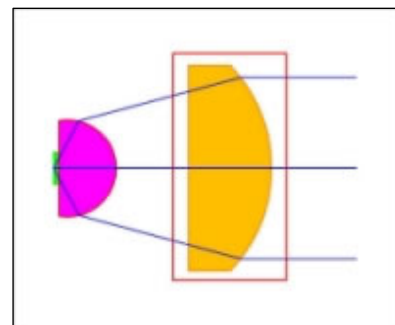


2.2 STB-CTLF-D25mm mounted collimating TPX lens for fiber coupled PCA with diameter 25 mm

STB-CTLF-25mm is an accessory for fiber coupled photoconductive antennas (STB-FC-PCA) that are mounted on a 25.4 mm diameter Al heat sink and are equipped with our hyperhemispherical silicon substrate lenses. The divergent THz beam of such an antenna is in a first step slightly collected by the hyperhemispherical silicon lens. In a second step the THz beam is collimated by a 1" diameter TPX (Polymethylpentene) lens. This collimated terahertz beam exits the CTLF-D25mm. It has a diameter of 22 mm. The same configuration can be used to measure a collimated THz beam. An additional focusing TPX lens can be mounted in front of the first TPX lens to obtain a focused THz beam with a focal length of 30 mm.

Collimating TPX lens

Material: TPX (Polymethylpentene)
 Refractive index: 1.45 @ 1 THz
 Absorption coeff. (α): 0.3 cm⁻¹
 Diameter: 25.4 mm
 Thickness: 10.3 mm
 Design focal length: 42 mm
 Back focal length: 30 mm (from flat surface)

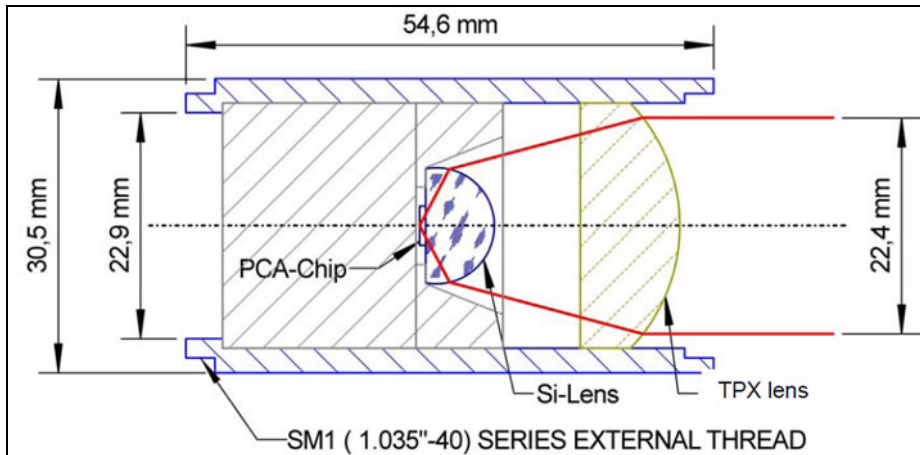


Collimated THz beam
 Beam diameter: 22.4 mm

Lens Tube
 Outer diameter: 30.5 mm
 Total length: 54.6 mm

Compatible PCAs

The STB-CTLF-D25mm can be used as housing for a FC-PCA, which is mounted on a 25.4 mm diameter Al heat sink. The electrical cable needs to point towards the front side (laser or chip side) of the PCA. Further the PCA needs to be equipped with one of our hyperhemispherical silicon substrate lenses.



2.3 STB-FTL-f32.5mm mounted focusing TPX lens with focal length 32.5 mm

STB-FTL-f30mm is a mounted TPX (Polymethylpentene) lens. It is used in combination with STB-CTL-D25mm or STB-CTLF-D25mm to focus the terahertz radiation emitted by a photoconductive antenna (PCA). The collimated THz beam of a photoconductive emitter antenna with a collimating TPX lens (STB-CTL-D25mm or STB-CTLF-D25mm) is focused using the mounted TPX lens STB-FTL-f32.5mm. The focal length is 32.5 mm.

Focusing TPX lens
 Material: TPX (Polymethylpentene)
 Refractive index: 1.45 @ 1 THz
 Absorption coeff.: 0.3 cm⁻¹
 Diameter: 25.4 mm
 Thickness: 8.0 mm
 Back focal length: 32.5 mm

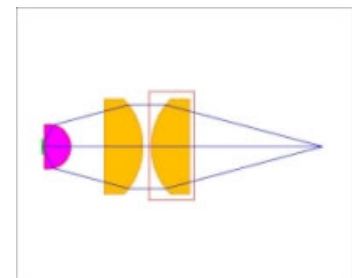
Focused THz beam
 Aperture angle: 17.6°

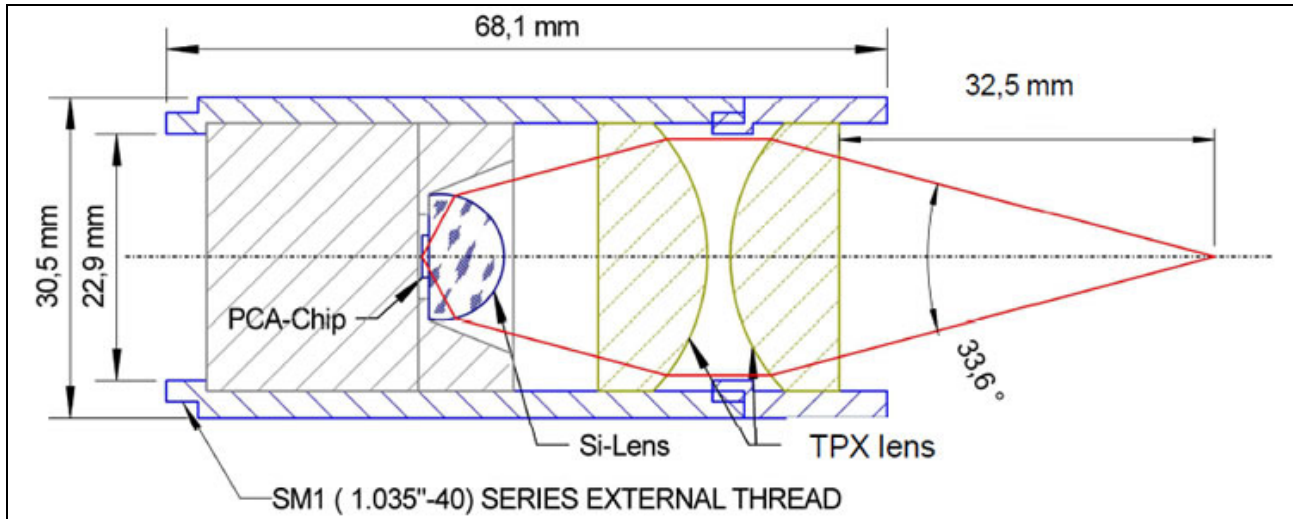
Airy disc diameter at 300 GHz 1.9 mm
 at 1 THz 554 μm
 at 3 THz 185 μm

Lens Tube
 Outer diameter: 30.5 mm
 Total length: 16.5 mm

Compatible PCAs

The STB-FTL-f32.5mm can be used with both STB-CTL-D25mm and STB-CTLF-D25mm.





3. TPX lenses with 1" and 2" diameter



List of available focusing plano-convex TPX lenses from stock. Other TPX lenses on request.

Part number	Lens Dia. mm	Focal length mm	Free aperture dia. mm	Ctr. Lens thk. mm	Edge thk. mm
STB-TPX-D25.4-f10	25.4	10	20	11.2	3.3
STB-TPX-D25.4-f15	25.4	15	23.4	10	2.5
STB-TPX-D25.4-f25	25.4	25	22.4	8	3.1
STB-TPX-D25.4-f32.5	25.4	32.5	22	8	4.2
STB-TPX-D25.4-f50	25.4	50	22.4	7	4.4
STB-TPX-D25.4-f67	25.4	67	22.4	6.94	5
STB-TPX-D25.4-f100	25.4	100	22.4	7	5.6
STB-TPX-D25.4-f150	25.4	150	22.4	6	5.1
STB-TPX-D50-f35	50	35	47	18	3
STB-TPX-D50.8-f65	50.8	65	47.4	13	4
STB-TPX-D50.8-f100	50.8	100	47.8	10	4
STB-TPX-D50.8-f200	50.8	200	47.8	8	5
STB-TPX-D50.8-f250	50.8	250	47	8	5.5