

### Almost linear responsivity in wide spectral range from 400 nm to 1550 nm

In some measurements, it is preferable to use a photodetector whose responsivity depends linearly on radiation wavelength. This feature is mostly characteristic to devices based on semiconductor material.

In co-operation with Tartu Observatory, we have constructed two trap detectors: based on Si-photodiodes and InGaAs-photodiodes. The trap detectors were constructed from photodiodes with active area of 10 mmx10 mm (Si-based photodiodes) and of diameter 10 mm (InGaAs-based photodiodes). In both trap detectors, three photodiodes were aligned in polarization-independent reflection type configuration with minimum optical length in the device (eg [http://www.hohenheide.ee/datasheets/datasheet\\_3.pdf](http://www.hohenheide.ee/datasheets/datasheet_3.pdf)). The trap detectors were characterized at our company and at AALTO/MIKES, Finland. The measured responsivities of both trap detectors are depicted on figure below.

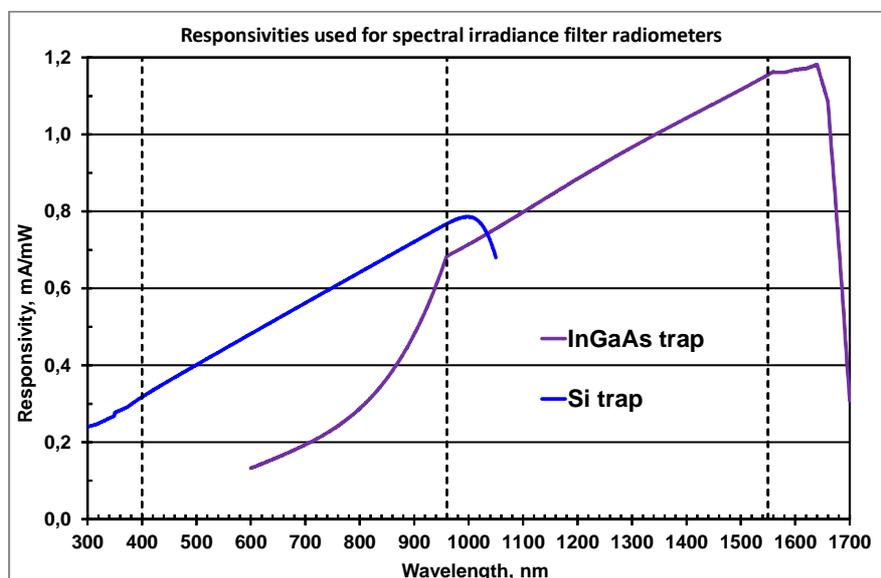


Figure. Measured responsivities of two reflection trap detectors composed of three photodiodes: one from Si-photodiodes and another from InGaAs-photodiodes. The vertical dashed lines illustrate approximate limits for trap detector linear responsivity of our devices.

Based on responsivity results we have observed that the trap detectors exhibit almost linear dependence of responsivity on wavelength in the wide spectral range from 400 nm to 1550 nm. The Si-photodiode based trap detector responsivity is linear in the wavelength range from 400 nm to 970 nm and InGaAs-based trap detector responsivity is linear from 960 nm to 1550 nm. The responsivity of the trap detectors can be expressed as linear functions with relative agreement to the measured values better than to  $\pm 0,2\%$  and  $\pm 0,8\%$  for Si-trap and InGaAs-trap, respectively.

Owing to suitable responsivity performance, both trap detectors were used as components of filter radiometers to establish the scale for spectral irradiance scale covering spectral range from 350 nm to 1500 nm at Tartu Observatory.