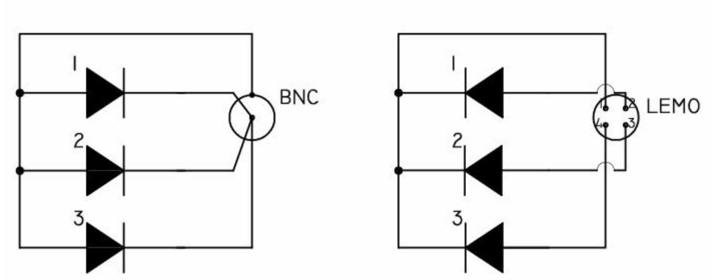
Isolated BNC

Proper electrical connection of a photodetector is important to register the signals from all photodiodes. The most popular electrical connector is an isolated female BNC-type connector owing to its robustness, availability and simple design.
In use of this type of electrical connector the anodes of all photodiodes are soldered together to a central conductor of the connector (Fig 1a).

Fig. 1. Three-element trap electrical connection



a) with BNC-type connector b) with multipole connector

In such a way, the photocurrents generated by each individual photodiode are summed up inside the detector and user can conveniently measure the total photocurrent of a multi-element photodetector.

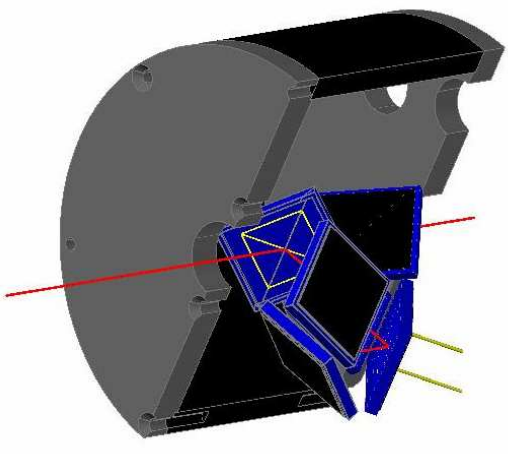
Multipole connector

The other option is to measure photocurrents from each photodiode individually. This can be done by using multipole connectors (eg LEMO). Using a multipole connector offers possibility to solder anodes of photodiodes separately to the pins of the connector (Fig 1b). As a result, user can sum up generated photocurrents outside the detector.
There are several features accompanying use of multipole connectors, which may be of interest in measurements:

- Properties, such as responsivity, ageing, spatial uniformity etc, of individual photodiodes in the multi-element detectors can be studied separately, but still simultaneously, thus increasing efficiency in performance check of a detector before demanding measurements
- Photodetector can be used as a reference detector and for monitoring purposes of radiation at the same time enhancing possibilities of measurement set-up
- By measuring the absolute optical power with the trap and photocurrents of photodiodes, the reflectance of each photodiode in the trap can be determined. For example, we have measured the photocurrents of each individual photodiode in a six-element transmission trap detector, in which linearly polarized laser beam impinges active areas of photodiodes at angle close to 45 º(see figure below).
  Based on measurement results, we estimated the reflectance ρ_i of photodiodes and silicon dioxide antireflection coating thicknesses *t*:

  ρ_1= 44,1 %; *t* = 28,5 nm
  ρ_2= 20,8 %; *t* = 30 nm
  ρ_3= 43,4 %; *t* = 31 nm
  ρ_4= 21,1 %; *t* = 27,5 nm
  ρ_5= 44,1 %; *t* = 28,5 nm
  ρ_6= 20,9 %; *t* = 30 nm

  at laser wavelength 633 nm. Theoretically, the reflectance values at angle of incidence 45 º on photodiodes with nominal SiO_2 antireflection coating thickness *t*=30 nm are ρ_1= 43,8 % and ρ_2= 20,9 % at this wavelength.



  Alternatively, by measuring photodiode signals separately and by knowing reflectance properties of photodiodes, the degree of polarization of radiation from unknown source can be determined.

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