Using Pyroelectric Detectors to Monitor Output and Position of Lasers

3.92 HK

1) Detector output

The pyroelectric detector is a capacitive element that delivers only an output signal upon a signal change. The frequency response depends on the load resitor. (Refer to ELTECdata # 100 and # 109).
ELTEC laser detectors do not include an integrated amplifier. This amplifier has to be provided externally. For fast response and to avoid interference and losses, the amplifier should be as close to the detector as possible, and all should be electrically shielded.

2) Energy measurement

For energy measurement of pulsed lasers, use a capacitive load as per ELTECdata 109.

3) Monitoring jitter

To monitor jitter of a CW laser, use a load resistor RL and an amplifer with an input impedance of >>RL.
The lowest frequency detectable is $f = 1/ 2 * \pi * RL * 30\ pF$.

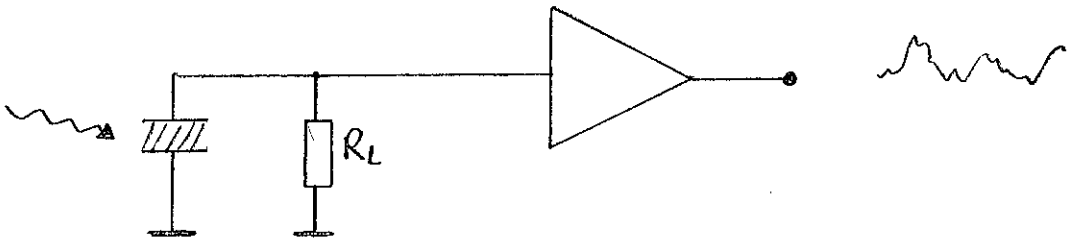

Fig. 1

4) Laser positioning

With a 4-quadrant detector as Model 4202M4, positioning can be detected and optimized. A small portion (generally 1 to 100 mW) of the beam should be deflected to the detector using a beam splitter and attenuators if required. The beam sould be focussed to an area with a diameter equal or larger to twice the maxumum off-axis tolerance, so that all 4 detector elements receive always some radiation.

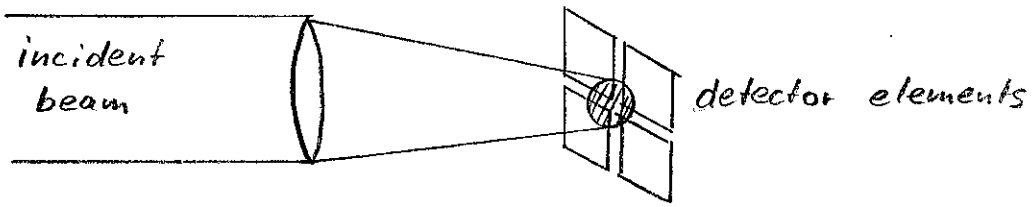

Fig. 2

4a) Compensate jitter

If positioning is only required to correct momentary deviations, the circuit as per Fig. 1 may be used for each detector element. A load resistor RL of 30 Megohms will result in a frequency response that allows the observation of changes (jitter) faster than 1 ms.

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4b) Static positioning

For the static positioning of CW lasers, a circuit as per 4a) may be used if the time of interest is not longer than C * RL (C= 30 pF and RL max. 10e12 Ohms, resulting in a time constant of max. 30 seconds).
If positioning accuracy is required over a longer time, a mechanical chopper is required. The chopper is formed by a simple motor-driven wheel with an on-off ratio of 1:1. The chopper speed should be faster than the control time delay. To compensate slow (generally thermally induced positioning errors), a chopper frequency of 100 Hz (4-blade wheel at 25 turns per second) may be adquate with a circuit as follows: