# HRPPD photosensor

- DC-coupled version assumed for either pfRICH or hpDIRC

  - Charge sharing is of a minor importance; therefore, saturation is of no harm (?)

- Operating gain: *variable*, up to ~10^7 (prefer to stay well below 10^6)

- Pulse leading edge ~0.5 ns, duration <2 ns

- Intrinsic single photon timing resolution <50 ps

- Noise level (DCR) ~1kHz/cm^2

- 1024 channels in a 120mm x 120mm footprint

- Assume ASIC backplane is directly attached to the sensor

  - A mezzanine connection is not excluded

- Pad+trace capacitance C_d < 10 pF
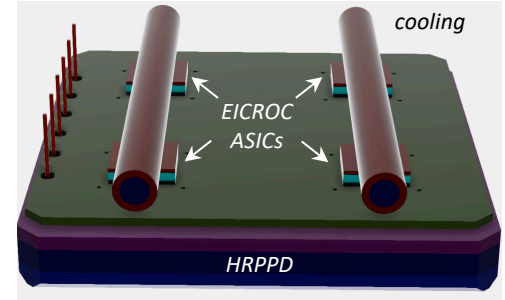
Requirements to ASIC

- ➢ Assume ToA/ADC architecture works well for this sensor type in general
  - ➢ Will hopefully have a direct proof on a half a year time scale
- ➢ Bump bonding to a custom backplane assumed (ASIC pitch does not matter)
- ➢ Assume 256ch per ASIC & copper uplink to RDOs
  - ➢ Can probably use 64..128ch version as well …
  - ➢ .. though may be problematic to pack that many individual fiber links on a backplane
- ➢ Prefer to stay within few mW/ch power dissipation (and can afford water cooling)
- ➢ Suggest intrinsic ASIC timing resolution <50ps (hpDIRC) and <20ps (pfRICH)
  - ➢ Provided C_d/Q ratio is not a limiting factor, and bearing in mind a difference between SPE (aerogel) and multi-photon (sapphire window) timing resolution requirements
  - ➢ Expect a typical amplitude difference ~10 times between the SPE and multi-photon cases

- ➢ Total sensor count: 68 for pfRICH & 72 for hpDIRC (therefore, ~70k channels each)