**Derivation of sensitivity of a Geiger mode APDs detector from a given efficiency to estimate total photon counts** KIYOTAKA HAMMURA, Hitachi Cambridge Laboratory, Cavendish Laboratory, UK — In quantum key distribution (QKD) experiments based on a single photon stream, a single photon detector incorporating Geiger mode avalanche photodiodes (APDs) is mostly used for detecting photons. It is important to estimate prior to experiment how many photons the detector can detect in total for a simple single photon stream. We propose a method of estimating it using intrinsic detection sensitivity (DS) instead of extrinsic detection efficiency (DE). We derive DS using figures to give the DE for some specific configuration and a quantity, designated by NB, of how many photons are ignored due to a blanking operation of the detector to suppress dark counts originating from after pulsing.

$$DS = \frac{\text{(How many photons have been counted per second)}}{\text{(How many photons have arrived per second} - N_B)} \qquad (1)$$

resulting in 0.27. Applying this value of DS to our experimental configuration, the total photon counts are estimated at 81,000 counts/second. DE under these configurations is estimated at 0.16, which is found to be smaller than that at a lower triggering rate configuration.

Kiyotaka Hammura
Hitachi Cambridge Laboratory, Cavendish Laboratory, UK