IRD Integration Time Calculation

Predicted exposure to obtain SN = 100 (= 10,000 photons in a pixel corresponding to 999 and 1620 nm) for a dwarf with an effective temperature of 3000 K or 5500 K, based on the total IRD throughput measured in 2017 September

Effective Temperature (K)	*J* brightness (mag)	Exp Time at 999 nm (seconds)	Exp Time at 1620 nm (seconds)
3000	10	1111	400
5500	10	769	417

Note: This calculation is based on the IRD's total throughput derived by observing HR 8634 (B type) in 2017 September. The throughput calculations include the influences of the atmospheric transmission, telescope, AO188 and its ADC, spectrometer, all fibers, and detector quantum efficiency. The model spectra used to infer the number of photons are the BT-Settl models, taken from http://perso.ens-lyon.fr/france.allard/. The IRD's total throughput depends on the AO188's performance (i.e., seeing) that is various from night to night. Here, only photon noise is assumed; it may be needed to include readout noise in the case of short integration and/or observation of a faint object.

IRD Integration Time Calculation (to be improved)

Predicted exposure to obtain SN = 100 (= 10,000 photons in a pixel corresponding to 999 and 1620 nm) for a dwarf with an effective temperature of 3000 K or 5500 K, based on the total IRD throughput measured in 2017 September

Effective Temperature (K)	*J* brightness (mag)	Exp Time at 999 nm (seconds)	Exp Time at 1620 nm (seconds)
3000	10	815	293
5500	10	564	306

Note: Same as the previous table except that the calculation is based on the assumption, which is that we are now planning to improve the throughput by adjusting some optical components outside the IRD chamber.