

Problems for Tutorial Week #4

CCDs

(problems 1-2 from E. Jensen)

1. Derive the four equations on pp. 72–73 (pp. 53–54 in the first edition) of Howell. *Remember that the statistics describe **photon counts**, not ADUs.*
2. The detector for the Pan-STARRS survey (<http://pan-starrs.ifa.hawaii.edu/public/home.html>) is a 64x64 array of CCDs, each of which is 600x600 pixels, all on one silicon chip. If this whole thing were one massive conventional CCD, how long would it take to read this array through a single amplifier at a pixel frequency of 1 MHz? This is why many large, modern CCDs have multiple readout amplifiers (for example, one at each corner of a chip) or (as in the Pan-STARRS case) they employ a different kind of readout altogether that can address individual pixels directly.

Howell Ch. 2: problems 4, 6