

Know Your Gain

What is Camera Gain?

System Gain is a camera property that is always ‘on’. The System Gain of a camera determines the rate of conversion between the number of electrons (e^-) recorded into digital units or grey levels in an image. Gain is given in e^- per Analogue to Digital Unit (ADU). A camera with a high gain will give rise to more grey levels than a camera with a low gain at the same signal level.

Key Specifications

Gain	Bit-depth	Conversion e^- /grey	Speed	Read noise (rms)	When to use
Correlated Multi-Sampling (CMS)	12-bit	0.25	43 fps	1.0	Best SNR mode, use for weak signals
High Dynamic Range (HDR)	16-bit	0.60	43 fps	1.7	When very bright and dark signals are present
Sensitivity	11-bit	1	63 fps	2.0	Best SNR at high speed
Balanced	11-bit	2.5	63 fps	3.2	Balance of read noise and full well
Full Well	11-bit	3.5	63 fps	3.5	Max full well

Table 1. Table of specifications for BSI gain settings. CMS is the recommended mode.

How Will It Affect Image Quality?

The same cells were imaged under the same conditions one after the other, but with the different gain settings on the Prime BSI. Figure 1 shows the resultant images and the line profiles associated. Using different gains alters the peak grey level signal, and the noise profile, thus changing the SNR. CMS mode is normally recommended.

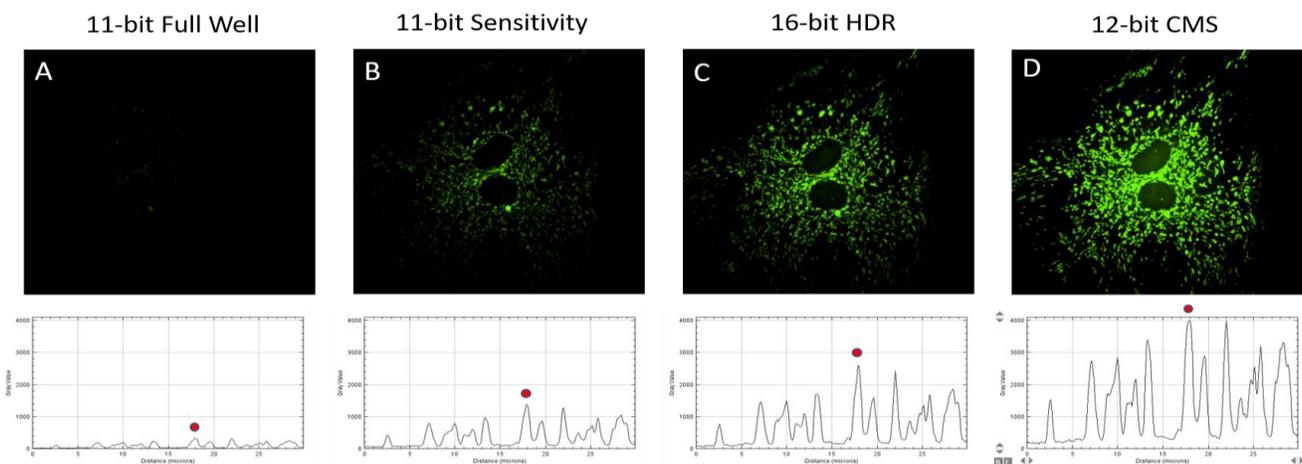


Figure 1. Fluorescent images of BPAE cells taken using the Prime BSI in gain settings A) Full well B) Sensitivity C) HDR and D) CMS mode. LUTs are equalized to the same level indicating the difference in gray levels obtained with the different gain modes.