

PRODUCING TIME-GATED LUMINESCENT IMAGES WITH LANTHANIDE ION LABELS(L14)

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**3D Image of the Europium Quantum Dye[®]
monoisothiocyanate**

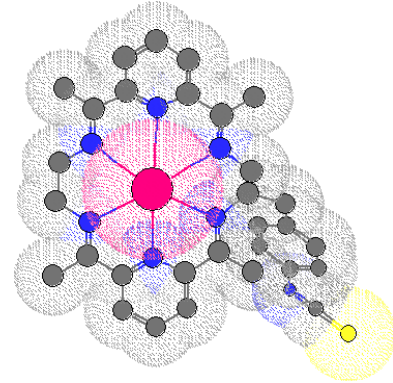


Image of a QDOT & Quantum Dye[®]

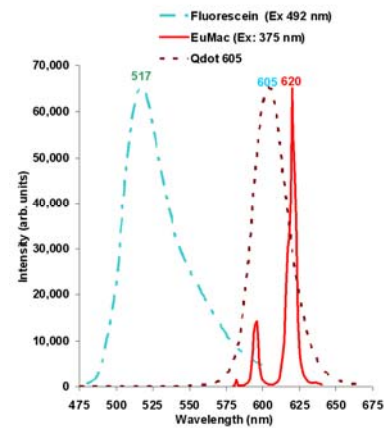
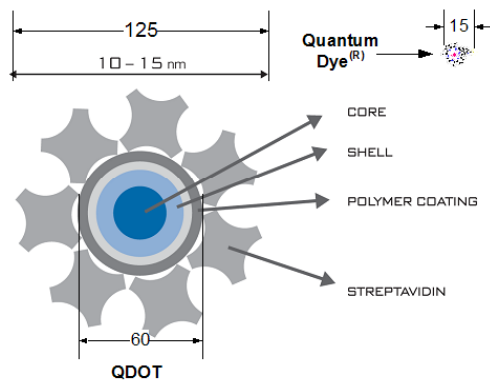
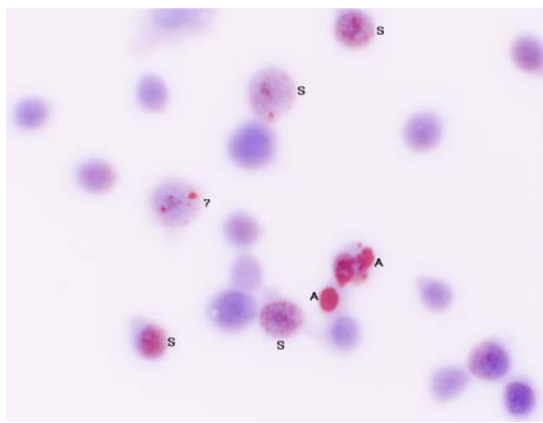
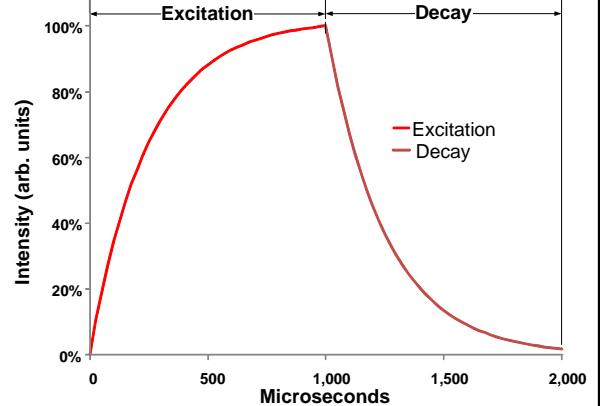


Image of Positive Control Apoptotic cells



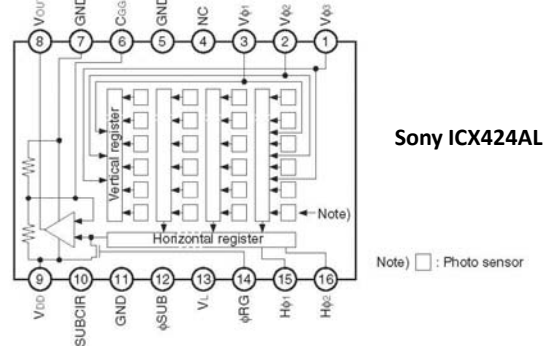
Lanthanide Luminescence



Long life-time imaging

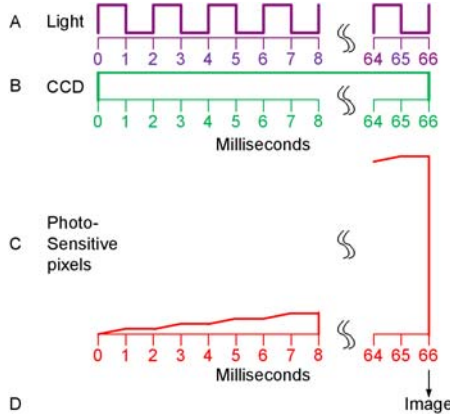
- Lanthanide complexes up to 2 milliseconds
- Time-gating eliminates fluorescence
- Sum multiple images
 - Digital 10 exposures per second for 1,000 exposures is 100 seconds. Too long & Read-out noise.
 - Analog, every 2 milliseconds. Only 1 Read-out.

Charge-Coupled Device (CCD) Image Sensor

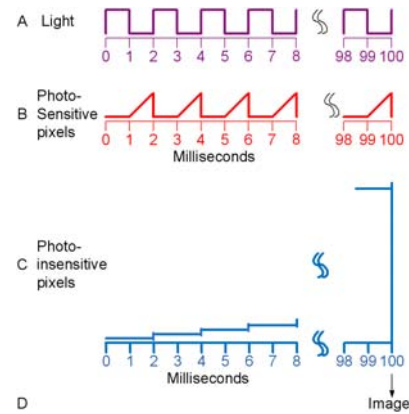


1. Photon into pixel. 2. Charge to vertical Reg. 3. Each vertical Reg. reads out bottom pixel to horizontal reg. 4. Horizontal reg. to ADC

Mode 0



Mode 5



Retiga Camera Studies

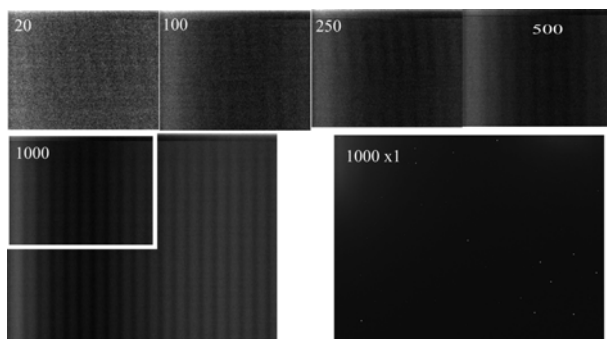
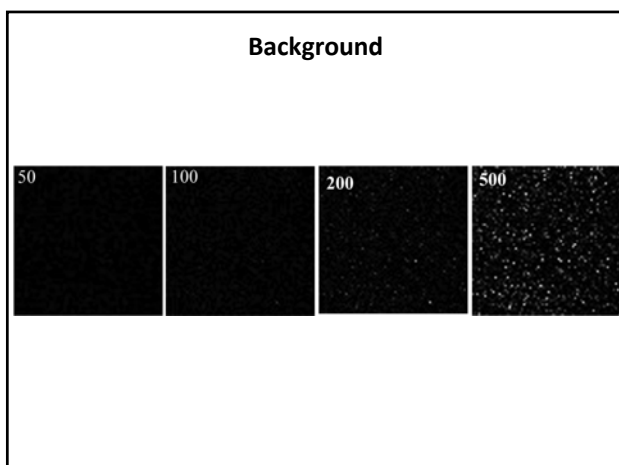
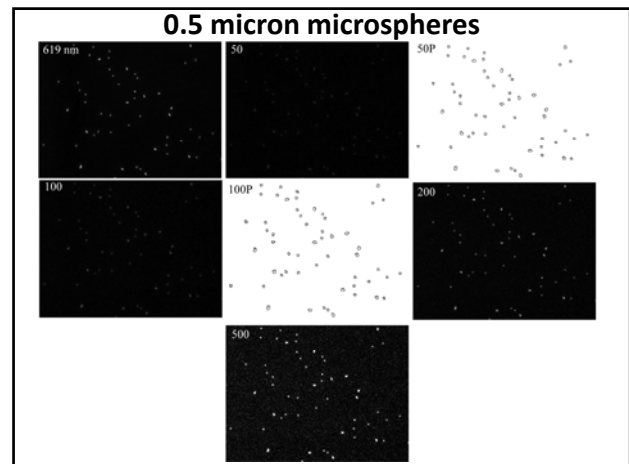
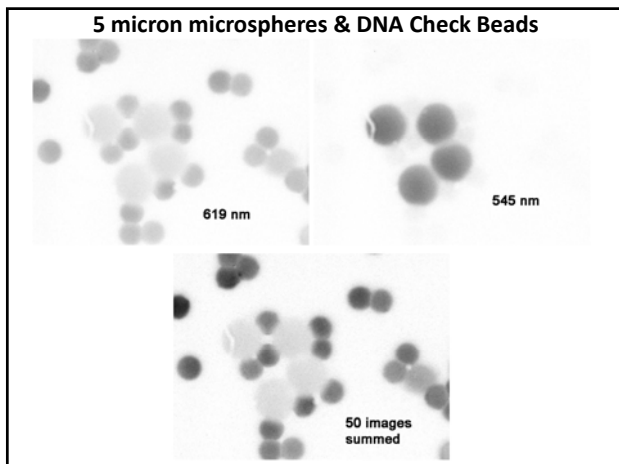
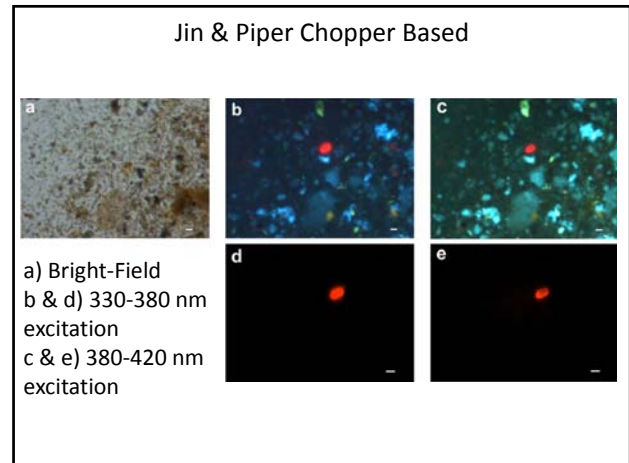
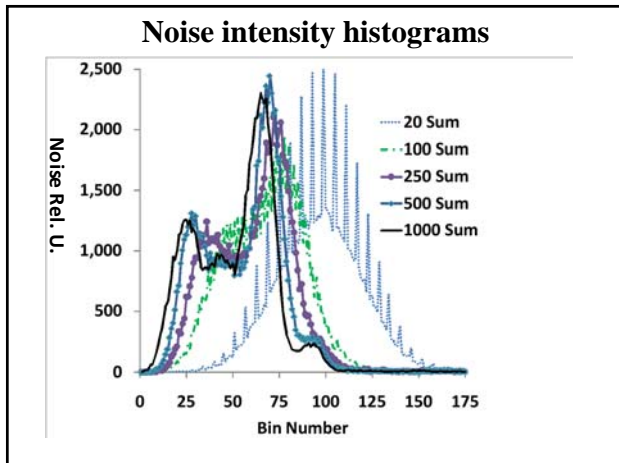


Image Manipulation

- Each digital readout contributes 8 photo-electron equivalents or a total of 20,000 electrons equivalents.
- Summation of the background included readout noise
 - Strange rollover of the 16 bit integers (pixels)
- Solved manufacturer use of 32 bit integers.
- Special program to process the images
 - Subtraction of an unexposed control image.
 - Reduced but did not eliminated background.



- ### Conclusions
- Analog summation works
 - Noise generation because of lack of cooling is problem for weakly labeled samples.
 - software modification (remove loop) Mode 5 a cooled scientific grade camera with a UV LED would permit relatively inexpensive time-gated luminescence image acquisition measurements.
 - Otherwise use a shutter.
 - The use of lanthanide, background free labels is now both practical and desirable.