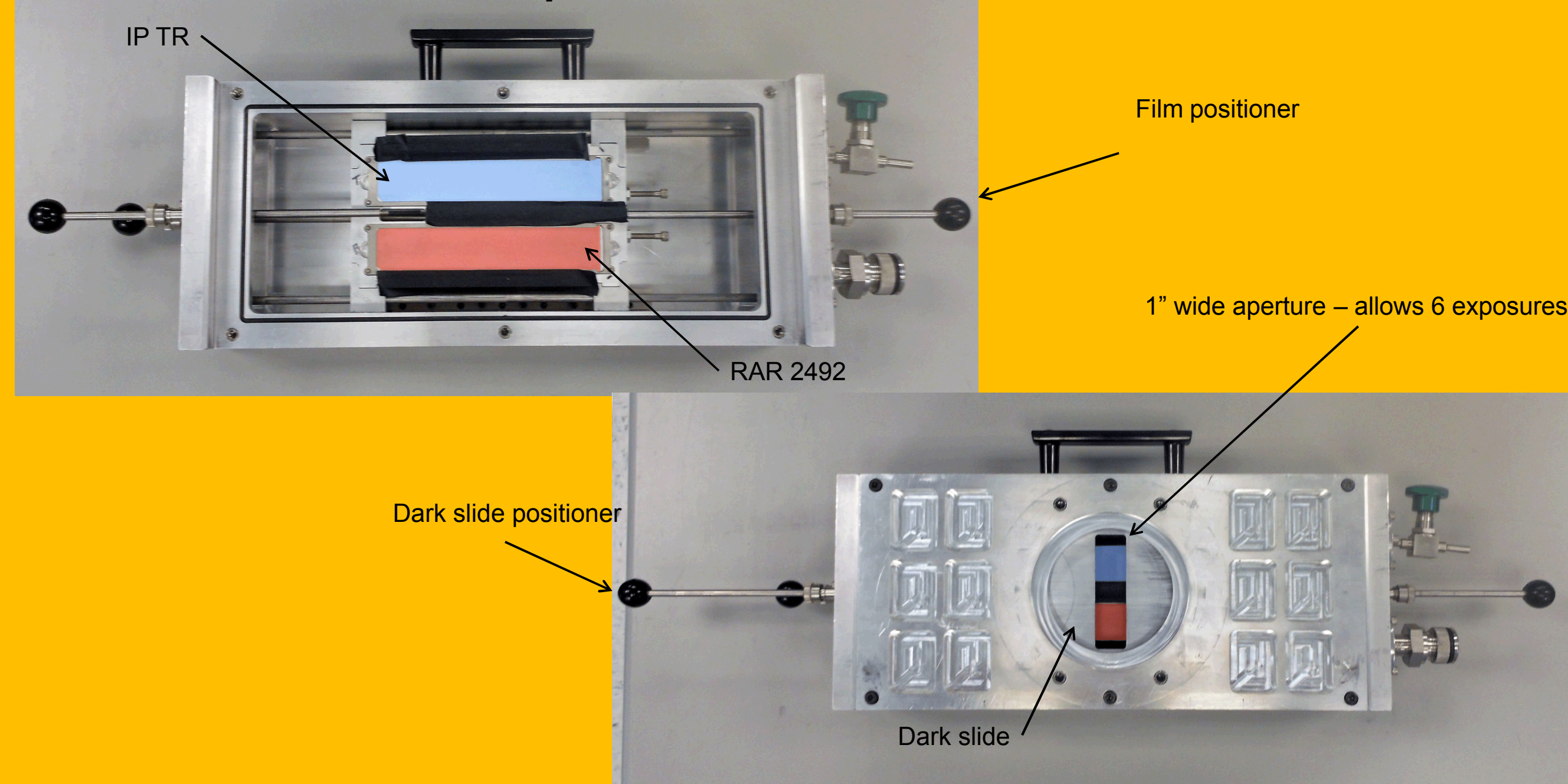


Comparison of image plate TR and RAR 2492 x-ray film for quantitative spectroscopy of high temperature plasmas



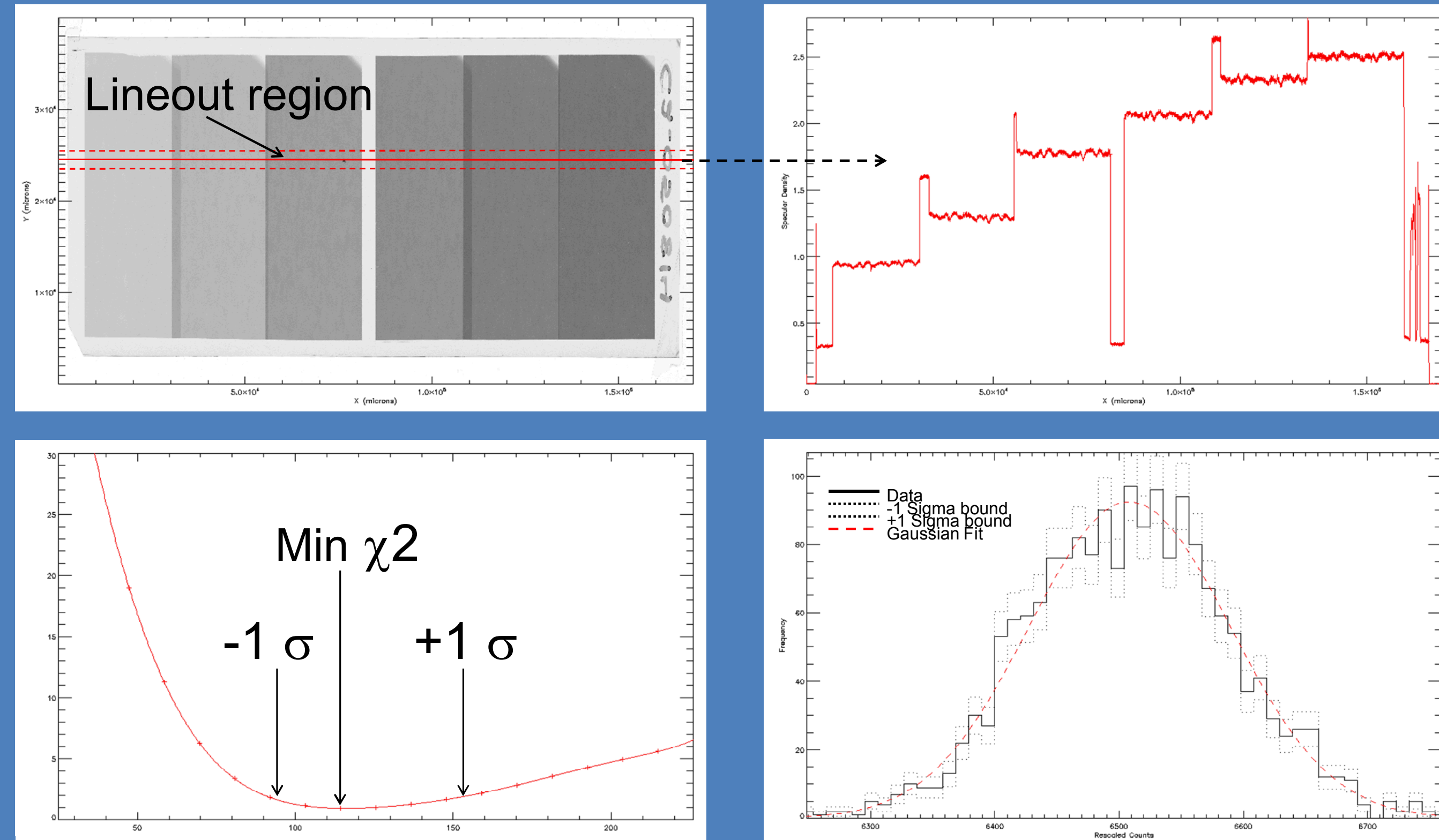
G.S. Dunham, G.A. Rochau, M.D. Kernaghan, L.B. Nielsen-Weber

Exposure Test Cassette

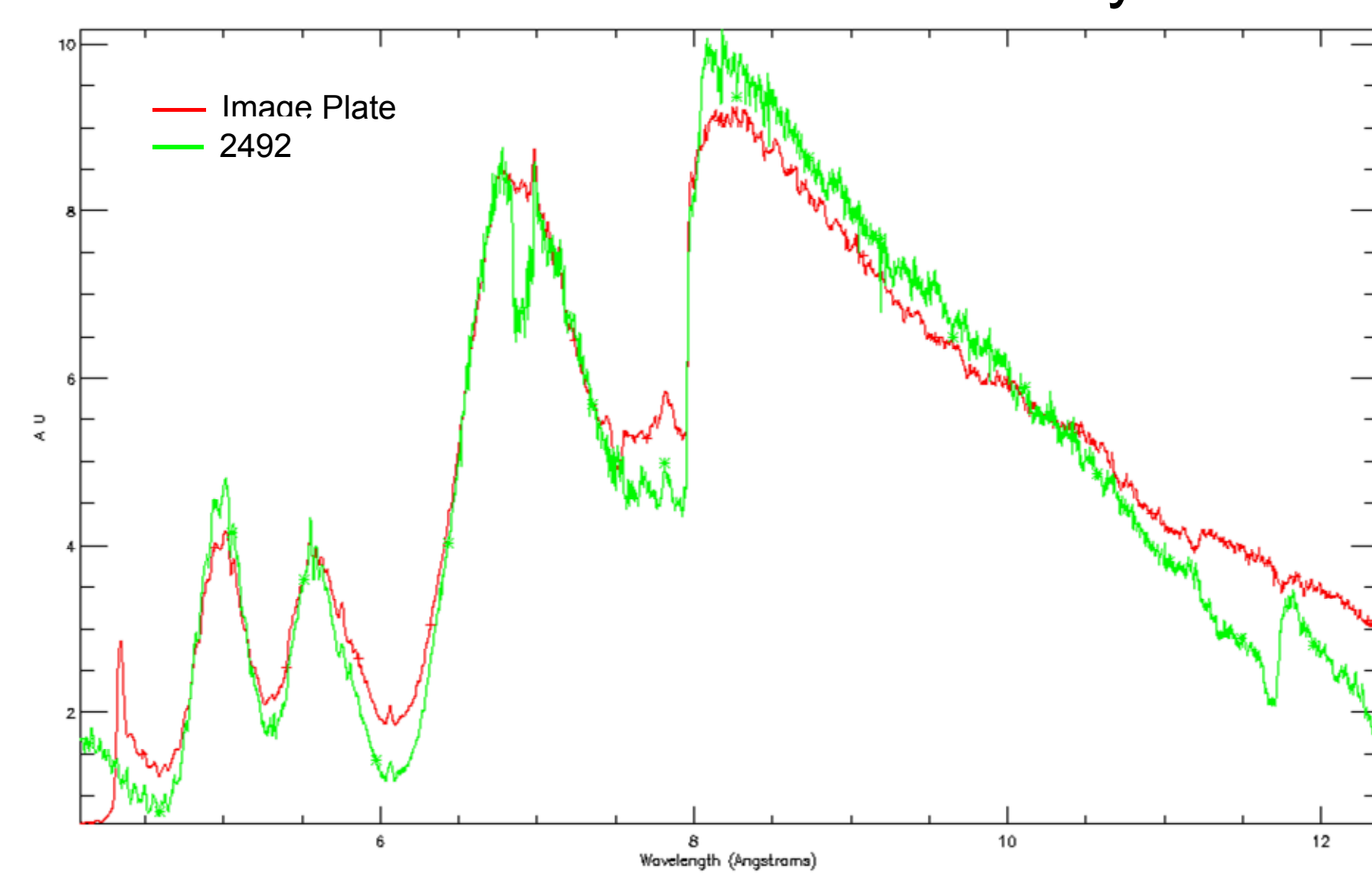


Conversion of PSL to Counts [1]

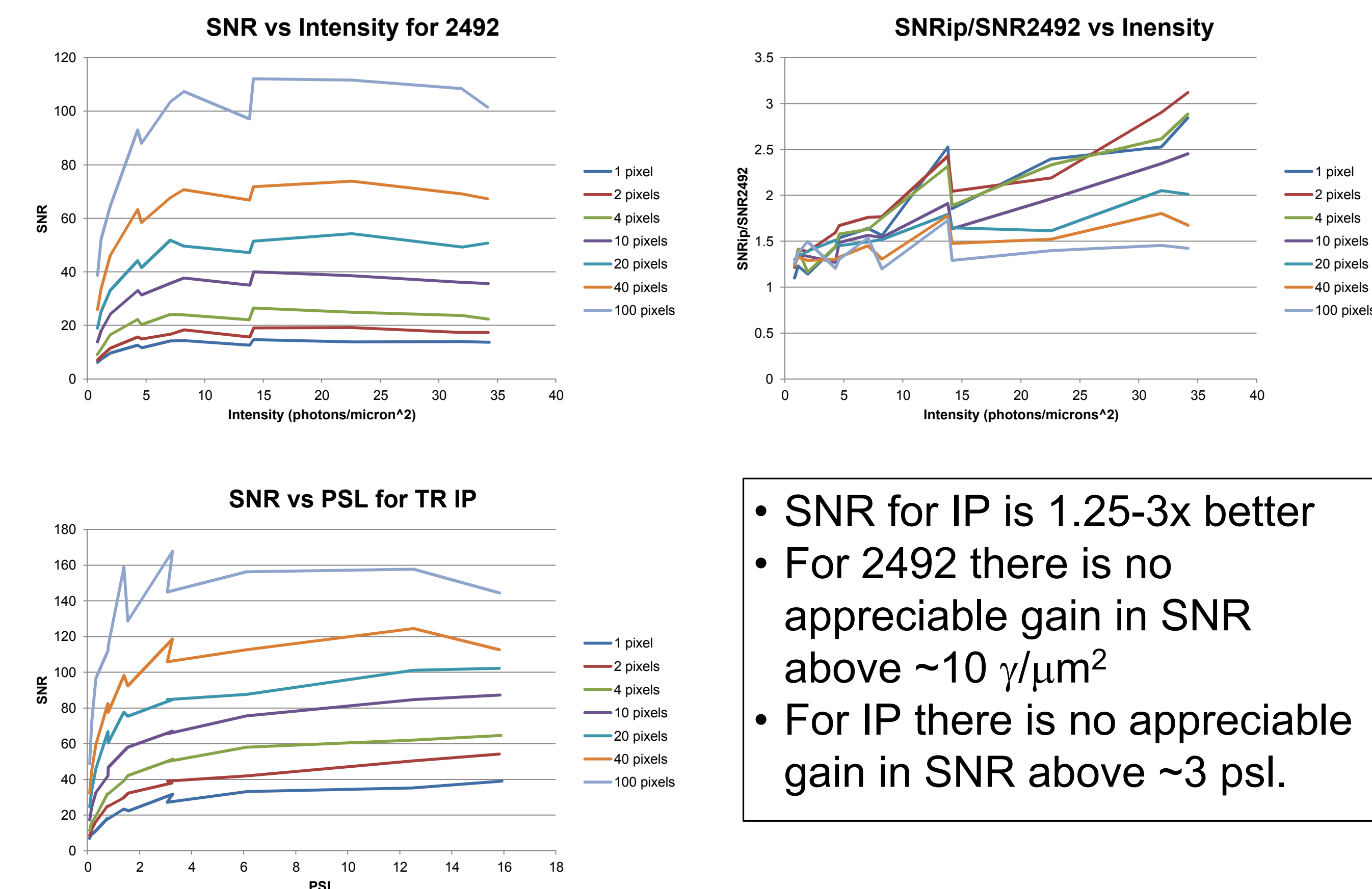
- Uncertainties can be assigned as the square root of the number of recorded counts
- Uncertainties can be assigned as the square root of the number of recorded counts.
- Measure mean intensity and uncertainty
 - A rescale factor to convert data to units of counts is determined by finding the value by which multiplying the data by creates the best approximation to a Poisson or Gaussian distribution
 - Uncertainty is determined by the $\pm 1 \chi^2$ bounds to the fit.



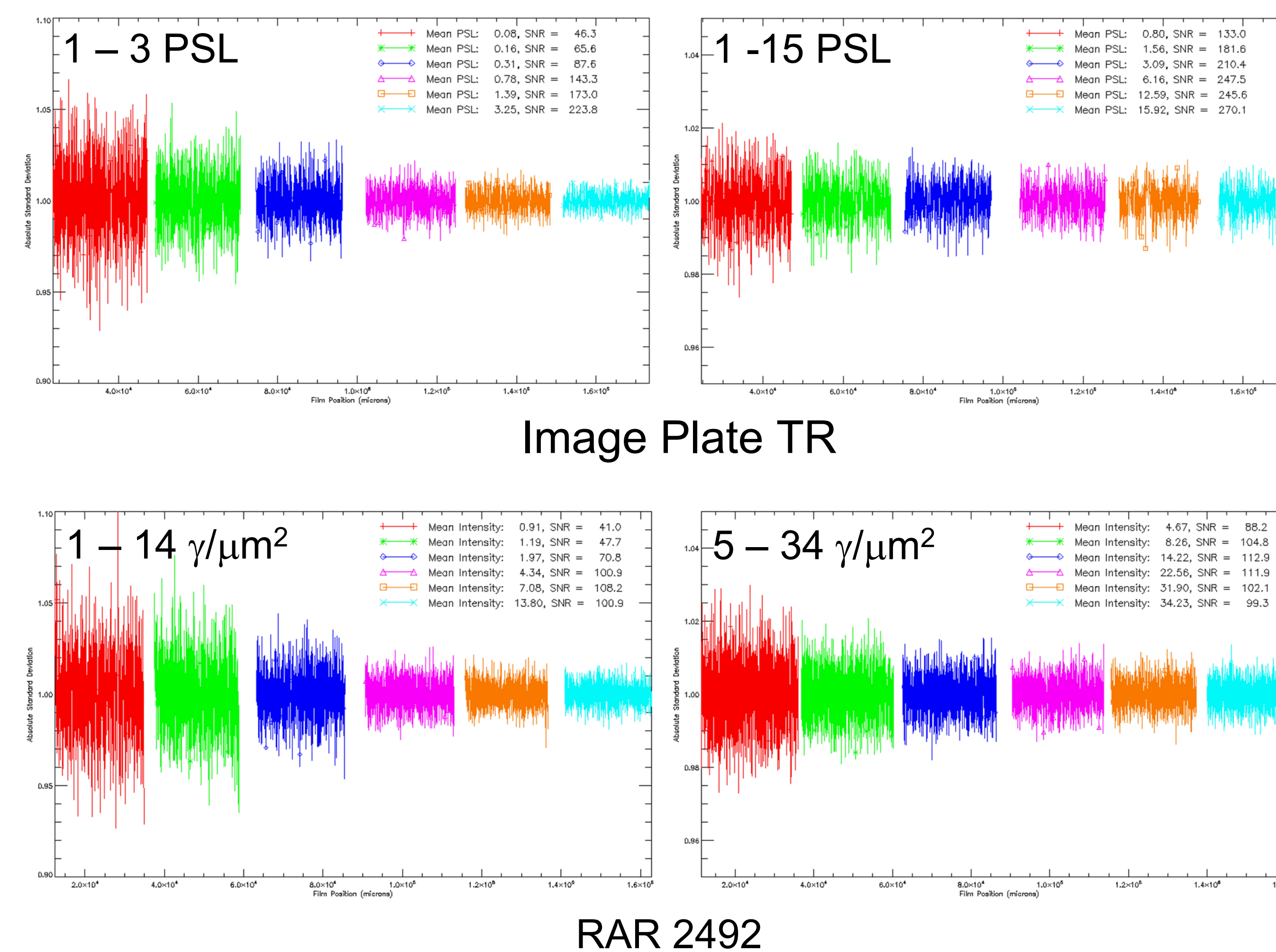
Comparison of Spectra from Z recorded on IP and 2492 simultaneously



Signal-to-Noise of IP is greater than for 2492



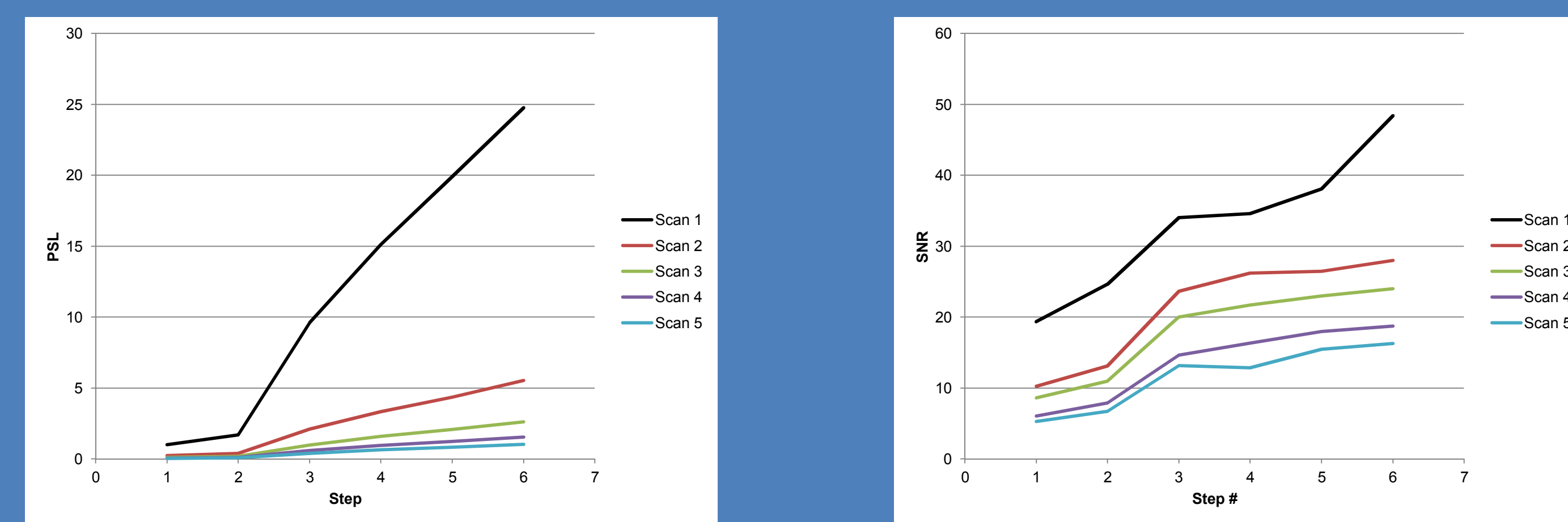
Absolute Standard Deviation



What is the effect on SNR from scanning IP multiple times?

	Scan 1 (PSL Value)	Scan 2 compared to scan 1		Scan 3 compared to scan 2		Scan 4 compared to scan 3		Scan 5 compared to scan 4	
Step		RR	% reduction	RR	% reduction	RR	% reduction	RR	% reduction
1	1.005	4.408	77.3%	2.073	51.8%	1.719	41.8%	1.455	31.3%
2	1.703	4.470	77.6%	2.140	53.3%	1.664	39.9%	1.486	32.7%
3	9.599	4.591	78.2%	2.129	53.0%	1.650	39.4%	1.506	33.6%
4	15.095	4.524	77.9%	2.109	52.6%	1.674	40.3%	1.465	31.7%
5	19.895	4.574	78.1%	2.099	52.4%	1.683	40.6%	1.490	32.9%
6	24.764	4.477	77.7%	2.124	52.9%	1.691	40.9%	1.498	33.2%

- Scan-to-scan reduction is independent of PSL value
- Reduction is asymptotic
- SNR decreases with number of scans



References:

- [1] G. Dunham *et. al.*, Rev. Sci. Instrum. **75**, 3687 (2004)
 [2] A. L. Meadowcroft *et. al.*, Rev. Sci. Instrum. **79**, 113102 (2008);

For our experimental conditions IP TR and 2492 obey counting statistics up to approximately 3 PSL or $7 \gamma/\mu\text{m}^2$

