



MC2750 EP-NIR Photometric Performance: Following the Ideal Curve!

SUMMARY: The following Technical note demonstrates the photometric performance of the Aspectrics MC2750 EP-NIR spectrometer as a function of time. RMS noise was calculated for co-addition times ranging from 1 second to 10 minutes. Experimental results show that the Aspectrics MC2750 spectrometer has a high degree of sensitivity due to extremely low (single-digit micro-absorbance units) instrumental noise.

An Aspectrics MC2750 Encoded Photometrics Near Infrared (EP-NIR) spectrometer covering the 1375-2750 nm spectral range for access to combination bands information was tested for photometric performance.

Optical configuration was open beam using the Aspectrics Near IR sampling bench.

Single beam spectra were collected every 10 millisecond over a 10 minute period. Consecutive single beam spectra were then ratioed and converted to absorbance spectra.

RMS noise values are calculated for approximately 44 nm wide spectral regions, corresponding to 5 consecutive photometric channel responses.

Theoretical response was calculated as the 1-second experimental noise corrected for integration time. The Experimental data were then regressed (power regression) against the theoretical data. Results show that the EP-NIR follows theoretical curve in reduction of RMS noise as a function of the integration time almost perfectly: the regression fit was $x^{-0.49}$ (region 1667-1711 nm; fig. 1) and $x^{-0.45}$ (region 2014-2057; fig. 2) for integration times up to 10 minutes when an ideal fit of $x^{-0.50}$ was expected. This proves the quality of the very-low noise photometric response of the MC2750 EP-NIR spectrometer.

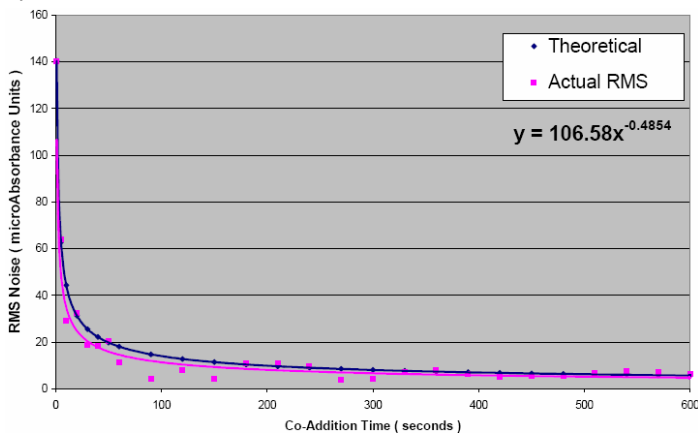


Fig. 1: RMS Noise (Experimental & Calculated) for range 1667-1711 nm. Fit is $X^{-0.49}$ compared to theoretical $X^{-0.50}$

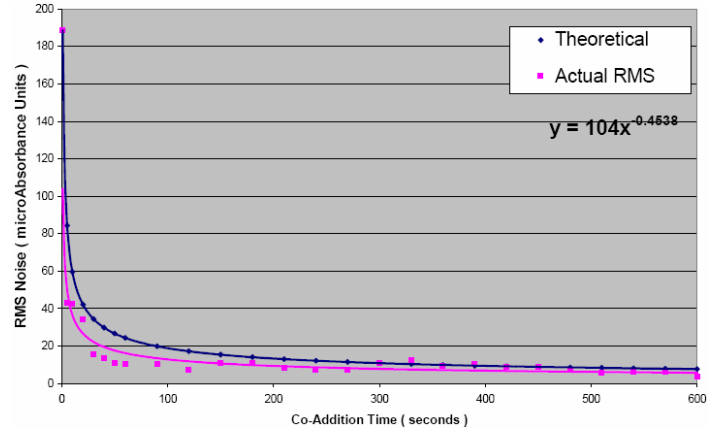


Fig. 2: RMS Noise (Experimental & Calculated) for range 2014-2057 nm. Fit is $X^{-0.45}$ compared to theoretical $X^{-0.50}$

Integration Time (seconds)	RMS Noise (Absorbance Units)			
	Region 1667-1711 nm		Region 2014-2057 nm	
	Calculated	Actual	Calculated	Actual
1	0.000140	0.000140	0.000189	0.000189
5	0.000063	0.000064	0.000084	0.000043
10	0.000044	0.000029	0.000060	0.000043
20	0.000031	0.000032	0.000042	0.000034
30	0.000026	0.000019	0.000034	0.000016
40	0.000022	0.000018	0.000030	0.000014
50	0.000020	0.000020	0.000027	0.000011
60	0.000018	0.000011	0.000024	0.000011
90	0.000015	0.000004	0.000020	0.000010
120	0.000013	0.000008	0.000017	0.000007
150	0.000011	0.000004	0.000015	0.000011
180	0.000010	0.000011	0.000014	0.000011
210	0.000010	0.000011	0.000013	0.000008
240	0.000009	0.000010	0.000012	0.000007
270	0.000009	0.000004	0.000011	0.000007
300	0.000008	0.000004	0.000011	0.000011
330	0.000008	0.000007	0.000010	0.000012
360	0.000007	0.000008	0.000010	0.000009
390	0.000007	0.000006	0.000010	0.000011
420	0.000007	0.000005	0.000009	0.000009
450	0.000007	0.000005	0.000009	0.000009
480	0.000006	0.000006	0.000009	0.000007
510	0.000006	0.000007	0.000008	0.000006
540	0.000006	0.000008	0.000008	0.000006
570	0.000006	0.000007	0.000008	0.000006
600	0.000006	0.000007	0.000008	0.000004

Table 1: Individual RMS Noise results