Scheme for MOC QLOOK Scaling to Compensate for Attenuation and RCR Areal Changes

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At the MOC there will be a stand-alone display of the STIX qlook counts in 4 second time bins. The goal is to present lightcurves that are most easily interpreted by users who are unfamiliar with the details of the STIX RateControlRegime.

For changes in area, the measured rates should be divided by the this correction factor:

QLi = QLi/ ( stx\_rcr\_area( rcr ) / stx\_rcr\_area( 0 ) )

That normalizes the area to the initial RCR state of the instrument.

Correction for the attenuator

A true correction for the attenuator transmission would depend on the measured spectrum and we won’t have that information with sufficient resolution in the QLOOK data packets. So, we have to use some average value over a range of spectra. As the effect is most pronounced at low energies where thermal spectra dominate. One possible issue is whether there will always be counts in the lowest QLOOK channel with the attenuator in. I’ve used the RHESSI mission as a guide and we can reasonably assume a minimum temperature near 10 MK (0.86 keV) when the flux is high enough to force the use of the attenuator to moderate the counts. We’re also assuming a count rate of about 5000 counts/sec/sc or a total count rate of 150,000 /sec to force an RCR increment.

The computations for the following table can be found in “stx\_qlook\_corrfac.pro” in the STIX software distribution.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | **temp in keV** |  |  |  |  |  |
| **Channel range in keV** |  | **4-10** | **10-15** | **15-25** | **25-50** | **50-150** |
|  |  |  |  |  |  |  |
| No Attenuation | **0.86** | 1.46E+05 | 3.57E+03 | 1.43E+00 | 3.00E-05 | 9.96E-16 |
|  | **1.11** | 1.43E+05 | 6.99E+03 | 1.14E+01 | 1.69E-03 | 6.77E-12 |
|  | **1.37** | 1.40E+05 | 1.03E+04 | 4.07E+01 | 2.08E-02 | 1.69E-09 |
|  | **1.63** | 1.36E+05 | 1.35E+04 | 1.02E+02 | 1.23E-01 | 7.79E-08 |
|  | **1.89** | 1.33E+05 | 1.66E+04 | 2.07E+02 | 4.65E-01 | 1.31E-06 |
|  | **2.14** | 1.30E+05 | 1.95E+04 | 3.60E+02 | 1.30E+00 | 1.14E-05 |
|  | **2.4** | 1.27E+05 | 2.23E+04 | 5.61E+02 | 2.98E+00 | 6.37E-05 |
|  |  |  |  |  |  |  |
| With Attenuation | **0.86** | 1.22E+01 | 2.54E+01 | 3.37E-01 | 1.93E-05 | 9.09E-16 |
|  | **1.11** | 2.78E+01 | 8.83E+01 | 2.99E+00 | 1.12E-03 | 6.20E-12 |
|  | **1.37** | 4.40E+01 | 1.92E+02 | 1.17E+01 | 1.41E-02 | 1.55E-09 |
|  | **1.63** | 6.13E+01 | 3.44E+02 | 3.20E+01 | 8.48E-02 | 7.16E-08 |
|  | **1.89** | 7.84E+01 | 5.42E+02 | 6.92E+01 | 3.25E-01 | 1.20E-06 |
|  | **2.14** | 9.46E+01 | 7.76E+02 | 1.27E+02 | 9.25E-01 | 1.05E-05 |
|  | **2.4** | 1.10E+02 | 1.04E+03 | 2.08E+02 | 2.14E+00 | 5.88E-05 |
| Ratios, No atten to atten |  |  |  |  |  |  |
|  | **0.86** | 1.20E+04 | 1.40E+02 | 4.26E+00 | 1.55E+00 | 1.09E+00 |
|  | **1.11** | 5.14E+03 | 7.91E+01 | 3.81E+00 | 1.51E+00 | 1.09E+00 |
| Choose mid-range values for scaling | **1.37** | ***3.17E+03*** | ***5.38E+01*** | ***3.47E+00*** | ***1.48E+00*** | ***1.09E+00*** |
|  | **1.63** | 2.23E+03 | 3.93E+01 | 3.20E+00 | 1.45E+00 | 1.09E+00 |
|  | **1.89** | 1.70E+03 | 3.06E+01 | 2.99E+00 | 1.43E+00 | 1.09E+00 |
|  | **2.14** | 1.37E+03 | 2.52E+01 | 2.83E+00 | 1.41E+00 | 1.08E+00 |
|  | **2.4** | 1.16E+03 | 2.15E+01 | 2.70E+00 | 1.39E+00 | 1.08E+00 |

The minimum count rate in the first qlook channel with the attenuator in will be about 12 counts/sec or close to 50 counts in 4 seconds. The rate should not go to zero and so can be used with the scaling factor to estimate the unattenuated count rate. Based on the mid-temperature range of 1.37 keV the attenuator scaling factors for the five channels should be, [3000., 50, 3.5, 1.5, 1.1].