0.1 Dead Time Correction for HRC QE values

During the Flat Field illumination tests of the HRC detectors, the electronics were modified so as to allow a data rate $\approx 10\times$ the telemetry limit of ≈ 188 sec^{-1}.

In practice, data rates were intentionally limited to $1200 - 1400$ sec^{-1} for the HRC-I for all energies except for Boron. The Boron data were flux limited.

The dead time for the HRC detectors has been measured to be $\tau = 68.5\mu$-seconds. The lions share of this is due to the ADC conversion time (Jack Gomes personal communication).

Due to the nature/cause of the dead time, dead time corrections can be applied to the Flat-Field HRC QE values by considering the instrument as a non-paralyzable (non-extendable dead time) detector with a characteristic dead time of $\tau = 68.5\mu$-seconds. At measured rates of ~ 1200 sec^{-1} this will cause an underestimate of the true rat of $\sim 9\%$. QE values as determined from these measurements will underestimate the QE values at low ("zero") count rates by the same factor.

It can be easily shown under the above assumptions that:

$$\frac{QE_{true}}{QE_{meas}} = \frac{R_{true}}{R_{meas}} = \frac{1}{1 - R_{meas}\tau} \tag{0.1}$$

Where the true values are the "zero-rate" limits. The values of these corrections are presented in **DTC_FF_correction.values**. They have been applied to the QE maps (fits format) and are indicated by the presence of dtc in the data name.