

Checkout3 Sky Model

Problems with the sky simulation in Checkout 3

The sky model that we used for Checkout 3 has been found to have a number of problems, none insurmountable, but worth noting in one place. Here are the known problems with the Checkout 3 data, in no particular order. Please correct or add to the entries as appropriate. The model itself is described in detail [here](#).

Pointing history The FT2.fits file was generated with an incorrect value for MJDREF, had non-zero live times for the intervals when the LAT was in the SAA (IN_SAA flag set), and had 100% live time for all intervals (instead of the constant 90% that we had intended to adopt).

The problem with MJDREF was that the value was not what the tools expected (51910., corresponding to January 1, 2001), and most or all of the tools do not actually check the value of MJDREF in the headers of the events files that they read. The MJDREF that was used, 54101, corresponded to January 1, 2007.

Jim Chiang has made available a corrected FT2 file, [STC3-FT2_v1.fits.gz](#) that will be used for generating a 'posterity' Checkout 3 sky simulation and possibly also for DC2. In the longer term, **makeFT2a** will need to be fixed so that making correct FT2 files with realistic orbit/attitude profiles will not require modifying the output.

Other 3EG sources Jean Ballet noticed that the 'Other 3EG' sources in the sky model for checkout 3 are not actually present in the data. This was an accidental omission on my part (Seth).

Pulsar light curves The problems generating accurate light curves for pulsars noted at the outset of the checkout have been resolved by Max Razzano with the help of Jim, Toby Burnett, Masa Hirayama, and James Peachey. PulsarSpectrum was implicitly assuming that the orbit would always be analytically calculated, rather than interpolated from an FT2 file, and the code in astro that made the interpolations had a bug in reading the FT2 file. *(I am not sure whether all of the fixes are in place in v6r0p4).*

Extragalactic isotropic Jean Ballet also noticed, and [documented very well](#), that the extragalactic isotropic intensity was not at all isotropic. In the XML file, the isotropic source was defined in terms of a zenith-centered coordinate system - which is alright because it is isotropic no matter what spherical coordinate system you use, and zenith-centered coordinates allowed an easy way to specify that gamma rays that would be blocked by the earth should not be generated anyway. However, as Jim figured out, the same bug in astro mentioned above affected calculations of the zenith direction. *The problem has been fixed in v6r0p4.*

Flaring blazars For the flaring blazars in the Checkout 3 data, nothing formally wrong was found, but some of the synthetic light curves have unphysically hard spectra - like rising with energy - at least some of the time.

GBM GRBs More than one user noticed that **gtbin** complained about the times being out of range for the simulated GBM data for the GRBs. This is a direct consequence of the incorrect MJDREF used in the FT2 file that was used for generating the LAT GRBs, and so is straightforward to resolve.

Galactic diffuse emission From Jean Ballet: "The latitude part of the WCS keywords for the Galactic diffuse cube are incorrect. They currently stand at CRPIX2=1, CRVAL2=-89.75. In the absence of any other indication, a compliant WCS tool (like ds9) interprets this as a cartesian projection in spherical coordinates such that the equatorial plane passes by this point (very close to the South pole), not really what you want. Look at Fig 2 of Calabretta and Greisen 2002 and the associated text which makes it very clear. The correct way to specify a cartesian projection is to set the reference point exactly on the equatorial plane you want (the Galactic plane in your case). CRPIX2=180.5 and CRVAL2=0. Also, 'GLON' should be 'GLON-CAR' and 'GLAT' should be 'GLAT-CAR' in CTYPE."