

Mock AGN README file - 22 Jun 2020 -

The following two mock catalogs of active galactic nuclei (AGNs) are made available in the SIMPUT format to allow straight simulations of X-ray AGN surveys with the SIXTE tool (Dauser et al. 2019; see also <https://www.sternwarte.uni-erlangen.de/research/sixte/> for all the technical details on SIXTE). They have been used by Marchesi et al. 2020 to simulate AGN surveys with Athena and with the AXIS probe. Please see that paper for additional information.

g07_a100deg2_sixte.fits (g07) :

It builds on the mock catalog g07_a100deg2.fits, generated using the Gilli, Comastri and Hasinger (2007) AGN population synthesis model (see the general README file on the webpage). AGNs have been simulated down to a 0.5-2 keV luminosity of $1E40$ erg/s, and up to redshift 10. The faintest sources reach 0.5-2 keV fluxes below $5E-20$ erg/s/cm² flux. The AGN surface density is $\sim 54,000/\text{deg}^2$.

v14_a100deg2_sixte.fits (v14) :

It builds on the mock catalog v14_a100deg2.fits, generated using the Vito et al. (2014) X-ray luminosity function (see the general README file on the webpage), and contains only high-z AGN (in the range $z=3-20$). AGNs have been simulated down to a 0.5-2 keV luminosity $1E40$ erg/s, and reach fluxes below $\sim 2E-20$ erg/s/cm² flux in the same band. The $z>3$ AGN surface density is $\sim 29,000/\text{deg}^2$.

IMPORTANT: to work within SIXTE, the names of column 1 to 9 should not be modified. The spectral library contained in the spectra_GCH07.tar.gz archive needs to be unpacked in the same directory of the mock catalogs.

Column description

Column 1: SRC_ID. A numerical identifier. There is no overlap between the g07 mock IDs and the v14 mock ones, to allow one to merge the two together (after removing the $z>3$ sources from the g07 mock).

Column 2: RA. Source Right Ascension. It ranges between -5.0 and 5.0 deg.

Column 3: DEC. Source Declination. It ranges between -5.0 and 5.0 deg.

Column 4: E_MIN. Lower energy boundary for the FLUX parameter (see column 6). This value is equal to 0.5 keV for all sources.

Column 5: E_MAX. Higher energy boundary for the FLUX parameter (see column 6). This value is equal to 10 keV for all sources.

Column 6: FLUX. Observed source flux in the energy range described by the E_MIN and E_MAX columns. This parameter is then used as an input for the SPECTRUM parameter (see column 7).

Column 7: SPECTRUM. Spectrum associated to the source. The full spectral library is contained in the spectra_GCH07.tar.gz archive and is based on the templates used in [Gilli, Comastri and Hasinger \(2007\)](#). In the XSPEC formalism the baseline model is: $phabs*(zcutoffpl+pexmon+zphabs*zcutoffpl)$, where

- *phabs* is the Galactic absorption (set to $1.8E20 \text{ cm}^{-2}$).
- The first *zcutoffpl* describes the fraction of main emission scattered, rather than absorbed by the obscuring material surrounding the accreting supermassive black hole, as well as the unresolved emission lines from photoionized gas in the narrow line region, and even soft X-ray emission from star forming processes in the host galaxy. The normalization of this power law component is set to 3% of the main power law, as typically seen in X-ray spectra of AGN. The photon index is $\Gamma=1.9$, and the high-energy cut-off is set at $E=200 \text{ keV}$.
- *pexmon* ([Nandra et al. 2007](#)) models the emission reprocessed by cold material surrounding the accreting supermassive black hole, including self-consistently generated fluorescence lines such as the Fe K α , the Fe K β , the Ni K α and the Fe K α Compton shoulder.
- *zphabs* models the photoelectric absorption of a material with column density NH . NH is quantized and varies within the following values: $\log NH=[20.5, 21.5, 22.5, 23.5, 24.5, 25.5]$.
- The second *zcutoffpl* models the main emission component.

For sources with $\log NH=25.5$ (i.e., heavily obscured Compton thick sources) we set the normalization of the power law component to 0, assuming that all the emission comes from the *pexmon* component: we do so because the *zphabs* component does not accurately describe the absorption caused by material having column density $\log(NH)>25$.

The spectra contained in our library are quantized in redshift, with steps $\Delta z=0.1$.

Column 8: IMAGE. This column describes the extended shape of the source. Since all AGNs are point-like in the X-rays, the value is set to NULL.

Column 9: LIGHTCUR. This column can be used to associate to the source a variability profile. This mock does not include variability effects, so the value is set to NULL.

Column 10: z. Source redshift.

Column 11: FLUX_052. Observed source flux in the 0.5-2 keV band in erg/s/cm^2 .

Column 12: FLUX_210. Observed source flux in the 2-10 keV band in erg/s/cm^2 .

Column 13: LX_052. Logarithm of the intrinsic 0.5-2 keV source luminosity in erg/s .

Column 14: NH. Logarithm of the column density of the obscuring material surrounding the accreting supermassive black hole in cm^{-2} .

Column 15: FLAG_TYPE. Flag of the source classifier (in this case "AGN").