The Southern Wide-field Gamma-ray Observatory

SWGO perspectives on the GADF

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For the SWGO Collaboration

VHE data format call: 29/09/2021

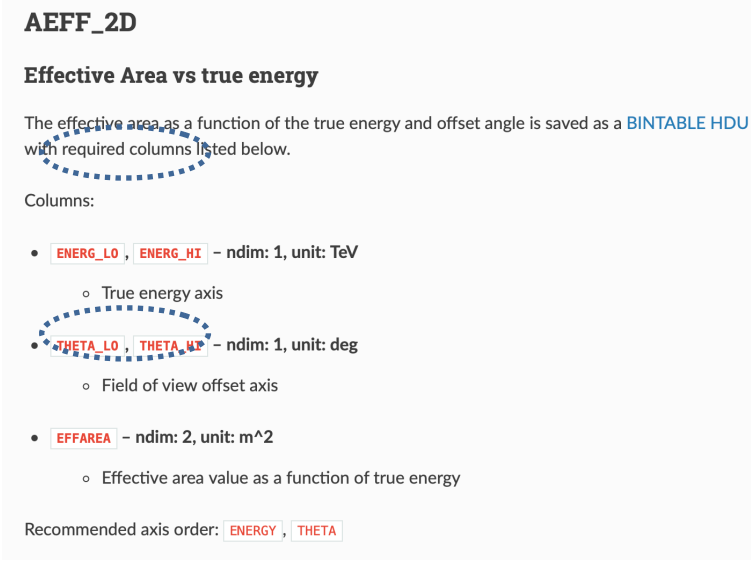
What is SWGO?

- A proposed Water Cherenkov Detector located in South America
- Energy range ~100s GeV to ~100s TeV
- High fill-factor core detector + sparse density outer array

IRFs production: The SWGO is very interested to produced GADF compliant IRFs and work with open source tools, but some adaptations to the GADF are requested.

SWGO IRFs - preliminary experiences and remarks

- The GADF format can work for SWGO with some tweaks
- The GADF definitions are very IACT-y
  - Some inclusive definitions would be nice
  - Definition of an observation
    - Utility of the obs-index table
  - Mostly time averaged IRFs
    - One CALDB with links to IRFs suffices, hdu-index redundant
  - The "natural" IRF axes are different for WCD vs IACT
    - Eg: zenith bins instead of offset bins
    - Possibility to have GADF agnostic to axis names? Eg: bins in (x1, x2, …)
      - This should be readable by gammapy.maps
- What is the implication of GTI for WCD?
- Dealing with different event classes is required
- Will most likely need asymmetric IRF definitions



AEFF_2D

Effective Area vs true energy

The effective area as a function of the true energy and offset angle is saved as a BINTABLE HDU with required columns listed below.

Columns:

- `ENERG_LO`, `ENERG_HI` – ndim: 1, unit: TeV
  - True energy axis
- `THETA_LO`, `THETA_HI` – ndim: 1, unit: deg
  - Field of view offset axis
- `EFFAREA` – ndim: 2, unit: m^2
  - Effective area value as a function of true energy

Recommended axis order: `ENERGY`, `THETA`

A DL4 unification

- A typical use case: All sky binned counts and background maps + IRFs
  - Typically called the DL4 level within CTA
  - No DL4 definition exists in the GADF
  - There is an internal gammapy format (Datasets, PSFMap, EDISPMap):
    - Should not be too complicated to generalise it
    - Strong use case within SWGO
    - Should also be useful for joint fitting with other instruments