Gammapy status on Pulsar analysis

Gammapy coding sprint, 10 - 14 June 2024

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PINT recipe

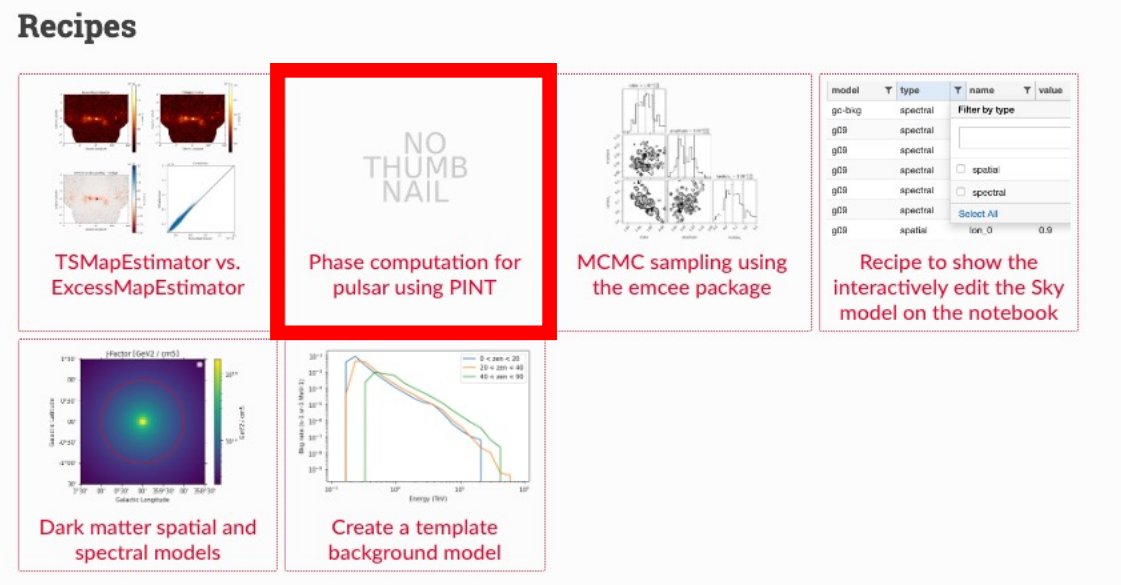
The recipe is now published and available at here !

It shows how to compute pulsar phases using PINT.

TODO:
- Tumbnail ?
- Update version:
  - Gammapy 1.2
  - PINT 1.0 (released April 26, 2024)
- Issue with written events:

EVENT_ID	TIME	RA	DEC	ENERGY
	s	deg	deg	TeV
int64	float64	float32	float32	float32
2402	333778852.5099249	84.59457	22.03088	0.18194601
2408	333778852.5267153	84.21462	23.44914	0.08397394
2434	333778852.61315054	83.524704	22.725792	0.10596932
2445	333778852.6690142	83.76957	22.451006	0.19733498
2478	333778852.7627939	83.478516	23.484594	0.08522219
2481	333778852.7778549	83.71517	21.985115	1.0020943
2513	333778852.8644467	82.421196	22.567652	0.14374068
2544	333778852.9826064	83.64136	22.041315	0.10316629
2559	333778853.0269414	84.069176	22.97337	0.047184493

Phases ?



Phase computation for pulsar using PINT

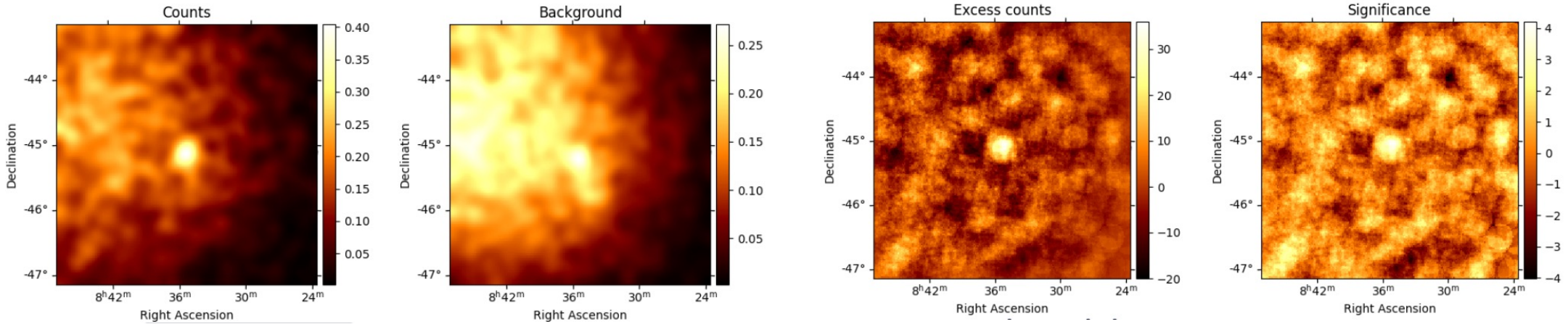
This notebook has been done for the following version of Gammapy and PINT:

Gammapy version : 1.0.1

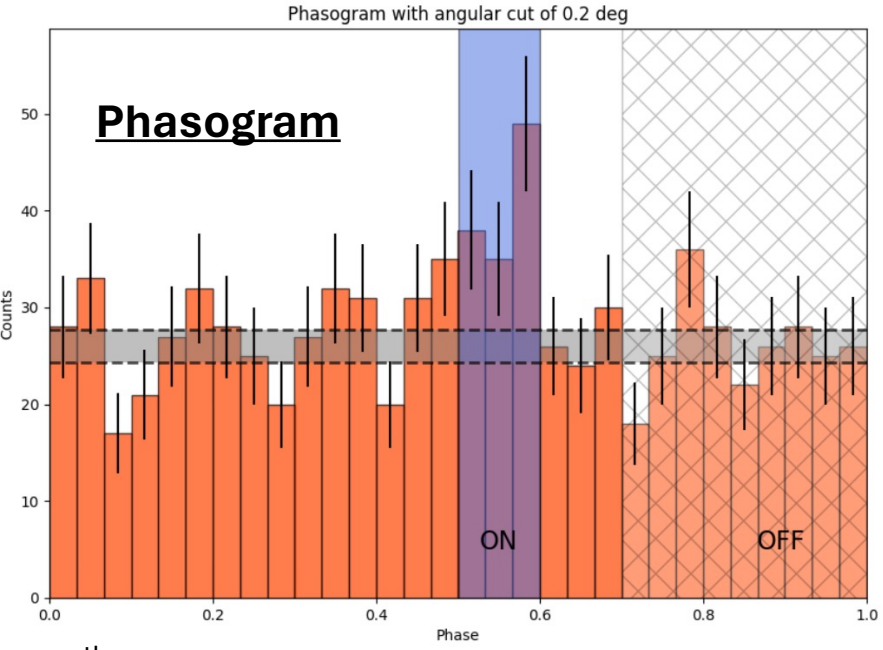
PINT version : 0.9.5

Pulsar analysis: What we can do !

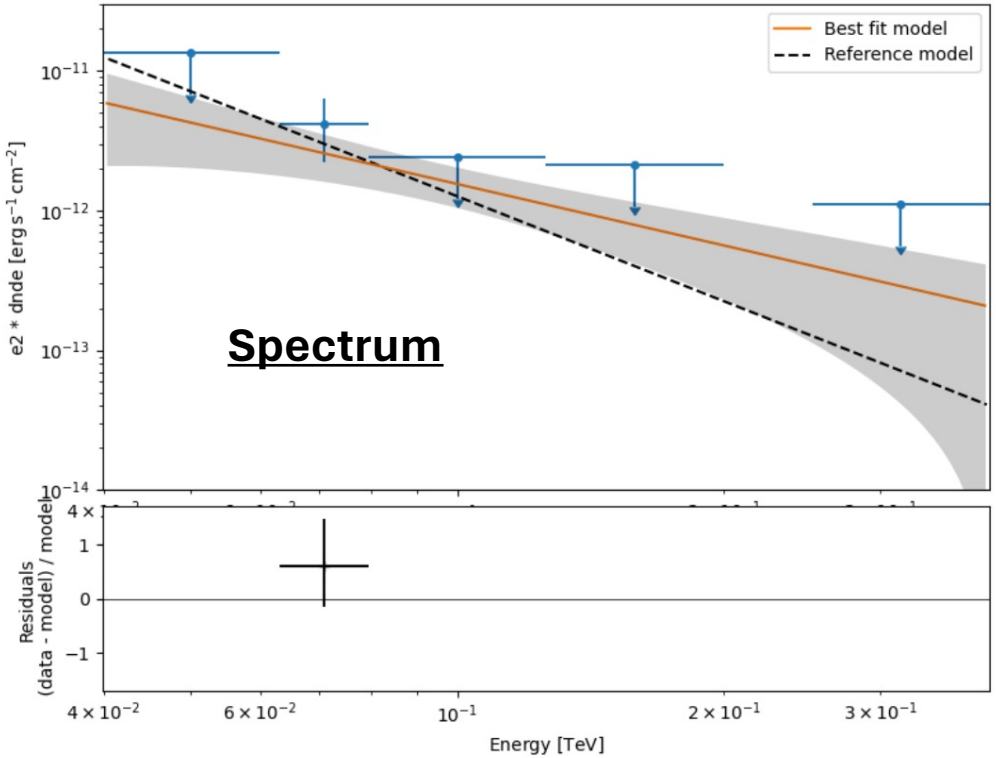
Pulse Map



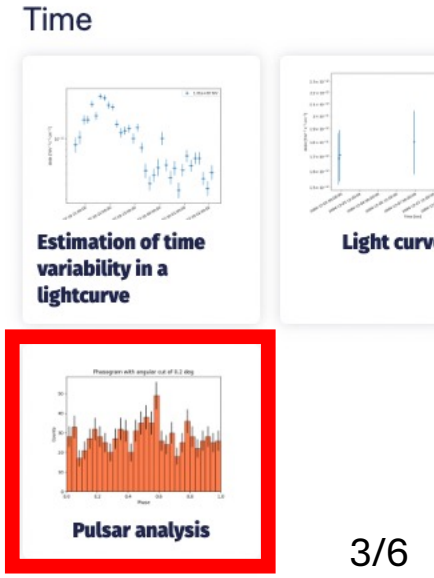
Phasogram



Spectrum



Tutorial



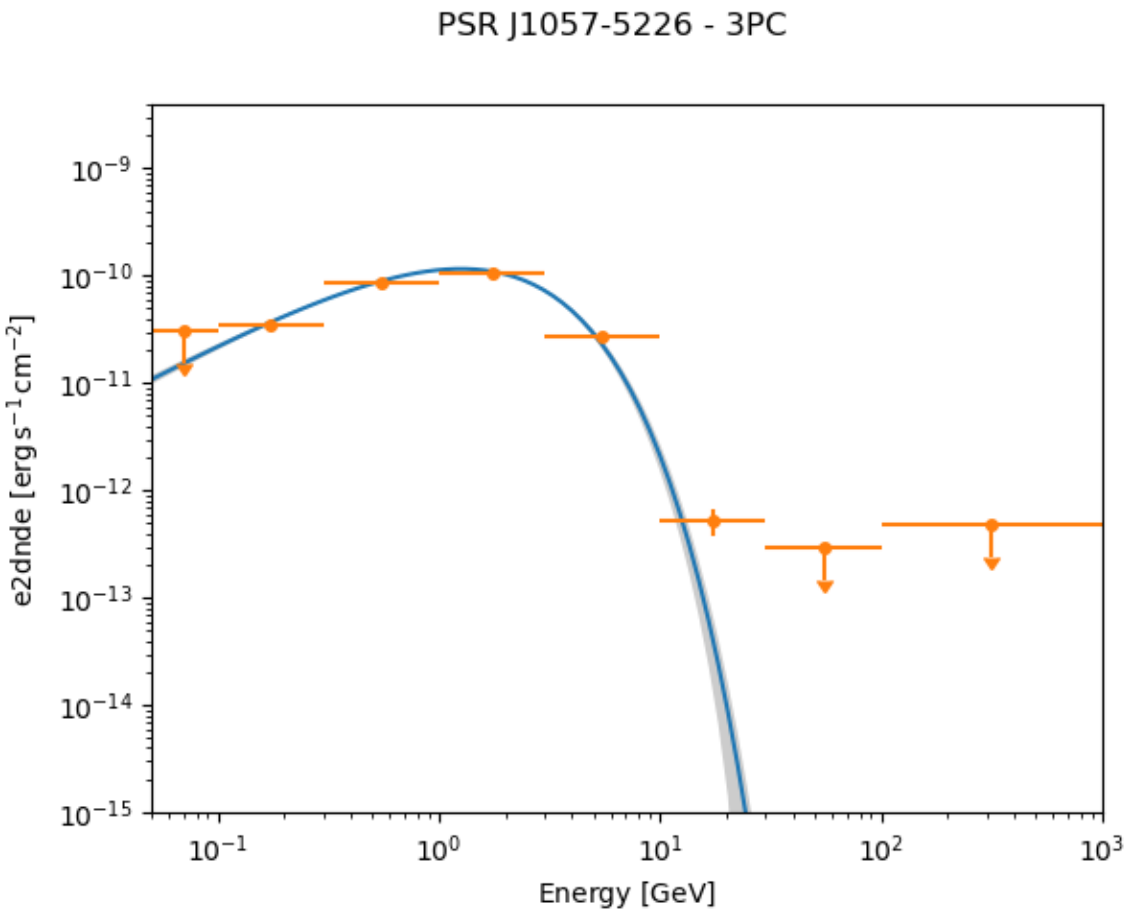
Fermi-LAT 2PC and 3PC

2PC and 3PC have been added to Gammapy catalog

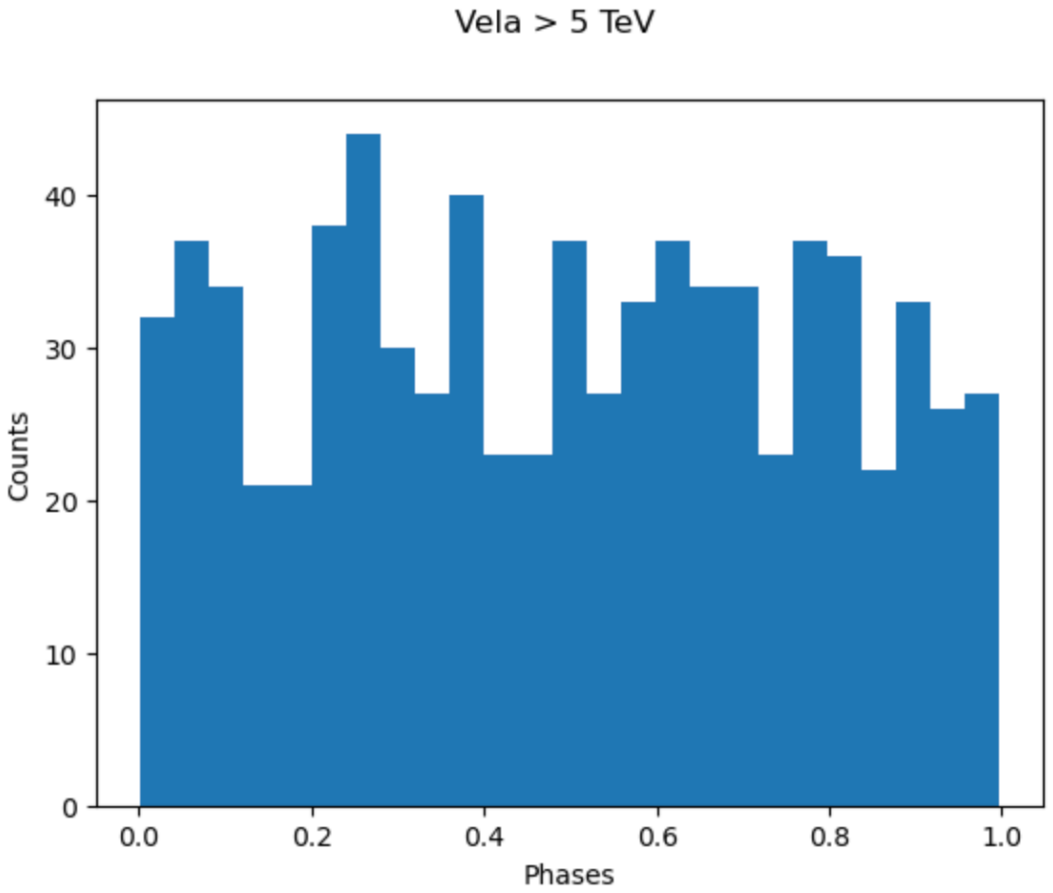
Pulsar characteristic:
- Period, $\dot{P}$, $\dot{E}$, etc..
- Number of peak, peak separation
- Position, distance,

Pulsar SED:
- Fitted model
- Flux points

Not implemented yet:
- Phasogram handling



Feedback from CTAO Interal SDC: Where is Vela ?



CTAO Internal Science Data Challenge

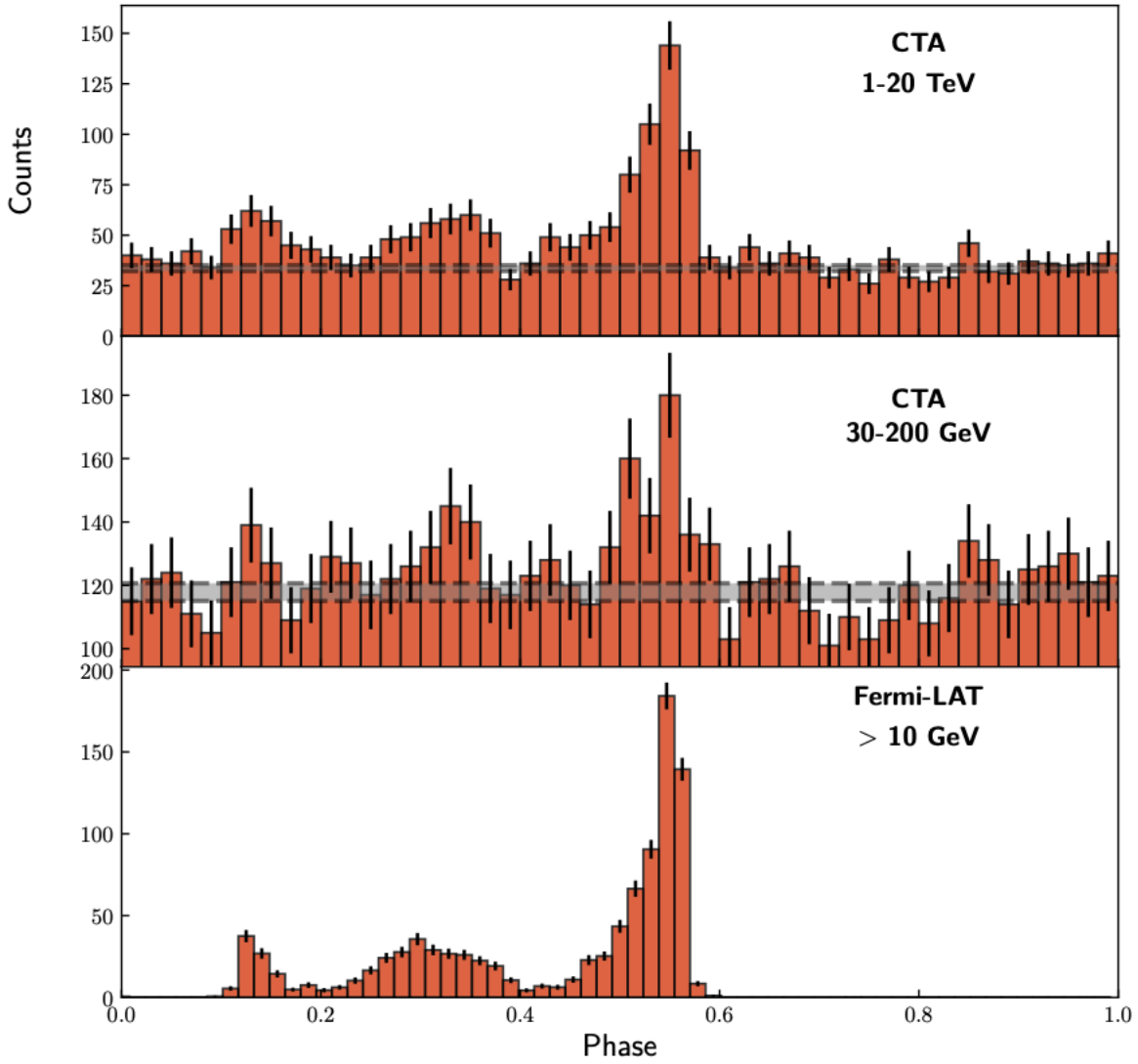


Fig 12 of CTAO GPS paper: ArXiv

Pulsar analysis: What we still need !

- Container for Phasogram

- Fitting Phasogram:
  - Prototype at gammapy-pulsar GitHub repo.
  - Using Gammapy Fit API
  - But: Gammapy model API pretty inflexible (SkyModel needs a spectral model !)

- Unbinned analysis:
  - Pulsars are a good use case (few events)
  - Weighted phasogram and periodicity tests (H-test)