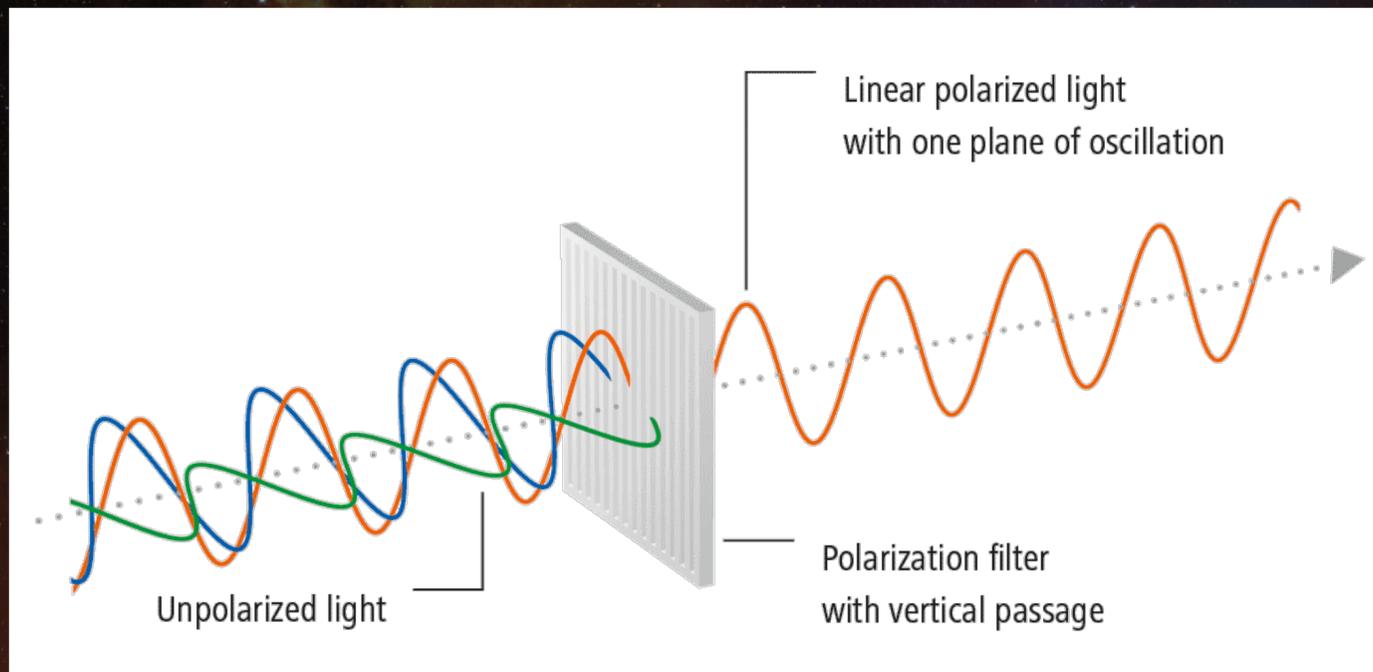


From models to measurements

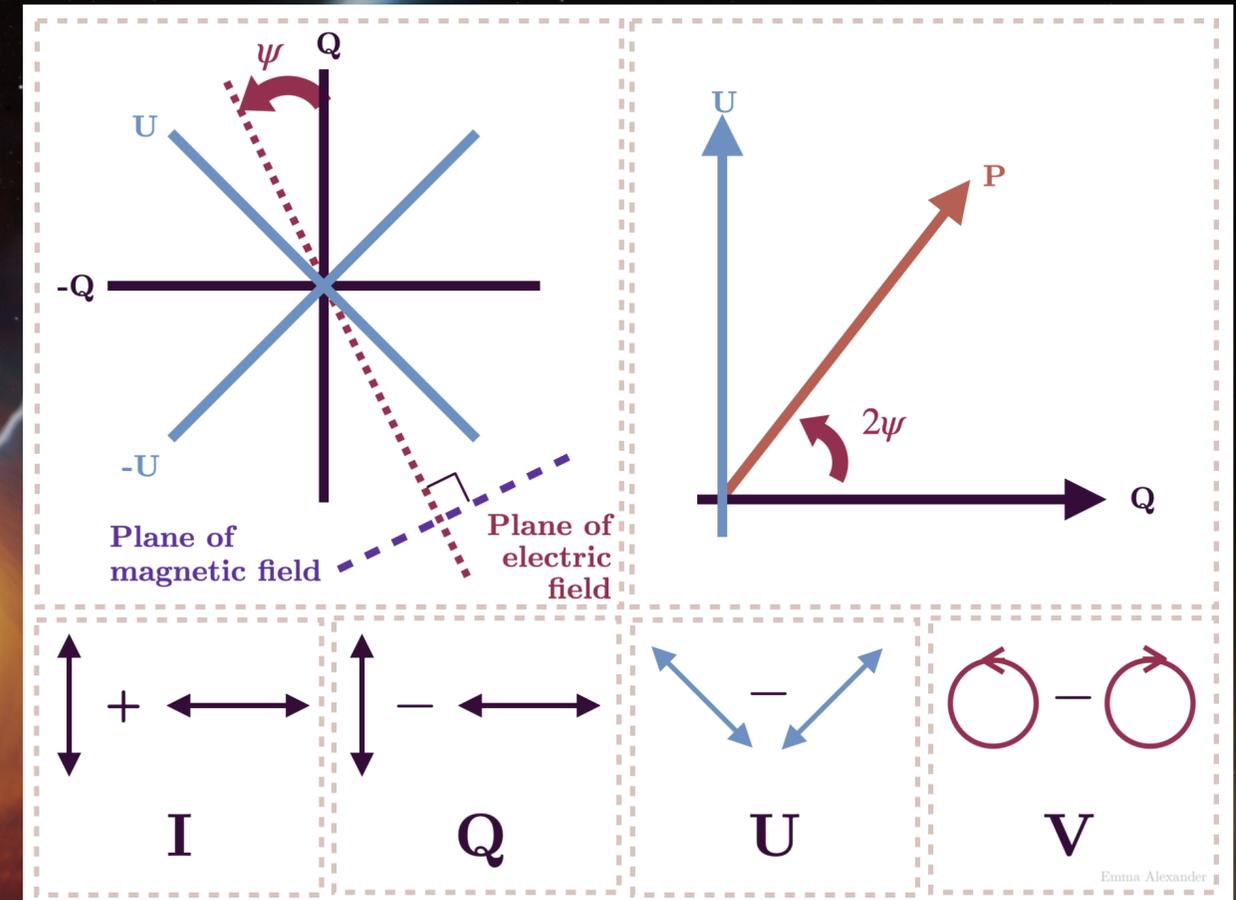
A unified framework for blazar polarisation detectability

Sara Capecchiacci
MuMeNTA - 2026

Polarisation



Baumer Switzerland



Emma Alexander

$$PD = \sqrt{q^2 + u^2} \quad PA = \frac{1}{2} \tan^{-1} \left(\frac{u}{q} \right)$$

Discriminating blazar emission models with high-energy polarimetry



- Obtain predictions on flux and PD of the Robopol Monitoring Program sample
- Give estimates of optimal exposure times
- Discriminate between leptonic, hadronic and hybrid emission scenarios

Discriminating blazar emission models with high-energy polarimetry



- StokeSAT: 0.275 keV
- eXTP: 0.5-10 keV
- IXPE: 2-8 keV
- EXPO: 6-35 keV
- COSI: 0.2-5 MeV
- Fermi-like: 0.1-100 GeV

Emission scenarios

Leptonic →

dominated by electron emission. SSC
from primary electrons, EC

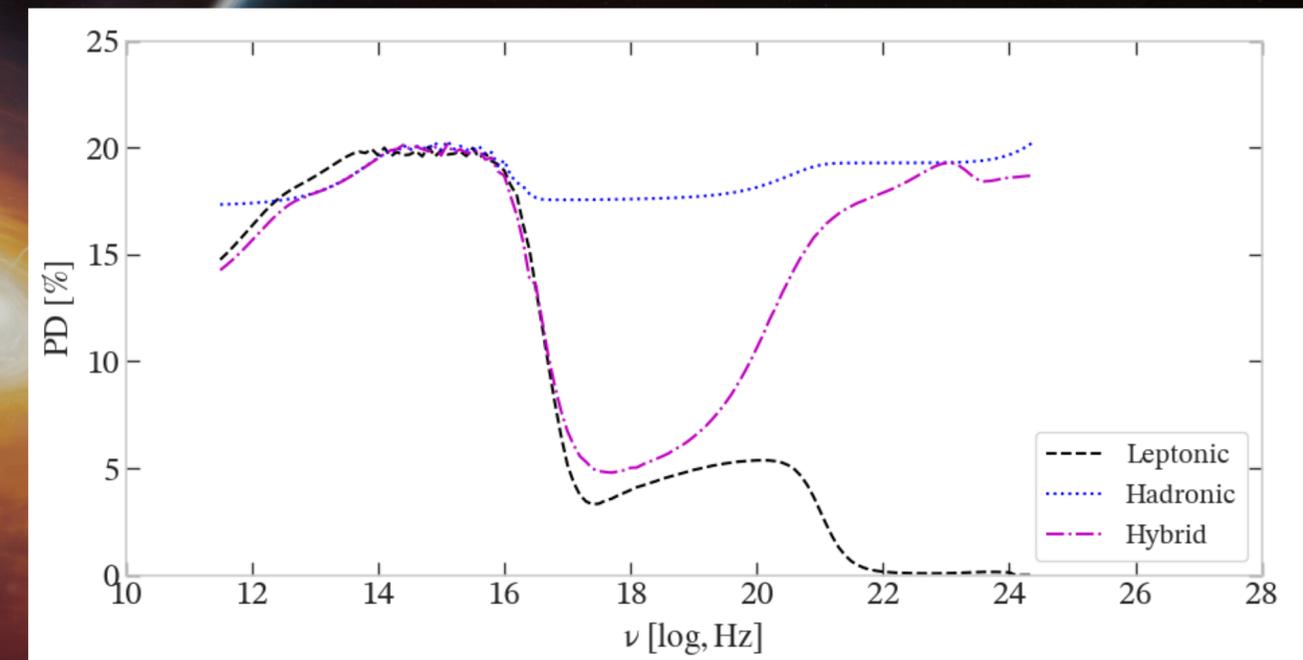
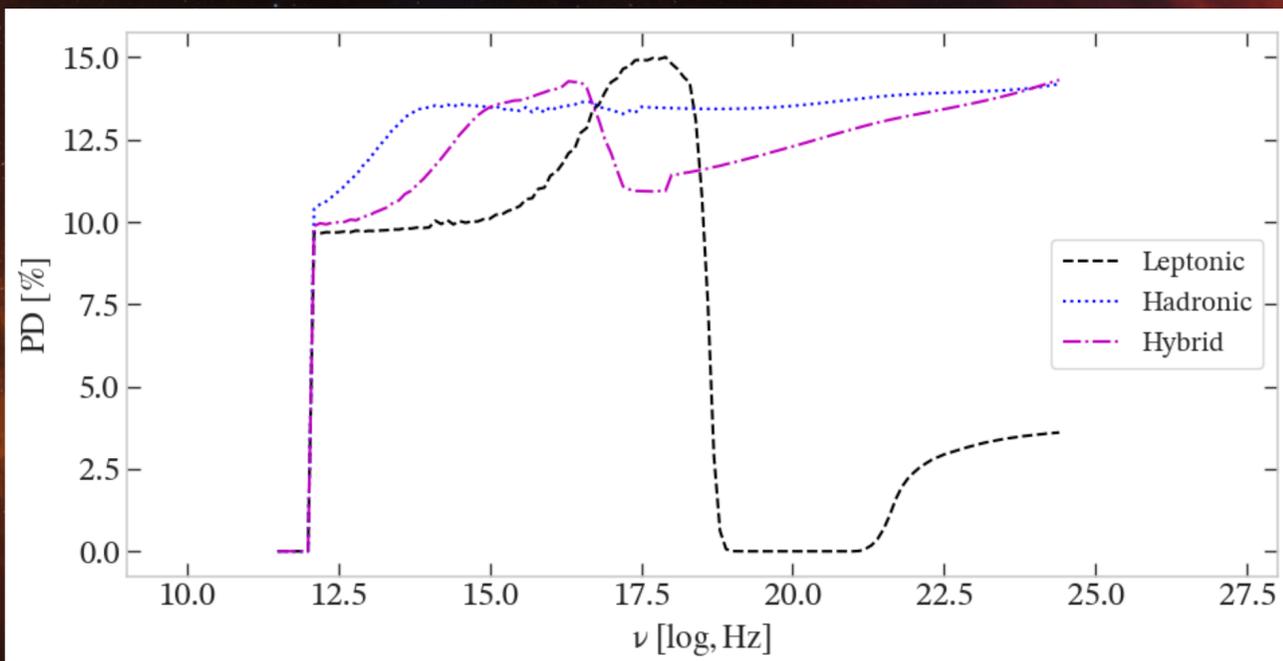
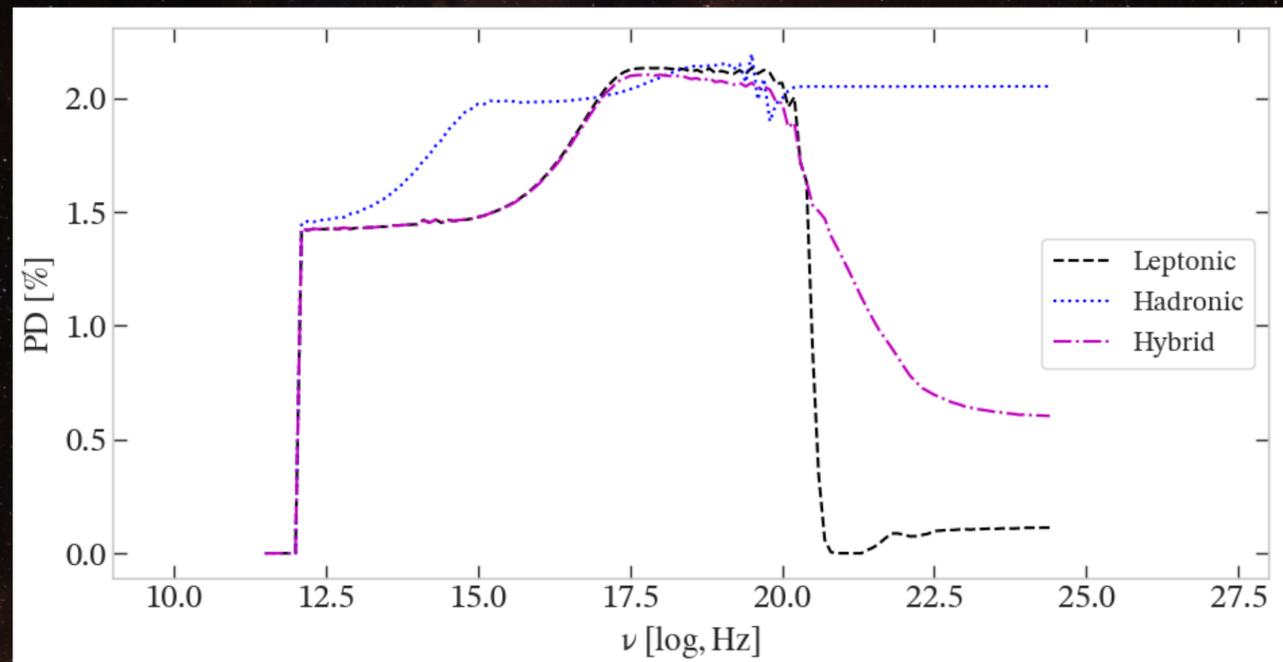
Hadronic →

dominated by primary electrons and
protons. Synchrotron by primary protons
and by secondary electron-positron pairs

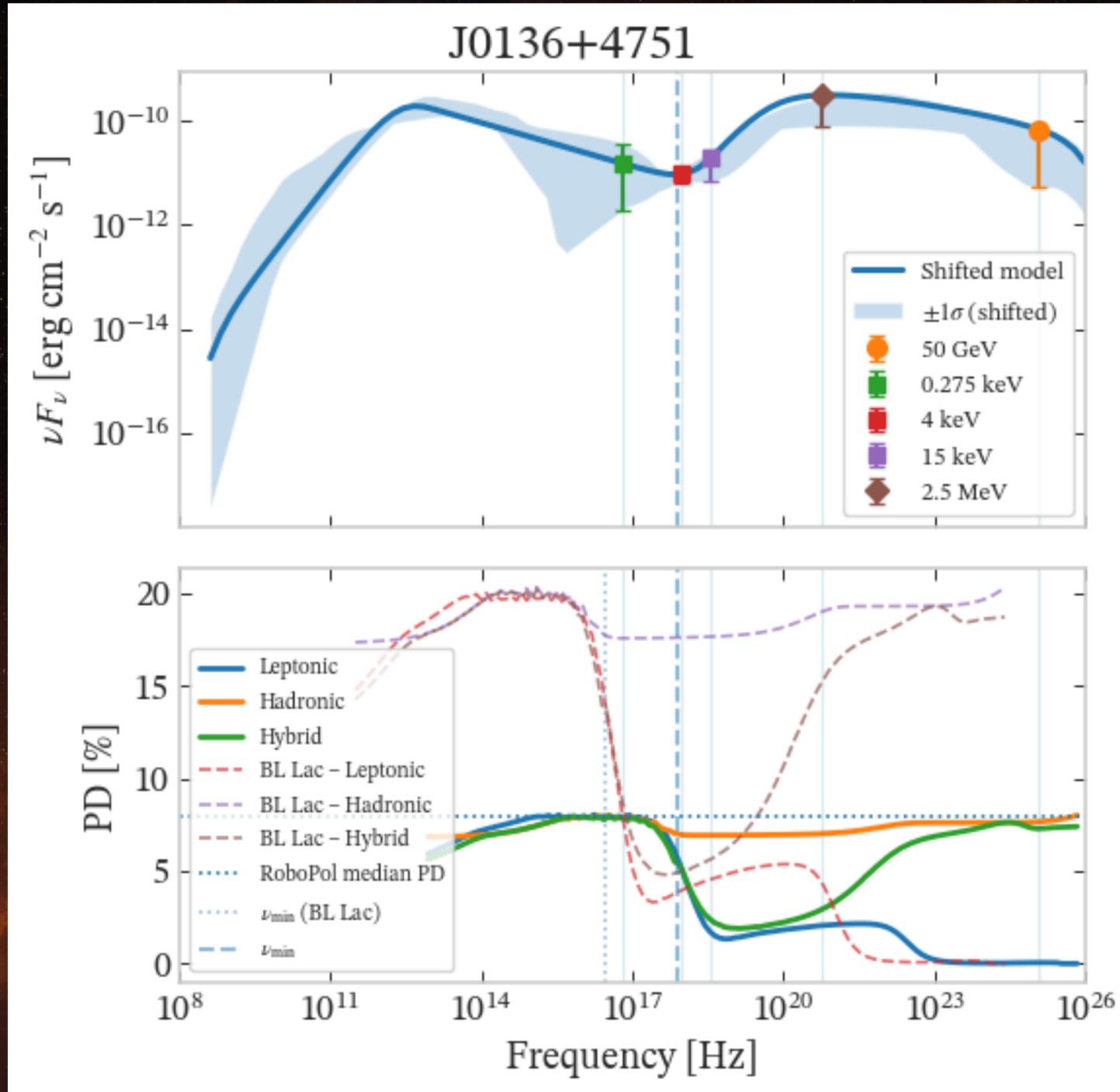
Hybrid →

hadronic + SSC from primary electrons

Polarisation models: templates



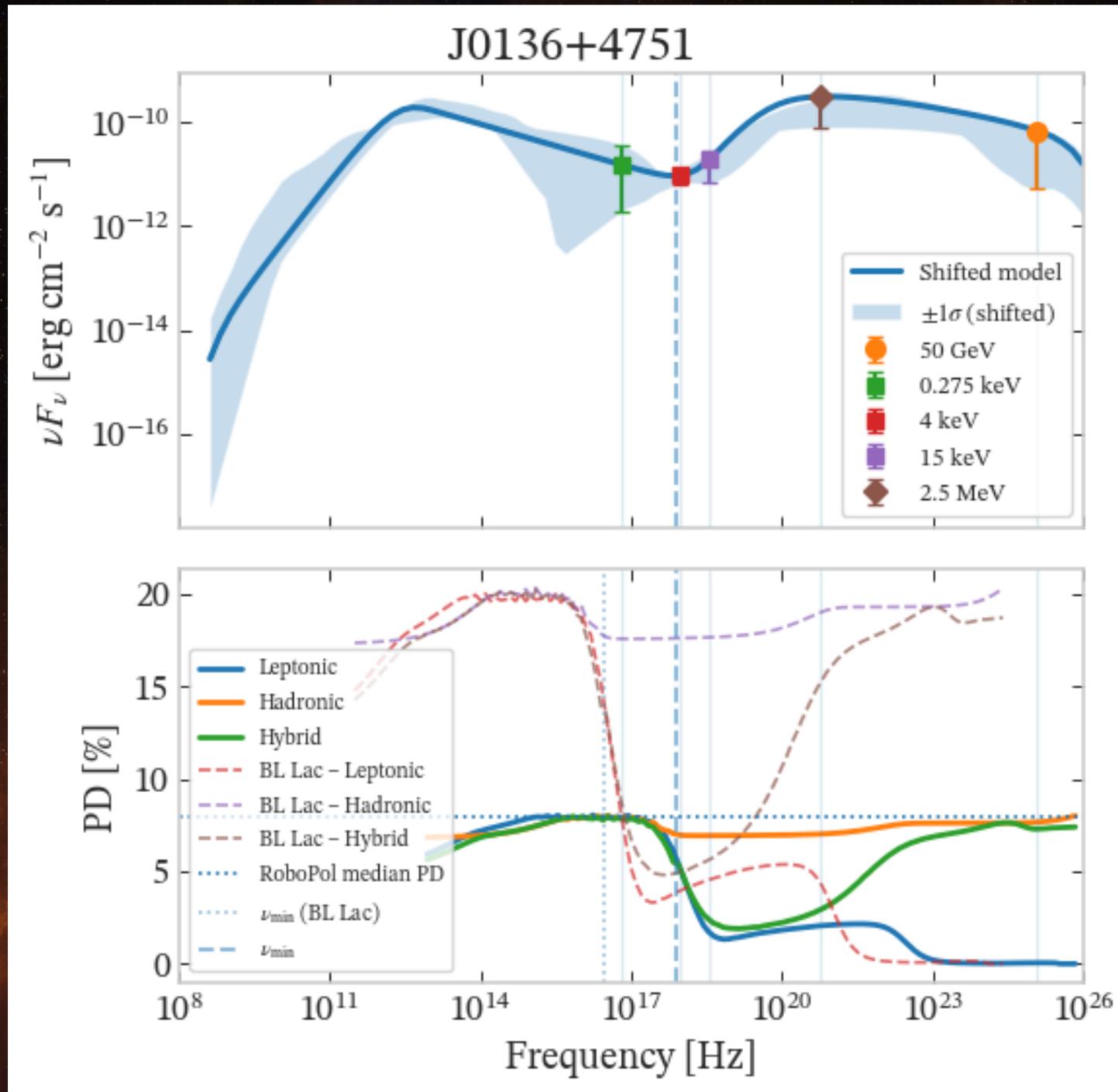
Modelling of flux and PD



Flux

- SED fitting: Bjet-MCMC
- Match to 4FGL synchrotron peak
- Match to CAZ flux (0.3-10 keV)
- Extract flux at frequencies of interest

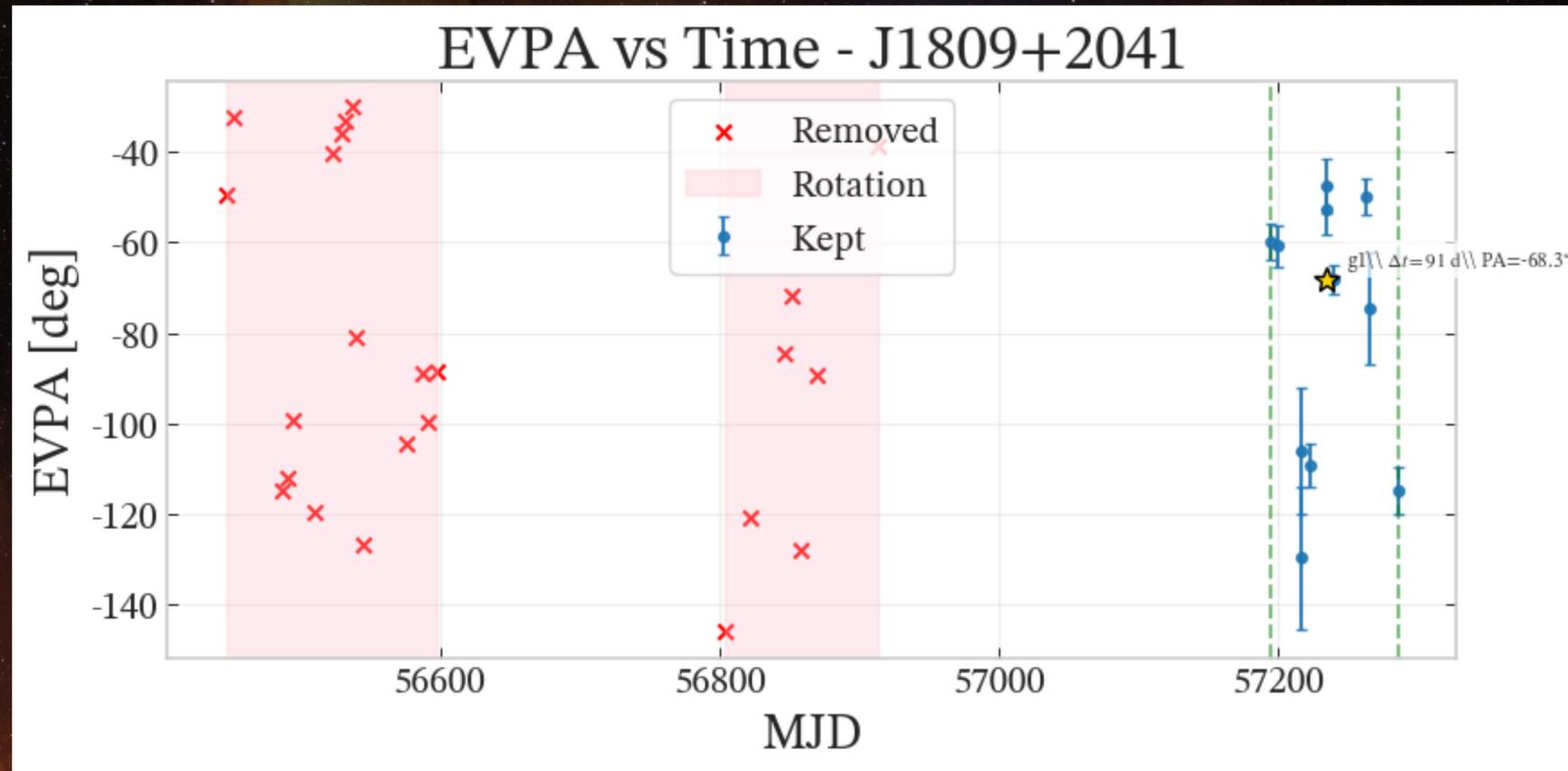
Modelling of flux and PD



PD

- Use our PD template models for our source classes
- Match the frequency of the minimum between the two peaks
- Match the median Robopol PD value
- Extract PD at frequencies of interest

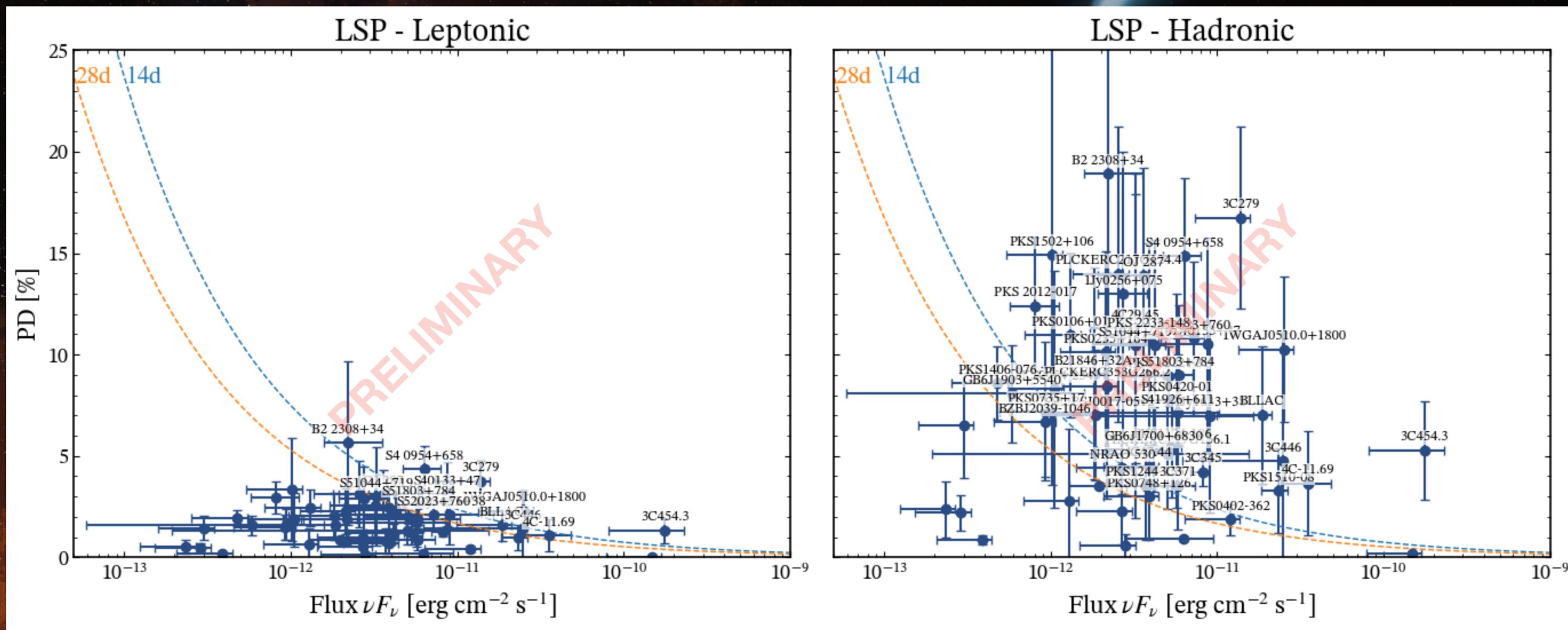
Estimate of exposure times



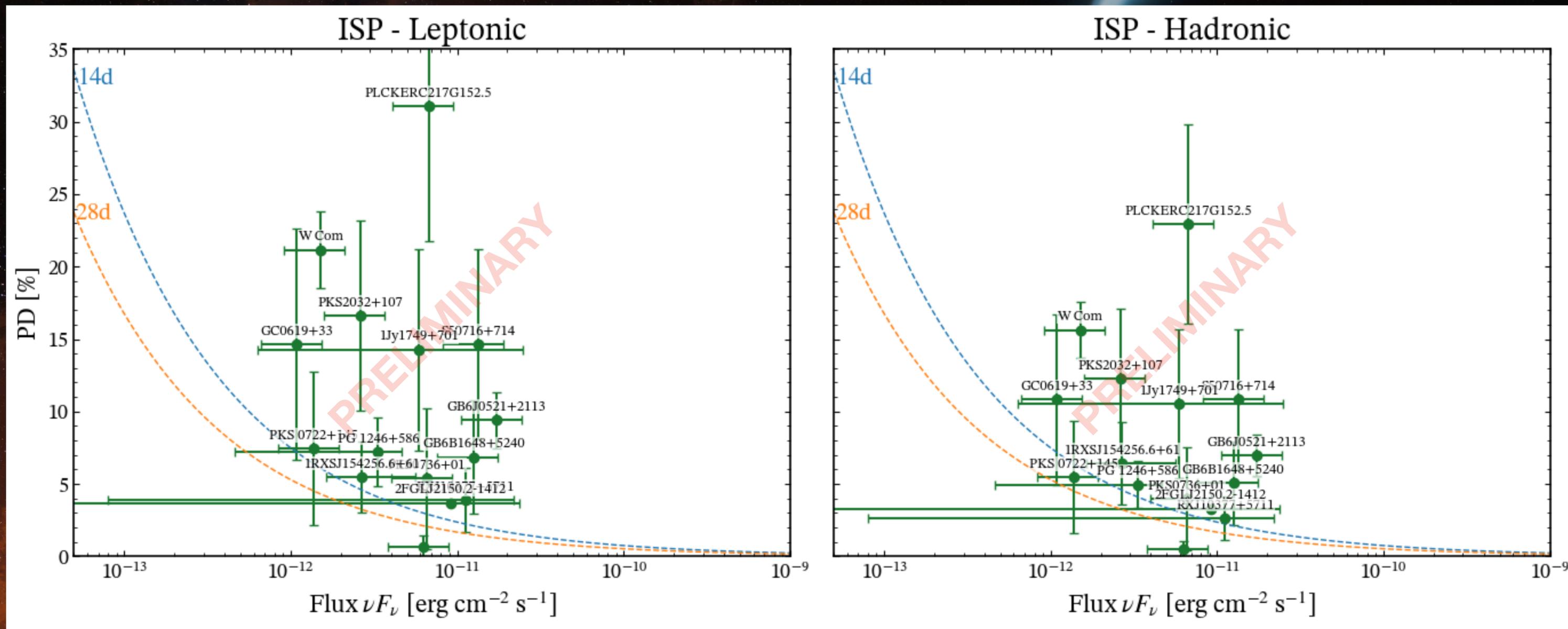
- Define rotations as $>90^\circ$
- Remove them from Robopol lightcurves
- Check the duration of PA-stable periods

Find optimal exposure times of 14 days and 28 days

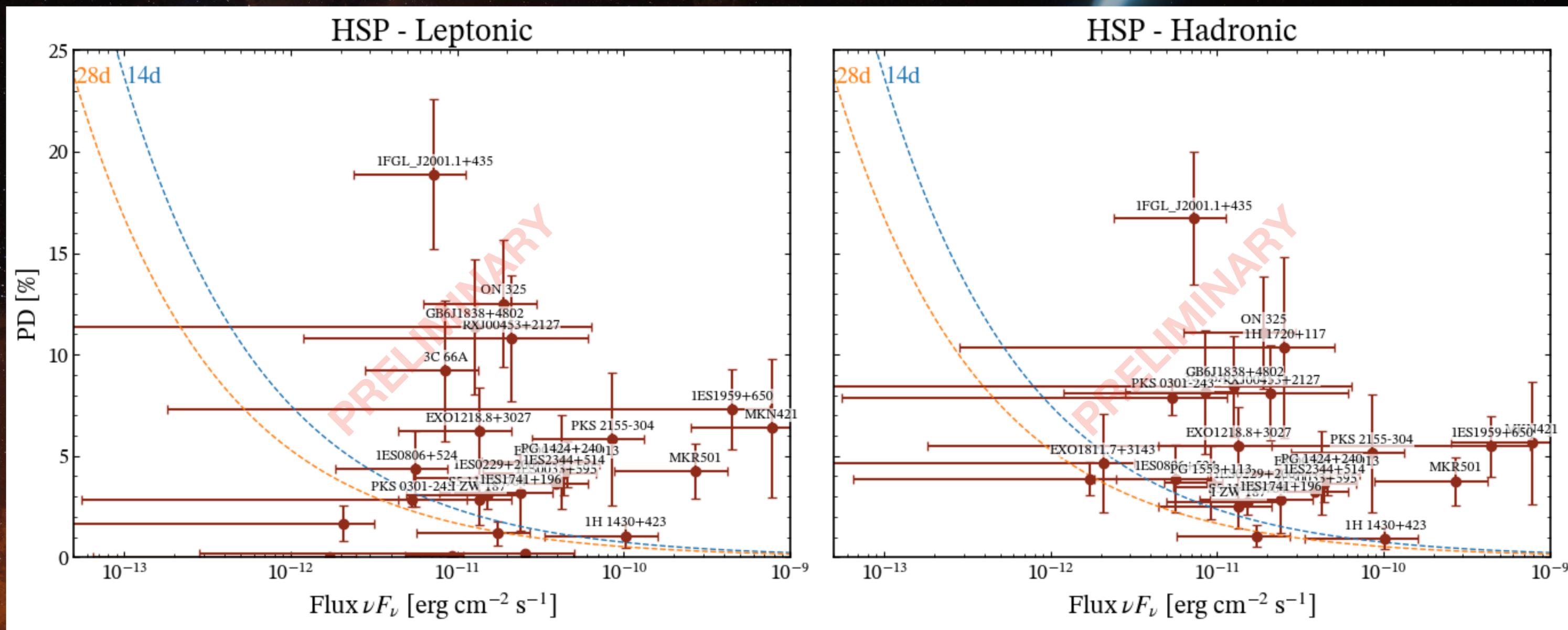
Example: 6-35 keV (EXPO)

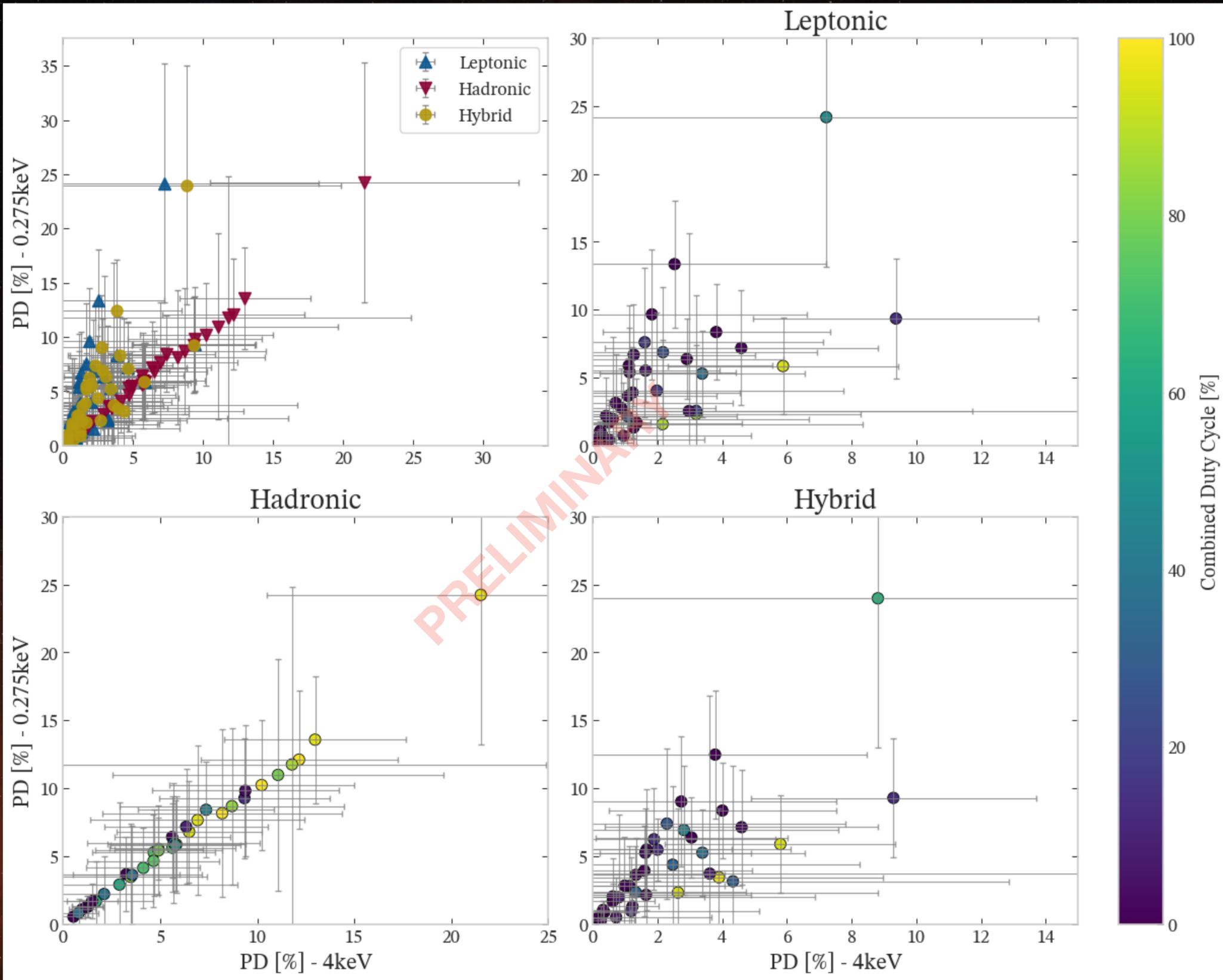


Example: 6-35 keV (EXPO)



Example: 6-35 keV (EXPO)

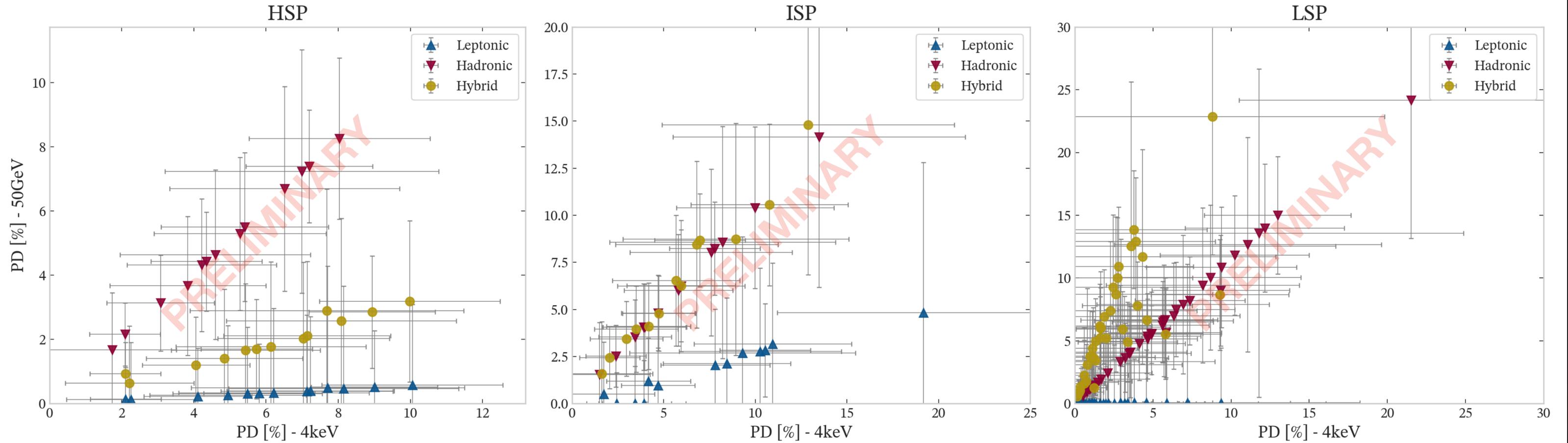




Instrument's duty cycle

- LSP sources
- 28 days exposure
- IXPE (2-8 keV) vs StokeSAT (0.275 keV)

Future GeV mission and requirements



SED class	Flux (14 d) [erg cm ⁻² s ⁻¹]	Flux (28 d) [erg cm ⁻² s ⁻¹]
LSP	$2.181 \cdot 10^{-10}$	$1.091 \cdot 10^{-10}$
	$1.860 \cdot 10^{-10}$	$9.300 \cdot 10^{-11}$
ISP	$2.354 \cdot 10^{-12}$	$1.177 \cdot 10^{-12}$
	$4.948 \cdot 10^{-11}$	$2.474 \cdot 10^{-11}$
HSP	$4.882 \cdot 10^{-11}$	$2.441 \cdot 10^{-11}$
	$3.703 \cdot 10^{-13}$	$1.852 \cdot 10^{-13}$
	$7.248 \cdot 10^{-11}$	$3.624 \cdot 10^{-11}$
	$1.065 \cdot 10^{-11}$	$5.326 \cdot 10^{-12}$

Summary

We can use this framework for:

- Predictions on blazar PD, flux (detectability)
- Predictions on instruments' performance and capabilities (building proposals)

High energy polarimetric measurements are crucial to discriminate between different emission scenarios.

...We really need a new GeV polarimeter!

Backup slides: model components (ISP)

