SUGGESTION FOR ANALYSIS WORKFLOW TO CONSTRAIN ALPS/LIV/IGMF

SIMULATE OBSERVED SPECTRA

- Use sources given in google document
- Assume some intrinsic spectrum ***F(E)*** with **parameters θ + EBL absorption** of one model
- Simulate spectra with ctools / gammapy (Asimov data set)

DERIVE CONSTRAINTS FOR LIV/ALPs

- Fit observed spectrum with $P(E)F(E,\boldsymbol{\theta})$
- **Null hypothesis:** $P(E) = exp(-\boldsymbol{\tau})$, i.e. EBL only
- **Alternative hypothesis:** $P(E)$ given by LIV, ALPs
- P(E): pre-compute over grid of model parameters, **e.g. ALP mass and photon ALP coupling**
- profile over θ (e.g. with ctools), **derive constraints for model parameters with likelihood ratio test**

DERIVE CONSTRAINTS ON IGMF

- In IGMF case: P(E) **depends on assumed intrinsic spectral parameters θ**
- **For ELMAG: possible to simulate for one set of θ and reweight simulation output**
- **Generate simulations for different IGMF parameters**
- **Fitting probably best performed with some homebrewed likelihood fit to implement reweighting**
- **Spatial fit?**