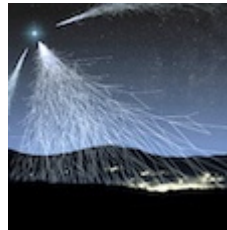


# ”Photons with GCOS”

*- flash talk -*



**GCOS workshop 2022  
Wuppertal, July 13-15**

Markus Risse, University of Siegen

*N.B.: I am also a big friend of neutrinos and normal CR!*

# Photons as UHE primaries ...

- the only gauge boson as CR primary!
- neutral (and massless)
  - source pointing!
  - transients (time-directional correlation)!
- **cornerstone of Multi-Messenger Astronomy**
- (proton-) GZK messengers
- attenuation length  $\sim 10$  Mpc: local universe (complementary to neutrinos)
- possible BSM indicators
  - time-directional correlation with distant transient: ?! (LIV, axions ...)
  - large photon fractions in top-down scenarios

**Photons are possible game changers**

# Photon detection by EAS (in SM)

- QED: precise theory! Hadronic uncertainties much reduced!
- $\sigma_{\text{EM}} \sim \sigma_{\text{p-air}}$  : usual EAS detectors OK
- trigger: EM detector (!)
- energy: EM detector
- separation:  $X_{\text{max}}$  (EM detector), muons (!)

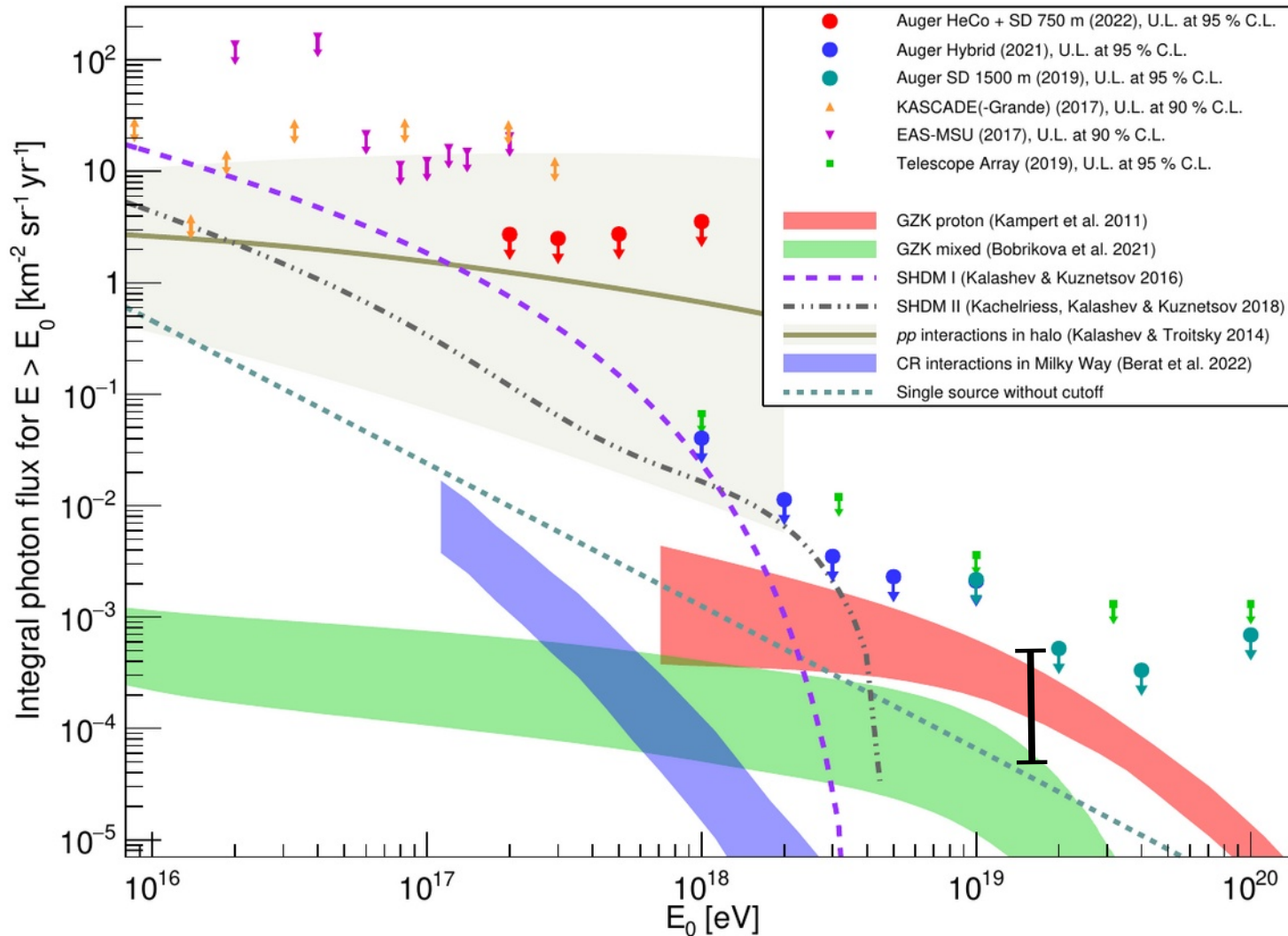
**“What is good for composition, is fine for photons” (EM trigger!)**

Current limitations:

- At UHE: exposure!
- At lower energy (larger statistics / bckgd ): separation!

# UHE photon search (diffuse flux)

Auger Collab. (ApJ 2022)  
[arXiv:2205.14864]



scratching GZK proton scenarios

factor  $\sim 10$  to reach mixed case: GCOS !

**Detection of cosmogenic photons in reach with GCOS ?!**

# **“Photons with GCOS” - conclusions:**

**Photons are a cornerstone of Multi-Messenger Astronomy**

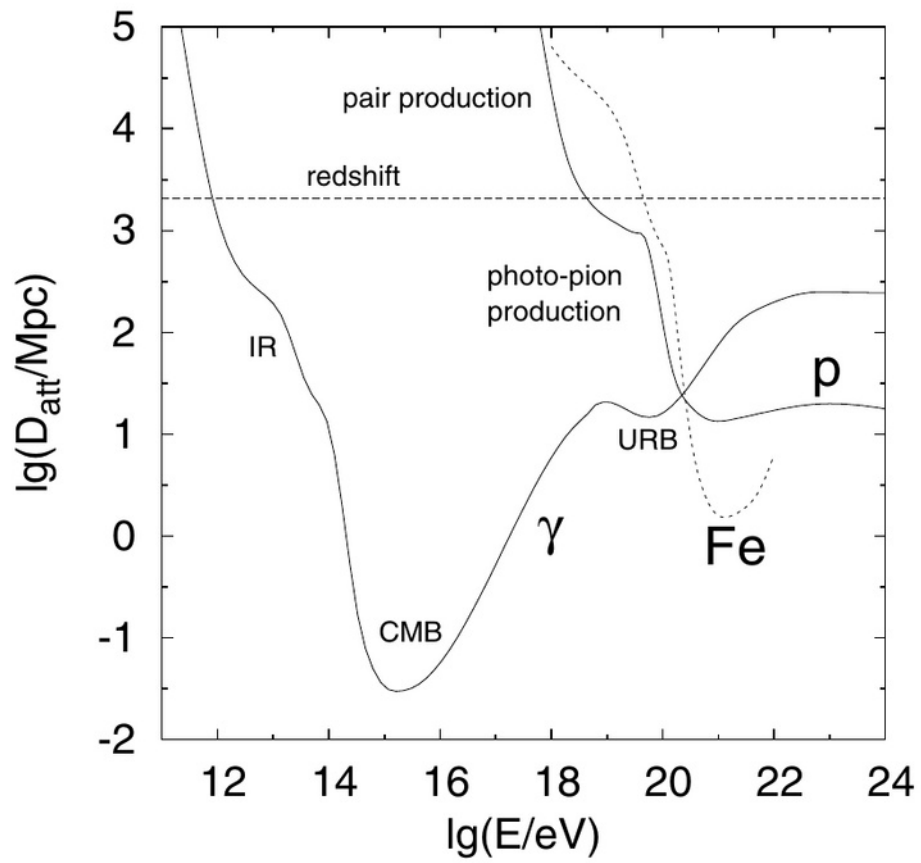
**Photons are possible game changers**

**“What is good for composition, is fine for photons!” (EM trigger!)**

**Detection of cosmogenic photons in reach with GCOS ?!**

**... consider UHE photon detection a primary GCOS goal:**

**Photons with GCOS !**



Risse, Homola (MPLA 2007)

