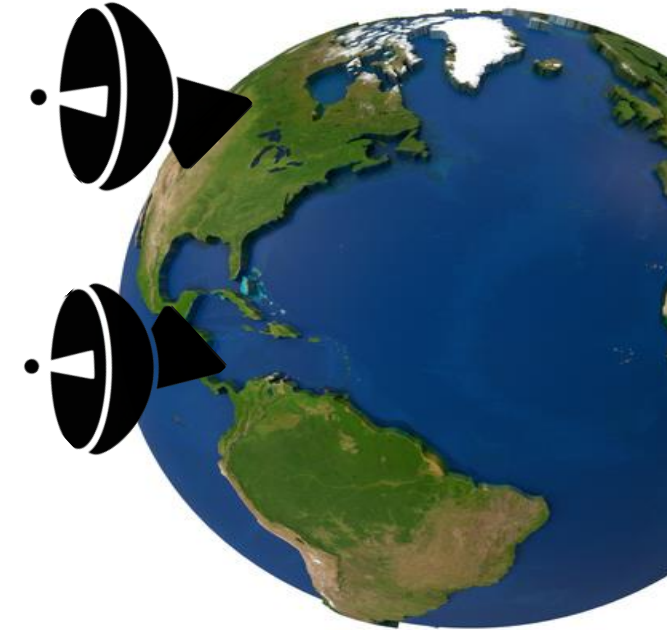
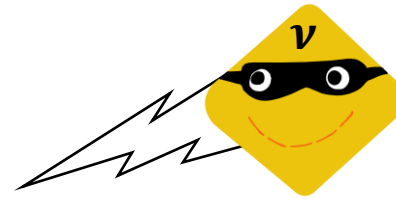
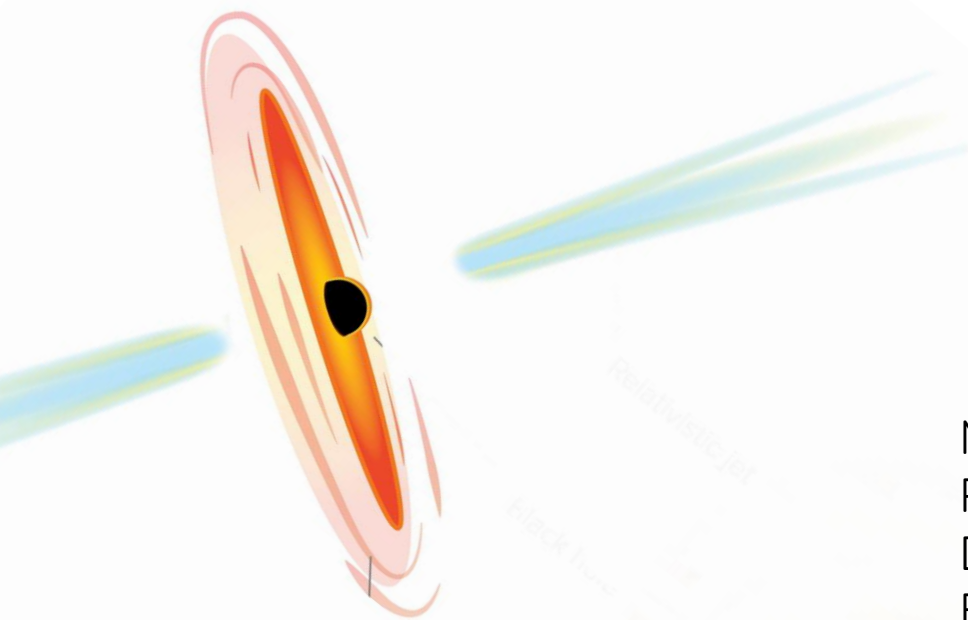


Probes of Jet Physics in Neutrino-Candidate Blazars with cm- and mm-VLBI

Florian Eppel

JMU Würzburg & MPIfR Bonn

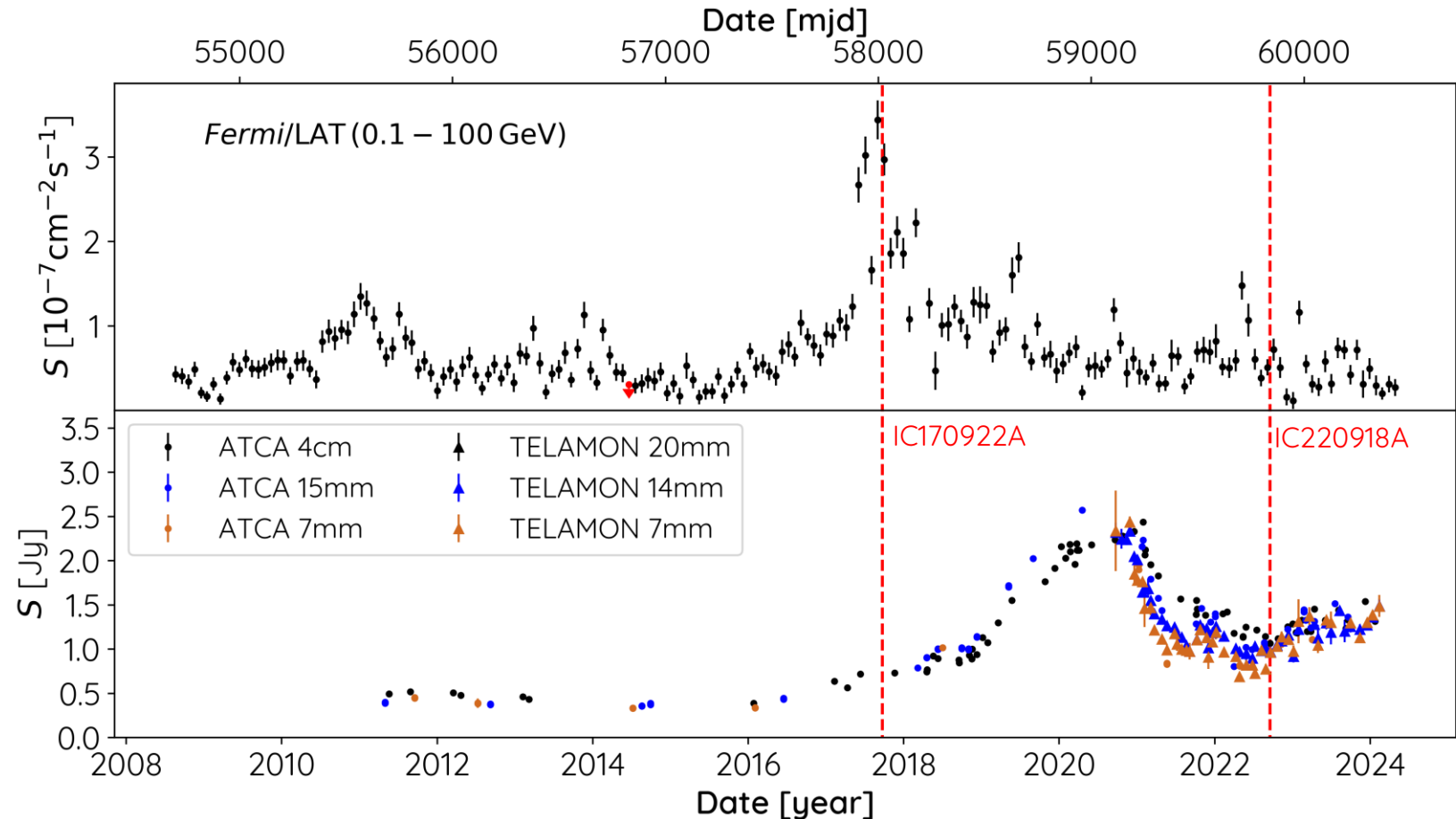


M. Kadler, E. Ros, J. Heßdörfer, F. Rösch, P. Benke, B. Boccardi, S. Buson, P. Edwards, C. Fromm, M. Giroletti, A. Gokus, J. L. Gomez, S. Hämmerich, D. Kirchner, Y. Y. Kovalev, T. P. Krichbaum, M. Lister, K. Mannheim, F. McBride, C. Nanci, R. Ojha, G.F. Paraschos, M. Perucho, A. Plavin, A.C. Readhead, J. Stevens, P. Weber, P. Torne

Credit: Sophia Dagnello, NRAO/AUI/NSF

TXS 0506+056 – Overview

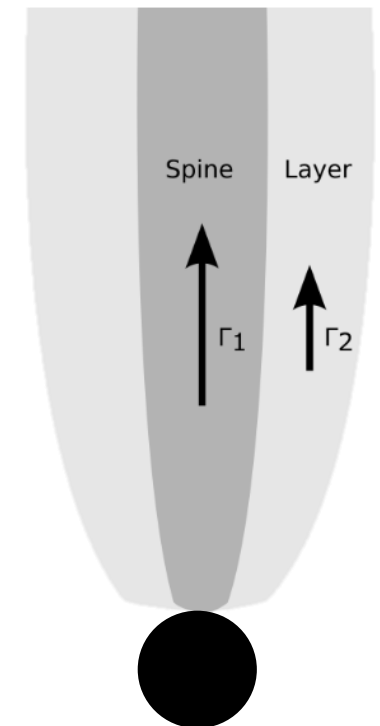
- Strong gamma-flare coincident with IC170922A (IceCube Coll. et al. 2018a)
- Flare of lower-energy neutrinos in 2014/15 (IceCube Coll. et al. 2018b)
- Pos. new neutrino associations (IC220918A, GVD210418CA)
- Jet geometry close to the mm-core inconclusive so far (precessing jet, Britzen et al. 2019; spine-sheath structure, Ros et al. 2020)



Use VLBI!

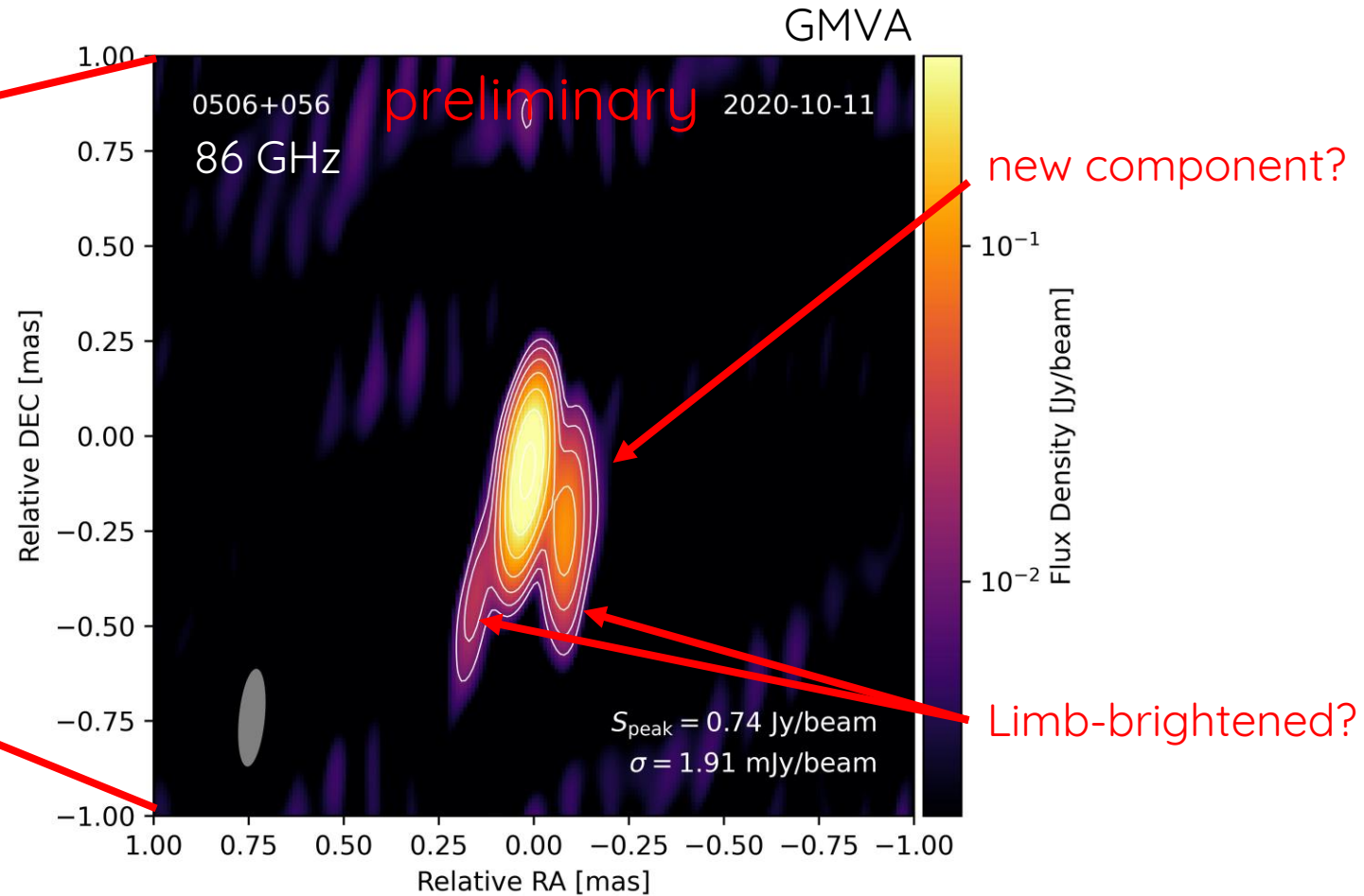
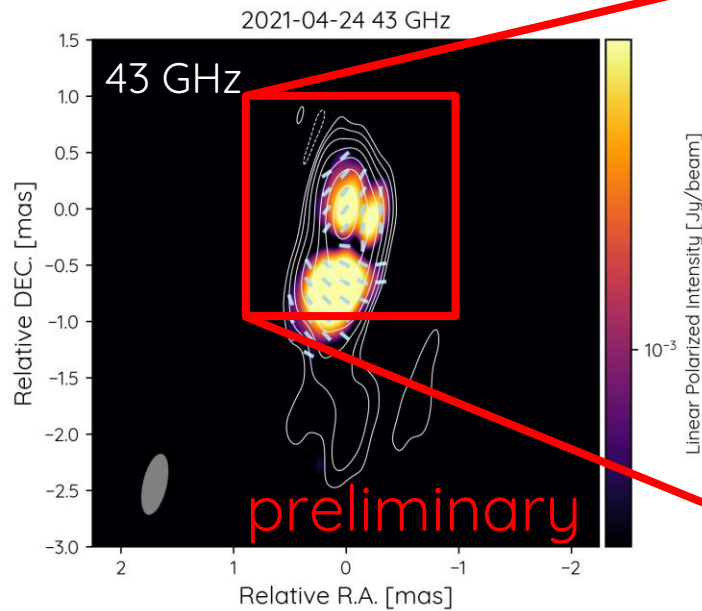
How does VLBI help to understand Neutrino Production in Blazars?

- Origin and properties of the **seed photon field** needed for hadronic processes for neutrino production is a **major open question**
- With VLBI we can investigate the **sub-pc scale jet structure** for characteristic signatures in total intensity and polarization
- Doppler factor, viewing angle and jet speed can be probed
- VLBI can constrain different models:
 - Limb-Brightening/Spine-Sheath Structure (Tavecchio et al. 2014, 2015)
 - Standing Recollimation Shocks (Kalashev et al. 2023)



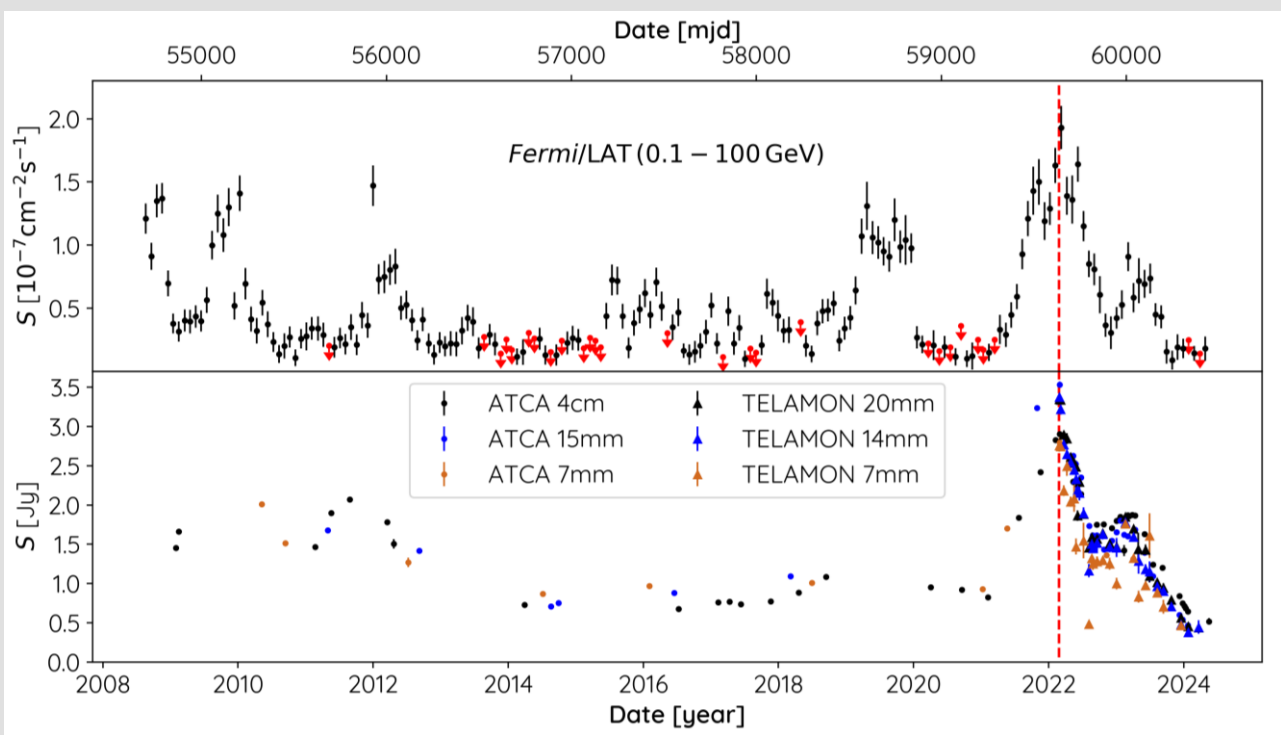
Rieger & Levinson, 2018

TXS 0506+056 at 86 GHz



-> One additional observation from Apr 2021 to be analyzed

PKS 0215+015: A New Neutrino Emitter?



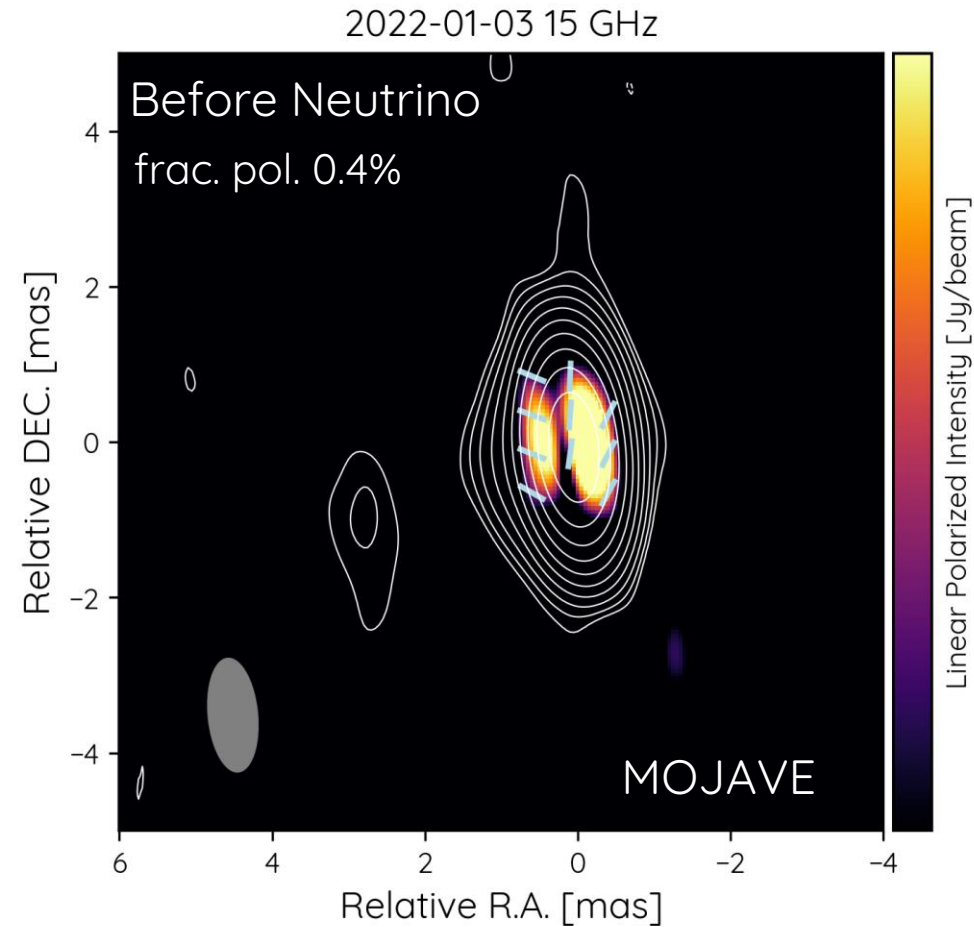
Gamma-ray and radio flaring of **PKS 0215+015** in coincidence with the IceCube Neutrino Alert IC220225A (red-dashed line)

- Strong MWL flare in PKS 0215+015 coincident with neutrino-event IC220225A
- Followed up with VLBA DDT observations & TELAMON Effelsberg monitoring in total intensity & polarization



Eppel et al. 2023a

PKS 0215+015: First Look at Polarization



PKS 0215+015: First Look at Polarization

