

BLAZARS AS NEUTRINOS FACTORIES



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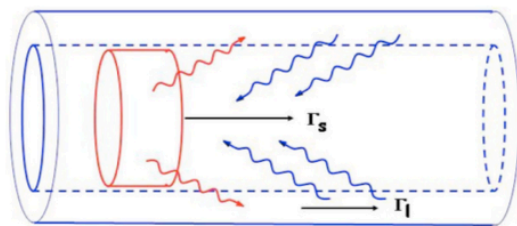
09 OTTOBRE 2018 ¹

FROM F. TAVECCHIO'S TALK

Structured jets in BL Lacs

$$\Gamma_{\text{rel}} = \Gamma_s \Gamma_l (1 - \beta_s \beta_l)$$

$$U' \simeq U \Gamma_{\text{rel}}^2$$



★ The *spine* "sees" an enhanced u_{rad} coming from the *layer*



Rates of processes involving soft photons are enhanced w.r.t. to the one-zone model

Both IC and neutrino emission!

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Rates of processes involved
w.r.t. to the observer

Both IC and neutrino

TXS 0506+056 & IC-170922A

2017 september 22

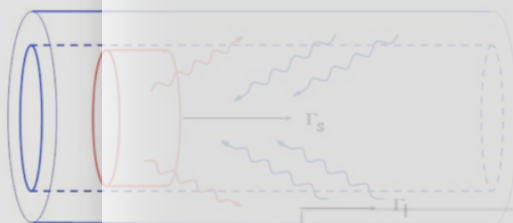


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2017 sep

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Rates of processes involving u_{rad} w.r.t. to the one-zone model are enhanced

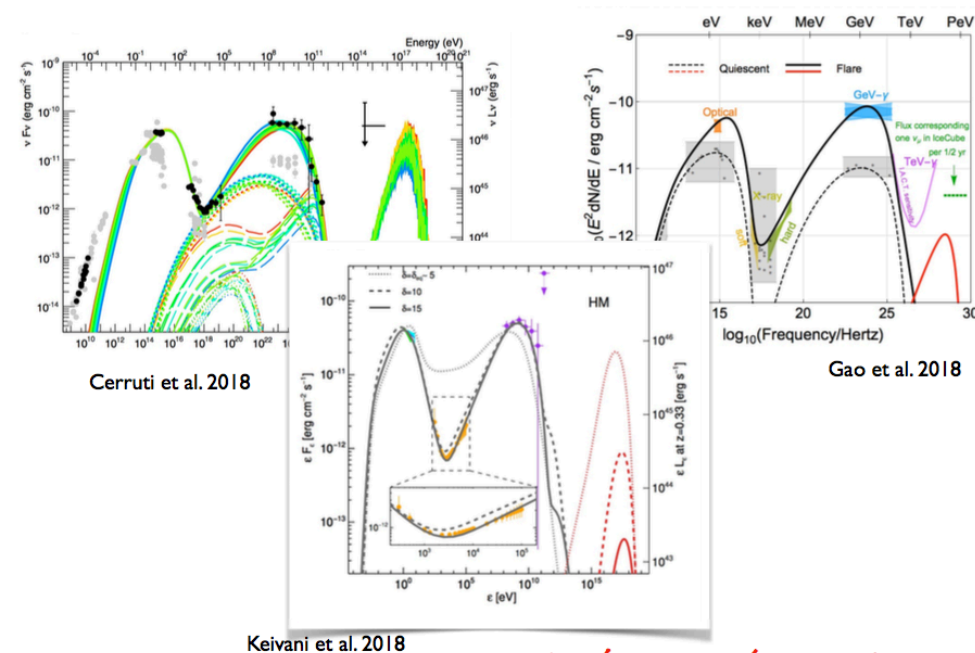
Both IC and neutrino emission!

TXS 0506+056 & IC-170922A

Fermi-LAT detection of γ -rays from TXS 0506+056. IceCube observation of a high-energy neutrino candidate event IC-170922A

GCN CIRCULAR
 NUMBER: 21916
 SUBJECT: IceCube-170922A - IceCube observation of a high-energy neutrino candidate event
 DATE: 17/09/23 01:09:26 GMT
 FROM: Erik Blaufuss at U. Maryland/IceCube (erik.blaufuss@icecube.umd.edu)
 ATel #10817; Razmik Mirzoyan for the MAGIC Collaboration
 on 4 Oct 2017; 17:17 UT
 Credential Certification: Razmik Mirzoyan (Razmik.Mirzoyan@mpp.mpg.de)

A burst of models ...



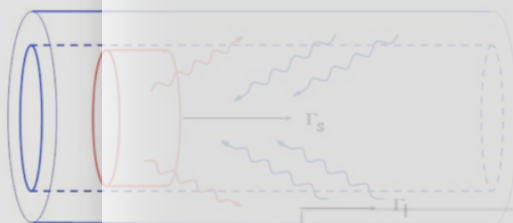
But the jet power is very large!

FROM F. TAVECCHIO'S TALK

Structured jets in BL Lacs

$$\Gamma_{\text{rel}} = \Gamma_s \Gamma_l (1 - \beta_s \beta_l)$$

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TXS 0506+056 & IC-170922A

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Rates of processes involving u_{rad} w.r.t. to the one-zone model

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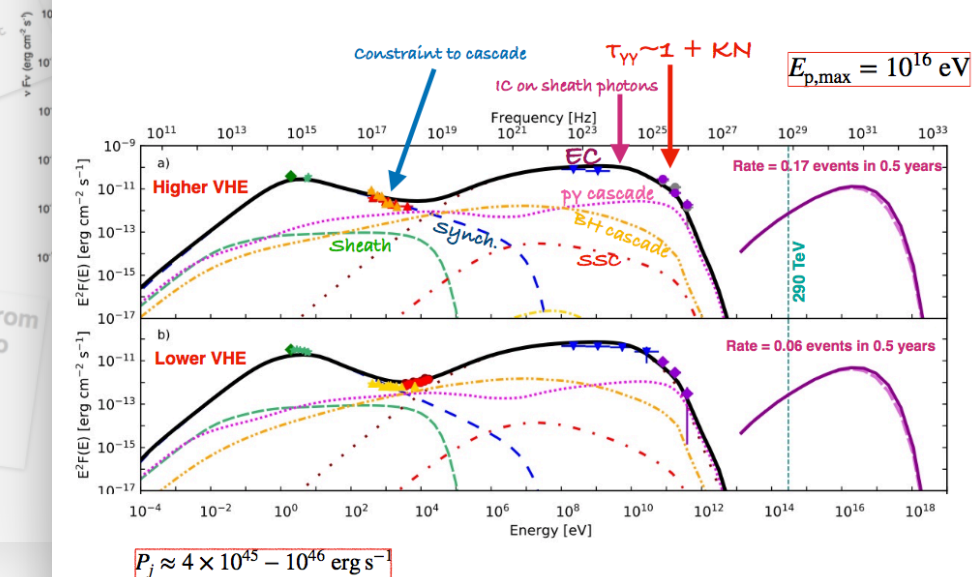
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A burst of models ...

Jet-sheath model



MAGIC Coll. 2018

FROM F. TAVECCHIO'S TALK

REMEMBER

$$E_p \sim 20 E_\nu$$
$$\varepsilon \geq \frac{10^{17}}{E_p} \text{ eV}$$

TO PRODUCE NEUTRINOS AT 10^{14} eV I NEED UV-SOFT X PHOTONS

$$\Gamma_{\text{rel}} = \Gamma_s \Gamma_l (1 - \beta_s)$$

$$U' \simeq U \Gamma_{\text{rel}}^2$$

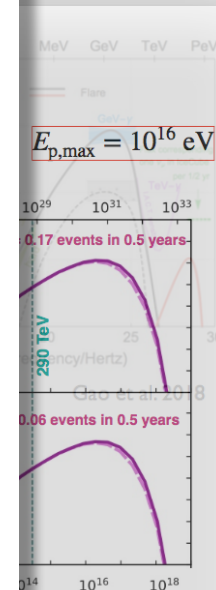
★ The spine "s"



R

$$P_j \approx 4 \times 10^{45} - 10^{46} \text{ erg s}^{-1}$$

Keivani et al. 2018



MAGIC Coll. 2018

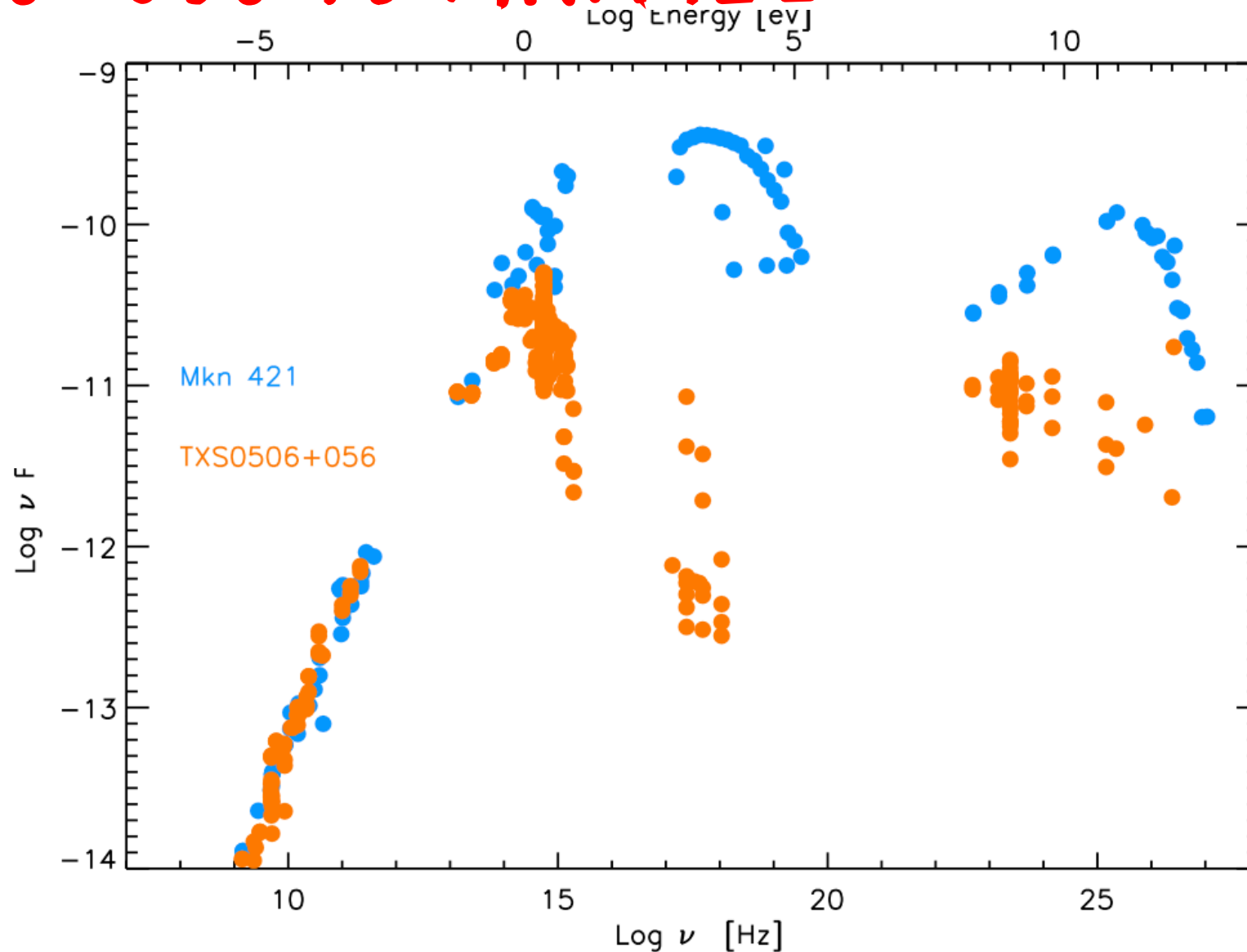
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TXS0506+056 VS MKN421

TXS0506+056

$z=0.33$

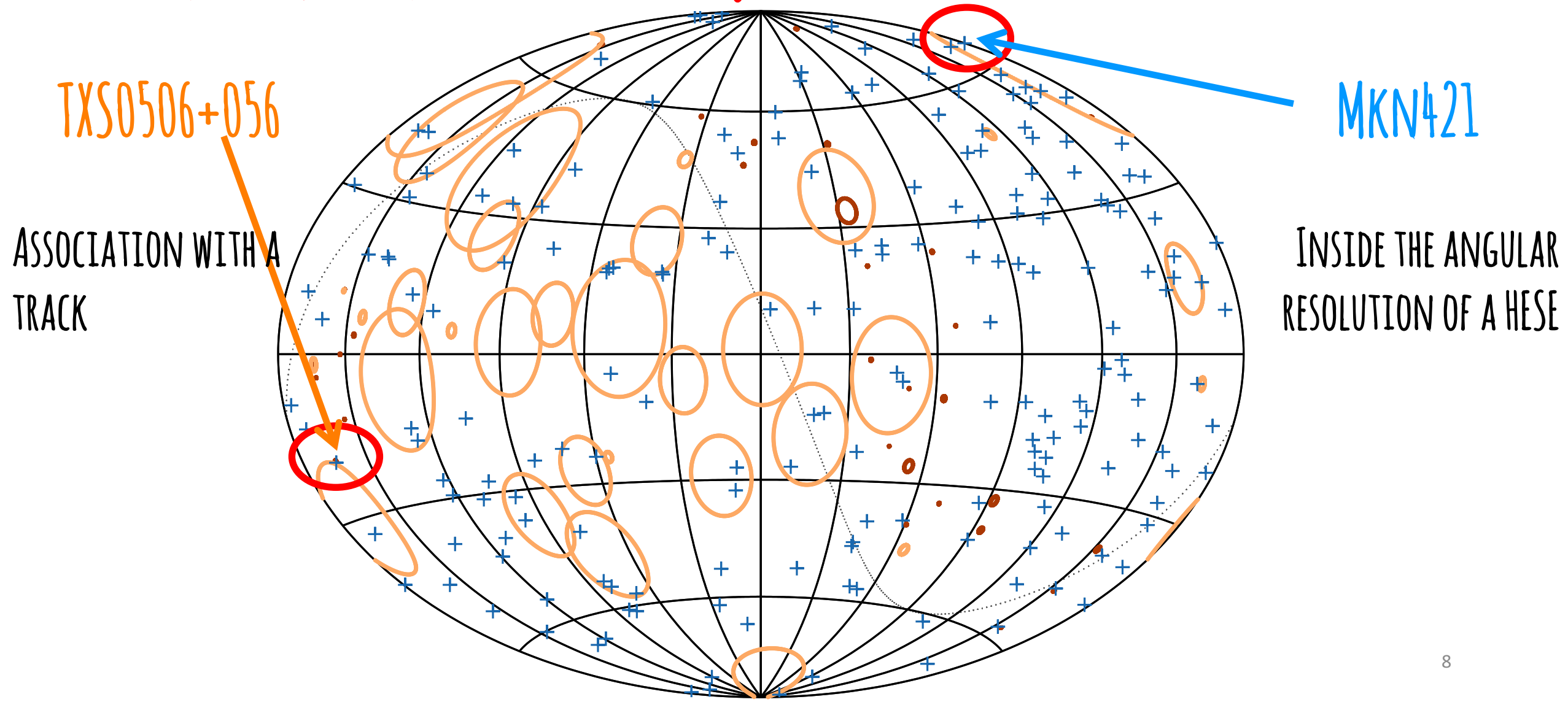
SEE S. PAIANO'S POSTER



MKN421

$z=0.03$

THE MKN PROBLEM



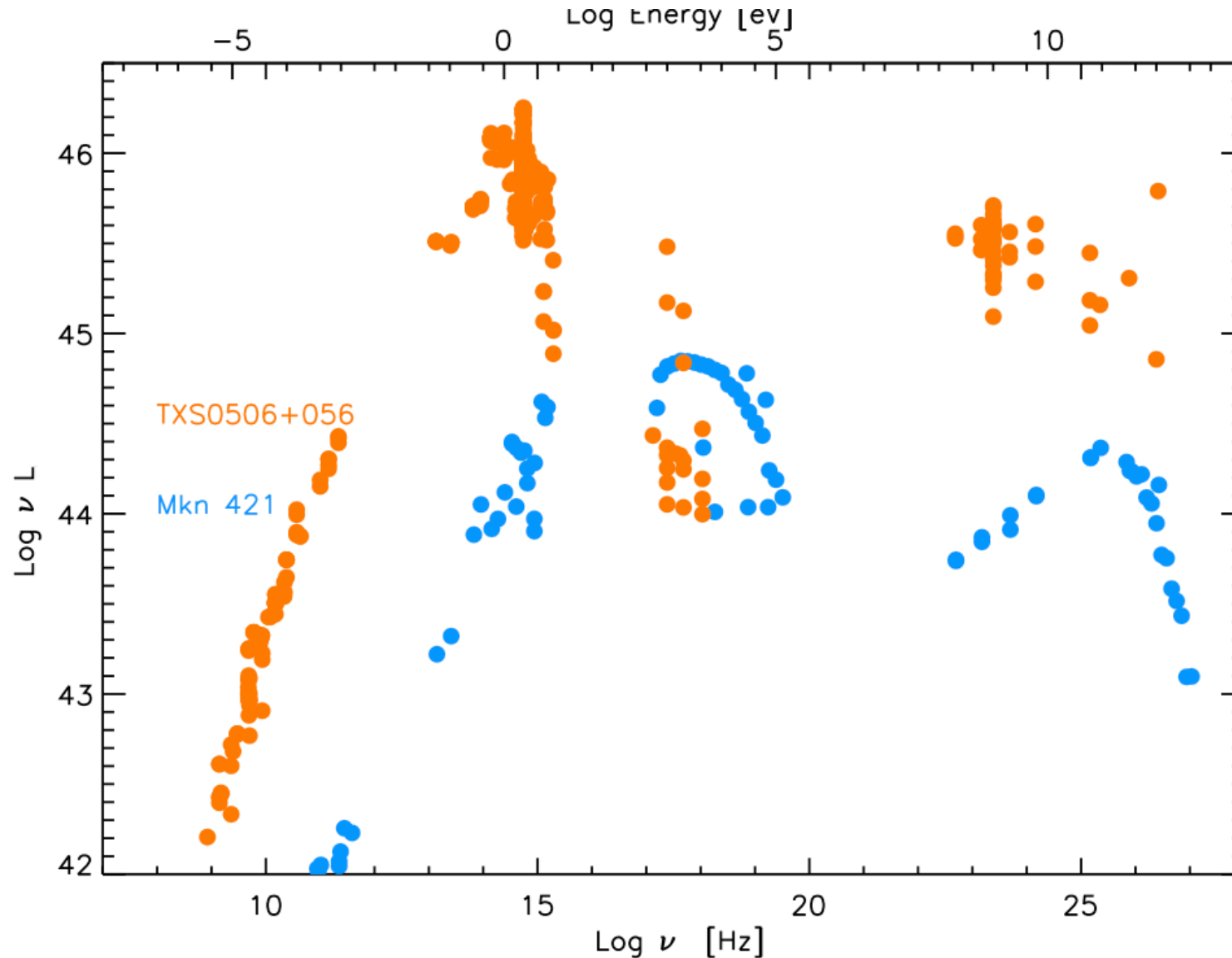
TXS0506+056 VS MKN421

TXS0506+056

MKN421

LBL/IBL
SYNCHRO PEAK $< 10^{15}$ Hz

TYPICAL HBL
SYNCHRO PEAK $> 10^{15}$ Hz



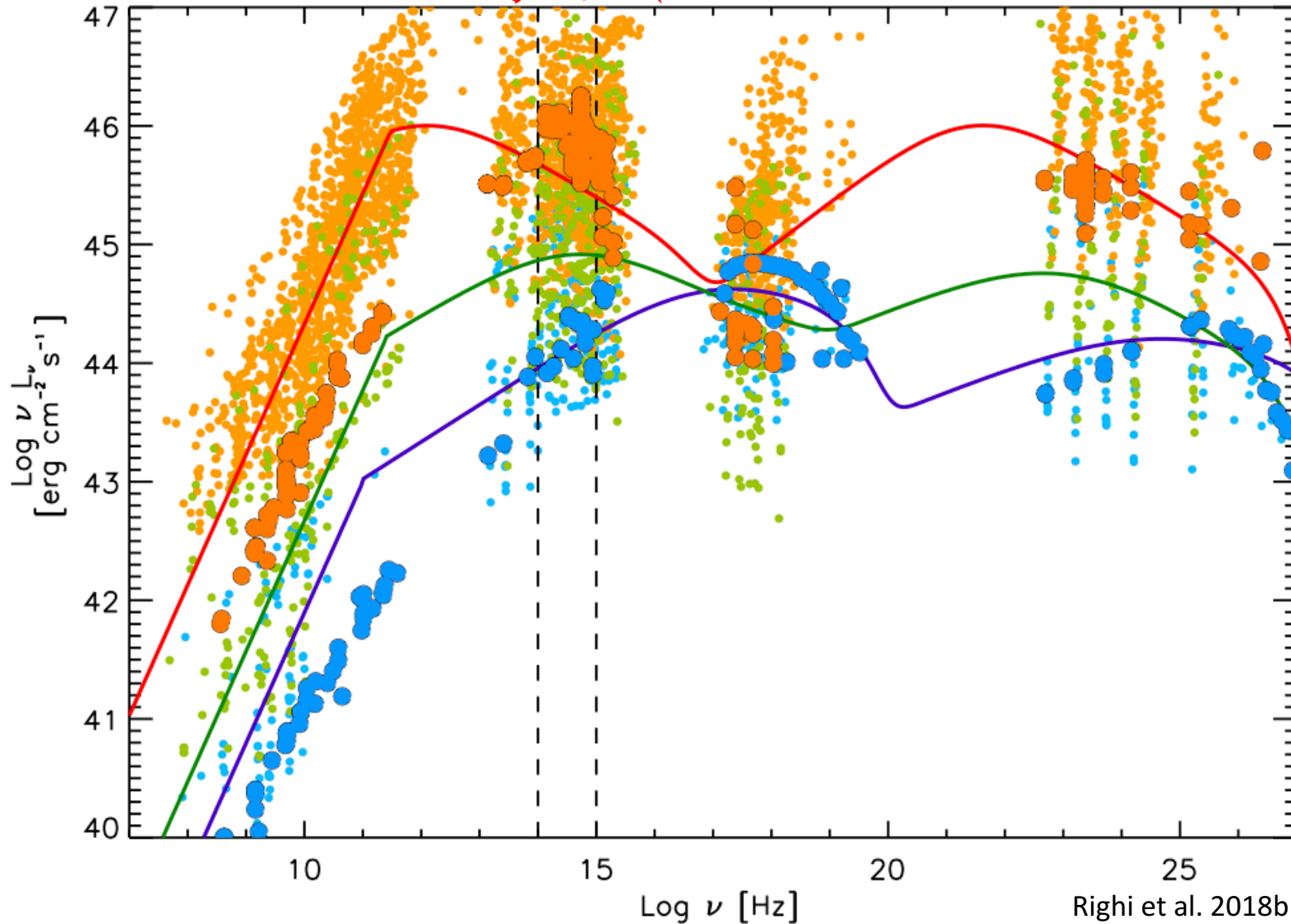
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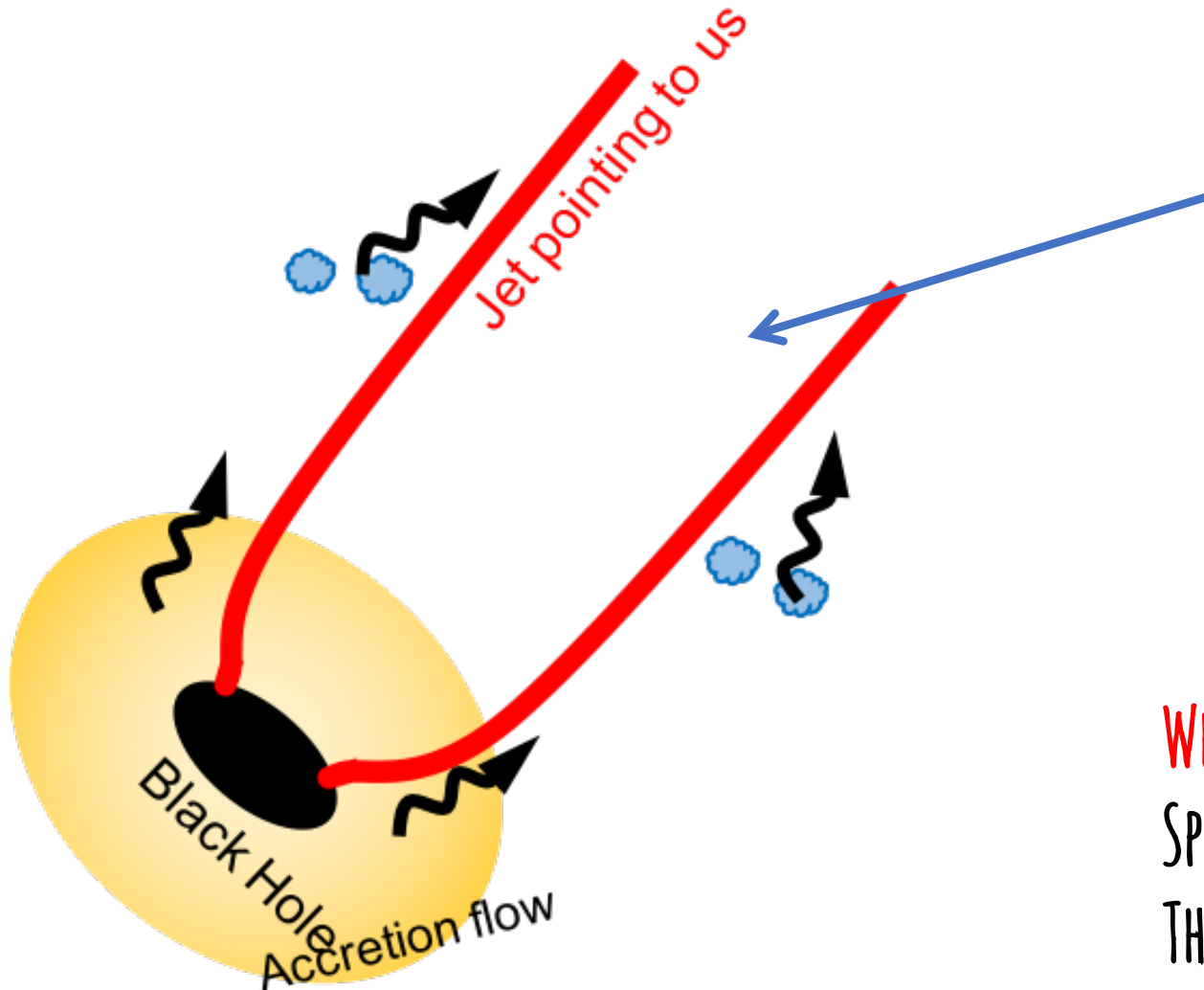
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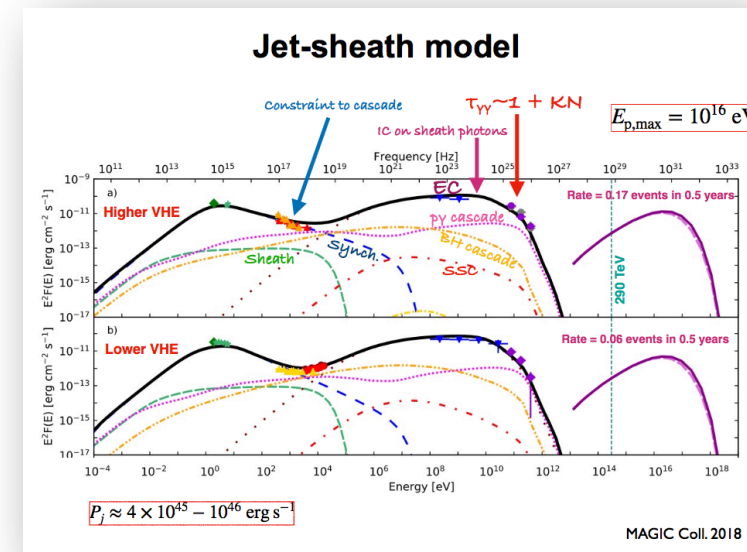
Righi et al. 2018b

BL LAC SCENARIO



SYNCHROTRON EMISSION

SPINE-LAYER (ONLY FOR HSP?)

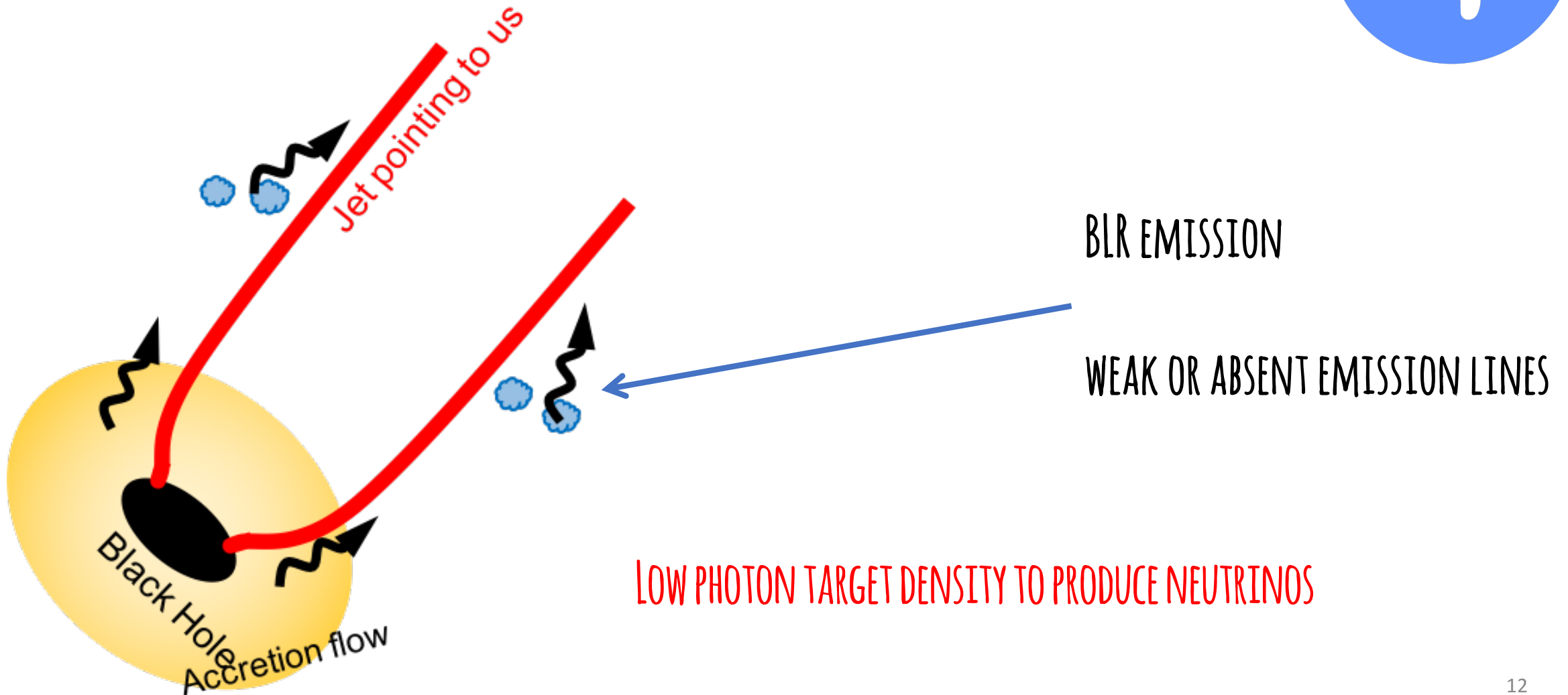


WHAT FABRIZIO DIDN'T SAY

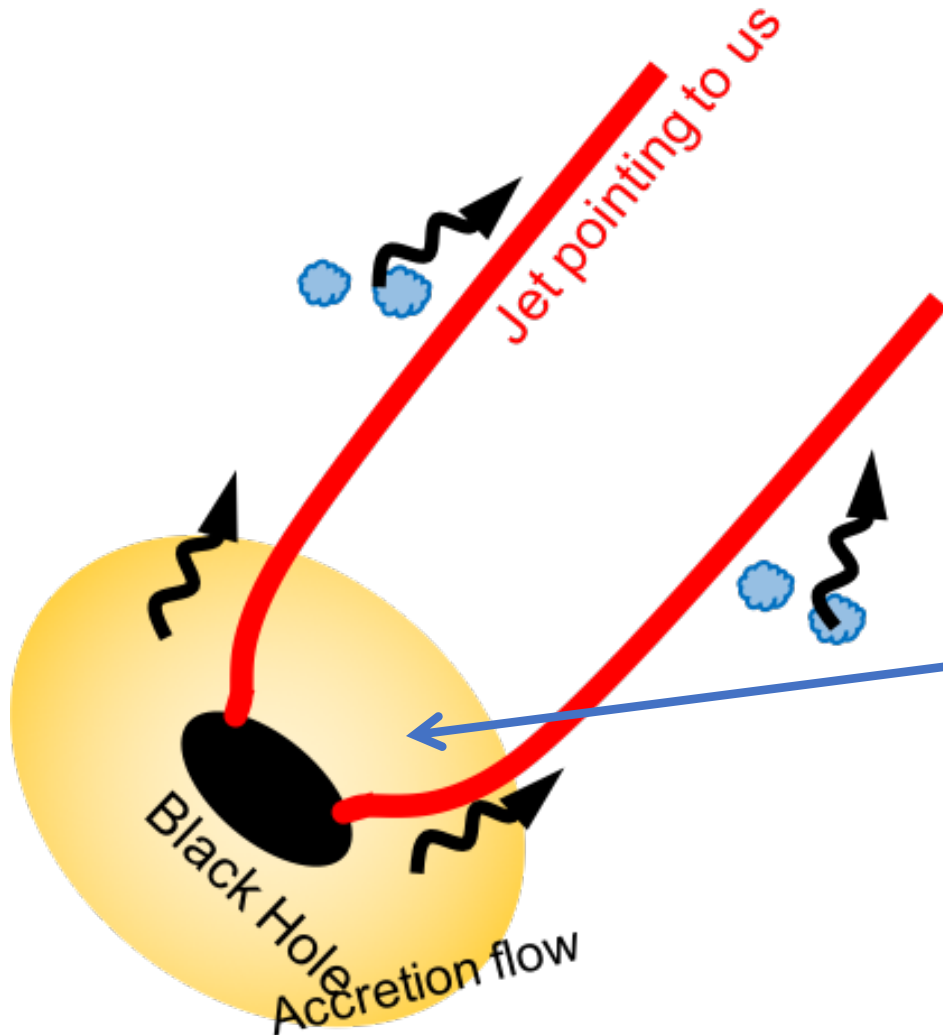
SPINE LAYER SCENARIO OBSERVED IN HBL-LIKE OBJECTS

THE EMISSION OF SPINE-LAYER IS NOT FIXED

BL LAC SCENARIO

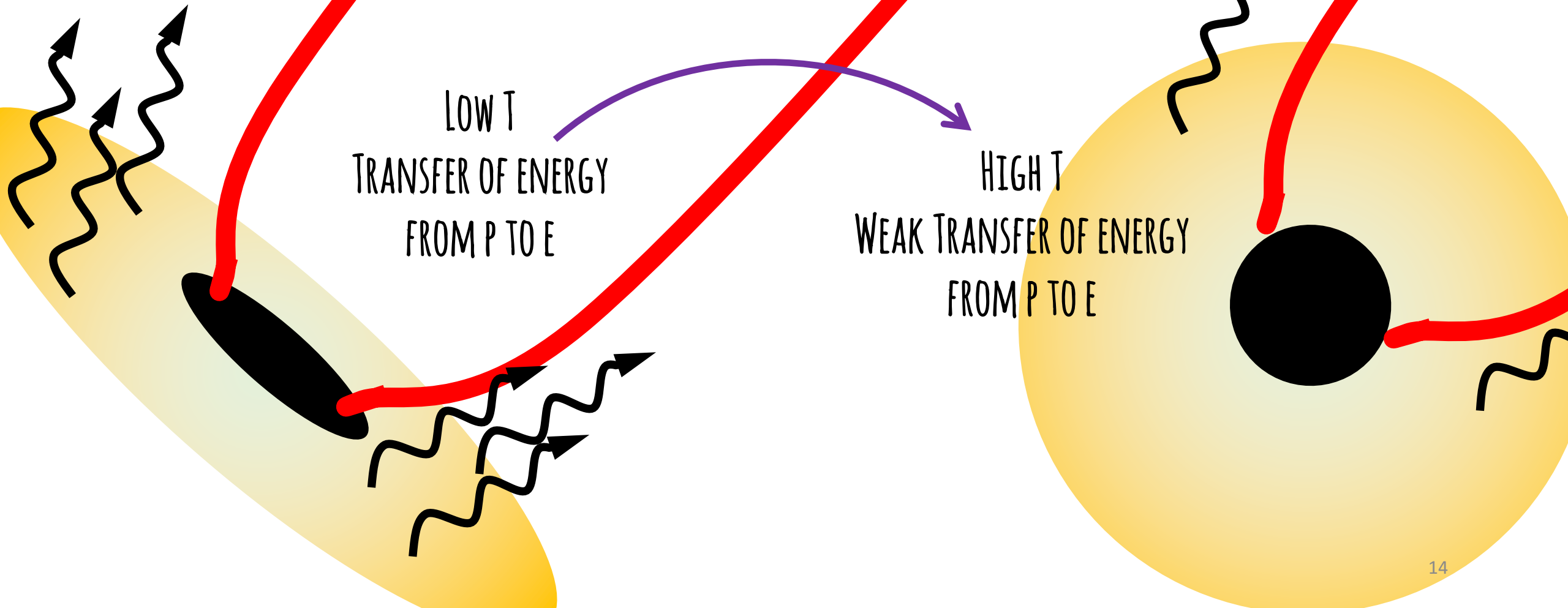


BL LAC SCENARIO



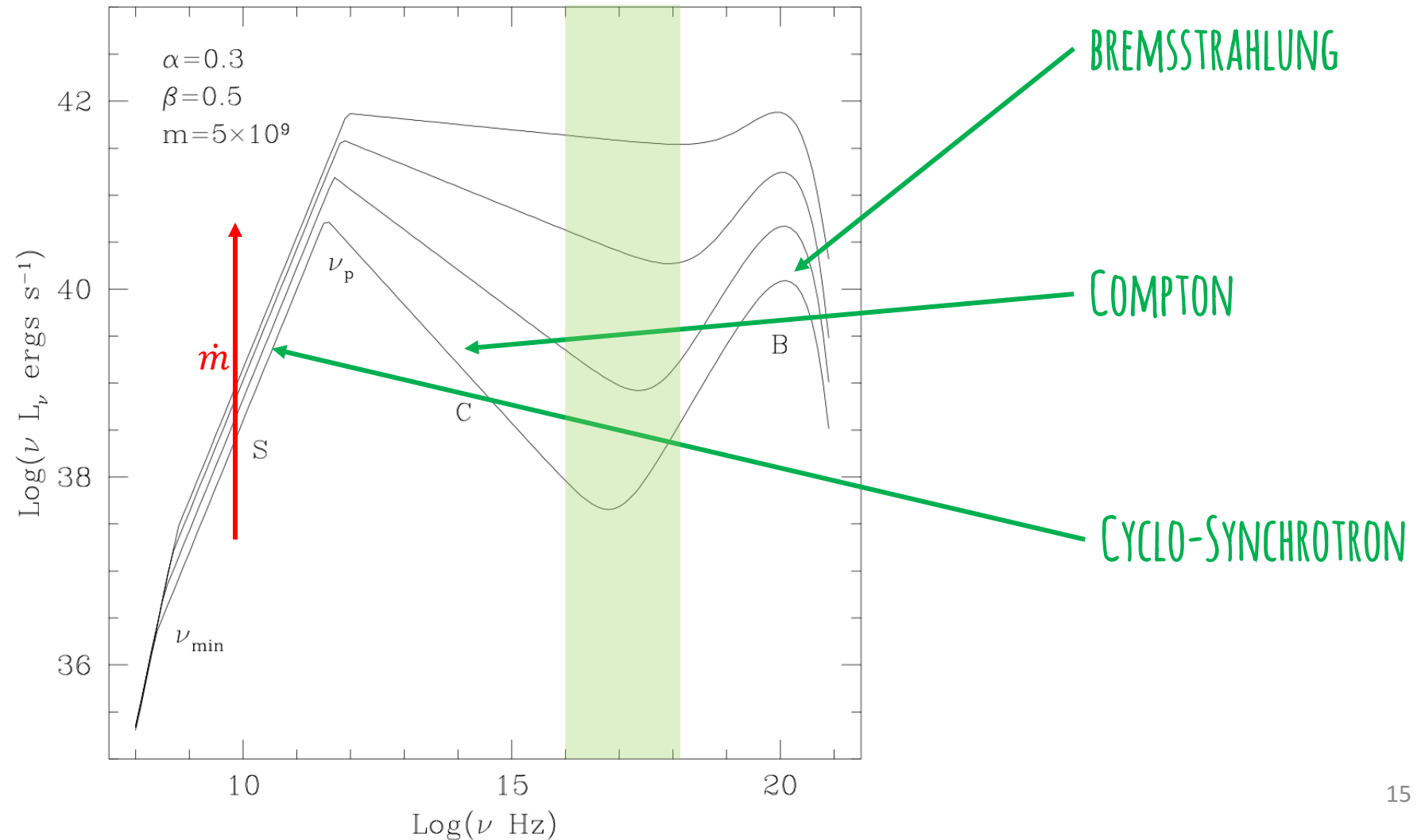
ACCRETION FLOW EMISSION
IT'S NOT A DISK (AS IN FSRQS), IT IS
INEFFICIENT AND NEARLY SPHERICAL

ADVECTION DOMINATED ACCRETION FLOW



ADAF SCENARIO

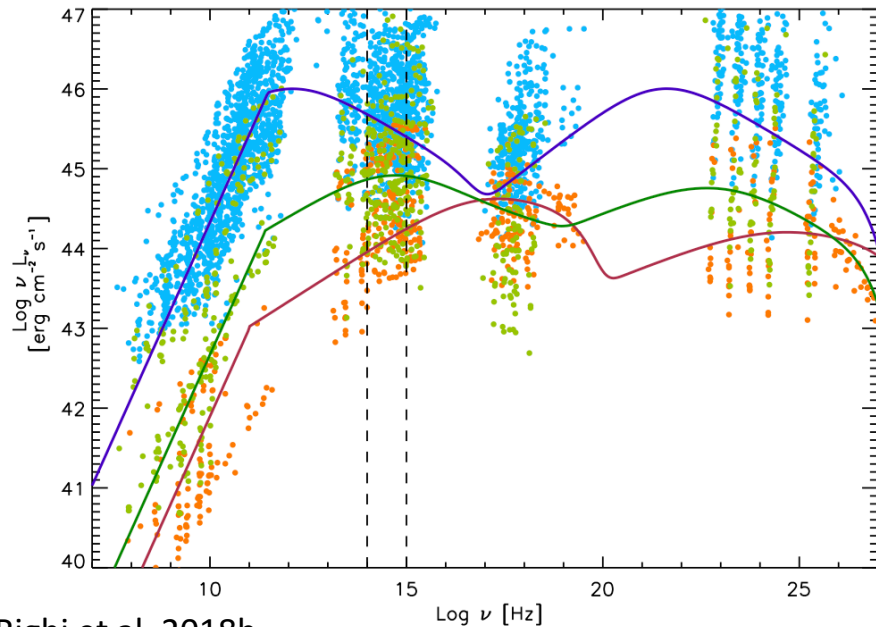
Mahadevan 96
Narayan & Yi 95



ADAF SCENARIO

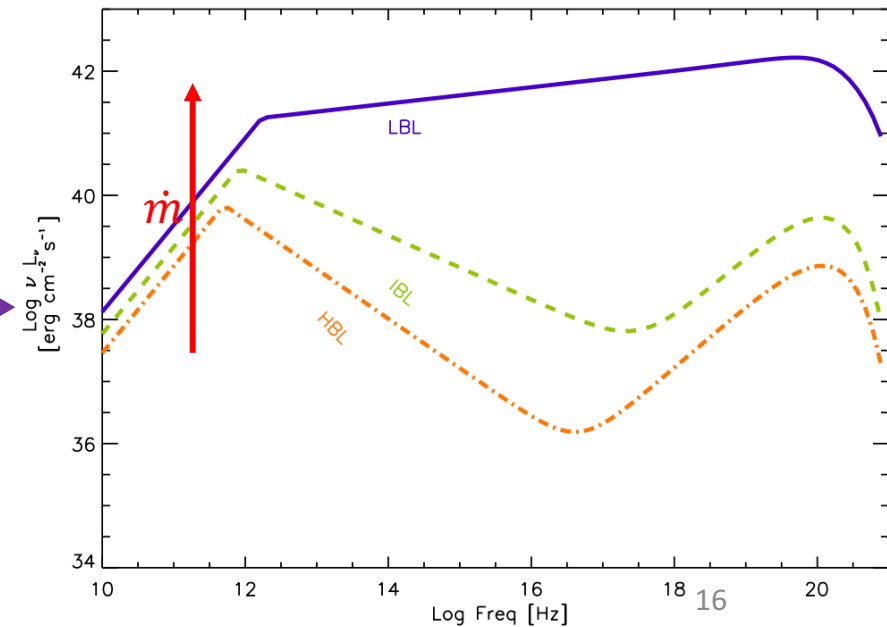
$$L_{bol} \quad P_{rad} = \frac{L_{bol}}{\Gamma^2} \quad P_{jet} = \frac{P_{rad}}{\eta_{rad}} \quad P_{jet} = \eta_{jet} \dot{M} c^2 \quad \dot{M} = \dot{m} \dot{M}_{EDD} \quad \dot{m}$$

SEDs FOR LBL, IBL, HBL



Righi et al. 2018b

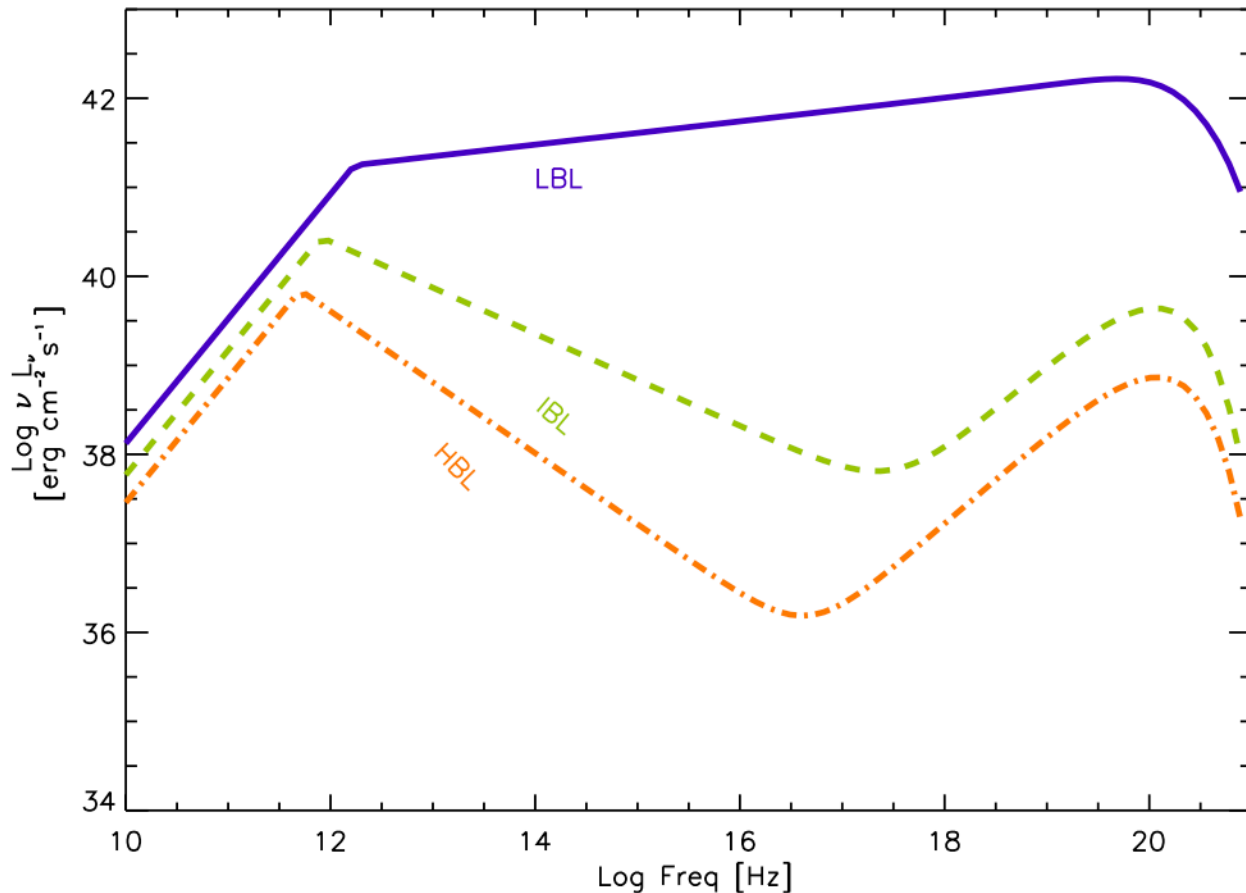
ADAF SPECTRA



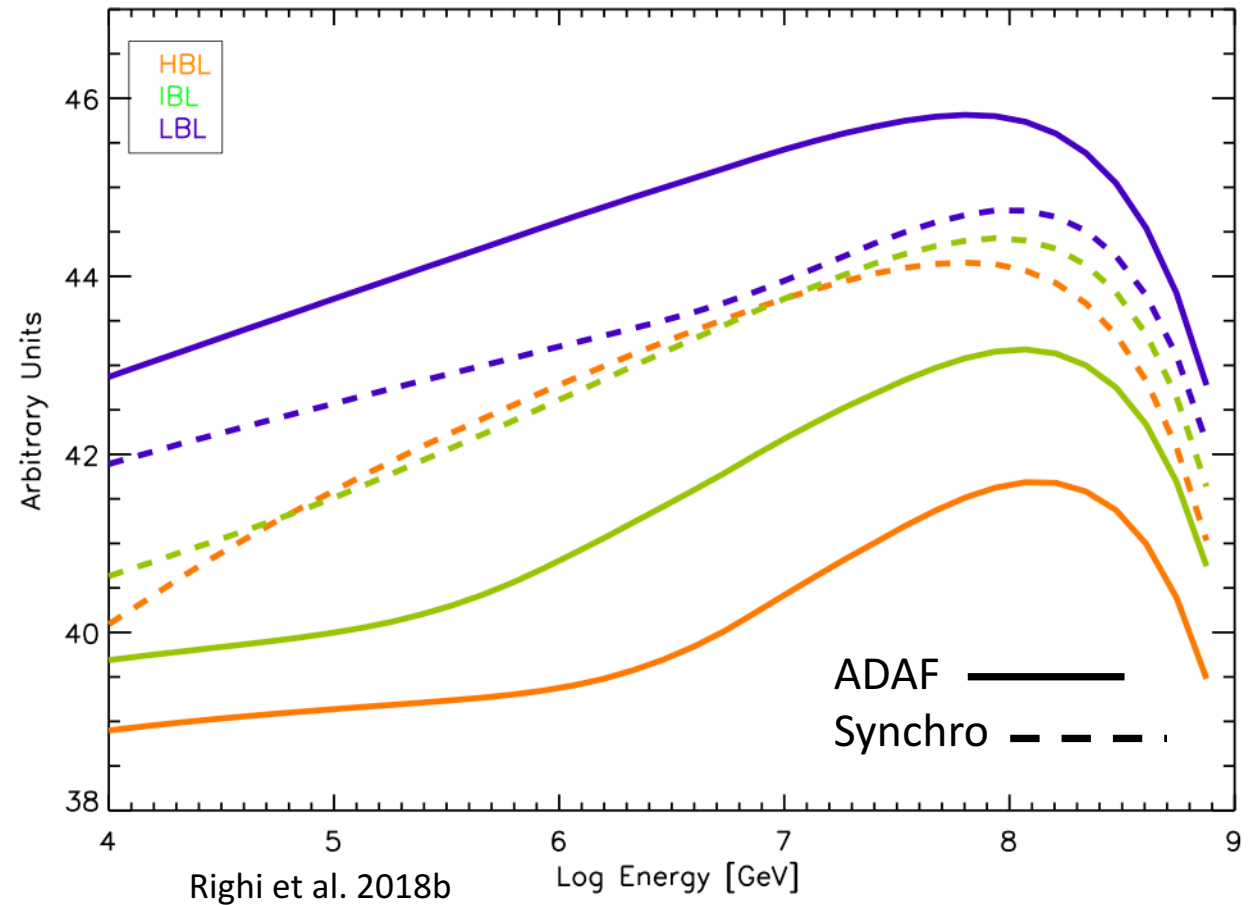
ADAF SCENARIO

$$p + \gamma \rightarrow \pi^\pm + X$$
$$\pi^\pm \rightarrow \mu^\pm + \nu_\mu \rightarrow e^\pm + \nu_e + \nu_\mu$$

ADAF SPECTRA

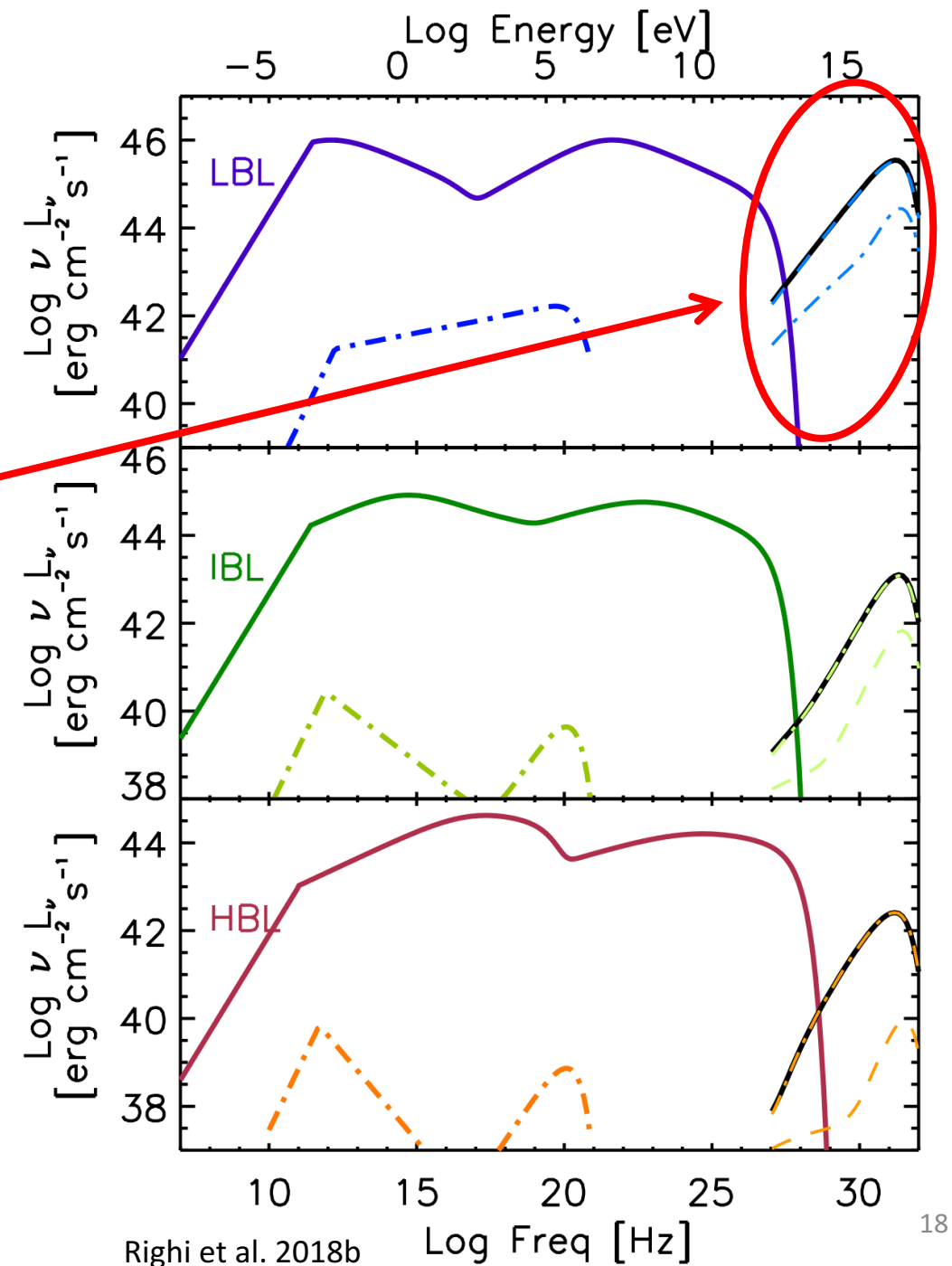


NEUTRINO SPECTRA



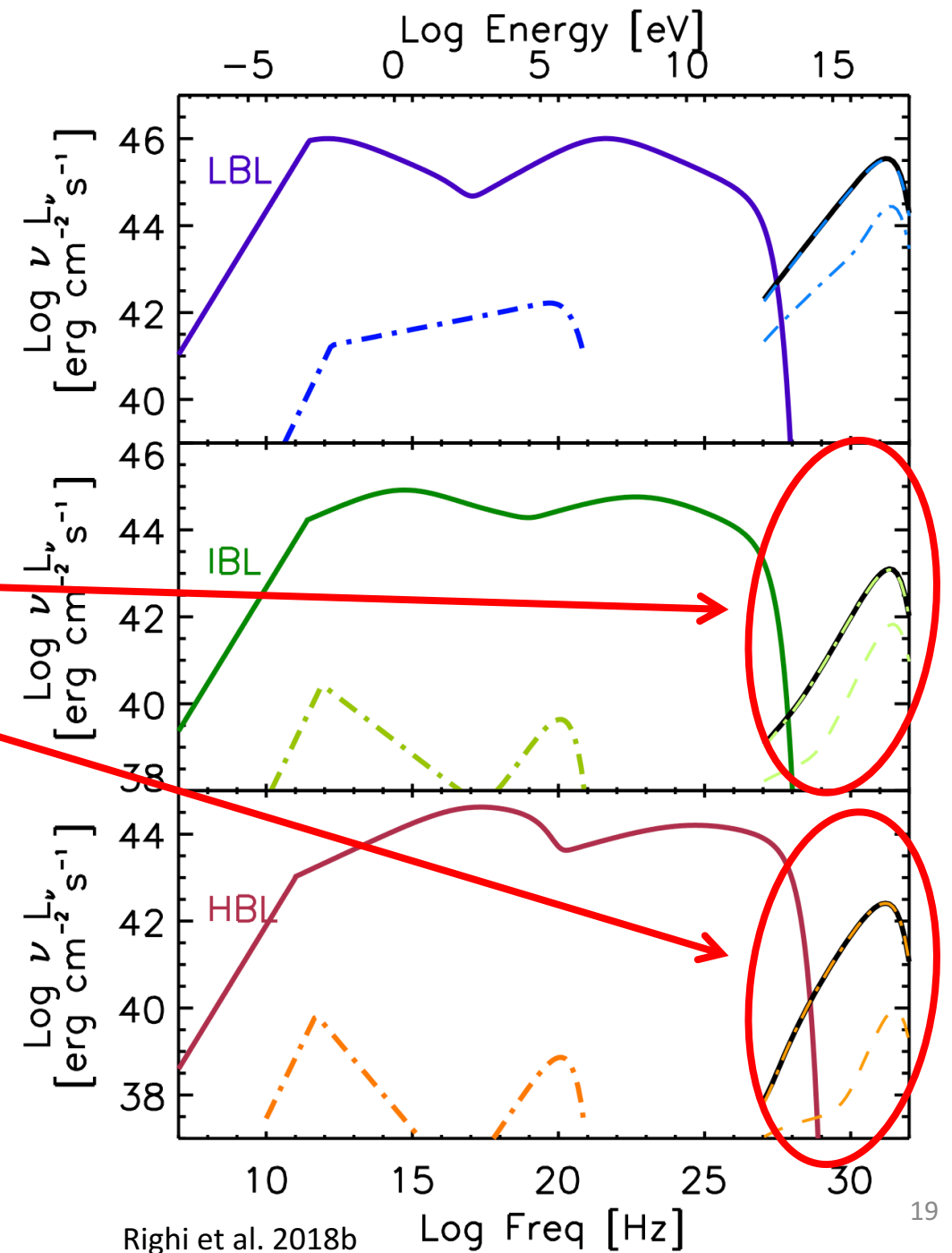
ADAF SCENARIO

NEUTRINO SPECTRUM USING ADAF
RADIATION AS PHOTON TARGET IS
DOMINANT COMPARED TO THE
NEUTRINO SPECTRUM USING
SYNCHROTRON RADIATION



ADAF SCENARIO

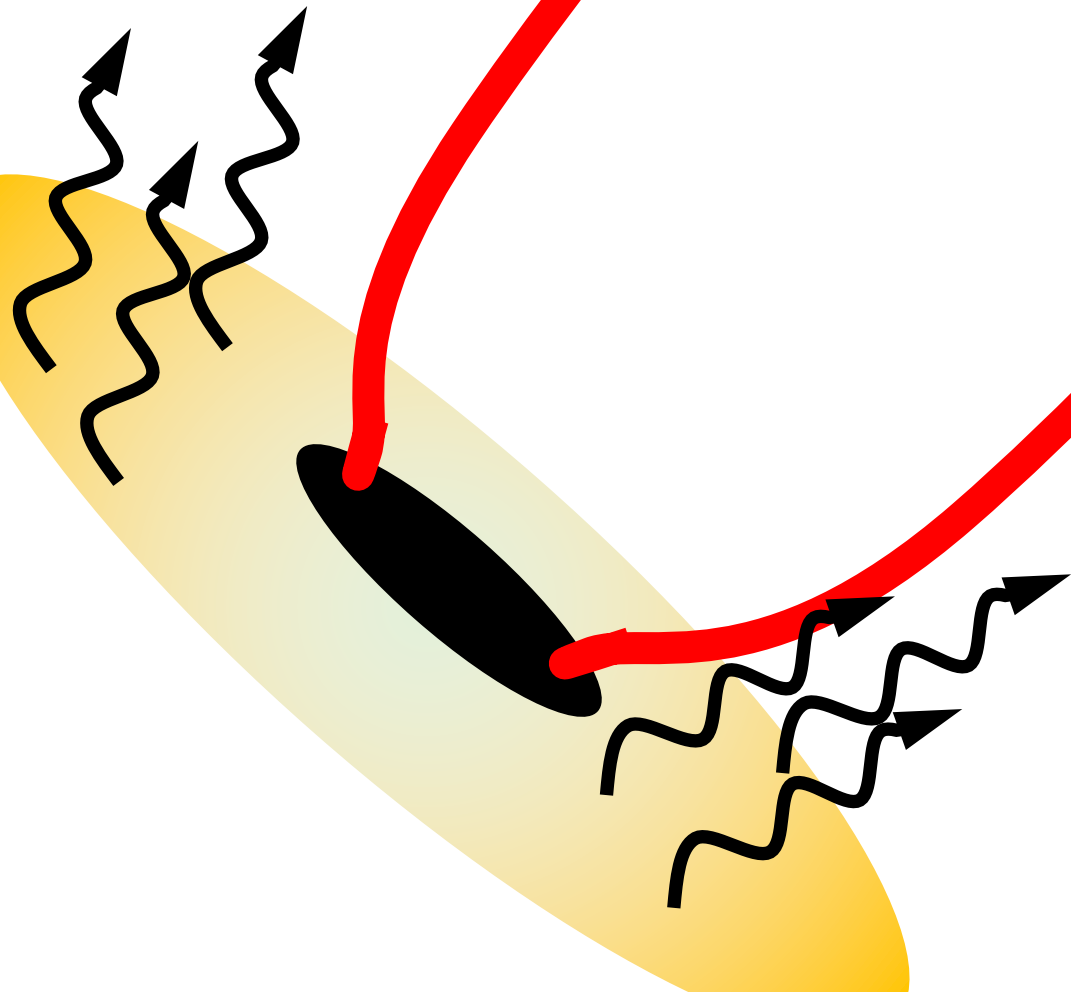
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TAKE HOME MESSAGES

- IC20170922/TXS 0506+056 EVENT WITH THE NON OBSERVATION OF A NEUTRINO FROM MKN 421 GAVE US SEVERAL CONSTRAINTS ON THE MODELLING OF THE JET
- ADAF SCENARIO IS A VALID ALTERNATIVE TO EXPLAIN THE OBSERVATION OF THE NEUTRINO FROM TXS AND NOT FROM MKN

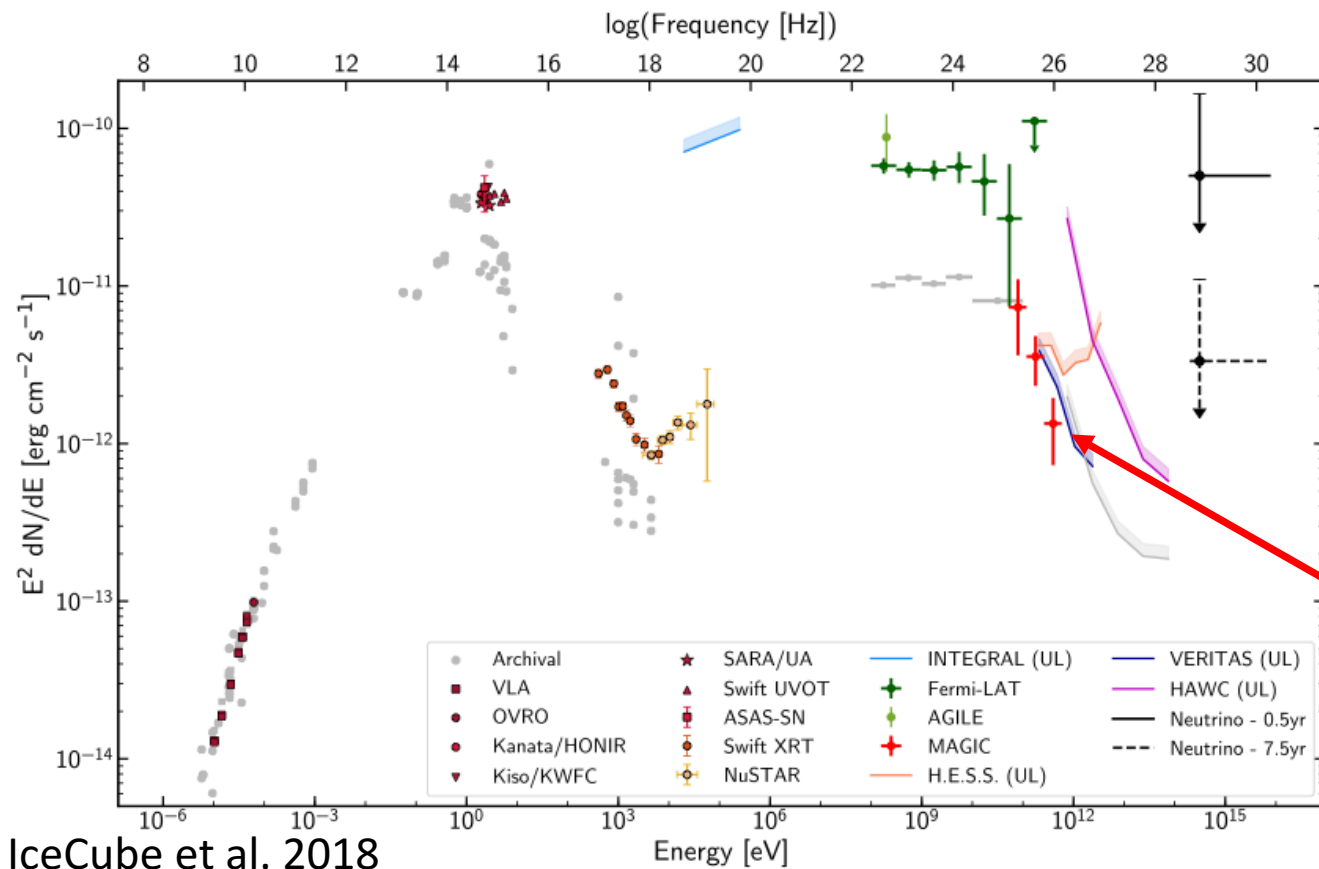
FSRQs



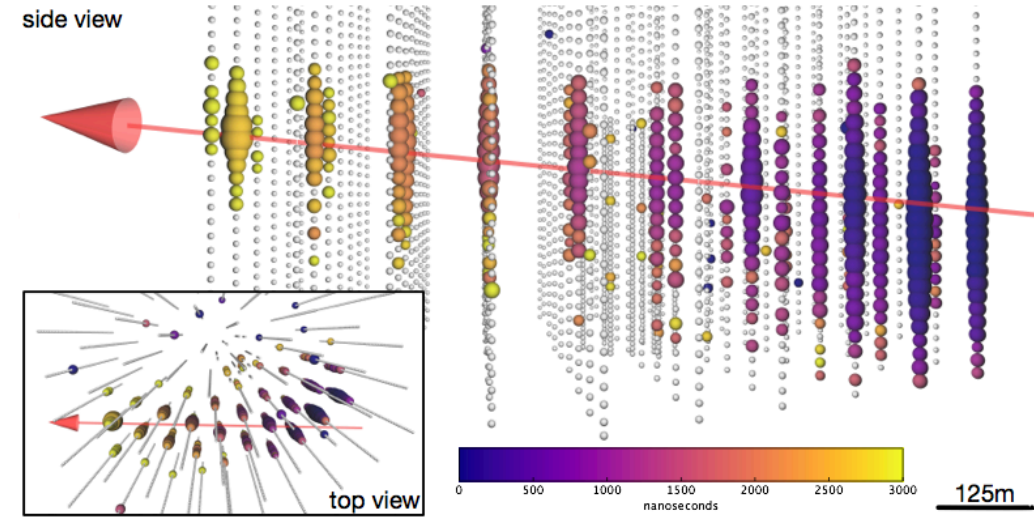
- TOO LESS \rightarrow MULTIPLETS
- IF I ACCELERATE P AND E IN THE SAME REGION I CANNOT CONSIDER THE EMISSION FROM THE DISK (OR X-RAY CORONA) AS DOMINANT

IC170922A AND TXS0506+056

2017 SEPTEMBER 22

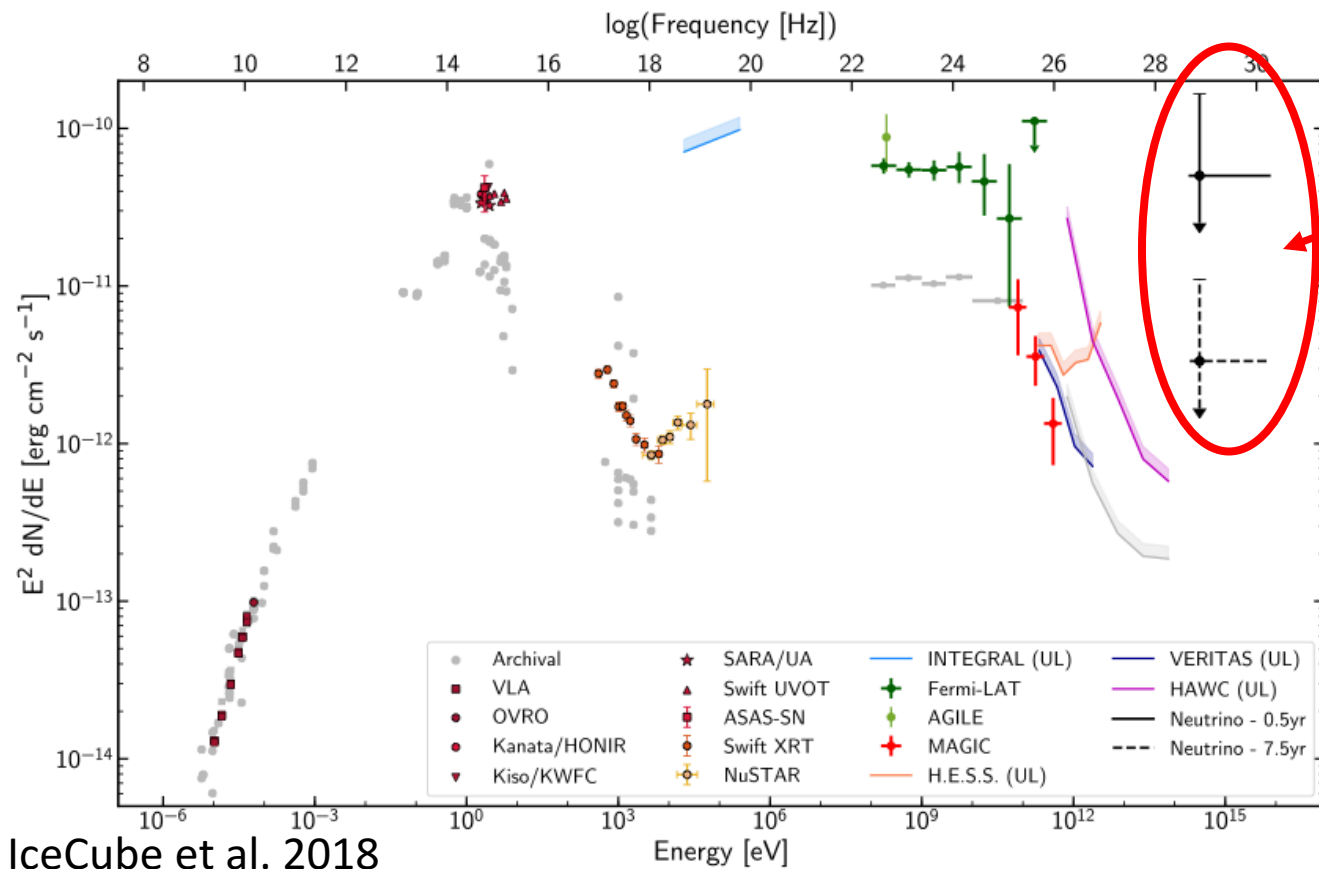


IceCube et al. 2018



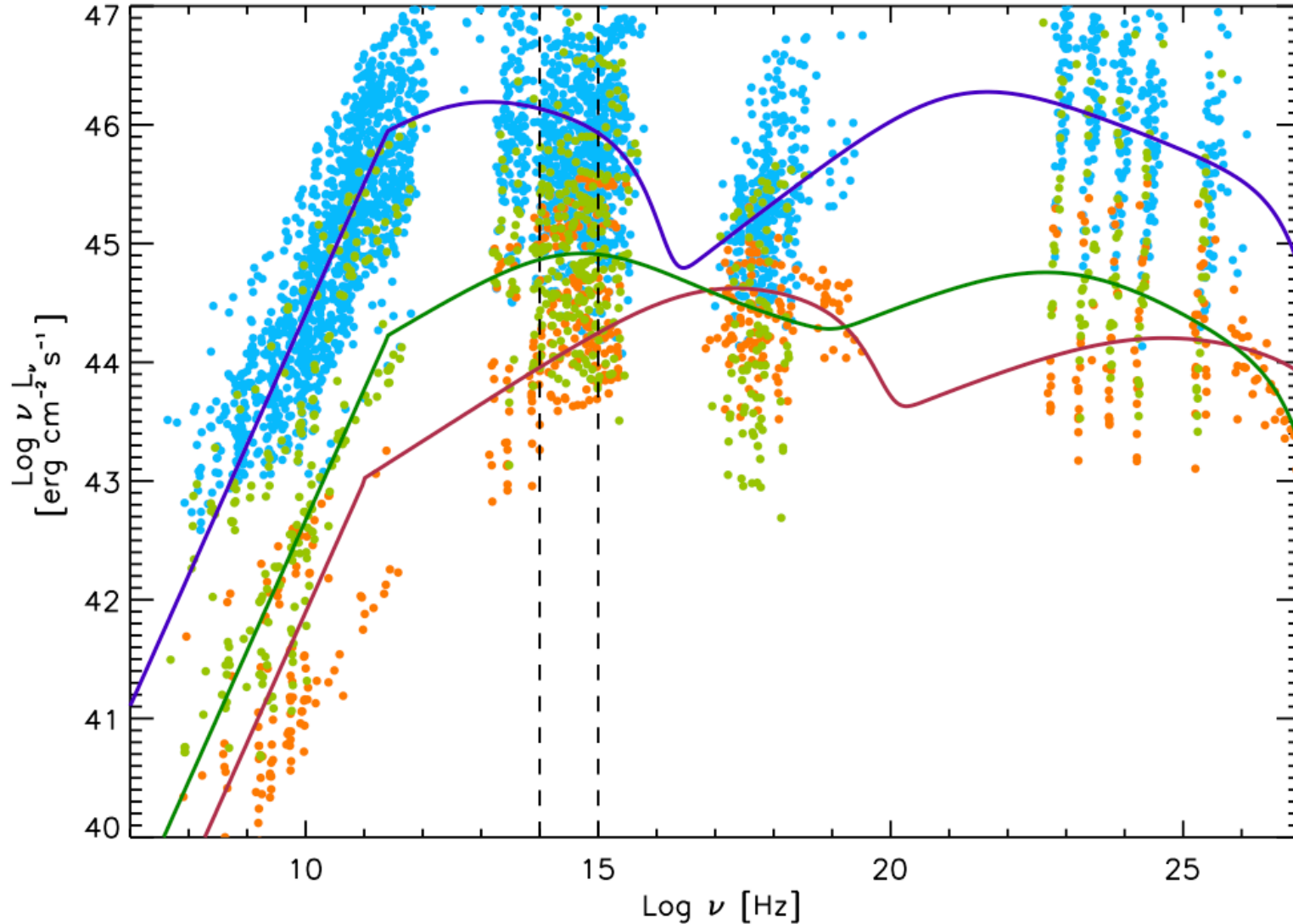
MAGIC CONTRIBUTE

IC170922A AND TXS0506+056



IceCube et al. 2018

HSP, ISP, LSP



TXS0506+056

IT NOT A FSRQ IT IS
NOT A HBL....