MAX

and Active Galactic Nuclei

(Seyferts, Quasars, Blazars)

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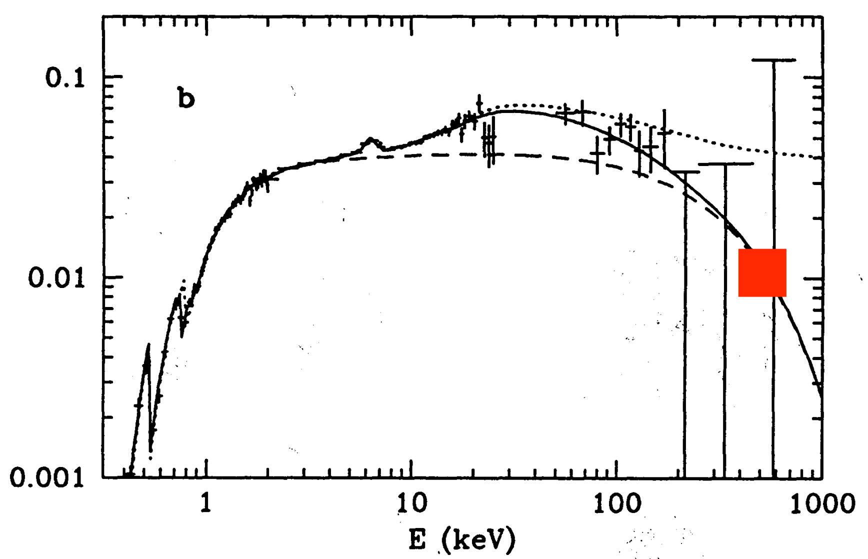
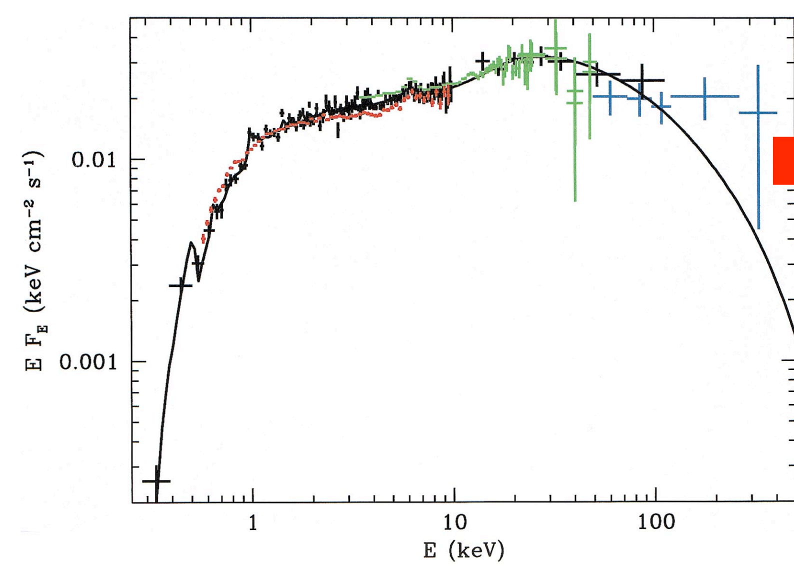
Seyfert galaxies: spectra

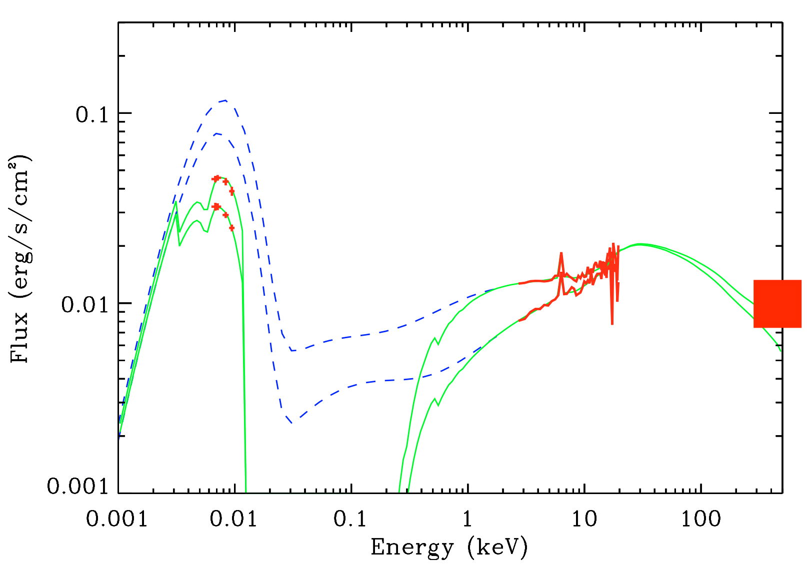
X-rays are generated by IC processes in the accretion disk corona or/and in the jet for radio galaxies



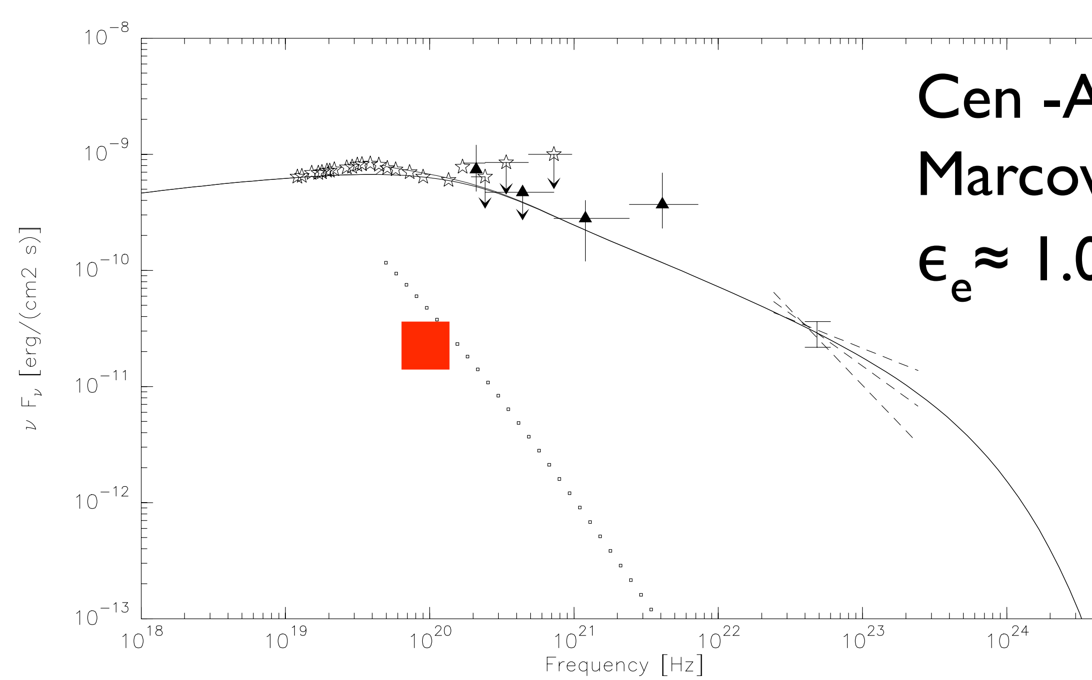
IC 4329 A
Madejski 1995
$\epsilon_e \approx 0.5\ m_e c^2$



3C 120
Zdziarski 2001
$\epsilon_e \approx 0.5\ m_e c^2$

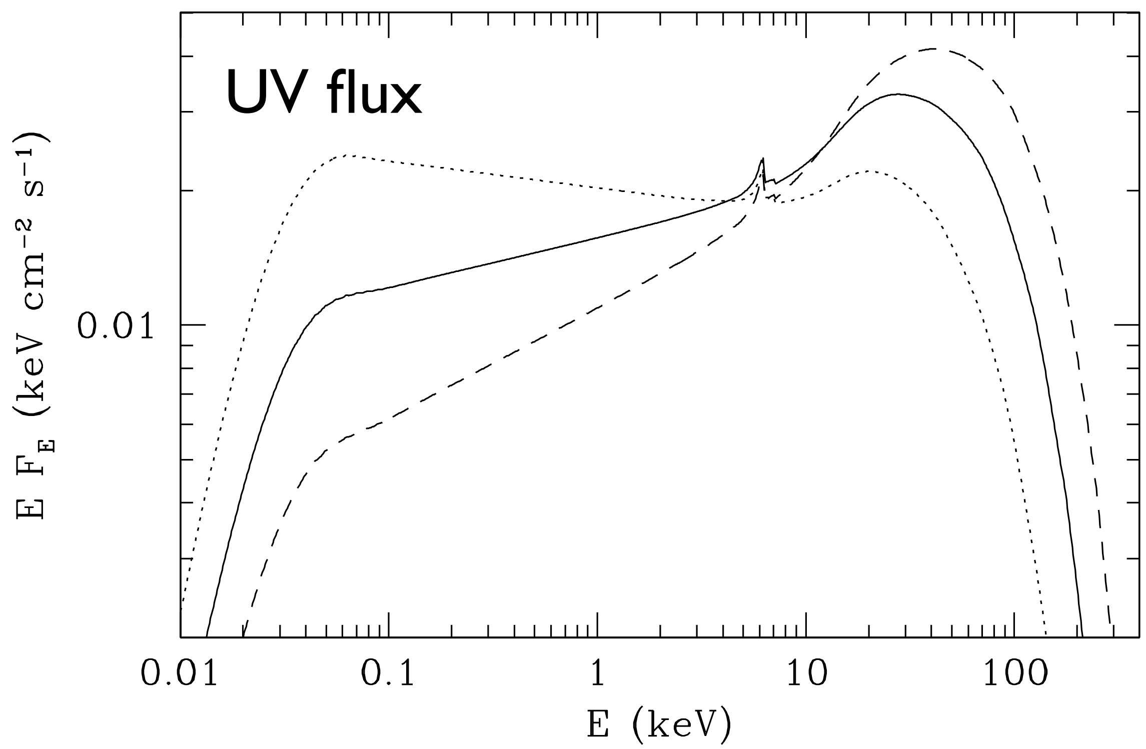


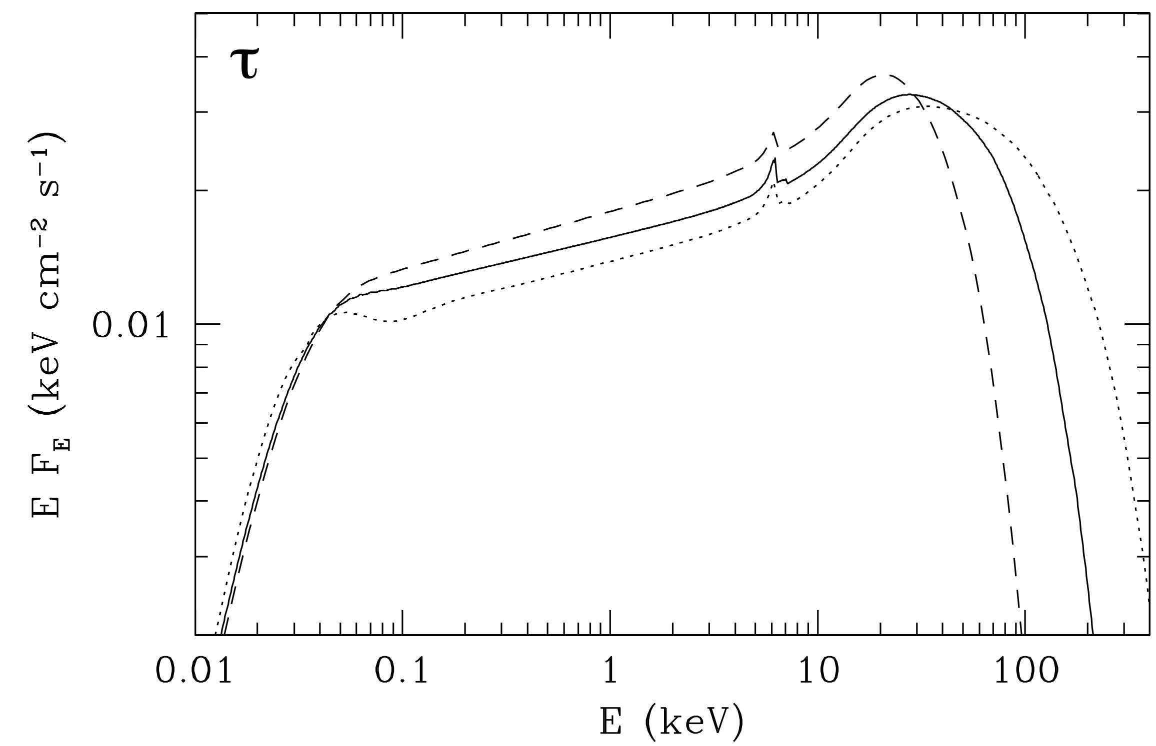
NGC 7469:
Petrucci 2004
$\epsilon_e \approx 0.5\ m_e c^2$



Cen -A
Marcowith 1998
$\epsilon_e \approx 1.0\ m_e c^2$

Seyfert galaxies: variability





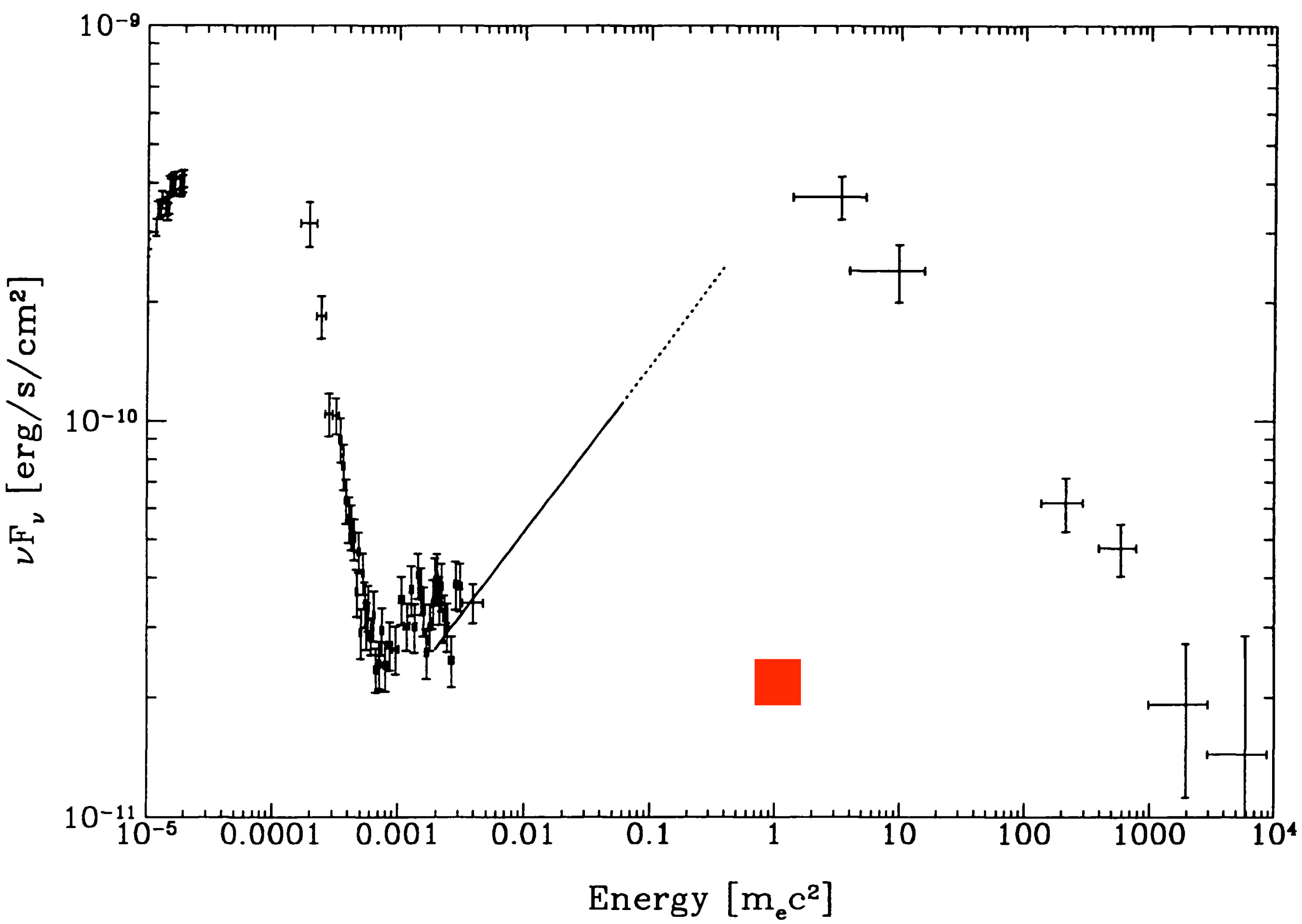
For a few bright sources, MAX will allow to study the spectral variability and hence the physics behind.

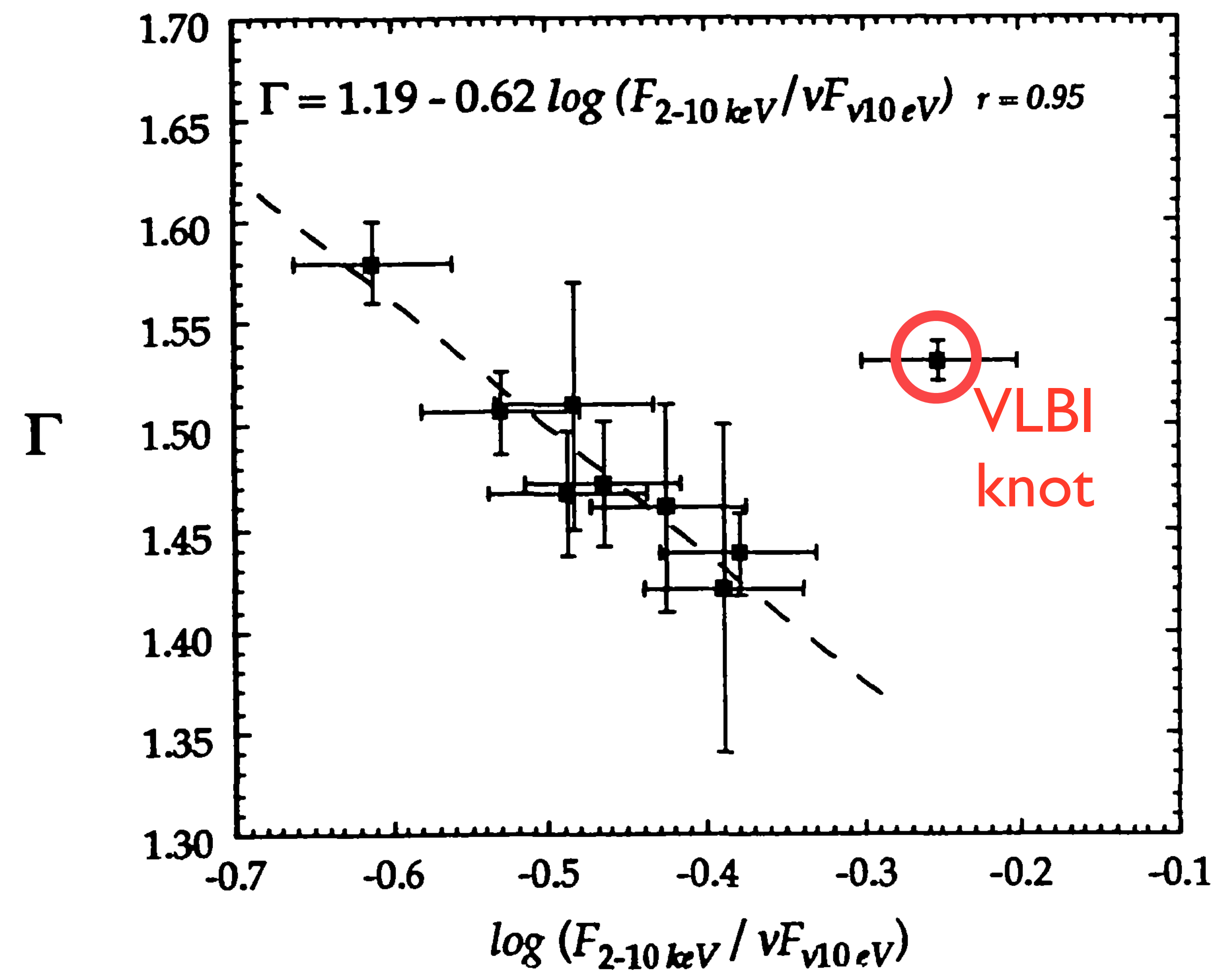
The source of the variability (inferred from the UV/X-ray bands) could be tested for the first time.

MAX and Seyfert galaxies

- If all Seyferts feature a spectral cutoff at 200 keV, MAX will provide meaningful upper limits to the cutoff energy for several dozen objects (cutoff energies have been determined for only a handful objects).
- There are a few Seyferts and radio galaxies that will be detected by MAX.
- If part of the X-ray bright Seyfert galaxies (e.g. the radio loud ones) have higher cutoff energies, MAX will detect them.
- For detected sources, multi-wavelength campaign including MAX will provide unique tests.

3C 273: “Seyfert” model

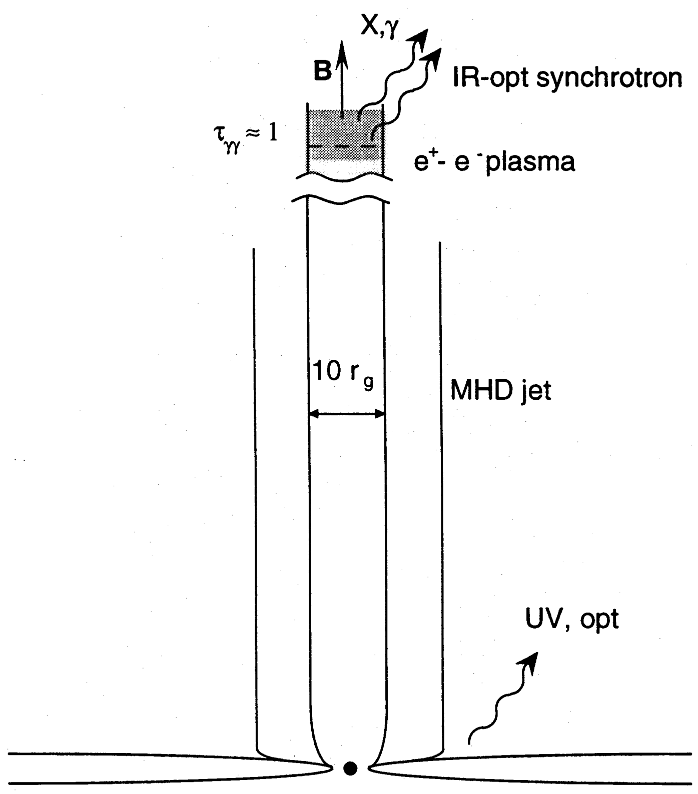


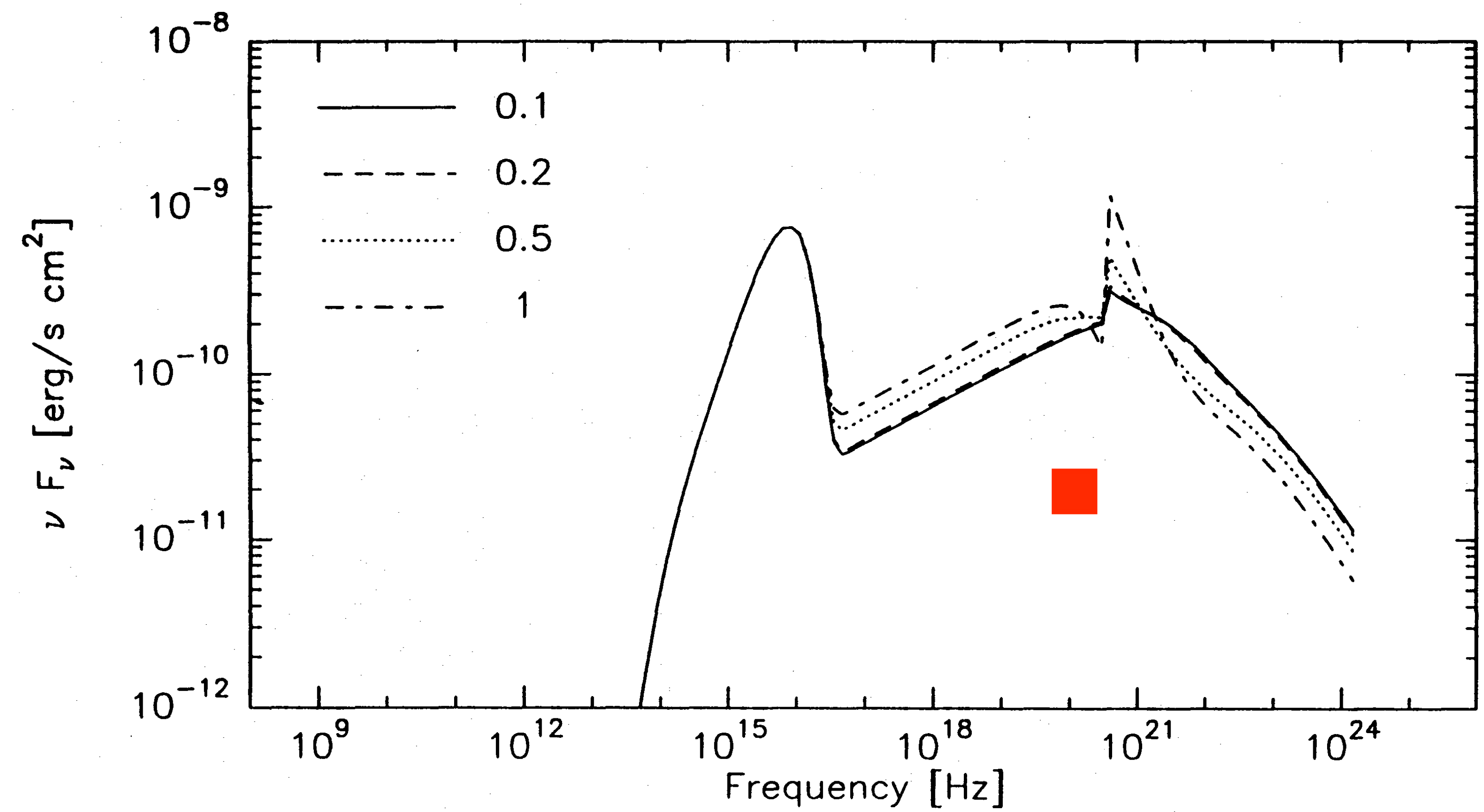


Photon starved pair models reproduce the spectral variations. A slope of -0.62 points to a low compactness (ℓ <10), optically thin (τ≈0.2) and quasi thermal ($\epsilon_e \approx$ 2-5 $m_e c^2$) e^- cloud, source of inverse Compton emission. Non thermal e^- required to explain the gamma-ray spectrum.

Static high compactness model (Zdziarski, Svensson) do not reproduce the spectral variations, however they explain the spectral slope and predict broad annihilation line at 511 keV.

3C 273: "blazar" model





Marcowith, Henri and Pelletier (1995)

IC occurs in the jet at $200R_G$ above the disk, where the pair density is maximized

➛ predict the correct spectral break

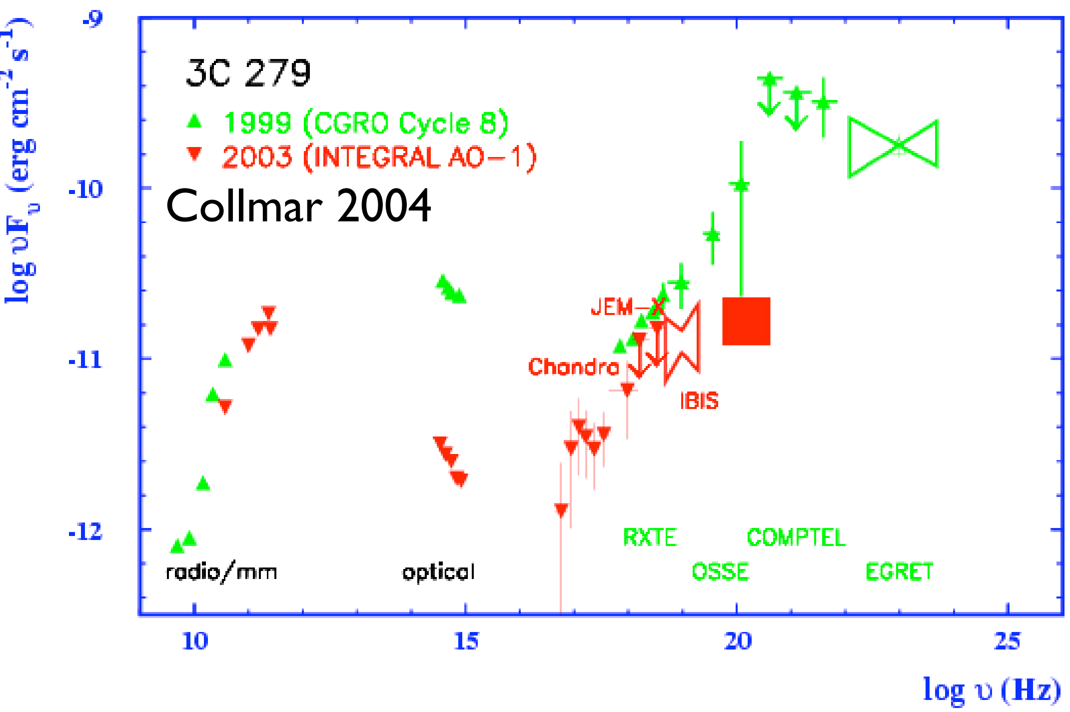
➛ spectral index and its variations are related to the electron energy distribution, observed spectral variations are not explained.

➛ predict a Doppler boosted broad annihilation line (above the MAX energy bands)

MAX and 3C 273

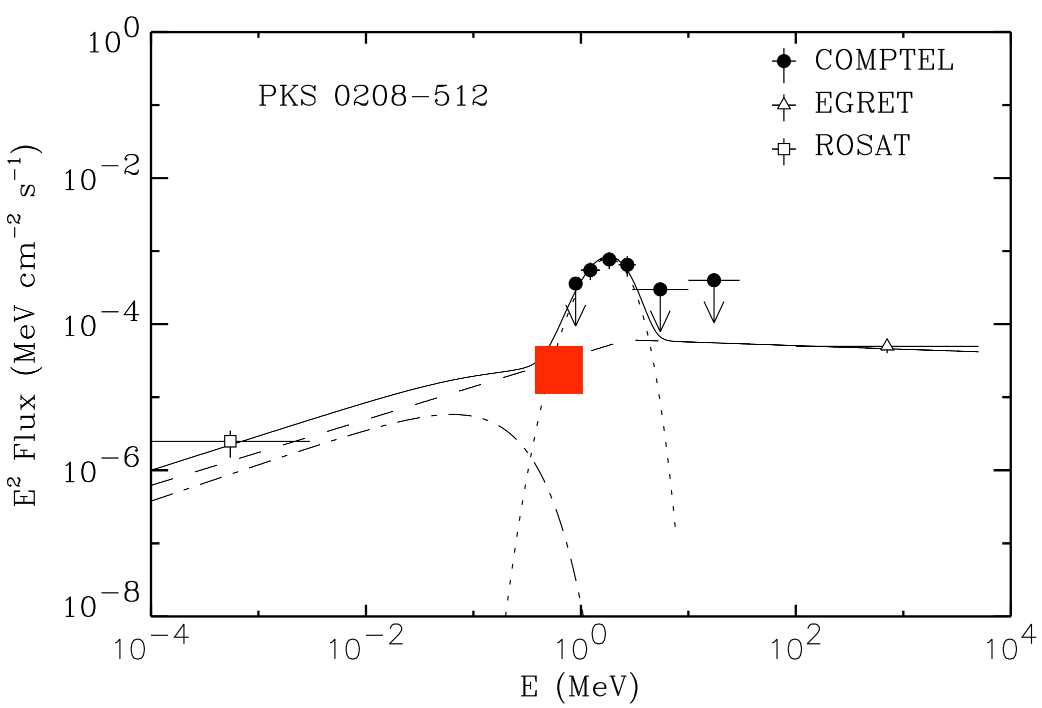
- MAX will detect 3C273 with no doubt, where its continuum is the brightest and where the spectral break occurs
- Simultaneous X-ray, MAX and GLAST observations would allow to study the complete high energy continuum of 3C273 and its variability for the first time and provide unique constraints on existing models
- Annihilation features are not excluded (however unlikely according to current models)

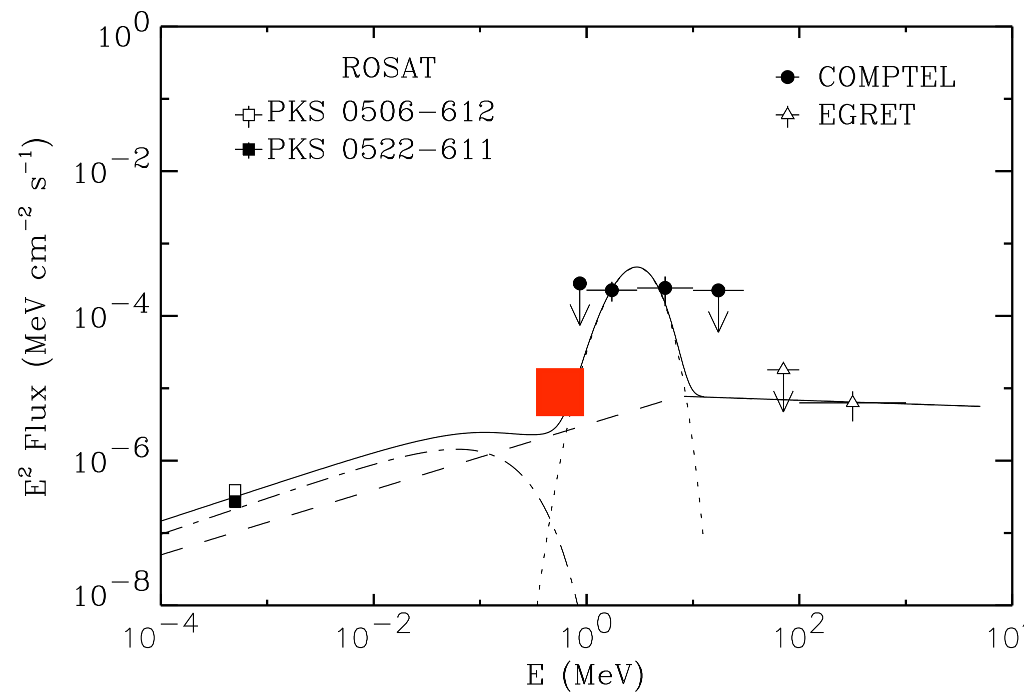
MeV Blazars



Simultaneous observation in the X-rays, and with MAX and GLAST would be very useful to constraint the continuum and to study how the SSC or IC models fit.

Broad annihilation lines possibly observed by Comptel are too broad for MAX, however multi-wavelength observations involving MAX could confirm them.



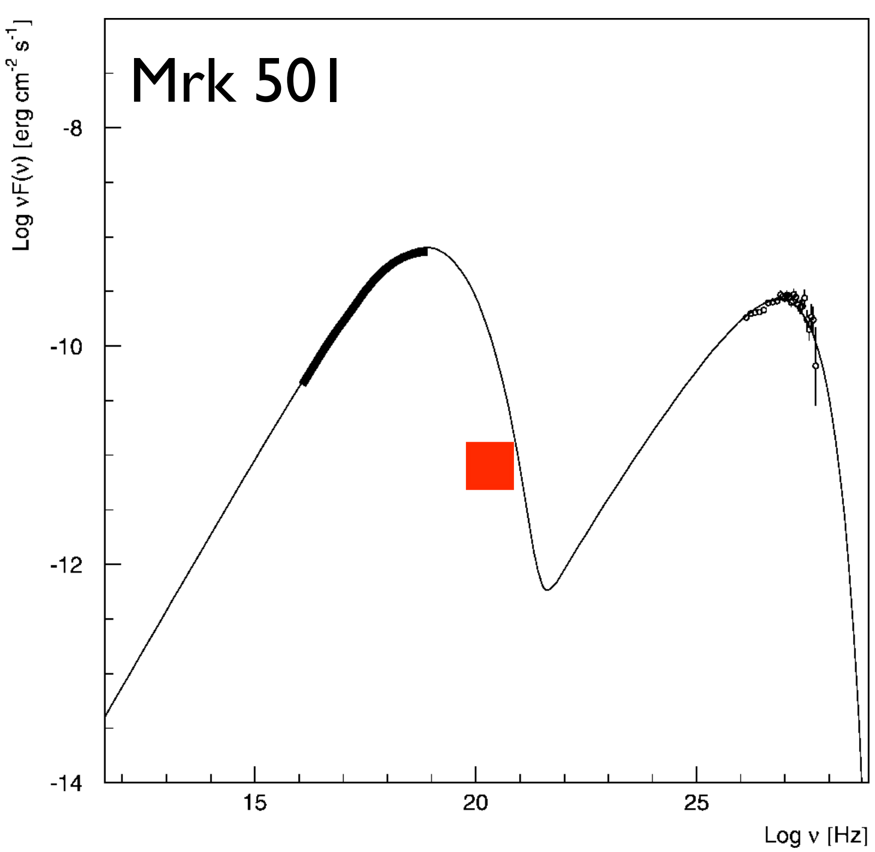


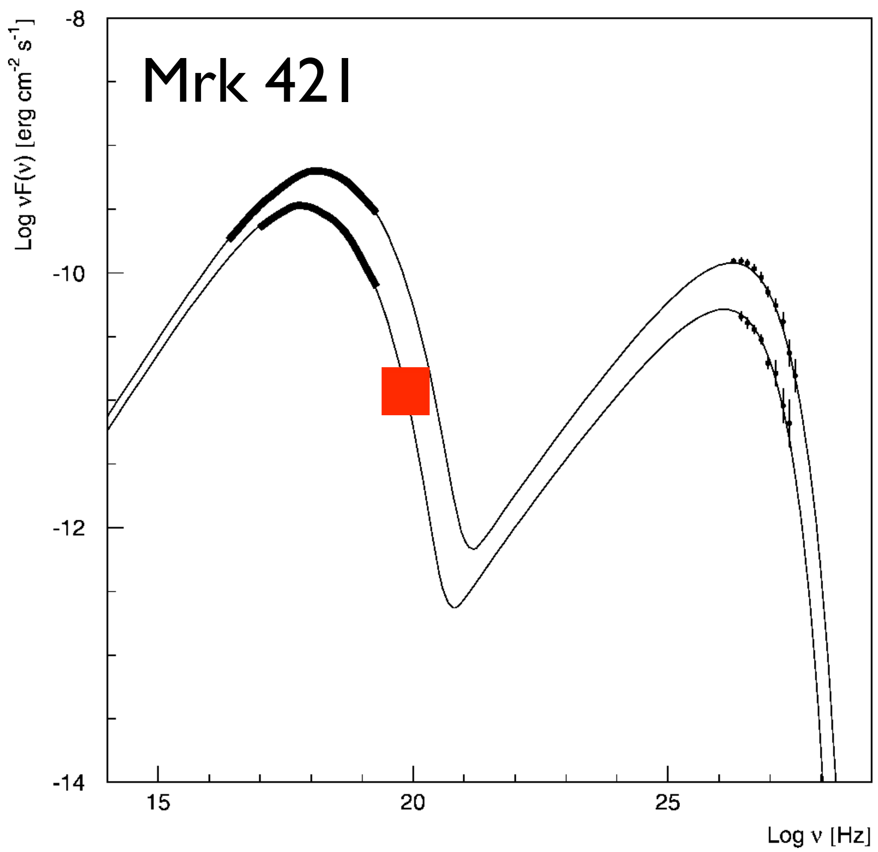
TeV Blazars

MAX could detect 10-20 High Energy Peaked Blazars for the first time in the synchrotron Compton transition zone. This allows an independent measure of γ_{max}.

Simultaneous observations in the X-rays, with MAX, GLAST and in the TeV range will be very constraining.

Annihilation features are expected to be completely smeared out.





MAX and blazars

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- MAX could detect at least 20 blazars
- MAX will observe MeV blazars close to their maximum and TeV blazars close to their minimum
- Simultaneous X-ray, MAX, GLAST and TeV observations would be very constraining
- Broad annihilation lines could possibly be confirmed

MAX and AGNs

- Multi-wavelength observations with MAX will help constraining the continuum emission much better
- MAX is necessary to explore the variability of bright sources in the MeV band
- According to current models, narrow annihilation lines are unlikely but broad lines should be looked for