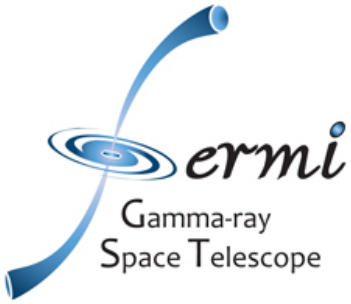

Search for Gamma-ray Emission From X-ray Selected Radio-quiet Seyfert Galaxies with Fermi-LAT

(Ackermann+ [*Fermi*-LAT collab.], 2012, ApJ, in press, arXiv:1109:4678)

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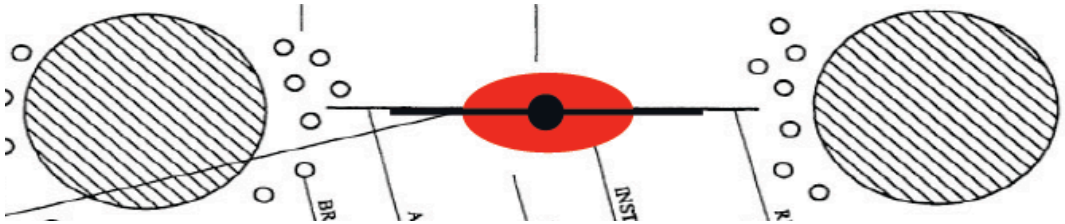
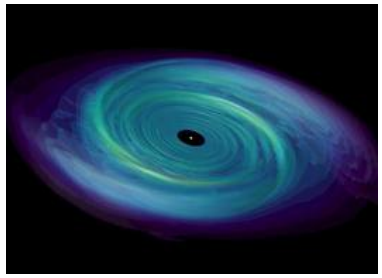
for the *Fermi*-LAT Collaboration

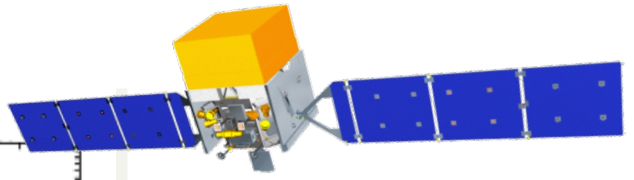
219th AAS
01/11/2012

SED of Seyfert galaxies

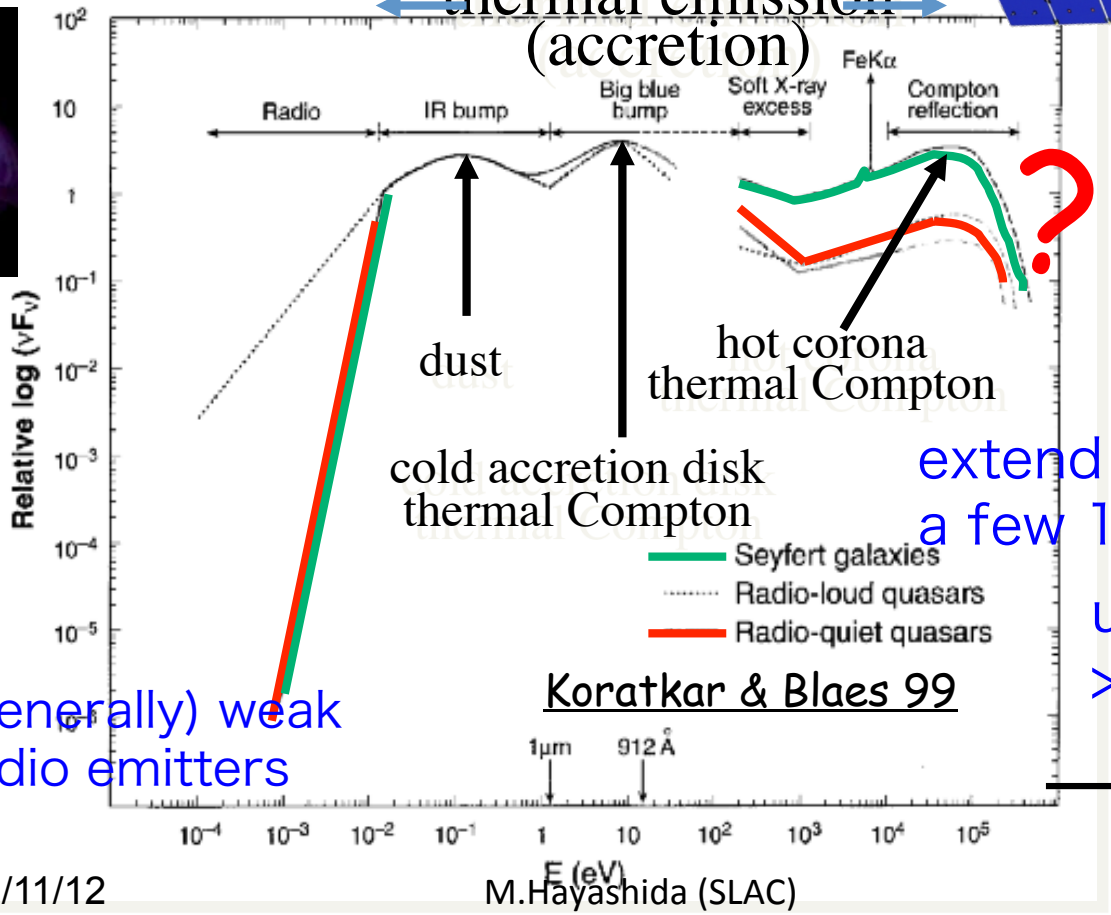




Gamma-ray:
20 MeV - > 300 GeV



***Fermi*-LAT**
(All sky survey)



?

?

?

extend up to
a few 100 keV

unknown
> 1 MeV

(generally) weak
radio emitters

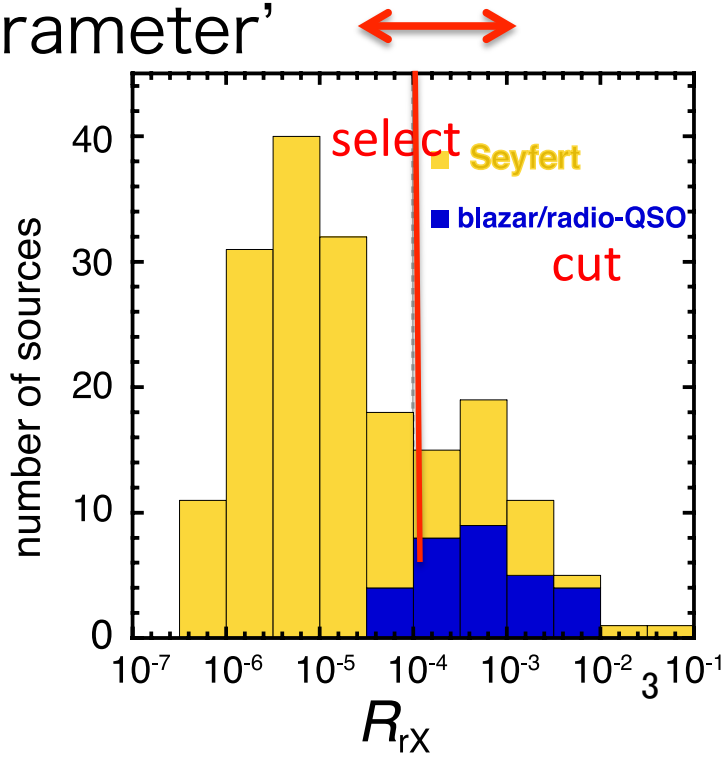
GeV

Sample Selection

1. use the 58-month *Swift*-BAT catalog
   "Galaxies" or "Seyfert" (as defined in the catalog)
   – $F_{14\text{-}195\ keV} > 2.5 \times 10^{-11}$ [erg/cm^2/s]
2. high-galactic-latitude sources
   – |b| > 10 deg (|b| > 20 deg for |l |< 20deg)
3. `hard X-ray radio loudness parameter'
   (to remove 'radio-loud' AGN)

NGC 4945
NGC 1068
are not in our list

$$R_{\rm rX} = \frac{[\nu F_\nu]_{1.4\,\rm GHz}}{[\nu F_\nu]_{14-195\rm keV}}$$

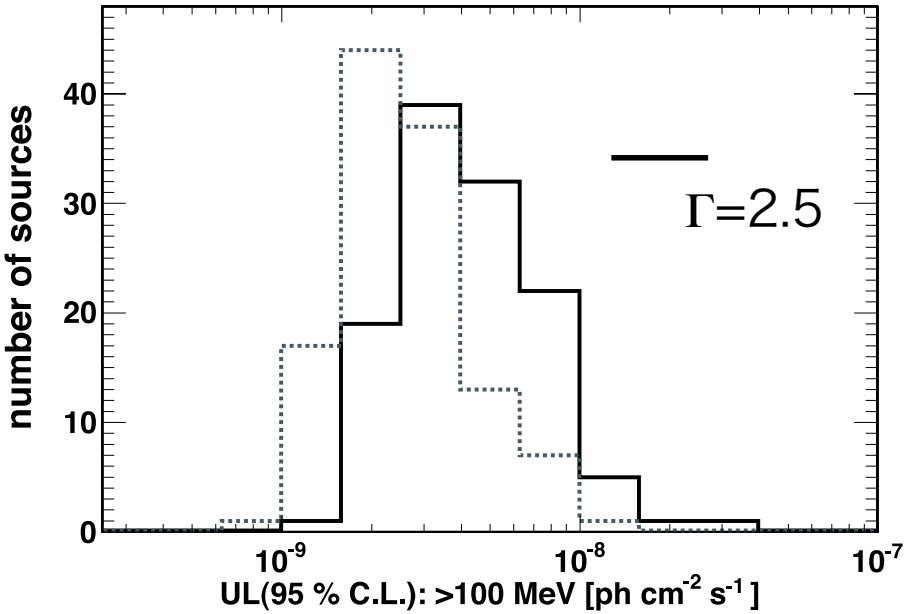


120 sources are selected !!

Results of LAT data analysis

No new radio-quiet γ-ray Seyferts is established!

UL distribution of the analyzed sample



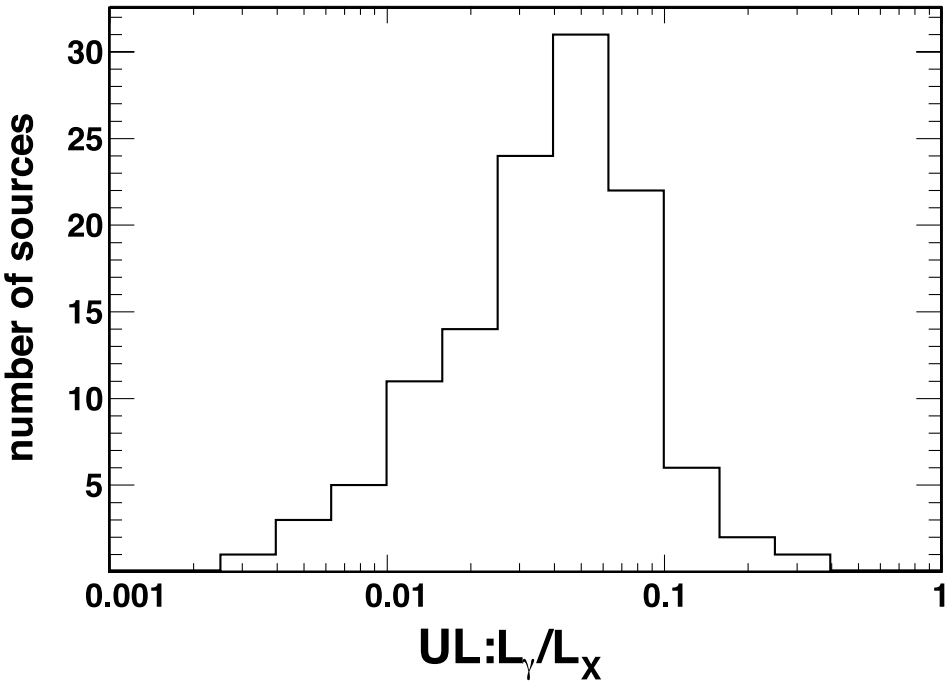
The mean value (>100 MeV) :
~ 4×10^{-9} ph cm^{-2} s^{-1}

The EGRET results (>100 MeV):
(0.5-1.5)$\times10^{-7}$ ph cm^{-2} s^{-1} (Lin et al. 1993)
(0.3-1.5)$\times10^{-8}$ ph cm^{-2} s^{-1} [stacking]
(Cillis et al.2004)

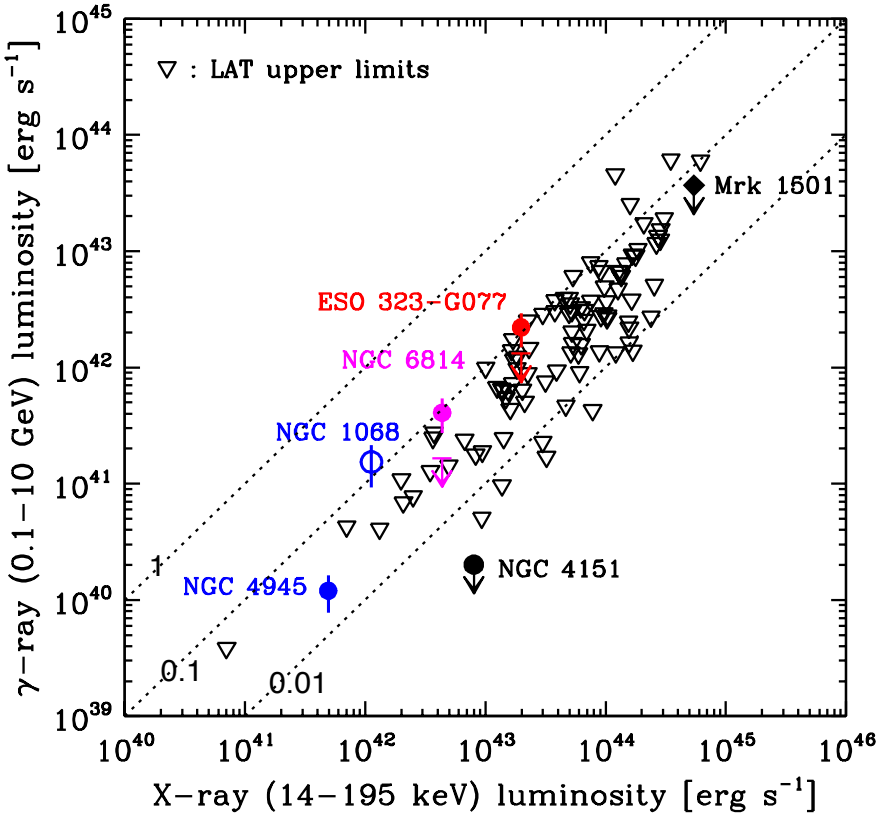
possible detections? : ESO 323-G077, NGC 6814
but the number of chance coincidence is ~ 2 sources (2FGL)

Multiwavelength Comparison-1

ratio of γ-ray and X-ray fluxes



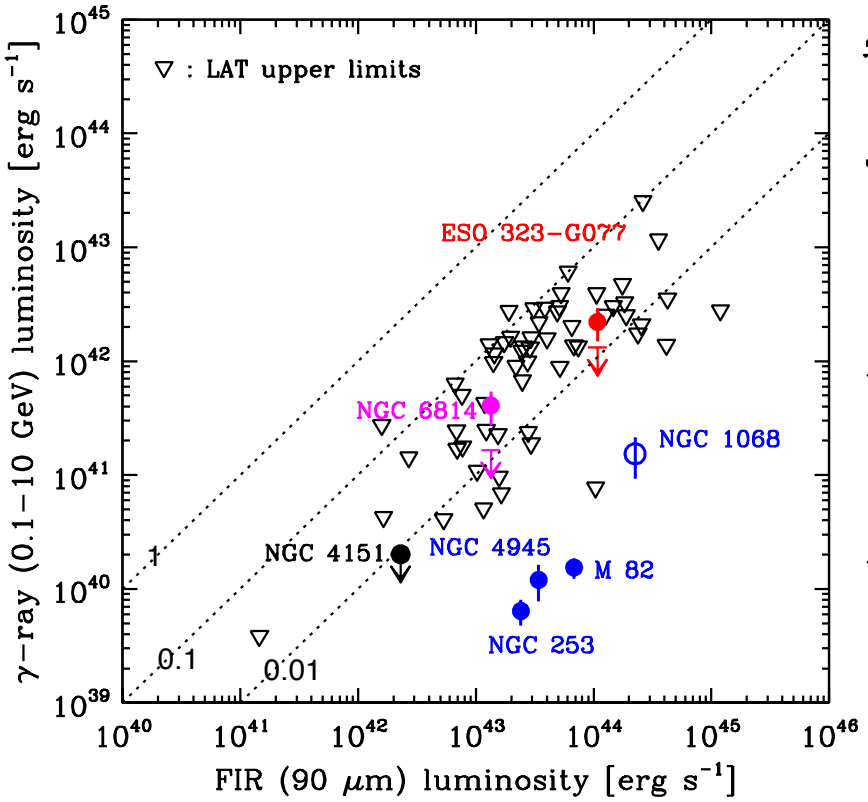
vs. X-ray (luminosities)



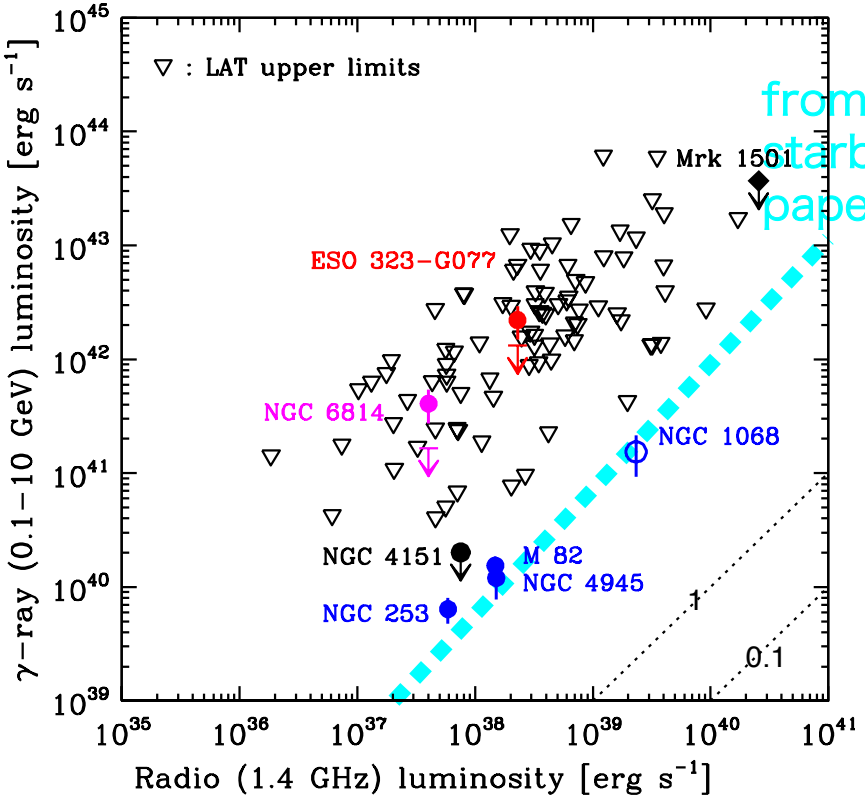
Mostly $L_\gamma/L_X < 0.1$, and even < 0.01 in some cases.

Multiwavelength Comparison-2

vs. FIR (90 μm) (luminosity)



vs. radio (1.4 GHz) (luminosity)



The derived LAT ULs are still higher than γ-ray luminosities which are expected from L_{FIR}-L_γ or L_{radio}-L_γ relations in starburst galaxies.

Summary

- We systematically search for γ-ray emission of 120 hard X-ray-selected Seyfert galaxies as `radio-quiet' objects, with 2-year *Fermi*-LAT data.
- We could *not* established new γ-ray Seyferts, but the possible exceptions of ESO 323-G077 and NGC 6814
- We found that there is no GeV emission component in the spectra of Seyfert galaxies, which could be related nuclear outflows, jets, accretion disks or disk coronae, down to 1% level of the bolometric accretion-related luminosities.