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# X-ray characterization of *Fermi*-LAT $\gamma$ -ray pulsars

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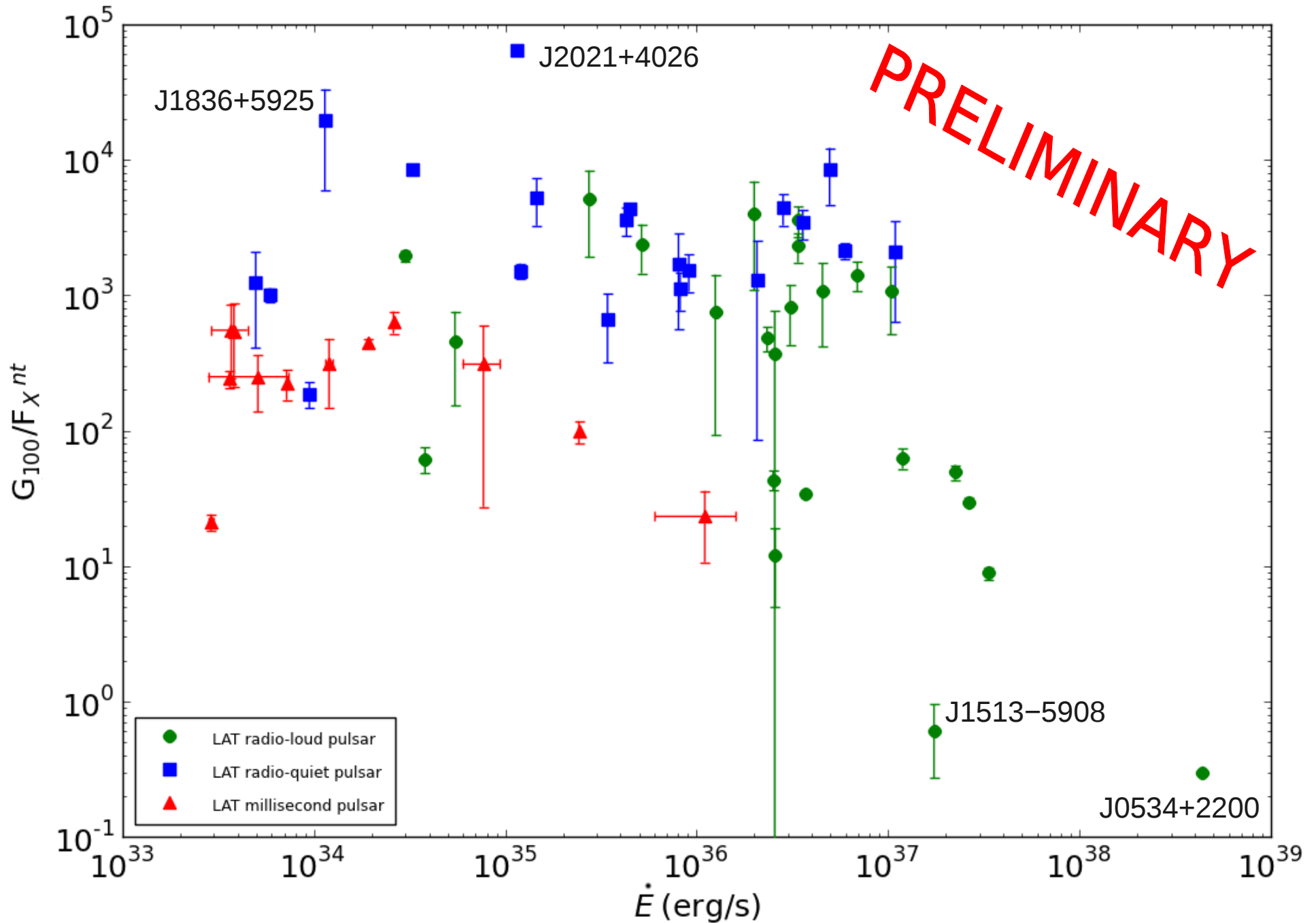
*Fermi*  
Gamma-ray Space Telescope

# X-ray coverage of $\gamma$ -ray pulsars

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- The second *Fermi*-LAT catalog of  $\gamma$ -ray pulsars includes **117 objects**
- **67  $\gamma$ -ray pulsars have an X-ray counterpart:**  
30 radio-loud, 19 radio-quiet and 18 millisecond
- Uneven coverage in the soft X-ray band **0.3-10 keV**
- *Chandra/ACIS, XMM-Newton, SWIFT/XRT, Suzaku*
- **Spectral characterization of 56 pulsars:** absorbed power low (+ thermal blackbody component + PWN)

# $\gamma$ -/X-ray non-thermal flux ratio vs $\dot{E}$



# Conclusions

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- Lack of correlation between  $\gamma$ - and X-ray fluxes → differences in the geometry of the emitting regions
- Pulsars with similar energetics have  $F_\gamma/F_x$  spanning more than 3 decades
- Most energetic pulsars have low ratios of  $F_\gamma/F_x$
- Millisecond pulsars show lower and less scattered values of  $F_\gamma/F_x$  ( $\langle \log (F_\gamma/F_x) \rangle \geq 2.31$ ,  $\sigma = 0.48$ )
- Radio-quiet pulsars show, on average, higher values of  $F_\gamma/F_x$  and appear definitely less scattered than radio-loud pulsars ( $\langle \log (F_\gamma/F_x) \rangle \geq 3.48$ ,  $\sigma = 0.49$  and  $\langle \log (F_\gamma/F_x) \rangle \geq 2.37$ ,  $\sigma = 1.10$ , respectively)

# References

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- “The second *Fermi* Large Area Telescope Catalog of Gamma-ray Pulsars”, in preparation
- Marelli, M. 2012, ArXiv:1205.1748
- Marelli, M., De Luca, A., & Caraveo, P. A. 2011, ApJ, 733, 82