

A Polarization Study of AGN in the Local Universe

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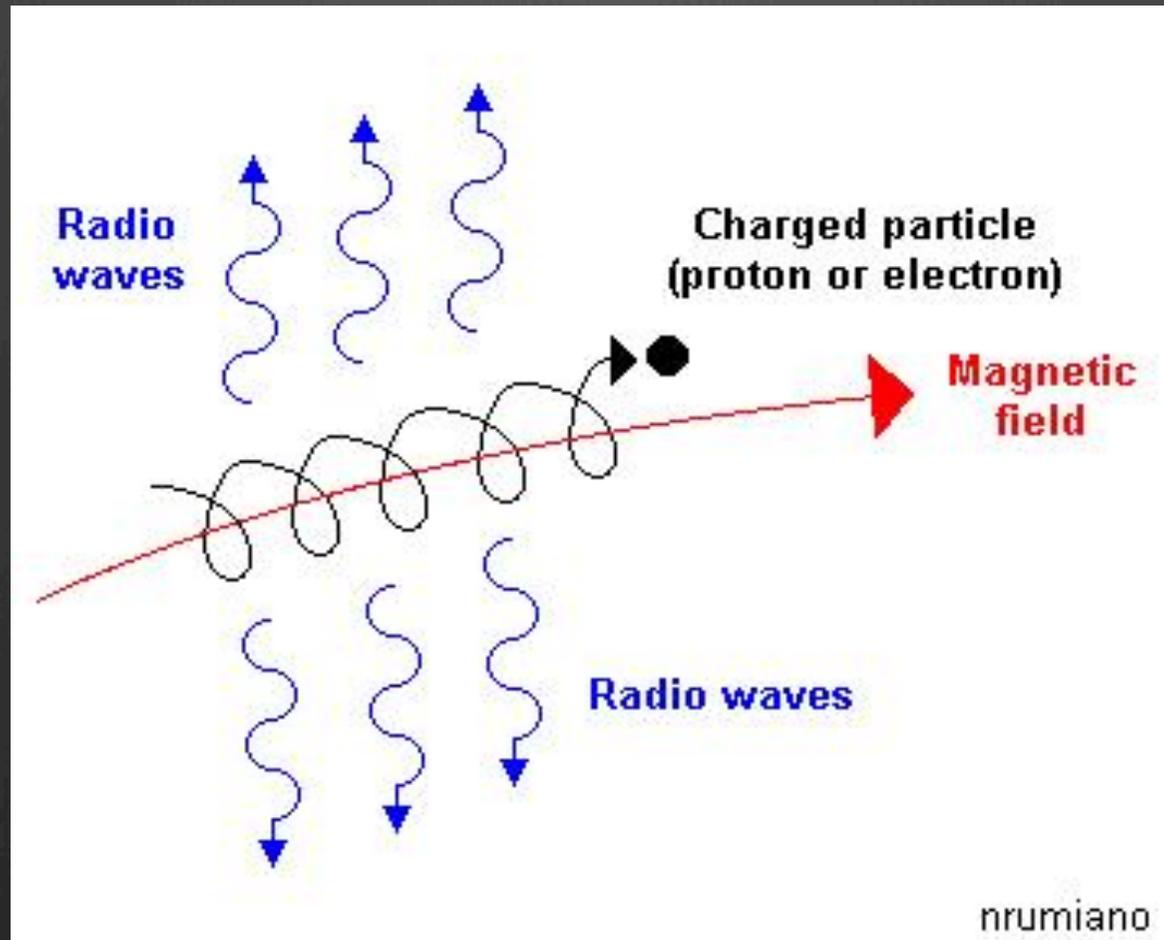
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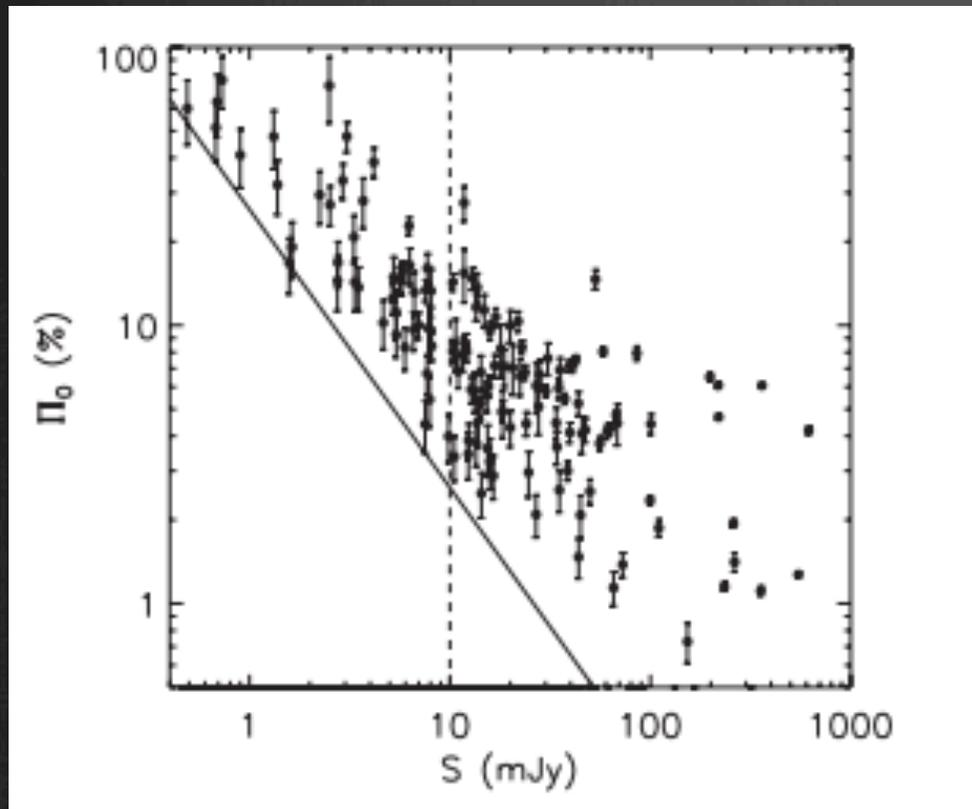
Radio Polarization

Polarized radio emission → synchrotron radiation

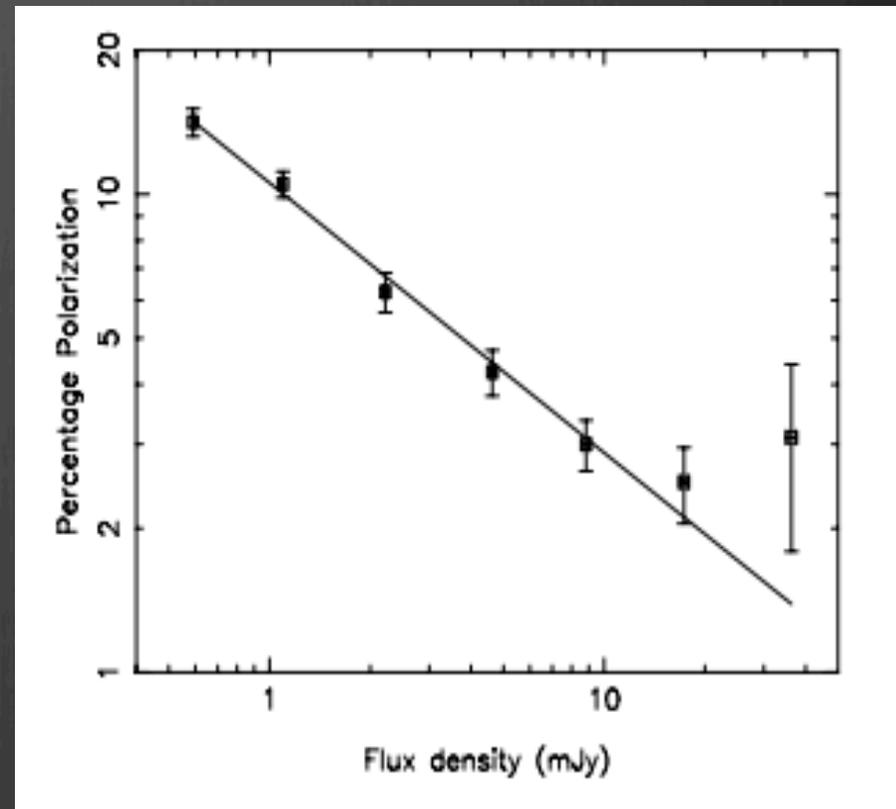


There is something puzzling about the faint polarized sky...

- ★ Flux density and percentage polarization are anti-correlated.



Banfield et al. (2011)



Subrahmanyan et al. (2010)

Possible Explanations

- Population change at faint flux densities (e.g. *Tucci et al. (2002)*, *Mesa et al (2004)*)
- Change in fraction of radio-quiet AGN (*Taylor et al. (2007)*)
- Mainly due to selection effects (e.g. *Hales (2014)*)

Exploring the trend

- * Flux density correlates with luminosity and/or redshift

What we want to do?

- Examine the polarization properties of a **large number** of AGN in the Local Universe.

How?

- Joint analysis of optical and radio survey data

Sample Construction

Radio Catalogue: NVSS

- 1.4 GHz continuum survey of the sky ($\delta > -40^\circ$). Polarized flux densities.

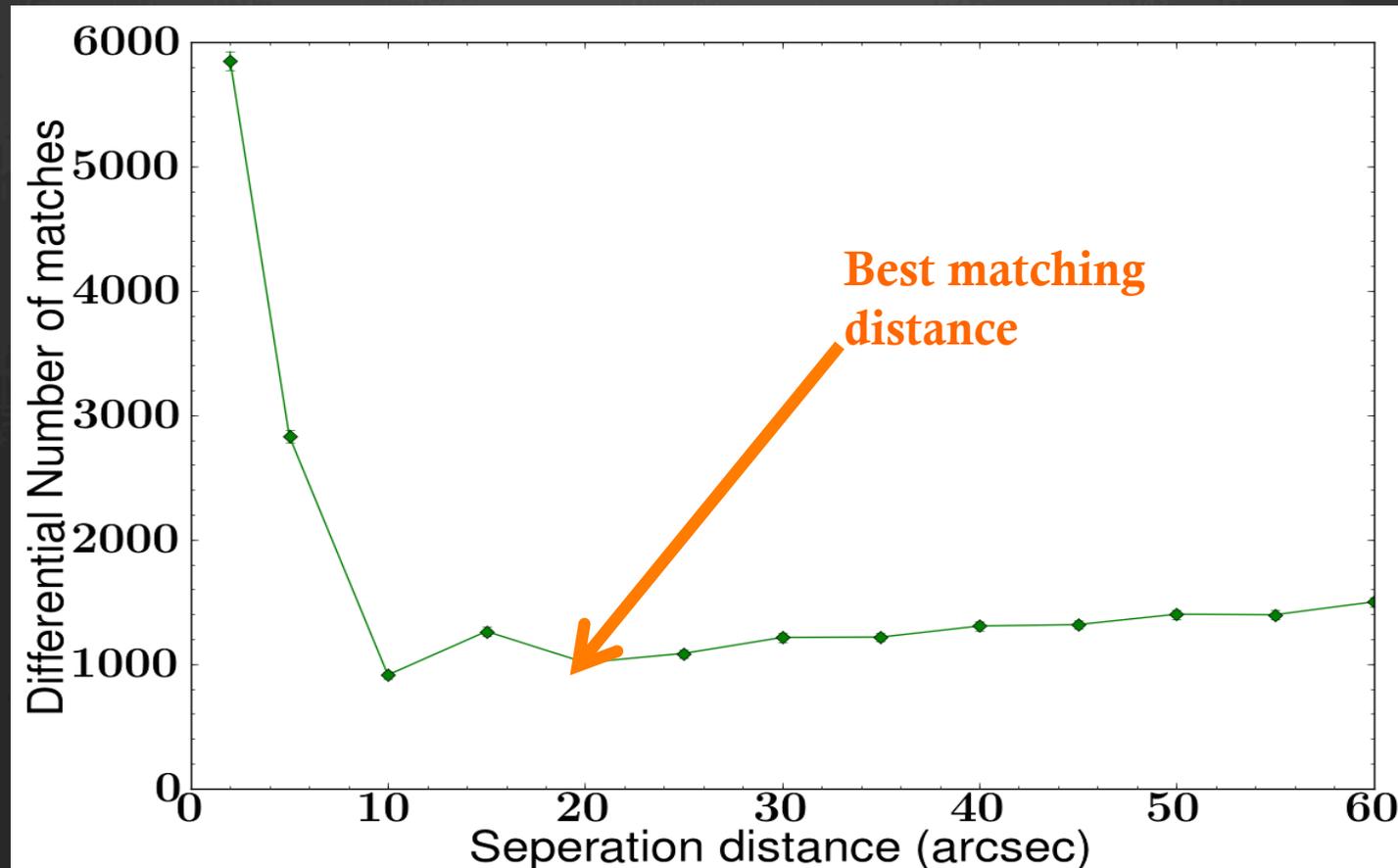
Optical Catalogue:



- Spectroscopic redshifts

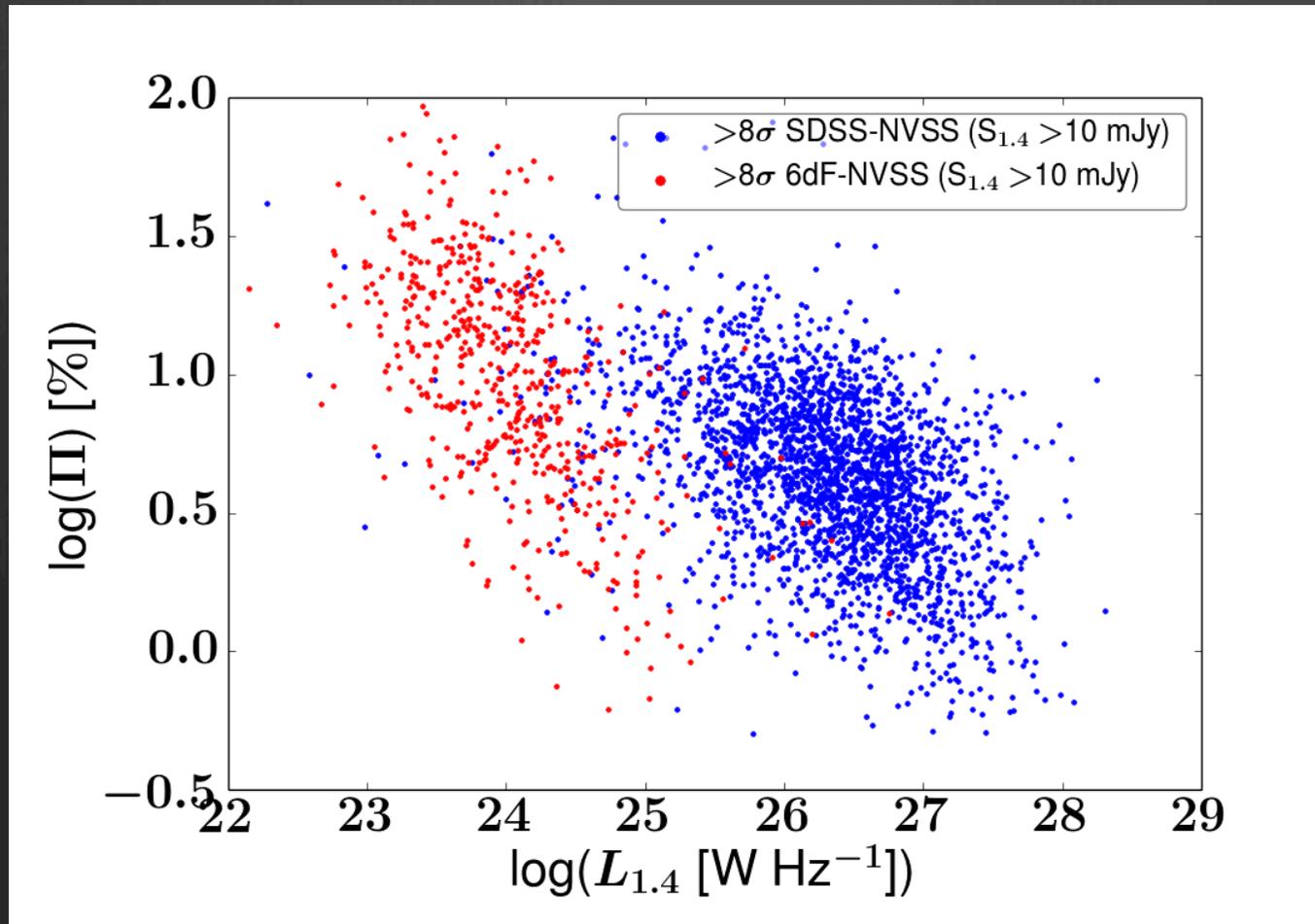
Cross-Matching Catalogues

- 5-60 arcsecs – find **closest** optical match for each NVSS polarized source.
- $S > 10$ mJy and $P > 8\sigma$ ($\sigma = 0.29$ mJy)
- ~ 600 6dF-NVSS and ~ 2400 SDSS-NVSS sources



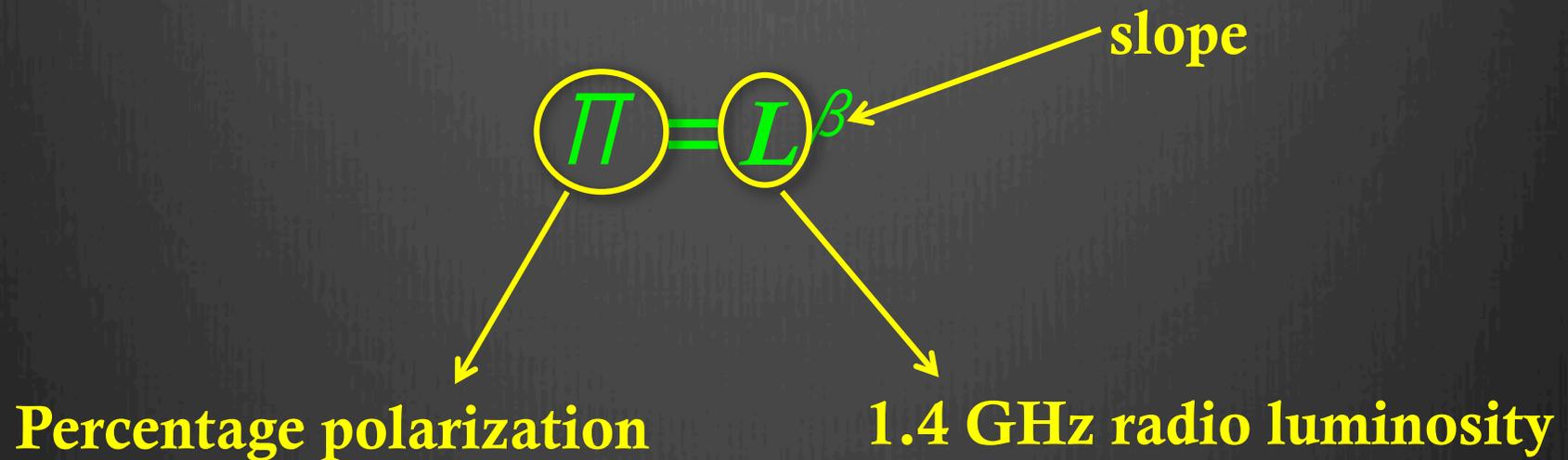
Preliminary Results

An anti-correlation indeed!!!



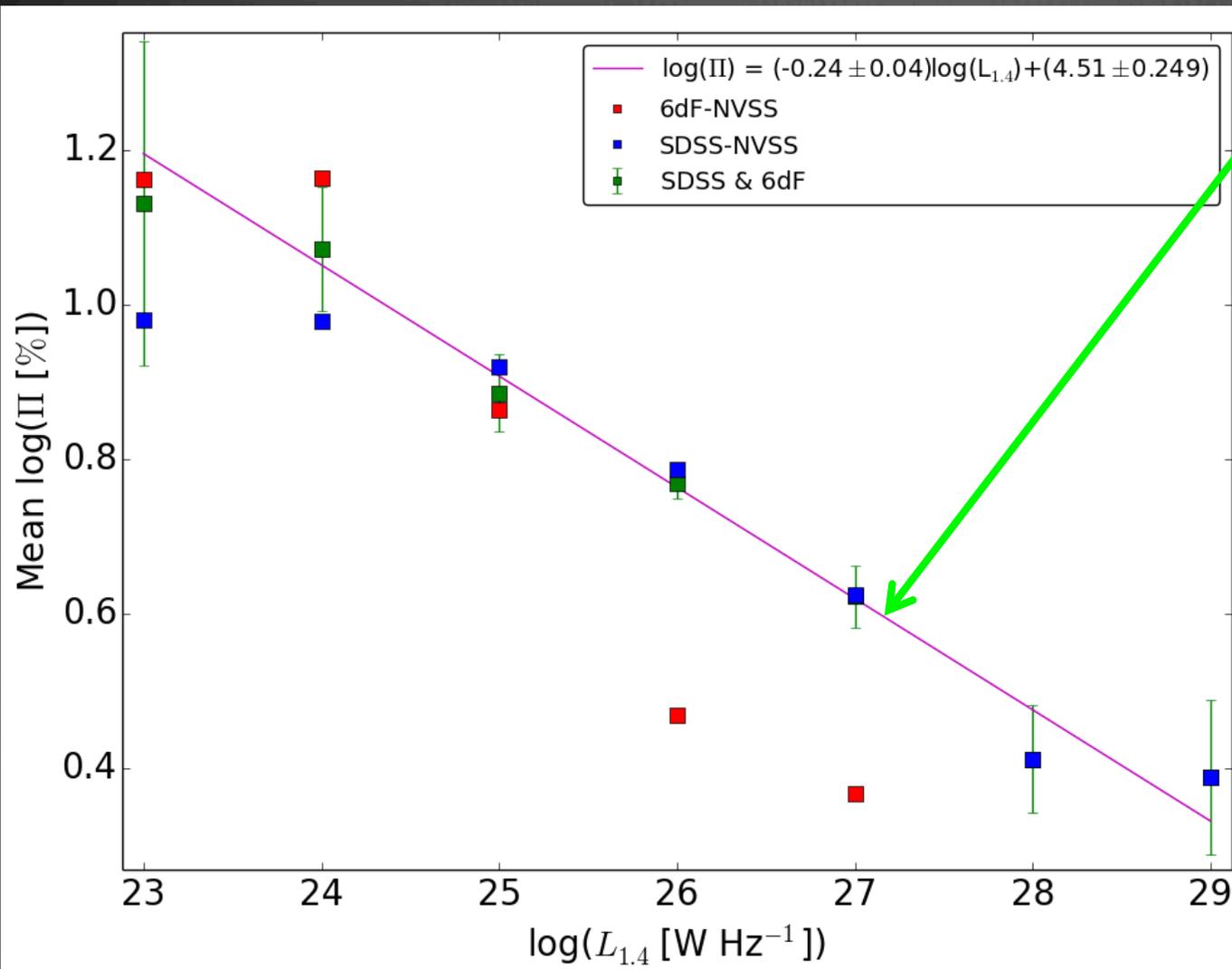
$$L_{1.4 \text{ GHz}} = 4\pi S_{1.4 \text{ GHz}} (D_L)^2 (1+z)^{-0.7}$$

➤ Power law relation:



$$\log \Pi = \beta \log L$$

Mean Trend



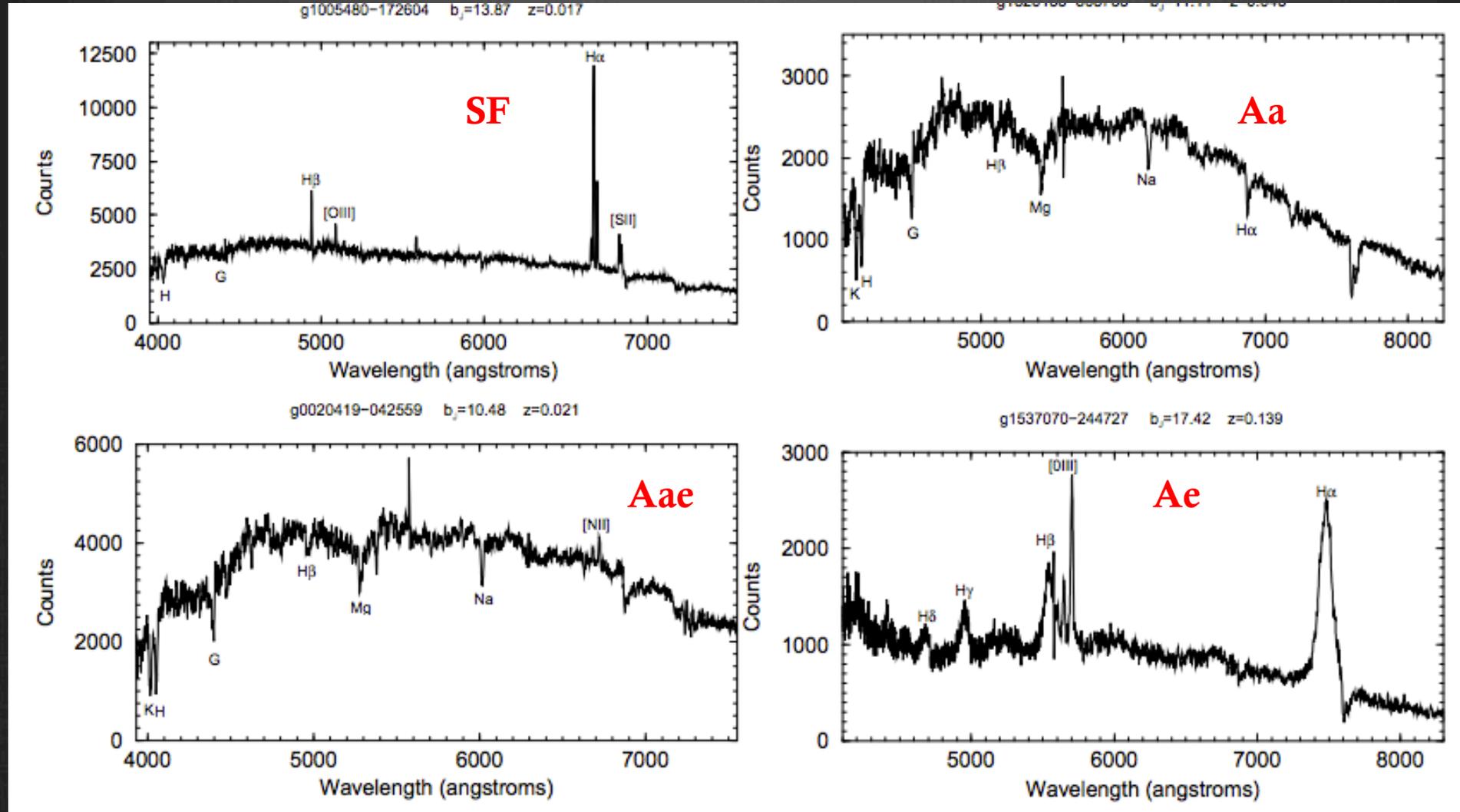
$\beta = -0.24 \pm 0.04$

• $\beta = -0.29 \pm 0.05$
(Banfield et al. 2013)

• Predicted $\beta = -0.25$
(O'Sullivan et al. 2008)

Next Step

- Classify optical sample into galaxies and AGN (also subclasses) -> Machine Learning



Mauch et al. (2009)

Future Outlook

- RM synthesis to explore magnetic properties of the AGN
- Construct the **FIRST** polarized luminosity function.