Spectroscopic studies on a LLQSOs sample
&
The impact of aperture effect on its classification

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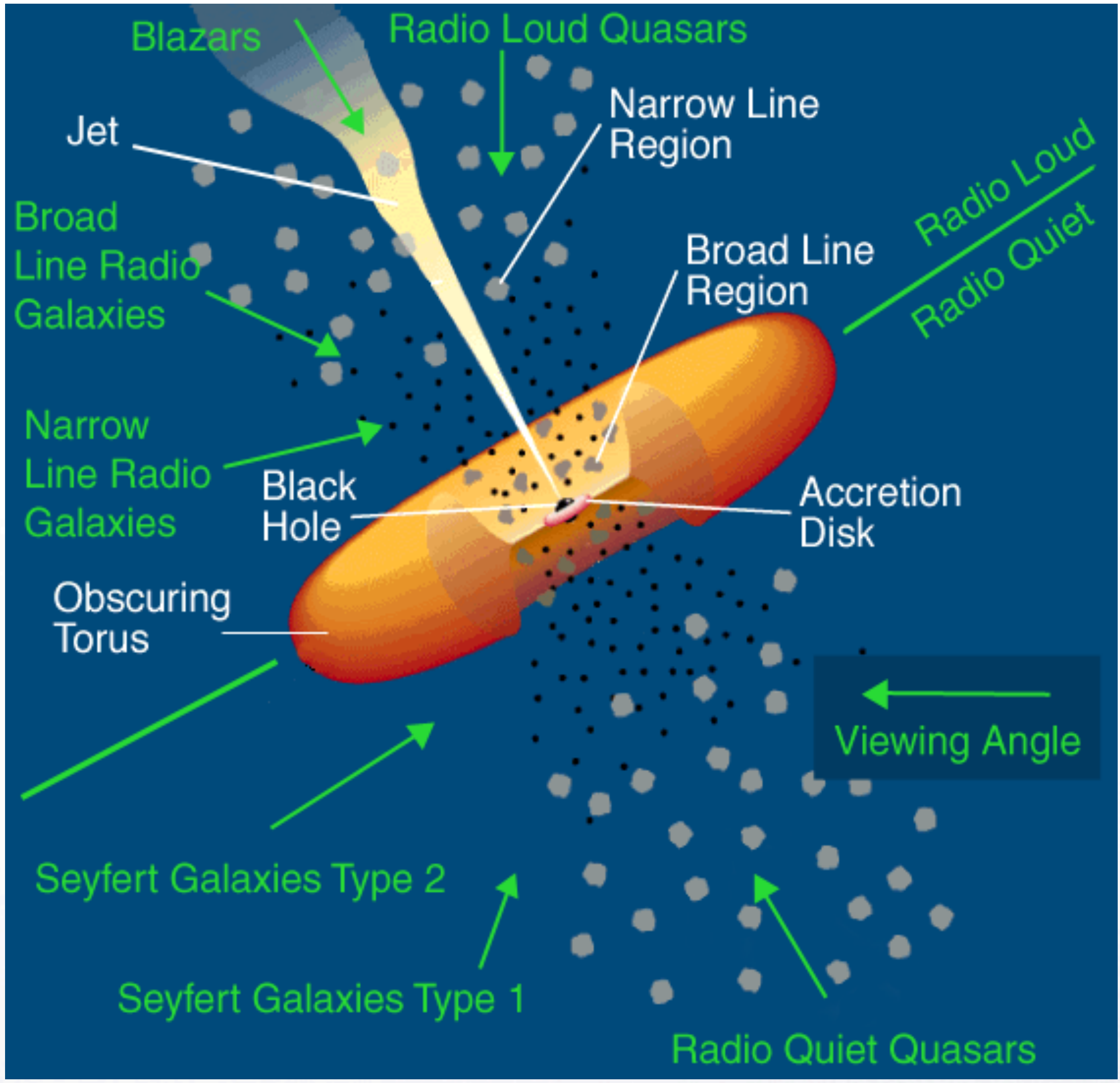
Outline

- Motivation
- The data
- Classification of the galaxies
- Simulating the Aperture Effect
- Results
- Summary & Outlook

Active Galactic Nuclei (AGN):

compact region at centers of galaxies

Antonucci (1993); Urry & Padovani (1995)



Credit: Nasa

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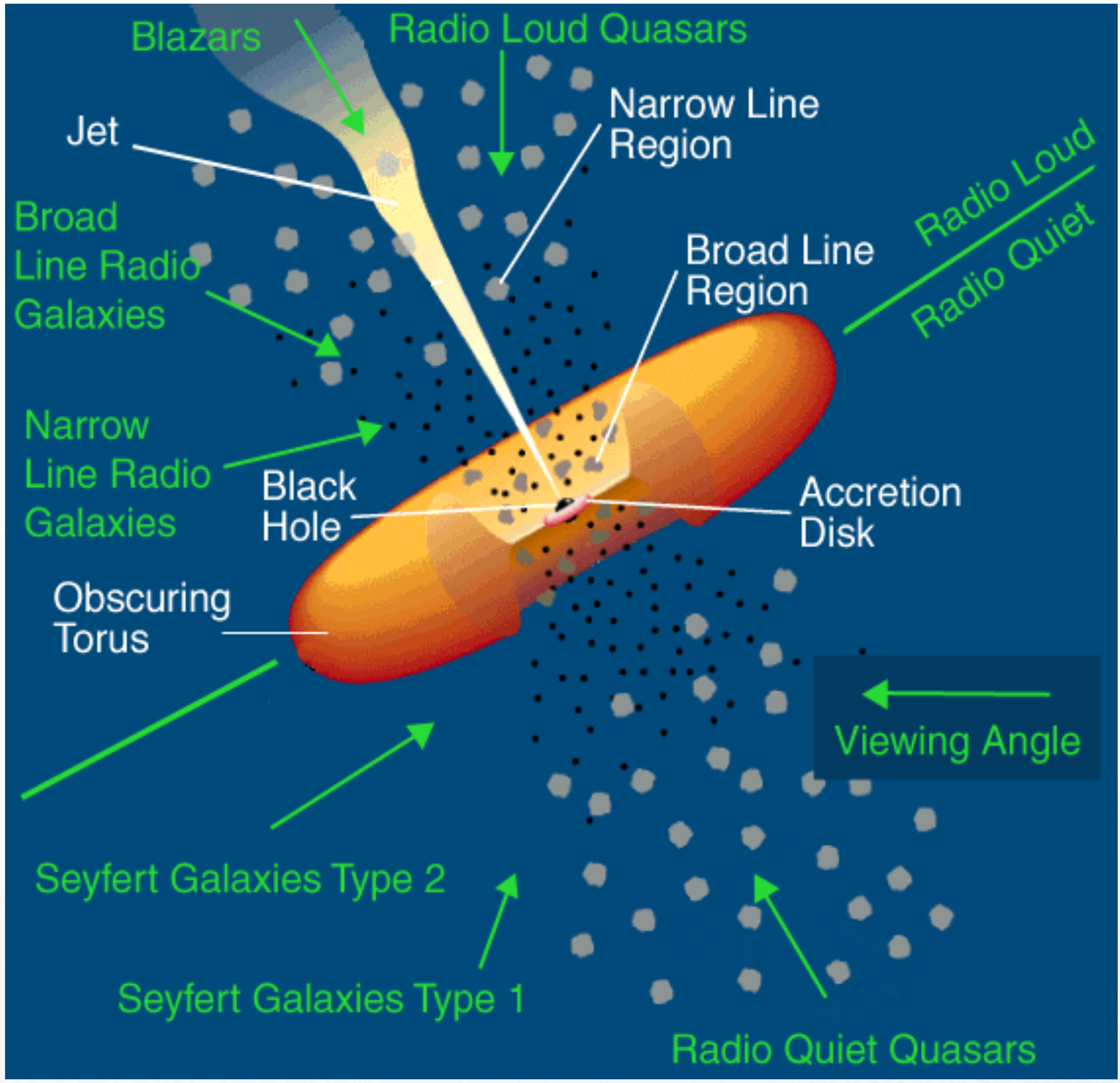
Radio Loud

(10% of the population)



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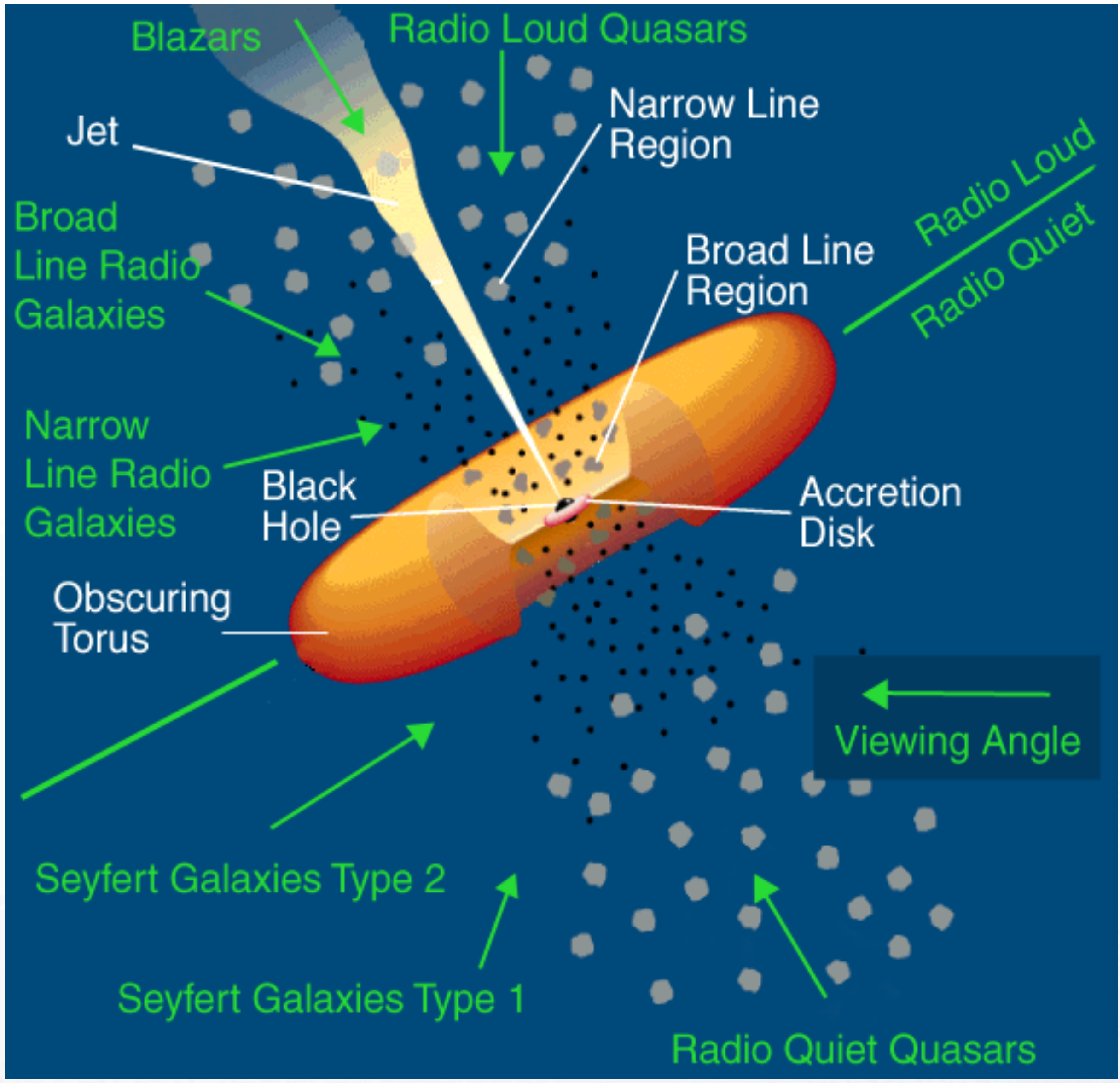
<u>Radio Quiet</u>
(90% of the population)



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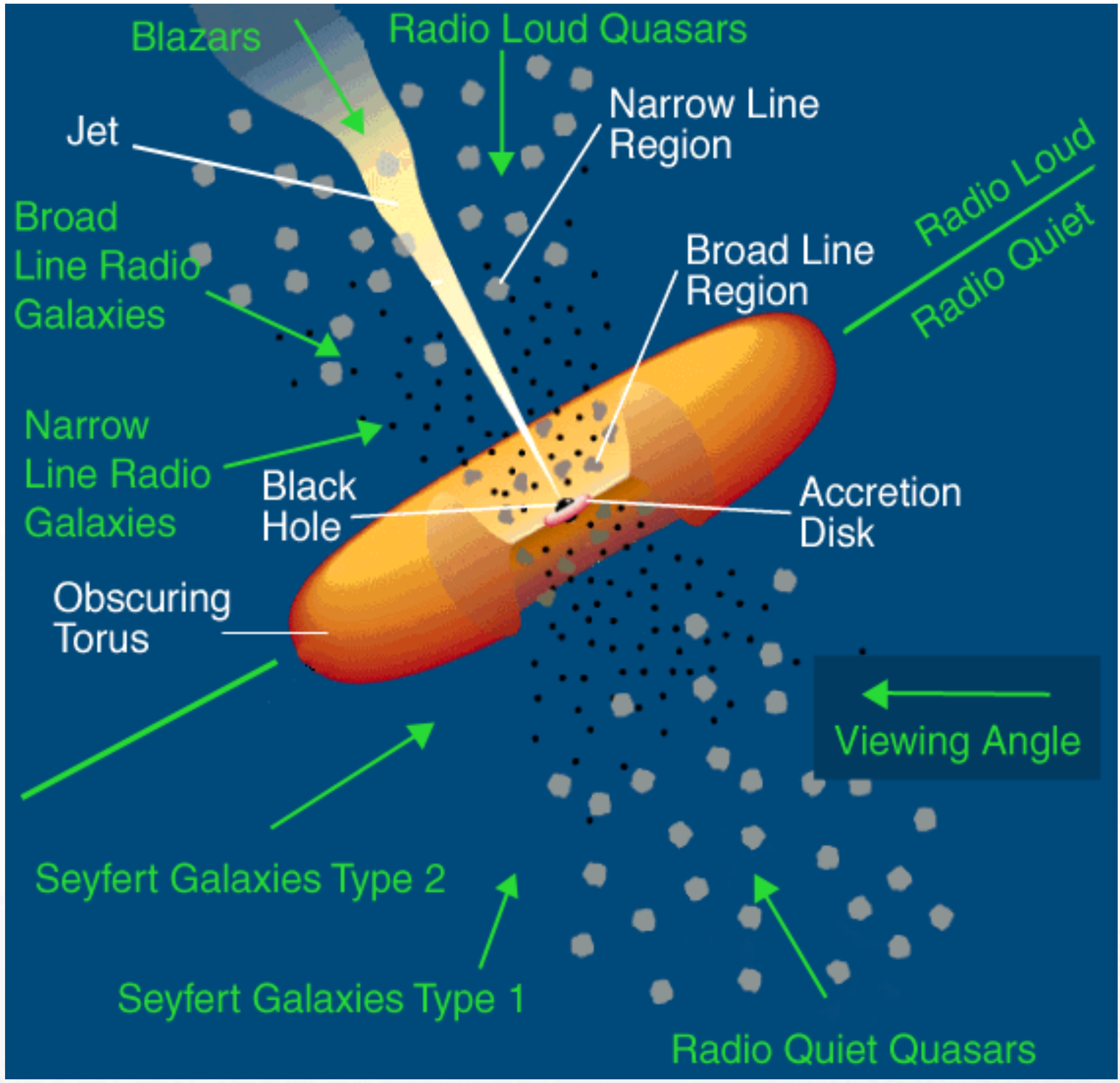
- Blazars
- Radio galaxies
- Radio Loud QSOs



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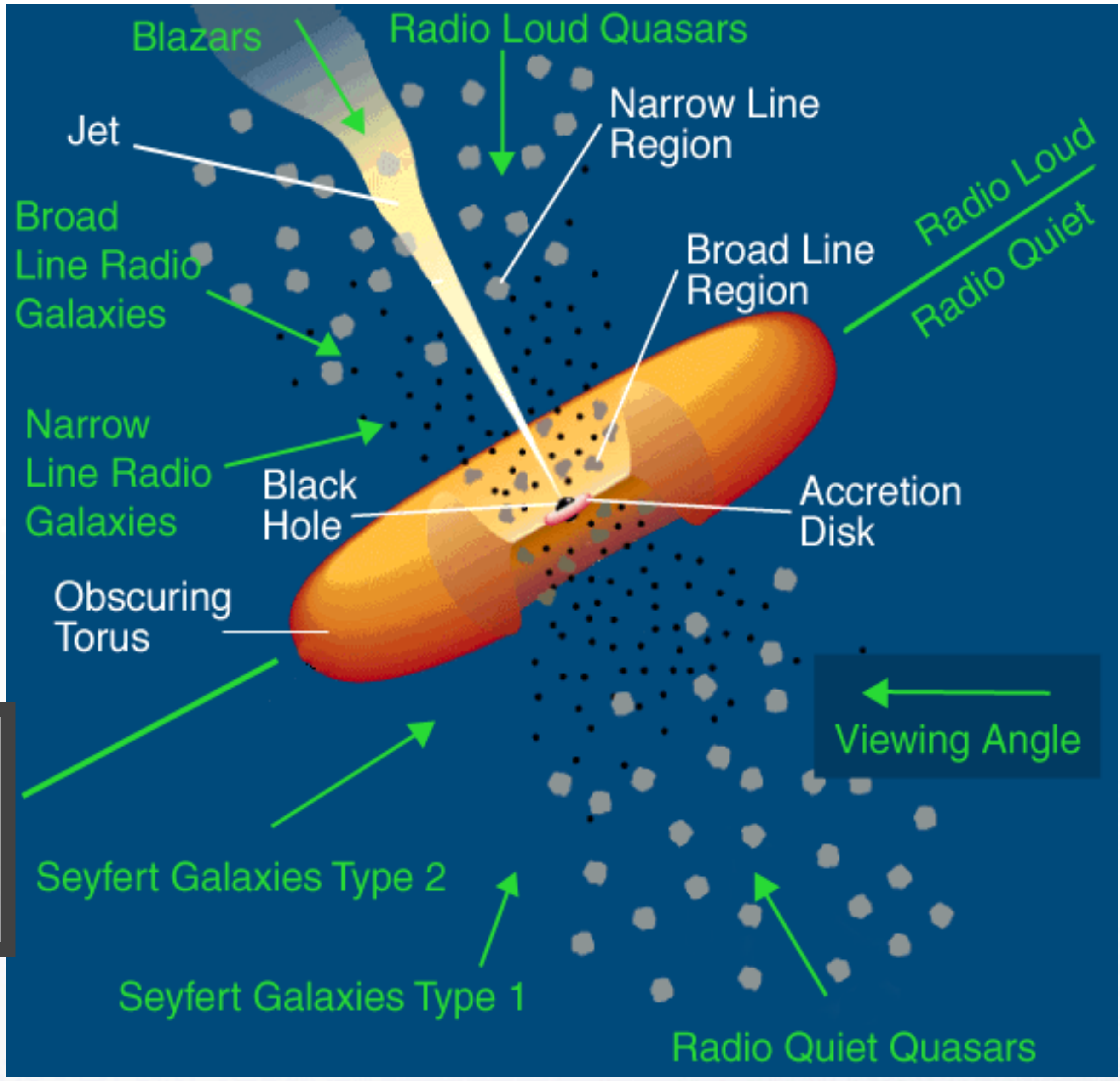

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AGNs

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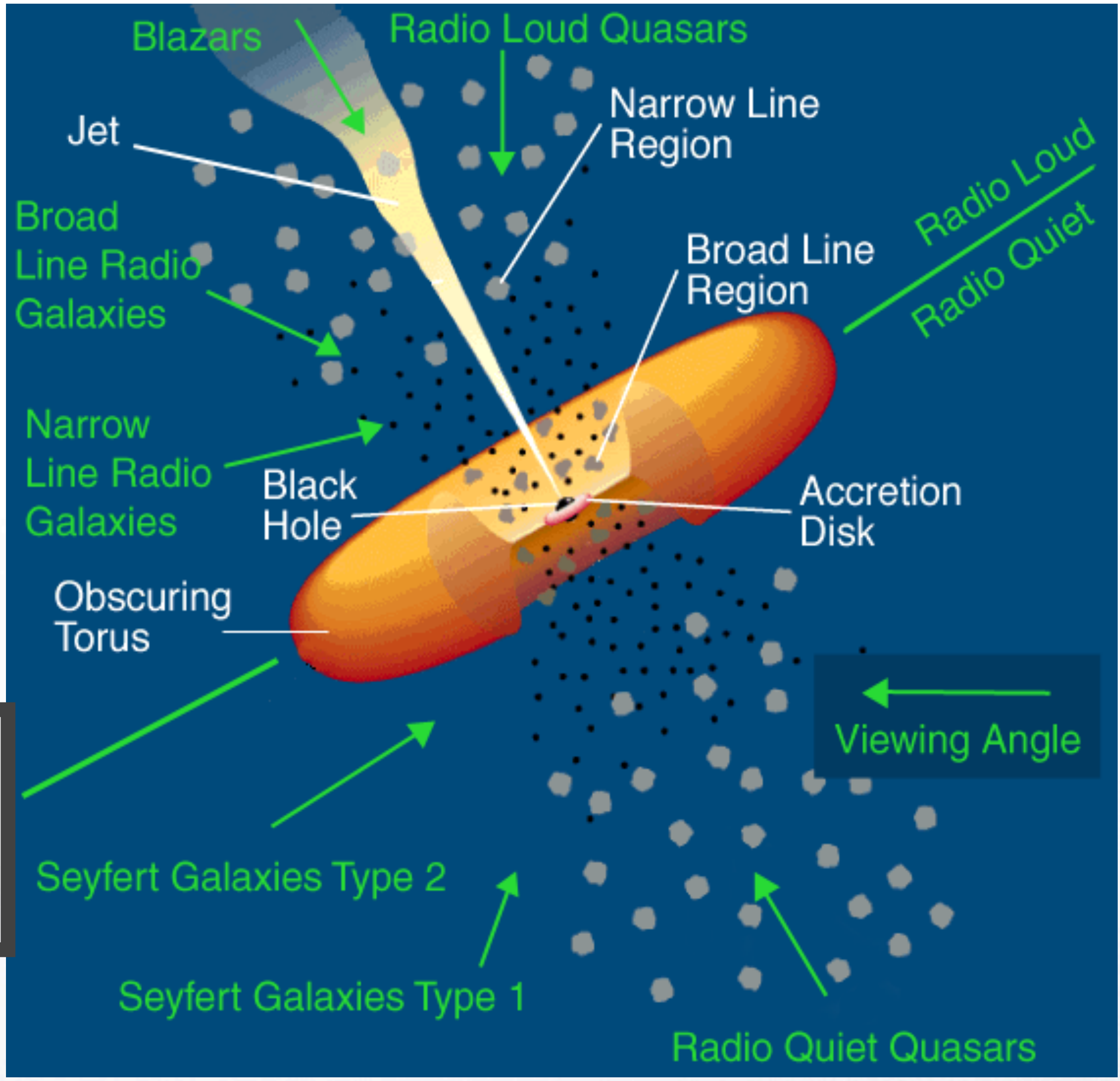
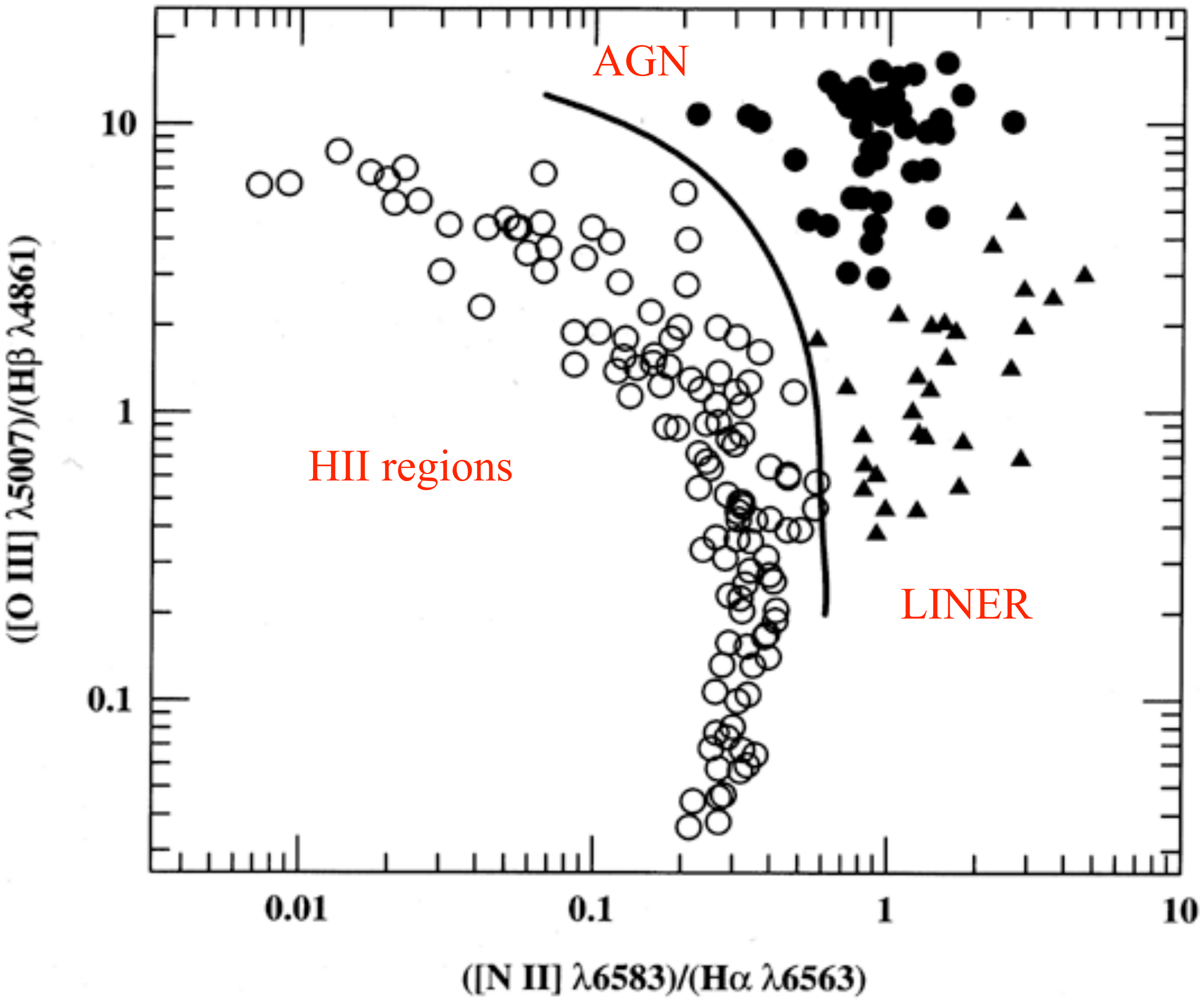


Credit: Nasa

Low Luminosity Quasi Stellar Objects: intermediate luminous AGNs

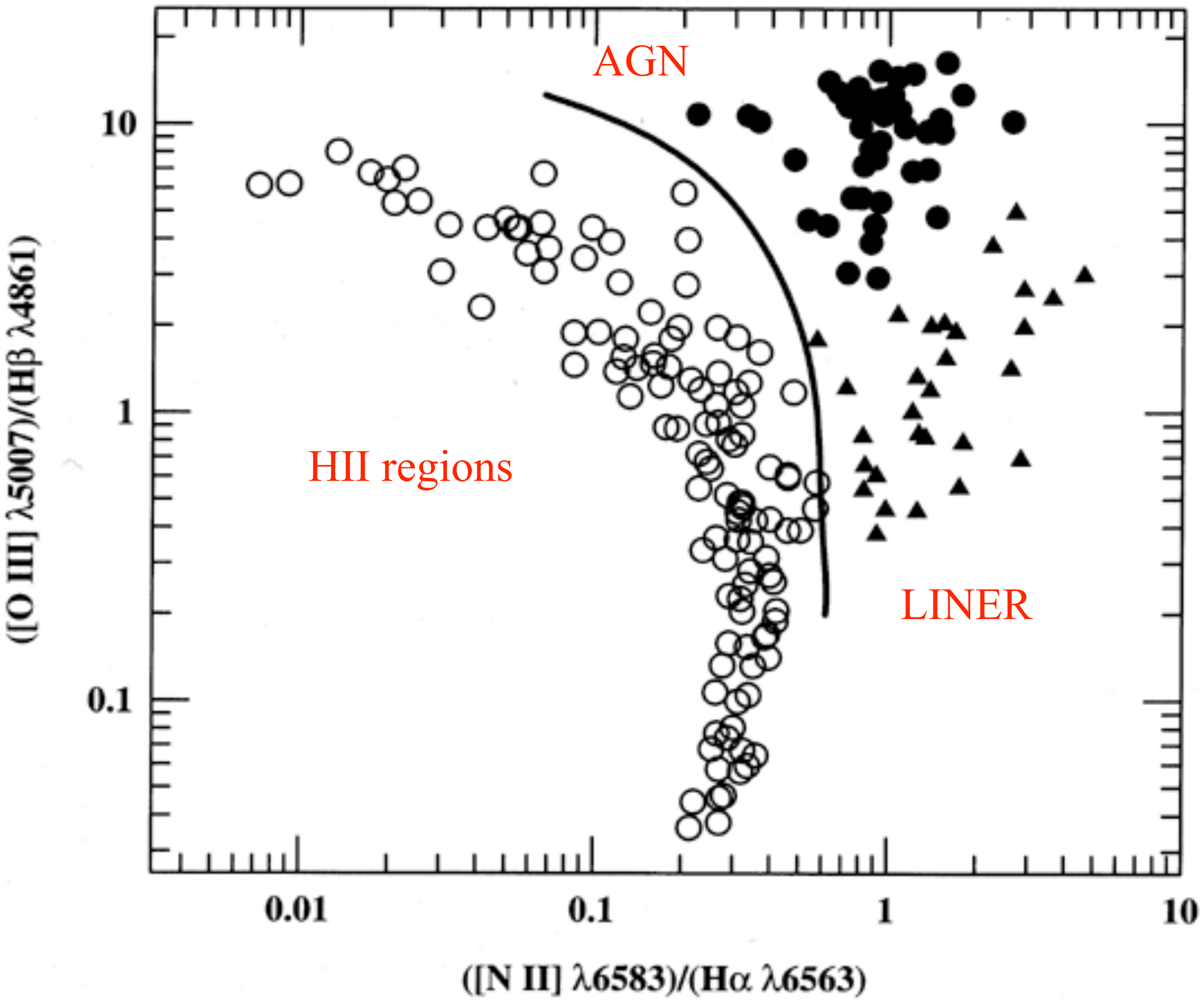
BPT, Diagnostic Diagram



Diagnose the ionizing source within a galaxy
(Baldwin, Philllips and Terlevich, 1981)

Excitation degree

BPT, Diagnostic Diagram



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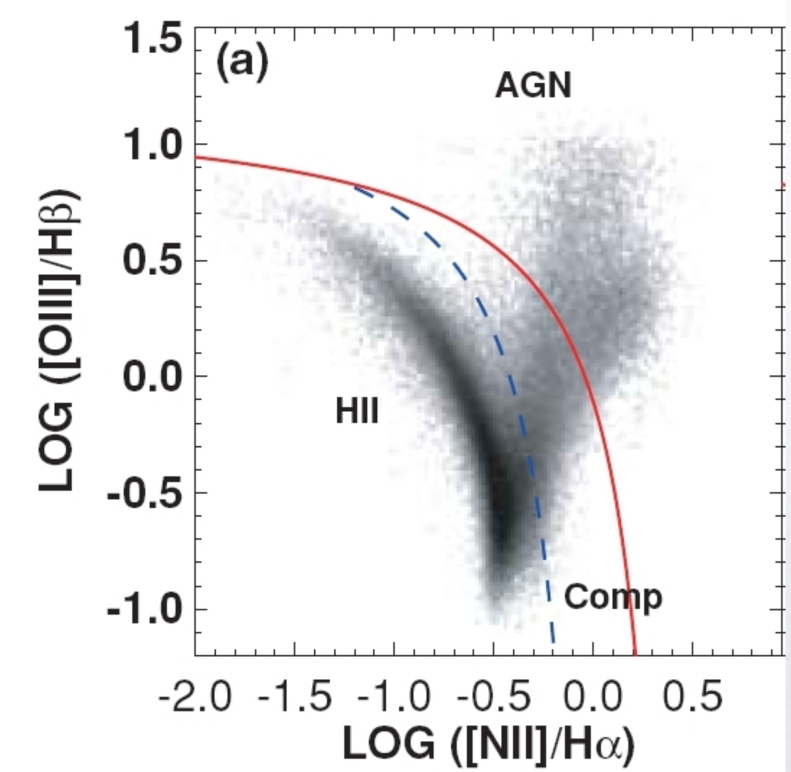

- Theoretical 'maximum starburst (red) line' from Kewley et al. (2001)
- The star formation/demarcation (blue dashed) line from Kauffmann et al. (2003)

The nearby low-luminosity QSO sample

~ 90 optical spectroscopic data from Hamburg/ESO survey (Wisotzki et al 2000)

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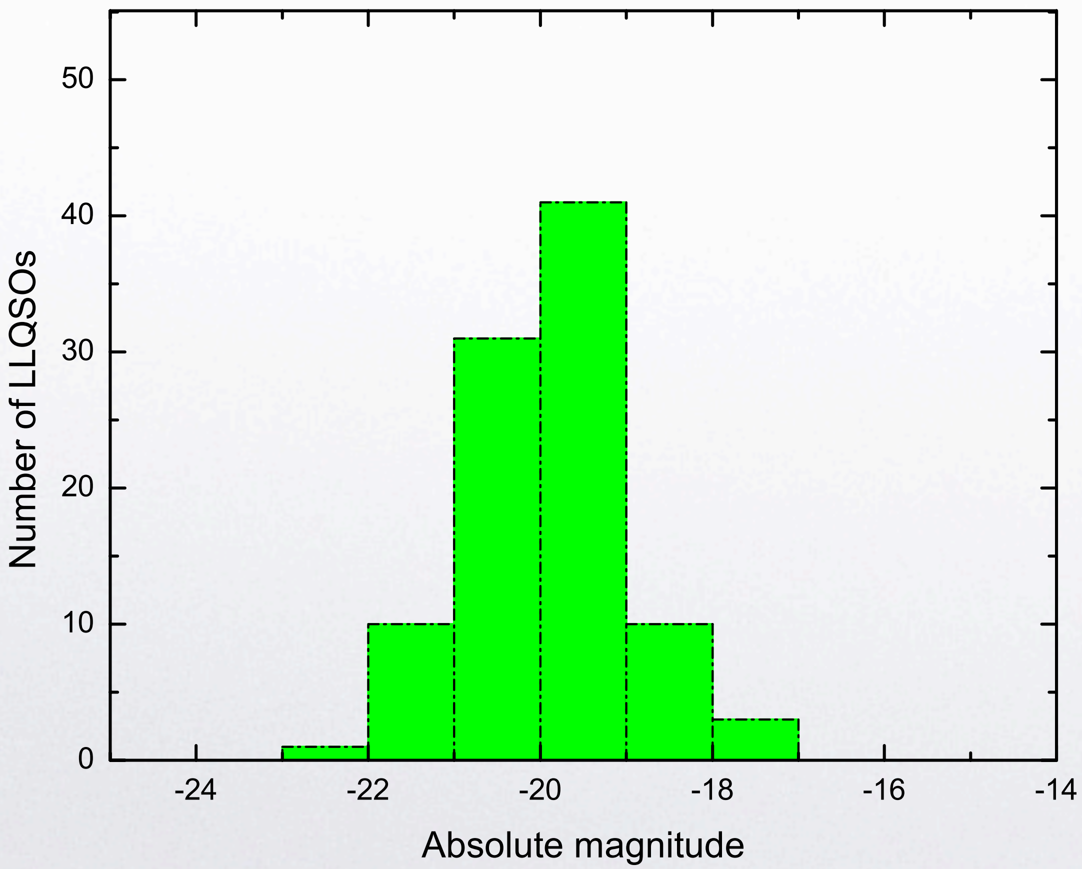
- flux limit Bj < 17.3



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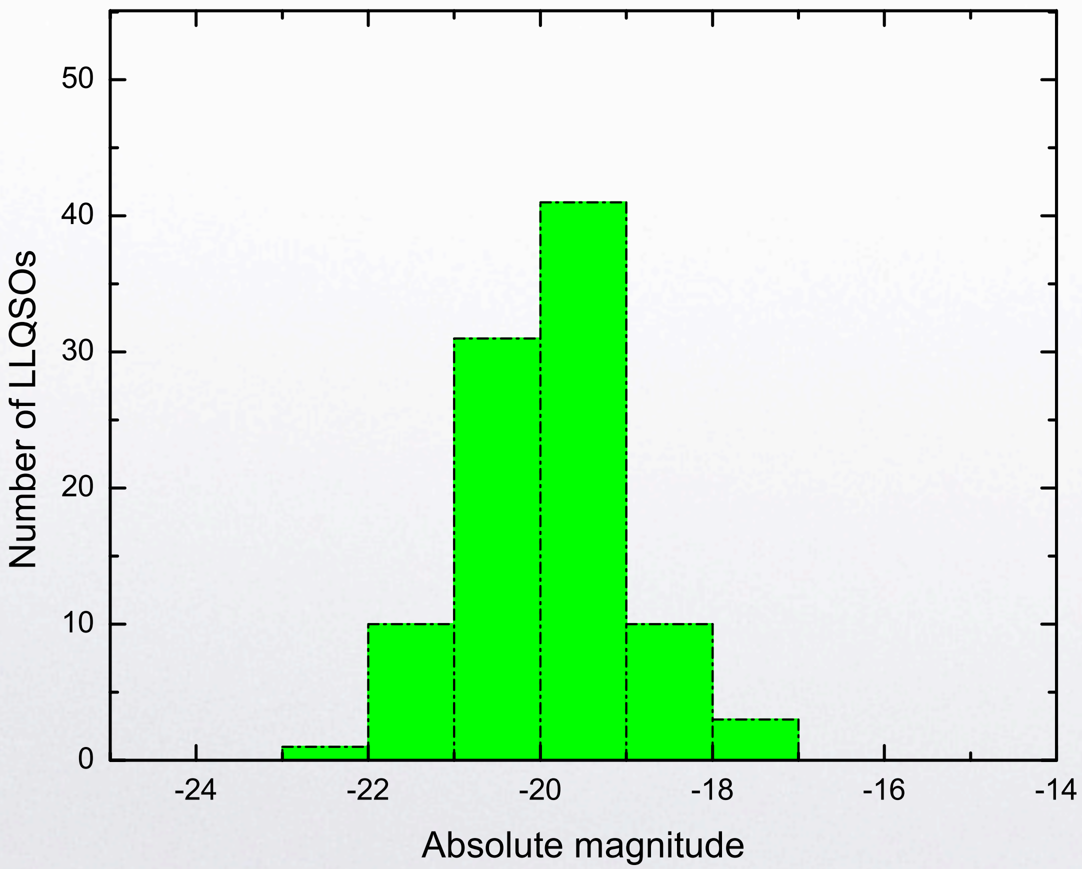

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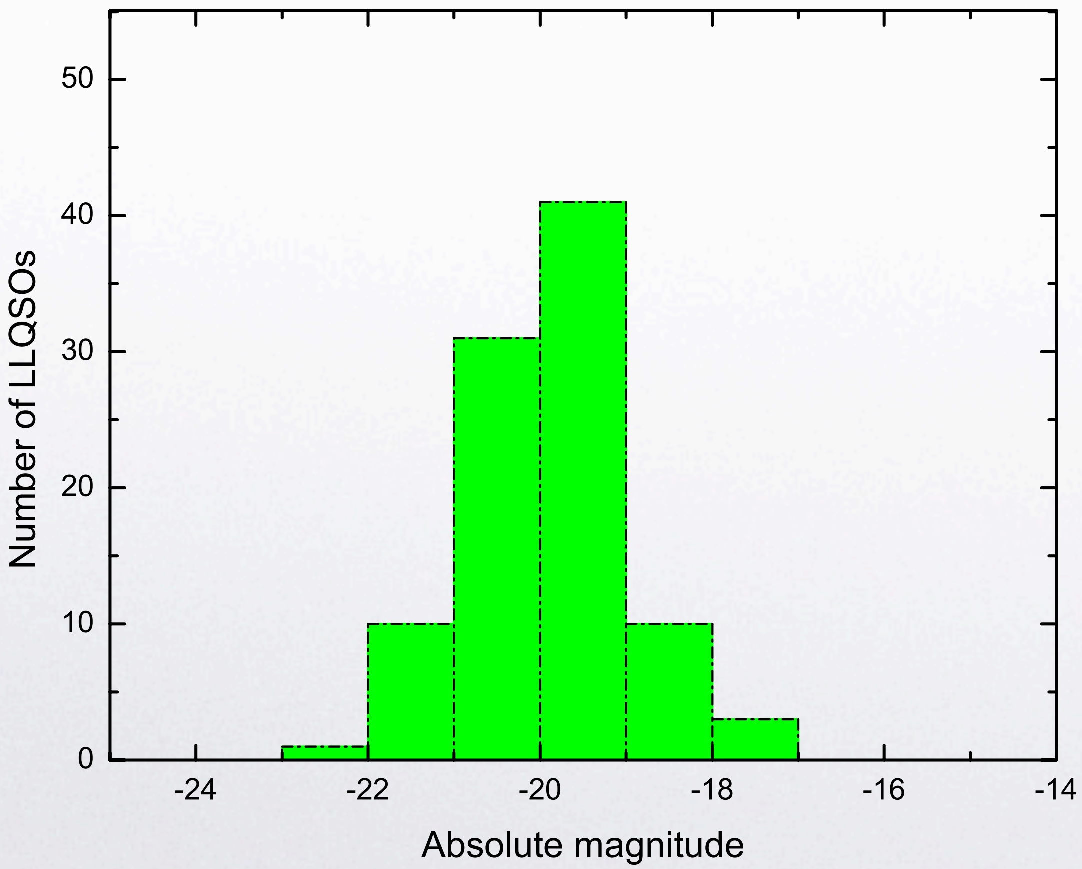

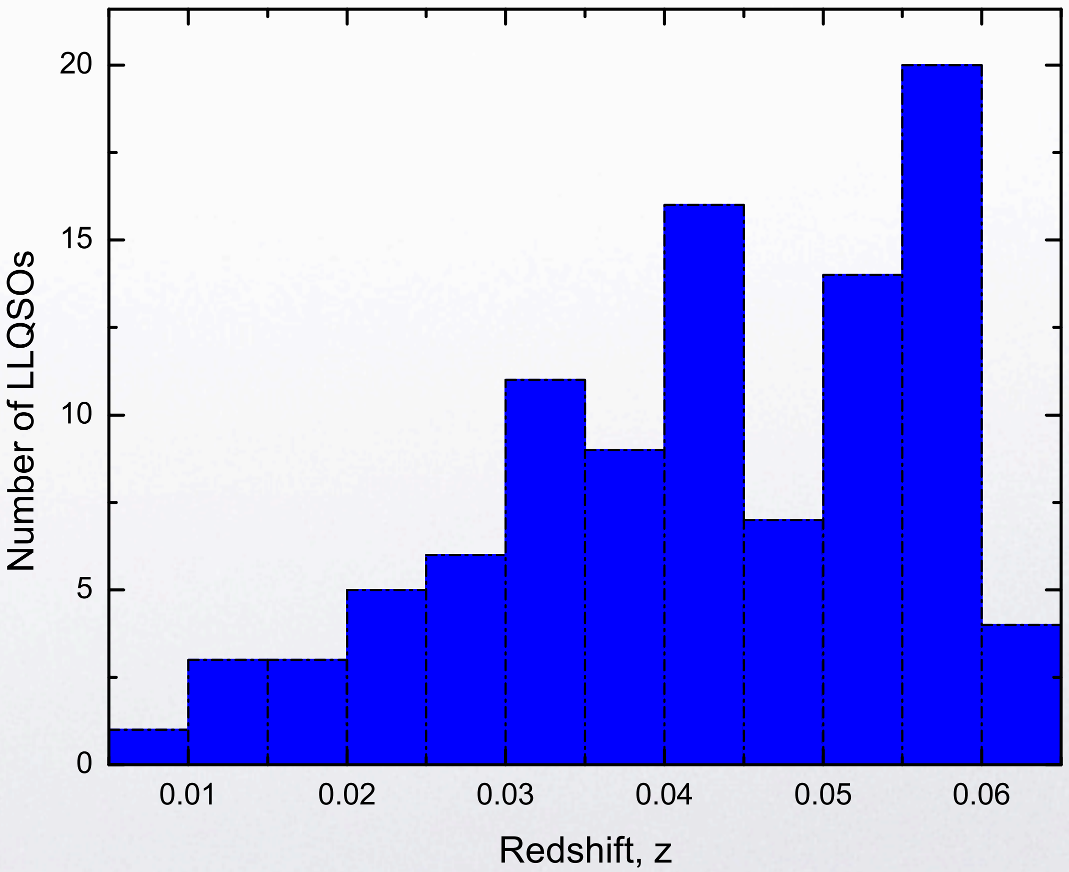

~ 90 optical spectroscopic data from Hamburg/ESO survey (Wisotzki et al 2000)

- flux limit Bj < 17.3
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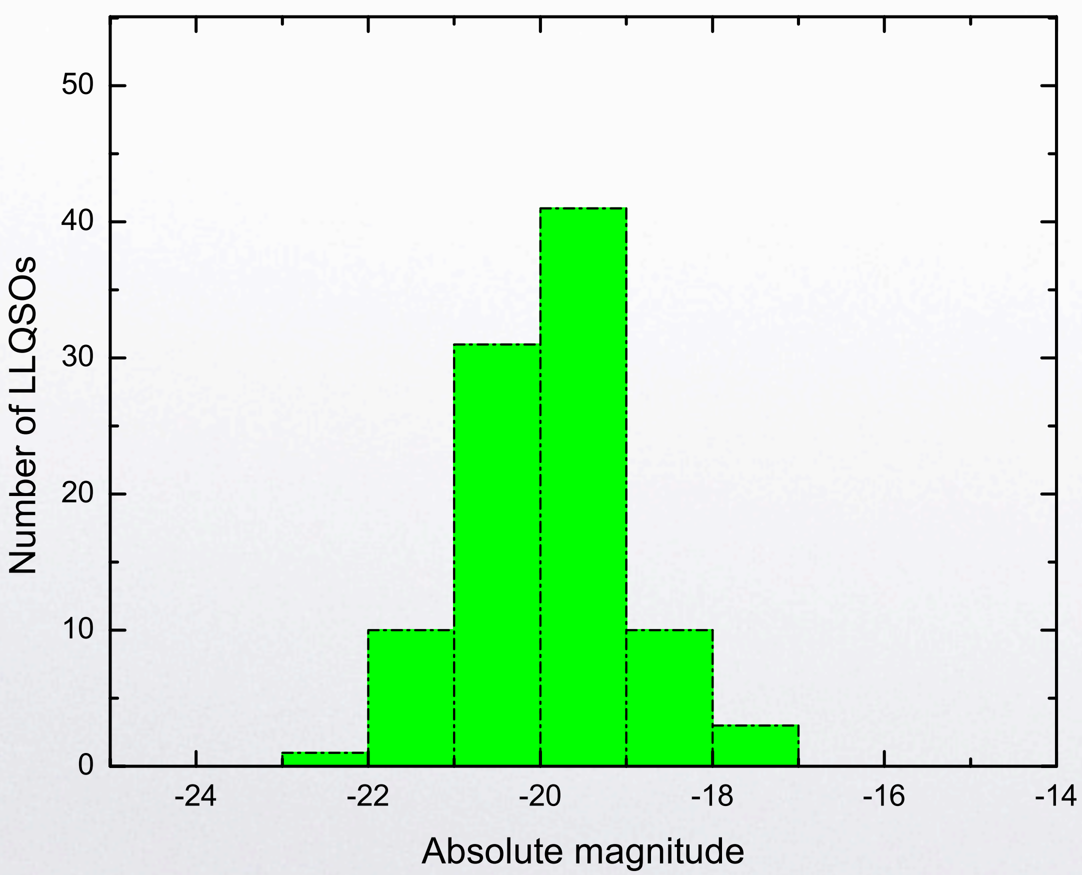
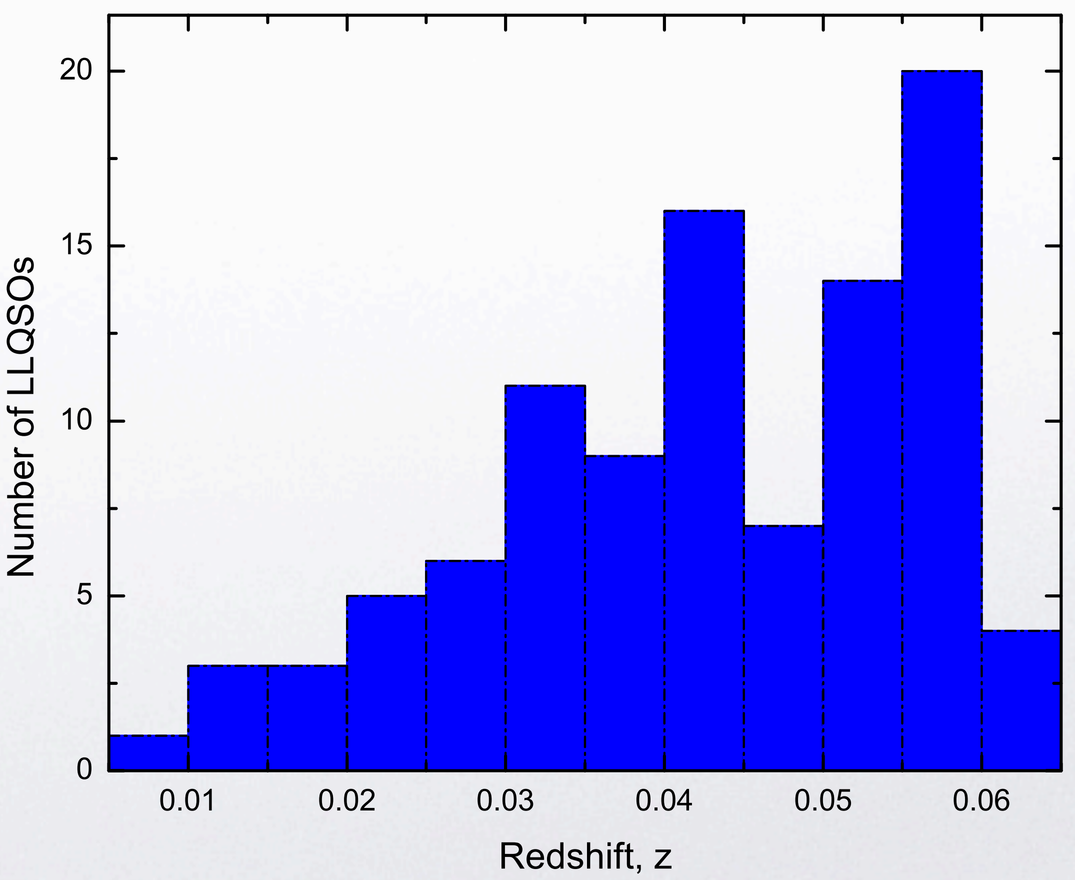
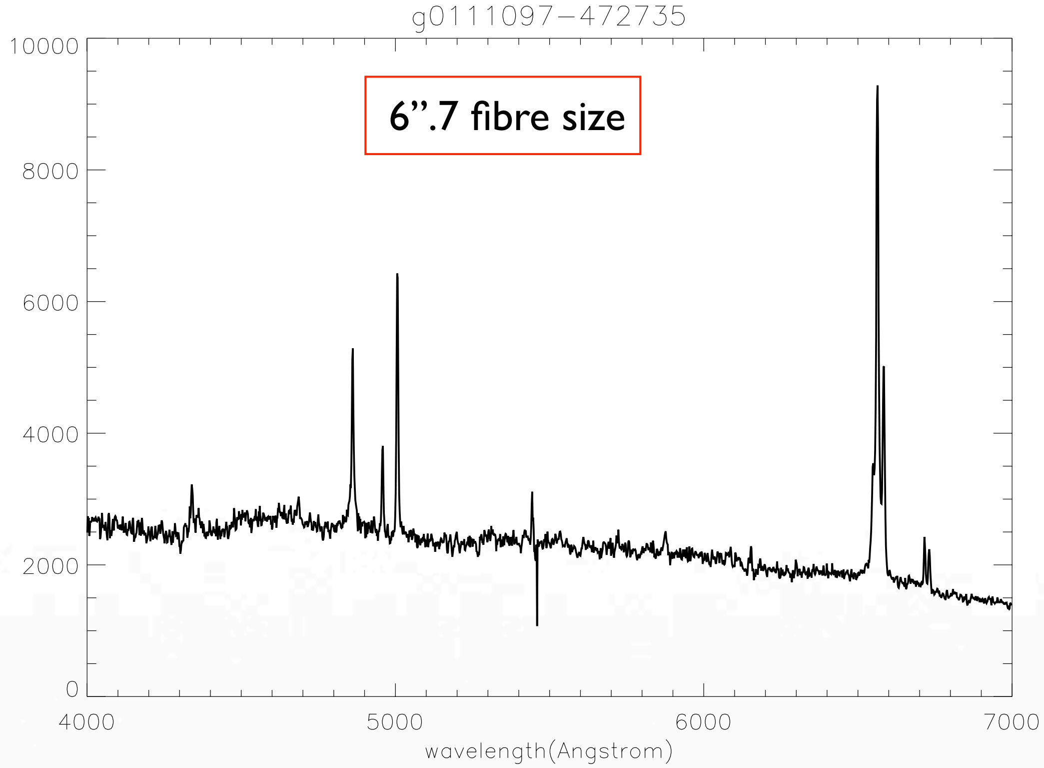
- redshift z < 0.06

~ 50 **additional** optical spectroscopic data from 6 Degree Field Galaxy Survey (6DFGS) (Jones et al 2004)





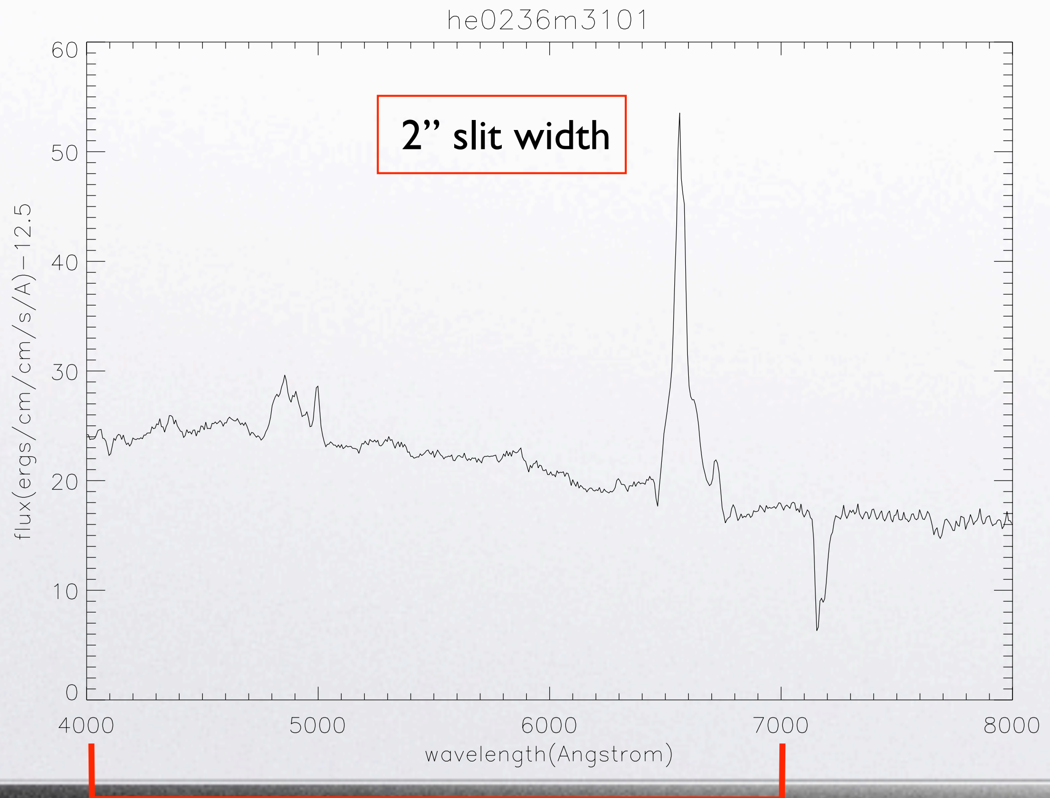
The spectroscopic data



6DFGS (~2002)

Anglo Australian Observatory's
UK Schmidt telescope, 1.52 m

Spectral resolution ~ 5 Å

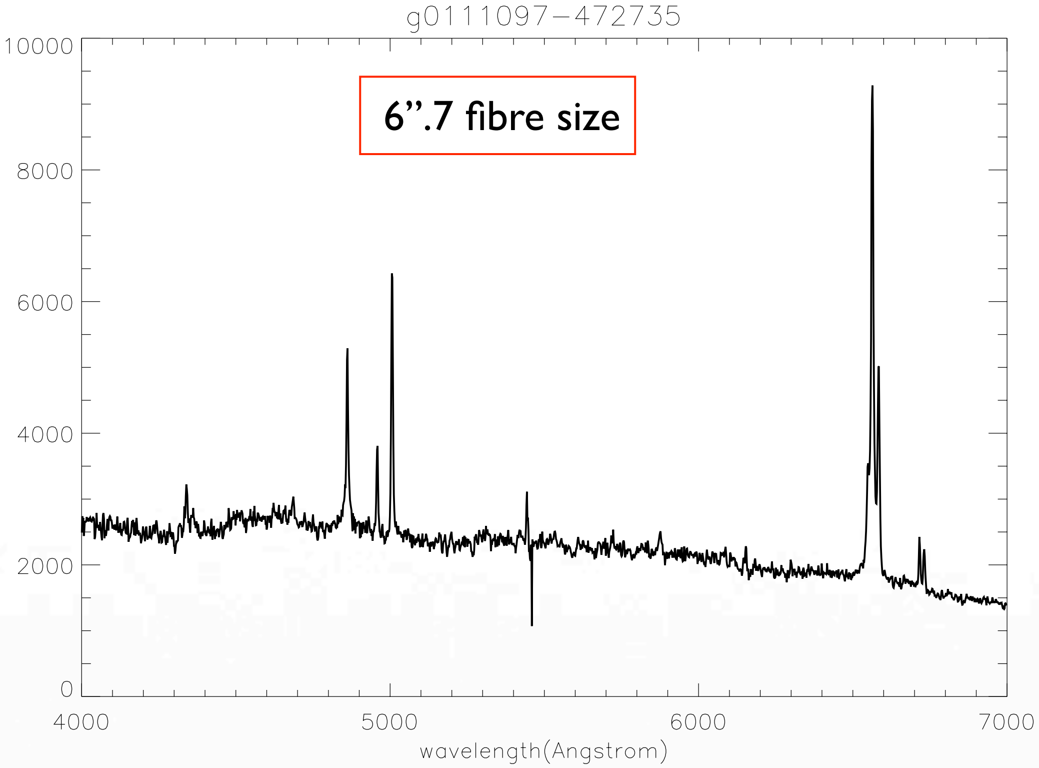


Hamburg/ESO survey (1990-2000)

3.6, 2.2 and 1.52 m ESO telescopes

Spectral resolution ~ 8 Å - 21 Å

The spectroscopic data



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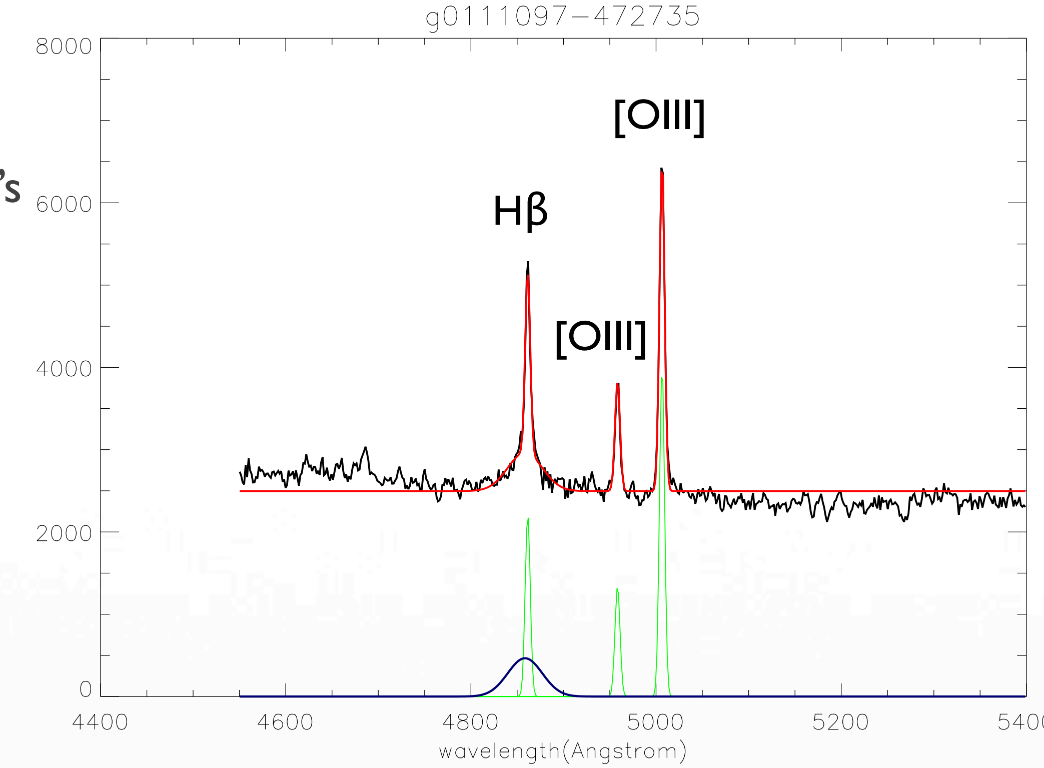

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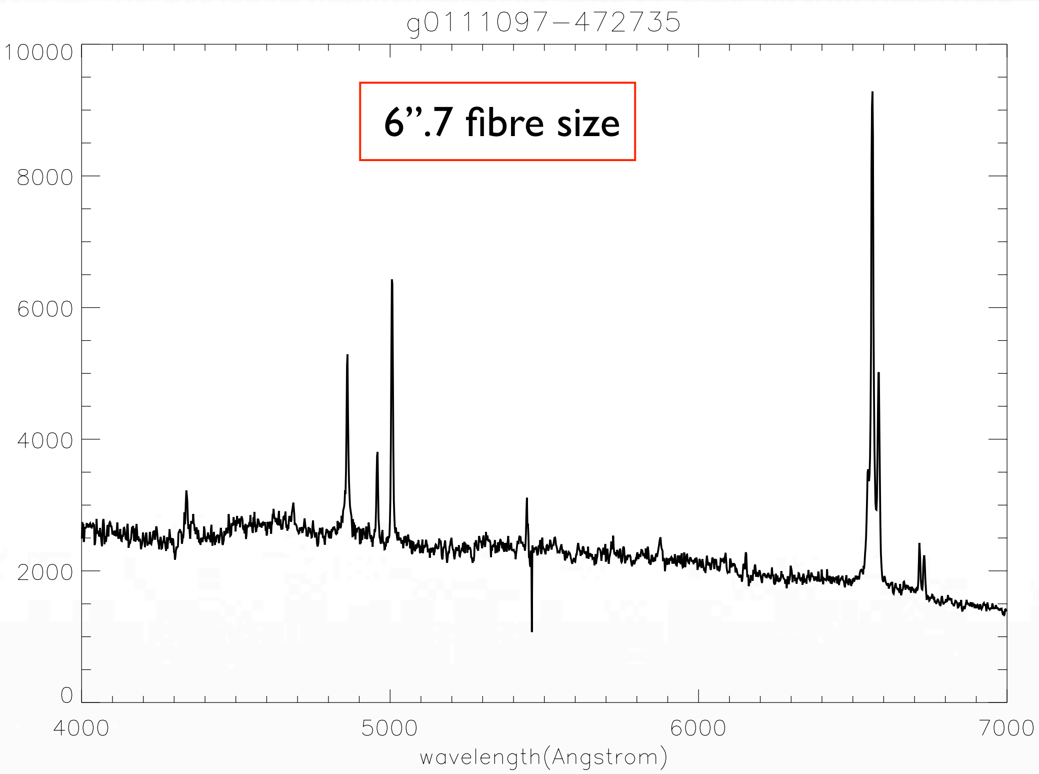

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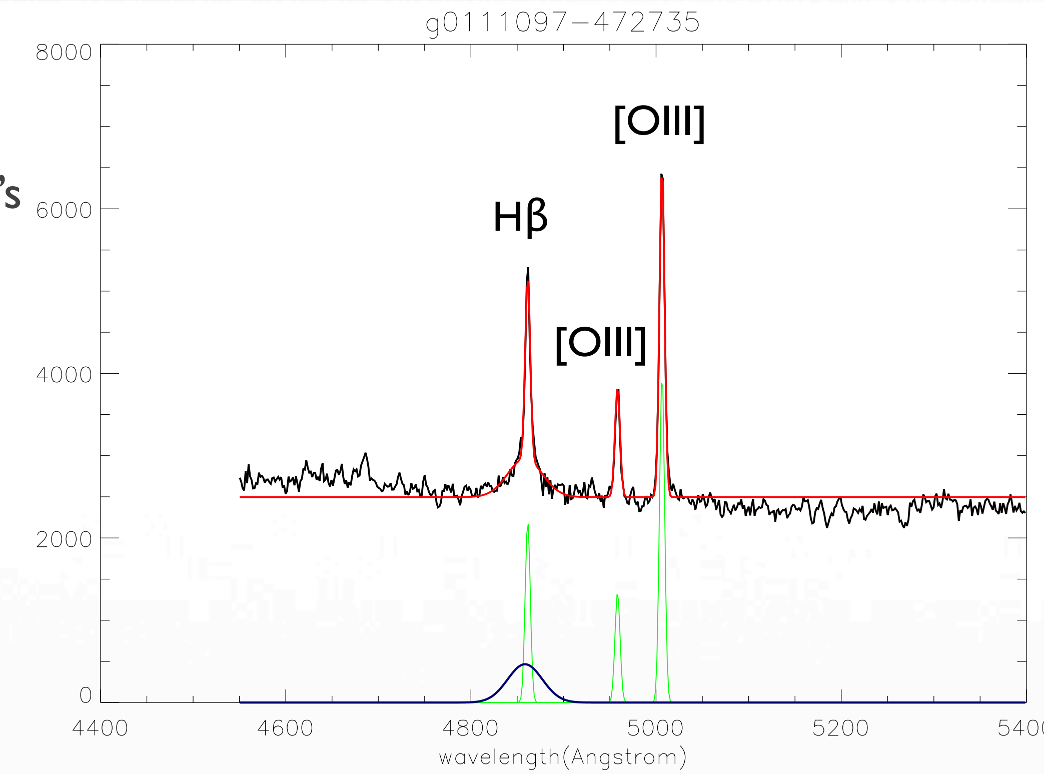

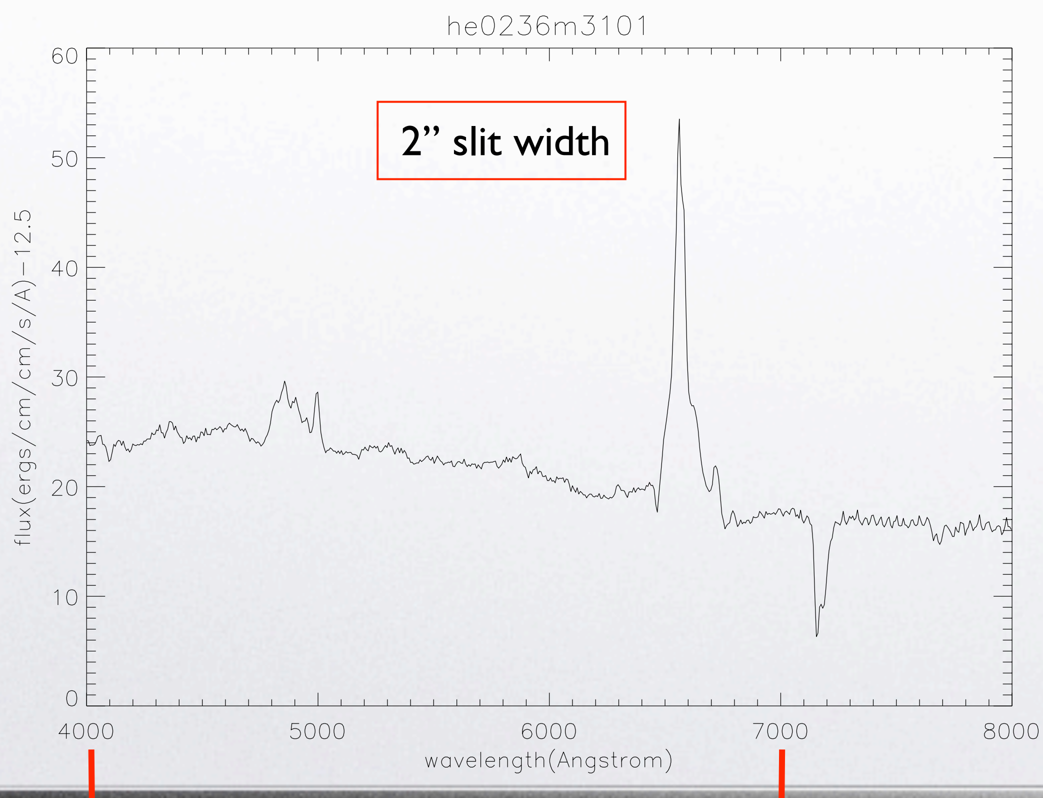

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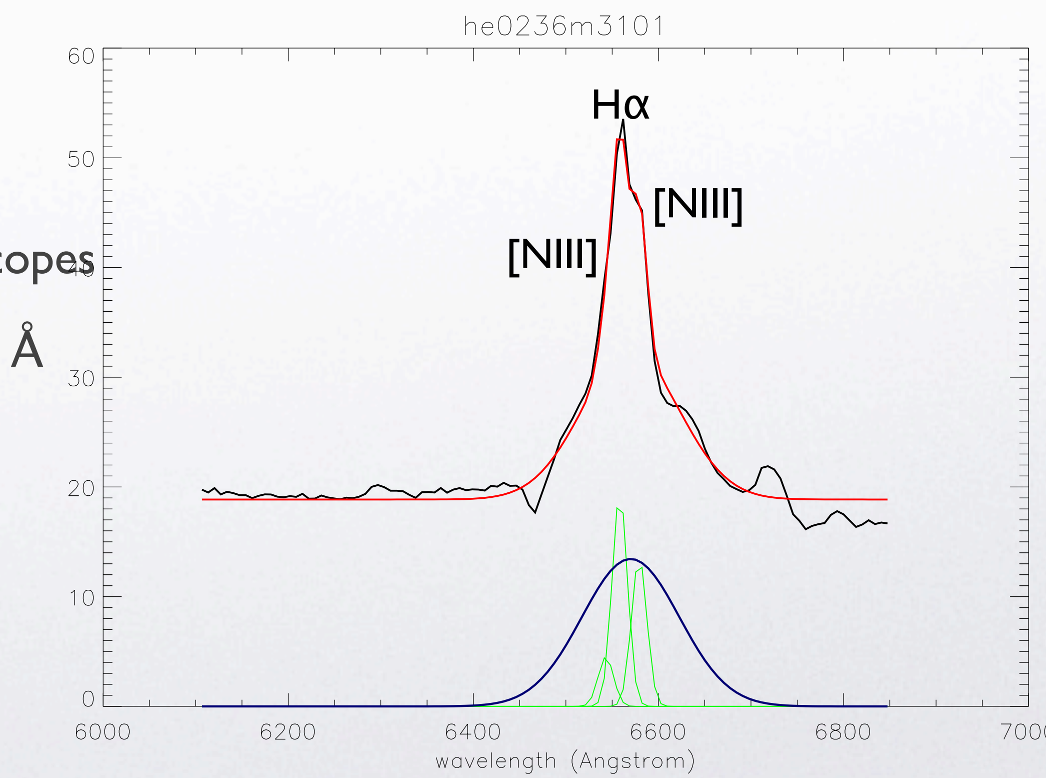
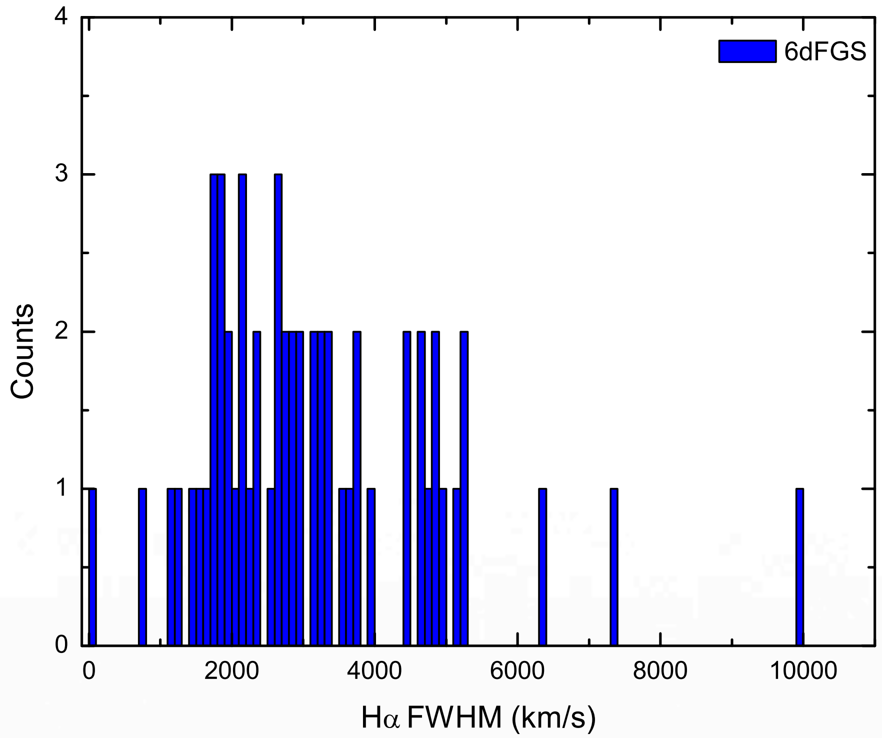
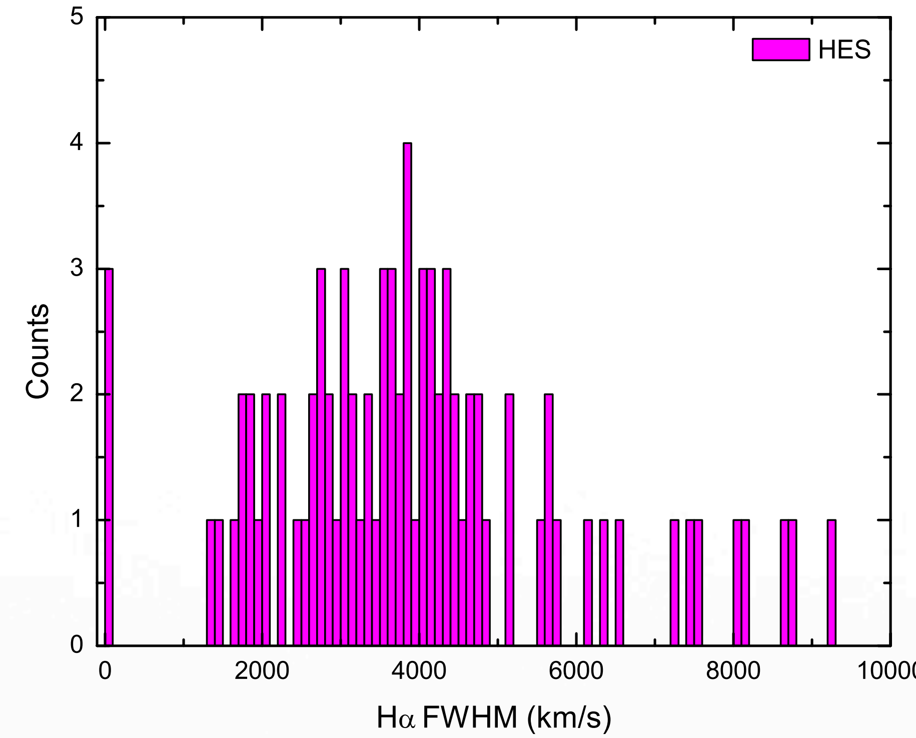
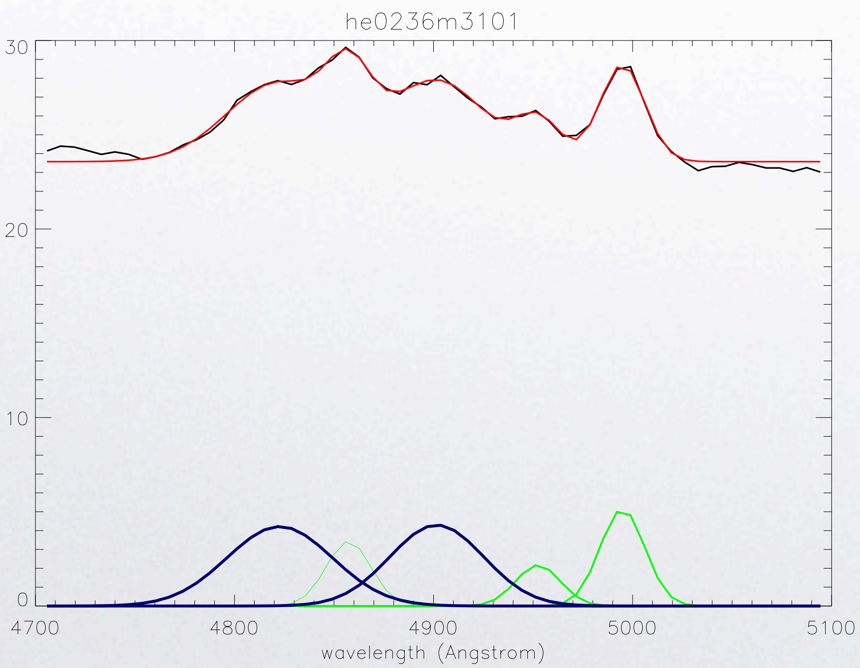




- broad FWHM > 2000 km/s
- narrow FWHM ~ 500 km/s



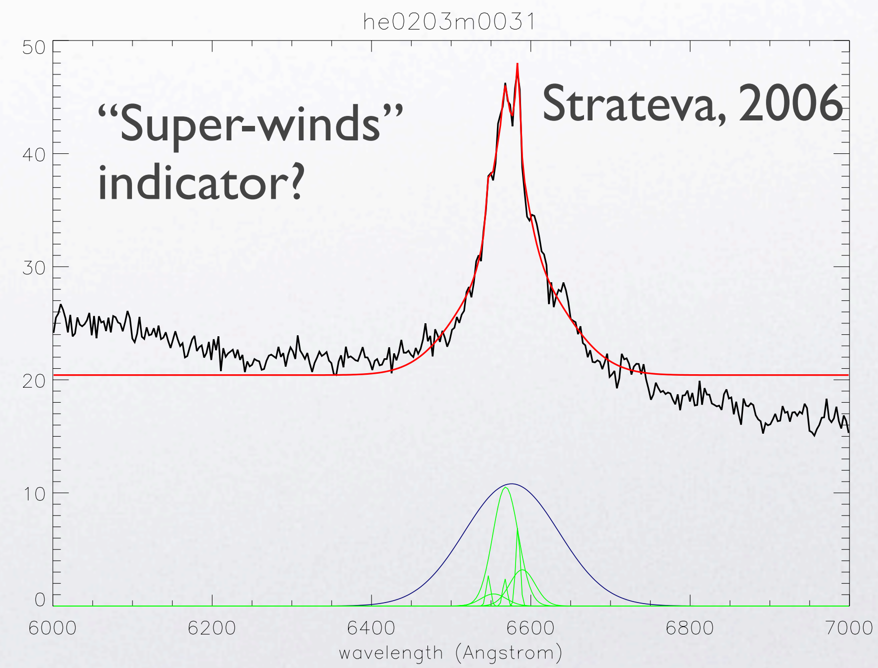
Double broad component



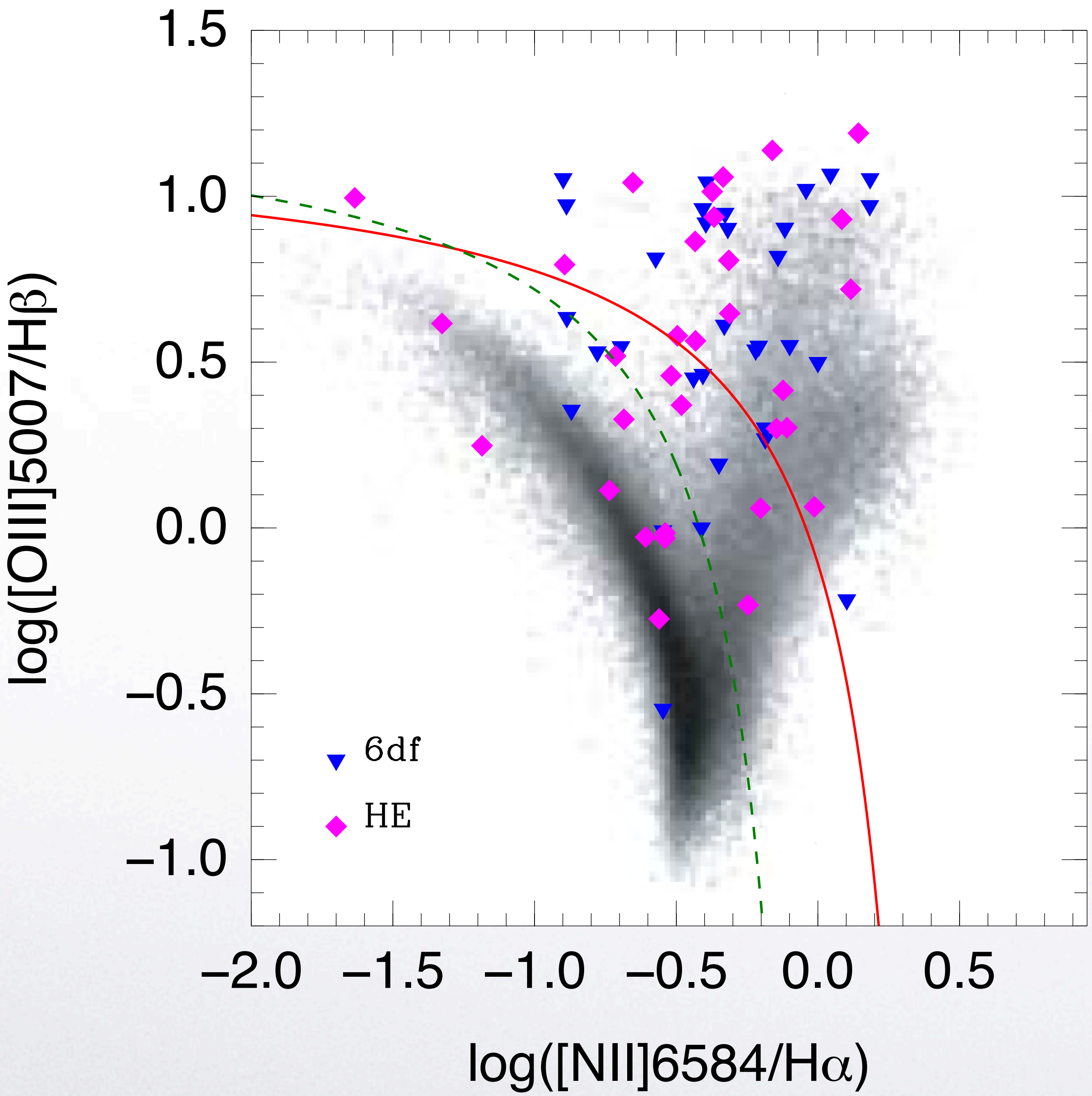
Colina, 1991: Accretion disk candidate.

Perez, 1988; Halpern, 1990: Models of relativistic accretion disk around a SMBH.

Double narrow component



Classification of the galaxies



Cross matching sources

	[O III]/Hβ versus [N II]/Hα	
	6dFGS	**HES**
No of targets	32	32
No of Seyfert	21	19
No of Starburst	6	8
No of LINERs	1	0
No of Composites	4	5

All sources

	[O III]/Hβ versus [N II]/Hα	
	6dFGS	**HES**
No of targets	44	59
No of Seyfert	32	33
No of Starburst	6	18
No of LINERs	1	0
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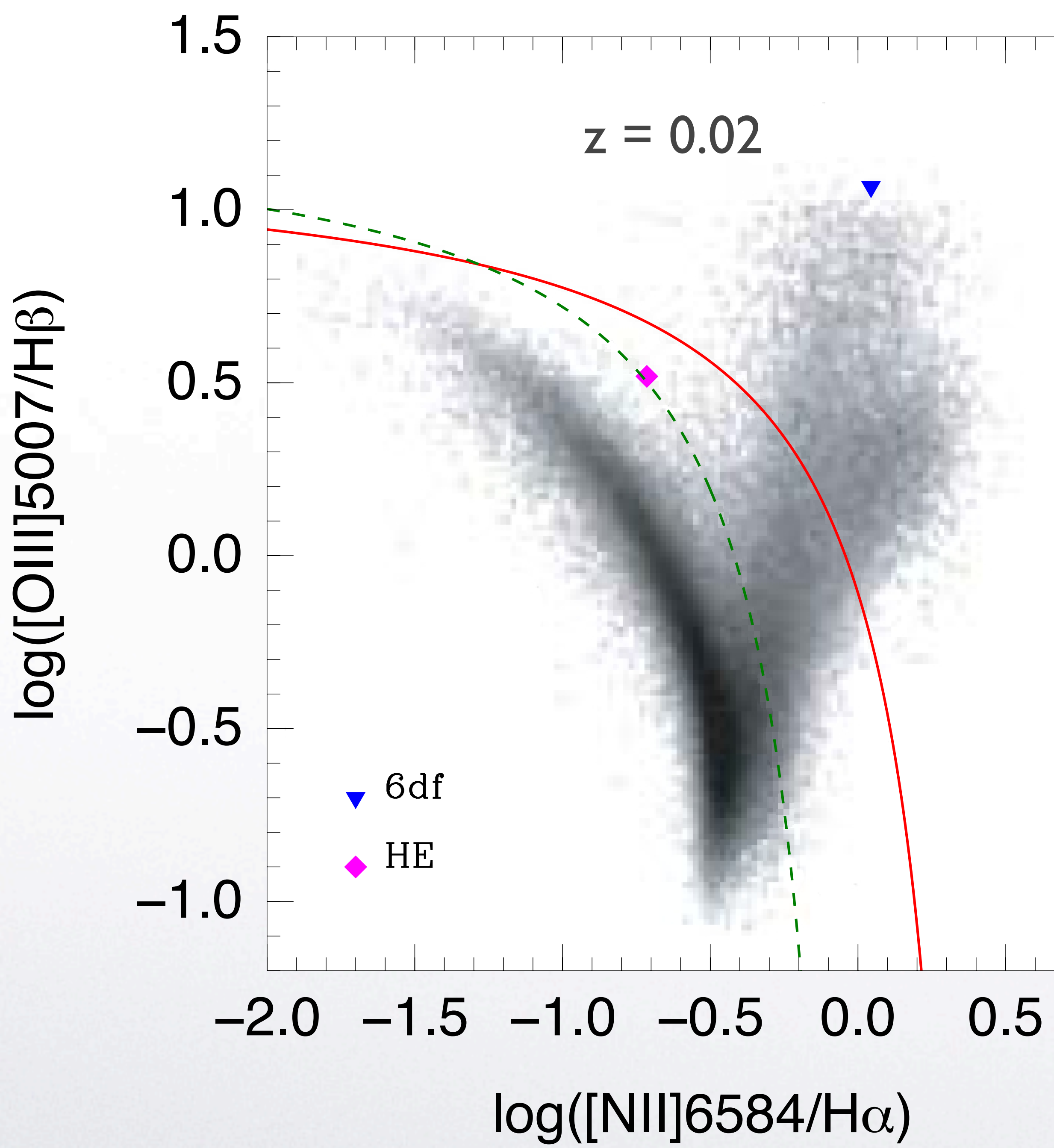
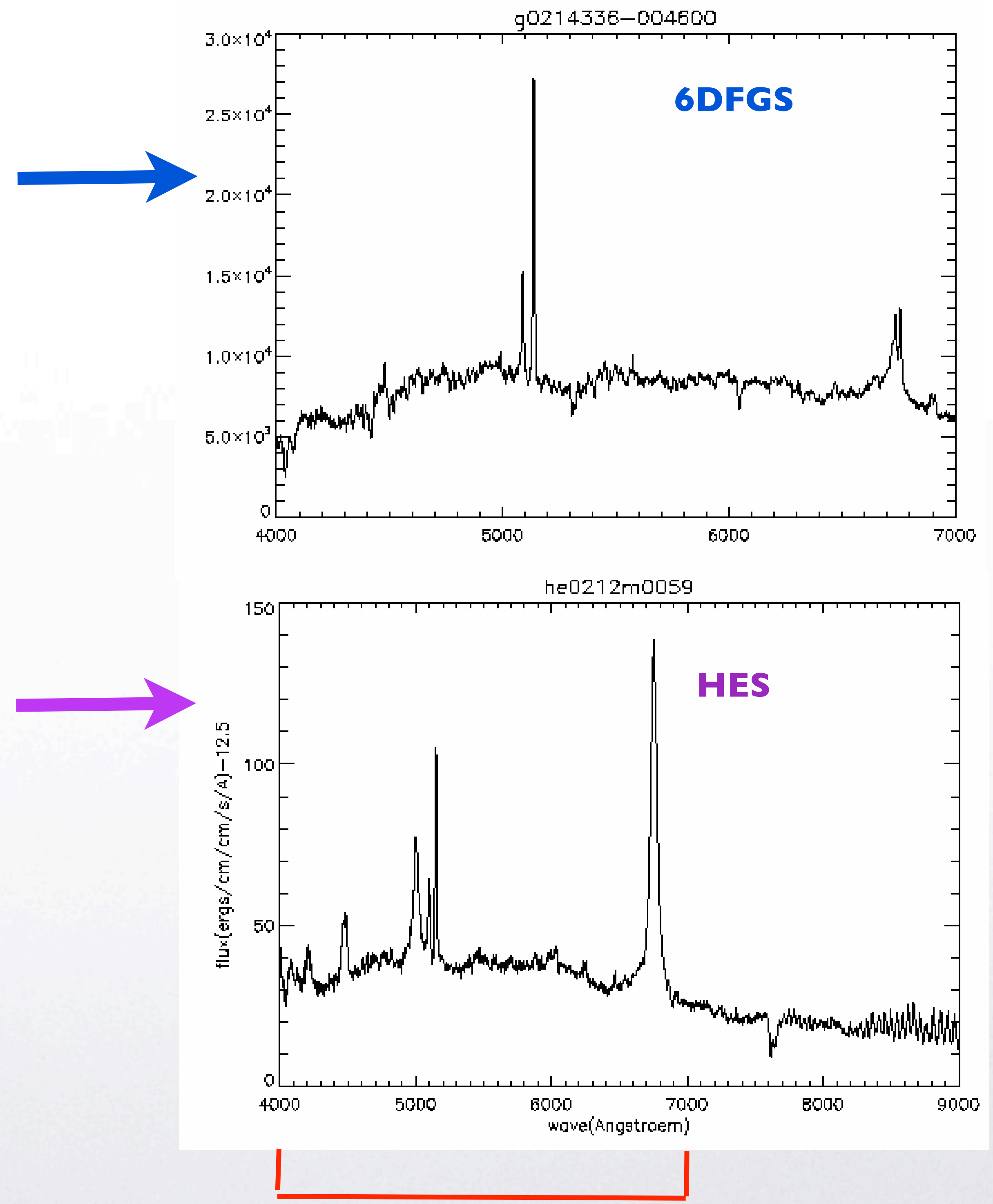
Motivation for the aperture effect study



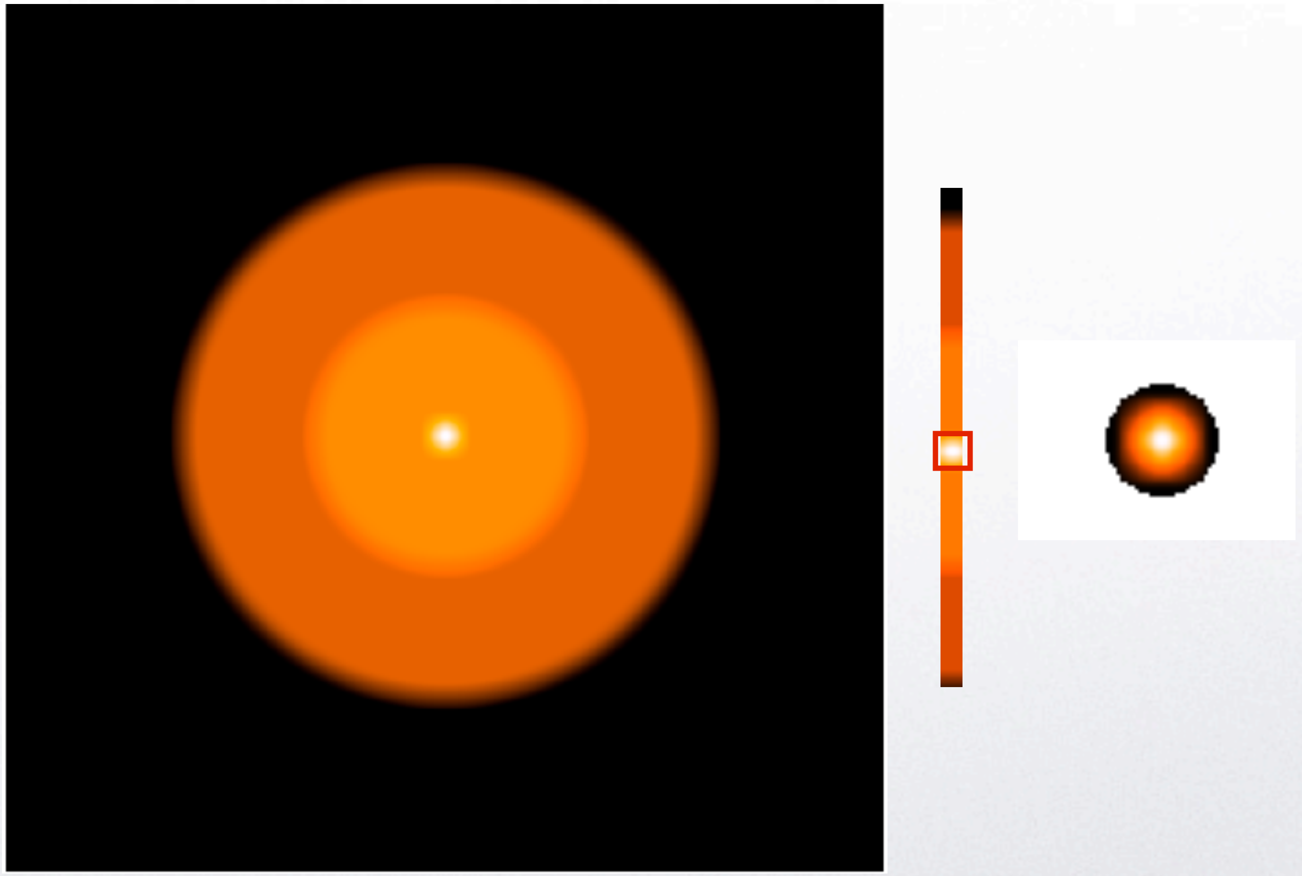


Simulations of the aperture effect

Initial conditions:

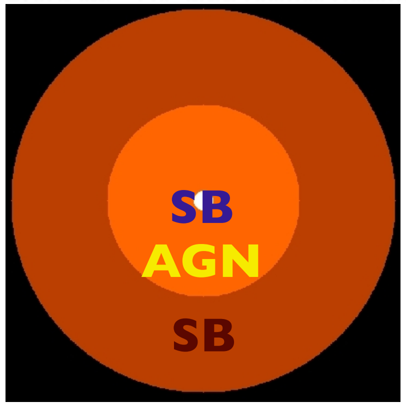
- Circular symmetry (face-on galaxy).
- Pixel scale: 0.1 ”/pixel.
- 3 concentric emission line regions, nucleus (3% of the galaxy size, ~ 0.6 kpc), bulge (22% of the galaxy size, ~ 4.7 kpc) and disk (75% of the galaxy size, ~ 16.1 kpc).
- Disk dominated.
- Emitted line flux = constant.
- Slit size (HES) = 2” x 2” - ‘seeing disk’, fibre size (6DFGS) = 6.7” and fibre size (SDSS) = 3”.
- nearby galaxy (i.e. z = 0.02).

Aim: further studies on different galaxies’ cases

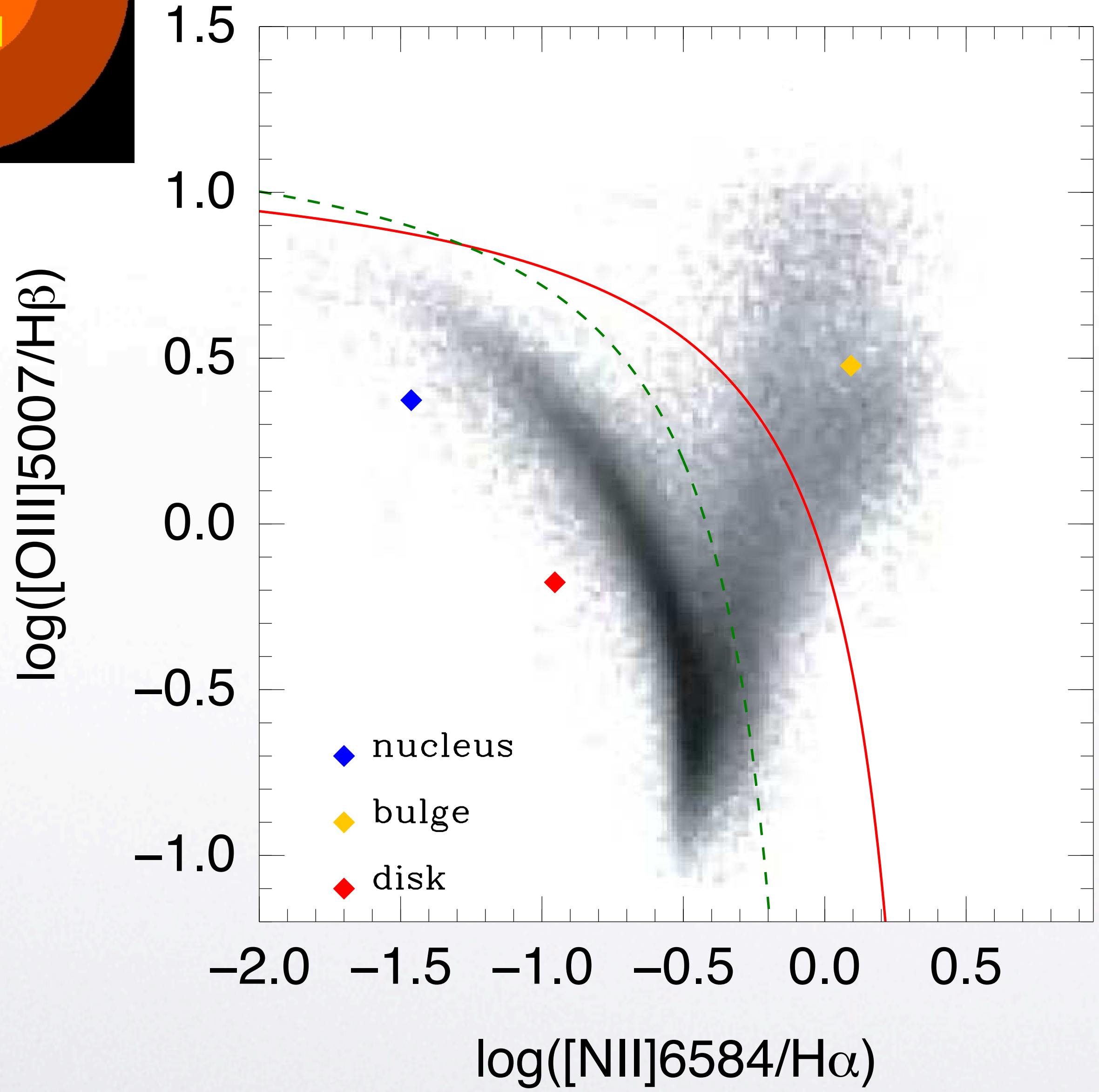


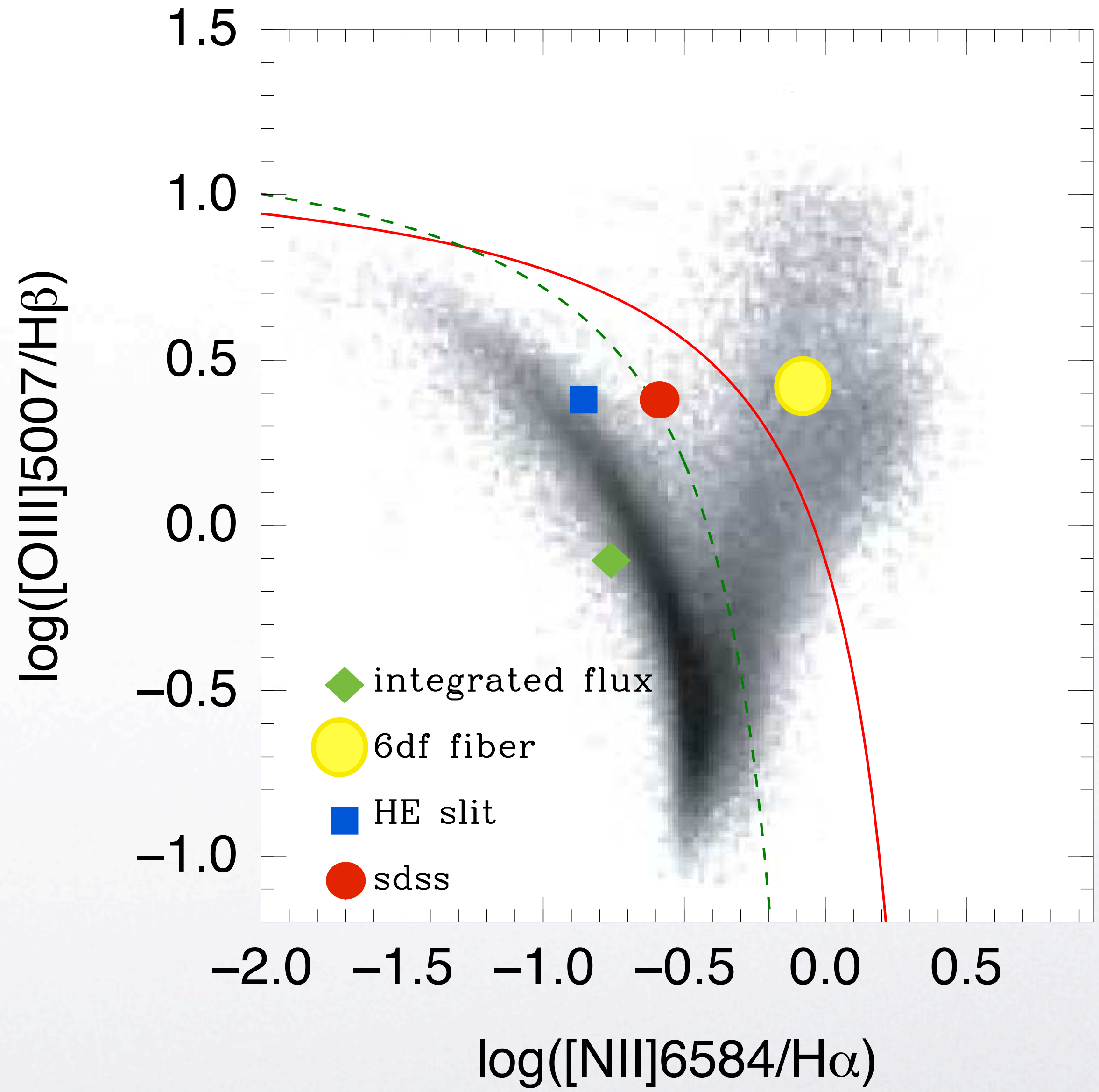
The galaxy The slit The fiber

Seyfert - 2, tracing ionization cone



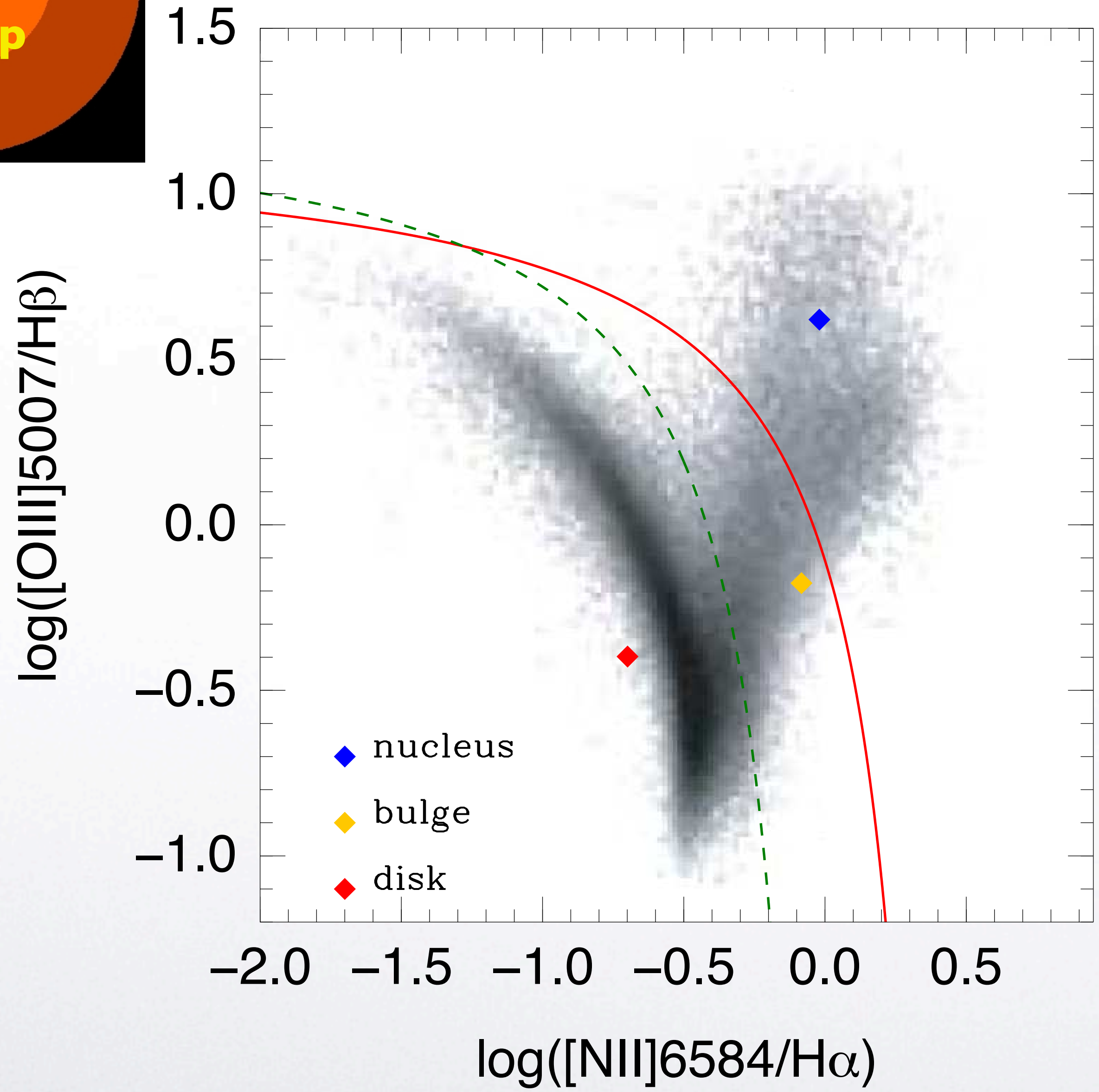
z = 0.02

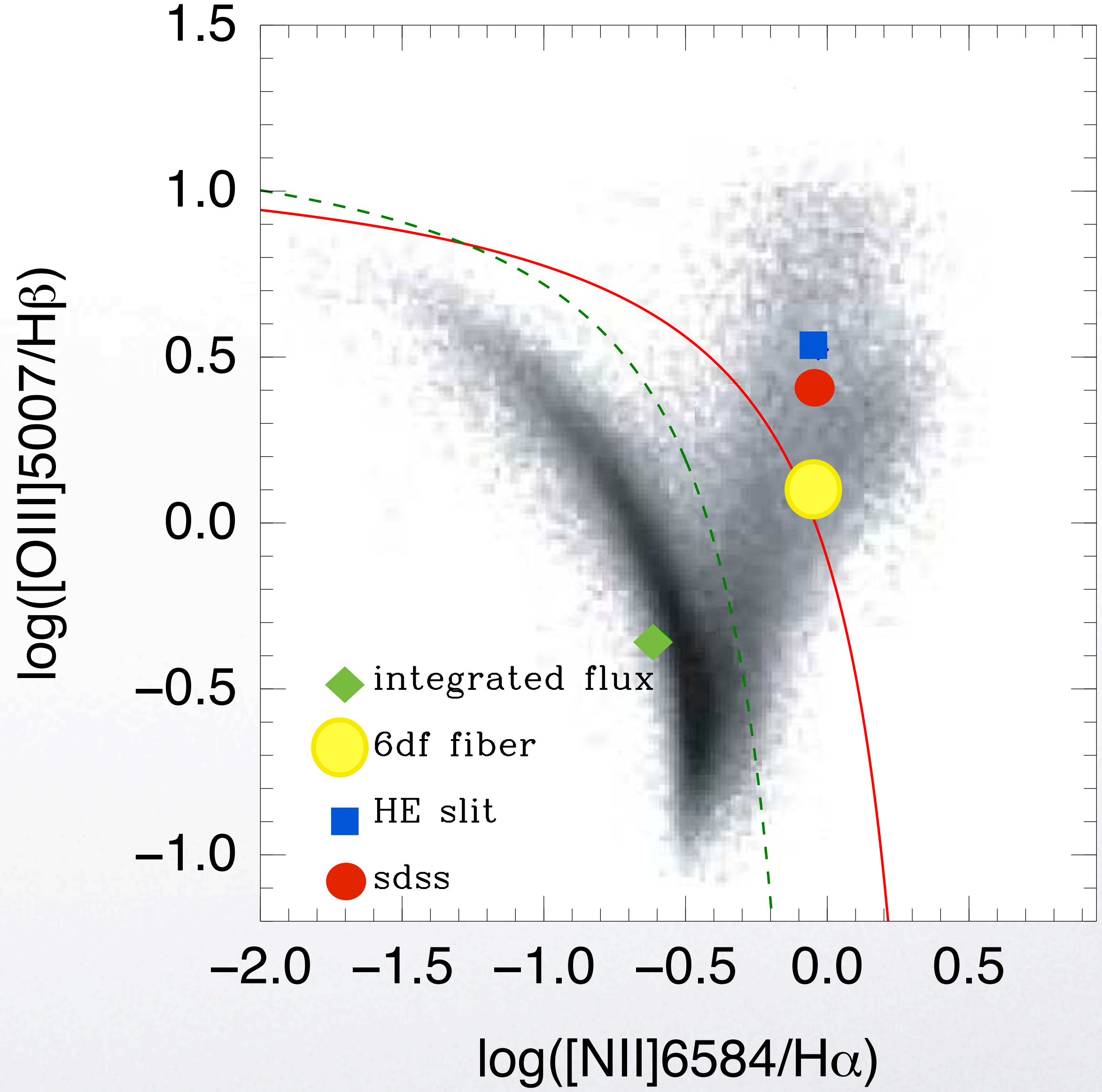




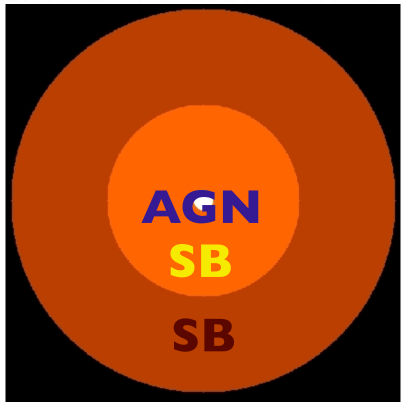
Typical Seyfert - 1 with composite bulge

z = 0.02





Typical Seyfert-1 - SF bulge, with long slit



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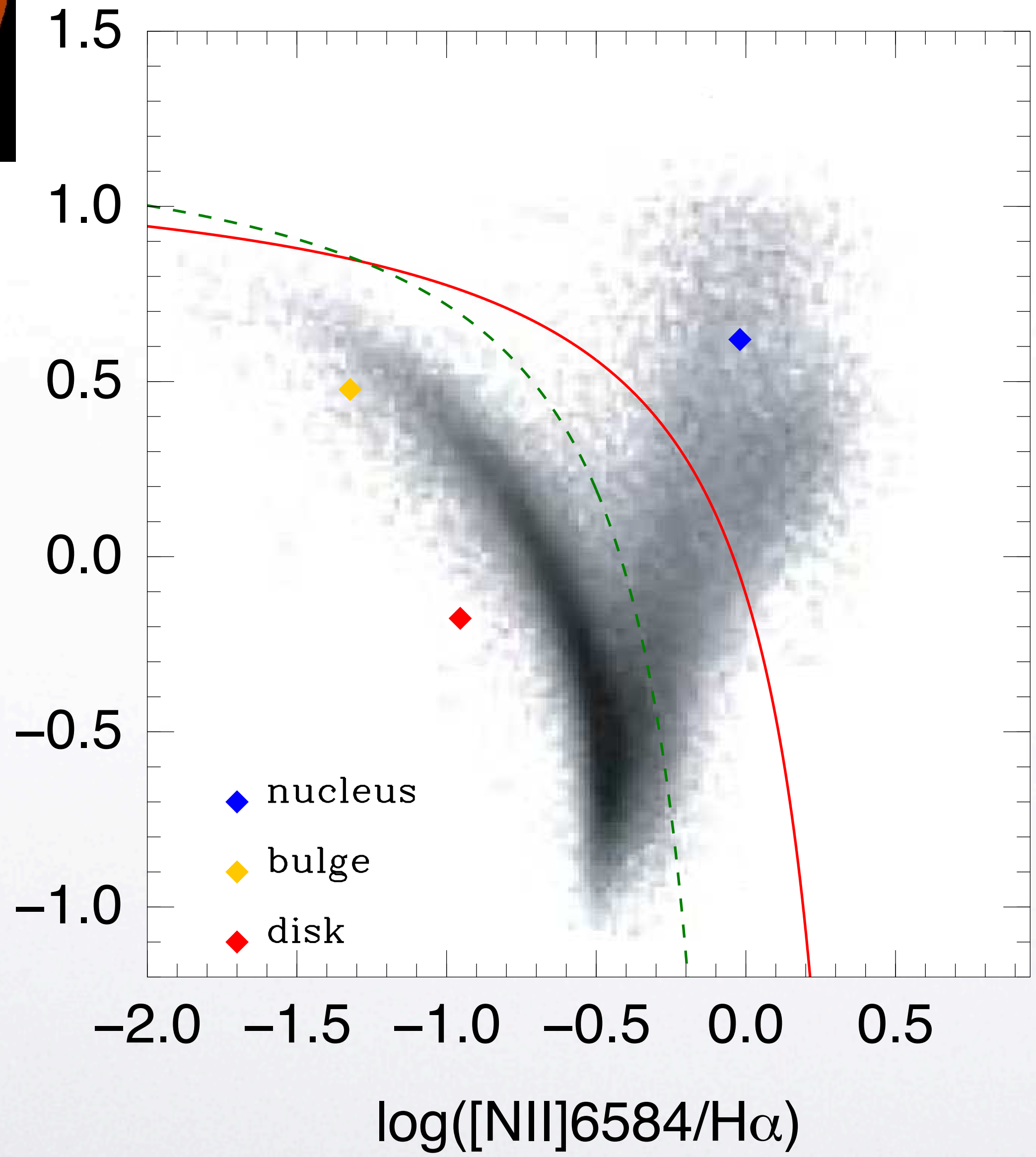
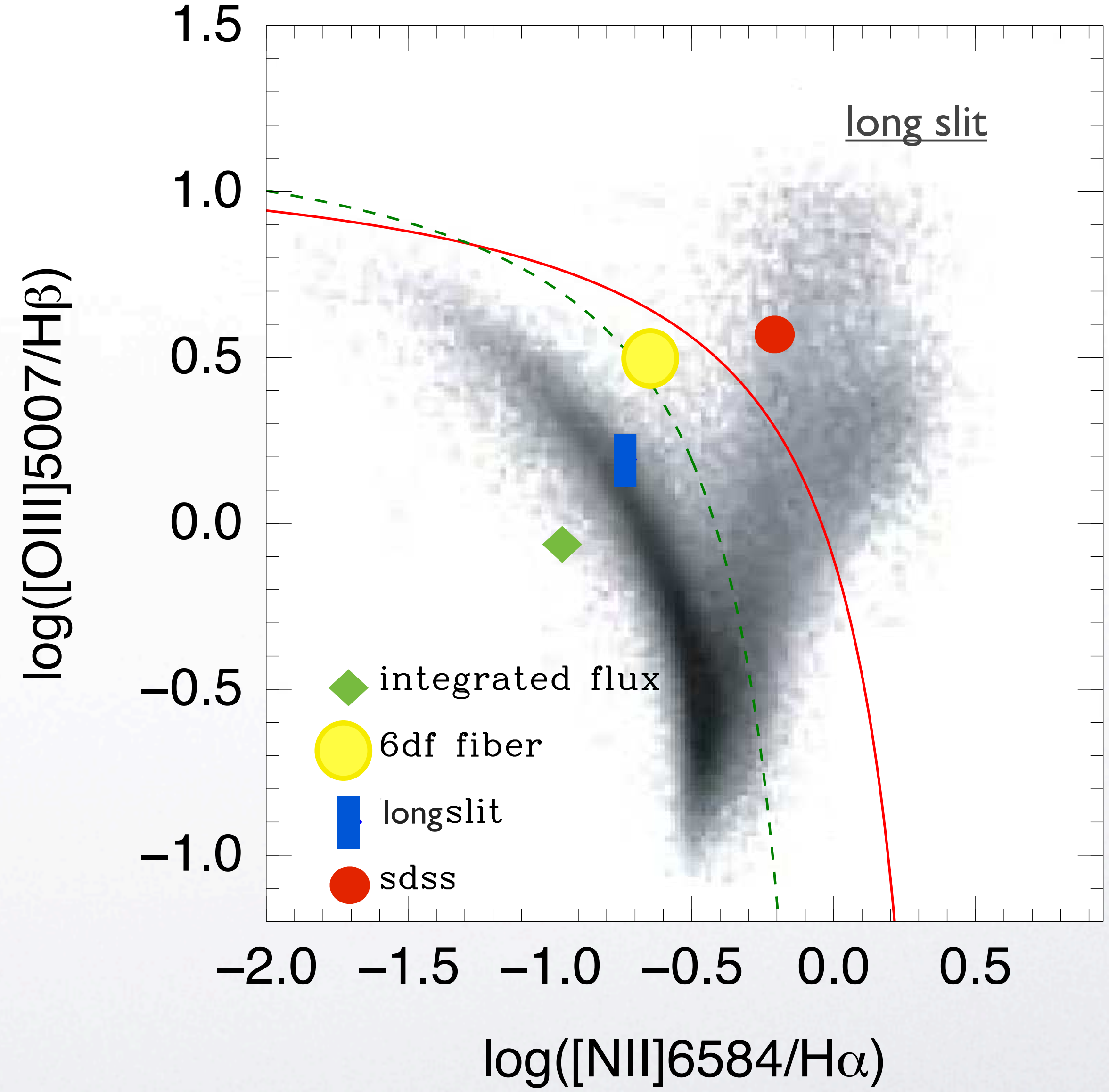
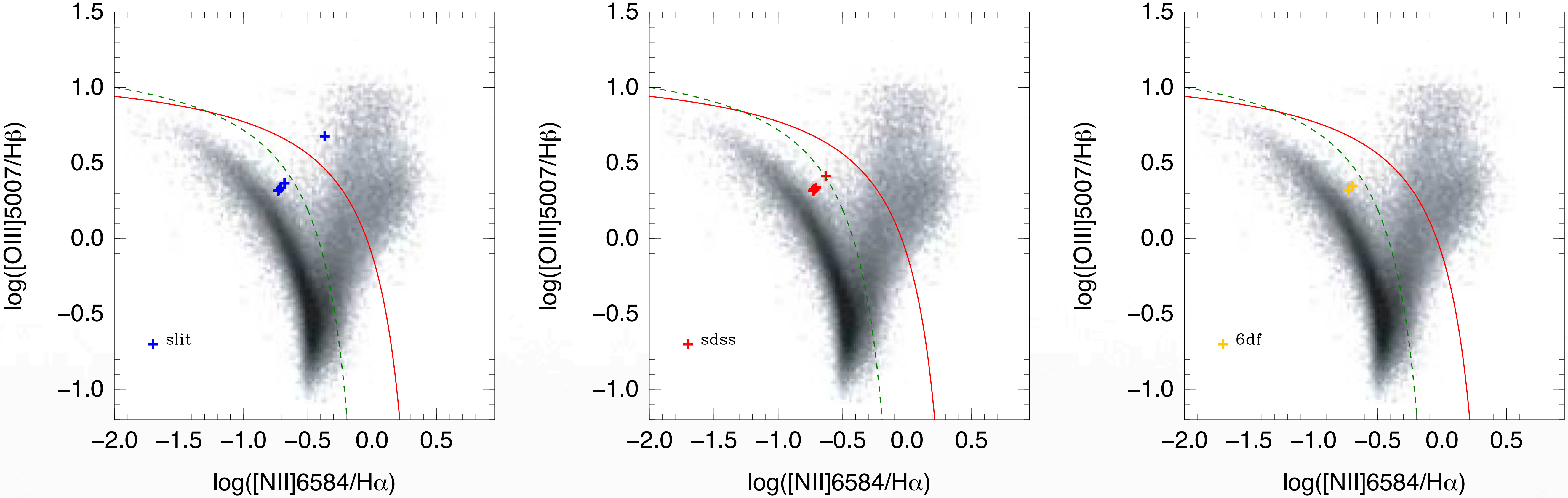
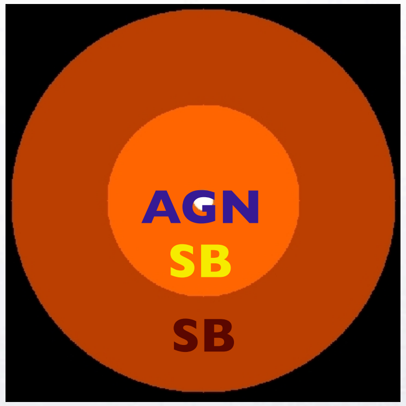
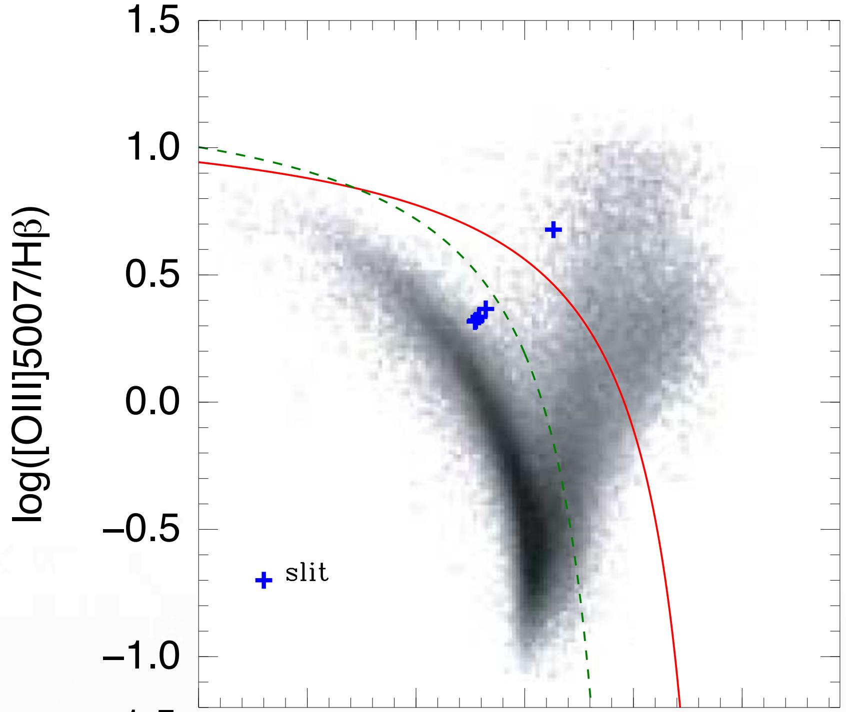


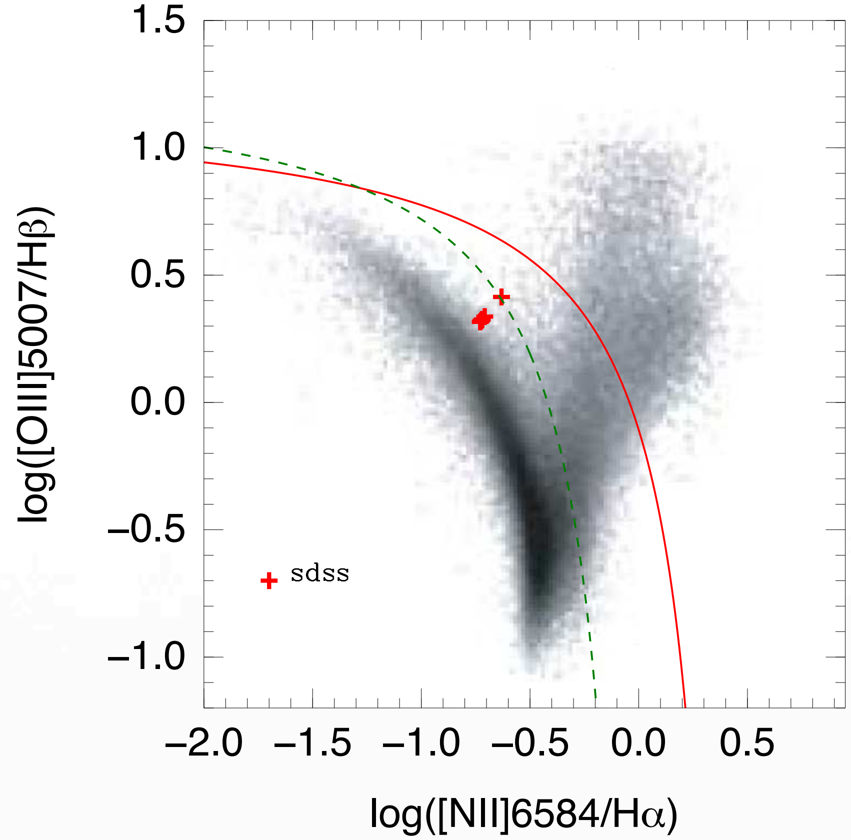


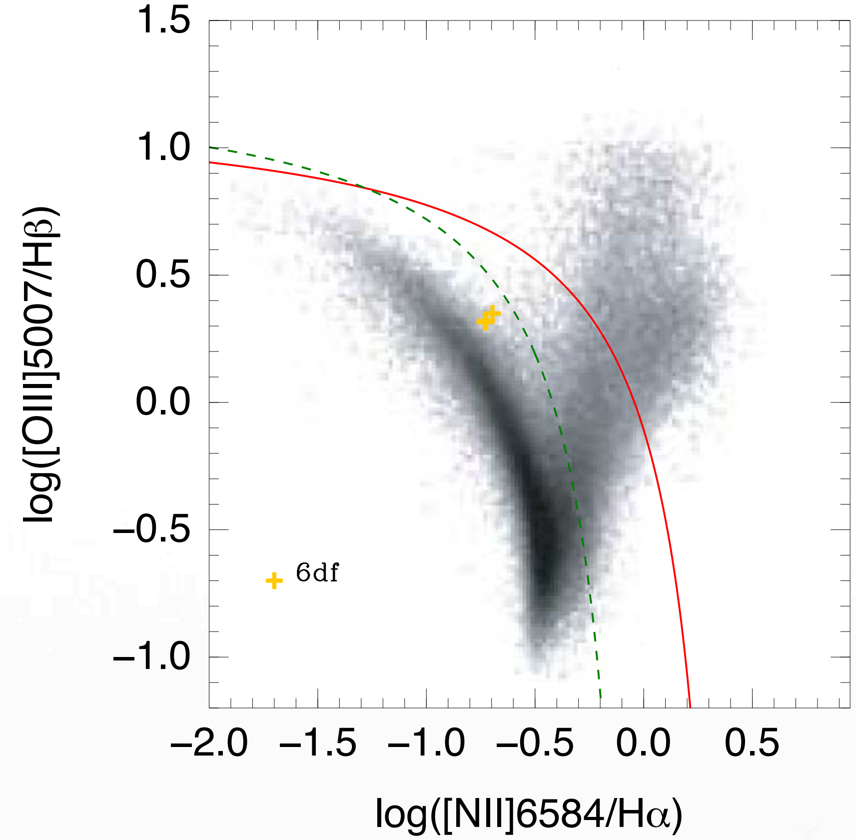


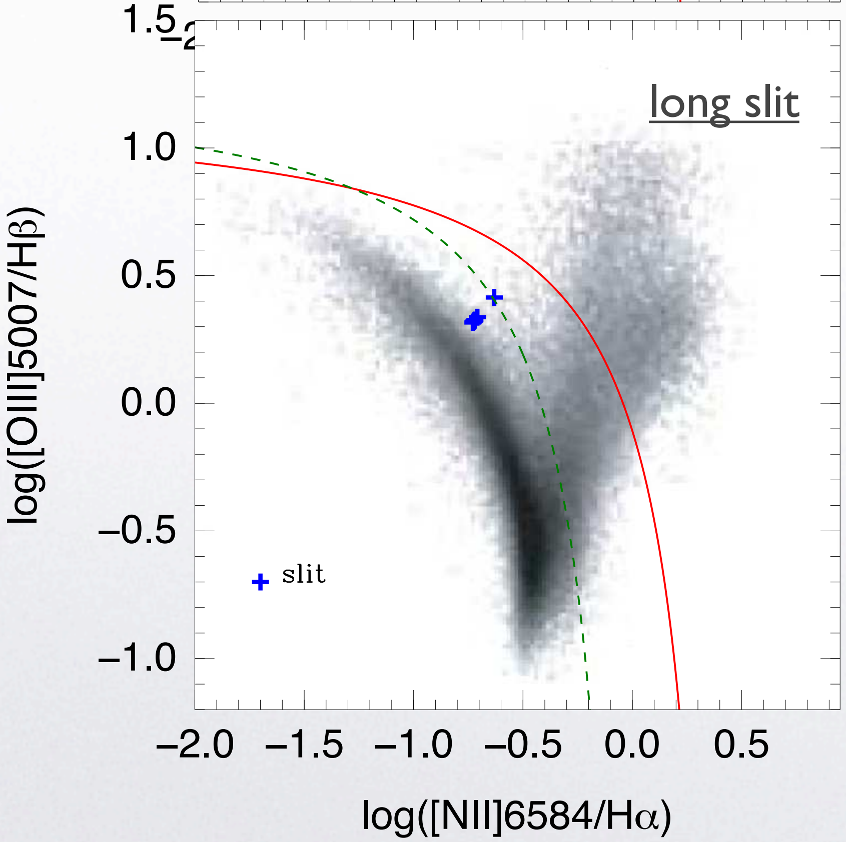


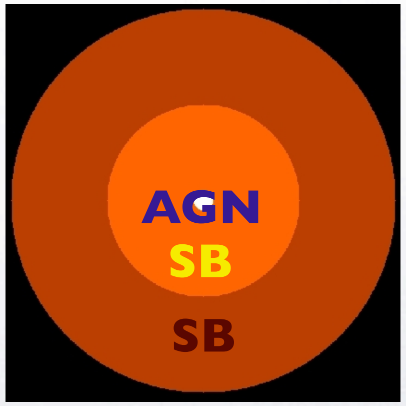
- No evolution consideration.
- 0.1 < z < 7.
- The biggest the aperture size, the less data distribution.
- The most local galaxy is dominated by AGN activity.











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Concluding remarks

- Star forming activity in a significant number of the LLQSO sample members (host galaxy).
- No LINER contribution in the LLQSO sample.
- Most of the sources have FWHM > 2000 km/s, Seyfert-1confirmation.
- HE 0203-0031 source may be an accretion disk candidate.
- Detection of double narrow components, indicates the existence of ‘super-winds’ and mergers.
- Variations up to ~0.6 dex in [NII]/Hα axis and up to ~0.4 dex in [OIII]/Hβ can be explained by the simulations.
- Impact of aperture effect is larger on the local universe.
- The individual classification of the galaxy region and its effective area are important.
- SDSS is affected by aperture effect.

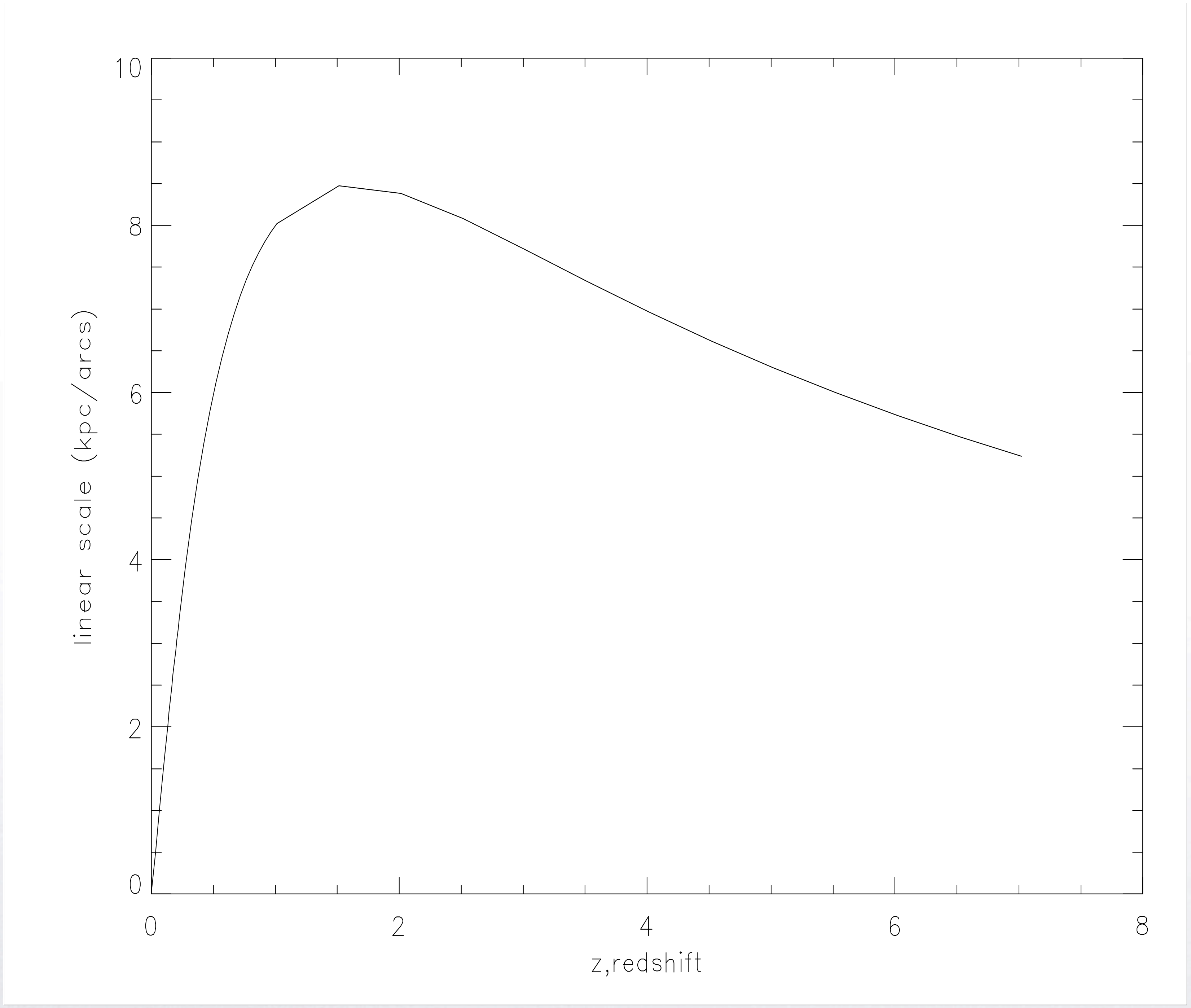
Summarizing & Outlook

- Analysis of ~ 90 sources from two data sets (HES & 6DFGS).
- BPT gives information about host galaxy and that helps in merger scenario (further studies: stellar population analysis, involving times scales for SB).
- Re - classification of the galaxies according to diagnostic diagrams.
- Impact of the aperture effect on more realistic models.

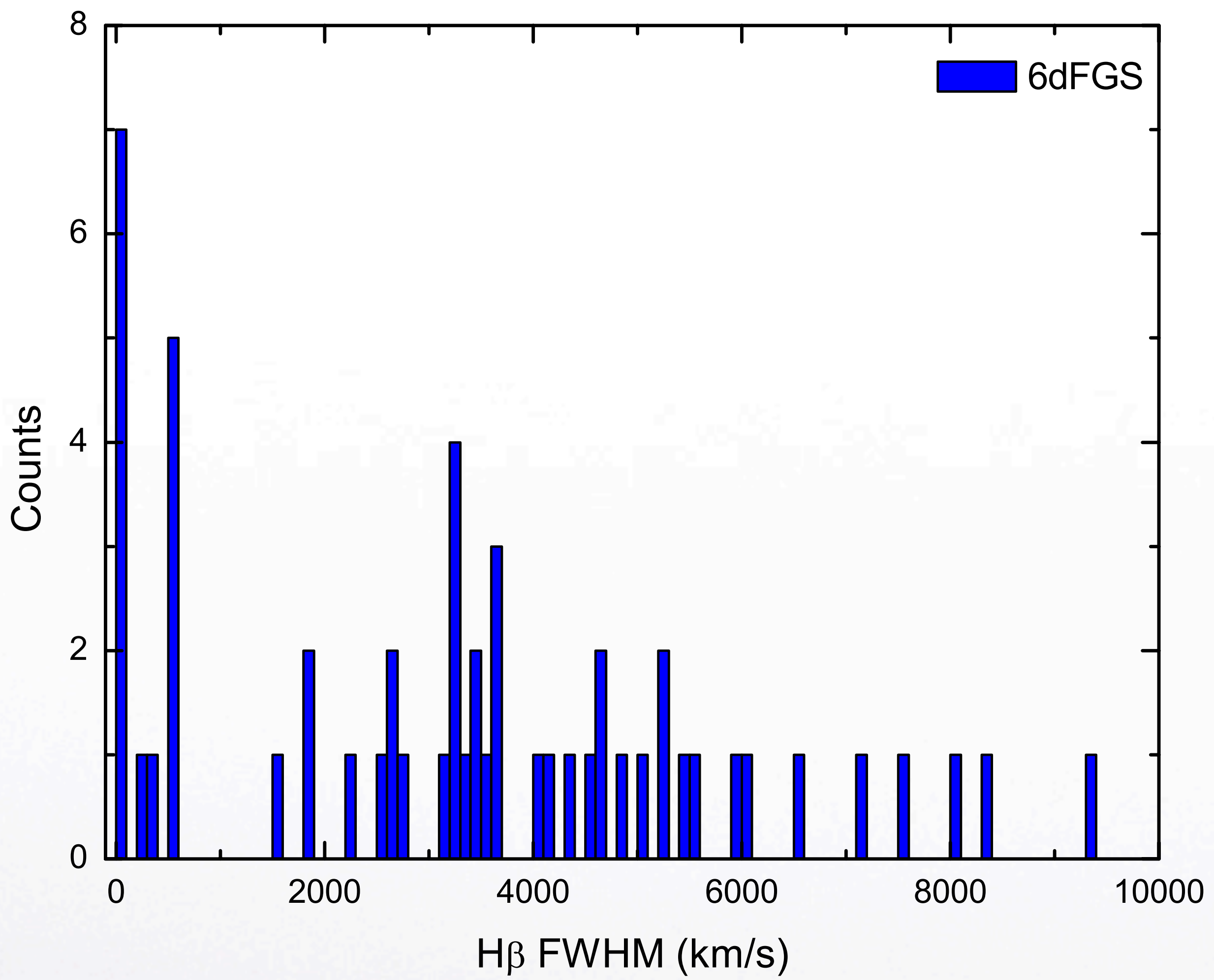
The end...

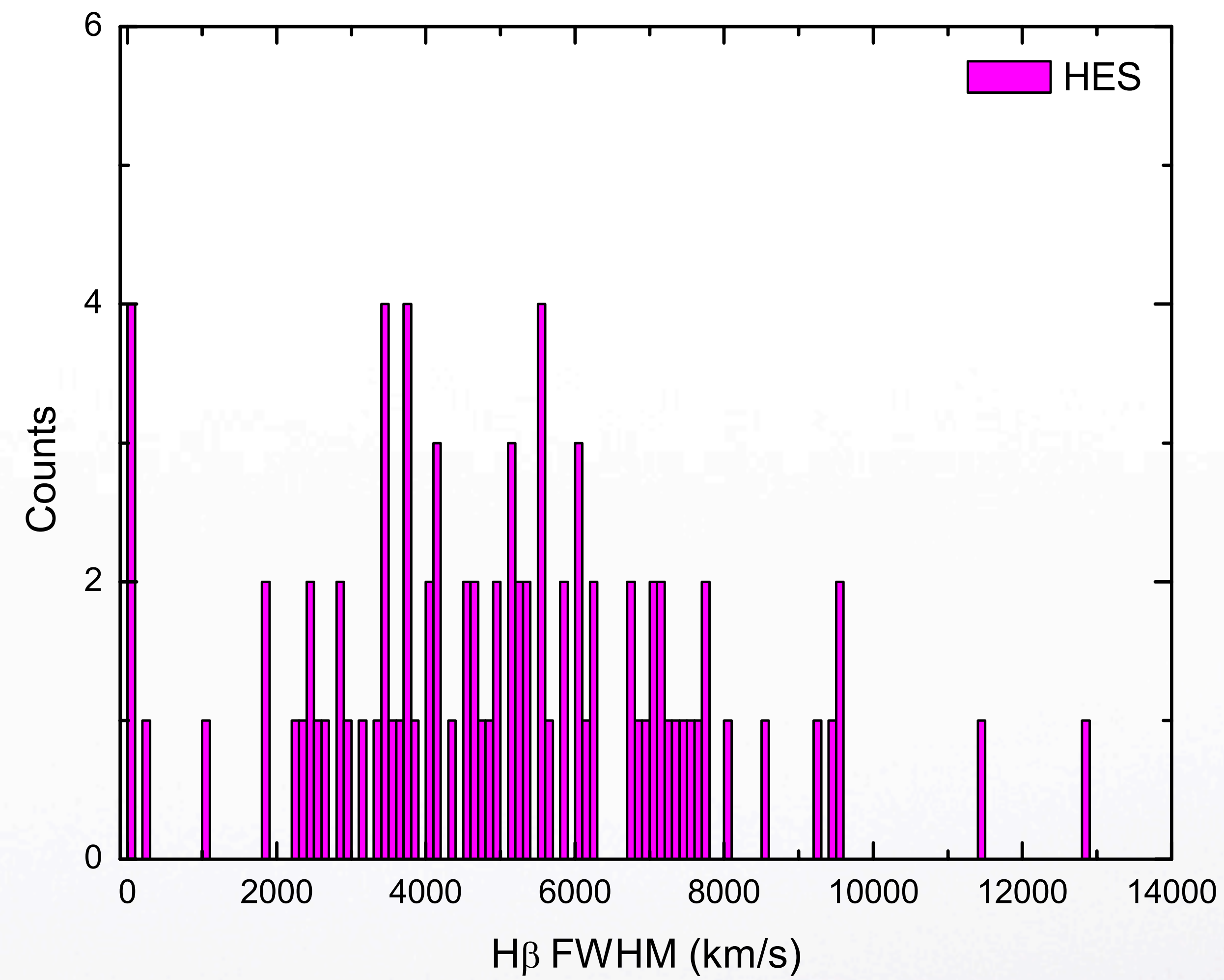
Thank you all!

Appendix

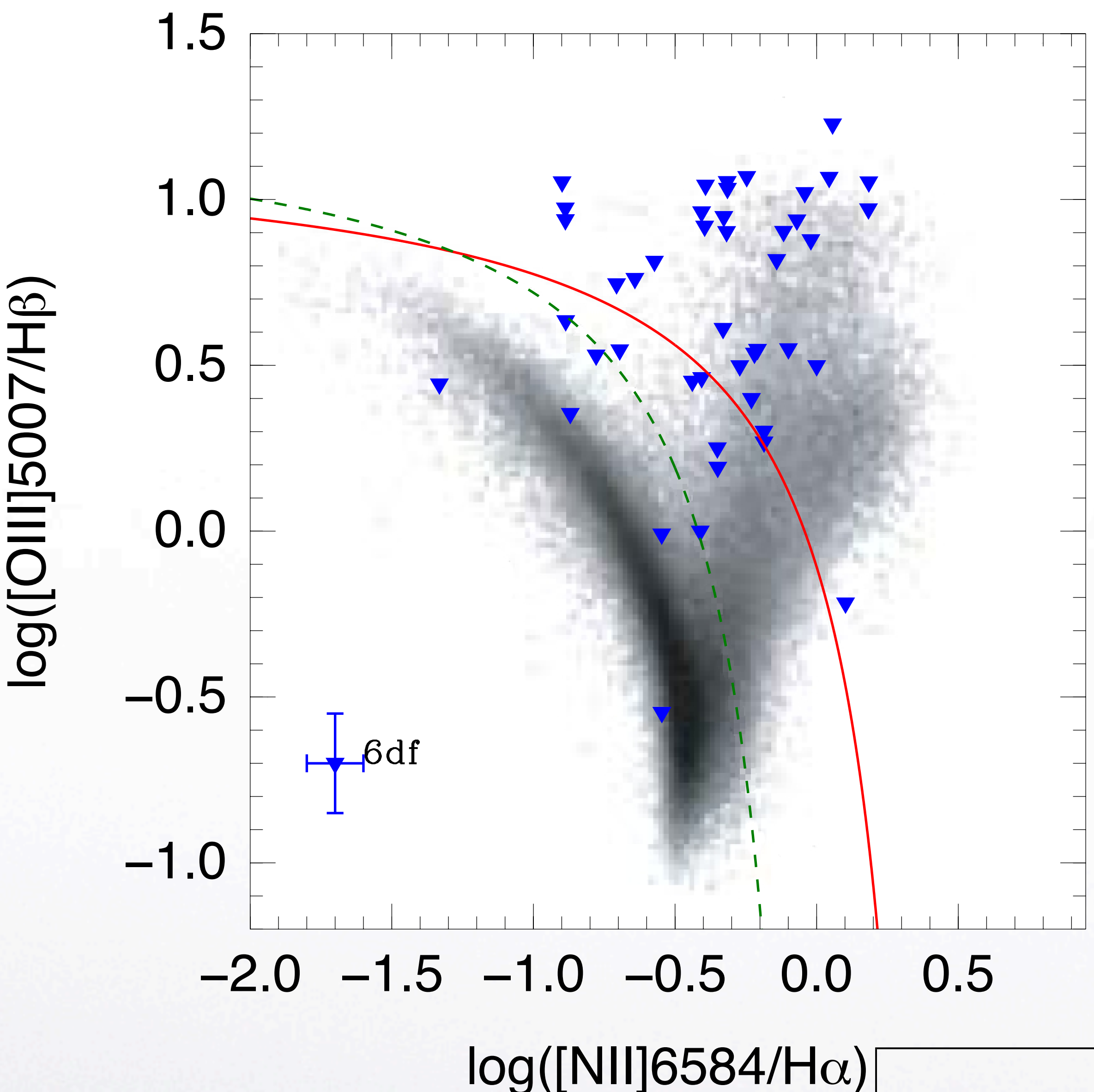


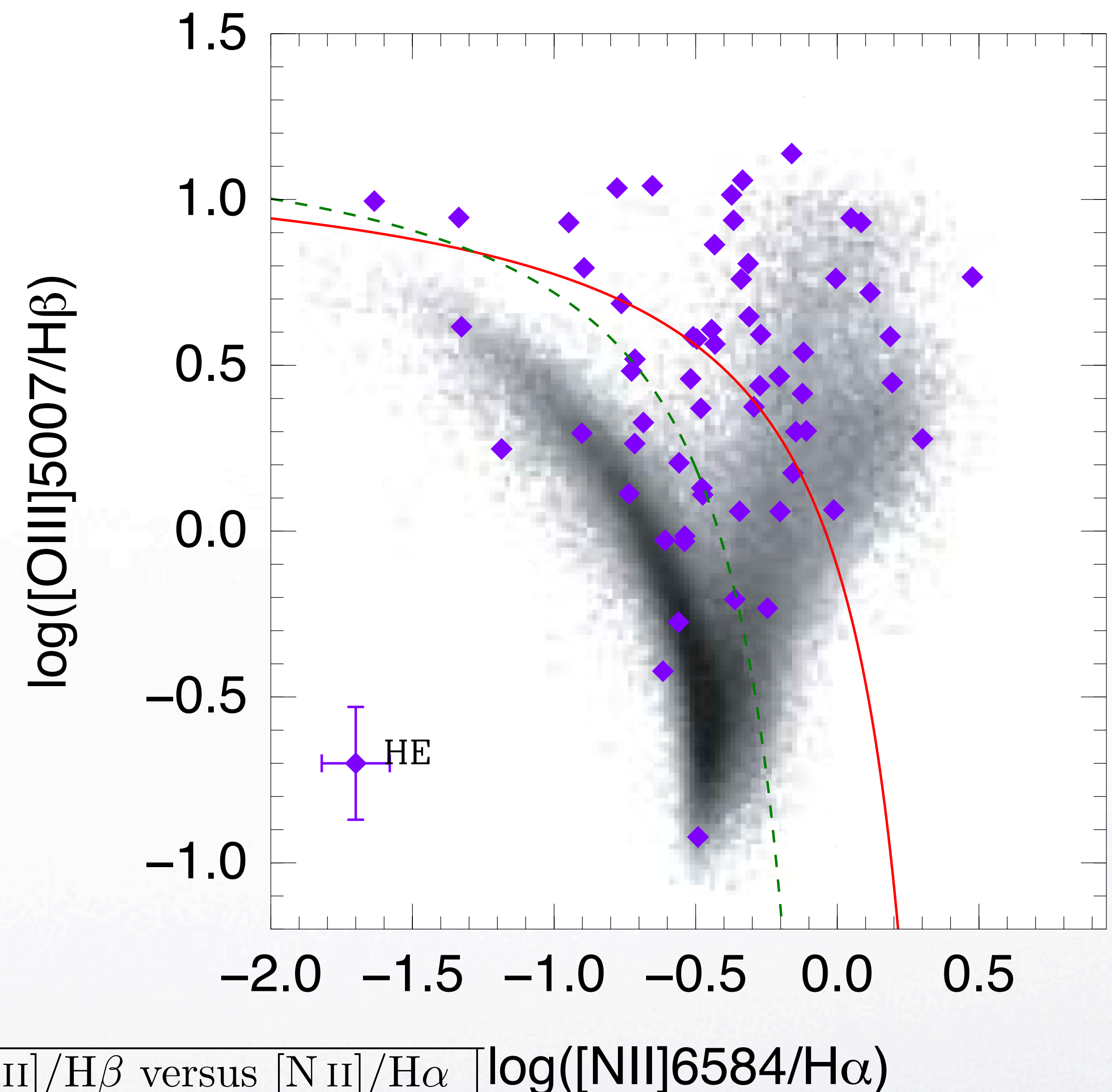
Appendix





FWHM Hβ <u>NOT</u> a clear peak!





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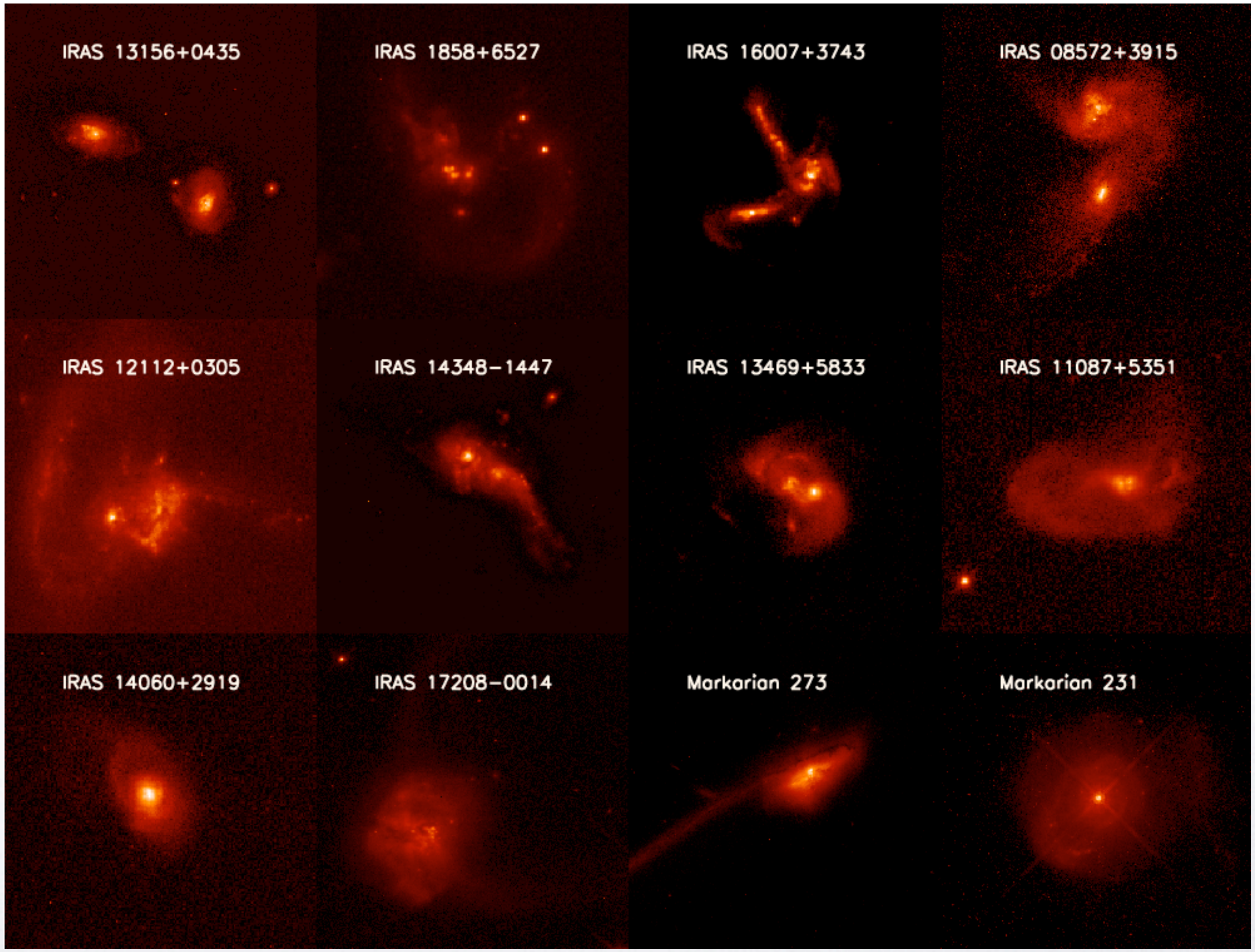
QSOs

QSOs are among the most distant and most luminous objects in the universe

- Redshift ($z \gtrsim 0.1$)
- Detectable at radio, infrared, optical, ultraviolet, X-ray and even gamma rays
- Harbor a Super Massive Black Hole (10^6 - 10^9 $M_\odot$)



Credit: M.Garcia Marin

QSOs are formed via strong tidal interactions or mergers (i.e. Sanders, 1988a)