

# Selecting Candidate Dual Active Galactic Nuclei at High Redshift

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Interacting Galaxies and Binary Quasars: A Cosmic Rendezvous  
Trieste, Italy, April 2, 2012

# Background

Dual AGN represent a stage of galaxy mergers when the two SMBHs are at separations on the scale of a kpc and are both active

These systems can improve our understanding of how galaxy mergers influence the activity of SMBHs

Candidates identified from AGN with double-peaked narrow emission lines

# Motivation

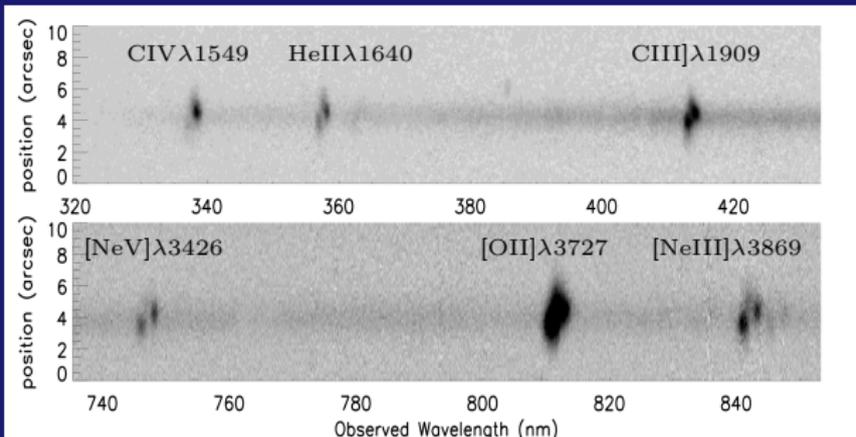
Results from 2-D spectroscopy and high-resolution imaging have found several strong candidates

Examination of alternative scenarios (e.g. gas kinematics, large-scale outflows)

Serendipitous discovery at  $z = 1.175$  through double rest-frame UV emission line components  
(Barrows et al. 2012, *ApJ*, 744, 7)

→ High- $z$  analog of spectroscopic candidate dual AGN  
(CXOXB142607.6+353351)

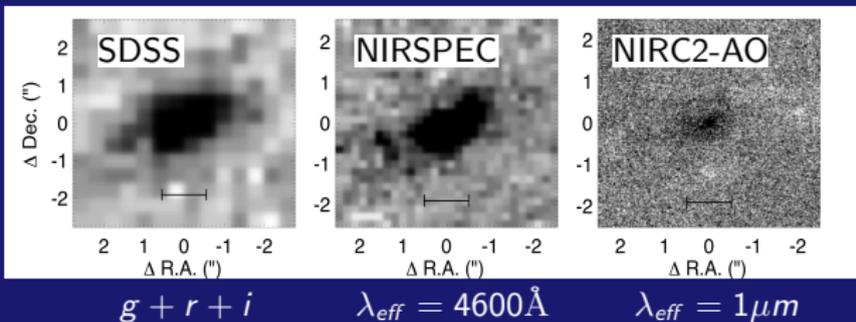
# A Candidate Dual AGN at $z=1.175$ (CXOJ1426+35)



Two actively accreting SMBHs in a galaxy merger remnant?

Large-scale outflow from a single AGN?

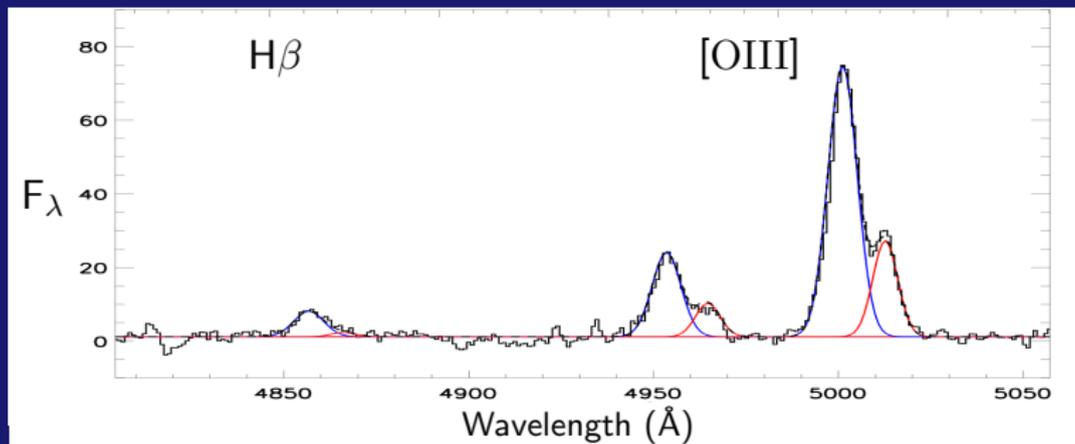
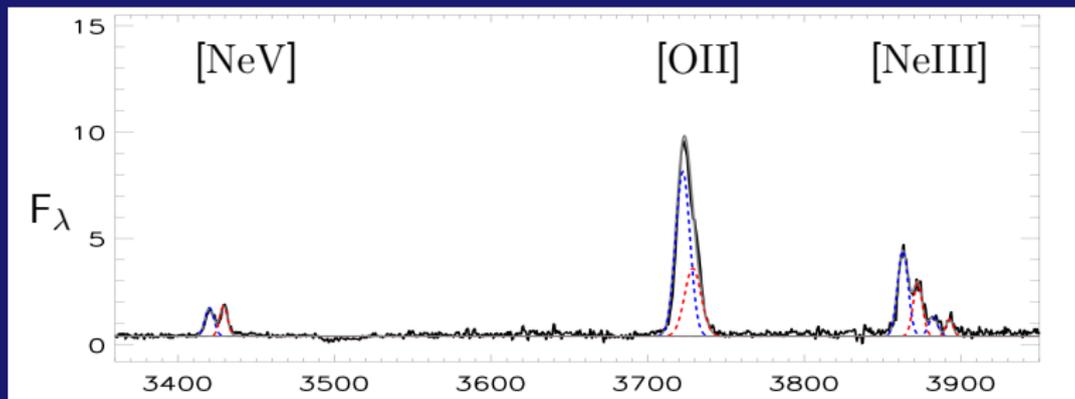
A combination of these scenarios?



The scale bar represents 10 kpc at  $z=1.175$

(From Barrows et al. 2012, *ApJ*)

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Two emission line components separated spatially (5.5 kpc) and in velocity-space ( $700 \text{ km s}^{-1}$ )

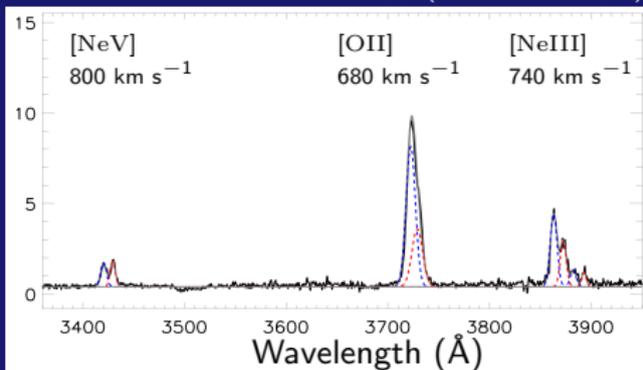
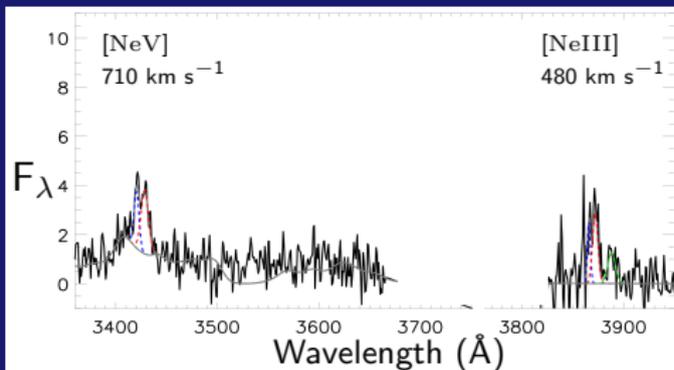
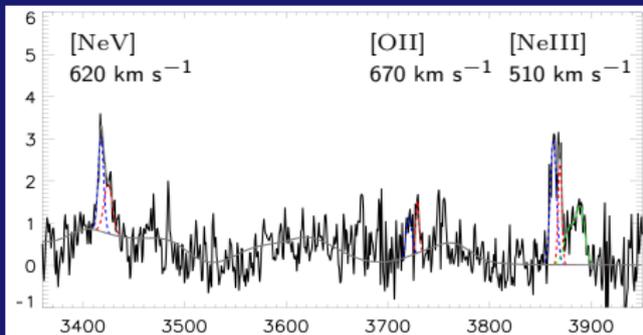
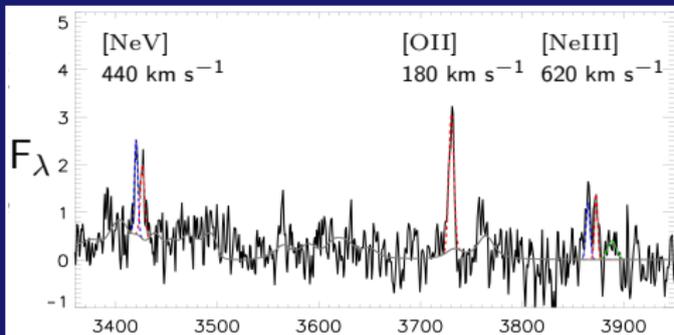
Double-peaked [OIII] profile resembles that of low-redshift candidate dual AGN

Rest-frame optical image reveals the galaxy has an elongated and 'lumpy' morphology, indicative of a past disturbance

Rest-frame  $1\mu\text{m}$  adaptive optics image reveals only a single, diffuse source

→ single AGN or is there a second, heavily obscured AGN?

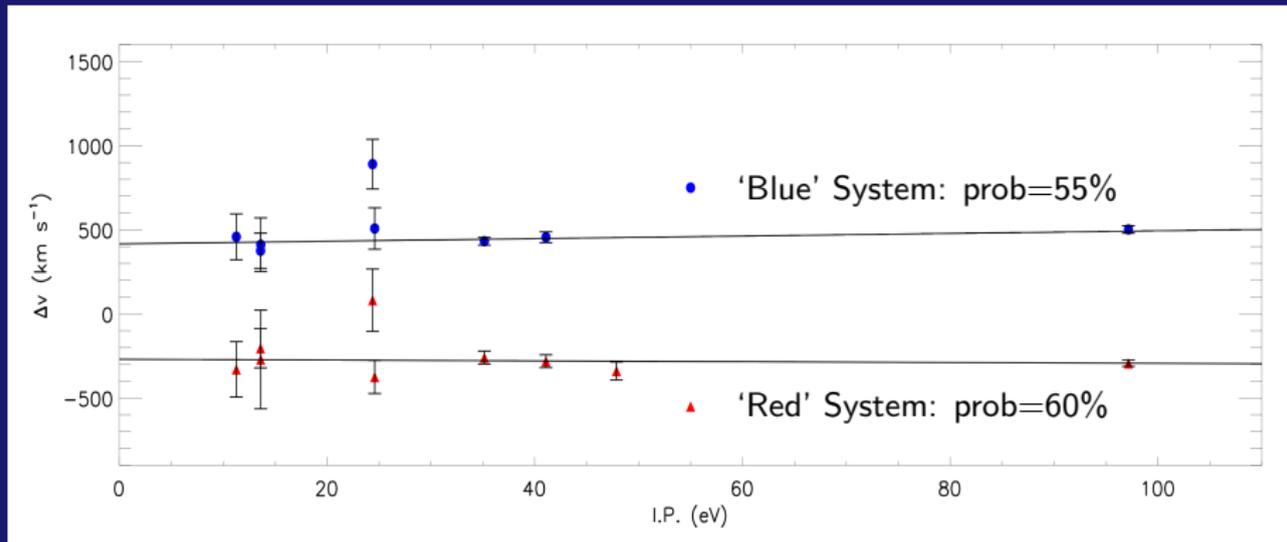
# Double-Peaked [NeV] $\lambda$ 3426 and [NeIII] $\lambda$ 3869 Sources



$z = 1.175$  (Barrows et al. 2012)

# Emission Line Diagnostics

Plot of ionization potential (I.P.) vs velocity offset ( $\Delta V$ ) in CXOJ1426+35, a candidate dual AGN at  $z = 1.175$  (Barrows et al. 2012)



There is no strong evidence for a correlation between I.P. and  $\Delta V$  for either the 'blue' or 'red' system.

-> The 'outflow' scenario appears unlikely based on this graph

## Summary

Double-peaked narrow emission line AGN detectable through double-peaked  $[\text{NeV}]\lambda 3426$  and  $[\text{NeIII}]\lambda 3869$

Profiles similar to those selected through double-peaked  $[\text{OIII}]$

However, this preferentially finds double-peaks with large  $\Delta V$  compared to  $[\text{OIII}]$

Velocity-splittings and ionization potentials provide information about the kinematics of the ionized gas

# Implications

More frequent mergers should result in more pairs of SMBHs in galaxies at  $z > 0.80$

Will they be observable as AGN with double-peaked narrow line features?

If these sources are instead outflows, what might be triggering them?

## Potential follow-up observations:

- 2-D spectroscopy: spatial offsets and morphologies
- NIR spectroscopy to access  $H\beta$  and  $[OIII]\lambda 5007$
- High-resolution imaging: adaptive optics, radio

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