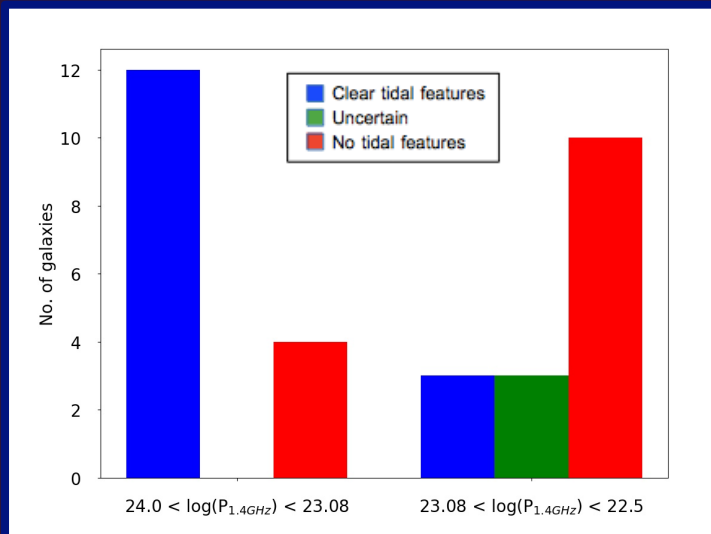
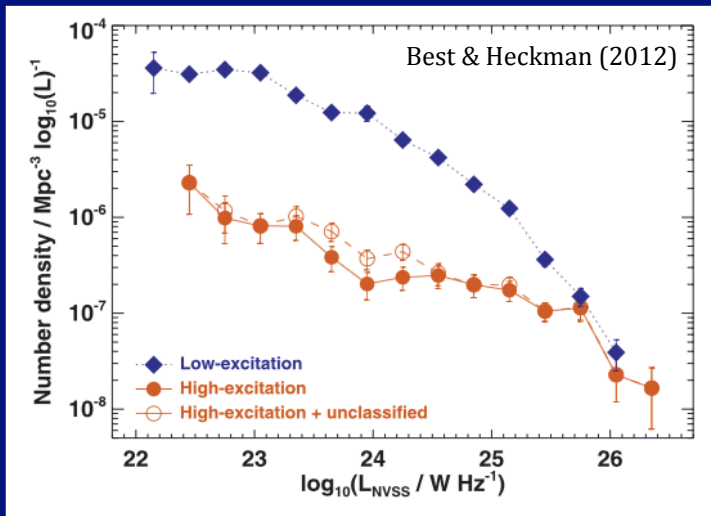


# Do mergers trigger AGNs with intermediate radio powers?



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## The Morphology Of AGNs Of Intermediate Radio Power

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### Introduction

Feedback from the jets and lobes of radio-loud AGNs can affect star formation and black hole accretion on scales of  $0.1 - 10 \text{ kpc}^{100}$ , and create cavities and suppress cooling flows in the X-ray emitting gas on larger scales  $1.0 \text{ Mpc} \rightarrow 1 \text{ Mpc}^{100}$ . To improve our understanding of galaxy evolution, determining how and when this type of AGN is triggered is therefore crucial.

It has been suggested that galaxy mergers and interactions can trigger an AGN<sup>116</sup>. Simulations imply that these events create tidal features and other interaction signatures<sup>116</sup>, which can be traced via deep optical imaging. These are prominent in powerful radio-loud AGNs ( $P_{1.4\text{GHz}} > 10^4 \text{ W Hz}^{-1}$ ), which also have environments suited to mergers<sup>116</sup>, implying this triggering mechanism could be dominant in these cases. Such AGNs are also predominantly hosted by elliptical galaxies, though a minority are spirals at lower powers. Examples of the features mentioned are indicated in the images of galaxies from the 2 Jy sample below<sup>116</sup>.

**Key Question:** Do the host galaxy types and prevalence of interaction signatures vary with radio power?

### Images

Below are displayed the (negative) reduced, stacked and combined images in four equally populated radio power bins, which decrease in power moving down the page. The radio power in each bin decreases from top-left to bottom-right. The approximate scales (kpc) are indicated on each image, which are all orientated as indicated on that of the most radio-powerful galaxy in the sample (top-leftmost).

$24.0 > \log(P_{1.4\text{GHz}} [\text{W Hz}^{-1}]) > 23.36$

$23.36 > \log(P_{1.4\text{GHz}} [\text{W Hz}^{-1}]) > 23.08$

$23.08 > \log(P_{1.4\text{GHz}} [\text{W Hz}^{-1}]) > 22.92$

$22.92 > \log(P_{1.4\text{GHz}} [\text{W Hz}^{-1}]) > 22.5$

### Sample Selection & Observations

Complete sample of 32 AGNs from larger sample of cross-matched SDSS and FIRST/NVSS sources<sup>116</sup>, with:

- Intermediate powers  $\sim 10^4 < P_{1.4\text{GHz}} [\text{W Hz}^{-1}] < 10^6$
- Low redshifts  $z < 0.1$
- High Excitation Radio Galaxy spectra (HERGs)

Observations:

- Deep optical - Sloan r-band
- INTWFC, La Palma
- Total exposure time per target = 2800s

### Results

- 15 of the 32 galaxies (47%) showed at least one clear tidal feature
- Number of hosts displaying features decreases with radio power (Figure 1)
- Proportion showing no sign of interaction increases
- Majority of the hosts have disk-like morphologies (lenticular and spiral)
- 21 out of 32 (66%), with 11 out of 32 (34%) having elliptical-like or very disturbed appearances

Figure 1 - The number of galaxies showing clear, uncertain or no features, in two equally populated radio power bins.

### Discussion

	2 Jy (9)	This work (32)
Interaction signatures	89% <sup>116</sup>	47%
Host types	Elliptical (>99%) Disk/spiral (<1%) <sup>116</sup>	Disk/spiral (66%) Elliptical (28%) Merger (34%)

Table 1 - The relative proportion of interaction signatures and host galaxy types across different samples at comparable redshifts (ages in brackets).

- These results refer to:
  - Merger hosts were those with disturbed morphologies which did fit cleanly into 2Jy samples
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**Hosts of intermediate radio power HERGs are:**

- Less likely to be interacting than radio-powerful examples.
- Predominantly fibrils or disks, unlike powerful radio galaxies.

### What next?

- Constrain host morphologies (GALFIT)
- Analysis environments
- Suitable control sample
- Automated feature detection method?

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