Unveiling the properties of Dumbbell galaxies: a 3D view from Integral Field Spectroscopy

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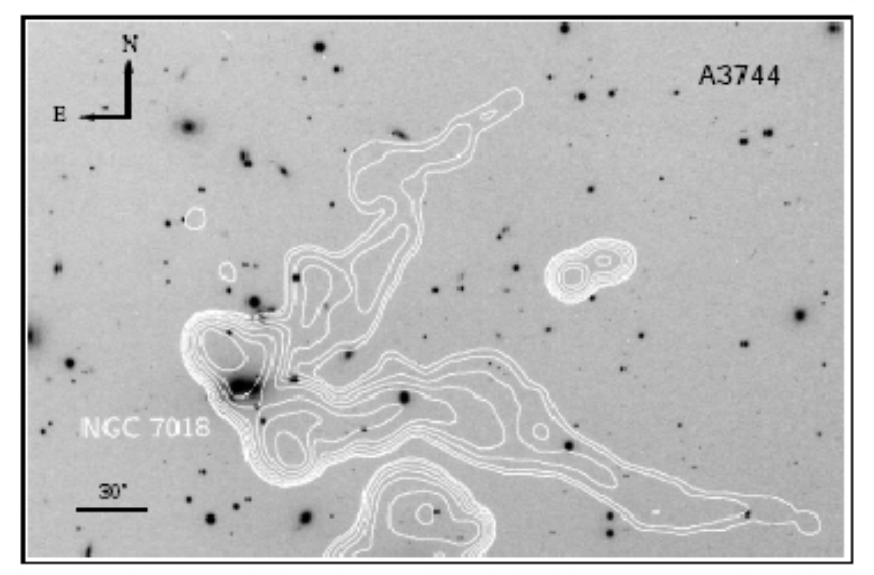
MULTIPLE GALAXY SYSTEMS IN RICH CLUSTERS

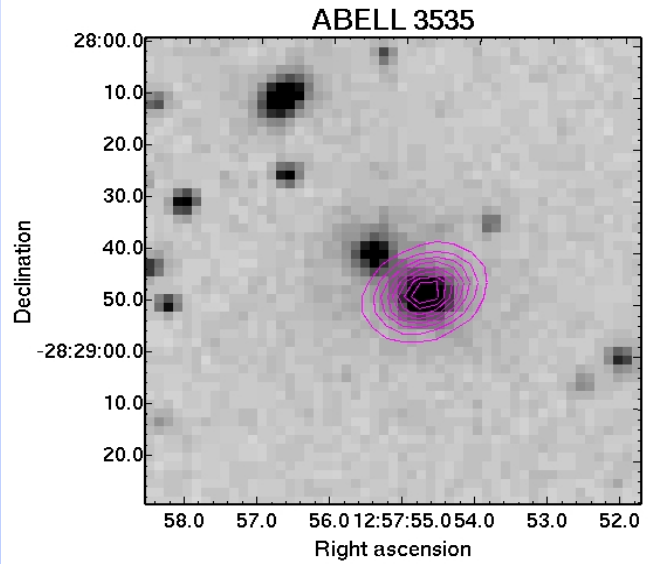
BCGs often have >1 optical component:

- **Dumbbells**: 2 nuclei, common envelope, $\Delta mag < 2$; $d < 70$ kpc

✓Origin, evolution and dynamical stability. *What prevents instability against merging*? Mass of envelope, orbits, etc.

✓Radio emission: wide range of radio morphologies. *Interplay: gas kinematics, onset of radio source and formation of complex radio structures*





AN OPTICALLY-SELECTED SAMPLE (Gregorini et al. 1994)

Dumbbells in ACO/Abell clusters @ δ < -17°. Volume-limited sample at z < 0.07 . Radio data: VLA,ATCA

VLT-VIMOS IFU OBSERVATIONS:

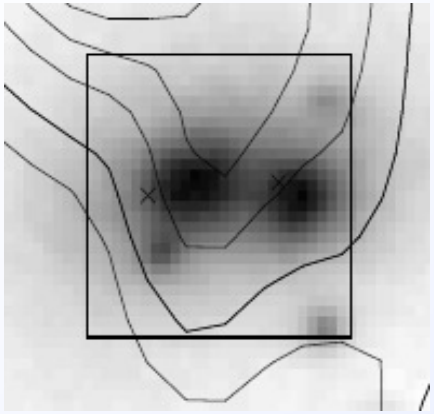
Three Dumbbell systems, different radio classes

High Resolution Orange grism (5200 – 7600 A), 0.67"/fibre, FoV 27"x27", 1600 spectra, 2hrs per target

Reduction & analysis: VIPGI pipeline + GIPSY package

Detected OIII, Ha, NII SII + many absorption features.

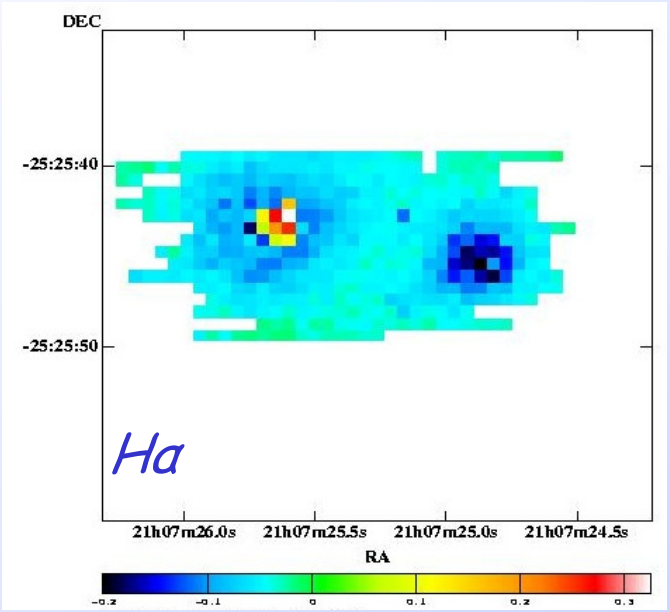
Preliminary results from VIMOS IFU 2D spectroscopy -I

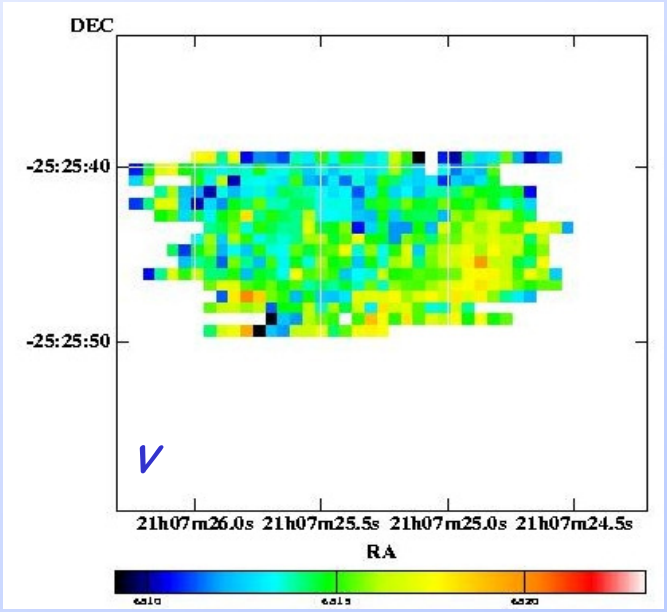


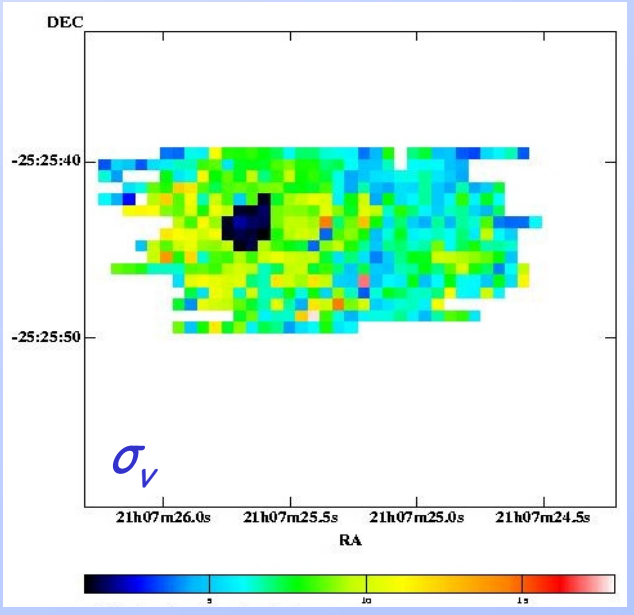
Optical+IFU FoV

A3744 in Ha (complex radio source, z=0.0384)

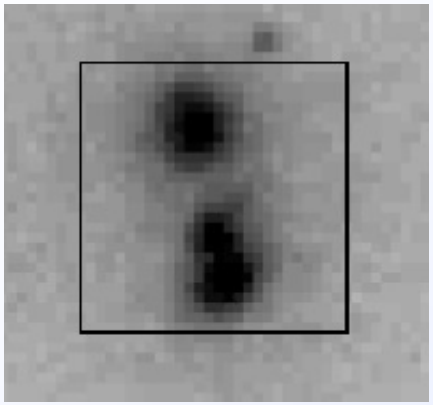
- emission at the centre of the E nucleus (radio)
- absorption in the W nucleus and throughout the system
- higher σ_v in the E nucleus. Turbulence extends in the internuclear region towards the West







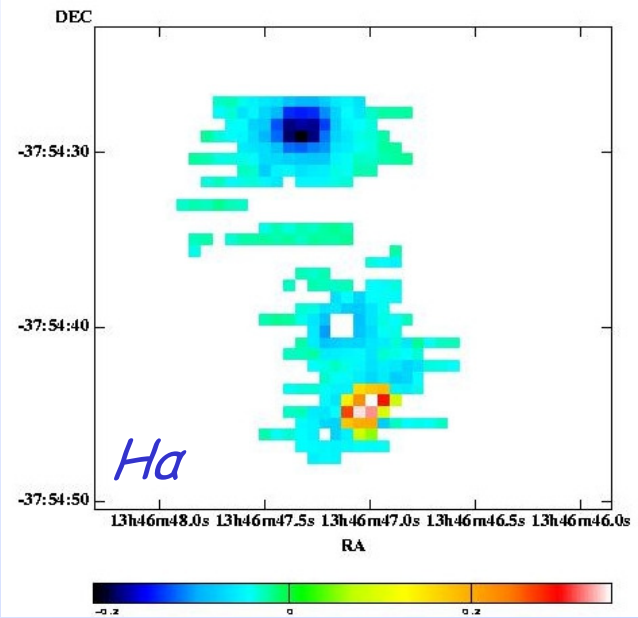
Preliminary results from VIMOS-IFU 2D spectroscopy -II

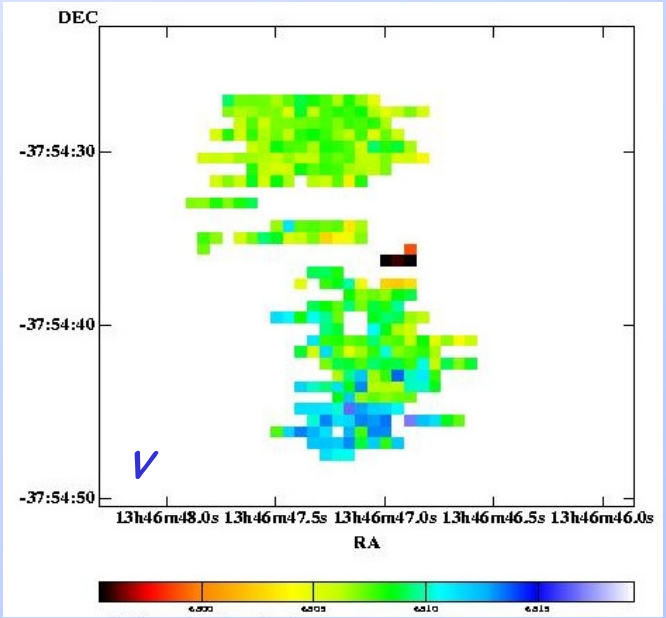


Optical+IFU FoV

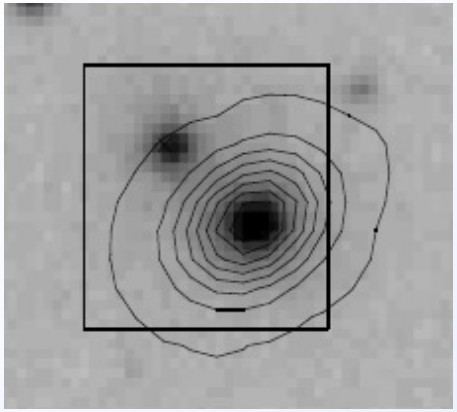
A3570 in Ha (no radio emission, z = 0.0375)

- emission in the centre + absorption around the **southern nucleus**
- very weak emission? in the centre + absorption around the **central galaxy**
- strong, deep absorption in the **northern nucleus**





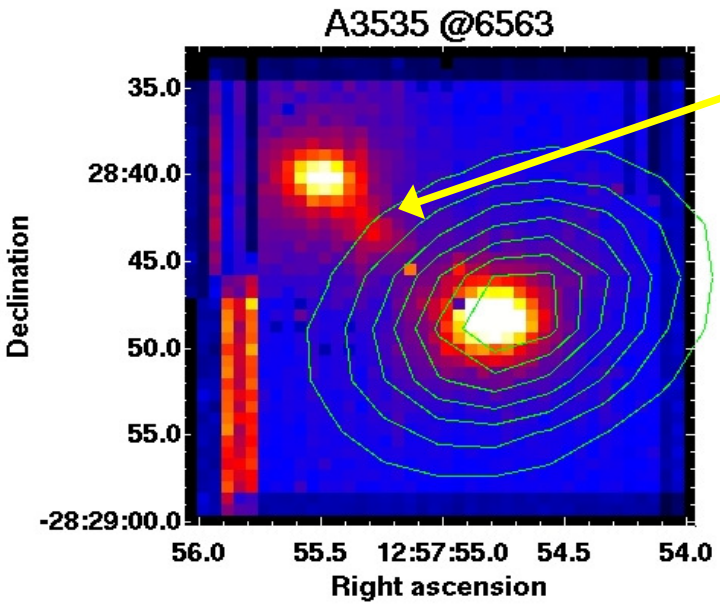
Preliminary results from VIMOS-IFU 2D spectroscopy -III

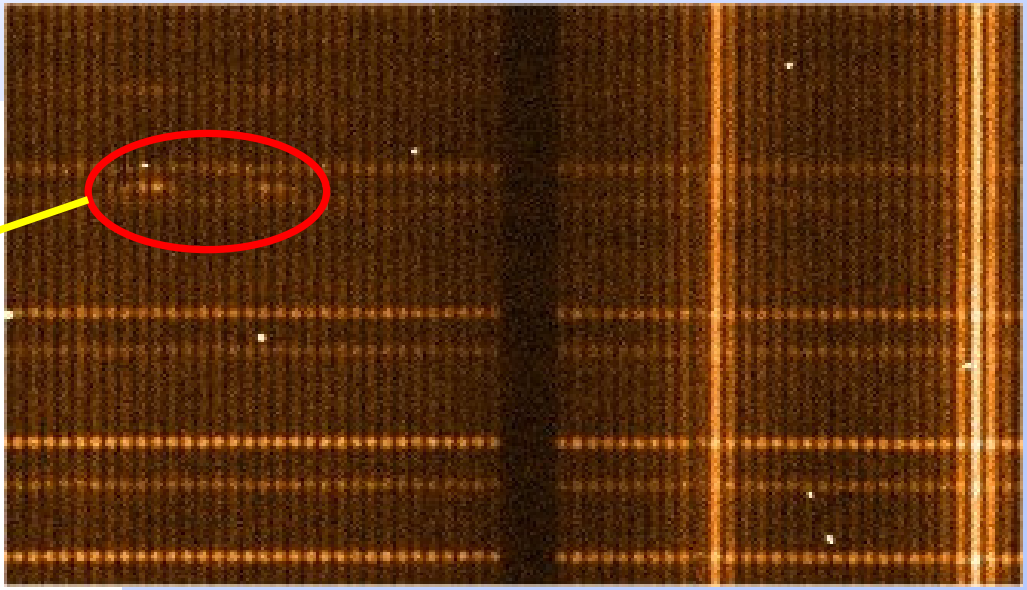


Optical+IFU FoV

A3535 in Ha (pointlike radiosource, z= 0.0658)

- Detection of line emission from the gas in the internuclear region.
- Gas is detected in OIII, Ha,...





2D reconstructed image in Ha. Radio contours are superimposed.

Next steps:

- Complete the analysis of gas and stars kinematics;
- pilot study: now go for the whole optically-selected sample;
- radio-selected Dumbbell sample (Parma et al. 1991);
- search for dust and CO (IRAM, [ALMA]).

...Stay tuned...