



Assegno di Ricerca

Title of the Project: *The effect of AGN feedback on the gas consumption in high-redshift host galaxies*

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"Black hole winds and the baryon life cycle of galaxies: the stone-guest at the galaxy evolution supper"

Outline of the Project:

The research project will be focused on the study of the physics and evolution of high-redshift AGN ($z \sim 1-4$), and in particular on the impact that AGN winds and outflows may have on the host galaxies gas reservoirs and eventually on the future evolution of galaxies. This will provide key constraints on models of SMBH-galaxies coevolution.

The project is based on the exploitation of *proprietary* ALMA data, in conjunction with ALMA and NOEMA archival data and exquisite multi-wavelength information available within the cosmological X-ray surveys fields (e.g. COSMOS, CDFS).

The main goals of the project will be:

- 1) Explore the AGN impact on host galaxies gas reservoir by measuring gas fraction and molecular gas depletion timescales;
- 2) look for trends of these quantities as a function of galaxy properties (SFR, M^*), AGN properties (BH mass, luminosity), presence/lack of outflows signatures in various gas phases;
- 3) In the cases molecular outflows are detected via spatially resolved imaging or asymmetric line profiles, investigate the multi-phase conditions of the ISM in the host galaxies and in the outflowing gas;
- 4) Compare the results from observations with wind properties in zoom-in simulations that use different AGN feedback physics.

The Post-Doctoral Research Associate (PDRA) will be **in charge of the ALMA data reduction and analysis** and will become a key member of the BLACKOUT team. In addition to these activities, the PDRA will also work on **collation and analysis of multi-multi-wavelength data** (at X-ray, optical, NIR, FIR, and radio wavelengths), relevant to provide a comprehensive characterisation of the feedback phenomenon. She/he will be responsible of the **dissemination of the results** through publications in international (peer reviewed) Journals and presentations at International conferences, and of **submission of proposals** to obtain follow-up exposures with JWST for the most interesting targets.

The successful candidate will work at the newly established Bologna Astrophysics campus, that includes DIFA, INAF-OAS, INAF-IRA and CTA. The research area, close to the CNR institutes, provides a highly motivated and motivating astrophysical environment. In particular, the PDRA will collaborate with local (@DIFA, OAS, IRA) team members of the BLACKOUT project (<http://blackholewinds.inaf.it/index.php/team/>) and with other world-known experts in the area of AGN physics, AGN-galaxy coevolution and sub-mm astronomy.

Detailed work plan:

The candidate will have the opportunity: to design and optimise the sample selection by matching ALMA data archive and known X-ray AGN samples from large area (eg. COSMOS, XXL) and pencil beam (e.g. CDFS, XUDS) surveys; perform ALMA data analysis to characterize the flux and spectral properties of the samples sources and fully exploit the 3D datacube; employ 1D, 2D and 3D fitting tools to constrain the kinematics properties of the sources with particular emphasis on the search for outflows; model the gas conditions using state-of-the-art photo-ionization codes; compare with theoretical model predictions.