

# Galaxy Evolution Traced by Multiple Galaxies from the BIG Sample

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**Abstract.** Optical identifications of all IRAS PSC sources at high galactic latitudes by means of the First Byurakan Survey (FBS) in the area with  $+61^\circ < \delta < +90^\circ$  at galactic latitudes  $|b| > 15^\circ$  have been carried out with a total surface of  $1487 \text{ deg}^2$ . 1577 sources have been optically identified, 1178 sources corresponding to galaxies. The BIG sample (Byurakan-IRAS Galaxies) was constructed of 1178 newly identified galaxies and 789 other IRAS galaxies in the same area, known before, altogether 1967 galaxies. Studies of the BIG objects include: spectroscopic follow-up for the brighter ( $< 18^m$ ) objects; discovery and study of new AGN; discovery and study of new ULIRGs; deep imagery of the most interesting objects and the “empty fields”; 2D spectroscopy of interacting/merging systems; search for obscured IRAS galaxies (with the Spitzer Space Telescope), etc. The BIG objects are a rich source for new AGN, high-luminosity IR galaxies (hence, starburst activity), and interacting/merging systems. All these phenomena are crucial for understanding the galaxy evolution and their interrelation, as well as the triggering of the powerful IR radiation. In frame of the redshift survey of these galaxies, spectroscopic observations have been carried out for the BIG objects (including the pairs and multiples) by means of the Byurakan Astrophysical Observatory (BAO, Armenia) 2.6m, Special Astrophysical Observatory (SAO, Russia) 6m, and Observatoire de Haute Provence (OHP, France) 1.93m telescopes. It is shown that, without an exception, all double/multiple BIG systems are physical pairs or groups, and they are mostly interacting and/or merging systems. From the high IR luminosities derived from the observations, one can conclude that perhaps the ULIRG/HLIRG phenomenon is connected with galaxy interactions/merging. We find an evolution in luminosity function of these objects with respect to their redshift distribution.

Existence of AGN among the multiple BIG objects provides a chance for study of the galaxy evolution in sense of interrelationship between the three phenomena: starburst, interactions/merging, and nuclear activity. We have shown (Mickaelian *et al.* 2001) that the maximum IR luminosity of a single spiral galaxy may not be larger than  $10^{12}$  Solar luminosities. Hence, all high-L IRAS galaxies are interacting pairs/multiples or mergers. But what is the relation of the active nucleus to the starburst (i.e. IR) activity?

**Keywords.** Galaxies: IRAS – Galaxies: multiple – Galaxies: evolution

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