REDSHIFT DISTRIBUTION & NATURE OF μ-JY RADIO SOURCES

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Abstract. During the preliminary deep imaging phase of our large spectroscopic survey of faint field galaxies (CFRS), one of our fields (10 arcmin $\times$ 10 arcmin) was chosen to coincide with the Fomalont et al (1991, A.J. 102,1258, hereafter FWKK) radio source field, including 36 S$\sim$ 16μJy radio sources of their complete sample. All sources but two have been identified to V $<$ 25 and/or $I_{AB} \leq$24, and/or $K_{AB} \leq$21.
The microJy population is mainly constituted of three distinct populations of galaxies with different redshift regimes: early-type galaxies at $z > 0.75$ with a low powered AGN in their cores, post-starburst galaxies at intermediate redshifts ($z = 0.375$ to $z = 0.8$ or slightly > 1), and emission-line galaxies at $z < 0.45$ containing AGNs. The fraction of μJy sources with $z > 1$ could be as high as 30%. Most of the μJy radio sources ($> 50\%$) are likely associated to AGNs, conversely to what is found at mJy levels (mostly starburst galaxies, Benn et al, 1993, MNRAS, 263, 98). Only one galaxy in our sample has a classical starburst spectrum.

The strong decrease of the radio spectral index from sub-mJy to μJy counts appears to be due to a combination of three factors: (1) the emergence of an elliptical population at high redshifts with moderate radio emission (2) an increasing fraction of narrow emission-line AGNs (Seyfert 2 and LINER); (3) a higher contribution of the thermal radiation to the radio emission from spirals, and the almost complete disappearance of starburst galaxies. Details of the results summarized here can be found in Hammer et al (1995, MNRAS, 276, 1085).

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1. Spectroscopy of the 25 $I_{AB} \leq 22.5$ radio counterparts.

Among objects enough bright for spectroscopy we find 5 early type galaxies (26%), 6 spirals (32%), 5 emission line galaxies (26%), 1 QSO and 1 M star while we failed to identify 3 objects.
The early type galaxies are rather luminous (L $\approx$ 2 L*), and have redshifts ranging from 0.7 to 1, the latter being the completeness limit for our spectroscopy. Their spectra show a red continuum with a significant 4000Å break and very faint or no [OII] emission. The spirals present disk-like morphologies, are rather luminous galaxies (L$\sim$1.5$\pm$0.4L*) and lie at moderately high redshift ($0.37 < z < 0.81$). They all show moderate [OII] emission (average W =12Å at rest) and relatively strong Balmer continuum and absorption lines (equivalent width ranging from 3 to 5Å), indicating the presence of A and F stars and suggesting that strong star formation occurred in these objects $\sim$1 Gyr ago. We classify them as post-starbursting galaxies. The emission line galaxies have relatively moderate luminosities (L<L*), while the emission line ratio of all of them but one are typical of AGNs (from current diagnostic diagrams, see C. Rola, PhD Thesis, 1994).

2. The radio spectral index-colour diagram and the faintest counterparts.

All red ellipticals have inverted radio spectra (α = -0.4$\pm$0.3), all the post-starbursts have moderately steep spectra (α = 0.40$\pm$0.18), while the bluest emission-line galaxies have inverted spectra, with the notable exception of the most distant one (α = 0.7), which could be classified as a starburst. Inverted-spectrum radio emission from ellipticals has been observed in some nearby ellipticals (Wrobel and Heeschen, 1984, Ap. J., 335, 677). This may indicate the presence of a low-power AGN (Rees, 1984, ARA&A, 22, 471), although other alternatives are possible. The post-starburst spirals have radio slopes noticeably flatter than the mJy starburst galaxies, which might indicate an increasing contribution of thermal radiation from star formation (Condon, 1992, A&A Review, 30, 575). Inverted radio spectra are also exhibited by the four very blue galaxies at low and moderate redshift, supporting the hypothesis that AGNs are present in their cores too, producing both the radio emission and the emission lines.
There is considerable evidence that virtually all of the 11 remaining sources (fainter than I_{AB} =22.5) are likely to be at $z > 1$. Indeed all the ones for which we have K photometry have color much redder than any object in the CFRS sample (I-K > 3.2) and are likely early type galaxies at $z > 1$.