J/A+A/621/A19 ATESP 5 GHz radio survey. IV. (Ricci+, 2019)

The ATESP 5 GHz radio survey.
IV. 19, 38, and 94 GHz observations and radio spectral energy distributions.

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=2019A&A...621A..19R (SIMBAD/NED BibCode)

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Abstract:
It is now established that the faint radio population is a mixture of star-forming galaxies and faint active galactic nuclei (AGNs), with the former dominating below $S_{1.4GHz}$~100uJy and the latter at larger flux densities. The faint radio AGN component can itself be separated into two main classes, mainly based on the host-galaxy properties: sources associated with red/early-type galaxies (like radio galaxies) are the dominant class down to ~100uJy; quasar/Seyfert-like sources contribute an additional 10-20%. One of the major open questions regarding faint radio AGNs is the physical process responsible for their radio emission. This work aims at investigating this issue, with particular respect to the AGN component associated with red/early-type galaxies. Such AGNs show, on average, flatter radio spectra than radio galaxies and are mostly compact (≲30kpc in size). Various scenarios have been proposed to explain their radio emission. For instance they could be core/core-jet dominated radio galaxies, low-power BL LACs, or advection dominated accretion flow (ADAF) systems.

We used the Australia Telescope Compact Array (ATCA) to extend a previous follow-up multi-frequency campaign to 38 and 94GHz. This campaign focuses on a sample of 28 faint radio sources associated with early-type galaxies extracted from the ATESP 5GHz survey. Such data, together with those already at hand, are used to perform radio spectral and variability analyses. Both analyses can help us to disentangle between core- and jet-dominated sources, as well as to verify the presence of ADAF/ADAF+jet systems. Additional high-resolution observations at 38GHz were carried out to characterise the radio morphology of these sources on kiloparsec scales.

Most of the sources (25/28) were detected at 38GHz, while only one (ATESP5J224547-400324) of the twelve sources observed at 94 GHz was detected. From the analysis of the radio spectra we confirmed our previous findings that pure ADAF models can be ruled out. Only eight out of the 28 sources were detected in the 38-GHz high-resolution (0.6 arcsec) radio images and of those eight only one showed a tentative core-jet structure. Putting together spectral, variability, luminosity, and linear size information we conclude that different kinds of sources compose our AGN sample: (a) luminous and large (≳100kpc) classical radio galaxies (~18% of the sample); (b) compact (confined within their host galaxies), low-luminosity, power-law (jet-dominated) sources (~46% of the sample); and (c) compact, flat (or peaked) spectrum, presumably core-dominated, radio sources (~36% of the sample). Variability is indeed preferentially associated with the latter.

Description:
(ATESP) survey for a complete sub-sample of Optical/IR Multi-band selected early-type radio galaxies are displayed in the ASCII table. The original survey data at 1.4 and 5GHz were published in Prandoni et al. (2000A&AS..146...41P, Cat. VIII/63) and Prandoni et al. (2006, Cat. J/A+A/457/517). A higher frequency follow-up at 5, 8 and 19 GHz was presented in Prandoni et al. (2010A&A...510A..42P). The flux densities of the 28 souces making up the early-type complete sub-sample observed in Sep 2011 and July 2012 follow-up campaigns with the Australia Telescope Compact Array (ATCA) at the radio frequencies of 19, 38 and 94 GHz are presented in the ASCII table. 2011 38-GHz flux densities are showed both at high- (HR: 0.6 arcsec) and low- (LR: 10-15 arcsec) angular resolutions.

File Summary:

FileName	Lrecl	Records	Explanations
ReadMe	80	.	This file
tablea1.dat	126	28	ATESP follow-up table

See also:
VIII/63 : ATESP radio survey. II. (Prandoni+, 2000)
J/A+A/457/517 : ATESP 5 GHz radio survey. I. (Prandoni+, 2006)

Byte-by-byte Description of file: tablea1.dat

Bytes	Format	Units	Label	Explanations

```
  1-  5  A5    ---     Seq       Source designation (srcNN)
  7- 20  A14   ---     ATESP     Source name (JHHMMSS+DDMMSS)
     22  A1    ---     l_S14     [=<] 1.4-GHz flux density upper limit flag (1)
 23- 27  F5.2  mJy     S14       ? 1.4-GHz flux density in ATESP survey
 29- 32  F4.2  mJy     e_S14     ? 1.4-GHz flux density error
     34  A1    ---     l_S5      [=<] 5-GHz flux density upper limit flag (1)
 35- 39  F5.2  mJy     S5        5-GHz flux density in ATESP survey
 41- 44  F4.2  mJy     e_S5      5-GHz flux density error
     46  A1    ---    l_S19-11   [=<] 19-GHz flux density upper limit flag (1)
 47- 52  F6.3  mJy     S19-11    ? 19-GHz flux density in 2011 ATCA follow-up
 54- 58  F5.3  mJy    e_S19-11   ? 19-GHz flux density error
     60  A1    ---     l_S38LR   [=<] 38-GHz LR flux density flag (1)
 61- 66  F6.3  mJy     S38LR     ? 38-GHz LR flux density in 2011 ATCA follow-up
 68- 72  F5.3  mJy     e_S38LR   ? 38-GHz LR flux density flag (1)
     74  A1    ---     l_S38HR   [=<] 38-GHz HR flux density marker
 75- 79  F5.3  mJy     S38HR     ? 38-GHz HR flux density in 2011 ATCA follow-up
 81- 86  F6.3  mJy     e_S38HR   ? 38-GHz HR flux density flag (1)
     88  A1    ---     l_S94     [=<] 94-GHz flux density marker
 89- 94  F6.3  mJy     S94       ? 94-GHz flux density in 2011 ATCA follow-up
 96-100  F5.3  mJy     e_S94     ? 94-GHz flux density flag (1)
    102  A1    ---    l_S19-12   [=<] 19-GHz flux density marker
103-107  F5.3  mJy     S19-12    ? 19-GHz flux density in 2012 ATCA follow-up
109-113  F5.3  mJy    e_S19-12   ? 19-GHz flux density flag (1)
    115  A1    ---     l_S38     [=<] 38-GHz flux density marker
116-120  F5.3  mJy     S38       ? 38-GHz flux density in 2012 ATCA follow-up
122-126  F5.3  mJy     e_S38     ? 38-GHz flux density flag (1)
```

Note (1): "<" stands for 3-sigma upper limit; "=" stands for detection.

Acknowledgements:
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References:

Prandoni et al., Paper I 2006A&A...457..517P, Cat. J/A+A/457/517
Mignano et al., Paper II 2008A&A...477..459M
Prandoni et al., Paper III 2010A&A...510A..42P

(End) Roberto Ricci [INAF-IRA, Italy], Patricia Vannier [CDS] 18-Dec-2018