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# Multifrequency study of GHz-peaked spectrum sources and candidates with the RATAN-600 radio telescope

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## Abstract

**Context.** Gigahertz peaked spectrum (GPS) radio sources are a class of extragalactic radio sources characterized by a spectral peak in the gigahertz domain. They are a mixed class of quasars and galaxies. A large proportion of the sources studied in the literature have only few data points in the radio domain, and the determination of variability and shape of the simultaneous spectra is inadequate. Sources currently included in the GPS source lists are very heterogeneous. **Aims.** We present the observational results from 12 observing campaigns (carried out between 2006 and 2010) at the RATAN-600 radio telescope to obtain the simultaneous radio spectra, which is valuable and necessary to derive genuine GPS sources from flatspectrum radio sources caught in a flaring state when their spectra are temporarily inverted. The sample contains both quasar- and galaxy-type GPS (122 sources) identified in the literature. **Methods.** The observations were carried out at six frequencies (1.1, 2.3, 4.8, 7.7, 11.2 and 21.7 GHz). The flux densities were measured at several epochs. A six-frequency broadband radio spectrum was obtained by observing simultaneously with an accuracy of up to a minute at 1.4, 2.7, 3.9, 6.25, 13, and 30 cm. **Results.** The original GPS source samples were highly contaminated. Finally, we selected 29% GPS source candidates within the sample. We found some difference in spectral properties between GPS galaxies and quasars within the sample. The GPS galaxies demonstrate a steeper spectral index in the optically thin part of the spectra. There are only relatively few (17) sources whose radio spectra strictly agree with the spectra of homogeneous self-absorbed synchrotron sources. The narrowest radio spectra are found in both ultra-high- $z$  ( $z \geq 1.8$ ) and low- $z$  ( $0.02 \leq z \leq 0.7$ , FWHM  $\sim 0.9$ ) convex spectrum radio sources. The majority of quasars within this sample should be considered as flat-spectrum radio sources with a temporarily inverted spectrum, and not as genuine GPS sources. The number of truly convex-spectrum sources remains low, and the lists of GPS sources should accordingly be revised. © 2012 ESO.

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## Keywords

Galaxies: active, Galaxies: general, Radio continuum: galaxies