OCRA-F

Mike Peel

OCRA Collaboration: University of Manchester, Torun Centre for Astrophysics & University of Bristol
Torun 32m
OCRA-p
OCRA-p

Image credit: S. Lowe
OCRA-p
Cross-scans
On-Offs
Long integrations
Preliminary Sunyaev–Zel’dovich observations of galaxy clusters with OCRA-p

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ABSTRACT
We present 30-GHz Sunyaev–Zel’dovich (SZ) observations of a sample of four galaxy clusters with a prototype of the One Centimetre Receiver Array (OCRA-p) which is mounted on the Torun 32-m telescope. The clusters (Cl0016+16, MS0451.6–0305, MS1054.4–0321 and Abell 2218) are popular SZ targets and serve as commissioning observations. All four are detected with clear significance (4–6σ) and values for the central temperature decrement are in good agreement with measurements reported in the literature. We believe that systematic effects are successfully suppressed by our observing strategy. The relatively short integration times required to obtain these results demonstrate the power of OCRA-p and its successors for future SZ studies.

Key words: galaxies: clusters: individual: Cl0016+16 – galaxies: clusters: individual: MS0451.6–0305 – galaxies: clusters: individual: MS1054.4–0321 – galaxies: clusters: individual: A2218 – cosmic microwave background – cosmology: observations.
30 GHz flux density measurements of the Caltech-Jodrell flat-spectrum sources with OCRA-p

(Research Note)

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ABSTRACT

Aims. To measure the 30-GHz flux densities of the 293 sources in the Caltech-Jodrell Bank flat-spectrum (CIF) sample. The measurements are part of an ongoing programme to measure the spectral energy distributions of flat spectrum radio sources and to correlate them with the millisecond structures from VLBI and other measured astrophysical properties.

Methods. The 30-GHz data were obtained with a twin-beam differencing radiometer system mounted on the Toruń 32-m telescope. The system has an angular resolution of 1.2".

Results. Together with radio spectral data obtained from the literature, the 30-GHz data have enabled us to identify 42 of the CIF sources as Giga-Hertz Peaked Spectrum (GPS) sources. Seventeen percent of the sources have rising spectra ($\alpha > 0$) between 5 and 30 GHz.

Key words. Astronomical data bases: miscellaneous – Radio continuum: galaxies

1. Introduction

The emission from most flat-spectrum radio sources, from radio frequencies through gamma-rays, is thought to arise in relativistic jets and beamed synchrotron self-Compton emission. Often described as blazar emission it is characterized by two peaks in the spectral energy distribution (SED), one synchrotron and one inverse Compton. From object to object the peak frequency can occur anywhere between $10^{10}$ Hz to $10^{15}$ Hz. There are claims that where the peaks occur depends systematically on redshift (Magdziarz and Zdziarski, 1995; Mezcua et al., 2003).

1. $S_{35 \text{GHz}} \geq 350 \text{ mJy}$
2. $a_{3.4 \text{GHz}} \geq -0.5$
3. $\delta(1950) \geq 35^\circ$
4. $|b| \geq 10^\circ$

In addition to the structural information obtained in the CJ VLBI surveys, extensive follow-up observations have been made with the VLBA (Britzen et al. in prep) to study the statistics of superradiant motions; redshift information is available for > 90%.
Science with OCRA-p
Preliminary Sunyaev–Zel’dovich observations of galaxy clusters with OCRA-p

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Aims. To measure the 30-GHz flux densities of Sunyaev–Zel’dovich sources at the millisecond level with OCRA-p. We aim to test if these sources are discrete or continuous and with what resolution.

Methods. The 30-GHz data were obtained with a focus on sources that are at least 100 mJy. The system has an angular resolution of 30″. Together with radio spectral index, the 30-GHz flux can be used to distinguish between discrete and continuous sources.


1. Introduction

The emission from most flat-spectrum sources at radio frequencies through gamma-rays, is produced by relativistic jets and beamed synchrotron radiation. Often described as blazar emission it peaks in the spectral energy distribution at one inverse Compton. From object that frequency can occur anywhere between 10^{15} and 10^{17} Hz, with claims that the peaks occur deep in the object itself (Rahman et al. 2006).

100 Element Array

Science with OCRA-p
OCRA-F
MMICs

Kettle et al. (2005, 2007)
Science with OCRA-F
100 beams

Image credit: S. Lowe
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