

flux emanating from that area at the frequency concerned and the flux density. This was done for the 5 components of the 1658MHz map. From the results the brightness temperatures of each of the components were estimated using the Rayleigh-Jeans approximation. Our answers are shown in table 1. The errors in the data are about 10%.

Table 1

	Flux Density / mJy Hz ⁻¹	Brightness Temperature / K
C1	3.39	58000
C2	3.71	103000
C3	3.75	189000
C4	3.94	1090000
C5	2.55	26000

Since the surface temperature of nearly all stars lies between 3000K and 25000K it is clear that the radiation from NGC4151's nucleus is not thermal radiation but something more powerful.

4. THE COMPONENTS' SPECTRA

The 5 components in the 1658MHz map are not so easily distinguishable in the 408.7MHz map. Estimates of the flux densities of C1 and C5 only were taken. Combining our data with the 15GHz and 1.7GHz data listed in [2] and 5GHz and 8GHz data in [3] log-log graphs of the frequency versus the flux density were plotted. Figure 4 shows the graph for C5. The gradients of the graph lines (spectral index) of all 5 components are shown in table 2.

Table 2

	Spectral Index
C1	-0.94 ± 0.30
C2	-0.88 ± 0.32
C3	-0.83 ± 0.39
C4	-0.45 ± 0.39
C5	-0.77 ± 0.21

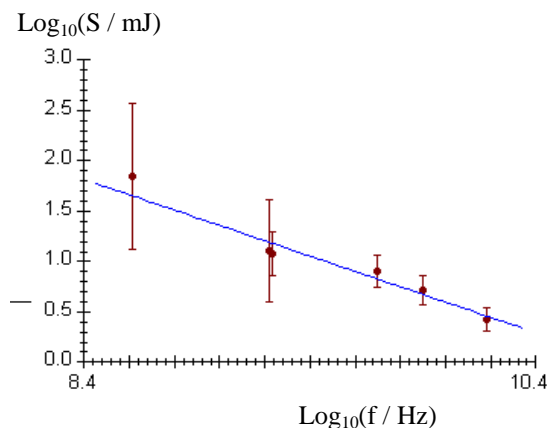


Figure 4. Spectrum of C5.

5. CONCLUSION

The values of the spectral indices indicate that the radiation is synchrotron. If it were black body radiation it would be -2. If it were free-free emission it would be between -0.1 and -0.2. C4's spectral index is about half that of the other's. Using the task "TVSLICE" a line plot through the centre of the main peak on the 408.7MHz map. Its peak lied close to where the centre of C3 was on the other map and was approximately a gaussian. C4 is barely visible at that frequency. Figure 5 shows the C4 graph with the flux density at 408.7MHz set to zero. The radiation from this component is synchrotron self-absorption. Only a very compact source can emit this kind of radiation. The electrons, which are gyrating in a very strong magnetic field and moving at relativistic speeds, are so close together that they absorb radiation of low frequency from their neighbours, [1]. 1.7GHz is probably quite close to the turnover point and 408 MHz is below. There must surely be a supergiant black hole within C4.

The other components are within the jets. With the data available it was not possible to deduce this but it seems reasonable to think that C1, C2 and C3 are part of the jet coming towards us as relativistic boosting would make that jet appear more luminous. C5 is part of the jet moving away from us (this is confirmed in [3]). The components we see are knots in the jets where the electrons are buffered by the interstellar medium. As the galaxy is positioned almost face-on to us it would appear that the jets are not pointing directly towards us or away from us.

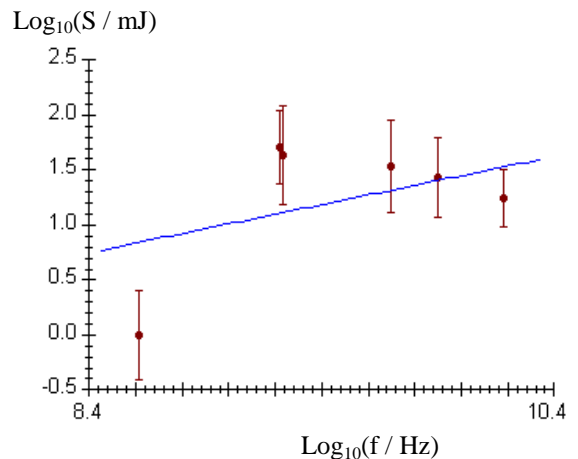


Figure 5. Spectrum of C4

6. REFERENCES

- [1] Malcolm S. Longair "High Energy Astrophysics, volume 2" (1993)
- [2] P. Carral et al. "15GHz compact Structure In Galactic Nuclei" (Astrophysical Journal, **362** pp 434 - 442, 1990)
- [3] A. Pedlar et al. "The Radio Nucleus of NGC4151" pp 470 - 480).