SUBMILLIMETRE SPECTRAL INDICES OF RADIO-QUIET QUASARS

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Hughes *etal.* (1993) have made submillimetre continuum observations of 10 IRAS selected radio-quiet quasars (RQQs). Three RQQs, I Zw 1, Mrk1014 and Mrk376, have been detected at 800 and 450μm using the ^{3}He bolometer UKT14 on t he 15-m James Clerk Maxwell telescope. These submillimetre data, together with existing 1.3 mm observations (Chini *etal.* 1989) demonstrate that the measured submillimetre spectral indices, $\langle \alpha_{sm} \rangle = 3.8 \pm 0.5$, significantly exceed the critical theoretical limit of $\alpha_{sm} = 2.5$ predicted for the self-absorption of synchrotron emission. This result is independent of any contributions to the 100μm IRAS fluxes from *cirrus* emission in the host galaxies, extended circumnucl ear starformation and FIR emission from companion or confusing sources. All current non-thermal models (de Kool & Begelman 1989, Schlickeiser *etal.* 1991) are rejected in favour of the alternative explanation that the FIR luminosity is dominated by thermal emission from warm (45–60 K) dust grains. The submillimetre optical depth and source-size for the thermal emission cannot yet be constrained by these data and, as a result, no discrimination can be made between dust heated by an extended (> 1 kpc) starburst region or a central compact luminosity source. However ground-based imaging observations at mid-IR wavelengths and FIR photometry (60 – 200μm) with the KAO are currently in progress specifically to address this problem. The high gas masses ($> 10^{10} M_\odot$) in RQQs inferred from the submillimetre continuum observations are in agreement with the H_2 masses determined from CO measurements. Alternatively the results show that the M_{H_2}/M_{dust} ratio measured in RQQs ($\sim 370 \pm 150$) is consistent with that measured in spiral galaxies and ultra-luminous IRAS galaxies.

References

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