

NEAR INFRARED SPECTROSCOPY AND THE SEARCH FOR CO EMISSION IN 3 EXTREMELY LUMINOUS IRAS SOURCES

AARON S. EVANS

Caltech, California, USA

D.B. SANDERS

Institute for Astronomy, Hawaii, USA

ROC M. CUTRI

IPAC-Caltech, California, USA

SIMON J.E. RADFORD

NRAO, Arizona, USA

PHIL M. SOLOMON

SUNY, New York, USA

DENNIS DOWNES

IRAM, Grenoble, FRANCE

AND

CARSTEN KRAMER

IRAM, Granada, SPAIN

Rest-frame 0.48–1.1 μm emission line strengths and molecular gas mass (H_2) upper limits for three luminous infrared sources – the hyperluminous infrared galaxies (HyLIGs: $L_{\text{ir}} \geq 10^{13} L_{\odot}$ where $L_{\text{ir}} \sim L(8 - 1000 \mu\text{m})$) IRAS F09105+4108 ($z = 0.4417$), IRAS F15307+3252 ($z = 0.926$), and the optically-selected QSO PG 1634+706 ($z = 1.338$) – are presented. Diagnostic emission-line ratios ($[\text{O III}] \lambda 5007/\text{H}\beta$, $[\text{S II}] \lambda 6724/\text{H}\alpha$, $[\text{N II}] \lambda 6583/\text{H}\alpha$, and $[\text{S III}] \lambda \lambda 9069+9532/\text{H}\alpha$) indicate a Seyfert 2-like spectrum for both infrared galaxies, consistent with previously published work. Upper limits on the molecular gas mass for all three sources are $M(\text{H}_2) < 1 - 3 \times 10^{10} h^{-2} M_{\odot}$ ($q_0 = 0.5$, $H_0 = 100h \text{ km s}^{-1} \text{ Mpc}^{-1}$), less than the H_2 mass of the most gas-rich infrared galaxies in the local Universe. All three sources have $L_{\text{ir}}/L'_{\text{CO}} \sim 1300 - 2000$, the most extreme values for extragalactic sources measured to date. Given the relatively warm far-infrared colors for all three objects, much of their infrared luminosity may emanate from a relatively small quantity of hot dust near an AGN.