**G29: fitting the full SED**

J.M. Kirk (jason.kirk@astro.cf.ac.uk, Cardiff, UK), E. Polehampton (RAL, UK; Lethbridge, Canada), L.D. Anderson, J.-P. Baluteau (Marseille, France), S. Bontemps (Bordeaux, France), C. Joblin (Toulouse, France), S.C. Jones, D.A. Naylor (Lethbridge, Canada), D. Ward-Thompson (Cardiff, UK), G. J. White (RAL & Open University, UK), and the “Evolution of Interstellar Dust” (SAG4) *Herschel* key programme consortium.

---

**Introduction**

An Ultra-Compact HII (UCHII) region is a small ionized nebula that surrounds a young massive-star that is still embedded within its natal cloud.

G29 96-0.02, hereafter G29, is a prototypical UCHII region (Wood & Churchwell 1989), located at a distance of 8.9 kpc (Sewilo et al 2004). Its driving source is an O5-6 star which has a luminosity of $3-4 \times 10^6 \, L_{\odot}$ (Watson & Hanson 1997, Martin-Hernandez et al 2003).

The UCHII region is embedded within the submillimetre clump G29.956-0.016SMM (Thompson et al 2006).

We have used the *Herschel* SPIRE FTS spectrograph (Griffin et al 2010, Swinyard et al 2010) to observe the clump containing G29.

The FTS has two spectral bands:

- **SSW** 194-313 $\mu$m, Beam FWHM ~19 arcsec
- **SLW** 303-671 $\mu$m, Beam FWHM ~35 arcsec

The spectrograph was used in its high-resolution mode. The spectral resolution, after apodization, was 2.17 GHz.

---

**Results**

The SPIRE FTS was used to simultaneously measure continuum and spectral line emission towards G29.

**Spectral Lines:** The continuum subtracted spectra are shown in Figure 1. The 13CO and CO spectral line ladders are clearly detected. Additionally the [CI] and [NII] species were detected. The 835 GHz line of CH$^+$ was seen in absorption in the FTS spectra and has been studied by Naylor et al (2010).

**Continuum:** Combining the FTS spectra with archival data shows that they match the long wavelength spectral slope of the existing data. The combined SED is shown in Figure 2.

A single component greybody fitted to the SED gives a characteristic temperature of 80 K. The long wavelength slope is consistent with a spectral index of $\beta=1.73$.

The bolometric luminosity of the SED was $4 \times 10^6 \, L_{\odot}$ - comparable to that of the O-star driving the UCHII region.

The estimated mass of of the clump was ~1500 $M_{\odot}$ - comparable to that of Infrared Dark Clouds (Rathborne et al 2006).

**Extended Emission:** Comparison of a sparse sampled map of [NII] emission with archive data shows several, possibly overlapping, features.

---

**References**


Naylor et al, 2010, in press


---

**Figure 1:** Continuum extracted spectra for the on-source bolometers. Fits to the SLW and SSW data are shown in red and blue respectively. The positions of well known lines are annotated.

**Figure 2:** Spectral Energy Distribution towards G29 constructed using data from the literature and archives over-plotted on the new SPIRE FTS spectrum.

**Figure 3:** A false-colour image of G29. The X marks the location of the UCHII region, the contours (850 $\mu$m archival SCUBA data) show the extent of the clump that it is embedded within.

- **Red MAGPIS 20 cm** - extended free-free emission.
- **Green Spitzer 8 $\mu$m** - small (PAH) dust grains in diffuse clouds and dense photo-dominated regions.
- **Blue Spitzer 4.5 $\mu$m** - stellar photospheres.

---

**Figure 4:** Sparse map of [NII] intensity towards G29. Circles show bolometer positions. Cross and contours as Figure 2.

The morphology of this region is complex showing several, possibly overlapping, features. The southern [NII] peak is coincident with a region of 20cm emission that is bounded to the north by a 8$\mu$m filament. This could be a neighbouring HII region that is separate from the UCHII.