We demonstrate a broadband terahertz gas spectroscopy through multimode self-mixing in a quantum cascade laser. The transmission spectra of methanol were simultaneously obtained within two distinct frequency ranges from 3.359 THz to 3.369 THz and from 3.426 THz to 3.433 THz. This approach has increased the total measurement bandwidth of self-mixing spectroscopy to 17GHz, by a factor of ~7, and underpins future work to develop the first broadband “detector-free” multi-gas QCL spectroscopy systems. Figure 1 shows schematic illustration of the configuration of the gas spectroscopy system. Figure 2 and figure 3 are the characterisation of emission spectra and the frequency tuning range of the QCL. Figures 4 and figure 5 shows the spectra of the methanol, obtained simultaneously from the two modes of the QCL. Figure 6 shows the absorption coefficients of the methanol at different pressure.