

In here we just look at some preliminary results from the 7200 with the use of a Nafion dryer. The goal is to see if to see the humidity effects on CO2 measurements, and how does the Nafion behave.

1) Humidifier system tests (no Nafion used yet)

As seen on Figure 1, the effect of water wapor on the CO2 measurement is to reduce the concentration (dilution effect). The corresponding variance spectra are plotted on Figure 2. When comparing Figure 2 with previous tests, we notice that the attenuation in the high frequency domain is not present anymore (see Figure 3 for comparison). This attenuation after 1Hz was also visible in the Picarro spectra. Thus I suspect this was probably due to our sampling line assembly that we modified today. The humidity levels generated with the humifier in use are plotted in Figure 4.

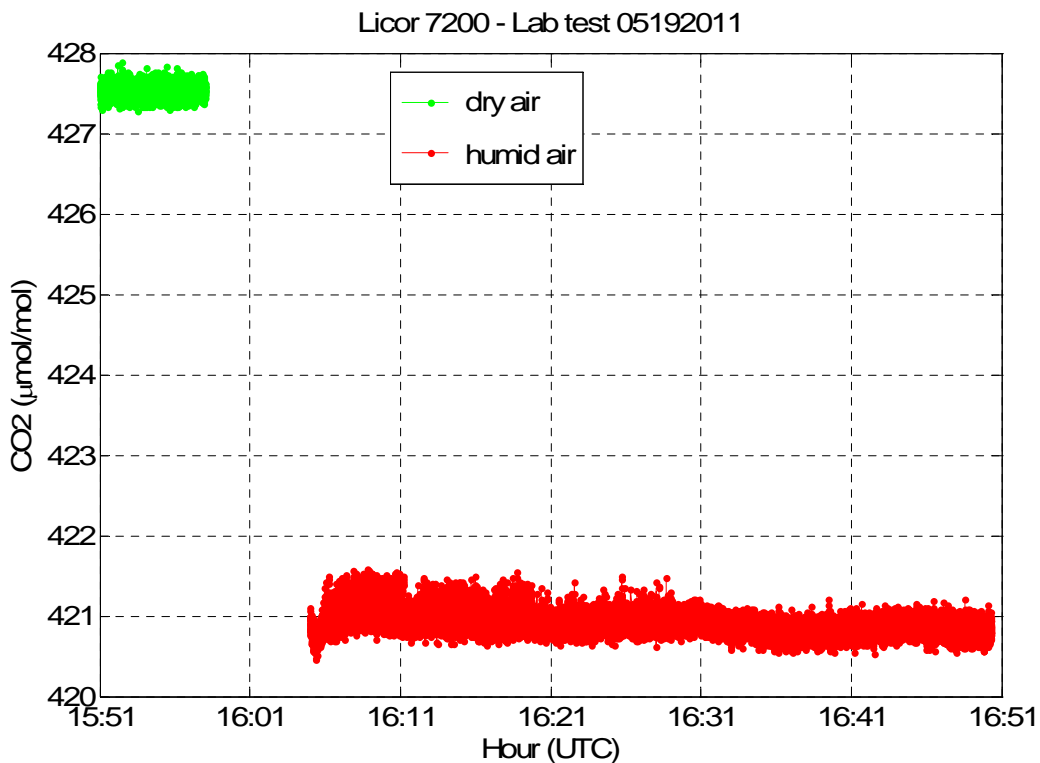


Figure 1: Time series of CO2 mole fraction Green is when only dry air is used, red when water vapor is added to the air flow.

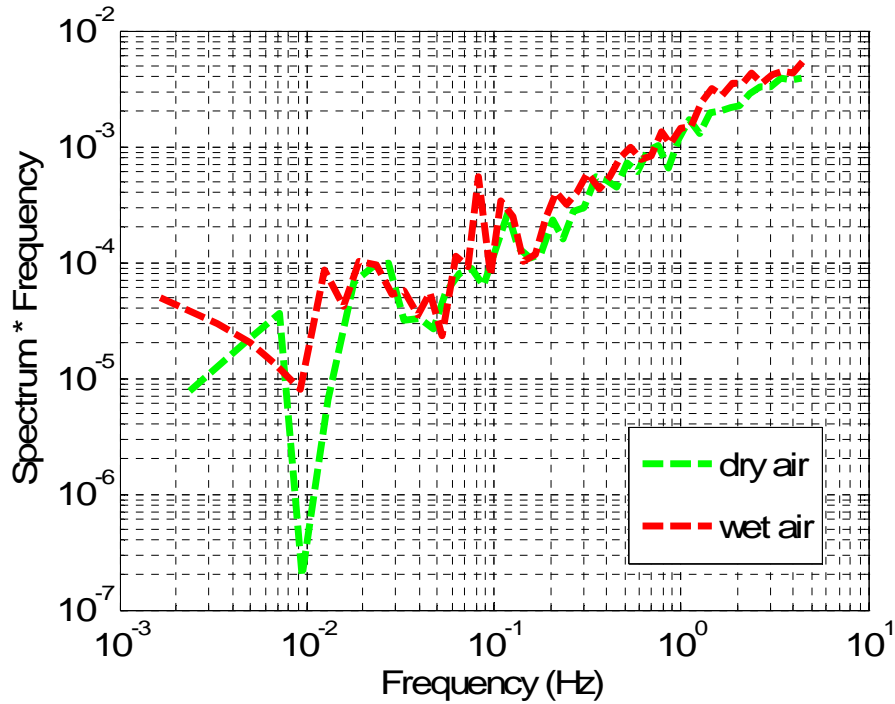


Figure 2. Normalized variance spectra of CO₂ mole fraction (umol/mol). Green is when only dry air is used, red when water vapor is added to the air flow.

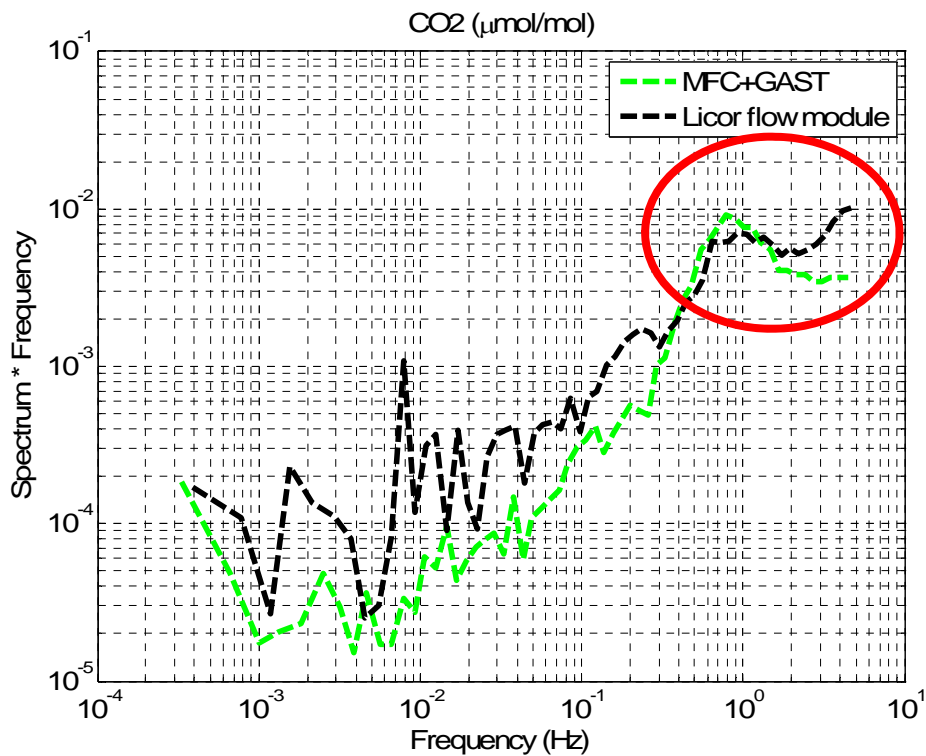


Figure 3. Normalized variance spectra of CO₂ mole fraction (umol/mol). Tests here were to compare original flow module versus alternative flow strategy.

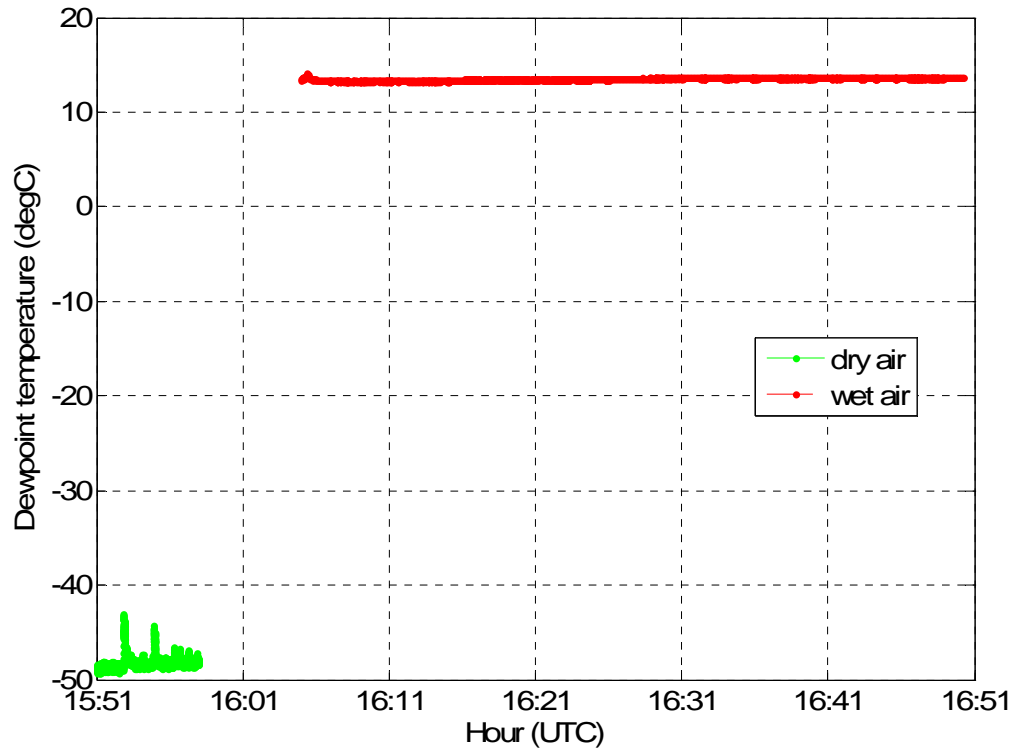


Figure 4. Time series of dew point temperature. Green is when only dry air is used, red when water vapor is added to the air flow.

2) Nafion dryer

The reduction in dewpoint temperature from the new Nafion was above expectation considering the air flow used. The reduction was about 50degC as seen on Figure 5. There were some weird variations in the generated humidity signal, but the Nafion nicely smoothed that out (Figure 6). The corresponding variance spectra are plotted on Figure 7. Another way to look at the frequency response is to plot the coherence spectrum (Figure 8).

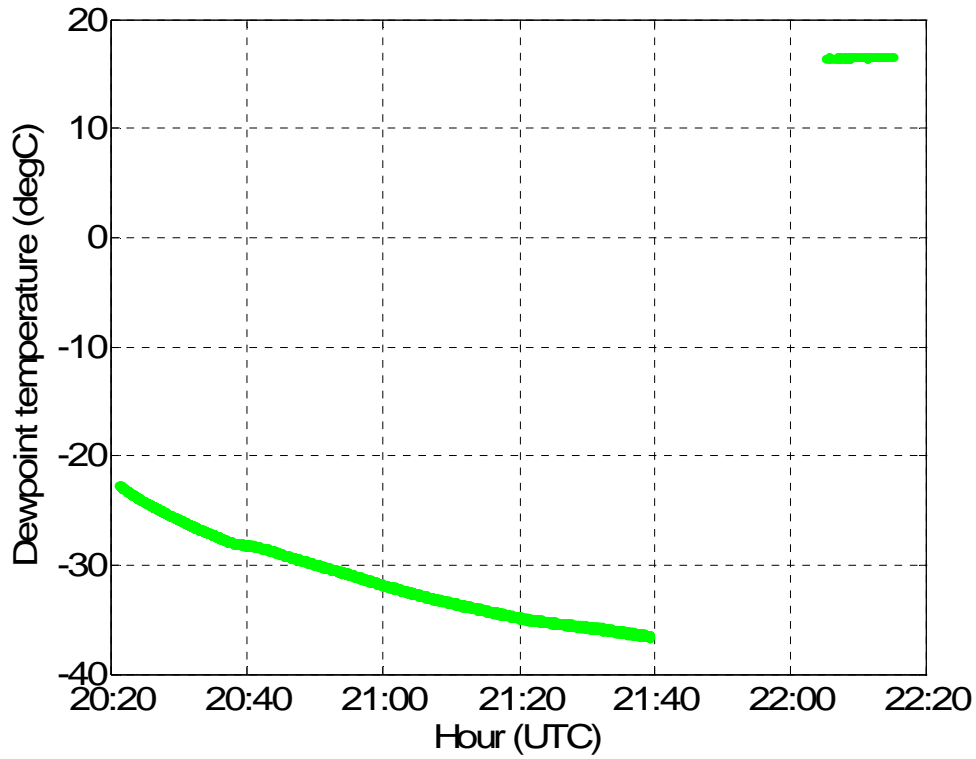


Figure 5. Time series of dew point temperature with use of the Nafion dryer.

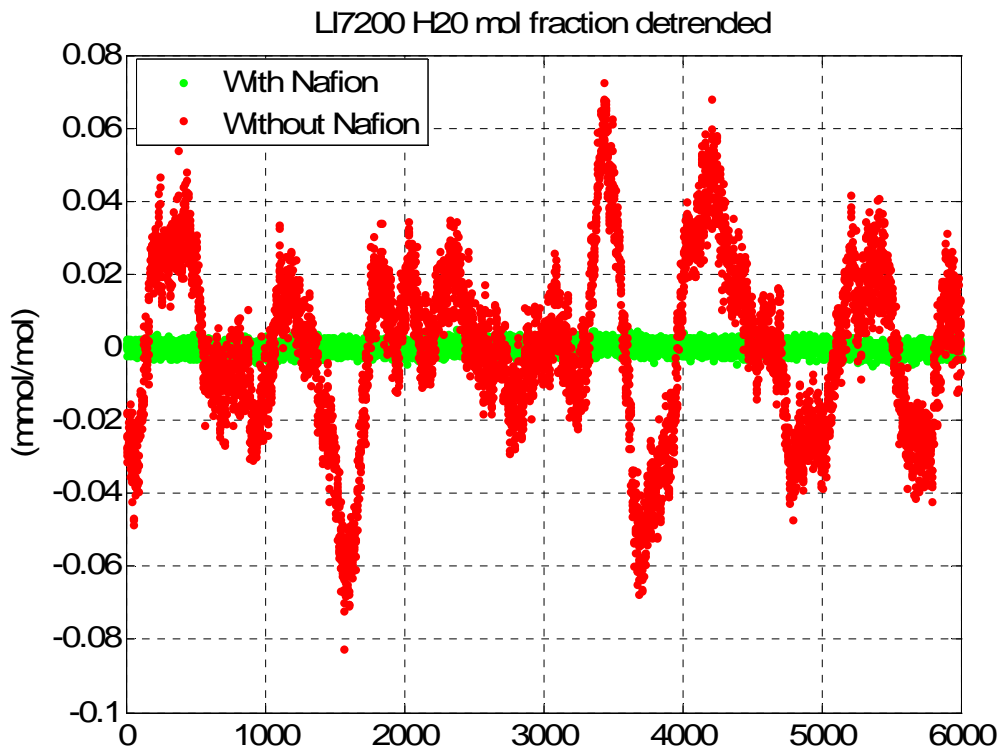


Figure 6. Time series of dew point temperature with and without Nafion dryer.

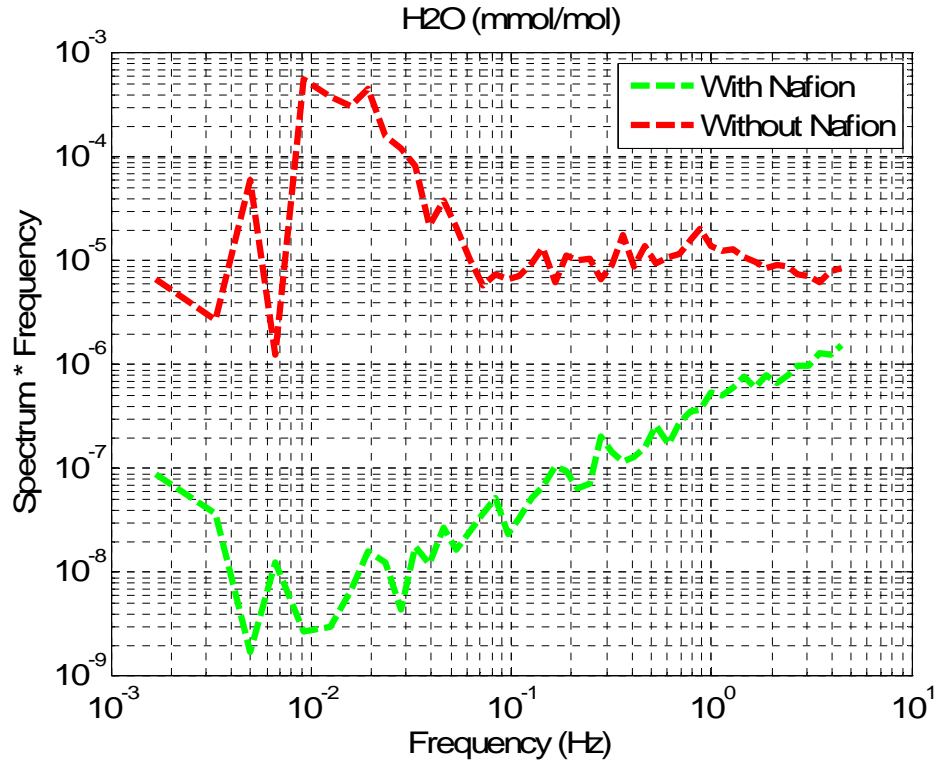


Figure 7. Normalized variance spectra of H2O mole fraction (mmol/mol) with and without Nafion.

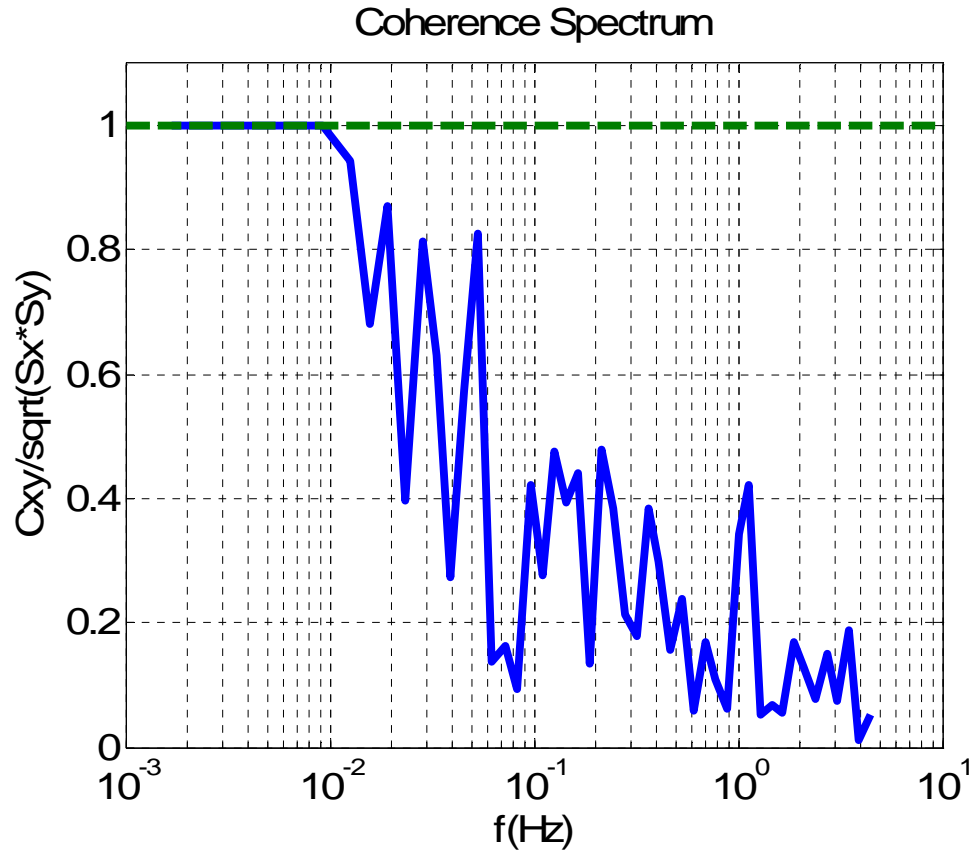


Figure 8. Ratio of the cospectrum between the water vapor signals with and without the Nafion dryer divided by the square root of the variance spectra product.