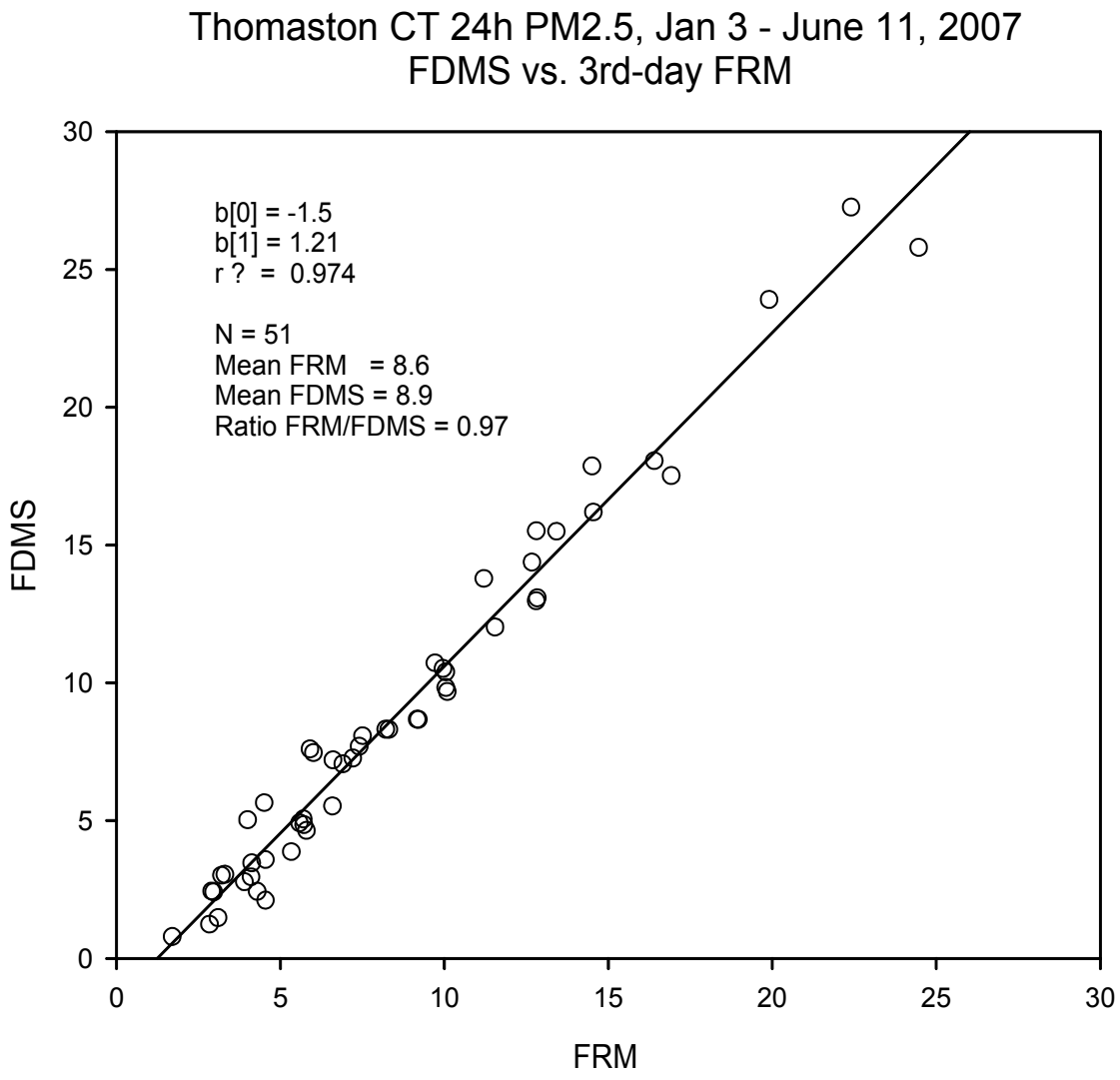
Supplementary Material: Calibration of DR-4 to FRM-like measurements.

There are several portable methods available for continuous measurement of ambient $PM_{2.5}$ based on nephelometery. It is widely recognized that the measurement accuracy of these methods can vary by a factor of up to 3 or more due to several factors. The response of the Thermo DR-4000 (dataRAM 4) was evaluated on ambient air. Monitoring was done in a small valley town in CT during the winter and spring of 2007. The DR-4 was run with its $PM_{2.5}$ inlet and with size correction off. While better data would be expected to be obtained with size correction on, Thermo recommends that it not be used. RH correction was on for these tests but instrument chamber RH was low enough that it was not a significant factor.

The test site for this work has moderate cold weather impact from local woodsmoke, substantial contribution from regionally transported aerosols, measurements to detect when woodsmoke is present in real-time, and both FRM and FDMS-TEOM $PM_{2.5}$ measurements. The DR-4 data were evaluated relative to the FDMS to evaluate the instrument's response relative to FRM-like data.

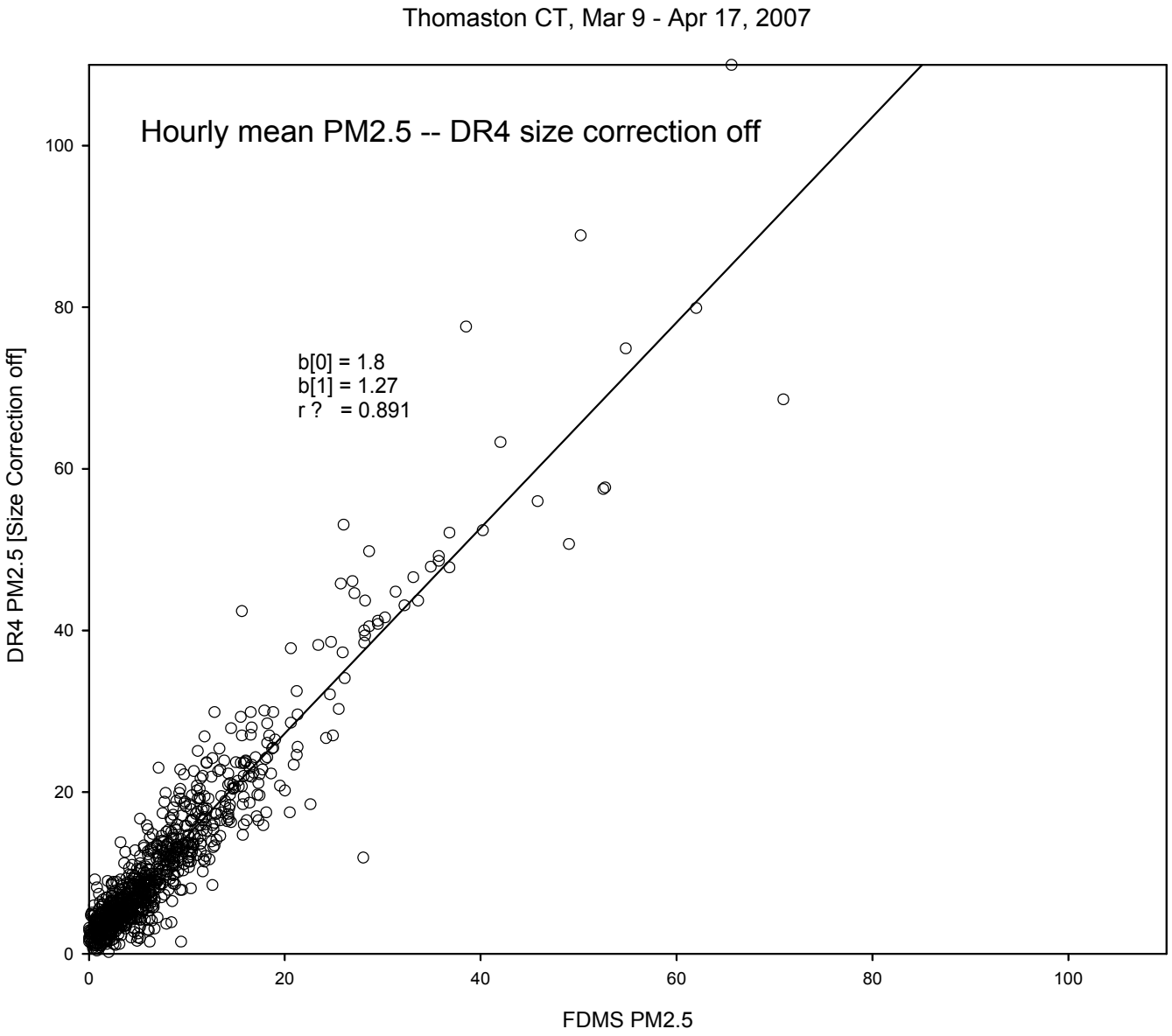
Test data were collected from 3/9/2007 to 4/17/2007, a period including both woodsmoke and regionally transported aerosols. To demonstrate that the FDMS $PM_{2.5}$ is "FRM-like", Figure 1 shows scatterplots of FDMS vs. FRM $PM_{2.5}$ for the first and second quarters of 2007 combined. The numerical agreement and correlation are very good, allowing the hourly FDMS data to be used to assess the DR4 performance in the context of "FRM-like" $PM_{2.5}$ data.

Figure 1.



To evaluate DR-4 performance at sub-daily time scales, the FDMS "FRM-like" data were used. Figure 2 shows the relationship between these two $PM_{2.5}$ methods. Relative to the woodsmoke concentrations of concern, there was a small offset; the regression slope was 1.27. The correlation was reasonable.

Figure 2. DR4 (size correction off).



The slope with the regression forced through the origin is 1.38; this was used to create a DR-4 correction factor of 0.7 (DR-4 * 0.7 = $PM_{2.5}$) for this study.