



## Supplement of

## **Collection efficiency of the soot-particle aerosol mass spectrometer (SP-AMS) for internally mixed particulate black carbon**

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Figure S1: Schematic of beam width probe orientation. Left: BWP orientation for particle beam width measurements, the BWP is situated perpendicular to the laser beam and is moved horizontally. Right: BWP orientation for effective laser beam width estimation, the BWP is moved vertically.



Figure S2:  $\text{RIE}_{\text{rBC,app}}$  (top) and  $\text{RIE}_{\text{Org,app}}$  (bottom) measured as a function of BES coating thickness, demonstrating an increase in sensitivity that reaches saturation at  $\text{R}_{\text{Org/RB}} \sim 3$ . Data are plotted against SP-AMS derived  $\text{R}_{\text{Org/RB}}$ because particle mass analyzer measurements were not available during this experiment. RIE<sub>Org,app</sub> values were obtained from SP-AMS data using measured  $d_{\text{va}}$  values and assuming that coated particles have a core-shell structure. Data from ARI SP-AMS (SN 215-039).



Figure S3: Top: The ratio of SP-AMS fraction of Regal Black ( $f_{RB}$ ) to the particle mass analyzer  $f_{RB}$  as a function of  $R_{Org/RB}$ . Data from ARI SP-AMS (SN 215-039 (blue) and 215-130 (red)) showing an approximately 40% underestimate in  $f_{RB}$  when CE effects are not accounted for. Bottom: The fraction of Regal Black in BES coated particles ( $f_{RB}$ ), obtained from particle mass measurements, plotted against the fraction of Regal Black obtained from SP-AMS mass loadings using uncorrected RIE<sub>rBC</sub> (0.2) and RIE<sub>Org</sub> (1.4).