Response to Reviewers
Manuscript Number: AMT-2012-280
Manuscript Title: Broadband measurements of aerosol extinction in the ultraviolet spectral region

The discussion below includes the complete text from the reviewer, along with our responses to the specific comments and the corresponding changes made to the revised manuscript. All of the line numbers refer to the original manuscript.

Response to Reviewer #2 Comments:

This paper presents methods for determining the refractive index of particles based on measurements of aerosol extinction using a cavity ring-down device and light sources spanning 360 to 420nm, (a rather small wavelength range). The main approach requires a method to generate monodisperse particles, which is done with a custom made DMA. The authors present the instrument as a laboratory device that has potential for field deployment. The method is tested on a number of aerosols from purely scattering to absorbing and the results agree with published particle refractive indices. The paper is well written and the authors have gone through careful consideration of many aspects of the method. Two reviews have already focused on issues with generating purely monodisperse particles, which is critical to the method, with how to handle multiple charging effects on the sizes of particles generated with a DMA.

Overall, this work is a significant contribution to an important aerosol problem; sensitive measurements of the complex refractive index of real un-altered ambient particles. The paper deserves to be published with very minor changes needed.

We thank the reviewer for the positive comments. Listed below are our responses to the two specific comments and the corresponding changes made to the revised manuscript.

My concerns with the method also deal with the method of generating monodisperse particles, especially if the instrument is used for ambient studies. I assume ambient aerosols would be dried so that the complex refractive index is not a function of particle water content. This raises the issue of non-spherical particle effects on sizing and optics, the authors discuss this briefly and suggest using a device that selects particles by density – more details would be helpful since this could be a critical issue.

The reviewer is correct that drying the aerosol or controlling the relative humidity will be important for field measurements. We have modified the text:

Pg. 138 lines 1-4: "This follows the approach of existing CRDS field instruments that operate at a single wavelength and report optical extinction *under dry conditions or at a controlled relative humidity* (Strawa et al., 2003; Moosmuller et al., 2005; Baynard et al., 2007; Langridge et al., 2011)."

We agree that particle non-sphericity will also be an important consideration for field measurements, and we have suggested one possible approach in the Summary and Conclusions section. Rather than speculating further, we prefer to address field measurements of broadband aerosol extinction in a future manuscript.

Secondly, the authors use a homemade DMA, I assume so that they can extend the size range to 800nm (long column). However, for ambient particles, extinction for particles larger than this size may be important and would not be considered by this method. How could the authors extend the method to larger sizes? Or maybe the authors feel measurements up to only 800 nm is sufficient? Is there any evidence for the latter?

The custom-built DMA was used to extend the size range to 800 nm and to quantify the multiply-charged particles at diameters greater than 800nm. This DMA is now available commercially and we have modified the text:

Pg. 120, lines 18-19: "Subsequently, particles were size-selected using a custom-built differential mobility analyzer (DMA*; now available from Brechtel Manufacturing Inc., Hayward, CA, USA*) (Knutson and Whitby, 1975)."

With a DMA sample flow rate of 0.2 vlpm (2.0 vlpm sheath flow), we were able to transmit particles with diameters up to 1850 nm, which was important to determine the fraction of doubly- and triply-charged particles. We have modified the text to indicate this:

Pg. 126, lines 21-22: "We measured the aerosol size distribution atomized for each solute concentration *from D_p = 80 – 1850 nm* using scanning electrical mobility spectroscopy…"

The custom-built DMA could be used to select diameters greater than 800 nm during ambient sampling, if there are sufficient particles concentrations at those sizes.