In response to "the comments by Murphy et al."

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In their comment, Murphy et al. criticize the fitting procedure we used in two previous papers [Srianand et al. 2004 (Paper I) and Chand et al. 2004 (Paper II)] and conclude that Paper I offers no stringent test to previous evidence for varying fine structure constant. We think this is a hasty conclusion as (a) our procedure is robust as shown in Paper II; (b) the data used by Murphy et al., in particular the error array, are different from ours and there are differences in the fitting procedure; (c) despite these differences, 70% of their individual measurements are consistent with that quoted in Paper II.

Point 1: In Paper II, we explain in details our procedure. In particular, we used $\Delta\alpha/\alpha$ as an external parameter (as in Webb et al. 1999) when Murphy et al. used it as an additional fitting parameter. This choice has been tested extensively using simulations. To reiterate this point, we have refitted the systems in our sample using VPFIT keeping $\Delta\alpha/\alpha$ as an external parameter (three examples are given in Fig. 1). Our new results (filled circles) match our original results (squares) and Murphy et al.'s (open squares) within 1σ. We point out that fluctuations in χ^2 curves get indeed smoothed after a large number of iterations but the results from the first and last iterations are found to be very similar. We find significant differences in only two cases (see below) compared to our earlier results.

Point 2: In the course of the analysis presented in Paper II, we realized that the treatment of errors is not trivial. Therefore we defined two errors for each pixel: one is the error calculated by the ESO-pipeline and one is calculated from the scatter of the different exposures (usually more than eight exposures). In principle the two errors should be of the same order but usually they are not because of the non-trivial observational procedure. This can be estimated by comparing the above errors with the scatter in the continuum. Murphy et al. used the data made available on the web with standard errors. This is illustrated in Fig. 2 where we show the SNR $(1/\sigma)$ used by Murphy et al. (dots) and by Srianand et al. (stars) versus the SNR as measured in the continuum around the absorption lines used in our analysis. It is apparent that errors used by Murphy et al. are underestimated. Ours are consistent in the low SNR regime and slightly over-estimated at high SNR. It must be remembered however that these measurements are done in the continuum and differences
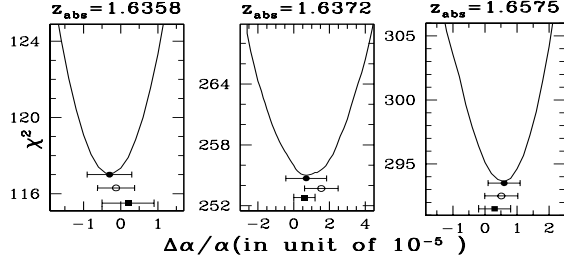
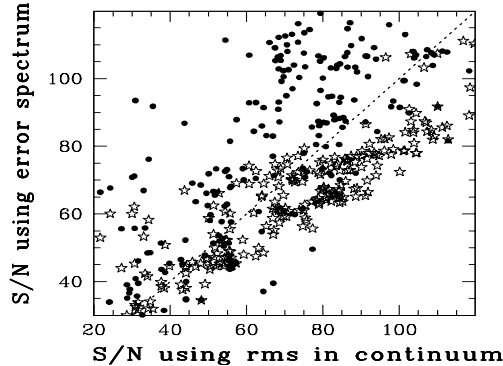FIG. 1: Examples from our reanalysis (see Point 1).

FIG. 2: SNR $(1/\sigma)$ used in Murphy et al. (dots) and our analysis (stars) given versus SNR in the continuum (Point 2).

are more crucial in the lines (where we cannot perform this experiment). In addition, our procedure takes into account the differences in spectral resolution in different settings (because of different observational settings and seeing conditions), while this is not the case with VPFIT.

Point 3: Despite these differences, it is clear from Fig. 3 (left panel) and Table 1 of Muphy et al. (2006) that their measurements match ours (Paper II) at $\leq 1\sigma$ level for 16 systems. The corresponding weighted mean is $\Delta\alpha/\alpha = (+0.06 \pm 0.18) \times 10^{-5}$. For the same systems Chand et al. find $\Delta\alpha/\alpha = (+0.03 \pm 0.09) \times 10^{-5}$. It is also easy to recognize that only two $> 4\sigma$ deviant systems (the $z = 1.5419$ system towards Q 0002−422 $[\Delta\alpha/\alpha = (-4.655 \pm 0.988) \times 10^{-5}]$ and the $z = 0.8593$ system towards Q 0122−380 $[\Delta\alpha/\alpha = (-4.803 \pm 0.941) \times 10^{-5}]$), dominate the final result by Murphy et al. By removing these two discrepant systems we get $\Delta\alpha/\alpha = (-0.19 \pm 0.16) \times 10^{-5}$ for 21 points. Our reanalysis using VPFIT (see point 1) keeping constant resolution across the spectrum and with identical initial guess parameters leads to $\Delta\alpha/\alpha = (0.01 \pm 0.15) \times 10^{-5}$ for 21 systems (excluding two systems that deviate at more than 3σ level) with very little scatter ($\chi^2_\nu \sim 1$) contrary to the

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claims by Murphy et al. Thus we believe, the results presented in Paper I and II are robust (although errors are probably larger) and are not due to the failure in our fitting procedure.

In any case, our result disagrees with earlier claims for a variation of α by more than 3σ. We are now awaiting the full independent analysis of UVES data by Murphy et al. and their results.

[1] Chand, H., et al. 2004, A&A, 417,853 (Paper II).

[2] Murphy, M. T., et al. 2006, astro-ph/0612407.

[3] Srianand, R., et al. 2004, PRL,92,121302 (Paper I).

[4] Webb et al. 1999, PRL., 82, 884.