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Interactive comment on "The Isotopx NGX and the ATONA Faraday Amplifiers" *by* Stephen E. Cox et al.

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General comments

This article describes the performance of a new patented type of capacitive transimpendence amplifier (CTIA) for noble gas mass spectrometry. Due to trade secrets the exact working of this amplifier is not described, only its performance is tested and compared to other commonly used amplifier technology. This seems to be a new step in amplifier development and although not fully disclosed, this is an development that likely will be implemented by several labs in the next 5 years or so. I therefore consider this paper worth publishing, because it is relevant for the community to judge the possible advantages and disadvantages of this new CTIA. The papers is well written and

clearly describes the experiments and tests that have been performed.

Specific comments and technical issues

Line 38 "as those are that are" → remove "are"

Line 63 "through small leaks". What do you consider small leaks?

Line 77-80: What about 37 beam. This is also a very small beam on e.g. young sanidine grains (can now possible be addressed with ATONA).

Line 96-97: Not fully clear, can you give examples of approaches you are thinking of (even tough not fully tested)?

Line 130-131: Can you provide used equations and calculations in appendix?

Line 142: modify to "approximately 8.5×10-13 moles of 40Ar per aliquot"

Line 146-149: Can you quantify? What signals did you expect based on your approximations and based on GLO? What is the 40Ar* content in your GLO standard? And I'll assume you mean APIS with the manometrically calibrated volume. Can you add an estimate of your system's sensitivity?

Line 152: Can you add for clarity 100% (8.5×10-13 moles 40Ar), 37.7 % (x moles 40Ar) etc

Line 211: "our lab standard" which is?

Line 213-214: "so a direct comparison of measured ratios is not possible" Comparison with what?

Line 224-225: "gain bias of the amplifiers is significantly more stable than both RTIAs and electron multipliers" This paper does not really provide data for comparison of gains for RTIAs and ATONA. Only gain data of ATONA are shown.

Figure 1: add the unit between brackets to the Y-axis title (e.g. cps). In caption it is mentioned that Faraday data are reported in Volts, in line 110-111 it is stated that you

convert back to beam current for easier comparison.

Figure 3 and text line 112-115: can you add your calculations / formulas used for RTIA noise to the appendix. Inset is really small and hard to read (especially when printed)

Figure 5: Is 40Ar/38Ar the t0 intensity of 40Ar air minus t0 intensity of 40Ar blank divided by the t0 intensity of 38Ar air minus t0 intensity of 38Ar blanks? How many blanks are run? In the legend there are only circle symbols, in the figure also squares. The way data are plotted suggests that Xact and ATONA measurements are bracketed. Can you first plot the Xact 100% data, followed by ATONA 100% data etc.?

Figure 6. Maybe a matter of reader preference, but I prefer to see the 10 different analyses of one beam size plotted combined instead of interspersed. Now I find it difficult to see that variation within 10 similar experiments. And we are looking at ratios of blank corrected time zero intensities of 40 and 36? Inset is again rather small.

Figure 7. The ARGUS RTIA data are from NMGRL? And are the measured with m/e36 on a Faraday with RTIA or multiplier? Colors of shaded lines are similar, not clear what they are showing.

Figure 8: in caption it is indicated that smaller aliquots are on the left, and larger on the right. Can you indicate different areas in the figure which are the 0.1cc, the 0.2cc aliquots etc. The NMGRL Argus measurements are with 40Ar on H2 with 10ˆ12 Ohm amplifier and 36 on L2 with 10ˆ13 Ohm amplifier? Do Argus data with 40Ar on H1 with 10ˆ12 or 10ˆ13 Ohm amplifier and 36Ar on L3 multiplier also exist? And if yes, how do they compare? Did NMGRL perform exactly the same experiment with 3 aliquots per pipette volume? And if not, what are the criteria to select these 3 data points?

Table 1: what is the $\pm$ in the header row? 1SD? What is the 1-σ at the bottom of the table: the standard deviation of the ten measurements? Can you also report the mean (or the weighted mean)?

Figure A1: I don't like the interspersed way of plotting. Also with all the colors that look

rather similar it is difficult to see what is what.

Figure A2: what is exactly plotted on the Y axis? Why not signal divided by average AX signal? Then the intercalibration factors mentioned in caption are immediately clear. And what is plotted on the X-axis? Why are there no data of aliquots 817, 820 etc. What is the beam size used for this intercalibration, is a baseline correction needed? And I'll assume data are regressed to time zero using a linear fit? What is the settling time, maybe worth mentioning, because a similar approach using RTIAs will take longer.

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