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Interactive comment on "A portable, robust, stable and tunable calibration source for gas-phase nitrous acid (HONO)" *by* Melodie Lao et al.

Anonymous Referee #3

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Lao et al. presented the design and detailed test results of a system capable of producing a wide range of concentrations of gas-phase HONO. The system is a modification to that by Febo et al (1995), based on displacement of nitrous acid from solid sodium nitrite by gaseous hydrochloric acid. The modifications include the uses of a custom-built HCl permeation source and a NaNO2-coated tube (or denuder) for the HONO displacement to take place. These modifications indeed make the system more compact in size and easier to transport. The tests are comprehensive, the results are well presented, and manuscript is well prepared. The manuscript can be helpful for laboratories in constructing a portable HONO generation system for calibrating field HONO instruments and for atmospheric HONO chemistry research in the laboratory. However, I find following major issues with the manuscript:

1. Compared to the original design by Febo (1995), the system described in this manuscript offers more compact in size and is capable of generating lower HONO source at concentrations (sub ppb vs 5 ppb). However, there are no improvements in stability and reproducibility (∼24% vs <0.4%), and purity (>90% vs 99.5%) of the HONO source generation. The NOx analyzer used to quantify HONO output has a lower detection limit of ∼0.4 ppb. The poor signal stability of the NOx analyzer near its detection limit may in part be responsible for the not-so-great performance of the system.

2. The HONO gas stream generated by this system must be calibrated by a primary instrument before it could be used as a HONO calibration source. Therefore, the system itself is not a tunable calibration source for HONO as the authors claimed in the title. A better HONO measurement will be needed to calibration the HONO source at low concentrations; the NOx analyzer described in the manuscript is not adequate for this purpose.

3. A commercial HONO source is available, based on the reaction of NaNO2 with diluted H2SO4 solution in a stripping coil (Taira and Kanda, 1990; Kleffmannet al., 2004) (https://quma-shop.de/images/LOPAP%2003%20HONO%20Source%20short_v2.pdf). A unit was used during the FIONA intercomparison in 2010 in Valencia, Spain, to generate a HONO source being distributed to and shared by the collaborating groups. Based on my own experience from this intercomparison, the system appeared to perform significantly better than the system described in the manuscript. Specifically, it offered high precision and stability (∼ 1% at low-ppb concentrations) and is truly tunable (stabilized within minutes after switching to a different concentration). Of course, the commercial unit could be much pricier than the home-build system described in this manuscript.

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