

Supplementary material for “Simple Template-Based Method to Produce Bradbury-Nielsen Gates”

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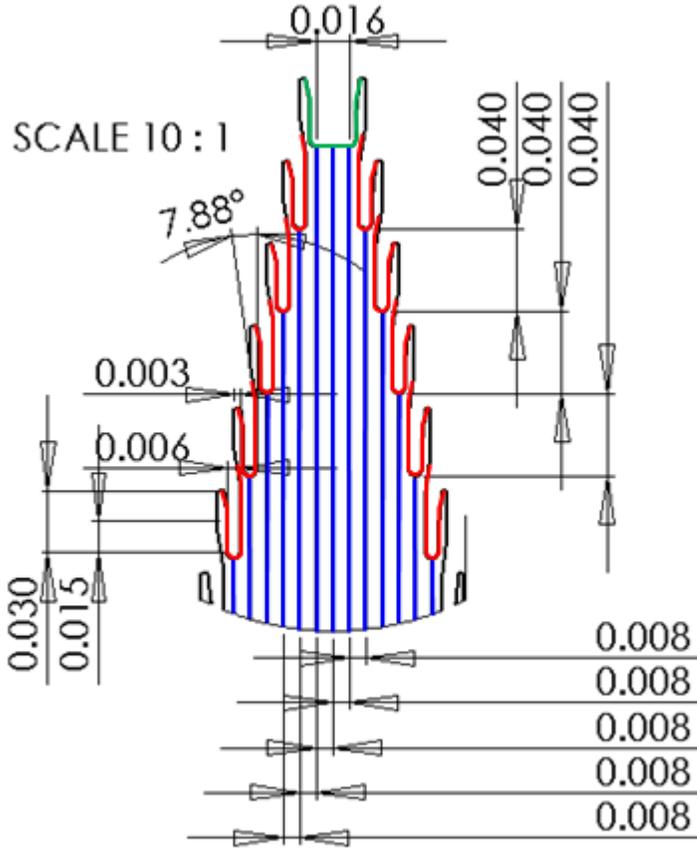


Figure S1. Mechanical drawing of alignment features on a template. The alignment features (red and green) are aligned with the troughs of V-grooves (blue). The alignment features are spaced by $200\ \mu\text{m}$ ($0.008''$) horizontally and by $1\ \text{mm}$ ($0.040''$) vertically. Minimum width of the features achieved by wire EDM at a reasonable cost is $150\ \mu\text{m}$ ($0.006''$). To maintain $200\ \mu\text{m}$ spacing, the alignment features have to be slightly bent at the entrance so that the alignment features are not too weak. The alignment feature at the top (green) is wider and is aligned with three V-grooves.

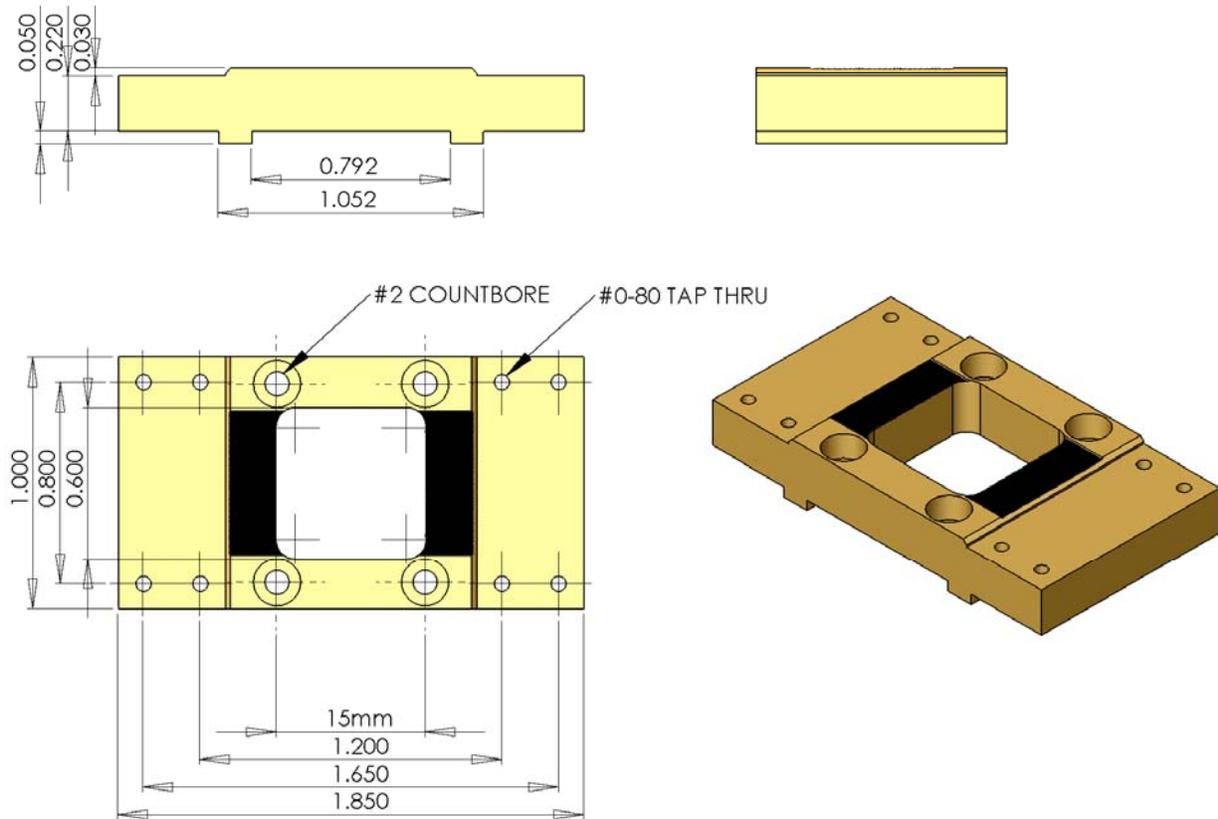


Figure S2. Mechanical drawing of a plastic mount. Ultem 1000 and Delrin have been used as the material for the plastic mount. There are V-grooves on the top surface that run across the central aperture. The wires on the templates are transferred to the V-grooves on the plastic mount. Thin metal strips and insulator are fixed to the plastic mount using #0-80 screws. #2-56 screws are used for mounting a finished BNG in the vacuum chamber.

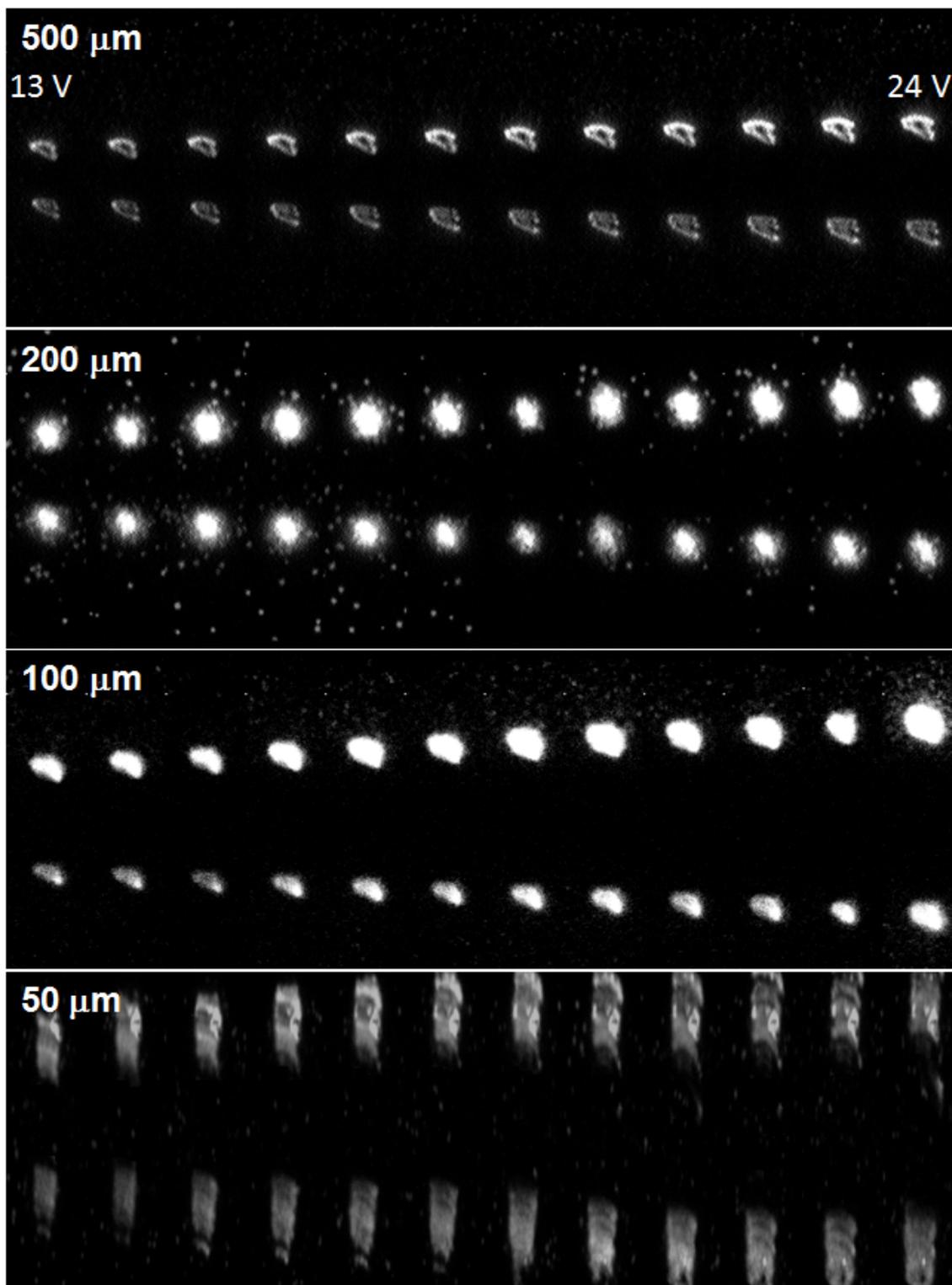


Figure S3. Static ion beam deflection images as a function of deflection voltage (13 – 24V) for BNGs with wire spacings of 500, 200, 100, and 50 μm . At deflection voltages above 19 V for the 50 μm wire spacing, the ion beam is clipped off the MCP.

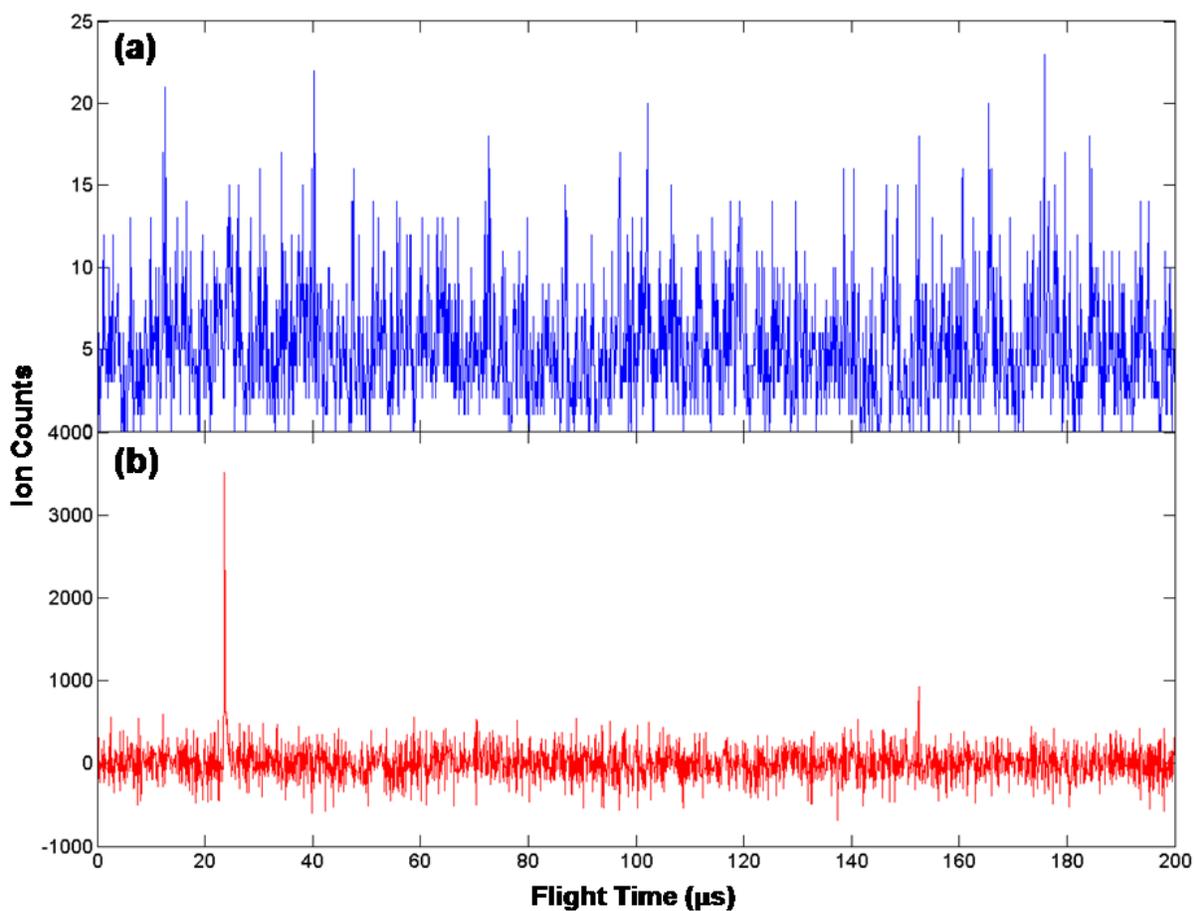


Figure S4. Hadamard transform time-of-flight (HT-TOF) mass spectrum of tetrabutylammonium ions taken using a 100 μm BNG produced using the method described in this publication. The HT-TOF technique has been explained in detail previously [1, 15]. The voltage applied to the BNG was modulated at 10 MHz using a sequence length of 2047: (a) raw data before deconvolution; and (b) mass spectrum after deconvolution.

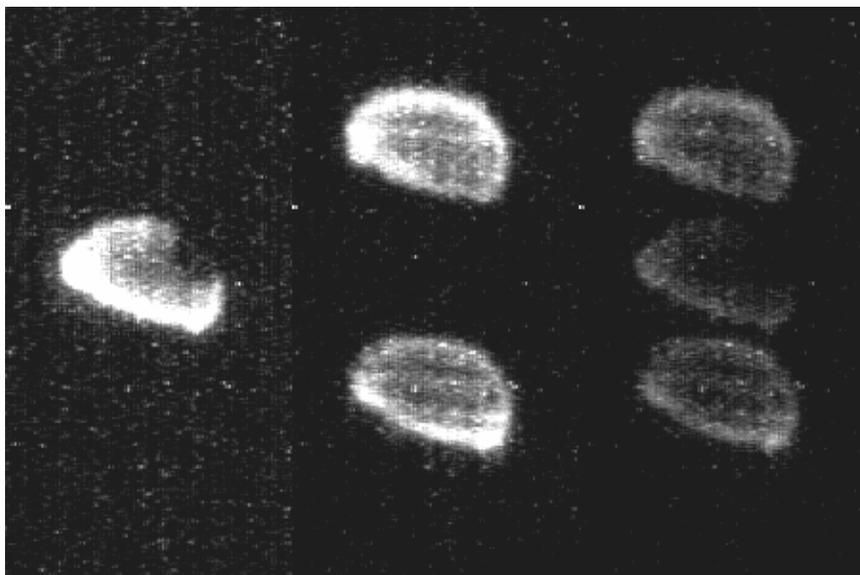


Figure S5. Ion beam images during modulation using 500 μm wire spacing BNG. Static equal voltage on the BNG wires (left), static ± 16 V (center), and modulated at 100 kHz (right).

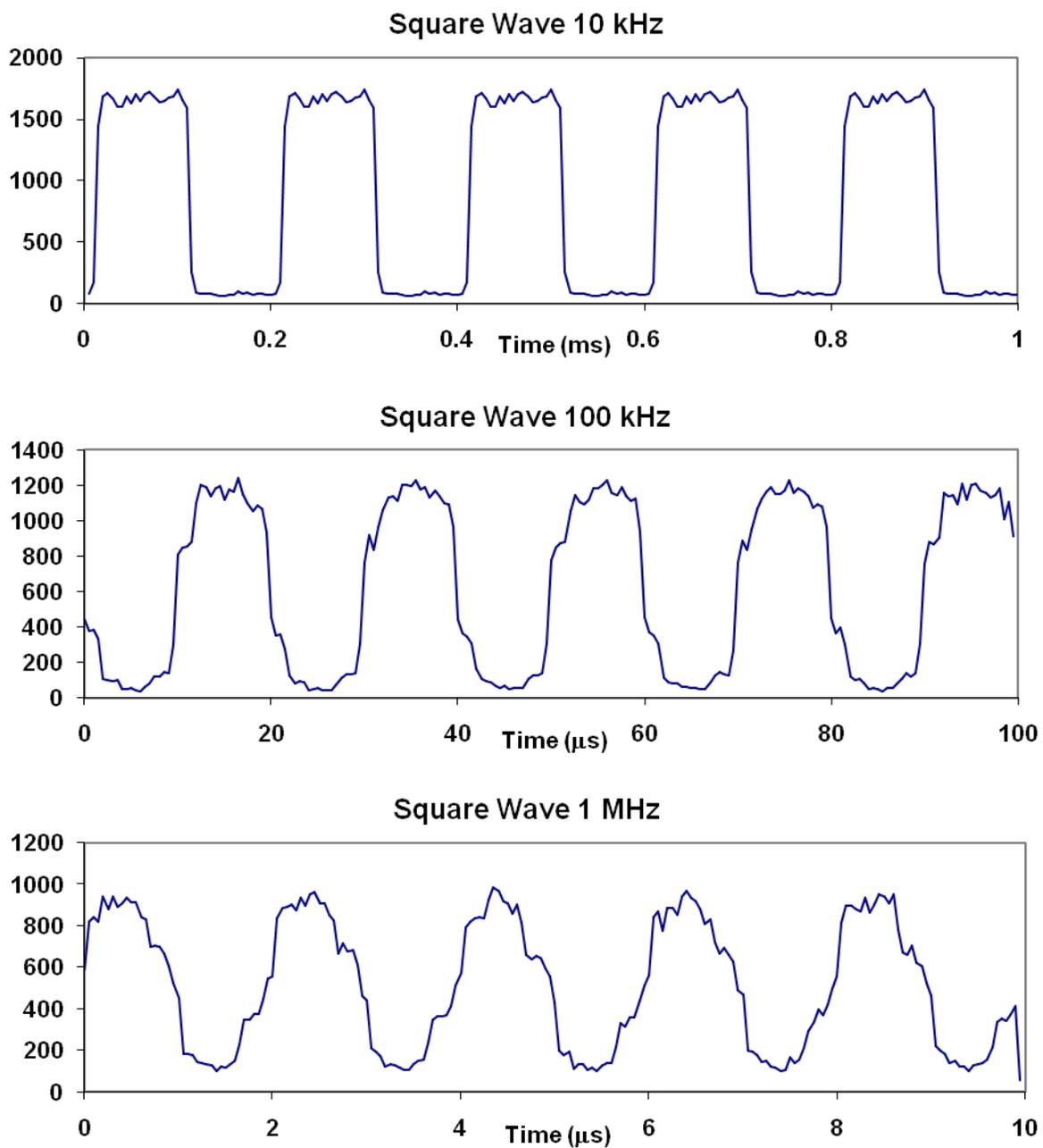


Figure S6. Ion counts during modulation. Ion counts are measured over a 1 cm MCP detector (unmasked portion of MCP) when a 100 μm wire spacing BNG is turned on and off with square waves at 10 kHz, 100 kHz, and 1 MHz.