Niobium structures releasing SOP

As a summary of our Winter Quarter research we worked out a method for releasing niobium structures with high yield. We provide a runsheet of this process in Table 9 and present a standard operating procedure for this microfabrication process:

1. Prepare the samples for release
   - 1.1. Microfabrication with 2 or 3 mask processes with patterned sacrificial layer and niobium can be done following our runsheets.
   - 1.2. Anneal the sample at 300°C for 30 minutes in the atmosphere, 3°C/min ramp down and up. Keep the chip in an aluminum box during the process
   - 1.3. Mount the chip on a teflon holder, 1 teflon screw can hold 5x10mm^2 chip
2. Release samples
   - 2.1. Enable wbflexcorr
   - 2.2. Prepare the chemicals:
     - 2.2.1. Put the full PPE on
     - 2.2.2. Transfer a bottle of hydrofluoric acid using a cart
     - 2.2.3. Check the bench for any spills and blow them away
     - 2.2.4. 4 beakers of fresh DI water
     - 2.2.5. 1 beaker with 10:1 HF solution, recommend 100 ml of water and 10 ml of hydrofluoric acid. Add acid to water
   - 2.3. Releasing
     - 2.3.1. When transferring the chip between beakers be very gentle to avoid damaging released structures with turbulent flow
     - 2.3.2. Immerse the holder with a chip in the HF solution for calibrated amount of time (13.5 minutes in our case), do not agitate
     - 2.3.3. Transfer the holder to the first water rinse, agitate very gently for 30 seconds
     - 2.3.4. Transfer the holder to the second water rinse, agitate very gently for 30 seconds, leave the holder in the water
     - 2.3.5. Prepare tweezers and take the holder out of the water bath and remove the chip, do not let it dry
     - 2.3.6. Rinse the chip in the third water beaker for 30 seconds
     - 2.3.7. Move the chip to the fourth water beaker and leave it there for 5 minutes
3. Critical point drying
   - 3.1. Prepare a beaker with 2-propanol
   - 3.2. Transfer the chip from the fourth water rinse to the IPA
   - 3.3. Let the chip soak for at least one hour
   - 3.4. Load the chip into the cpd and run the drying procedure following the cpd SOP
4. Characterize results
   - 4.1. Take optical microscope pictures, check for film uniformity
   - 4.2. If film looks suspicious check under the scanning confocal microscope