CH TECHNOLOGIES (USA)

Standard Operating Procedure (SOP) for the gravimetric (via filter) determination of aerosol concentration in an exposure chamber.

1. On day of exposure, select the appropriate number of 47 mm Cambridge filters pads. It is recommended that at least three filter samples be taken for each exposure session. Create a log sheet and assign each filter an identification number.

2. Condition the filter pads if possible. If possible, weigh the filter pads with a suitable balance, for example, critical measures may require a controlled-environment microbalance with 0.0001 mg sensitivity. Coarse measures that need only to be accurate to the nearest milligram may use a less sensitive balance. Be aware of the filter weight. Heavy filters make it difficult to measure small difference. When you are done, enter these weights on the log sheet.

3. Place the filters into locking filter cassettes or Petri dishes labeled with their correspondent identification numbers. If you use BGI type filters, load the filter holder and carefully tighten to assure that you do not cause leaks. (see below)

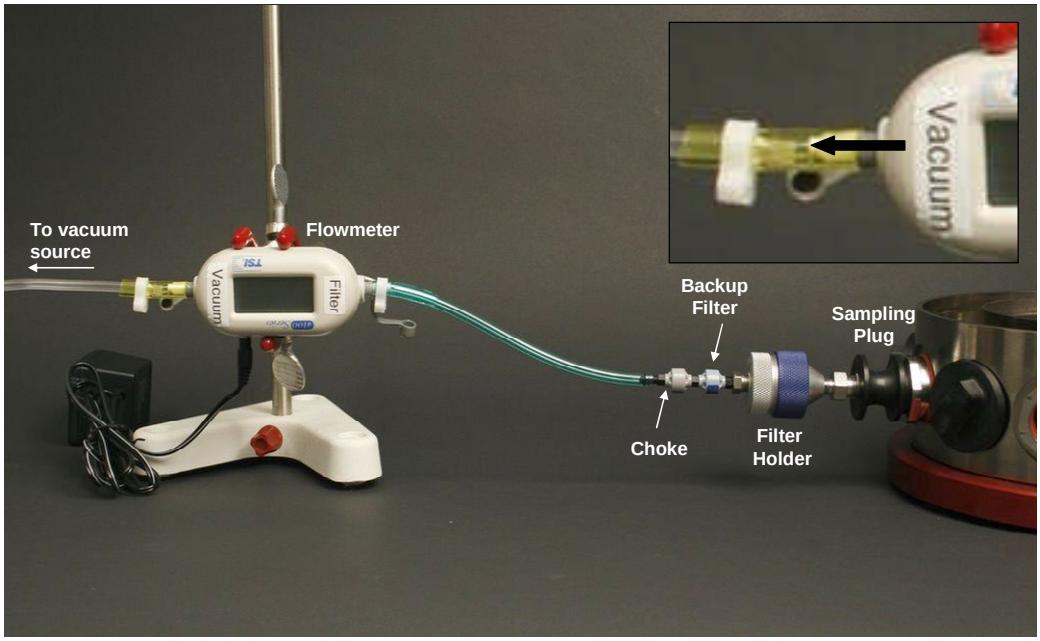
4. In the case of a BGI 47 mm filter holder, holding the filter holder upright, unscrew the blue ring and remove the upper conical part. Observe the stainless steel filter support screen and make sure that is placed correctly (centered). Take one of the pre-weighed filter pads, place it on top of the support screen and, after making sure that the filter pad is centered, carefully place the upper part (conical) of the filter holder. Place the blue ring onto the filter holder and carefully, tighten up the blue ring.

5. Connect a critical orifice with a flowrate around 0.5 L/min between the sampling pump (or other vacuum source) and the filter holder. Make sure to use a vacuum source that pulls a vacuum of at least 15 inches water column. For vacuum lower than 15 inches the orifice will not be able to control the flow appropriately (is not under critical conditions). If a larger flow is desired, omit the Critical Flow Orifice (CFO) and use a calibrated flow meter. It is best to measure the flow at the front of the filter holder since flow meters in vacuum lines are NOT ACCURATE.

6. In preparation for subsequent sampling, verify the sample flow rate of the filter holder by following these steps:
   - Connect a standard-traceable mass flowmeter between the critical orifice and vacuum source (see figure). The mass flow meter should be insensitive to

reduced pressure and should be LEAK FREE. Do a pressure test under positive and negative pressure to be sure.

- Switch the flowmeter **ON**
- Turn ON the vacuum source
- Record the reading of the flow meter on your log sheet
- Stop measurement by turning OFF the vacuum source
- Disconnect the flowmeter from the sampling line
- Reconnect the sample line and make sure it is leak free.
- Be aware that clogging of the filter will change the flow rate.



(the illustration above shows a 25 mm filter holder)

7. Connect the filter holder to the appropriate exposure port. Lock the other filter cassettes and store them away.

8. Start sampling by turning ON the vacuum source. At the same time start measuring the sampling time with an accurate laboratory timer.

9. When the predetermined sampling time is up, turn OFF the vacuum source. Remove the filter holder from the sampling exposure port and immediately plug the port with a black polycarbonate plug (supplied with the system)

NOTE- Install the Mass flow meter and recheck the flow to verify that it has not changed. If it did, you may have to use an average value. It is best to test the flow after varying degrees of filter loading to ascertain when it becomes plugged.

10. Open the filter holder and carefully remove the filter pad with a pair of tweezers. Check the filter edges for tears and breaks. If noted, then the filter may have leaked and the results are NOT VALID. Place the filter pad into its own cassette and store it in the controlled-environment weighing room. Enter the sampling time in the log sheet.

11. Repeat the exposure sampling as in steps 4 thru 9 for the other filter pads (if you do less than 3 exposure cycles a day, pre-weigh only the necessary number of filter pads).

12. After you are done sampling, take all the filter pads out of their cassettes and weigh them separately. Log in their weights. As an option, you can leave the filters to condition or dry out if they seem moist from the sampling; they can be left for 24 hours in the weighing room and then weigh them. If you chose to do so, you should also condition the filters 24 hours before pre-weighing them.

13. Calculate the aerosol concentration for each filter pad (in μg/l):

$$Ci = \frac{(Mi_a - Mi_b)}{F * T}$$

Were: Ci – aerosol concentration as given by the i^{th} filter (μg/l)
Mi_a – weight of i^{th} filter after sampling (μg)
Mi_b – weight of i^{th} filter before sampling (μg)
F – flow rate (in L/min)
T – sampling time (minutes)

14. Calculate the aerosol concentration for the whole exposure session as the average of all the filters sampled (in mg/l or in μg/l):

$$C_{avg} = \frac{1}{n} * [\sum_{n}^{i=1} (Ci)]$$

Were: n – number of filters sampled