

**WORCESTER POLYTECHNIC INSTITUTE
HEALTH PHYSICS PROCEDURE HP-18
GAS-FLOW PROPORTIONAL COUNTING**

1. PURPOSE:
To detect the presence of and to quantify the amount of alpha and beta radioactive material on various samples.
2. FREQUENCY:
This procedure shall be performed as necessary.
3. MATERIALS, TOOLS, AND EQUIPMENT:
 - 3.1. Form(s):
 - 3.1.1. Scaler Counting
 - 3.2. Gas-flow proportional counter
 - 3.3. Alpha standard button source
(i.e.: Am-241)
 - 3.4. Beta standard button source
(i.e.: C-14)
 - 3.5. Samples
4. PRECAUTIONS:
 - 4.1. Ensure that all health physics practices are followed throughout the survey.
 - 4.2. Take all necessary precautions to avoid the spread of possible contamination.
 - 4.3. Perform an operability check on all instrumentation used. Ensure that the instrumentation has been calibrated within the proper time limit.
5. INSTRUCTIONS:
 - 5.1. Open the large grey valve on the gas tank fully.

- 5.2. Adjust the small regulating valve so that the gauge reads a gas pressure between 3 and 5 psi.
- 5.3. Ensure that the HV button on the gas-flow proportional counter is in the off position (the button should not be depressed).
- 5.4. Turn on the power, then the HV.
- 5.5. Open the drawer to ensure that the chamber is empty. Close the drawer and turn the knob to the right to check gas flow. Proper flow rate is approximately 2-3 bubbles/second (the knob may need to be jiggled before the bubbles begin to flow).

NOTE: Never operate the Gas-Flow Proportional Counter without gas flow.

- 5.6. Perform the alpha background count.
 - 5.6.1. Dial in the alpha voltage listed on the machine, record this voltage.
 - 5.6.2. Select a count time of 5 minutes (time selector will read 0050).
 - 5.6.3. Select a purge time of 144 seconds.
 - 5.6.4. Depress reset.
 - 5.6.5. Record the counts obtained.
- 5.7. Perform the beta background count.
 - 5.7.1. Dial in the beta voltage listed on the machine, record this voltage.

NOTE: Dial down the high voltage before depressing the "Add 1000 V" button.

- 5.7.2. Select a count time of 5 minutes.
- 5.7.3. Select a purge time of 12 seconds (the shorter purge time may be used since the chamber has not been opened).
- 5.7.4. Depress reset.
- 5.7.5. Record the counts obtained.

5.8. Perform the alpha source count.

- 5.8.1. Record the source selected, its reference activity, and its reference date.
- 5.8.2. Place the source in the chamber.

NOTE: Generally, the source is located on the bottom of the button source. Ensure that the source is facing upwards.

- 5.8.3. Dial in the alpha voltage appearing on the machine.
- 5.8.4. Select a count time of 5 minutes.
- 5.8.5. Select a purge time of 144 seconds.
- 5.8.6. Depress reset.
- 5.8.7. Record the counts obtained.

5.9. Repeat step 5.8. using the beta source and the beta voltage appearing on the machine.

5.10. Complete the upper portion of the form. The following spreadsheet may be used:

- 5.10.1. Cursor to the RSO directory in x-tree, type x.
- 5.10.2. Type scaler at the command prompt.

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- 5.10.3. Change the appropriate data.
- 5.10.4. Record the calculated values.
- 5.10.5. Exit works through the "File" menu.
- 5.11. Ensure that the machine is functioning properly by comparing the results obtained to those previously obtained (the results should be roughly consistent).
- 5.12. Count each sample.
 - 5.12.1. Place the sample in the chamber.
 - 5.12.2. Dial in either the alpha or the beta voltage appearing on the machine.
 - 5.12.3. Select a count time of 1 minute.
 - 5.12.4. Select a purge time of 144s.
 - 5.12.5. Depress reset.
 - 5.12.6. Repeat using the other voltage.
- 5.13. Compare "CPM above BKGD" for the sample to the "Significant Counts Above Background".

NOTE: If the "CPM above BKGD" are fairly close to, or exceed, the "Significant Counts Above Background," recount the sample for 5 minutes to verify its activity.

- 5.14. Turn off the Add 1000 V, the HV, the power, and the gas (use the large grey valve on the tank).
- 5.15. Calculate the sample's activity if significant counts above background were detected.
- 5.16. Sign and date the form, submit it to the RSO for review.

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5.17. Samples containing no detectable activity may be disposed of in an ordinary trash receptical.

5.18. Samples containing detectable activity should be disposed of at the discretion of the RSO. Any samples containing activity above twice background should be investigated.

6. RESTORATION:

None

7. REFERENCES:

7.1. Nuclear Measurements Corp. Nuclear Instrumentation Proportional Counting System NMC Model PC-5 Instruction Manual

7.2. Code of Federal Regulations Part 10, Chapter 20

7.3. Radiation, Health and Safeguards Committee Radiation Regulations