The FILTER METHOD for determining the presence of Sr-90 in the presence of Cs-134/Cs-137

Theory:
Using a detector sensitive to alpha particles, beta particles and photons, timed counts through a stepped number of solid disc filters are taken The geometry is stabilized by using either solid filters or ring shaped spacers,all of the same thickness, in combination for a total of 3, . Betas energies are identified by their penetrating depth in plastic.

One solid 0.084" plastic filter will block beta and electron energies up to Tl-204 betas (763 keV).
Two solid plastic filters will block beta and electron energies up to Cs-137 betas (1173 keV).
Three solid plastic filters will block beta and electron energy up to Sr-90 (2284 keV)- while passing most of the photons on through.

This approach works when the gamma component is not overwhelming, that is as long as the detector is in its linear response range vis-a-vis Deadtime.
When the gamma/beta ratio is unfavorable, as when Co-60, !-131 or other high energy gamma emitters are present, use the Magnetic Method previously described.

Materials list:

A GM or other detector sensitive to alpha-beta-gamma. Pancake or end window GM is acceptable
1 sample planchet (shallow tray) sized to fit into the counting shield cavity. A Petri dish is acceptable. The diameter of the sample holder should be
equal to or greater than the detector diameter.

1 paper alpha filter, sized to match the detector window diameter as a minimum.

3 filter discs, sized to match the planchet and detector diameter.

3 spacer rings of the same diameter as the filters.

A) Place the empty planchet, the 3 spacer rings and the detector into the counting shield chamber. Take a timed background baseline count.

B) A sample is placed in the planchet. The first reading is taken with the detector *three filter thickness distances* from the sample, using 3 spacer rings only. This reading represents the total alpha-beta-gamma-X-Ray contributions. Sample size to be adjusted so that the total count does not drive the detector in use into saturation or Deadtime non-linearity. This figure will vary depending on the type of detector,

C) A paper filter is placed over the sample to block alpha particles. It remains for the rest of the beta testing. A reading is taken at *3 filter thickness distances* from the sample, using 3 spacer rings. This reading represents beta-gamma-X-Ray, minus alpha.

D) Replace all 3 ring with the 3 solid filters. Make sure the paper alpha filter remains in place. A reading is taken at *3 filter distances* which represents the gamma/ X-Ray contribution. Betas are almost all blocked, even those from Y-90.

E) Replace the solid filter closest to the alpha filter with a spacer ring. This leaves 2 solid filters above the ring. Another reading is taken, still maintaining the same *3 filter thickness distances*. This is the Gamma/X-Ray + Y-90 beta reading.

F) Replace the center solid filter with a spacer ring. Now there should be sample-paper-spacer-spacer-solid filter-detector. The timed count reading now represents the
total of photons plus all beta and electron energies above Tl-204.

G) Record reading and retain the sample for a week. Duplicate the tests at that time. Any changes will be accounted for by short half-life isotopes.

Other filter materials, density/thickness etc. should be investigated.

This setup demonstrates startling and dramatic changes when the beta energy's mean-free-path density is exceeded.

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