MEASURING IODINE FROM STACK FILTERS

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- Finnish energy company with nuclear power plants in Olkiluoto
- 2 * 880 MW BWR power plants in operation
- 1 * 1600 MW EPR under construction
  - After completion TVO produces one third of Finnish electricity

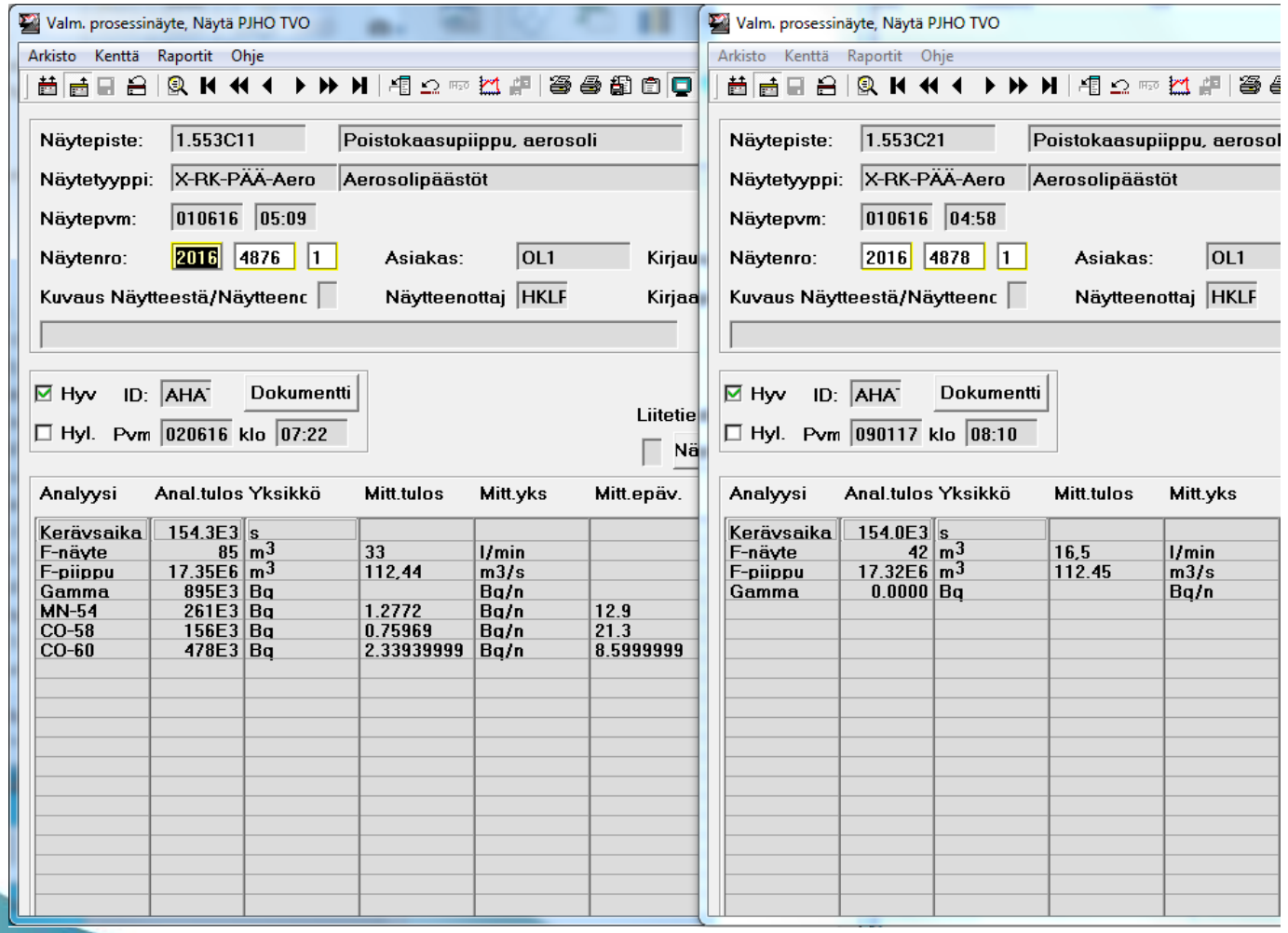
CHANGES IN MEASUREMENT SYSTEMS WERE MADE DURING WINTER 2015 AND 2016

- Old system
  - 2 parallel lines with noble gas pulse counter and aerosol/iodine filter for laboratory analysis
- Current system
  - One line with online noble gas monitor and aerosol/iodine filter for laboratory analysis (No modification to sampling point)
  - One line with online noble gas monitor, α/β particulate monitor and iodine monitor and aerosol/iodine filter for laboratory analysis (new sampling point)

OLD SYSTEM

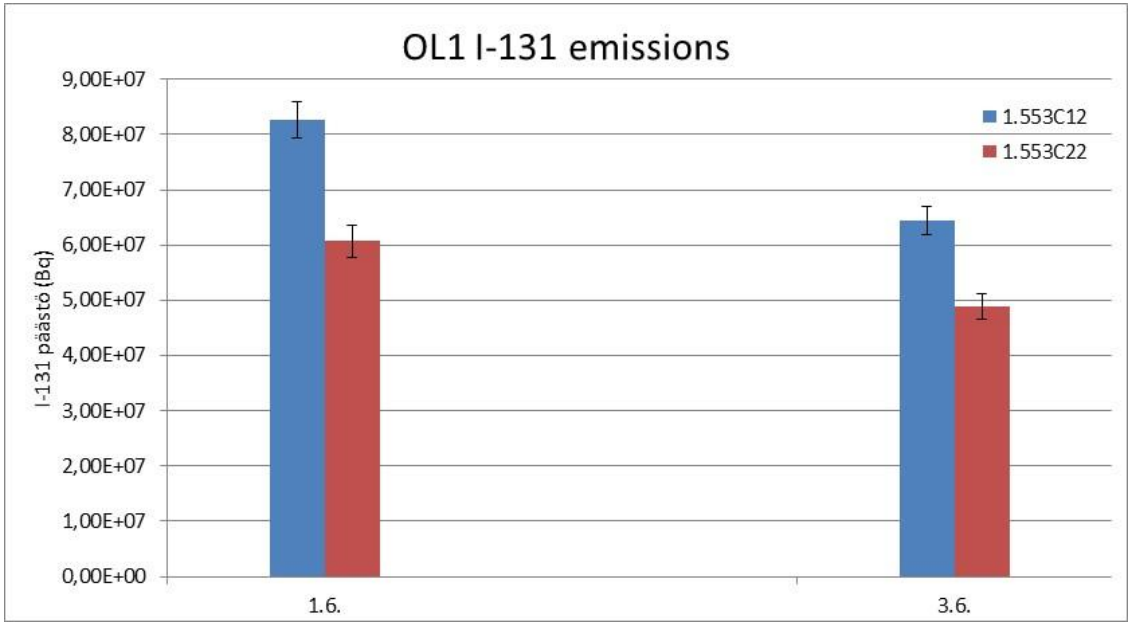
NEW SYSTEM

AEROSOL RESULTS FROM PARALLEL LINES DIDN'T MATCH



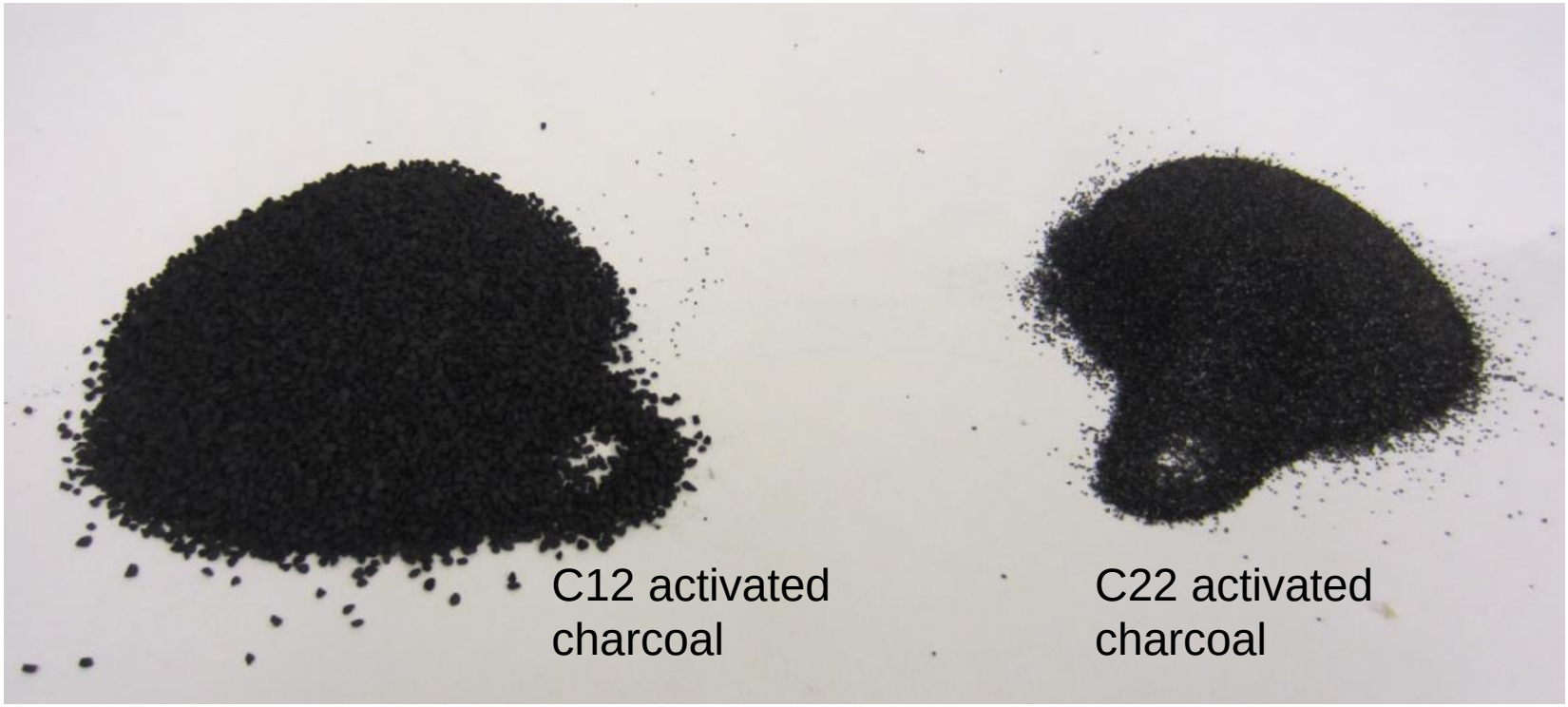
IODINE RESULTS WEREN'T PERFECT EITHER

- We were able to get aerosol collection to work better, but it still isn't good. It will require sampling line modification
- Iodine collection efficiency didn't remarkably get better after opening control valve and closing delay line
- Maybe something is wrong with calibrations

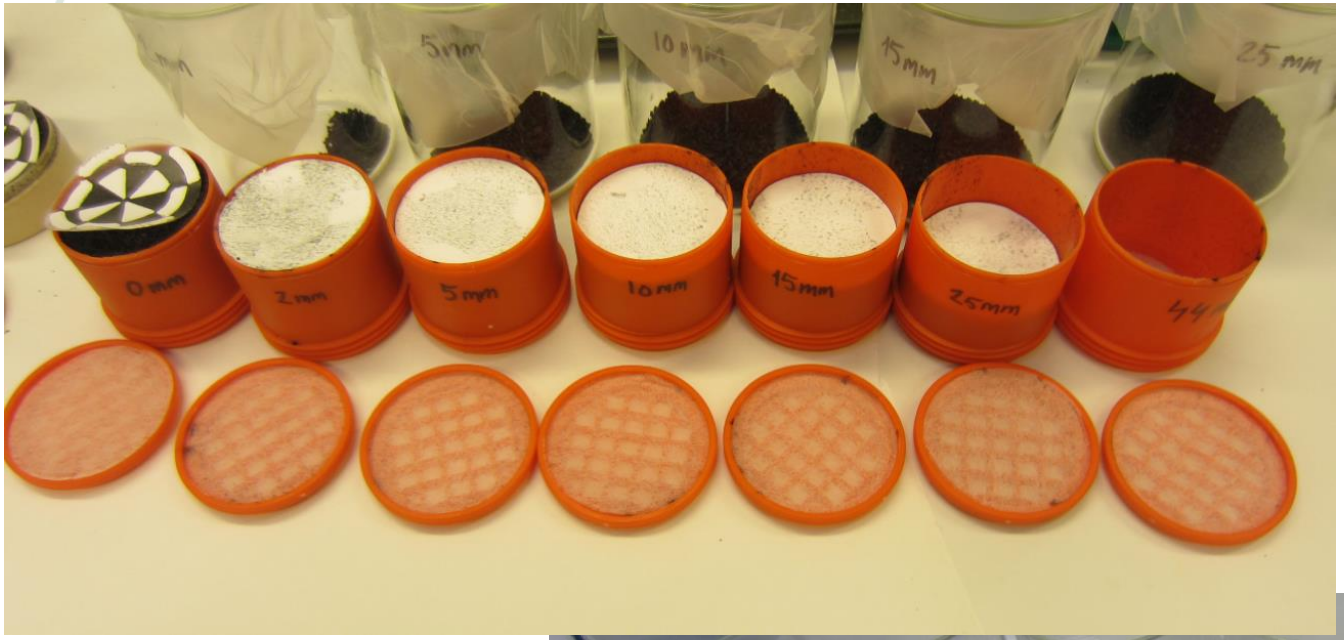


FILTERS FROM PARALLEL LINES

GRAIN SIZE IS DIFFERENT

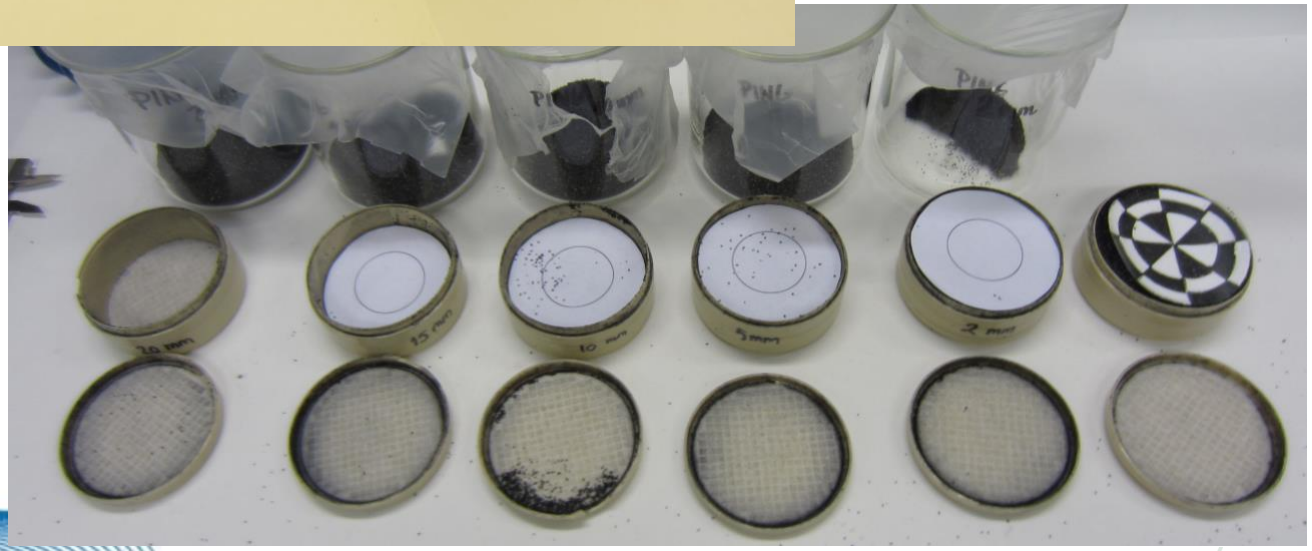


TIME FOR SOME NEW CALIBRATION SOURCES



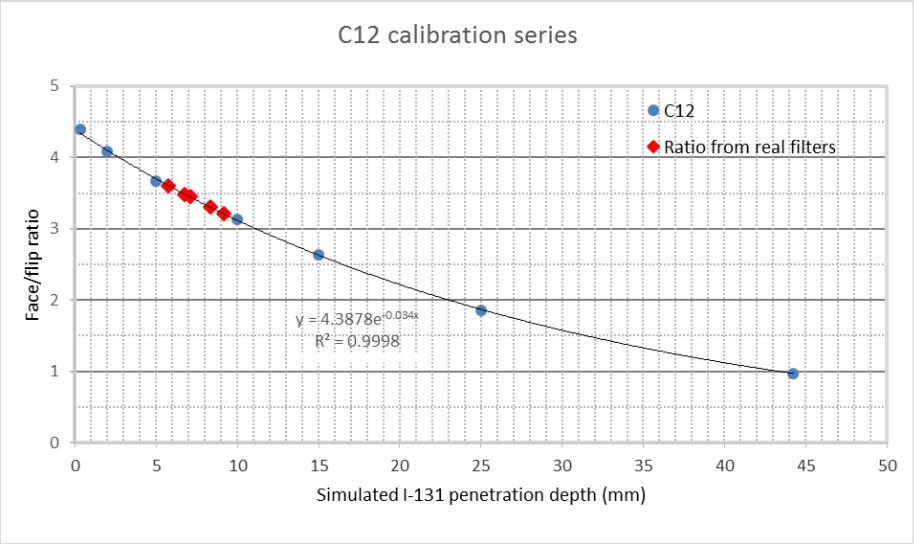
C12 calibration sources were made for 0, 2, 5, 10, 15, 25 and 44 mm penetration depth

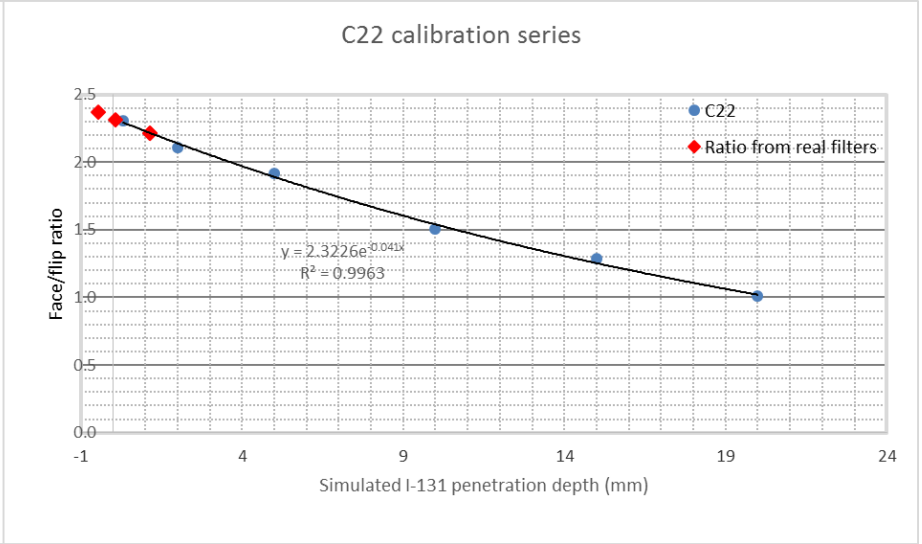
C22 calibration sources were made for 0, 2, 5, 10, 15 and 20 mm penetration depth



RESULTS OF CALIBRATION MEASUREMENTS

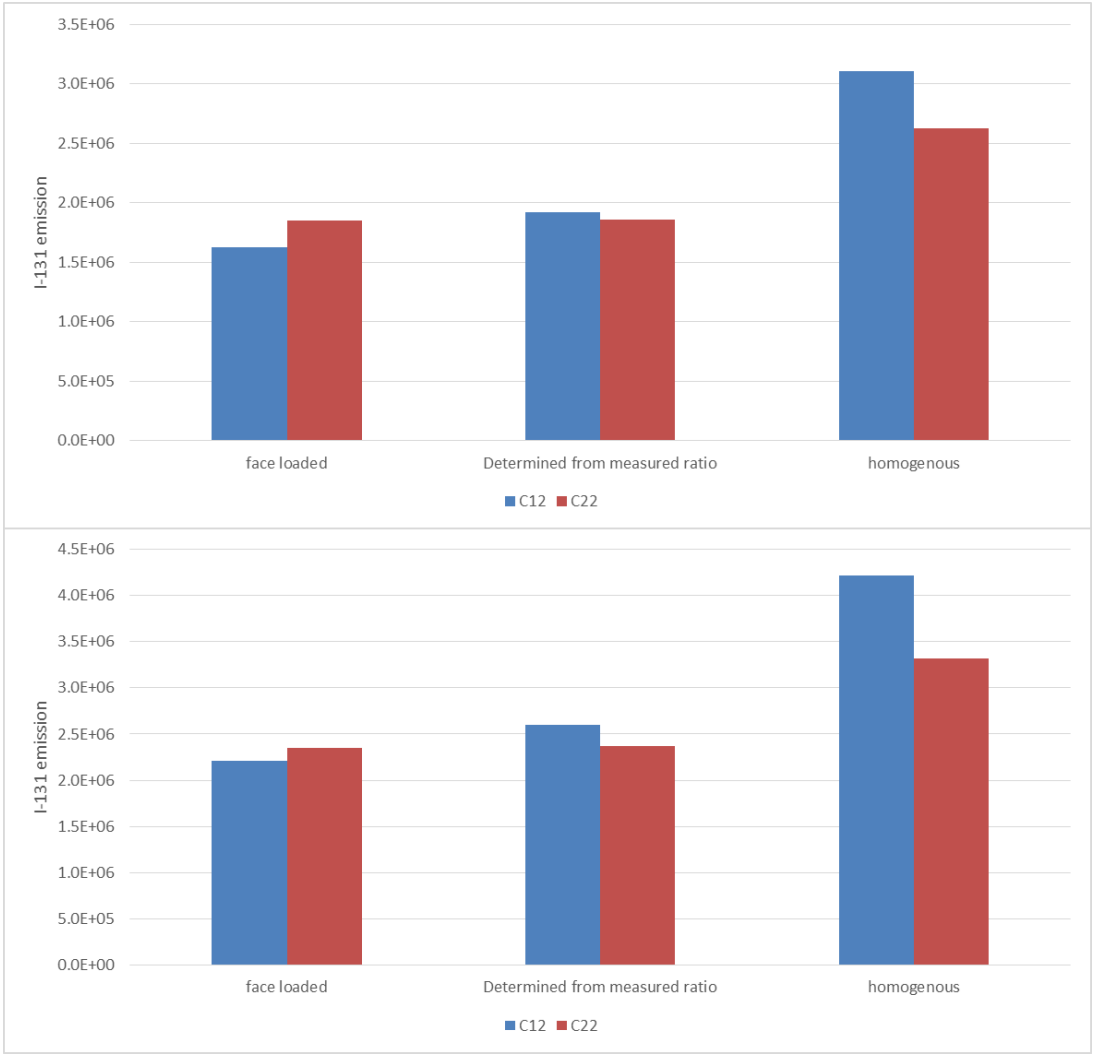
- Filters were spiked with E&Z mixed nuclide gamma standard solution
- Filters were measured face side down and then flipped over and measured again three times.
- Sn-113 392 keV peak was used to determine face/flip ratio. It was chosen because it's energy line is relatively close to I-131.
- This was done for two different detectors. Both detectors have calibration for every penetration depth. Ratio is determined when there is significant activity in the filter and calibration is chosen accordingly.





THE DIFFERENCE BETWEEN CALIBRATIONS

For C12 filter 10 mm calibration was used and for C22 filter 2 mm calibration was used



WHAT'S STILL LEFT TO BE DONE

- Sampling line need to be modified for better aerosol collection
- We're looking into changing C12 filter holders to similar with C22 filter so both sampling lines would have same filters
- Preparing and measuring takes long time, could this be done with LabSOCS. We will be changing to Canberra later this year.

REFERENCES

Activated charcoal measurement is applied from D.M. Montgomery's paper, "Calibrating Germanium Detectors for Assaying Radio-iodine in Charcoal Cartridges", Radioact. Radiochem, 1(2),4, (1990)

"Zero" penetration depth filter is made according to ANSI N42.14-1999. It's supposed to be pseudo-uniformly deposited source with no significant migration of the activity.

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