



iCAM™ Filter Options

Features/Benefits

ICAM/FCF

- > x 2 reduction in MDA, so
4–10 x reduction in false alarm rate
- No changes in setup of iCAM required
- Better results when counted in iSolo®/iMatic™

ICAM/FCC

- A low cost method for beta particulate and molecular ¹³¹I monitoring (non-discriminating)

ICAM/FCI

- A low cost method for alpha and beta particulate and molecular ¹³¹I monitoring (non-discriminating)

Description

CANBERRA now offers several new Filter options for the iCAM™ alpha/beta air monitor. These include:

- ICAM/FCF – Millipore® Fluoropore FSLW 3 micron membrane filters – for improved alpha spectrum resolution with consequent reductions in Minimum Detectable Activity (MDA) and false alarm rate.
- ICAM/FCC – For simultaneous beta particulate and molecular iodine monitoring.
- ICAM/FCI – For simultaneous alpha particulate, beta particulate and molecular iodine monitoring.



ICAM/FCF

This new filter card can dramatically improve the iCAMs performance at a low cost. In particular, false alarm rates (already low in iCAM due to the adaptive radon compensation) can be reduced by a factor of up to ten for the same alarm levels and background conditions. This improvement is achieved by replacing the standard GFA filter card with the ICAM/FCF filter, which uses a Millipore Fluoropore FSLW 3 micron membrane filter (as used in the iCAM/MF). This gives far superior alpha spectrum resolution compared to the GFA filter, and so reduces the size of the tails of the Radon and Thoron daughter peaks, thus reducing the background in the U/Pu region and reducing the MDA and false alarm rate. In good operating conditions the standard deviation of the compensated alpha reading (and thus the MDA) is reduced by a factor of >2, and in poor/high background conditions, the improvements are even more dramatic. The table below shows the reduction in MDA using the ICAM/FCF, compared to the GFA filter in good conditions:

iCAM: Minimum Detectable Alpha Activity					
Interfering Background: Radon and Thoron daughters: ²¹⁸ Po, ²¹⁴ Po, ²¹² Bi and ²¹² Po (Radon Equilibrium Factor F = 0.5)					
²²² Rn gas (Bq/m ³)	Uncompensated Alpha Background (Bq.h/m ³)	Minimum Detectable Alpha Activity (Bq.h/m ³)			
		Whatman GF/A		Fluoropore FSWL (3 μm)	
		5 min. Response	20 min. Response	5 min. Response	20 min. Response
10	7	0.3	0.2	0.2	0.12
20	14	0.4	0.3	0.25	0.17
40	28	0.6	0.4	0.35	0.25
60	42	0.7	0.5	0.45	0.30
80	56	0.8	0.55	0.50	0.35
100	70	0.9	0.65	0.55	0.37
120	84	1.0	0.70	0.60	0.40
140	98	1.1	0.75	0.65	0.45

The total radon daughters concentration in air is 2.3 times the stated ²²²Rn gas concentration.

iCAM Filter Options

As noted above, the improvement under poor conditions is even greater. The better filter spectral resolution will also give better results if the filters are counted off-line after sampling in an *iSolo* or *iMatic*.

ICAM/FCC

In this version of the filter card the GFA filter medium is replaced by a charcoal-loaded filter (Whatman type 72). This filter absorbs molecular iodine with very high efficiency, in addition to collecting particulate. ¹³¹I, the most common iodine isotope of interest, has several high intensity betas and so will be detected with very high efficiency (~24%) by the *iCAM*'s beta channel.

Detectable High-Intensity Beta Energies	
Isotope	I-131
Half Life	8.0207 days
Mean Beta Energy keV	181.92
Intensity %	100.50

Iodine occurs in two distinct forms: molecular iodine, i.e. I₂, is normally encountered as fission product from fuel or reprocessing. This form is readily collected by a charcoal-loaded filter paper such as ICAM/FCI. The second form is organic iodine, e.g. methyl iodide, more frequently encountered in nuclear medicine. This form is not readily absorbed by a thin filter, so a bulk iodine absorption cartridge must be used (as in the CAM110PIFF). Iodine in the environment is also likely to have exchanged with organic molecules so a cartridge-type system such as the CAM110PIFF should be used for wide area environmental monitoring systems. The ICAM/FCC is not suitable for alpha particulate measurement due to the poor spectrum shape produced, but it is suitable for beta particulate in air monitoring. If simultaneous alpha, beta and iodine monitoring is required then use the ICAM/FCI filter.

ICAM/FCI

The ICAM/FCI filter has both a GFA filter (for alpha and beta particulate) and a type 72 charcoal-loaded filter below it. Using the ICAM/FCI allows an *iCAM* to monitor for alpha and beta particulates and for molecular iodine simultaneously, with the comments above for the ICAM/FCC filter applying to the iodine monitoring. The only disadvantage of using this filter is the greater pressure drop caused by the two layers, with consequent reduction in the filter life (typically 1–2 days) compared to the lifetime of a standard GFA filter of 5–7 days.

Note, ¹²⁹I and ¹²⁵I do not have a detectable beta emission and so will not be detected by an *iCAM* fitted with the ICAM/FCI or ICAM/FCC filters.

Summary/Conclusion

ICAM/FCF

- Greatly improves performance of existing *iCAM*s with no setup changes required.
- Product Code: ICAM/FCF – box of 100 filter cards.

ICAM/FCC

- A filter to allow *iCAM* to monitor for beta particulate and molecular iodine (nondiscriminating).
- Product Code: ICAM/FCC – box of 50 filter cards.

ICAM/FCI

- A filter that allows *iCAM* to monitor for alpha and beta particulate and molecular iodine (non-discriminating).
- Product Code: ICAM/FCI – box of 50 filter cards.



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C36432 – 08/08