

RADIOACTIVE CONTAMINATION ANALYSER TYPE : RA1006A

Technical Data



FEATURES :

- 100% foolproof test for identifying RaC in packed food stuffs (directly placed in sample tray) such as meat, fish, milk, diary products, vegetable, breads & minerals etc., and also in food stuffs in liquid or solid form placed in Marinelli beaker.
- System can detect very low levels of contamination upto 0.05 Bq/gm.
- Compact state of art Electronic system comprising of 1k MCA (USB interface) with built-in High voltage & shaping amplifier
- Uses (2"x2") or (3"x3") NaI scintillation detector for sample analysis.
- Optional accessory: Marinelli beaker (500ml / 1ltr to store food stuff, for analysis.
- Input power to MCA system ~(100V-240)VAC, 47-63Hz (excluding PC power).

Software features:

- Spectrum calibration.
- Efficiency calibration, current Activity calculator.
- Spectrum file loading, saving, printing, plotting, multiple ROI Selection, up to (5-ROIs)
- Spectrum smoothing.
- Food stuff contamination report.
- Report generation for RaC in Bq/l or Bq/g with isotopic identification in food stuffs.
- Nuclide library.

Radioactive contamination (RaC) Analyser is a compact laptop/ tablet pc, based 1K MCA system with built in High voltage for detector bias & shaping amplifier, with (2"x2") or (3"x3") NaI scintillation detector covered with adequate lead shielding having sample chamber arrangement.

System configuration consists of:

- 1K MCA (USB interface) with built in High voltage & shaping amplifier module.
- Laptop / Tablet PC with windows operating system.
- (2"x2") or (3"x3") NaI Scintillation detector with preamplifier.
- 40/50mm lead shielding with food sample chamber arrangement.
- Input power to MCA system ~ (100-240) VAC, 47-63Hz (excluding PC power).
- Power adapter output 12V @ 1A to MCA module.
- MCA data acquisition, processing and report generation software.

In a Nuclear disaster accident scenario, or NBC event, or criticality accident in a nuclear fuel cycle or Radiological emergency, it becomes necessary to check for Radioactive Contamination in and around the Nuclear accident or event. It may be necessary to measure quality of air, water, Dust, Rain water, packed food stuffs, such as meat, fish, milk, diary products, vegetable, breads & other commodities including minerals etc., for contamination.

It is well known that Radioactive Iodine and Caesium are by products of nuclear reactors which end, releasing radioactive contamination into the atmosphere in the event a major Nuclear disaster / accident. While I-131 has a radioactive half-life of eight days, caesium-137's half-life is about 30 years. Checking for Cs-137 & I-131 contamination becomes more important on account of this.

This system gives isotopic details in addition to quantification of the Radioactive contamination present in the food stuff. System has lot of powerful data processing & analysis features which include spectrum acquisition, printing, plotting, ROI selection – FIVE ROIs, smoothing, vertical, horizontal scale expansion etc. Software is made very user friendly.

SPECIFICATION

Hardware features:

- **Detector** : (2"x2") or (3"x3") NaI scintillation detector integral assembly with built in pre amplifier
- **Resolution** : Better than 7.5% with Cs-137
- **Detector Bios** : (0-1200V) @ 0.5A, Adjustable thru Rear panel trimpot to set required bias
- **Shaping amplifier output** : Built - in Guassian bi-polar 1024 channels succeeded approximation.
- **Max. counts / channel** : 31 bit (2 Giga counts)
- **Pulse processing time** : 7 μ sec
- **INL** : Better than \pm 1%
- **Preset time** : 1 sec to 136 years
- **Lead shielding with food sample chamber** : 40/50mm shielding to enclose detector & food stuff
- **1K MCA / AMP / HV module dimensions** : 95 Width X 80 Height X 245 Length (approx)

Software features :

- Spectrum / calibration
- Efficiency calibration, current Activity calculator
- Spectrum file loading , saving, printing , plotting , multiple ROI
- Selection up to (5-ROIS)
- Spectrum smoothing
- Food stuff contamination
- Report generation for RaC in Bq / l or Bq / g with isotopic identification in food stuffs
- Nuclide library



Fig. 1 : Packed food stuffs that can be analyzed using this system

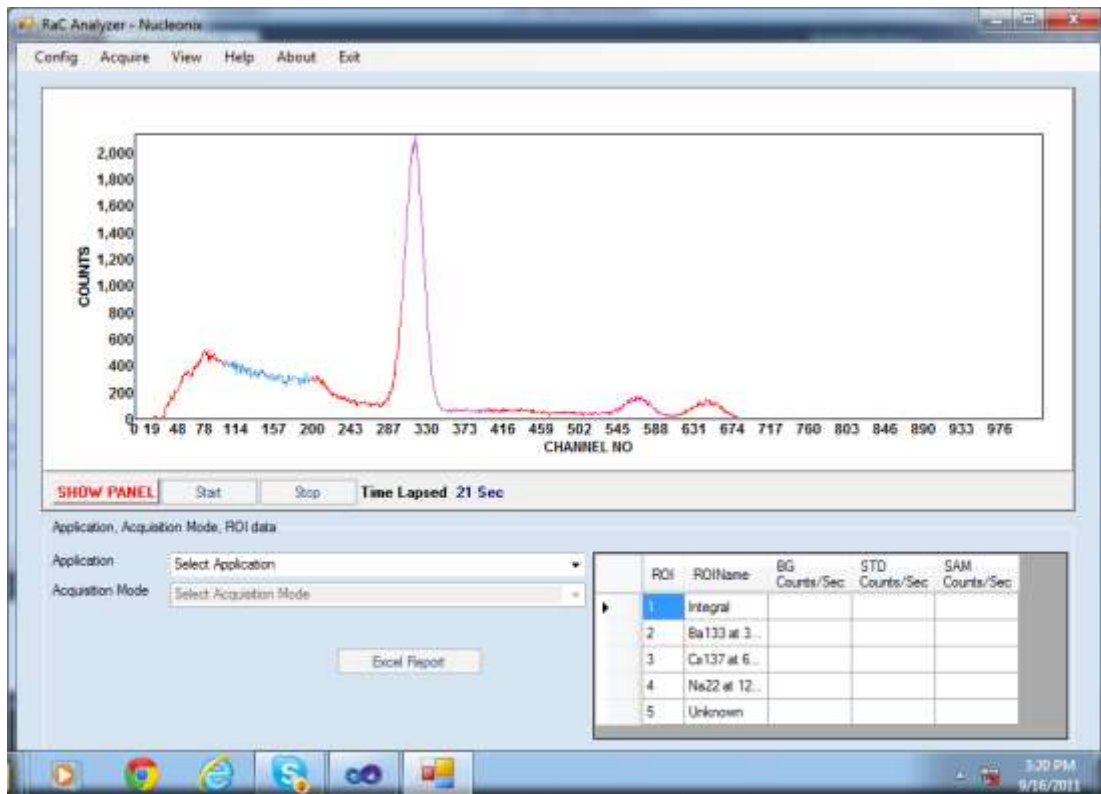


Fig. 2 : 1K MCA, PHA spectral window showing Cs-137 & Co-60 spectra

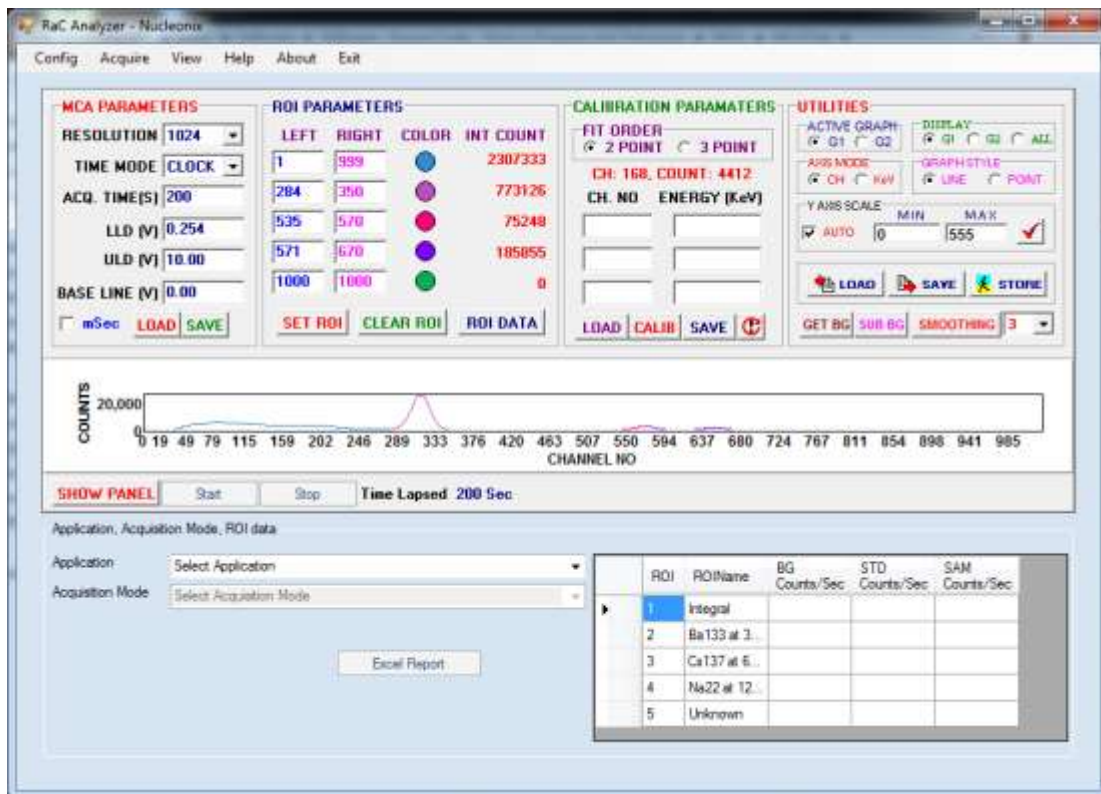


Fig. 3: 1K MCA with configuration panel

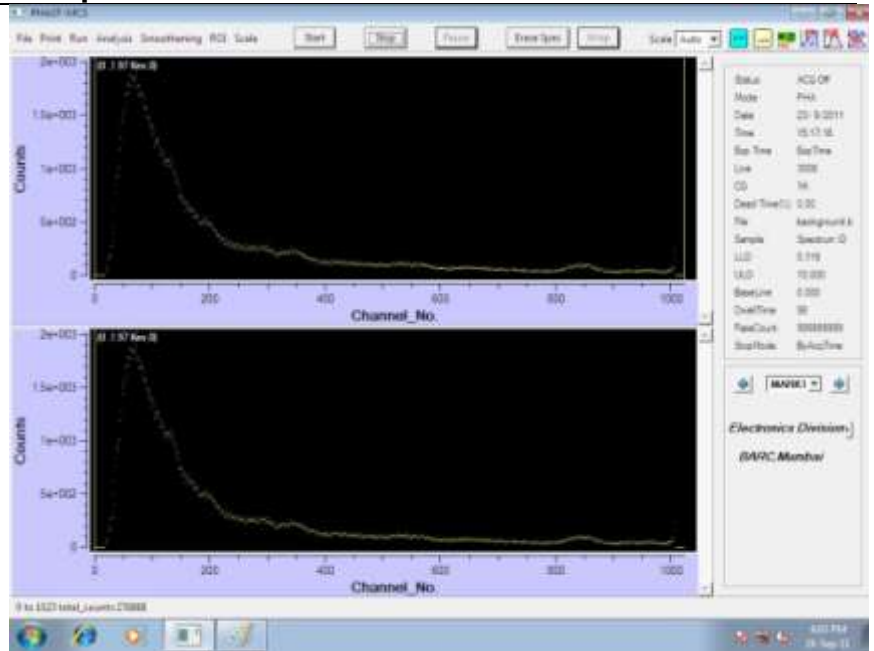
CASE STUDIES

Typical measurement data [using 3"x3" NaI (TI) Scintillation Multi-channel Spectrometer]

Spectra of Background and Food Samples :

Background

Total (integral) counts : 276888

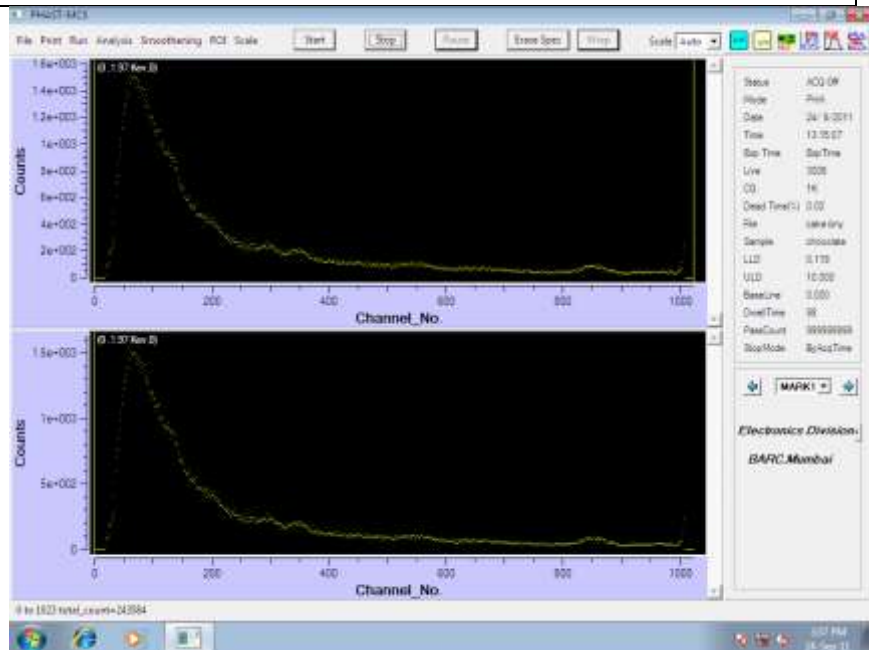


Background spectrum



Packed Chocolate (Sample-1)

Total (integral) counts : 243584

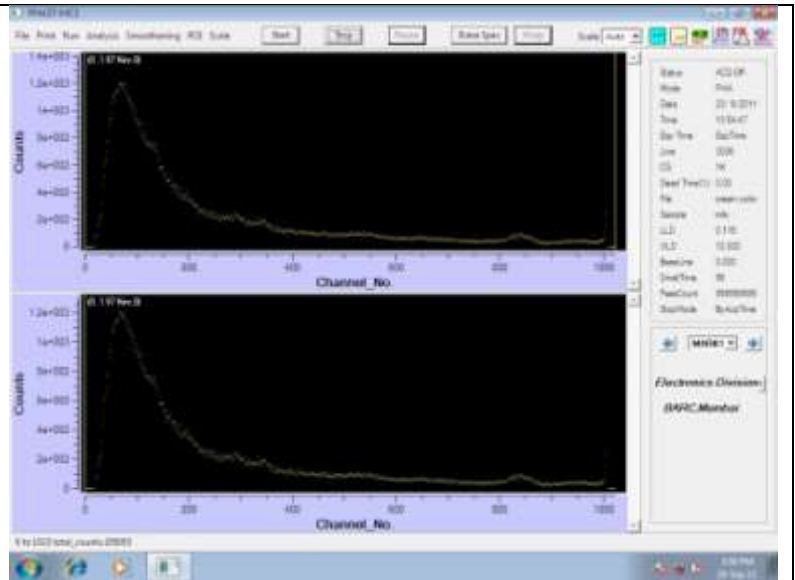


Sample-1 spectrum



**Packed Milk
(Sample-2)**

Total (integral) counts : 205053

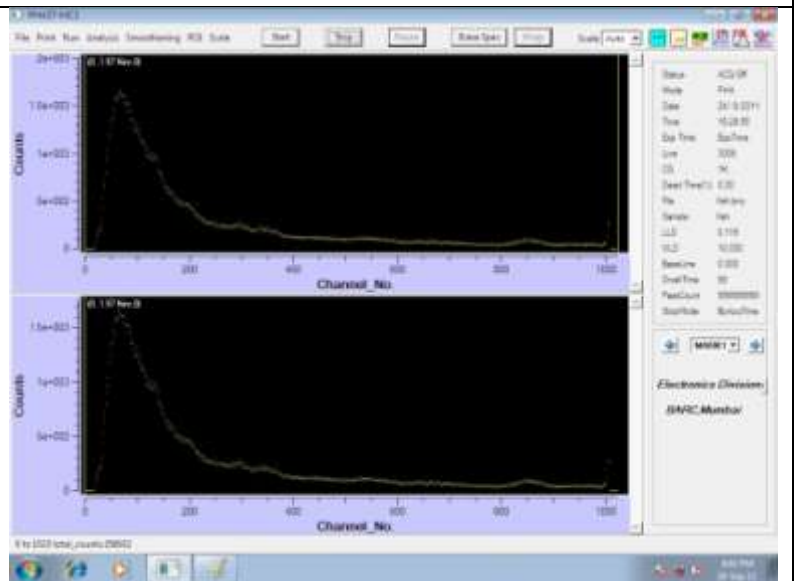


Sample-2 spectrum



**Packed Fish
(Sample-3)**

Total (integral) counts : 256932



Sample-3 spectrum

Analysis of the data :

The background and food samples' spectra are acquired for a period of 3000 seconds. In comparison with the background spectrum, no additional peaks were observed in the food samples' spectra. Further the total (integral) counts of all the food samples were less than the total (integral) counts of background. This is because when the detector is covered with the food samples, some of the background that is supposed to reach the detector gets absorbed in the food samples, thereby resulting in the reduction of total (integral) counts. The amount of reduction in the total (integral) counts depends on the density of the food samples.

Based on the above, we can conclude that **the food samples are free from Radioactive contamination.**