

TEMPORAL β Compton Binocular

The sensitivity of a Germanium, but with an image !



A high sensitivity multifunction instrument (image, spectrum, counts)

Our Compton camera | a “all in one” instrument

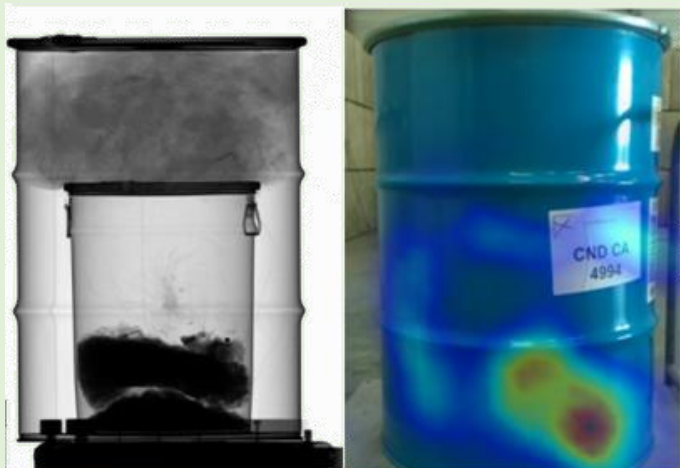
The best Compton **imager** (400 KeV- 3000 KeV), excellent **spectrometer** (50 KeV-3000 KeV), stable **photon counter** with **dose estimation**. Key advantages:

- **The most sensitive Compton camera on the market**
 - Exceptional sensitivity (<1 nSv/h) allowing imaging of natural background in less than 2 hours.
- **Noise reduction through dual heads**
- **Distance to the source in Gamma**
 - Is the source in front of the wall, into the wall or behind the wall ?
- **Efficient tool for isotope identification:** Energy resolution: <1.5% at 662 keV.
- **Stable photon counter both energy and spatially resolved allowing quantification.**
- **Automatic panoramic screening option**



Why are Temporal δ cameras unique?

1,3 MeV Compton Image



- X Ray radiography
- CND 4994 drum

- 4.67 MBq
- Drum at 1,3 meter
- 20 mn acquisition
- Image at 1.3 MeV on ^{60}Co

Temporal δ is a new generation portable Compton gamma camera - spectrometer and imager - based on temporal imaging: a completely new detection concept backed by 9 proprietary patents and software.

Temporal imaging uses both light and time distribution of each scintillation event to localize it very precisely in space (X-Y-Z), time (T) and energy (E).

The use of large volume monolithic, high density, high Z_{eff} **CeBr₃ crystals** having a low natural radioactivity and fast high yield scintillations guarantees very efficient and clean photon detection by Digital Si-PM.

Our asymmetric Compton concept, 300 ps time veto, and event selection scheme explain our camera good angular resolution and signal/noise.

Damavan Imaging was founded in 2014 to develop its Temporal Imaging patents. It won in 2015 a big grant from ANDRA (French Nuclear Waste Agency) to develop a Compton camera able to image low activity waste. In 2018 Damavan has won a H2020 European Award. Camera sales started in 2018.

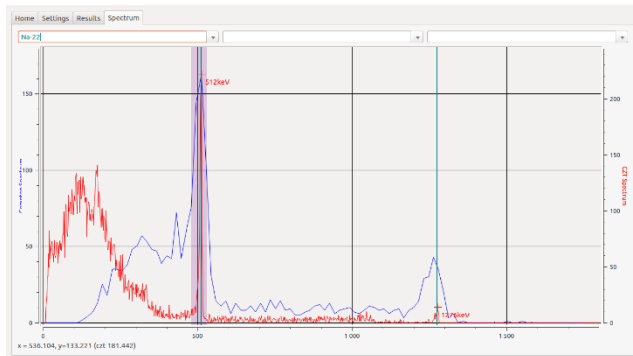
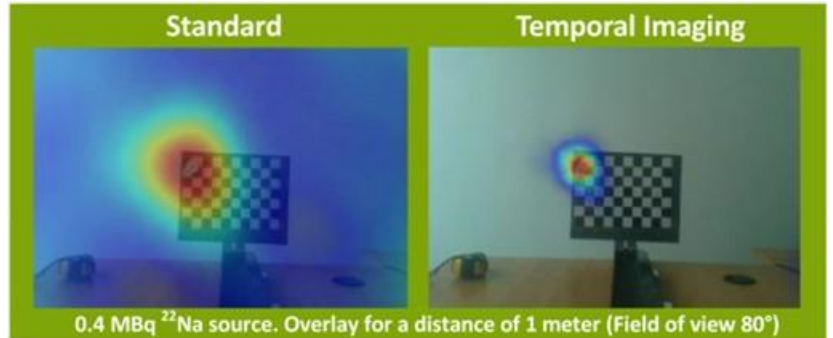
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Imaging is done in Compton mode from 350 KeV to 3000 KeV overlaid on "natural" (96 x 96°) FOV optical images. Good angular resolution and image quality translates in more details reliably detected.

The most precise imaging is obtained in energy-gated mode gating on a specific isotope line.



In **spectrometry and dosimetry**, the high sensitivity CeBr3 spectrum is complemented by an energy resolved CZT spectrometric detector (1.5% on ^{137}Cs) to allow reliable isotope identification in energy range 50 KeV-3 MeV with the help of a library, even in a completely "unknown" environment.

Energy and spatially resolved quantification of radiation can be done with the Compton head (400 KeV-3 000 KeV)

Usages: new cost & risk reduction possibilities in Waste management

Temporal δ can be used in nuclear power plants in operation or in decommissioning, fuel and waste treatment and storage centers, transportation and logistics units, laboratories, etc. It is an ideal tool for locating radioactive hot-spots, characterizing sources and mapping an area for **routine operations**: It is also suitable for **emergency situations and homeland security applications**.

It is **uniquely designed to image very low intensity sources**, (final release of decontaminated objects, field contamination...). Resolved images could be obtained from larger distance than with conventional cameras, thus **limiting the risks and the dose** for the operators. Temporal δ being a stable photon counter allows estimating **the mass of the source**, for ex. the mass of Uranium in a plugged pipe.

Specifications

Field of view	96 x 96 flat field	Timing Resolution	300 ps @ 511 KeV
Sensitivity high flux	3mR/h < 30s	Angular resolution	< 10 degrees (full spectrum) < 8 degrees (energy gated)
Sensitivity low flux	3 kBq ^{137}Cs @ 1m in 1h	Sensors	2 Compton CeBr3 + CZT

Miscellaneous characteristics:

- Hand held camera (< 8 kg)
- Interface through laptop 15' (supplied)
- Standard or motorized tripod in option
- 4π source sensing

Operating Temperature	-20°C to 40°C	Spectral resolution	<1.5% @ 662KeV
Energy range	50 keV-3MeV (spectroscopy) 400 keV- 3MeV (imagery)	Weight	< 8 kg
Count rate limit	2 mSv/h	Power Source	110 – 220V (mains)
Dimension	31 x 30 x 16 cm	Communication	Ethernet to laptop,Wi-Fi option possible

- Dose estimation
- Telemeter distance ranging
- Water tight (IP65) decontaminable upper half
- Energy resolved photon counting