Development of a real-time gamma field mapping device

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IN THIS PRESENTATION

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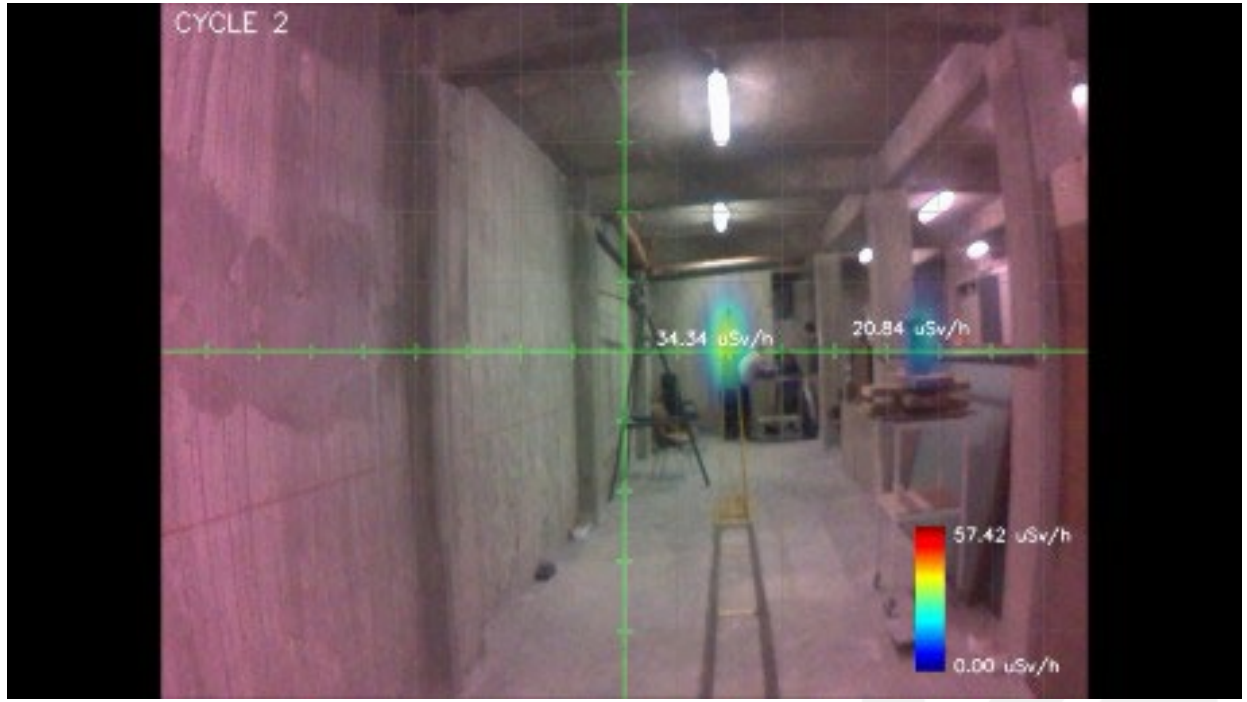
What is a gamma radiation camera?

Real-time gamma field mapping device → Gamma radiation camera → A camera? → Visual image of a radiation field

- Radiation
  - Visible
  - Infrarred
  - Gamma



Not so familiar image

Why?

The problem – a new technological approach

Reason

- Difficulties in reconstructing gamma field

Interaction of gamma radiation with matter

- Photoelectric effect
- Compton effect
- Pair creation

Specific technological approaches

- Collimation → Coded aperture
- Compton scattering

Existing Devices

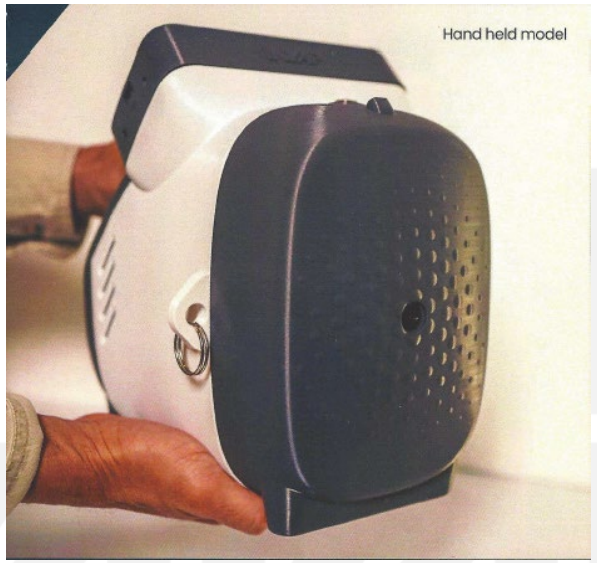
- (Generally) slow
- (Generally) bulky
- (Generally) expensive

New concept

High Speed Gamma Imaging Device

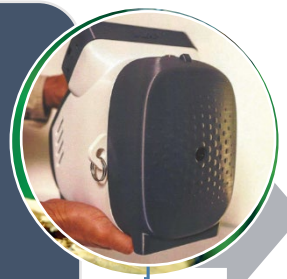
Patented concept

- Real-time gamma field visualization
- Ergonomic, portable design
- Easy to manufacture



Device concept

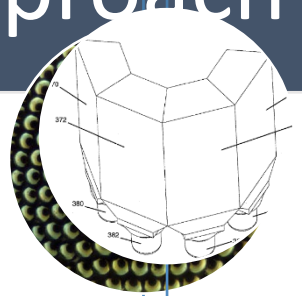
New technological approach



Vision System

New device

Arthropod vision system



Sensing array

Compound eye

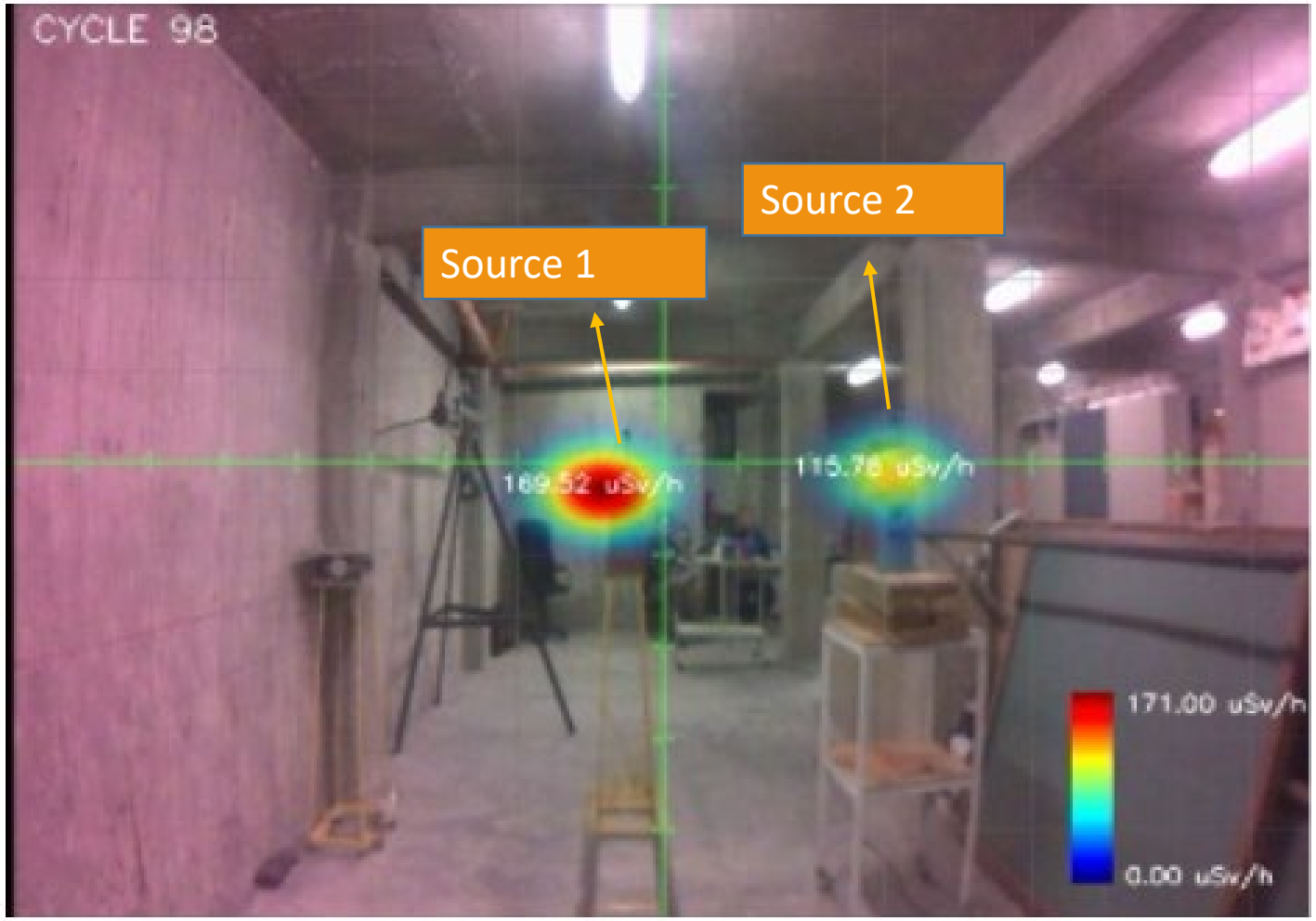
Central Processing Unit

Brain

Detectors

Ommatidia

Device concept



Position and intensity of each source superimposed over visual image

Extra sense to our vision (real-time)

Experimental Measurements

1-dimensional capabilities
- Real-time Detection along one angle (horizontal)

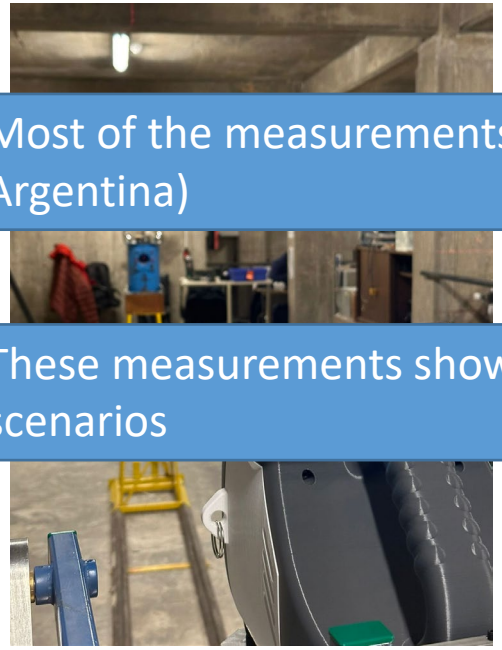
2-dimensional capabilities
- Detection along horizontal and vertical angles

1 source capabilities
- Detection capabilities
- Ergonomic & HMI design
- Point and field source tests

Multiple source capabilities
- Point source tests
- Field tests
- More improvements in all fields

Most of the measurements and testing took place in CNEA RA-6 facility (Bariloche, Argentina)

These measurements show the capabilities of the device in a wide variety of scenarios



Applications

Radioprotection-related activities	Monitoring of rooms and specific operations	Maintenance operations Manipulation of radioactive material
	Detect shielding leaks	
Nuclear medicine	Monitoring of work and patient areas	
	Support for incident and accident management	

- By functioning as an additional sense, this device can enhance the efficiency of the tasks it assists with.
- Probability of human errors is reduced, thereby enhancing radiation safety overall.
- A stronger radiation protection culture can be developed.
- Staff management is improved, since dose limits can be better supervised.

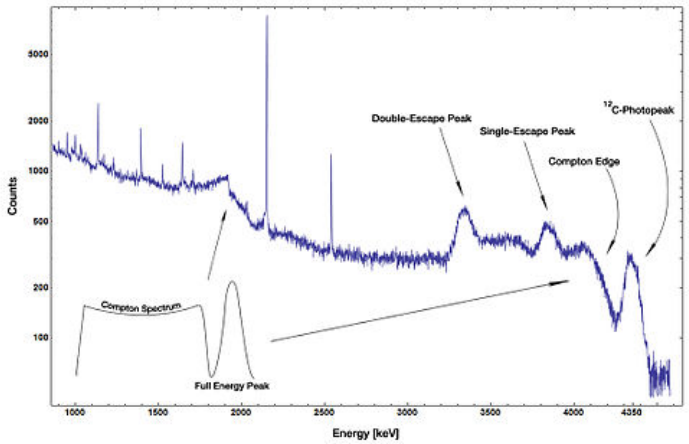
Way forward

Large level of effort

- Wearable display concept
- UAV (drone)
- Legged robot

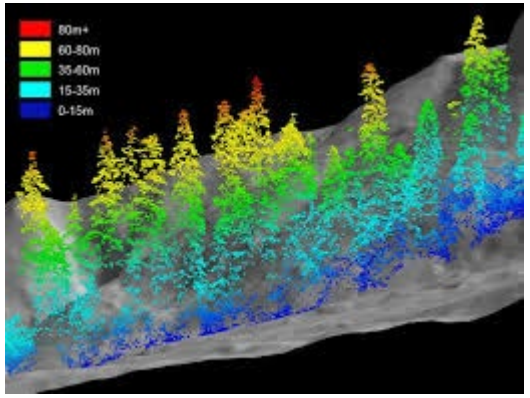
Lesser level of effort

- Spectrometry capabilities
- Movement detection



Medium level of effort

- LIDAR capabilities



Conclusions

Innovative design for gamma radiation monitoring is presented

- Real-time capabilities
- User-friendly design

Measurements show the performance of the new design

- Wide array of scenarios
- Mixed reality features
- Diversity of applications and potential for improvement of radioprotection-related activities

Way forward

- Short-term, Long-term developments

Acknowledgements

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Q&A

Thank you for your attention

Feel free to make any questions that you may have.