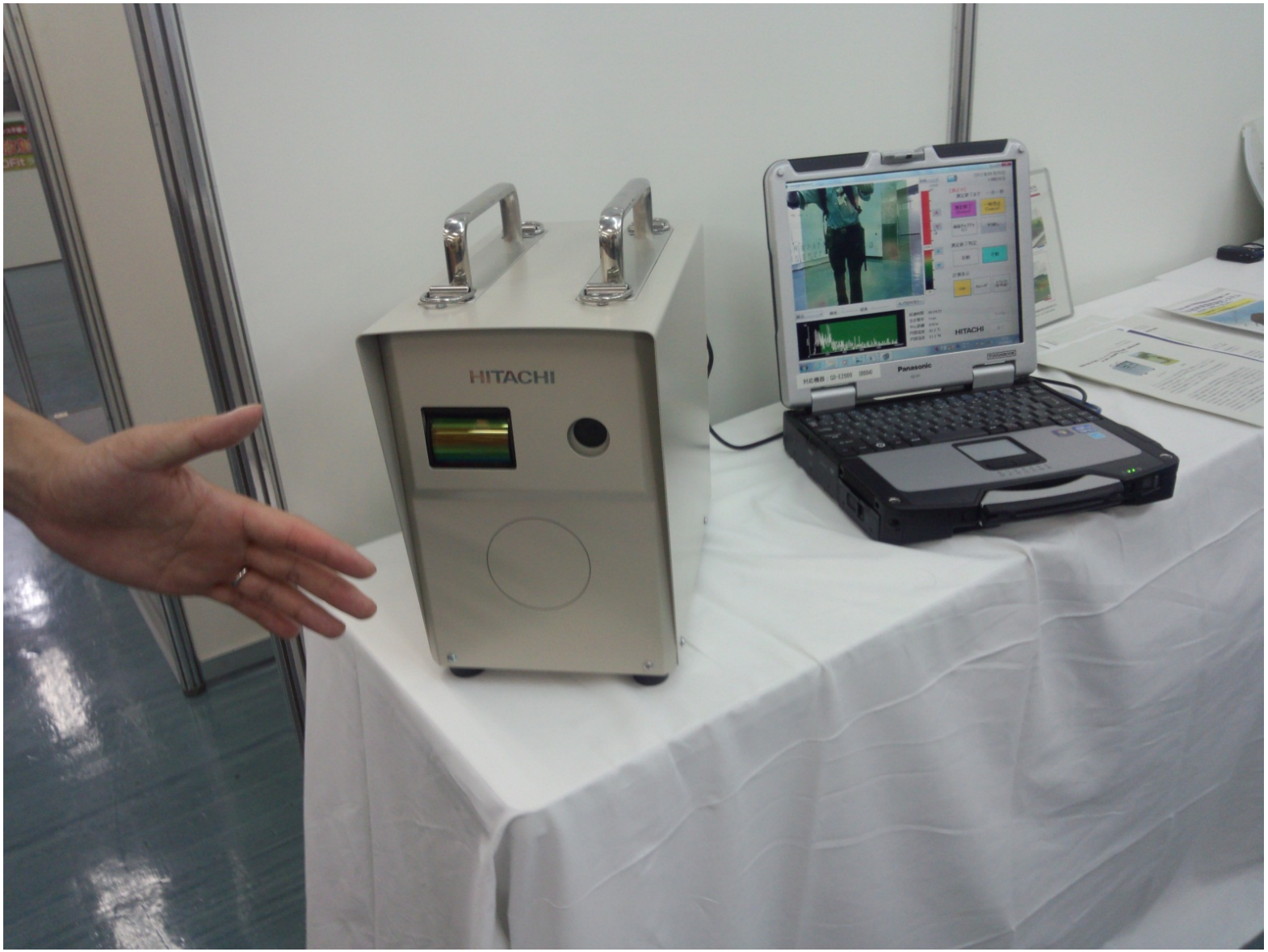
Development of Cesium Camera and Application for Decontamination of Cs 134& 137 caused by the Nuclear Power Plant Accident in Fukushima

Nobuhiro Toyota[1)]、Soji Otsuki[1)]、Masashi Takada[2)]、and Masaji Takahashi[3)]

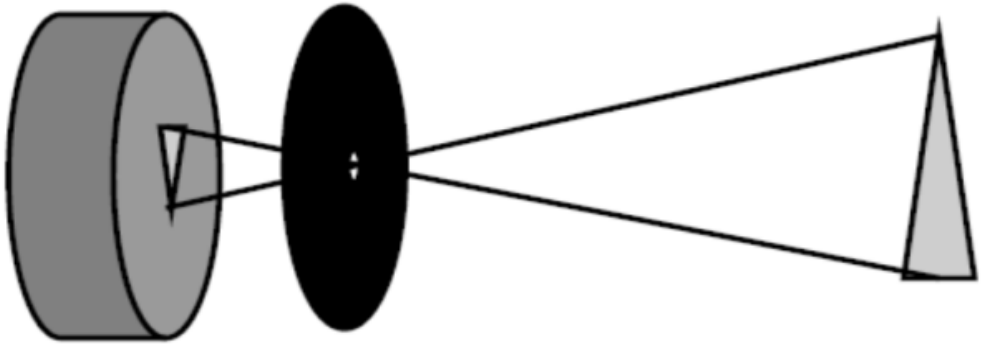
1) Osaka University 2) National Institute of Radiological Sciences and 3) Takahashi Science

Conventional gamma camera with Pin hole type collimator



Limitation of pin hole type collimator (Conventional gamma camera)

- Trade off of the incoming gamma ray and the resolution
- Problem #1: Ghost image caused by artefact
- Problem #2: Long capturing time (20-40 min)
- Problem #3: Heavy weight (30 kg)

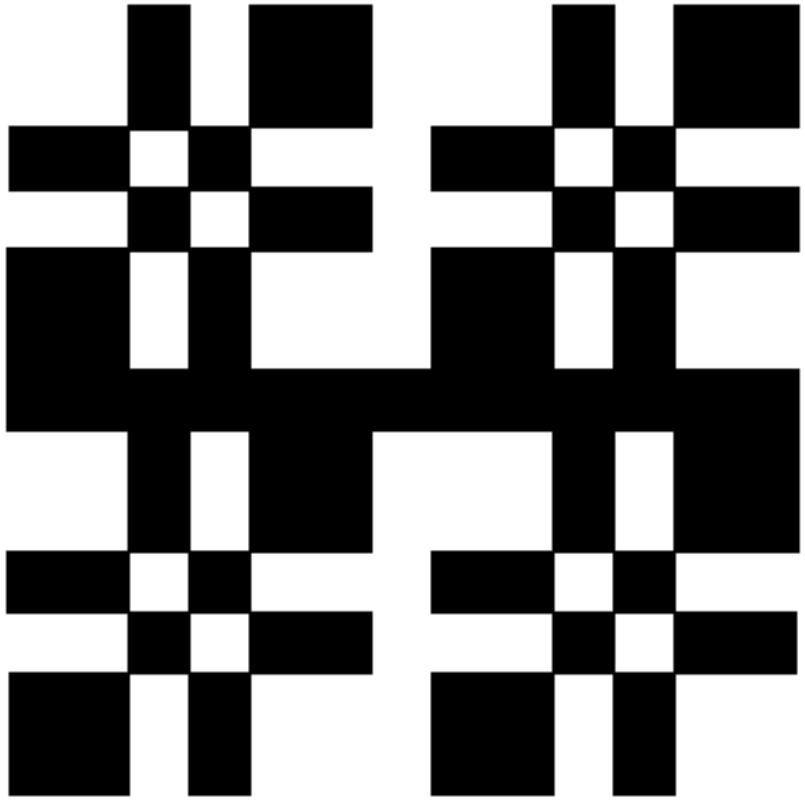


Example of Coded Aperture #1

- Hexagonal Uniformly Redundant Array (HURA)

Example of Coded Aperture #2

- MURA Modified Uniformly Redundant Array



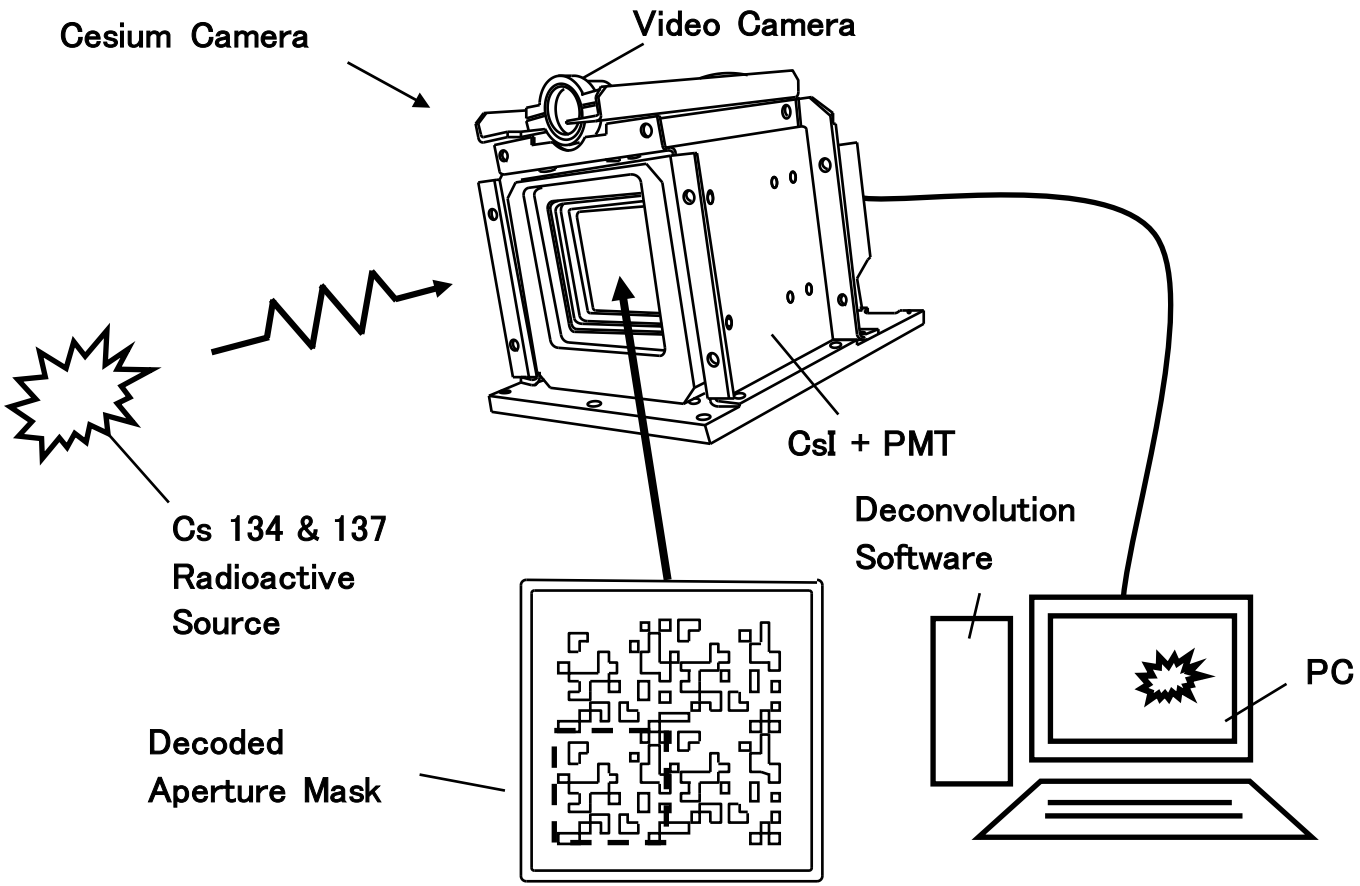
Pinhole vs Coded Aperture – Visible Spectra
Coded Aperture is essentially multiple pinhole

Lens Image | Single Pinhole | Multi Pinhole | Coded Aperture | De-con CA

CA shows good resolution

CA shows Depth of Field; Distance to Object

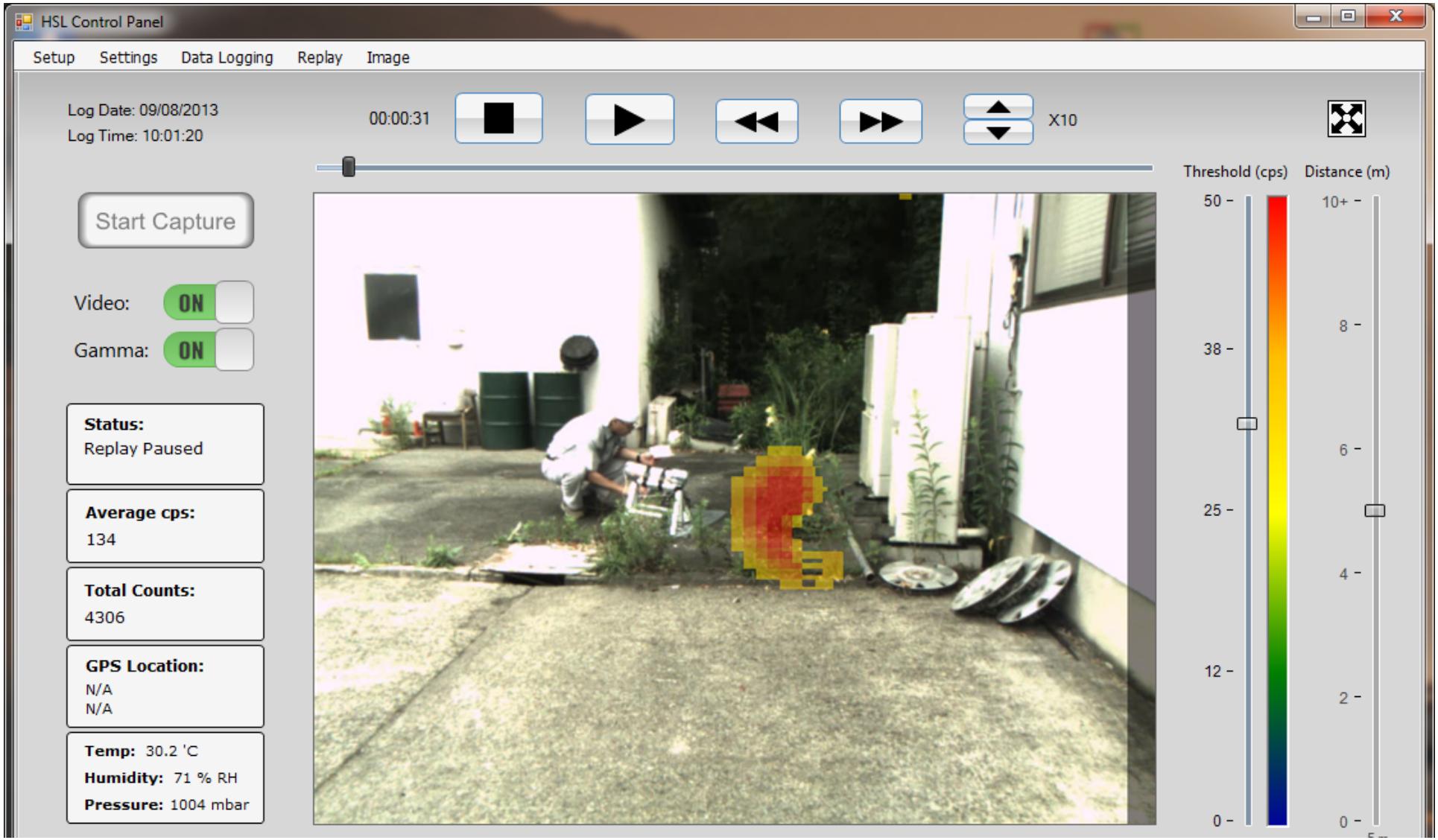
The time to Acquire is the same


Cesium Camera
Video Camera
CsI + PMT
Cs 134 & 137
Radioactive
Source
Deconvolution
Software
PC
Decoded
Aperture Mask

Cesium Camera 500

Experiment in Fukushima; Hot Spot

Cesium Graph Imaging
(Capturing time; 30 seconds, Distance ; 5m)
Detector surface 0.18µSv/h with BGD 1.5µSv/h



Conclusion

- **Cesium Camera was developed to be useful for detecting hot spots of radioactive Cesiums and verifying decontamination work being completed in residential areas of Fukushima prefecture.**
- **Further application of the coded aperture technology is expected to develop new type of gamma cameras in order to get the distribution map from the sky and also to detect radioactive materials in decommissioning work of the old nuclear reactors.**