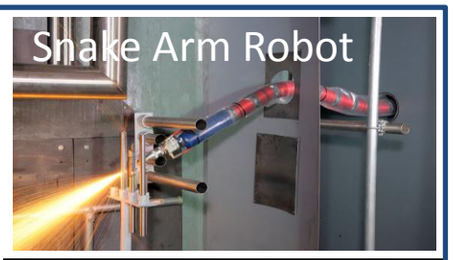
# Feasibility Study of Visual and Measurement Technology for Innovative Approach <Createc >

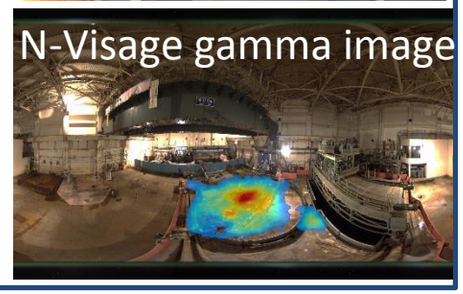
## Purpose and Goal

Project objective: to demonstrate the feasibility of gamma imaging and 3D laser scanning for fuel debris location, particularly with respect to tolerance of very high radiation environments.

## Overview and Feature

This project utilised Createc's established N-Visage gamma camera deployed using a snake arm robot from OC Robotics.
N-Visage gamma imaging has already been successfully deployed at Fukushima.
Gamma imaging shows the location of the most radioactive objects in scene; fuel debris will be shown clearly.




## Outcome obtained

### Radiation Detectors

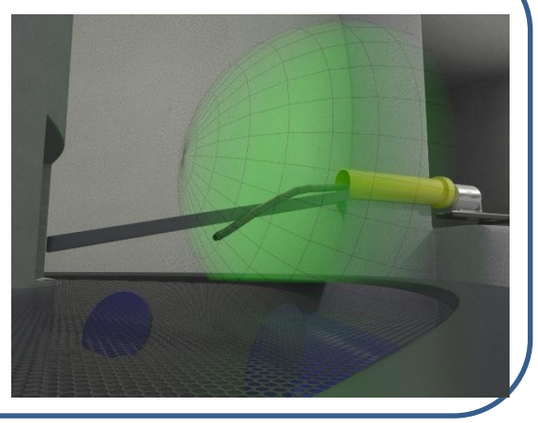
Viable radiation detectors identified – both scintillation and semiconductor types. Radiation hardness testing has demonstrated robustness to both maximum dose rate and total dose exposure.

### Lidar Sensors

One commercial off the shelf lidar sensor suitable for the application has been identified. This device has been evaluated in the laboratory and radiation hardness tested.

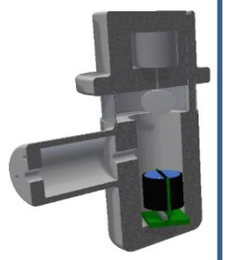
### Deployment

The deployment using an OC Robotics snake arm robot has been analysed and simulated to investigate the areas of the PCV/RPV that can be reached with the system. The snake arm is able to reach almost all areas when deployed from a vertical mast



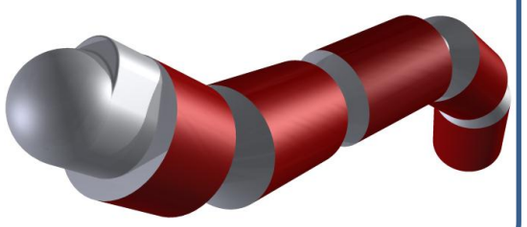
### 3D lidar device

Using results from the radiation hardness testing, a concept design for a shielded 3D laser imaging device has been produced. The device would be able to produce high accuracy point clouds, but would also be quite heavy due to shielding.



### Radiation Imaging Device

A new design concept for radiation imaging using dynamic coded aperture masks has been developed. This concept enables small, (<100mm), fast (~1 min) and light (<4kg) imaging.



## Challenges and Issues in the future

The gamma imaging method is promising, but novel so further demonstration will be required. The mass of the laser sensor must be reduced. Sensitive components must be eliminated from the snake arm motor pack.