



*Improving Detection Capabilities*

## CASE STUDY

# Nuclear Safeguards & Nuclear Disarmament Verification

For nuclear safeguards, technical measures are required to verify that states do not divert nuclear materials to develop weapons and to ensure that obligations under international non-proliferation treaties are met. This involves detecting the misuse of declared facilities and the existence of undeclared facilities. Similarly, nuclear disarmament verification activities require technologies to determine the presence or absence of nuclear material during the weapon dismantlement process.

### THE CHALLENGE

Radiation detection technologies are central to nuclear safeguards and nuclear disarmament verification applications, by providing confidence in state-based declarations. The ability to passively identify and locate the low energy gamma emissions, as well as detect the presence of neutrons, can be essential information in providing confidence during the inspection process.

### THE SOLUTION

CORIS360<sup>®</sup> is an advanced radiation imaging solution with the unique ability to quickly detect, identify and localise gamma emitting radiation over a large field of view (360° × 90°) and across a wide energy range (40 keV to >3 MeV). CORIS360<sup>®</sup> can accurately determine the presence or absence of nuclear material by either closely examining equipment of interest, or by searching an entire area in one acquisition. With the added ability to detect neutrons, CORIS360<sup>®</sup> is the most advanced gamma imaging technology for the detection of nuclear material.

CORIS360<sup>®</sup> was used to confirm the presence of nuclear material at an International Partnership for Nuclear Disarmament Verification (IPNDV) exercise, hosted by the SCK-CEN in Belgium. A range of mixed-oxide (MOX) fuel pin configurations were imaged. The figures below show the images obtained from a single acquisition of one fuel configuration.

Imaging the lower energy 60 keV <sup>241</sup>Am emissions, shown in Figure 1, revealed an unexpected gap at the bottom of the cadmium shielding that surrounds the entire fuel assembly.

Figure 2 shows the localisation of the 375 keV <sup>239</sup>Pu gamma emissions from the MOX fuel pin, confirming the presence of plutonium across the full length of the assembly. The CLLBC detector technology, employed in CORIS360<sup>®</sup>, further confirmed the presence of nuclear material through the detection of neutrons during the measurements.



## Imaging of Nuclear Material

Using compressed sensing, CORIS360<sup>®</sup> generates an image with far fewer samples than traditional methods. With the ability to image low and high energy gamma-rays (40 keV to >3 MeV), detect the presence of neutrons and search a large area in one acquisition, CORIS360<sup>®</sup> can accurately and rapidly confirm the location of nuclear material.

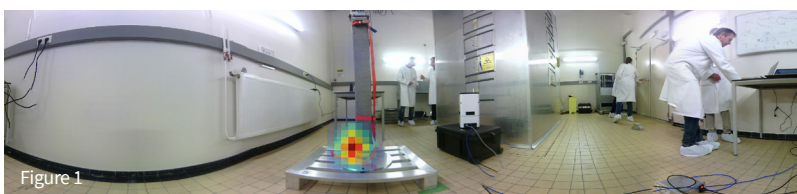


Figure 1

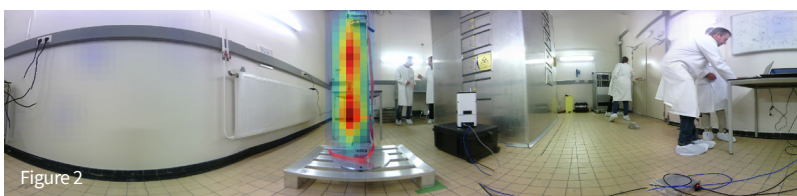


Figure 2

Figure 1. 360° gamma image from the 60 keV <sup>241</sup>Am peak, revealing a gap in the cadmium shielding surrounding the fuel assembly.

Figure 2. 360° gamma image from the 375 keV <sup>239</sup>Pu peak, showing the localisation of the nuclear material inside the full length of the fuel pin.



CASE STUDY

# Nuclear Safeguards & Nuclear Disarmament Verification

## CORIS360® Benefits

- Accurately identifies and localises gamma emissions across the full energy range (40 keV to >3 MeV), including low energy emissions from nuclear material (40 – 200 keV)
- Provides gamma and optical imagery over a 360° × 90° field of view, allowing for large areas to be screened
- Ability to detect the presence of neutrons associated with nuclear material
- Quickly verifies the presence or absence of nuclear material
- Fast start time and remote operation
- Ability to image multiple signatures
- Easy to use interface with optical overlay to aid interpretation
- Operates in low and high dose environments

*CORIS360® delivers value. Better data improves decision making for anyone working in radioactive environments.*



### Intelligent

Optimised sampling to identify and localise radiation sources



### Fast

Compressed sensing delivers faster results



### Full energy range

Image across the full energy range. Ability to detect presence of neutrons



### Large field of view

See more in one acquisition



### Precision

Better data for improved decision making



### Safe

Remote operation reduces worker exposure



### User-friendly

Easy to interpret and versatile with customisable detectors



### Cost effective

Faster imaging saves time and resources



## Contact us

For further information on CORIS360® including case studies and technical reports please visit:

### Website

[www.coris360.com](http://www.coris360.com)

### Email

[coris360@ansto.gov.au](mailto:coris360@ansto.gov.au)

### Phone

+61 2 9717 3311



Australian Government



CORIS360® is a product of ANSTO, the Australian Nuclear Science and Technology Organisation, with over 60 years of experience in meeting the nuclear needs of industry.

