

# ATTRACT TWD Symposium: Trends, Wishes and Dreams in Detection and Imaging Technologies



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## Simultaneous x-ray transmission and fluorescence imaging.

X-ray imaging exploits the differences in the complex x-ray refractive index of materials to obtain spatial information on electron density changes. This technique has been used for over 100 years and is a popular in many areas of research. The use of x-ray fluorescence from materials for imaging has taken a little longer to emerge, but is now a mainstream imaging technique for materials analysis, especially on synchrotron storage ring sources. If these two techniques are combined and information obtained simultaneously on electron density and elemental concentration, It would add greatly to the characterisation of the object.

We have been exploring methods of using coded illuminating beams during x-ray computed tomography. This is done in such a way that has little or no effect on the quality of the x-ray CT but the fluorescence emission from regions with the object is encoded. Encoding needs to be done in a way that provides a means of decoding the position of fluorescing regions within the object. A manifestation of compressed sensing has been trialled on the beamline with some encouraging results. The technology we are exploring is aimed at this particular problem, but the concept can be applied to other situations especially where multi-element detectors are difficult or expensive to develop.

### Summary

Coded beam x-ray imaging could be used for simultaneous computed tomography and x-ray fluorescence tomography.

**Author:** HALL, Christopher (Australian Synchrotron)

**Presenter:** HALL, Christopher (Australian Synchrotron)