Claims:

1. A mask for use in compressed sensing of incoming radiation, comprising:

~~a body formed of~~ a material that modulates an intensity of incoming radiation ~~of interest~~; ~~and~~

~~wherein the body has~~ a plurality of mask aperture regions~~, each comprising at least one mask aperture that allows a higher transmission of the radiation relative to other portions of the respective mask aperture region, the relative transmission being sufficient to allow reconstruction of the compressed sensing measurements~~; and

~~the mask has~~ one or more axes of rotational symmetry with respect to the plurality of mask aperture regions;

wherein each mask aperture region comprises at least one mask aperture that allows a higher transmission of the incoming radiation relative to other portions of each mask aperture region, a relative transmission being sufficient to allow a reconstruction of compressed sensing measurements, and

each of the at least one mask aperture has a shape that provides a symmetry under a rotation about the one or more axes of rotational symmetry; and

~~the mask apertures have a shape that provides symmetry after a rotation about the one or more axes of rotational symmetry; and~~

a mutual coherence of a sensing matrix generated by the rotation of the plurality of ~~respective~~ mask aperture regions is less than one.

2. The ~~A~~ mask as claimed in claim 1, wherein the mutual coherence of the sensing matrix is expressed as $\mu(\varphi)$, where:

$$\mu(\varphi) = \max_{i \neq j} \left| \varphi_i^T \varphi_j \right|,$$

where φ is a matrix containing $M \times N^2$ rows of the sensing matrix, arising from M measurements and an N^2 pixel image, and φ_i and φ_j are columns of φ.

3. ~~A~~ The mask as claimed in claim 1, wherein the mutual coherence of the sensing matrix is expressed as $\mu(\varphi)$, where:

$$\mu(\varphi) = \max_{i \neq j} \frac{\left| \varphi_i^T \varphi_j \right|}{\|\varphi_i\|_2 \left\|\varphi_j\right\|_2},$$

where φ is a matrix containing $M \times N^2$ rows of the sensing matrix, arising from M measurements and an N^2 pixel image, and φ_i and φ_j are columns of φ.

4. ~~A~~ The mask as claimed in ~~any one of the preceding claims~~claim 1, wherein the mutual coherence of the sensing matrix~~the mask apertures~~ is a minimized mutual coherence.

5. ~~A~~ The mask as claimed in claim 1, further comprising:

~~any one of the preceding claims, wherein the mask is~~ (i) a ~~cubic~~ cube or other Platonic solid,

~~or~~ (ii) a truncated icosahedral or other Archimedean solid, or

(iii) a ~~cylindrical~~cylinder.

6. ~~A~~ The mask as claimed in ~~any one of~~ claim~~s~~ 1 ~~to 4~~, further comprising: a sphere.~~wherein the mask is spherical, wherein the mask aperture regions are defined such that the mask has the one or more axes of rotational symmetry with respect to the mask aperture regions.~~

7. A detector for compressed sensing of incoming radiation, ~~the detector~~ comprising:

a mask as claimed ~~in any one of the preceding claims~~in claim 1;

one or more radiation sensors within ~~said~~ the mask and sensitive to the incoming radiation; and

a drive for rotating the mask about at least one of ~~said~~ the one or more axes of rotational symmetry.

8. ~~A~~ The detector as claimed in claim 7, further comprising:

a plurality of radiation sensors; and

a radiation shield arranged to mutually shield the plurality of ~~said~~ radiation sensors.

9. A radiation detection method, comprising:

making compressed sensing measurements with a detector as claimed in ~~either~~ claim 7 ~~or 8~~.

10. An imaging system ~~for compressed sensing of incoming radiation, the imaging system~~ , comprising:

imaging with a detector as claimed in claim 7.

~~a mask as claimed in any one of claims 1 to 6;~~

~~one or more radiation sensors within said mask and sensitive to the incoming radiation; and~~

~~a drive for rotating the mask about at least one of said one or more axes of rotational symmetry.~~

~~11. An imaging system as claimed in claim 10, comprising a plurality of radiation sensors and a radiation shield arranged to mutually shield said radiation sensors.~~

~~12. An imaging method, comprising imaging with the imaging system of either claim 10 or 11.~~

1~~1~~3. ~~An~~ The imaging method as claimed in claim 1~~0~~2, further comprising:

~~-~~making optical images and/or infrared images of the field of view of the ~~imaging system~~ detector or a portion thereof; ~~,~~ and

overlaying the optical images and/or infrared images and an image generated with the ~~imaging system~~detector.

~~14~~12. The radiation detection method as claimed in claim 9, further comprising any one of more of:

~~A method of nuclear reactor~~ decommissioning a nuclear reactor, radiation safety monitoring or surveying, characterizing radioactive waste ~~characterisation~~, security or defence monitoring, medical imaging, conducting a radiotherapy, conducting a particle therapy, conducting a gamma-ray astronomy, conducting a X-ray astronomy, remote characterizing ~~characterisation~~ or ~~detection~~ detecting of misalignments in a charged particle accelerator beam or in a radiation inducing beam, or enforcing border security~~, the method comprising a radiation detection method as claimed in claim 9 or an imaging method as claimed in claim 12~~.

~~15. A system for use in nuclear reactor decommissioning, radiation safety monitoring or surveying, radioactive waste characterisation, security or defence monitoring, medical imaging, radiotherapy, particle therapy, gamma-ray astronomy, X-ray astronomy, remote characterisation or detection of misalignments in a charged particle accelerator beam or in a radiation inducing beam, or border security, the system comprising a detector as claimed in claim 7 or an imaging system as claimed in claim 10.~~

13. The mask as claimed in claim 3, wherein the mutual coherence of the sensing matrix is a minimized mutual coherence.

14. The mask as claimed in claim 3, further comprising:

(i) a cube or other Platonic solid,

(ii) a truncated icosahedral or other Archimedean solid,

(iii) a cylinder, or

(iv) a sphere.

15. The detector as claimed in claim 7, wherein the mutual coherence of the sensing matrix is expressed as $\mu(\varphi)$, where:

$$\mu(\varphi) = \max_{i \neq j} \left| \varphi_i^T \varphi_j \right|, \quad \text{or}$$

$$\mu(\varphi) = \max_{i \neq j} \frac{|\varphi_i^T \varphi_j|}{\|\varphi_i\|_2 \|\varphi_j\|_2},$$

where φ is a matrix containing $M \times N^2$ rows of the sensing matrix, arising from M measurements and an N^2 pixel image, and φ_i and φ_j are columns of φ; and

the mutual coherence of the sensing matrix is a minimized mutual coherence.

16. The detector as claimed in claim 7, wherein the mutual coherence of the sensing matrix is expressed as $\mu(\varphi)$, where:

$$\mu(\varphi) = \max_{i \neq j} \left| \varphi_i^T \varphi_j \right|, \quad \text{or}$$

$$\mu(\varphi) = \max_{i \neq j} \frac{|\varphi_i^T \varphi_j|}{\|\varphi_i\|_2 \|\varphi_j\|_2},$$

where φ is a matrix containing $M \times N^2$ rows of the sensing matrix, arising from M measurements and an N^2 pixel image, and φ_i and φ_j are columns of φ; and

the mask further comprises

(i) a cube or other Platonic solid,

(ii) a truncated icosahedral or other Archimedean solid,

(iii) a cylinder, or

(iv) a sphere.