

## Description of the Scintillation radiation detector to be launched in a CubeSat

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### Objective:

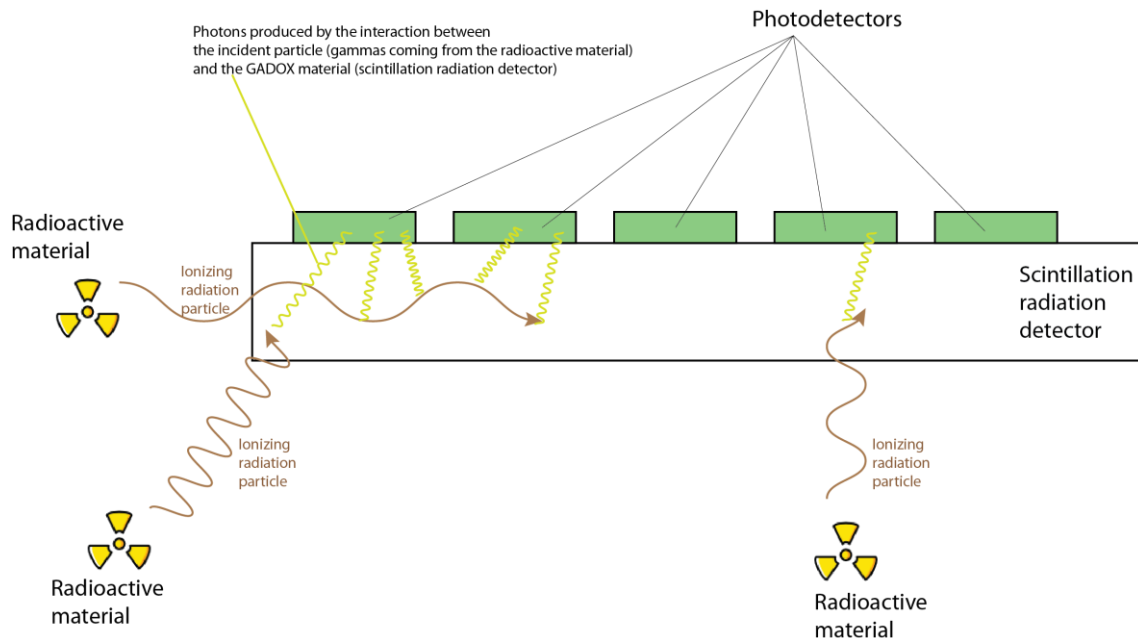
To build a cheap and effective detector able to detect undeclared radioactive material for illegal uses.

This detector is able to detect the energy of the incident particles coming from the radioactive material and the direction of these particles.

The space is a radioactive place full of ionizing radiation particles coming from the Universe. This detector can be tested in the space as a laboratory of a large dimension with all kind of ionizing radiation particles coming from different places.

### Physics:

When a gamma particle coming from the radioactive material or from the space hits with the Scintillation radiation detector (SRD), this produce a photon of light (visible or UV). Photodetectors placed along of the SRD collect these photons of light. The collected light gives an alarm warning of the presence of radioactive material.



### Materials:

Scintillation radiation detector could be made of gadolinium Oxysulfide (GADOX) doped with rare earths like Eu, Tb, Tl, Ce, etc. This material is ceramic. This material have been tested for

ionizing radiation detections with very good results and is part of some commercialized equipments of detections for medical and X-rays purposes. It is very cheap. GADOX will be content by a thin plastic cover.

Good candidates for the photodetectors are CCD (specialized or normal like the mobile phones), CMOS or specific photodetectors. Experiments with conventional CCD have been made with good results.

A lens for light pick up, could be good to increase the light in the photodetector. This lens could be placed between GADOX and photodetector. A good candidate of lens would be Fresnel type.

**Other materials:**

Electronic circuit for data transfer and / or storage data.

Battery for this electronic circuit

Wires for the connections between photodetectors and electronic circuit and the battery.

**Sizes:**

Detector system (GADOX + photodetectors): maximum of 3 cm x 3 cm x 25 cm .

Battery size like a mobile phone.

Electronic circuit as little as possible.

**Extra requirements:**

In principle, no extra requirements is needed.

**Results of the space experiment:**

The results coming from the experiment in the space help to design a detector to be used for specials military forces, police, watchman, etc. The main different between conventional detector and this detector is the price. Why? This detector does not be used to dosimetry measurements; only will be used for detect any kind of ionizing radiation, it`s to say, gives an alarm. The other reasons of the very low costs is the price of the GADOX, photodetectors (if CCD are used) and the electronic chain.

Decreasing the price of ionizing radiation detectors, every people can have one. By this way, its is possible to create a big data of undeclared radioactive material to be used for illegal uses and control better than the actual mode.

One possibility is to build only a little volume of detector and to be coupled to a mobile phone (with camera). Other equipments to be coupled could be surveillance cameras, normal cameras, etc. with an app or software for the warning detection. By this way the price of the detector is only of the GADOX detector (~5 \$).

