Study and manufacturing of an APD arrays polarized in Geiger-mode for application in radiology for detection of cancer cells

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The domain of Geiger-APD has reached an advanced development in the last years. The basic idea of this structure consists in polarizing an APD in Geiger-mode by applying a voltage beyond its breakdown voltage. In this case of polarization, the APD is working in a special mode and is able to detect the single photon. The theory of detection of single photon using this detector has been invented in the beginning of 90's and developed for detection of low light intensity. By using this kind of photodiode in the Geiger-mode, we designed a new type of detector and several applications have been explored. In astrophysics, we can use this detector for the detection of cosmic rays (through the detection of Cerenkov light generated by atmospheric showers). Another application is also possible and reveals an important method for detection of cancer cells.

The idea of this work is to use the spatial resolution and rapidity of the Geiger-APD in the field of very low light intensities; it would be possible to explore new areas. The equipment that we intend to achieve will be a series of Geiger-APD arrays (imagers) based on the principle detector unit.

But where is the importance of this detector in very low light intensities in life? For example, in all the phenomena of induced fluorescence, with risks of disruption of life due to lighting inducer itself. But also in spontaneous emissions which can occur at the cellular level. These emissions related to the exchange of oxygen, would be stronger in cancer cells because of their increased metabolism. This would be a new diagnostic tool for detecting these activated areas.

We will describe in this paper the technology of manufacturing of the APD arrays and the detailed system used for detection of cancer cells.