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X-ARAPUCA a new development of the ARAPUCA device

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The X-ARAPUCA is an improvement of the concept of the original ARAPUCA device. The original idea remains the same in term of photon trapping inside an highly reflective box. The acceptance window is constituted by a dichroic window, which has the property of being highly transparent for wavelengths below a certain cutoff, while being highly reflective above it. The filter is coated with two wavelength shifters on its two sides: the one the external side converts the VUV 127 nm light to the region where the filter is transparent, while the internal one shifts the light to the region where it is reflective. In this way light enters the device, but can not exit.

The improvement consists in installing a waveshifting light guide inside the box, in the form of a slab with the same dimensions of the acceptance window. The dichroic filter, in this case, should be coated only on the external side. A photon trapped inside the X-Arapuca will be detected in two different ways by the SiPM array: guided by the waveshifting light guide or reaching it after few reflections on the internal surfaces (as standard ARAPUCAs do). This could lead to a substantial increase of the ARAPUCA collection efficiency.

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