

X-ray camera makes A-grade particle detector

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In the particle identification business, two pieces of information are vital: energy and spatial location. By measuring its energy you can work out the mass of your mystery particle. From its spatial location on the surface of a detector, you can work out where the particle came from – and therefore how big the event was that produced the particle in the first place. For the range of energies close to one million electron volts (1 MeV) – a popular energy range to probe, with uses in a variety of fields from cancer treatment research to astrochemistry – there are currently two leading methods of detecting particles. But both are limited in the types of molecules they can detect, and both sacrifice one type of information – spatial location or energy measurements – for the other.

Now a group of nuclear physicists and molecular scientists from the Université Paris Sud and Hamamatsu Photonics have demonstrated a new type of detector that can do both of these jobs at the same time. Their device uses the CCD image sensor chip in a particular off-the-shelf X-ray camera. In the study, described in a paper accepted to the AIP's *Review of Scientific Instruments*, the experimenters accelerated charged atoms (or ions) of carbon at various energies above 1 MeV, then "caught" those atoms with the camera. A single ion impact with the camera produced a bright spot on the image sensor. They also accelerated molecules containing carbon and hydrogen. Unfortunately, these bigger [particles](#) overwhelmed the CCD chip, wiping out the details.

To avoid saturating the sensor, the researchers came up with the solution

of putting a piece of thin carbon foil in front of it. The foil breaks up the projectile molecules that collide with it and sends them, like shrapnel, to the sensor to be counted. The foil also allowed them to separate different types of molecules from one another when the molecules' signatures would otherwise have overlapped.

The researchers say they hope their new detector will open the door to a new class of tools in the study of complex [molecules](#) using high-energy accelerators.

More information: "Detection of atomic and molecular MeV projectiles using an X-ray CCD camera" is accepted for publication in the *Review of Scientific Instruments*.

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