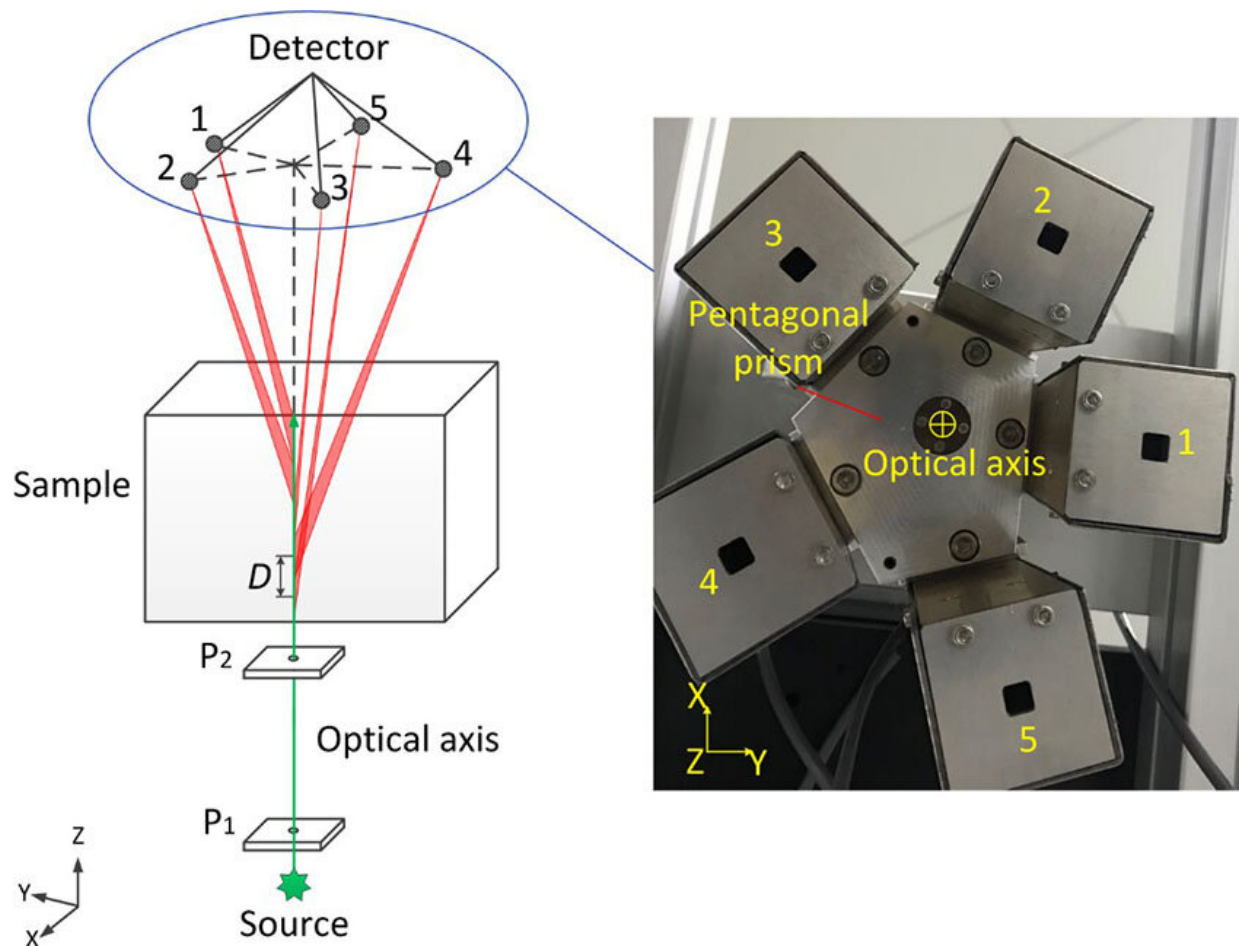


Improving efficiency, effectiveness of security X-ray technology

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A 3D view and a photograph of the spiral EDXRD system. Credit: Baozhong Mu

The smuggling of contraband, such as explosives and drugs, is a major

threat in airport security. These risks have increased in modern times with the uptick in parcel delivery, but security inspection methods have not seen any significant improvements.

In the journal *AIP Advances*, researchers at Tongji University and Zhejiang University City College propose a new technique for the efficient [security](#) detection of contraband items. Typically, [airport security](#) uses X-ray imaging to quickly scan through baggage, but this method suffers many limitations.

"In the field of security inspection, the X-ray apparatus is the most important device," said Baozhong Mu, a professor at Tongji University. "However, an X-ray apparatus can't distinguish explosives, drugs and [raw materials](#) from usual organic matter."

To address this, luggage with suspicious X-ray results undergoes supplementary screening using a method called energy-dispersive X-ray diffraction. With EDXRD, every material has its own unique fingerprint, so the pattern of light created by the scan can be used to identify a suspicious substance in a bag. Despite this important capability, EDXRD can only cover small, thin areas, making it inefficient as a primary screening mechanism.

The group developed an EDXRD system capable of examining thick objects without the need to conduct multiple scans at different locations. By placing an array of detectors into a spiral setup, the total detection area increases.

Using a test spiral setup of five detectors, the group was able to identify the EDXRD fingerprints of concealed objects and [illicit drugs](#) placed anywhere within a bag that was about 4 inches thick. By adding more detectors into the spiral setup, the detection depth can be increased to cover the average luggage size.

"Accurately identifying explosives and drugs without opening the bag was thought to be impossible," Mu said.

With an increased detection depth, the EDXRD [spiral](#) array setup can be used to distinguish individual items within an entire suitcase. "This technology is expected to be widely used in five years," he said.

More information: Yifan Chen et al, Energy-dispersive X-ray diffraction system with a spiral-array structure for security inspection, *AIP Advances* (2019). [DOI: 10.1063/1.5126051](https://doi.org/10.1063/1.5126051)

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