

Research team realizes three-color photodetector

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While infrared waves are available in short, mid, and long lengths, most detection devices are unable to harness all three at the same time.

Now Northwestern University's Manijeh Razeghi and her team have developed a new approach in device design to realize a three-color, shortwave-midwave-longwave infrared [photodetector](#). With the new design, the devices can detect different infrared wavebands by simply varying the applied bias voltage. This could open up a range of potential applications, including infrared color televisions and three-color infrared imaging.

"A device capable of detecting different infrared wavebands is highly desirable in the next generation infrared imaging systems," said Razeghi, Walter P. Murphy Professor of Electrical Engineering and Computer Science in Northwestern's McCormick School of Engineering.

Supported by DARPA, the Army Research Laboratory, Air Force Research Laboratory, and NASA, the team's finding were published on April 7 in Nature's *Scientific Reports*.

Led by Razeghi, the researchers invented and investigated the new design for three-color photodiodes without using additional terminal contacts. The resulting photodetector is based on indium-arsenide/gallium-antimonide/aluminum-antimonide type-II superlattices.

As the applied bias voltage varies, the photodetector sequentially

exhibits the behavior of three different colors, corresponding to the bandgap of three absorbers, and achieves well-defined cut-off wavelengths and high-quantum efficiency in each channel.

This new research builds on the Razeghi group's many years of work in Northwestern's Center for Quantum Devices, including the development of the first single-color, short-wavelength infrared photodetector and two-color, shortwave-midwave infrared photodetector based on type-II superlattices.

"I am fascinated by these results," Razeghi said. "The initial success in this demonstration will drive us to the new frontier of infrared detection and imaging technology."

More information: Anh Minh Hoang et al. High performance bias-selectable three-color Short-wave/Mid-wave/Long-wave Infrared Photodetectors based on Type-II InAs/GaSb/AlSb superlattices, *Scientific Reports* (2016). [DOI: 10.1038/srep24144](https://doi.org/10.1038/srep24144)

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