

## 1.1. Subject

Technical Application Note (TAN2008006): Quantum Efficiency Curve Comparison for ICX445AL

## 1.2. Applicable Product(s)

- Point Grey cameras equipped with Sony® ICX445AL, ICX424AL, ICX204AL, ICX267AL, ICX274AL, ICX285AL, ICX414AL, ICX618AL or IMX035LQR imaging sensors

## 1.3. Application Note Description

The purpose of this Technical Application Note is to provide a comparison of the quantum efficiency performance of the Sony® ICX445AL progressive scan CCD with that of other popular sensors.

## 1.4. Overview

Point Grey Research has camera models equipped with a Sony® ICX445 1/3" progressive scan image sensor. Featuring EXview HAD CCD technology, this sensor is designed to capture light in the near infrared region with greater sensitivity. The FL2G-13S2 and CMLN-13S2 are the most recent models using this sensor.

This article compares the quantum efficiency curve of the ICX445AL with that of the ICX424AL, ICX204AL, ICX267AL, ICX274AL, ICX285AL, ICX618AL and ICX414AL. Additionally, the color channels of the ICX445AQ sensor are compared with those of the IMX035LQR.

Imager	Pixel Size
ICX445AL	3.75µm x 3.75µm
ICX424AL	7.4 µm x 7.4µm
ICX204AL	4.65µm x 4.65µm
ICX267AL	4.65µm x 4.65µm
ICX274AL	4.4µm x 4.4µm
ICX285AL	6.45µm x 6.45µm
ICX414AL	9.9 µm x 9.9 µm
ICX618AL	5.6 µm x 5.6 µm
IMX035LQR	3.63 µm x 3.63 µm

## 1.5. Capturing Quantum Efficiency Data

Quantum Efficiency (QE) measures the efficiency of the sensor to convert incident photons into charge, taking into account only those photons that actually reach the sensor surface. QE differs from

spectral, or relative, response in that spectral response measures the signal generated by the sensor relative to the amount of light directed at the sensor.

Measurements were taken by projecting a monochromatic light on both the camera and a power measuring diode. The produced wavelength of the apparatus was adjusted in increments of 10nm in order to scan the range indicated by the graph. At any given point the sensitivity measure is the quotient of response over measured power. The camera's response is a digital number average of the image produced by the camera minus the image average at pitch dark conditions. For purposes of comparison, the preset electronic shutter time for each measurement is used to scale sensitivity.

## 1.6. Interpreting Quantum Efficiency Data

Against the ICX204AL, ICX267AL, ICX414AL and ICX424 sensors, the ICX445 shows significantly higher luminance sensitivity across much of the spectrum, particularly the mid- to high-wavelengths. Of particular note is that this sensitivity does not come at the expense of pixel size. In fact, at  $3.75\mu\text{m} \times 3.75\mu\text{m}$ , the ICX445 has the smallest pixel size of all the sensors measured, except the IMX035 ( $3.63\mu\text{m} \times 3.63\mu\text{m}$ ). Against the ICX274, higher sensitivity is concentrated across mid- to high-wavelengths. The ICX445 is slightly less sensitive across lower wavelengths. Against the ICX285AL, the ICX445AL is slightly more sensitive across higher wavelengths, and equally or less sensitive across middle and lower wavelengths. Against the ICX618AL, the ICX445AL is slightly less sensitive across the mid- to high-wavelengths. The red channel of the ICX445AQ exhibits slightly higher sensitivity than the IMX035LQR across mid- to high-wavelengths, while the blue and green channels exhibit slightly less sensitivity near the middle of their spectra.

## 1.7. Sensor Response Comparison Graphs

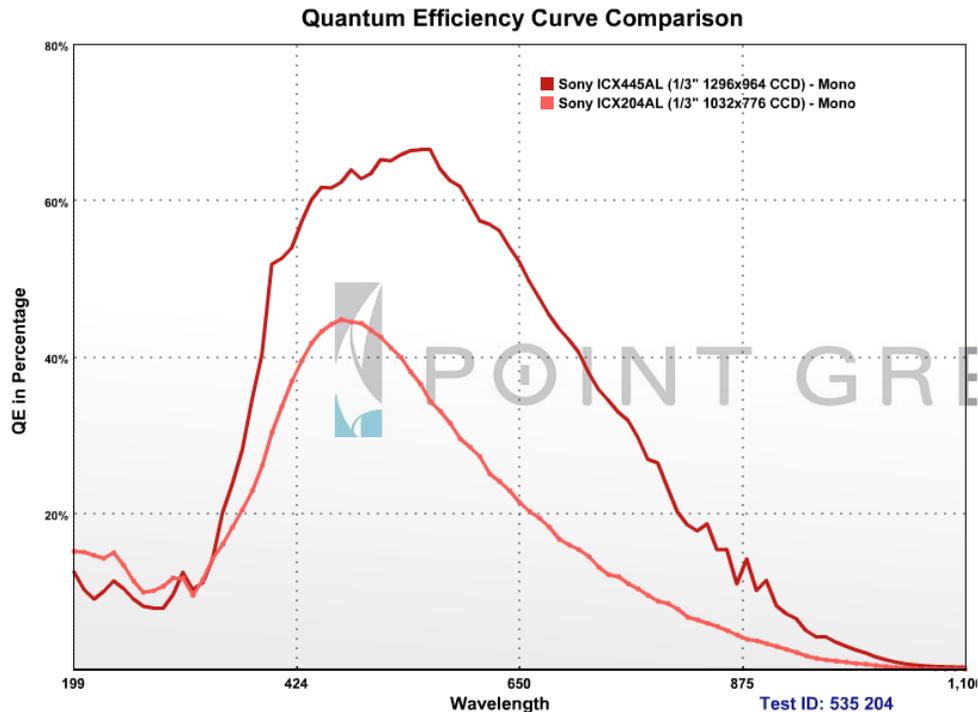


Figure 1: ICX445AL and ICX204AL

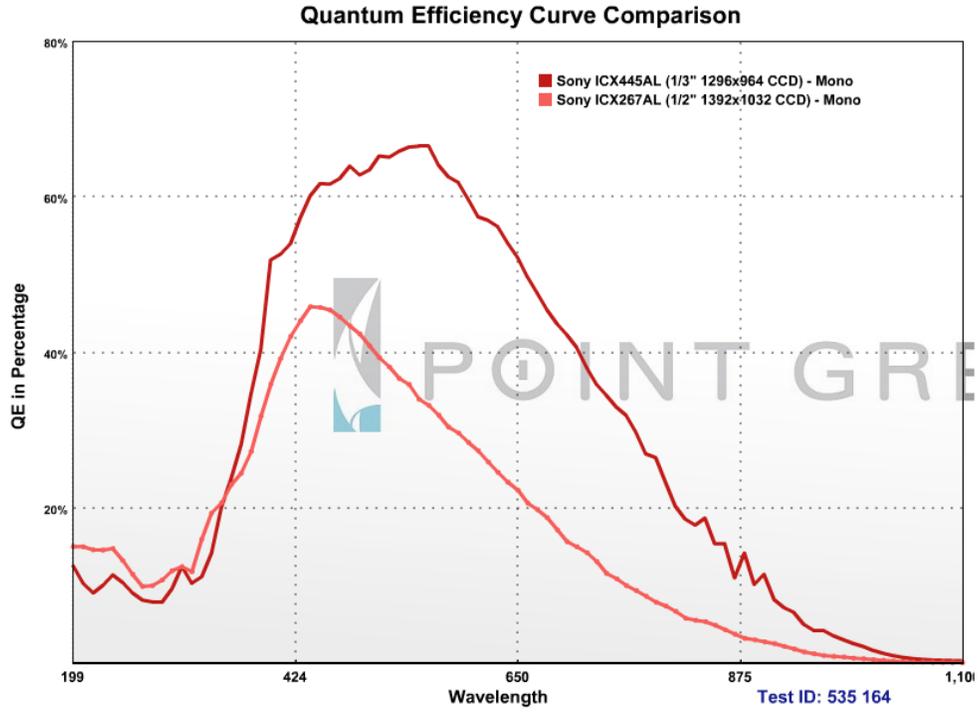


Figure 2: ICX445AL and ICX267AL

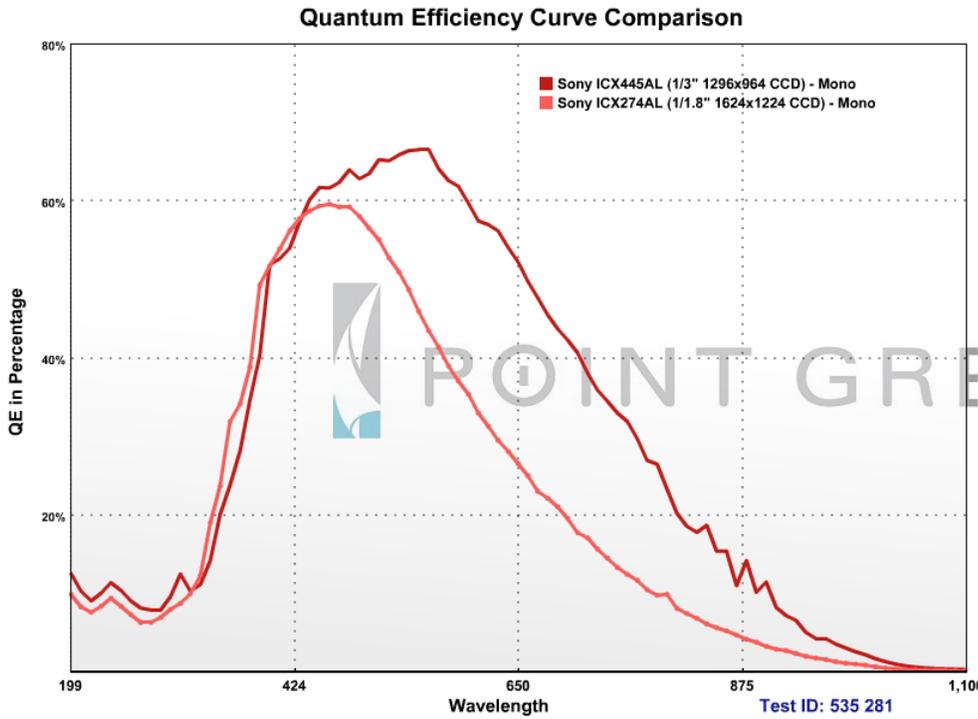


Figure 3: ICX445AL and ICX274AL

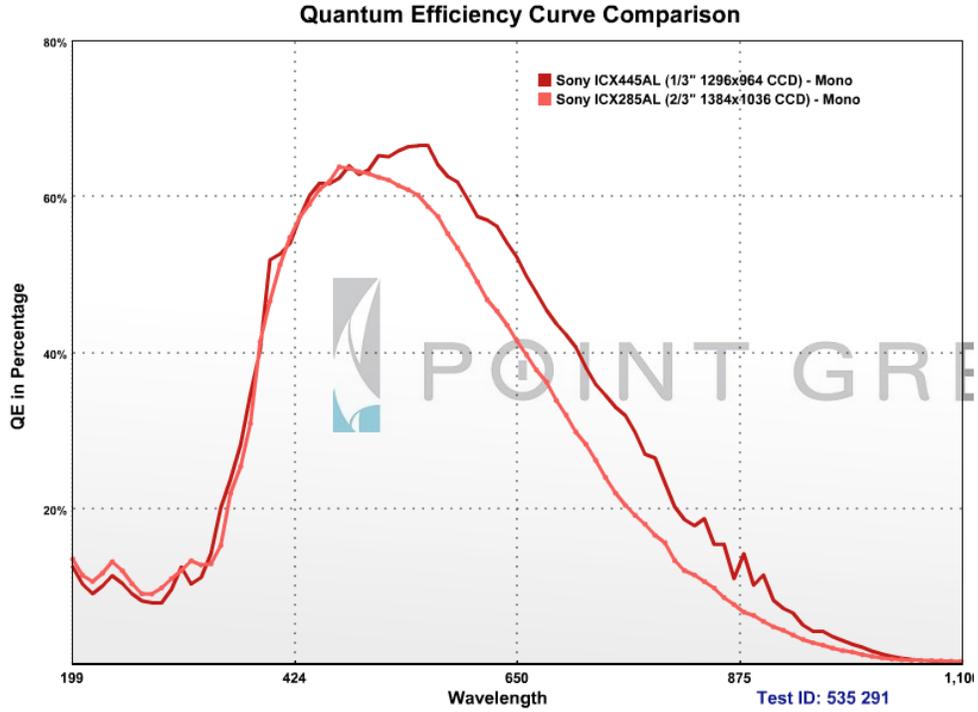


Figure 4: ICX445AL and ICX285AL

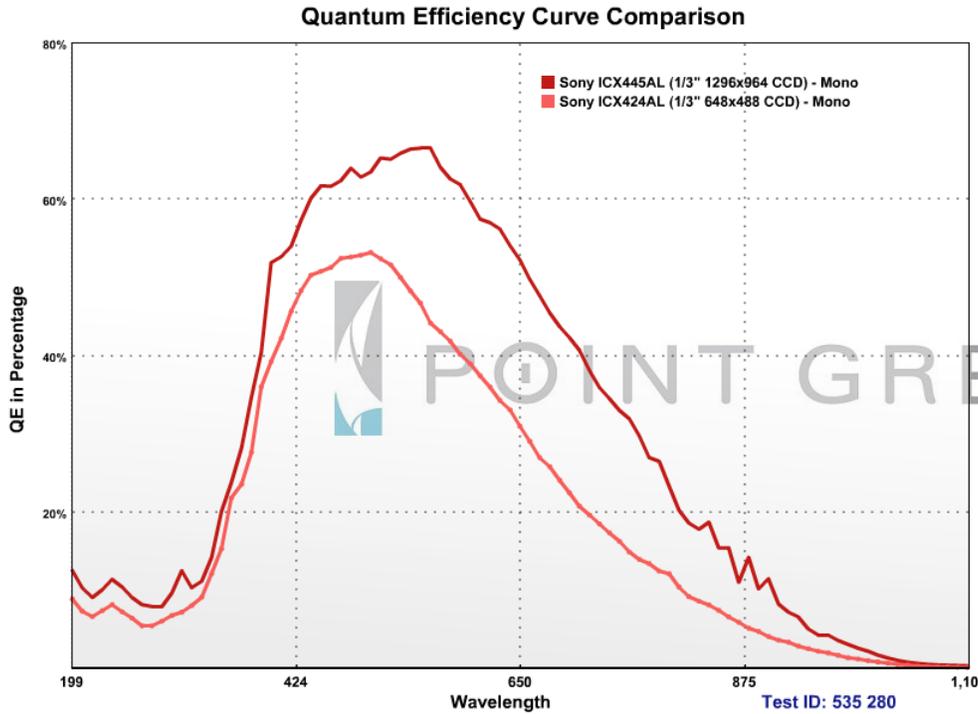


Figure 5: ICX445AL and ICX424AL

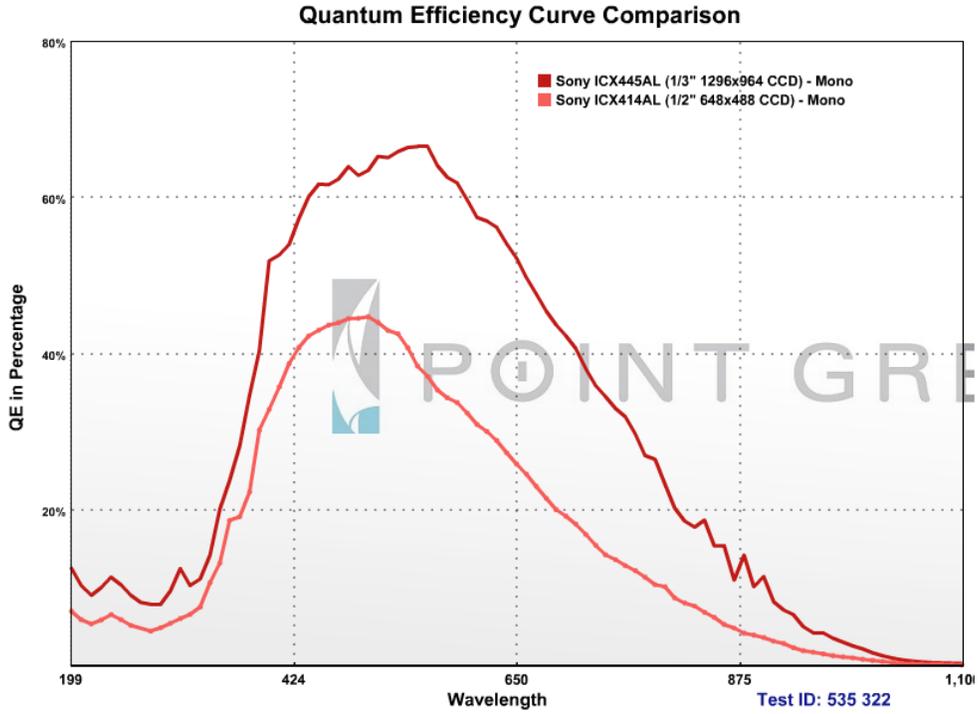


Figure 6: ICX445AL and ICX414AL

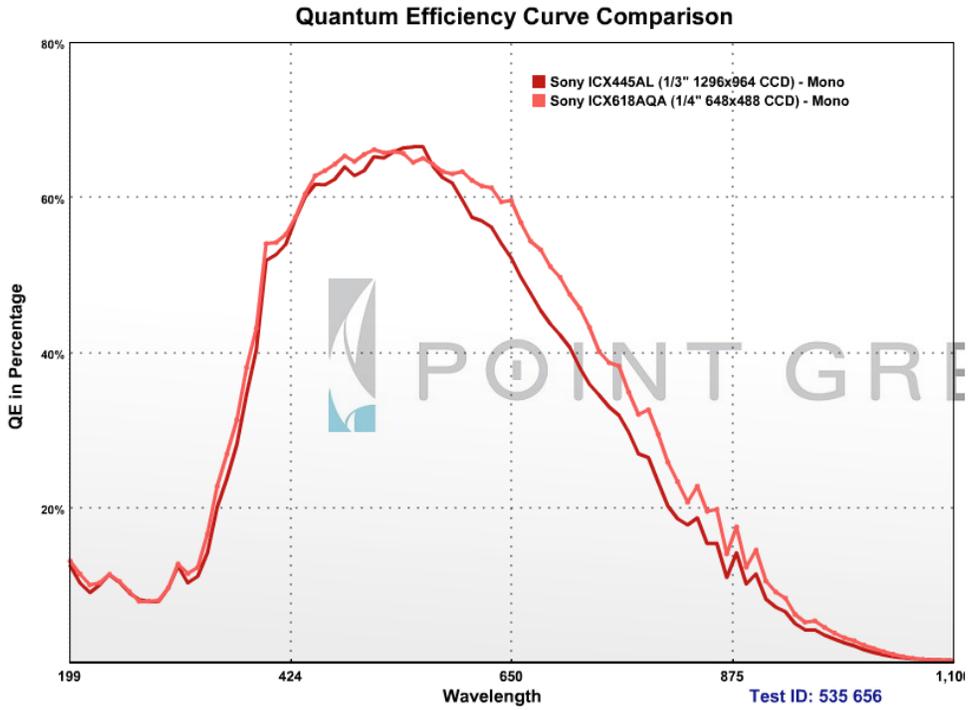


Figure 7: ICX445AL and ICX618AL

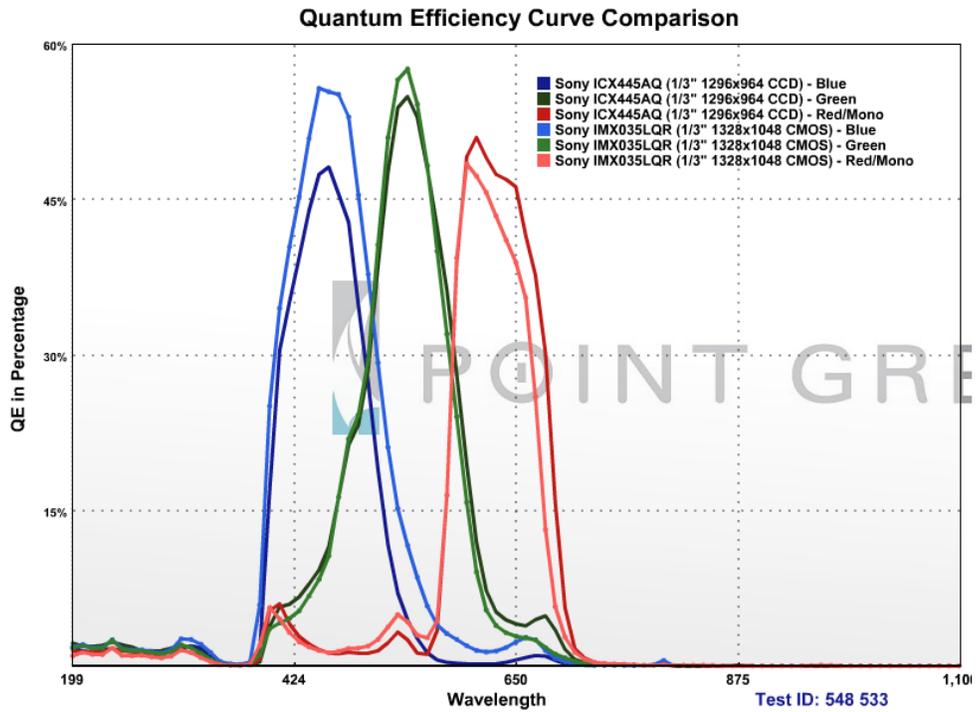


Figure 8: ICX445AQ and IMX035LQR



*QE response of color channels was generated with an infrared cut filter in place.*

## 1.8. Additional Downloads and Support

Access more Technical Application Notes on the web at [www.ptgrey.com/support/downloads](http://www.ptgrey.com/support/downloads).

Point Grey Research Inc. endeavors to provide the highest level of technical support possible to our customers. Most support resources can be accessed through the Product Support section of our website: [www.ptgrey.com/support](http://www.ptgrey.com/support).

### Creating a Customer Login Account

The first step in accessing our technical support resources is to obtain a Customer Login Account. This requires a valid name, e-mail address, and camera serial number. To apply for a Customer Login Account go to [www.ptgrey.com/support/downloads/](http://www.ptgrey.com/support/downloads/).

### Knowledge Base

Our on-line knowledge base at [www.ptgrey.com/support/kb/](http://www.ptgrey.com/support/kb/) contains answers to some of the most common support questions. It is constantly updated, expanded, and refined to ensure that our customers have access to the latest information.

### Product Downloads

Customers with a Customer Login Account can access the latest software and firmware for their cameras from our downloads site at [www.ptgrey.com/support/downloads](http://www.ptgrey.com/support/downloads). We encourage our customers to keep their software and firmware up-to-date by downloading and installing the latest versions.

### Contacting Technical Support

Before contacting Technical Support, have you:

1. *Read the product documentation and user manual?*
2. *Searched the Knowledge Base?*
3. *Downloaded and installed the latest version of software and/or firmware?*

If you have done all the above and still can't find an answer to your question, contact our Technical Support team at [www.ptgrey.com/support/contact/](http://www.ptgrey.com/support/contact/).