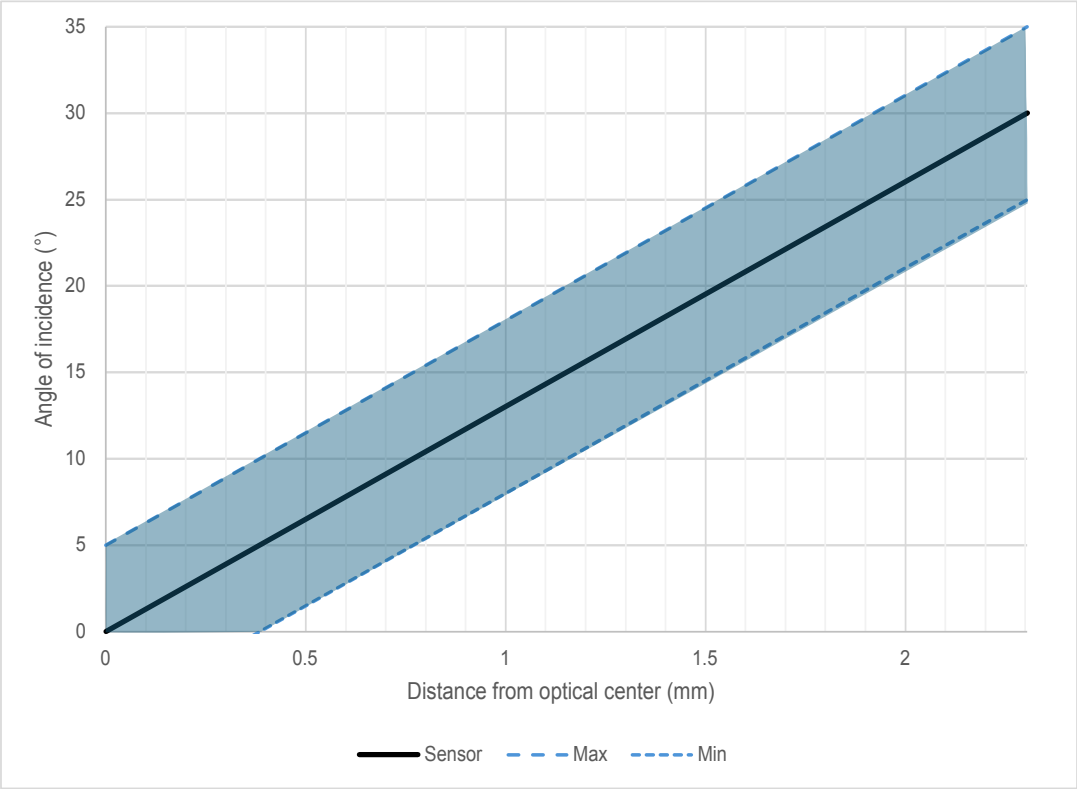
# Lens CRA matching recommendations for optimal colorization

## Introduction

The VB66GY, VD66GY, VB16GZ, and VD16GZ sensors embed microlenses on the top of each pixel to increase light collection. To compensate for the lens chief ray angle (CRA), the microlens position is shifted linearly. It is centered over the pixel at the matrix center and becomes progressively more decentered towards the matrix edges.

The VB66GY, VD66GY, VB16GZ, and VD16GZ sensors are optimized for matching a lens CRA of 30° at the corners (see black line in Figure 1 ).

**Figure 1. Sensor microlens shift and lens CRA tolerance for optimal colorization versus distance from optical center**




The CRA mismatch occurs as soon as the lens CRA is not identical to the sensor CRA, which can affect the image quality, especially the color accuracy, and uniformity.

In practice, this situation happens when the light coming out of the lens hits the pixels with an angle of incidence (AOI) outside the angular acceptance range of the microlenses (see blue area in Figure 1).

RGB and RGB-NIR sensors are particularly sensitive to CRA mismatch because optical crosstalk depends on wavelength.

When light strikes a color sensor with a Bayer filter at an incorrect AOI, the light can leak from one color channel to an adjacent one, creating a color shading.

Generally, color shading has a characteristic pinkish tint in the image corners (see the first two images in Figure 2).

*Note: It is recommended to match the lens CRA with the sensor CRA to maximize the light collection and the image quality.*

*If not, we recommend choosing a lens with a CRA mismatch in the ±5° tolerance versus the sensor CRA (see the blue area in Figure 1) to avoid colorization artifacts (see the third image in Figure 2).*

***Figure 2. Color shading observation for three CRA mismatch***

## Revision history

Table 1. **Document revision history**

| Date | Version | Changes |
|---|---|---|
| 24-Mar-2026 | 1 | Initial release |