Sensor Field of View

A 25 mm diameter sensor is used with a 50 mm focal length optical system to image a distant scene. What is the angular FOV of the system? The system is in air.

Solution:

\[ \tan \frac{\theta_{1/2}}{2} = \frac{12.5\text{mm}}{50\text{mm}} = 0.25 \]

\[ \theta_{1/2} = 14.04^\circ \]

\[ FOV = \theta = 2\theta_{1/2} \]

\[ FOV = 28.07^\circ \]

Since the system is in air, the principal planes and nodal points are coincident. The ray angle transfers from \( P' \) to \( P \).

The object is distant (at infinity) so the chief ray through the Entrance Pupil will be parallel to this object space ray through the Front Principal Point/Nodal Point. This is independent of the Entrance Pupil position.

\[ \bar{u}_0 = \tan \theta_{1/2} = 0.25 \]

In general, because the Exit Pupil is not located at the Rear Principal Plane, the image space chief ray is not parallel to the image space nodal ray:

\[ \bar{u}' \neq \bar{u}_0 = \tan \theta_{1/2} \]