

Answer on Question 55056, Physics / Astronomy | Astrophysics

Question:

The 2.3GHz feed at Arecibo illuminates an elliptical aperture 225m by 200m in size, and the aperture efficiency η_A over this ellipse is η_A about 0.70. What is the sensitivity of this system in K/Jy?

Solution:

The geometric area of the ellipse illuminated is $A_{\text{geom}} = \pi AB$, where A and B are the semi-major and semi-minor axes (i.e. 225/2m and 200/2 m, respectively). Therefore:

$$A_{\text{geom}} = 3.53 \times 10^8 \text{ cm}^{-2}$$

Since the aperture efficiency is:

$$\eta_A = \frac{\max(A_e)}{A_{\text{geom}}},$$
$$A_e \leq 2.47 \times 10^8 \text{ cm}^{-2}$$

Following part (a), the sensitivity in K/Jy will be:

$$\frac{A_e}{2k} = 8.9 \text{ K} / \text{Jy}$$

Answer: 8.9 K/Jy