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Method for Calculating Refractive Gain for Color TV Picture Tube and Color Monitor Tube Screens

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Method for Calculating Refractive GainFor Color TV Picture Tube and Color Monitor Tube Screens

The size of TV picture tubes and monitor tubes is determined by the minimum viewable screen diagonal in the Worldwide Type Designation System. For color TV picture tubes and color monitor tubes, the actual screen size (on the inside surface of the face panel) is calculated from the specified minimum viewable screen (as viewed from the outside surface of the face panel). Therefore, it takes into account the refractive gain of the glass face panel of the tube (See EIA Recommended Standard EIA-527). However, there are different methods of determining the refractive gain. This TEPAC Publication describes the two methods of calculating the refractive gain that are to be used for color TV picture tubes and color monitor tubes. The first method is for face panels that are described by a polynomial, and the second method is for face panels that are described by annular segments of spheres.

For Face Panels Described by a Polynomial

This method is to be used when the outside and inside surfaces of the face panel are described by the following general polynomial:

$$\begin{aligned} Z = & A_0 + A_1 * X^2 + A_2 * X^4 + A_3 * X^6 & (1) \\ & + A_4 * Y^2 + A_5 * X^2 * Y^2 + A_6 * X^4 * Y^2 + A_7 * X^6 * Y^2 \\ & + A_8 * Y^4 + A_9 * X^2 * Y^4 + A_{10} * X^4 * Y^4 + A_{11} * X^6 * Y^4 \\ & + A_{12} * Y^6 + A_{13} * X^2 * Y^6 + A_{14} * X^4 * Y^6 + A_{15} * X^6 * Y^6 \end{aligned}$$

Where: Z = Sagittal height at the desired location
X = Horizontal distance to the desired location
Y = Vertical distance to the desired location

The radial distance W from the Z axis of the tube to the location of the desired sagittal height is calculated as follows:

$$W = (X^2 + Y^2)^{0.5} \quad (2)$$

For the horizontal axis of the screen, Y = 0; therefore, W = X and formula (1) becomes:

$$Z = A_0 + A_1 * X^2 + A_2 * X^4 + A_3 * X^6 \quad (3)$$

Likewise, for the vertical axis of the screen, X = 0; therefore, W = Y and formula (1) becomes:

$$Z = A_0 + A_4 * Y^2 + A_8 * Y^4 + A_{12} * Y^6 \quad (4)$$

