line of some width made up of many thin lines each at different optical densities and at an angle $\gamma$ to the space axis of the film. The optical density of the broad line varies from high to low density in the direction of the camera sweep (i.e., increasing time). The geometry of the envelope of lines is shown in Fig. C.1.

An analytical expression for the error can easily be derived from the geometry, resulting in

$$\varepsilon = AB \sin \gamma/(S-AB \cos \gamma) \qquad (C.5)$$

where $AB$ is the camera slit width, $\gamma$ is the angle of the trace, and $S$ is the trace length. The typical systematic error is $0.018$ rad for $AB = 0.05$ mm, $\gamma = 0.786$ rad, and $S = 2$ mm.

The third contribution to the error is that due to the accuracy of the Vanguard analyzer in determining $\gamma$. By assuming the error can be assigned to one reader variable, then Eq. (C.1) is applicable. The slit width $AB$ in Eq. (C.1) is replaced by the smallest distance measurable by the Vanguard analyzer (0.005 mm). A typical error is $0.002$ rad for $\gamma = 0.786$ rad and $S = 2$ mm.

The fourth contribution to the error is due to the spatial resolution. The smallest distinguishable spatial distance on the film was about $0.03$ mm for the camera in a simulated experimental setup. (See Appendix B.) Treating this uncertainty as independent of the others, an expression for this error becomes

$$\varepsilon_{SR} = \left(\frac{0.03 \text{ mm}}{S}\right) \cdot \cos \gamma \ . \qquad (C.6)$$

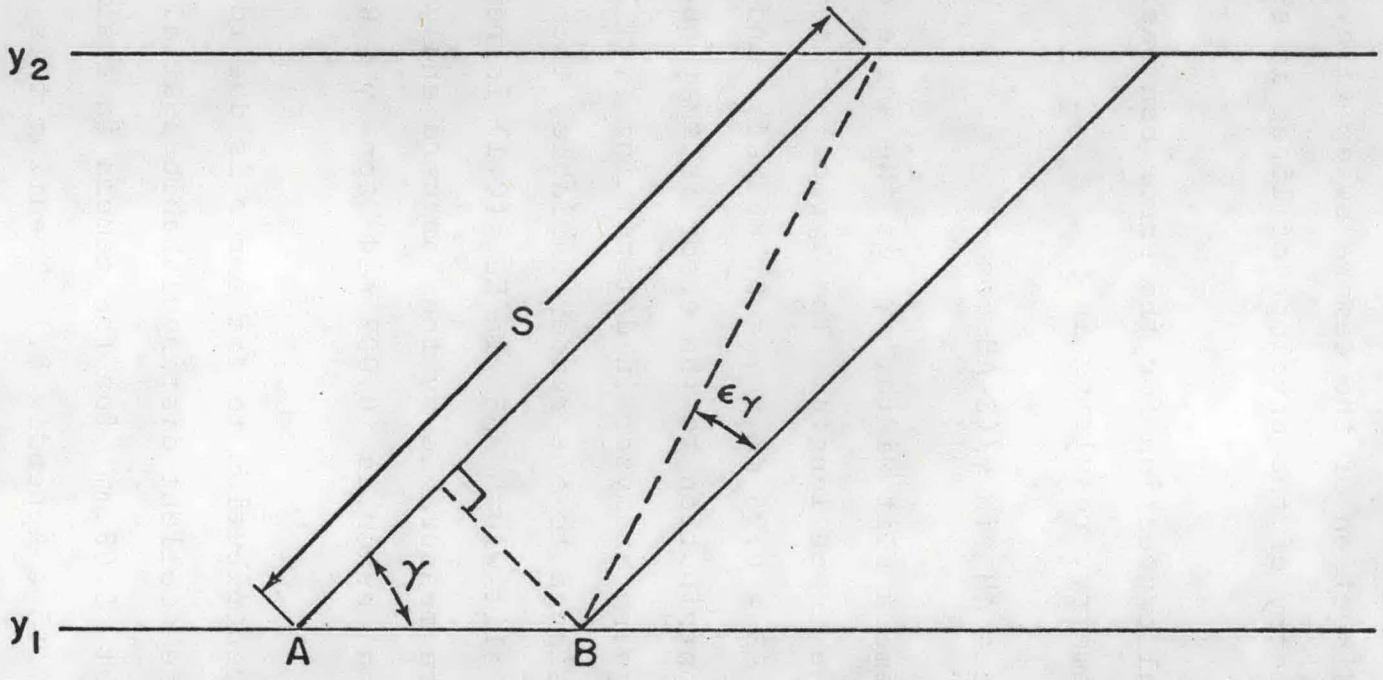


Fig. C.1.--Envelope of parallel lines between A and B make up the streak camera trace.