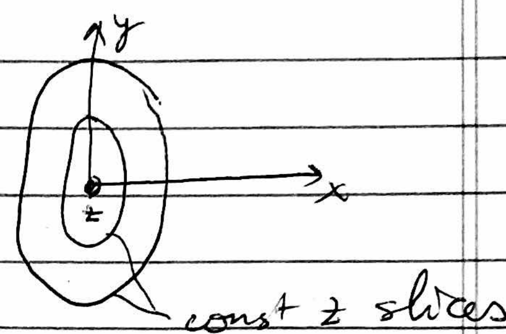
Sphere, at rest $x^2+y^2+z^2=1$

moving $\frac{x^2}{1-\beta^2}+y^2+z^2=1$



looking from a distance along z,

Suppose image from $z=0$ slice ~~arrives~~ emits @ $t=0$,
Then, from other slices its emitted at times $t=\frac{z}{c} \in \left(-\frac{1}{c}, \frac{1}{c}\right)$.

Thus, images of slices are

$$\frac{(x-vt)^2}{1-\beta^2}+y^2+z^2=1$$

or $$\frac{(x-\beta z)^2}{1-\beta^2}+y^2+z^2=1$$

now, for fixed y, extremize x, to find envelope

$$x=\beta z \pm \sqrt{(1-y^2-z^2)(1-\beta^2)}$$

$$\frac{\partial x}{\partial z}=\beta \pm z\sqrt{\frac{(1-\beta^2)}{(1-y^2-z^2)}}=0$$

$$\beta^2=\frac{z^2(1-\beta^2)}{1-z^2-y^2}$$

$$\beta^2(1-\cancel{z^2}-y^2) = z^2(1-\cancel{\beta^2})$$

$$z^2 = \beta^2(1-y^2)$$

$$\hookrightarrow \pm x = \beta^2\sqrt{1-y^2} + \sqrt{\left(1-y^2-\beta^2(1-y^2)\right)(1-\beta^2)}$$

$$= \beta^2\sqrt{1-y^2} + (1-\beta^2)\sqrt{1-y^2} = \sqrt{1-y^2}$$

$$\hookrightarrow x^2+y^2 = 1$$

for image of Lorentz contracted sphere