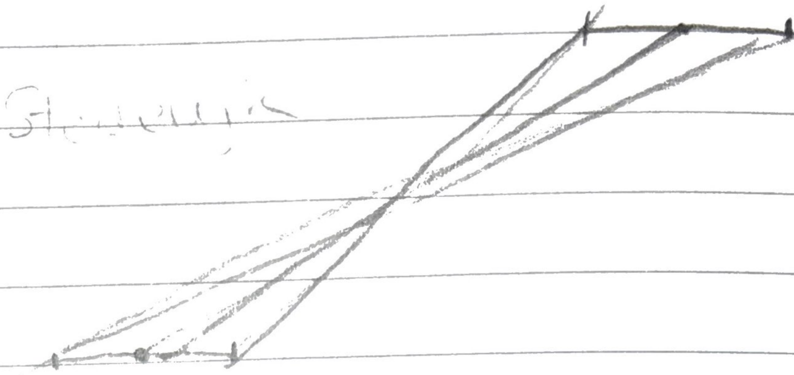
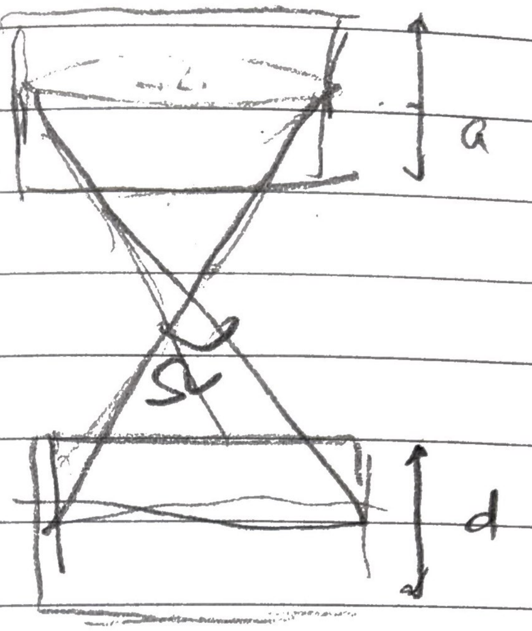


Calculating the Solid angle

between 2 plates

V. 2.0

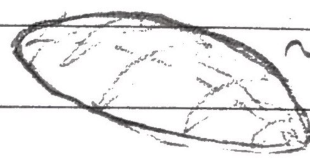
Two scintillators plates of area A ($w \times h$) separated vertically d



Simple case, aligned and parallel scintillators

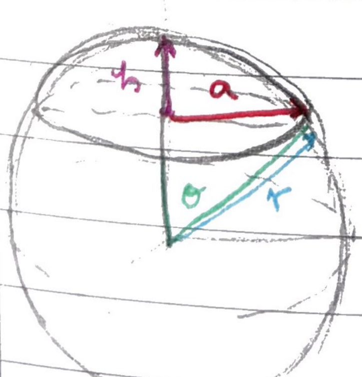
$$\omega\Omega = \frac{A}{r^2}\,sr = \frac{2\pi h r}{r^2} = \frac{2\pi h}{r}$$

$A \equiv$ spherical cap



SPHERICAL CAP AREA [google Spherical Cap]

dependent on		
radius (r) height cap (h)	radius base cap (a) height cap (h)	radius (r) polar angle (θ)
$A = 2\pi r h$	$A = \pi(a^2 + h^2)$	$A = 2\pi r^2(1-\cos\theta)$
$0 \le h \le 2r$	$0 \le a \quad 0 \le h$	$0 \le \theta \le \pi$ / $0 \le r$



$\omega\Omega$

where

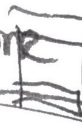
WIKI

[can be shown geometrically too]

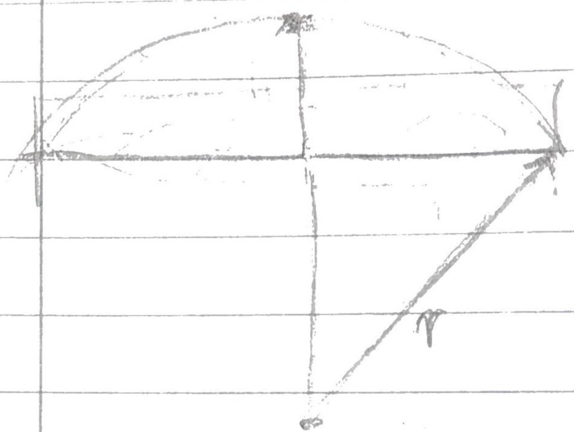
$$a = r\sin\theta$$
$$h = r(1-\cos\theta)$$
$$2hr = a^2 + h^2$$
$$2ha = (a^2 + h^2)\sin\theta$$

These allow to go from one to the other

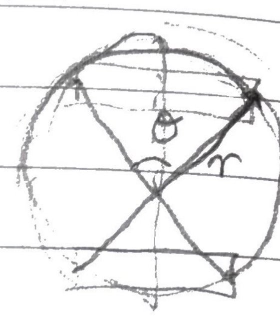
PARALLEL PLATES

cap a Stacked one  on top of each other

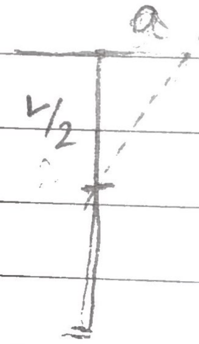
With the bases of the and the height of the cap



Taking the middle point of the scintillator



The radius can be calculated by measuring the distance between the edges or



$$\boxed{r = \sqrt{a^2 + \left(\frac{L}{2}\right)^2}}$$

where L is the distance between both scintillators, 1 height of them. and a is half the width of one scintillator

Now to calculate the height of the cap.

$$h = r - \left(\frac{L}{2} + \underbrace{(\text{half height scintillator})}_{b}\right)$$

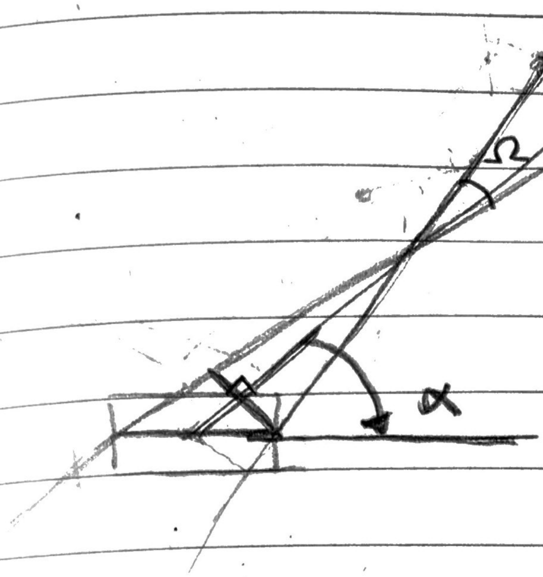
$$\boxed{h = \sqrt{a^2 + \left(\frac{L}{2}\right)^2} - \left(\frac{L}{2} + b\right)}$$

$$\Omega = \frac{A}{r^2} = \frac{\pi(a^2 + h^2)}{r^2}$$

Scintillators as flat circular surfaces

Sources. WIKI: { SOLID ANGLE
SPHERICAL CAP

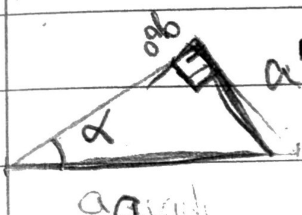
PLATES AT AN ANGLE



Now the virtual area used to calculat the angle is a projection of the surface of the scintillator on the perpendicular plane to the line that connects both centers

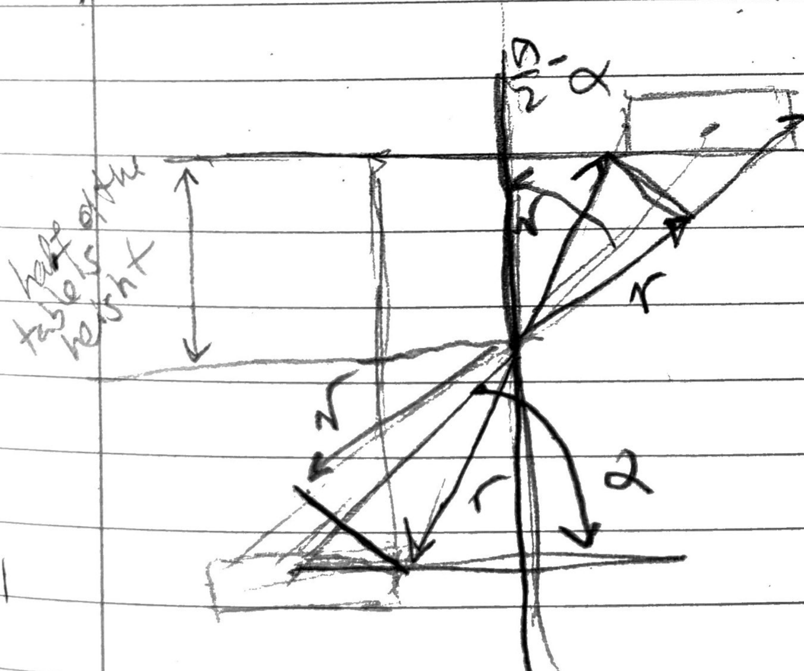
$\alpha \equiv$ chosen angle to measure the asymmetry of the muon flux.

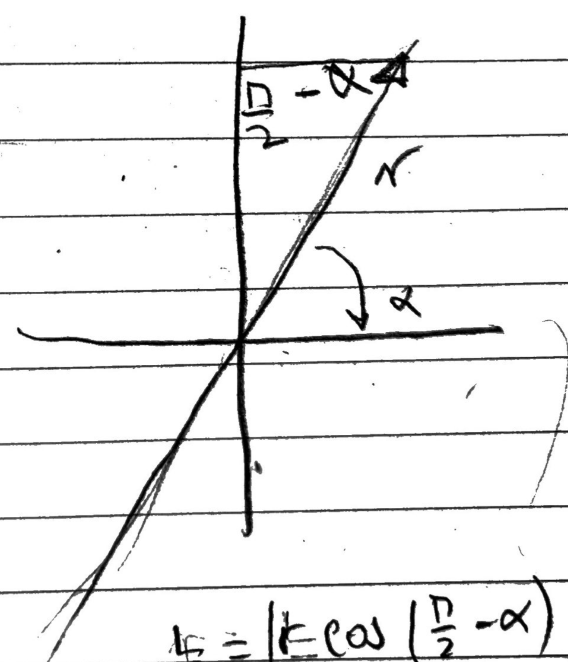
$\Omega \equiv$ our solid angle $\Rightarrow$ desired variable.



$\underbrace{a' = a\sin\alpha}$ → new radios of the cap.

Then proceed as for parallel plates





$r = \frac{L}{2}\operatorname{cosec}(\alpha)$

$\frac{L}{2} = \left| r\cos\left(\frac{\pi}{2}-\alpha\right) \right|$

$\frac{L}{2} = r\sin(\alpha)$