ME 74 Max vertical displacement of Lidar Calculations

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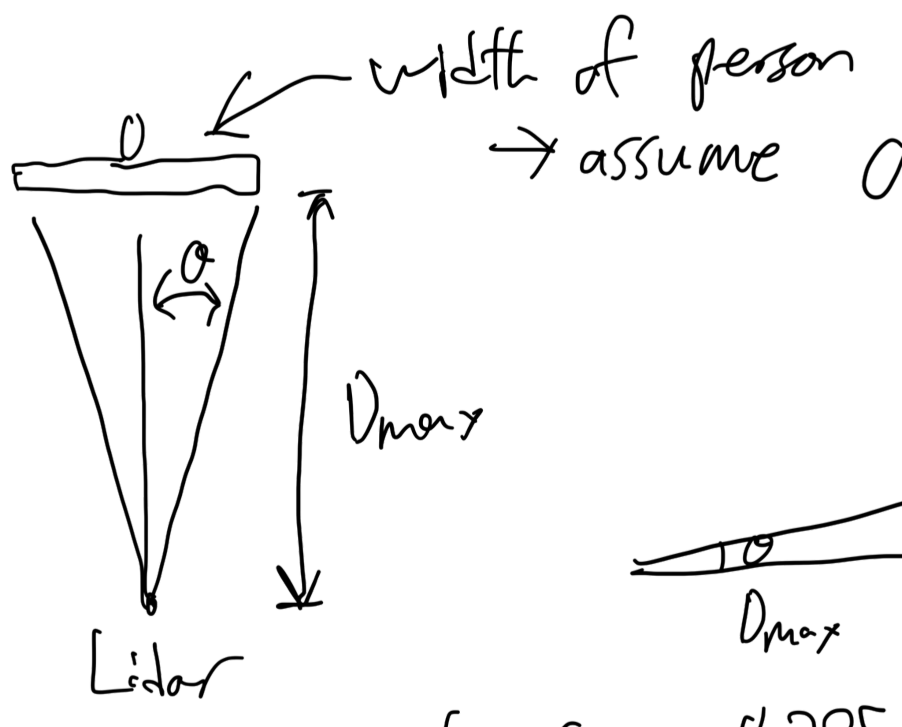
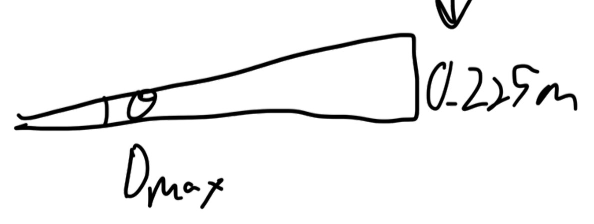
VLP 16 Specs

Vertical FOV: +15° to −15° (30°)
Resolution: 2.0°

Horz. FOV: 360°
Resolution: 0.1 – 0.4°
↳ Assume $\theta = 0.4°$

We want a min. of 3 sample points across the chest of a person →



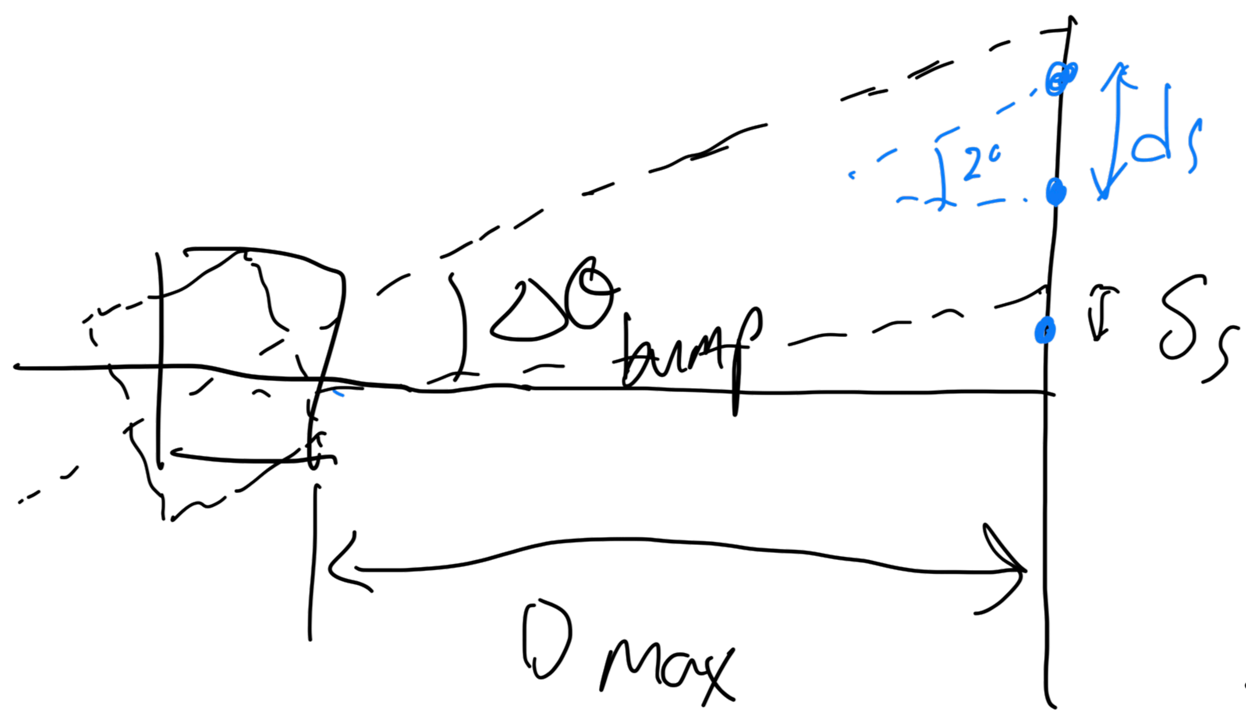


$\tan\theta = \frac{0.225}{D_{max}}$

$D_{max} = \frac{0.225}{\tan 0.4}$

$= 32.2\ m$

$\therefore$ Assume $\boxed{D_{max} = 30\ m}$



We want δ_s caused by the bump to be $\frac{d_s}{k}$, where k is the ratio of d_s to δ_s.

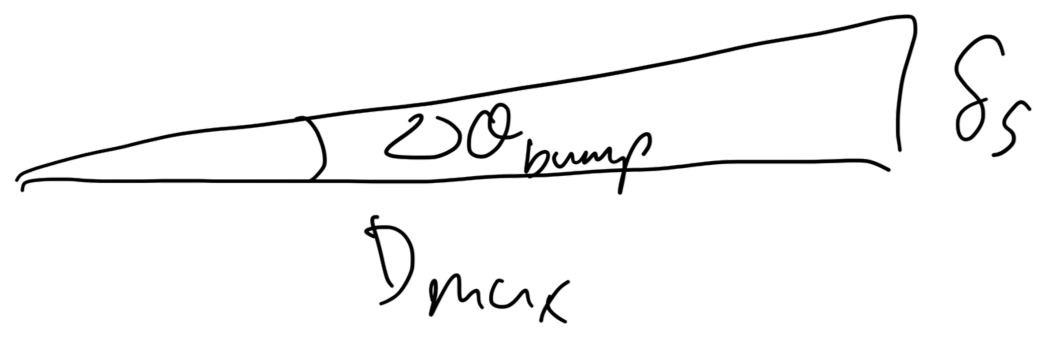
Taking $D_{max} = 30m$,

$d_s = 30 \cdot \frac{2 \cdot \pi}{180} = 1.047m$ ← Dist. between sample points

Taking k to be 4, $\delta_s = \frac{1.047}{4}$

$= 0.262\ m$

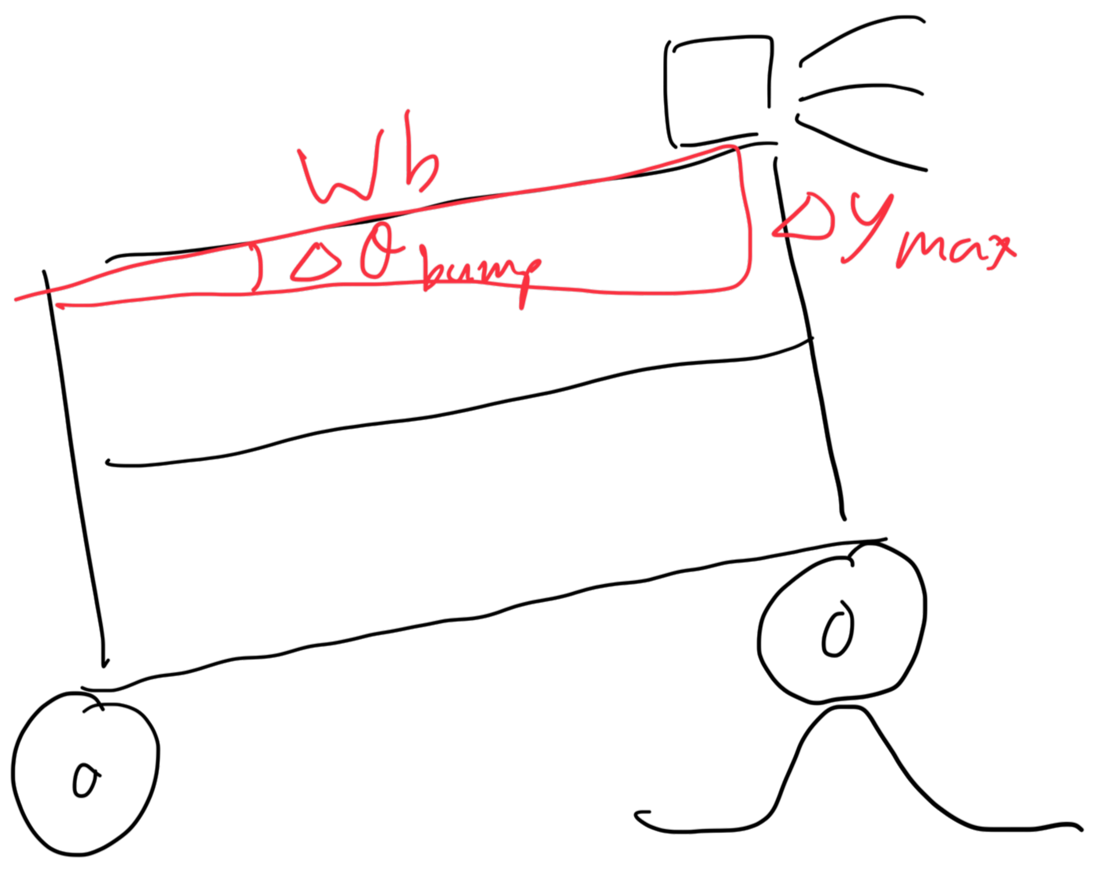
which is more than 6x shorter than a 1.7m tall person.



$\therefore \Delta\theta_{bump} = \tan^{-1}\frac{\delta_s}{D_{max}}$

$= \tan^{-1}\left(\frac{.262}{30}\right)$

$= 0.5°$



Wb = wheelbase
≈ 0.9m

$\therefore \Delta y_{max}$ = max vertical displacement of Lidar

$\sin(\Delta\theta_{bump}) = \frac{\Delta y_{max}}{W_b}$

$\Delta y_{max} = W_b \sin(\Delta\theta_{bump})$

$= 0.9 \cdot \sin(0.5°)$

$= 0.00785m$

$\approx \boxed{8mm}$