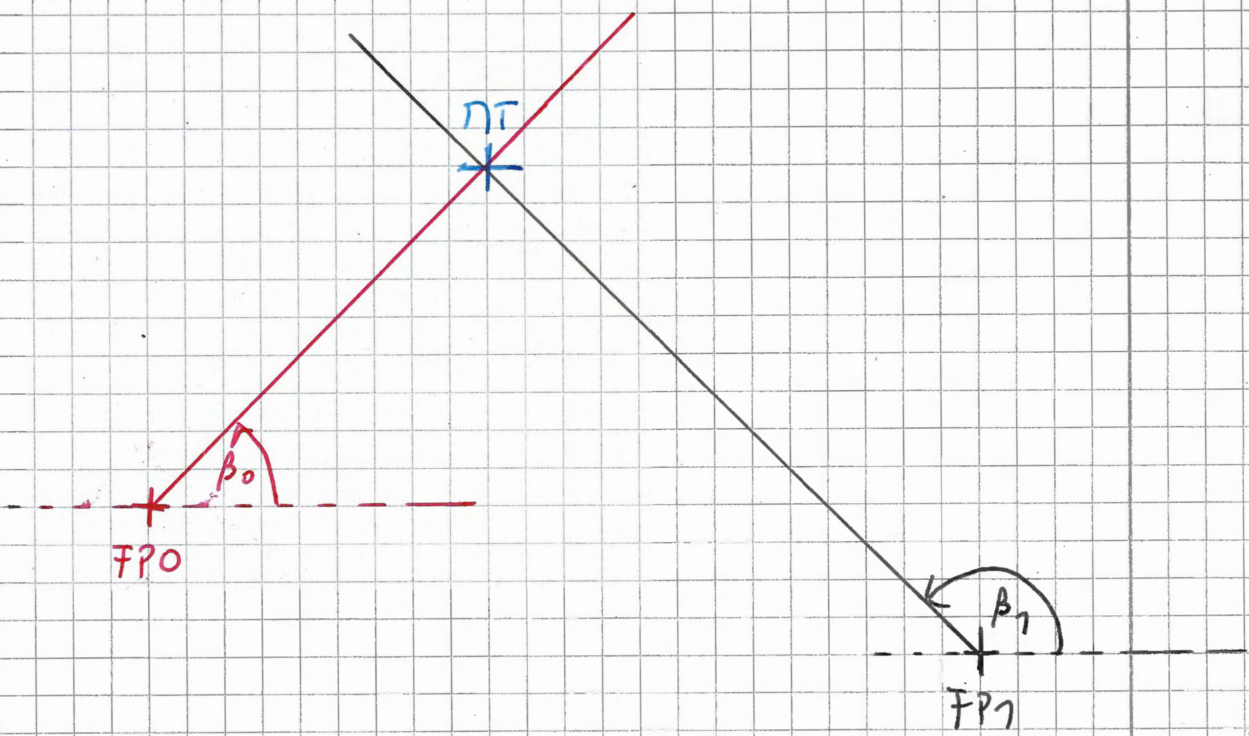
Angle of Arrival (AOA)

Scenario



for $K \geq 2$ FPs one unique intersection point of straight lines in 2D scenarios
(if no measurement errors)

Least Squares Method

requires $K \geq 2$ FPs in 2D scenarios

$$\tan(\beta_k) = \frac{y - y_k}{x - x_k}$$

$$(x - x_k)\tan(\beta_k) = y - y_k$$

$$x\tan(\beta_k) - y = x_k\tan(\beta_k) - y_k$$

set up an (over-) determined linear system of equations

$$\underbrace{\begin{pmatrix} \tan(\beta_0) & -1 \\ \vdots & \vdots \\ \tan(\beta_{K-1}) & -1 \end{pmatrix}}_{A} \cdot \underbrace{\begin{pmatrix} x \\ y \end{pmatrix}}_{x} = \underbrace{\begin{pmatrix} x_0\tan(\beta_0) - y_0 \\ \vdots \\ x_{K-1}\tan(\beta_{K-1}) - y_{K-1} \end{pmatrix}}_{b}$$

$$A \cdot x = b$$

least squares pseudosolution

$$x = (A^T \cdot A)^{-1} \cdot A^T \cdot b$$

remark: also here a Gauss-Newton method based on linearization is possible. This is especially useful for the construction of hybrid techniques exploiting different kinds of measurements.