Sensor Local System

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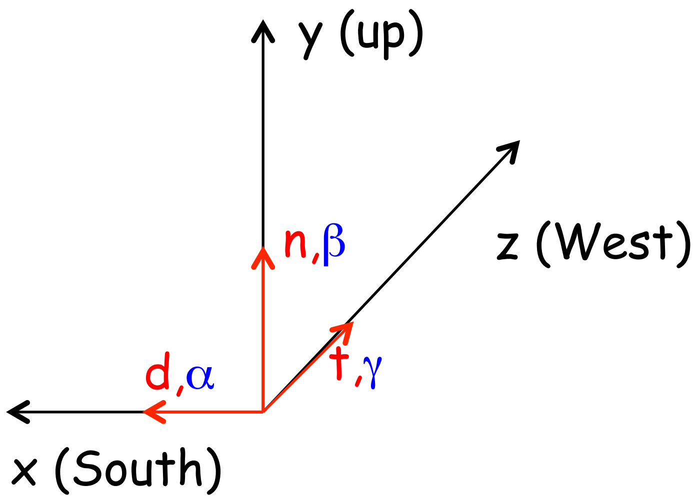
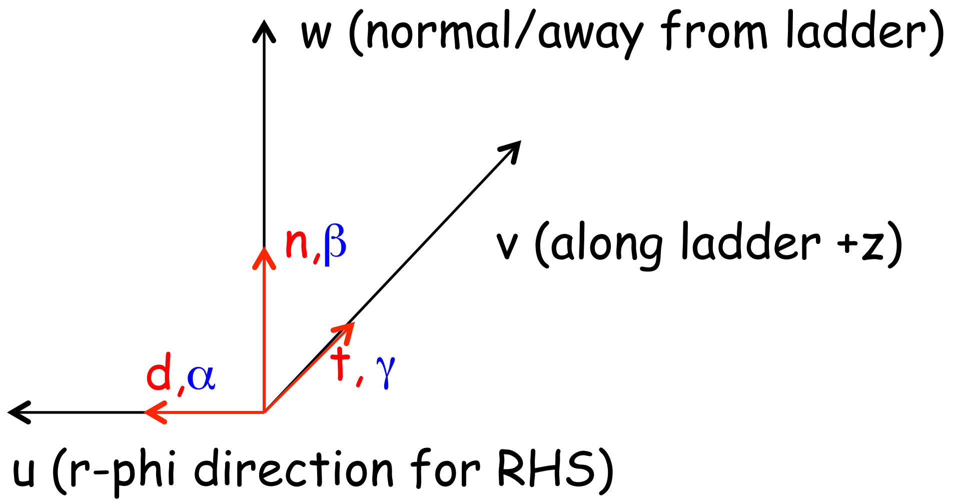
Definitions

STAR Global Coordinates

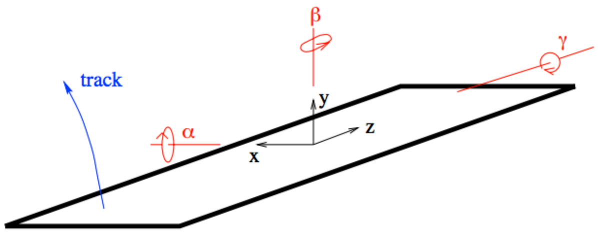


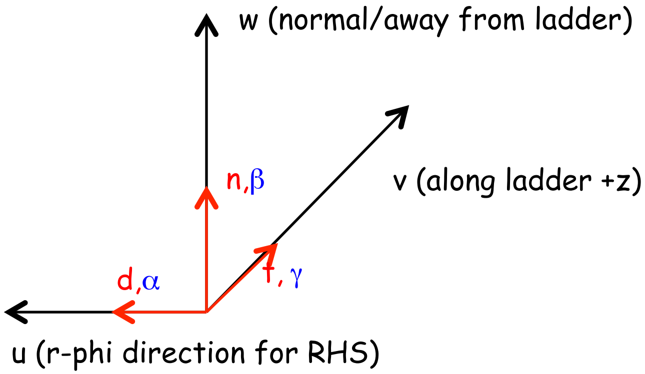
Wafer Local Coordinates



- Local v (along ladder) is fixed and along global +z
- Local w (normal to u-v [wafer] plane). Points away from exposed surface
- Local u (r-phi on wafer plane) varies so it forms a RHS with v-w (u,w,v)

Wafer Local Coordinates Examples

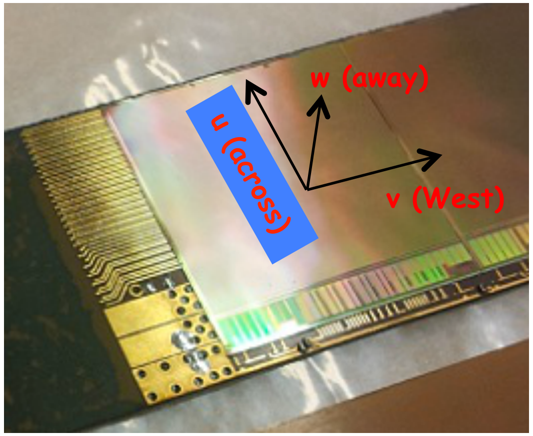




- We use the above RHS notation (u,w,v)

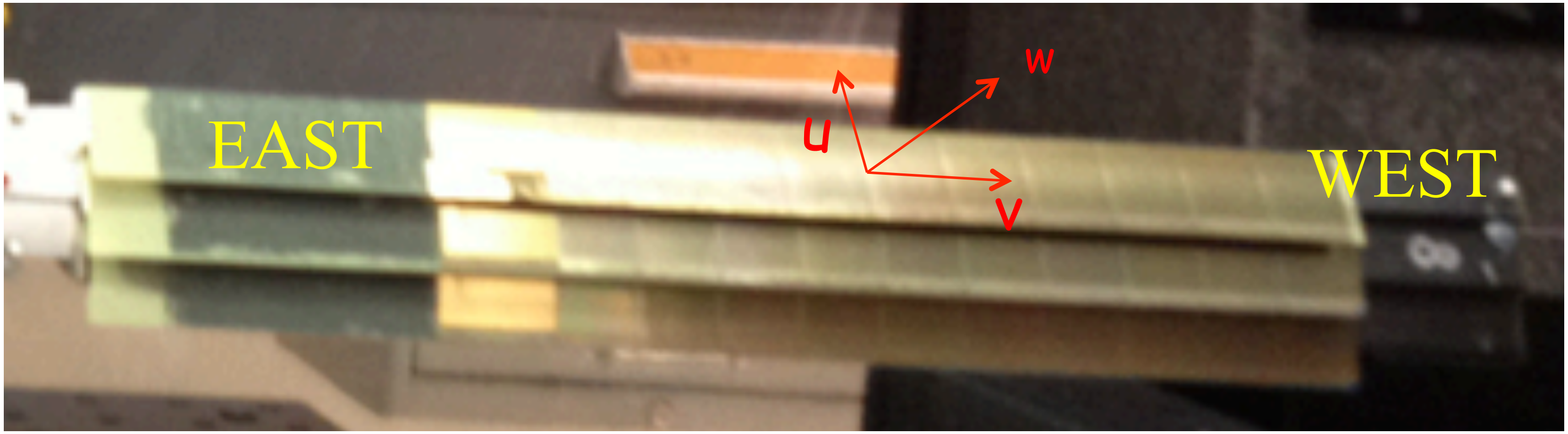
Local PXL system definitions (offline)

sensor



- PXL Sector origin is the same as STAR global
  - use same convention as in SSD/IST (as a whole) and IDS to simplify software

ladder



Survey Info in Db

- Survey info stores position information of sensor,ladder etc center in STAR Global
- Local-to-Global positioning is done in terms of **TGeoHMatrix**
- d,n,t are unit vectors and α, β,γ the corresponding rotation angles in x,y,z [u,w,v] directions [RHS] . d_x is the unit vector d projection on the x-axis etc

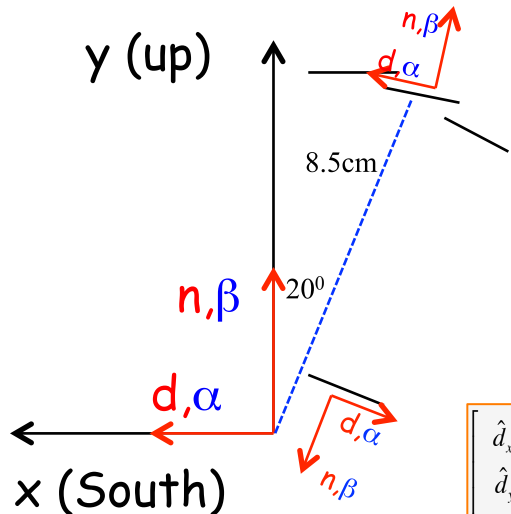
TGeoHMatrix definition

$$\begin{pmatrix} x_G \\ y_G \\ z_G \\ 1 \end{pmatrix} = \begin{bmatrix} \hat{d}_x & \hat{n}_x & \hat{t}_x & d_x \\ \hat{d}_y & \hat{n}_y & \hat{t}_y & d_y \\ \hat{d}_z & \hat{n}_z & \hat{t}_z & d_z \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{pmatrix} x_L \\ y_L \\ z_L \\ 1 \end{pmatrix}$$

Local to Global transformation definition

$$x_G^i = R \cdot x_L^i + T^i$$

$$x_G = \left(\hat{d}_x \cdot x_L + \hat{n}_x \cdot y_L + \hat{t}_x \cdot z_L\right) + d_x$$



$$\begin{bmatrix} \hat{d}_x = \cos 20 & \hat{n}_x = -\sin 20 & \hat{t}_x = 0 & d_x = -\sin 20 * 8.5cm = -2.91cm \\ \hat{d}_y = \sin 20 & \hat{n}_y = \cos 20 & \hat{t}_y = 0 & d_y = \cos 20 * 8.5cm = 7.99cm \\ \hat{d}_z = 0 & \hat{n}_z = 0 & \hat{t}_z = 1 & d_z = sensor - z_C \\ 0 & 0 & 0 & 1 \end{bmatrix}$$

$$\begin{bmatrix} \hat{d}_x = -\cos 20 & \hat{n}_x = \sin 20 & \hat{t}_x = 0 & d_x = -\sin 20 * 2.5cm = -0.85cm \\ \hat{d}_y = -\sin 20 & \hat{n}_y = -\cos 20 & \hat{t}_y = 0 & d_y = \cos 20 * 2.5cm = 2.35cm \\ \hat{d}_z = 0 & \hat{n}_z = 0 & \hat{t}_z = 1 & d_z = sensor - z_C \\ 0 & 0 & 0 & 1 \end{bmatrix}$$