# Lookup table & constants

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# Introduction

 To translate the "local" stub co-ordinates to global coordinates to be used for track fit



# Choice of constants

- Global constants
  - Strip pitch (90µm)
  - rz pitch for 2S(5cm)
  - rz pitch for PS(1.5mm)
- Local constants depending on
  - trigger tower
  - layer
  - Ladder
  - module
- Representation of these constants will depend on the need of PCA
  - xy & rz fit
  - $\mathbf{r} \phi \& \mathbf{rz}$  fit

### Case I : xy & rz

- Constants to store
  - $x_0$ ,  $y_0$ ,  $z_0$ , r,  $sin\phi_0$ ,  $cos\phi_0$  for each module of a sector
  - $x_0$ ,  $y_0$ ,  $z_0$  global co-ordinates to the edge/center of the module
  - r radius of the module
  - $\phi_{0-}$  moule tilt
- $x_i = x_0 + \text{strip}_{pitch} * i * \sin \phi_0$  (similarly for y)
  - i = stripNumber
- $z = z_0 + / rzPitch*segmentId$
- Easy to implement from simulation
- PCA seems to have lower resolution of c/pt and phi using fit in xy plane
- Data for  $x_0$ ,  $y_0$ ,  $z_0$ ,  $\phi_0$  already available from simulation

#### Case II : rφ & rz

- Constants to store
  - r,  $z_0, \phi_0, \sin\phi_0, \cos\phi_0$
  - r radius of the module
  - $\phi_{0-}$  moule tilt
- $\phi_i = f(i)$ 
  - i = stripNumber
- $z = z_0 + / rzPitch*segmentId$
- Tried to check relation between phi and strip number from simulation
  - Resolution in phi is degraded for the first 3 layers
- PCA seems to have better resolution of c/pt and phi using fit in rφ plane

### Determination of strip phi

- Consider 1 ladder from a layer
- Plot stripPhi vs stripNo. for all modules in that layer
- A linear nature is observed(see next slides)
- Obtain slope and intercept
- Plug back these constants to calculate phi for each strip
- Deviation is observed especially at module edges
- Applying a correction factor improves the result.

Studies performed with CMSSW\_6\_2\_0\_SLHC24 For tower 18



# StripPhi vs strip No.



7



# StripPhiDiff vs strip No.



Modeled as a 3<sup>rd</sup> order polynomial to get correction factors



Layer 5 ladder 5 Difference ~ 1.73 mradians Layer 10 ladder 18

Difference ~ .06 mradians

#### Discussion

- Decide on which set of constants to use
- Using rφ representation will introduce additional constants for each ladder in a trigger tower
  - Specially for 3PS layers
- Number of operations performed is also a factor
- Next steps
  - Try to generate a list of stubs from simulation using the AM package
  - Compute the coordinates using the constants from look up table and compare with generated coordinates
  - For now, both xy and rphi can be studied
  - Do PCA fit with these constants and compare the resolution.