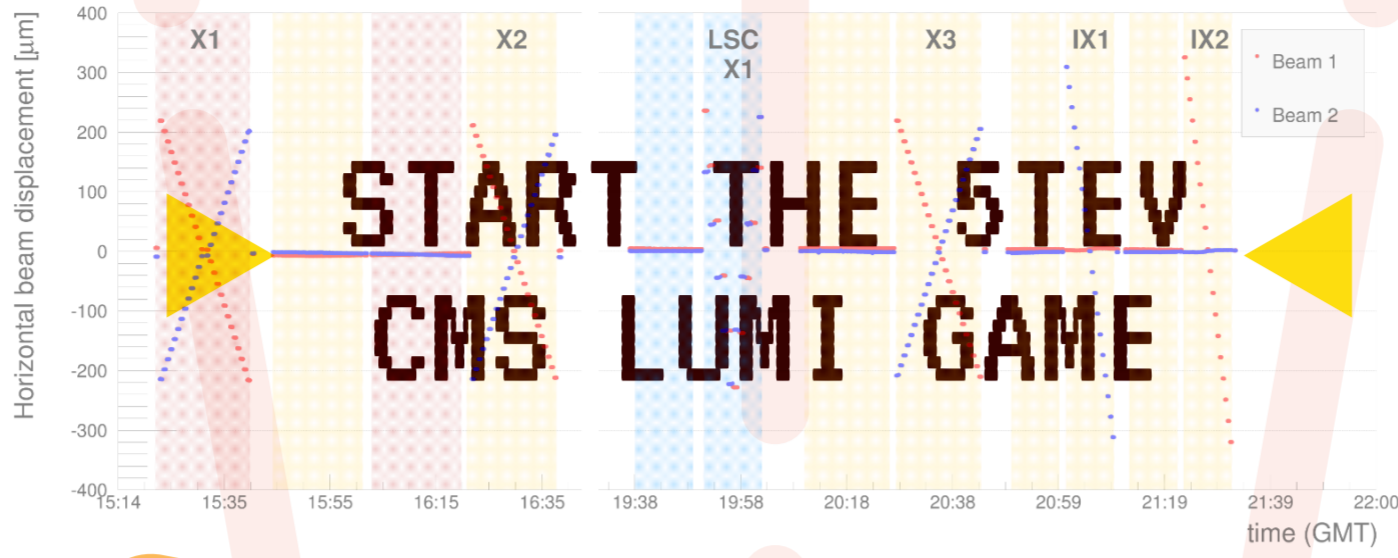
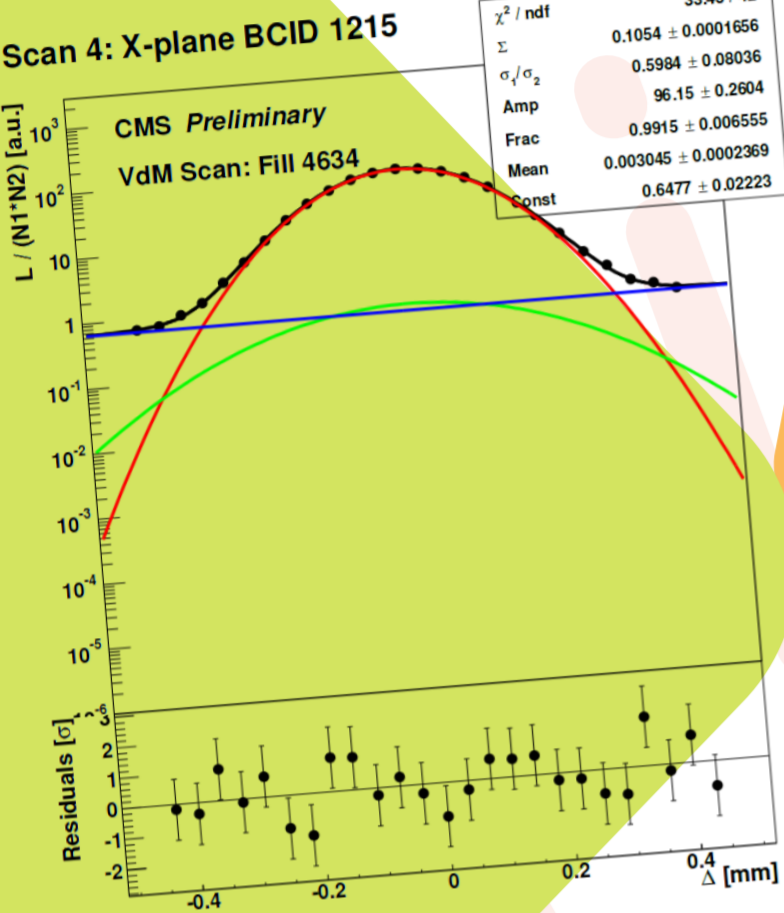
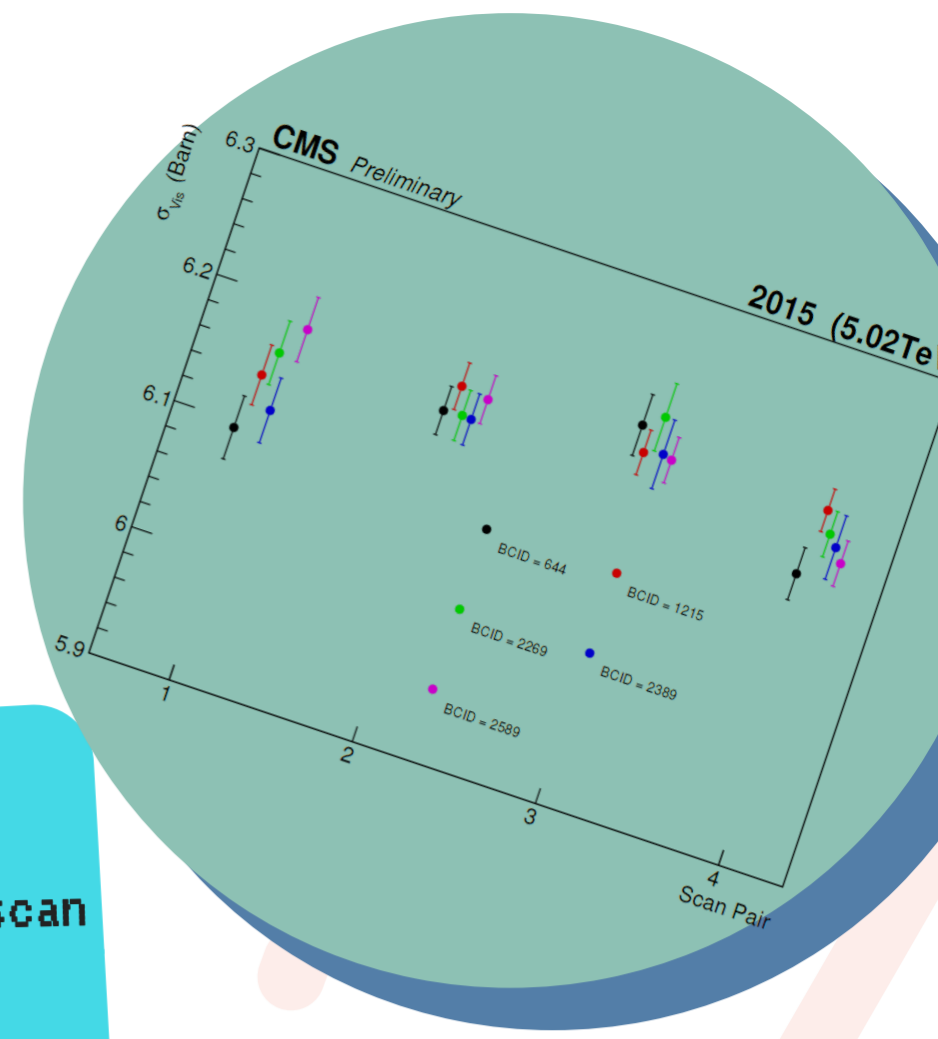


LET'S PLAY ON!



START THE 5TEV CMS LUMI GAME



EXTRACT
The convolved size of the **beam overlap** by fitting a normalized event rate, e.g. pixel clusters (PCC)

MEASURE
The beam overlap in a scan **sequence** to ensure reproducibility and to constrain impact of norm. systematics

CHECK
The dependence, if any, on the event rate **stability** that might be introduced from the detecting devices

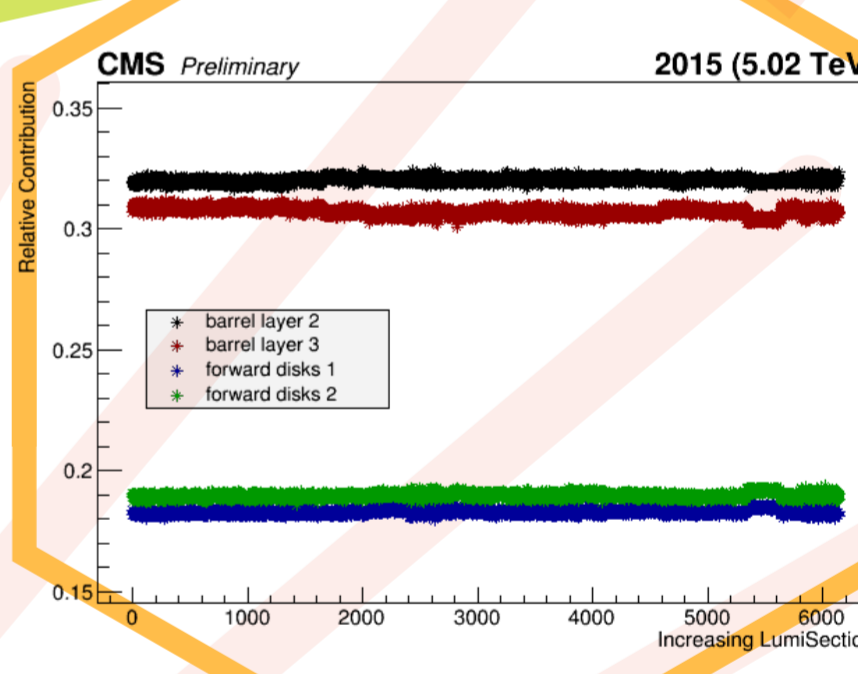
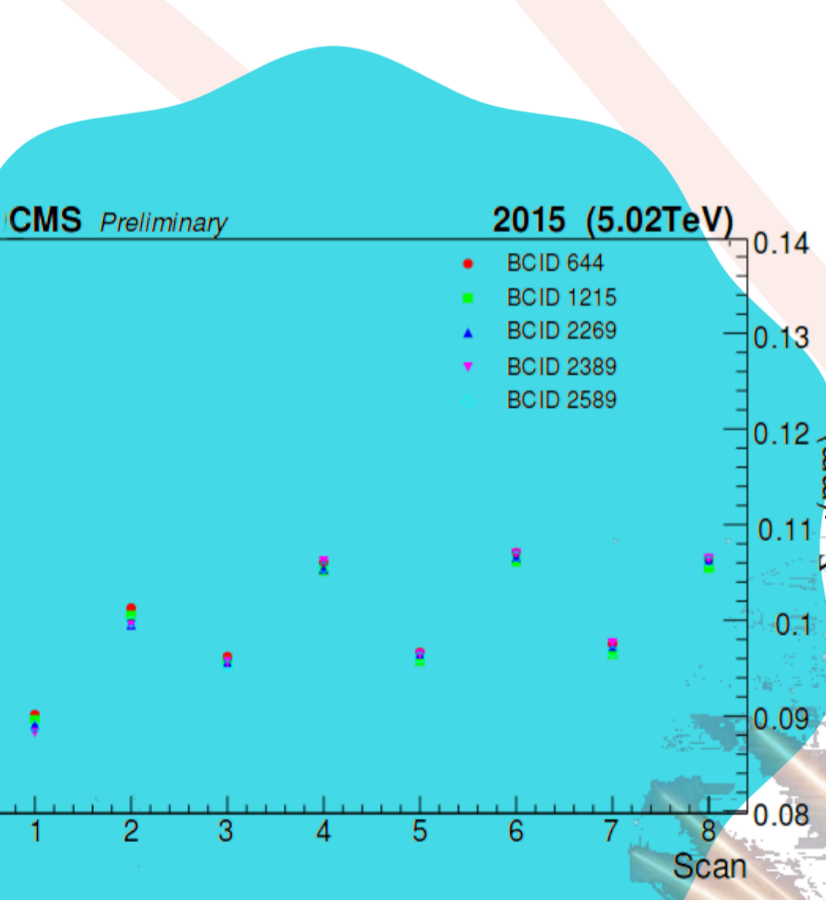
CONVERT
The measurement to a meaningful **calibration constant** which signifies the scale of luminosity



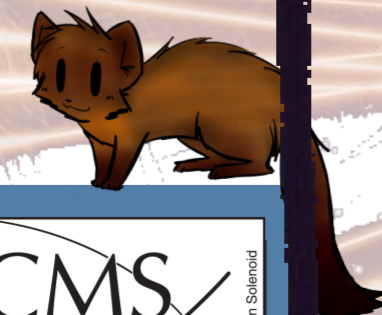
$$\mathcal{L} = \frac{\langle N_{\text{cluster}} \rangle f}{\sigma_{\text{vis}}^{\text{PCC}}}$$

- Beam energy
- Peak luminosity
- Peak pileup
- Injection scheme
- Beam 1/2 intensity
- Number of bunches in beam 1/2
- Number of colliding bunches in beam 1/2
- Beams crossing angle

$$\sigma_{\text{vis}}^{\text{PCC}} = \frac{2\pi \Sigma_x \Sigma_y R(\Delta x_0, \Delta y_0)}{N_1 N_2 f}$$



LUM-16-001



Systematic	correction (%)	uncertainty (%)
Stability	-	1
type 1/2	7	1
CMS downtime	-	0.5
Dynamic Inefficiency	-	0.4
XY-Correlations	-	1.5
Beam current calibration	-	0.3
Ghosts and satellites	1.8	0.2
Length scale	1	0.2
Orbit Drift	-	0.4
Beam-beam deflection	1	0.2
Dynamic-β	-	0.5
Total		2.3