Sloppy Models Updates

- Revisiting genetic algorithms
- Derive distribution of lattices from Jacobian of orbit, dispersion, and coupling

Lattice Distribution from Jacobian

- According to Sethna, probability density of lattices in magnet space goes as

$$= \mathcal{C} \exp\left(-\frac{\Omega_{\alpha\beta}\,\theta_\alpha\theta_\beta}{2} + b_\alpha\,\theta_\alpha \right), \tag{5}$$

where

$$\Omega_{\alpha\beta} = \sum_i \frac{J_{i\alpha} J_{i\beta}}{{s_i}^2} - \frac{\delta_{\alpha\beta}}{{\sigma_\alpha}^2}, \text{ and } \quad b_\alpha = \sum_i \frac{J_{i\alpha} d_i}{{s_i}^2}. \tag{6}$$

- Ignore second term (assume measurements d_i consistent with zero)

- Ω should have same singular directions as our empirical distribution and inverse squares of its singular values

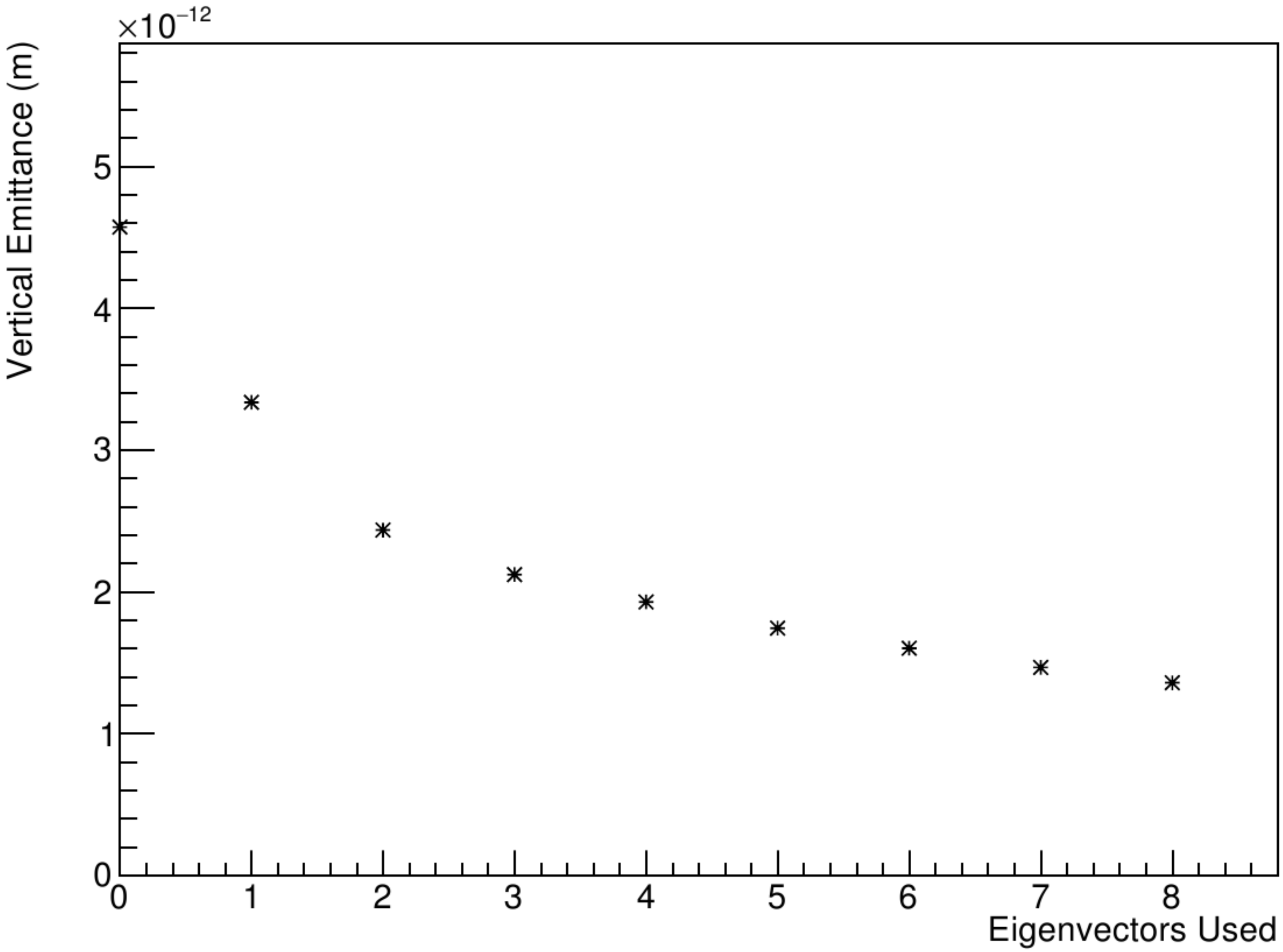
Lattice Distribution from Jacobian (cont.)

- Compute Ω and compare with empirical lattice distribution

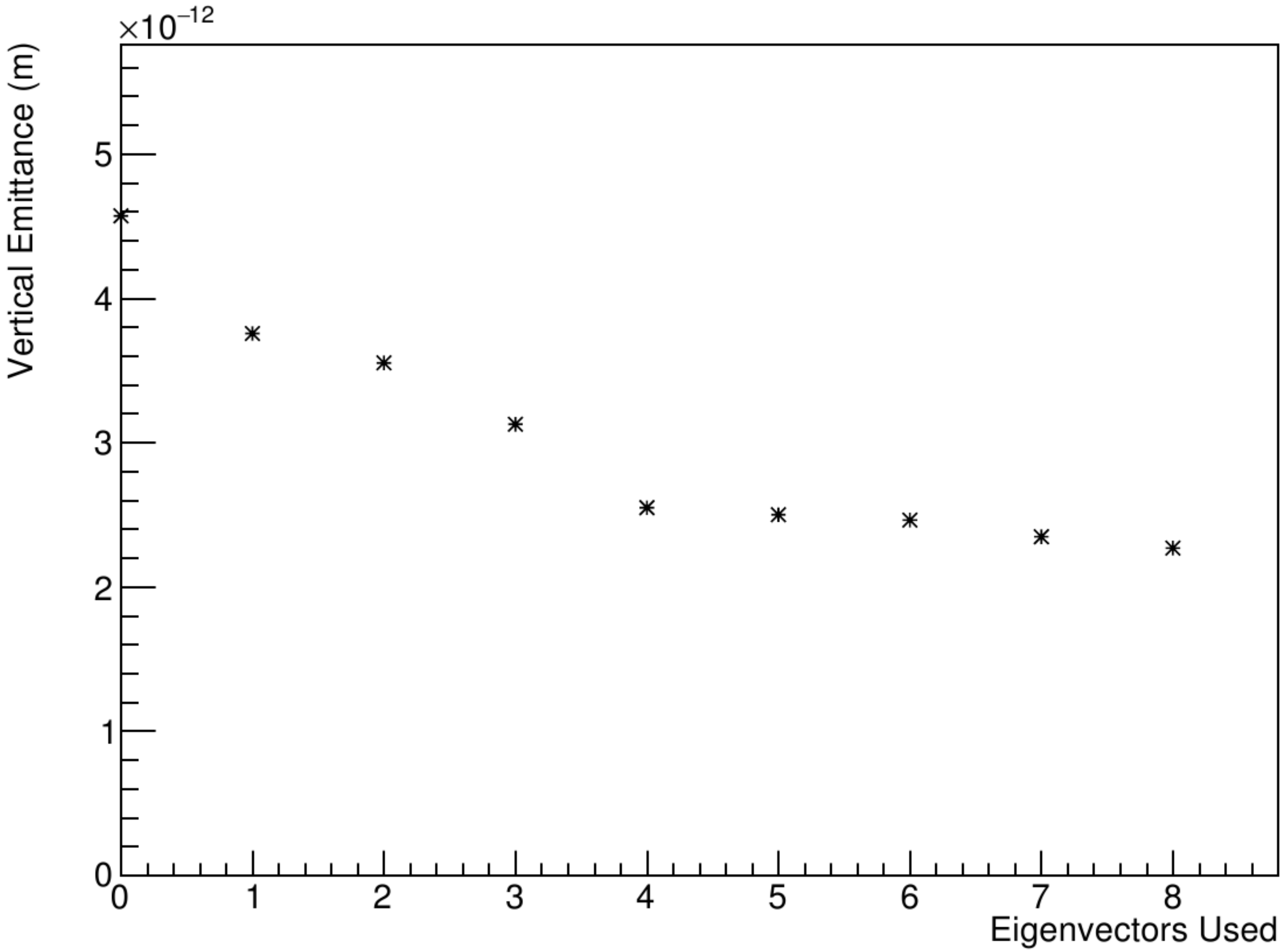
- There is a correlation in their singular vectors, but the one is insufficient to understand the other (dot products of first two most-corrected directions in the two systems are over 0.9, but later ones are typically ~0.2 - 0.3)

- Using Jacobian-based distribution to derive knobs gives worse results than using empirical distribution

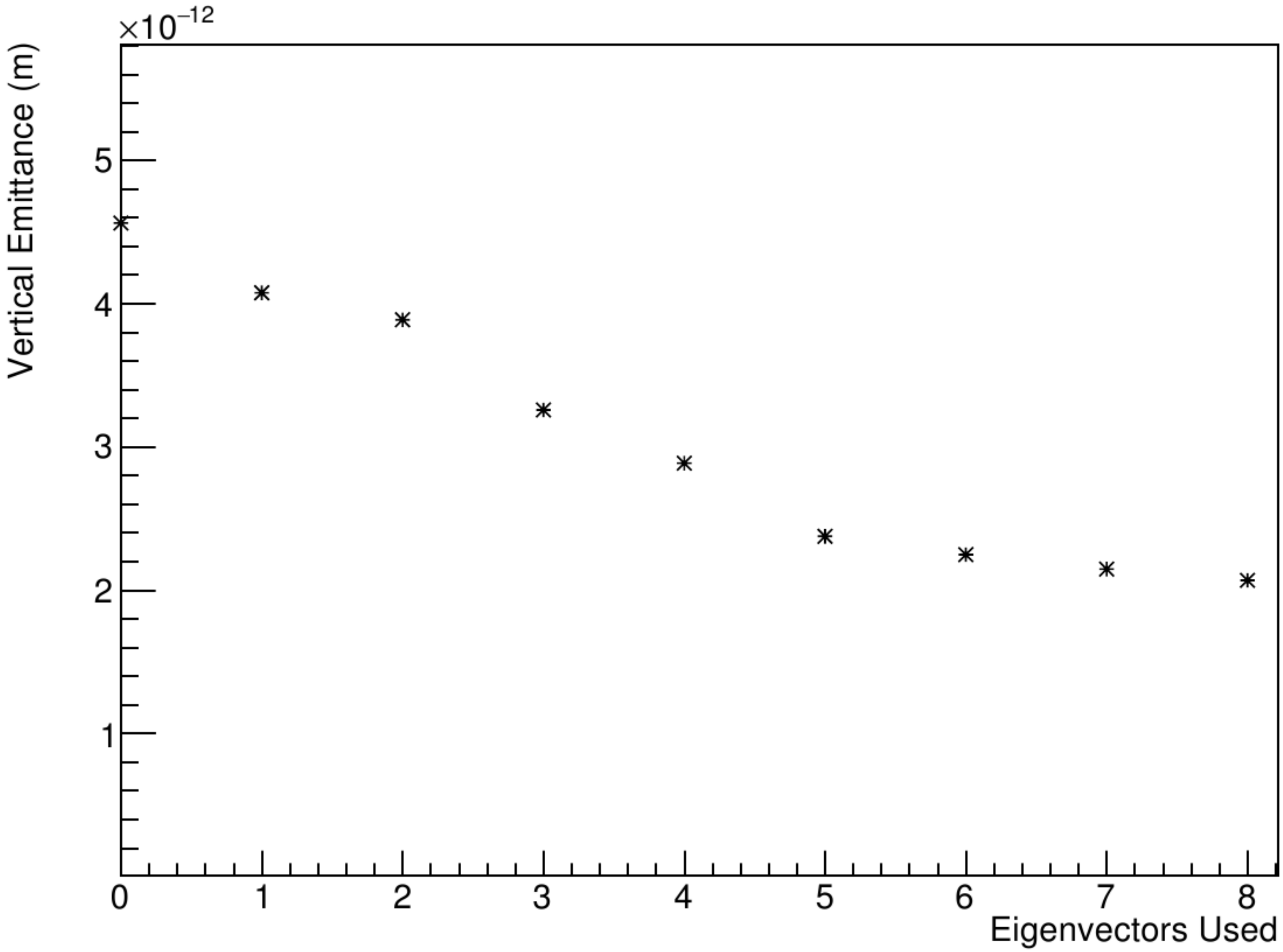
Knobs Based on Empircal Distribution



Knobs Based on Jacobian Distribution



Knobs with Isotropic Distribution Assumption



Conclusion

- More information needed than just the Jacobians with useful knobs

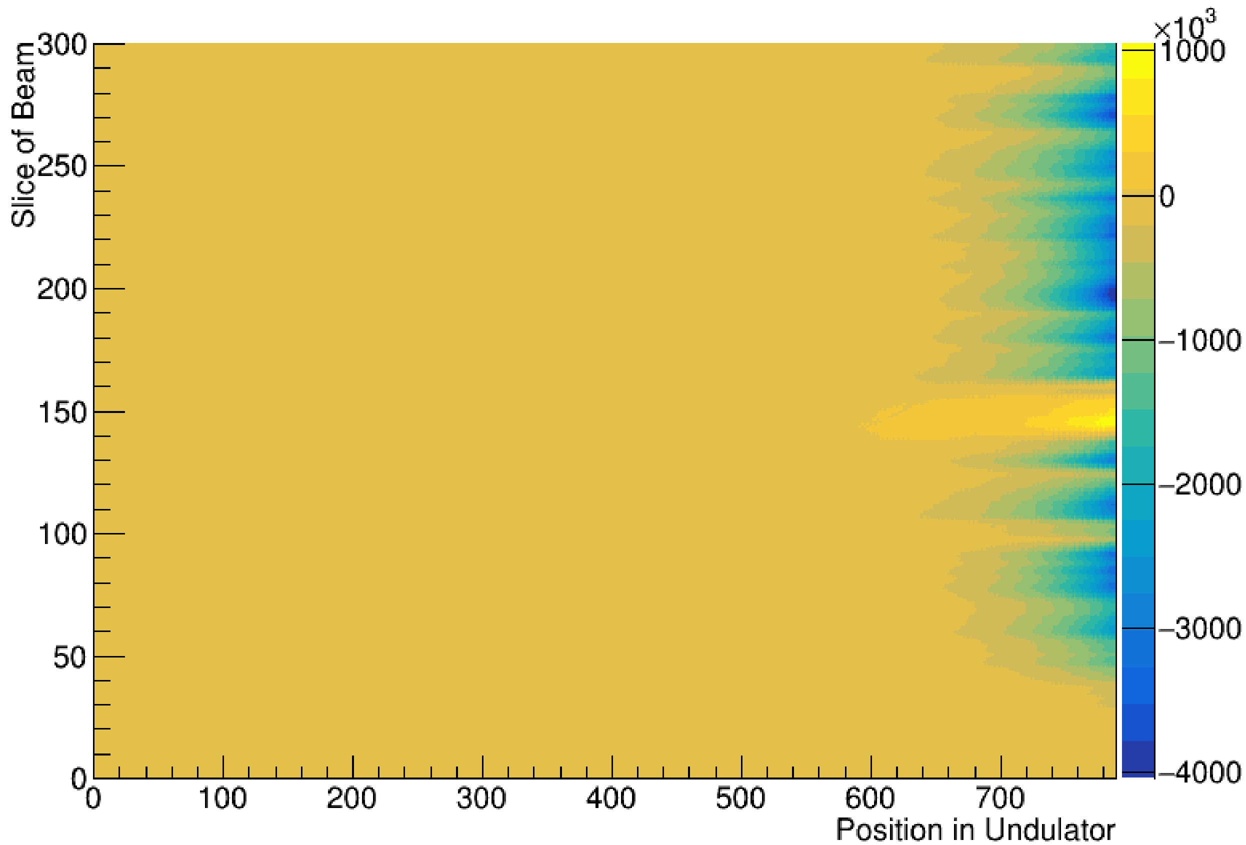
- Perhaps affected by use of other magnets and merit functions in initial corrections?

OSC

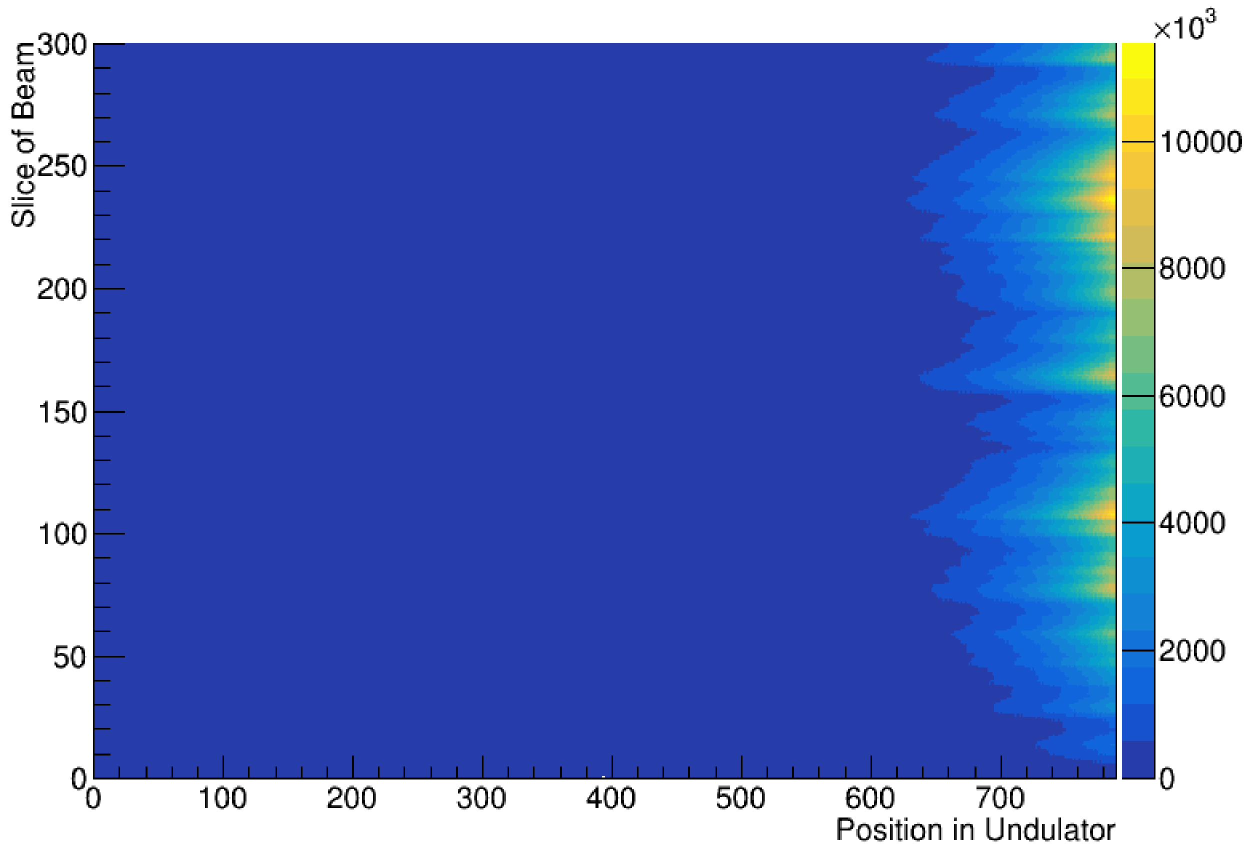
- Can get destructive interference in long (98 period undulator)

- Issues with translating this to 3-period undulator

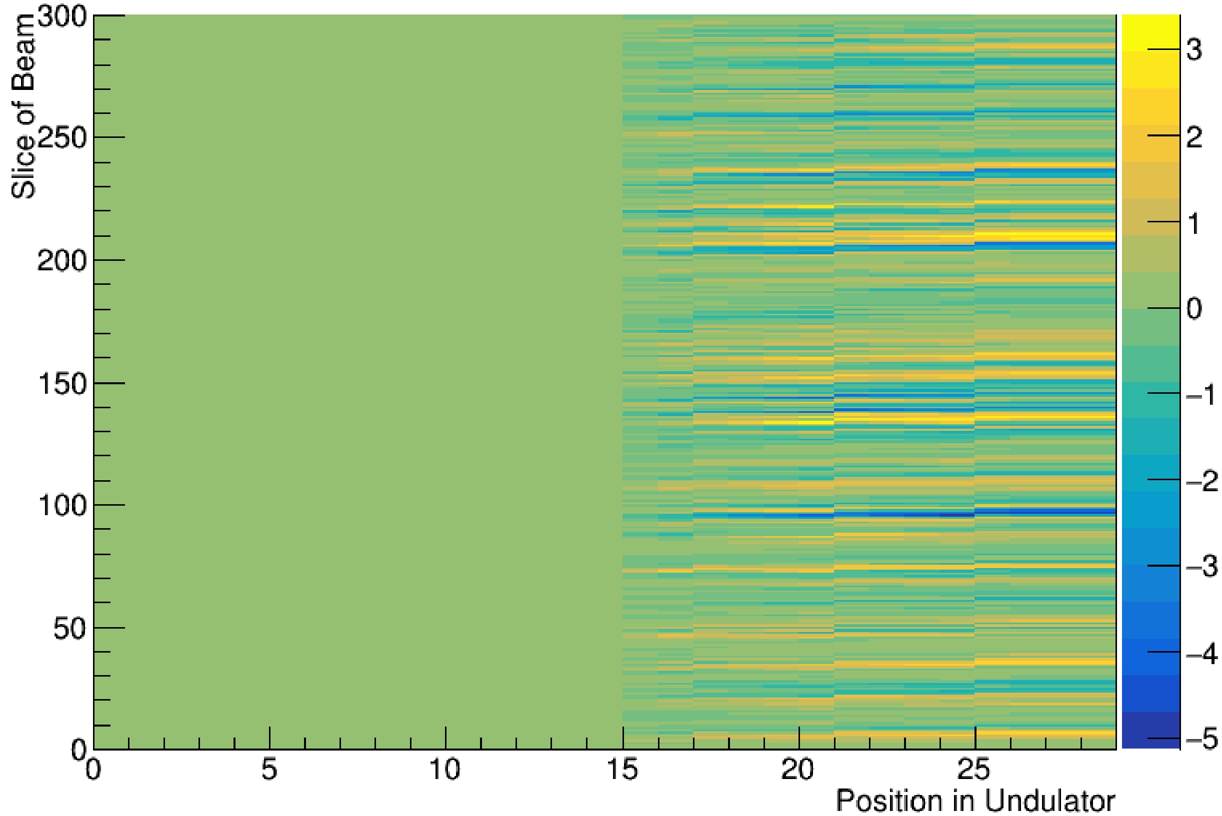
Difference In Intensity in Long Undulator (Interf – No Interf)



Long Undulator, No Interf



Difference In Intensity in Short Undulator (Interf – No Interf)



Short Undulator, No Interf