Sensitivity coefficients for unpolarized TMDs

Results from Pavia group

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Background information

- Similar study as the one presented on Aug 31st by Alexey
- Sensitivity coefficients defined as (see, e.g., arXiv:2007.08300)

$$S[f,O] = \frac{\langle O_{\rm th} f\rangle - \langle O_{\rm th}\rangle\langle f\rangle}{\delta O_{\rm exp}\delta f}$$

$$(\text{no impact}) \;=\; 0 < |S| \;\;\rightarrow\;\; (>1)\text{large impact}$$

- *O* is in our case the structure function F_{UUT}, *f* are the values of the nonperturbative parameters, the averaging is done on the replica set, the relative experimental error comes from Ralf's pseudodata

Starting points

- Pseudodata generated by Ralf and available on https://github.com/VladimirovAlexey/EIC_YR_TMD
  For the moment, we used Data4_cut, with ACC_opt5

- Grids of SIDIS F_{UUT} structure function based on PV17 fit and available on https://github.com/vbertone/NangaParbat

- To reproduce the following plots, one also needs the 200 sets of parameters from the PV17 fit. They are available upon requests (and actually included inside Nanga Parbat).

Functional form of PV17

arXiv:2007.08300

$$f^a_{1\mathrm{NP}}(x, \boldsymbol{k}^2_\perp) = \frac{1}{\pi}\ \frac{\left(1+\lambda \boldsymbol{k}^2_\perp\right)}{g_{1a}+\lambda\ g^2_{1a}}\ e^{-\frac{\boldsymbol{k}^2_\perp}{g_{1a}}}\ ,$$

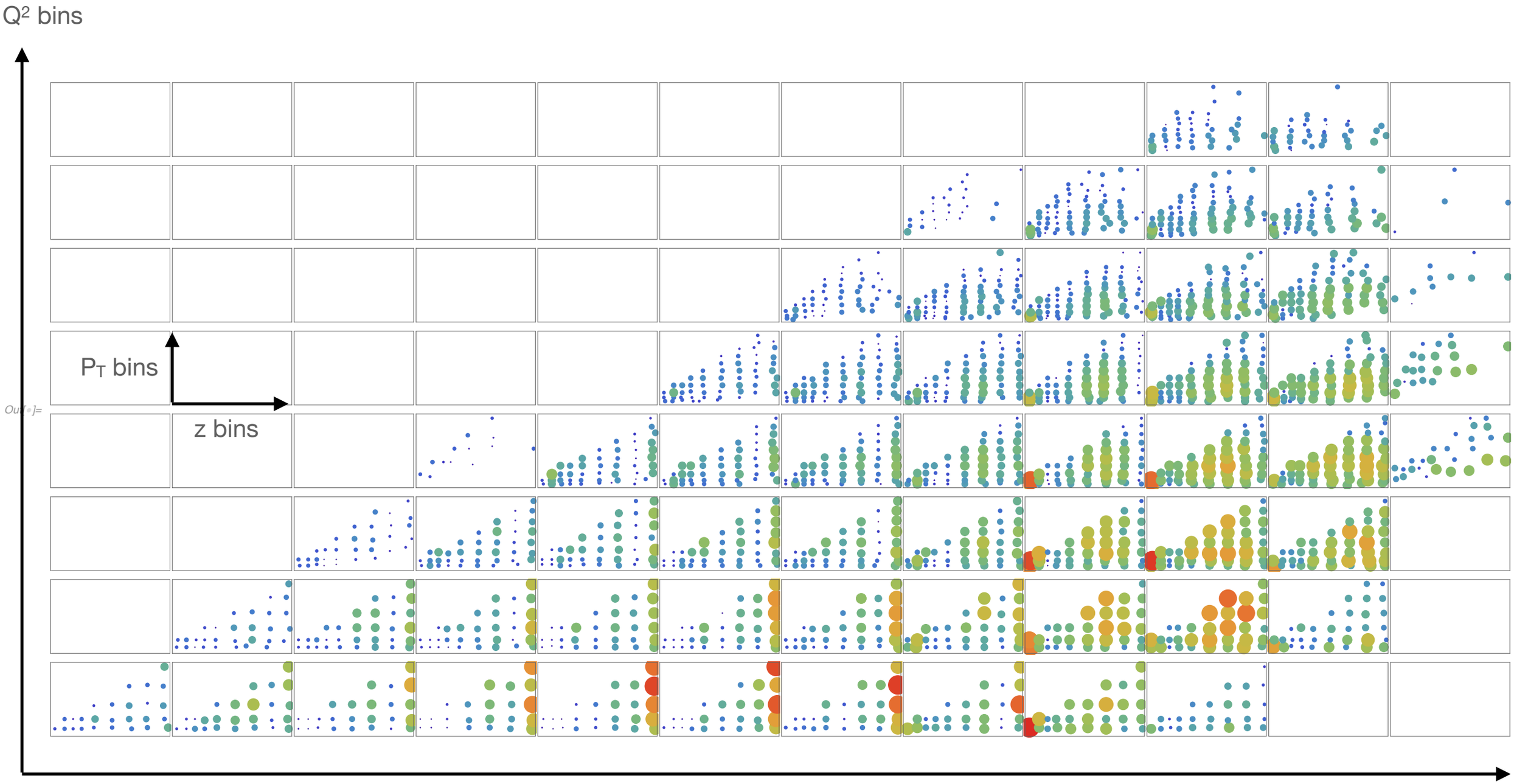
$$g_1(x) = N_1\ \frac{(1-x)^\alpha\ x^\sigma}{(1-\hat{x})^\alpha\ \hat{x}^\sigma}$$

$$D^{a\to h}_{1\mathrm{NP}}(z, \boldsymbol{P}^2_\perp) = \frac{1}{\pi}\ \frac{1}{g_{3a\to h}+\left(\lambda_F/z^2\right)g^2_{4a\to h}}\ \left(e^{-\frac{\boldsymbol{P}^2_\perp}{g_{3a\to h}}}+\lambda_F\frac{\boldsymbol{P}^2_\perp}{z^2}\ e^{-\frac{\boldsymbol{P}^2_\perp}{g_{4a\to h}}}\right)$$

$$g_{3,4}(z) = N_{3,4}\ \frac{(z^\beta+\delta)\ (1-z)^\gamma}{(\hat{z}^\beta+\delta)\ (1-\hat{z})^\gamma}$$

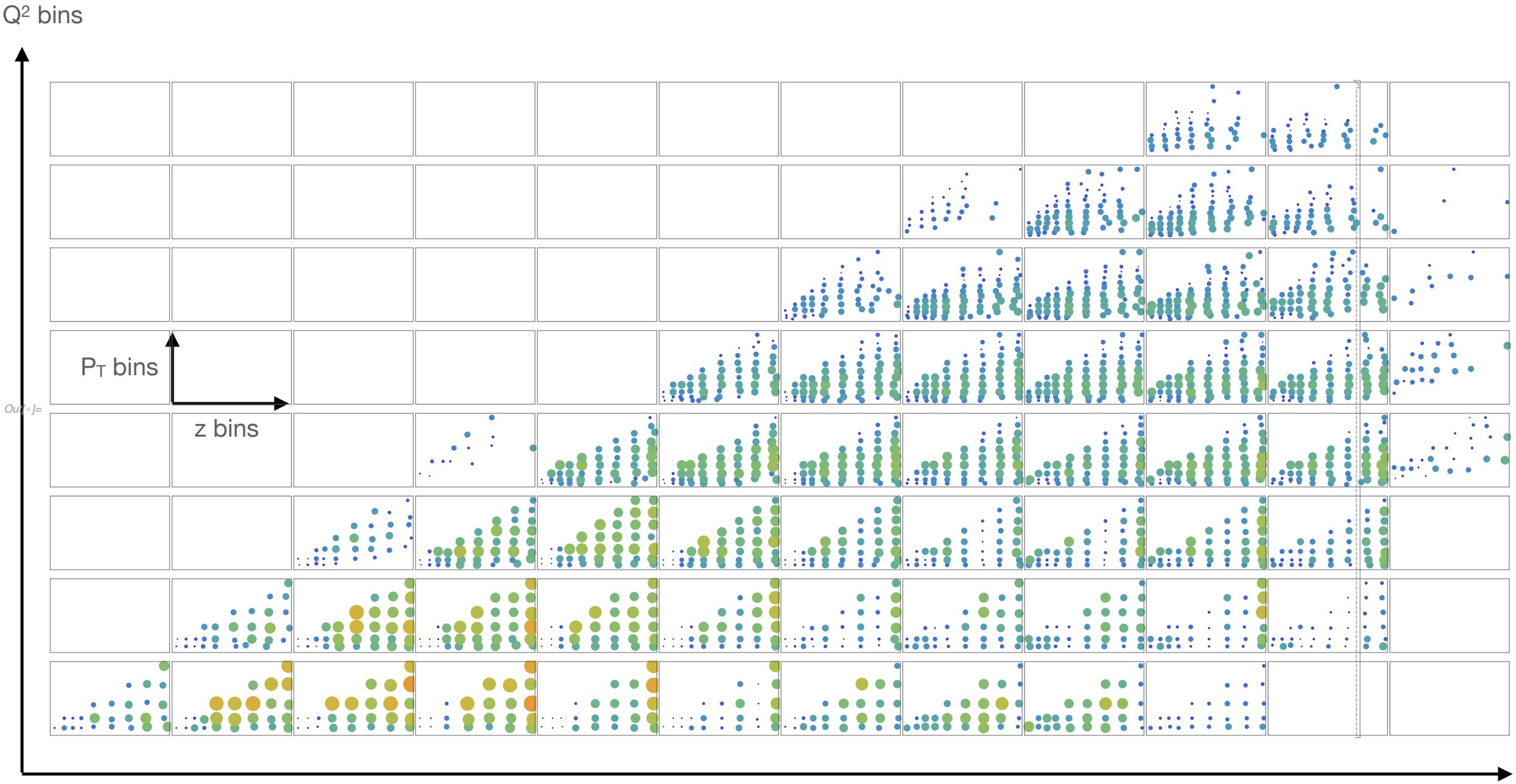
5x41 configuration

Sensitivity coefficients for TMD PDF width (N_1 parameter of PV17)



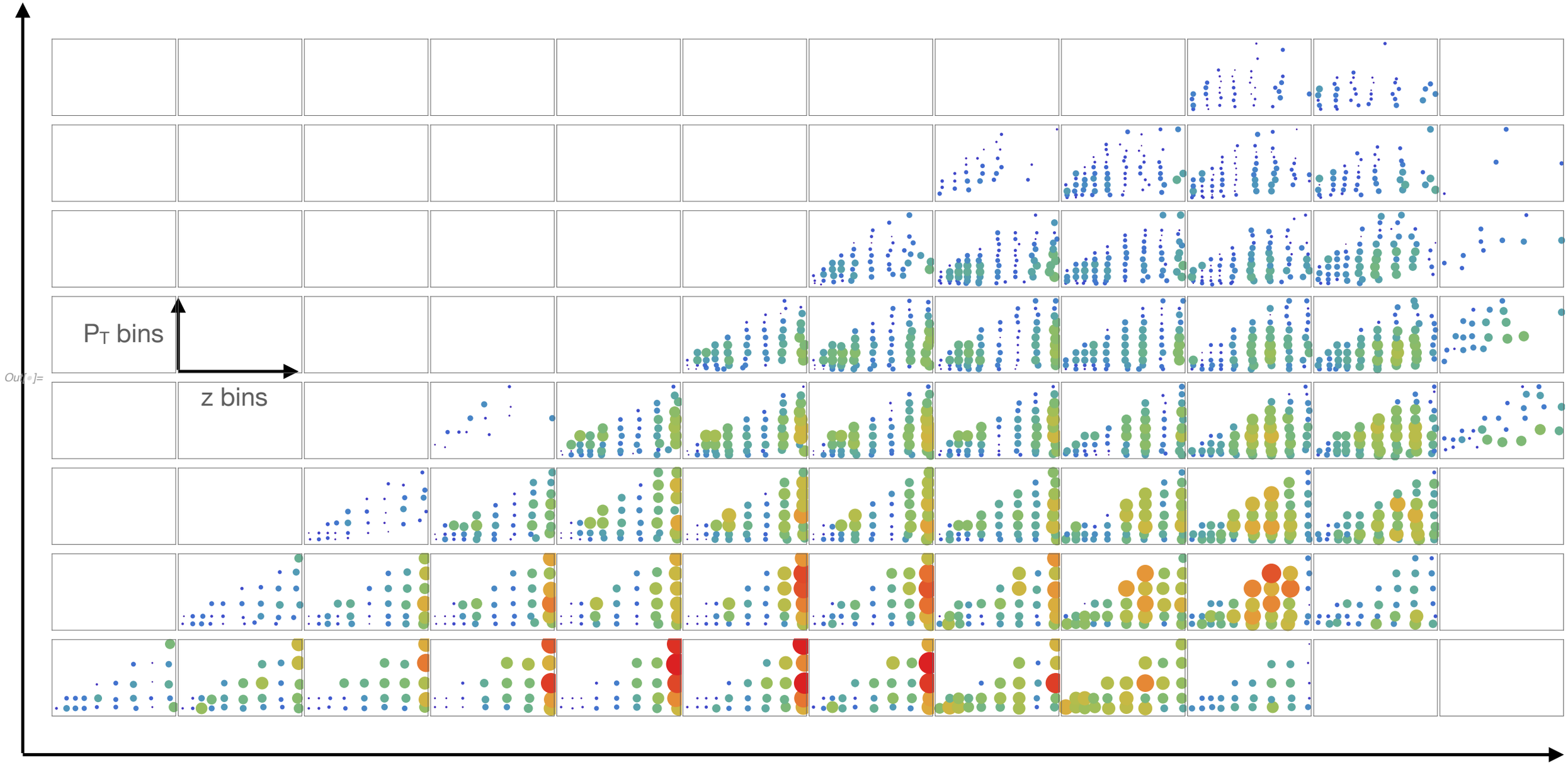
5x41 beam configuration

Sensitivity coefficients for low x-dependence of TMD PDF width (σ parameter of PV17)



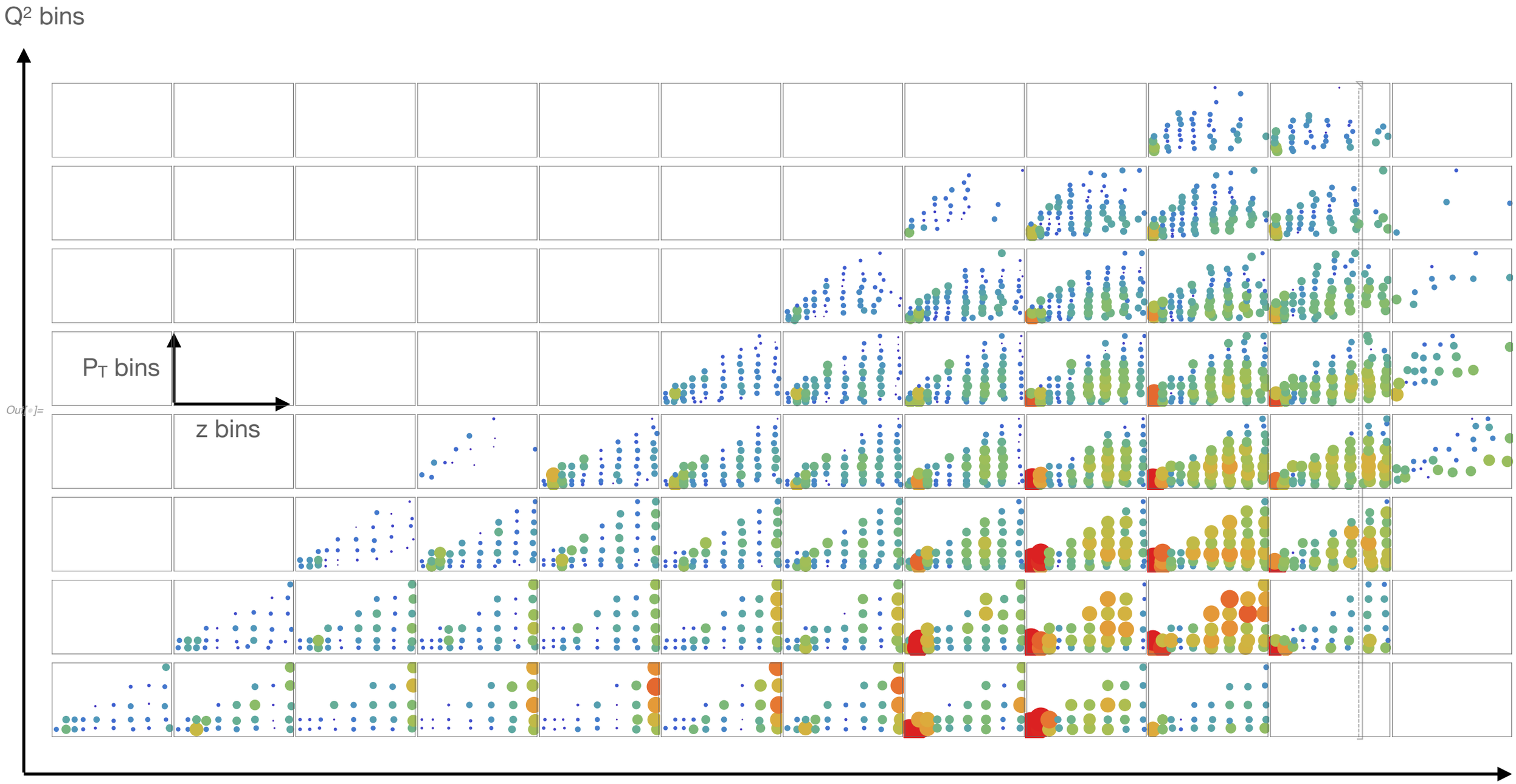
5x41 beam configuration

Sensitivity coefficients for TMD FF width (N_3 parameter of PV17)



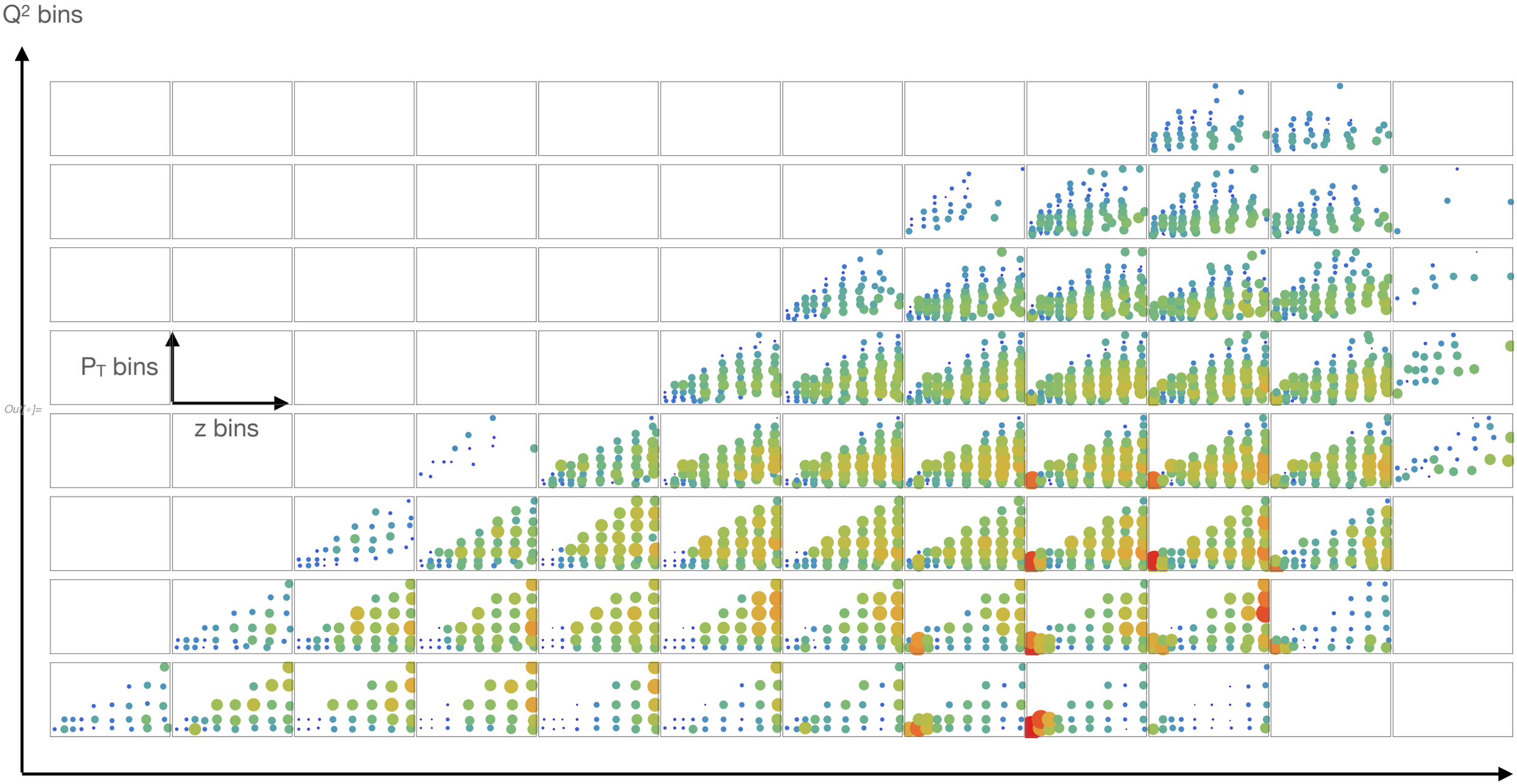
5x41 beam configuration

Sensitivity coefficients for non-Gaussian contribution to TMD FF (λ_F parameter in PV17 parametrization)



5x41 beam configuration

Sensitivity coefficients for nonperturbative evolution parameter (g_2 parameter of PV17)



5x41 beam configuration

10x100 configuration

Sensitivity coefficients for TMD PDF width (N_1 parameter of PV17)

Q^2 bins

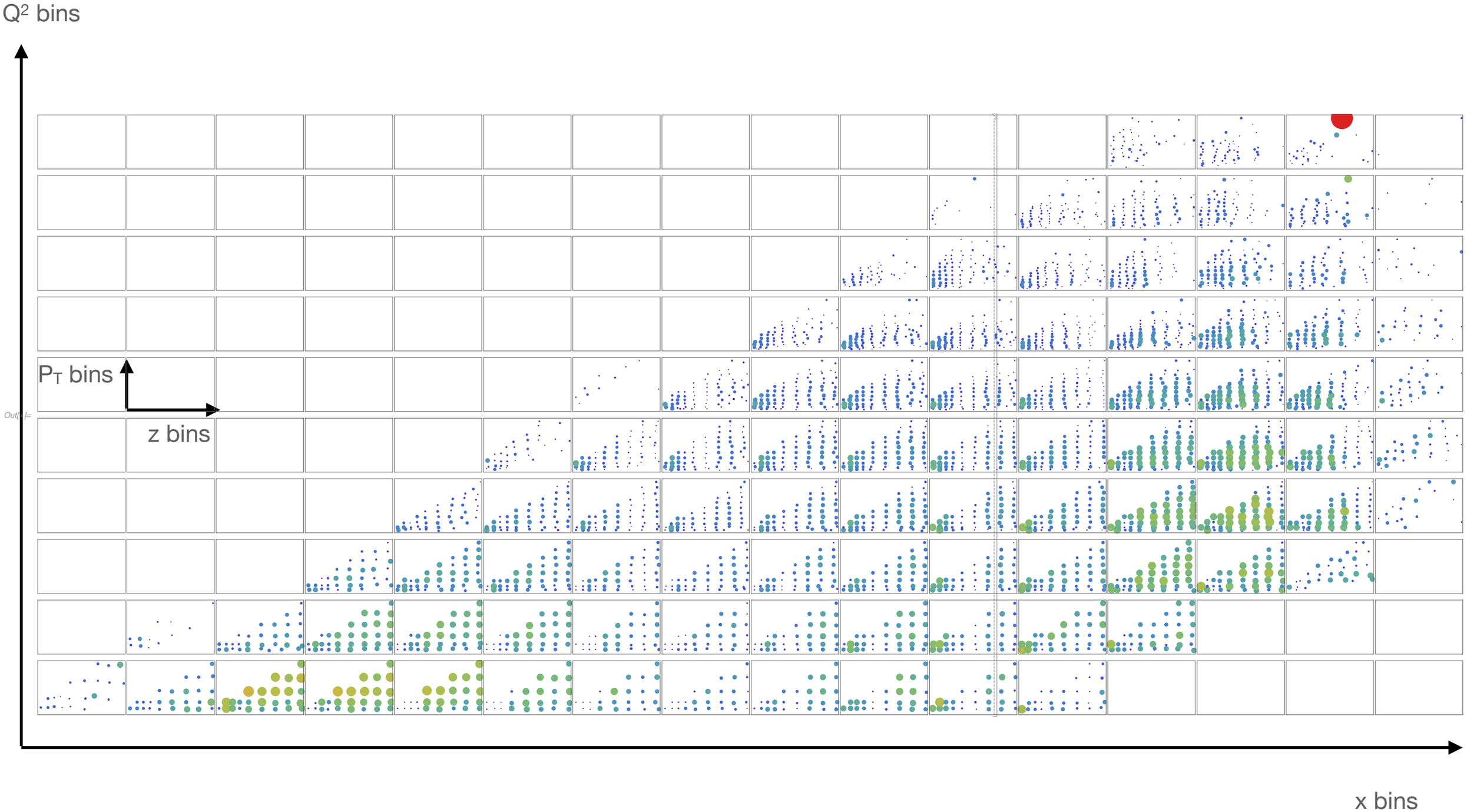
P_T bins

z bins

x bins

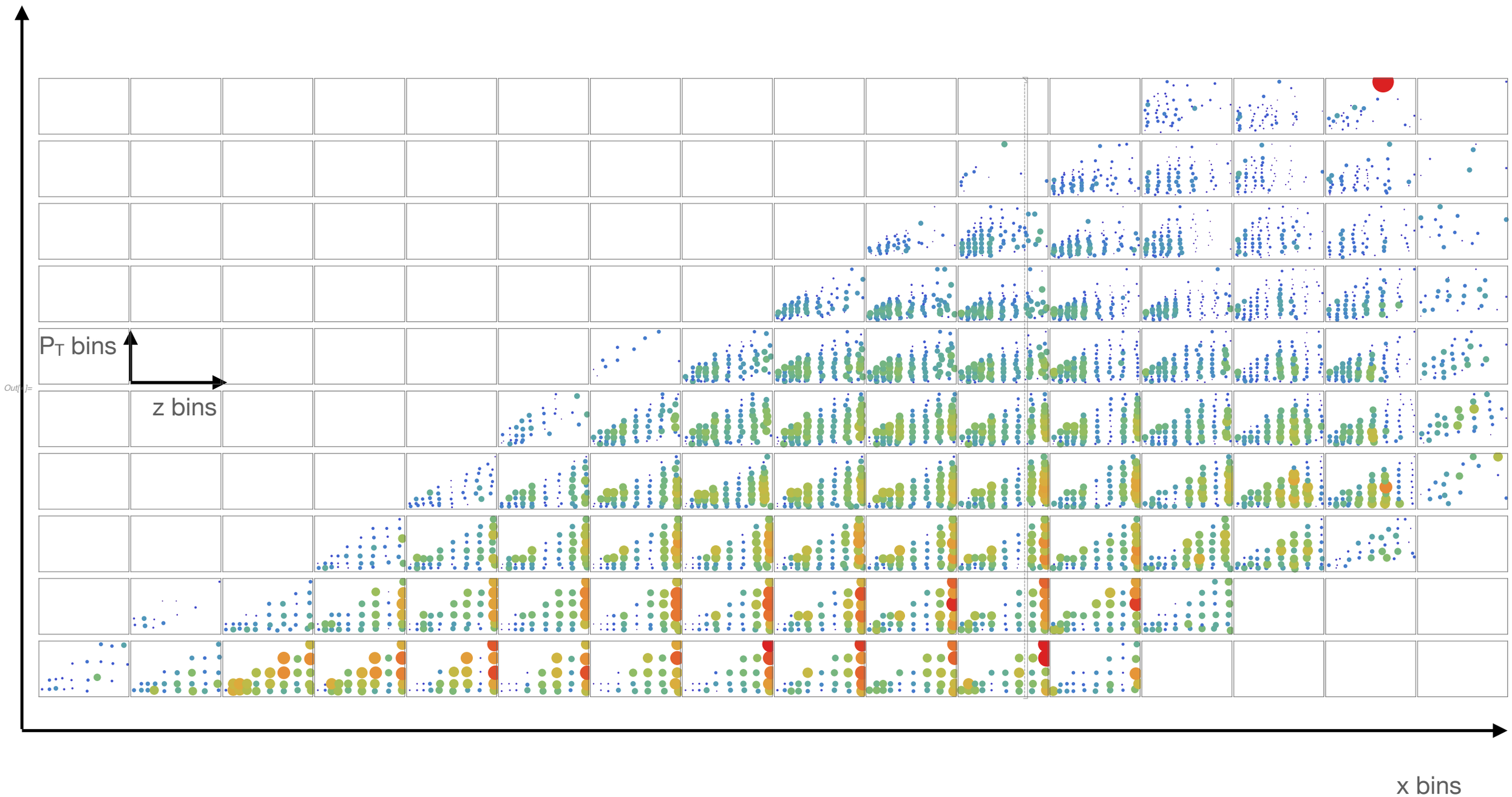
10x100 beam configuration

Sensitivity coefficients for low x-dependence of TMD PDF width (σ parameter of PV17)



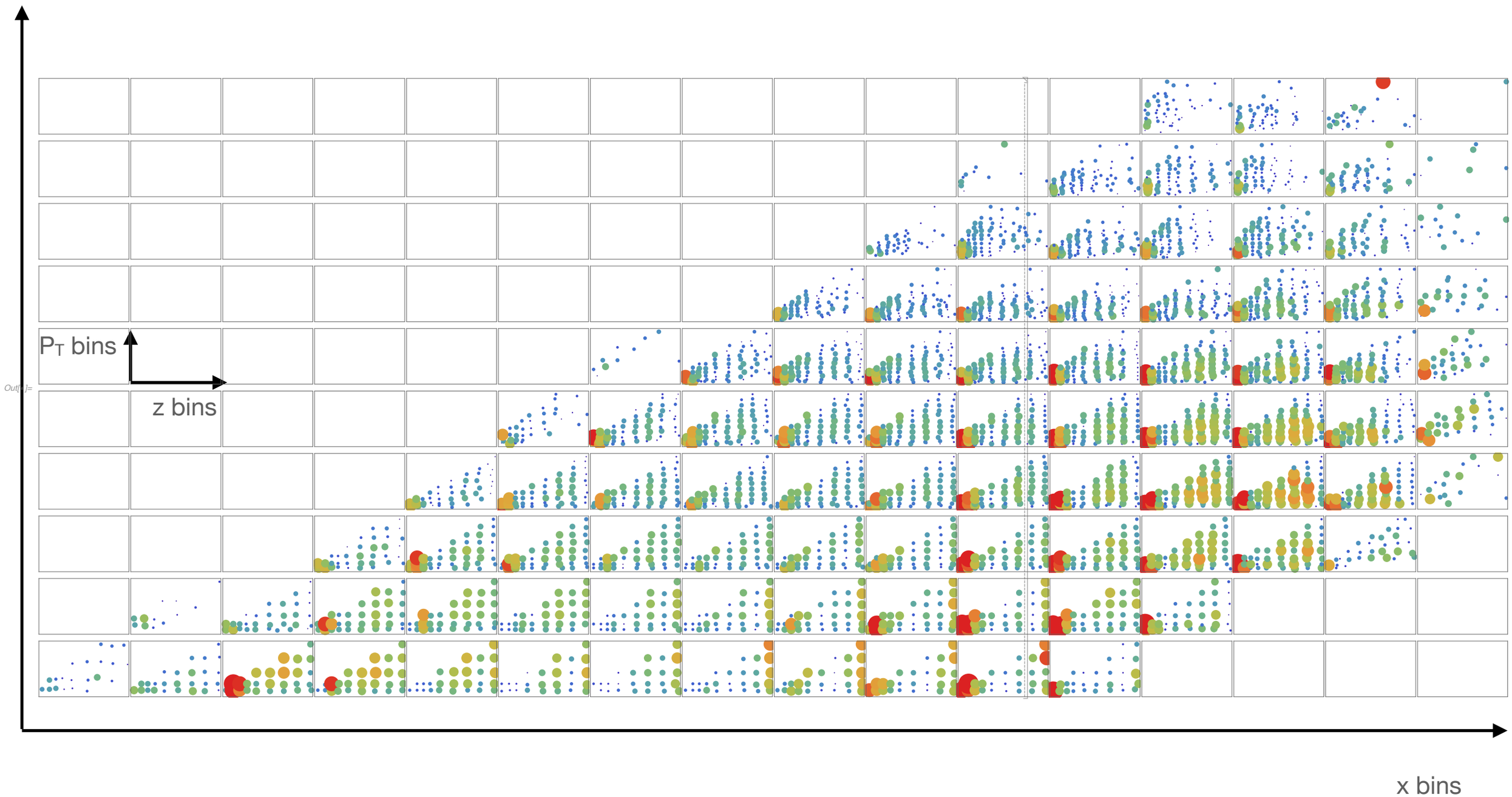
10x100 beam configuration

Sensitivity coefficients for TMD FF width (N_3 parameter of PV17)



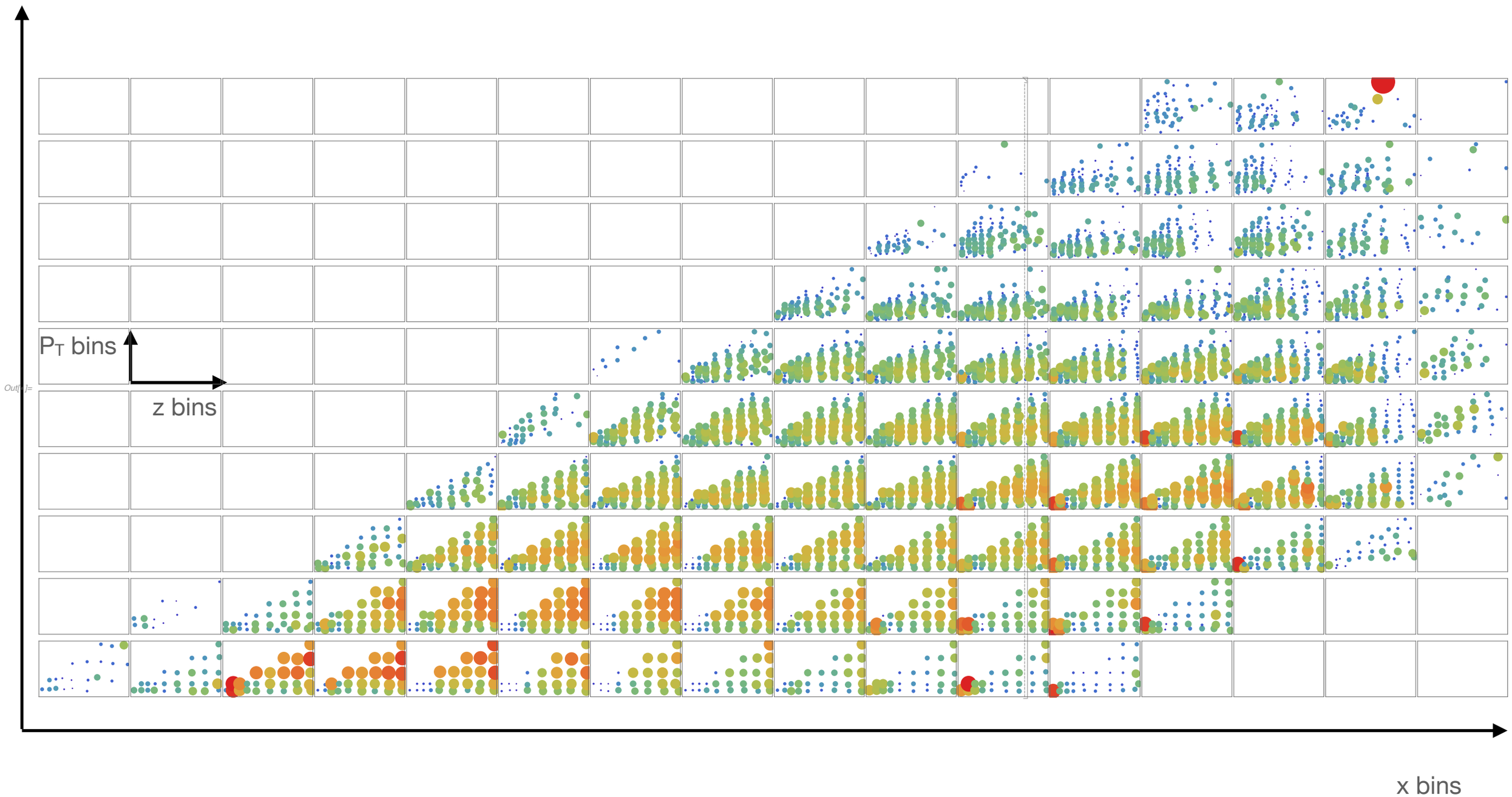
10x100 beam configuration

Sensitivity coefficients for non-Gaussian contribution to TMD FF (λ_F parameter in PV17 parametrization)



10x100 beam configuration

Sensitivity coefficients for nonperturbative evolution parameter (g_2 parameter of PV17)



10x100 beam configuration