Simulation of Q PS Stability

Qs are classified into 5 groups(cf. Kumada case1)

QD0, QF1, QD4&10, QM, others

In this simulation, for each Q, K1 error is

dK1=σ maxK1/K1

assuming the stability is defined at the strongest Q and the error remains unchanged down to zero.

Here maxK1 is maximum Abs[K1] of the group and

σ =10ppm(QD0)

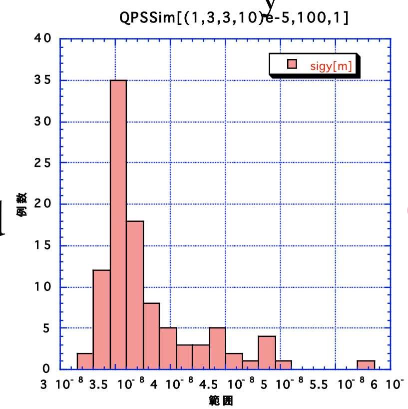
30ppm(QF1, QD4&10)

σ_x(QM, others)

Sim. Cond.

ε_x=2e-9,$\gamma\varepsilon_y$=3e-8, δ=8e-4

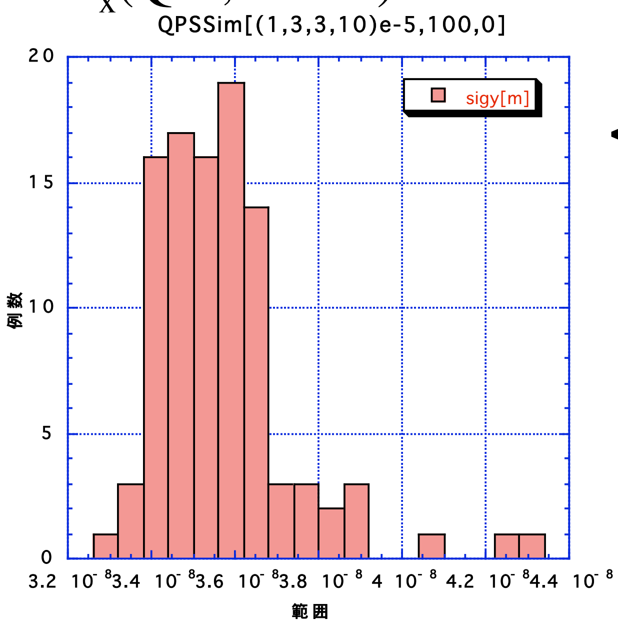
→ideal σ_y=34.8nm



σ_x =100ppm

Gaussian error dist.

σ_y(95%CL)=48nm



← σ_x =100ppm

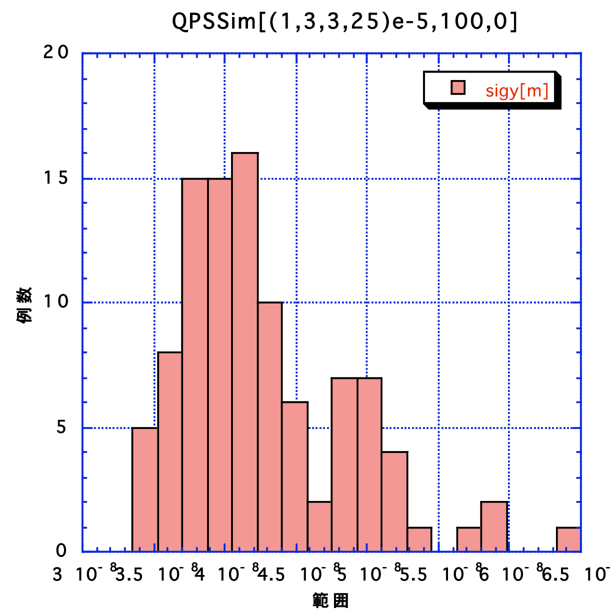
Uniform error dist.

σ_y(95%CL)=38.5nm

σ_x =250ppm

Uniform error dist.

σ_y(95%CL)=52nm →



Simulation of B,Q&SX PS Stability

Magnet groups

QD0, QF1, QD4&10, QM, otherQ, SX, Bchi, B

Error : dKN=σ maxKN/KN

Here maxKN is maximum Abs[KN] of the group

σ =10ppm(QD0, QF1, QD4&10,B)

σ_{PS}(QM, otherQ, SX, Bchi)

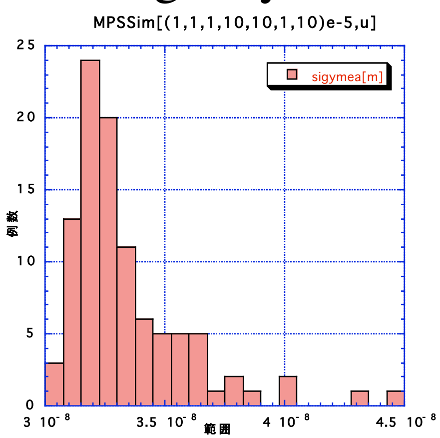
Error distribution: uniform in ± dKN

(For 4 chicane Bs(Bchi) errors are the same assuming they are connected in series.)

Simulation is for FF only.
Oct&Dec are excluded
since KN=0 for them

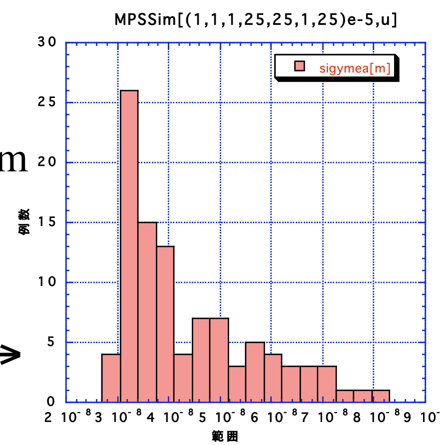
Measured beam size is defined

$\sigma_{mea}^2=\sigma_y^2+\Delta y^2$



← σ_{PS} =100ppm
σ_{mea}(95%CL)=38nm

σ_{PS} =250ppm
σ_{mea}(95%CL)=69nm →



Contribution of dy is small: Δy^2(95%CL)=7e-18m^2 for both case.

H Bend stability →H orbit & beam size:

For σ_{PS} =100ppm, Δx^2(95%CL)=5e-10m^2, $\sigma_{mea\ x}$ (95%CL) =22.5um !

(Maybe we do not care about this)