# Simulated errors due to misalignments

Project THOMx

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# Uncertainties and jitters – Laser pulse



| Parameters | ASTRA Names | Distribution | Uncertainties | laser3 |
|---|---|---|---|---|
| X offset in position (pointing instability) | *Xoff* | Gaussian (F) | 0.24 mm | 1 |
| Y offset in position (pointing instability) | *Yoff* | Gaussian (F) | 0.24 mm | 1 |
| Laser pulse duration fluctuations | *Trms* | Gaussian (F) | 100 fs | 2 |
| Timing offset (laser intrinsic jitter) | *Toff* | Gaussian (F) | 0.3 ps | 3 |
| Fluctuations in spot size (hor.) | *Xrms* | Gaussian (F) | 0.01 mm | 4 |
| Fluctuations in spot size (ver.) | *Yrms* | Gaussian (F) | 0.01 mm | 4 |
| Fluctuations in peak energy (or charge) | *Qbunch* or *Q_total* | Gaussian (F) | 50 pC | 5 |

**F: full Gaussian distribution (no cuts)**

# Misalignments & fluctuations – Solenoid ($B_3$)



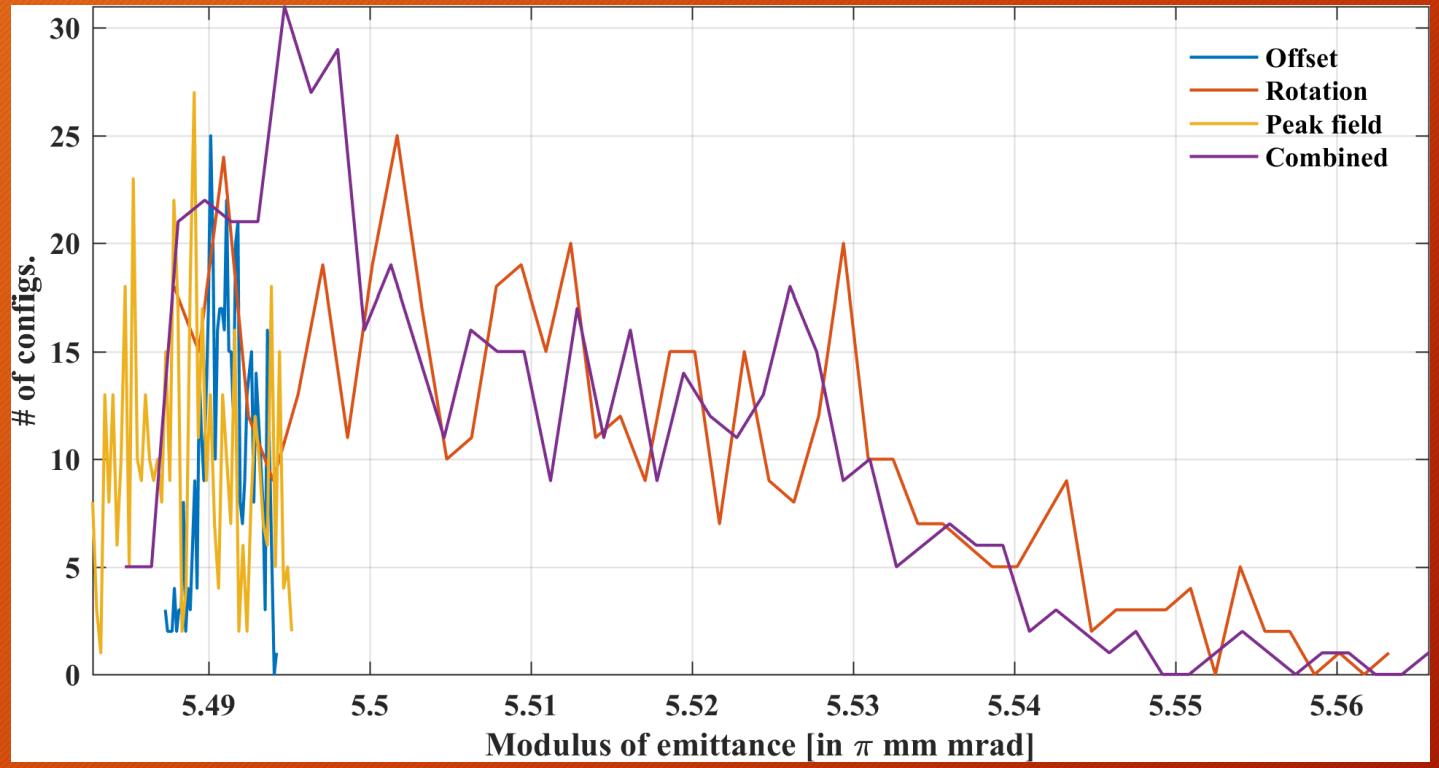
| Parameters | ASTRA Names | Distribution | Uncertainties | Sole3 |
|---|---|---|---|---|
| X offset in alignment | *S_xoff* | Uniform ($\sigma$) | 50 μm | 1 |
| Y offset in alignment | *S_yoff* | Uniform ($\sigma$) | 50 μm | 1 |
| Tilt along x-axis | *S_xrot* | Uniform ($\sigma$) | 1.0 mrad | 2 |
| Tilt along y-axis | *S_yrot* | Uniform ($\sigma$) | 1.0 mrad | 2 |
| Fluctuations in peak field | *MaxB* | Gaussian ($\sigma$) | 0.025 mT | 3 |

**$\sigma$: The said distribution is cut at $1\sigma$.**

# Results for solenoid ($B_3$) misalignments



- Emittance @6.1 m




| Name | Δ |
|---|---|
| *S_xoff* | 50 μm |
| *S_yoff* | 50 μm |
| *S_xrot* | 1.0 mrad |
| *S_yrot* | 1.0 mrad |
| *MaxB* | 0.025 mT |

Emittance is dominated by the rotational misalignments along $x$ and $y$ axes.

# Uncertainties and jitters – RF gun



| Parameters | ASTRA Names | Distribution | Uncertainties | gun2 |
|---|---|---|---|---|
| RF gun phase (due to sync jitter) | *Phi(1)* | Gaussian (F) | 1 deg. | 1 |
| Fluctuations in peak field | *MaxE(1)* | Gaussian ($\sigma$) | 0.8 MV/m | 2 |

# Uncertainties and jitters – Acc. section



| Parameters | ASTRA Names | Distribution | Uncertainties | cavity2 |
|---|---|---|---|---|
| X offset in alignment | *C_xoff(2)* | Uniform ($\sigma$) | 50 μm | 1 |
| Y offset in alignment | *C_yoff(2)* | Uniform ($\sigma$) | 50 μm | 1 |
| Tilt along x-axis | *C_xrot(2)* | Uniform ($\sigma$) | 0.02 mrad | 2 |
| Tilt along y-axis | *C_yrot(2)* | Uniform ($\sigma$) | 0.02 mrad | 2 |
| Cavity phase (due to sync jitter) | *Phi(2)* | Gaussian (F) | 1 deg. | 3 |
| Fluctuations in peak field | *MaxE(2)* | Gaussian ($\sigma$) | 0.14 MV/m | 4 |

# More results pending…

Simulations are running on various servers simultaneously. T H A N K  Y O U ☺



Presentation prepared by Harsh Purwar