

CSR in the RTL of SuperKEKB

D. Zhou and Y. Seimiya

Acknowledgements:

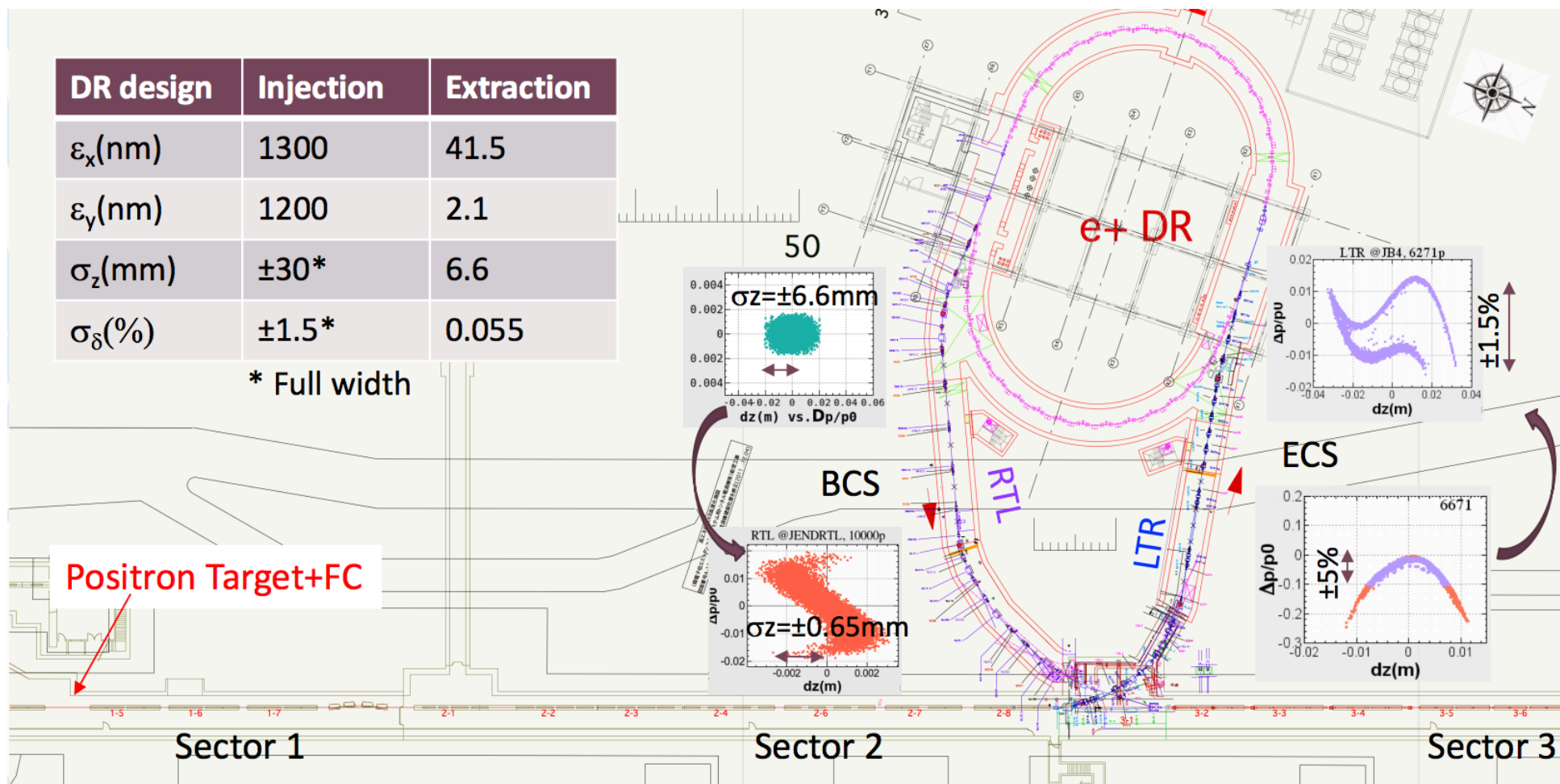
N. Iida

Emittance preservation task force meeting, Sep. 13, 2018

1. Single-bunch effects: Longitudinal: CSR

➤ CSR at RTL of SuperKEKB

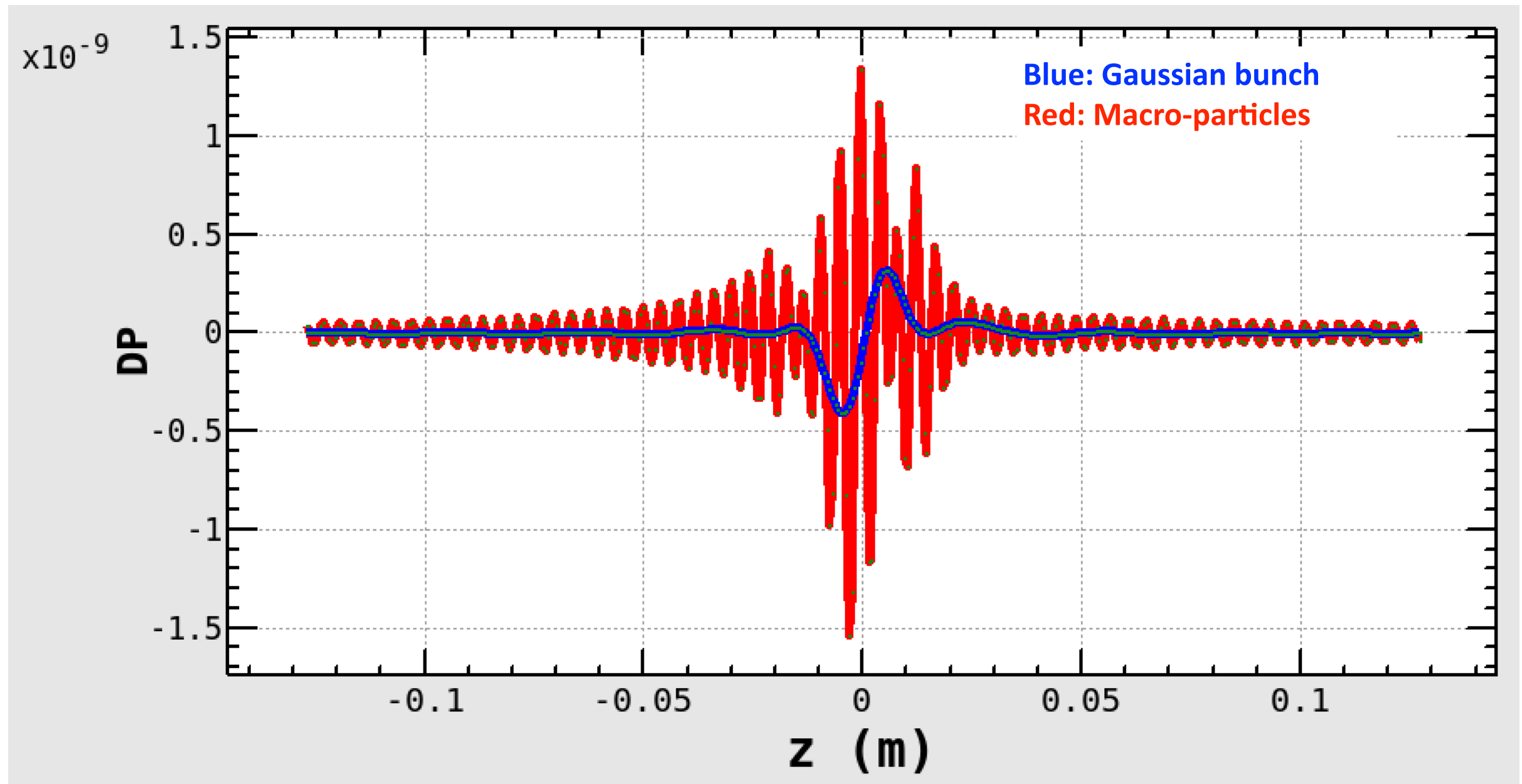
- Impedance calculated by CSRZ
- Chamber: $w=90$ mm, $h=21$ mm, $R=7.71$ (BSE1), 4.75 (BRS), 3.36 (BL1S&BL2S), 3.64 (BC1E2) m
- RMS bunch length: 23 ps - 2 ps
- Maximum bunch charge: 4-8nC



1. Single-bunch effects: Longitudinal: CSR

➤ CSR at BSE1:

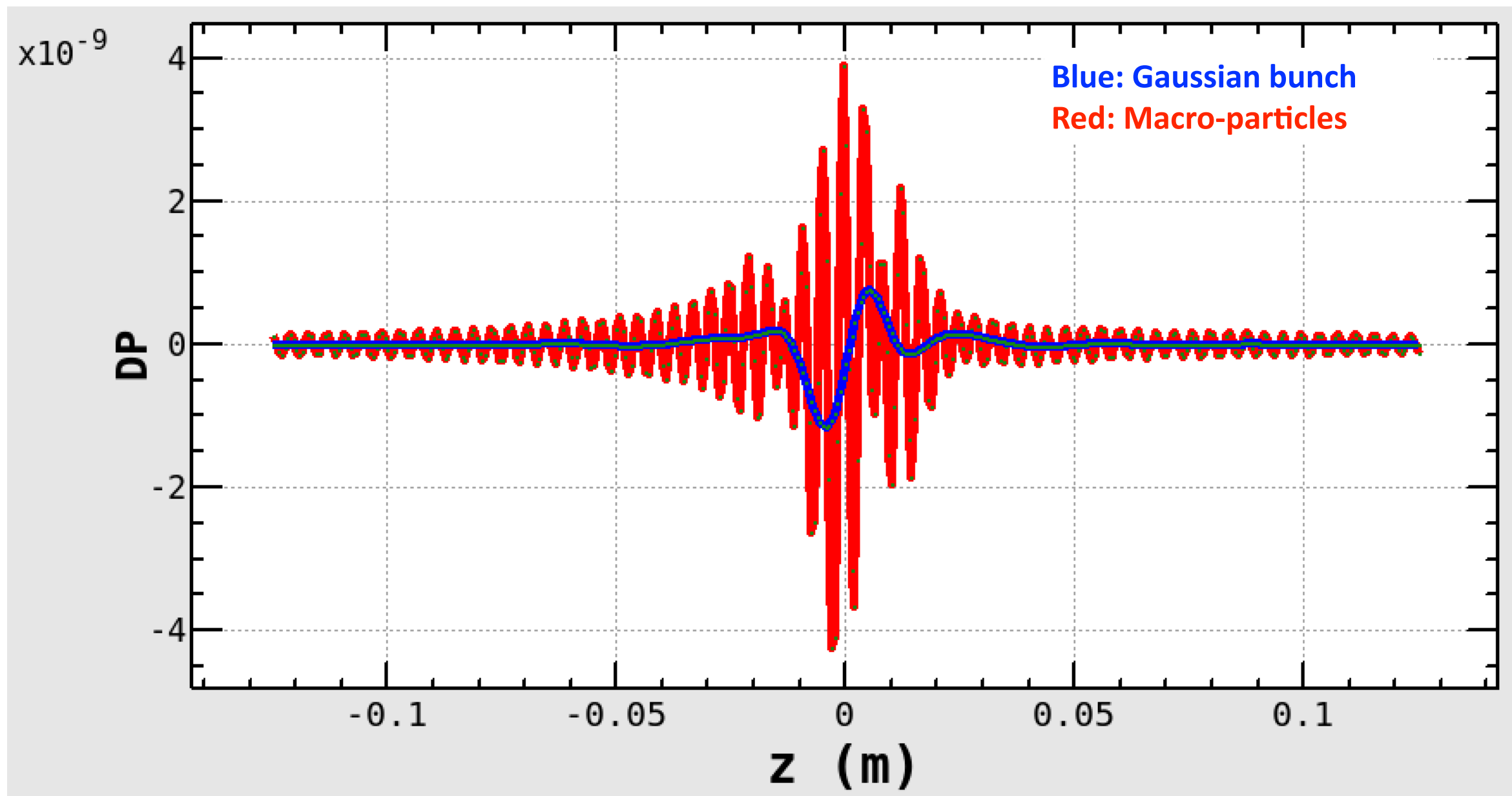
- Gaussian bunch $\sigma_z=6.35$ mm, $V_{rf}=21.5$ MV, $Q=0.7$ nC



1. Single-bunch effects: Longitudinal: CSR

➤ CSR at BRS.{1,2,3}:

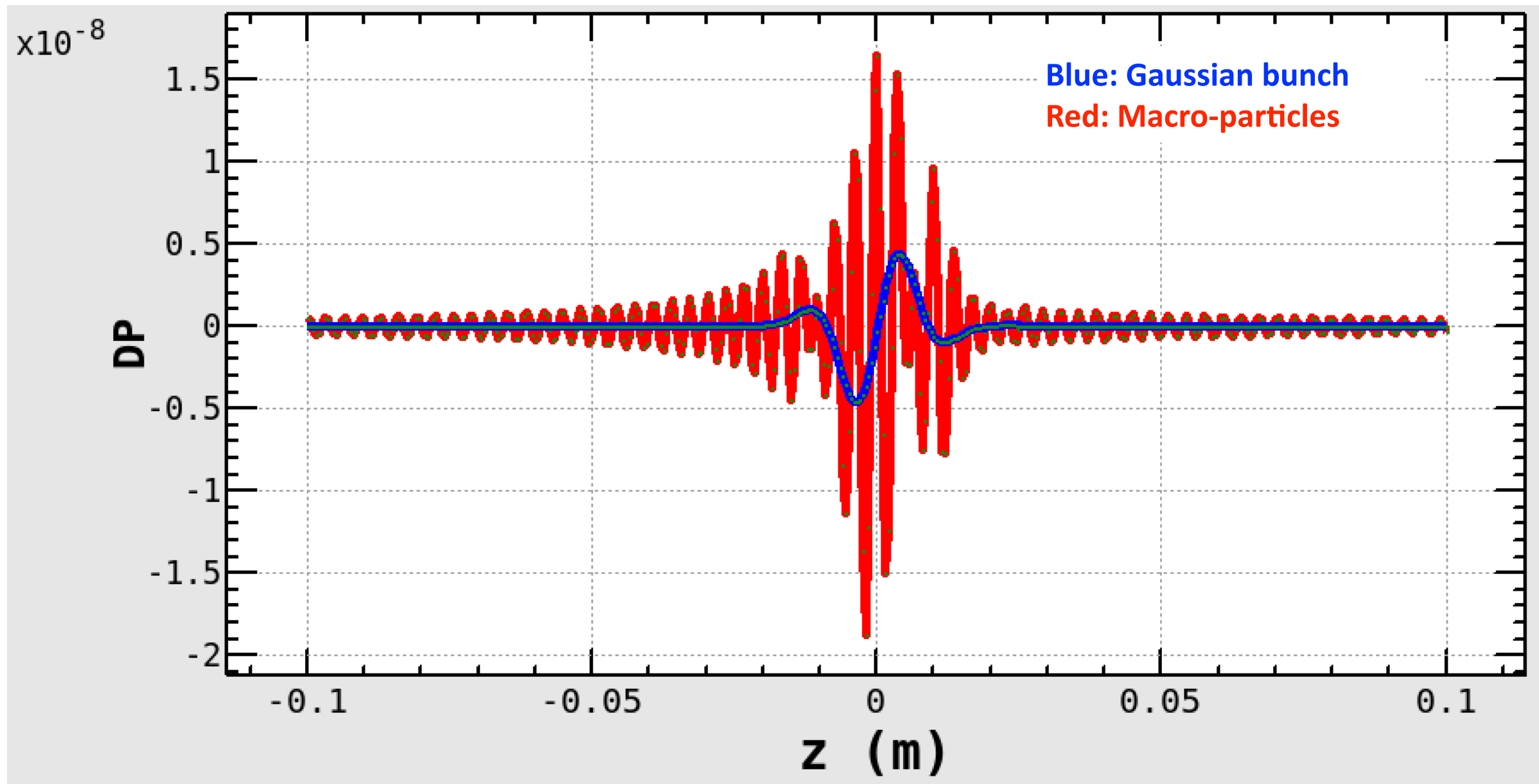
- Gaussian bunch $\sigma_z \sim 6.25$ mm, $V_{rf} = 21.5$ MV, $Q = 0.7$ nC



1. Single-bunch effects: Longitudinal: CSR

➤ CSR at BL1S.{1,2}:

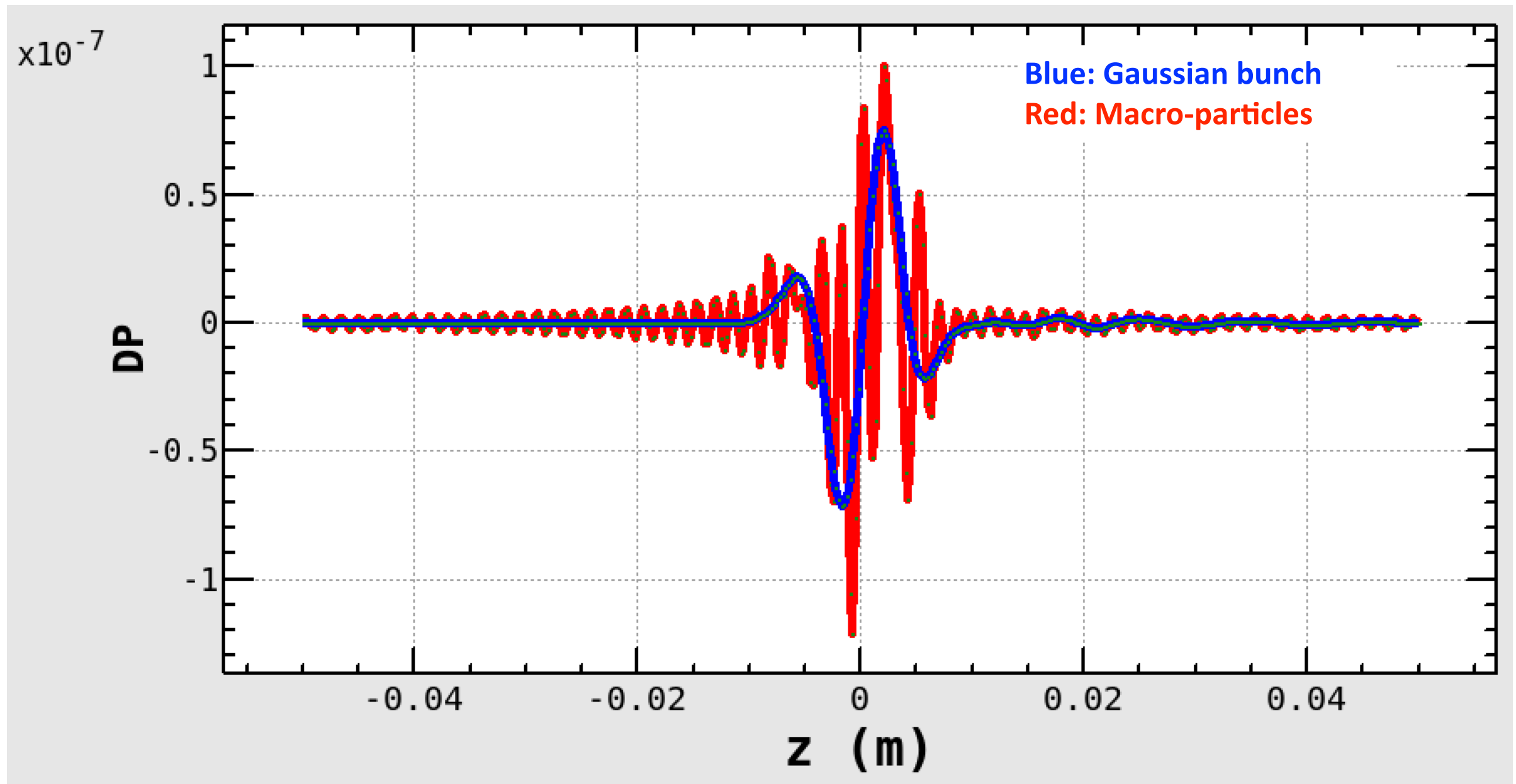
- Gaussian bunch $\sigma_z \sim 5$ mm, $V_{rf} = 21.5$ MV, $Q = 0.7$ nC



1. Single-bunch effects: Longitudinal: CSR

➤ CSR at BL2S.1:

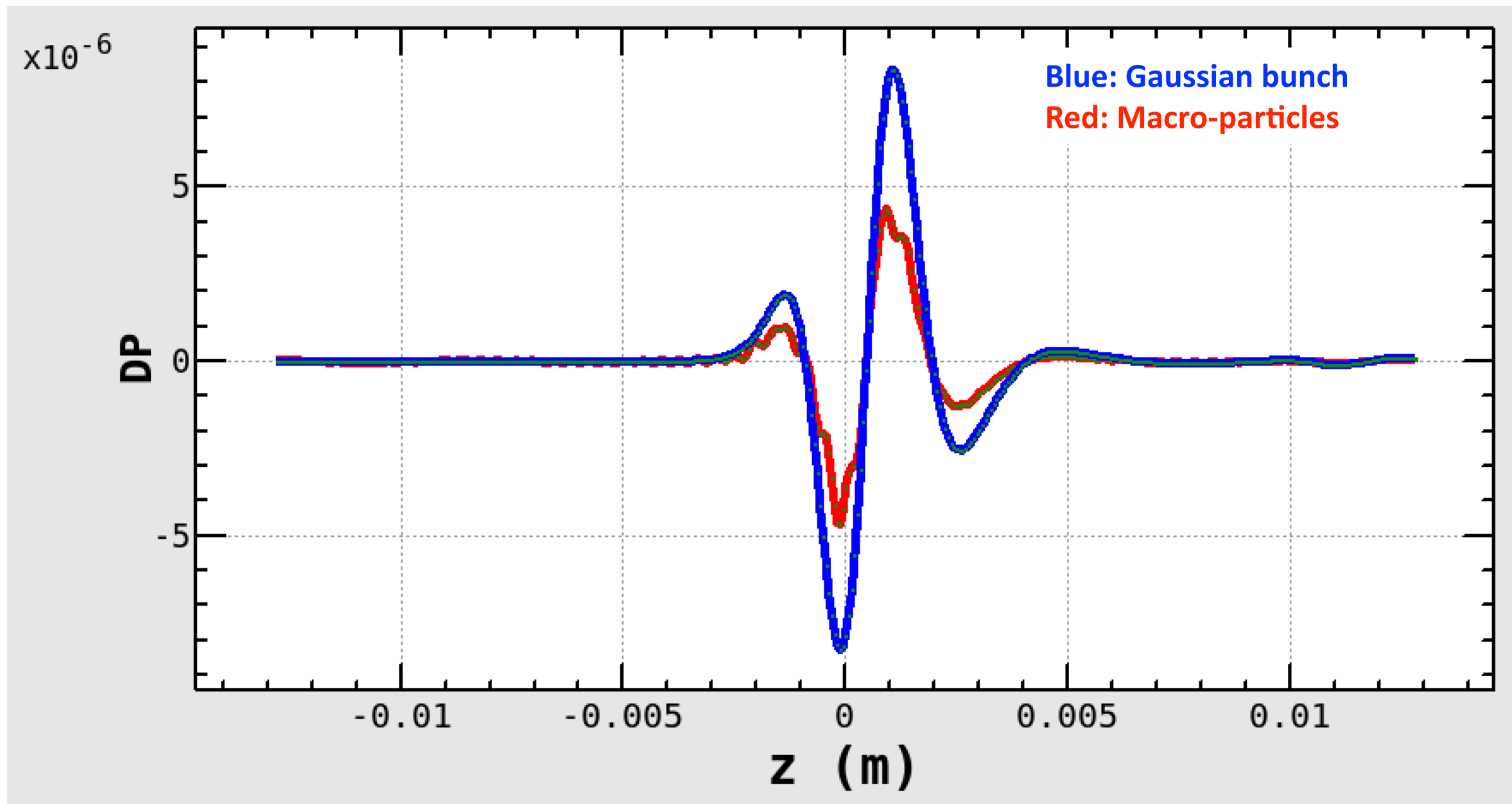
- Gaussian bunch $\sigma_z \sim 2.5$ mm, $V_{rf} = 21.5$ MV, $Q = 0.7$ nC



1. Single-bunch effects: Longitudinal: CSR

➤ CSR at BL2S.2:

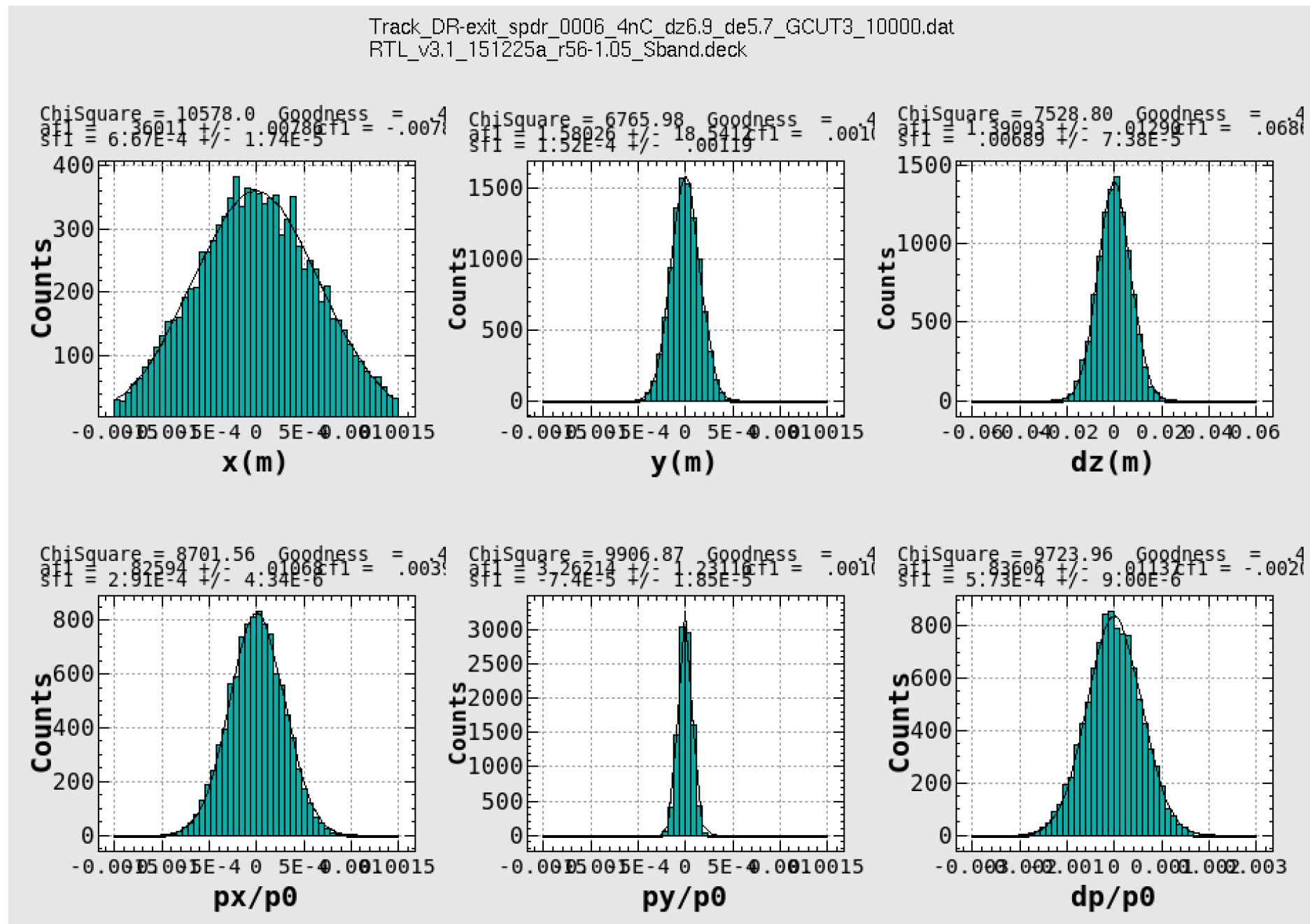
- Gaussian bunch $\sigma_z \sim 0.64$ mm, $V_{rf} = 21.5$ MV, $Q = 0.7$ nC
- Question: Factor of 2 missing? Need debugging the code



1. Single-bunch effects: Longitudinal: CSR

➤ Tracking without CSR:

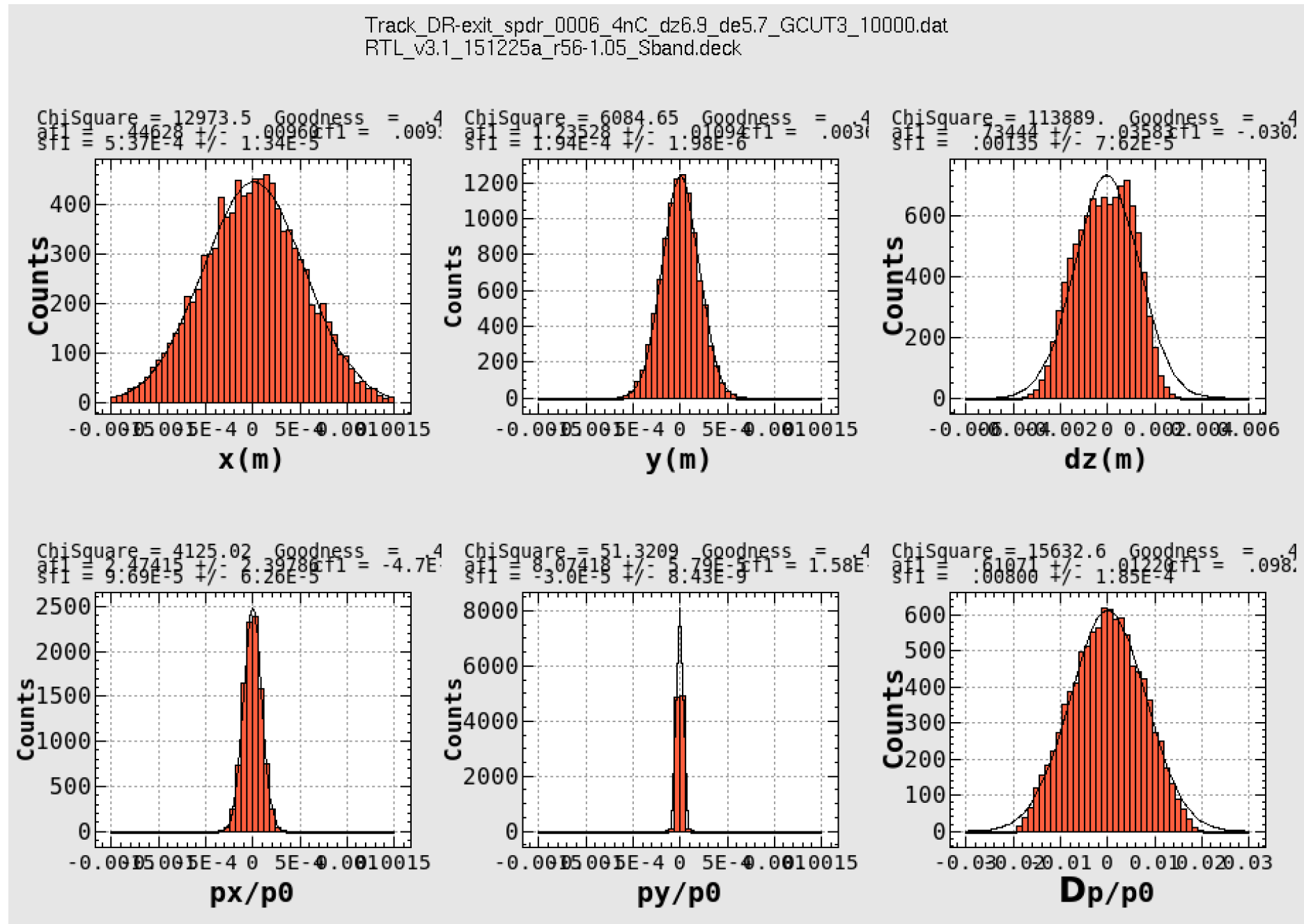
- Initial distribution



1. Single-bunch effects: Longitudinal: CSR

➤ Tracking without CSR:

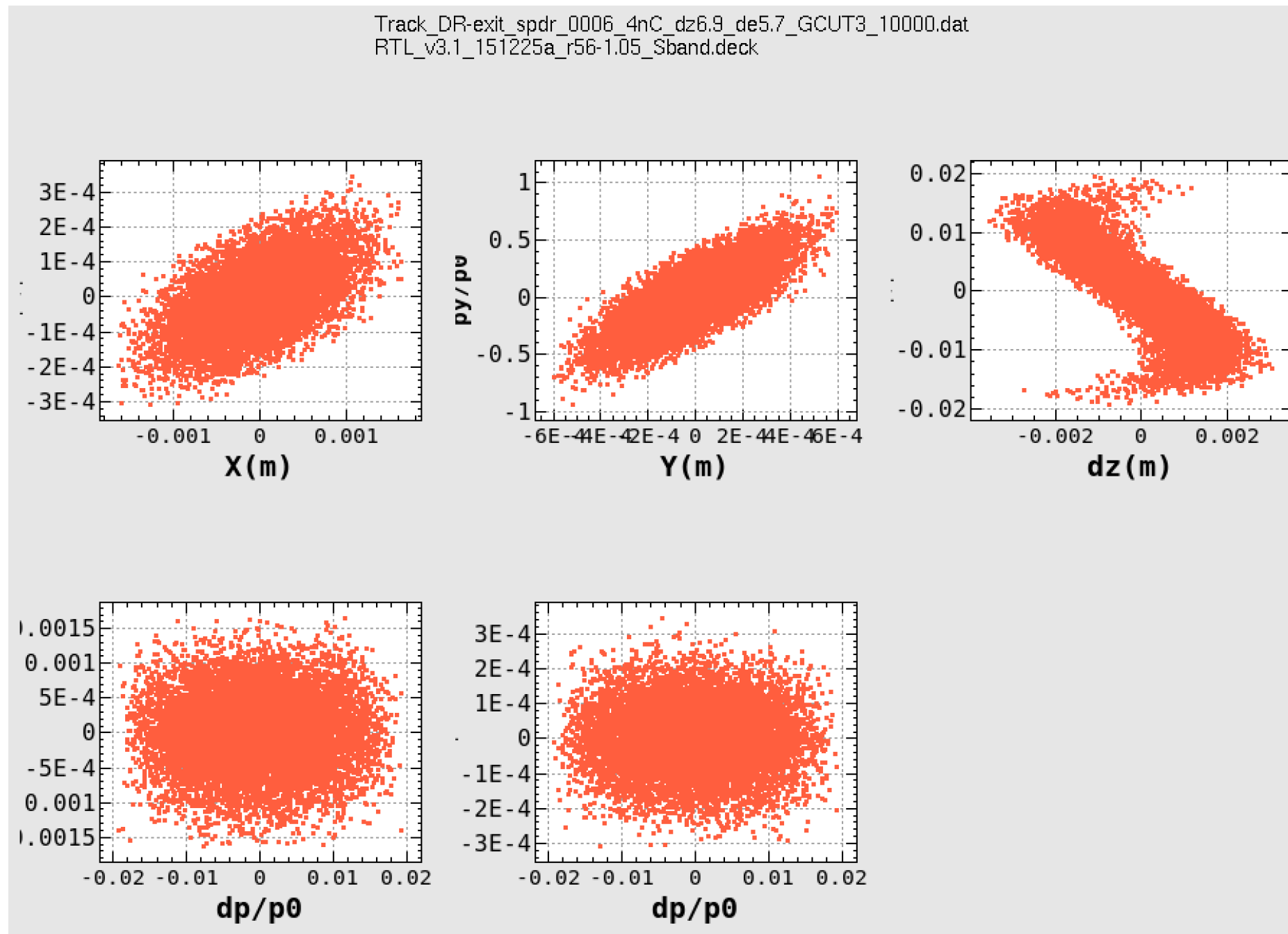
- Distribution at end of RTL



1. Single-bunch effects: Longitudinal: CSR

► Tracking without CSR:

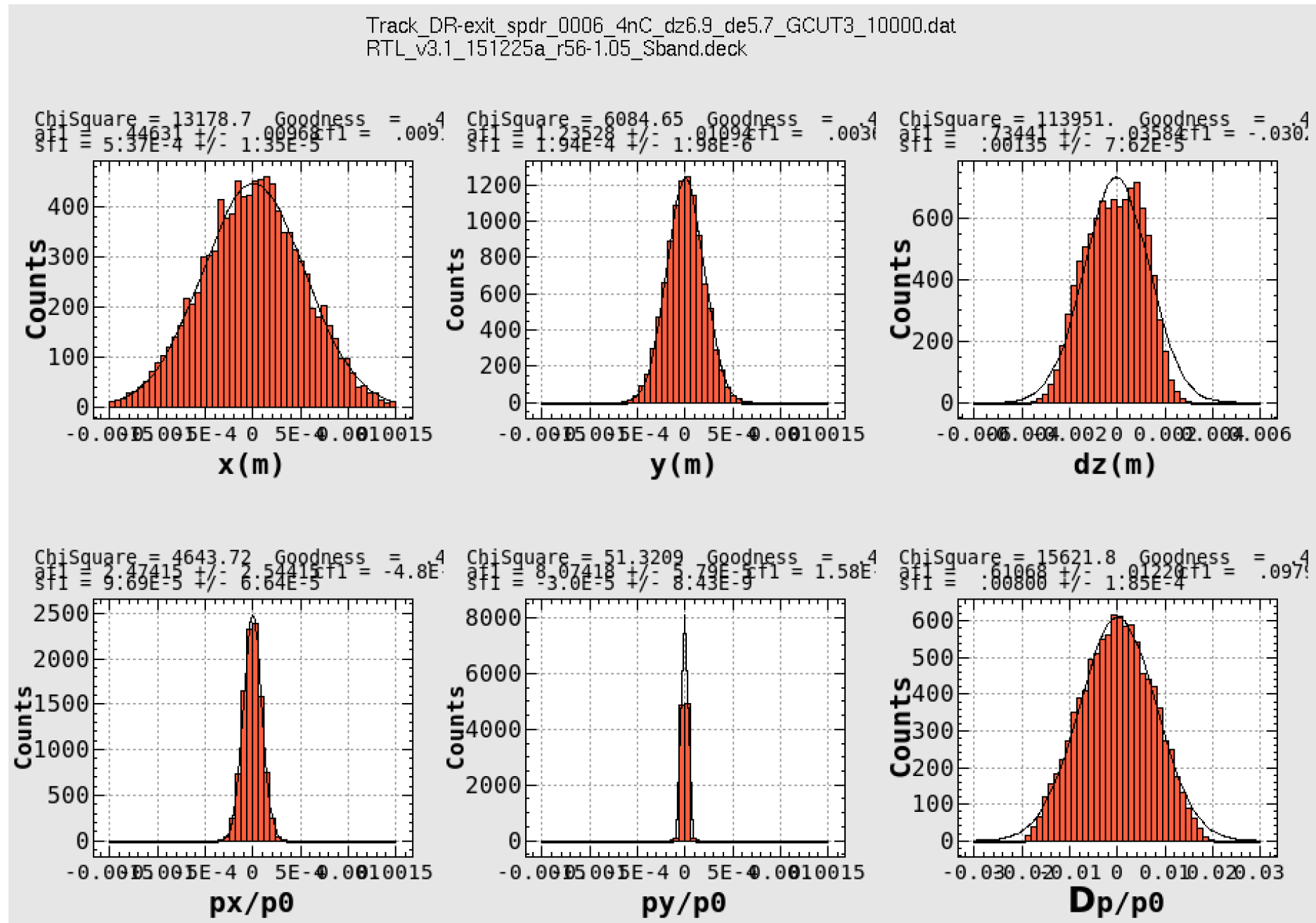
- Distribution at end of RTL



1. Single-bunch effects: Longitudinal: CSR

► Tracking with CSR:

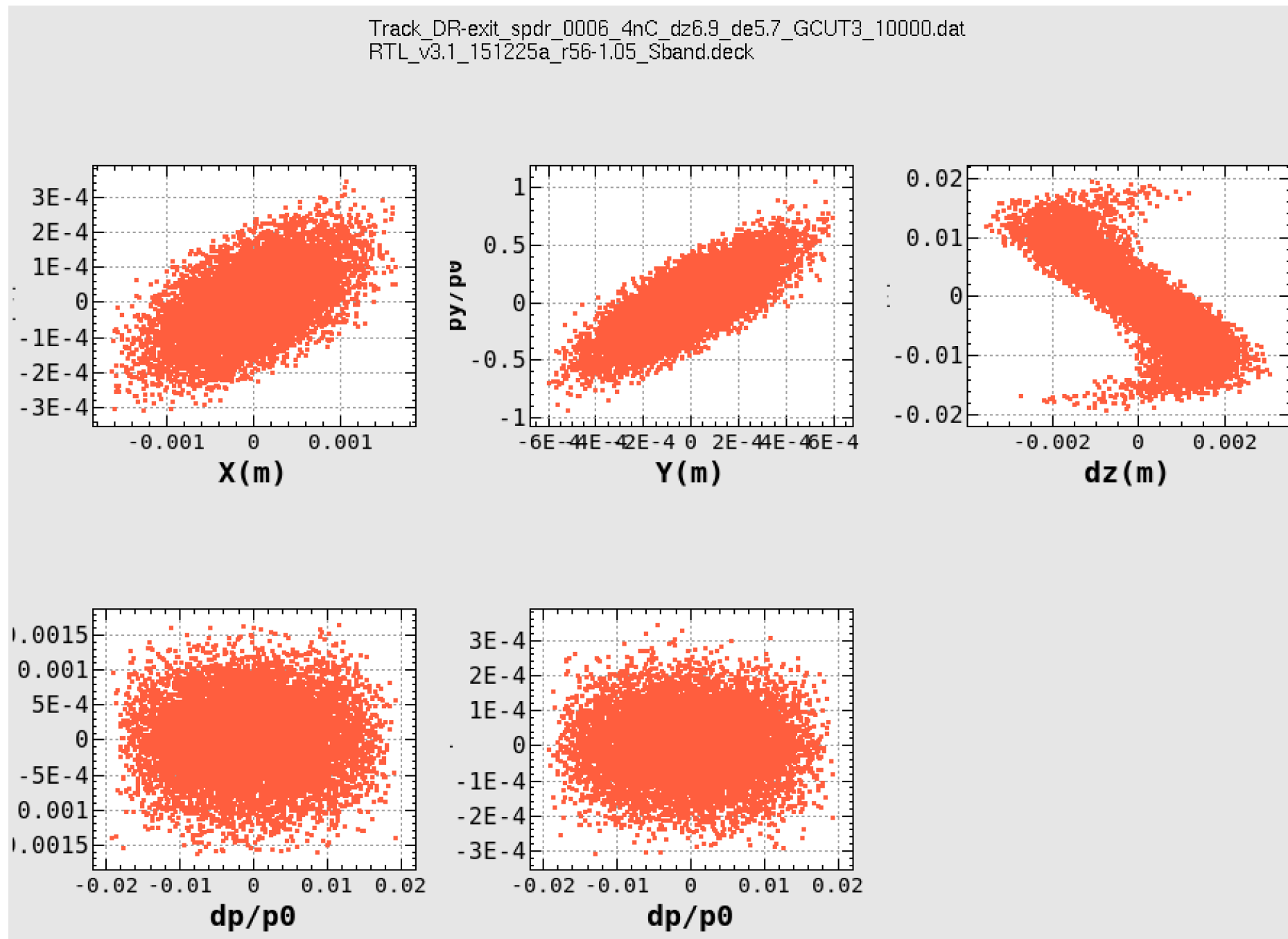
- Distribution at end of RTL



1. Single-bunch effects: Longitudinal: CSR

► Tracking with CSR:

- Distribution at end of RTL



1. Single-bunch effects: Longitudinal: CSR

➤ Tracking without and with CSR:

● Without CSR

```
exrms = 41.27557207522119 nm, g*exrms = 88851.52501515325 nm  
eyrms = 3.0551130965656372 nm, g*eyrms = 6576.564395738163 nm  
CSIx/2 = 41.27639663315544 nm  
CSIy/2 = 3.0552498794652325 nm  
41.27557207522119      41.27639663315544      3.0551130965656372      3.0552498794652325
```

● With CSR

```
exrms = 41.27582134597261 nm, g*exrms = 88852.06160581189 nm  
eyrms = 3.055113117415658 nm, g*eyrms = 6576.564440620791 nm  
CSIx/2 = 41.27664770159706 nm  
CSIy/2 = 3.0552498903791276 nm  
41.27582134597261      41.27664770159706      3.055113117415658      3.0552498903791276
```

2. Summary

- First tracking with CSR done**
- Need further debugging of the code**