Smoothing EM fields in ASTRA

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Electromagnetic fields in ASTRA

- Solenoid
- RF cavities (e.g. gun, booster, ACC)
- Quads (now gradient profile is implemented)

Electromagnetic fields in ASTRA

- Solenoid

```
&SOLENOID
LBfield=.T,
File_Bfield(1)='Main3mcomp.txt',
MaxB(1) = 0.22385,
S_smooth(1) = 50
```

If cavity and solenoid fields are not calculated with high precision the derivatives, which are used for the calculation of transverse field components, show fluctuations. (Use fieldplot to check!) A new parameter has been introduced in CAVTIY and SOLENOID for smoothing of fields: C_smooth( ) and S_smooth( ), respectively. A soft, iterative procedure is used for smoothing the fields. C_smooth( ) and S_smooth( ) have to be set to the number of iterations to be done, usually C_smooth( )=10 works fine. (Default values are zero). Use fieldplot to check that the longitudinal field component remains basically unchanged and that the transverse components get as smooth as you want.
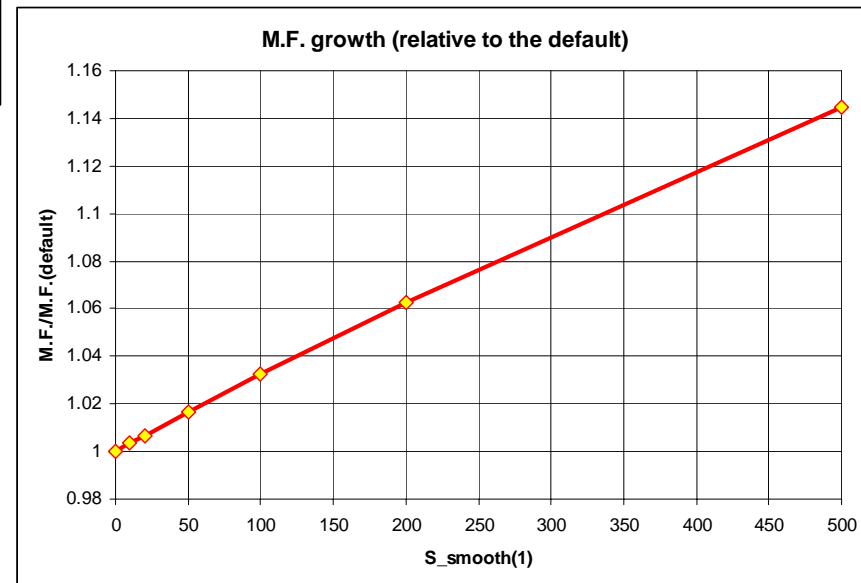
C_smooth   Integer Array
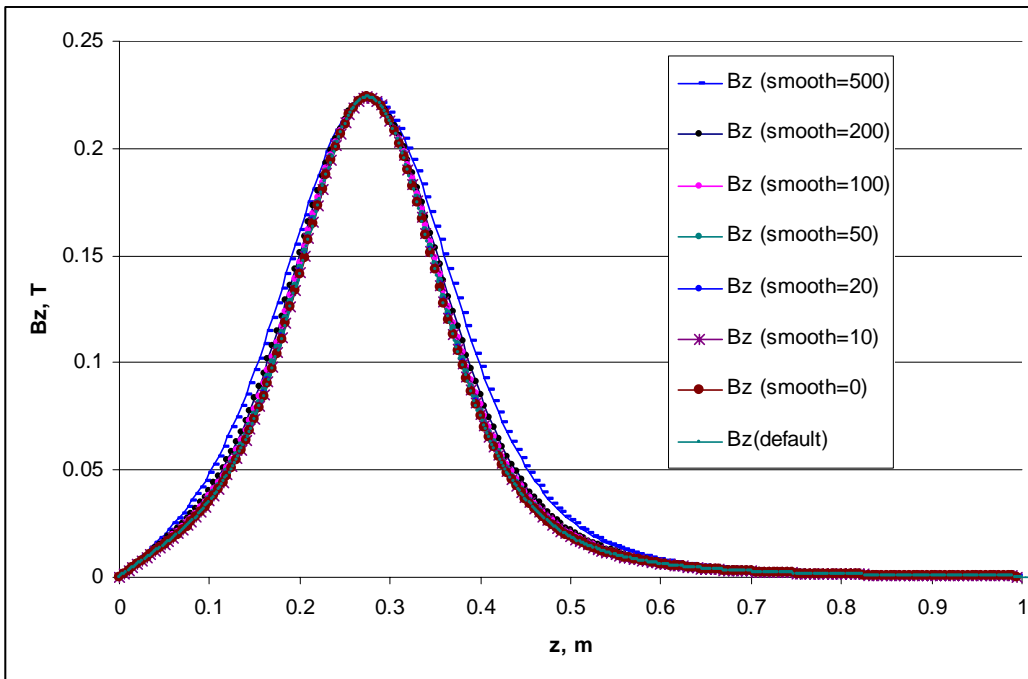S_smooth   Integer Array

Electromagnetic fields in ASTRA
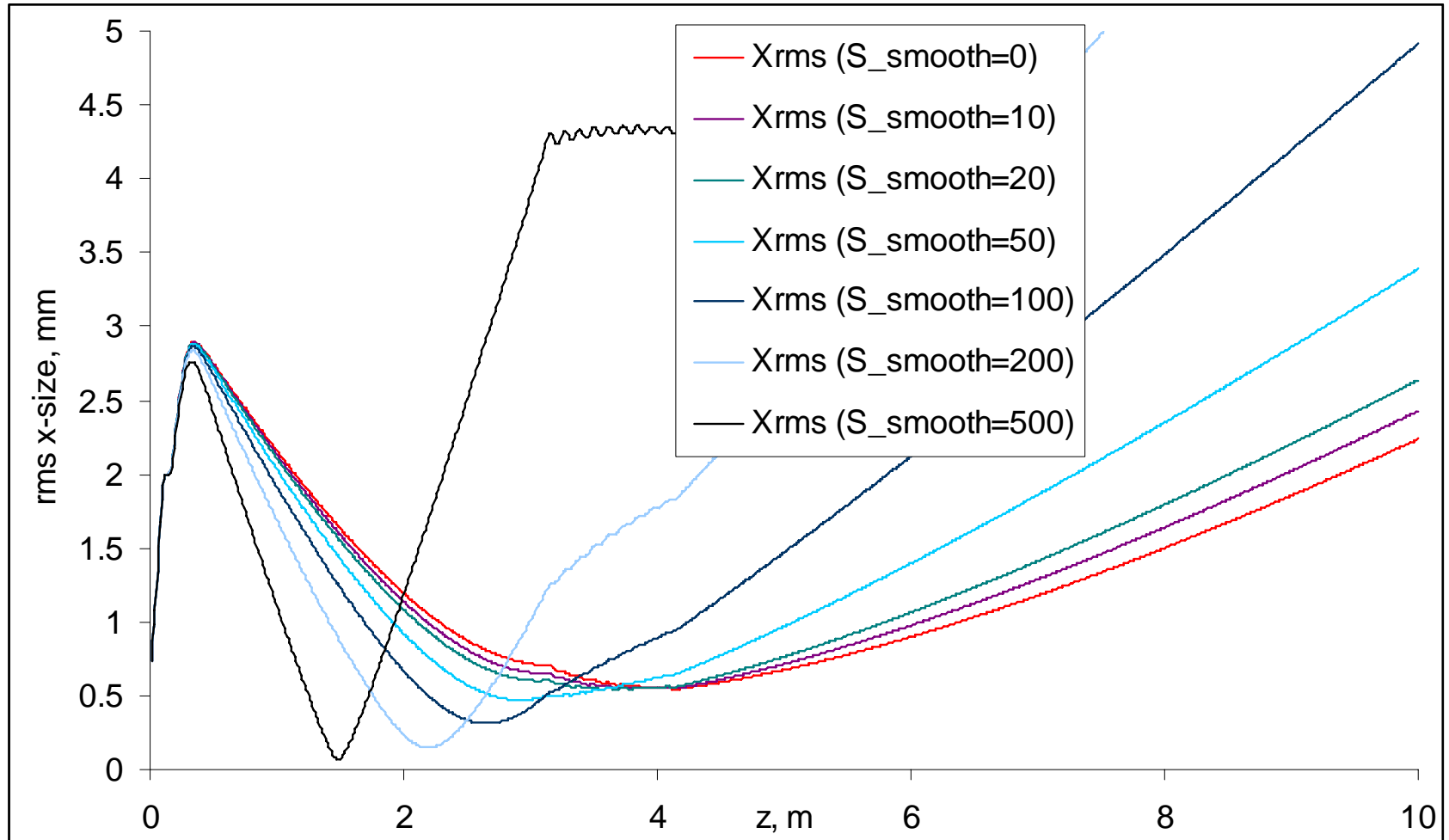
- Solenoid-> S_smooth(1)

Electromagnetic fields in ASTRA

- Solenoid-> S_smooth(1)

Conclusions

- Be careful by using smoothing procedure in ASTRA
  - The fields [solenoid->Bz(z), RF-cavilties->Ez(z), quads->G(z)] should be smooth up to higher order of derivatives
  - Multiple applying a smoothing procedure results in change of the field profile
- Recommendation: to produce good field profiles before their plug-in in ASTRA:
  - They should be as close as possible to the measured (simulated) profiles
  - They should be smooth enough
  - Check convergency and smoothness of simulated electron beam properties in corresponding structures