Benchmark of SAD, Bmad and PTC for sler_1689

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Study memo

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Tasks of benchmark work

➤ Parameters at IP
➤ Twiss functions
➤ Summary
1. Parameters at IP with $\delta=0$.

Bmad:
$\beta_x=0.031935787m$, $\alpha_x=0.5912462E-3$, $v_x=44.530088$,
$D_x=0.20343695E-6m$, $D'_x=0.16998011E-4$,
$\beta_y=2.6352853E-4m$, $\alpha_y=-0.3626459E-3$, $v_y=46.56811$,
$D_y=-0.14648086E-7m$, $D'_y=0.20250707E-4$,

SAD:
$\beta_x=0.032m$, $\alpha_x=-4.05E-11$, $v_x=44.53$,
$D_x=-2.08E-13m$, $D'_x=-1.84E-12$,
$\beta_y=2.7E-4m$, $\alpha_y=-2.22E-11$, $v_y=46.57$,
$D_y=1.856E-14m$, $D'_y=-8.34E-12$,

PTC:
$\beta_x=0.0330051927985m$, $\alpha_x=0.0001759686421$, $v_x=44.53113$,
$D_x=-0.0000001585562m$, $D'_x=0.0000157630134$,
$\beta_y=0.0003034185606m$, $\alpha_y=-0.0102517001672$, $v_y=46.57934$,
$D_y=-0.0000001272302m$, $D'_y=0.0002105706129$,
1. Closed orbit: X
1. Closed orbit: Y

- Graph 1: Y [mm] vs. s [m]
  - SAD
  - Bmad
  - PTC

- Graph 2: Y [mm] vs. s [m]
  - SAD
  - Bmad
  - PTC

- Graph 3: Y [mm] vs. s [m]
  - SAD
  - Bmad
  - PTC

- Graph 4: Y [nm] vs. s [m]
  - SAD
  - Bmad
  - PTC
1. Closed orbit: $Z$
1. Closed orbit: PX
1. Closed orbit: PY

- Diagram showing the variation of PY with s [m] for different values of SAD, Bmad, and PTC.
- Different graphs illustrate the behavior at specific intervals.
1. Closed orbit: PZ
1. Closed orbit: NuX
1. Closed orbit: NuY
1. Twiss function: BetaX

![Graph showing the behavior of BetaX over s [m] for different values of SAD, Bmad, and PTC.](image)

The graphs illustrate the variation of BetaX with respect to s [m] for different parameters, showing oscillatory patterns for some values.
1. Twiss function: AlphaX

![Graph 1](image1.png)

![Graph 2](image2.png)

![Graph 3](image3.png)
1. Twiss function: BetaY

![Graph 1](image1.png)

![Graph 2](image2.png)

![Graph 3](image3.png)
1. Twiss function: AlphaY
1. Twiss function: Dispersion-X

![Graphs showing dispersion functions for different parameters.]
1. Twiss function: Dispersion-X-Prime
1. Twiss function: Dispersion-Y

![Graphs showing dispersion functions for SAD, Bmad, and PTC.](image-url)
1. Twiss function: Dispersion-Y-Prime
3. Summary

➤ In general, now Bmad, SAD and PTC (by E. Forest) are in fairly good agreement
➤ The discrepancy of dispersion prime function is due to different definitions of dispersion prime function in Bmad and SAD [Ref. D. Sagan, Bmad manual]