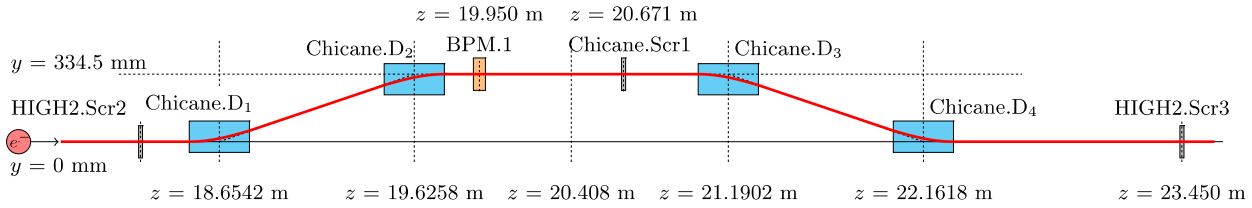
Beam matching into BC and THz generation



19 degrees bending angle

Challenges

1. Big dispersion inside BC → 0.32 m
2. Big R56 → 0.2 m

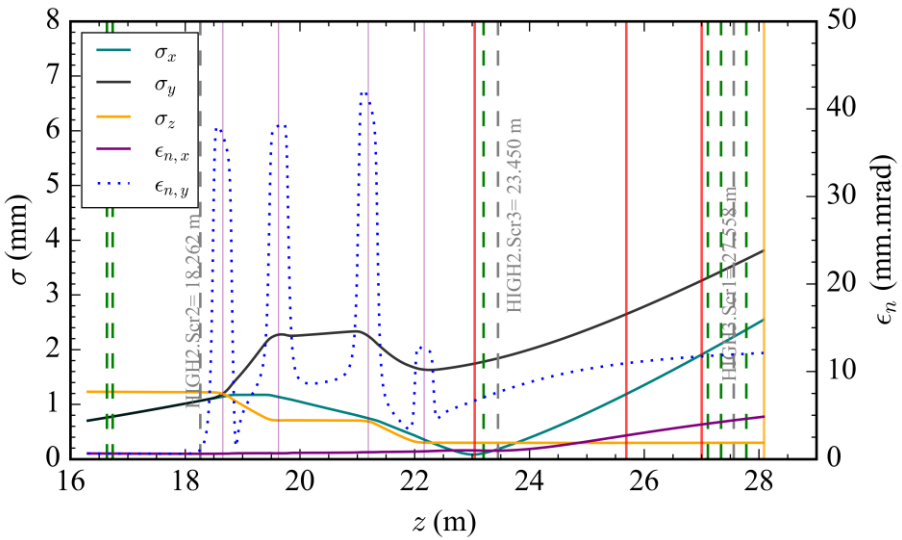
$$R_{56} \propto \theta_0^2$$

3. High space charge beam → 0.7 %

$$R_{56} = -\frac{1}{h_i}$$

Matching parameters

1. Dispersion → zero after BC
2. Emittance → need to be minimized
3. Space charge dominated
4. Edge focusing (rectangular dipole)
   - Horizontal
5. CSR



Meam momentum : 17 MeV/c

Phase : -20 deg. w.r.t. MMMG

Bunch charge : 250 pC

Beam matching into BC and THz generation

Solving these problems

1. Horizontal focusing
2. Effect from space charge
3. Effect CSR next step

Input beam properties

Meam momentum : 17 MeV/c

Phase : -20 deg. w.r.t. MMMG

Bunch charge : 250 pC

Norm. emittance : 0.8 mm.mrad

Optimized parameters

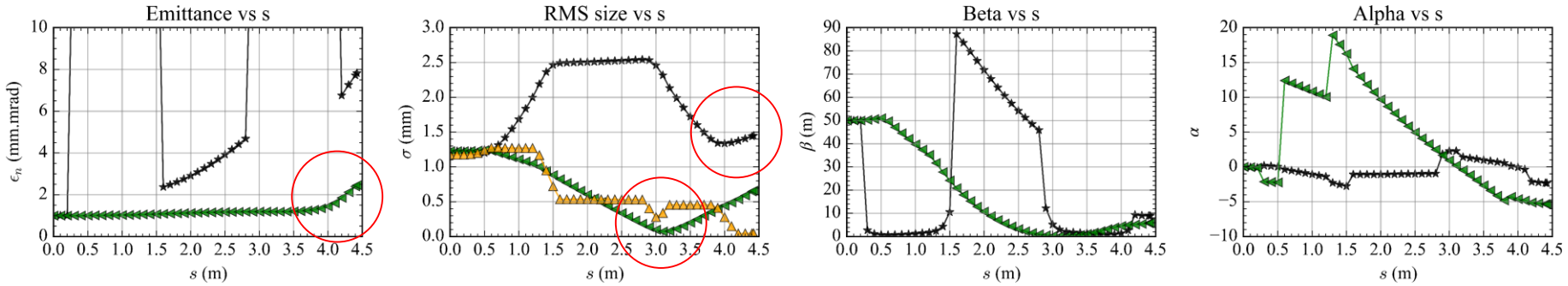
Twiss parameters

$$\sigma_{11} = \langle x_i^2 \rangle = \epsilon\beta$$

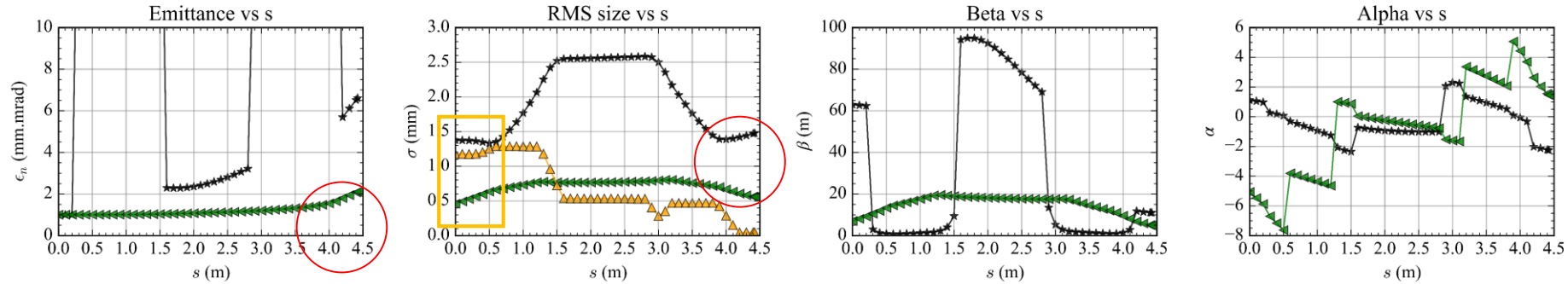
$$\sigma_{22} = \langle x_i'^2 \rangle = \epsilon\gamma$$

$$\sigma_{12} = \sigma_{21} = \langle x_i x_i' \rangle = -\epsilon\alpha$$

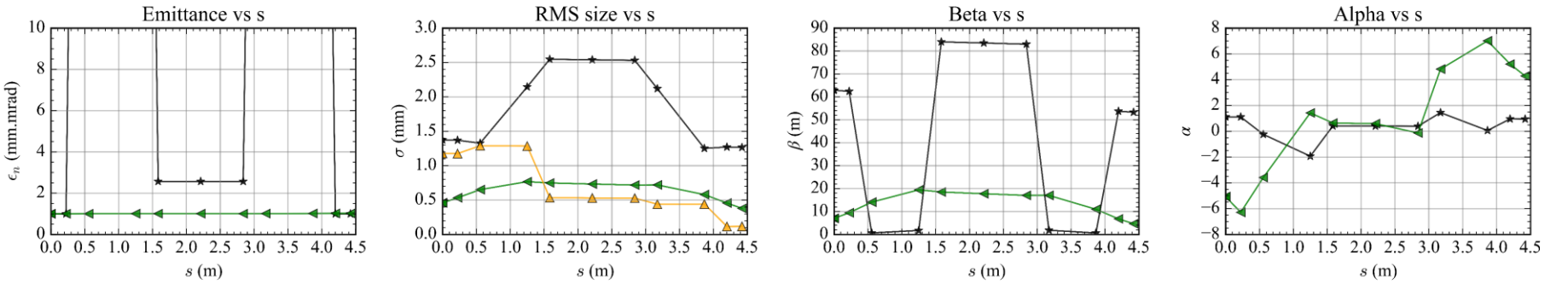
Before optimization (round beam)

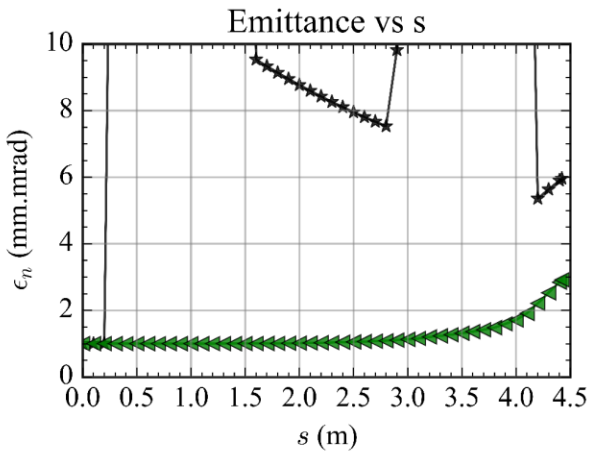


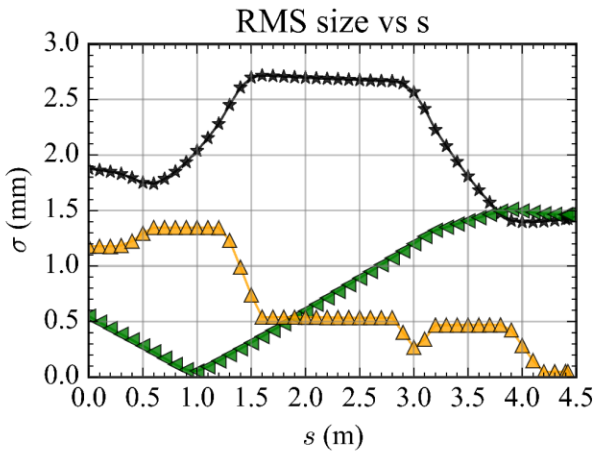
After improvement trajectory with space charge

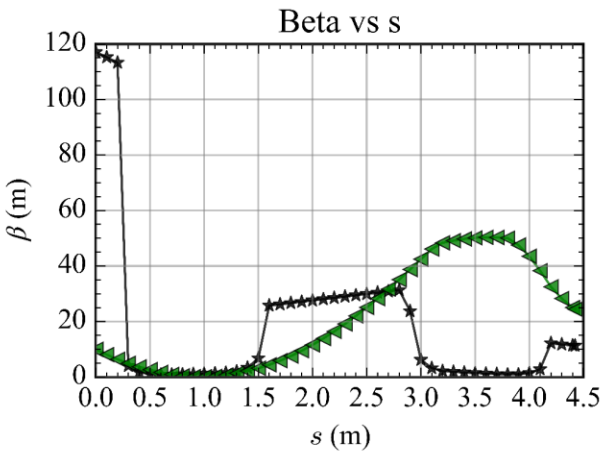


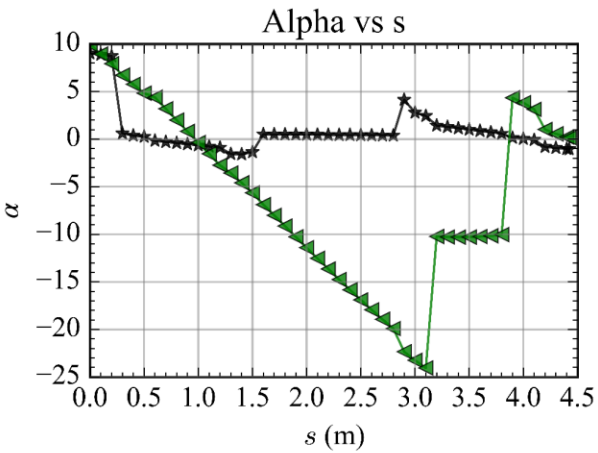
After improvement trajectory without space charge




Emittance vs s
ϵ_n (mm.mrad)
s (m)


RMS size vs s
σ (mm)
s (m)


Beta vs s
β (m)
s (m)


Alpha vs s
α
s (m)

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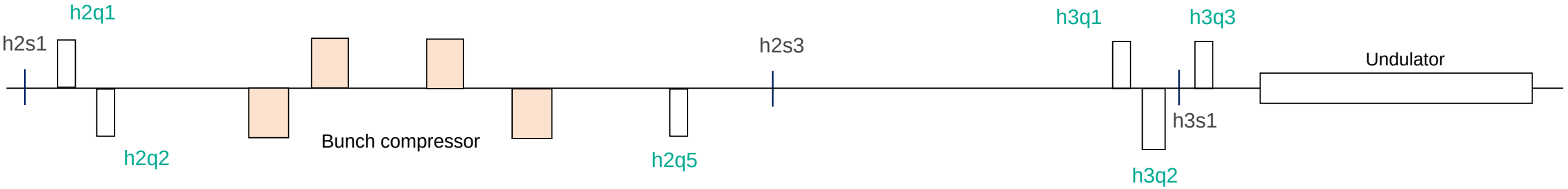

Beam matching into chicane

THz generation based on super-radiant

Measurement beam size or twiss-parameters before and after BC

Beam properties

- Laser (FWHM): > 8 ps
- BSA : 1 mm
- Bunch charge : maximum of 250 pC at Low.FC1
- Main solenoid current : < 340 A check focusing after booster
- Beam momentum at LEDA: 6.3 MeV/c for gun phase **MMMG**
- Beam momentum at HEDA1 : ~ **17** MeV/c at +20 w.r.t. **MMMG**