

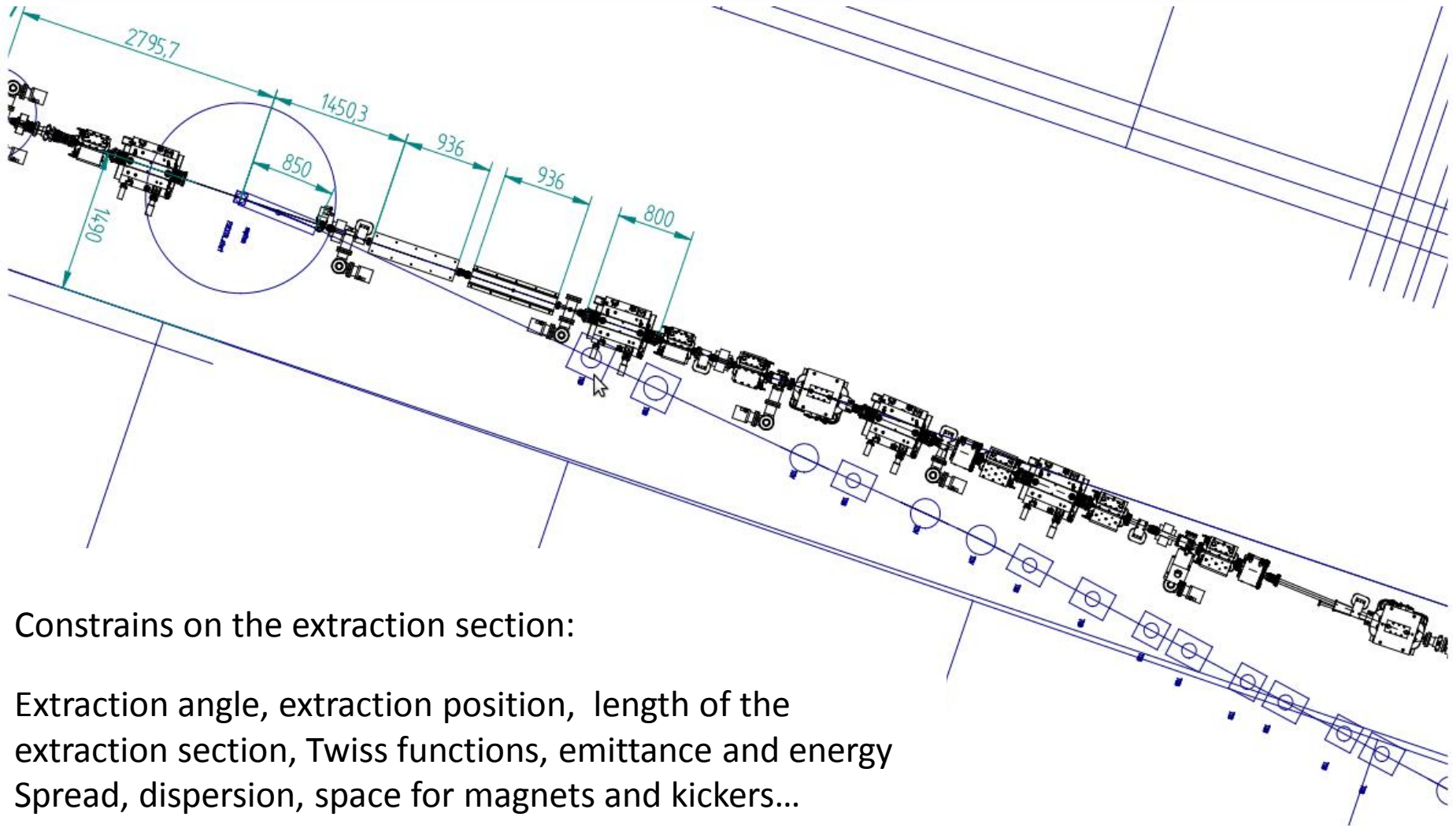
FLASH II s2e simulations

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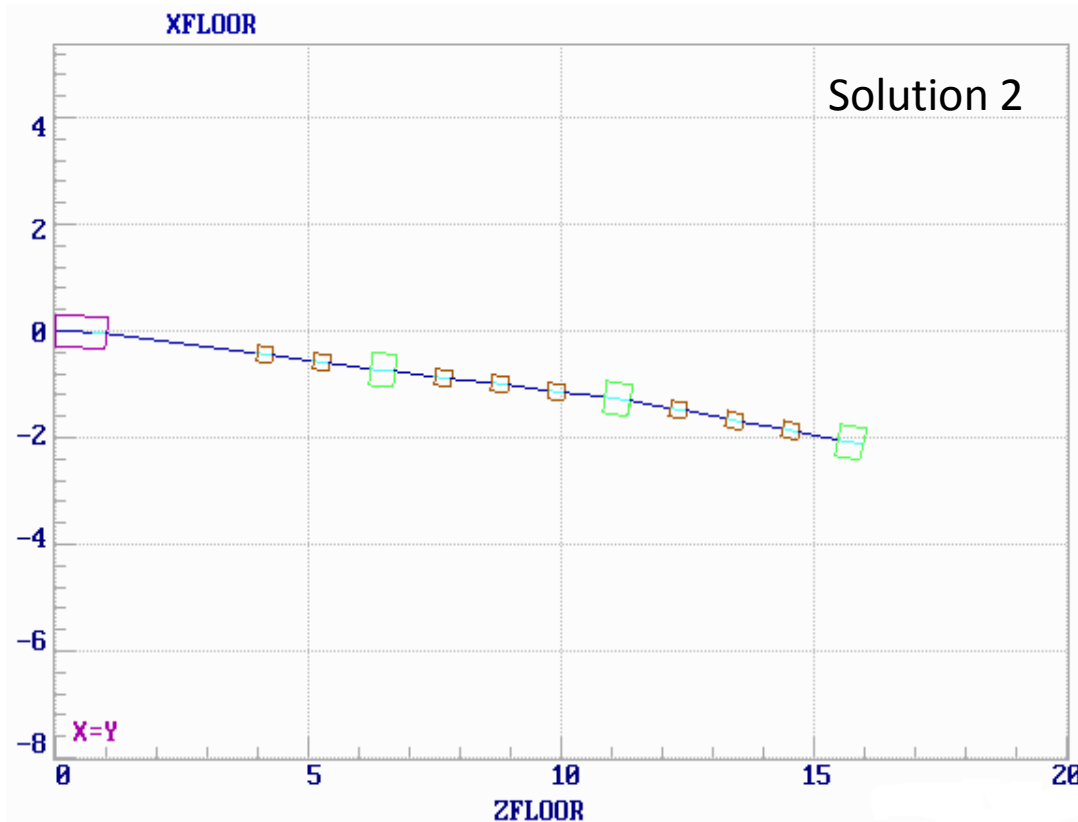
FLASH II extraction overview



Constrains on the extraction section:

Extraction angle, extraction position, length of the extraction section, Twiss functions, emittance and energy Spread, dispersion, space for magnets and kickers...

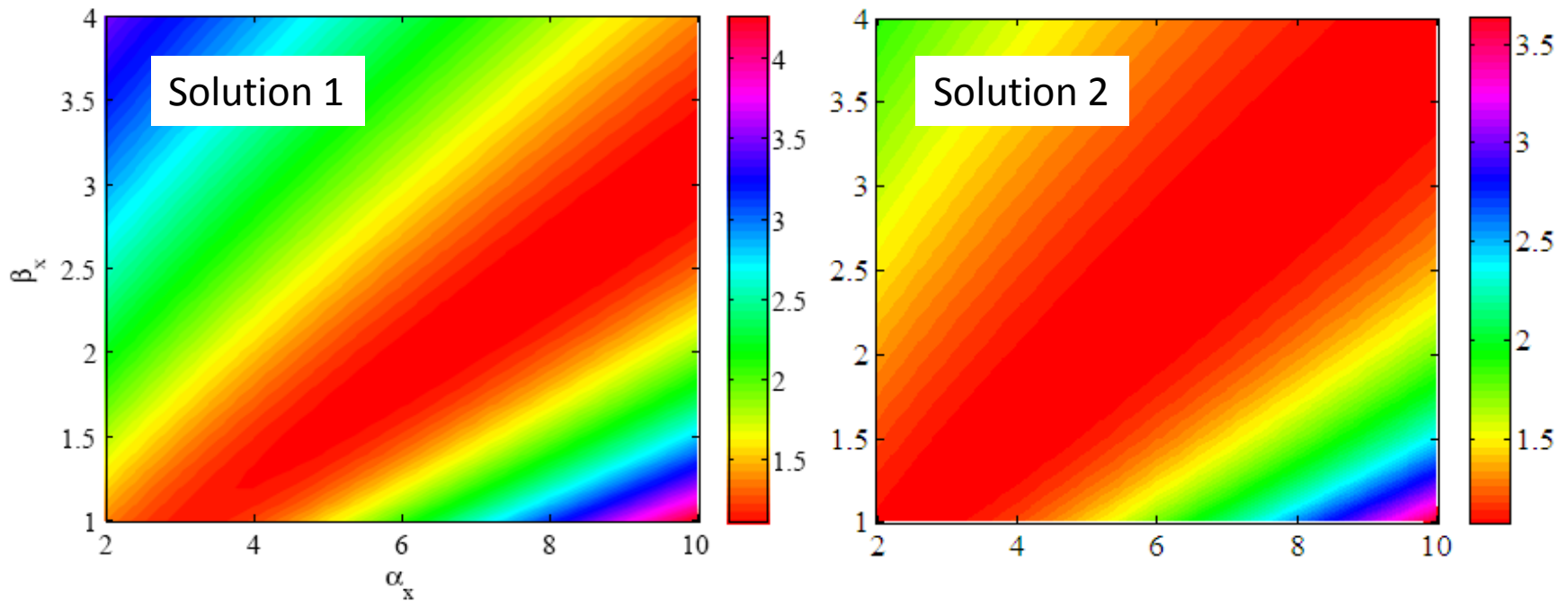
Two different solutions for the extraction



Solution 1: 7.0 / -0.5 / 7 / -1.5 degree
Solution 2: 7.0 / -0.5 / 3.5 / 2.0 degree
Total angle: 12 degree

Constrains for the Twiss-functions at extraction point

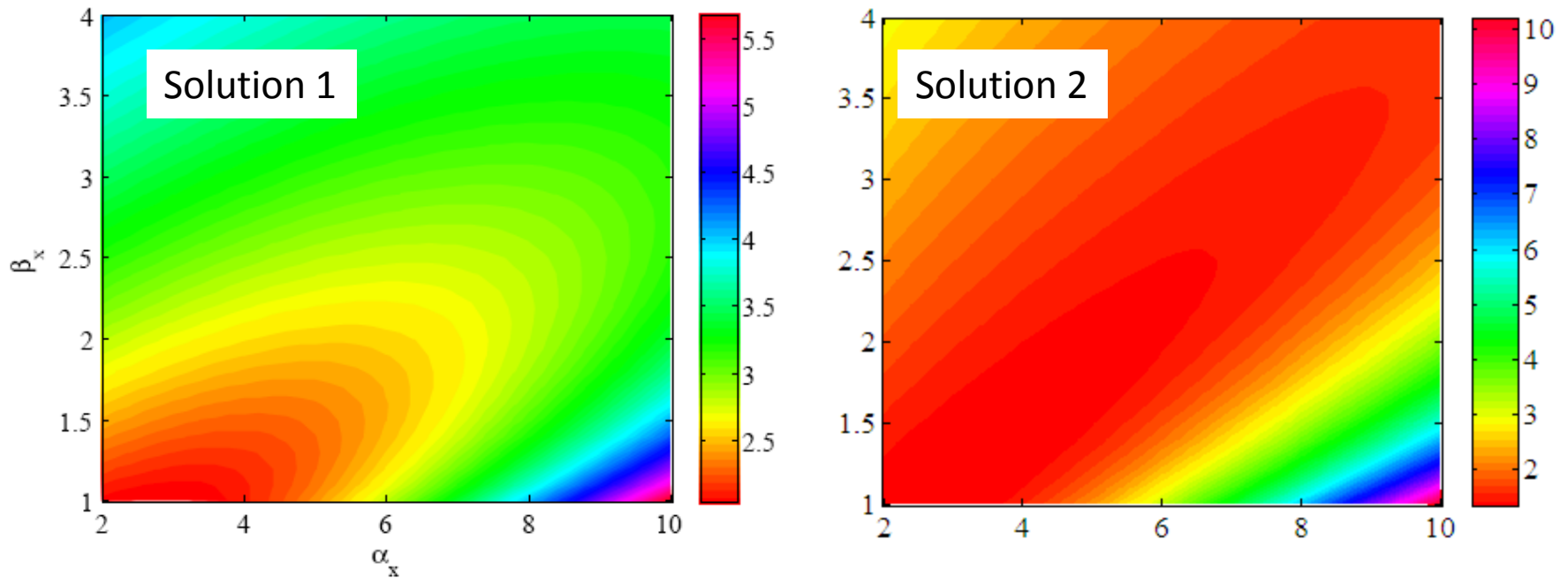
- Emittance after extraction, calculated for a Gaussian beam without energy chirp.



- Solution 2 gives a larger area for the accepted alpha-beta-settings.

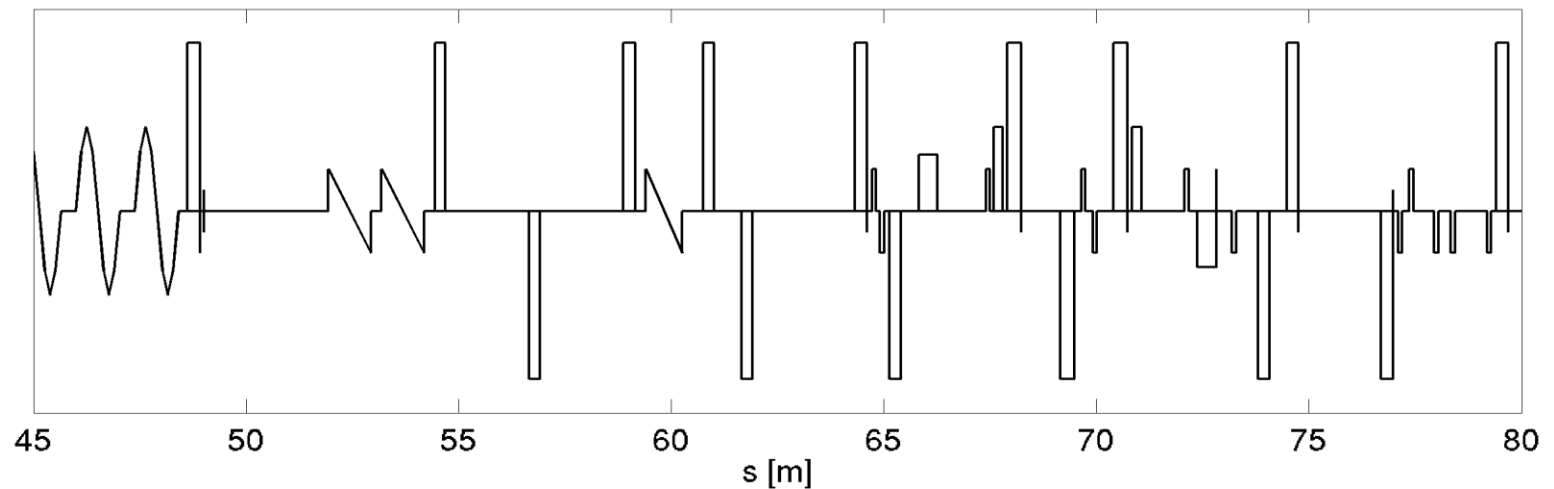
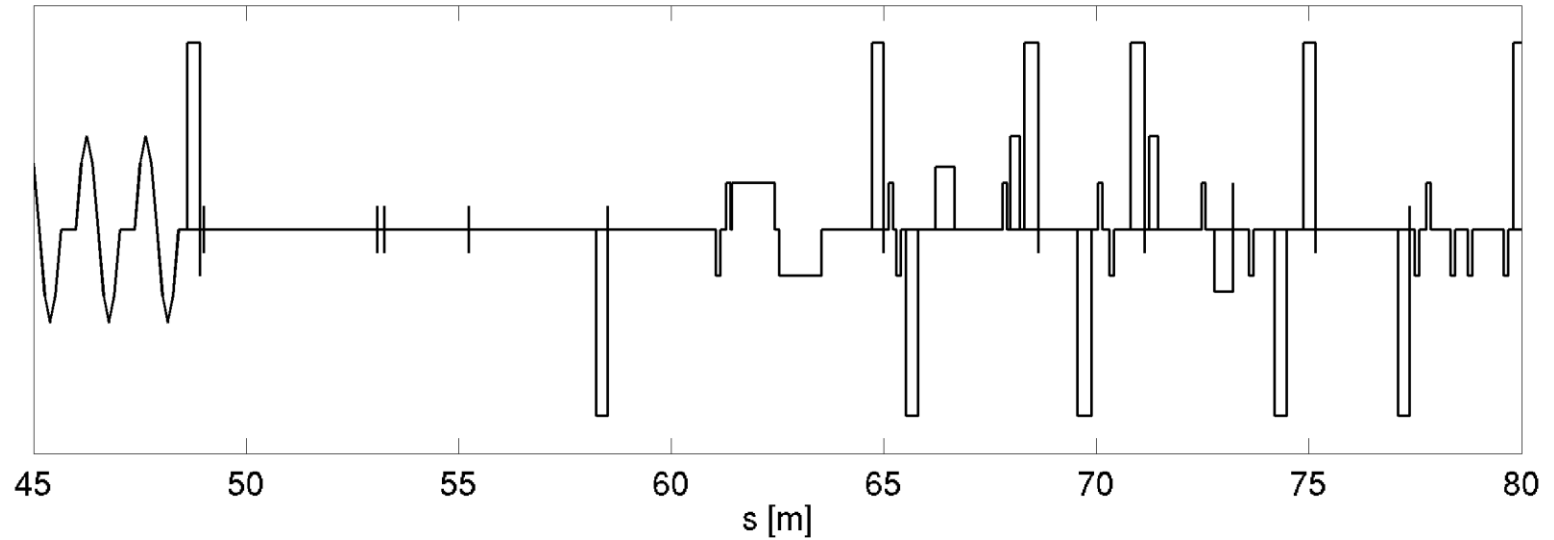
Constraints for the Twiss-functions at extraction point

- Emittance after extraction, calculated for a Gaussian beam with energy chirp.

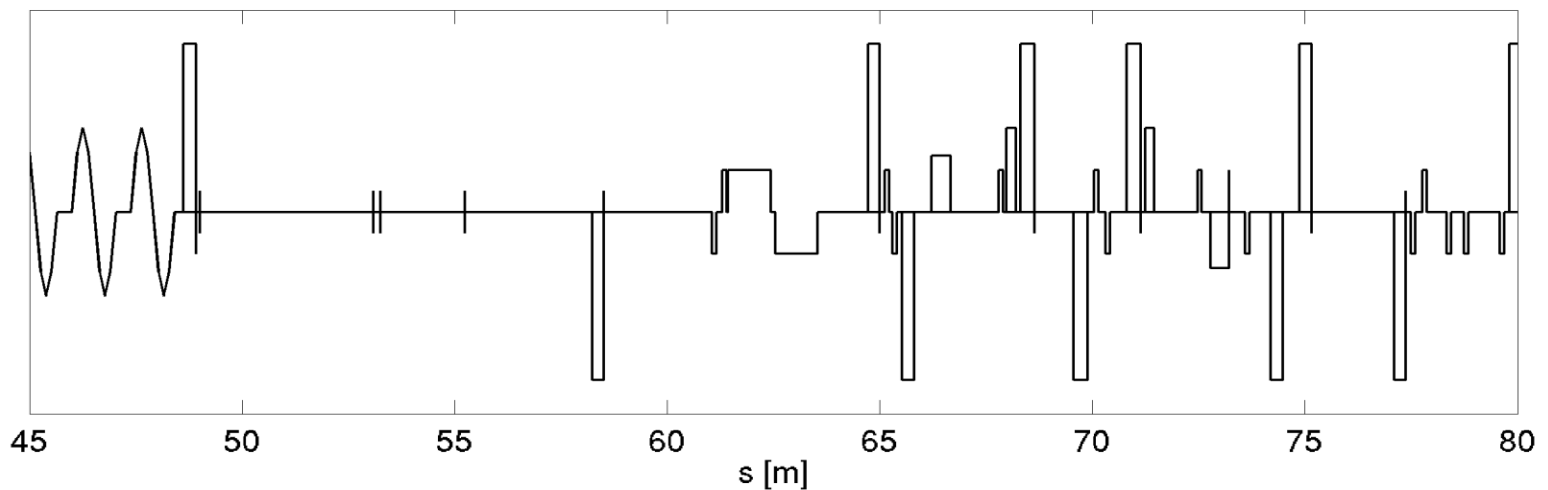
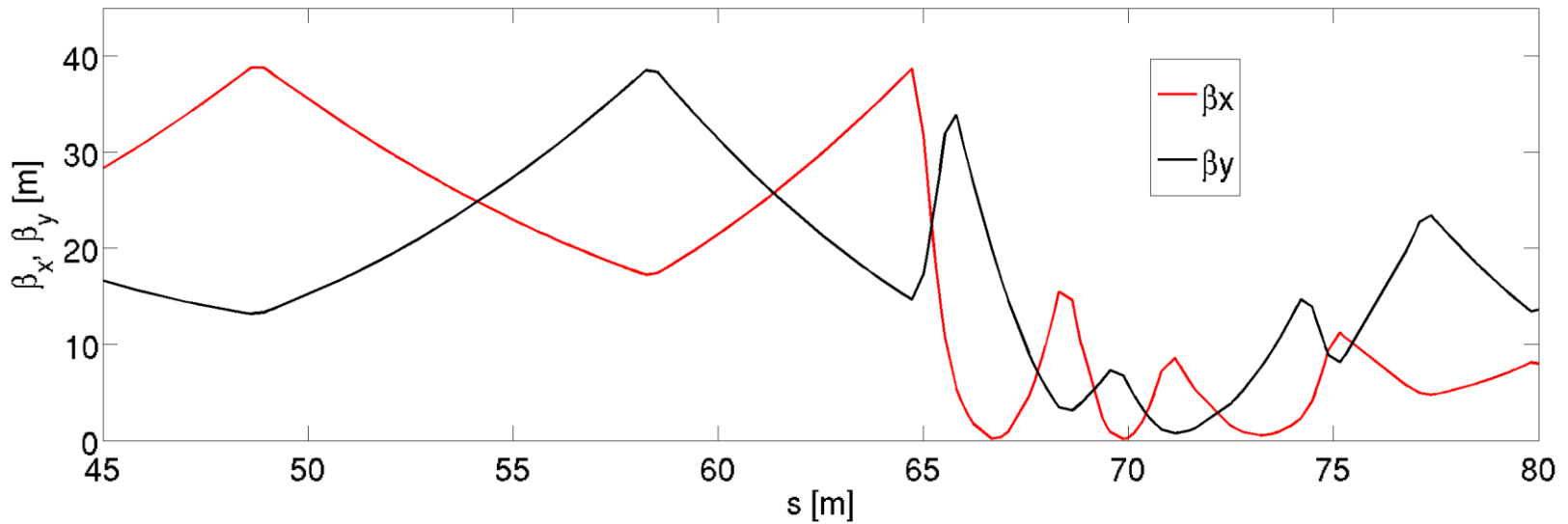


- Solution 2 gives again a larger area for the acceptable alpha-beta-settings.

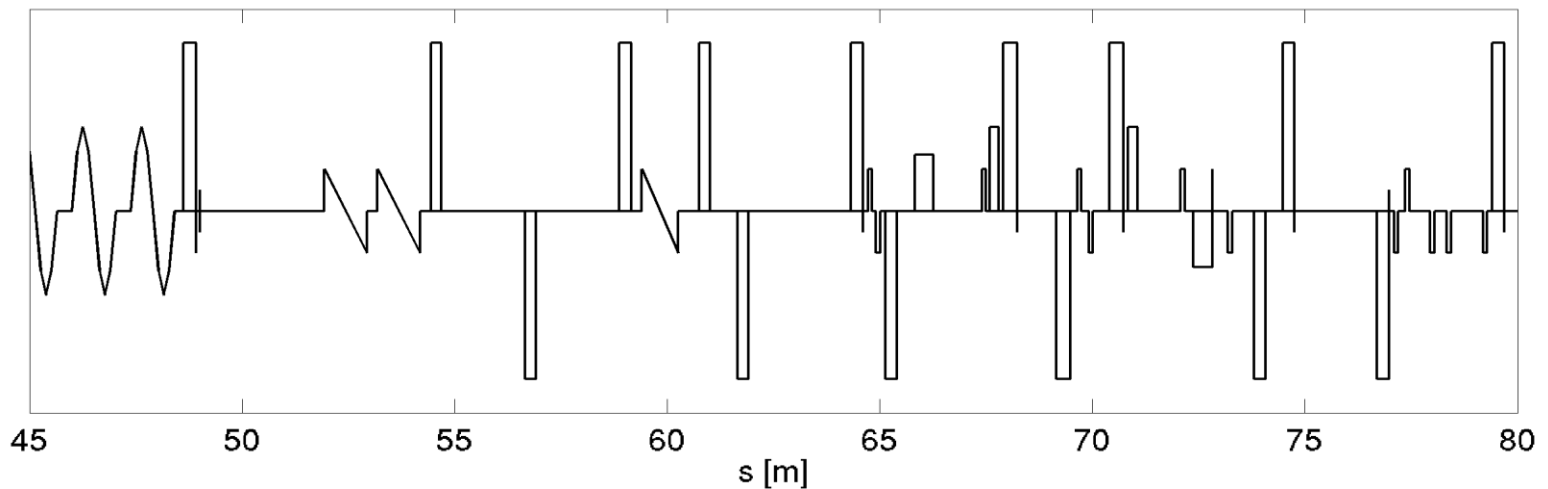
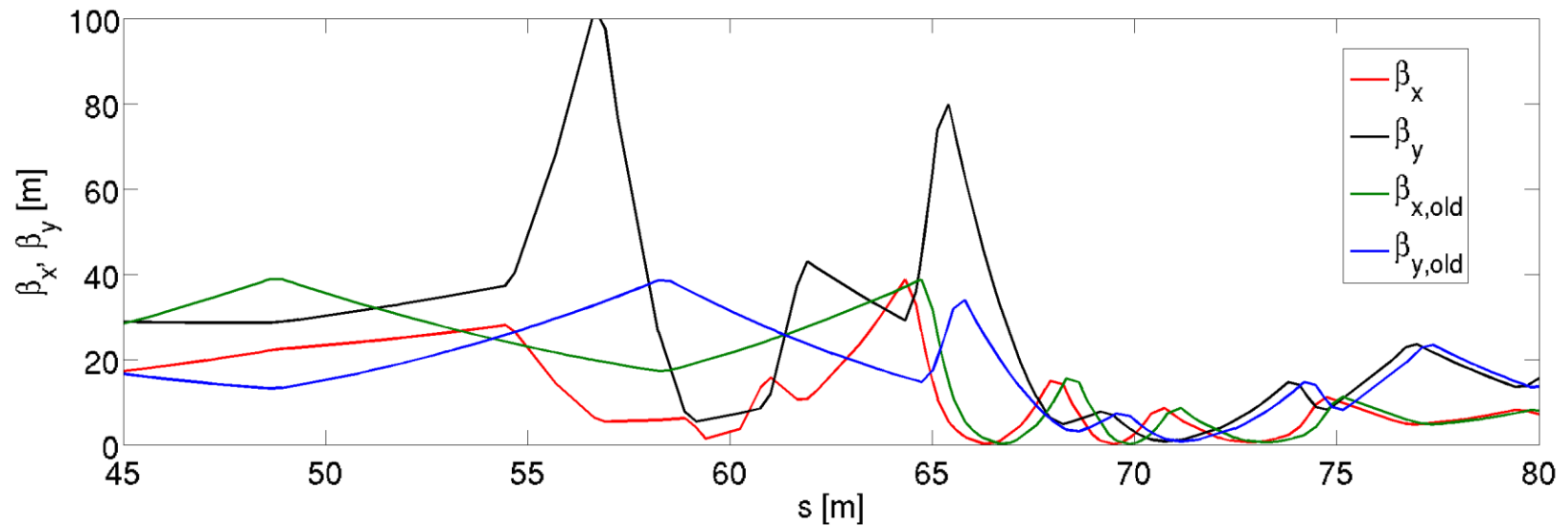
Current FLASH I and new FLASH I lattice



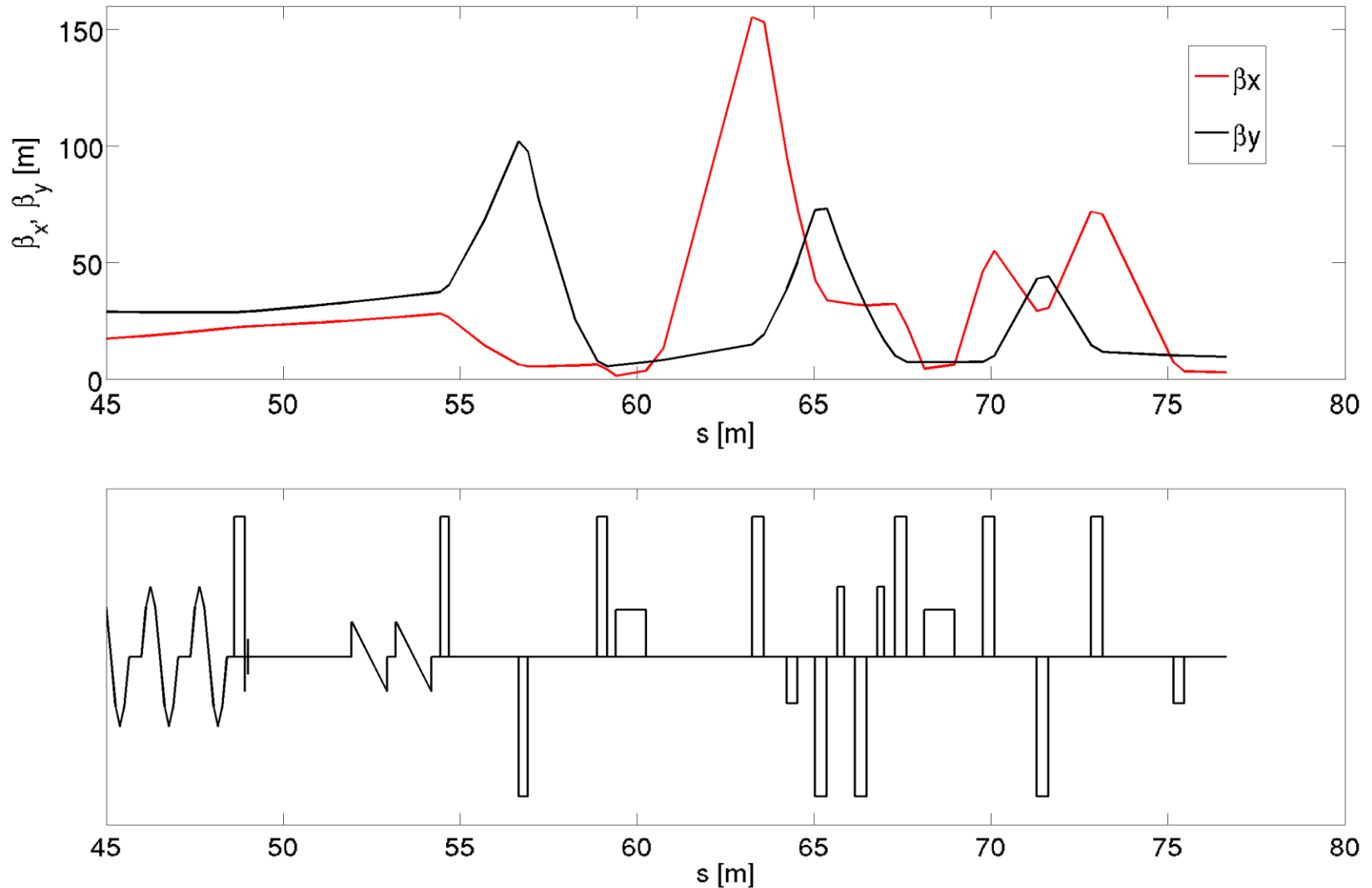
Current FLASH I lattice and beta functions



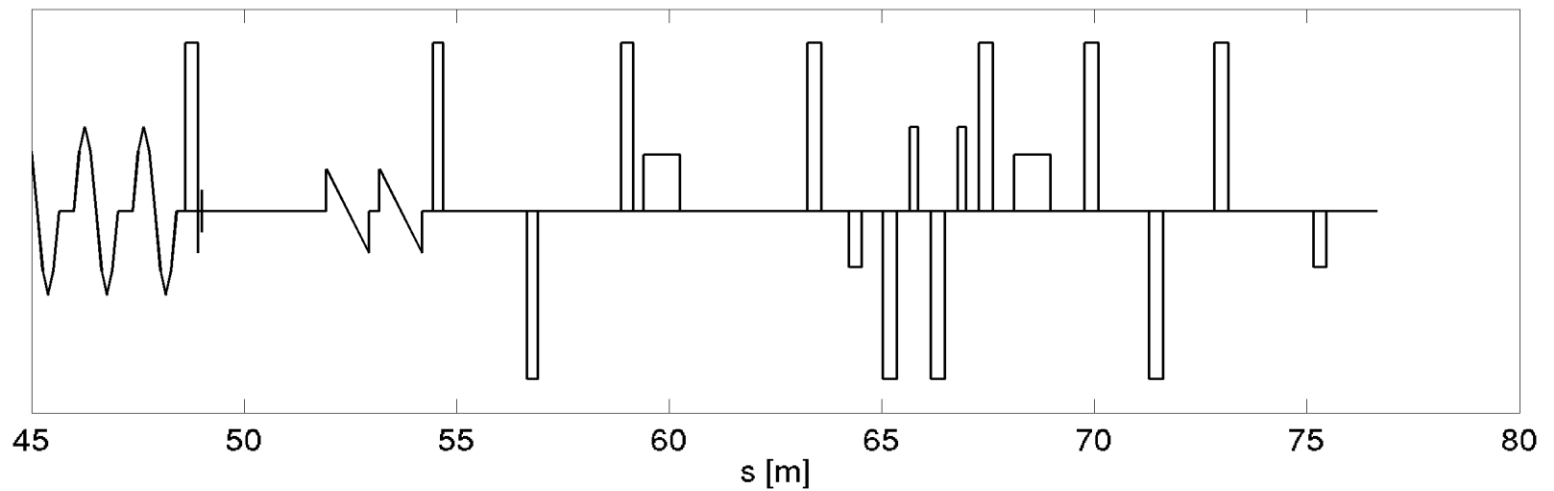
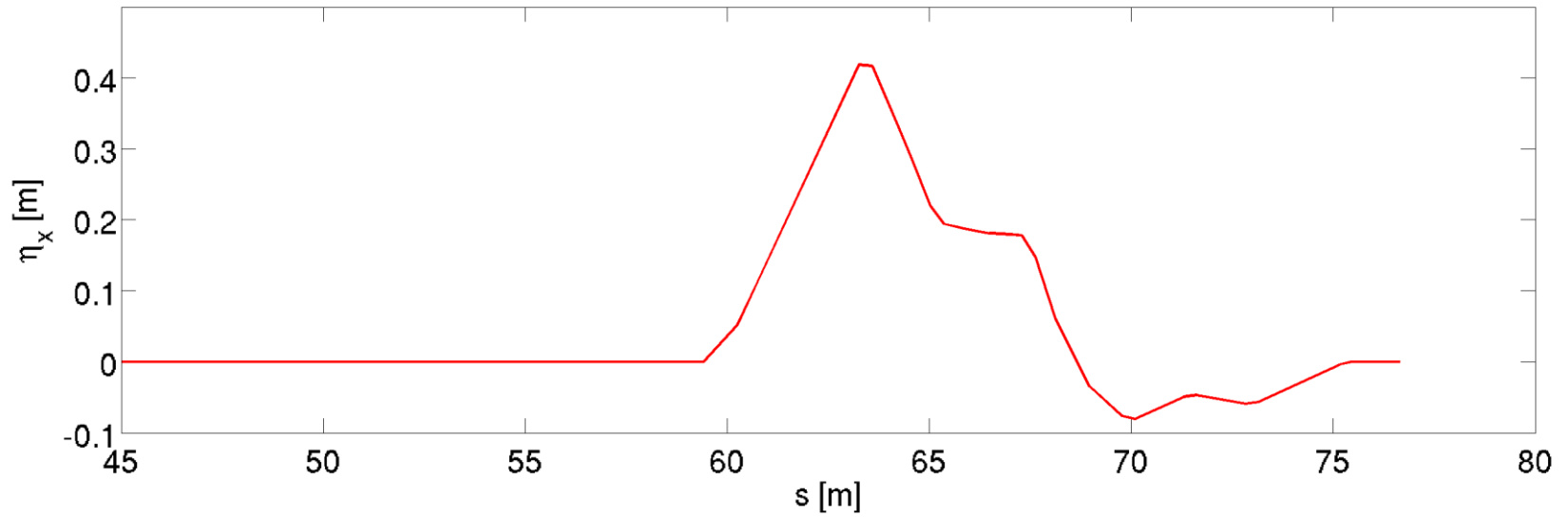
New FLASH I lattice and beta functions



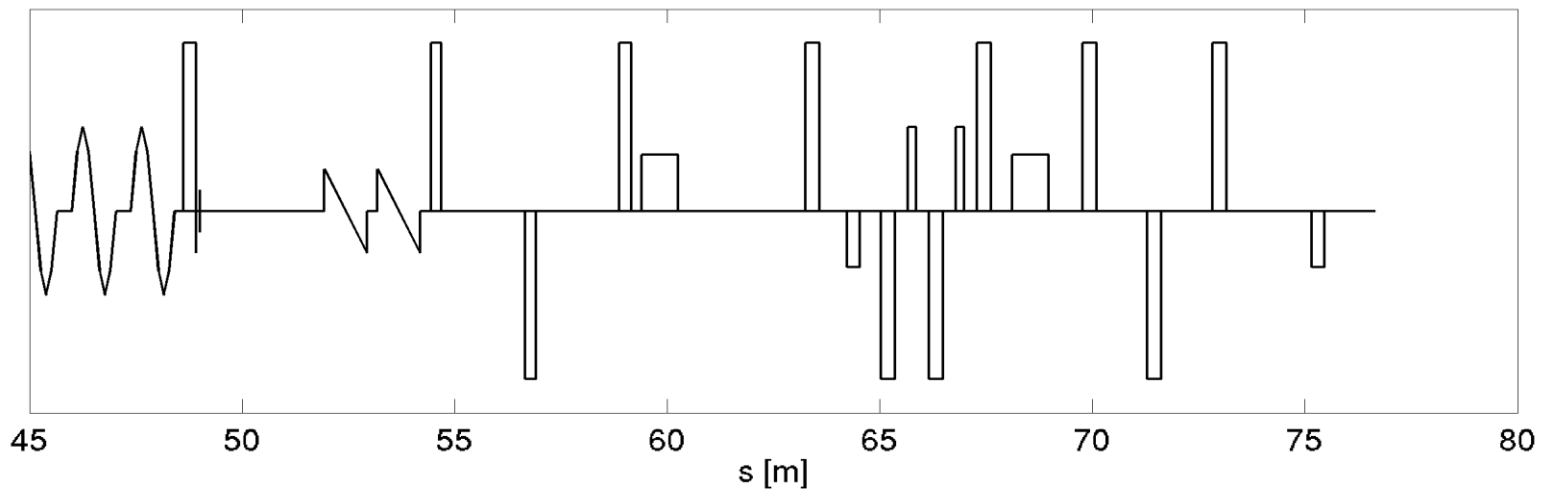
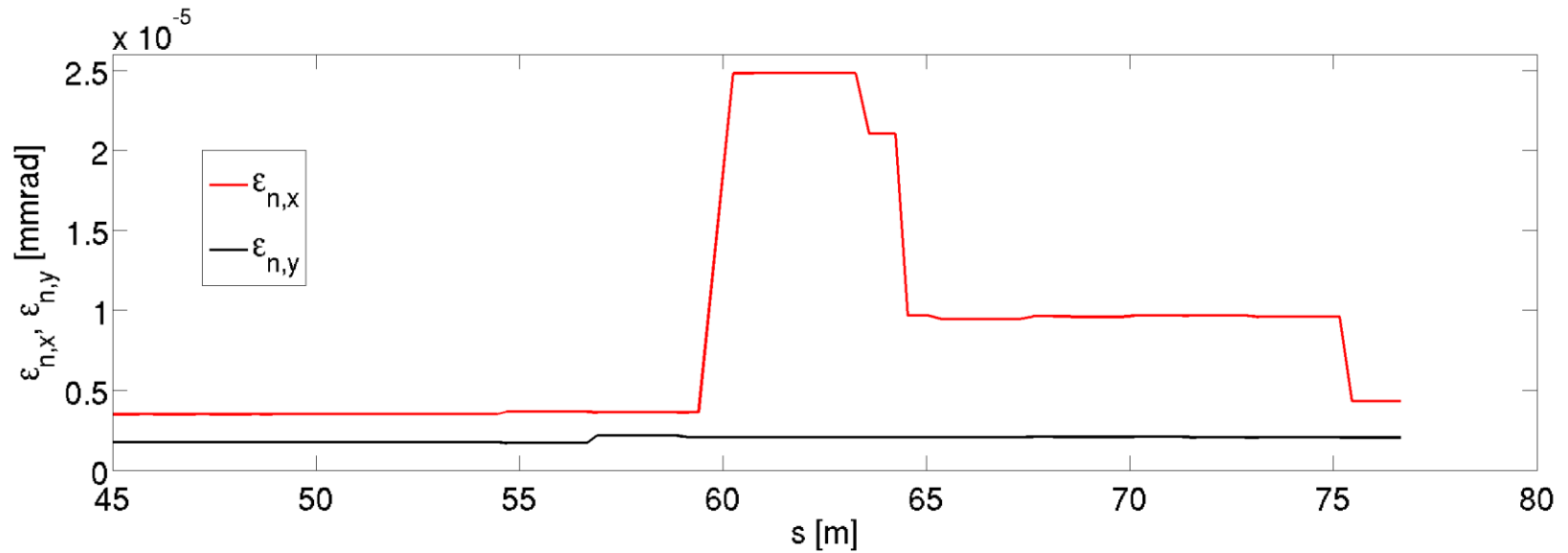
FLASH II lattice and beta functions, solution 1



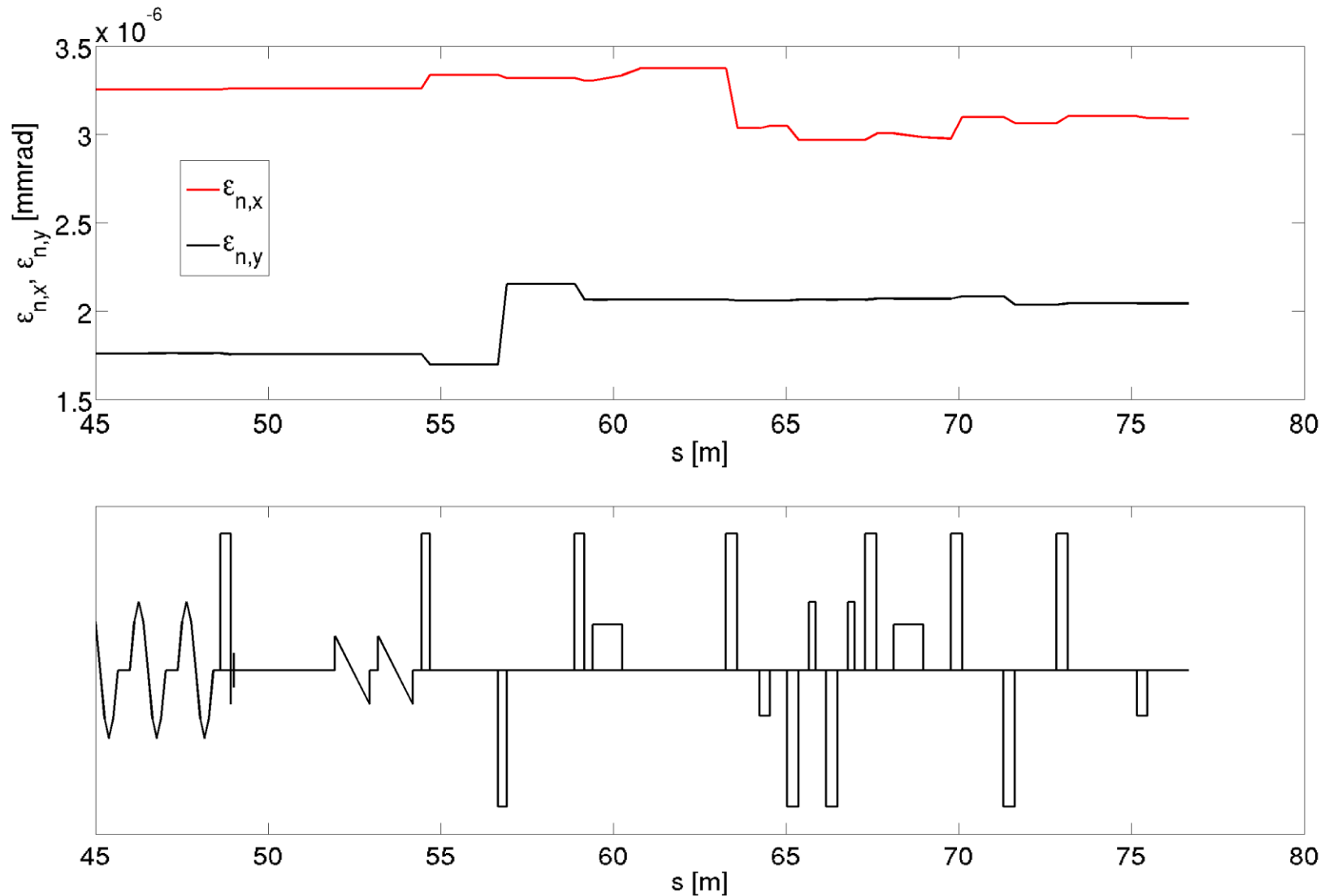
Dispersion, solution 1



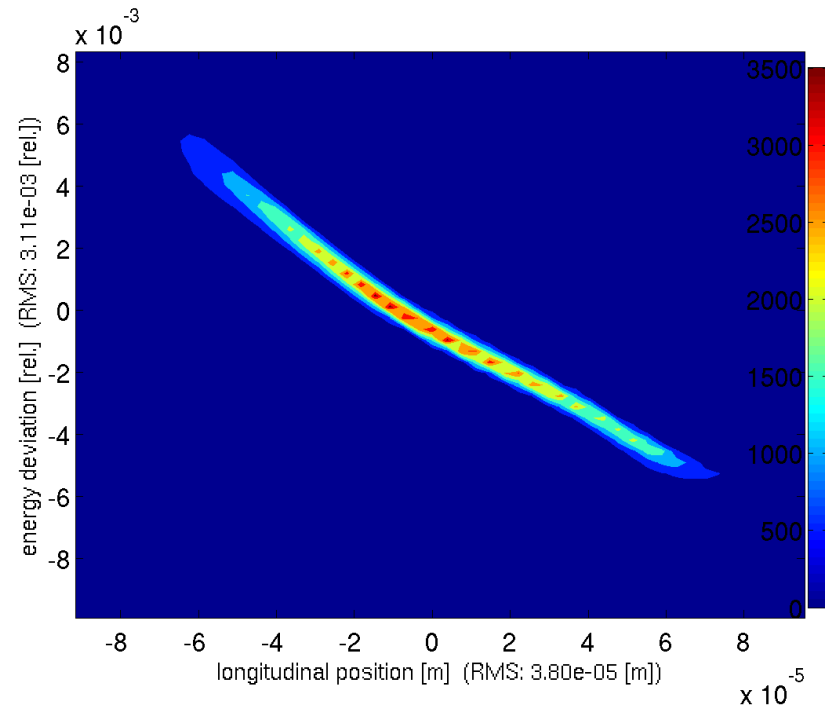
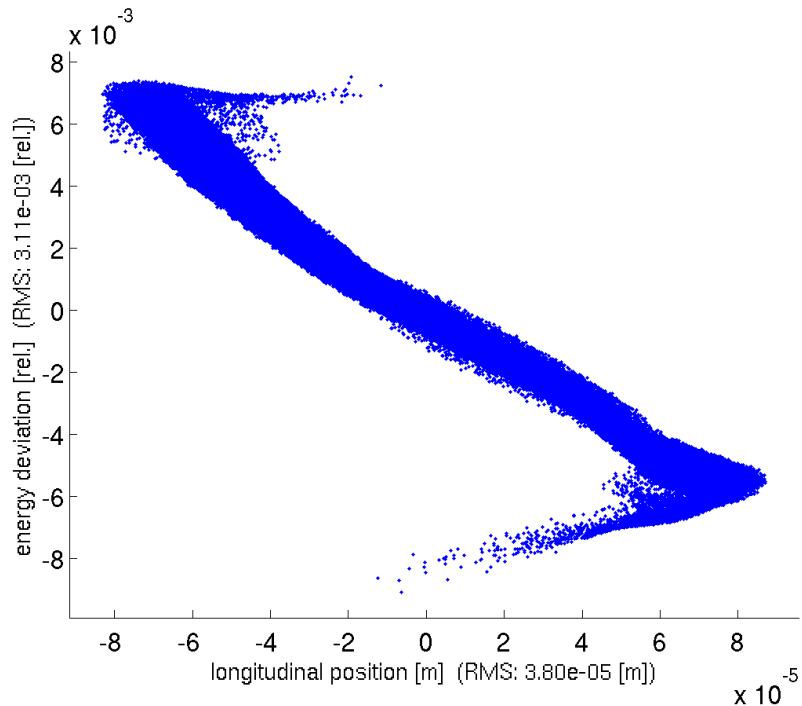
Normalized emittance, solution 1



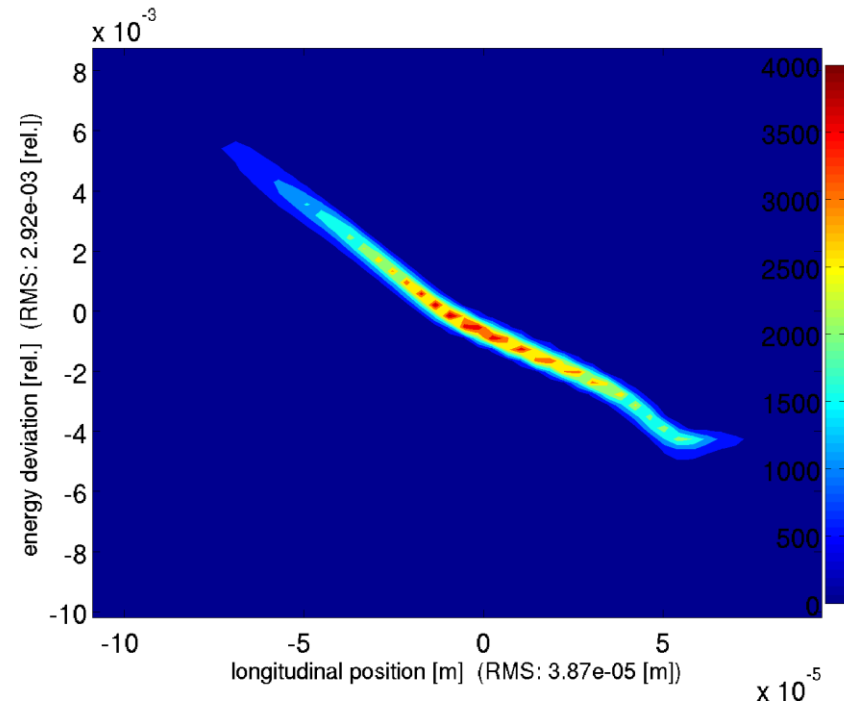
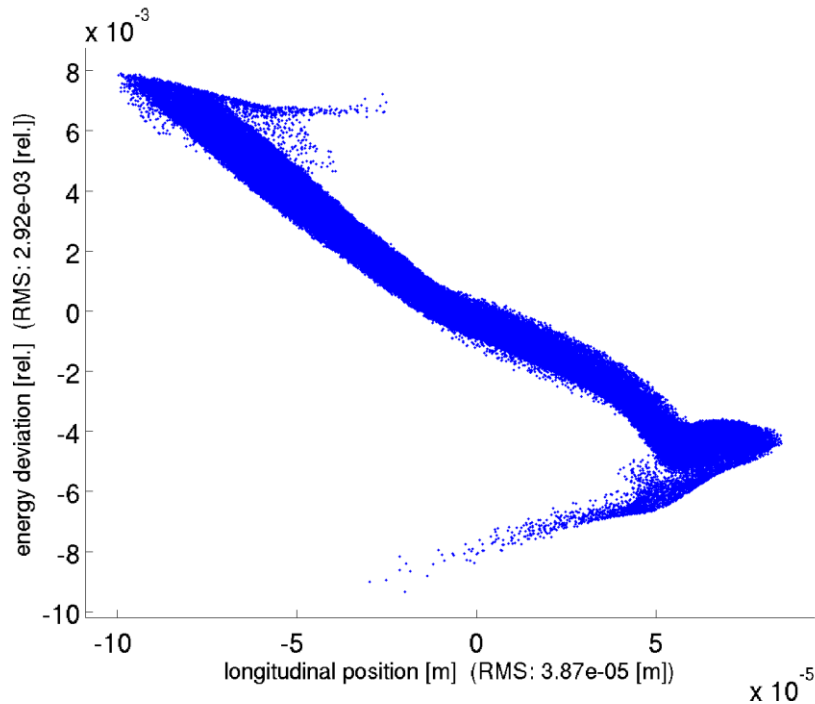
Normalized emittance without effects from dispersion, s 1



Longitudinal phase space at the septum



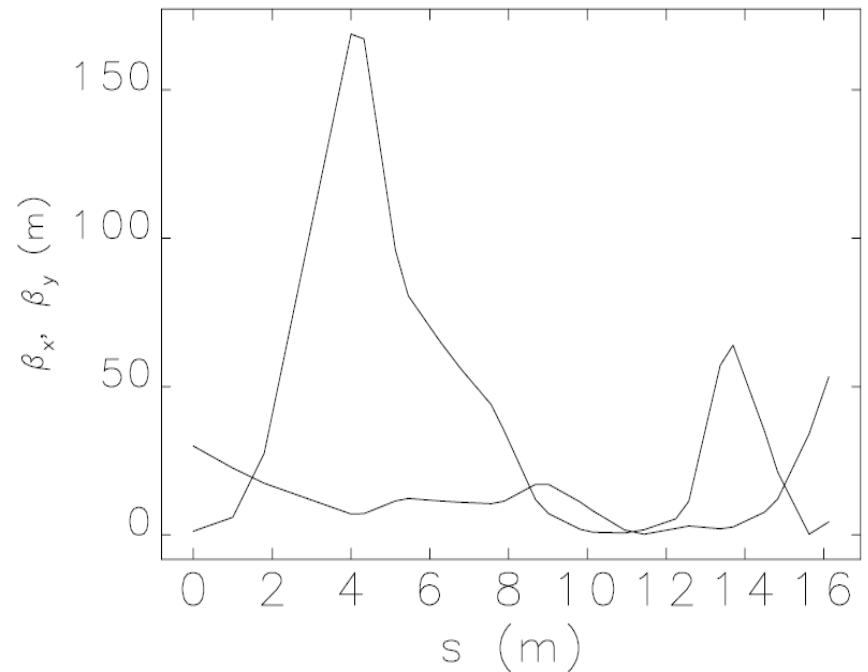
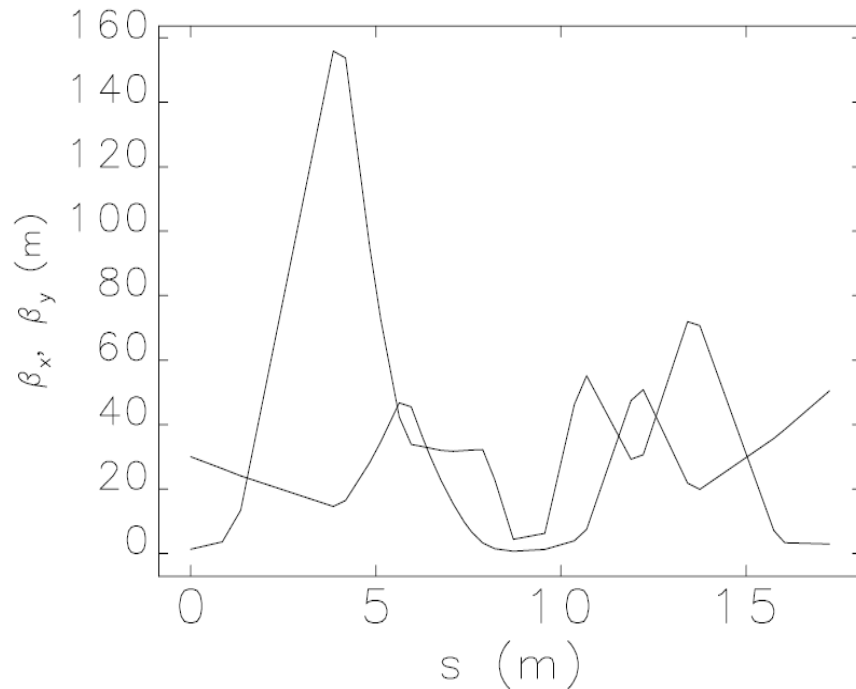
Longitudinal phase space at the end of extraction, solution 1



Beta functions for solution 1 and 2

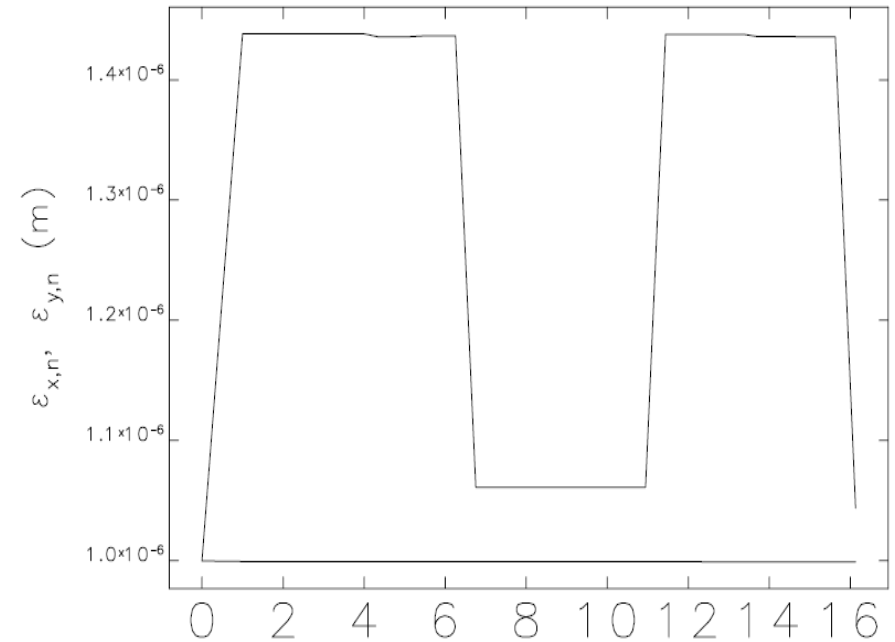
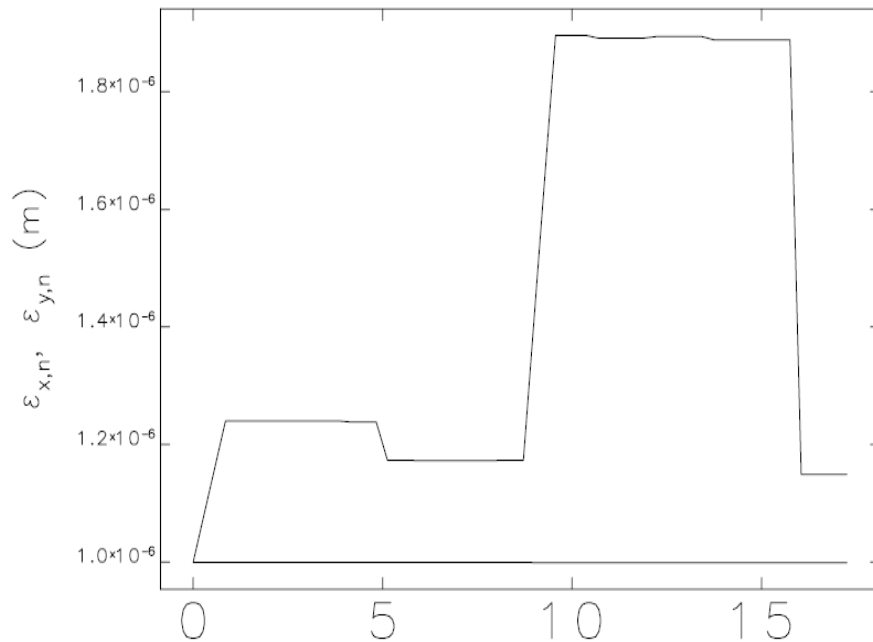
■ Initial Twiss parameters:

- $\beta_{x_0}=1.3$, $\alpha_{x_0}=3.9$; (Matthias's matching results?)
- $\beta_{y_0}=30$, $\alpha_{y_0}=2.0$; $\alpha_{y_0}=4.0$ in solution 2.



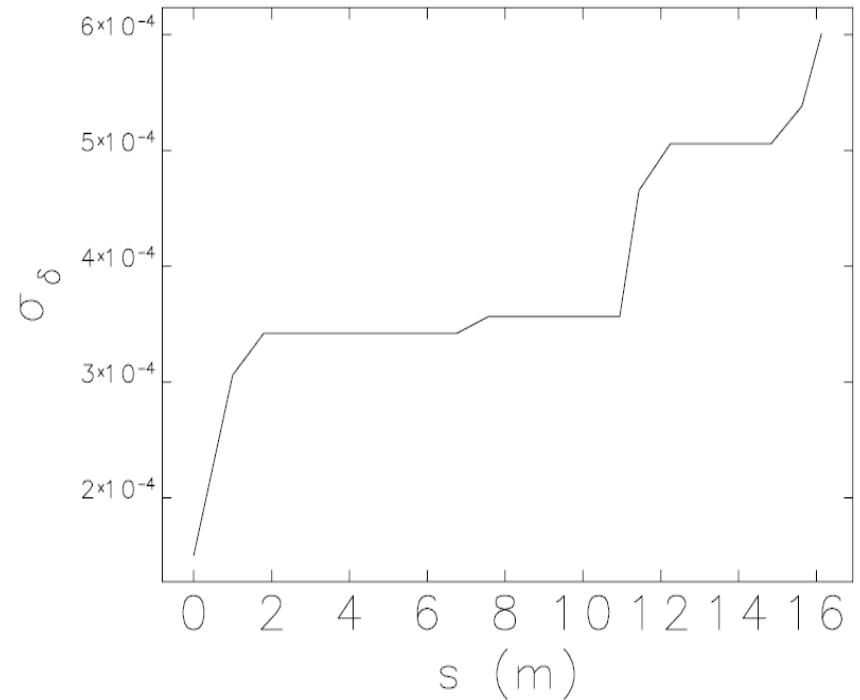
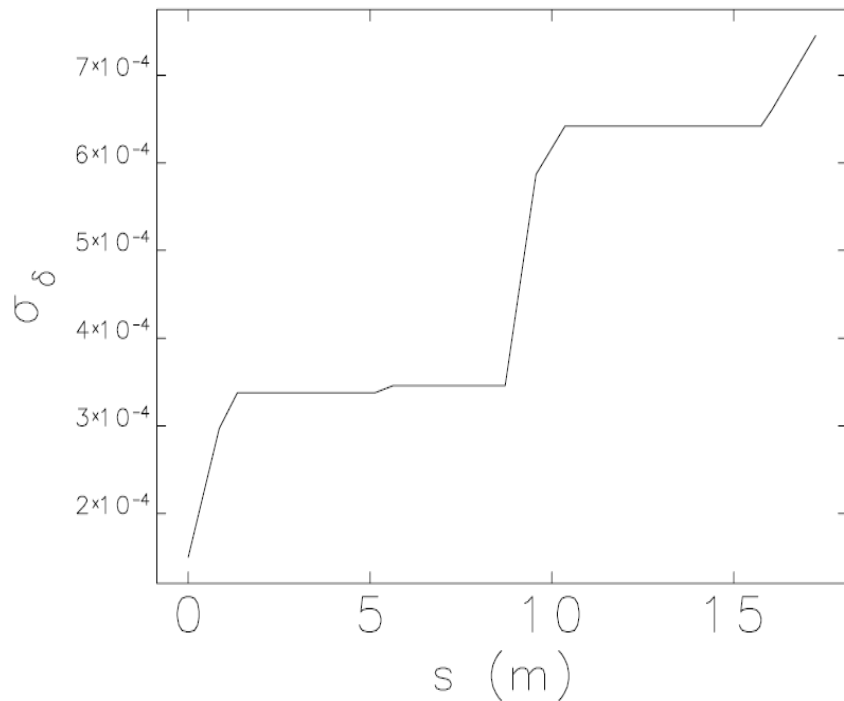
Normalized emittance for solution 1 and 2

- Gaussian beam (1nC)
- Emittance growth:
 - Solution 1: 15%
 - Solution 2: 4%



Energy spread for solution 1 and 2

- Gaussian beam (1nC)
- Energy spread growth:
 - Solution 1: 3.9 times
 - Solution 2: 3.0 times



S2E results (1nC) to compare solution 1 and 2

- Emittance growth:

 - 100% particles

 - Solution 1: from 3.52 to 4.15 umrad
 - Solution 2: from 3.52 to 3.11 umrad

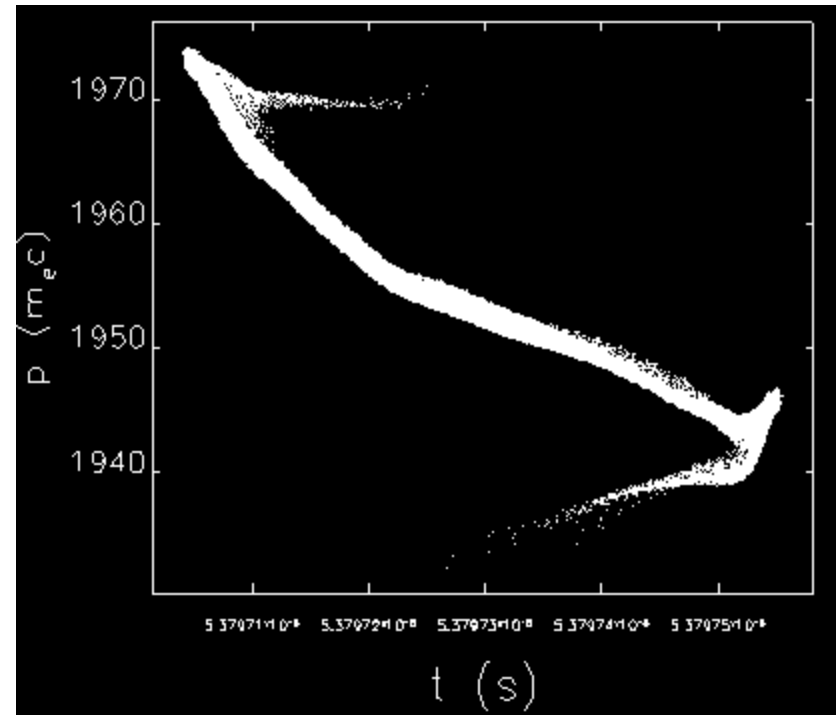
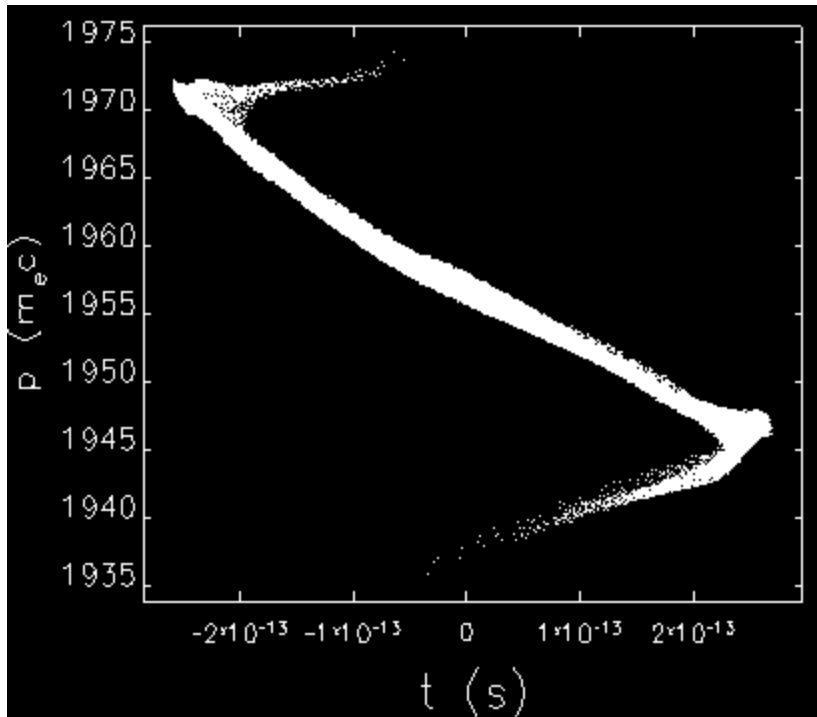
 - 90% particles

 - Solution 1: from 1.88 to 2.68 umrad
 - Solution 2: from 1.88 to 1.88 umrad

 - 80% particles

 - Solution 1: from 1.41 to 2.34 umrad
 - Solution 2: from 1.41 to 1.53 umrad

Before and after extraction, solution 2 (1nC)



Further tasks

- ❑ More simulations for solution 2 have to be carried out.
- ❑ The maximum beta functions in the extraction section have to be reduced by optimizing the positions of some quads.
- ❑ The positions of the quads between kickers and septum have to be optimized in order to achieve the required offset of 2 cm with a smaller kick.
- ❑ One has to take into account the vertical kick and the vertical dispersion in the extraction chicane.
- ❑ The positions of the collimators in FLASH I and FLASH II have to be checked/ identified.
- ❑ The extraction to future FLASH III has to be discussed.