

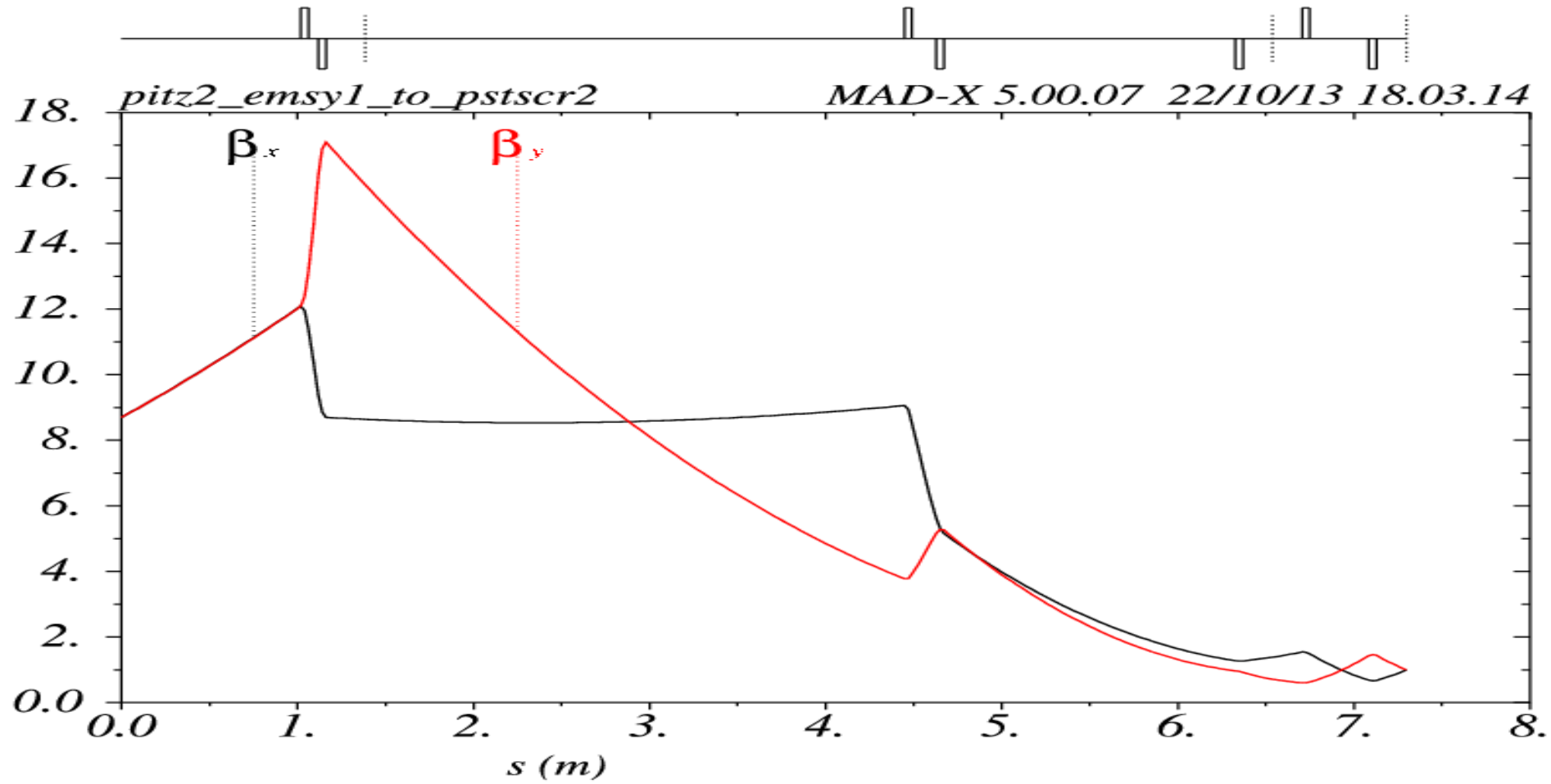
Emittance Growth in the matching section

PPS 30/01/2014

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Intro

- Transverse tomography measurements require specific twiss parameters at PST → matching section



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- Aim of study: use ASTRA to calculate the emittance growth induced by different matching solutions (provided by MAD) of the same input beam at EMSY1 + observe correlation with phase advance

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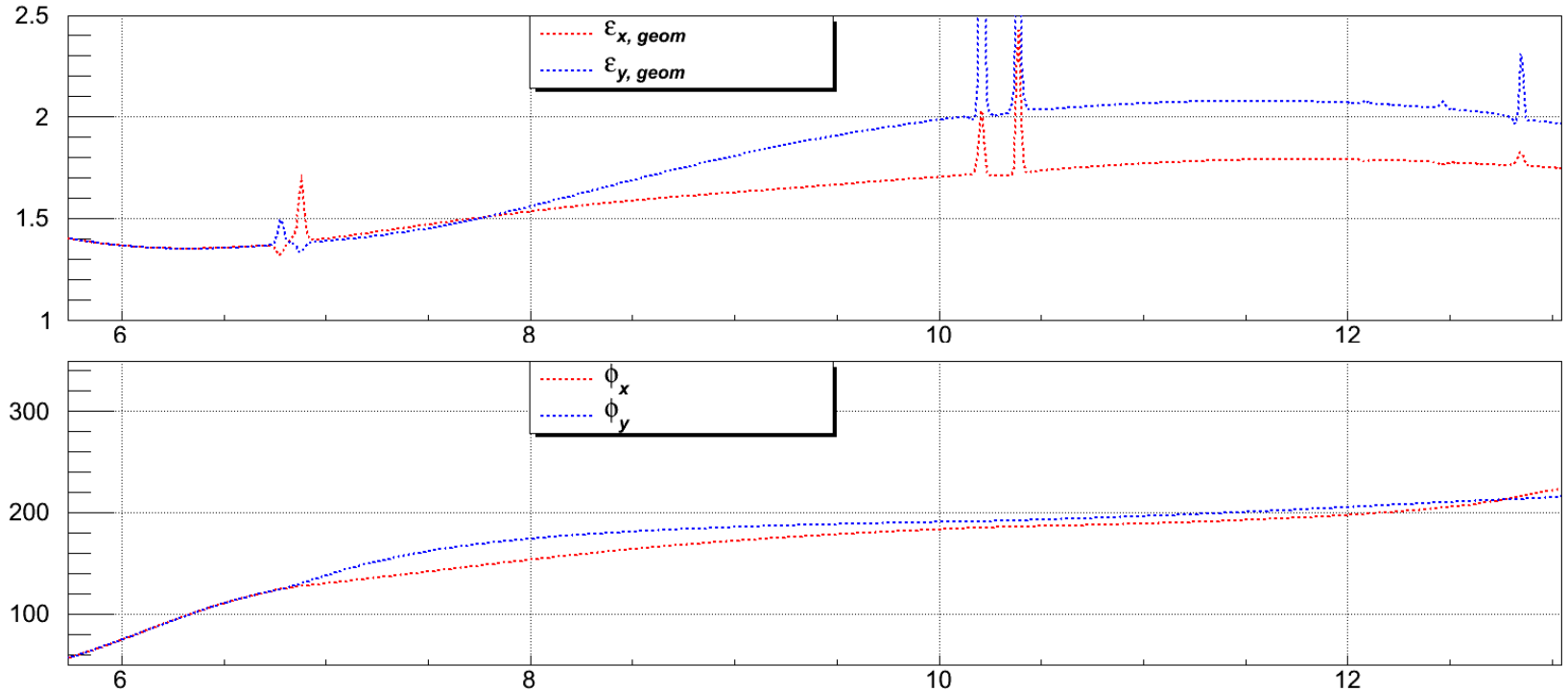
- Transverse tomography measurements require specific twiss parameters at PST → matching section
- Aim of study: use ASTRA to calculate the emittance growth induced by different matching solutions (provided by MAD) of the same input beam at EMSY1 + observe correlation with phase advance
- Input beams (Charge, emit @ EMSY 1):
 1. 1nC, 1.400mm*mrad (375A , 0.435mm, alpha>0)
 2. 1nC, 1.152mm*mrad (378A , 0.360mm, alpha<0)
 3. 100pC

Quad strengths of each matching solution for case 1

Quad Gradients	1a [T/m]	1b [T/m]	1c [T/m]
q3	-6.145	6.899	-7.728
q4	6.040	-6.370	7.343
q5	-3.695	-3.805	-4.073
q6	3.671	4.042	4.192
qm1	0.273	-1.730	-1.749
qm2	0.539	1.235	4.504
qm3	-3.657	-3.481	-6.051

Point 1a

1nC, 1.400mm*mrad @ EMSY1

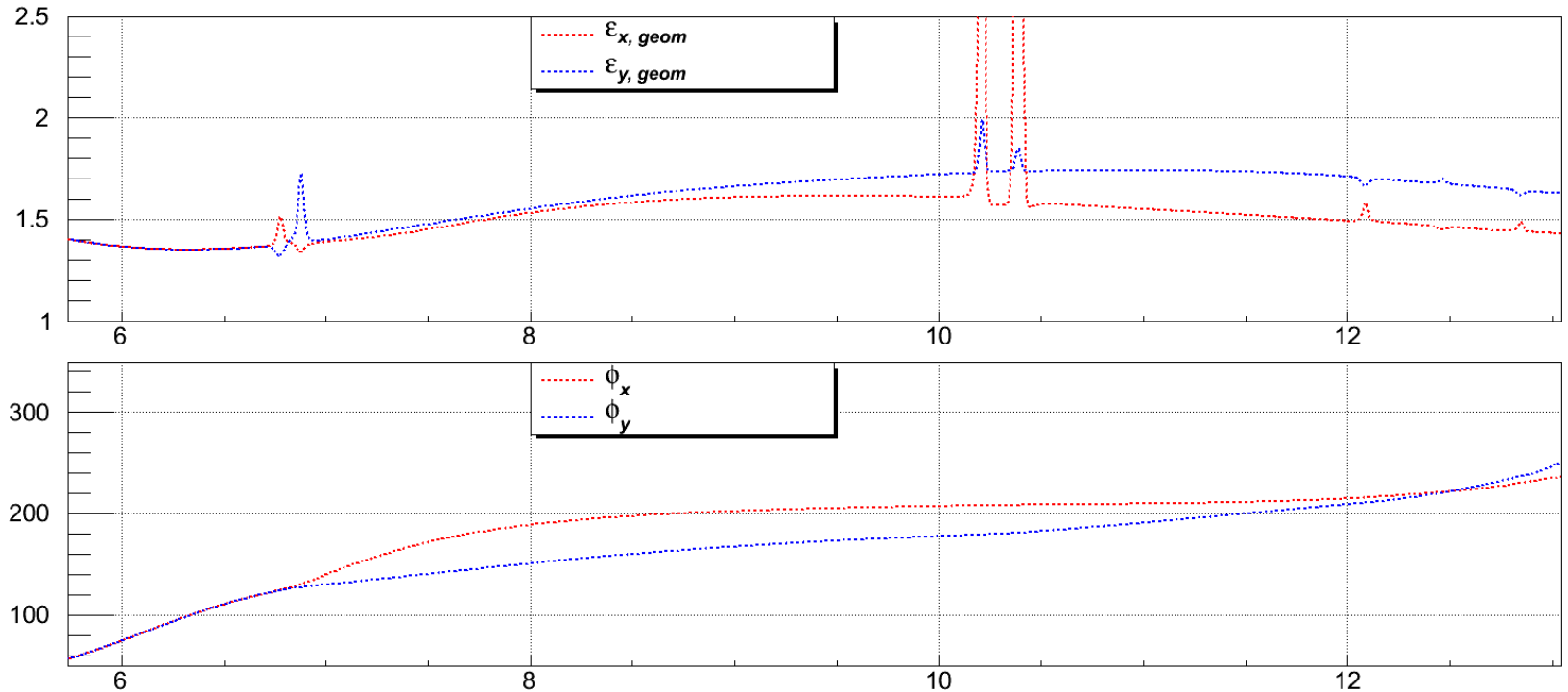


Relative difference between
PST2 and EMSY 1

$emit_x$	25%	(1.746)	phi_x	293%	(223.1)
$emit_y$	40%	(1.966)	phi_y	280%	(215.6)

Point 1b

1nC, 1.400mm*mrad @ EMSY1

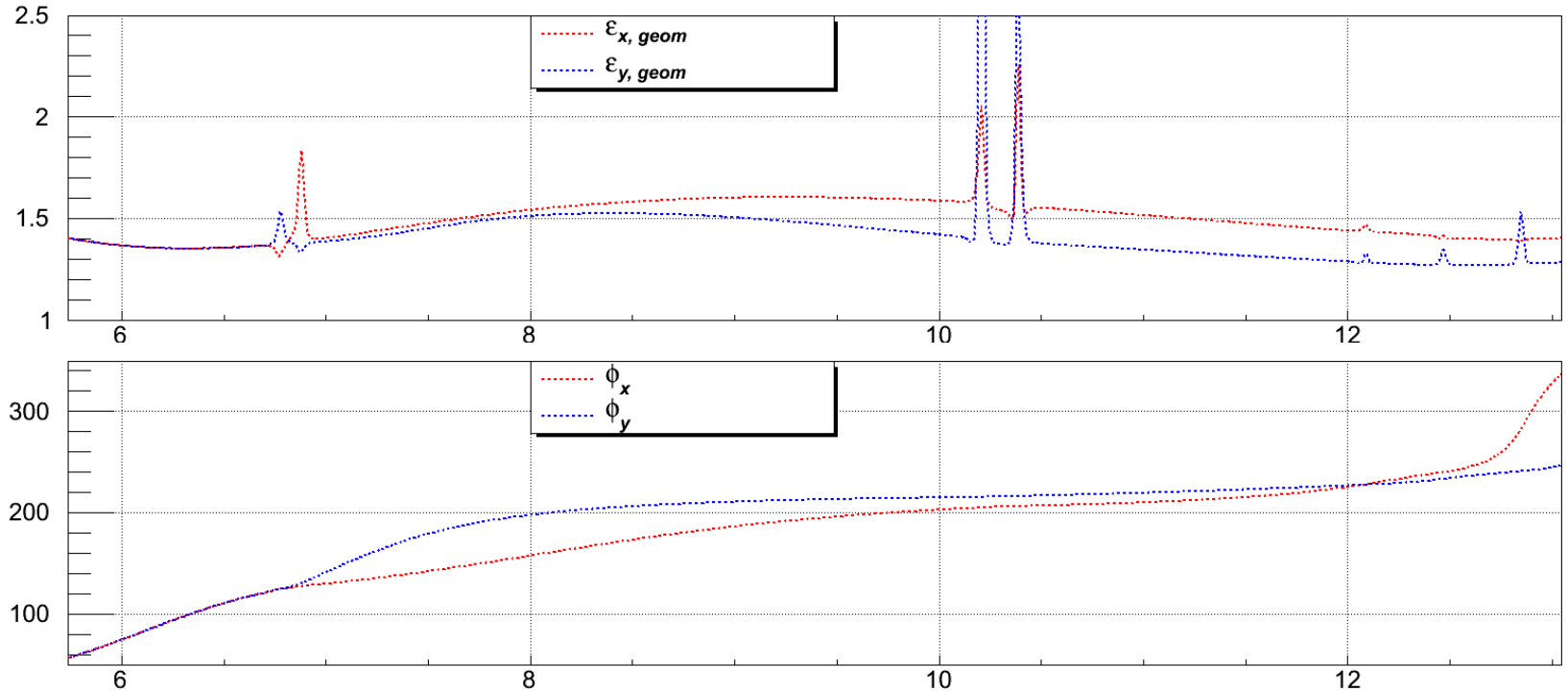


Relative difference between
PST2 and EMSY 1

$emit_x$	2%	(1.429)	phi_x	316%	(236.0)
$emit_y$	16%	(1.628)	phi_y	342%	(251.0)

Point 1c

1nC, 1.400mm*mrad @ EMSY1

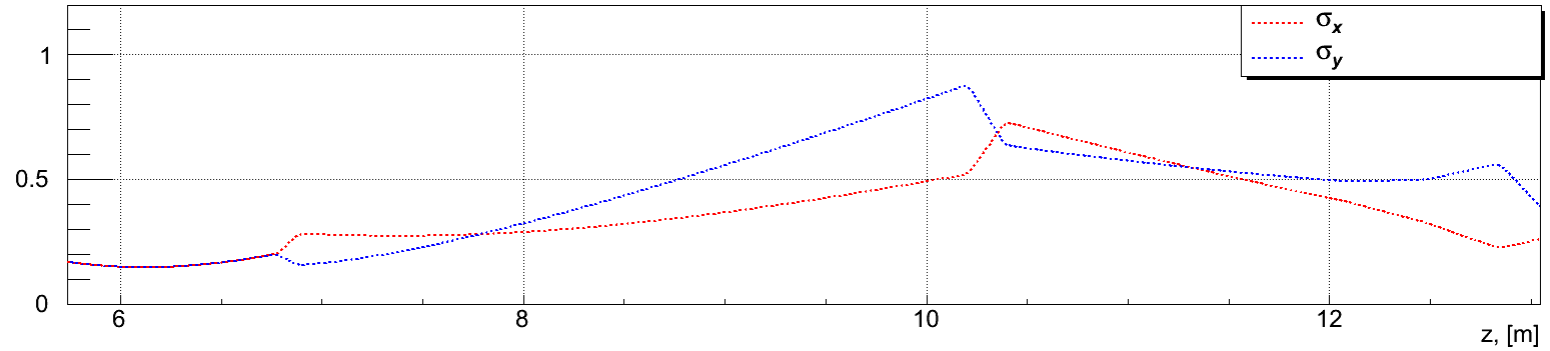


Relative difference between
PST2 and EMSY 1

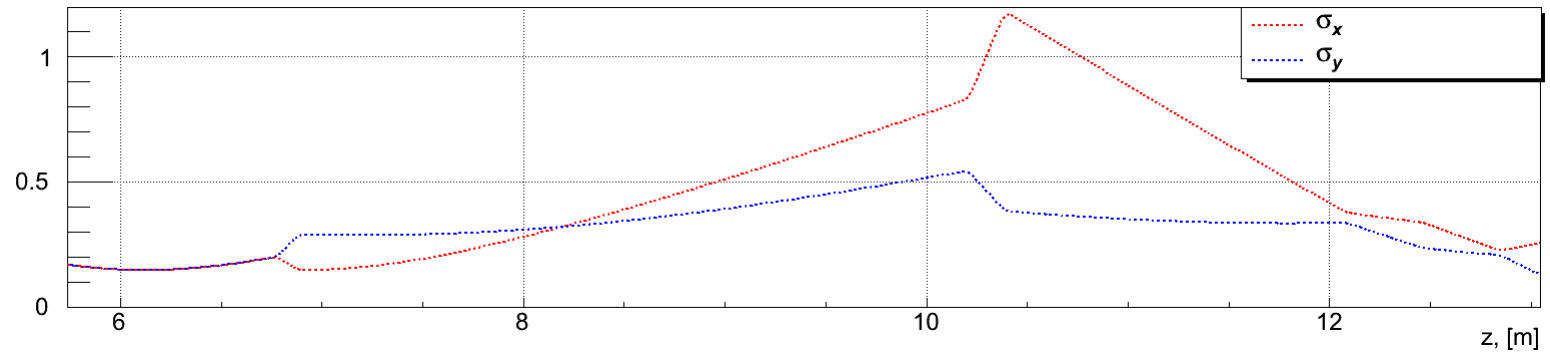
$emit_x$	0%	(1.403)	phi_x	486%	(334.3)
$emit_y$	-8%	(1.282)	phi_y	335%	(247.7)

Comparison of sigmas for case 1

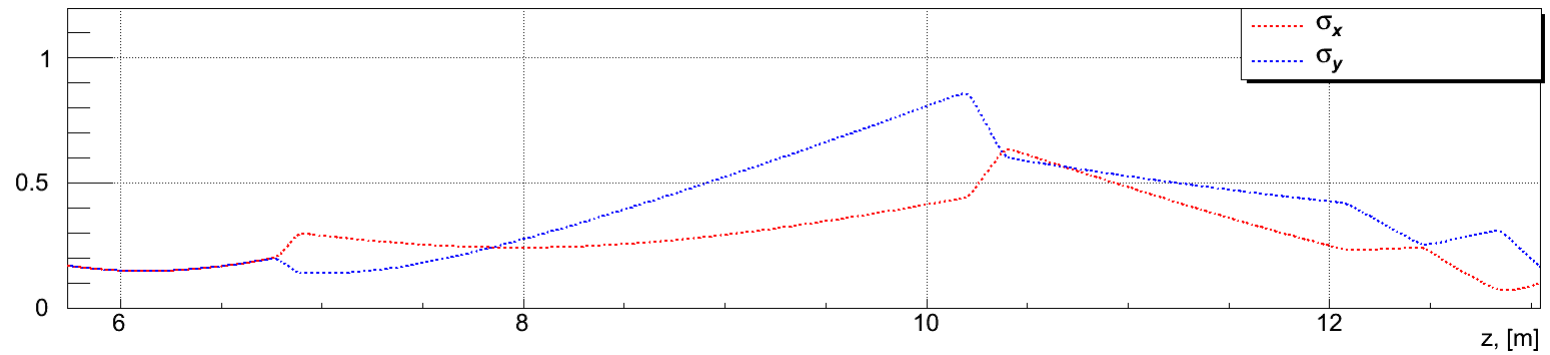
a)



b)

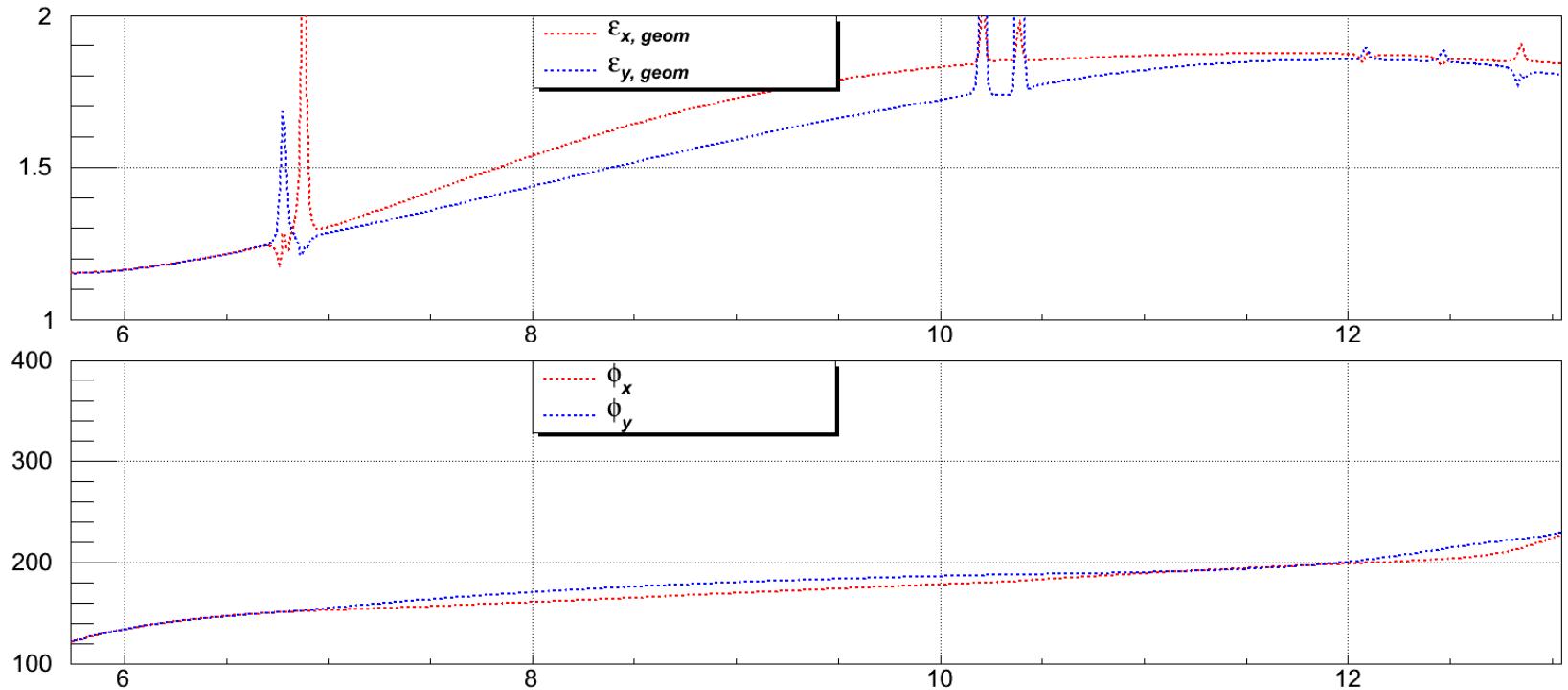


c)



Point 2a

1nC, 1.152mm*mrad @ EMSY1

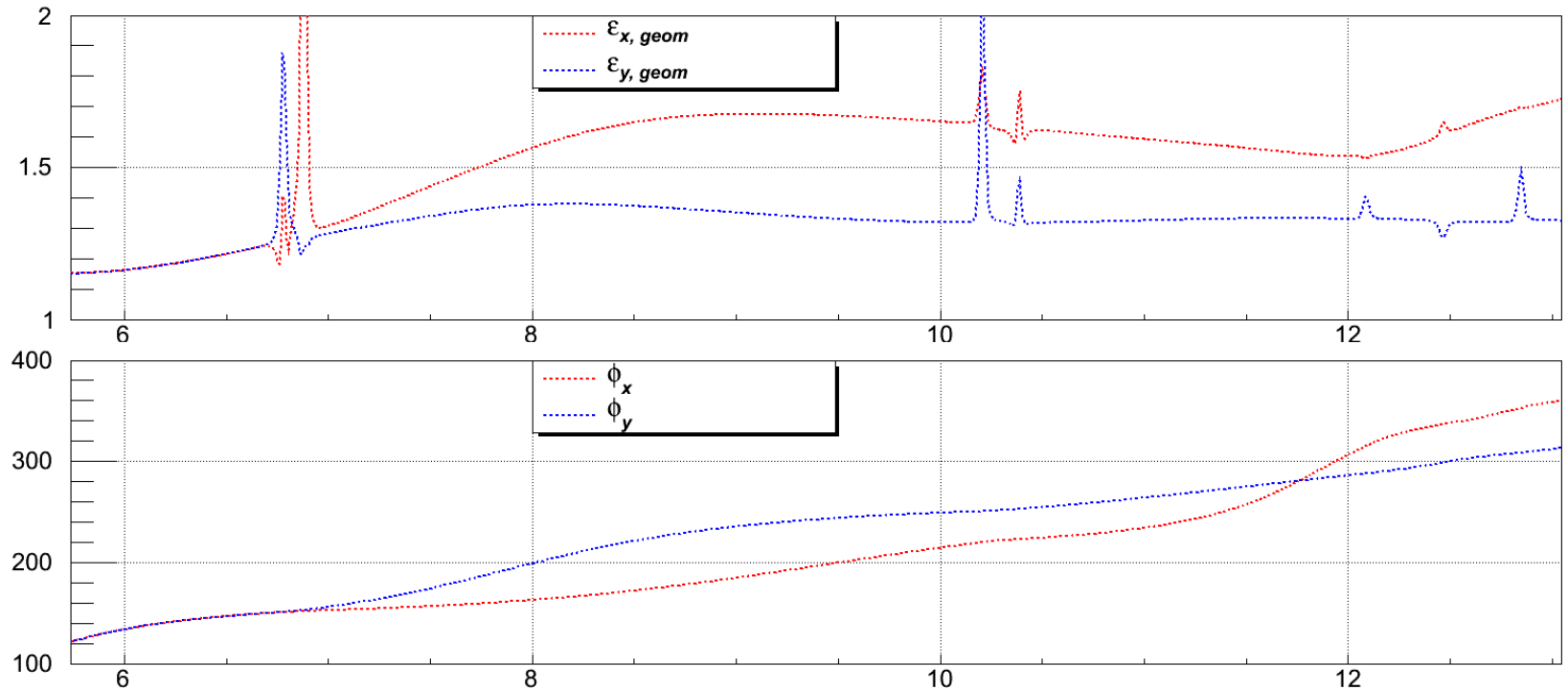


Relative difference between
PST2 and EMSY 1

$emit_x$	60%	(1.841)	phi_x	87%	(227.2)
$emit_y$	57%	(1.805)	phi_y	88%	(229.4)

Point 2b

1nC, 1.152mm*mrad @ EMSY1

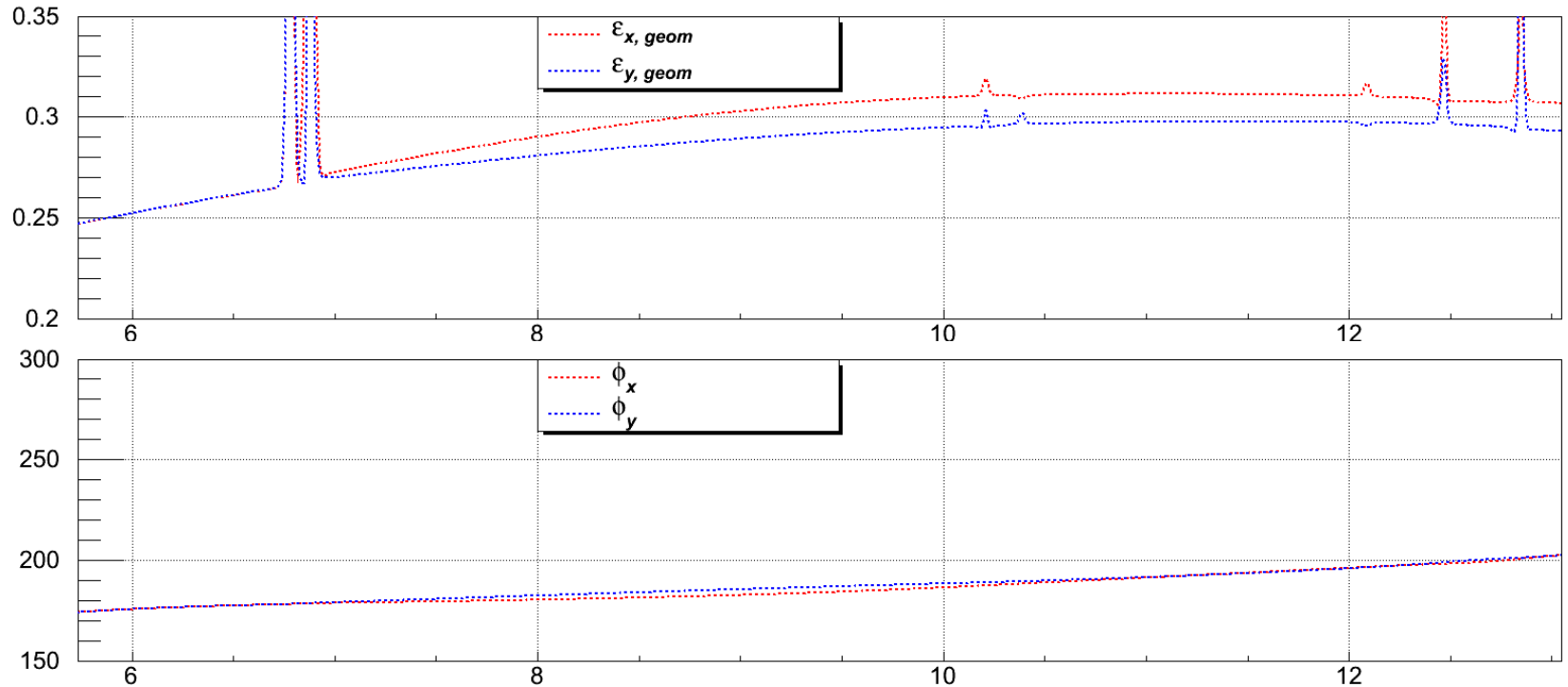


Relative difference between
PST2 and EMSY 1

$emit_x$	49%	(1.722)	phi_x	196%	(359.7)
$emit_y$	15%	(1.325)	phi_y	158%	(313.3)

Point 3a

100pC, 0.247mm*mrad @ EMSY1

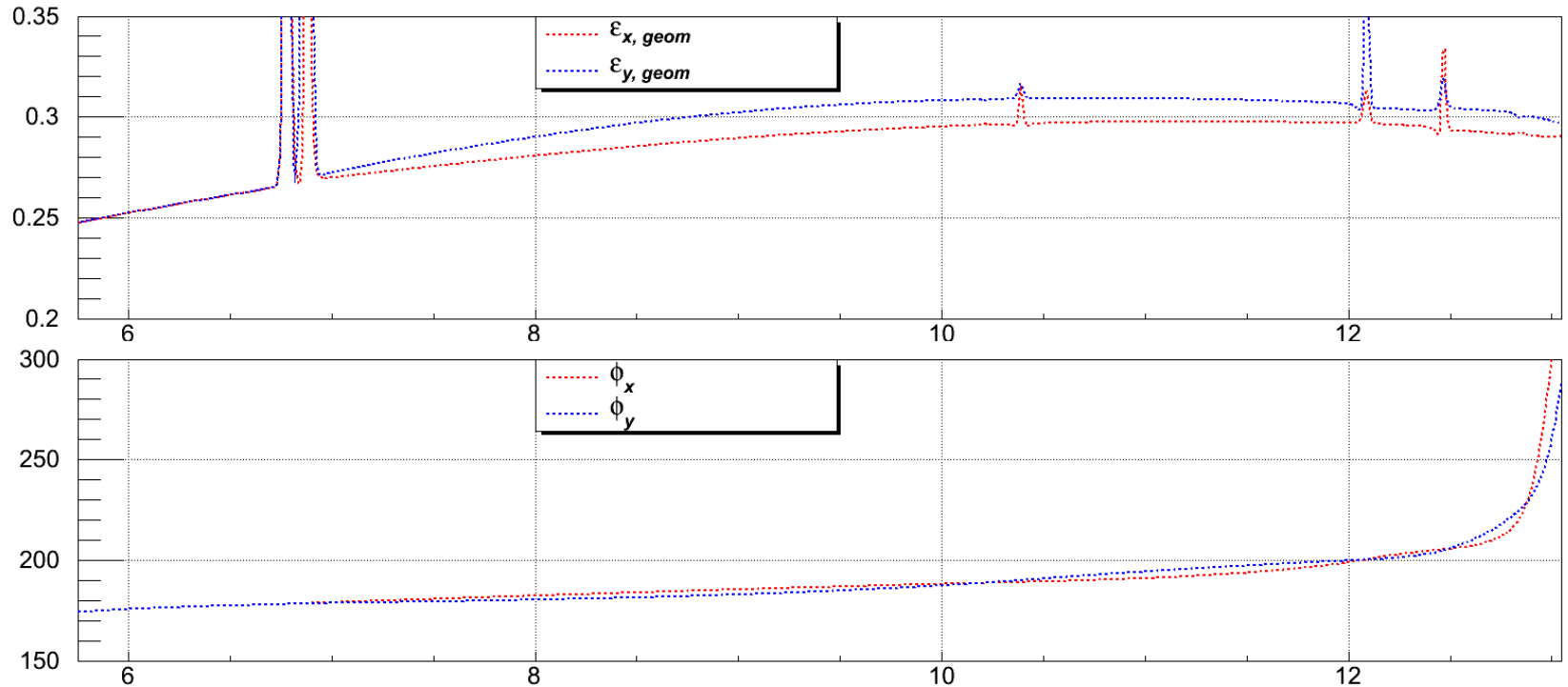


Relative difference between
PST2 and EMSY 1

$emit_x$	24%	(0.307)	phi_x	16%	(202.4)
$emit_y$	19%	(0.293)	phi_y	17%	(204.3)

Point 3b

100pC, 0.247mm*mrad @ EMSY1



Relative difference between
PST2 and EMSY 1

$emit_x$	17%	(0.290)	phi_x	83%	(318.9)
$emit_y$	20%	(0.297)	phi_y	63%	(283.0)

Conclusions(?) - Discussion

- Smaller emittance increase observed with bigger phase advance == stronger focusing
- Positive alpha is better ->? bigger spot size during measurements
- ... no other apparent correlation of beta and alpha with the emittance increase and the matching...