Update for the new optics for V6.503

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Thanks to Massimo, Stephane and Thys

Introduction

- IP1-IP5 phasing discussed in LCU 26/Aug/08

V6.503s1 collision

Beam1

	IR1	IR2	IR3	IR4	IR5	IR6	IR7	IR8
MUX	2.633	2.986	2.260	2.129	2.633	2.015	2.367	3.183
MUY	2.649	2.809	1.990	1.958	2.649	1.780	1.822	2.974

	MUX	MUY		
IP1	0.00	0.00		0.75
IP5	32.06	29.75	0.25	
IP1L	64.31	59.32		0.57

Beam2

	IR1	IR2	IR3	IR4	IR5	IR6	IR7	IR8
MUX	2.633	2.991	2.260	2.124	2.633	2.015	2.491	3.059
MUY	2.649	2.844	1.990	1.922	2.649	1.780	2.015	2.782

	MUX	MUY		
IP1	0.00	0.00		0.75
IP5	32.06	29.75	0.25	
IP1L	64.31	59.32		0.57

V6.503s2 collision

Beam1

	IR1	IR2	IR3	IR4	IR5	IR6	IR7	IR8
MUX	2.633	2.986	2.260	2.12940	2.633	2.015	2.49060	3.059
MUY	2.649	2.809	1.990	1.95787	2.649	1.780	2.01413	2.782

	MUX	MUY		
IP1	0.00	0.00		0.75
IP5	32.06	29.75	0.25	
IP1L	64.31	59.32		0.57

Beam2

	IR1	IR2	IR3	IR4	IR5	IR6	IR7	IR8
MUX	2.633	2.986	2.260	2.12860	2.633	2.015	2.49140	3.059
MUY	2.649	2.809	1.990	1.95713	2.649	1.780	2.01487	2.782

	MUX	MUY		
IP1	0.00	0.00		0.75
IP5	32.06	29.75	0.25	
IP1L	64.31	59.32		0.57

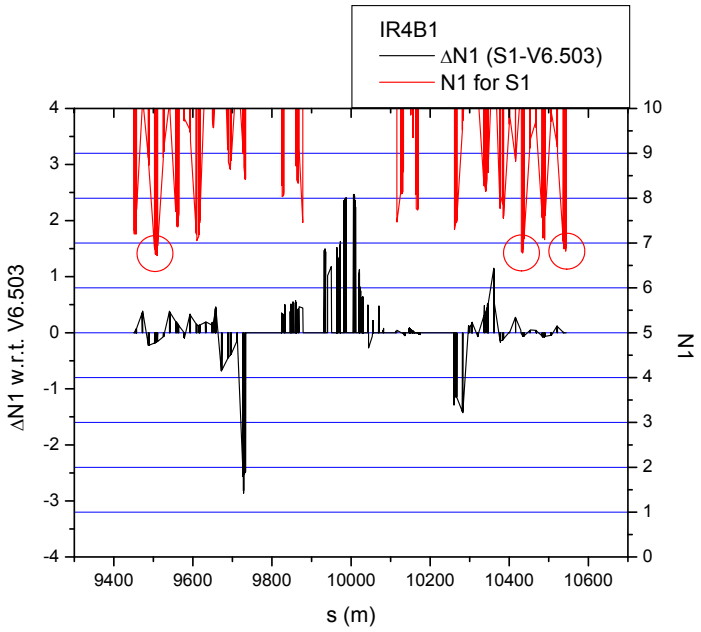
$\pi/2$ IP5 to IP1 for H and IP1 to IP5 for V

Update

- Aperture optimization
  - IR4B1
  - IR8B1
  - IR2B2
- Presqueezing and squeezing for IR8B1
  - Under optimization

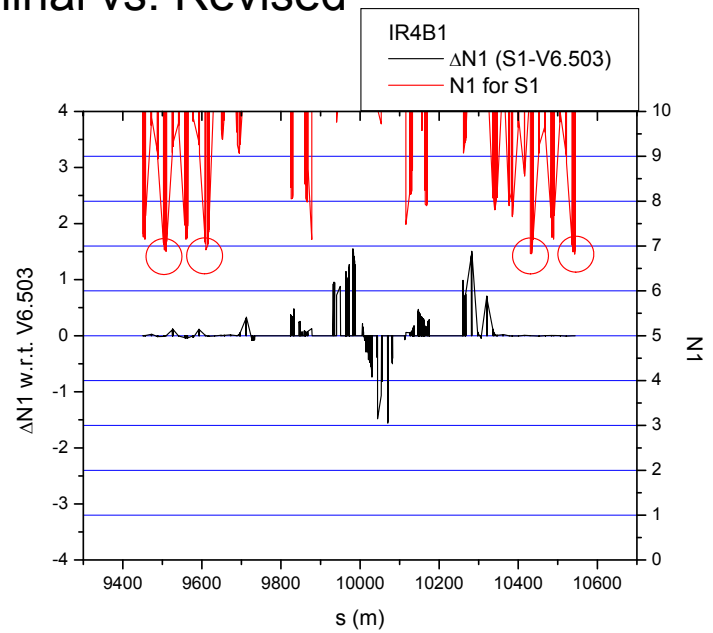
IR4B1 S1

Nominal vs. Proposed



s~9500 m, ΔN1~-0.16, N1>6.7 (D)
s~9610 m, N1>7.0 (D)
s~10430 m, ΔN1~-0.06, N1>6.7 (D)
s~10540 m, ΔN1~0.0, N1>6.8 (D)

Nominal vs. Revised

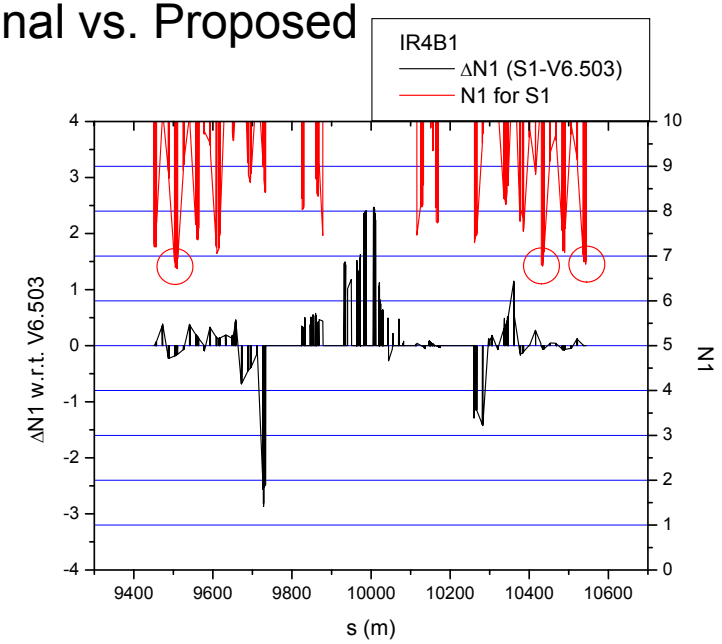


s~9500 m, ΔN1~-0.01, N1>6.9 (D)
s~9610 m, ΔN1~0.0, N1>6.9 (D)
s~10430 m, ΔN1~0.0, N1>6.8 (D)
s~10540 m, ΔN1~0.0, N1>6.8 (D)

Aperture loss peak ~-3.0 → ~-1.5

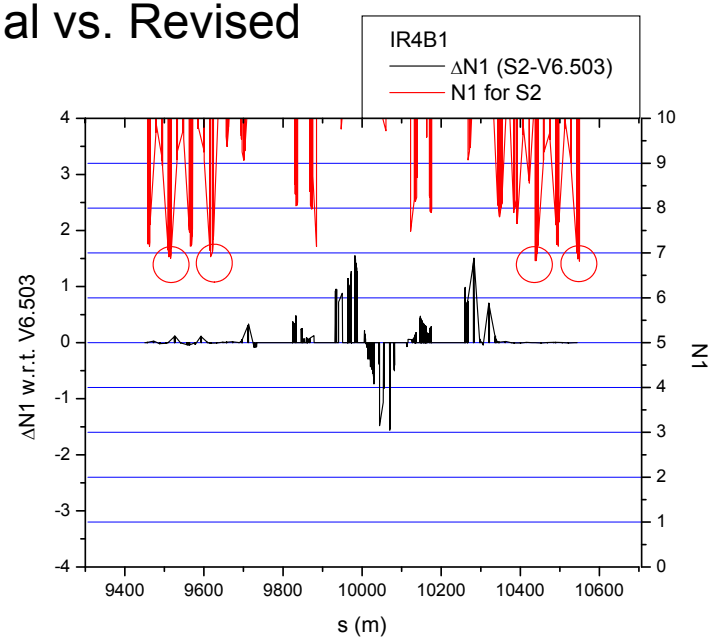
IR4B1 S2

Nominal vs. Proposed



s~9500 m, ΔN1~-0.16, N1>6.7 (D)
s~9610 m, N1>7.0 (D)
s~10430 m, ΔN1~-0.06, N1>6.7 (D)
s~10540 m, ΔN1~0.0, N1>6.8 (D)

Nominal vs. Revised

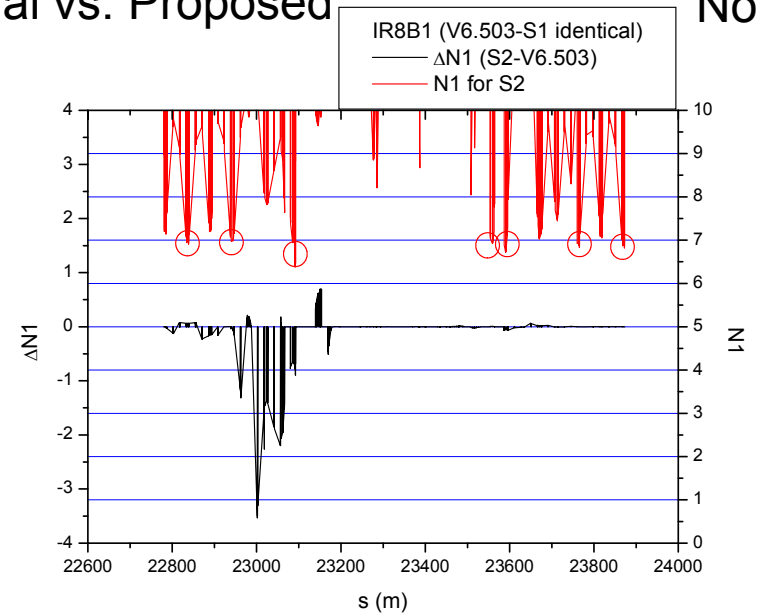


s~9500 m, ΔN1~-0.01, N1>6.9 (D)
s~9610 m, ΔN1~0.0, N1>6.9 (D)
s~10430 m, ΔN1~0.0, N1>6.8 (D)
s~10540 m, ΔN1~0.0, N1>6.8 (D)

Aperture loss peak ~-3.0 → ~-1.5

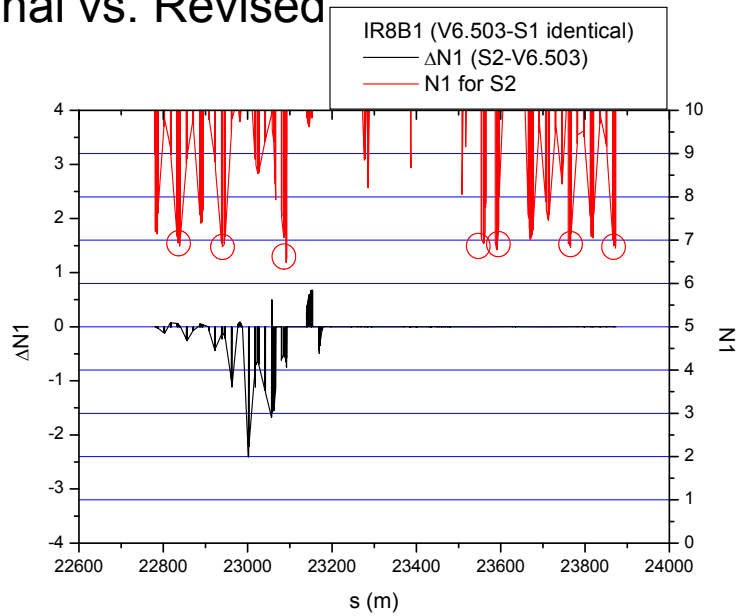
IR8B1 (S1 identical to V6.503)

Nominal vs. Proposed



s~22840 m, ΔN1~+0.06, N1>6.9 (F)
s~22940 m, ΔN1~0.0, N1>6.9 (D)
s~23080 m, ΔN1~-0.65, N1>6.9 (D)
s~23090 m, ΔN1~-0.7, N1~6.4 (TCLIM)
s~23560 m, ΔN1~+0.006, N1>6.9 (F)
s~23590 m, ΔN1~-0.06, N1>6.7 (D)
s~23760 m, ΔN1~0.0, N1>6.8 (D)
s~23870 m, ΔN1~0.0, N1>6.8 (D)

Nominal vs. Revised

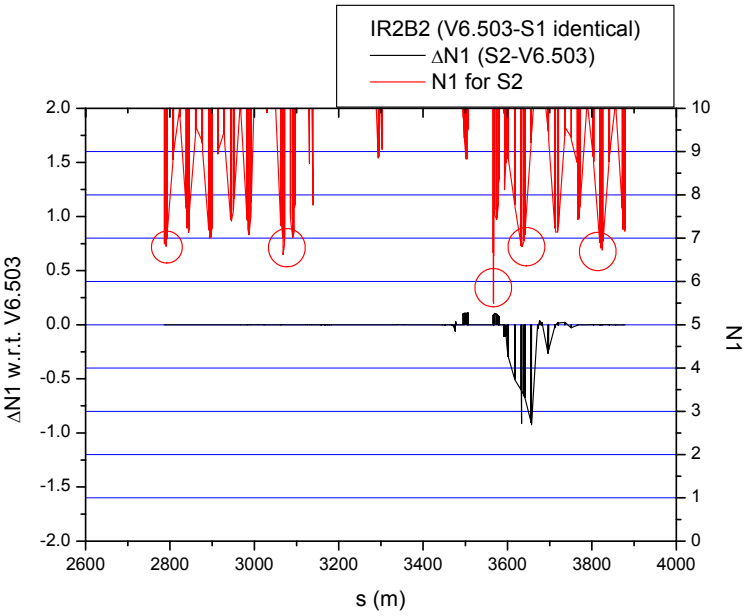


s~22840 m, ΔN1~+0.02, N1>6.8 (D)
s~22940 m, ΔN1~-0.12, N1>6.8 (D)
s~23080 m, N1>7.0 (D)
s~23090 m, ΔN1~-0.6, N1~6.5 (TCLIM)
s~23560 m, ΔN1=0.0, N1>6.9 (F)
s~23590 m, ΔN1=0.0, N1>6.7 (D)
s~23760 m, ΔN1=0.0, N1>6.8 (D)
s~23870 m, ΔN1=0.0, N1>6.8 (D)

Aperture loss peak ~-3.5 → ~-2.5
Note: Aperture model has been updated recently

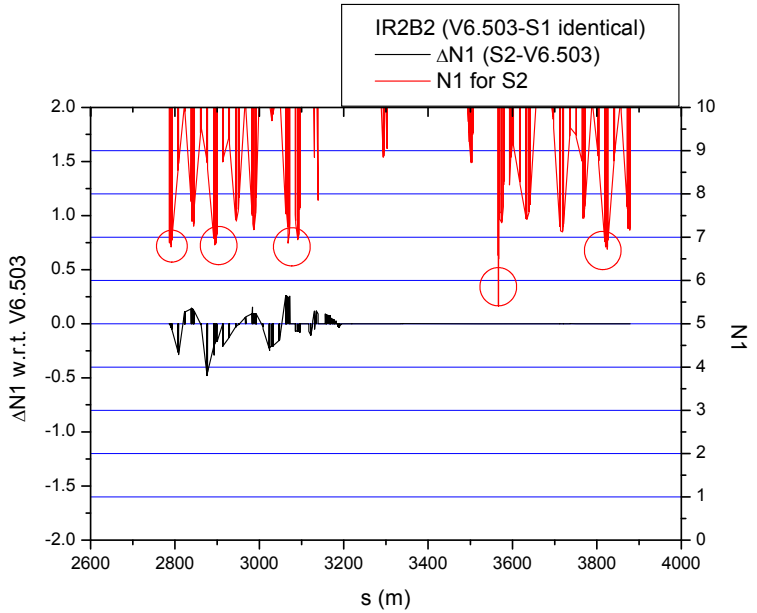
IR2B2 S2 (S1 identical to V6.503)

Nominal vs. Proposed



s~2790 m, ΔN1=0.0, N1>6.8 (D)
s~2890 m, N1>7.0
s~3070 m, ΔN1=0.0, N1~6.6 (D)
s~3570 m, ΔN1~+0.1, N1~5.5 (D,TCLIM)
s~3630 m, ΔN1~-0.6, N1>6.8 (D)
s~3820 m, ΔN1~0.0, N1>6.7 (D)

Nominal vs. Revised



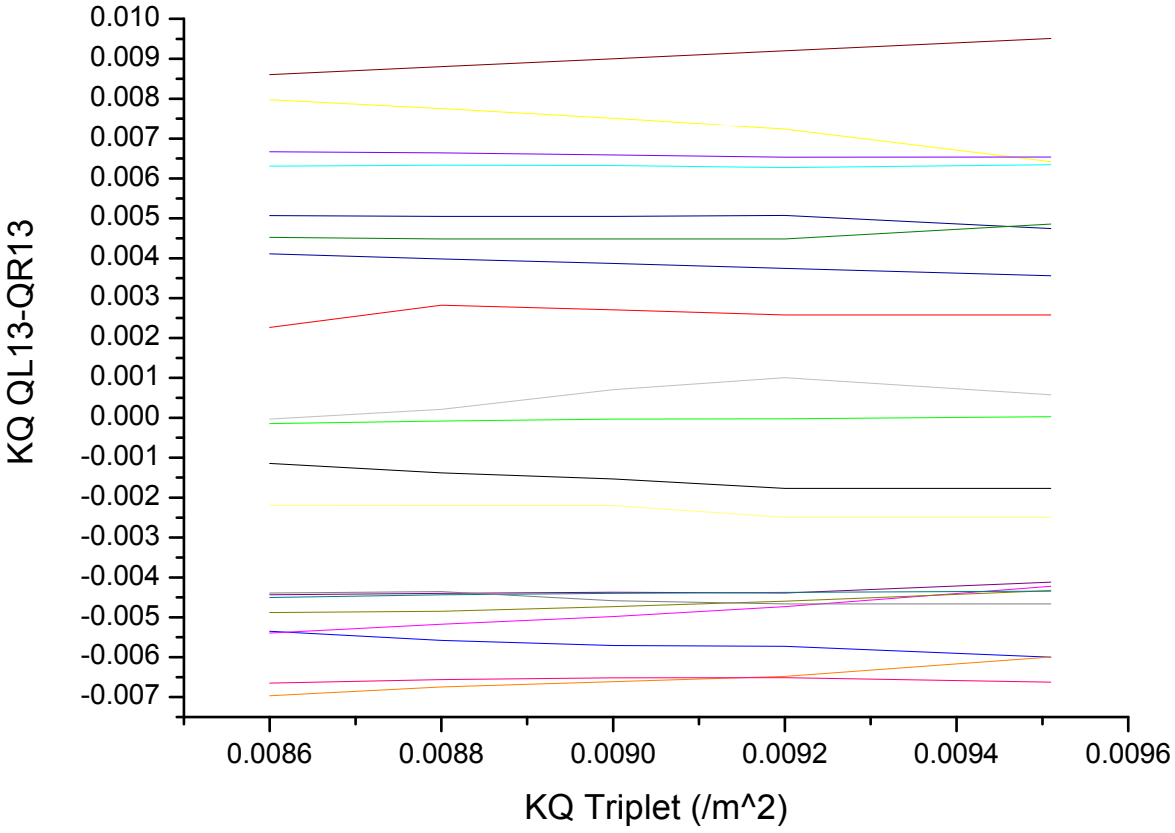
s~2790 m, ΔN1~-0.04, N1>6.7 (D)
s~2890 m, ΔN1~-0.2, N1>6.8 (D)
s~3070 m, ΔN1~+0.24, N1>6.8 (D)
s~3570 m, ΔN1=0.0, N1~5.4 (D,TCLIM)
s~3630 m, N1>7.0 (D)
s~3820 m, ΔN1~0.0, N1>6.7 (D)

Aperture loss peak ~-1.0 → ~-0.5
Aperture bottle neck at Q7L is improved!

IR8B1 Presqueezing

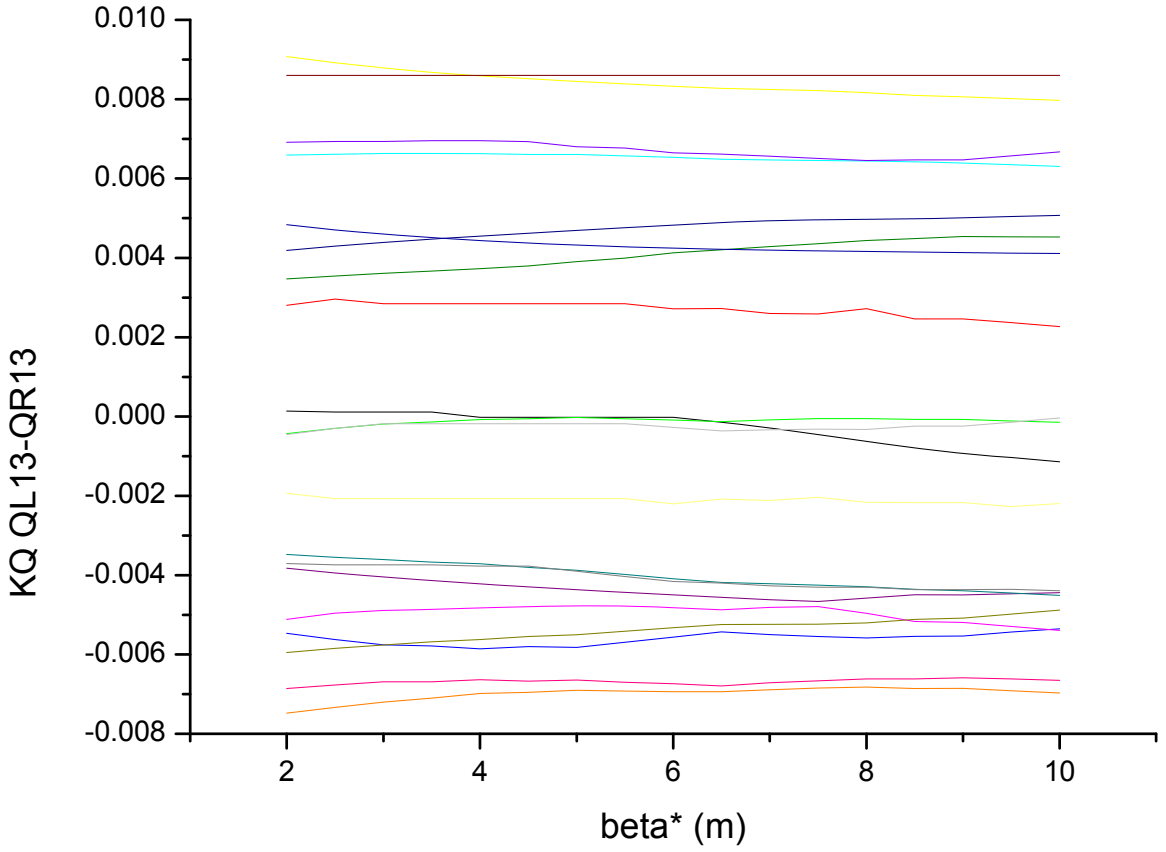
- Reduce the triplet strength from 222 T/m to 205 T/m (7 TeV equivalent)
  - PS limit (CT) ~ 206 T/m (~ 222*6.5/7 T/m)
  - Magnet limit = 215 T/m
- Operation (without PS upgrade)
  - < ~6.5 TeV, presqueezing at flat top or during acceleration
  - > ~6.5 TeV, presqueezing during acceleration

IR8B1 Presqueezing



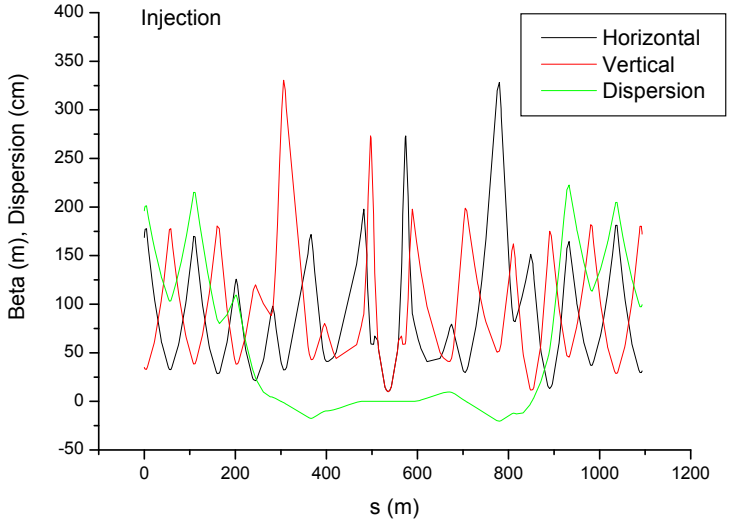
Under optimization but presqueezing seems feasible

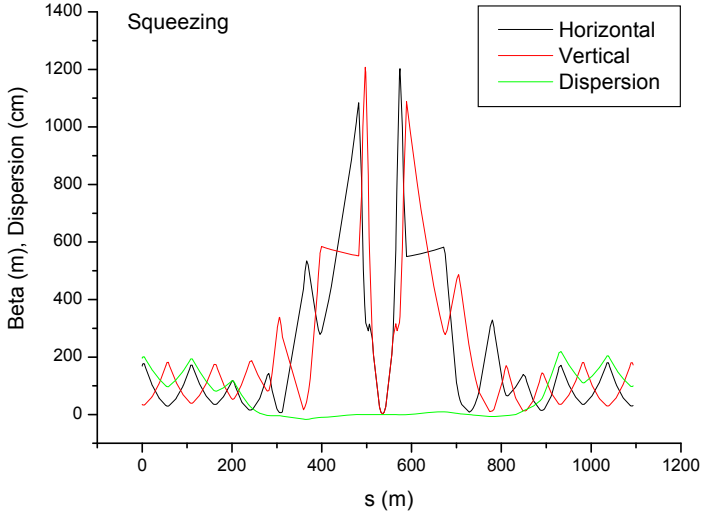
IR8B1 Squeezing

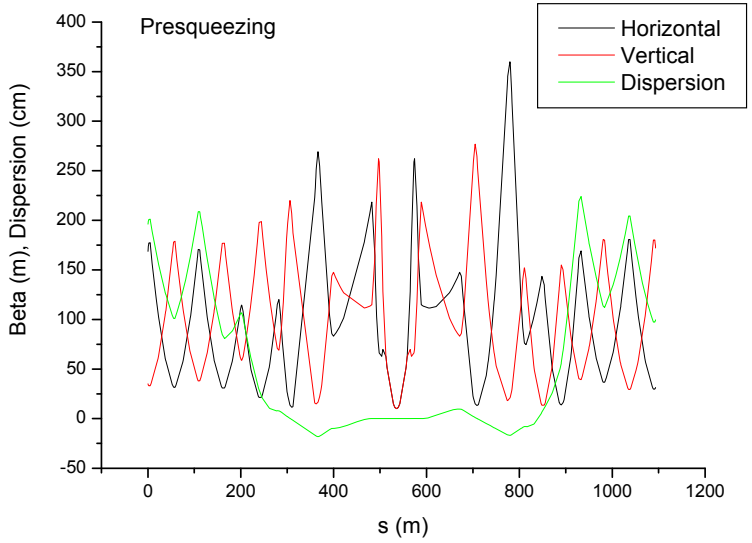


Under optimization but squeezing seems feasible

IR8B1 Pre+Squeezing



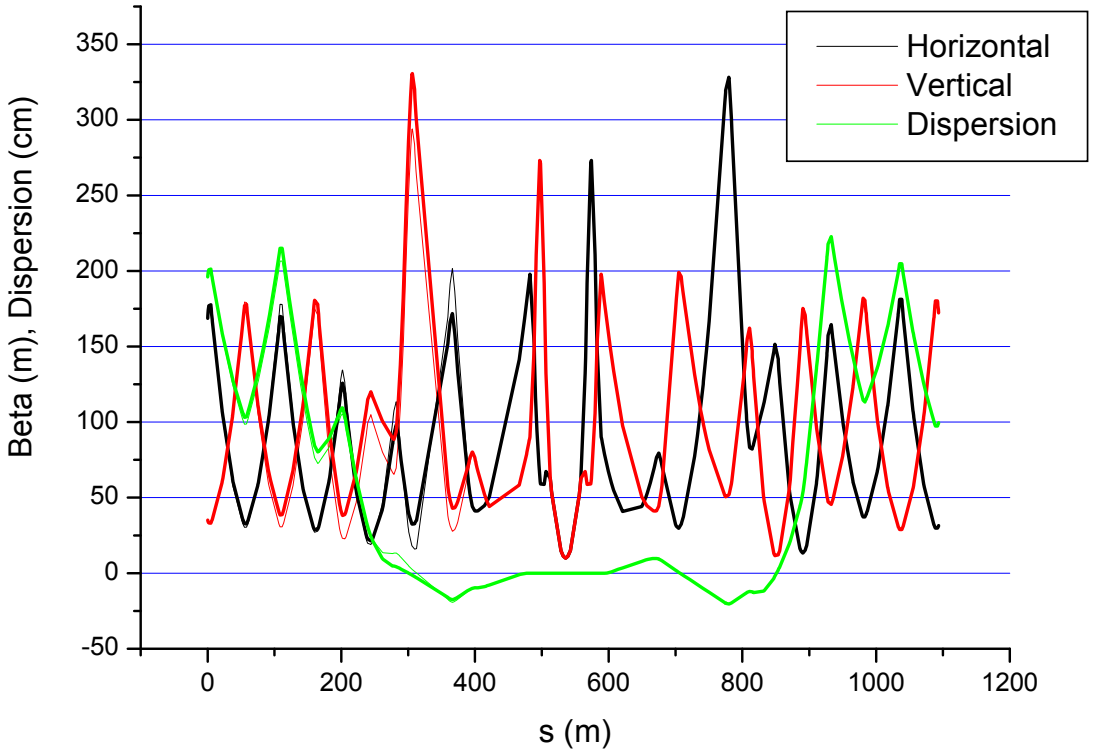




Summary

- Update of IP1-IP5 phasing optics
  - Aperture optimization has been done
  - Presqueezing and squeezing of IR8B1 seems feasible for the new phase advances
    - It's time to pass the new optics (at least B1) to the collimation team?
  - To do list
    - Presqueezing & squeezing for IR2B2
    - Crossing scheme for IR8B1 and IR2B2

IR8B1 optics



(3.183, 2.974) → (3.059, 2.782)

V phase advance is mainly reduced around the location of aperture loss peak.