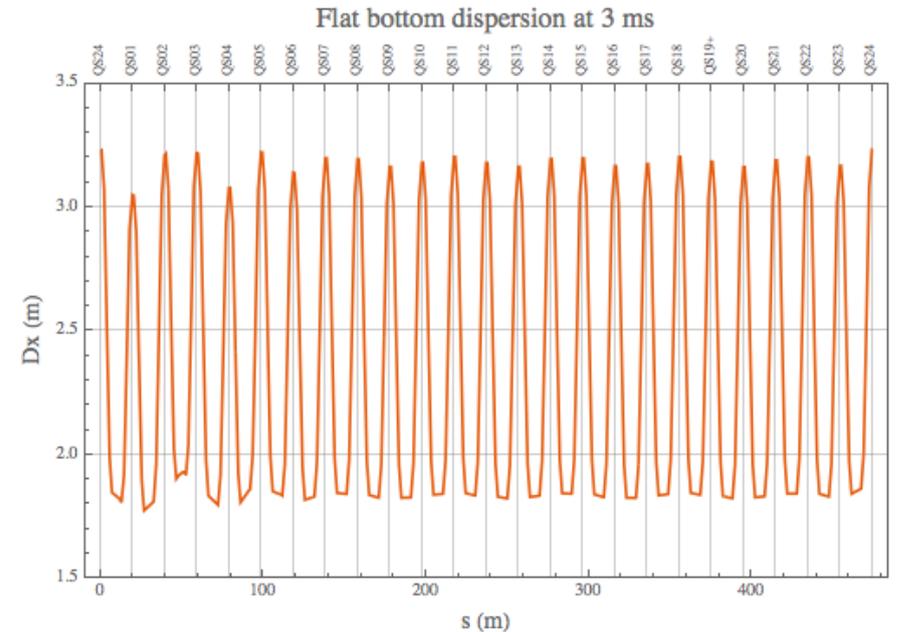
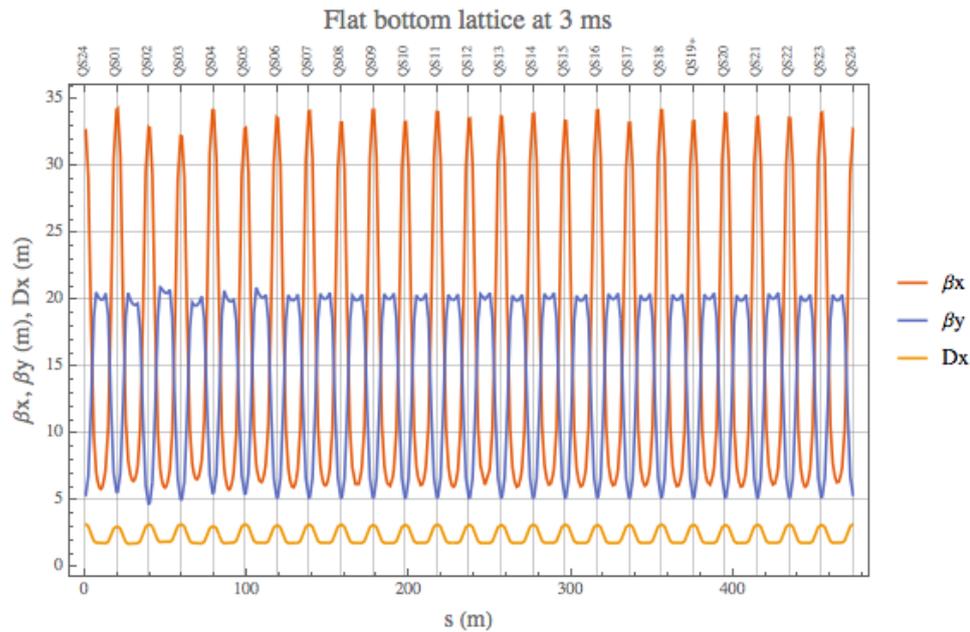
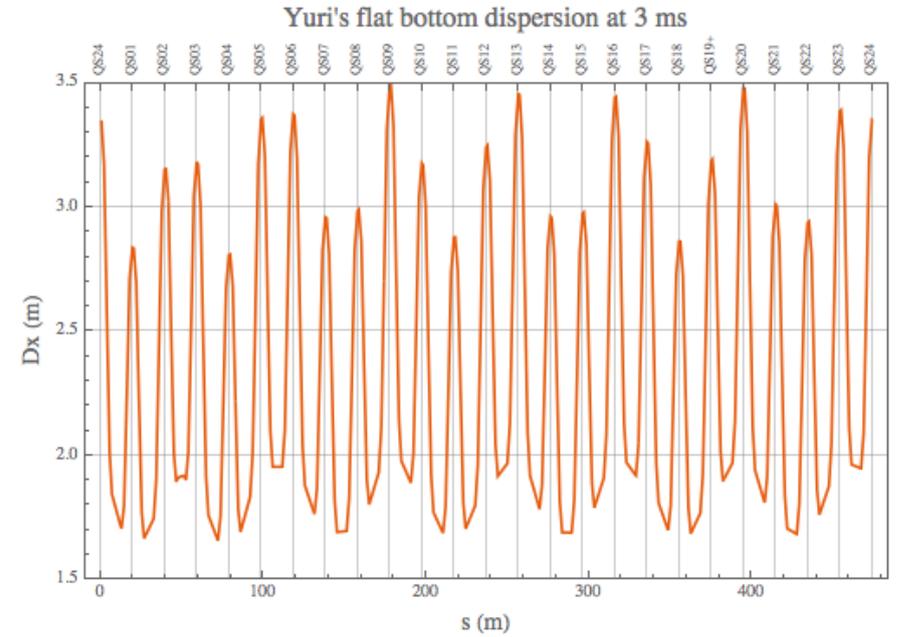
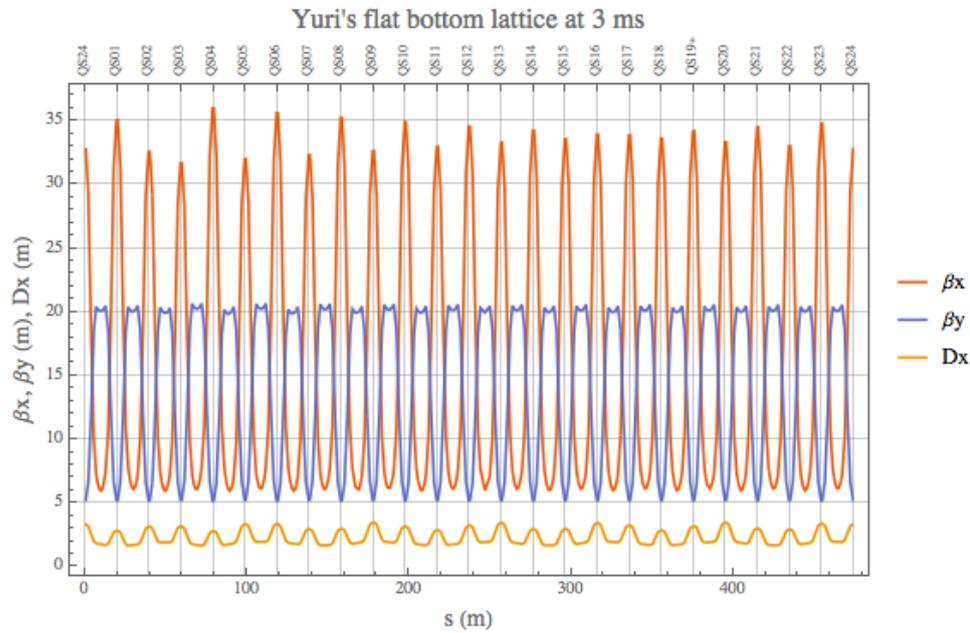


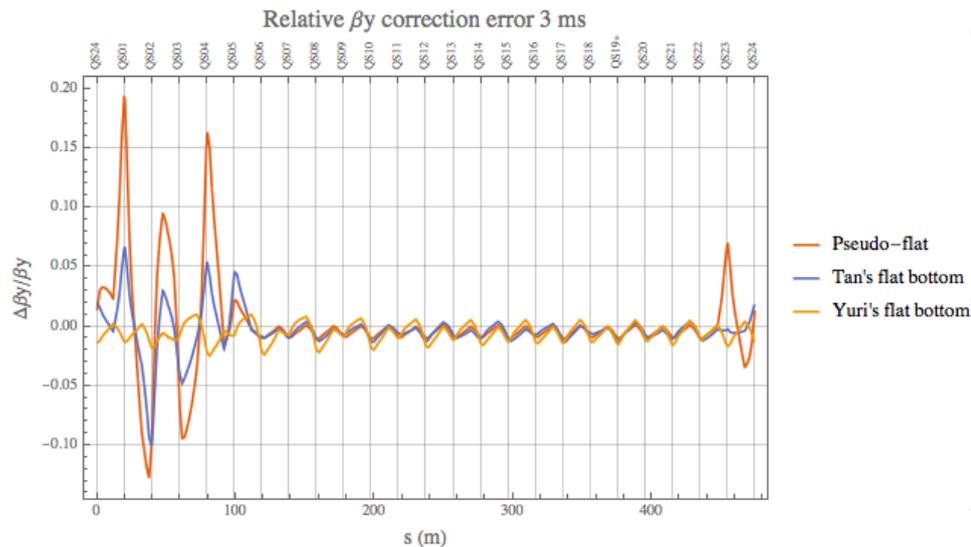
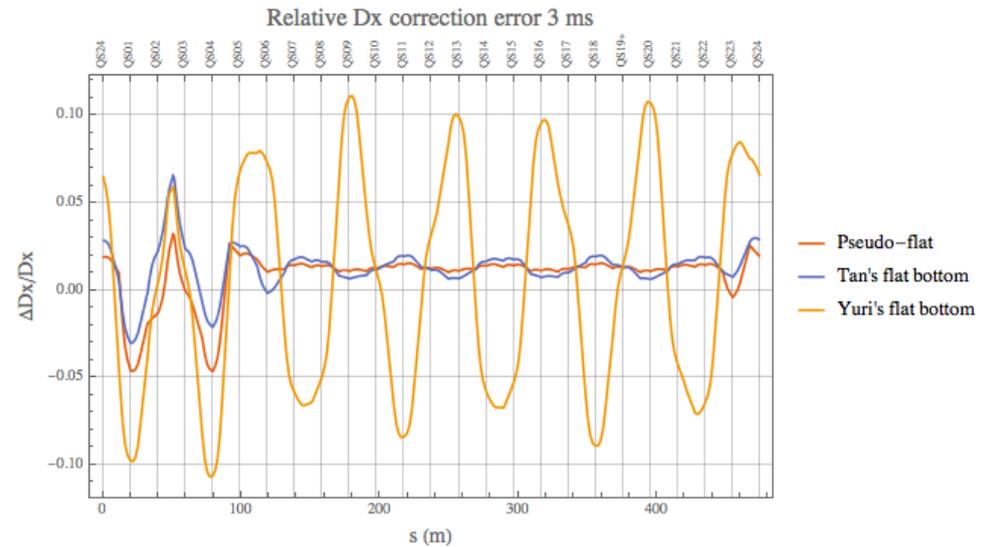
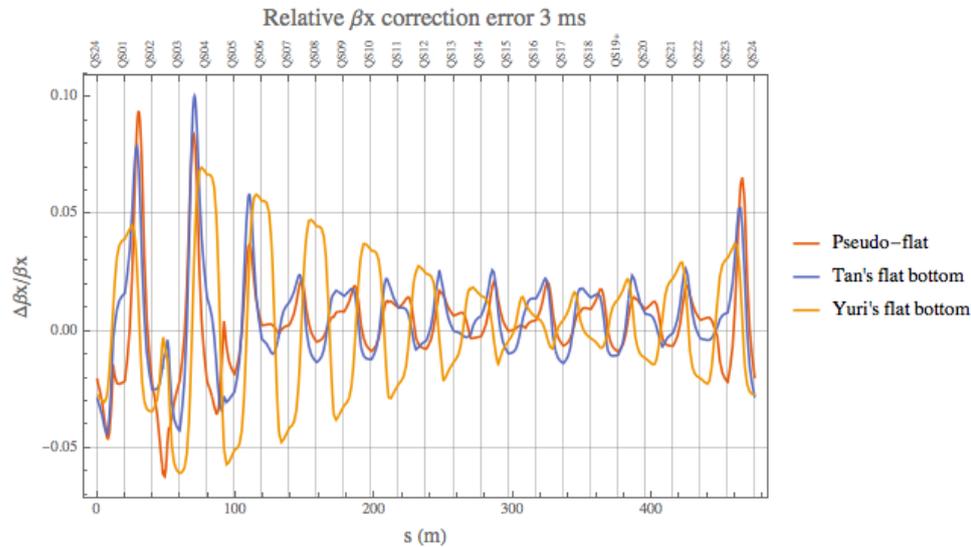
Flat Bottom Lattice

C.Y. Tan
12 Apr 2017

Improving Yuri's flat bottom lattice



Relative errors w.r.t. ideal lattice



Yuri's flat bottom compared

Both β_x and dispersion relative errors are improved.

β_y relative errors are worse around dogleg.

Pseudo flat compared

β_y relative errors are better than pseudo flat.
 D_x a little worse outside dogleg region.

Again only using 17 quads in optimization.

Why is flat bottom better?

- Note the large beta and dispersion beatings in x and dispersion
 - So why is flat bottom better than pseudo flats?

From V. Lebedev's talk on 03 Apr 2017

		$\Delta v_{xSB} \cdot 10^{-3}$	$\Delta v_{ySB} \cdot 10^{-3}$
1	No correction	9.6	0.84
2	Lebedev, 2013	2.2	0.27
3	Lebedev, 2017	2	0.36
4	Alexahin, 2017	0.82	0.64

- All considered optics corrections reduces space charge driven effects relative to the uncorrected lattice
- Resonance driving terms and beta-beating look similar for all optics corrections. However, Choice 4 (Yu. Alexahin) looks 2.5 better from the resonance driving terms point of view

From A. Valishev's talk on 03 Apr 2017

Lattice	turn	N_surv	ϵ_x (r.m.s.)	ϵ_y (r.m.s.)	σ_{pt}	$\sigma_t \times C$
all	1	5000	2.5e-06	2.5e-06	0.00136	0.962
HEP	2000	2689	1.2e-5	6.4e-6	0.00113	0.982
Flat-top	2000	4985	3.6e-06	3.8e-06	0.00126	1.091
Flat-bottom	2000	4996	3.1e-06	3.0e-06	0.00127	1.071
Dogless	2000	5000	2.5e-06	2.5e-06	0.00127	1.065

- 'Flat-bottom' optics comes close to supersymmetric machine
- How reproducible the optics tuning will be in regular operation?

So, is it better to "flatten" vert only, and disregard x and dispersion?

Settling lattice for studies

- We need to settle on a lattice because the “cost” of doing studies is quite high.
 - The flat bottom lattice will have to be propagated to the earlier and later slots.
 - Have to make sure that the tunes are ok.
 - It takes 3 days to do a tune response measurement.
 - Orbits change all the time in Booster, so we have to be quick to compare HEP to flat lattice.
- **So which lattice?**