Beam-beam simulations for SuperKEKB Phase-3

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Acknowledgements:

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Outline

- Introduction
- Simulation using BBSS
- Summary

1. Introduction

➤ Phase-3 machine parameters (Road map)

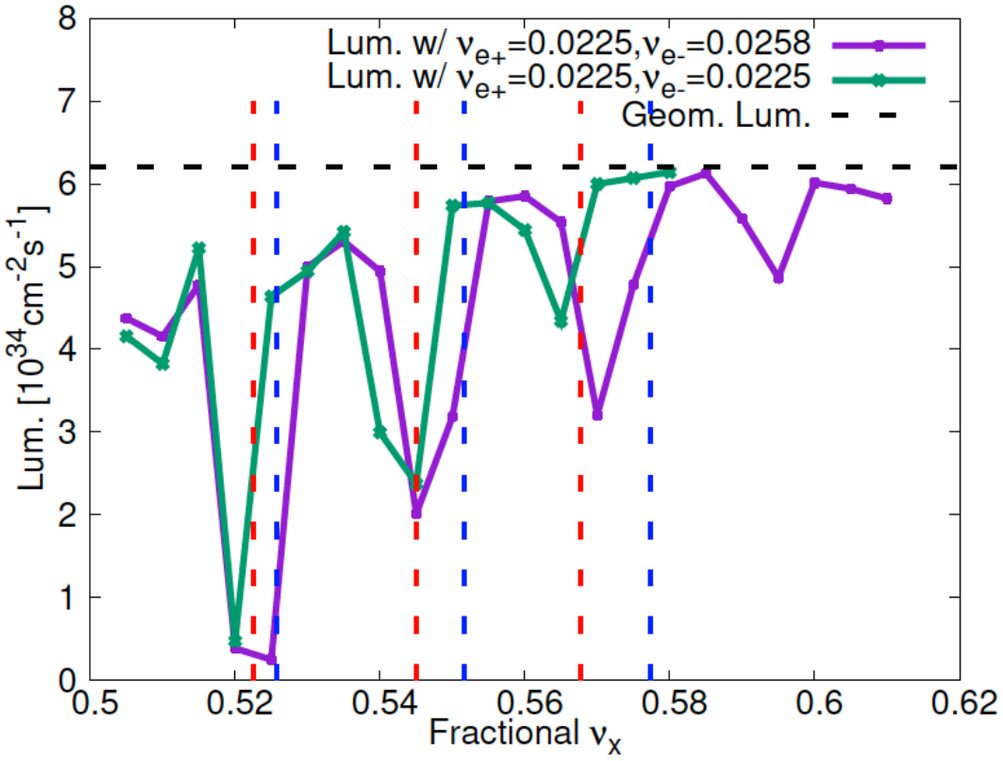
- Ref. A. Morita, Talk at SuperKEKB commissioning meeting, Oct. 12, 2018

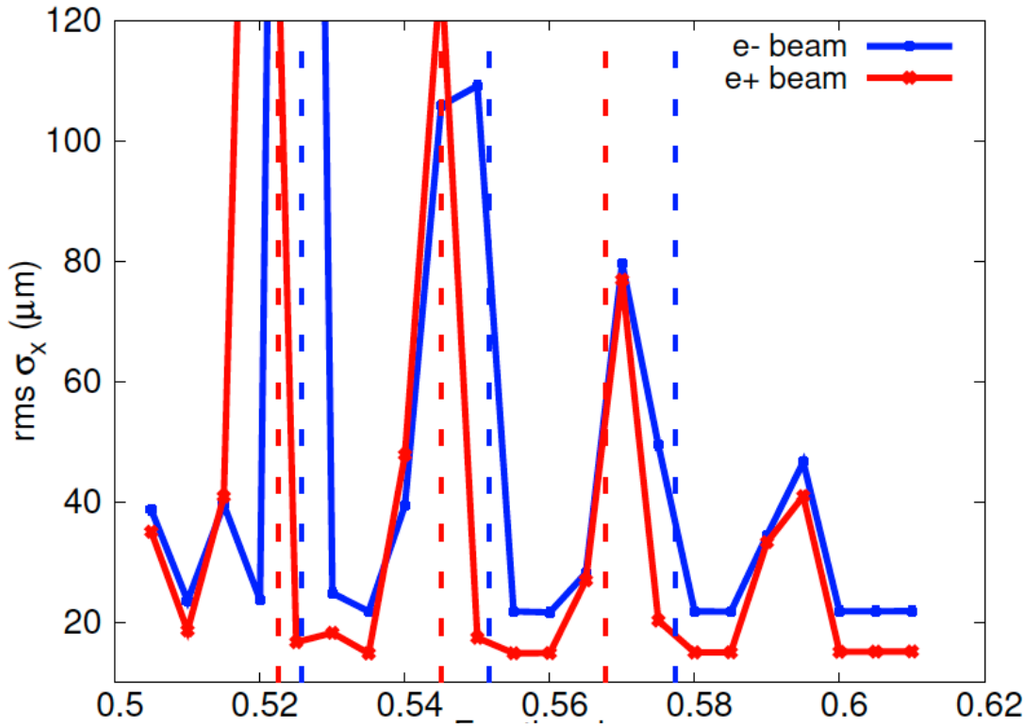
	1		1ex		2		2ex		3		3'		3ex	
	HER	LER	HER	LER	HER	LER	HER	LER	HER	LER	HER	LER	HER	LER
I_b (A)	1.0	1.2	1.0	1.4	1.0	1.4	1.2	1.7	1.3	1.8	1.15	1.6	1.4	2.0
# bunch	1576		1576		1576		1576		1576		1576		1576	
ε_x (nm)	4.6	2.0	4.6	2.0	4.6	2.0	4.6	2.0	4.6	2.0	4.6	2.0	4.6	2.0
ε_y (pm)	368	160	230	150	138	140	128.8	130	138	140	101.2	100	101.2	100
β_x (mm)	100	100	100	100	100	100	100	100	100	100	100	100	100	100
β_y (mm)	3	3	3	3	2	2	2	2	1.4	1.4	1.25	1.25	1.2	1.2
σ_z (mm)	6	6	6	6	6	6	6	6	6	6	6	6	6	6
ν_x	45.57	44.57	45.57	44.57	45.57	44.57	45.57	44.57	45.57	44.57	45.57	44.57	45.57	44.57
ν_y	43.61	46.61	43.61	46.61	43.61	46.61	43.61	46.61	43.61	46.61	43.61	46.61	43.61	46.61
ν_s	0.0258	0.0225	0.0258	0.0225	0.0258	0.0225	0.0258	0.0225	0.0258	0.0225	0.0258	0.0225	0.0258	0.0225
ξ_y(Geom.)	0.0272	0.0262	0.0328	0.0331	0.0278	0.0351	0.0351	0.0436	0.0302	0.0387	0.0301	0.0397	0.0369	0.0453
$\mathcal{L}$(Geom.)	1.06E+34		1.46E+34		2.08E+34		3.14E+34		4.11E+34		4.00E+34		6.20E+34	
$\mathcal{L}$(BBSS)	1.00E+34		1.30E+34		1.74E+34		2.16E+34		2.52E+34		2.55E+34		3.21E+34	

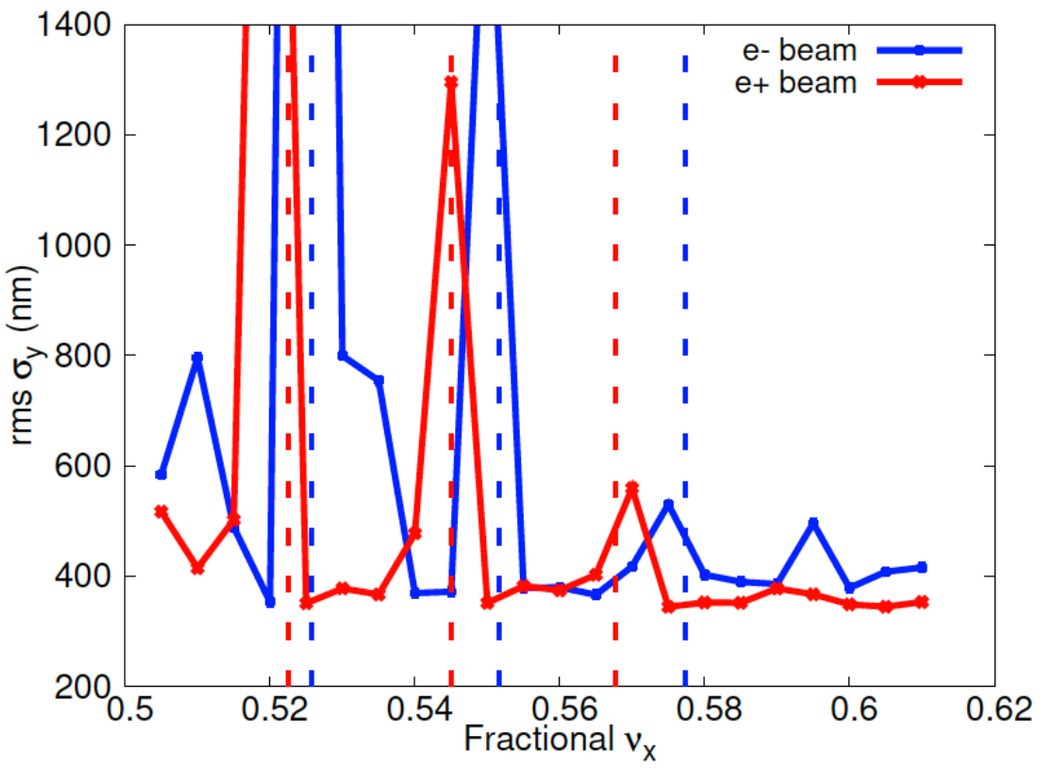
2. BBSS simulation

➤ All parameter set (3ex): ν_y=*.61

- **Scan of ν_x (same fractional part for LER and HER)**





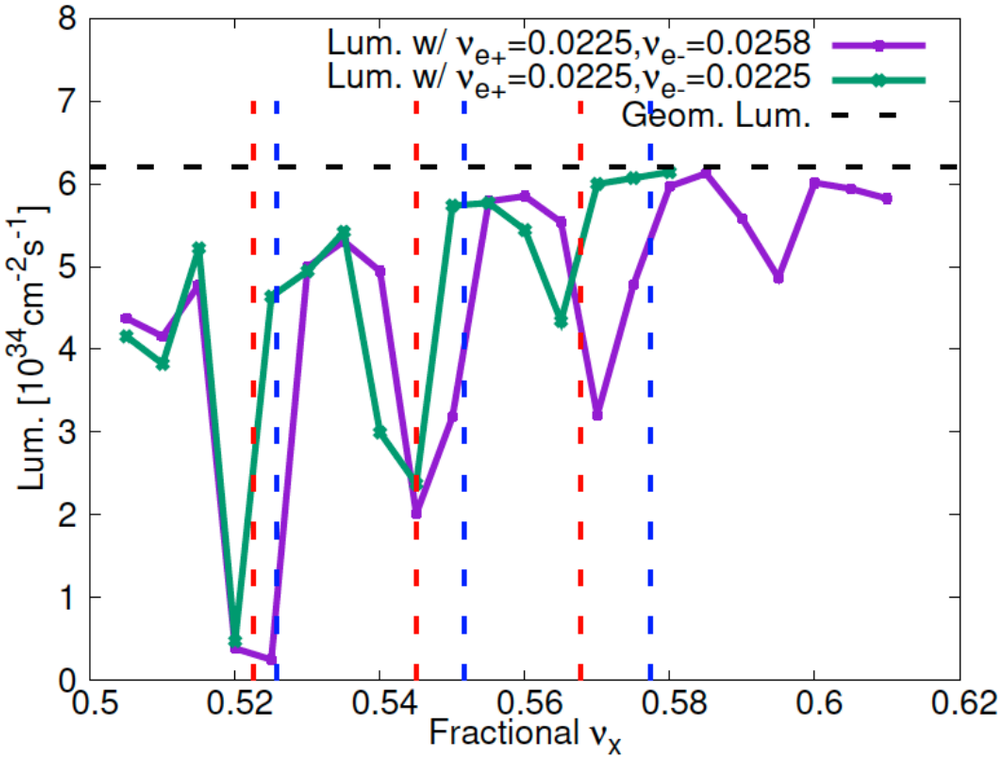


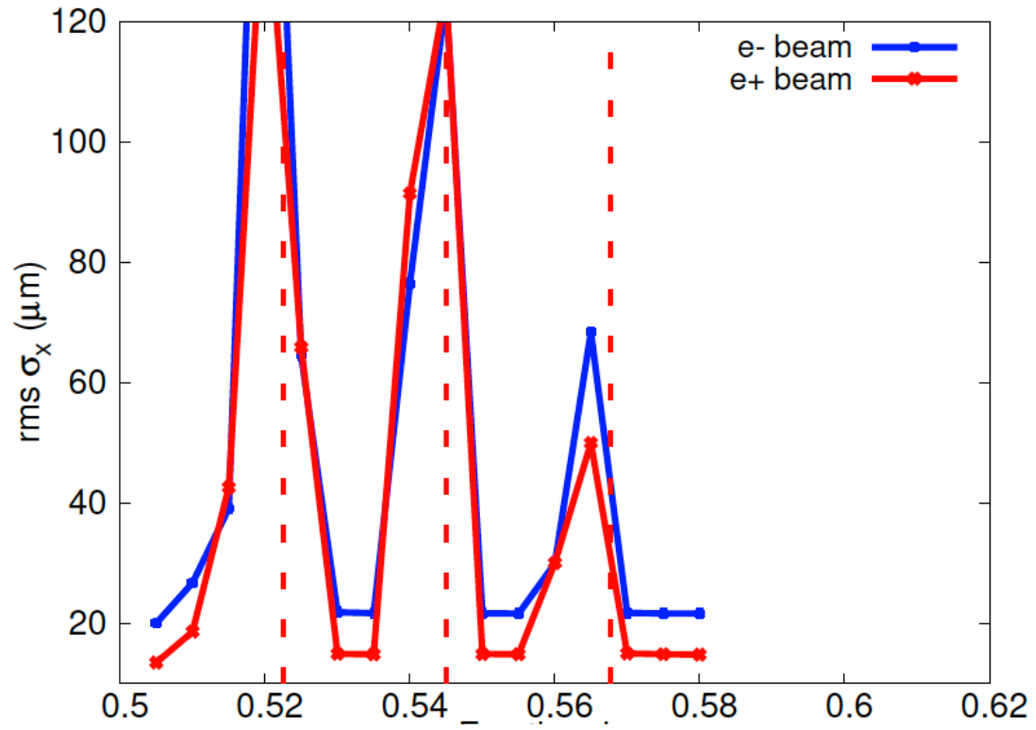
Beam sizes for ν_{s+}=.0225, ν_{s-}=.0258

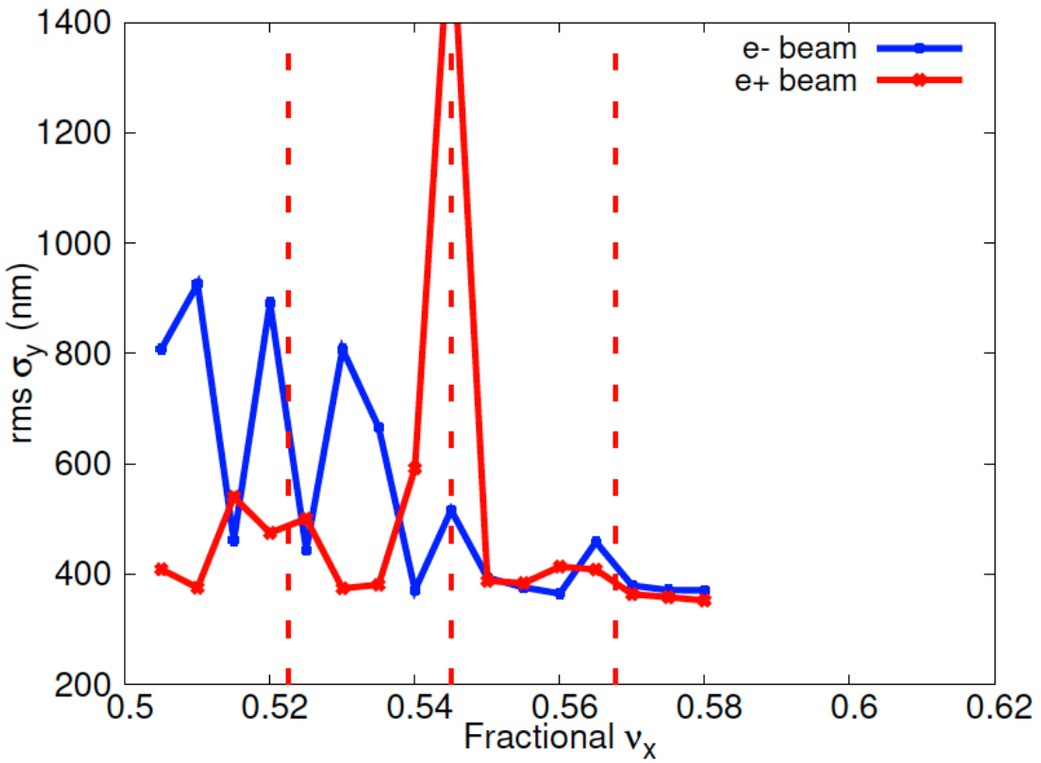
2. BBSS simulation

➤ All parameter set (3ex): ν_y=*.61

- **Scan of ν_x (same fractional part for LER and HER)**







Beam sizes for ν_{s+}=.0225, ν_{s-}=.0225

3. Summary

➤ **Simulations using BBSS**

- **x-z beam-beam instability (or blow-up) easily seen in BBSS simulations**
- **Likely $\nu_{s+}=\nu_{s-}$ is better than $\nu_{s+}\neq\nu_{s-}$?**

4. Proposal

➤ **Organization of a Virtual Working Group on "Beam dynamics issues at SuperKEKB"**

- **Mailing list created: skb-bd@ml.post.kek.jp**
- **Webpage created: http://research.kek.jp/group/skb-bd/ (under construction)**
- **Possible members:**
  - *** Salvatore Dicarlo (LAL, Beam-beam simulations)**
  - *** Renjun Yang and Dima El Khechen (CERN, Background)**
  - *** Kouki Hirosawa (Beam-beam simulations with lattice nonlinearity)**
  - *** Others: K. Ohmi, K. Oide (Supervisors), D. Zhou, …**