SuperTRISTAN

A possibility of ring collider for Higgs factory

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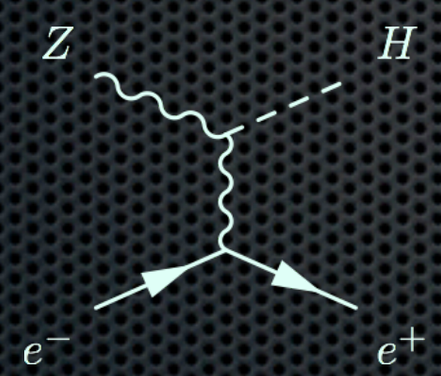
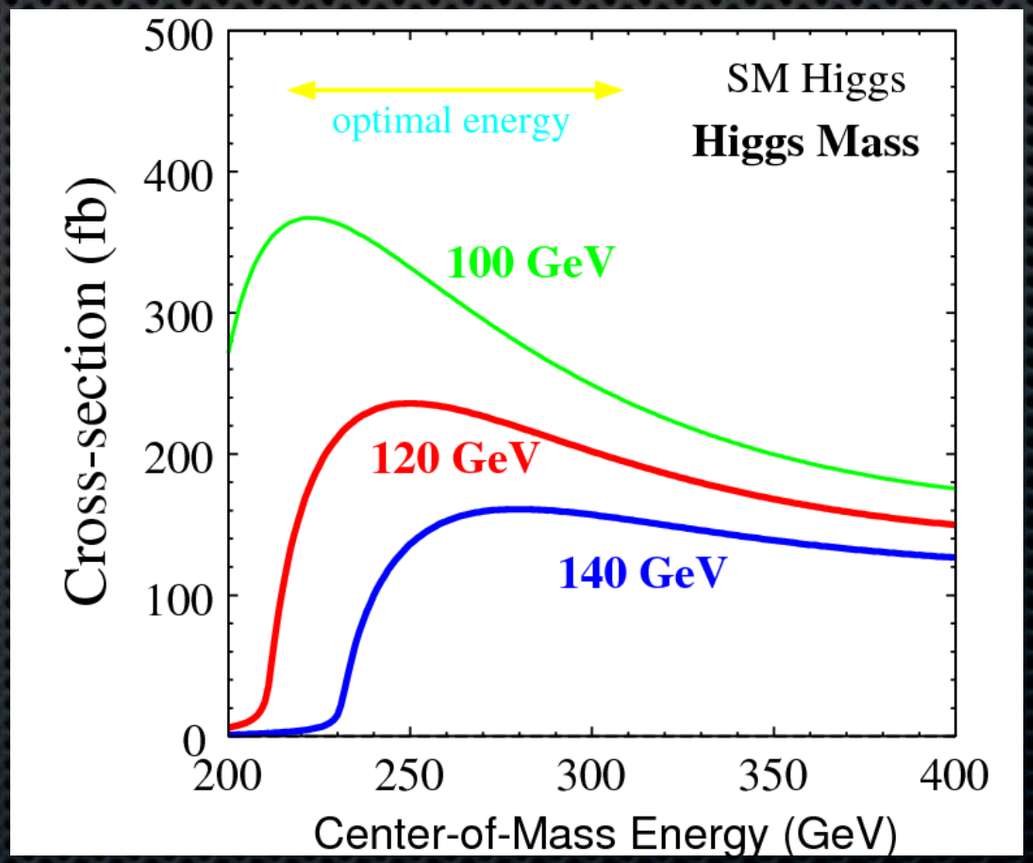
K. Oide (KEK)

Inspired by A. Blondel and F. Zimmermann, "*A High Luminosity e+e- Collider in the LHC tunnel to study the Higgs Boson*", V2.1 - V2.7, arXiv:1112.2518v1 [hep-ex], 24 Dec 2011.

Motivations

- If the Higgs mass is below 130 GeV, an e+e- ring collider may have merits as a Higgs factory:
  - Based on existing technologies which have been proven for 40 years by a number of colliders.
  - The machine will be simple enough, and the operation will be easy and straightforward. The design luminosity will be quickly achieved, for instance after 6 months commissioning.
  - Cheaper construction / operation costs than linear machines.





S. Yamashita via

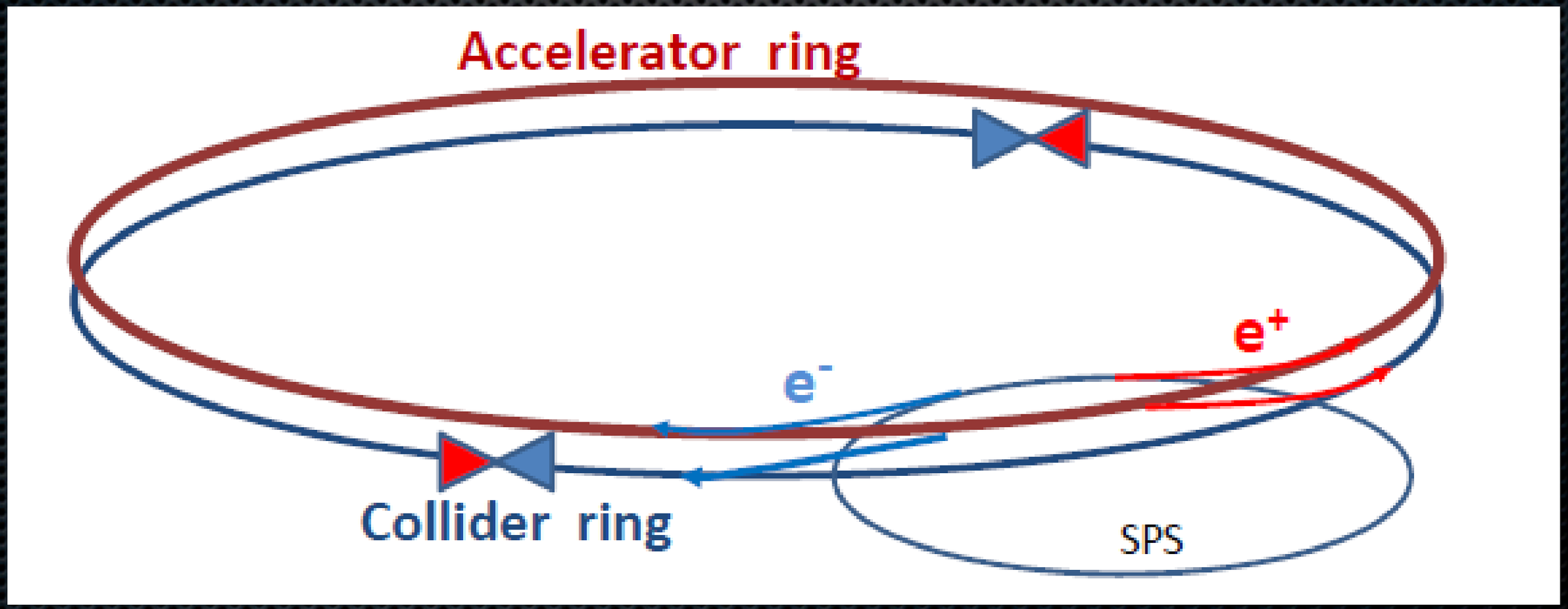
A. Blondel and F. Zimmermann

Parameters Example

	TRISTAN	KEKB	LEP2	LEP3	DLEP	SuperTRISTAN		
						40	60	
Beam Energy	32	8 / 3.5	105	120	120	120	120	GeV
Circumference	3	3	27	27	53	40	60	km
Beam Current / beam	7	1400 / 1700	4	7.2	14.4	8.6	8.6	mA
Bunches / beam	2	1600	4	3	60	12	18	
β^* x / y	2000 / 40	1200 / 6	1500 / 65	150 / 1.2	200 / 2	80 / 2.5	80 / 2.5	mm
Emittances x / y		18 / 0.1	48 / 0.25	20 / 0.15	5 / 0.05	23.3 / 0.09	24.6 / 0.09	nm
Bunch length	10	6	3	3	1.5	3	3	mm
Beam-beam parameters	0.02 0.025	0.05 0.09	0.025 0.065	0.126 0.13	0.1 0.1	0.05 0.156	0.045 0.155	
Radiation loss / turn	300	4 / 2	2750	6900	3470	3420	2150	MV
RF Voltage	400	10 / 5	3640	9000	4600	5000	3300	MV
RF frequency	508	509	352	1300	1300	1300	1300	MHz
Total SR Power	4.2	5.6 / 3.4	22	100	100	59	37	MW
Luminosity / IP	0.04	21	0.13	13	16	10	10	/nb/s

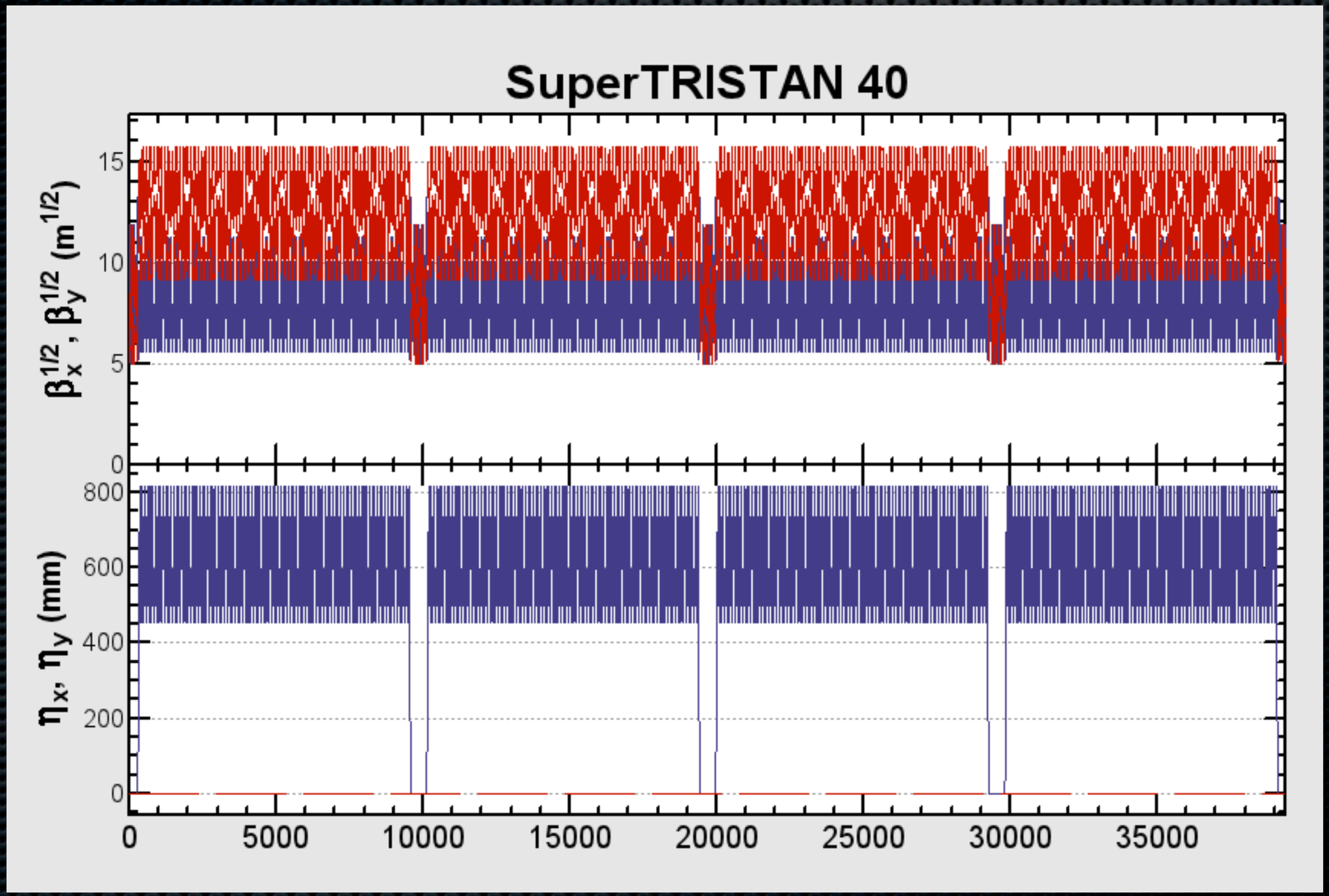
Injection / top up

- Just follow the LEP3's scheme (Figure).
- Use a 10 GeV injector instead of SPS in our case.



A. Blondel and F. Zimmermann

Lattice (without IP, etc.)



SuperTRISTAN 40

薬王院

八郷植物センター

12.3 km

KEK

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Costs (very very rough)

	SuperTRISTAN 40	SuperTRISTAN 60	
Tunnel	1600	2400	0.04 / m
RF	450	300	5 / MW
Magnet	50	60	0.04 / magnet
Beam pipe	80	120	0.002 / m
Synchrotron	150	200	?
Others	100	100	?
Detector	60	60	1 IP?
CF	100	100	?
Total construction	2590	3340	
power cost / year	84	60	4,000h 15 yen / kWh