IR issues	JLC	NLC	tools	R&D other choices
Collimation	non-linear 1.2km/1.5TeV $6\sigma_x$ x $40\sigma_y$	linear 2.4km/1TeV(1.5TeV?) $7\sigma_x$ x $35\sigma_y$	SAD, EGS MUCARLO	wake field measurement detail tunnel geometry shorter collimation
muon background	6 cylinders (iron or lead) 0.6ϕ x 120m	4 spoilers tunnel filler 3 x 3 x 9m^3		radio-activation in tunnel optimization with two schemes exotic : laser, liquid metal collimation....
Crossing angle	8mrad toward smaller angle limited by SR backgrounds	20mrad toward larger angle,limited by "3 Tesla".	ABEL,CAIN, Guinea-Pig	tolerance for crab cavity requires 0.2°phase stability
Crab cavity	option (lum. 40% up) why? higher luminosity without crab cavity.	must why? easier extraction of disrupted beam.		needs prototype-cavity (measurement at SLAC, M.Ross) KEK B-factory crab cavity can be prototype?
Final focus Q-magnet	warm magnet, 2.2m long inner radius=6.85mm 2m from IP, why?	2 permanet magnets, 1m long each, + Q1SC(0.5m) inner radii=7 and 8 mm outer radii=2 and 2.5cm PEP-II experience 2m from IP, why?		warm magnet: water cooling w/o vibration permanet magnet: no beam-based alignment smaller angle: superconducting magnet how to extract beam?
	longer distance makes smaller dead cone and less background (back-scattered photons) and it must be benifit if it is set outside the conpact detector. if □ *=1m, 25% shorter final focuss system if □ *=3m, 20% longer final focuss system			optics with large □ *