This sheet defines named cells (variables) that are used elsewhere

variables most commonly changed

ntunnels	2 tunnels minimum in accel tunnel	tunnel configuration for all regions except those with their own variables give below	
ntunnels_linac	2 tunnels minimum in accel tunnel	tunnel configuration for the linac and compressors.	
positron_source	undulator	type of positron source: undulator (which may be polarized) or conventional (with 5 GeV drive linac)	
tunetimefraction_fudge	1	Increase all the tune time fractions by this factor. A number greather than one decreases the integrated luminosity	
MD_time_fudge	1	Increase all the Machine Development time by this factor. A number greater than one decreases the integrated luminosity	
mtbf_global_fudge	1	make all MTBFs this factor larger than nominal. A number greater than 1 increases the integrated luminosity	
MTTR_global_fudge	1	make all MTTRs this factor larger than nominal. A number greater than 1 decreases the integrated luminosity	
access_hours_fudge	1	make all hours needed to access the tunnels larger by this factor. A number greater than 1 decreases the integrated luminosity	
linac_energy_overhead_pct	0,03001	linac energy overhead for failed components in percent	
inj_energy_overhead_pct	0,1	injector energy overhead in percent	
crab_energy_overhead_pct	0,1	energy overhead of the crab cavities in percent	
BNS_overhead_pct	0,03	Extra energy overhead needed in linac and injectors for BNS damping phases and short klystron trips (few seconds)	
tunetimefraction_low	1	Fraction of the tunetimefraction which can be done with a low intensity beam	
MD_time_low	1	Fraction of the Machine Development which can be done with a low intensity beam	
inj_nspare_klystrons	1	the number of spare klystrons/modulator systems that can be switched to provide RF to replace any klystron that dies in places where 1 dead klystron would be lethal	
RF_scheme	10MW	How the high power RF is generated.	
low_P	TRUE		

Variables changed by macro when copying sheets

include	yes	=yes to copy the sheet, no to not use it	
region	e- linac	name of the region to use when copying the sheet	
subregion			
egain_nominal_MeV	245.620	the nominal energy gain of the cryomodules. This does not include the energy overhead	
engy_overhead_pct	0,06001	The energy overhead to add on to the nominal gain (as a fraction of egainNom)	
n_spare_klys	0	Some critical RF sections have a hot spare klystron which can be switched in with waveguide switches. This will normall be 0 or 1.	
description	RF for main e- linac	Not used for anything yet.	

energies at various places

inject_energy	5.000 MeV	final energy of the injector (before injection into the damping ring)	
drive_energy	6.000 MeV	final energy of the drive beam used to make the e+ of a conventional source	
compressor_energy	4.380 MeV	energy at the end of all compressor stages	
linac_energy	250.000 MeV	final energy of the main e+ and e- linac	
undulator_energy	150.000 MeV	energy at which the undulator for e+ production is placed.	
inject_ele_energy_warm	80 MeV	energy in the e- injector warm acceleration stops and cold starts	
inject_pos_energy_warm	250 MeV	energy positrons are acceleratored to with warm cavities	
drive_energy_warm	80 MeV	energy in the drive beam used to make e+ where warm acceleration stops and cold starts	

cold linac parameters

cgradient	30	cold gradient (MeV/m)	
cgradient_degraded	19	cold gradient under degraded conditions(MeV/m)	
ccavity_length	1,038	cold cavity length (m)	
ccavity_per_module	8,6666666	number of cavities per cryomodule	
cmodule_per_klystron	6	number of cryomodules powered by each 10 MW klystron	
cmodule_per_klyClus_klystron	6	number of cryomodules powered by each 10 MW klystron	
cmodule_per_DRFS_klystron	0,461538462	number of cryomodules powered by each DRFS (0.7 MW) klystron	
cnmodule_per_string	12	number of cryo modules per "string" A "string" can be isolated from others with vacuum and helium valves	
cnklys_per_waterpump	1	number of 10 MW klystrons per water cooling pump	
cn_klyClus_klys_per_waterpun	17	number of KlyClus klystrons per water cooling pump	
cn_DRFS_klys_per_modulator	13	number of DRFS klystrons per mod anode modulator	
cn_DRFS_klys_per_waterpum	13	number of KlyClus klystrons per water cooling pump	
ncorrector_PS_per_chassis	1	number of corrector power supplies per chassis or bulk supply	
nother_controls_per_klystron	3	Number of other controls (filament current etc) per klystron	
nflow_switch_per_pump	3	Number flow switches per water pump	
nmover_per_magnet	3	Number of mover channels per magnet which gets moved	
nwater_instr_per_pump	3	Number of instrumentation channels (pressure, flow, temperature) per water pump	

warm (L band) linac parameters

wgradient	7,7	warm gradient (MeV/m)	
wstructure_length	2,2	warm structure length (m)	
wnstructure_per_klystron	1	number of structures powered by each klystron	
wnklys_per_waterpump	2	number of klystrons per water cooling pump	

MTTRs (mean times to repairs)

mttr_cryo	672	mttr to repair something at cryogenic temperature. Includes warmup and cooldown.	
mttr_big_PS	4	mttr to repair/replace a big power supply or modulator	

MTBFs (mean times to failure) and number of people needed to make repairs

Common MTBFs	MTBF	starting MTBF	MTBF improvement factor	Comments	name	# people needed for repair	name	mean time to repair	Starting MTTR
mttf_electronic_module	3,00E+05	1,00E+05	3		np_electronic_module	1	mttr_electronic_module	1	1
mttf_PS_controller	3,30E+06	1,10E+06	3		np_PS_controller	1	mttr_PS_controller	1	1
mttf_controls_local_backbone	1,00E+06	1,00E+05	10	VME crate or its modern equivalent	np_controls_local_backbone	1	mttr_controls_local_backbone	1	1
mttf_magnet	2,00E+07	2,00E+06	10	water cooled magnet	np_magnet	2	mttr_magnet	8	8
mttf_sc_magnet	3,00E+07	3,00E+07	1	superconducting magnet	np_sc_magnet	2	mttr_sc_magnet	672	672
mttf_small_magnet	1,00E+07	1,00E+07	1	air cooled magnet (corrector)	np_small_magnet	2	mttr_small_magnet	2	2
mttf_PM_magnet	3,40E+07	3,40E+07	1	permanent magnet	np_PM_magnet	2	mttr_PM_magnet	2	2
mttf_PS_corrector	1,10E+06	1,10E+06	1	corrector power supply	np_PS_corrector	1	mttr_PS_corrector	1	1
mttf_PS	3,30E+06	1,10E+06	3	magnet (quad, bend..) power supply	np_PS	2	mttr_PS	2	2
mttf_kicker	1,00E+05	1,00E+05	1		np_kicker	2	mttr_kicker	8	8
mttf_kickpulser	3,50E+04	7,00E+03	5		np_kickpulser	2	mttr_kickpulser	2	2
mttf_modulator	5,00E+04	5,00E+04	1		np_modulator	2	mttr_modulator	4	4
mttf_dr_klystron	3,00E+04	3,00E+04	1	damping ring klystron	np_dr_klystron	2	mttr_dr_klystron	8	8
mttf_mb_klystron	4,00E+04	4,00E+04	1	multibunch klystron (used in cold linac)	np_mb_klystron	2	mttr_mb_klystron	8	8
mttf_DRFS_klystron	1,20E+05	1,20E+05	1	DRFS klystron (used in cold linac) about 0.7 MW	np_DRFS_klystron	2	mttr_DRFS_klystron	2	2
mttf_X_klystron	2,50E+04	2,50E+04	1	x band klystron (used in warm linac)	np_X_klystron	2	mttr_X_klystron	4	4
mttf_cavity	1,00E+08	1,00E+08	1		np_cavity	2	mttr_cavity	672	672
mttf_coupler_intlk	5,00E+06	1,00E+06	5	the actual sensors for the coupler interlock is as	np_coupler_intlk	1	mttr_coupler_intlk	1	1
mttf_coupler_intlk_electronics	1,00E+06	1,00E+06	1	The electronics for the coupler interlocks is assu	np_coupler_intlk_electronics	1	mttr_coupler_intlk_electronics	1	1
mttf_mover	5,00E+05	5,00E+05	1		np_mover	2	mttr_mover	2	2
mttf_VacP	1,00E+07	1,00E+07	1	vacuum pump	np_VacP	2	mttr_VacP	4	4

Variable	Value 1	Value 2	N	Description	np_ variable	N	mttr_ variable	N1	N2
mttf_VacP_power_supply	1,00E+05	1,00E+05	1	vacuum pump power supply	np_VacP_power supply	1	mttr_VacP_power supply	1	1
mttf_valve	5,00E+06	1,00E+06	5	vacuum valve	np_valve	2	mttr_valve	4	4
mttf_vac_valve_controller	9,50E+05	1,90E+05	5		np_vac_valve_controller	1	mttr_vac_valve_controller	2	2
mttf_fs	7,50E+06	2,50E+05	30	MTTF of flowswitch. DB says typical 125K top	np_fs	1	mttr_fs	1	1
mttf_pulsed_cable	2,00E+05	2,00E+05	1	cable from klystron to transformer	np_pulsed_cable	2	mttr_pulsed_cable	8	8
mttf_xfrmr	2,00E+05	2,00E+05	1	pulse transformer	np_xfrmr	2	mttr_xfrmr	4	4
mttf_waterpump	1,20E+05	1,20E+05	1		np_waterpump	2	mttr_waterpump	4	4
mttf_water_instr	3,90E+05	1,30E+05	3		np_water_instr	2	mttr_water_instr	2	2
mttf_elec_small	1,60E+06	1,60E+06	1		np_elec_small	2	mttr_elec_small	2	2
mttf_elec_big	1,60E+06	1,60E+06	1		np_elec_big	2	mttr_elec_big	4	4
mttf_vac_mech_device	5,00E+05	1,00E+05	5	moving vacuum devices such as collimators, tur	np_vac_mech_device	2	mttr_vac_mech_device	8	8
mttf_laser_wire	2,00E+04	2,00E+04	1		np_laser_wire	2	mttr_laser_wire	2	2
mttf_wire_scanner	1,00E+05	1,00E+05	1		np_wire_scanner	2	mttr_wire_scanner	2	2
mttf_klys_preamp	1,00E+05	1,00E+05	1		np_klys_preamp	1	mttr_klys_preamp	1	1
mttf_vacG_controller	4,70E+05	4,70E+05	1		np_vacG_controller	1	mttr_vacG_controller	1	1
mttf_cavity_tuner	1,00E+06	1,00E+06	1		np_cavity_tuner	2	mttr_cavity_tuner	672	672
mttf_cavity_piezo_tuner	5,00E+05	5,00E+05	1		np_cavity_piezo_tuner	2	mttr_cavity_piezo_tuner	672	672
mttf_power_coupler	1,00E+07	1,00E+07	1		np_power_coupler	2	mttr_power_coupler	2	2
mttf_SLED	1,00E+05	1,00E+05	1		np_SLED	2	mttr_SLED	4	4
mttf_cryo_leak	1,00E+05	1,00E+05	1		np_cryo_leak	2	mttr_cryo_leak	8	8
mttf_JT_valve	3,00E+05	3,00E+05	1	Joule-Thompson valve	np_JT_valve	2	mttr_jt_valve	2	2
mttf_cryo_big_prob	1,00E+07	1,00E+07	1		np_cryo_big_prob	2	mttr_cryo_big_prob	8	8
mttf_target	4,38E+04	4,4E+04	1	positron target	np_target	1	mttr_target	8	8
mttf_MPS_region	3,00E+04	3,00E+04	1	MPS or feedback regional system	np_MPS_region	1	mttr_MPS_region	1	1

calculated variables based on things above

n_positron_targets   1   number of positron targets in simultaneous use. In addition to this, there is 1 spare.

The following are calculations for the superconducting linac

Variable	Value	Description
cMEV_per_cavity	31,14	number of MEV energy gain per cavity
ccavity_per_klystron	52	number of cavities per klystron
ccavity_per_klyClus_klystron	52	number of cavities per klystron
ccavity_per_DRFS_klystron	4	number of cavities per klystron
cMEV_per_klystron	1619,28	number of MEV energy gain per klystron
cMEV_per_klyClus_klystron	1619,28	number of MEV energy gain per klystron
cMEV_per_DRFS_klystron	124,56	number of MEV energy gain per klystron
cMEV_per_DRFS_modulator	1619,28	number of MEV energy gain per klystron
cMEV_per_module	269,88	number of MEV energy gain per cryo module
cMEV_per_string	3238,56	number of MEV energy gain per "string"
cMEV_per_waterpump	1619,28	energy lost if a klystron cooling waterpump trips off
cMEV_per_klyClus_waterpump	27527,76	energy lost if a klystron cooling waterpump trips off
cMEV_per_DRFS_waterpump	1619,28	energy lost if a klystron cooling waterpump trips off
cMEV_degraded_loss	-11	cgradient_degraded - cgradient

The following are calculations for the warm linac sections

Variable	Value	Description
wMEV_per_structure	16,94	number of MEV energy gain per cavity
wMEV_per_klystron	16,94	number of MEV energy gain per klystron
wMEV_per_waterpump	33,88	energy lost if a klystron cooling waterpump trips off

The following are calculations for a linac. They use the arguments set by the "sheets 2" sheet as input

Variable	Value	Description
cenergy	245.620	The energy gain in the accelerator from cold cavities. No energy overhead is included in this.
energy_overhead_pct	0,06001	The energy overhead in percent needed for failed rf parts so feedback and turning on spares can keep the energy constant.
cnmodule	965,00	number of cryomodules
cnklystron	161,00	The total number of klystrons
cnklyClus_klystron	161,00	The total number of klystrons
cnDRFS_klystron	2091,00	The total number of klystrons
cnDRFS_modulator	161,00	number of modulators in the DRFS power scheme. For other schemes, this is equal to the number of klystrons.
cncavity	8364,00	number of superconduction cavities
cnstring	81,00	number of cryo strings (insulating vacuum can be different in different strings)
wnklystron	15370,00	number of klystrons for a warm accelerator section

degradation methods
add
mult

Systems
Magnets
PS + controllers
RF power sources
RF structure
Vacuum
Diagnostic
Cryo
Water system
AC power
lumped
controls

ILC13 made from ILC10b.

    Change to RDR config with central injector and single stage bunch compressor

    DRs were in linac tunnel. Now they are together in their own tunnel

    Injectors are in their own tunnel still

    there are new regions: e- extraction, e-transport, e- turnaround and same for e+. They are all in linac PPS zone

    allow each region to have its own tunnel configuration (e.g. 1 or 2 tunnel) independent of the others.

    added missing "PS controller string" to BDS

    moved e+ source to end of linac.

ILC14 made from ILC14

    Add option of klyClus and DRFS RF schemes

    Add low power RF option

    changed code in mainloop.mat to fix only fraction of cryo problems during long downs

    Increased injector energy overhead from 5 to 20% to avoid month long shutdown caused by above change

    Gave controls_local_backbone it's own MTBF of 1e5 instead of being same as an electronics module

    Changed scheduled downs from 16 + 8 recover to 9 + 15 to avoid too much unsched recovery from sched down time.

    MTBF changes

Device	RDR starting MTBF	RDR table A factor	RDR final MTBF	New starting MTBF	Table D MTBF improvement factors	SLC MTBF
mttf_electronic_module	1,0E+05	3	3,0E+05	1,0E+05	3	
mttf_PS_controller	1,0E+05	10	1,0E+06	**1,1E+06**	**3**	8,0E+04
mttf_controls_local_backbone	1,0E+05	3	3,0E+05	1,0E+05	**10**	
mttf_magnet	1,0E+06	20	2,0E+07	**2,0E+06**	**10**	5,0E+05
mttf_sc_magnet	3,0E+07	1	3,0E+07	3,0E+07	1	
mttf_small_magnet	1,0E+07	1	1,0E+07	**3,4E+07**	1	3,4E+07
mttf_PM_magnet	1,0E+07	1	1,0E+07	1,0E+07	1	
mttf_PS_corrector	4,0E+05	1	4,0E+05	**1,1E+06**	1	4,3E+05
mttf_PS	2,0E+05	5	1,0E+06	**1,1E+06**	**3**	4,3E+05
mttf_kicker	1,0E+05	1	1,0E+05	1,0E+05	1	1,0E+05
mttf_kickpulser	7,0E+03	5	3,5E+04	7,0E+03	5	6,6E+03
mttf_modulator	5,0E+04	1	5,0E+04	5,0E+04	1	6,4E+04
mttf_dr_klystron	3,0E+04	1	3,0E+04	3,0E+04	1	
mttf_mb_klystron	4,0E+04	1	4,0E+04	4,0E+04	1	5,0E+04
mttf_DRFS_klystron	1,2E+05	1	1,2E+05	1,2E+05	1	
mttf_X_klystron	2,5E+04	1	2,5E+04	2,5E+04	1	

mttf_cavity	1,0E+08	1	1,0E+08	1,0E+08	**5**	
mttf_coupler_intlk	1,0E+06	5	5,0E+06	1,0E+06	**1**	9,6E+04
mttf_coupler_intlk_electronics	1,0E+06	1	1,0E+06	1,0E+06	1	9,6E+04
mttf_mover	5,0E+05	1	5,0E+05	5,0E+05	1	5,1E+05
mttf_VacP	1,0E+07	1	1,0E+07	1,0E+07	1	3,8E+06
mttf_VacP_power_supply	1,0E+05	1	1,0E+05	1,0E+05	**5**	
mttf_valve	1,0E+06	1	1,0E+06	1,0E+06	**5**	1,0E+06
mttf_vac_valve_controller	1,9E+05	1	1,9E+05	1,9E+05	**30**	1,9E+05
mttf_fs	2,5E+05	10	2,5E+06	2,5E+05	**1**	2,2E+05
mttf_pulsed_cable	2,0E+05	1	2,0E+05	2,0E+05	1	
mttf_xfrmr	2,0E+05	1	2,0E+05	2,0E+05	1	
mttf_waterpump	1,2E+05	1	1,2E+05	1,2E+05	**3**	1,2E+05
mttf_water_instr	3,0E+04	10	3,0E+05	**1,3E+05**	**1**	3,0E+04
mttf_elec_small	3,6E+05	1	3,6E+05	**1,6E+06**	1	3,6E+05
mttf_elec_big	3,6E+05	1	3,6E+05	**1,6E+06**	**5**	3,6E+05
mttf_vac_mech_device	1,0E+05	5	5,0E+05	1,0E+05	**1**	
mttf_laser_wire	2,0E+04	1	2,0E+04	2,0E+04	1	
mttf_wire_scanner	1,0E+05	1	1,0E+05	1,0E+05	1	
mttf_klys_preamp	1,0E+05	1	1,0E+05	1,0E+05	1	
mttf_vacG_controller	1,0E+05	1	1,0E+05	**4,7E+05**	1	4,7E+05
mttf_cavity_tuner	1,0E+06	1	1,0E+06	1,0E+06	1	5,1E+05
mttf_cavity_piezo_tuner	5,0E+05	1	5,0E+05	5,0E+05	1	
mttf_power_coupler	1,0E+07	1	1,0E+07	1,0E+07	1	
mttf_SLED	1,0E+05	1	1,0E+05	1,0E+05	**10**	
mttf_cryo_leak	1,0E+05	1	1,0E+05	1,0E+05	1	
mttf_JT_valve	3,0E+05	1	3,0E+05	3,0E+05	1	
mttf_cryo_big_prob	1,0E+07	1	1,0E+07	1,0E+07	1	
mttf_target	4,4E+04	1	4,4E+04	4,4E+04	1	
mttf_MPS_region	5,0E+03	1	5,0E+03	**3,0E+04**	5,0E+03	

FNAL Tevatron MTBF	FNAL Main Injector MTBF	APS MTBF	other MTBF
1,8E+05	1,1E+05	1,1E+06	
	2,0E+06		
1,6E+06			
1,8E+05	1,1E+05	1,1E+06	
1,8E+05	1,1E+05	1,1E+06	4,0E+04
			1,7E+05

1,3E+05
1,3E+05

1,6E+06
6,7E+05   1,6E+06

3,0E+04

cell name	ILC101	ILC102	ILC103	ILC104	ILC105	ILC106
Based on:	ILC1	ILC101	ILC102	**ILC102**	**ILC102**	ILC105
		e+ source study				
runname	2 tunnels with min in accel tunnel; conventional e+; Nominal MTBFs	ILC101 but table D MTBF's	ILC102 but with undulator e+ and no keep alive e+ source	ILC102 but with undulator e+ and keep alive e+ source 1	ILC102 but with undulator e+ and keep alive e+ source 2	ILC105 but linac in 1 tunnel
main configuration parameters						
ntunnels	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel
ntunnels_linac	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	**all in 1 tunnel, no robots**
positron_source	conventional	conventional	**undulator**	**undulator**	**undulator**	undulator
tunetimefraction_fudge	1	1	1	1	1	1
MD_time_fudge	1	1	1	1	1	1
mtbf_global_fudge	1	1	1	1	1	1
MTTR_global_fudge	1	1	1	1	1	1
access_hours_fudge	1	1	1	1	1	1
linac_energy_overhead_pct	0,03	0,03	0,03	0,03	**0,04**	0,04
inj_energy_overhead_pct	0,1	0,1	0,1	0,1	0,1	0,1
crab_energy_overhead_pct	0,1	0,1	0,1	0,1	0,1	0,1
BNS_overhead_pct	0,03	0,03	0,03	0,03	0,03	0,03
tunetimefraction_low	0	0	0	**0,66**	**1**	1
MD_time_low	0	0	0	**0,71**	**1**	1
inj_nspare_klystrons	1	1	1	1	1	1
ele_DR_PPS_zone	e- DR	e- DR	e- DR	e- DR	e- DR	e- DR
pos_DR_PPS_zone	e- DR	e- DR	e- DR	e- DR	e- DR	e- DR
extrarepairtimefactor1	1,5	1,5	1,5	1,5	1,5	1,5
extrarepairtimefactor2	2	2	2	2	2	2
scheddownperiod	0	0	0	0	0	0
scheddownlength	9	9	9	9	9	9
scheddownrecovery	15	15	15	15	15	15
RF_scheme	10MW	10MW	10MW	10MW	10MW	10MW
MTBF improvement factors						
factor_mttf_electronic_module	1	**3**	3	3	3	3
factor_mttf_PS_controller	1	**3**	3	3	3	3
factor_mttf_controls_local_backbone	1	**10**	10	10	10	10
factor_mttf_magnet	1	**10**	10	10	10	10
factor_mttf_sc_magnet	1	1	1	1	1	1
factor_mttf_small_magnet	1	1	1	1	1	1
factor_mttf_PM_magnet	1	1	1	1	1	1

factor_mttf_PS_corrector	1	1	1	1	1	1
factor_mttf_PS	1	**3**	3	3	3	3
factor_mttf_kicker	1	1	1	1	1	1
factor_mttf_kickpulser	1	**5**	5	5	5	5
factor_mttf_modulator	1	1	1	1	1	1
factor_mttf_dr_klystron	1	1	1	1	1	1
factor_mttf_mb_klystron	1	1	1	1	1	1
factor_mttf_X_klystron	1	1	1	1	1	1
factor_mttf_cavity	1	1	1	1	1	1
factor_mttf_coupler_intlk	1	**5**	5	5	5	5
factor_mttf_coupler_intlk_electronics	1	1	1	1	1	1
factor_mttf_mover	1	1	1	1	1	1
factor_mttf_VacP	1	1	1	1	1	1
factor_mttf_VacP_power_supply	1	1	1	1	1	1
factor_mttf_valve	1	**5**	5	5	5	5
factor_mttf_vac_valve_controller	1	**5**	5	5	5	5
factor_mttf_fs	1	**30**	30	30	30	30
factor_mttf_pulsed_cable	1	1	1	1	1	1
factor_mttf_xfrmr	1	1	1	1	1	1
factor_mttf_waterpump	1	1	1	1	1	1
factor_mttf_water_instr	1	**3**	3	3	3	3
factor_mttf_elec_small	1	1	1	1	1	1
factor_mttf_elec_big	1	1	1	1	1	1
factor_mttf_vac_mech_device	1	**5**	5	5	5	5
factor_mttf_laser_wire	1	1	1	1	1	1
factor_mttf_wire_scanner	1	1	1	1	1	1
factor_mttf_klys_preamp	1	1	1	1	1	1
factor_mttf_vacG_controller	1	1	1	1	1	1
factor_mttf_cavity_tuner	1	1	1	1	1	1
factor_mttf_cavity_piezo_tuner	1	1	1	1	1	1
factor_mttf_power_coupler	1	1	1	1	1	1
factor_mttf_SLED	1	1	1	1	1	1
factor_mttf_cryo_leak	1	**10**	10	10	10	10
factor_mttf_JT_valve	1	1	1	1	1	1
factor_mttf_cryo_big_prob	1	1	1	1	1	1
factor_mttf_target	1	1	1	1	1	1
factor_mttf_MPS_region	1	1	1	1	1	1

end of data

ILC107	ILC108	ILC109	ILC110	ILC111	ILC112	ILC113	ILC114	ILC115
ILC105	ILC107	ILC107	ILC105	ILC105	ILC109	ILC109	ILC109	ILC109
ILC105 but no extra repairs during unsched downs	ILC107 but add sched downs with no repairs	ILC107 but add sched downs with repairs made	ILC105 but fix nothing in the long down	ILC105 but fix everything in the long down	ILC109 but tunetimefraction=0	ILC109 but linac in 1 tunnel and klyClus	ILC109 but linac in 1 tunnel and DRFS	ILC109 but linac in 1 tunnel
2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	**all in 1 tunnel, no robots**	**all in 1 tunnel, no robots**	**all in 1 tunnel, no robots**
undulator	undulator	undulator	undulator	undulator	undulator	undulator	undulator	undulator
1	1	1	1	1	**0**	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04
0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
e- DR	e- DR	e- DR	e- DR	e- DR	e- DR	e- DR	e- DR	e- DR
e- DR	e- DR	e- DR	e- DR	e- DR	e- DR	e- DR	e- DR	e- DR
0	0	0	1,5	1,5	0	0	0	0
0	0	0	2	2	0	0	0	0
0	**336**	**336**	0	0	336	336	336	336
9	**0,1**	9	9	9	9	9	9	9
15	**23,9**	15	15	15	15	15	15	15
10MW	10MW	10MW	10MW	10MW	10MW	**KlyClus**	**DRFS**	10MW
3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3
10	10	10	10	10	10	10	10	10
10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1

1	1	1	1	1	1	1	1	1
3	3	3	3	3	3	3	3	3
1	1	1	1	1	1	1	1	1
5	5	5	5	5	5	5	5	5
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
5	5	5	5	5	5	5	5	5
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
5	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5
30	30	30	30	30	30	30	30	30
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
3	3	3	3	3	3	3	3	3
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
5	5	5	5	5	5	5	5	5
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1

ILC116 ILC105	ILC117 ILC105	ILC118 ILC105	ILC119 ILC105	ILC120 ILC105	ILC121 ILC105	ILC122 ILC105	ILC123 ILC105	ILC124 ILC105
TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel
undulator	undulator	undulator	undulator	undulator	undulator	undulator	undulator	undulator
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04	0,04
0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1	0,1
0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03	0,03
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
e- DR	e- DR	e- DR	e- DR	e- DR	e- DR	e- DR	e- DR	e- DR
e- DR	e- DR	e- DR	e- DR	e- DR	e- DR	e- DR	e- DR	e- DR
1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5	1,5
2	2	2	2	2	2	2	2	2
0	0	0	0	0	0	0	0	0
9	9	9	9	9	9	9	9	9
15	15	15	15	15	15	15	15	15
10MW	10MW	10MW	10MW	10MW	10MW	10MW	10MW	10MW
3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3
10	10	10	10	10	10	10	10	10
10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1

1	1	1	1	1	1	1	1	1
3	3	3	3	3	3	3	3	3
1	1	1	1	1	1	1	1	1
5	5	5	5	5	5	5	5	5
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
5	5	5	5	5	5	5	5	5
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
5	5	5	5	5	5	5	5	5
5	5	5	5	5	5	5	5	5
30	30	30	30	30	30	30	30	30
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
3	3	3	3	3	3	3	3	3
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
5	5	5	5	5	5	5	5	5
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
10	10	10	10	10	10	10	10	10
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1

| ILC125 | ILC126 | ILC127 | ILC128 |
ILC105	ILC105	ILC105	ILC105
TBD	TBD	TBD	TBD
2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel	2 tunnels minimum in accel tunnel
undulator	undulator	undulator	undulator
1	1	1	1
1	1	1	1
1	1	1	1
1	1	1	1
1	1	1	1
0,04	0,04	0,04	0,04
0,1	0,1	0,1	0,1
0,1	0,1	0,1	0,1
0,03	0,03	0,03	0,03
1	1	1	1
1	1	1	1
1	1	1	1
e- DR	e- DR	e- DR	e- DR
e- DR	e- DR	e- DR	e- DR
1,5	1,5	1,5	1,5
2	2	2	2
0	0	0	0
9	9	9	9
15	15	15	15
10MW	10MW	10MW	10MW
3	3	3	3
3	3	3	3
10	10	10	10
10	10	10	10
1	1	1	1
1	1	1	1
1	1	1	1

1	1	1	1
3	3	3	3
1	1	1	1
5	5	5	5
1	1	1	1
1	1	1	1
1	1	1	1
1	1	1	1
1	1	1	1
5	5	5	5
1	1	1	1
1	1	1	1
1	1	1	1
1	1	1	1
5	5	5	5
5	5	5	5
30	30	30	30
1	1	1	1
1	1	1	1
1	1	1	1
3	3	3	3
1	1	1	1
1	1	1	1
5	5	5	5
1	1	1	1
1	1	1	1
1	1	1	1
1	1	1	1
1	1	1	1
1	1	1	1
1	1	1	1
1	1	1	1
10	10	10	10
1	1	1	1
1	1	1	1
1	1	1	1
1	1	1	1

component name subsys/segment	system	problem name	parameter effected	add/mult	degradation
Bends beamline	Magnets	broken	luminosity	mult	0,00
BPMs diagnostic	Diagnostic	broken	luminosity	mult	0,999
Cavities cavity	RF structur	broken	energy overhead e- linac	add	-31,14
Cavity piezo tuner cavity	RF structur	broken	energy overhead e- linac	add	-5,00
Cavity tuner cavity	RF structur	broken	energy overhead e- linac	add	-31,14
controls backbone sector	controls	broken	luminosity	mult	0,00
Controls PPS region	controls	broken	luminosity	mult	0,00
Corrs - can't tune around beamline	Magnets	broken	luminosity	mult	0,00
Corrs - can tune around beamline	Magnets	broken	luminosity	mult	0,00
coupler interlock electronics coupler	RF structur	broken	energy overhead e- linac	add	-1619,28
coupler interlock sensors coupler	RF structur	broken	energy overhead e- linac	add	-1619,28
cryo JT valve cryo string	Cryo	broken	energy overhead e- linac	add	-3238,56
cryo vac enclosure cryo module	Cryo	broken	energy overhead e- linac	add	-3238,56
cryo vac enclosure cryo segment	Cryo	broken	luminosity	mult	0,00
Electrical - .05<<0.5 beamline	AC power	broken	luminosity	mult	0,00
Electrical - .05<<0.5 klystron	AC power	broken	energy overhead e- linac	add	-1619,28
Electrical - .05<<0.5 Utility power	AC power	broken	luminosity	mult	0,00
Electrical - >0.5 beamline	AC power	broken	luminosity	mult	0,00
Electrical - >0.5 klystron	AC power	broken	energy overhead e- linac	add	-1619,28
Electrical>0.5 Utility power	AC power	broken	luminosity	mult	0,00
FC pulser beamline	PS + contro	broken	luminosity	mult	0,00
Flow Switch - quads beamline	Water syst	broken	luminosity	mult	0,00
Flow Switch beamline	Water syst	broken	luminosity	mult	0,00
Flow Switch klystron	Water syst	broken	energy overhead e- linac	add	-1619,28
Flux Concentrator beamline	Magnets	broken	luminosity	mult	0,00
HVPS beamline	PS + contro	broken	luminosity	mult	0,00
HVPS controller beamline	PS + contro	broken	luminosity	mult	0,00
insulating vacuumP cryo module	Cryo	leak	energy overhead e- linac	add	0,00
insulating vacuumP cryo string	Cryo	leak	energy overhead e- linac	add	-3238,56
Kicker diagnostic	Diagnostic	broken	luminosity	mult	0,95
Kicker pulser - ext beamline	PS + contro	broken	e- linac ext kick	add	-0,03
Kicker pulser - inj beamline	PS + contro	broken	e- linac inj kick	add	-0,03
Kicker pulser beamline	PS + contro	broken	luminosity	mult	0,00
Kicker pulser diagnostic	Diagnostic	broken	luminosity	mult	0,95
Kickers - extraction beamline	Magnets	broken	e- linac ext kick	add	-0,03
Kickers - injection beamline	Magnets	broken	e- linac inj kick	add	-0,03
Kickers beamline	Magnets	broken	luminosity	mult	0,00
Klys Power supply klystron	RF power s	broken	energy overhead e- linac	add	-18,00
klys pre-amp klystron	RF power s	broken	energy overhead e- linac	add	-1619,28
klys filament supply klystron	RF power s	broken	energy overhead e- linac	add	-1619,28
klys solenoid supply klystron	RF power s	broken	energy overhead e- linac	add	-1619,28
Klystron 10MW klystron	RF power s	broken	energy overhead e- linac	add	-1619,28
Klystron DRFS klystron	RF power s	broken	energy overhead e- linac	add	-1619,28
laser beamline	Diagnostic	broken	luminosity	mult	0,00
Laser PS beamline	PS + contro	broken	luminosity	mult	0,00
laser wires diagnostic	Diagnostic	broken	luminosity	mult	0,95

LLRF cavity	RF structur	broken	energy overhead e- linac	add	-31,14
LLRF klystron	RF structur	broken	energy overhead e- linac	add	-16,94
local backbone sector	controls	broken	luminosity	mult	0,00
Modulators klystron	RF power s	broken	energy overhead e- linac	add	-1619,28
mover controller beamline	PS + contr	broken	luminosity	mult	1,00
movr or trim beamline	Magnets	retuned	luminosity	mult	0,99
MPS & FastFdbk region	controls	broken	luminosity	mult	0,00
MPS & FFWD region	controls	broken	luminosity	mult	0,00
Octupoles beamline	Magnets	broken	luminosity	mult	0,00
other controls beamline	controls	broken	luminosity	mult	0,00
other controls klystron	controls	broken	energy overhead e- linac	add	-1619,28
power coupler coupler	RF structur	broken	energy overhead e- linac	add	-1619,28
power coupler disc coupler	RF structur	disc	energy overhead e- linac	add	-31,14
Power supplies - bend beamline	PS + contr	broken	luminosity	mult	0,00
PS - quad can tune around beamline	PS + contr	broken	luminosity	mult	0,00
PS Corrs can tune around beamline	PS + contr	broken	luminosity	mult	0,00
PS Corrs can't tune around beamline	PS + contr	broken	luminosity	mult	0,00
Power supplies individual beamline	PS + contr	broken	luminosity	mult	0,00
Power supplies strings beamline	PS + contr	broken	luminosity	mult	0,00
Power supplies Trims beamline	PS + contr	broken	luminosity	mult	0,99
PS controller - bend beamline	PS + contr	broken	luminosity	mult	0,00
PS controller - corr can tune around be	PS + contr	broken	luminosity	mult	0,00
PS controller - quad can tune around b	PS + contr	broken	luminosity	mult	0,00
PS controller - corr can't tune around b	PS + contr	broken	luminosity	mult	0,00
PS controller string beamline	PS + contr	broken	luminosity	mult	0,00
pulse cables klystron	RF power s	broken	energy overhead e- linac	add	-1619,28
Pulse transformers klystron	RF power s	broken	energy overhead e- linac	add	-1619,28
Q/S Movers beamline	Magnets	broken	luminosity	mult	0,00
quad or corr beamline	Magnets	retuned	luminosity	mult	0,99
Quad/Sext trims beamline	Magnets	broken	luminosity	mult	0,99
Quads beamline	Magnets	broken	luminosity	mult	0,00
Quads SC beamline	Magnets	broken	luminosity	mult	0,00
Sextupoles beamline	Magnets	broken	luminosity	mult	0,00
Sextupoles SC beamline	Magnets	broken	luminosity	mult	0,00
Solenoids beamline	Magnets	broken	luminosity	mult	0,00
spare klystron klystron	RF power s	broken	luminosity	add	-1,00
spare target beamline	Magnets	broken	spare target	add	-1,00
Target beamline	Magnets	broken	luminosity	mult	0,00
timing beamline	controls	broken	luminosity	mult	0,00
timing klystron	controls	broken	energy overhead e- linac	add	-1619,28
timing sector	controls	broken	luminosity	mult	0,00
Undulators beamline	Magnets	broken	luminosity	mult	0,00
Vac Mech device beamline	Vacuum	broken	luminosity	mult	0,00
VacG/Ctrl klystron	RF power s	broken	energy overhead e- linac	add	-1619,28
VacP beamline	Vacuum	broken	luminosity	mult	1,00
VacP coupler	RF structur	broken	energy overhead e- linac	add	-1619,28
VacP klystron	RF power s	broken	energy overhead e- linac	add	-1619,28
VacP power supply beamline	Vacuum	broken	luminosity	mult	1,00
VacP power supply coupler	RF structur	broken	energy overhead e- linac	add	-1619,28
VacP power supply klystron	RF power s	broken	energy overhead e- linac	add	-1619,28
VacV beamline	Vacuum	broken	luminosity	mult	0,00
VacV controller beamline	Vacuum	broken	luminosity	mult	0,00

Water instr beamline	Water syst	broken	luminosity	mult	0,00
Water instr klystron	Water syst	broken	energy overhead e- linac	add	-1619,28
Water pumps beamline	Water syst	broken	luminosity	mult	0,00
Water pumps klystron	Water syst	broken	energy overhead e- linac	add	-1619,28
Wigglers beamline	Magnets	broken	luminosity	mult	0,00
wire scanners diagnostic	Diagnostic	broken	luminosity	mult	0,95

MTTR	Still broken after repair	access needed?	n repair people	Starting MTBF	all in 1 tunnel, no robots	TESLA	all in 1 tunnel, robots	2 tunnels, access only with RF off
8		1	2	2,0E+07	1	1	1	1
1		-1	1	3,0E+05	1	1	**-1**	0
672		1	2	1,0E+08	1	1	1	1
672		1	2	5,0E+05	1	1	1	1
672		1	2	1,0E+06	1	1	1	1
1		0	1	3,0E+05	1	**0**	**0**	0
1		0	1	3,0E+05	1	**0**	**0**	0
2		1	2	1,0E+07	1	1	1	1
0,5	quad or co	-1	2	1,0E+07	-1	-1	-1	-1
1		-1	1	1,0E+06	1	1	**-1**	0
1		1	1	5,0E+06	1	1	1	1
2		1	2	3,0E+05	1	1	1	1
8		1	2	1,0E+07	1	1	1	1
8		1	2	1,0E+07	1	1	1	1
2		0	2	1,6E+06	1	1	1	0
2		0	2	1,6E+06	1	**0**	1	0
2		0	2	1,6E+06	1	1	1	0
4		0	2	1,6E+06	1	1	1	0
4		0	2	1,6E+06	1	**0**	1	0
4		0	2	1,6E+06	1	1	1	0
2		-1	2	3,5E+04	1	**-1**	**-1**	0
1		1	1	7,5E+06	1	1	**-1**	1
1		-1	1	7,5E+06	1	**0**	**-1**	0
1		-1	1	7,5E+06	1	**-1**	**-1**	0
8	spare targe	-1	1	2,0E+07	-1	-1	-1	-1
2		1	2	3,3E+06	1	1	1	1
1		-1	1	3,3E+06	1	1	**-1**	0
8		1	2	1,0E+05	1	1	1	1
8		1	2	1,0E+05	1	1	1	1
8		1	2	1,0E+05	1	1	1	1
2		1	2	3,5E+04	1	1	**-1**	1
2		1	2	3,5E+04	1	1	**-1**	1
2		1	2	3,5E+04	1	1	**-1**	1
2		1	2	3,5E+04	1	1	**-1**	1
8		1	2	1,0E+05	1	1	1	1
8		1	2	1,0E+05	1	1	1	1
8		1	2	1,0E+05	1	1	1	1
4		-1	2	5,0E+04	1	**-1**	1	0
1		-1	1	1,0E+05	1	**-1**	**-1**	0
2		-1	1	3,3E+06	1	**-1**	**-1**	0
2		-1	1	3,3E+06	1	**-1**	**-1**	0
8		-1	2	4,0E+04	1	1	1	0
4		-1	2	1,2E+05	1	1	1	0
2		-1	2	2,0E+04	**-1**	-1	-1	**-1**
2		-1	2	3,3E+06	**-1**	-1	-1	**-1**
2		-1	2	2,0E+04	**-1**	-1	-1	**-1**

1		-1	1	3,0E+05	1	1	**-1**	0
1		-1	1	3,0E+05	1	1	**-1**	0
1		0	1	1,0E+06	1	**0**	**0**	0
4		-1	2	5,0E+04	1	**-1**	**-1**	0
1		-1	1	3,3E+06	1	1	**-1**	0
2		1	2	1,0E+50	1	1	1	1
1		0	1	3,0E+04	1	**0**	**0**	0
1		0	1	3,0E+04	1	1	**0**	0
8		1	2	2,0E+07	1	1	1	1
1		-1	1	3,0E+05	1	1	**-1**	0
1		-1	1	3,0E+05	1	1	**-1**	0
16		1	2	1,0E+07	1	1	1	1
672		1	2	1,0E+50	1	1	1	1
2		-1	2	3,3E+06	1	1	**-1**	0
2	quad or cor	-1	2	3,3E+06	-1	-1	-1	-1
0,5	quad or cor	-1	1	1,1E+06	-1	-1	-1	-1
2		-1	1	1,1E+06	1	1	**-1**	0
2		-1	2	3,3E+06	1	1	**-1**	0
4		-1	2	3,3E+06	1	1	**-1**	0
1		-1	1	1,1E+06	1	1	**-1**	0
1		-1	1	3,3E+06	1	1	**-1**	0
0,5	quad or cor	-1	1	3,3E+06	-1	-1	-1	-1
1	quad or cor	-1	1	3,3E+06	-1	-1	-1	-1
1		-1	1	3,3E+06	1	1	**-1**	0
1		-1	1	3,3E+06	1	1	**-1**	0
8		-1	2	2,0E+05	1	1	1	0
4		0	2	2,0E+05	1	1	1	0
0,5	movr or trir	-1	2	5,0E+05	-1	-1	-1	-1
2		1	2	1,0E+50	1	1	1	1
8		1	2	1,0E+07	1	1	1	1
8		1	2	2,0E+07	1	1	1	1
672		1	2	3,0E+07	1	1	1	1
8		1	2	2,0E+07	1	1	1	1
672		1	2	3,0E+07	1	1	1	1
8		1	2	2,0E+07	1	1	1	1
8		-1	2	4,0E+04	1	1	1	0
336		-1	5	1,0E+50	**-1**	-1	-1	0
8	spare targe	-1	1	4,4E+04	-1	-1	-1	-1
1		0	1	3,0E+05	1	**0**	**0**	0
1		-1	1	3,0E+05	1	1	**-1**	0
1		0	1	3,0E+05	1	**0**	**0**	0
8		1	2	3,4E+07	1	1	1	1
8		1	2	5,0E+05	1	1	1	1
1		-1	1	4,7E+05	1	1	**-1**	0
4		1	2	1,0E+07	1	1	1	1
4		1	2	1,0E+07	1	1	1	1
8		-1	2	1,0E+07	1	1	1	0
1		-1	1	1,0E+05	1	1	**-1**	0
1		-1	1	1,0E+05	1	1	**-1**	0
1		-1	1	1,0E+05	1	1	**-1**	0
4		1	2	5,0E+06	1	1	1	1
2		0	1	9,5E+05	1	**0**	**0**	0

2	-1	2	3,9E+05	1	**-1**	**-1**	0
2	-1	2	3,9E+05	1	1	**-1**	0
4	-1	2	1,2E+05	1	1	1	0
4	-1	2	1,2E+05	1	1	1	0
8	1	2	3,4E+07	1	1	1	1
2	1	2	1,0E+05	1	1	1	1

2 tunnels minimum in accel tunnel	2 tunnels, some equip in accel tunnel	2 tunnels, some equip in accel tunnel; robots
1	1	1
-1	**1**	**-1**
1	1	1
1	1	1
1	1	1
0	0	0
0	0	0
1	1	1
-1	-1	-1
-1	**1**	**-1**
1	1	1
1	1	1
1	1	1
1	1	1
0	0	0
0	0	0
0	0	0
0	0	0
0	0	0
0	0	**1**
-1	-1	-1
1	1	1
-1	-1	-1
-1	-1	-1
-1	-1	-1
1	1	1
-1	**1**	**-1**
1	1	1
1	1	1
1	1	1
1	1	1
1	1	1
1	1	1
1	1	1
1	1	1
1	1	1
-1	-1	-1
-1	-1	-1
-1	-1	-1
-1	-1	-1
-1	-1	-1
-1	-1	-1
-1	-1	-1
-1	-1	-1
-1	-1	-1

-1	**1**	**-1**
-1	**1**	**-1**
0	**1**	**-1**
-1	-1	-1
-1	**1**	**-1**
1	1	1
0	0	0
0	0	0
1	1	1
-1	**1**	**-1**
-1	-1	-1
1	1	1
1	1	1
-1	**1**	**-1**
-1	-1	-1
-1	-1	-1
-1	**1**	**-1**
-1	**1**	**-1**
-1	**1**	**-1**
-1	**1**	**-1**
-1	**1**	**-1**
-1	-1	-1
-1	-1	-1
-1	**1**	**-1**
-1	**1**	**-1**
-1	-1	-1
0	0	0
-1	-1	-1
1	1	1
1	1	1
1	1	1
1	1	1
1	1	1
1	1	1
1	1	1
-1	-1	-1
-1	-1	-1
-1	-1	-1
0	**1**	**-1**
-1	-1	-1
0	0	0
1	1	1
1	1	1
-1	-1	-1
1	1	1
1	1	1
-1	-1	-1
-1	**1**	**-1**
-1	**1**	**-1**
-1	-1	-1
1	1	1
0	**1**	**-1**

-1	-1	-1
-1	-1	-1
-1	-1	-1
-1	-1	-1
1	1	1
1	1	1

name	ppszone	upstream	accesshours	recoverhours	tunetimefraction
none	none	none	0	0	0
Cryo plants	none	none	0	0	0
Site power	none	Cryo plants	0	0	0
Global controls	none	Site power	0	0	0
e- source	e- source	Global controls	1	1	0,1
e- DR	e- DR	e- source	1	1	0,2
e- extraction	e- linac	e- DR	1	1	0,05
e- transport	e- linac	e- extraction	1	1	0,05
e- turnaround	e- linac	e- transport	1	1	0,05
e- compressor	e- linac	e- turnaround	1	1	0,1
e- linac	e- linac	e- compressor	1	1	0,1
e- BDS	e- linac	e- linac	1	1	0,1
e+ source	e+ source	**e- linac**	1	1	0,1
e+ transprt hi e	e- linac	e+ source	1	1	0,2
e+ DR	e- DR	e+ transprt hi e	1	1	0,2
e+ extraction	e+ linac	e+ DR	1	1	0,05
e+ transport	e+ linac	e+ extraction	1	1	0,05
e+ turnaround	e+ linac	e+ transport	1	1	0,05
e+ compressor	e+ linac	e+ turnaround	1	1	0,1
e+ linac	e+ linac	e+ compressor	1	1	0,1
e+ BDS	e+ linac	e+ linac	1	1	0,1
IP	IP	e+ BDS	1	1	0,2

start of beamline?	% MD time	tunetimefraction low	% MD time low
0	0		
1	0		
0	0		
0	0		
0	1		
0	1,9		
0	0,2		
0	0,2		
0	0,2		
0	0,5		
0	1		
0	1		
11	1	0,1	1
0	0,5	0,2	0,5
0	1,9	0,2	1,9
0	0,2	0,05	0,5
0	0,2	0,05	0,5
0	0,2	0,05	0,5
0	0,5	0,1	0,5
0	1	0,1	1
0	1	0,1	1
0	1	0	1

tunnel configuration

2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel
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2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel
2 tunnels minimum in accel tunnel

variable name	value	
format_version	2	
maxaccess	1000	
maxpeopleoutside	1000	
maxmaintpeople	500	
simhours	146000	
runhours	3650	
randseed	6	
extrarepairtimefactor1	0	1,5
extrarepairtimefactor2	0	2
allowaccesshours	8	
minMDhours	2	
scheddownperiod	336	
scheddownlength	9	
scheddownrecovery	15	
runwhenrecoverearly	0	
switchtimelow	2	
traceprtlevel	0	
tracefilename	trace.dat	
resultsfilename	warmresults1.csv	
runname	ILC107 but add sched downs with repairs made	

name	design	minimum	
luminosity	1,00E+34	5,00E+33	
energy overhead e- source buncher	39	0	
energy overhead e- source linac	492	0	
energy overhead e- compressor	319	0	
energy overhead e- linac	7371	0	
energy overhead e- BDS crab cavities	63	0	
energy overhead e+ source RF gun	32	0	
energy overhead e+ source buncher	39	0	
energy overhead e+ source e- drive linac	592	0	
energy overhead e+ source rf separator 1	54	0	
energy overhead e+ source after target	56	0	
energy overhead e+ source rf separator 2	54	0	
energy overhead e+ source e+ linac	492	0	
energy overhead e+ compressor	319	0	
energy overhead e+ linac	7371	0	
energy overhead e+ BDS crab cavities	63	0	
spare klystron e- source buncher	1	0	
spare klystron e- source linac	1	0	
spare klystron e- compressor	1	0	
spare klystron e- BDS crab cavities	1	0	
spare klystron e+ source RF gun	1	0	
spare klystron e+ source buncher	1	0	
spare klystron e+ source e- drive linac	1	0	
spare klystron e+ source rf separator 1	1	0	
spare klystron e+ source after target	1	0	
spare klystron e+ source rf separator 2	1	0	
spare klystron e+ source e+ linac	1	0	
spare klystron e+ compressor	1	0	
spare klystron e+ BDS crab cavities	1	0	
energy overhead e- DR	54	49,49955	
energy overhead e+ DR	54	49,49955	
e- DR inj kick	0,63003	0,6	
e- DR ext kick	0,63003	0,6	
e+ DR inj kick	0,63003	0,6	
e+ DR ext kick	0,63003	0,6	
spare target	1	0	number of spare posit

tron target beamlines

sheet	include	region	subregion	egain_nominal_MeV	engy_overhead_pct	n_spare_klys
		Electron injector				
RF 10MW	no	e- linac	test	3.239	0,00	0
e- source	yes	e- source				
warm RF	yes	e- source	buncher	80	0,49	1
inj	yes	e- source	linac			
RF 10MW	yes	e- source	linac	4.920	0,10	1
		e- damping ring				
DR	yes	e- DR				
		e- RTML				
extraction	yes	e- extraction				
transport	yes	e- transport				0
turnaround	yes	e- turnaround				0
compressor	yes	e- compressor				
RF 10MW	yes	e- compressor		1.176	0,27	1
		e- linac				
main linac	yes	e- linac				
RF 10MW	yes	e- linac		245.620	0,06	0
		e- Beam Delivery System				
BDS	yes	e- BDS				
RF 10MW	yes	e- BDS	crab cavities	10	6,33	1
		e+ source (conventional - unpolarized)				
e+ source conv	no	e+ source				
warm RF	no	e+ source	RF gun	7	4,55	1
RF 10MW	no	e+ source	buncher	80	0,49	1
inj	no	e+ source	e- drive linac			
RF 10MW	no	e+ source	e- drive linac	5.920	0,10	1
RF 10MW	no	e+ source	rf separator 1	230	0,24	1
warm RF	no	e+ source	after target	250	0,22	1
RF 10MW	no	e+ source	rf separator 2	230	0,24	1
inj	no	e+ source	e+ linac			
RF 10MW	no	e+ source	e+ linac	4.920	0,10	1
		e+ source (polarized using an undulator at the end of the e- linac)				
e+ source pol	yes	e+ source				
warm RF	yes	e+ source	after target	250	0,22	1
inj	yes	e+ source	e+ linac			
RF 10MW	yes	e+ source	e+ linac	4.920	0,10	1
		e+ DR				
DR	yes	e+ DR				
		e+ RTML				
extraction	yes	e+ extraction				
transport	yes	e+ transport				0
turnaround	yes	e+ turnaround				0
compressor	yes	e+ compressor				
RF 10MW	yes	e+ compressor		1.176	0,27	1
		e+ linac				
main linac	yes	e+ linac				
RF 10MW	yes	e+ linac		245.620	0,06	0
		e+ Beam Delivery System				
BDS	yes	e+ BDS				

RF 10MW	yes	e+ BDS	crab cavities	10	6,33	1

IP	yes	IP

otherparts	yes

description

Here temporarily to test 1 RF unit (6 cryomodule) rf counts
laser + polarized gun + buncher + LTR
buncher + accel to 80 MeV
non RF components of e- injector linac
RF components of e- injector linac

All e- damping ring components

extraction line from DR to long transport line in linac tunnel
long low emittance e- transport line through BDS and linac to turn around
turn around at low energy end of e- linac
non RF e- compressor hardware
RF for e- compressor

main e- linac
RF for main e- linac

e- Beam Delivery System
crab cavities

laser + RF gun + target
RF for RF gun
buncher + accel to 80 MeV
non RF components of e- drive linac for conventional positron production
RF of e- drive linac for conventional positron production
rf separater upstream of the multiple targets
accelerate e+ after target with warm RF
rf separater downstream of the multiple targets
non RF components of e+ injector linac for conventional positron production
RF of e+ injector linac for conventional positron production

undulator + target + turnarounds + long transport
accelerate e+ after target with warm RF
non RF components of e+ injector linac for conventional positron production
RF of e+ injector linac for conventional positron production

All e+ damping ring components

extraction line from DR to long transport line in linac tunnel
long low emittance e+ transport line through BDS and linac to turn around
turn around at low energy end of e+ linac
non RF e+ compressor hardware
RF for e+ compressor

main e+ linac
RF for main e+ linac

e+ Beam Delivery System

crab cavities
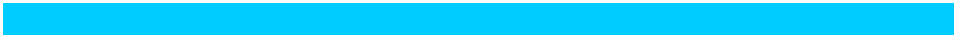
Interaction Point
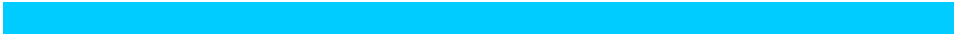
Global controls, cryo, site power

system	component name	subsys/segment	problem name	quantity	parameter effected	add/ mult	degradation	MTTF	MTTR	Still broken after rerpair	access needed ?
			This is the otherparts sheet. It contains the systems which are not modelled in detail.								
	Cryo plants										
lumped	cryo plant	beamline	broken	1	luminosity	mult	0	1,00E+03	10		0
	Site power										
lumped	site power	beamline	broken	1	luminosity	mult	0	2,00E+03	10		0
	Global controls										
lumped	Controls sitewide	beamline	broken	1	luminosity	mult	0	2,50E+03	5		0

n repair people	rand seed	nominal % downtime
	4	1
	4	0,5
	4	0,2
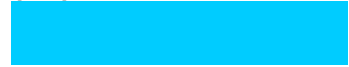
system	component name	subsys/segment	problem name	quantity	parameter effected
			RF for main e- linac		
	e- linac		SC RF include=yes region=e- linac subregion= e		
RF power sourc	Modulators	klystron	broken	15370	energy overhead e- linac
RF structure	LLRF	klystron	broken	15370	energy overhead e- linac
RF power sourc	Klystron 10MW	klystron	broken	15370	energy overhead e- linac
RF power sourc	klys pre-amp	klystron	broken	15370	energy overhead e- linac
RF power sourc	VacG/Ctrl	klystron	broken	15370	energy overhead e- linac
RF power sourc	VacP	klystron	broken	15370	energy overhead e- linac
RF power sourc	VacP power supply	klystron	broken	15370	energy overhead e- linac
RF power sourc	spare klystron	klystron	broken	0	luminosity
Vacuum	VacP	beamline	broken	15370	luminosity
Vacuum	VacP power supply	beamline	broken	15370	luminosity
controls	timing	klystron	broken	15370	energy overhead e- linac
controls	other controls	klystron	broken	46110	energy overhead e- linac
Water system	Water pumps	klystron	broken	7685	energy overhead e- linac
Water system	Water instr	klystron	broken	23055	energy overhead e- linac
Water system	Flow Switch	klystron	broken	23055	energy overhead e- linac
AC power	Electrical - >0.5	klystron	broken	7685	energy overhead e- linac
AC power	Electrical - .05<<0.5	klystron	broken	7685	energy overhead e- linac

add/mult	degradation	MTBF	MTTR	Still broken after	access needed?	n repair people	randseed	Starting MTBF
egain_nominal_MeV=245620 engy_overhead_pct=0.06001 n_spare_klys=(								
add	**-16,94**	5,0E+04	4		-1	2		5,0E+04
add	-16,94	3,0E+05	1		-1	1		3,0E+05
add	**-16,94**	4,0E+04	8		-1	2		4,0E+04
add	**-16,94**	1,0E+05	1		-1	1		1,0E+05
add	**-16,94**	4,7E+05	1		-1	1		4,7E+05
add	**-16,94**	1,0E+07	8		-1	2		1,0E+07
add	**-16,94**	1,0E+05	1		-1	1		1,0E+05
add	-1,00	1,0E+50	8		-1	2		4,0E+04
mult	1,00	1,0E+07	4		1	2		1,0E+07
mult	1,00	1,0E+05	1		-1	1		1,0E+05
add	**-16,94**	3,0E+05	1		-1	1		3,0E+05
add	**-16,94**	3,0E+05	1		-1	1		3,0E+05
add	**-16,94**	1,2E+05	4		-1	2		1,2E+05
add	**-16,94**	3,9E+05	2		-1	2		3,9E+05
add	**-16,94**	7,5E+06	1		-1	1		7,5E+06
add	**-16,94**	1,6E+06	4		0	2		1,6E+06
add	**-16,94**	1,6E+06	2		0	2		1,6E+06

MTBF improvement

1
1
1
1
1
1
1
1
1
1
1
1
1
1
1
1

system	component name	subsys/segment	problem name	quantity
	e- linac		RF for main e- linac SC RF include=yes req	
RF structure	Cavities	cavity	**degrade**	8364
RF structure	Cavities	cavity	broken	8364
RF structure	Cavity tuner	cavity	broken	8364
RF structure	Cavity piezo tuner	cavity	broken	8364
RF structure	LLRF	cavity	broken	8364
RF structure	power coupler	coupler	**degrade**	8364
RF structure	power coupler	coupler	broken	8364
RF structure	power coupler disc	coupler	disc	8364
RF structure	coupler interlock sensors	coupler	broken	8364
RF structure	coupler interlock electronics	coupler	broken	8364
RF structure	VacP	coupler	broken	965
RF structure	VacP power supply	coupler	broken	965
Vacuum	VacP	beamline	broken	965
Vacuum	VacP power supply	beamline	broken	965
Cryo	insulating vacuumP	cryo string	leak	81
Cryo	cryo JT valve	cryo string	broken	81
RF power sources	Modulators	klystron	broken	161
RF power sources	pulse cables	klystron	broken	0
RF power sources	Pulse transformers	klystron	broken	161
RF power sources	Klystron 10MW	klystron	broken	161
RF power sources	klys pre-amp	klystron	broken	161
RF power sources	klys filament supply	klystron	broken	161
RF power sources	klys solenoid supply	klystron	broken	161
RF power sources	VacG/Ctrl	klystron	broken	161
RF power sources	VacP	klystron	broken	161
RF power sources	spare klystron	klystron	broken	0
RF power sources	VacP power supply	klystron	broken	161
controls	timing	klystron	broken	161
controls	other controls	klystron	broken	483
Water system	Water pumps	klystron	broken	161
Water system	Water instr	klystron	broken	483
Water system	Flow Switch	klystron	broken	483
AC power	Electrical - >0.5	klystron	broken	161
AC power	Electrical - .05<<0.5	klystron	broken	161

parameter effected	add/mult	degradation	MTBF	MTTR	Still broken after	access needed?	n repair people
gion=e- linac subregion= egain_nominal_MeV=245620 engy_overhead_pct=0.06001 n_spare_klys=0							
energy overhead e- linac	add	**-11,00**	1,0E+08	672		1	2
energy overhead e- linac	add	-31,14	1,0E+08	672		1	2
energy overhead e- linac	add	-31,14	1,0E+06	672		1	2
energy overhead e- linac	add	-5,00	5,0E+05	672		1	2
energy overhead e- linac	add	-31,14	3,0E+05	1		-1	1
energy overhead e- linac	add	**-572,00**	1,0E+07	**2**	**power cou**	1	2
energy overhead e- linac	add	-1619,28	1,0E+07	**2**	**power cou**	1	2
energy overhead e- linac	add	-31,14	1,0E+50	672		1	2
energy overhead e- linac	add	-1619,28	5,0E+06	1		1	1
energy overhead e- linac	add	-1619,28	1,0E+06	1		-1	1
energy overhead e- linac	add	-1619,28	1,0E+08	4		1	2
energy overhead e- linac	add	-1619,28	1,0E+06	1		-1	1
luminosity	mult	1,00	1,0E+07	4		1	2
luminosity	mult	1,00	1,0E+05	1		-1	1
energy overhead e- linac	add	-3238,56	1,0E+05	8		1	2
energy overhead e- linac	add	-3238,56	3,0E+05	2		1	2
energy overhead e- linac	add	-1619,28	5,0E+04	4		-1	2
energy overhead e- linac	add	-1619,28	2,0E+05	8		-1	2
energy overhead e- linac	add	-1619,28	2,0E+05	4		0	2
energy overhead e- linac	add	-1619,28	4,0E+04	8		-1	2
energy overhead e- linac	add	-1619,28	1,0E+05	1		-1	1
energy overhead e- linac	add	-1619,28	3,3E+06	2		-1	1
energy overhead e- linac	add	-1619,28	3,3E+06	2		-1	1
energy overhead e- linac	add	-1619,28	4,7E+05	1		-1	1
energy overhead e- linac	add	-1619,28	1,0E+07	8		-1	2
luminosity	add	-1,00	1,0E+50	8		-1	2
energy overhead e- linac	add	-1619,28	1,0E+05	1		-1	1
energy overhead e- linac	add	-1619,28	3,0E+05	1		-1	1
energy overhead e- linac	add	-1619,28	3,0E+05	1		-1	1
energy overhead e- linac	add	-1619,28	1,2E+05	4		-1	2
energy overhead e- linac	add	-1619,28	3,9E+05	2		-1	2
energy overhead e- linac	add	-1619,28	7,5E+06	1		-1	1
energy overhead e- linac	add	-1619,28	1,6E+06	4		0	2
energy overhead e- linac	add	-1619,28	1,6E+06	2		0	2

randseed	Starting MTBF	MTBF improvement
	1,0E+08	1
	1,0E+08	1
	1,0E+06	1
	5,0E+05	1
	3,0E+05	1
	1,0E+07	1
	1,0E+07	1
	1,0E+50	1
	5,0E+06	1
	1,0E+06	1
	1,0E+08	1
	1,0E+06	1
	1,0E+07	1
	1,0E+05	1
	1,0E+05	1
	3,0E+05	1
	5,0E+04	1
	2,0E+05	1
	2,0E+05	1
	4,0E+04	1
	1,0E+05	1
	3,3E+06	1
	3,3E+06	1
	4,7E+05	1
	1,0E+07	1
	4,0E+04	1
	1,0E+05	1
	3,0E+05	1
	3,0E+05	1
	1,2E+05	1
	3,9E+05	1
	7,5E+06	1
	1,6E+06	1
	1,6E+06	1

system	component name	subsys/segment	problem name	quantity
	e- linac		RF for main e- linac SC RF include=yes reg	
RF structure	Cavities	cavity	**degrade**	8364
RF structure	Cavities	cavity	broken	8364
RF structure	Cavity tuner	cavity	broken	8364
RF structure	Cavity piezo tuner	cavity	broken	8364
RF structure	LLRF	cavity	broken	8364
RF structure	power coupler	coupler	**degrade**	8364
RF structure	power coupler	coupler	broken	8364
RF structure	power coupler disc	coupler	disc	8364
RF structure	coupler interlock sensors	coupler	broken	8364
RF structure	coupler interlock electronics	coupler	broken	8364
RF structure	VacP	coupler	broken	965
RF structure	VacP power supply	coupler	broken	965
Vacuum	VacP	beamline	broken	965
Vacuum	VacP power supply	beamline	broken	965
Cryo	insulating vacuumP	cryo string	leak	81
Cryo	cryo JT valve	cryo string	broken	81
RF power sources	Modulators	klystron	broken	161
RF power sources	pulse cables	klystron	broken	0
RF power sources	Pulse transformers	klystron	broken	0
RF power sources	Klystron DRFS	klystron	broken	2091
RF power sources	klys pre-amp	klystron	broken	2091
RF power sources	klys filament supply	klystron	broken	161
RF power sources	klys solenoid supply	klystron	broken	0
RF power sources	VacG/Ctrl	klystron	broken	0
RF power sources	VacP	klystron	broken	0
RF power sources	spare klystron	klystron	broken	0
RF power sources	VacP power supply	klystron	broken	0
controls	timing	klystron	broken	161
controls	other controls	klystron	broken	483
Water system	Water pumps	klystron	broken	161
Water system	Water instr	klystron	broken	483
Water system	Flow Switch	klystron	broken	483
AC power	Electrical - >0.5	klystron	broken	161
AC power	Electrical - .05<<0.5	klystron	broken	161

parameter effected	add/mult	degradation	MTBF	MTTR	Still broken after	access needed?	n repair people
region=e- linac subregion=	egain_nominal_MeV=245620	engy_overhead_pct=0.06001 n_spare_klys=0					
energy overhead e- linac	add	**-11,00**	1,0E+08	672		1	2
energy overhead e- linac	add	-31,14	1,0E+08	672		1	2
energy overhead e- linac	add	-31,14	1,0E+06	672		1	2
energy overhead e- linac	add	-5,00	5,0E+05	672		1	2
energy overhead e- linac	add	-31,14	3,0E+05	1		-1	1
energy overhead e- linac	add	**-44,00**	1,0E+07	**2**	**power cou**	1	2
energy overhead e- linac	add	**-124,56**	1,0E+07	**2**	**power cou**	1	2
energy overhead e- linac	add	-31,14	1,0E+50	672		1	2
energy overhead e- linac	add	**-124,56**	5,0E+06	1		1	1
energy overhead e- linac	add	**-124,56**	1,0E+06	1		-1	1
energy overhead e- linac	add	**-124,56**	1,0E+08	4		1	2
energy overhead e- linac	add	**-124,56**	1,0E+06	1		-1	1
luminosity	mult	1,00	1,0E+07	4		1	2
luminosity	mult	1,00	1,0E+05	1		-1	1
energy overhead e- linac	add	-3238,56	1,0E+05	8		1	2
energy overhead e- linac	add	-3238,56	3,0E+05	2		1	2
energy overhead e- linac	add	-1619,28	2,5E+05	4		-1	2
energy overhead e- linac	add	-1619,28	2,0E+05	8		-1	2
energy overhead e- linac	add	-1619,28	2,0E+05	4		0	2
energy overhead e- linac	add	**-124,56**	1,2E+05	4		-1	2
energy overhead e- linac	add	**-124,56**	1,0E+05	1		-1	1
energy overhead e- linac	add	**-124,56**	2,0E+06	2		-1	1
energy overhead e- linac	add	**-124,56**	3,3E+06	2		-1	1
energy overhead e- linac	add	**-124,56**	4,7E+05	1		-1	1
energy overhead e- linac	add	**-124,56**	1,0E+07	8		-1	2
luminosity	add	-1,00	1,0E+50	8		-1	2
energy overhead e- linac	add	**-124,56**	1,0E+05	1		-1	1
energy overhead e- linac	add	-1619,28	3,0E+05	1		-1	1
energy overhead e- linac	add	-1619,28	3,0E+05	1		-1	1
energy overhead e- linac	add	-1619,28	1,2E+05	4		-1	2
energy overhead e- linac	add	-1619,28	3,9E+05	2		-1	2
energy overhead e- linac	add	-1619,28	7,5E+06	1		-1	1
energy overhead e- linac	add	-1619,28	1,6E+06	4		0	2
energy overhead e- linac	add	-1619,28	1,6E+06	2		0	2

randseed	Starting MTBF	MTBF improvement
	1,0E+08	1
	1,0E+08	1
	1,0E+06	1
	5,0E+05	1
	3,0E+05	1
	1,0E+07	1
	1,0E+07	1
	1,0E+50	1
	5,0E+06	1
	1,0E+06	1
	1,0E+08	1
	1,0E+06	1
	1,0E+07	1
	1,0E+05	1
	1,0E+05	1
	3,0E+05	1
	2,5E+05	1
	2,0E+05	1
	2,0E+05	1
	1,2E+05	1
	1,0E+05	1
	2,0E+06	1
	3,3E+06	1
	4,7E+05	1
	1,0E+07	1
	4,0E+04	1
	1,0E+05	1
	3,0E+05	1
	3,0E+05	1
	1,2E+05	1
	3,9E+05	1
	7,5E+06	1
	1,6E+06	1
	1,6E+06	1

system	component name	subsys/segment	problem name	quantity
	e- linac		RF for main e- linac SC RF include=yes reg	
RF structure	Cavities	cavity	**degrade**	8364
RF structure	Cavities	cavity	broken	8364
RF structure	Cavity tuner	cavity	broken	8364
RF structure	Cavity piezo tuner	cavity	broken	8364
RF structure	LLRF	cavity	broken	965
RF structure	power coupler	coupler	**degrade**	8364
RF structure	power coupler	coupler	broken	8364
RF structure	power coupler disc	coupler	disc	8364
RF structure	coupler interlock sensors	coupler	broken	8364
RF structure	coupler interlock electronics	coupler	broken	8364
RF structure	VacP	coupler	broken	965
RF structure	VacP power supply	coupler	broken	965
Vacuum	VacP	beamline	broken	965
Vacuum	VacP power supply	beamline	broken	965
Cryo	insulating vacuumP	cryo string	leak	81
Cryo	cryo JT valve	cryo string	broken	81
RF power sources	Modulators	klystron	broken	161
RF power sources	pulse cables	klystron	broken	0
RF power sources	Pulse transformers	klystron	broken	161
RF power sources	Klystron 10MW	klystron	broken	161
RF power sources	klys pre-amp	klystron	broken	161
RF power sources	klys filament supply	klystron	broken	161
RF power sources	klys solenoid supply	klystron	broken	161
RF power sources	VacG/Ctrl	klystron	broken	161
RF power sources	VacP	klystron	broken	161
RF power sources	spare klystron	klystron	broken	0
RF power sources	VacP power supply	klystron	broken	161
controls	timing	klystron	broken	161
controls	other controls	klystron	broken	483
Water system	Water pumps	klystron	broken	10
Water system	Water instr	klystron	broken	30
Water system	Flow Switch	klystron	broken	30
AC power	Electrical - >0.5	klystron	broken	10
AC power	Electrical - .05<<0.5	klystron	broken	10

parameter effected	add/mult	degradation	MTBF	MTTR	Still broken after	access needed?	n repair people
egion=e- linac subregion= egain_nominal_MeV=245620 engy_overhead_pct=0.06001 n_spare_klys=0							
energy overhead e- linac	add	**-11,00**	1,0E+08	672		1	2
energy overhead e- linac	add	-31,14	1,0E+08	672		1	2
energy overhead e- linac	add	-31,14	1,0E+06	672		1	2
energy overhead e- linac	add	-5,00	5,0E+05	672		1	2
energy overhead e- linac	add	**-269,88**	3,0E+05	1		-1	1
energy overhead e- linac	add	**-269,88**	1,0E+07	**2**	**power cou**	1	2
energy overhead e- linac	add	**-269,88**	1,0E+07	**2**	**power cou**	1	2
energy overhead e- linac	add	-31,14	1,0E+50	672		1	2
energy overhead e- linac	add	**-269,88**	5,0E+06	1		1	1
energy overhead e- linac	add	**-269,88**	1,0E+06	1		-1	1
energy overhead e- linac	add	**-269,88**	1,0E+08	4		1	2
energy overhead e- linac	add	**-269,88**	1,0E+06	1		-1	1
luminosity	mult	1,00	1,0E+07	4		1	2
luminosity	mult	1,00	1,0E+05	1		-1	1
energy overhead e- linac	add	-3238,56	1,0E+05	8		1	2
energy overhead e- linac	add	-3238,56	3,0E+05	2		1	2
energy overhead e- linac	add	-1619,28	5,0E+06	4		-1	2
energy overhead e- linac	add	-1619,28	2,0E+07	8		-1	2
energy overhead e- linac	add	-1619,28	2,0E+07	4		**-1**	2
energy overhead e- linac	add	-1619,28	4,0E+06	8		-1	2
energy overhead e- linac	add	-1619,28	1,0E+07	1		-1	1
energy overhead e- linac	add	-1619,28	3,3E+08	2		-1	1
energy overhead e- linac	add	-1619,28	3,3E+08	2		-1	1
energy overhead e- linac	add	-1619,28	4,7E+07	1		-1	1
energy overhead e- linac	add	-1619,28	1,0E+09	8		-1	2
luminosity	add	-1,00	1,0E+50	8		-1	2
energy overhead e- linac	add	-1619,28	1,0E+07	1		-1	1
energy overhead e- linac	add	-1619,28	3,0E+05	1		-1	1
energy overhead e- linac	add	-1619,28	3,0E+05	1		-1	1
energy overhead e- linac	add	**-27527,76**	1,2E+07	4		-1	2
energy overhead e- linac	add	**-27527,76**	3,9E+05	2		**0**	2
energy overhead e- linac	add	**-27527,76**	7,5E+06	1		**0**	1
energy overhead e- linac	add	-1619,28	1,6E+06	4		0	2
energy overhead e- linac	add	-1619,28	1,6E+06	2		0	2

randseed	Starting MTBF	MTBF improvement
	1,0E+08	1
	1,0E+08	1
	1,0E+06	1
	5,0E+05	1
	3,0E+05	1
	1,0E+07	1
	1,0E+07	1
	1,0E+50	1
	5,0E+06	1
	1,0E+06	1
	1,0E+08	1
	1,0E+06	1
	1,0E+07	1
	1,0E+05	1
	1,0E+05	1
	3,0E+05	1
	5,0E+04	100
	2,0E+05	100
	2,0E+05	100
	4,0E+04	100
	1,0E+05	100
	3,3E+06	100
	3,3E+06	100
	4,7E+05	100
	1,0E+07	100
	4,0E+04	100
	1,0E+05	100
	3,0E+05	1
	3,0E+05	1
	1,2E+05	100
	3,9E+05	1
	7,5E+06	1
	1,6E+06	1
	1,6E+06	1

system	component name	subsys/segment	problem name	quantity	parameter effected	add/mult
			RF for main e- linac			
			e- source non-RF including laser, polarized gun, bu			
	e- linac	laser	e- source laser and laser optics elements			
Diagnostic	laser	beamline	broken	1	luminosity	mult
PS + controllers	Laser PS	beamline	broken	2	luminosity	mult
Vacuum	Vac Mech device	beamline	broken	2	luminosity	mult
Vacuum	VacP	beamline	broken	5	luminosity	mult
Vacuum	VacP power supply	beamline	broken	5	luminosity	mult
Vacuum	VacV	beamline	broken	2	luminosity	mult
Vacuum	VacV controller	beamline	broken	2	luminosity	mult
controls	timing	beamline	broken	1	luminosity	mult
controls	other controls	beamline	broken	1	luminosity	mult
Water system	Water pumps	beamline	broken	2	luminosity	mult
Water system	Water instr	beamline	broken	6	luminosity	mult
Water system	Flow Switch	beamline	broken	6	luminosity	mult
AC power	Electrical - >0.5	beamline	broken	0	luminosity	mult
AC power	Electrical - .05<<0.5	beamline	broken	5	luminosity	mult
	e- linac	pol gun	e- source components that work on the electron bea			
Magnets	Corrs - can't tune aroun	beamline	broken	4	luminosity	mult
PS + controllers	HVPS	beamline	broken	1	luminosity	mult
PS + controllers	HVPS controller	beamline	broken	1	luminosity	mult
PS + controllers	PS Corrs can't tune arou	beamline	broken	4	luminosity	mult
PS + controllers	PS controller - corr can't	beamline	broken	4	luminosity	mult
Vacuum	Vac Mech device	beamline	broken	1	luminosity	mult
Vacuum	VacP	beamline	broken	5	luminosity	mult
Vacuum	VacP power supply	beamline	broken	5	luminosity	mult
Vacuum	VacV	beamline	broken	2	luminosity	mult
Vacuum	VacV controller	beamline	broken	2	luminosity	mult
Diagnostic	BPMs	diagnostic	broken	4	luminosity	mult
controls	controls backbone	sector	broken	1	luminosity	mult
controls	local backbone	sector	broken	10	luminosity	mult
controls	Controls PPS	region	broken	2	luminosity	mult
controls	MPS & FastFdbk	region	broken	1	luminosity	mult
AC power	Electrical>0.5	Utility powe	broken	1	luminosity	mult
AC power	Electrical - .05<<0.5	Utility powe	broken	10	luminosity	mult
	e- linac	buncher				
Magnets	Bends	beamline	broken	0	luminosity	mult
Magnets	Quads	beamline	broken	10	luminosity	mult
Magnets	Corrs - can't tune aroun	beamline	broken	20	luminosity	mult
Magnets	Solenoids	beamline	broken	10	luminosity	mult
Magnets	Wigglers	beamline	broken	0	luminosity	mult
Magnets	Kickers	beamline	broken	0	luminosity	mult
PS + controllers	Kicker pulser	beamline	broken	0	luminosity	mult
PS + controllers	Power supplies strings	beamline	broken	12	luminosity	mult
PS + controllers	PS Corrs can't tune arou	beamline	broken	20	luminosity	mult
PS + controllers	Power supplies Trims	beamline	broken	0	luminosity	mult
PS + controllers	PS controller string	beamline	broken	12	luminosity	mult
PS + controllers	PS controller - corr can't	beamline	broken	20	luminosity	mult
PS + controllers	mover controller	beamline	broken	0	luminosity	mult
Water system	Flow Switch - quads	beamline	broken	2	luminosity	mult
Cryo	cryo vac enclosure	cryo segme	broken	0	luminosity	mult
Vacuum	Vac Mech device	beamline	broken	2	luminosity	mult

Vacuum	VacP	beamline	broken	5	luminosity	mult
Vacuum	VacP power supply	beamline	broken	5	luminosity	mult
Vacuum	VacV	beamline	broken	2	luminosity	mult
Vacuum	VacV controller	beamline	broken	2	luminosity	mult
Water system	Water pumps	beamline	broken	2	luminosity	mult
Water system	Water instr	beamline	broken	6	luminosity	mult
Water system	Flow Switch	beamline	broken	6	luminosity	mult
Diagnostic	BPMs	diagnostic	broken	10	luminosity	mult
Diagnostic	laser wires	diagnostic	broken	0	luminosity	mult
Diagnostic	wire scanners	diagnostic	broken	0	luminosity	mult
Diagnostic	Kicker	diagnostic	broken	0	luminosity	mult
Diagnostic	Kicker pulser	diagnostic	broken	0	luminosity	mult
controls	controls backbone	sector	broken	1	luminosity	mult
controls	timing	sector	broken	2	luminosity	mult
controls	local backbone	sector	broken	2	luminosity	mult
controls	Controls PPS	region	broken	1	luminosity	mult
controls	MPS & FastFdbk	region	broken	1	luminosity	mult
AC power	Electrical - .05<<0.5	Utility powe	broken	15	luminosity	mult

degradation	MTBF	MTTR	Still broken after repair	access needed?	n repair people	rand seed	Starting MTBF	MTBF improvement factor
0,00	2,0E+04	2		-1	2		2,0E+04	1
0,00	3,3E+06	2		-1	2		3,3E+06	1
0,00	5,0E+05	8		1	2		5,0E+05	1
0,00	1,0E+07	4		1	2		1,0E+07	1
0,00	1,0E+05	1		-1	1		1,0E+05	1
0,00	5,0E+06	4		1	2		5,0E+06	1
0,00	9,5E+05	2		0	1		9,5E+05	1
0,00	3,0E+05	1		0	1		3,0E+05	1
0,00	3,0E+05	1		-1	1		3,0E+05	1
0,00	1,2E+05	4		-1	2		1,2E+05	1
0,00	3,9E+05	2		-1	2		3,9E+05	1
0,00	7,5E+06	1		-1	1		7,5E+06	1
0,00	1,6E+06	4		0	2		1,6E+06	1
0,00	1,6E+06	2		0	2		1,6E+06	1
am								
0,00	1,0E+07	2		1	2		1,0E+07	1
0,00	3,3E+06	2		1	2		3,3E+06	1
0,00	3,3E+06	1		-1	1		3,3E+06	1
0,00	1,1E+06	2		-1	1		1,1E+06	1
0,00	3,3E+06	1		-1	1		3,3E+06	1
0,00	5,0E+05	8		1	2		5,0E+05	1
1,00	1,0E+07	4		1	2		1,0E+07	1
1,00	1,0E+05	1		-1	1		1,0E+05	1
0,00	5,0E+06	4		1	2		5,0E+06	1
0,00	9,5E+05	2		0	1		9,5E+05	1
0,999	3,0E+05	1		-1	1		3,0E+05	1
0,00	3,0E+05	1		0	1		3,0E+05	1
0,00	1,0E+06	1		0	1		1,0E+06	1
0,00	3,0E+05	1		0	1		3,0E+05	1
0,00	3,0E+04	1		0	1		3,0E+04	1
0,00	1,6E+06	4		0	2		1,6E+06	1
0,00	1,6E+06	2		0	2		1,6E+06	1
0,00	2,0E+07	8		1	2		2,0E+07	1
0,00	2,0E+07	8		1	2		2,0E+07	1
0,00	1,0E+07	2		1	2		1,0E+07	1
0,00	2,0E+07	8		1	2		2,0E+07	1
0,00	3,4E+07	8		1	2		3,4E+07	1
0,00	1,0E+05	8		1	2		1,0E+05	1
0,00	3,5E+04	2		1	2		3,5E+04	1
0,00	3,3E+06	4		-1	2		3,3E+06	1
0,00	1,1E+06	2		-1	1		1,1E+06	1
0,99	1,1E+06	1		-1	1		1,1E+06	1
0,00	3,3E+06	1		-1	1		3,3E+06	1
0,00	3,3E+06	1		-1	1		3,3E+06	1
1,00	3,3E+06	1		-1	1		3,3E+06	1
0,00	7,5E+06	1		1	1		7,5E+06	1
0,00	1,0E+07	8		1	2		1,0E+07	1
0,00	5,0E+05	8		1	2		5,0E+05	1

1,00	1,0E+07	4		1	2	1,0E+07	1
1,00	1,0E+05	1		-1	1	1,0E+05	1
0,00	5,0E+06	4		1	2	5,0E+06	1
0,00	9,5E+05	2		0	1	9,5E+05	1
0,00	1,2E+05	4		-1	2	1,2E+05	1
0,00	3,9E+05	2		-1	2	3,9E+05	1
0,00	7,5E+06	1		-1	1	7,5E+06	1
0,999	3,0E+05	1		-1	1	3,0E+05	1
0,99	2,0E+04	2		-1	2	2,0E+04	1
0,95	1,0E+05	2		1	2	1,0E+05	1
0,95	1,0E+05	8		1	2	1,0E+05	1
0,95	3,5E+04	2		1	2	3,5E+04	1
0,00	3,0E+05	1		0	1	3,0E+05	1
0,00	3,0E+05	1		0	1	3,0E+05	1
0,00	1,0E+06	1		0	1	1,0E+06	1
0,00	3,0E+05	1		0	1	3,0E+05	1
0,00	3,0E+04	1		0	1	3,0E+04	1
0,00	1,6E+06	2		0	2	1,6E+06	1

system	component name	subsys/segment	problem name	quantity	parameter effected
	e- linac		RF for main e- linac all components of the beamline from DRX to the		
Magnets	Bends	beamline	broken	54	luminosity
Magnets	Quads SC	beamline	broken	0	luminosity
Magnets	Quads	beamline	broken	161	luminosity
Magnets	Sextupoles	beamline	broken	0	luminosity
Magnets	Corrs - can tune around	beamline	broken	220	luminosity
Magnets	quad or corr	beamline	retuned	381	luminosity
PS + contro	Power supplies strings	beamline	broken	0	luminosity
PS + contro	Power supplies individual	beamline	broken	215	luminosity
PS + contro	PS Corrs can tune around	beamline	broken	220	luminosity
PS + contro	Power supplies Trims	beamline	broken	0	luminosity
PS + contro	PS controller string	beamline	broken	215	luminosity
PS + contro	PS controller - corr can tune arou	beamline	broken	220	luminosity
Water syste	Flow Switch - quads	beamline	broken	161	luminosity
Cryo	cryo vac enclosure	cryo segment	broken	0	luminosity
Vacuum	Vac Mech device	beamline	broken	0	luminosity
Vacuum	VacV	beamline	broken	2	luminosity
Vacuum	VacV controller	beamline	broken	2	luminosity
Water syste	Water pumps	beamline	broken	2	luminosity
Water syste	Water instr	beamline	broken	6	luminosity
Water syste	Flow Switch	beamline	broken	6	luminosity
Diagnostic	BPMs	diagnostic	broken	161	luminosity
Diagnostic	laser wires	diagnostic	broken	4	luminosity
Diagnostic	wire scanners	diagnostic	broken	4	luminosity
Diagnostic	Kicker	diagnostic	broken	4	luminosity
Diagnostic	Kicker pulser	diagnostic	broken	4	luminosity
controls	controls backbone	sector	broken	2	luminosity
controls	timing	sector	broken	2	luminosity
controls	local backbone	sector	broken	20	luminosity
controls	Controls PPS	region	broken	1	luminosity
controls	MPS & FastFdbk	region	broken	1	luminosity
AC power	Electrical>0.5	Utility power	broken	4	luminosity
AC power	Electrical - .05<<0.5	Utility power	broken	21	luminosity

add/ mult	degradation	MTBF	MTTR	Still broken after	access needed ?	n repair people	rand seed	Starting MTBF	MTBF improvement factor
<td colspan="10">long transport line in the linac tunnel includes emittance, collimation, pulsed dump extraction, PPS segmentatio</td>
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	3,0E+07	**2**	**quad or c**	**0**	2		3,0E+07	1
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	1,0E+07	0,5	quad or co	-1	2		1,0E+07	1
mult	0,99	1,0E+50	2		1	2		1,0E+50	1
mult	0,00	3,3E+06	4		-1	2		3,3E+06	1
mult	0,00	3,3E+06	2		-1	2		3,3E+06	1
mult	0,00	1,1E+06	0,5	quad or co	-1	1		1,1E+06	1
mult	0,99	1,1E+06	1		-1	1		1,1E+06	1
mult	0,00	3,3E+06	1		-1	1		3,3E+06	1
mult	0,00	3,3E+06	0,5	quad or co	-1	1		3,3E+06	1
mult	0,00	7,5E+06	1		1	1		7,5E+06	1
mult	0,00	1,0E+07	8		1	2		1,0E+07	1
mult	0,00	5,0E+05	8		1	2		5,0E+05	1
mult	0,00	5,0E+06	4		1	2		5,0E+06	1
mult	0,00	9,5E+05	2		0	1		9,5E+05	1
mult	0,00	1,2E+05	4		-1	2		1,2E+05	1
mult	0,00	3,9E+05	2		-1	2		3,9E+05	1
mult	0,00	7,5E+06	1		-1	1		7,5E+06	1
mult	0,999	3,0E+05	1		-1	1		3,0E+05	1
mult	**0,99**	2,0E+04	2		-1	2		2,0E+04	1
mult	0,95	1,0E+05	2		1	2		1,0E+05	1
mult	0,95	1,0E+05	8		1	2		1,0E+05	1
mult	0,95	3,5E+04	2		1	2		3,5E+04	1
mult	0,00	3,0E+05	1		0	1		3,0E+05	1
mult	0,00	3,0E+05	1		0	1		3,0E+05	1
mult	0,00	1,0E+06	1		0	1		1,0E+06	1
mult	0,00	3,0E+05	1		0	1		3,0E+05	1
mult	0,00	3,0E+04	1		0	1		3,0E+04	1
mult	0,00	1,6E+06	4		0	2		1,6E+06	1
mult	0,00	1,6E+06	2		0	2		1,6E+06	1

on and escalator

system	component name	subsys/segment	problem name	quantity	parameter effected
	e- linac		RF for main e- linac		
			all components of the beamline from DRX to the		
Magnets	Bends	beamline	broken	0	luminosity
Magnets	Quads SC	beamline	broken	0	luminosity
Magnets	Quads	beamline	broken	365	luminosity
Magnets	Sextupoles	beamline	broken	0	luminosity
Magnets	Corrs - can tune around	beamline	broken	546	luminosity
Magnets	quad or corr	beamline	retuned	911	luminosity
PS + contro	Power supplies strings	beamline	broken	0	luminosity
PS + contro	Power supplies individual	beamline	broken	365	luminosity
PS + contro	PS Corrs can tune around	beamline	broken	546	luminosity
PS + contro	Power supplies Trims	beamline	broken	0	luminosity
PS + contro	PS controller string	beamline	broken	365	luminosity
PS + contro	PS controller - corr can tune arou	beamline	broken	546	luminosity
Water syste	Flow Switch - quads	beamline	broken	365	luminosity
Cryo	cryo vac enclosure	cryo segment	broken	0	luminosity
Vacuum	Vac Mech device	beamline	broken	0	luminosity
Vacuum	VacV	beamline	broken	20	luminosity
Vacuum	VacV controller	beamline	broken	20	luminosity
Water syste	Water pumps	beamline	broken	6	luminosity
Water syste	Water instr	beamline	broken	18	luminosity
Water syste	Flow Switch	beamline	broken	18	luminosity
Diagnostic	BPMs	diagnostic	broken	365	luminosity
Diagnostic	laser wires	diagnostic	broken	4	luminosity
Diagnostic	wire scanners	diagnostic	broken	4	luminosity
Diagnostic	Kicker	diagnostic	broken	0	luminosity
Diagnostic	Kicker pulser	diagnostic	broken	0	luminosity
controls	controls backbone	sector	broken	2	luminosity
controls	timing	sector	broken	2	luminosity
controls	local backbone	sector	broken	20	luminosity
controls	Controls PPS	region	broken	1	luminosity
controls	MPS & FastFdbk	region	broken	1	luminosity
AC power	Electrical>0.5	Utility power	broken	4	luminosity
AC power	Electrical - .05<<0.5	Utility power	broken	21	luminosity

add/ mult	degradation	MTBF	MTTR	Still broken after	access needed ?	n repair people	rand seed	Starting MTBF	MTBF improvement factor
long transport line in the linac tunnel.									
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	3,0E+07	**2**	**quad or c**	**0**	2		3,0E+07	1
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	1,0E+07	0,5	quad or cc	-1	2		1,0E+07	1
mult	0,99	1,0E+50	2		1	2		1,0E+50	1
mult	0,00	3,3E+06	4		-1	2		3,3E+06	1
mult	0,00	3,3E+06	2		-1	2		3,3E+06	1
mult	0,00	1,1E+06	0,5	quad or cc	-1	1		1,1E+06	1
mult	0,99	1,1E+06	1		-1	1		1,1E+06	1
mult	0,00	3,3E+06	1		-1	1		3,3E+06	1
mult	0,00	3,3E+06	0,5	quad or cc	-1	1		3,3E+06	1
mult	0,00	7,5E+06	1		1	1		7,5E+06	1
mult	0,00	1,0E+07	8		1	2		1,0E+07	1
mult	0,00	5,0E+05	8		1	2		5,0E+05	1
mult	0,00	5,0E+06	4		1	2		5,0E+06	1
mult	0,00	9,5E+05	2		0	1		9,5E+05	1
mult	0,00	1,2E+05	4		-1	2		1,2E+05	1
mult	0,00	3,9E+05	2		-1	2		3,9E+05	1
mult	0,00	7,5E+06	1		-1	1		7,5E+06	1
mult	0,999	3,0E+05	1		-1	1		3,0E+05	1
mult	**0,99**	2,0E+04	2		-1	2		2,0E+04	1
mult	0,95	1,0E+05	2		1	2		1,0E+05	1
mult	0,95	1,0E+05	8		1	2		1,0E+05	1
mult	0,95	3,5E+04	2		1	2		3,5E+04	1
mult	0,00	3,0E+05	1		0	1		3,0E+05	1
mult	0,00	3,0E+05	1		0	1		3,0E+05	1
mult	0,00	1,0E+06	1		0	1		1,0E+06	1
mult	0,00	3,0E+05	1		0	1		3,0E+05	1
mult	0,00	3,0E+04	1		0	1		3,0E+04	1
mult	0,00	1,6E+06	4		0	2		1,6E+06	1
mult	0,00	1,6E+06	2		0	2		1,6E+06	1

system	component name	subsys/segment	problem name	quantity	parameter effected
	e- linac		RF for main e- linac turn around and spin rotator		
Magnets	Bends	beamline	broken	90	luminosity
Magnets	Quads SC	beamline	broken	8	luminosity
Magnets	Quads	beamline	broken	93	luminosity
Magnets	Sextupoles	beamline	broken	0	luminosity
Magnets	Corrs - can tune around	beamline	broken	141	luminosity
Magnets	quad or corr	beamline	retuned	234	luminosity
PS + contro	Power supplies strings	beamline	broken	0	luminosity
PS + contro	Power supplies individual	beamline	broken	183	luminosity
PS + contro	PS Corrs can tune around	beamline	broken	141	luminosity
PS + contro	Power supplies Trims	beamline	broken	0	luminosity
PS + contro	PS controller string	beamline	broken	183	luminosity
PS + contro	PS controller - corr can tune arou	beamline	broken	141	luminosity
Water syste	Flow Switch - quads	beamline	broken	93	luminosity
Cryo	cryo vac enclosure	cryo segment	broken	0	luminosity
Vacuum	Vac Mech device	beamline	broken	0	luminosity
Vacuum	VacV	beamline	broken	2	luminosity
Vacuum	VacV controller	beamline	broken	2	luminosity
Water syste	Water pumps	beamline	broken	2	luminosity
Water syste	Water instr	beamline	broken	6	luminosity
Water syste	Flow Switch	beamline	broken	6	luminosity
Diagnostic	BPMs	diagnostic	broken	101	luminosity
Diagnostic	laser wires	diagnostic	broken	4	luminosity
Diagnostic	wire scanners	diagnostic	broken	4	luminosity
Diagnostic	Kicker	diagnostic	broken	0	luminosity
Diagnostic	Kicker pulser	diagnostic	broken	0	luminosity
controls	controls backbone	sector	broken	2	luminosity
controls	timing	sector	broken	2	luminosity
controls	local backbone	sector	broken	20	luminosity
controls	Controls PPS	region	broken	1	luminosity
controls	MPS & FastFdbk	region	broken	1	luminosity
AC power	Electrical>0.5	Utility power	broken	4	luminosity
AC power	Electrical - .05<<0.5	Utility power	broken	21	luminosity

add/ mult	degradati on	MTBF	MTTR	Still broken after	access needed ?	n repair people	rand seed	Starting MTBF	MTBF improveme nt factor
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	3,0E+07	**48**		1	2		3,0E+07	1
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	1,0E+07	0,5	quad or cc	-1	2		1,0E+07	1
mult	0,99	1,0E+50	2		1	2		1,0E+50	1
mult	0,00	3,3E+06	4		-1	2		3,3E+06	1
mult	0,00	3,3E+06	2		-1	2		3,3E+06	1
mult	0,00	1,1E+06	0,5	quad or cc	-1	1		1,1E+06	1
mult	0,99	1,1E+06	1		-1	1		1,1E+06	1
mult	0,00	3,3E+06	1		-1	1		3,3E+06	1
mult	0,00	3,3E+06	0,5	quad or cc	-1	1		3,3E+06	1
mult	0,00	7,5E+06	1		1	1		7,5E+06	1
mult	0,00	1,0E+07	8		1	2		1,0E+07	1
mult	0,00	5,0E+05	8		1	2		5,0E+05	1
mult	0,00	5,0E+06	4		1	2		5,0E+06	1
mult	0,00	9,5E+05	2		0	1		9,5E+05	1
mult	0,00	1,2E+05	4		-1	2		1,2E+05	1
mult	0,00	3,9E+05	2		-1	2		3,9E+05	1
mult	0,00	7,5E+06	1		-1	1		7,5E+06	1
mult	0,999	3,0E+05	1		-1	1		3,0E+05	1
mult	**0,99**	2,0E+04	2		-1	2		2,0E+04	1
mult	0,95	1,0E+05	2		1	2		1,0E+05	1
mult	0,95	1,0E+05	8		1	2		1,0E+05	1
mult	0,95	3,5E+04	2		1	2		3,5E+04	1
mult	0,00	3,0E+05	1		0	1		3,0E+05	1
mult	0,00	3,0E+05	1		0	1		3,0E+05	1
mult	0,00	1,0E+06	1		0	1		1,0E+06	1
mult	0,00	3,0E+05	1		0	1		3,0E+05	1
mult	0,00	3,0E+04	1		0	1		3,0E+04	1
mult	0,00	1,6E+06	4		0	2		1,6E+06	1
mult	0,00	1,6E+06	2		0	2		1,6E+06	1

system	component name	subsys/segment	problem name	quantity
	e- linac		RF for main e- linac bunch compressor a	
Magnets	Bends	beamline	broken	106
Magnets	Quads SC	beamline	broken	6
Magnets	Quads	beamline	broken	53
Magnets	Sextupoles	beamline	broken	3
Magnets	Corrs - can tune around	beamline	broken	58
Magnets	quad or corr	beamline	retuned	111
PS + contr	Power supplies strings	beamline	broken	0
PS + contr	Power supplies individual	beamline	broken	162
PS + contr	PS Corrs can tune around	beamline	broken	58
PS + contr	Power supplies Trims	beamline	broken	0
PS + contr	PS controller string	beamline	broken	162
PS + contr	PS controller - corr can tune arou	beamline	broken	58
Water syste	Flow Switch - quads	beamline	broken	53
Cryo	cryo vac enclosure	cryo segment	broken	0
Vacuum	Vac Mech device	beamline	broken	0
Vacuum	VacV	beamline	broken	20
Vacuum	VacV controller	beamline	broken	20
Water syste	Water pumps	beamline	broken	6
Water syste	Water instr	beamline	broken	18
Water syste	Flow Switch	beamline	broken	18
Diagnostic	BPMs	diagnostic	broken	59
Diagnostic	laser wires	diagnostic	broken	4
Diagnostic	wire scanners	diagnostic	broken	4
Diagnostic	Kicker	diagnostic	broken	4
Diagnostic	Kicker pulser	diagnostic	broken	4
controls	controls backbone	sector	broken	2
controls	timing	sector	broken	2
controls	local backbone	sector	broken	20
controls	Controls PPS	region	broken	1
controls	MPS & FastFdbk	region	broken	1
AC power	Electrical>0.5	Utility power	broken	4
AC power	Electrical - .05<<0.5	Utility power	broken	21

parameter effected	add/ mult	degradation	MTBF	MTTR	Still broken after	access needed ?	n repair people	rand seed
nd dump extraction line								
luminosity	mult	0,00	2,0E+07	8		1	2	
luminosity	mult	0,00	3,0E+07	**2 quad or c**		**0**	2	
luminosity	mult	0,00	2,0E+07	8		1	2	
luminosity	mult	0,00	2,0E+07	8		1	2	
luminosity	mult	0,00	1,0E+07	0,5 quad or cc		-1	2	
luminosity	mult	0,99	1,0E+50	2		1	2	
luminosity	mult	0,00	3,3E+06	4		-1	2	
luminosity	mult	0,00	3,3E+06	2		-1	2	
luminosity	mult	0,00	1,1E+06	0,5 quad or cc		-1	1	
luminosity	mult	0,99	1,1E+06	1		-1	1	
luminosity	mult	0,00	3,3E+06	1		-1	1	
luminosity	mult	0,00	3,3E+06	0,5 quad or cc		-1	1	
luminosity	mult	0,00	7,5E+06	1		1	1	
luminosity	mult	0,00	1,0E+07	8		1	2	
luminosity	mult	0,00	5,0E+05	8		1	2	
luminosity	mult	0,00	5,0E+06	4		1	2	
luminosity	mult	0,00	9,5E+05	2		0	1	
luminosity	mult	0,00	1,2E+05	4		-1	2	
luminosity	mult	0,00	3,9E+05	2		-1	2	
luminosity	mult	0,00	7,5E+06	1		-1	1	
luminosity	mult	0,999	3,0E+05	1		-1	1	
luminosity	mult	**0,99**	2,0E+04	2		-1	2	
luminosity	mult	0,95	1,0E+05	2		1	2	
luminosity	mult	0,95	1,0E+05	8		1	2	
luminosity	mult	0,95	3,5E+04	2		1	2	
luminosity	mult	0,00	3,0E+05	1		0	1	
luminosity	mult	0,00	3,0E+05	1		0	1	
luminosity	mult	0,00	1,0E+06	1		0	1	
luminosity	mult	0,00	3,0E+05	1		0	1	
luminosity	mult	0,00	3,0E+04	1		0	1	
luminosity	mult	0,00	1,6E+06	4		0	2	
luminosity	mult	0,00	1,6E+06	2		0	2	

Starting MTBF	MTBF improvement factor
2,0E+07	1
3,0E+07	1
2,0E+07	1
2,0E+07	1
1,0E+07	1
1,0E+50	1
3,3E+06	1
3,3E+06	1
1,1E+06	1
1,1E+06	1
3,3E+06	1
3,3E+06	1
7,5E+06	1
1,0E+07	1
5,0E+05	1
5,0E+06	1
9,5E+05	1
1,2E+05	1
3,9E+05	1
7,5E+06	1
3,0E+05	1
2,0E+04	1
1,0E+05	1
1,0E+05	1
3,5E+04	1
3,0E+05	1
3,0E+05	1
1,0E+06	1
3,0E+05	1
3,0E+04	1
1,6E+06	1
1,6E+06	1

system	component name	subsys/segment	problem name	quantity	parameter effected
			RF for main e- linac		
			Non RF components of the polaraized positron s		
	e- linac	undulator	all undulator components including e- chicane		
Magnets	Bends	beamline	broken	40	luminosity
Magnets	Quads	beamline	broken	230	luminosity
Magnets	Solenoids	beamline	broken	0	luminosity
Magnets	Quad/Sext trims	beamline	broken	230	luminosity
Magnets	Q/S Movers	beamline	broken	0	luminosity
Magnets	movr or trim	beamline	retuned	230	luminosity
Magnets	Undulators	beamline	broken	100	luminosity
Magnets	Kickers	beamline	broken	0	luminosity
Magnets	Corrs - can tune around	beamline	broken	360	luminosity
Magnets	quad or corr	beamline	retuned	360	luminosity
PS + contr	Kicker pulser	beamline	broken	0	luminosity
PS + contr	Power supplies strings	beamline	broken	25	luminosity
PS + contr	PS Corrs can tune around	beamline	broken	360	luminosity
PS + contr	Power supplies Trims	beamline	broken	230	luminosity
PS + contr	PS controller string	beamline	broken	25	luminosity
PS + contr	PS controller - corr can tune ar	beamline	broken	590	luminosity
PS + contr	mover controller	beamline	broken	0	luminosity
Water syst	Flow Switch - quads	beamline	broken	230	luminosity
Cryo	cryo vac enclosure	cryo segment	broken	0	luminosity
Vacuum	Vac Mech device	beamline	broken	2	luminosity
Vacuum	VacP	beamline	broken	85	luminosity
Vacuum	VacP power supply	beamline	broken	17	luminosity
Vacuum	VacV	beamline	broken	42	luminosity
Vacuum	VacV controller	beamline	broken	42	luminosity
Water syst	Water pumps	beamline	broken	7	luminosity
Water syst	Water instr	beamline	broken	21	luminosity
Water syst	Flow Switch	beamline	broken	21	luminosity
Diagnostic	BPMs	diagnostic	broken	230	luminosity
Diagnostic	laser wires	diagnostic	broken	0	luminosity
Diagnostic	wire scanners	diagnostic	broken	0	luminosity
Diagnostic	Kicker	diagnostic	broken	0	luminosity
Diagnostic	Kicker pulser	diagnostic	broken	0	luminosity
controls	controls backbone	sector	broken	1	luminosity
controls	timing	sector	broken	1	luminosity
controls	local backbone	sector	broken	30	luminosity
controls	Controls PPS	region	broken	0	luminosity
controls	MPS & FastFdbk	region	broken	2	luminosity
AC power	Electrical>0.5	Utility power	broken	7	luminosity
AC power	Electrical - .05<<0.5	Utility power	broken	33	luminosity
	e- linac	target1	beamline components up and downstream of the		
Magnets	Bends	beamline	broken	10	luminosity
Magnets	Quads	beamline	broken	20	luminosity
Magnets	Solenoids	beamline	broken	10	luminosity
Magnets	Corrs - can't tune around	beamline	broken	20	luminosity
Magnets	Kickers	beamline	broken	0	luminosity
PS + contr	Kicker pulser	beamline	broken	0	luminosity
PS + contr	Power supplies strings	beamline	broken	25	luminosity
PS + contr	PS Corrs can't tune around	beamline	broken	20	luminosity
PS + contr	Power supplies Trims	beamline	broken	20	luminosity
PS + contr	PS controller string	beamline	broken	25	luminosity

PS + contrc	PS controller - corr can't tune a	beamline	broken	40	luminosity
Water syste	Flow Switch - quads	beamline	broken	20	luminosity
Cryo	cryo vac enclosure	cryo segment	broken	0	luminosity
Vacuum	Vac Mech device	beamline	broken	2	luminosity
Vacuum	VacP	beamline	broken	20	luminosity
Vacuum	VacP power supply	beamline	broken	20	luminosity
Vacuum	VacV	beamline	broken	6	luminosity
Vacuum	VacV controller	beamline	broken	6	luminosity
Water syste	Water pumps	beamline	broken	6	luminosity
Water syste	Water instr	beamline	broken	18	luminosity
Water syste	Flow Switch	beamline	broken	18	luminosity
Diagnostic	BPMs	diagnostic	broken	30	luminosity
Diagnostic	laser wires	diagnostic	broken	0	luminosity
Diagnostic	wire scanners	diagnostic	broken	0	luminosity
Diagnostic	Kicker	diagnostic	broken	0	luminosity
Diagnostic	Kicker pulser	diagnostic	broken	0	luminosity
controls	controls backbone	sector	broken	1	luminosity
controls	timing	sector	broken	5	luminosity
controls	local backbone	sector	broken	30	luminosity
controls	Controls PPS	region	broken	1	luminosity
controls	MPS & FastFdbk	region	broken	1	luminosity
AC power	Electrical - .05<<0.5	Utility power	broken	10	luminosity
	e- linac	target2	Target itself, flux concentrator		
Magnets	Target	beamline	broken	1	luminosity
Magnets	spare target	beamline	broken	1	spare target
Vacuum	Vac Mech device	beamline	broken	1	luminosity
Magnets	Flux Concentrator	beamline	broken	1	luminosity
Magnets	Solenoids	beamline	broken	10	luminosity
PS + contrc	FC pulser	beamline	broken	1	luminosity
	e- linac	transport	long transport line from target across IP to e+ DF		
Magnets	Bends	beamline	broken	6	luminosity
Magnets	Quads	beamline	broken	50	luminosity
Magnets	Solenoids	beamline	broken	0	luminosity
Magnets	Undulators	beamline	broken	0	luminosity
Magnets	Kickers	beamline	broken	0	luminosity
Magnets	Corrs - can tune around	beamline	broken	50	luminosity
Magnets	quad or corr	beamline	retuned	50	luminosity
PS + contrc	Kicker pulser	beamline	broken	0	luminosity
PS + contrc	Power supplies strings	beamline	broken	31	luminosity
PS + contrc	PS Corrs can tune around	beamline	broken	50	luminosity
PS + contrc	Power supplies Trims	beamline	broken	0	luminosity
PS + contrc	PS controller string	beamline	broken	31	luminosity
PS + contrc	PS controller - corr can tune arc	beamline	broken	50	luminosity
Water syste	Flow Switch - quads	beamline	broken	50	luminosity
Cryo	cryo vac enclosure	cryo segment	broken	0	luminosity
Vacuum	Vac Mech device	beamline	broken	5	luminosity
Vacuum	VacP	beamline	broken	50	luminosity
Vacuum	VacP power supply	beamline	broken	151	luminosity
Vacuum	VacV	beamline	broken	152	luminosity
Vacuum	VacV controller	beamline	broken	152	luminosity
Water syste	Water pumps	beamline	broken	0	luminosity
Water syste	Water instr	beamline	broken	0	luminosity
Water syste	Flow Switch	beamline	broken	0	luminosity
Diagnostic	BPMs	diagnostic	broken	50	luminosity
Diagnostic	laser wires	diagnostic	broken	0	luminosity
Diagnostic	wire scanners	diagnostic	broken	1	luminosity

Diagnostic	Kicker	diagnostic	broken	0	luminosity
Diagnostic	Kicker pulser	diagnostic	broken	0	luminosity
controls	controls backbone	sector	broken	2	luminosity
controls	timing	sector	broken	1	luminosity
controls	local backbone	sector	broken	**5**	luminosity
controls	Controls PPS	region	broken	0	luminosity
controls	MPS & FastFdbk	region	broken	1	luminosity
AC power	Electrical>0.5	Utility power	broken	0	luminosity
AC power	Electrical - .05<<0.5	Utility power	broken	4	luminosity

add/ mult	degradati on	MTBF	MTTR	Still broken after	access needed ?	n repair people	rand seed	Starting MTBF	MTBF improveme nt factor
source									
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,99	1,0E+07	8		1	2		1,0E+07	1
mult	0,00	5,0E+05	0,5	movr or tri	-1	2		5,0E+05	1
mult	0,99	1,0E+50	2		1	2		1,0E+50	1
mult	0,00	3,4E+07	8		1	2		3,4E+07	1
mult	0,00	1,0E+05	8		1	2		1,0E+05	1
mult	0,00	1,0E+07	0,5	quad or co	-1	2		1,0E+07	1
mult	0,99	1,0E+50	2		1	2		1,0E+50	1
mult	0,00	3,5E+04	2		1	2		3,5E+04	1
mult	0,00	3,3E+06	4		-1	2		3,3E+06	1
mult	0,00	1,1E+06	0,5	quad or co	-1	1		1,1E+06	1
mult	0,99	1,1E+06	1		-1	1		1,1E+06	1
mult	0,00	3,3E+06	1		-1	1		3,3E+06	1
mult	0,00	3,3E+06	0,5	quad or co	-1	1		3,3E+06	1
mult	1,00	3,3E+06	1		-1	1		3,3E+06	1
mult	0,00	7,5E+06	1		1	1		7,5E+06	1
mult	0,00	1,0E+07	8		1	2		1,0E+07	1
mult	0,00	5,0E+05	8		1	2		5,0E+05	1
mult	1,00	1,0E+07	4		1	2		1,0E+07	1
mult	1,00	1,0E+05	1		-1	1		1,0E+05	1
mult	0,00	5,0E+06	4		1	2		5,0E+06	1
mult	0,00	9,5E+05	2		0	1		9,5E+05	1
mult	0,00	1,2E+05	4		-1	2		1,2E+05	1
mult	0,00	3,9E+05	2		-1	2		3,9E+05	1
mult	0,00	7,5E+06	1		-1	1		7,5E+06	1
mult	0,999	3,0E+05	1		-1	1		3,0E+05	1
mult	**0,99**	2,0E+04	2		-1	2		2,0E+04	1
mult	0,95	1,0E+05	2		1	2		1,0E+05	1
mult	0,95	1,0E+05	8		1	2		1,0E+05	1
mult	0,95	3,5E+04	2		1	2		3,5E+04	1
mult	0,00	3,0E+05	1		0	1		3,0E+05	1
mult	0,00	3,0E+05	1		0	1		3,0E+05	1
mult	0,00	1,0E+06	1		0	1		1,0E+06	1
mult	0,00	3,0E+05	1		0	1		3,0E+05	1
mult	0,00	3,0E+04	1		0	1		3,0E+04	1
mult	0,00	1,6E+06	4		0	2		1,6E+06	1
mult	0,00	1,6E+06	2		0	2		1,6E+06	1
e target									
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	1,0E+07	2		1	2		1,0E+07	1
mult	0,00	1,0E+05	8		1	2		1,0E+05	1
mult	0,00	3,5E+04	2		1	2		3,5E+04	1
mult	0,00	3,3E+06	4		-1	2		3,3E+06	1
mult	0,00	1,1E+06	2		-1	1		1,1E+06	1
mult	0,99	1,1E+06	1		-1	1		1,1E+06	1
mult	0,00	3,3E+06	1		-1	1		3,3E+06	1

mult	0,00	3,3E+06	1		-1	1	3,3E+06	1
mult	0,00	7,5E+06	1		1	1	7,5E+06	1
mult	0,00	1,0E+07	8		1	2	1,0E+07	1
mult	0,00	5,0E+05	8		1	2	5,0E+05	1
mult	1,00	1,0E+07	4		1	2	1,0E+07	1
mult	1,00	1,0E+05	1		-1	1	1,0E+05	1
mult	0,00	5,0E+06	4		1	2	5,0E+06	1
mult	0,00	9,5E+05	2		0	1	9,5E+05	1
mult	0,00	1,2E+05	4		-1	2	1,2E+05	1
mult	0,00	3,9E+05	2		-1	2	3,9E+05	1
mult	0,00	7,5E+06	1		-1	1	7,5E+06	1
mult	0,999	3,0E+05	1		-1	1	3,0E+05	1
mult	**0,99**	2,0E+04	2		-1	2	2,0E+04	1
mult	0,95	1,0E+05	2		1	2	1,0E+05	1
mult	0,95	1,0E+05	8		1	2	1,0E+05	1
mult	0,95	3,5E+04	2		1	2	3,5E+04	1
mult	0,00	3,0E+05	1		0	1	3,0E+05	1
mult	0,00	3,0E+05	1		0	1	3,0E+05	1
mult	0,00	1,0E+06	1		0	1	1,0E+06	1
mult	0,00	3,0E+05	1		0	1	3,0E+05	1
mult	0,00	3,0E+04	1		0	1	3,0E+04	1
mult	0,00	1,6E+06	2		0	2	1,6E+06	1
mult	0,00	4,4E+04	8	spare targ	-1	1	4,4E+04	1
add	-1,00	1,0E+50	336		-1	5	1,0E+50	1
mult	0,00	4,4E+04	8	**spare targ**	**0**	**1**	**4,4E+04**	1
mult	0,00	2,0E+07	8	spare targ	-1	1	2,0E+07	1
mult	0,00	2,0E+07	8	**spare targ**	**0**	**1**	2,0E+07	1
mult	0,00	3,5E+04	2		-1	2	3,5E+04	1

R including turn-arounds

mult	0,00	2,0E+07	8		1	2	2,0E+07	1
mult	0,00	2,0E+07	8		1	2	2,0E+07	1
mult	0,00	2,0E+07	8		1	2	2,0E+07	1
mult	0,00	3,4E+07	8		1	2	3,4E+07	1
mult	0,00	1,0E+05	8		1	2	1,0E+05	1
mult	0,00	1,0E+07	0,5	quad or co	-1	2	1,0E+07	1
mult	0,99	1,0E+50	2		1	2	1,0E+50	1
mult	0,00	3,5E+04	2		1	2	3,5E+04	1
mult	0,00	3,3E+06	4		-1	2	3,3E+06	1
mult	0,00	1,1E+06	0,5	quad or co	-1	1	1,1E+06	1
mult	0,99	1,1E+06	1		-1	1	1,1E+06	1
mult	0,00	3,3E+06	1		-1	1	3,3E+06	1
mult	0,00	3,3E+06	0,5	quad or co	-1	1	3,3E+06	1
mult	0,00	7,5E+06	1		1	1	7,5E+06	1
mult	0,00	1,0E+07	8		1	2	1,0E+07	1
mult	0,00	5,0E+05	8		1	2	5,0E+05	1
mult	1,00	1,0E+07	4		1	2	1,0E+07	1
mult	1,00	1,0E+05	1		-1	1	1,0E+05	1
mult	0,00	5,0E+06	4		1	2	5,0E+06	1
mult	0,00	9,5E+05	2		0	1	9,5E+05	1
mult	0,00	1,2E+05	4		-1	2	1,2E+05	1
mult	0,00	3,9E+05	2		-1	2	3,9E+05	1
mult	0,00	7,5E+06	1		-1	1	7,5E+06	1
mult	0,999	3,0E+05	1		-1	1	3,0E+05	1
mult	**0,99**	2,0E+04	2		-1	2	2,0E+04	1
mult	0,95	1,0E+05	2		1	2	1,0E+05	

mult	0,95	1,0E+05	8	1	2	1,0E+05	1
mult	0,95	3,5E+04	2	1	2	3,5E+04	1
mult	0,00	3,0E+05	1	0	1	3,0E+05	1
mult	0,00	3,0E+05	1	0	1	3,0E+05	1
mult	0,00	1,0E+06	1	0	1	1,0E+06	1
mult	0,00	3,0E+05	1	0	1	3,0E+05	1
mult	0,00	3,0E+04	1	0	1	3,0E+04	1
mult	0,00	1,6E+06	4	0	2	1,6E+06	1
mult	0,00	1,6E+06	2	0	2	1,6E+06	1

system	component name	subsys/segment	problem name	quantity	parameter effected	add/ mult
	e- linac	laser	RF for main e- linac conventional positron source including laser + RF gun + e- source laser and laser optics elements			
Diagnostic	laser	beamline	broken	1	luminosity	mult
PS + contrc	Laser PS	beamline	broken	2	luminosity	mult
Vacuum	Vac Mech device	beamline	broken	2	luminosity	mult
Vacuum	VacP	beamline	broken	5	luminosity	mult
Vacuum	VacP power supply	beamline	broken	5	luminosity	mult
Vacuum	VacV	beamline	broken	2	luminosity	mult
Vacuum	VacV controller	beamline	broken	2	luminosity	mult
controls	timing	beamline	broken	1	luminosity	mult
controls	other controls	beamline	broken	1	luminosity	mult
Water syste	Water pumps	beamline	broken	2	luminosity	mult
Water syste	Water instr	beamline	broken	6	luminosity	mult
Water syste	Flow Switch	beamline	broken	6	luminosity	mult
AC power	Electrical - >0.5	beamline	broken	0	luminosity	mult
AC power	Electrical - .05<<0.5	beamline	broken	5	luminosity	mult
	e- linac	gun	Components which are near the electrons			
Magnets	Corrs - can't tune arou	beamline	broken	4	luminosity	mult
PS + contrc	HVPS	beamline	broken	1	luminosity	mult
PS + contrc	HVPS controller	beamline	broken	1	luminosity	mult
PS + contrc	PS Corrs can't tune ar	beamline	broken	4	luminosity	mult
PS + contrc	PS controller - corr cai	beamline	broken	4	luminosity	mult
Vacuum	Vac Mech device	beamline	broken	1	luminosity	mult
Vacuum	VacP	beamline	broken	5	luminosity	mult
Vacuum	VacP power supply	beamline	broken	5	luminosity	mult
Vacuum	VacV	beamline	broken	2	luminosity	mult
Vacuum	VacV controller	beamline	broken	2	luminosity	mult
Diagnostic	BPMs	diagnostic	broken	4	luminosity	mult
controls	controls backbone	sector	broken	1	luminosity	mult
controls	local backbone	sector	broken	10	luminosity	mult
controls	Controls PPS	region	broken	2	luminosity	mult
controls	MPS & FastFdbk	region	broken	1	luminosity	mult
AC power	Electrical>0.5	Utility power	broken	1	luminosity	mult
AC power	Electrical - .05<<0.5	Utility power	broken	10	luminosity	mult
	e- linac	target1	beamline components up and downstream of the target			
Magnets	Bends	beamline	broken	1	luminosity	mult
Magnets	Quads	beamline	broken	20	luminosity	mult
Magnets	Corrs - can't tune arou	beamline	broken	20	luminosity	mult
Magnets	Wigglers	beamline	broken	0	luminosity	mult
Magnets	Kickers	beamline	broken	0	luminosity	mult
PS + contrc	Kicker pulser	beamline	broken	0	luminosity	mult
PS + contrc	Power supplies strings	beamline	broken	21	luminosity	mult
PS + contrc	PS Corrs can't tune ar	beamline	broken	20	luminosity	mult
PS + contrc	PS controller string	beamline	broken	21	luminosity	mult
PS + contrc	PS controller - corr cai	beamline	broken	20	luminosity	mult
Water syste	Flow Switch - quads	beamline	broken	20	luminosity	mult
Cryo	cryo vac enclosure	cryo segment	broken	0	luminosity	mult
Vacuum	Vac Mech device	beamline	broken	2	luminosity	mult
Vacuum	VacP	beamline	broken	20	luminosity	mult
Vacuum	VacP power supply	beamline	broken	20	luminosity	mult
Vacuum	VacV	beamline	broken	6	luminosity	mult
Vacuum	VacV controller	beamline	broken	6	luminosity	mult

Water syste	Water pumps	beamline	broken	6	luminosity		mult
Water syste	Water instr	beamline	broken	18	luminosity		mult
Water syste	Flow Switch	beamline	broken	18	luminosity		mult
Diagnostic	BPMs	diagnostic	broken	30	luminosity		mult
Diagnostic	laser wires	diagnostic	broken	0	luminosity		mult
Diagnostic	wire scanners	diagnostic	broken	0	luminosity		mult
Diagnostic	Kicker	diagnostic	broken	0	luminosity		mult
Diagnostic	Kicker pulser	diagnostic	broken	0	luminosity		mult
controls	controls backbone	sector	broken	1	luminosity		mult
controls	timing	sector	broken	5	luminosity		mult
controls	local backbone	sector	broken	30	luminosity		mult
controls	Controls PPS	region	broken	1	luminosity		mult
controls	MPS & FastFdbk	region	broken	1	luminosity		mult
AC power	Electrical - .05<<0.5	Utility power	broken	10	luminosity		mult
	e- linac	target2	Target itself, flux concentrator				
Magnets	Target	beamline	broken	1	luminosity		mult
Magnets	spare target	beamline	broken	1	spare target		add
Vacuum	Vac Mech device	beamline	broken	1	luminosity		mult
Magnets	Flux Concentrator	beamline	broken	1	luminosity		mult
Magnets	Solenoids	beamline	broken	10	luminosity		mult
PS + contro	FC pulser	beamline	broken	1	luminosity		mult

degradation	MTBF	MTTR	Still broken after	access needed?	n repair people	rand seed	Starting MTBF	MTBF improvement factor

degradation	MTBF	MTTR	Still broken after	access needed?	n repair people	rand seed	Starting MTBF	MTBF improvement factor

Table:

degradation	MTBF	MTTR	Still broken after	access needed?	n repair people	rand seed	Starting MTBF	MTBF improvement factor
+ buncher + target + accel to 250 MeV except for cold RF								
0,00	2,0E+04	2		-1	2		2,0E+04	1
0,00	3,3E+06	2		-1	2		3,3E+06	1
0,00	5,0E+05	8		1	2		5,0E+05	1
1,00	1,0E+07	4		1	2		1,0E+07	1
1,00	1,0E+05	1		-1	1		1,0E+05	1
0,00	5,0E+06	4		1	2		5,0E+06	1
0,00	9,5E+05	2		0	1		9,5E+05	1
0,00	3,0E+05	1		0	1		3,0E+05	1
0,00	3,0E+05	1		-1	1		3,0E+05	1
0,00	1,2E+05	4		-1	2		1,2E+05	1
0,00	3,9E+05	2		-1	2		3,9E+05	1
0,00	7,5E+06	1		-1	1		7,5E+06	1
0,00	1,6E+06	4		0	2		1,6E+06	1
0,00	1,6E+06	2		0	2		1,6E+06	1
								1
0,00	1,0E+07	2		1	2		1,0E+07	1
0,00	3,3E+06	2		1	2		3,3E+06	1
0,00	3,3E+06	1		-1	1		3,3E+06	1
0,00	1,1E+06	2		-1	1		1,1E+06	1
0,00	3,3E+06	1		-1	1		3,3E+06	1
0,00	5,0E+05	8		1	2		5,0E+05	1
1,00	1,0E+07	4		1	2		1,0E+07	1
1,00	1,0E+05	1		-1	1		1,0E+05	1
0,00	5,0E+06	4		1	2		5,0E+06	1
0,00	9,5E+05	2		0	1		9,5E+05	1
0,999	3,0E+05	1		-1	1		3,0E+05	1
0,00	3,0E+05	1		0	1		3,0E+05	1
0,00	1,0E+06	1		0	1		1,0E+06	1
0,00	3,0E+05	1		0	1		3,0E+05	1
0,00	3,0E+04	1		0	1		3,0E+04	1
0,00	1,6E+06	4		0	2		1,6E+06	1
0,00	1,6E+06	2		0	2		1,6E+06	1
b								
0,00	2,0E+07	8		1	2		2,0E+07	1
0,00	2,0E+07	8		1	2		2,0E+07	1
0,00	1,0E+07	2		1	2		1,0E+07	1
0,00	3,4E+07	8		1	2		3,4E+07	1
0,00	1,0E+05	8		1	2		1,0E+05	1
0,00	3,5E+04	2		1	2		3,5E+04	1
0,00	3,3E+06	4		-1	2		3,3E+06	1
0,00	1,1E+06	2		-1	1		1,1E+06	1
0,00	3,3E+06	1		-1	1		3,3E+06	1
0,00	3,3E+06	1		-1	1		3,3E+06	1
0,00	7,5E+06	1		1	1		7,5E+06	1
0,00	1,0E+07	8		1	2		1,0E+07	1
0,00	5,0E+05	8		1	2		5,0E+05	1
1,00	1,0E+07	4		1	2		1,0E+07	1
1,00	1,0E+05	1		-1	1		1,0E+05	1
0,00	5,0E+06	4		1	2		5,0E+06	1
0,00	9,5E+05	2		0	1		9,5E+05	1

0,00	1,2E+05	4	-1	2	1,2E+05	1
0,00	3,9E+05	2	-1	2	3,9E+05	1
0,00	7,5E+06	1	-1	1	7,5E+06	1
0,999	3,0E+05	1	-1	1	3,0E+05	1
0,99	2,0E+04	2	-1	2	2,0E+04	1
0,95	1,0E+05	2	1	2	1,0E+05	1
0,95	1,0E+05	8	1	2	1,0E+05	1
0,95	3,5E+04	2	1	2	3,5E+04	1
0,00	3,0E+05	1	0	1	3,0E+05	1
0,00	3,0E+05	1	0	1	3,0E+05	1
0,00	1,0E+06	1	0	1	1,0E+06	1
0,00	3,0E+05	1	0	1	3,0E+05	1
0,00	3,0E+04	1	0	1	3,0E+04	1
0,00	1,6E+06	2	0	2	1,6E+06	1
0,00	4,4E+04	8 spare targ	-1	1	4,4E+04	1
-1,00	1,0E+50	336	-1	5	1,0E+50	1
0,00	4,4E+04	**8 spare targ**	**0**	**1**	**4,4E+04**	1
0,00	2,0E+07	8 spare targ	-1	1	2,0E+07	1
0,00	2,0E+07	**8 spare targ**	**0**	**1**	2,0E+07	1
0,00	3,5E+04	2	-1	2	3,5E+04	1

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	system	component name	subsys/segment	problem name	quantity	parameter effected	add/mult	degradation	MTBF	MTTR	Still broken after repair	access needed?	n repair people	rand seed	Starting MTBF	MTBF improvement factor
2				RF for main e- linac												
3		e- linac		non-RF components for 5-6 GeV linac												
4	Magnets	Bends	beamline	broken	32	luminosity	mult	0,00	2,0E+07	8		1	2		2,0E+07	1
5	Magnets	Quads	beamline	broken	130	luminosity	mult	0,00	2,0E+07	8		1	2		2,0E+07	1
6	Magnets	Solenoids	beamline	broken	4	luminosity	mult	0,00	2,0E+07	8		1	2		2,0E+07	1
7	Magnets	Quad/Sext trims	beamline	broken	72	luminosity	mult	0,99	1,0E+07	8		1	2		1,0E+07	1
8	Magnets	quad or corr	beamline	retuned	1	luminosity	mult	0,99	1,0E+50	2		1	2		1,0E+50	1
9	Magnets	Corrs - can tune around	beamline	broken	130	luminosity	mult	0,00	1,0E+07	0,5	quad or corr	-1	2		1,0E+07	1
10	Magnets	Wigglers	beamline	broken	0	luminosity	mult	0,00	3,4E+07	8		1	2		3,4E+07	1
11	Magnets	Kickers	beamline	broken	0	luminosity	mult	0,00	1,0E+05	8		1	2		1,0E+05	1
12	PS + controllers	Kicker pulser	beamline	broken	0	luminosity	mult	0,00	3,5E+04	2		1	2		3,5E+04	1
13	PS + controllers	Power supplies strings	beamline	broken	7	luminosity	mult	0,00	3,3E+06	4		-1	2		3,3E+06	1
14	PS + controllers	PS Corrs can tune around	beamline	broken	130	luminosity	mult	0,00	1,1E+06	0,5	quad or corr	-1	1		1,1E+06	1
15	PS + controllers	Power supplies Trims	beamline	broken	72	luminosity	mult	0,99	1,1E+06	1		-1	1		1,1E+06	1
16	PS + controllers	PS controller string	beamline	broken	7	luminosity	mult	0,00	3,3E+06	1		-1	1		3,3E+06	1
17	PS + controllers	PS controller - corr can tune around	beamline	broken	202	luminosity	mult	0,00	3,3E+06	0,5	quad or corr	-1	1		3,3E+06	1
18	Water system	Flow Switch - quads	beamline	broken	20	luminosity	mult	0,00	7,5E+06	1		1	1		7,5E+06	1
19	Cryo	cryo vac enclosure	cryo segme	broken	1	luminosity	mult	0,00	1,0E+07	8		1	2		1,0E+07	1
20	Vacuum	Vac Mech device	beamline	broken	2	luminosity	mult	0,00	5,0E+05	8		1	2		5,0E+05	1
21	Vacuum	VacP	beamline	broken	100	luminosity	mult	1,00	1,0E+07	4		1	2		1,0E+07	1
22	Vacuum	VacP power supply	beamline	broken	20	luminosity	mult	1,00	1,0E+05	1		-1	1		1,0E+05	1
23	Vacuum	VacV	beamline	broken	6	luminosity	mult	0,00	5,0E+06	4		1	2		5,0E+06	1
24	Vacuum	VacV controller	beamline	broken	6	luminosity	mult	0,00	9,5E+05	2		0	1		9,5E+05	1
25	Water system	Water pumps	beamline	broken	6	luminosity	mult	0,00	1,2E+05	4		-1	2		1,2E+05	1
26	Water system	Water instr	beamline	broken	18	luminosity	mult	0,00	3,9E+05	2		-1	2		3,9E+05	1
27	Water system	Flow Switch	beamline	broken	18	luminosity	mult	0,00	7,5E+06	1		-1	1		7,5E+06	1
28	Diagnostic	BPMs	diagnostic	broken	154	luminosity	mult	0,999	3,0E+05	1		-1	1		3,0E+05	1
29	Diagnostic	laser wires	diagnostic	broken	0	luminosity	mult	**0,99**	2,0E+04	2		-1	2		2,0E+04	1
30	Diagnostic	wire scanners	diagnostic	broken	9	luminosity	mult	0,95	1,0E+05	2		1	2		1,0E+05	1
31	Diagnostic	Kicker	diagnostic	broken	1	luminosity	mult	0,95	1,0E+05	8		1	2		1,0E+05	1
32	Diagnostic	Kicker pulser	diagnostic	broken	1	luminosity	mult	0,95	3,5E+04	2		1	2		3,5E+04	1
33	controls	controls backbone	sector	broken	1	luminosity	mult	0,00	3,0E+05	1		0	1		3,0E+05	1
34	controls	timing	sector	broken	1	luminosity	mult	0,00	3,0E+05	1		0	1		3,0E+05	1
35	controls	local backbone	sector	broken	50	luminosity	mult	0,00	1,0E+06	1		0	1		1,0E+06	1
36	controls	Controls PPS	region	broken	3	luminosity	mult	0,00	3,0E+05	1		0	1		3,0E+05	1
37	controls	MPS & FastFdbk	region	broken	1	luminosity	mult	0,00	3,0E+04	1		0	1		3,0E+04	1
38	AC power	Electrical - .05<<0.5	Utility powe	broken	30	luminosity	mult	0,00	1,6E+06	2		0	2		1,6E+06	1

Cell: E4
Comment: M. Ross:
three bend strings

Cell: E5
Comment: M. Ross:
mdw deck has 251 quad entries with 9 singles and 242 doubles
Even though the linac is about 3 x longer leave the number of quads since there will be few per cryomodule - most are in the xport anyway

Cell: E7
Comment: M. Ross:
one per bend and one for each of 40 quads
!!! Includes BEND trims !!!

Cell: E9
Comment: jnelson:
only 16 in deck, probably 10-15% low, all magnets on movers instead… 16 mainly for feedbacks

Cell: E11
Comment: nan: paired extraction kicker, only 1 input kicker

Cell: B12
Comment: Marc Ross:
includes dumper magnets

Cell: E13
Comment: M. Ross:
3 bend strings
4 quad strings downstream linac

Cell: E15
Comment: M. Ross:
one per bend and one for each of 40 quads

Cell: E18
Comment: MCR: 1/ 10 m, about 2 girders

Cell: B19
Comment: Marc Ross:
larger problem with cryo segment (4 cryo units in e-linac)

Cell: E21
Comment: nan: scaled from cold dr # by length
Nan's number is too small - should be 1/2m or 100 for inj xport

Cell: E22
Comment: nan: scaled from cold dr # by length
gang pumps /5 mcr

Cell: E25
Comment: MCR: WAG

Cell: E28
Comment: MCR: number in MDW deck; Nan
"Sext, and Wiggler magnet, plus 10 for circum chicane, misc"

Cell: B31
Comment: Marc Ross:
includes dumper magnets

Cell: B32
Comment: Marc Ross:
includes dumper magnets

Cell: B35
Comment: Marc Ross:
Low level controls module

Cell: E35
Comment: Nan Phinney:
1/10 magnets
or 1/rf unit + 1/10 mag sys outside linac

Cell: B36
Comment: Marc Ross: basic
segmentation (number of principal access shafts/ramps

Cell: B37
Comment: Marc Ross:
segments - dumper spacing

Cell: E38
Comment: MCR: includes 1/Quad string=nFS
1/water pump struc
1/sector

system	component name	subsys/segment	problem name	quantity	parameter effected	add/ mult	degrad ation	MTBF	MTTR	Still broken after repair
			RF for main e- linac							
	e- linac		Damping ring non-energy producing components							
Magnets	Bends	beamline	broken	216	luminosity	mult	0,00	2,0E+07	8	
Magnets	Quads	beamline	broken	849	luminosity	mult	0,00	2,0E+07	8	
Magnets	Sextupoles	beamline	broken	312	luminosity	mult	0,00	2,0E+07	8	
Magnets	Quad/Sext trims	beamline	broken	892	luminosity	mult	0,99	1,0E+07	8	
Magnets	movr or trim	beamline	retuned	892	luminosity	mult	0,99	1,0E+50	2	
Magnets	Corrs - can tune aroun	beamline	broken	629	luminosity	mult	0,00	1,0E+07	0,5	quad or corr
Magnets	quad or corr	beamline	retuned	629	luminosity	mult	0,99	1,0E+50	2	
Magnets	Wigglers	beamline	broken	90	luminosity	mult	0,00	3,4E+07	8	
Magnets	Kickers - injection	beamline	broken	21	e- linac inj kick	add	-0,03	1,0E+05	8	
PS + controllers	Kicker pulser - inj	beamline	broken	21	e- linac inj kick	add	-0,03	3,5E+04	2	
Magnets	Kickers - extraction	beamline	broken	21	e- linac ext kick	add	-0,03	1,0E+05	8	
PS + controllers	Kicker pulser - ext	beamline	broken	21	e- linac ext kick	add	-0,03	3,5E+04	2	
PS + controllers	Power supplies strings	beamline	broken	36	luminosity	mult	0,00	3,3E+06	4	
PS + controllers	Power supplies individ	beamline	broken	0	luminosity	mult	0,00	3,3E+06	2	
PS + controllers	PS Corrs can tune aro	beamline	broken	629	luminosity	mult	0,00	1,1E+06	0,5	quad or corr
PS + controllers	Power supplies Trims	beamline	broken	892	luminosity	mult	0,99	1,1E+06	1	
PS + controllers	PS controller string	beamline	broken	36	luminosity	mult	0,00	3,3E+06	1	
PS + controllers	PS controller - corr car	beamline	broken	1521	luminosity	mult	0,00	3,3E+06	0,5	quad or corr
Water system	Flow Switch - quads	beamline	broken	350	luminosity	mult	0,00	7,5E+06	1	
Vacuum	Vac Mech device	beamline	broken	4	luminosity	mult	0,00	5,0E+05	8	
Vacuum	VacP	beamline	broken	2048	luminosity	mult	1,00	1,0E+07	4	
Vacuum	VacP power supply	beamline	broken	2048	luminosity	mult	1,00	1,0E+05	1	
Vacuum	VacV	beamline	broken	85	luminosity	mult	0,00	5,0E+06	4	
Vacuum	VacV controller	beamline	broken	85	luminosity	mult	0,00	9,5E+05	2	
Water system	Water pumps	beamline	broken	6	luminosity	mult	0,00	1,2E+05	4	
Water system	Water instr	beamline	broken	18	luminosity	mult	0,00	3,9E+05	2	
Water system	Flow Switch	beamline	broken	18	luminosity	mult	0,00	7,5E+06	1	
Diagnostic	BPMs	diagnostic	broken	1251	luminosity	mult	0,999	3,0E+05	1	
Diagnostic	laser wires	diagnostic	broken	2	luminosity	mult	0,95	2,0E+04	2	
Diagnostic	wire scanners	diagnostic	broken	0	luminosity	mult	0,95	1,0E+05	2	
Diagnostic	Kicker	diagnostic	broken	0	luminosity	mult	0,95	1,0E+05	8	
Diagnostic	Kicker pulser	diagnostic	broken	0	luminosity	mult	0,95	3,5E+04	2	

	e- linac				Damping ring RF components				
RF structure	Cavities	cavity	broken	12	energy overhead e- linac	add	**-4,50**	1,0E+08	672
RF structure	LLRF	cavity	broken	12	energy overhead e- linac	add	**-4,50**	3,0E+05	1
RF structure	power coupler	coupler	broken	12	energy overhead e- linac	add	**-18,00**	1,0E+07	16
RF structure	coupler interlock sensc	coupler	broken	12	energy overhead e- linac	add	**-18,00**	5,0E+06	1
RF structure	coupler interlock electr	coupler	broken	12	energy overhead e- linac	add	**-18,00**	1,0E+06	1
RF structure	VacP	coupler	broken	24	energy overhead e- linac	add	**-18,00**	1,0E+07	4
RF structure	VacP power supply	coupler	broken	24	energy overhead e- linac	add	**-18,00**	1,0E+05	1
Cryo	insulating vacuumP	cryo module	leak	1	energy overhead e- linac	add	**-18,00**	1,0E+05	8
Cryo	cryo vac enclosure	cryo module	broken	1	energy overhead e- linac	add	**-18,00**	1,0E+07	8
RF power sources	Klystron 10MW	klystron	broken	3	energy overhead e- linac	add	**-18,00**	4,0E+04	8
RF power sources	Klys Power supply	klystron	broken	3	energy overhead e- linac	add	-18,00	5,0E+04	4
RF power sources	klys pre-amp	klystron	broken	3	energy overhead e- linac	add	**-18,00**	1,0E+05	1
RF power sources	VacG/Ctrl	klystron	broken	3	energy overhead e- linac	add	**-18,00**	4,7E+05	1
RF power sources	VacP	klystron	broken	6	energy overhead e- linac	add	**-18,00**	1,0E+07	8
RF power sources	VacP power supply	klystron	broken	6	energy overhead e- linac	add	**-18,00**	1,0E+05	1
controls	timing	klystron	broken	3	energy overhead e- linac	add	**-18,00**	3,0E+05	1
controls	other controls	klystron	broken	9	energy overhead e- linac	add	**-18,00**	3,0E+05	1
Water system	Water pumps	klystron	broken	3	energy overhead e- linac	add	**-18,00**	1,2E+05	4
Water system	Water instr	klystron	broken	9	energy overhead e- linac	add	**-18,00**	3,9E+05	2
Water system	Flow Switch	klystron	broken	9	energy overhead e- linac	add	**-18,00**	7,5E+06	1
AC power	Electrical - >0.5	klystron	broken	3	energy overhead e- linac	add	**-18,00**	1,6E+06	4
AC power	Electrical - .05<<0.5	klystron	broken	3	energy overhead e- linac	add	**-18,00**	1,6E+06	2
AC power	Electrical - .05<<0.5	Utility power	broken	200	luminosity	mult	0,00	1,6E+06	2
controls	controls backbone	sector	broken	3	luminosity	mult	0,00	3,0E+05	1
controls	timing	sector	broken	3	luminosity	mult	0,00	3,0E+05	1
controls	local backbone	sector	broken	200	luminosity	mult	0,00	1,0E+06	1
controls	Controls PPS	region	broken	2	luminosity	mult	0,00	3,0E+05	1
controls	MPS & FastFdbk	region	broken	2	luminosity	mult	0,00	3,0E+04	1

access needed?	n repair people	rand seed	Starting MTBF	MTBF improvement factor
1	2		2,0E+07	1
1	2		2,0E+07	1
1	2		2,0E+07	1
1	2		1,0E+07	1
1	2		1,0E+50	1
-1	2		1,0E+07	1
1	2		1,0E+50	1
1	2		3,4E+07	1
1	2		1,0E+05	1
1	2		3,5E+04	1
1	2		1,0E+05	1
1	2		3,5E+04	1
-1	2		3,3E+06	1
-1	2		3,3E+06	1
-1	1		1,1E+06	1
-1	1		1,1E+06	1
-1	1		3,3E+06	1
-1	1		3,3E+06	1
1	1		7,5E+06	1
1	2		5,0E+05	1
1	2		1,0E+07	1
-1	1		1,0E+05	1
1	2		5,0E+06	1
0	1		9,5E+05	1
-1	2		1,2E+05	1
-1	2		3,9E+05	1
-1	1		7,5E+06	1
-1	1		3,0E+05	1
-1	2		2,0E+04	1
1	2		1,0E+05	1
1	2		1,0E+05	1
1	2		3,5E+04	1

1	2	1,0E+08	1
-1	1	3,0E+05	1
1	2	1,0E+07	1
1	1	5,0E+06	1
-1	1	1,0E+06	1
1	2	1,0E+07	1
-1	1	1,0E+05	1
1	2	1,0E+05	1
1	2	1,0E+07	1
-1	2	4,0E+04	1
-1	2	5,0E+04	1
-1	1	1,0E+05	1
-1	1	4,7E+05	1
-1	2	1,0E+07	1
-1	1	1,0E+05	1
-1	1	3,0E+05	1
-1	1	3,0E+05	1
-1	2	1,2E+05	1
-1	2	3,9E+05	1
-1	1	7,5E+06	1
0	2	1,6E+06	1
0	2	1,6E+06	1
0	2	1,6E+06	1
0	1	3,0E+05	1
0	1	3,0E+05	1
0	1	1,0E+06	1
0	1	3,0E+05	1
0	1	3,0E+04	1

system	component name	subsys/segment	problem name	quantity	parameter effected	add/mult	degradation	MTBF	MTTR	Still broken after	access needed?	n repair people
			RF for main e- linac									
	e- linac		Non energy producing components along the full length of the linac.									
Magnets	Quads SC	beamline	broken	253	luminosity	mult	0,00	3,0E+07	**2**	**quad or c**	**0**	2
Magnets	Corrs - can tune arour	beamline	broken	379	luminosity	mult	0,00	1,0E+07	0,5	quad or cc	-1	2
Magnets	quad or corr	beamline	retuned	632	luminosity	mult	0,99	1,0E+50	2		1	2
PS + contrc	PS - quad can tune ar	beamline	broken	253	luminosity	mult	0,00	3,3E+06	2	quad or cc	-1	2
PS + contrc	PS Corrs can tune aro	beamline	broken	379	luminosity	mult	0,00	1,1E+06	0,5	quad or cc	-1	1
PS + contrc	PS controller - quad c	beamline	broken	253	luminosity	mult	0,00	3,3E+06	1	quad or cc	-1	1
PS + contrc	PS controller - corr ca	beamline	broken	379	luminosity	mult	0,00	3,3E+06	0,5	quad or cc	-1	1
Vacuum	Vac Mech device	beamline	broken	6	luminosity	mult	0,00	5,0E+05	8		1	2
Vacuum	VacV	beamline	broken	70	luminosity	mult	0,00	5,0E+06	4		1	2
Vacuum	VacV controller	beamline	broken	70	luminosity	mult	0,00	9,5E+05	2		0	1
Water syste	Water pumps	beamline	broken	3	luminosity	mult	0,00	1,2E+05	4		-1	2
Water syste	Water instr	beamline	broken	9	luminosity	mult	0,00	3,9E+05	2		-1	2
Water syste	Flow Switch	beamline	broken	9	luminosity	mult	0,00	7,5E+06	1		-1	1
Cryo	cryo vac enclosure	cryo segment	broken	4	luminosity	mult	0,00	1,0E+07	8		1	2
Diagnostic	BPMs	diagnostic	broken	300	luminosity	mult	0,999	3,0E+05	1		-1	1
Diagnostic	laser wires	diagnostic	broken	12	luminosity	mult	0,95	2,0E+04	2		-1	2
Diagnostic	wire scanners	diagnostic	broken	12	luminosity	mult	**0,99**	1,0E+05	2		1	2
Diagnostic	Kicker	diagnostic	broken	1	luminosity	mult	0,95	1,0E+05	8		1	2
Diagnostic	Kicker pulser	diagnostic	broken	1	luminosity	mult	0,95	3,5E+04	2		1	2
AC power	Electrical - .05<<0.5	Utility power	broken	150	luminosity	mult	0,00	1,6E+06	2		0	2
controls	controls backbone	sector	broken	50	luminosity	mult	0,00	3,0E+05	1		0	1
controls	timing	sector	broken	50	luminosity	mult	0,00	3,0E+05	1		0	1
controls	local backbone	sector	broken	305	luminosity	mult	0,00	1,0E+06	1		0	1
controls	Controls PPS	region	broken	5	luminosity	mult	0,00	3,0E+05	1		0	1
controls	MPS & FFWD	region	broken	2	luminosity	mult	0,00	3,0E+04	1		0	1

system	component name	subsys/segment	problem name	quantity	parameter effected
			RF for main e- linac		
	e- linac		Non energy producing components of the beam		
Magnets	Bends	beamline	broken	83	luminosity
Magnets	Quads	beamline	broken	119	luminosity
Magnets	Quads SC	beamline	broken	8	luminosity
Magnets	Sextupoles	beamline	broken	3	luminosity
Magnets	Sextupoles SC	beamline	broken	2	luminosity
Magnets	Octupoles	beamline	broken	8	luminosity
Magnets	Quad/Sext trims	beamline	broken	36	luminosity
Magnets	Q/S Movers	beamline	broken	132	luminosity
Magnets	movr or trim	beamline	retuned	132	luminosity
Magnets	Kickers	beamline	broken	0	luminosity
Magnets	Corrs - can't tune around	beamline	broken	16	luminosity
PS + contro	Kicker pulser	beamline	broken	0	luminosity
PS + contro	Power supplies strings	beamline	broken	8	luminosity
PS + contro	Power supplies individual	beamline	broken	94	luminosity
PS + contro	PS Corrs can't tune around	beamline	broken	16	luminosity
PS + contro	Power supplies Trims	beamline	broken	36	luminosity
PS + contro	PS controller string	beamline	broken	102	luminosity
PS + contro	PS controller - corr can't tune ar	beamline	broken	52	luminosity
PS + contro	mover controller	beamline	broken	396	luminosity
Water syste	Flow Switch - quads	beamline	broken	7	luminosity
Vacuum	Vac Mech device	beamline	broken	18	luminosity
Vacuum	VacP	beamline	broken	26	luminosity
Vacuum	VacP power supply	beamline	broken	6	luminosity
Vacuum	VacV	beamline	broken	26	luminosity
Vacuum	VacV controller	beamline	broken	26	luminosity
Water syste	Water pumps	beamline	broken	11	luminosity
Water syste	Water instr	beamline	broken	33	luminosity
Water syste	Flow Switch	beamline	broken	33	luminosity
Diagnostic	BPMs	diagnostic	broken	120	luminosity
Diagnostic	laser wires	diagnostic	broken	6	luminosity
Diagnostic	wire scanners	diagnostic	broken	6	luminosity
Diagnostic	Kicker	diagnostic	broken	3	luminosity
Diagnostic	Kicker pulser	diagnostic	broken	3	luminosity
controls	controls backbone	sector	broken	3	luminosity
controls	timing	sector	broken	3	luminosity
controls	local backbone	sector	broken	20	luminosity
controls	Controls PPS	region	broken	1	luminosity
controls	MPS & FastFdbk	region	broken	10	luminosity
AC power	Electrical>0.5	Utility power	broken	11	luminosity
AC power	Electrical - .05<<0.5	Utility power	broken	21	luminosity

add/ mult	degradati on	MTBF	MTTR	Still broken after	access needed ?	n repair people	rand seed	Starting MTBF	MTBF improveme nt factor
delivery system									
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	3,0E+07	672		1	2		3,0E+07	1
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,00	3,0E+07	672		1	2		3,0E+07	1
mult	0,00	2,0E+07	8		1	2		2,0E+07	1
mult	0,99	1,0E+07	8		1	2		1,0E+07	1
mult	0,00	5,0E+05	0,5	movr or tri	-1	2		5,0E+05	1
mult	0,99	1,0E+50	2		1	2		1,0E+50	1
mult	0,00	1,0E+05	8		1	2		1,0E+05	1
mult	0,00	1,0E+07	2		1	2		1,0E+07	1
mult	0,00	3,5E+04	2		1	2		3,5E+04	1
mult	0,00	3,3E+06	4		-1	2		3,3E+06	1
mult	0,00	3,3E+06	2		-1	2		3,3E+06	1
mult	0,00	1,1E+06	2		-1	1		1,1E+06	1
mult	0,99	1,1E+06	1		-1	1		1,1E+06	1
mult	0,00	3,3E+06	1		-1	1		3,3E+06	1
mult	0,00	3,3E+06	1		-1	1		3,3E+06	1
mult	1,00	3,3E+06	1		-1	1		3,3E+06	1
mult	0,00	7,5E+06	1		1	1		7,5E+06	1
mult	0,00	5,0E+05	8		1	2		5,0E+05	1
mult	1,00	1,0E+07	4		1	2		1,0E+07	1
mult	1,00	1,0E+05	1		-1	1		1,0E+05	1
mult	0,00	5,0E+06	4		1	2		5,0E+06	1
mult	0,00	9,5E+05	2		0	1		9,5E+05	1
mult	0,00	1,2E+05	4		-1	2		1,2E+05	1
mult	0,00	3,9E+05	2		-1	2		3,9E+05	1
mult	0,00	7,5E+06	1		-1	1		7,5E+06	1
mult	0,999	3,0E+05	1		-1	1		3,0E+05	1
mult	0,95	2,0E+04	2		-1	2		2,0E+04	1
mult	**0,99**	1,0E+05	2		1	2		1,0E+05	1
mult	0,95	1,0E+05	8		1	2		1,0E+05	1
mult	0,95	3,5E+04	2		1	2		3,5E+04	1
mult	0,00	3,0E+05	1		0	1		3,0E+05	1
mult	0,00	3,0E+05	1		0	1		3,0E+05	1
mult	0,00	1,0E+06	1		0	1		1,0E+06	1
mult	0,00	3,0E+05	1		0	1		3,0E+05	1
mult	0,00	3,0E+04	1		0	1		3,0E+04	1
mult	0,00	1,6E+06	4		0	2		1,6E+06	1
mult	0,00	1,6E+06	2		0	2		1,6E+06	1

system	component name	subsys/segment	problem name	quantity	parameter effected
	e- linac		RF for main e- linac For now, the IP has very little in it because it is a		
PS + contro	Power supplies - bend	beamline	broken	1	luminosity

add/ mult	degradation	MTBF	MTTR	Still broken after	access needed ?	n repair people	rand seed	Starting MTBF	MTBF improvement factor
all included in the BDS. May want to separate it out later if can have tuneup dump just outside the IP.									
mult	0,00	3,3E+06	2		-1	2		3,3E+06	1

.
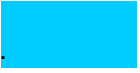
The e injector deck from MDW is for the warm machine
To make it consistent with the cold machine:
lower the gradient and paste in cold linac stuff
add another 3 GeV to make a total of 5 GeV
old warm 2 GeV linac length was 160 m; new is ccavity_length * ncav *fill factor- 1.3(1.038*175 =)
warm total injector was 355 m - subtract 160m to get xport length = 195
set linac length and scale number of quads - maybe the number of quads is the same, since the spa
assume the transport is the same

2%overhead - needs to be coded somehow
Maybe this is not important. It seems that each tube delivers about 900MeV in the cold technology s
There should be 1 initial tube without which the system does not work. Since this tube will produce a

230 BPMs total

no correctors under magnets? - cuz if they break we don't care?

Long XPORT
1 low energy Q/10m
30km long
1 corr/Q

BDS
mdw says only these counts are correct: bend, quads, sext, octu   not tracking
ebds1 from Woodley - 1 IR with 20 mr xing angle   only probab
119 quads (238 lines in mad deck/2)   two of the s
12 lines for ecol - all have unique names - prot collimators   will octupol
7 xcors (just the ones MDW knows about) - 6 FB, 1 IR
5 INSTs (instruments, phasemon, fbk things)
120 BPMs
8 octupoles
83 bends
5 sextupoles
9 ycors (undercounted, obviously)
6 wires

2 stage BC counts from PT
544 SC structs in 68 modules, 8 struct per   how to dea
118 quads - 68 SC in modules, rest room temp
40 Bends (2 strings? - 29 & 11) - room temp
118xcor, 118 ycors, 68 of each in modules, rest room temp
16 small corr quads for x&y disp correction, but not in deck yet
N.B. 2stage BC accelerates from 5 to 10 GeV - need to reduce linac parts
1468 m long

need to fix region names for 4 sheets

acing is greater.

so there are 7 or 8 for the 5 GeV linac and one more for the 6 GeV drive linac.
a 500MeV beam, it is easy to imagine that all the rest are exchange-able.

ʝ fs/bend?
ɔly 1 or 2 strings, rest are individual supplies?
sextupoles are superconducting…
es have trims?

l with linac energy tweaking?

Assumptions made about how the ILC will be implemented that effect this availability calculation
Lasers for laser wires are accessible in all cases
Power supplies have MTBF of 2E5 hours which is what was calculated for the DESY redundant supply and is
There is a dump and shielding between each region such that beam can be in a region and people in the region
All locations where a single klystron failure would cause downtime (e.g. crab cavities, e- injector, first few GeV of
main linac) have hot spare klystron and modulator with remotely controlled waveguide switches
Corrector supplies and controllers are packaged 1 per swappable unit, not the 16 which is often used at SLAC.
Timing channels are fanned out in modules that go from 1 to 16 outputs as was done for SLC. Hence they are not
There are high power waveguide valves that allow one to safely change a klystron without being exposed to RF
low scale redundancy (such as 4 of 5 regulators in a power supply) is not explicitly modelled. Just a higher MTBF
is used. If it is not hot swappable then more repair people are needed when the accel is down to handle replacing
the bad modules. Also the correct MTBF for a redundant item in the accel tunnel will be much shorter than that for
failures of individual movers and many correctors can be tuned around with minimal luminosity loss
It is possible to tune around bad SC quads in the compressor and linac