Status of collimators TCDI for TI2 and TI8

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Concept:
 Three collimators at the end of the lines 3.5 m long MSI, 2 m long 90° H,V
 Also foreseen:
 One momentum collimator at the beginning, first place of high dispersion.
 Extra 45 / 135 ^{o} (or 225, 315 ^{o}) collimators in both H / V.

Positions are defined and integration issues studied.
  Looks feasible, with some compromise (low β, some dispersion for extra collimators)
  detailed information on the web: http://proj-lti.web.cern.ch/proj-lti/TCDI/TCDI_layout.htm   and   http://hbu.home.cern.ch/hbu/LHCBeamLoss.html

SPS: shaving at ~ 3.5 σ

TCDI: set at 5 σ. Protects injection region (MSI) and first turn injection in the LHC.
 from failures upstream (example: wrong dipole kick from bends/correctors in the pulsed transfer lines)

 Large > 7 σ oscillations in the LHC are excluded, except if they are generated in or downstream
 of the TCDI region (few bends, MSI). There we will have to rely on an active protection.

Collimators in TI8   H.Burkhardt   ~/tex/lhcinj/CollTi8.txt of 09/7/2003

Given here are the end positions with respect to s = 0 m at "TI8$START" = "PT4"
Collimators are 2 m long, with the exception of TCDIMSI which is 3.5 m long.
Very roughly: 1 m in s corresponds to 1 degree phase advance
Dx, Dy : horizontal and vertical dispersion
mux, muy: horizontal and vertical phase advance from the beginning of the line / 2pi (1 unit = 360 degrees)
sigx, sigxd : horizontal rms beam size without and with dispersion
sigy, sigyd : horizontal rms beam size without and with dispersion
Collimator setting: +/- 5 sigma of the beam size with dispersion, or 10 sigma between jaws
   example TCDIV90 sigyd = 0.636 mm, distance between jaws = 6.36 mm

TI8 has vertical and horizontal bends until close to the LHC, which leave little freedom to position collimators.
   allow for up to +/- 5 degrees in phase advance compared to ideal position

Comments:
H 45 degree just downstream of QI16 would be very close to LHC magnets, use 225 degrees instead.
H 90 degree position is QI15, move monitors and correctors a bit.
H 135 degree is taken by the BH4 magnets, use 315 degrees instead
H 225 degree position looks ok, betax very small
H 315 degree position, move OTR a bit
V 45 degree position, put just upstream of BH4_001
V 90 degree position, between BV2_005 and TED, next to OTR

Name	s	betax	mux	Dx	sigx	sigxd	betay	muy	Dy	sigy	sigyd	delta mu to TCDIMSI
	m	m		m	mm	mm	m		m	mm	mm	degrees
MBI_006	657.03	40.27					62.45					
TCDIMom	670.67	91.73	2.519	-4.437	0.818	1.585	22.11	2.483	0.000	0.402	0.402	244.5 in x
TCDIH315	2387.83	17.80	9.595	-2.014	0.360	0.714	69.92	9.736	-0.983	0.714	0.775	311.4 in x
TCDIH225	2398.24	7.10	9.783	-0.508	0.228	0.276	149.82	9.752	-1.350	1.046	1.124	232.9 in x
Q11	2399.64	8.69					152.67					
Q12	2429.94	236.26					43.73					
TCDIV135	2436.00	194.51	9.929	2.703	1.191	1.450	55.44	9.835	-0.373	0.636	0.646	134.9 in y
QI13	2459.79	76.24					124.07					
TCDIV090	2485.90	108.05	10.007	2.478	0.888	1.168	55.21	9.932	0.101	0.635	0.636	88.7 in y
QI14	2500.07	129.60					37.68					
TCDIV045	2515.01	75.54	10.050	2.059	0.742	0.974	58.74	10.034	0.129	0.655	0.656	45.0 in y
QI17	2611.70	30.68					227.65					
TCDIMSI	2626.02	44.02	10.453	-0.629	0.567	0.599	161.82	10.195	-0.034	1.087	1.087	0

Collimators in TI2   H.Burkhardt   ~/tex/lhcinj/CollTi2.txt of 20/6/2003

Given here are the end positions with respect to s = 0 m at "TI2$START" = "EJECTPT"
Collimators are 2 m long, with the exception of TCDIMSI which is 3.5 m long.
Very roughly: 1 m in s corresponds to 1 degree phase advance
Dx, Dy : horizontal and vertical dispersion
mux, muy: horizontal and vertical phase advance from the beginning of the line / 2pi (1 unit = 360 degrees)
sigx, sigxd : horizontal rms beam size without and with dispersion
sigy, sigyd : horizontal rms beam size without and with dispersion
Collimator setting: +/- 5 sigma of the beam size with dispersion, or 10 sigma between jaws
   example TCDIV90 sigyd = 0.571 mm, distance between jaws = 5.71 mm

The vertical   45 degree position is taken by BH2 bending magnets, use 225 degrees instead.
The horizontal 45 degree position looks feasible for TI2 but is very close to LHC magnets.
  A 225 horizontal position just downstream of Q8 would interfere with vertical bends.

Name	s	betax	mux	Dx	sigx	sigxd	betay	muy	Dy	sigy	sigyd	delta mu to TCDIMSI
	m	m		m	mm	mm	m		m	mm	mm	degrees
Q6	400.71	106.99					17.17					
TCDIMom	403.12	95.39	1.139	-0.041	0.834	0.834	19.44	1.048	-1.490	0.377	0.591	50.6 in y
TCDIV225	2902.14	81.89	11.488	-1.358	0.773	0.878	58.65	11.341	-0.266	0.574	0.579	225.06 in y
Q10	2916.80	53.16					84.66					
Q11	2947.10	185.66					20.63					
TCDIV135	2962.34	96.41	11.591	-2.328	0.839	1.100	48.52	11.591	-0.140	0.595	0.597	134.99 in y
TCDIH135	2975.58	45.22	11.623	-1.649	0.574	0.764	95.01	11.622	-0.117	0.833	0.833	135.02 in x
Q12	2977.40	41.53					99.60					
TED	2996.57	38.34					98.82					
TCDIH090	3006.47	44.42	11.748	-1.231	0.569	.683	96.42	11.673	-0.084	0.839	0.839	90.00 in x
TCDIV090	3026.18	122.47	11.797	-1.413	0.945	1.040	44.67	11.716	-0.053	0.571	0.571	90.06 in y
Q14	3033.84	172.39					26.84					
Q15	3066.90	113.31					58.38					
TCDIH045	3083.09	63.38	11.873	-0.684	0.680	0.712	131.34	11.941	0.025	0.979	0.979	45.03 in x
Q16	3103.48	31.15					262.29					
TCDIMSI	3114.78	47.23	11.998	-0.212	0.587	0.591	185.91	11.966	0.046	1.165	1.165	0

Ti2 V6.4 end of Ti2   MAD-X 1.12 23/06/03 22.28.36

~/tex/lhcinj/ti2_end_mu.eps

UJ22

TI 2

BLMI 29320

F2 29312

MBIBH29314

VPIAL29305

BPMIH29304

MQIF29300

TCDIV090

VPIAL29205

MQID29200

TCDIH090

PPG 29150

TED29133

BFCTI29125

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