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Classical proton radius [m] 1.53E-18

Maximum Luminosity Estimates for RHIC II

Beams	**unit**	**p**	**p**	**unit**	**Si**	**Cu**	**d**	**p**	**Au**	**unit**	**Au**
Charge number Z	…	1	1	…	14	29	1	1	79	…	79
Mass number A	…	1	1	…	28	63	2	1	197	…	197
Relativistic γ	…	108	271	…	108	108	107	108	107	…	107
Revolution frequency	kHz	78.2	78.2	kHz	78.2	78.2	78.2	78	78.2	kHz	78.2
Normalised emittance, 95%, min	mm mrad	12	12	mm mrad	12	12	12	12	12	mm mrad	10
Ions/bunch, initial	10^9	200	200	10^9	10.7	5.2	150	200	1.0	10^9	1.0
Charges per bunch	10^9e	200	200	10^9e	150	150	150	200	80	10^9e	80
No of bunches	…	110	110	…	110	110	110	110	110	…	110
Average beam current/ring	mA	275	275	mA	206	206	206	275	110	mA	110
Luminosity at one IP	**unit**	**p-p**	**p-p**	**unit**	**Si-Si**	**Cu-Cu**	**d-Au**	**p-Au**	**Au-Au**	**unit**	**Au-Au**
Beam-beam parameter per IP	…	0.0123	0.0123	…	0.0046	0.0043	0.0024 0.0036	0.0048 0.0048		…	0.0024
β*	m	1.0	0.5	m	1.0	1.0	2.0	2.0		m	0.5
Peak luminosity	10^{30} $cm^{-2}s^{-1}$	150	750	10^{28} $cm^{-2}s^{-1}$	42	10	28	37		10^{26} $cm^{-2}s^{-1}$	90
Peak / average luminosity	…	1.5	1.5	…	1.3	1.3	1.5	1.5		…	1.3
Average store luminosity	10^{30} $cm^{-2}s^{-1}$	100	500	10^{28} $cm^{-2}s^{-1}$	32	8	19	25		10^{26} $cm^{-2}s^{-1}$	70
Time in store	%	55	55	%	55	55	55	55		%	60
Luminosity/week	pb^{-1}	33	166	nb^{-1}	108	25	62	83		nb^{-1}	2.5
Luminosity/week, achieved	pb^{-1}	0.9		nb^{-1}		2.4	4.5			nb^{-1}	0.16

Note for collisions of 250GeV p on 100GeV Au: Not possible.

Longitudinal acceptance interval	m	0.4
Distance between bunches	m	32
Reduction factor due to moving collision point	…	1%
Reduction factor due to luminosity lifetime	…	10%
Minimum reduction factor		**1.E-03**

Can possibly run with 5mm radius offset in both beams.
This is equivalent to a difference of about 400Hz in the rf frequencies.
Thus, at best 100GeV/n Au could collide with 120GeV protons.
This would still pose considerable problems for the beam and luminosity lifetime.