Running at Lower Energies

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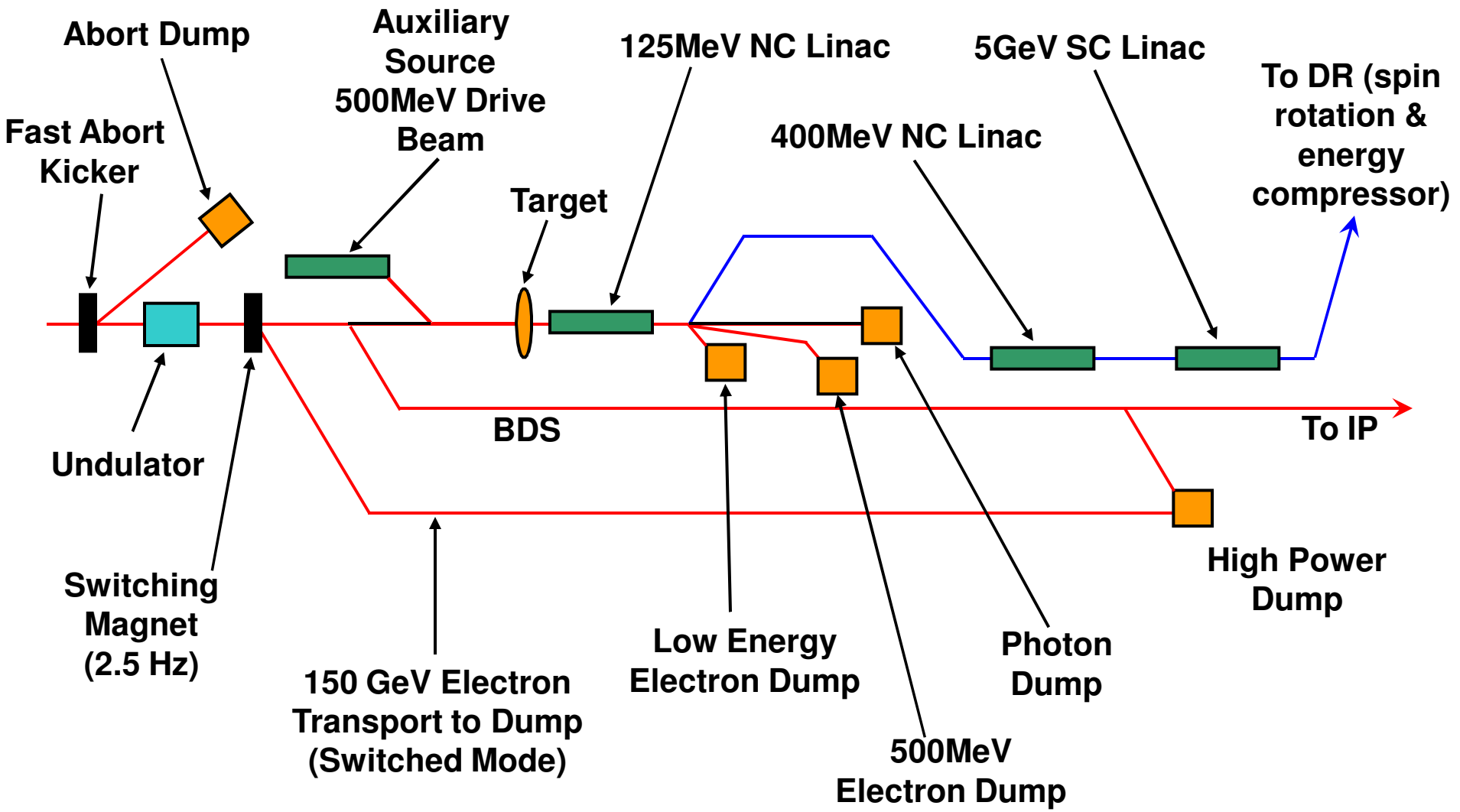
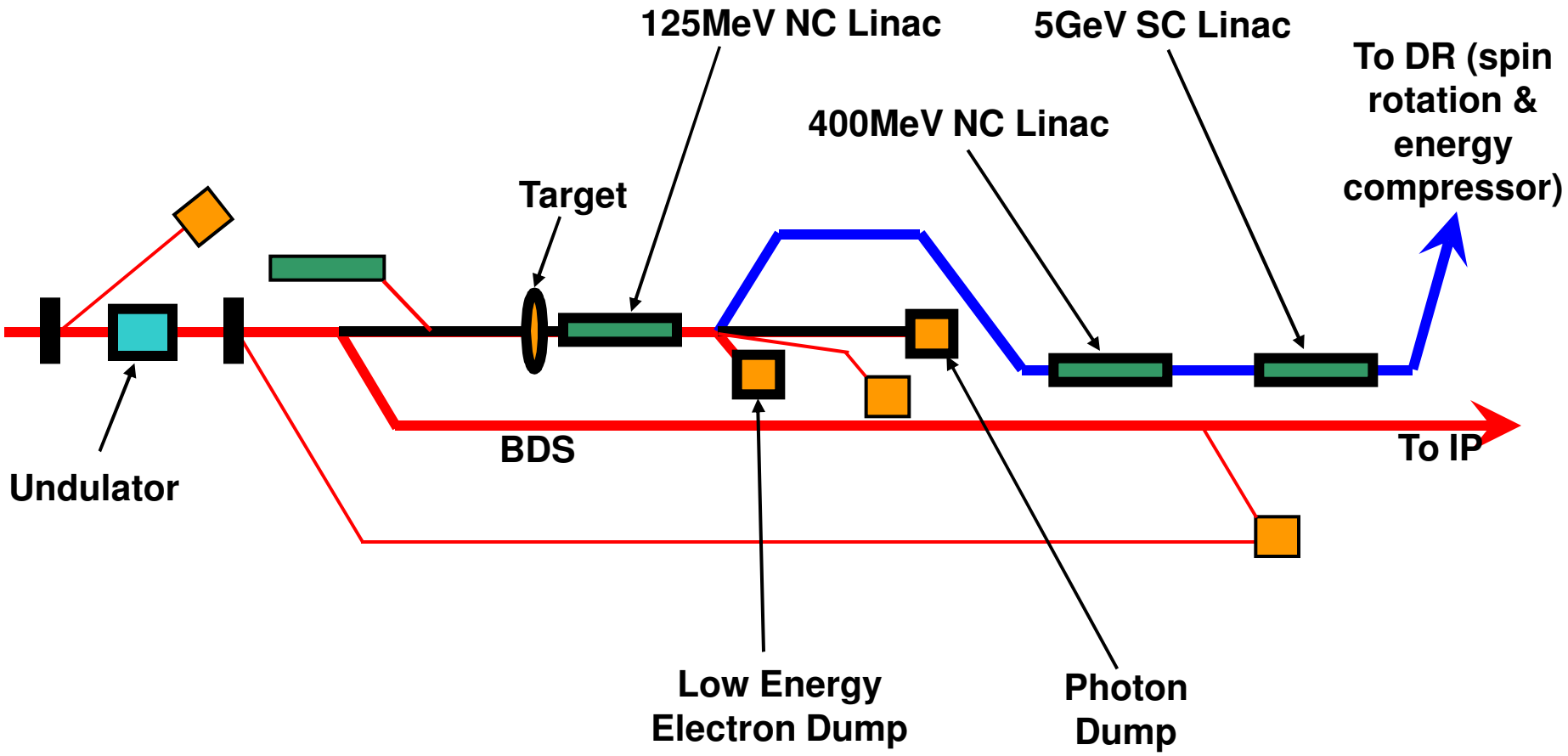
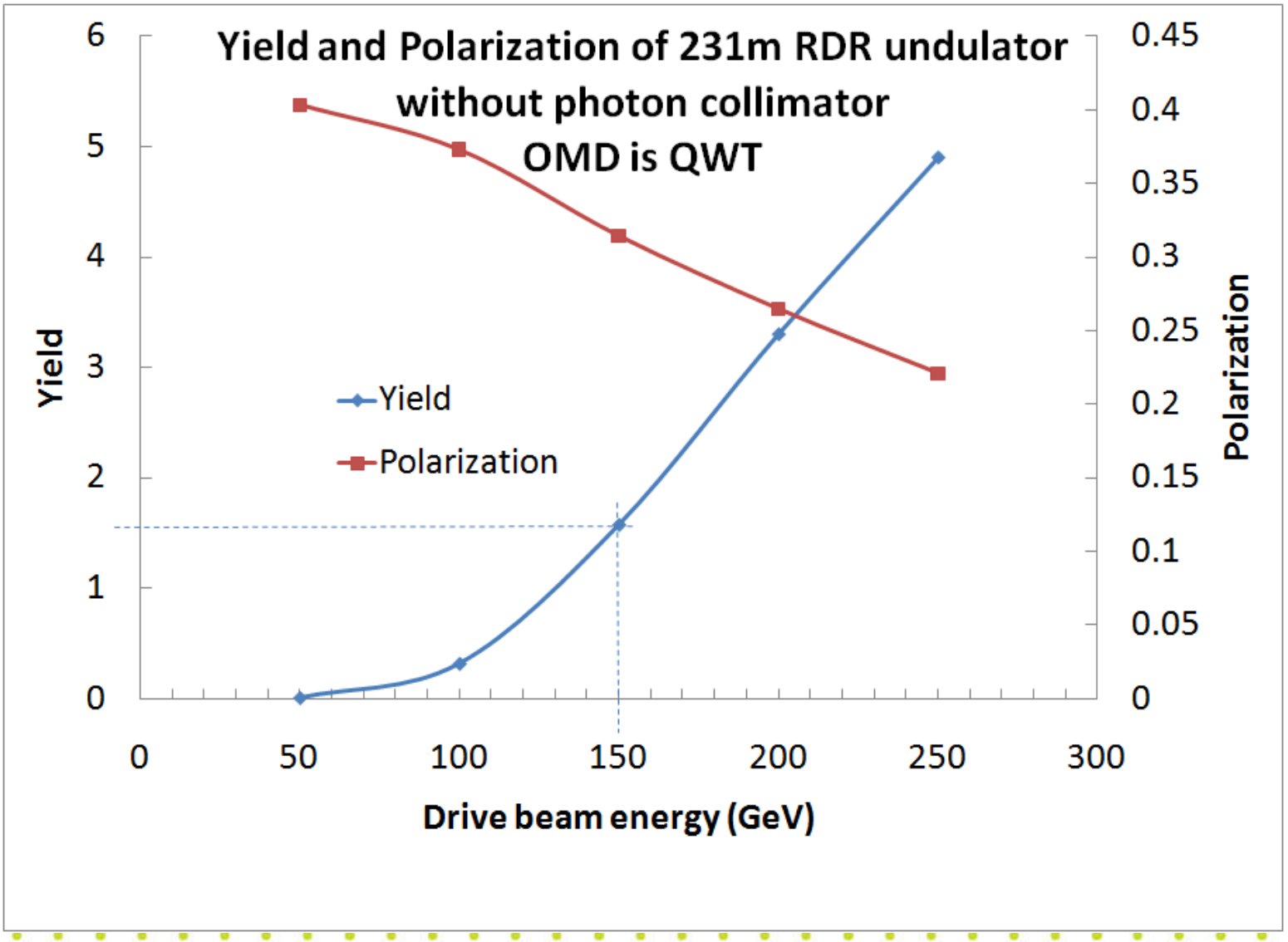
Schematic Layout



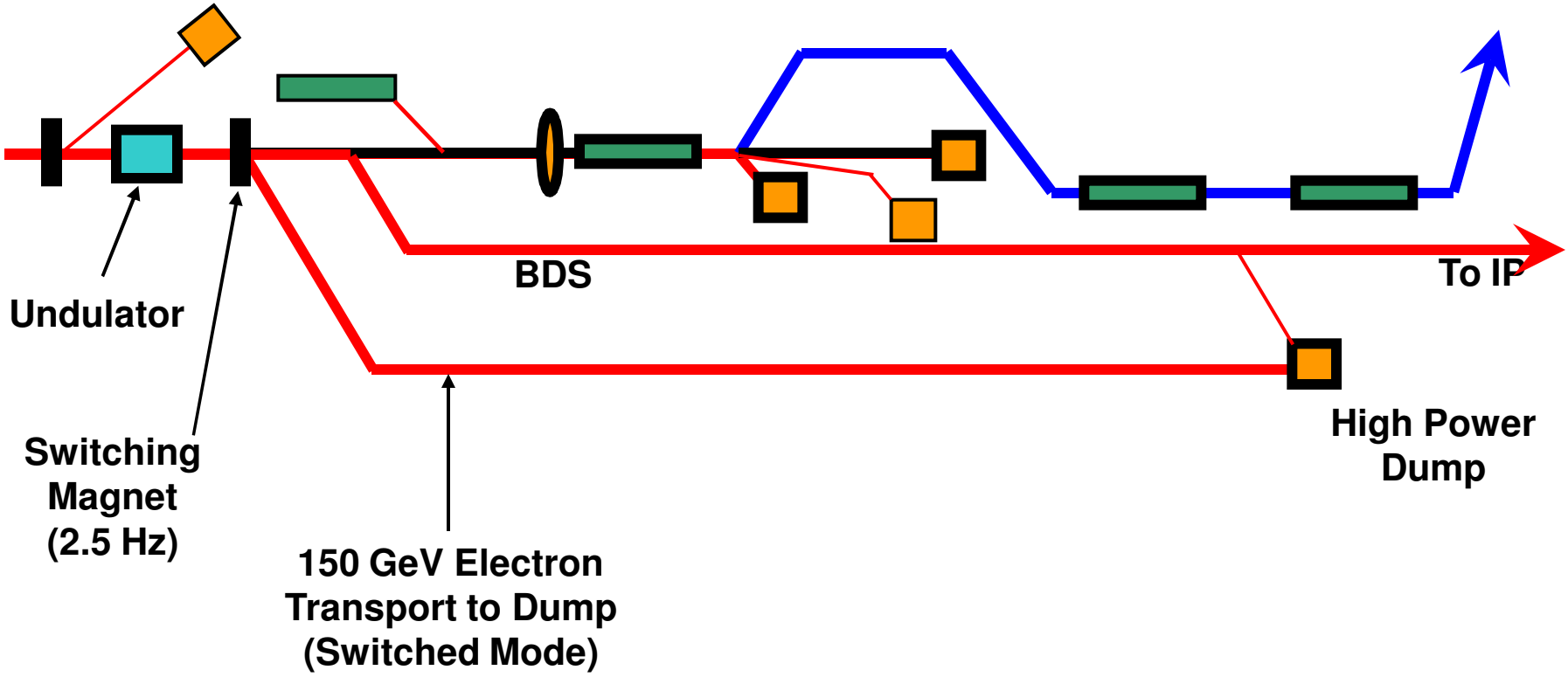
Normal Operation



Positron Yield

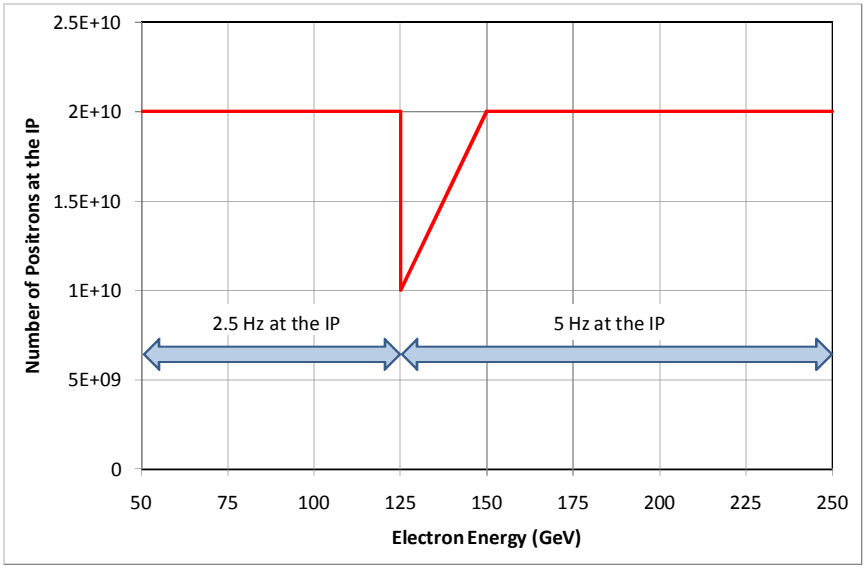


Switched Mode

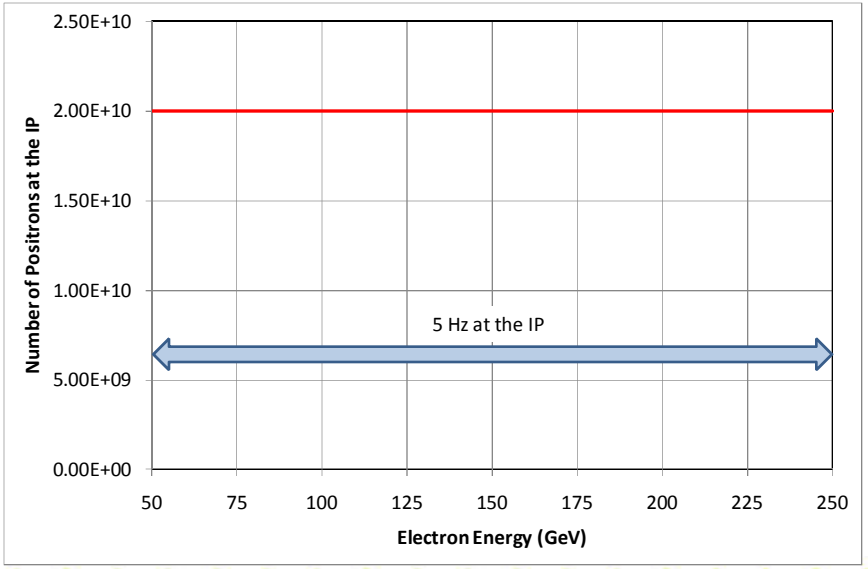


Number of Positrons per Bunch

SB2009



RDR



Energy Spread Assumptions

- Energy spread at the entrance to the main linac is 1.5% at 15 GeV for RDR and 1.08% at 15GeV for SB2009 (N Solyak)
- No growth due to linac etc
- In RDR case e+ are generated by e- at 150GeV
  - **e- are either accelerated or decellerated after the undulator to achieve their required energy at the IP**
- In SB2009, energy of e- is variable in the undulator
  - **125 to 250GeV @ 5Hz operation or**
  - **150 GeV @ 2.5Hz operation**
  - **Length of undulator is varied (modules are switched on/off) to keep yield at 1.5e+/e-**

Positron Energy Spread

- e+ energy spread is **independent** of the source (set by DR & RTML)
  - **Scales as inverse of IP energy**
  - **RDR and SB2009 are different**

	RDR	SB2009
Positron Energy at the IP (GeV)	Relative Positron Energy Spread (%)	Relative Positron Energy Spread (%)
50	0.450	0.324
75	0.300	0.216
100	0.225	0.162
125	0.180	0.130
150	0.150	0.108
175	0.129	0.093
200	0.113	0.081
225	0.100	0.072
250	0.090	0.065

Electron energy spread

- When e^- emit SR in undulator energy spread is **increased**
- The SR induced contribution is added in quadrature to inherent energy spread

RDR

Electron Energy at the IP (GeV)	Relative Electron Energy Spread (%)
50	0.679
75	0.453
100	0.340
125	0.272
150	0.226
175	0.194
200	0.170
225	0.151
250	0.136

Electron energy spread

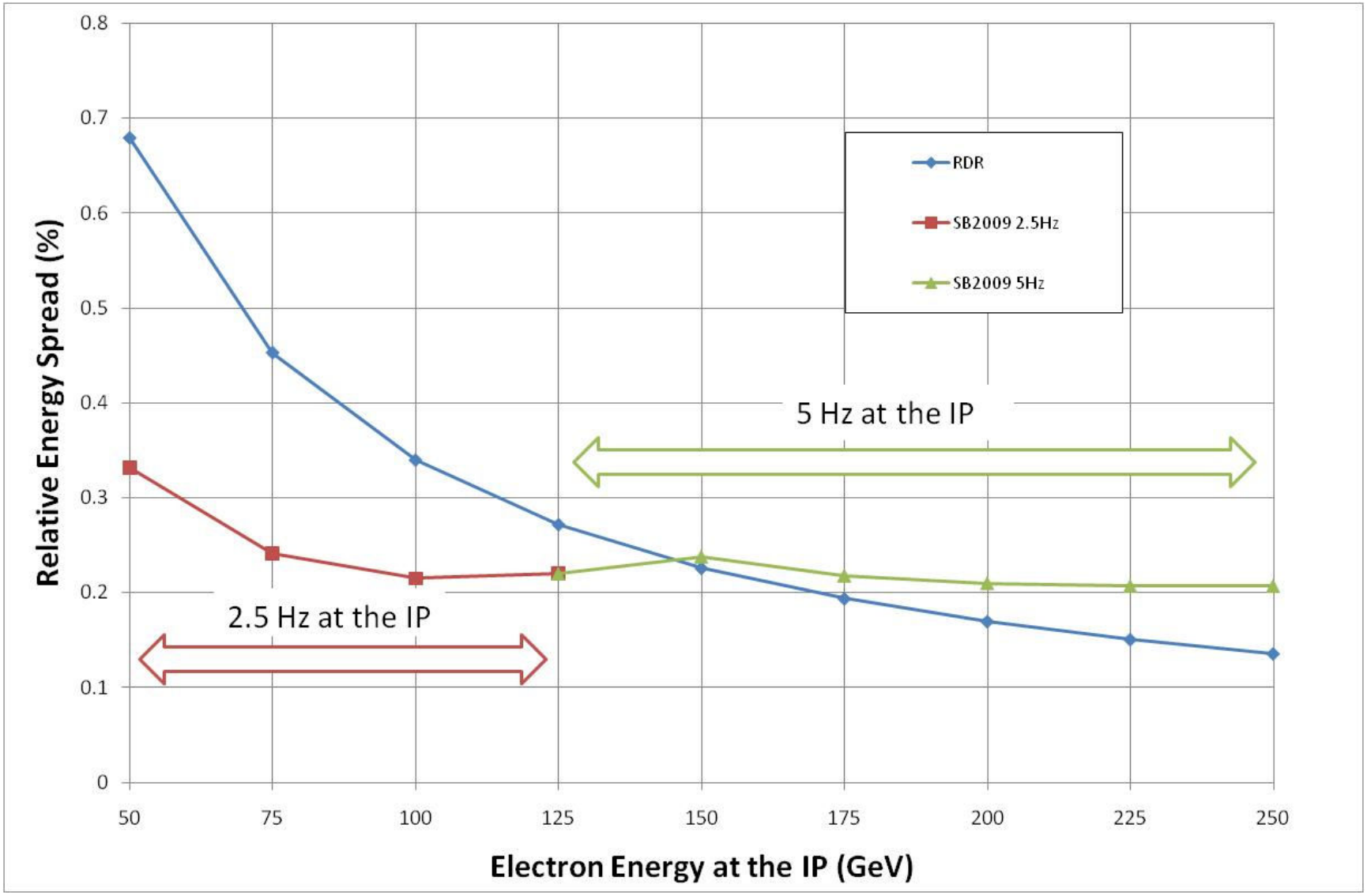
- SB2009 has two modes of operation
  - **First mode (5Hz) have to account for changing undulator length**
  - **Second mode (2.5Hz), although e- beam for IP is not used to generate e+ it still travels through the undulator and emits SR**

Electron energy spread

- SB2009

Electron Energy at the IP (GeV)	Undulator Energy (GeV)	Undulator Length (m)	Relative Electron Energy Spread (%)
50 (2.5Hz)	50	231	0.332
75 (2.5Hz)	75	231	0.241
100 (2.5Hz)	100	231	0.215
125 (2.5Hz)	125	231	0.22
125 (5Hz)	125	231	0.220
150 (5Hz)	150	231	0.238
175 (5Hz)	175	147	0.218
200 (5Hz)	200	108	0.210
225 (5Hz)	225	86	0.207
250 (5Hz)	250	71	0.207

Electron energy spread



Mitigating the Low Energy Impact

- The present 'breakpoints' of 150 GeV and 125 GeV are somewhat arbitrary
- Once the mass of Higgs is known the ILC can be tailored to provide improved performance
- If the mass is ~120 GeV then higher rep rate operation of the ILC (ie >5 Hz) during pulse switching is an option
- If the mass is ~140 GeV then a ~20% longer undulator would restore the present loss in positron yield