

Benchmarking of Availability Simulation

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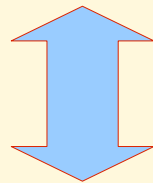
Grömitz, 1 December 2005

Availsim

- simulates integrated luminosity/downtime of linear collider (after commissioning phase)
- by Tom Himel for US LC Technology Options Study
- quantitative comparison of different designs

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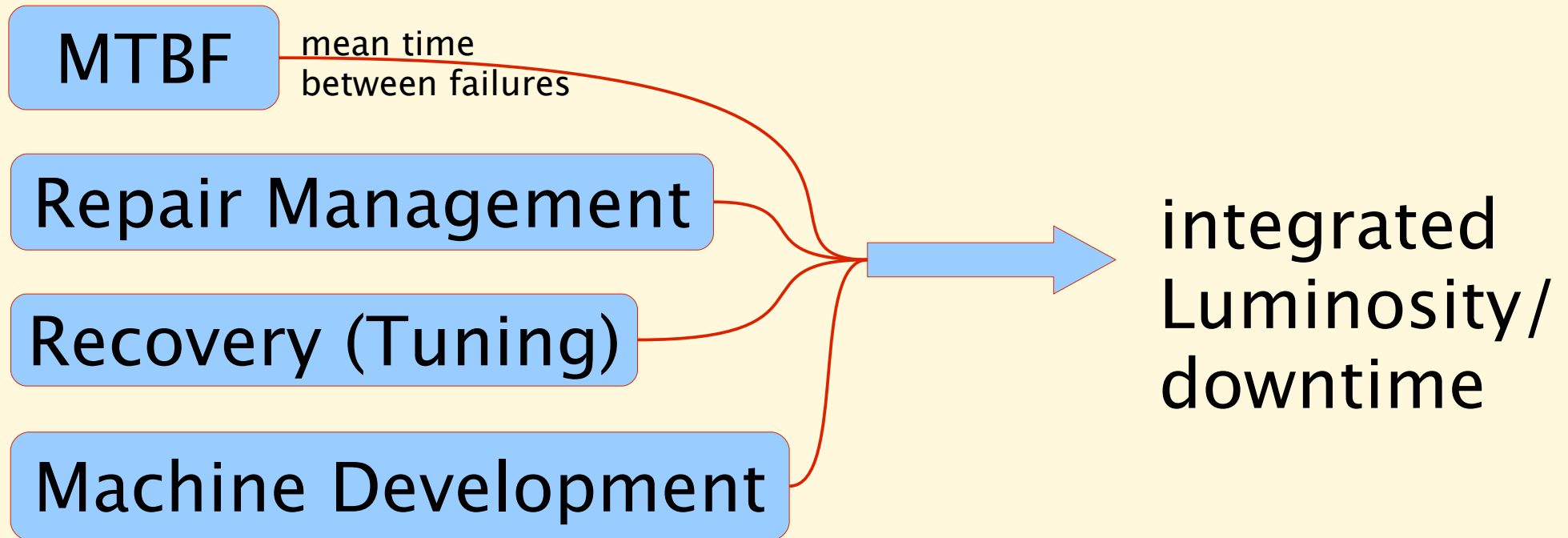


Reality?

Questions about Availsim

- Can we believe the **absolute downtime?**
- Can we believe **comparisons?**
(E.g., conventional e^+ source vs. undulator)
- Can Availsim make **recommendations for ILC design?**

Availsim Mapping

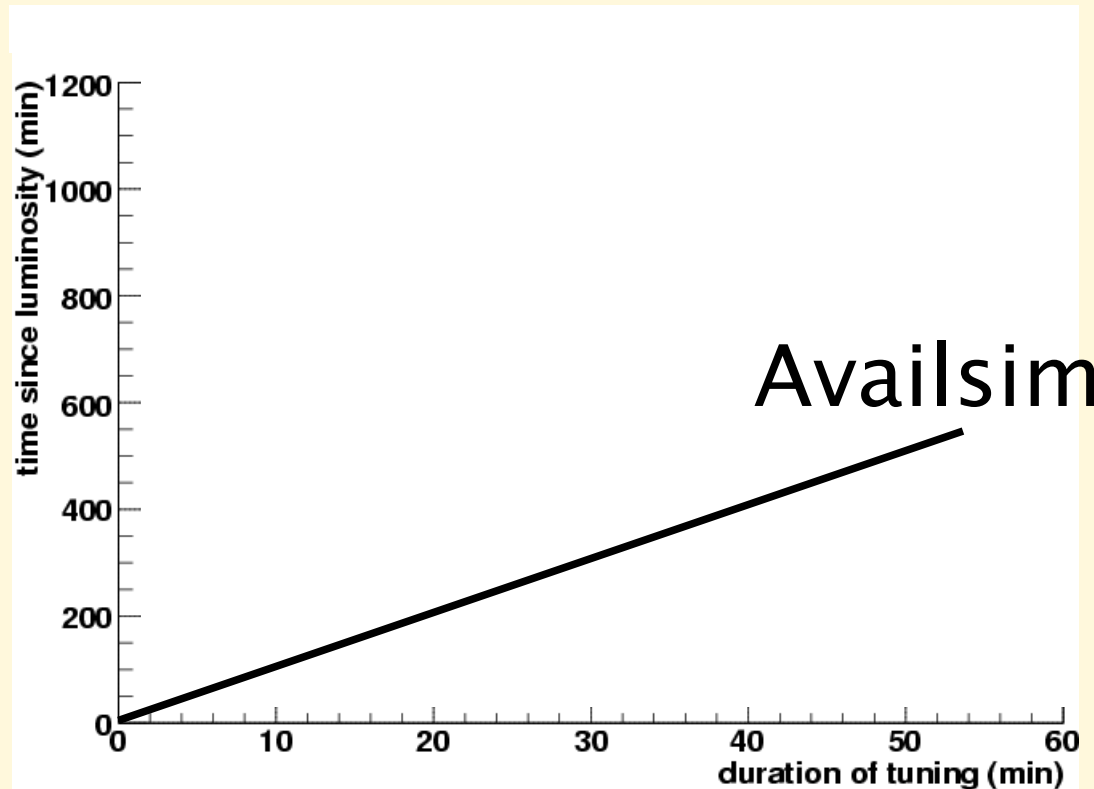


HERA 2000

- stable machine (8 years of running)
- control & monitoring system
- systematic logging of failures

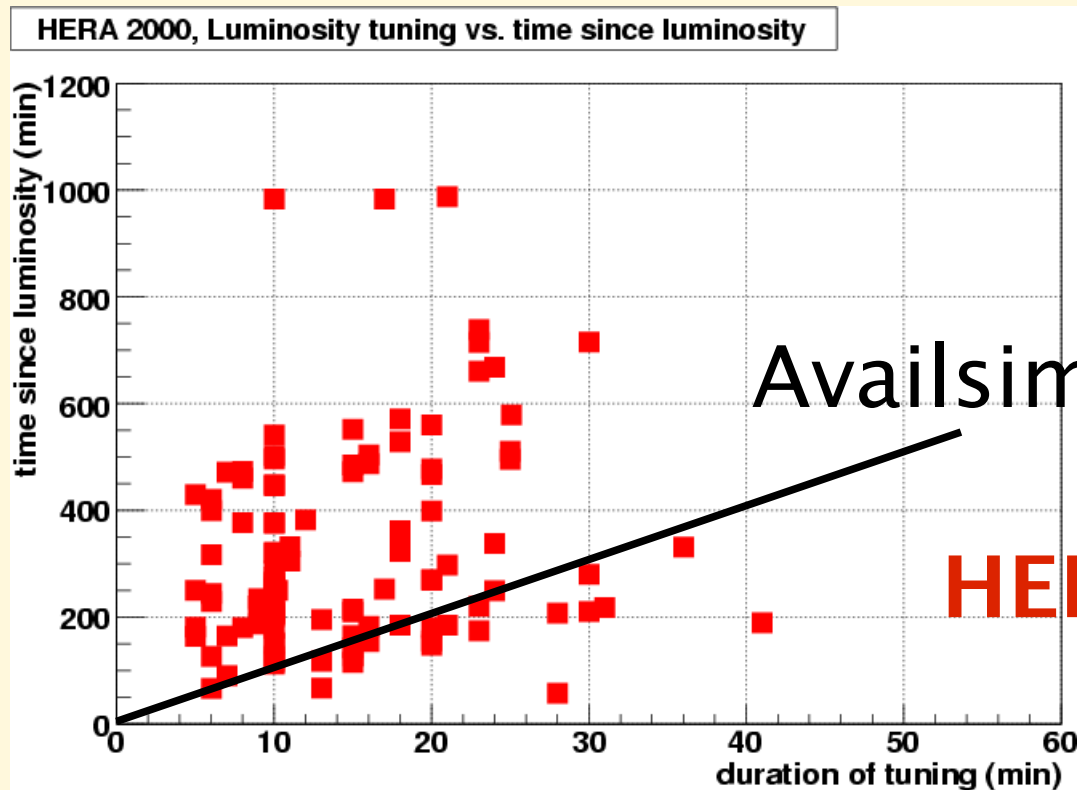
	Montag, 22. Mai 2000		
5/23/2004 4:00	p-Inj	1:51	p-Inj
5/23/2004 5:51	e-Inj	0:41	e-Inj
5/23/2004 6:32	Lumi tuning	0:10	Lumituning
5/23/2004 6:42	Lumi run	10:14	Lumirun
5/23/2004 16:56	e+ run fuer Hermes	2:00	Exp
5/23/2004 18:56	ZZ für Zeus LPS	1:44	Warten
5/23/2004 20:40	p-Inj	0:20	p-Inj
5/23/2004 21:00	QP65 Ausfall waerend Massage	0:30	Ausfall
5/23/2004 21:30	p-Inj (52/208 MHz phasing)	2:33	p-Inj

Luminosity Tuning



- assumed:
proportionality
to time since last
luminosity

Luminosity Tuning



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proportionality
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HERA: No correlation

Impact on Availability

Example: ILC e^+ production designs:

Undulator:

- use of high energy e^-

Conventional:

- additional e^- source

Impact on Availability

Example: ILC e^+ production designs:

Undulator:

- use of high energy e^-
- e^+ not available before e^-

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- additional e^- source
- e^+ available without e^-

Impact on Availability

Example: ILC e^+ production designs:

Undulator:

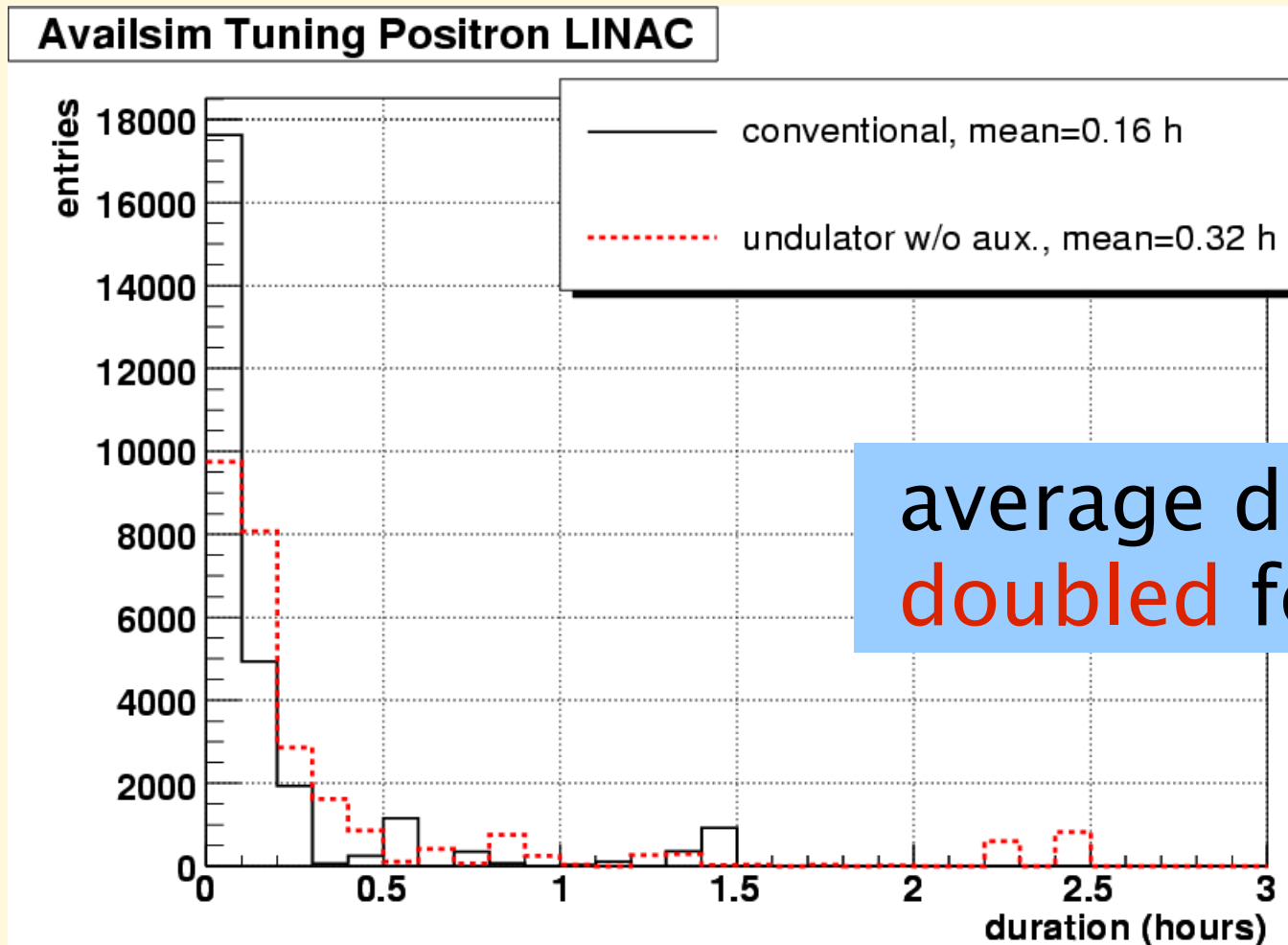
- use of high energy e^-
- e^+ not available before e^-

 long recovery

Conventional:

- additional e^- source
- e^+ available without e^-

Tune-time in e^+ LINAC



Tune-time per ILC region

average tune time (hours)	electron arm		positron arm	
	conv.	undulator	conv.	undulator
Source	0.05	0.05	0.06	0.19
DR	0.18	0.20	0.21	0.47
Compressor	0.12	0.13	0.13	0.29
LINAC	0.15	0.16	0.16	0.32
BDS	0.17	0.18	0.18	0.36
IP	dto.	dto.	0.54	0.81

- similar in e^- arm
- factor ≈ 2 larger in e^+ arm for undulator

New Simulation

- use fixed tune-time:
average value from e^- arm

Results

Description	time down incl forced MD (%)	time integrating lum or sched MD (%)	time integrating lum (%)	time scheduled MD (%)	time actual opportunistic MD (%)	time useless down (%)	accesses per month
conventional	13.8	86.2	81.8	4.4	2.7	11.2	2.9
undulator	19.9	80.1	68.1	12.0	2.5	17.4	3.0
conv. fixed tune-time	12.1	87.9	82.5	5.3	1.7	10.5	3.0
undulator fixed tune-time	13.4	86.6	74.1	12.4	2.1	11.4	3.2

uptime nearly the same

Results

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but: MD takes longer for undulator
(no simultaneous MD in e^+ and e^- arms)

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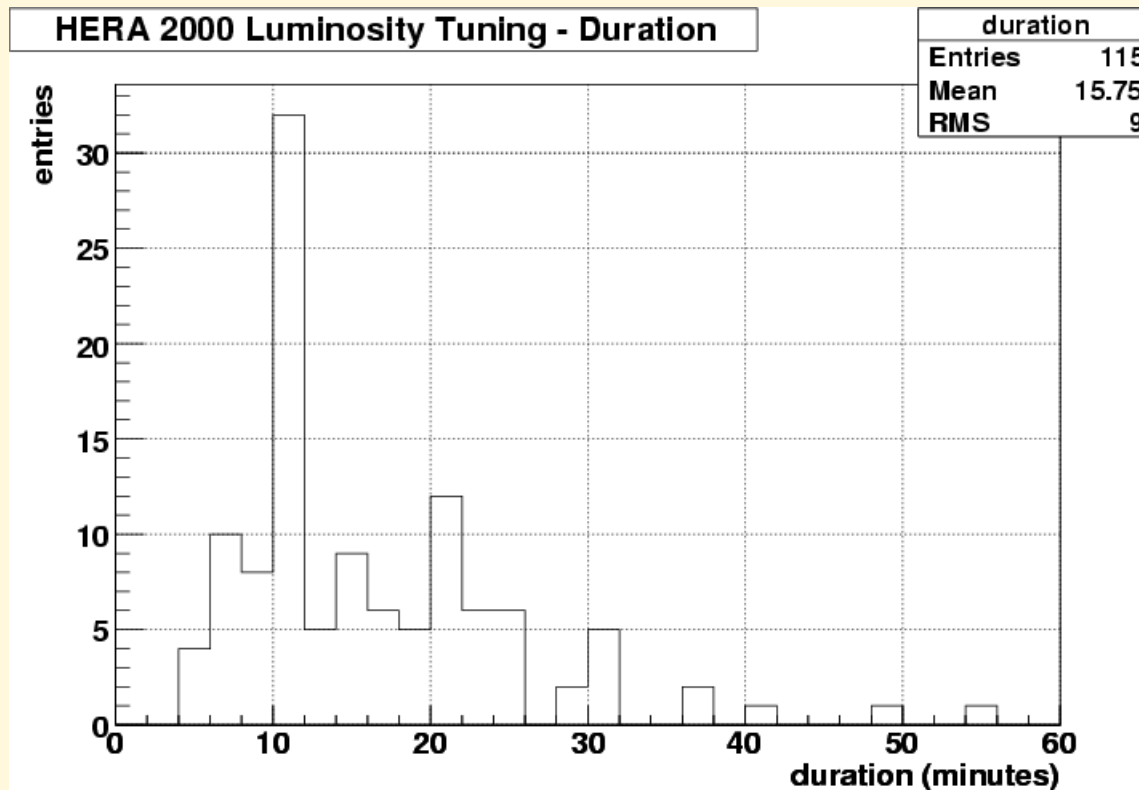
➡ Machine Development causes
10% luminosity loss for undulator

Conclusions

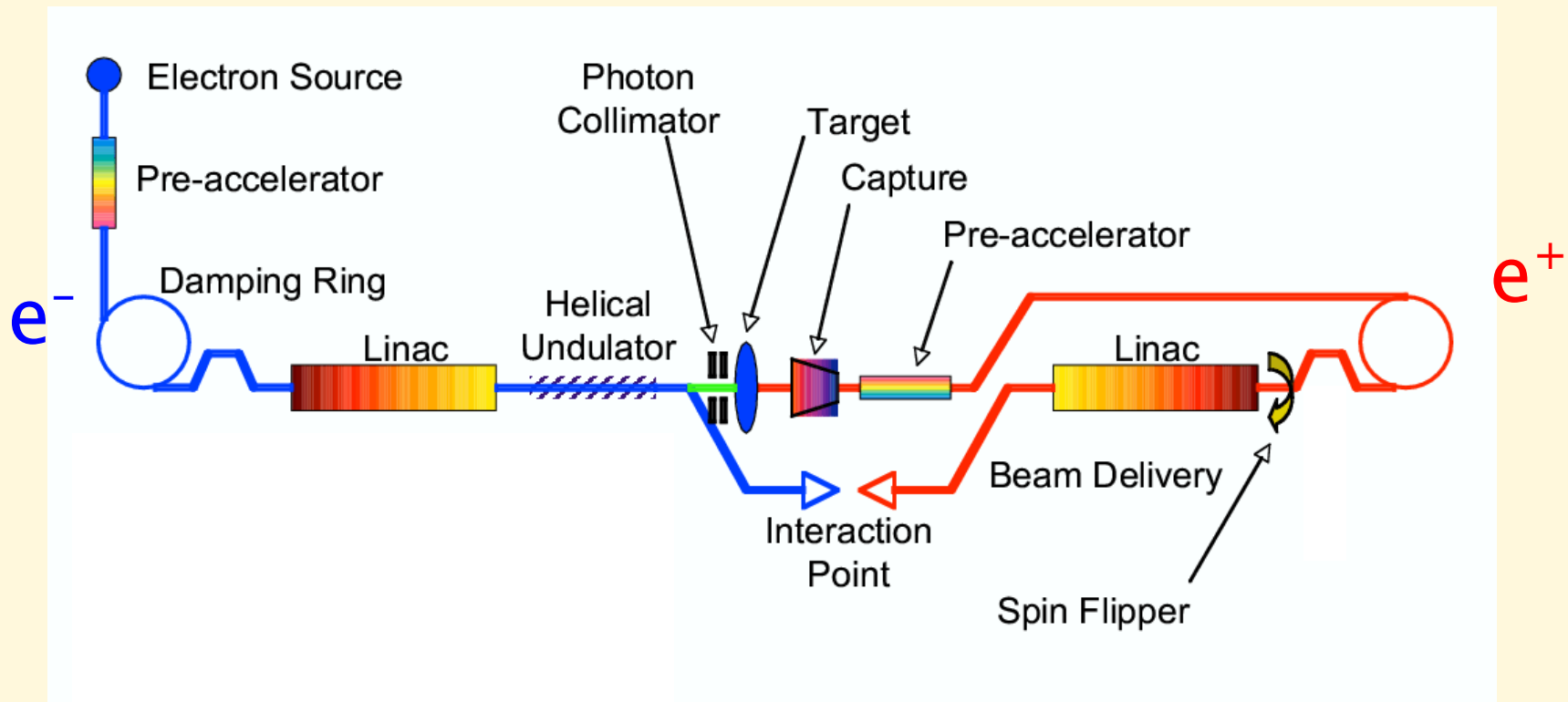
- basic assumptions of availability simulation have to be critically analysed
 - strong impact on results (e.g., source comparison)
- analysis of HERA MD experience needed

Backup Slides

HERA Luminosity Tuning

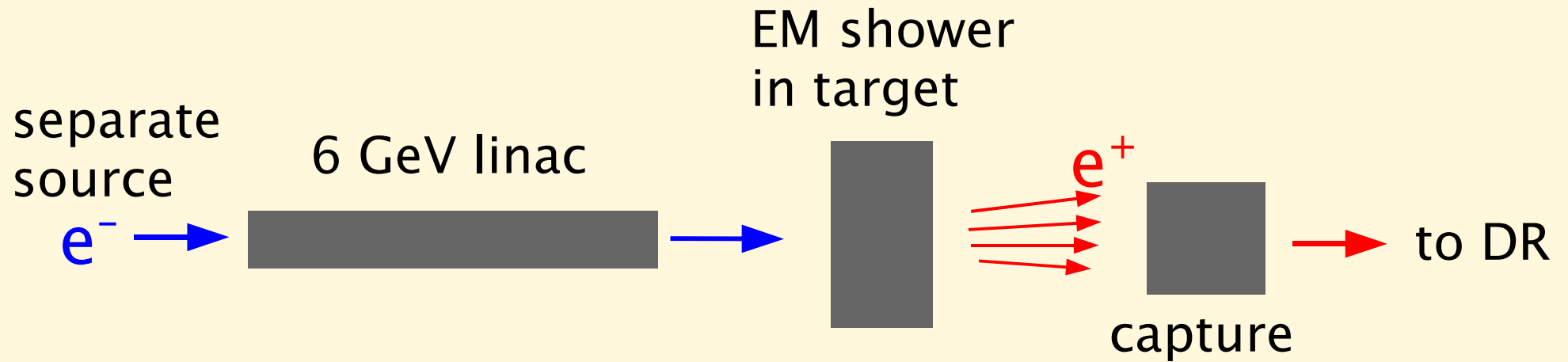


Undulator e^+ Source



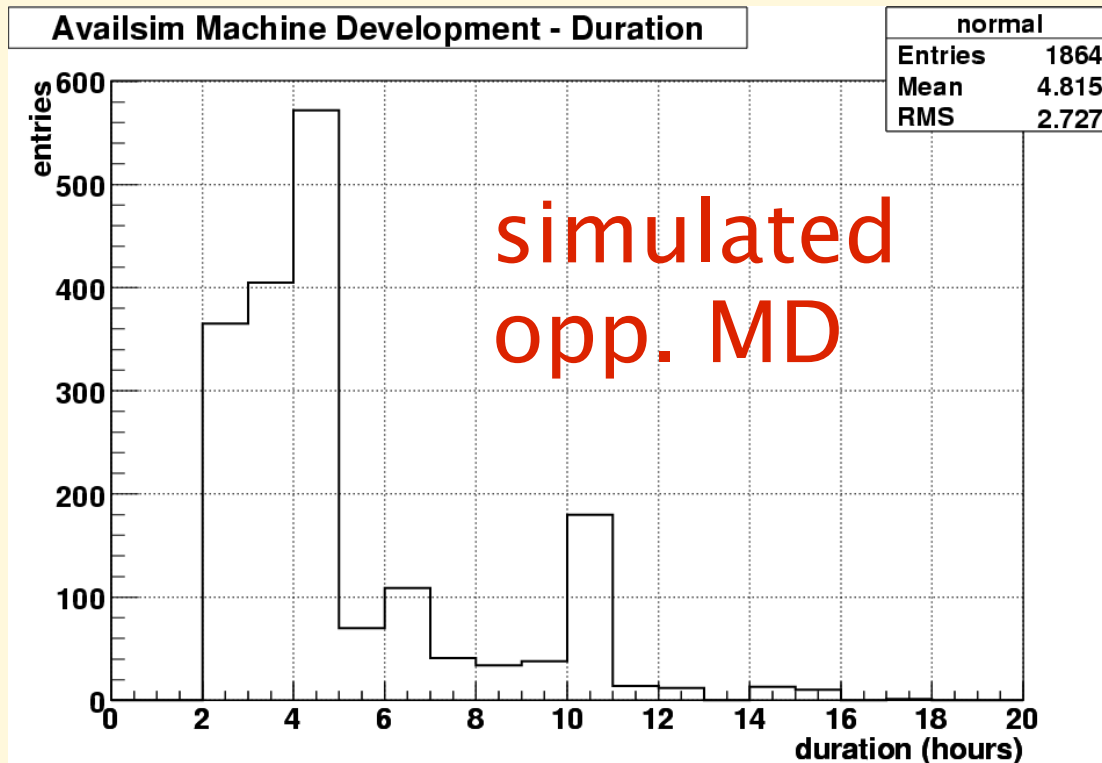
- electron LINAC needed for positrons
- time without beam larger for e^+ regions

Conventional e^+ Source



independent of electron beam-line

Opportunistic MD



- 2 hours reasonable?