Conclusions

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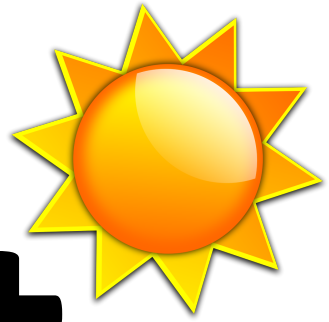

		Goals	DC	S vb	S mc	C vb	S/X	X mc
Charge (Q)	pC	75	10	75	75	75	75	75
Beam energy	MeV	300	270	313	280	346/341	300	300
rms bunch length *(σt)*	fs	350	700	367	300	323/350	133-350	353.5 (83.7 after BC1)
Peak current (Q12σt)	A	60	4	57	60	67/62	65-162	61.23
rms Energy Spread	%	0.5	0.2	0.2	0.3	0.3/0.4	0.3	0.48%(BC1)
Projected rms norm. emittance	μm	0.2	0.25	0.2	0.2	0.23/0.15	0.13	0.17
Peak Field at Cathode	Mv/m	/	10	120	120	240/160	120	200 - 250
Repetition rate	Hz	100 -1000	750-1000	100-400	100-400	100 Hz-1 KhZ	1kHz x-band 400 Hz s-band	100 - 400
Total Length	m	/	11.3	<15	<15+8	10	8.6 m	7 m + Ka-band + chicane
TRL		/		8	8	2	8/5	4
Priority			?	Medium	Medium	High	Medium	Low

G. Technology readiness levels (TRL)

Where a topic description refers to a TRL, the following definitions apply, unless otherwise specified:

- TRL 1 – basic principles observed
- TRL 2 – technology concept formulated
- TRL 3 – experimental proof of concept
- TRL 4 – technology validated in lab
- TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 7 – system prototype demonstration in operational environment
- TRL 8 – system complete and qualified
- TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

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Parameter Sets

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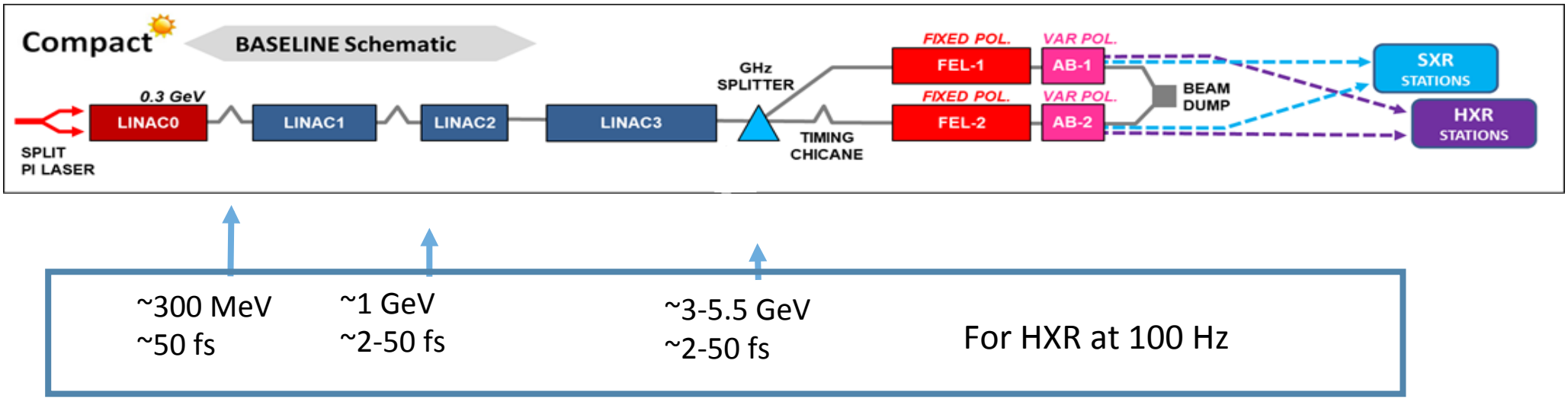
Facility



- 100 Hz, two bunch; to drive two HXR line with 65 MV/m gradient
- 250 Hz, two bunch to drive two SXR line with ~20 MV/m gradient
- 100 Hz, two bunch to drive SXR & HXR line with 65 MV/m gradient

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Electron Beam Parameters

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Parameter	Unit	HXR			**SXR**		
Beam Energy	GeV	5,5	3,9	2,75	1,95	1,37	0,97
Photon Energy Range	keV	16 - 8	8 - 4	4 - 2	2 - 1	1 - 0.5	0.5 - 0.25
Minimum Peak Current *	kA	5.0	2.5	1.5	0.925	0.65	0.35
RMS Slice Energy Spread	%	0.01	0.014	0.02	0.028	0.04	0.056
Peak Current-1	pC/fs	75/15	75/30	75/50	75/75	75/115	75/200
Peak Current-2	pC/fs	50/10	50/20	50/30	50/50	50/75	50/75
Peak Current	pC/fs	75/15			75/50		
Photon Pulse duration	fs	0.1-15			1-50		
Normalised Emittance	mm-mrad	0.2					

Instability is driven by strong wake field of high frequency structure.

Transverse wake potential

$$V_{\perp}(s) = \int_{-\infty}^{s} ds' \lambda(s') W_{\perp}(s - s')$$

Causes transverse deflection along bunch

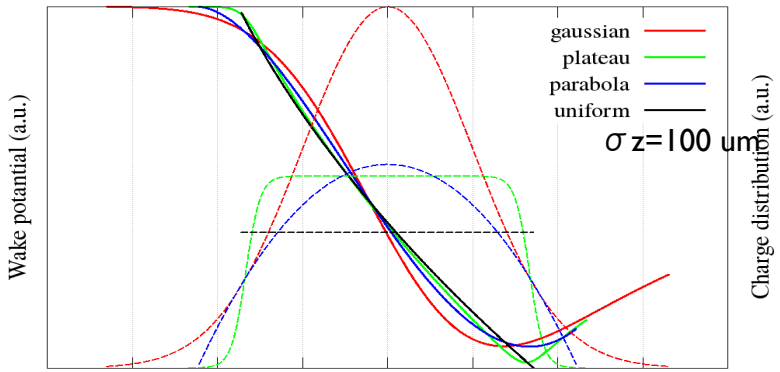
Longitudinal wake potential

$$V_{\parallel}(s) = \int_{-\infty} ds' \lambda(s) W_{\parallel}(s - s')$$

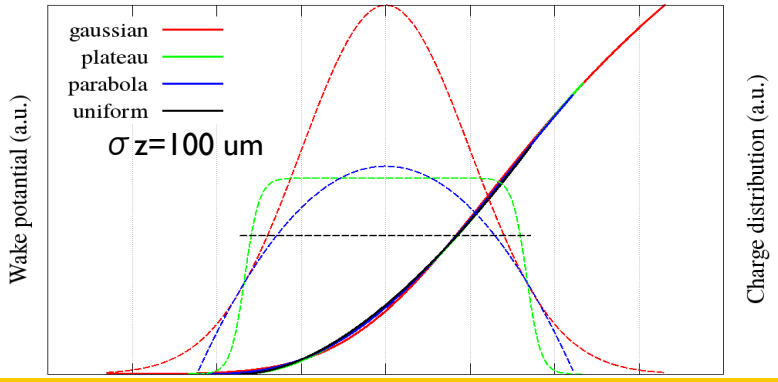
Causes enegy change along bunch

To reduce the wake effect → Optimize charge distribution

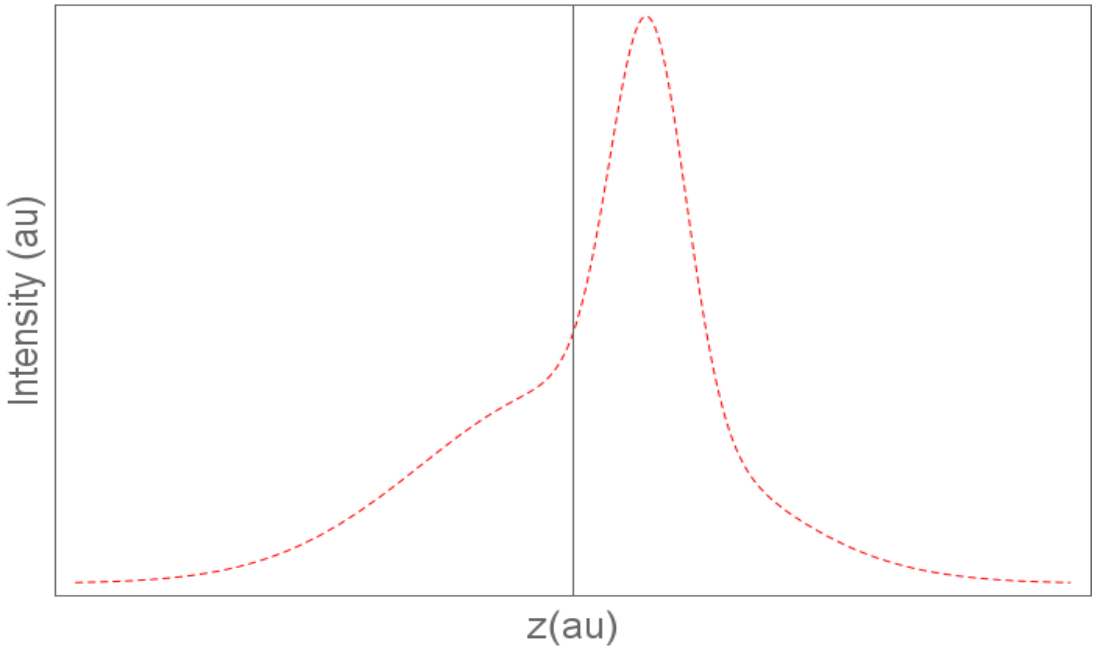
Longitudinal wake potential

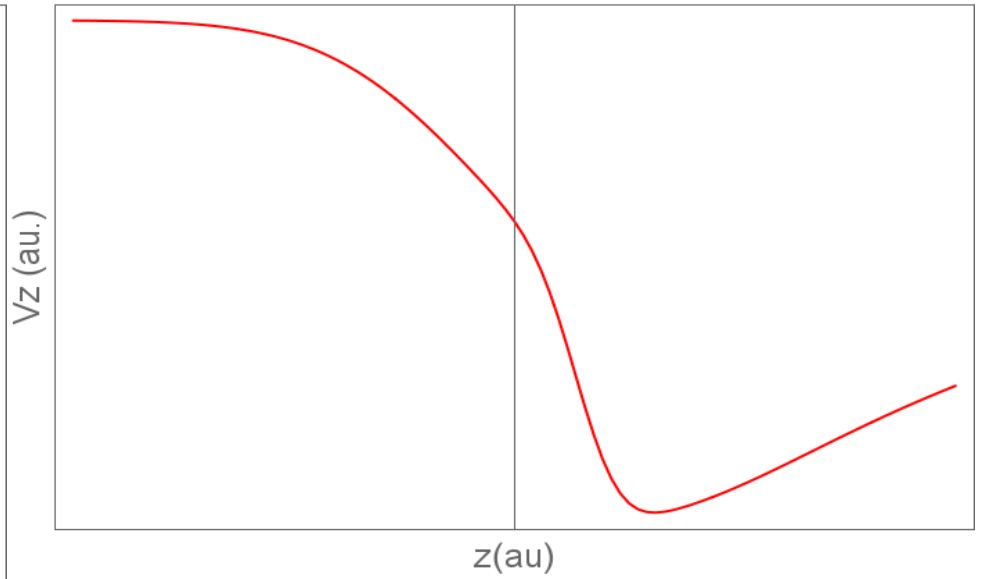


Transverse wake potential



- For both transverse and longitudinal case
  - uniform bunch distribution and no tail is preferred
  - Bunch distribution is fixed in injector → try to make it uniform on bunch compressors


Intensity (au)
z(au)


Vz (au.)
z(au)

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To make better comparision

- Uniform bunch charge (as uniform as possible)
- Minimum uncorrelated energy spread (as minimum as possible)
  - ➔ The longitudinal emittance
- Beam energy arround 100 MeV
  - We need to adjust RF phase for optimum compression
- Is it possible to have better bunch parameters if the bunch charge lower?
  - What is the minimu bunch length requirement?

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How to exhange results

- A text file describing the simulation
- i.e. For Asrtra
  - RF gun at z=0 peak field= xx V, phase=yyy Deg, field map=«field.dat»
  - Solenoid at z=0, axis field=xx T, field map=«field.dat»
  - TW accelerator, z=1 m, peak field =xx V, phase=yy Deg, Field map=«field.dat», no of cell
  - Quad z=1.3, strength=xx 1m/^2, length=xx m
  - …
- In adidition to that we need field maps and and parameters of all elements
- i.e. Cavity:
  - Bore radi
  - Gap length
  - Cell radiu
  - No of cells + coupler cells
  - Max gradient
  - Phase lenth
  - Wake file (if exists)

i.e. Solenoid:

Bore radi

Total length

…

And also 6D input / output particle distribution
For linacs we can use Placet's notation

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Thank you!

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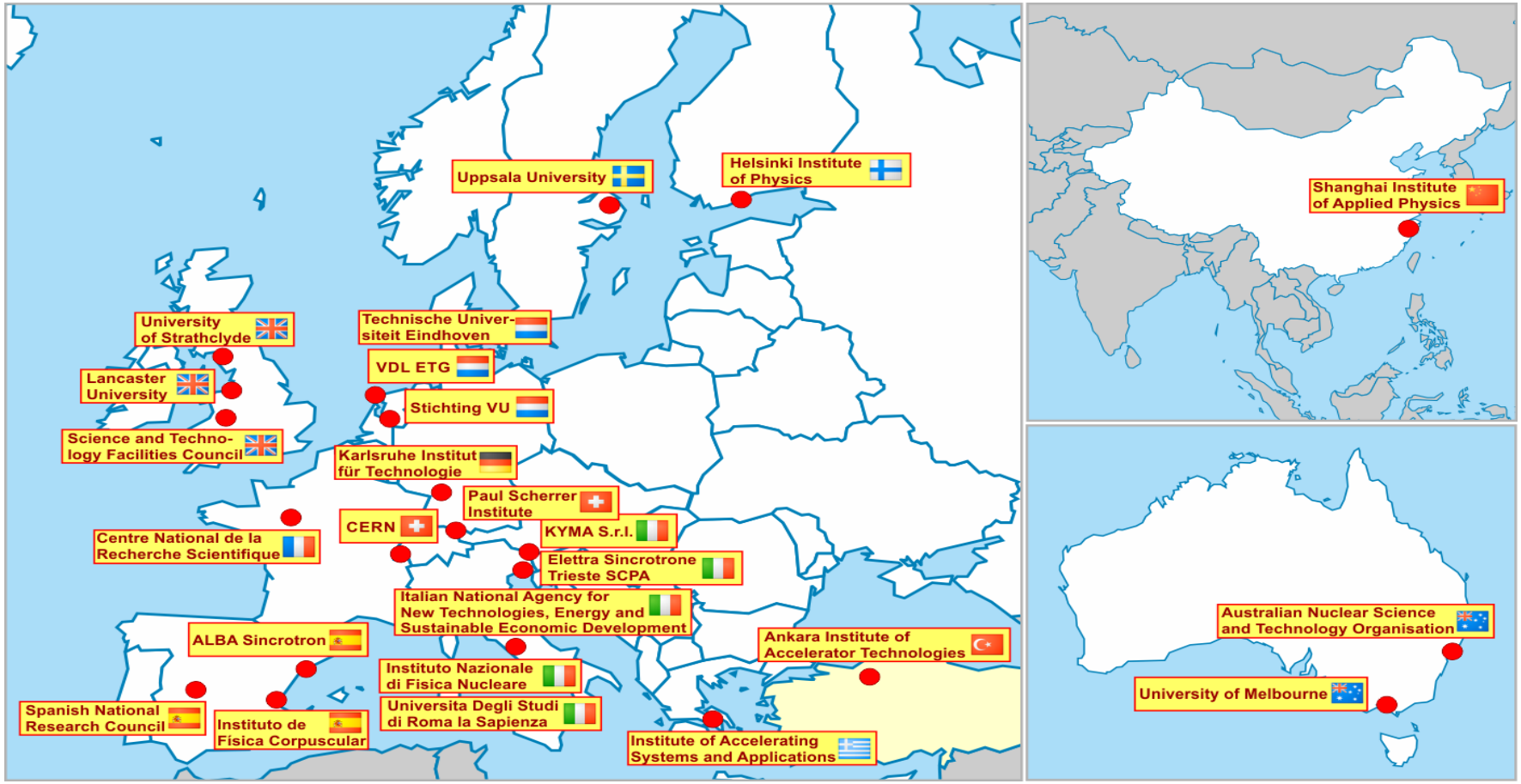

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