Tutorials at the

Introductory Course of the CERN

Accelerator School (CAS)

Tutorials

Some of the lectures are supported by exercises, organized as tutorials. They should demonstrate how the material from the lectures is put into practice. All tutorials are found on the programme of the school.
These lectures are:

- **Transverse dynamics (TBD)**
- **Longitudinal dynamics (LBD)**
- **Electron beam dynamics (EBD)**

Towards the end of the school there is also a

- **General tutorial (GEN)**

Tutorials

For all 4 tutorials you will receive the exercises at the beginning of the school. The solutions and upcoming questions on the lectures will be discussed in small groups with a tutor.
Where: → 4 separate seminar rooms.

Dedicated time is reserved for "guided studies" for the 3 tutorials where the lecturers and tutors are available for any questions related to the exercises (or the lectures).
Where: → auditorium or whereever lecturers are

Of course all lecturers of the school will be happy to discuss anything at any time and anywhere during the next 12 days.

General tutorial

For the first 3 tutorials you will have to work on questions with formal solutions.

For the General Tutorial we shall appeal to your fantasy and initiative. Given a few basic specifications for an accelerator, you are encouraged to think about a possible design and (realistic) parameters. Material from several lectures are needed. Some (strategic) questions will help you through this exercise. For this tutorial a unique solution does not exist and it is meant to experience the spirit of a design study.

This includes to get input from other people (lecturers, colleagues and google) and the organization of your work.

There is no "guided study" for this tutorial.

Organization

We shall divide the ≈ 100 participants into 4 roughly equal groups, G1 - G4, these groups remain the same during the school (and use the same seminar room).

The tutors for the tutorials and groups are:

	TBD	LBD	EBD	GEN
G1	B.Holzer	F.Tecker	S.Sheehy	W.Herr
G2	W.Herr	B.Holzer	A.Wolski	G.Papotti
G3	R.Tomas	R.Steerenberg	W.Herr	G.Franchetti
G4	R.Steerenberg	W.Herr	G.Franchetti	A.Wolski

Some more comments

- **The tutorials are NOT examinations !**

  We highly encourage you to work with your colleagues

  For the "general tutorial" we propose to work in small teams of 8 - 10 people, see proposed list.

Group 1	Group 2	Group 3	Group 4
S. AGUILERA	L. FERNANDEZ	J. LAULAINEN	L. SABBATINI
M. ALBERT	J. FERNANDEZ-GARC	C. LORIN	J. SANCHEZ
D. ALVES	L. FISCARELLI	J. LUDWIN	L. SCHEBACHER
D. ASTAPOVYCH	T. FERRAND	C. MARCHAND	F. SCHILLACI
M. ATAY	A. FRANCES	R. MARTIN	J. SFERRUZZA
J. BAI	O. FRIJNS	J. MARTINEZ	P. SOLANS
C. BARIBEAU	M. FURSEMAN	M. MATLASZEK	A. SOZEN
G. BAUD	J. GALINDO-GUARCH	S. MAZZONI	M. STASZCZAK
M. BEN-ABDILLAH	L. GARCIA-FAJARDO	A. MITROFANOV	L. STOEL
S. BENEDETTI	F. GARTNER	A. MONETTI	A. SUBLET
R. BEREZOV	D. GAVELA	J. MUNILLA	P. SUDMUANG
M. BETZ	N. GAZIS	A. MUNOZ-MARTIN	K. SZYMCZYK
F. BISESTO	O. GEITHNER	S. MURPHY	C. TAMBASCO
G. BORGESE	J. GETHMANN	M. NAVARRO-TAPIA	A. TOPALOUDIS
B. BRADU	N. GHAZARYAN	A. NIKIPELOV	C. TOPPING
D. CARTELLI	B. GONSALVES	J. OLEXA	J. TOWLER
B. CASSANY	A. GOTTBERG	K. PAPKE	O. TURKOT
Z. CHARIFOULLINE	W. GRABOWSKI	P. PATCHAKUI	L. VENTURA
T. CHARITONIDIS	K. GROSS	D. QUARTULLO	Q. VEYRAT
X. CHEN	O. HAAS	R. RATA	P. WARZYBOK
C. CLAESSENS	B. HARER	A. REZAEIZADEH	G. WILLERING
J. CORNO	D. HICKIN	L. RIBO-MOR	X. WU
A. CRISOL	M. ILKOV	J. RICAUD	D. YEPEZ
M. CROUCH	V. IVANOVA	S. RICCIARDI	H. ZHA
B. DELILLE	E. JANSA	M. RIHL	S. ZORZETTI
G. DI-GIOVANNI	J. JORGENSEN	W. ROGERS	—
A. DIETRICH	R. KALT	T. ROGGEN	—
D. DRASKOVIC	I. KARPOV	A. RUSSO	—
—	M. KRUPA	J. RYSTI	—

Some handsome formula - luminosity

As a reminder, the formula is:

$$L = \frac{kN_1N_2f}{4\pi\sigma_x\sigma_y}$$

with:

k**: number of colliding bunches**

N_1, N_2**: particles per bunch**

f**: revolution frequency**

σ_x, σ_y**: horizontal and vertical beam sizes**

Number of events per second for a process p**:** $\frac{dR}{dt} = L \cdot \sigma_p$
where σ_p **is the cross section of this process**

Total number of events R **during a time** T**:** $\sigma_p \cdot \int_0^T Ldt$
$\int_0^T Ldt$ **is also called Integrated Luminosity**

Some handsome formula - β in FODO cell

For a FODO cell with phase advance ϕ and a cell length L we have for the maximum and minimum β (see lecture on transverse dynamics):

$$\hat{\beta} \;=\; L \;\cdot\; \frac{1+sin(\phi/2)}{sin(\phi)} = \; L_{1/2} \;\cdot\; \frac{1+sin(\phi/2)}{sin(\phi/2)\cdot cos(\phi/2)} \qquad (1)$$

and

$$\check{\beta} \;=\; L \;\cdot\; \frac{1-sin(\phi/2)}{sin(\phi)} = \; L_{1/2} \;\cdot\; \frac{1-sin(\phi/2)}{sin(\phi/2)\cdot cos(\phi/2)} \qquad (2)$$