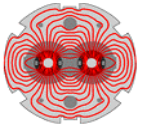
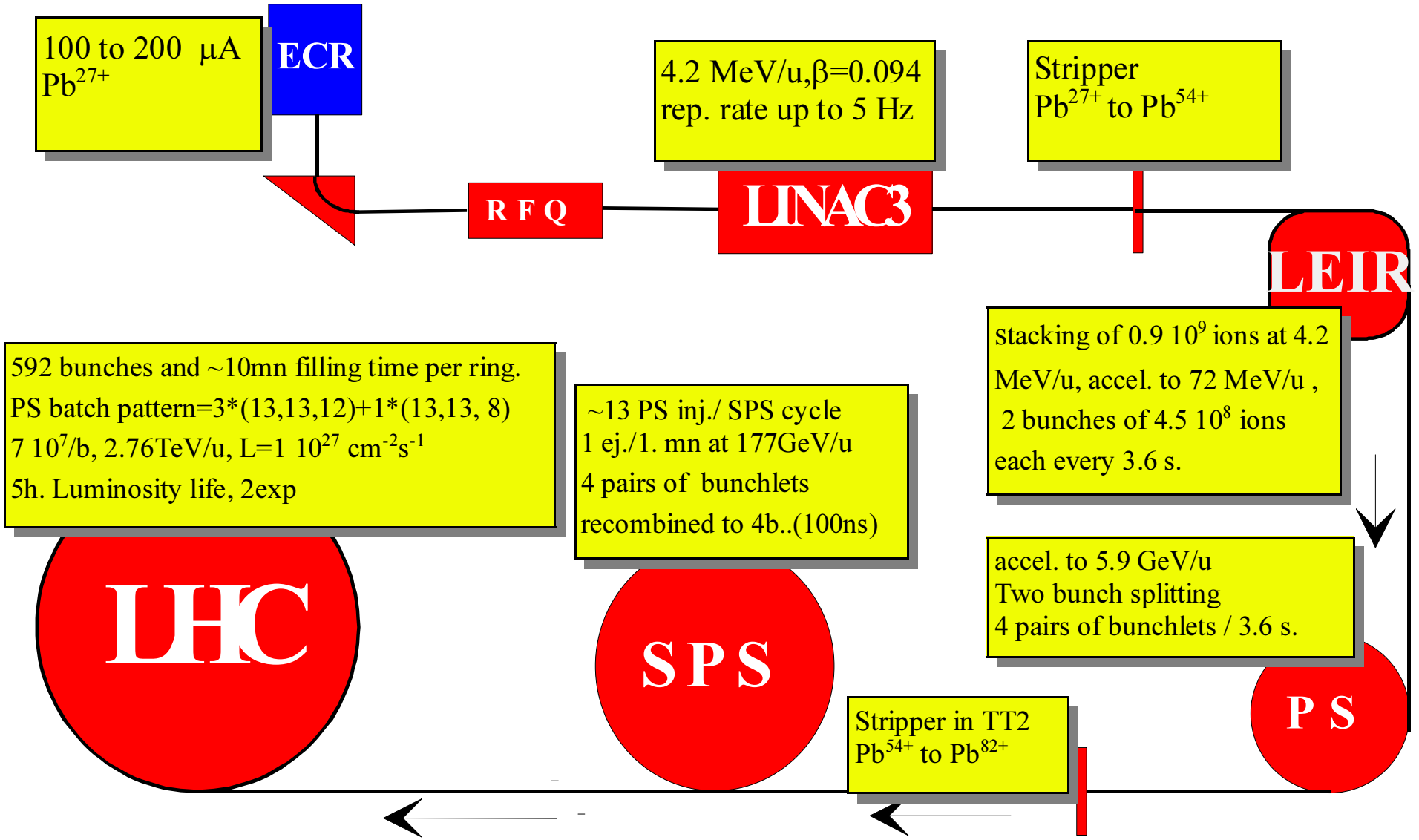


IONS for LHC: LEIR and PS

Presented by M. CHANEL

June 28th 2002 –LHC Ions Workshop

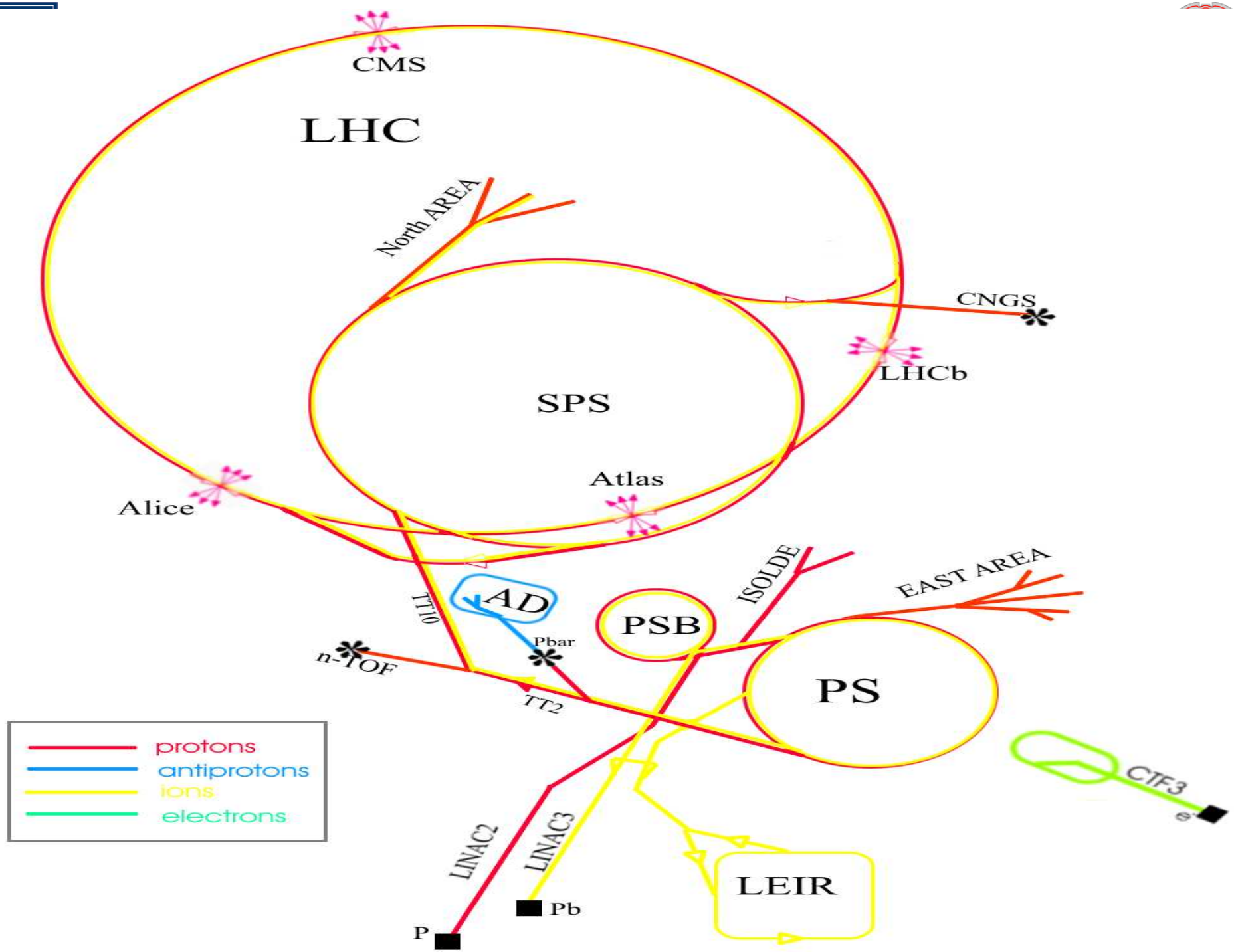
GENERAL SCHEME

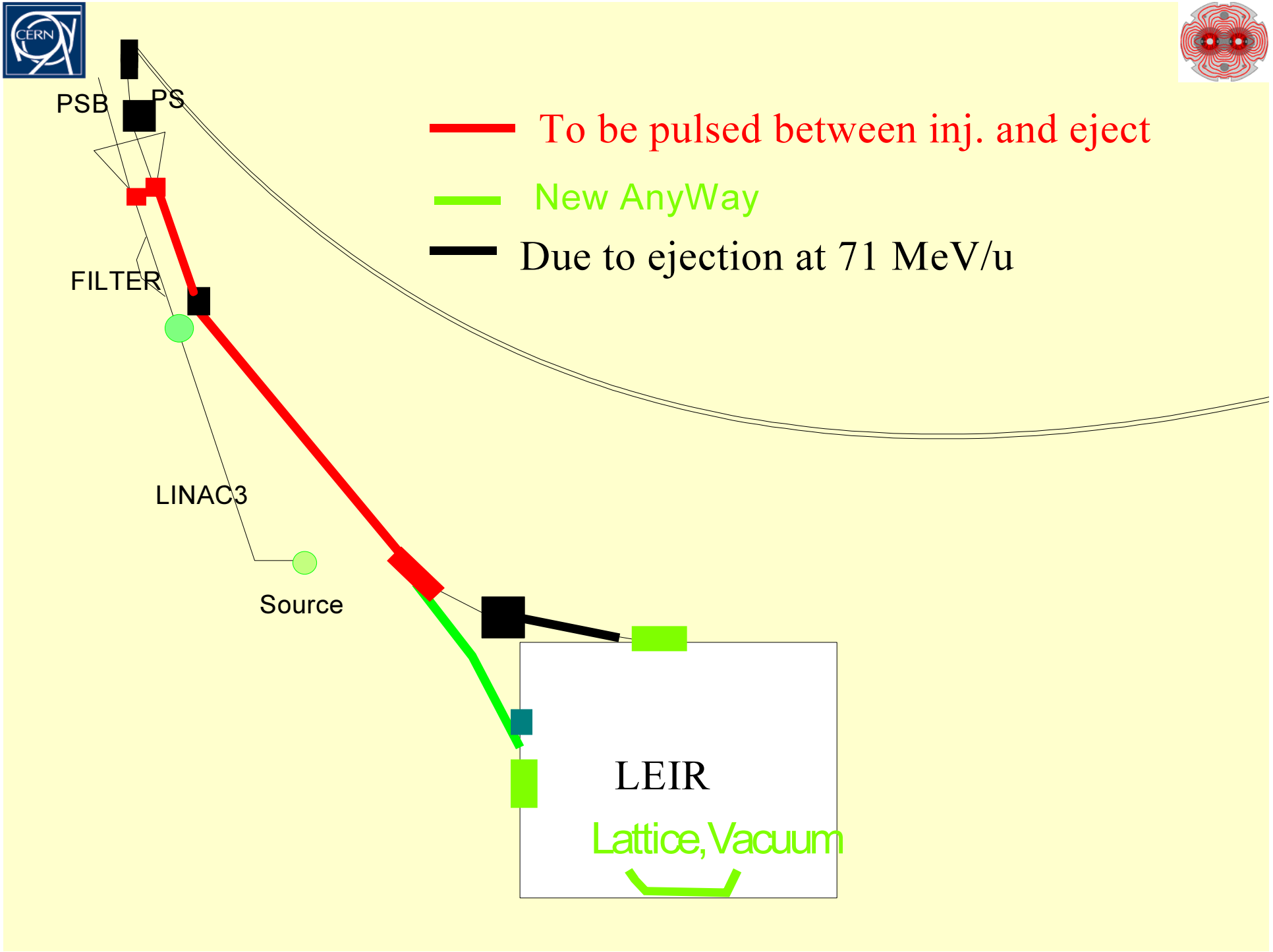


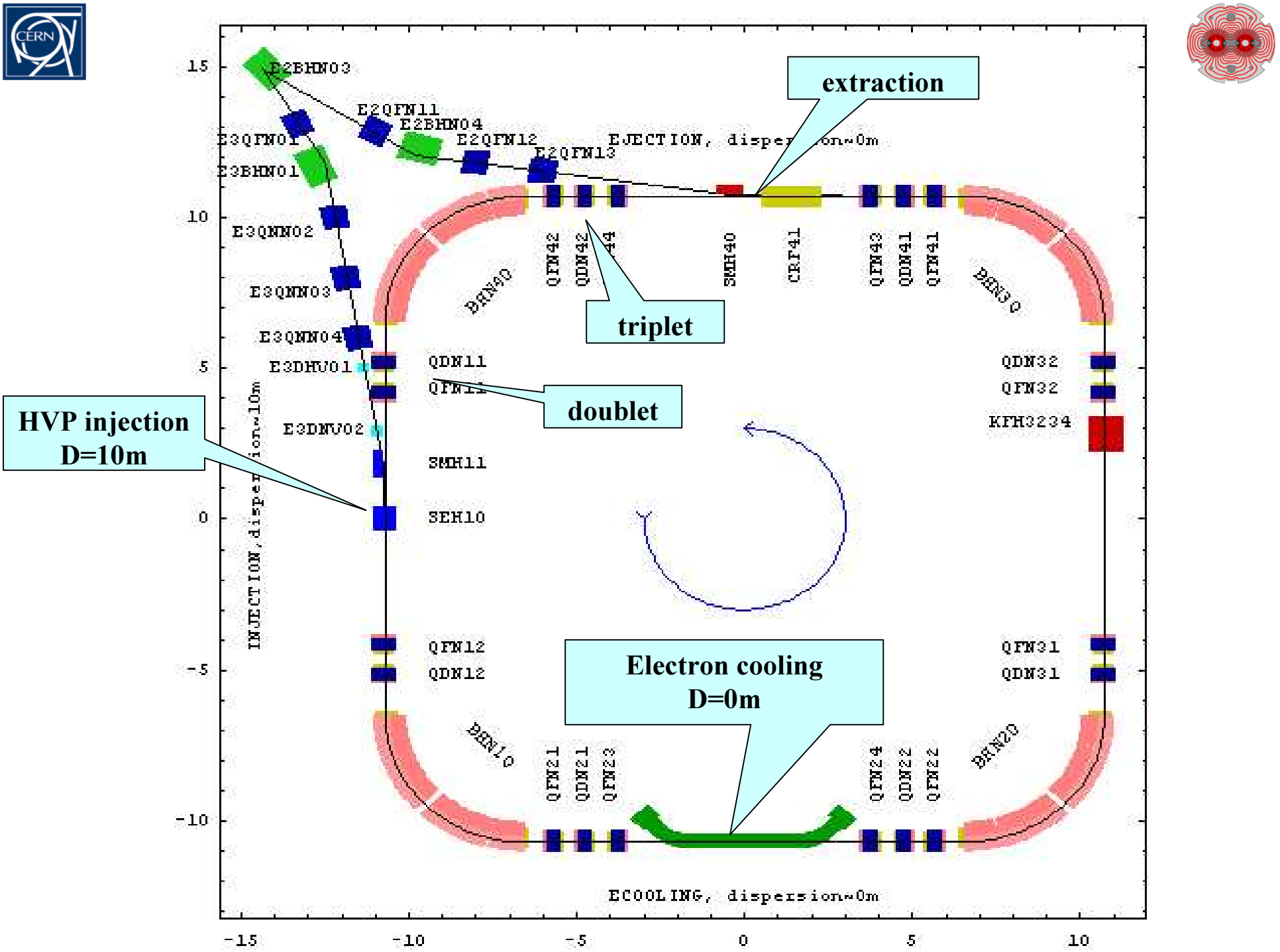
LHC.LEAD.new.PUB

Nominal Performance for LEAD ions

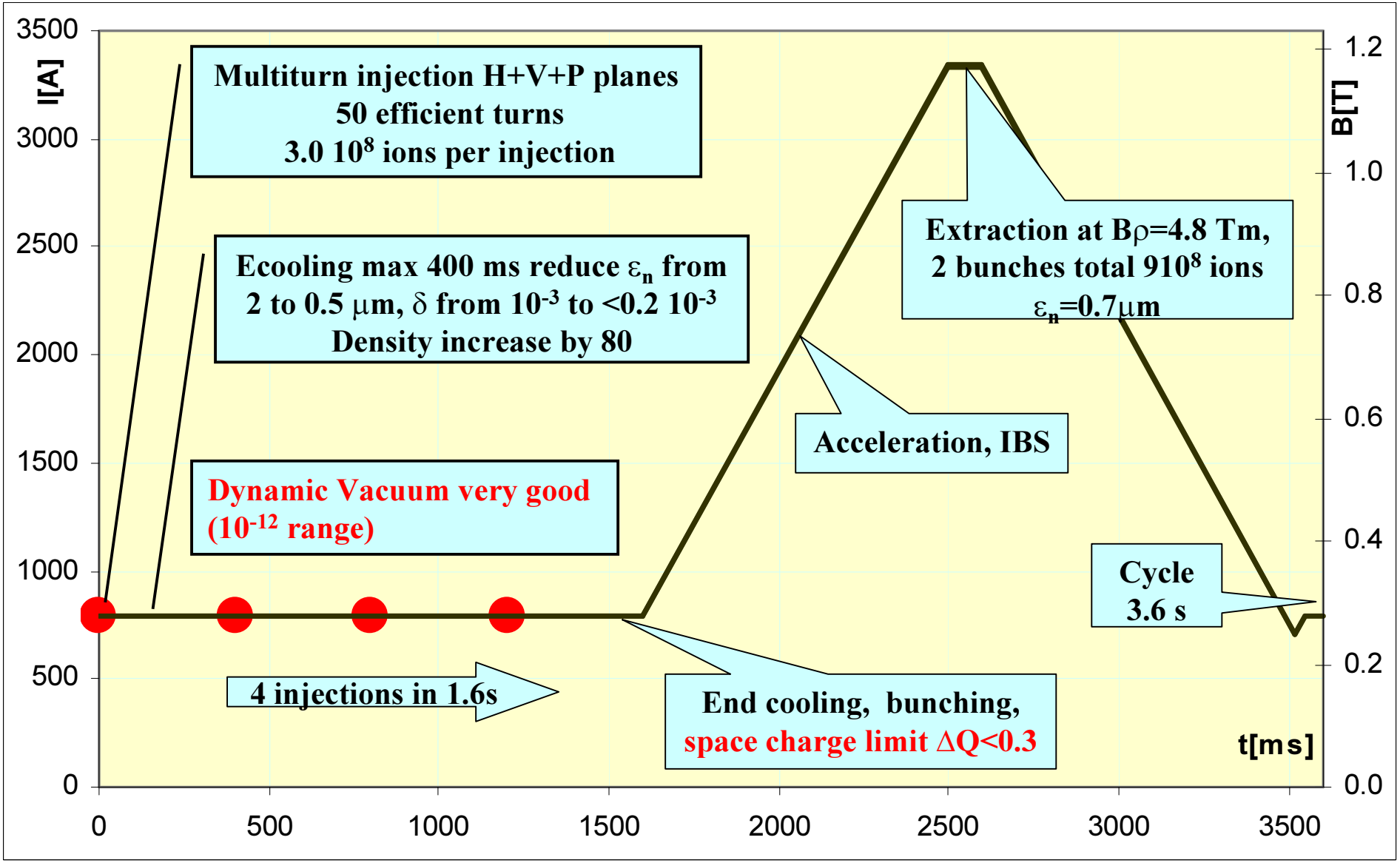
- 7 10^7 Lead ions/bunch in LHC at 2.7 TeV/n in a normalised emittance of 1.5 μm($\beta\gamma\ \sigma^2/\beta_{h,v}$).
- Overall transfer efficiency(from Leir extraction lo LHC coast) of 30%,
- $\varepsilon^* < 1.2$ μm at the exit of SPS,
- $\varepsilon^* < 1$ μm at the entrance of SPS after final stripping,
- $\varepsilon^* < 0.7$ μm at the entrance of PS.
- A total of 0.9 10^9 ions extracted from LEIR
- Limit as much as possible LHC filling time.


CMS
LHC
North AREA
CNGS
LHCb
SPS
Atlas
Alice
ISOLDE
EAST AREA
AD
PSB
TT10
Pbar
n-TOF
TT2
PS
CTF3
protons
antiprotons
ions
electrons
LINAC2
LINAC3
LEIR
Pb
P

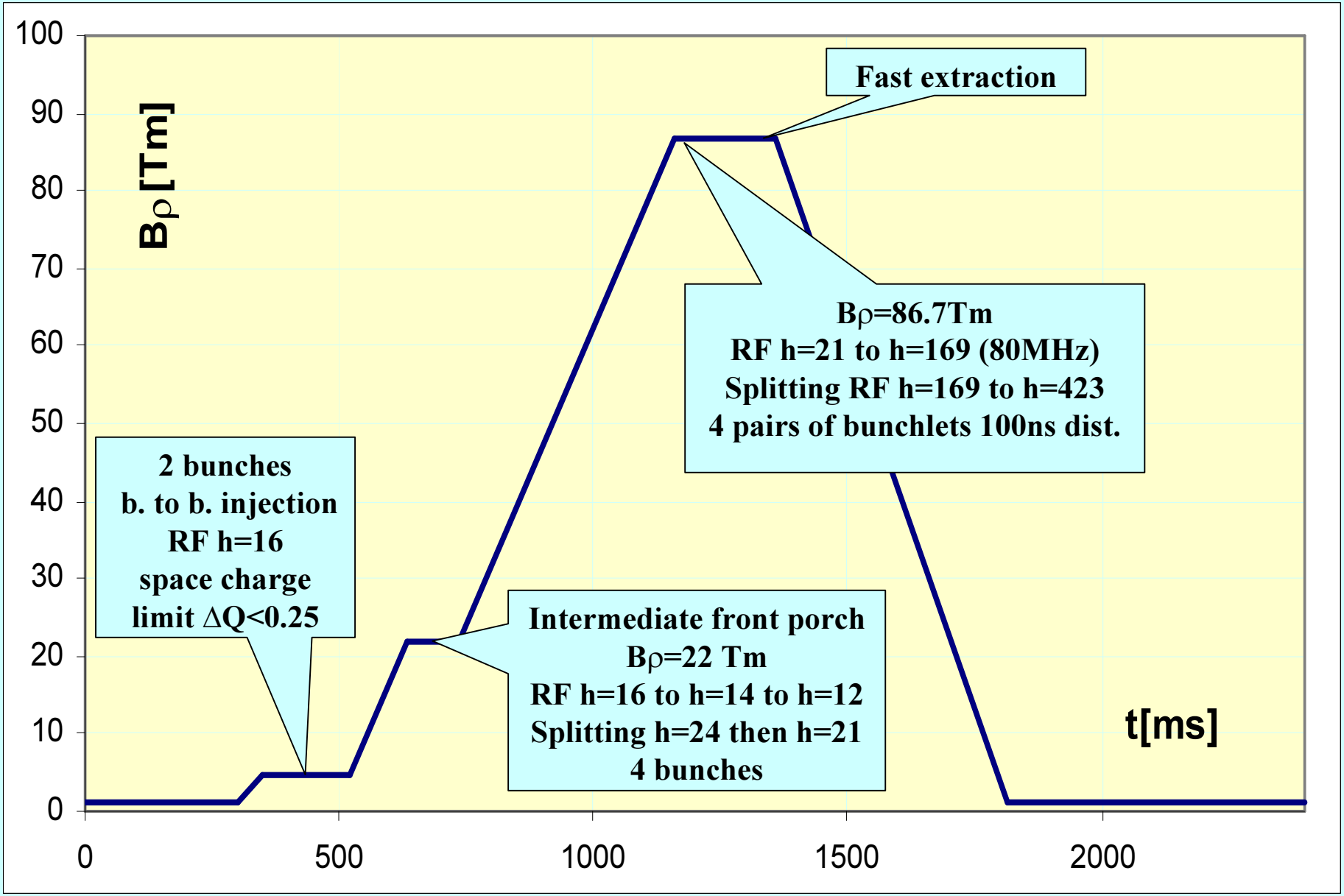

PSB
PS
FILTER
LINAC3
Source
To be pulsed between inj. and eject
New AnyWay
Due to ejection at 71 MeV/u
LEIR
Lattice, Vacuum


extraction
triplet
doublet
HVP injection
D=10m
Electron cooling
D=0m
E2BHN03
E2QFN11
E2BHN04
E2QFN12
E2QFN13
E3QFN01
E3BHN01
E3QNN02
E3QNN03
E3QNN04
E3DHV01
E3DHV02
QDN11
QFN12
SMH11
SEH10
QFN12
QDN12
QFN21
QDN21
QFN23
QFN24
QDN22
QFN22
QFN31
QDN31
QDN32
QFN32
KFH3234
QFN42
QDN42
SMH40
CRF41
QFN43
QDN41
QFN41
BRN40
BRN30
BRN10
BRN20
INJECTION, dispersion~10m
ECOOLING, dispersion~0m
15
10
5
0
-5
-10
-15
-10
-5
0
5
10

LEIR cycle for LEAD ions



LEAD IN THE PS



Injection h=16

h=16 to 14

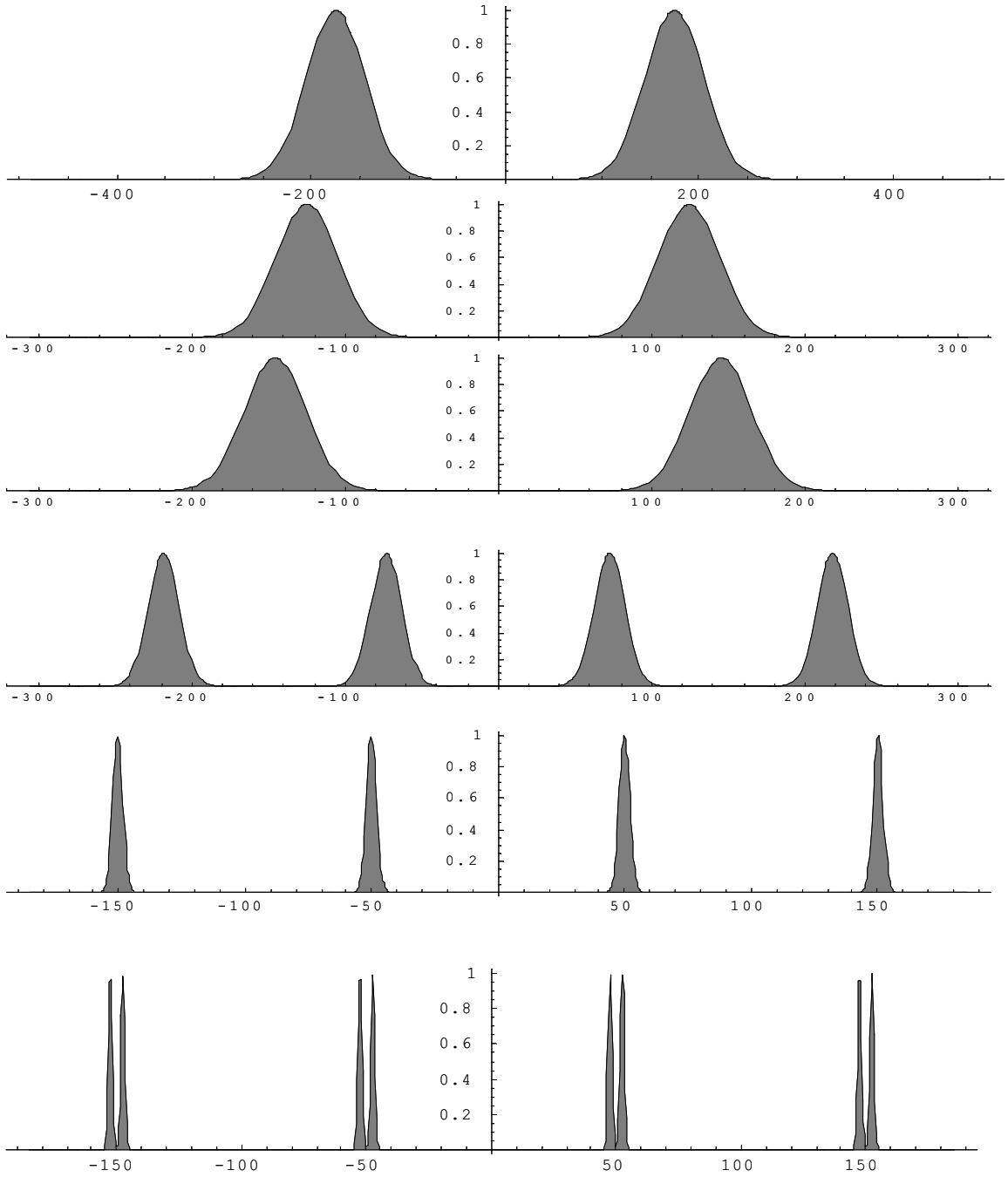
h=14 to 12

Splitting
h=12 to 24

h=24 to 21

to 169

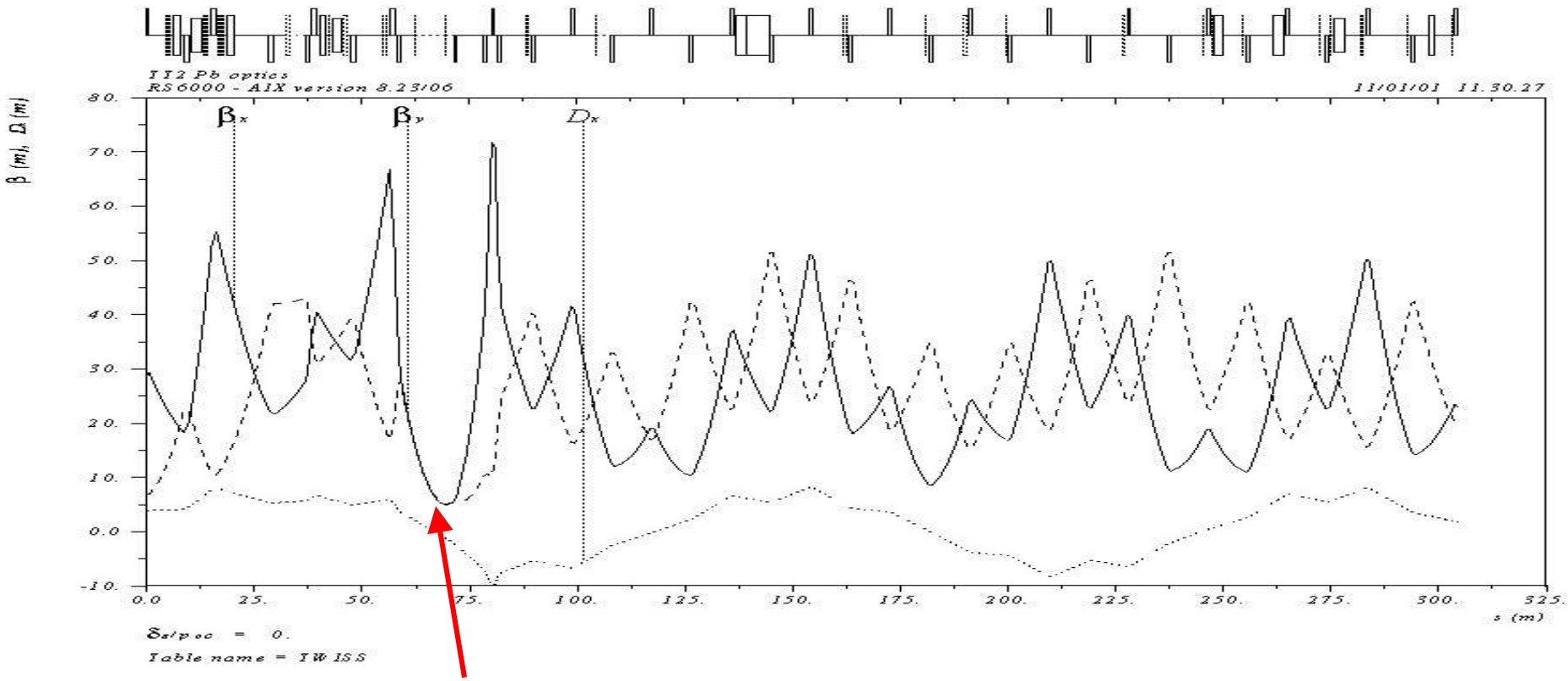
Splitting
h~423
(200MHz)



Front PORCH

FLAT TOP

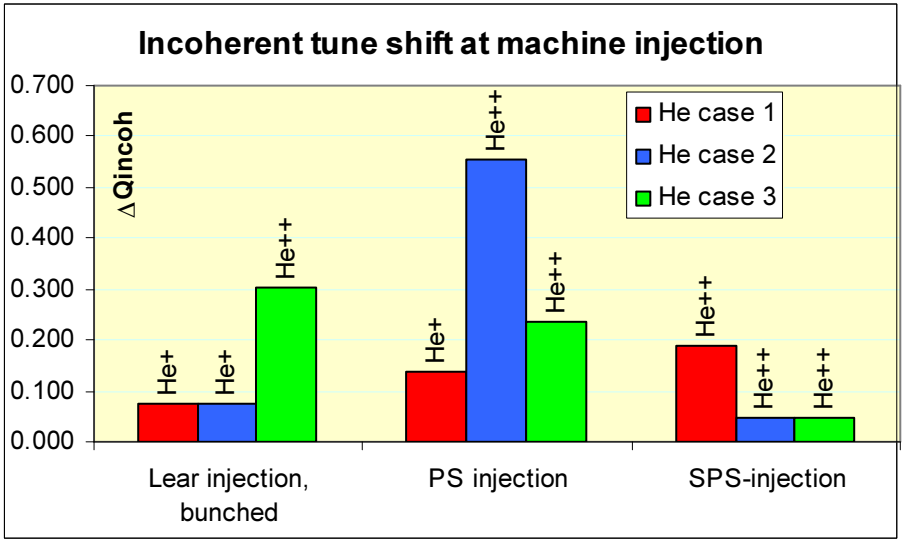
TT2 (from PS to SPS, has to be changed)



- At stripper $\beta_{h,v}$~20m→5m, D~-1m
- Blow-up reduced by a factor 4 compared to old(normal)optic….needs MD for SPS matching. Δε~0.2μm after re-matching in SPS?.
- Need of 4 quads, 6 power supplies +building.(mostly recuperated)

Other ions

- Ions should have the highest possible charge state already in LEIR:
  - Remove SPS limit
  - Better and faster cooling in LEIR(Z^2/A)
- Limits are in LEIR and PS (space charge)
- PS RF not studied



See Daniel's talk

LEIR + PIL Cost

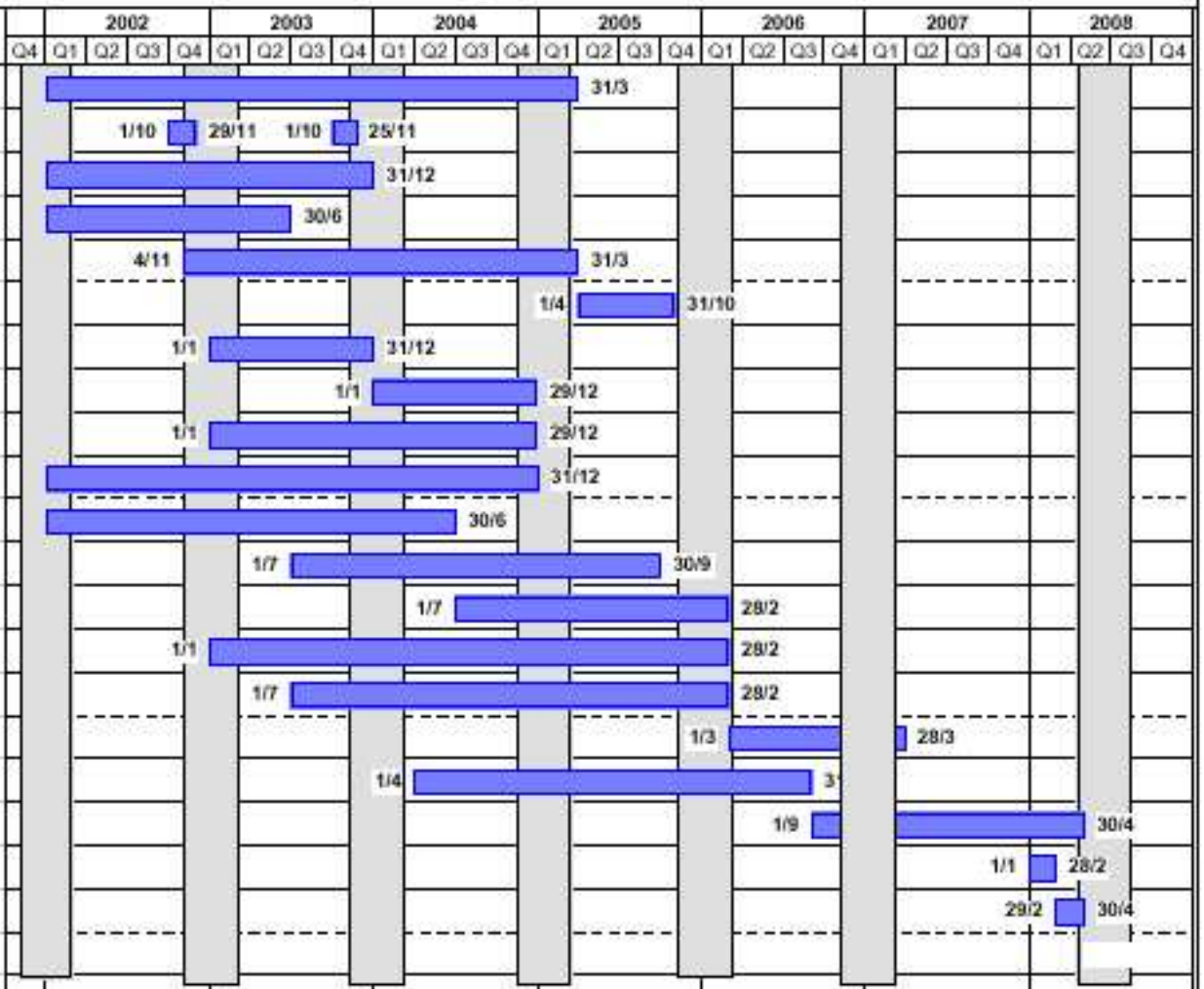
Year	2002	2003	2004	2005	2006	TOTAL PIL & LEIR
TOTAL	2150	6050	6380	4289	610	19479

Schedule

Project Leader: S. Maury

PIL Tentative Planning

ID	Task Name	
1	Source (ECR) upgrade (0.5 my)	
2	SPS fixed target Ion runs	
5	Leir studies	
6	Vacuum studies (L3+Lear)	
7	Leir installation	
8	Leir Running-in	
9	Energy Corr.cavity (L3) study/construct.)	
10	E-Corr.Cav.install./comissioning (1mv)	
11	14 Power supplies L3 Dipoles	
12	10 Power supplies Quad.	
13	2 Power supplies Solenoide	
14	PS-Supply for septum 26 (2.0 my)	
15	PS-New septum 26 (1.5 my)	
16	PS-Kickers 28 upgrade (1.0 my)	
17	PS-RF upgrade (1.0 my)	
18	PS Running-in with ions	
19	Stripping TT2 (2 my)	
20	SPS running-in with ions	
21	Lead ions possible in LHC	
22	Run physic LHC	
23		

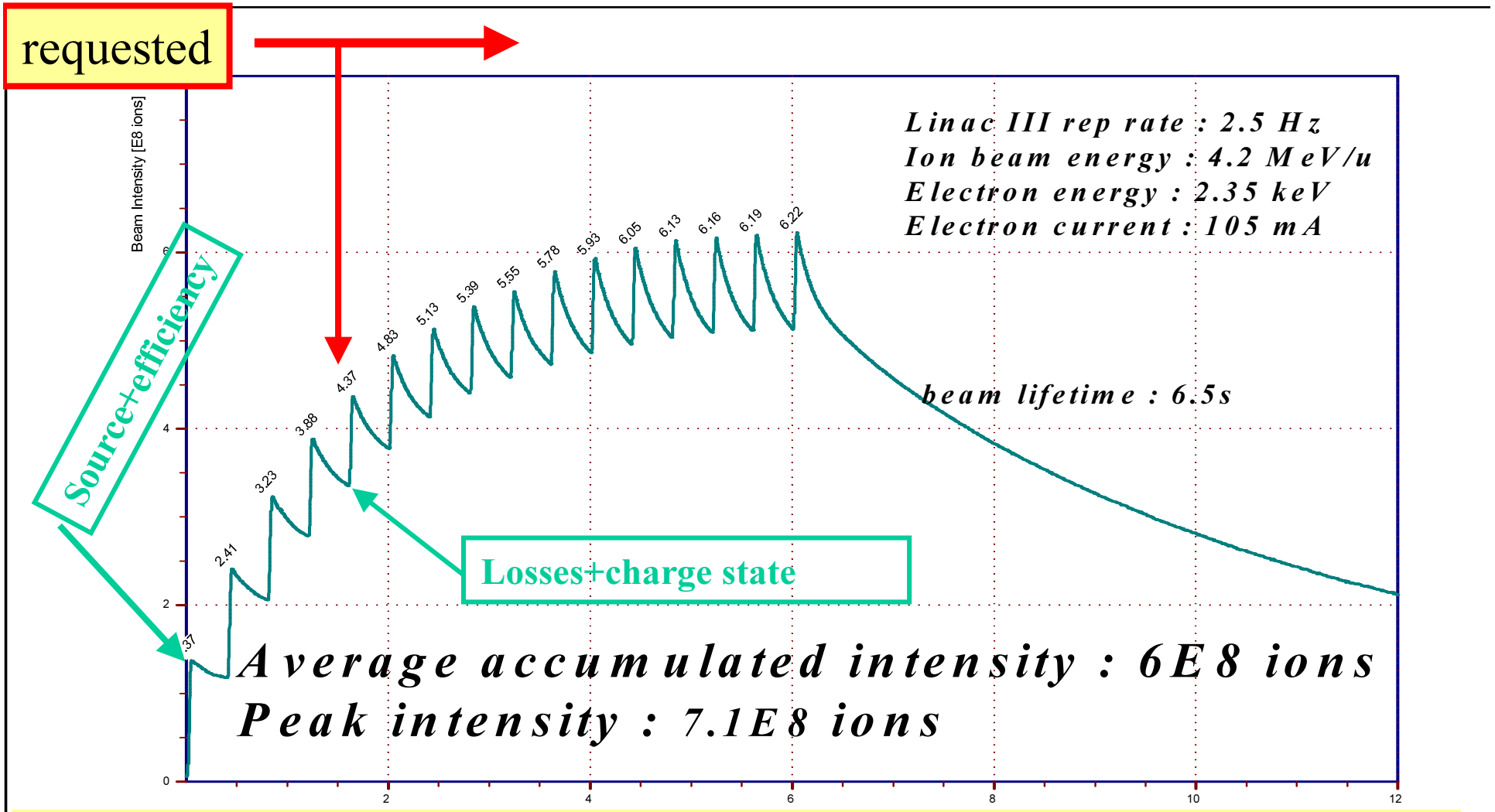


Conclusions

- LEIR and PS well adapted for all ions.
- Flexible in terms of Nions/bunch.
- Can be operational for 2008

- More in http://chanel.home.cern.ch/chanel/Welcome.htm

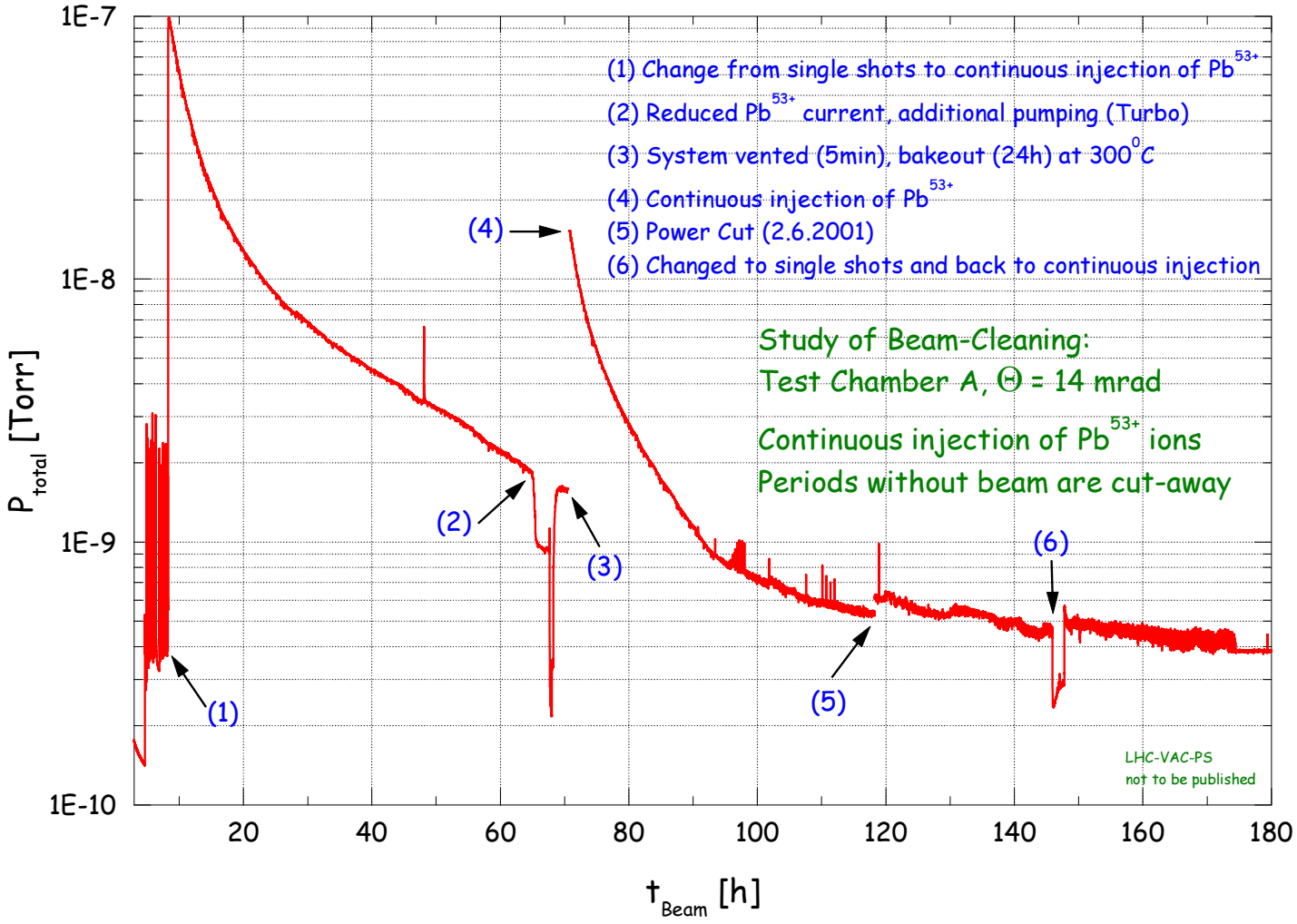
Stacking tests of lead ions



With the lattice used, it was not possible to accelerate the beam

Ion induced desorption tests at LINAC 3

J. Hansen, J.-M. Laurent, E. Mahner & LINAC 3-Team



Lead Ions Limitations