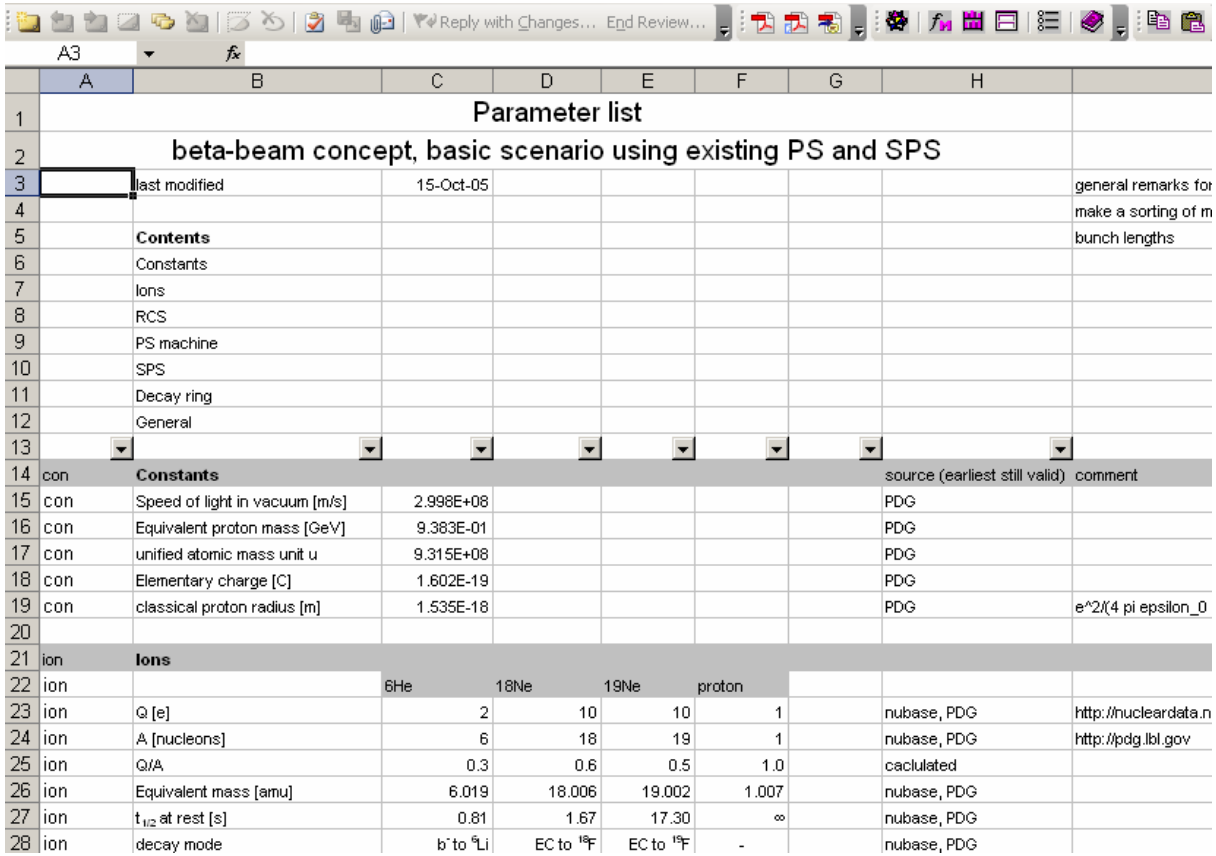
Beta-beam baseline: Parameter List

A.Fabich
AB department, CERN

2nd beta-beam task meeting
Saclay, 17th October 2005

Outline

- Aim
- Layout
- Maintenance



	A	B	C	D	E	F	G	H	
1	Parameter list								
2	beta-beam concept, basic scenario using existing PS and SPS								
3		last modified	15-Oct-05						general remarks for
4									make a sorting of m
5		**Contents**							bunch lengths
6		Constants							
7		Ions							
8		RCS							
9		PS machine							
10		SPS							
11		Decay ring							
12		General							
13									
14	con	**Constants**						source (earliest still valid)	comment
15	con	Speed of light in vacuum [m/s]	2.998E+08					PDG	
16	con	Equivalent proton mass [GeV]	9.383E-01					PDG	
17	con	unified atomic mass unit u	9.315E+08					PDG	
18	con	Elementary charge [C]	1.602E-19					PDG	
19	con	classical proton radius [m]	1.535E-18					PDG	e^2/(4 pi epsilon_0
20									
21	ion	**Ions**							
22	ion		6He	18Ne	19Ne	proton			
23	ion	Q [e]	2	10	10	1		nubase, PDG	http://nucleardata.n
24	ion	A [nucleons]	6	18	19	1		nubase, PDG	http://pdg.lbl.gov
25	ion	Q/A	0.3	0.6	0.5	1.0		caclulated	
26	ion	Equivalent mass [amu]	6.019	18.006	19.002	1.007		nubase, PDG	
27	ion	$t_{1/2}$ at rest [s]	0.81	1.67	17.30	∞		nubase, PDG	
28	ion	decay mode	b⁻ to ^{6}Li	EC to ^{18}F	EC to ^{19}F	-		nubase, PDG	

Aim of the parameter list

Task 12 Milestone for Oct. 2005: PARAMETER LIST

"Versions"

- notes are the official communication path for design updates/changes
- but not a database type collection of numbers

"Parameter list"

Numerical contents equal to task notes

- Provide an comprehensive parameter overview
  - Only parameters and numbers
  - Fast access to parameters
  - easily trace back the origin of parameters
- Describes the baseline scenario only (with one exception) based on:
  - Input of EURISOL task 12
  - "version" notes
  - existing parameters of PS and SPS
  - Derived parameters
- Available at document task webpage: http://cern.ch/beta-beam/redir.asp?l=taskdocs

Layout (1)

- Excel spread sheet
  - Header
    - Contents
    - Filter
  - Constants
  - Basic ion properties
  - Machine name
    - machine parameters
    - ion specific parameters
      - ^{6}He, ^{18}Ne, ^{19}Ne, proton equivalent

        For ^{19}Ne often same values assumed as for ^{18}Ne

Looped over target, ECR, RCS, PS, SPS, Decay ring

Layout (2)

Machine name

Machine parameters

Ion specific parameters

filter	parameter	Values					origin
PS	p ejection [eV/c /charge]	2.6E+10	2.6E+10	2.6E+10	2.6E+10		calculated
PS	intensity ejection [ions/cycle]	9.58E+12	1.81E+11				version2
SPS	**SPS**						
SPS							
SPS	machine radius [m]	1100					n.a.
SPS	circumference [m]	6911.50					n.a.
SPS	number of PS batches	1					version1
SPS	beta function maximum hor. [m]	107.12					yellow report CERN-2004-
SPS	beta function maximum ver. [m]	107.73					yellow report CERN-2004-
SPS	accumulation time [s]	0					calculated
SPS							
SPS		6He	18Ne	19Ne	proton equiv.		
SPS	emittance injection hor. [mm mrad]	0.8	0.5		-		version2
SPS	emittance injection ver. [mm mrad]	0.4	0.3		-		version2
SPS	E ejection/nucleon [eV]	9.3E+10	9.2E+10	9.2E+10	1.7E+12		calculated
SPS	E ejection [eV]	5.6E+11	1.7E+12	1.8E+12	1.7E+12		calculated
SPS	p ejection [eV/c /nucleon]	5.6E+11	1.7E+12	1.8E+12	1.7E+12		calculated
SPS	p ejection [eV/c /charge]	1.7E+12	3.0E+12	3.3E+12	1.7E+12		calculated
SPS	bunch size full [eVs]	1.0	2.0	2.0			version2
SPS	intensity ejection [ions/cycle]	9.05E+12	1.79E+11				version2
decay	**Decay ring**						
decay	length straight section	2500					nufact02
decay	arc length [m]	1000					nufact02

Not shown: column with comments

"origin" = earliest, still valid definition

Parameter types

- List of already added
  - Universal constants
  - Ion properties
  - All parameters from version 1&2
  - Relativistic parameters: energy, momentum, β, γ,…
  - Acceptance, emittance
- List of missing items
  - Vacuum
  - Decay ring
  - injection (septa, kicker design) see B.Goddard
  - merging
  - ejection (septa, kicker, dump)
  - collimation
  - decay losses
  - RF system
  - closed orbit studies
  - + corrector systems
  - vacuum system
  - magnets
  - BDI
  - power supplies
  - cryogenics
  - civil engineering
  - collective effects (space charge, IBS)
  - costs

Maintenance

CERN maintains the completeness and validity

- With your help!

It will grow rapidly!

- Regularly we will ask responsibles of the sub-tasks to provide input to keep the parameter list complete and updated.

- Currently all parameters in one sheet
  - About 150 entries now
- Possible split into parts later
  - Change to separated sheets
  - Change to database (MS access) style?
    - Provides enormous increase on flexibility

- Finally it should provide all numbers ever identified
- Base reference in the end!