Parameters Report

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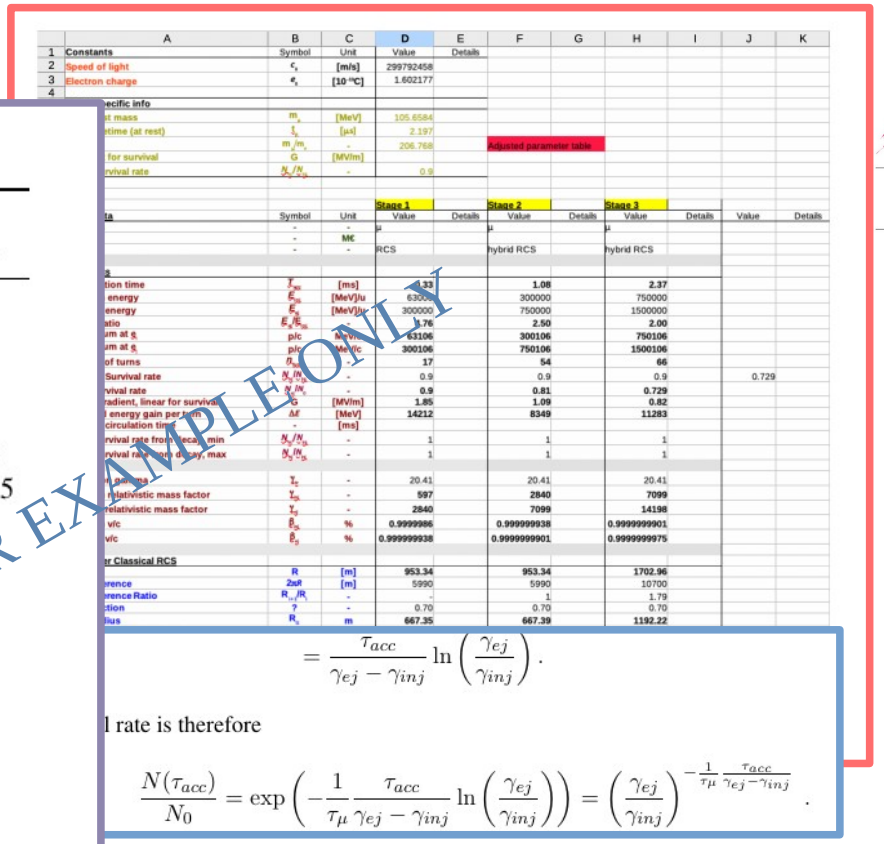
Parameters Report

- Describe parameters of the facility
  - Equipment parameters
  - Assumptions
- Aim is to support discussion between WGs
  - Target audience is mostly internal
- EU project milestone due end of October

E.g. High-Energy Acceleration



A	B	C	D	E	F	G	H	I	J	K
1 Constants	Symbol	Unit	Value	Details						
2 Speed of light	c_0	[m/s]	299792458							
3 Electron charge	e_0	[10 $^{-19}$C]	1.602177							
4										
ecific info										
t mass	m_0	[MeV]	105.6584							
time (at rest)	τ_0	[μs]	2.197							
	$m_0/m_{0,e}$	-	206.768		Adjusted parameter table					
for survival	G	[MV/m]								
rvival rate	N_{ej}/N_{inj}	-	0.9							
			Stage 1		Stage 2		Stage 3			
ta	Symbol	Unit	Value	Details	Value	Details	Value	Details	Value	Details
	-	-	μ		μ		μ			
	-	MC								
	-	-	RCS		hybrid RCS		hybrid RCS			
3										
tion time	T_{acc}	[ms]	0.33		1.08		2.37			
energy	E_{inj}	[MeV]/u	63000		300000		750000			
energy	E_{ej}	[MeV]/u	300000		750000		1500000			
atio	E_{ej}/E_{inj}		4.76		2.50		2.00			
um at ej	p/c	MeV/c	63106		300106		750106			
um at ej	p/c	MeV/c	300106		750106		1500106			
of turns	n_{turn}		17		54		66			
Survival rate	N_{ej}/N_{inj}	-	0.9		0.9		0.9		0.729	
vival rate	N_{ej}/N_{inj}	-	0.9		0.81		0.729			
radient, linear for survival	G	[MV/m]	1.85		1.09		0.82			
energy gain per turn	ΔE	[MeV]	14212		8349		11283			
circulation time	-	[ms]								
rvival rate from decay, min	N_{ej}/N_{inj}	-	1		1		1			
rvival rate from decay, max	N_{ej}/N_{inj}	-	1		1		1			
	γ_{tr}	-	20.41		20.41		20.41			
relativistic mass factor	γ_{inj}	-	597		2840		7099			
elativistic mass factor	γ_{ej}	-	2840		7099		14198			
v/c	β_{inj}	%	0.9999986		0.999999938		0.9999999901			
v/c	β_{ej}	%	0.999999938		0.9999999901		0.9999999975			
r Classical RCS										
	R	[m]	953.34		953.34		1702.96			
rence	$2\pi R$	[m]	5990		5990		10700			
rence Ratio	R_{inj}/R	-	-		1		1.79			
tion	?	-	0.70		0.70		0.70			
lius	R_0	m	667.35		667.39		1192.22			

$$= \frac{\tau_{acc}}{\gamma_{ej} - \gamma_{inj}} \ln\left(\frac{\gamma_{ej}}{\gamma_{inj}}\right).$$

l rate is therefore

$$\frac{N(\tau_{acc})}{N_0} = \exp\left(-\frac{1}{\tau_\mu}\frac{\tau_{acc}}{\gamma_{ej} - \gamma_{inj}} \ln\left(\frac{\gamma_{ej}}{\gamma_{inj}}\right)\right) = \left(\frac{\gamma_{ej}}{\gamma_{inj}}\right)^{-\frac{1}{\tau_\mu}\frac{\tau_{acc}}{\gamma_{ej}-\gamma_{inj}}}.$$

Table 7.1: Exemplary parameters for RCS1

RCS 1 Parameters			
Parameter	**Symbol**	**Unit**	**Value**
Circumference	C	[m]	5990
Injection energy	E_{inj}	[GeV]/u	63
Ejection energy	E_{ej}	[GeV]/u	313
Energy ratio	E_{ej}/E_{inj}	-	4.98
Momentum at ei p/c	p/c	MeV/c	63105
Momentum at ej p/c	p/c	MeV/c	313935
Number of turns	n_{turn}	-	17
Planned survival rate	N_{ej}/N_{inj}	-	0.9
Acceleration time	T_{acc}	[ms]	0.34
Repetition rate	f_{rep}	[Hz]	5
Aver. accel. gradient in RCS	G	[GV/m]	2.4
Required energy gain per turn	ΔE	[GeV]	14.75
Main RF frequency	f_{RF}	[MHz]	1300
Number of cavities	-	-	700
Length of straight section	-	[m]	2300
Ramping rate	$\dot{B}$	[kT/s]	4.2

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Timeline

- Discussion at Annual Meeting ~ June
- Presentation of parameters at weekly Monday meeting
  - 18/09/23
  - 25/09/23
- Report complete 01/10/23
- Editing and discussion
- Final version 27/10/23