Parameter List

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3rd beta-beam task meeting, GSI, May 2006

Outline

- Parameter list specification
- Database: added value
- Database design
- Setup and maintenance
- Examples
- Conclusion

Parameter List Specification

- The Parameter List Specification is based on the Specification presented at the 2nd bb task meeting 2005
- Single source
- Describe the Baseline
- Versioning
- Insures coherence of studies

Database: Added Value

Slide from bb task meeting 2 (improvements marked by ✸)

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! ✸

Database: Added Value, General

- Unique data source
- Easily maintainable and extendable
- Open system ready to use
- Common acces from several programs like Mathematica
- Data export in a variety of formats (txt, PDF, csv, ASCII, word...)

Database: Added Value, Technical

Our choice of implementation: ORACLE

- Reliability
- Security and fine grained access rights
- Powerful access and maintenance systems exist (i.e. Golden Retriever)
- Daily backups by CERN Oracle support
- Assistance by CERN Oracle support

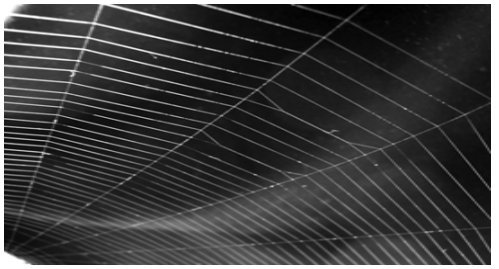
Design: Requirements

Components

Parameters

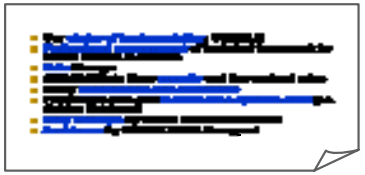
Search Engine

Web Access



Database

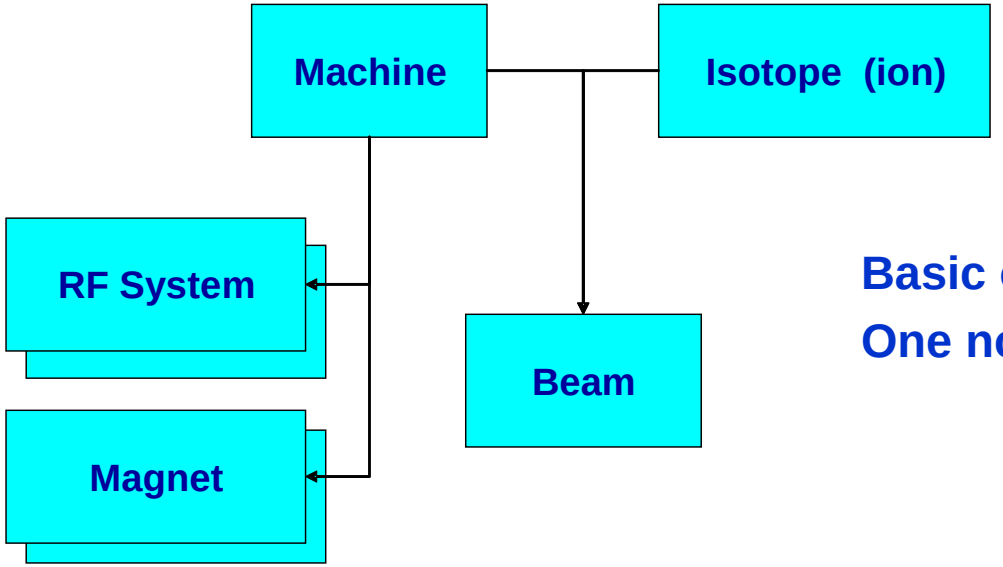
Logging



Access from other tools

Report generation

Design: Structure



Basic object structure for this application:
One node, max two parents

Impose a rigorous systematization of the knowledge about the system,
Separate the parameter definition (metadata) and parameter value (data),
Store the system definition (metadata) in the database.

Origin and Type of Parameter Values

- The *values* of a given parameter can have various sources:

  1. Given value. The value has to be inserted manually, and for each value the exact source (published document, presentation, web site etc.) must be specified. All sources are registered in the detailed *Data Sources list*.
  2. Automated input from e.g. *Mathematica* (for the parameters derived from other requiring complex calculations).
  3. Calculated on the fly upon parameter access (the formulae are defined and stored in the database along with the parameter definition).

- The **type of the source** for a parameter values and **unit** for the numeric values are defined (fixed) in the parameter *definition*. The *value* itself can be either numeric or alpha-numeric.

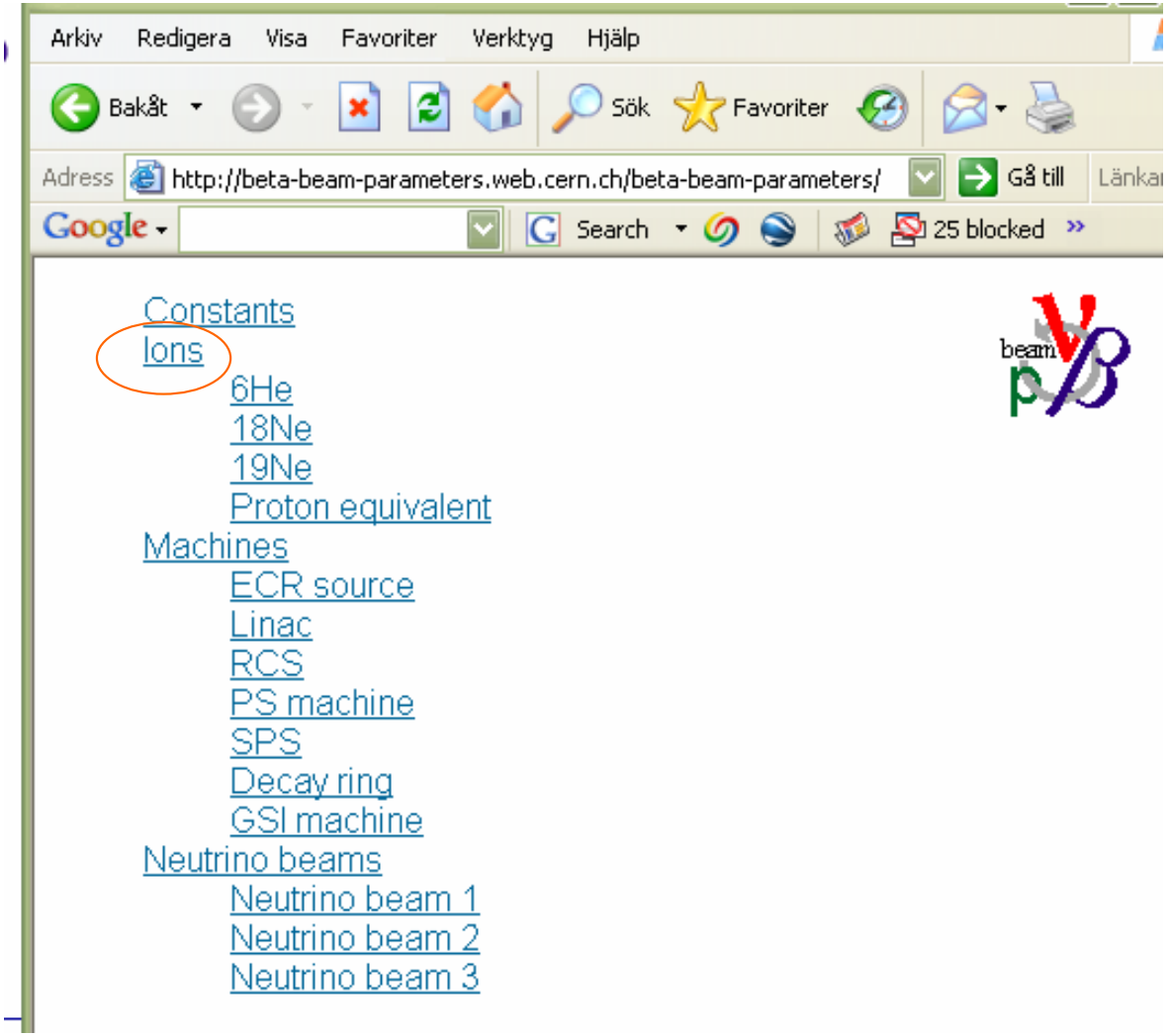
Database Maintenance

- For the database, web and tools:

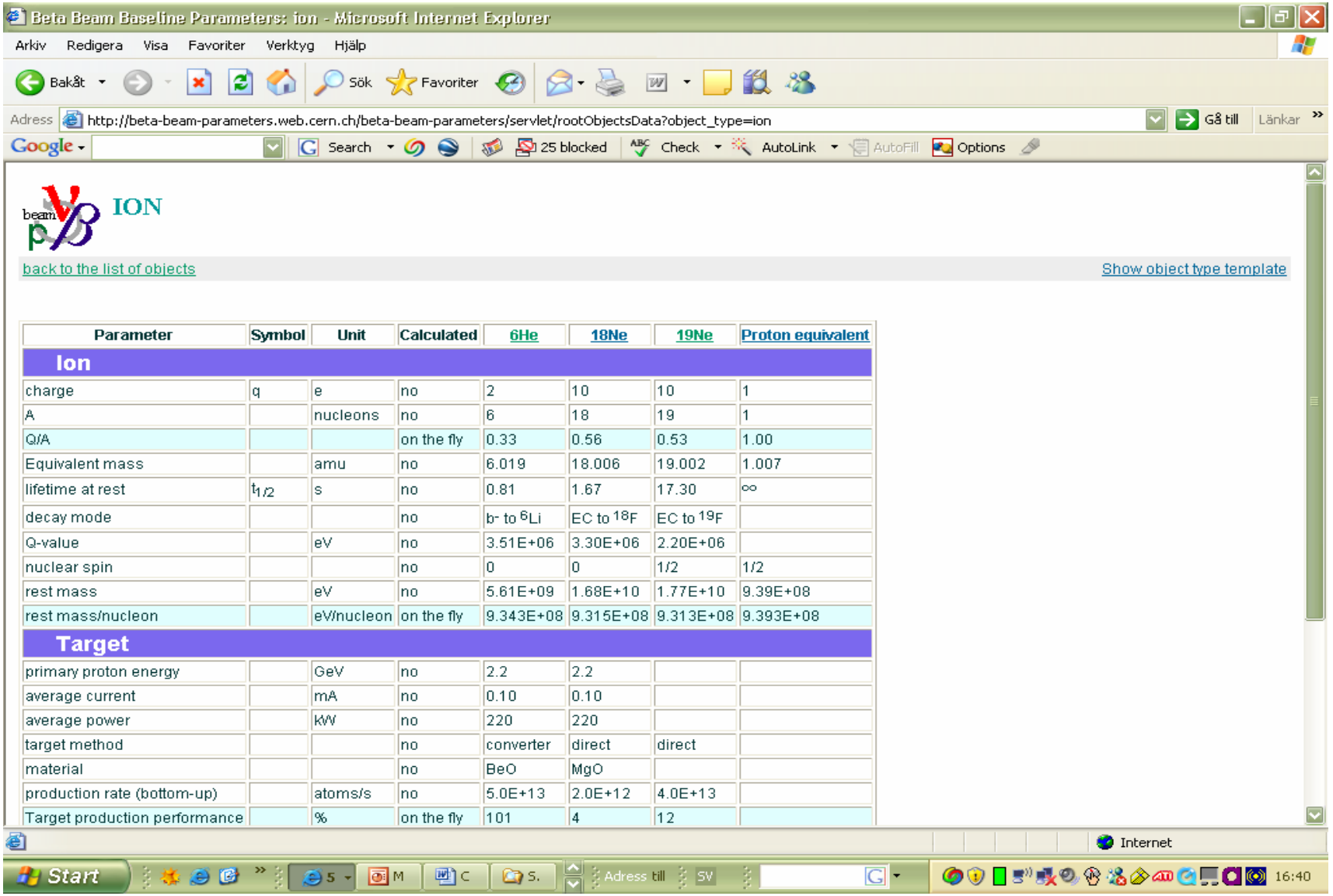
  CERN, Natalia Emelianenko
- For the parameters: CERN, A Fabich

- Versions to be stamped and generated after agreement in task meeting?
- Older versions can be obtained (.pdf and by special tool or request).

Parameters on the Web 1

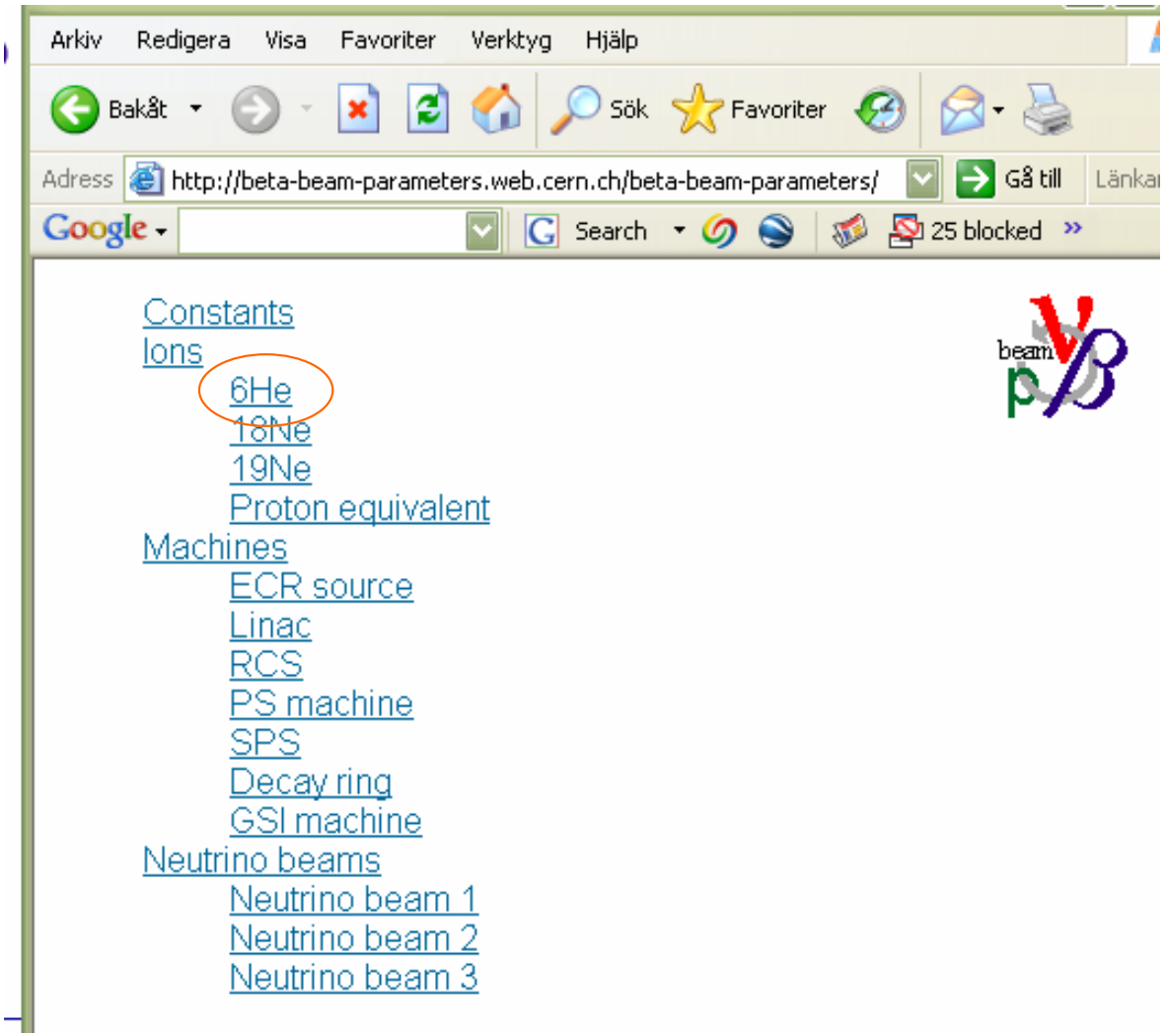


Parameters on the Web 2

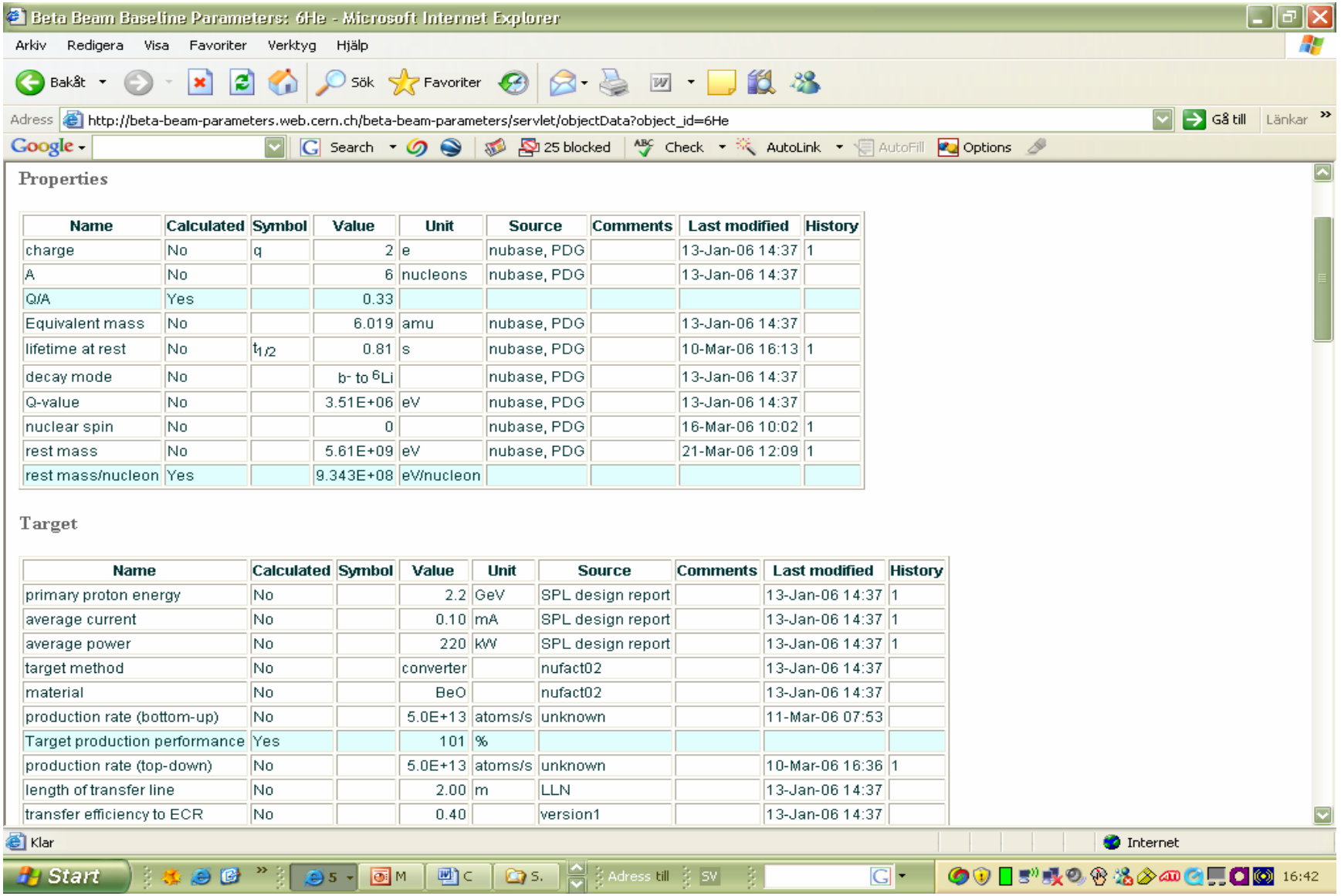


Parameter	Symbol	Unit	Calculated	6He	18Ne	19Ne	Proton equivalent
Ion							
charge	q	e	no	2	10	10	1
A		nucleons	no	6	18	19	1
Q/A			on the fly	0.33	0.56	0.53	1.00
Equivalent mass		amu	no	6.019	18.006	19.002	1.007
lifetime at rest	$t_{1/2}$	s	no	0.81	1.67	17.30	∞
decay mode			no	b- to ^{6}Li	EC to ^{18}F	EC to ^{19}F	
Q-value		eV	no	3.51E+06	3.30E+06	2.20E+06	
nuclear spin			no	0	0	1/2	1/2
rest mass		eV	no	5.61E+09	1.68E+10	1.77E+10	9.39E+08
rest mass/nucleon		eV/nucleon	on the fly	9.343E+08	9.315E+08	9.313E+08	9.393E+08
Target							
primary proton energy		GeV	no	2.2	2.2		
average current		mA	no	0.10	0.10		
average power		kW	no	220	220		
target method			no	converter	direct	direct	
material			no	BeO	MgO		
production rate (bottom-up)		atoms/s	no	5.0E+13	2.0E+12	4.0E+13	
Target production performance		%	on the fly	101	4	12	

Parameters on the Web 3



Parameters on the Web 4



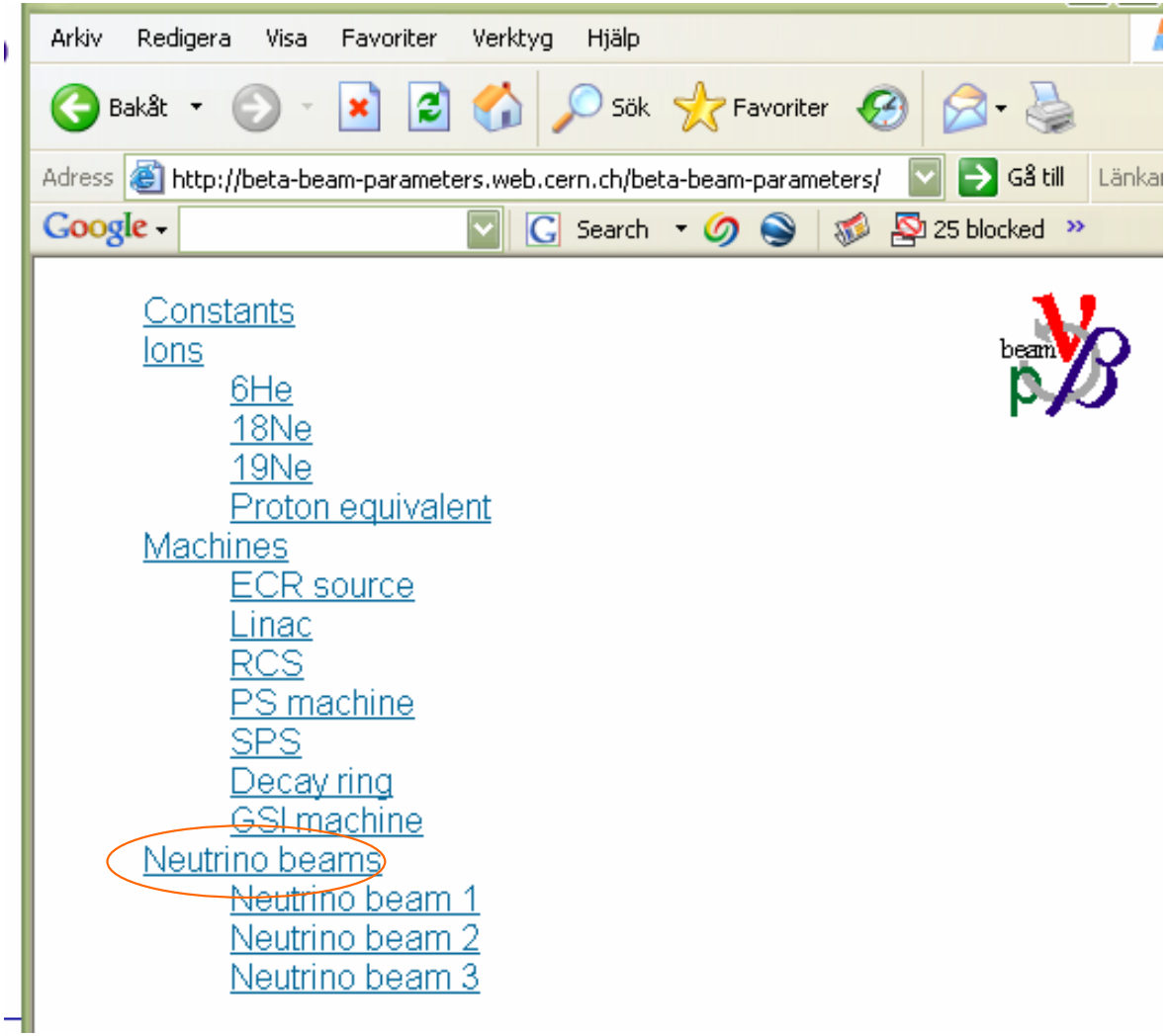
Properties

Name	Calculated	Symbol	Value	Unit	Source	Comments	Last modified	History
charge	No	q	2	e	nubase, PDG		13-Jan-06 14:37	1
A	No		6	nucleons	nubase, PDG		13-Jan-06 14:37	
Q/A	Yes		0.33					
Equivalent mass	No		6.019	amu	nubase, PDG		13-Jan-06 14:37	
lifetime at rest	No	$t_{1/2}$	0.81	s	nubase, PDG		10-Mar-06 16:13	1
decay mode	No		b- to ^{6}Li		nubase, PDG		13-Jan-06 14:37	
Q-value	No		3.51E+06	eV	nubase, PDG		13-Jan-06 14:37	
nuclear spin	No		0		nubase, PDG		16-Mar-06 10:02	1
rest mass	No		5.61E+09	eV	nubase, PDG		21-Mar-06 12:09	1
rest mass/nucleon	Yes		9.343E+08	eV/nucleon				

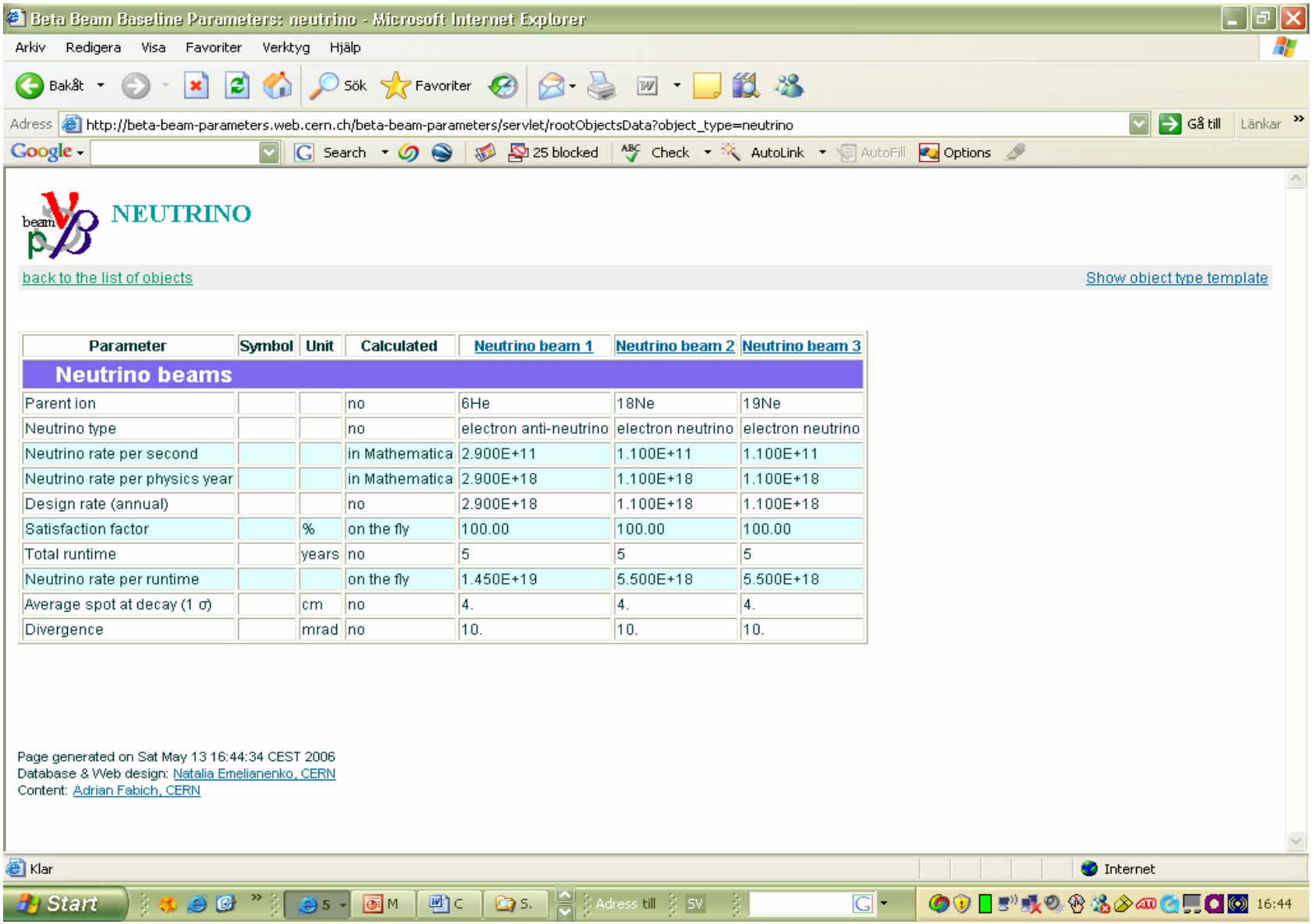
Target

Name	Calculated	Symbol	Value	Unit	Source	Comments	Last modified	History
primary proton energy	No		2.2	GeV	SPL design report		13-Jan-06 14:37	1
average current	No		0.10	mA	SPL design report		13-Jan-06 14:37	1
average power	No		220	kW	SPL design report		13-Jan-06 14:37	1
target method	No		converter		nufact02		13-Jan-06 14:37	
material	No		BeO		nufact02		13-Jan-06 14:37	
production rate (bottom-up)	No		5.0E+13	atoms/s	unknown		11-Mar-06 07:53	
Target production performance	Yes		101	%				
production rate (top-down)	No		5.0E+13	atoms/s	unknown		10-Mar-06 16:36	1
length of transfer line	No		2.00	m	LLN		13-Jan-06 14:37	
transfer efficiency to ECR	No		0.40		version1		13-Jan-06 14:37	

Parameters on the Web 5

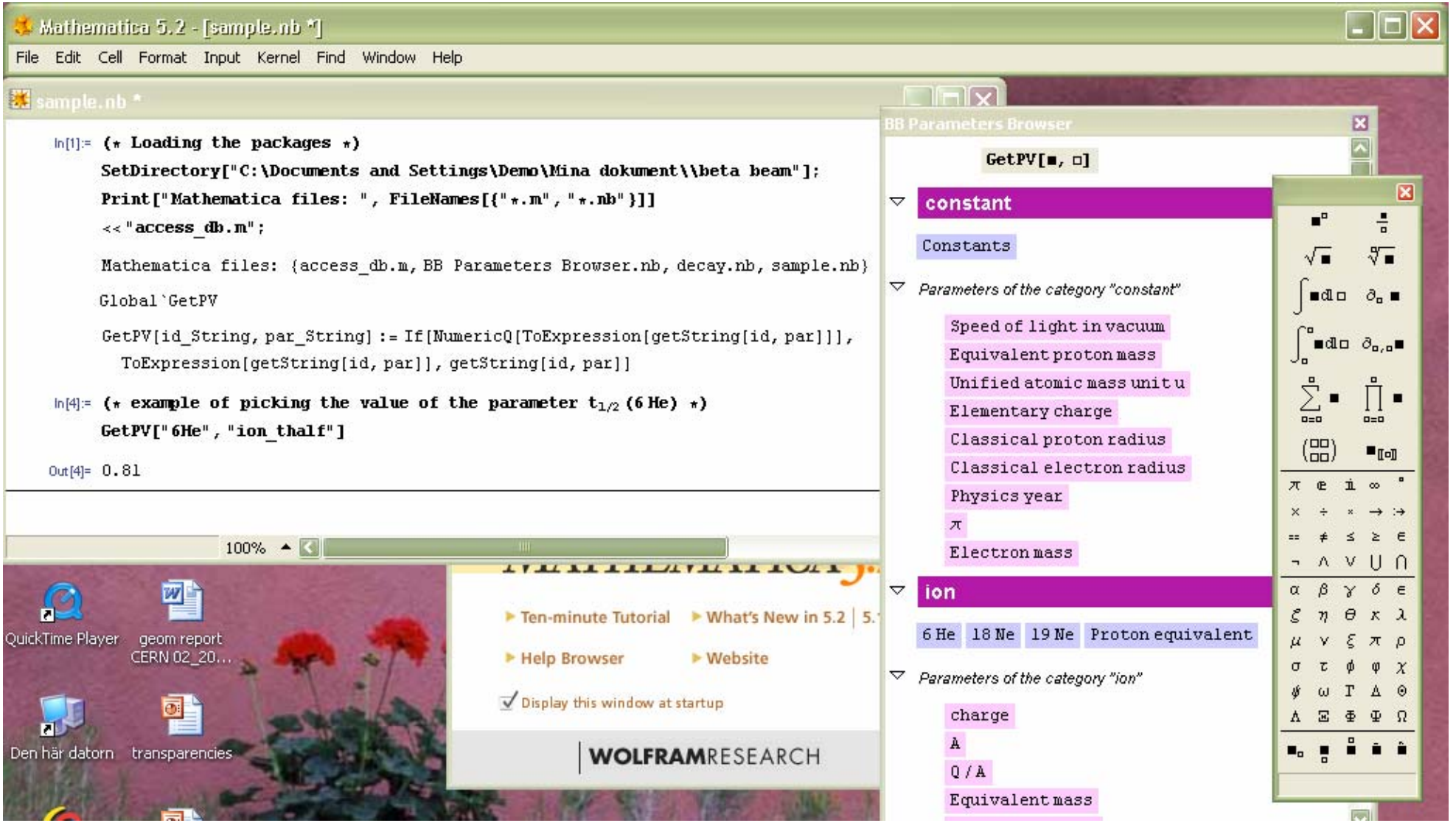


Parameters on the Web 6



Parameter	Symbol	Unit	Calculated	Neutrino beam 1	Neutrino beam 2	Neutrino beam 3
Neutrino beams						
Parent ion			no	6He	18Ne	19Ne
Neutrino type			no	electron anti-neutrino	electron neutrino	electron neutrino
Neutrino rate per second			in Mathematica	2.900E+11	1.100E+11	1.100E+11
Neutrino rate per physics year			in Mathematica	2.900E+18	1.100E+18	1.100E+18
Design rate (annual)			no	2.900E+18	1.100E+18	1.100E+18
Satisfaction factor		%	on the fly	100.00	100.00	100.00
Total runtime		years	no	5	5	5
Neutrino rate per runtime			on the fly	1.450E+19	5.500E+18	5.500E+18
Average spot at decay (1 σ)		cm	no	4.	4.	4.
Divergence		mrad	no	10.	10.	10.

Use database from Mathematica 1



Use database from Mathematica 2

```
In[160]:= (* Loading the packages *)
          SetDirectory["\\\\cern.ch\\dfs\\users\\a\\afabich\\MyDocs\\BetaBeam"];
          <<"access_db.m";
          <<"prolog.m"; (* define plot options *)

          Global`GetPV

          GetPV[id_String, par_String] :=
           If[NumericQ[ToExpression[getString[id, par]]], ToExpression[getString[id, par]], getString[id, par]]
```

Standard header, including standard plot options

```
In[163]:= (* choose ion *)
              Ion = "18Ne";
              Ion = "6He";
          (* get parameters from database *)
              <<"IonBasicParameters.m"
          (* calculate derived values *)
              iondecayed = IonTot (1 - e^(-Log[2] cyclelength / topgam thalf));
              Print["Energy loss/cycle due to decay: ",
           energylossdecay = iondecayed GetPV["DECAY-" <> Ion, "beam_beam_inj_e_ion"] elec]
              CoolimatedEmomentum = IonIn e^(-Log[2] merges cyclelength / topgam thalf) GetPV["DECAY-" <> Ion, "beam_beam_inj_e_ion"] elec;
          (* define parameters not yet in database *)
              Print["Merging delay [s]: ", MergeDelay = 0.5]
              Print["Collimation delay [s]: ", pCollDelay = 0.3]

          energy injected [J]: 808325.

          Energy loss/cycle due to decay: 434121.

          Merging delay [s]: 0.5

          Collimation delay [s]: 0.3
```

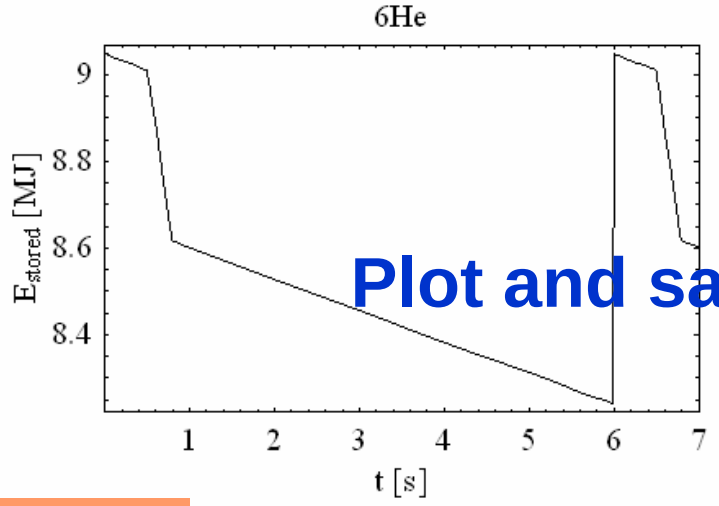
Main: loading constants and ion parameters, call packages and define additional parameters (PUT THEM in DB, send mail!!)

Use database from Mathematica 2

```
elec = GetPV["constant", "const_e"];
IonIn = GetPV["SPS-" <> Ion, "beam_int_ej_ions_cycle"];
Print["energy injected [J]: ",
Einj = IonIn GetPV["DECAY-" <> Ion, "beam_beam_inj_e_ion"] elec]
IonTot = GetPV["DECAY-" <> Ion, "beam_int_inj_ions_cycle"];
thalf = GetPV[Ion, "ion_thalf"];
topgam = GetPV["DECAY-" <> Ion, "beam_beam_inj_gamma"];
merges = GetPV["DECAY-" <> Ion, "beam_cycle_decay_merges"];
cyclelength = GetPV["DECAY-" <> Ion, "beam_cycle_time"];
storedEtot = N[GetPV["DECAY-" <> Ion, "beam_int_inj_energy"]
```

Standard package to load ion parameters

```
In[171]:= Export["EnergyBalanceDecayRing_" <> Ion <> ".gif",
  DisplayTogether[
   Plot[
    1/10^6
     (storedEtot + If[t - Floor[t/cyclelength] cyclelength < MergeDelay + pCollDelay,
       CoolimatedEmomentum If[t - Floor[t/cyclelength] cyclelength > MergeDelay,
        1/pCollDelay (pCollDelay + MergeDelay - (t - Floor[t/cyclelength] cyclelength)), 1], 0])
     e^(-Log[2] (t - Floor[t/cyclelength] cyclelength)/(topgam thalf)),
    {t, 0, 15},
    PlotRange → {{0, cyclelength + 1}, All}, FrameLabel → {"t [s]", "E_stored [MJ]"}, PlotLabel → Ion]
  ]]
```



Ring_6He.gif

Plot and save.

- Programs valid for all times with the current baseline parameters of the database.

Conclusion

- A database implementation of the bb parameters is now available
- CERN is maintaining the system
- It can be accessed via web and application programs
- So far the system seems to give satisfaction
- Feedback from users is mportant for the further improvements!
- To add parameters: email request sufficient