Updated ISOLDE Yield Database

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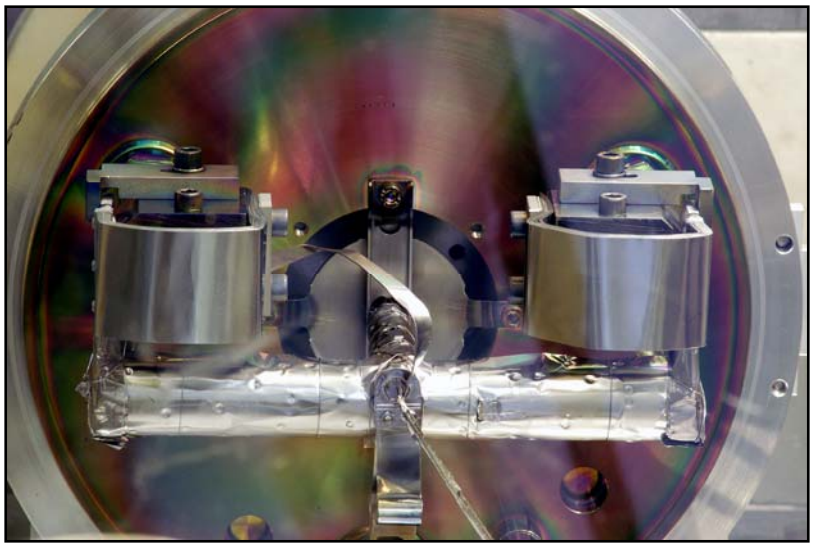
Why is the Yield db updated?

- Accurate value of yields essential for the preparation of experimental proposals
- The data should be based in published yield values
- The yield db is based on ORACLE and it is located at CERN, which allows:
  - Easy access
  - A lot of flexibility
  - A proper structure
  - Reliable
  - Secure
  - Long term suppport by CERN

Which information is stored?

- Target
  - Z
  - Thickness
  - Solid state structure
  - ISOLDE name of the target
- Ion Source
  - Sort
  - Efficiency
- Yield
  - PSB/SC
  - Energy
  - Yield
- Analysis
  - α
  - t_r
  - t_f
  - t_s
  - Release fraction



Not only a new webpage…

Not only a new webpage…

DB design

- Identification of the parameters to include in the tables
- Creation of the tables: yields, isotopes, half life, palette… with the parameters in the right format (number, character,…) ⇒ SQL code

DB creation

- Creation of the relationships between tables
- Including data in the tables

Web application

- Programming the web application ⇒ PL/SQL code (ORACLE language)
  - Tables in the web page are filled on line from the stored tables
- Yield graphs ⇒ Java applet
  - Graphs are plotted on line with the information stored up to that moment in the db

DB Web Application

How is the information accesible?

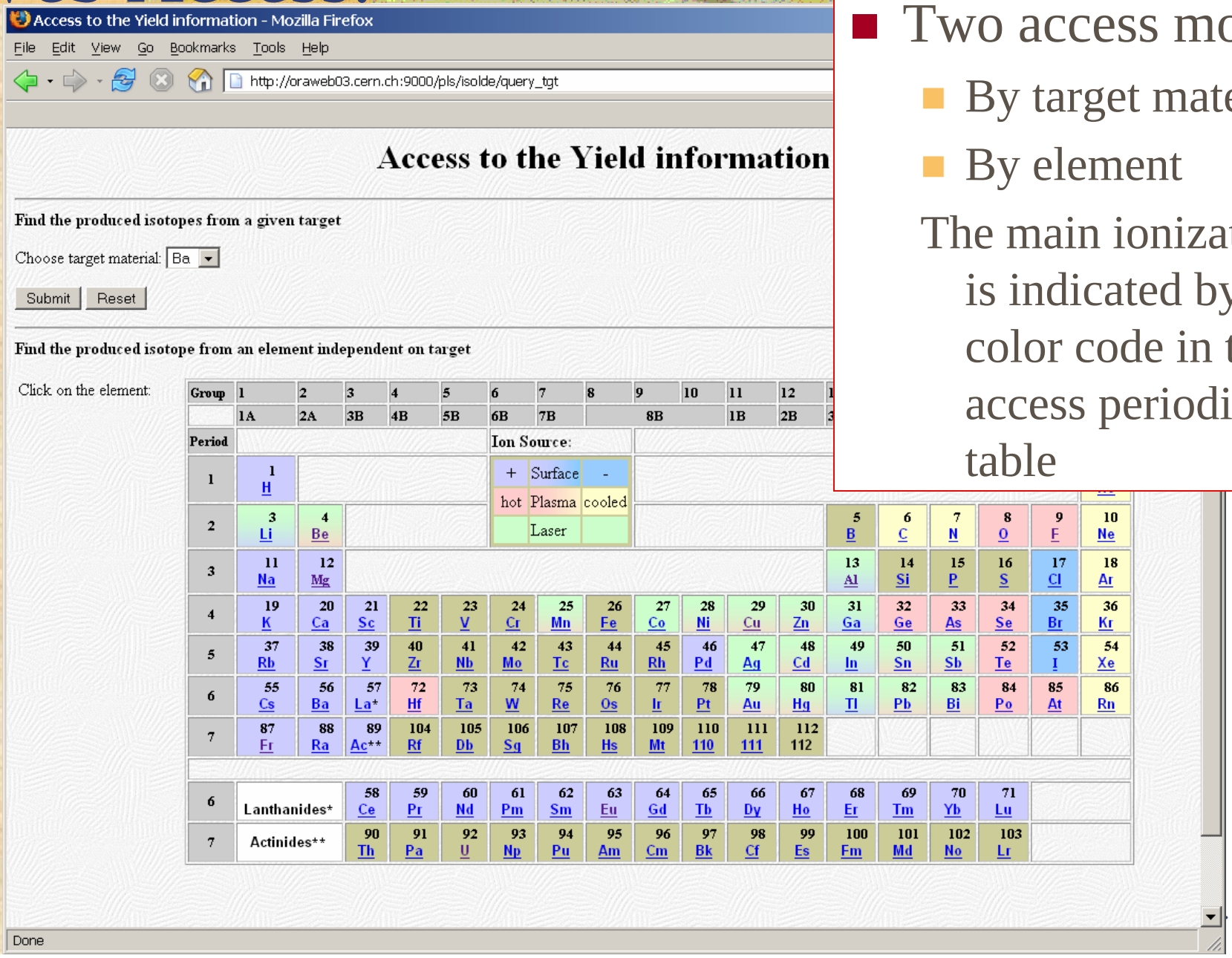
- Linked to the updated ISOLDE webpages:

  http://cern.ch/isolde/yields

- Or:

http://oraweb03.cern.ch:9000/pls/isolde/query_tgt

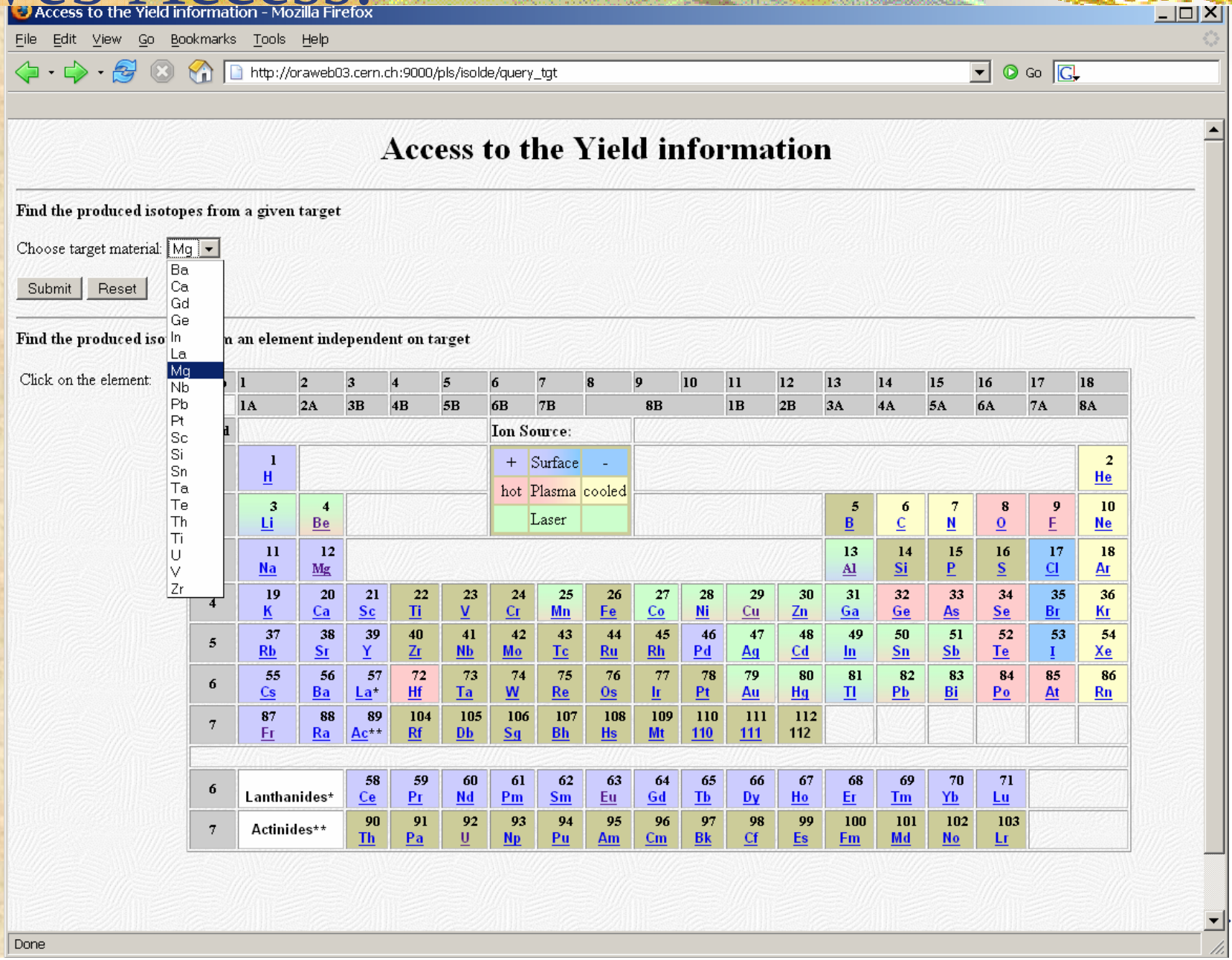
Web Access:



- Two access modes:
  - By target material
  - By element

  The main ionization is indicated by the color code in the access periodic table

Web Access:



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Web Access:

- Half life
- Plot
- More details…

Isotopes produced from Mg - Mozilla Firefox

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http://oraweb03.cern.ch:9000/pls/isolde/q_tgt_isotope

Isotopes produced from Mg

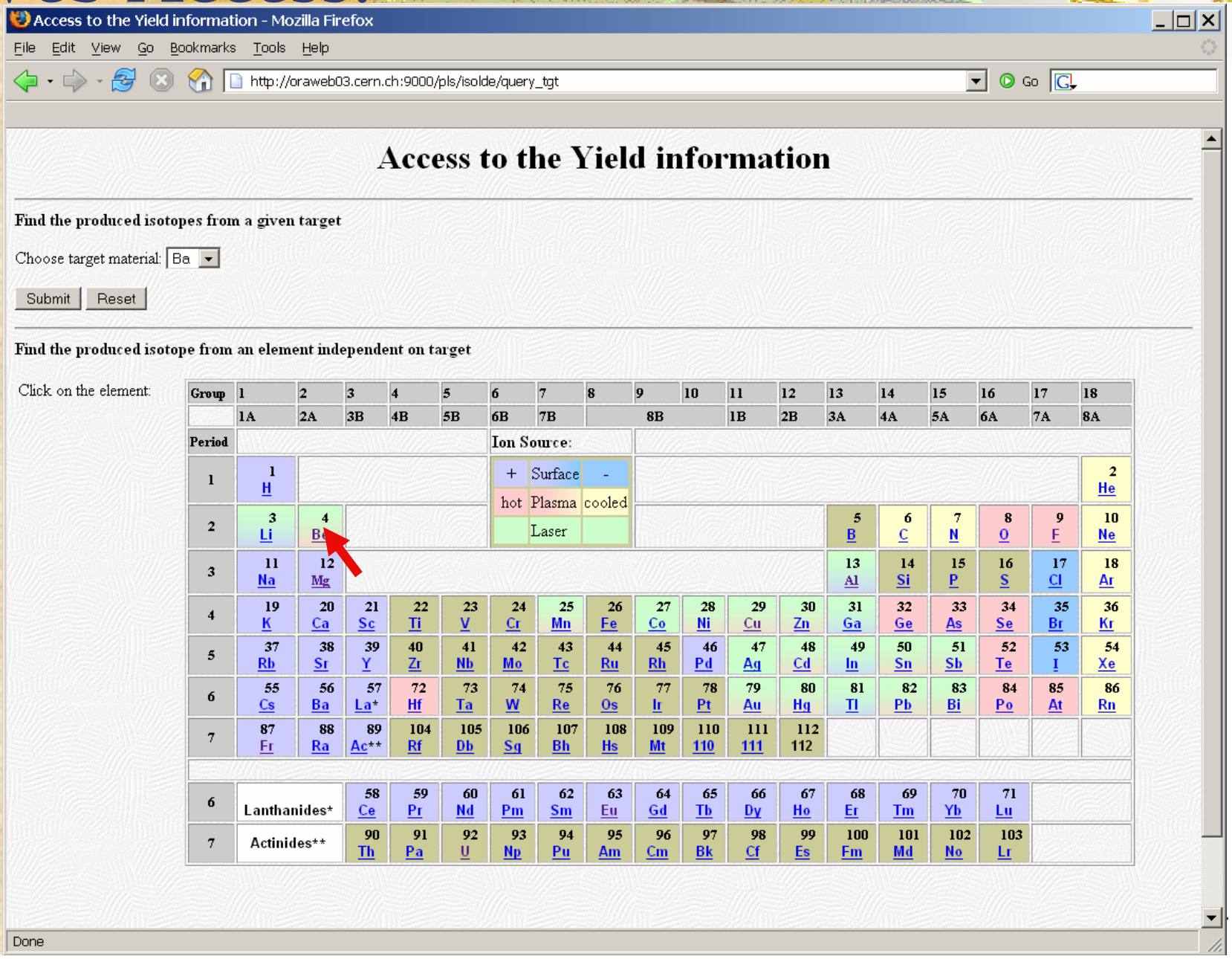
Element	Z	A number	g or m	Half life	SC or PSB*	Yield at ISOLDE	Target	Target density	Ion Source
						(ions/μC)		(g/cm²)	
He	2	6	g	806.7 ms 15	SC	4.4E+05	MgO	3.0	MK7
He	2	8	g	119.0 ms 15	SC	6.6E+03	MgO	3.0	MK7
C	6	9	g	126.5 ms 9	SC	4.0E+03	MgO	3.0	MK6
C	6	10	g	19.255 s 53	SC	1.8E+04	MgO	3.0	MK6
C	6	11	g	20.39 m 2	SC	6.8E+05	MgO	3.0	MK6
C	6	15	g	2.449 s 5	SC	7.7E+02	MgO	3.0	MK6
N	7	13	g	9.965 m 4	SC	9.2E+03	MgO	3.0	MK7
Ne	10	17	g	109.2 ms 6	SC	4.5E+03	MgO	3.0	MK7
Ne	10	18	g	1672 ms 8	SC	3.5E+06	MgO	3.0	MK7
Ne	10	19	g	17.22 s 2	SC	3.0E+07	MgO	3.0	MK7
Ne	10	23	g	37.24 s 12	SC	5.1E+06	MgO	3.0	MK7
Ne	10	24	g	3.38 m 2	SC	1.6E+06	MgO	3.0	MK7
Ne	10	25	g	602 ms 8	SC	5.9E+02	MgO	3.0	MK7

**In the ISOLDE Yield Database the beam intensities for isotopes of the elements measured at ISOLDE PSB (PS Booster with 1.0 or 1.4 GeV protons) are presented. For isotopes where no new yields are listed yet from the PSB, one can get an idea from looking at the available SC yields (0.6 GeV protons).*

Back

Done

Web Access:


Access to the Yield information - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://oraweb03.cern.ch:9000/pls/isolde/query_tgt
Go
Access to the Yield information
Find the produced isotopes from a given target
Choose target material: Ba
Submit Reset
Find the produced isotope from an element independent on target
Click on the element:
Group 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
1A 2A 3B 4B 5B 6B 7B 8B 1B 2B 3A 4A 5A 6A 7A 8A
Period
Ion Source:
+ Surface -
hot Plasma cooled
Laser
1 H 2 He
3 Li 4 Be 5 B 6 C 7 N 8 O 9 F 10 Ne
11 Na 12 Mg 13 Al 14 Si 15 P 16 S 17 Cl 18 Ar
19 K 20 Ca 21 Sc 22 Ti 23 V 24 Cr 25 Mn 26 Fe 27 Co 28 Ni 29 Cu 30 Zn 31 Ga 32 Ge 33 As 34 Se 35 Br 36 Kr
37 Rb 38 Sr 39 Y 40 Zr 41 Nb 42 Mo 43 Tc 44 Ru 45 Rh 46 Pd 47 Ag 48 Cd 49 In 50 Sn 51 Sb 52 Te 53 I 54 Xe
55 Cs 56 Ba 57 La* 72 Hf 73 Ta 74 W 75 Re 76 Os 77 Ir 78 Pt 79 Au 80 Hg 81 Tl 82 Pb 83 Bi 84 Po 85 At 86 Rn
87 Fr 88 Ra 89 Ac** 104 Rf 105 Db 106 Sg 107 Bh 108 Hs 109 Mt 110 110 111 111 112 112
Lanthanides* 58 Ce 59 Pr 60 Nd 61 Pm 62 Sm 63 Eu 64 Gd 65 Tb 66 Dy 67 Ho 68 Er 69 Tm 70 Yb 71 Lu
Actinides** 90 Th 91 Pa 92 U 93 Np 94 Pu 95 Am 96 Cm 97 Bk 98 Cf 99 Es 100 Fm 101 Md 102 No 103 Lr
Done

Web Access:

- List of produced isotopes (stored)
- Plot
- More details…

yield - Mozilla Firefox

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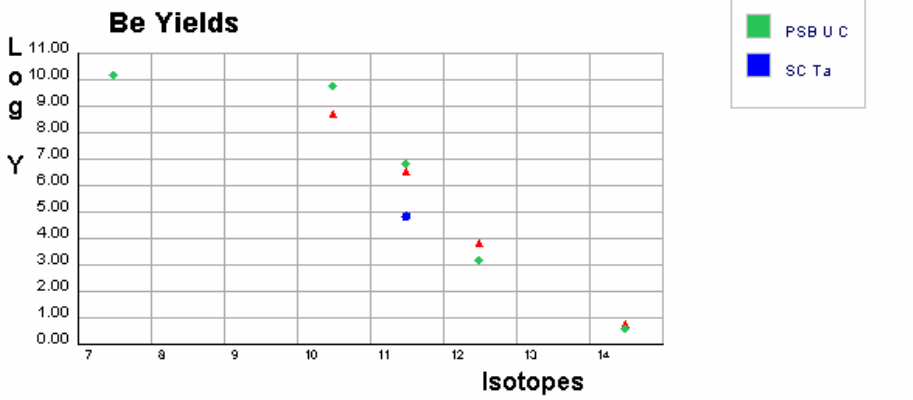
http://oraweb03.cern.ch:9000/pls/isolde/yield?v_z=4

Isotope Yield

7, 10, 11, 12, 14, Be

Element	A number	Half life	SC or PSB*	Yield at ISOLDE (ions/μC)	Target material
Be	7	53.12 d 7	PSB	1.4E+10	UC2
Be	10	1.51E+6 y 6	PSB	6.0E+09	UC2
Be	10	1.51E+6 y 6	PSB	4.9E+08	Ta
Be	11	13.81 s 8	PSB	7.0E+06	UC2
Be	11	13.81 s 8	PSB	3.4E+06	Ta
Be	12	23.6 ms 9	PSB	1.5E+03	UC2
Be	12	23.6 ms 9	PSB	7.0E+03	Ta
Be	14	4.35 ms 17	PSB	4.0E+00	UC2
Be	14	4.35 ms 17	PSB	6.1E+00	Ta
Be	11	13.81 s 8	SC	1.5E+05	Ta
Be	11	13.81 s 8	SC	3.3E+03	Ta
Be	11	13.81 s 8	SC	5.0E+04	Ta
Be	11	13.81 s 8	SC	5.4E+04	Ta



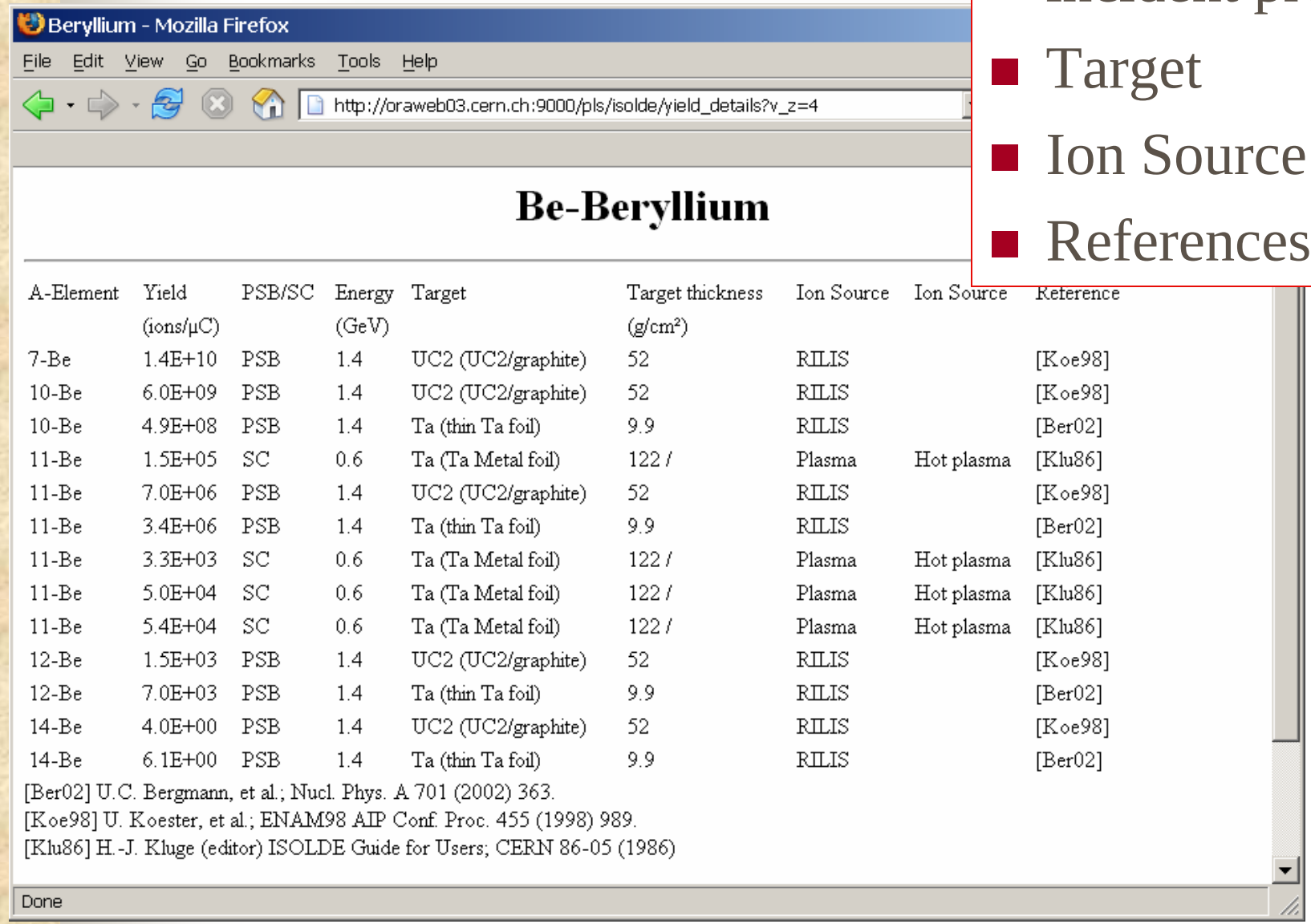
Production details: Target density, Ion Source, Reference, ...

In the ISOLDE Yield Database the beam intensities for isotopes of the elements measured at ISOLDE PSB (PS Booster with 1.0 or 1.4 GeV protons) are presented. For isotopes where no new yields are listed yet from the PSB, one can get an idea from looking at the available SC yields (0.6 GeV protons).

Applet LinePlot started

Web Access:

- Energy of the incident protons
- Target
- Ion Source
- References



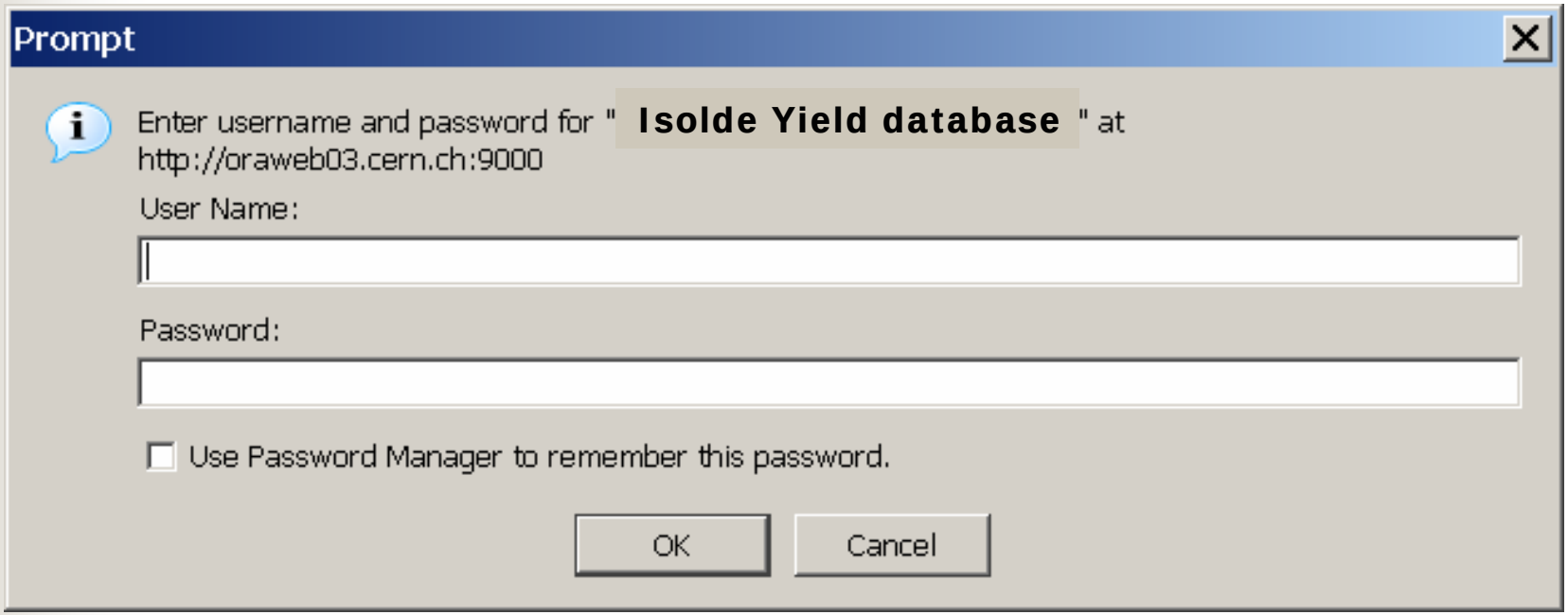
Be-Beryllium

A-Element	Yield (ions/μC)	PSB/SC	Energy (GeV)	Target	Target thickness (g/cm²)	Ion Source	Ion Source	Reference
7-Be	1.4E+10	PSB	1.4	UC2 (UC2/graphite)	52	RILIS		[Koe98]
10-Be	6.0E+09	PSB	1.4	UC2 (UC2/graphite)	52	RILIS		[Koe98]
10-Be	4.9E+08	PSB	1.4	Ta (thin Ta foil)	9.9	RILIS		[Ber02]
11-Be	1.5E+05	SC	0.6	Ta (Ta Metal foil)	122 /	Plasma	Hot plasma	[Klu86]
11-Be	7.0E+06	PSB	1.4	UC2 (UC2/graphite)	52	RILIS		[Koe98]
11-Be	3.4E+06	PSB	1.4	Ta (thin Ta foil)	9.9	RILIS		[Ber02]
11-Be	3.3E+03	SC	0.6	Ta (Ta Metal foil)	122 /	Plasma	Hot plasma	[Klu86]
11-Be	5.0E+04	SC	0.6	Ta (Ta Metal foil)	122 /	Plasma	Hot plasma	[Klu86]
11-Be	5.4E+04	SC	0.6	Ta (Ta Metal foil)	122 /	Plasma	Hot plasma	[Klu86]
12-Be	1.5E+03	PSB	1.4	UC2 (UC2/graphite)	52	RILIS		[Koe98]
12-Be	7.0E+03	PSB	1.4	Ta (thin Ta foil)	9.9	RILIS		[Ber02]
14-Be	4.0E+00	PSB	1.4	UC2 (UC2/graphite)	52	RILIS		[Koe98]
14-Be	6.1E+00	PSB	1.4	Ta (thin Ta foil)	9.9	RILIS		[Ber02]

[Ber02] U.C. Bergmann, et al.; Nucl. Phys. A 701 (2002) 363.
[Koe98] U. Koester, et al.; ENAM98 AIP Conf. Proc. 455 (1998) 989.
[Klu86] H.-J. Kluge (editor) ISOLDE Guide for Users; CERN 86-05 (1986)

Password restricted DB

More details



More details

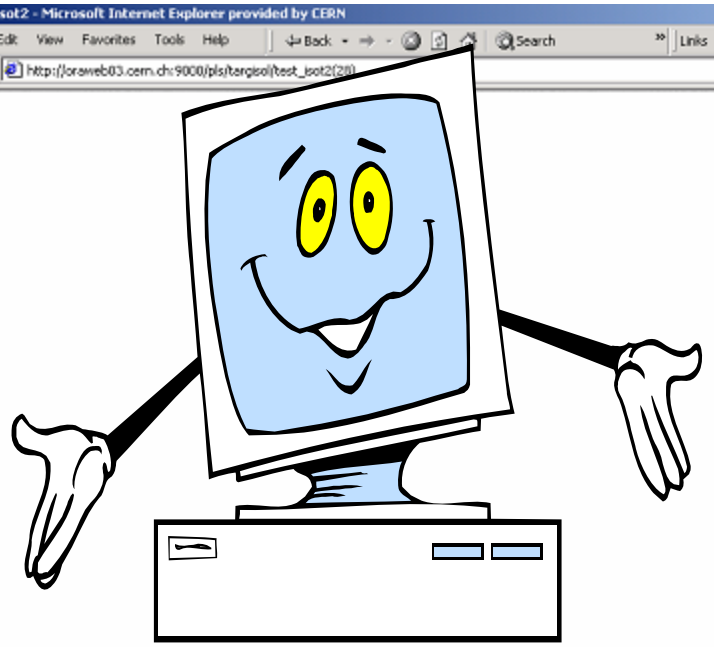
- Ion source efficiency
- Method of yield measurement
- Temperature of the target, transfer line, …
- Total current
- Fitting parameters: α, t_r, t_f, t_s
- Release fraction
- Molecular sideband
- ...

To conclude…

- More than 2000 entries of yield values are already included of around 850 isotopes
- The database is prepared to be extended with REX-Isolde data

Thanks to:

Ulli Köster: for helping me in the identifi parameters of yield



That is all !

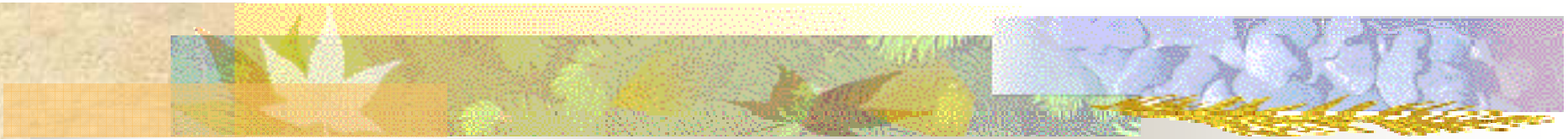


Table attributes related to the **yield**

	NAME	DATA_TYPE	UNITS	NULLABLE
1	ID_ISOL	NUMBER(4)		N
2	**Z_ISOL**	NUMBER(3)		N
3	**A_ISOL**	NUMBER(3)		N
4	GM_ISOL	VARCHAR2		Y
5	**NAMET_ISOL**	VARCHAR2(8)		N
6	DENT_ISOL	NUMBER(5)	g/cm2	N
7	X_TARGET	NUMBER(3)	mm	
8	Z_TARGET	NUMBER(3)		Y
9	Z_TARGET2	NUMBER(3)		Y
10	**IS_ISOL**	VARCHAR2		N
11	IS_EFF	NUMBER(2)		Y
12	**YIE_ISOL**	NUMBER(20)	ions/mC	N
13	PSB_SC_ISOL	VARCHAR2(3)		N
14	ENERGY	NUMBER(4,3)	GeV	Y
15	PROYECTILE	VARCHAR2(5)		N
16	CONVERTER	NUMBER(4)		N
17	**T_TARGET**	**NUMBER(4)**	**K**	**Y**
18	**T_LINE**	**NUMBER(4)**	**K**	**Y**
19	**TOTAL_Current**	**NUMBER(4,2)**	**pA**	**Y**
20	***Comm_Current***	***VARCHAR2(80)***		**Y**
21	**ALFA**	**NUMBER(1)**		**Y**
22	**TR**	**NUMBER(6)**		**Y**
23	**TF**	**NUMBER(6)**		**Y**
24	**TS**	**NUMBER(6)**		**Y**
25	**RELEASE Fract**	**NUMBER(1)**		**Y**
26	**A_SEPAR_SET**	**NUMBER(3)**		**Y**
27	***Comm_Molec_Sideband***	***VARCHAR2(80)***		**Y**
28	*COMM_ISOL*	*VARCHAR2(80)*		Y

-Total current on this mass (can give all possible contamination)

-Release function to be fitted:

$$P(t,\lambda_r,\lambda_f,\lambda_s,\alpha)= =(1-e^{-\lambda_r t})(\alpha e^{-\lambda_f t}+(1-\alpha)e^{-\lambda_t t})$$

$\lambda_r,\lambda_f,\lambda_s \Rightarrow$ time-constant-like parameters

$\alpha \Rightarrow$ weighing parameter

$$\text{-in target production} = \frac{\text{yield}}{\text{is\_eff x release\_fract}}$$

Example of table: Yield_isol

ID_ISOL	Z_ISOL	A_ISOL	YIE_ISOL	TAR_ISOL	NAMET_ISOL	DENT_ISOL	IS_ISOL	GM_ISOL	PSB_SC_ISOL	COMM_ISOL	Z_TARGET	Z_TARGET2
1	3	8	580000000	thin Ta foil	Ta.188	8.8	WSI	g	psb		73	
2	3	9	17000000	thin Ta foil	Ta.188	8.8	WSI	g	psb		73	
3	3	11	7000	thin Ta foil	Ta.188	8.8	WSI	g	psb		73	
4	4	7	14000000000	UC2/graphite	UC2.120	52	RILIS	g	psb		92	6
5	4	10	6000000000	UC2/graphite	UC2.120	52	RILIS	g	psb		92	6
6	4	10	490000000	thin Ta foil	Ta.129	9.9	RILIS	g	psb		73	
7	4	11	3400000	thin Ta foil	Ta.129	9.9	RILIS	g	psb		73	
8	4	12	1500	UC2/graphite	UC2.120	52	RILIS	g	psb		92	6
9	4	12	7000	thin Ta foil	Ta.129	9.9	RILIS	g	psb		73	
10	4	14	4	UC2/graphite	UC2.120	52	RILIS	g	psb		92	6
11	4	14	6.1	thin Ta foil	Ta.129	9.9	RILIS	g	psb		73	
12	6	9	400	CaO powder	CaO.123	5	MK7	g	psb		20	8
13	6	9	2									8
14	11	25	2									6
15	11	27	8									6
16	11	28	9									6
17	11	29	1									6
18	11	30	5									6
19	11	31	4									6
20	11	32	1									6
21	11	33	1									6
22	13	28	1									6
23	13	30	2									6
24	13	34	1									6
25	13	35	4									6
26	19	48	1									6
27	19	49	2									6
28	19	50	3									6
29	19	51	4									6
30	19	52	5									6

```
ID_ISOL        NUMBER(4) NOT NULL,
Z_ISOL         NUMBER(3) NOT NULL,        Z
A_ISOL         NUMBER(3) NOT NULL,        A
GM_ISOL        VARCHA2(4),
YIE_ISOL       NUMBER(20,2) NOT NULL,     Yield
PSB_SC_ISOL    VARCHAR2(3),
TAR_ISOL       VARCHAR2(80) NOT NULL,
NAMET_ISOL     VARCHAR2(20) NOT NULL,
DENT_ISOL      NUMBER(5,1) NOT NULL,      Density
IS_ISOL        VARCHAR2(80) NOT NULL,     Ion Source
COMM_ISOL      VARCHAR2(80),              Comments
SYM_TARGET     VARCHAR2(3),
SYM_TARGET2    VARCHAR2(3),
Z_TARGET       NUMBER(3),
Z_TARGET2      NUMBER(3)
```

Database Status:

1817 yield entries

843 entries (Z, A, Yield), 96 from PSB and 805 from SC

REX database

ELEM	ISOT	INFGEN	REX	
z	z_isot	z	**id_isol**	Experiment number
Symbol	a_isot	Series	**tar_rex**	“Ta_123”
Zname	gm_isot	year_of_discovery	**numb_rex**	
Elem_z_pk	t_isot	…	**z_rex**	Z
	agm_isot_pk	infgen_z_fk	**a_rex**	A
	a_isott_fk		**q_rex**	A/q
			gm_rex	G or m
			I_rex	Intensity [Atoms/s]
			Efic_rex	
			Efic_trap	
			Efic_ebis	
			Efic_linac	
			z_contam	
			a_contam	
			Stripper_foil	Yes or No
			Energy	[MeV/uam]
			Breading_time	EBIS
			comm_isol	Comments