

//  
 // 14.12.14 09/05/20, // 14.12.15 09/06/20 // 14.12.16 09/07/20  
 // plots connection (15 plots done)

// left top setup panel : all 4 reactions counters were done!

// "Clear All reactions" signal  
 // correction for the "refreshShowSetup" signal  
 // Fission : gauge, statusBar  
 // Abrasion-Fission benchmarks

Qt

<b>Projectile</b>	238 U <sup>92+</sup>	secRot 2694
240 MeV/u	400 kW	AF Low 804
<b>Fragment</b>	121 Ag <sup>47+</sup>	AF Mid 1295
		AF High 1824

Borland

<b>P</b> rojectile	238U <sup>92+</sup>	AF o 804
240 MeV/u	400 kW	AF mi 1295
LowEx: 25 MeV	237U <sup>+</sup>	AF hi 1824
MidEx: 100 MeV	232Th <sup>+</sup>	secR 2748
HighEx: 250 MeV	226Ra <sup>+</sup>	
<b>F</b> ragment	121Ag <sup>47+</sup>	

Transmission statistics: 121Ag

121Ag Beta- & Beta-n decay (Z=47, N=74) Silver

All reactions total isotope rate 6.51e+08 pps  
 and Overall isotope transmission 19.167 %

Reaction	AFhigh	AFmid	AFlow
Q1 (D1)	47	47	47
Q2 (D2)	47	47	47
Q3 (D3)	47	47	47
Q4 (D4)	47	47	47
Ion Production Rate (pps)	7.93e+05	1.13e+08	5.37e+08
Total ion transmission (%)	24.616	21.225	18.777
X-Section in target (mb)	3.26e-03	5.4e-01	2.9e+00
Target (%)	93.39	93.39	93.51
Unreacted in material (%)	93.39	93.39	93.39
Unstopped in material (%)	100	100	100
Secondary Reactions (coef)	1	1	1
D1 (%)	84.83	78.58	71.61
X angular transmission (%)	100	99.71	98.87
Y angular transmission (%)	84.85	78.8	72.43
I1_slits (%)	51.7	48.36	45.12
X space transmission (%)	51.7	48.36	45.12
D2 (%)	99.56	99.66	99.64
X angular transmission (%)	99.84	100	100
Y angular transmission (%)	99.72	99.66	99.64
I2_slits (%)	70.87	70.25	73.13
X space transmission (%)	70.87	70.25	73.13
I2_wedge (%)	100	100	100
Unreacted in material (%)	100	100	100
Unstopped in material (%)	100	100	100

Qt

Abrasion-Fission

statistics: 121Ag

121Ag Beta- and Beta-n decay (Z=47, N=74) Silver

All reactions total isotope rate 6.51e+8 pps  
 and Overall isotope transmission 19.167 %

Reaction	AFhigh	AFmid	AFlow
Q1 (D1)	47	47	47
Q2 (D2)	47	47	47
Q3 (D3)	47	47	47
Q4 (D4)	47	47	47
Ion Production Rate (pps)	7.93e+5	1.13e+8	5.37e+8
Total ion transmission (%)	24.616	21.225	18.777
X-Section in target (mb)	3.26e-3	5.4e-1	2.9e+0
Target (%)	93.39	93.39	93.51
Unreacted in material (%)	93.39	93.39	93.39
Unstopped in material (%)	100	100	100
Secondary Reactions (coef)	1	1	1
D1 (%)	84.83	78.58	71.61
X angular transmission (%)	100	99.71	98.87
Y angular transmission (%)	84.85	78.8	72.43
I1_slits (%)	51.7	48.36	45.12
X space transmission (%)	51.7	48.36	45.12
D2 (%)	99.56	99.66	99.64
X angular transmission (%)	99.84	100	100
Y angular transmission (%)	99.72	99.66	99.64
I1_slits (%)	70.87	70.25	73.13
X space transmission (%)	70.87	70.25	73.13
D3 (%)	99.1	99.09	99.04
X angular transmission (%)	100	100	100
Y angular transmission (%)	99.17	99.09	99.04
D4 (%)	85.99	86.26	86.16
X angular transmission (%)	100	100	100
Y angular transmission (%)	85.99	86.27	86.22
FP_PPACO (%)	100	100	100
Unreacted in material (%)	100	100	100
Unstopped in material (%)	100	100	100
FP_PPAC1 (%)	100	100	100

Borland

Oleg on this week:  
RIBF workshop,  
experiment @ MSU

```
//-----
// 14.12.17 09/08/20
// plots connection (17 plots done)
// FusionFission, FusionResidual, Secondary Reactions corrections (Gauge, flags) and benchmarks
// AF EERs information
```

<b>Projectile</b>	208 <b>Pb</b> 82+	secReact 2430
300 MeV/u	400 kW	AF Mid 1465
EERs: <sup>195</sup> Au*(188)	<sup>184</sup> Re*(310)	AF High 1617
<b>Fragment</b>	96 <b>Kr</b> 36+	

//-----

// 14.12.18 09/09/20  
 // plots connection (22 plots done)

// setSubTitle(const char \*) ==> new setSubTitle(const QString &)  
 // class "plot":  
 // char \*FileName, \*xTitle, \*yTitle, \*SubTitle, \*dim25 ==>  
 // QString dim25, FileName, xTitle, yTitle, subTitle

//-----

// 14.12.19 09/10/20  
 // plots connection (27 plots done)

// Global revision of d\_Twinsol & d\_Twinsol\_plot  
 // corrections in ini-file & utility-calculate, MakeBeam subroutines  
 // all plots are connected

**Qt**

**TwinSol settings**

- Use the second solenoid
- Twinsol operation mode:  Antiparallel,  Parallel
- Use the defocusing solenoid
- Use the absorber
- Use the "soft-edge" corrections for solenoid matrix calculations

**1-st solenoid block**

Block Length = 0.594 m  
B = 2 T

**2-nd solenoid block**

Block Length = 0.594 m  
B = 2 T

**Beam tracking**

Distance to plot rays: 7.4 m

	Beam emittance	Initial ray values	Beam sigmas	Ray Values	Ray TRACE
1. X	1	5	10.22	40.61	23.47
2. T	20	20	2.38	3.23	1.81
3. Y	1	-5	10.22	10.88	64.82
4. F	20	25	2.38	6.41	15.84
1&3. R	1.41	7.07	14.45	42.04	68.94
2&4. A	28.28	32.02	3.37	7.17	15.95

Energy (MeV/u) = 10  
Energy (MeV/u) = 170.77

40Ar18+ (10.00 MeV/u)  
P tnsprit 0.3038 GeV/c

plots were connected

**Borland**

**TwinSol settings**

- Use the second solenoid
- Twinsol operation mode:  Antiparallel,  Parallel
- Use the defocusing solenoid
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3. Y	1	-5	10.22	10.88	64.82
4. F	20	25	2.38	6.41	15.84
1&3. R	1.41	7.07	14.45	42.04	68.94
2&4. A	28.28	32.02	3.37	7.17	15.95

Energy (MeV/u) = 10  
Time of flight (ns) = 170.77

40Ar18+ (10.00 MeV/u)  
P tnsprit 0.3038 GeV/c

plots were connected

//-----  
 // 14.13.1 09/11/20  
 // plots connection (41 plots done, 7 were adapted (benchmarked))  
 // global library has been implemented to LISEcute based on Tong's git  
 // correction (bug was in Borland) for equilibrium thickness assignment  
 // middle version has been increased  
 // analysis of screen resolution to select a font size

The Global\_Qt application (by M.Kuchera) has been reconstructed by **Tong** for the Global-Qt library, and Global\_Qt\_application based on this Global-Qt library how it was done initially in LISE-Borland

**Qt**

Physical Calculator

After / Into material

Material: Si 1 micron

Energy Remain: 70 MeV/u

Energy Loss: 1.542 MeV

Energy Straggling ( $\sigma$ ): 0.0021 MeV/u

Angular Straggling ( $\sigma$ ): 0.1063 mrad (plane)

Lateral Spread ( $\sigma$ ): 1.051e-05 microns

Brho (for q=Z): 2.77744 T m

Equilibrium values after "Si" material

Charge State <q>: 29.91

dq ( $\sigma$ ): 0.29

Thickness (mg/cm<sup>2</sup>): 4.731

Block	Z	Thickness	Remain MeV/u	Remain MeV	E-Loss MeV	<q>
FP_PIN	Si (504 micron)	57.864	3929.4	825.68	29.82	
FP_Stack0	Si (500 micron)	43.752	2971.2	958.29	29.59	
FP_Stack1	Si (1000 micron)	0	0	2971.2	0.00	
FP_Stack2	Si (1000 micron)	0	0	0		
FP_Stack3	Si (1000 micron)	0	0	0		
FP_Stack4	Si (1000 micron)	0	0	0		
FP_SCI	C9H10 (100 mm)	0	0	0		

**Borland**

Physical calculator

Element: Zn, Z: 30, Q: 30

Stable

Ion mass = 67.9084 amu

Energy: 70.0227 MeV/u

Brho: 2.77791 T m

Erho: 306.344 MJ/C

P: 24983.9 MeV/c

p\_trnspt: 0.832797 GeV/c

Energy: 69.9284 AMeV

TKE: 4755.13 MeV

Velocity: 11.0128 cm/ns

Beta: 0.3673486

Gamma: 1.075172

Equilibrium values for material "Si"

Charge State <Q>: 29.91

dQ (sigma): 0.29

Thickness: 4.7315 mg/cm<sup>2</sup>

Block	Z \ Thickness	MeV/u	MeV	MeV	<Q>
FP_PIN	Si 504 micron	57.864	3929.5	825.68	29.82
FP_SCI	C9H10 100 mm	0	0	3929.5	0.00

```
//-----
// 14.13.1 09/11/20
// plots connection (41 plots done, 7 were adapted (benchmarked))

// global library has been implemented to LISEcute based on Tong's git
// correction (bug was in Borland) for equilibrium thickness assignment
// middle version has been increased

// analysis of screen resolution to select a font size
```

The Global\_Qt application (by M.Kuchera) has been reconstructed by **Tong** for the Global-Qt library, and Global\_Qt\_application based on this Global-Qt library how it was done initially in LISE-Borland

\* some difference between LISE\_Borland and LISEcute in "global" charge state calculations is coming global libraries. Should be understood.

Transmission statistics: 157Sm

Save As Print Transmission analysis LISE database Decay analysis Branching ratio Z-wallet NNDC A, Z NNDC A, Z JAEA-14 TOrl (Se) Wiki: Sm (Z=62) Discover

**157 Sm** Beta- decay (Z=62, N=95) **Samarium** **Qt**

All reactions total isotope rate **9.02e+02 pps**  
and Overall isotope transmission 85.894 %

Q1 (D1)	62	61	60	59	58	57
Q2 (D2)	62	61	60	59	58	57
Q3 (D3)	62	61	60	59	58	57
Q4 (D4)	62	61	60	59	58	57
Reaction	ProjFrag	ProjFrag	ProjFrag	ProjFrag	ProjFrag	ProjFrag
<b>Ion Production Rate (pps)</b>	<b>3.93e+01</b>	<b>2.5e+02</b>	<b>5.71e+02</b>	<b>4.03e+01</b>	<b>9.6e-01</b>	<b>2.05e-02</b>
Total ion transmission (%)	3.741	23.843	54.378	3.839	0.091	0.002
Total: this reaction (pps)	9.02e+02	9.02e+02	9.02e+02	9.02e+02	9.02e+02	9.02e+02
X-Section in target (mb)	1.48e-04	1.48e-04	1.48e-04	1.48e-04	1.48e-04	1.48e-04
<b>Target (%)</b>	<b>3.75</b>	<b>23.86</b>	<b>56.34</b>	<b>12.8</b>	<b>2.61</b>	<b>0.502</b>
Unreacted in material (%)	100	100	100	100	100	100
<b>Q (Charge) ratio (%)</b>	<b>3.75</b>	<b>23.87</b>	<b>56.37</b>	<b>12.81</b>	<b>2.61</b>	<b>0.502</b>
Unstopped in material (%)	100	100	100	100	100	100
<b>D1 (%)</b>	<b>99.72</b>	<b>100</b>	<b>96.52</b>	<b>29.99</b>	<b>3.5</b>	<b>0.39</b>
X space transmission (%)	99.77	100	96.56	30.01	3.5	0.39
X angular transmission (%)	100	100	100	100	100	100
Y angular transmission (%)	100	100	100	100	100	100

statistics: 157Sm

**157Sm** Beta- decay (Z=62, N=95) **Samarium** **Borland**

All reactions total isotope rate **9.04e+2 pps**  
and Overall isotope transmission 86.071 %

Q1 (D1)	62	61	60	59	58	57
Q2 (D2)	62	61	60	59	58	57
Q3 (D3)	62	61	60	59	58	57
Q4 (D4)	62	61	60	59	58	57
Reaction	ProjFrag	ProjFrag	ProjFrag	ProjFrag	ProjFrag	ProjFrag
<b>Ion Production Rate (pps)</b>	<b>3.83e+1</b>	<b>2.48e+2</b>	<b>5.77e+2</b>	<b>3.98e+1</b>	<b>9.33e-1</b>	<b>1.98e-2</b>
Total ion transmission (%)	3.644	23.62	54.923	3.793	0.089	0.002
Total: this reaction (pps)	9.04e+2	9.04e+2	9.04e+2	9.04e+2	9.04e+2	9.04e+2
X-Section in target (mb)	1.48e-4	1.48e-4	1.48e-4	1.48e-4	1.48e-4	1.48e-4
<b>Target (%)</b>	<b>3.65</b>	<b>23.64</b>	<b>56.91</b>	<b>12.65</b>	<b>2.54</b>	<b>0.483</b>
Unreacted in material (%)	100	100	100	100	100	100
<b>Q (Charge) ratio (%)</b>	<b>3.66</b>	<b>23.65</b>	<b>56.93</b>	<b>12.65</b>	<b>2.54</b>	<b>0.483</b>
Unstopped in material (%)	100	100	100	100	100	100
<b>D1 (%)</b>	<b>99.72</b>	<b>100</b>	<b>96.51</b>	<b>29.99</b>	<b>3.5</b>	<b>0.39</b>
X space transmission (%)	99.77	100	96.56	30	3.5	0.39
X angular transmission (%)	100	100	100	100	100	100
Y angular transmission (%)	100	100	100	100	100	100

the next issue **should be solved**: lise\_global.dll works only from Build directory

```

TEMPLATE = app
TARGET = LISE++
CONFIG += c++11
//QT += widgets sql gui core printsupport multimedia
QT += widgets gui core printsupport multimedia
    
```

project

```

INCLUDEPATH += $$PWD/Lib/include
unix {
    LIBS += $$PWD/Lib/lib/libglobal.so.1.0.0
}
# 64 bit
win32 {
    LIBS += $$PWD/Lib/lib/global.dll
}
    
```

location

Name	↑Ext	Size	Date	Attr
[.]		<DIR>	09/11/2020 00:35	
libglobal.so.1.0	0	95,768	09/10/2020 23:37	a-
global	dll	107,520	09/11/2020 01:21	a-

Does not work

```

Lister - [C:\build-LISE_Qt-Desktop_Qt_5_14_1_MinGW_64_bit-Debug\Makefile]
File Edit Options Help
#####
# Makefile for building: LISE++
# Generated by qmake (3.1) (Qt 5.14.1)
# Project: ..\LISEcute\LISE_Qt.pro
# Template: app
# Command: C:\Qt\5.14.1\mingw73_64\bin\qmake.exe -o Makefile ..\LISEcute\LISE_Qt.pro -spec win32-g++
#####
MAKEFILE      = Makefile
EQ            = =

##### Compiler, tools and options

CC            = gcc
CXX          = g++
DEFINES      = -DUNICODE -DWIN32 -DMINGW_HAS_SECURE_API=1 -DQT_DEPRECATED_WARNINGS -DQT_CFLAGS = -fno-keep-inline-dllexport -g -Wall -Wextra -Wextra $(DEFINES)
CXXFLAGS     = -fno-keep-inline-dllexport -g -std=gnu++11 -Wall -Wextra -Wextra -fexceptions -mthr
INCPATH      = -I..\LISEcute -I.. -I..\LISEcute\Lib\include -I..\Qt\5.14.1\mingw73_64\include -I..\Qt\5.14.1\mingw73_64\include\QtGui -I..\Qt\5.14.1\mingw73_64\include\QtANGLE -I..\Qt\5.14.1\mingw73_64\include\QtNetwork
LINKER       = g++
LFLAGS      = -Wl,-subsystem:windows -mthreads
LIBS         = C:\LISEcute\Lib\lib\global.dll ;..\Qt\5.14.1\mingw73_64\lib\libQt5PrintSupport.C:\Qt\5.14.1\mingw73_64\lib\libQt5Network.a C:\Qt\5.14.1\mingw73_64\lib\libQt5Core.a -lmingw32 C:\QMAKE = C:\Qt\5.14.1\mingw73_64\bin\qmake.exe
DEL_FILE     = del
    
```

makefile

**Works only from Build-directory**

Name	↑Ext	Size	Date
[.]		<DIR>	09/11/2020 05:57
[moc]		<DIR>	09/10/2020 02:11
[obj]		<DIR>	09/11/2020 04:59
[rcc]		<DIR>	09/10/2020 02:10
[ui]		<DIR>	09/10/2020 02:03
Makefile		7,056,499	09/11/2020 02:12
global	dll	107,520	09/11/2020 01:21
LISE++	exe	338,468,690	09/11/2020 04:59
object_script	LISE++	17,386	09/11/2020 02:12
.qmake	stash	1,003	09/11/2020 01:35

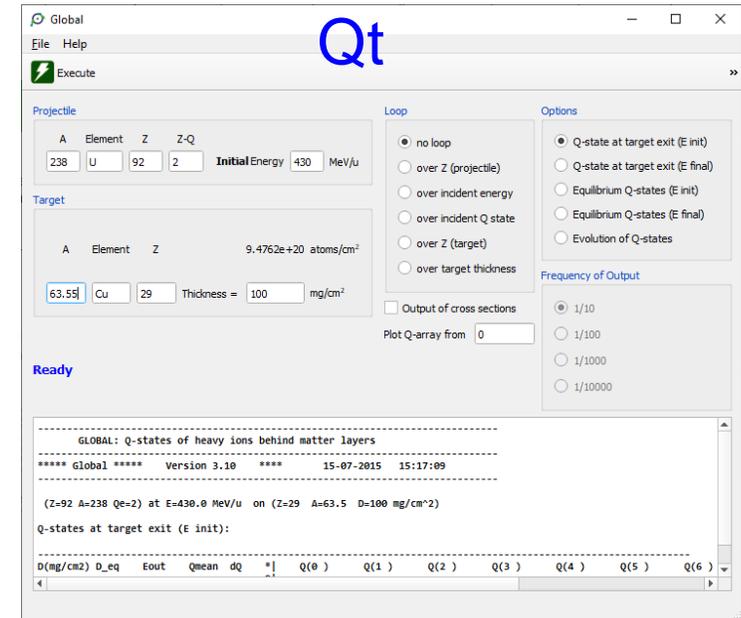
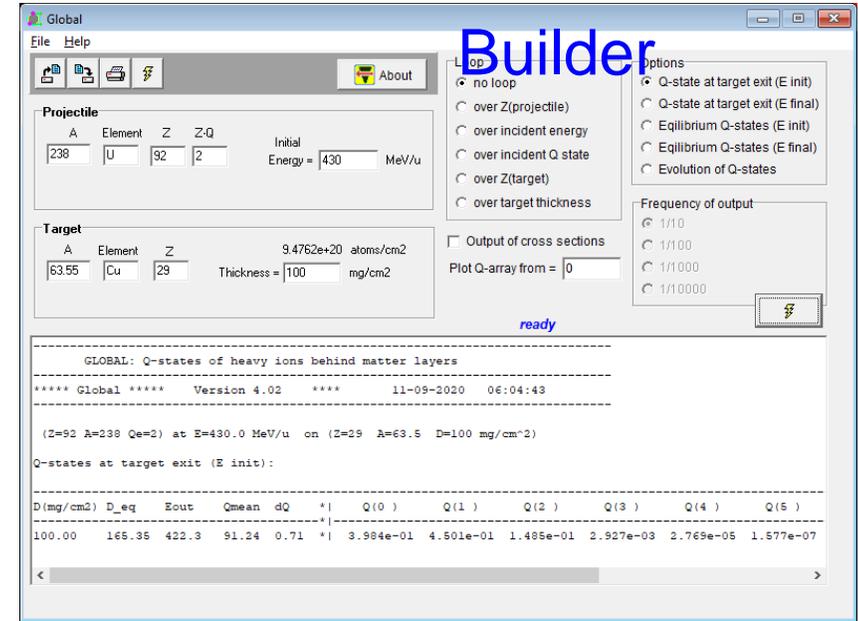
- some difference between LISE\_Borland and LISEcute in "global" charge state calculations is coming from the "global" library versions. Should be understood.
- call "global.dll" using the class "Lise\_global" will probably not be accepted by Excel for the future LISE for Excel application

```
#ifndef GLOBAL_H
#define GLOBAL_H

#include "_global.h"

class LISE_GLOBALSHARED_EXPORT Lise_global
{
public:
    Lise_global();
    int runGlobal(char *filename, bool option_read_data_file, char *Global_version,
        double gAF, double gZF, double gAT, double gZT,
        double gDTARGET, double gEN0, int gQIN,
        int I_WR, int I_CHAR, int I_OUTP,
        int I_LOOP, int N_Steps, int Qshow,
        int DELZF, double DELE,
        int DELQ, int DELZT, double DELDT);
    int GlobalExtern (
        double *qtab, double *Inform, int fast,
        double gAF, double gZF, double gAT, double gZT,
        double gDTARGET, double gEN0, int gQIN,
        int I_CHAR);
};

#endif // GLOBAL_H
```



The Global-Qt application should be remade.  
(some menu items (save, print) are absent,  
layout of dialog should be improved)

57 files contains 114 Graphs (Plots)

1	Directory	Subdirectory	Dialog	Link, %	DONE	Plots total	Plots done	Needs	Oleg benchmrks	N
2	c_PlotGraph		c_Graph_cm	0		0				0
3	d_BlockOptic		d_Buncher	100	1	1	0			0
4	d_BlockOptic		d_D6	100	1					0
5	d_BlockOptic		d_Delay	100	1					0
6	d_BlockOptic		d_Finger	100	1					0
7	d_BlockOptic		d_Kicker	100	1					0
8	d_BlockOptic		d_Kicker_optimization	100	1					0
9	d_BlockOptic		d_Solenoid_block	100	1					0
10	d_Calculator		d_Calculator_errorMean	100	1	1				0
11	d_Calculator	Kinematics	d_Kinematics	100	1	5				0
12	d_Calculator	Kinematics	d_Kinematics_2	100	1	0				0
13	d_Calculator	Kinematics	d_Kinematics_fission	100						0
14	d_Calculator	Kinematics	d_Kinematics_fissionDlg	100	1	1				0
15	d_CN	d_CS	d_CS_differFile	100	1	3	0			0
16	d_Evap		d_Evaporation_plot	100	1	9	0			0
17	d_Evap		d_Evaporation_plot2	100	1	1				0
18	d_Evap		d_Fission_barrier	100	1	2	2	init_distribution		0
19	d_Evap	d_Apf	d_Apf	100	1	2	0			0
20	d_Evap	d_Apf	d_Apf_excitation	100	1		0			0
21	d_MC		d_MC_plot	100	1	1	1	guage		0
22	d_Mechanism	AF_initFN	d_AbrasionFission_initFN_Plot	100	1	5	5			0
23	d_Mechanism		d_Fragmentation_convolution	100	1	2	2	check it again!!!		0
24	d_Mechanism		d_Mechanism_abrasionFission	100	1	2	2			0
25	d_Mechanism		d_Mechanism_abrasionFissionRestor	100	1	0	0			0
26	d_Mechanism		d_Mechanism_fissionPlot	100	1	3	3			0
27	d_Mechanism		d_Mechanism_fusionPlot	100	1	6	6	Invalidate(); ???		0
28	d_Options		d_CS_filesPlot	100	1	1	1		done 9/7	0

57 files contains 114 Graphs (Plots) : 41 graphs have been connected

1	Directory	Subdirectory	Dialog	Link, %	DONE	Plots total	Plots done	Needs	Oleg benchamrks	N	
29	d_Options		d_Secondary_targetStatistics	50	0.5			done 9/7		0	
30	d_Options		d_Secondary_reactions	100	1	2	2	remake it		0	
31	d_Thick	d_Profile	d_Profile_wedge (base)	100	1	1	1	line 604 (textline)	9-Sep	DONE	1
32	d_Thick	d_Profile	d_Profile_curved	100	1	2	1	check line 648	done 9/08	DONE	1
33	d_Thick	d_Profile	d_Profile_customCalc	100	1	1	1	check line 1050	done 9/08	DONE	1
34	d_Uilities		d_Brho_analyzer	100	1	1	1	fix it	done 9/08	DONE	1
35	d_Uilities		d_Foil_lifetimePlot	100	1	3	3	line 335 (qMin(Npmode))	9-Sep		0
36	d_Uilities		d_Gamma_detection	100	1	1	1		9-Sep		0
37	d_Uilities		d_Isol_catcherPlot	100	1	1	1	uncomment MCIsol in c_Gra	10-Sep		0
38	d_Uilities		d_Range_optimizer	100	1	3	3		10-Sep		0
39	d_Uilities	Solenoid	d_Solenoid	100	1	1	1	done 9/08		DONE	1
40	d_Uilities	Solenoid	d_Twinsol_plot	100	1	2	2	K fixed	9-Sep	DONE	2
41	w_Bi		d_Bi	80	0.8	1	1		10-Sep		0
42	w_Stuff		d_Transmission_statistics	100	1	1	1		10-Sep		0
43	w_Graph		w_Graph	100							0
44	w_Graph		w_Graph_CS								0
45	w_Graph		w_Graph_DB								0
46	w_Graph		w_Graph_envelope								0
47	w_Graph		w_Graph_optimum								0
48	w_Graph		w_Graph_optimumScanning								0
49	w_Graph		w_Graph_optimumWedge								0
50	w_Graph		w_Graph_Ogg								0
51	w_Graph		w_Graph_TKE								0
52	w_Graph		w_Graph_utilities								0
53			w_Graph_charges.cpp,								0
54			// w_Graph_E, w_Graph_second, w_Graph_gamma								0
55	w_Main		MainWindow_fit								0
56	w_Main		MainWindow_rate								0
57											
58							41				7

41

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