Stopping Power

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Hierarchical Index

1.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Chapter 2

Class Index

2.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 3

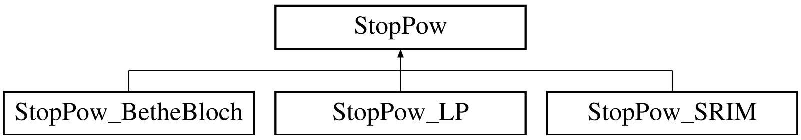
Class Documentation

3.1 StopPow Class Reference

Generic class for stopping power calculators.

```
#include <StopPow.h>
```

Inheritance diagram for StopPow:



Public Member Functions

- StopPow ()
- StopPow (int set_mode)
- float dEdx (float E)
- virtual float **dEdx_MeV_um** (float E)=0
- virtual float **dEdx_MeV_mgcm2** (float E)=0
- float Eout (float E, float x)
- float Ein (float E, float x)
- float Thickness (float E1, float E2)
- float get_dx ()
- void set_dx (float new_dx)
- int get_mode ()
- void set_mode (int new_mode)

Static Public Attributes

- static const float **DEFAULT_DX**
- static const float **DEFAULT_DRHOR**
- static const int **MODE_LENGTH**
- static const int **MODE_RHOR**

Protected Attributes

- float **dx**
- int **mode**

3.1.1 Detailed Description

Generic class for stopping power calculators.

In addition to setting the abstract template for stopping power calculators, this also includes several generic methods. The stopping power utilities here can be called as functions of linear distance or areal density. To specify which, the mode must be set correctly.

Author

Alex Zylstra

Date

2013/03/29

3.1.2 Constructor & Destructor Documentation

3.1.2.1 StopPow::StopPow ( )

Simple constructor for the generic class

3.1.2.2 StopPow::StopPow (int *set_mode*)

Construct a new StopPow object given a starting mode

Parameters

set_mode	the mode you want to use (defined using class constants)

3.1.3 Member Function Documentation

3.1.3.1 float StopPow::dEdx (float *E*)

Calculate stopping power. Return units depend on mode.

Parameters

E	the particle energy in MeV

Returns

dE/dx in MeV/um [MeV/(mg/cm2)]

Exceptions

invalid_argument	

3.1.3.2 float StopPow::Ein (float *E*, float *x*)

Get incident energy for a particle.

Parameters

E	the particle energy in MeV
x	thickness of material in um [mg/cm2]

Returns

initial particle energy in MeV

Exceptions

invalid_argument	

3.1.3.3 float StopPow::Eout (float *E*, float *x*)

Get energy downshift for a particle.

Parameters

E	the particle energy in MeV
x	thickness of material in um [mg/cm2]

Returns

final particle energy in MeV

Exceptions

invalid_argument	

3.1.3.4 float StopPow::get_dx ( )

Get the current step sized being used for calculations.

Returns

dx the step size in um [mg/cm2]

3.1.3.5 int StopPow::get_mode ( )

Get the current mode being used for calculations.

Returns

mode Either StopPow.MODE_LENGTH or StopPow.MODE_RHOR

3.1.3.6 void StopPow::set_dx (float *new_dx*)

Set the step size for calculations

Parameters

new_dx	the new step size to use, in um [mg/cm2]

Exceptions

invalid_argument	

3.1.3.7 void StopPow::set_mode (int *new_mode*)

Set the mode for calculations

Parameters

new_mode	Either StopPow.MODE_LENGTH or StopPow.MODE_RHOR

Exceptions

invalid_argument	

3.1.3.8 float StopPow::Thickness (float *E1*, float *E2*)

Get thickness of material traversed.

Parameters

E1	the initial particle energy in MeV
E2	the final particle energy in MeV

Returns

material thickness in um [mg/cm2]

Exceptions

invalid_argument	

The documentation for this class was generated from the following file:

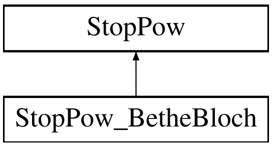
- /Users/alex/Dropbox/Research/workspace/StopPow/src/StopPow.h

3.2 StopPow_BetheBloch Class Reference

Calculate Bethe-Bloch stopping power.

```
#include <StopPow_BetheBloch.h>
```

Inheritance diagram for StopPow_BetheBloch:



Public Member Functions

- StopPow_BetheBloch (float mt, float Zt, vector< float > mf, vector< float > Zf, vector< float > nf)

- float dEdx_MeV_um (float E)
- float dEdx_MeV_mgcm2 (float E)

Additional Inherited Members

3.2.1 Detailed Description

Calculate Bethe-Bloch stopping power.

Implement a stopping-power calculator for arbitrary cold matter, using the simple Bethe-Bloch theory.

Author

Alex Zylstra

Date

2013/03/29

3.2.2 Constructor & Destructor Documentation

3.2.2.1 StopPow_BetheBloch::StopPow_BetheBloch (float *mt,* float *Zt,* vector$<$ float $>$ *mf,* vector$<$ float $>$ *Zf,* vector$<$ float $>$ *nf*)

Initialize the Bethe-Bloch calculator.

Parameters

mt	the test particle mass in AMU
Zt	the test particle in charge (units of e)
mf	vector containing ordered field particle masses in AMU
Zt	vector containing ordered field particle charges in units of e
nf	vector containing ordered field particle densities in units of 1/cm3

Exceptions

invalid_argument	

3.2.3 Member Function Documentation

3.2.3.1 float StopPow_BetheBloch::dEdx_MeV_mgcm2 (float *E*) [virtual]

Calculate the total stopping power

Parameters

E	the test particle energy in MeV

Returns

stopping power in units of MeV/(mg/cm2)

Exceptions

invalid_argument	

Implements StopPow.

3.2.3.2 float StopPow_BetheBloch::dEdx_MeV_um (float *E*) [virtual]

Calculate the total stopping power

Parameters

E	the test particle energy in MeV

Returns

stopping power in units of MeV/um

Exceptions

invalid_argument	

Implements StopPow.

The documentation for this class was generated from the following file:

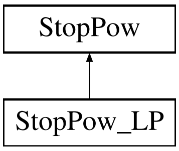
- /Users/alex/Dropbox/Research/workspace/StopPow/src/StopPow_BetheBloch.h

3.3 StopPow_LP Class Reference

Calculate Li-Petrasso stopping power.

```
#include <StopPow_LP.h>
```

Inheritance diagram for StopPow_LP:



Public Member Functions

- StopPow_LP (float mt, float Zt, vector< float > mf, vector< float > Zf, vector< float > Tf, vector< float > nf)
- float dEdx_MeV_um (float E)
- float dEdx_MeV_mgcm2 (float E)
- void set_collective (bool set)

Additional Inherited Members

3.3.1 Detailed Description

Calculate Li-Petrasso stopping power.

Implement a stopping-power calculator for plasma, using the Fokker-Planck theory described in Li and Petrasso, PRL 1993.

Author

Alex Zylstra

Date

2013/03/29

3.3.2 Constructor & Destructor Documentation

3.3.2.1 StopPow_LP::StopPow_LP (float *mt*, float *Zt*, vector< float > *mf*, vector< float > *Zf*, vector< float > *Tf*, vector< float > *nf*)

Initialize the Li-Petrasso stopping power.

Parameters

mt	the test particle mass in AMU
Zt	the test particle in charge (units of e)
mf	vector containing ordered field particle masses in AMU
Zt	vector containing ordered field particle charges in units of e
Tf	vector containing ordered field particle temperatures in units of keV
nf	vector containing ordered field particle densities in units of 1/cm3

Exceptions

invalid_argument	

3.3.3 Member Function Documentation

3.3.3.1 float StopPow_LP::dEdx_MeV_mgcm2 (float *E*) [virtual]

Calculate the total stopping power

Parameters

E	the test particle energy in MeV

Returns

stopping power in units of MeV/(mg/cm2)

Exceptions

invalid_argument	

Implements StopPow.

3.3.3.2 float StopPow_LP::dEdx_MeV_um (float *E*) [virtual]

Calculate the total stopping power

Parameters

E	the test particle energy in MeV

Returns

stopping power in units of MeV/um

Exceptions

invalid_argument	

Implements StopPow.

3.3.3.3 void StopPow_LP::set_collective (bool *set*)

Turn collective effects on or off.

Parameters

set	if you want to use collective effects

The documentation for this class was generated from the following file:

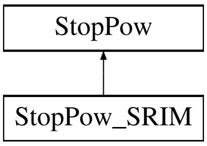
- /Users/alex/Dropbox/Research/workspace/StopPow/src/StopPow_LP.h

3.4 StopPow_SRIM Class Reference

Cold-matter tabulated stopping.

```
#include <StopPow_SRIM.h>
```

Inheritance diagram for StopPow_SRIM:



Public Member Functions

- StopPow_SRIM (string fname)
- ∼StopPow_SRIM ()
- float dEdx_MeV_um (float E)
- float dEdx_MeV_mgcm2 (float E)

Additional Inherited Members

3.4.1 Detailed Description

Cold-matter tabulated stopping.

A wrapper class for calculating stopping powers using tabulated SRIM data (stored in csv files) Linear interpolation is performed between data points.

Author

Alex Zylstra

Date

2013/03/29

3.4.2 Constructor & Destructor Documentation

3.4.2.1 StopPow_SRIM::StopPow_SRIM (string *fname*)

Constructor for SRIM object. Data file must be in standard SRIM format.

Parameters

fname	file name (or relative path) for the data

Exceptions

ios_base::failure	

3.4.2.2 StopPow_SRIM::∼StopPow_SRIM ( )

Destructor

3.4.3 Member Function Documentation

3.4.3.1 float StopPow_SRIM::dEdx_MeV_mgcm2 (float *E*) [virtual]

Get stopping power from the data.

Parameters

E	the particle energy in MeV

Returns

dE/dx in MeV/(mg/cm2)

Exceptions

invalid_argument	

Implements StopPow.

3.4.3.2 float StopPow_SRIM::dEdx_MeV_um (float *E*) [virtual]

Get stopping power from the data.

Parameters

E	the particle energy in MeV

Returns

dE/dx in MeV/um

Exceptions

invalid_argument	

Implements StopPow.

The documentation for this class was generated from the following file:

- /Users/alex/Dropbox/Research/workspace/StopPow/src/StopPow_SRIM.h

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