Sapphire

v1.0

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Contents

Chapter 1

README

This is the original version of Sapphire by Mary Beard. Only the README-file has been changed.

Compiling Sapphire requires CMake,ROOT,and GSL.

To compile:

1. Create a build directory under the main Sapphire directory (i.e. mkdir build), and change to that directory (i.e. cd build/).
2. Run CMake against the main directory, optionally specifying the desired C++ compiler (i.e. cmake -DCMAKE_CXX_COMPILER=icpc -DCMAKE_C_COMPILER=icc ..).
3. Type make install to build Sapphire. The executable is put in the build directory.

Be aware that Sapphire links the paths to the needed tables at compile time. While the executable can be moved, the main Sapphire directory should stay in place. If moved, the build process should be repeated.

To execute the code just enter

sapphire X+a

where X is the heavy nucleus and a is the projectile. Examples are 25Mg+a or 60Fe+n.

Chapter 2

Namespace Index

2.1 Namespace List

Here is a list of all namespaces with brief descriptions:

Chapter 3

Hierarchical Index

3.1 Class Hierarchy

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

Chapter 4

Class Index

4.1 Class List

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

Chapter 5

File Index

5.1 File List

Here is a list of all files with brief descriptions:

Chapter 6

Namespace Documentation

6.1 boost Namespace Reference

Namespaces

- serialization

6.2 boost::serialization Namespace Reference

Functions

- void serialize (Archive &ar, DecayData &g, const unsigned int version)
- void serialize (Archive &ar, DecayProduct &g, const unsigned int version)

6.2.1 Function Documentation

6.2.1.1 void boost::serialization::serialize (Archive & *ar*, DecayData & *g*, const unsigned int *version*)

6.2.1.2 void boost::serialization::serialize (Archive & *ar*, DecayProduct & *g*, const unsigned int *version*)

6.3 std Namespace Reference

Namespaces

- tr1

Classes

- struct equal_to< MassKey >

6.4 std::tr1 Namespace Reference

Classes

- struct hash< MassKey >

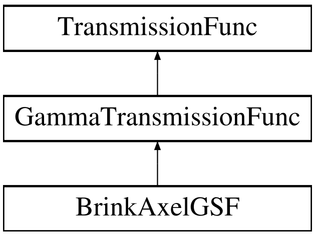
Chapter 7

Class Documentation

7.1 BrinkAxelGSF Class Reference

```
#include <BrinkAxelGSF.h>
```

Inheritance diagram for BrinkAxelGSF:



Public Member Functions

- BrinkAxelGSF (int, int, double, int, double, int, double, double, double, double, TransmissionFunc ∗)
- double CalcStrengthFunction (double)

Additional Inherited Members

7.1.1 Constructor & Destructor Documentation

7.1.1.1 BrinkAxelGSF::BrinkAxelGSF (int *z2,* int *m2,* double *jInitial,* int *piInitial,* double *jFinal,* int *piFinal,* double *maxL,* double *totalWidthForCorrection,* double *uncorrTotalWidthForCorrection,* double *uncorrTotalWidthSqrdForCorrection,* TransmissionFunc ∗ *previous*)

BrinkAxelGSF.h

7.1.2 Member Function Documentation

7.1.2.1 double BrinkAxelGSF::CalcStrengthFunction (double *energy*) `[virtual]`

Implements GammaTransmissionFunc.

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

- BrinkAxelGSF.h
- BrinkAxelGSF.cpp

7.2 CDFEntry Class Reference

```
#include <Decayer.h>
```

Public Member Functions

- CDFEntry (int pairIndex, double energy, double value)

Public Attributes

- int pairIndex_
- double energy_
- double value_

7.2.1 Constructor & Destructor Documentation

7.2.1.1 CDFEntry::CDFEntry (int *pairIndex,* double *energy,* double *value*) [inline]

7.2.2 Member Data Documentation

7.2.2.1 double CDFEntry::energy_

7.2.2.2 int CDFEntry::pairIndex_

7.2.2.3 double CDFEntry::value_

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

- Decayer.h

7.3 CoulFunc Class Reference

```
#include <CoulFunc.h>
```

Public Member Functions

- CoulFunc (int z1, int z2, double redmass, bool useGSLFunctions)
- int z1 () const
- int z2 () const
- double redmass () const
- int lLast () const
- double radiusLast () const
- double energyLast () const
- struct CoulWaves coulLast () const
- void setLast (int, double, double, CoulWaves)
- CoulWaves operator() (int, double, double)
- double Penetrability (int, double, double)
- double PEShift (int, double, double)
- double PEShift_dE (int, double, double)

Static Public Member Functions

- static void GSLErrorHandler (const char ∗, const char ∗, int, int)

7.3.1 Constructor & Destructor Documentation

7.3.1.1 CoulFunc::CoulFunc (int *z1,* int *z2,* double *redmass,* bool *useGSLFunctions*)

7.3.2 Member Function Documentation

7.3.2.1 struct CoulWaves CoulFunc::coulLast ( ) const

Returns the last Coulomb functions which were calculated.

7.3.2.2 double CoulFunc::energyLast ( ) const

Returns the last energy value at which the Coulomb functions were calculated.

7.3.2.3 void CoulFunc::GSLErrorHandler (const char ∗ *reason,* const char ∗ *file,* int *line,* int *errorCode*) [static]

7.3.2.4 int CoulFunc::lLast ( ) const

Returns the last orbital angular momentum value at which the Coulomb functions were calculated.

7.3.2.5 CoulWaves CoulFunc::operator() (int *l,* double *radius,* double *energy*)

The parenthesis operator is defined to make the class instance callable as a function. The orbital angular momentum, radius, and energy in the center of mass system are the dependent variables. The function returns the Coulomb waves.

7.3.2.6 double CoulFunc::Penetrability (int *l,* double *radius,* double *energy*)

Returns the penetrability as a function of orbital angular momentum, radius, and energy in the center of mass system.

7.3.2.7 double CoulFunc::PEShift (int *l,* double *radius,* double *energy*)

Returns the positive energy shift function a function of orbital angular momentum, radius, and energy in the center of mass system.

7.3.2.8 double CoulFunc::PEShift_dE (int *l,* double *radius,* double *energy*)

Returns the energy derivative of the shift function a function of orbital angular momentum, radius, and energy in the center of mass system.

7.3.2.9 double CoulFunc::radiusLast ( ) const

Returns the last radius value at which the Coulomb functions were calculated.

7.3.2.10 double CoulFunc::redmass ( ) const

Returns the reduced mass of the particle pair.

7.3.2.11 void CoulFunc::setLast (int *lLast*, double *rLast*, double *eLast*, CoulWaves *coulLast*)

Sets the last calculated Coulomb waves and the values for which they were calculated.

7.3.2.12 int CoulFunc::z1 ( ) const

Returns the atomic number of the first particle in the pair.

7.3.2.13 int CoulFunc::z2 ( ) const

Returns the atomic number of the second particle in the pair.

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

- CoulFunc.h
- CoulFunc.cpp

7.4 Coulomb_wave_functions Class Reference

```
#include <cwfcomp.H>
```

Public Member Functions

- Coulomb_wave_functions (const bool is_it_normalized_c, const std::complex< double > &l_c, const std::complex< double > &eta_c)
- ∼Coulomb_wave_functions (void)
- void F_dF_init (const std::complex< double > &z, const std::complex< double > &F, const std::complex< double > &dF)
- void F_dF (const std::complex< double > &z, std::complex< double > &F, std::complex< double > &dF)
- void G_dG (const std::complex< double > &z, std::complex< double > &G, std::complex< double > &dG)
- void H_dH (const int omega, const std::complex< double > &z, std::complex< double > &H, std::complex< double > &dH)
- void H_dH_scaled (const int omega, const std::complex< double > &z, std::complex< double > &H, std::complex< double > &dH)

Public Attributes

- const std::complex< double > l
- const std::complex< double > eta
- const bool is_it_normalized

7.4.1 Constructor & Destructor Documentation

7.4.1.1 Coulomb_wave_functions::Coulomb_wave_functions (const bool *is_it_normalized_c*, const **std::complex**< double > & *l_c*, const **std::complex**< double > & *eta_c*) [inline]

7.4.1.2 Coulomb_wave_functions::∼Coulomb_wave_functions (void) [inline]

7.4.2 Member Function Documentation

7.4.2.1 void Coulomb_wave_functions::F_dF (const **std::complex**< double > & *z*, **std::complex**< double > & *F*, **std::complex**< double > & *dF*)

7.4.2.2 void Coulomb_wave_functions::F_dF_init (const **std::complex**< double > & *z*, const **std::complex**< double > & *F*, const **std::complex**< double > & *dF*)

7.4.2.3 void Coulomb_wave_functions::G_dG (const **std::complex**< double > & *z*, **std::complex**< double > & *G*, **std::complex**< double > & *dG*)

7.4.2.4 void Coulomb_wave_functions::H_dH (const int *omega*, const **std::complex**< double > & *z*, **std::complex**< double > & *H*, **std::complex**< double > & *dH*)

7.4.2.5 void Coulomb_wave_functions::H_dH_scaled (const int *omega*, const **std::complex**< double > & *z*, **std::complex**< double > & *H*, **std::complex**< double > & *dH*)

7.4.3 Member Data Documentation

7.4.3.1 const **std::complex**<double> Coulomb_wave_functions::eta

7.4.3.2 const bool Coulomb_wave_functions::is_it_normalized

7.4.3.3 const **std::complex**<double> Coulomb_wave_functions::l

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

- cwfcomp.H
- cwfcomp.cpp

7.5 CoulWaves Struct Reference

```
#include <CoulFunc.h>
```

Public Attributes

- double F
- double dF
- double G
- double dG

7.5.1 Member Data Documentation

7.5.1.1 double CoulWaves::dF

7.5.1.2 double CoulWaves::dG

7.5.1.3 double CoulWaves::F

7.5.1.4 double CoulWaves::G

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

- CoulFunc.h

7.6 CrossSection Class Reference

```
#include <CrossSection.h>
```

Public Member Functions

- CrossSection (int, int, int, std::string, bool, int entranceState=0, std::vector< int > exitStates=std::vector< int >(4,-1))
- bool IsValid () const
- void Calculate ()
- void PrintCrossSections ()
- void PrintTransmissionTerms ()
- std::pair< double, double > CalcAverageSWaveResWidth ()
- std::pair< double, double > CalcAveragePWaveResWidth ()
- std::pair< double, double > CalcAverageDWaveResWidth ()
- void CalculateReactionRates (bool)
- void PrintReactionRates (bool)

Static Public Member Functions

- static void SetResidualGamma (bool residual)
- static void SetResidualNeutron (bool residual)
- static void SetResidualProton (bool residual)
- static void SetResidualAlpha (bool residual)
- static void SetCalculateGammaCutoff (bool calc)
- static void CreateTempVector ()
- static void CreateMACSEnergiesVector ()

7.6.1 Constructor & Destructor Documentation

7.6.1.1 CrossSection::CrossSection (int *Z*, int *A*, int *pType*, std::string *energyFile*, bool *forRates*, int *entranceState* = `0`, std::vector< int > *exitStates* = `std::vector<int>(4,-1)`)

7.6.2 Member Function Documentation

7.6.2.1 std::pair< double, double > CrossSection::CalcAverageDWaveResWidth ( )

7.6.2.2 std::pair< double, double > CrossSection::CalcAveragePWaveResWidth ( )

7.6.2.3 std::pair< double, double > CrossSection::CalcAverageSWaveResWidth ( )

7.6.2.4 void CrossSection::Calculate ( )

7.6.2.5 void CrossSection::CalculateReactionRates (bool *macs*)

7.6.2.6 void CrossSection::CreateMACSEnergiesVector ( ) `[static]`

7.6.2.7 void CrossSection::CreateTempVector ( ) `[static]`

7.6.2.8 bool CrossSection::IsValid ( ) const `[inline]`

7.6.2.9 void CrossSection::PrintCrossSections ( )

7.6.2.10 void CrossSection::PrintReactionRates (bool *macs*)

7.6.2.11 void CrossSection::PrintTransmissionTerms ( )

7.6.2.12 static void CrossSection::SetCalculateGammaCutoff (bool *calc*) [inline], [static]

7.6.2.13 static void CrossSection::SetResidualAlpha (bool *residual*) [inline], [static]

7.6.2.14 static void CrossSection::SetResidualGamma (bool *residual*) [inline], [static]

7.6.2.15 static void CrossSection::SetResidualNeutron (bool *residual*) [inline], [static]

7.6.2.16 static void CrossSection::SetResidualProton (bool *residual*) [inline], [static]

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

- CrossSection.h
- CrossSection.cpp
- Setup.cpp

7.7 CrossSectionValues Class Reference

```
#include <CrossSection.h>
```

Public Member Functions

- CrossSectionValues (double gamma, double neutron, double proton, double alpha, double gammaStellar, double neutronStellar, double protonStellar, double alphaStellar)

Public Attributes

- double gamma_
- double neutron_
- double proton_
- double alpha_
- double gammaStellar_
- double neutronStellar_
- double protonStellar_
- double alphaStellar_

7.7.1 Constructor & Destructor Documentation

7.7.1.1 CrossSectionValues::CrossSectionValues (double *gamma,* double *neutron,* double *proton,* double *alpha,* double *gammaStellar,* double *neutronStellar,* double *protonStellar,* double *alphaStellar*) [inline]

7.7.2 Member Data Documentation

7.7.2.1 double CrossSectionValues::alpha_

7.7.2.2 double CrossSectionValues::alphaStellar_

7.7.2.3 double CrossSectionValues::gamma_

7.7.2.4 double CrossSectionValues::gammaStellar_

7.7.2.5 double CrossSectionValues::neutron_

7.7.2.6 double CrossSectionValues::neutronStellar_

7.7.2.7 double CrossSectionValues::proton_

7.7.2.8 double CrossSectionValues::protonStellar_

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

- CrossSection.h

7.8 DecayController Class Reference

```
#include <DecayController.h>
```

Public Member Functions

- DecayController (int Z, int A, double jInitial, int piInitial, double energy, int initialNeutronNumber=-1, int initialNeutronHoleNumber=-1, int initialProtonNumber=-1, int initialProtonHoleNumber=-1)
- bool Decay (double &, double &, double &, double &, double &, double &, double &, double &)
- std::vector< DecayProduct > DecayProducts () const
- void PrintDecays ()

7.8.1 Constructor & Destructor Documentation

7.8.1.1 DecayController::DecayController (int *Z,* int *A,* double *jInitial,* int *piInitial,* double *energy,* int *initialNeutronNumber* = -1, int *initialNeutronHoleNumber* = -1, int *initialProtonNumber* = -1, int *initialProtonHoleNumber* = -1) [inline]

7.8.2 Member Function Documentation

7.8.2.1 bool DecayController::Decay (double & *neutronEntrance,* double & *protonEntrance,* double & *alphaEntrance,* double & *gammaEntrance,* double & *neutronTotalWidth,* double & *protonTotalWidth,* double & *alphaTotalWidth,* double & *gammaTotalWidth*)

7.8.2.2 std::vector<DecayProduct> DecayController::DecayProducts ( ) const [inline]

7.8.2.3 void DecayController::PrintDecays ( )

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

- DecayController.h
- DecayController.cpp

7.9 DecayData Class Reference

```
#include <DecayProduct.h>
```

Public Member Functions

- DecayData ()
- DecayData (double energy, double neutronEntranceWidth, double protonEntranceWidth, double alphaEntranceWidth, double gammaEntranceWidth, double neutronTotalWidth, double protonTotalWidth, double alphaTotalWidth, double gammaTotalWidth)
- double energy () const
- double neutronEntranceWidth () const
- double protonEntranceWidth () const
- double alphaEntranceWidth () const
- double gammaEntranceWidth () const
- double neutronTotalWidth () const
- double protonTotalWidth () const
- double alphaTotalWidth () const
- double gammaTotalWidth () const

7.9.1 Constructor & Destructor Documentation

7.9.1.1 DecayData::DecayData ( ) `[inline]`

7.9.1.2 DecayData::DecayData (double *energy,* double *neutronEntranceWidth,* double *protonEntranceWidth,* double *alphaEntranceWidth,* double *gammaEntranceWidth,* double *neutronTotalWidth,* double *protonTotalWidth,* double *alphaTotalWidth,* double *gammaTotalWidth*) `[inline]`

7.9.2 Member Function Documentation

7.9.2.1 double DecayData::alphaEntranceWidth ( ) const `[inline]`

7.9.2.2 double DecayData::alphaTotalWidth ( ) const `[inline]`

7.9.2.3 double DecayData::energy ( ) const `[inline]`

7.9.2.4 double DecayData::gammaEntranceWidth ( ) const `[inline]`

7.9.2.5 double DecayData::gammaTotalWidth ( ) const `[inline]`

7.9.2.6 double DecayData::neutronEntranceWidth ( ) const `[inline]`

7.9.2.7 double DecayData::neutronTotalWidth ( ) const `[inline]`

7.9.2.8 double DecayData::protonEntranceWidth ( ) const `[inline]`

7.9.2.9 double DecayData::protonTotalWidth ( ) const `[inline]`

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

- DecayProduct.h

7.10 Decayer Class Reference

```
#include <Decayer.h>
```

Public Member Functions

- Decayer (int Z, int A, double jInitial, int piInitial, double energy, double totalWidthForCorrection=0., double uncorrTotalWidthForCorrection=0., double uncorrTotalWidthSqrdForCorrection=0., Decayer ∗widthCorrectedDecayer=NULL)
- ∼Decayer ()
- bool Decay (int &, int &, double &, int &, double &, double &)
- void PrintFunctions ()
- void PrintCDF ()
- void CorrectWidthFluctuations ()
- double NeutronEntranceWidth () const
- double ProtonEntranceWidth () const
- double AlphaEntranceWidth () const
- double GammaEntranceWidth () const
- double GammaTotalWidth () const
- double NeutronTotalWidth () const
- double AlphaTotalWidth () const
- double ProtonTotalWidth () const

Static Public Member Functions

- static void SetCrossSection (bool isCrossSection)
- static void SetMaxL (double maxL)
- static double GetMaxL ()

Friends

- class CrossSection

7.10.1 Constructor & Destructor Documentation

7.10.1.1 Decayer::Decayer (int *Z*, int *A*, double *jInitial*, int *piInitial*, double *energy*, double *totalWidthForCorrection* = `0.`, double *uncorrTotalWidthForCorrection* = `0.`, double *uncorrTotalWidthSqrdForCorrection* = `0.`, Decayer ∗ *widthCorrectedDecayer* = `NULL`)

7.10.1.2 Decayer::∼Decayer ( )

7.10.2 Member Function Documentation

7.10.2.1 double Decayer::AlphaEntranceWidth ( ) const `[inline]`

7.10.2.2 double Decayer::AlphaTotalWidth ( ) const `[inline]`

7.10.2.3 void Decayer::CorrectWidthFluctuations ( )

7.10.2.4 bool Decayer::Decay (int & *Z*, int & *A*, double & *jFinal*, int & *piFinal*, double & *excitationEnergy*, double & *decayEnergy*)

7.10.2.5 double Decayer::GammaEntranceWidth ( ) const `[inline]`

7.10.2.6 double Decayer::GammaTotalWidth ( ) const `[inline]`

7.10.2.7 static double Decayer::GetMaxL ( ) `[inline]`, `[static]`

7.10.2.8 double Decayer::NeutronEntranceWidth ( ) const [inline]

7.10.2.9 double Decayer::NeutronTotalWidth ( ) const [inline]

7.10.2.10 void Decayer::PrintCDF ( )

7.10.2.11 void Decayer::PrintFunctions ( )

7.10.2.12 double Decayer::ProtonEntranceWidth ( ) const [inline]

7.10.2.13 double Decayer::ProtonTotalWidth ( ) const [inline]

7.10.2.14 static void Decayer::SetCrossSection (bool *isCrossSection*) [inline], [static]

7.10.2.15 static void Decayer::SetMaxL (double *maxL*) [inline], [static]

7.10.3 Friends And Related Function Documentation

7.10.3.1 friend class CrossSection [friend]

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

- Decayer.h
- Decayer.cpp
- Setup.cpp

7.11 DecayProduct Class Reference

`#include <DecayProduct.h>`

Public Member Functions

- DecayProduct ()
- DecayProduct (int Z, int A, double J, int Pi, double excitationEnergy, double fragmentEnergyCM, double fragmentEnergy, double fragmentMomentumX, double fragmentMomentumY, double fragmentMomentumZ, int decayType, double particleThetaCM, double particlePhiCM, double particleEnergyCM, double particleEnergy, double particleMomentumX, double particleMomentumY, double particleMomentumZ)

Public Attributes

- int Z_
- int A_
- int Pi_
- int particleType_
- double J_
- double excitationEnergy_
- double fragmentEnergyCM_
- double fragmentEnergy_
- double fragmentMomentumX_
- double fragmentMomentumY_
- double fragmentMomentumZ_
- double particleThetaCM_
- double particlePhiCM_

- double particleEnergyCM_
- double particleEnergy_
- double particleMomentumX_
- double particleMomentumY_
- double particleMomentumZ_

7.11.1 Constructor & Destructor Documentation

7.11.1.1 DecayProduct::DecayProduct ( ) [inline]

7.11.1.2 DecayProduct::DecayProduct (int *Z*, int *A*, double *J*, int *Pi*, double *excitationEnergy*, double *fragmentEnergyCM*, double *fragmentEnergy*, double *fragmentMomentumX*, double *fragmentMomentumY*, double *fragmentMomentumZ*, int *decayType*, double *particleThetaCM*, double *particlePhiCM*, double *particleEnergyCM*, double *particleEnergy*, double *particleMomentumX*, double *particleMomentumY*, double *particleMomentumZ*) [inline]

7.11.2 Member Data Documentation

7.11.2.1 int DecayProduct::A_

7.11.2.2 double DecayProduct::excitationEnergy_

7.11.2.3 double DecayProduct::fragmentEnergy_

7.11.2.4 double DecayProduct::fragmentEnergyCM_

7.11.2.5 double DecayProduct::fragmentMomentumX_

7.11.2.6 double DecayProduct::fragmentMomentumY_

7.11.2.7 double DecayProduct::fragmentMomentumZ_

7.11.2.8 double DecayProduct::J_

7.11.2.9 double DecayProduct::particleEnergy_

7.11.2.10 double DecayProduct::particleEnergyCM_

7.11.2.11 double DecayProduct::particleMomentumX_

7.11.2.12 double DecayProduct::particleMomentumY_

7.11.2.13 double DecayProduct::particleMomentumZ_

7.11.2.14 double DecayProduct::particlePhiCM_

7.11.2.15 double DecayProduct::particleThetaCM_

7.11.2.16 int DecayProduct::particleType_

7.11.2.17 int DecayProduct::Pi_

7.11.2.18 int DecayProduct::Z_

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

- DecayProduct.h

7.12 DecayResults Class Reference

```
#include <DecayResults.h>
```

Public Member Functions

- DecayResults (int, int, double, int, double, double, int)
- ∼DecayResults ()
- void AddResults (std::vector< std::pair< DecayData, std::vector< DecayProduct > > > &)

7.12.1 Constructor & Destructor Documentation

7.12.1.1 DecayResults::DecayResults (int *Z*, int *A*, double *J*, int *Pi*, double *initialEnergyLow*, double *initialEnergyHigh*, int *suffixNo*)

7.12.1.2 DecayResults::∼DecayResults ( )

7.12.2 Member Function Documentation

7.12.2.1 void DecayResults::AddResults (std::vector< std::pair< **DecayData**, std::vector< **DecayProduct** > > > & *results*)

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

- DecayResults.h
- DecayResults.cpp

7.13 EntrancePairs Struct Reference

Public Member Functions

- EntrancePairs (int Z, int A, int pType)

Public Attributes

- int Z_
- int A_
- int pType_

7.13.1 Constructor & Destructor Documentation

7.13.1.1 EntrancePairs::EntrancePairs (int *Z*, int *A*, int *pType*) [inline]

7.13.2 Member Data Documentation

7.13.2.1 int EntrancePairs::A_

7.13.2.2 int EntrancePairs::pType_

7.13.2.3 int EntrancePairs::Z_

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

- Sapphire.cpp

7.14 std::equal_to< MassKey > Struct Template Reference

```
#include <NuclearMass.h>
```

Public Member Functions

- bool operator() (MassKey const &left, MassKey const &right) const

7.14.1 Member Function Documentation

7.14.1.1 bool std::equal_to< MassKey >::operator() (MassKey const & *left,* MassKey const & *right*) const [inline]

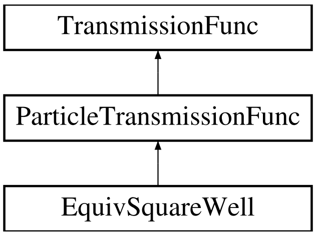
The documentation for this struct was generated from the following file:

- NuclearMass.h

7.15 EquivSquareWell Class Reference

```
#include <EquivSquareWell.h>
```

Inheritance diagram for EquivSquareWell:



Public Member Functions

- EquivSquareWell (int z1, int m1, int z2, int m2, double jInitial, int piInitial, double jFinal, int piFinal, double spin, int parity, double maxL, double totalWidthForCorrection, double uncorrTotalWidthForCorrection, double uncorrTotalWidthSqrdForCorrection, TransmissionFunc ∗previous)
- ∼EquivSquareWell ()
- double CalcTransmission (double, int, double)

Additional Inherited Members

7.15.1 Constructor & Destructor Documentation

7.15.1.1 EquivSquareWell::EquivSquareWell (int *z1,* int *m1,* int *z2,* int *m2,* double *jInitial,* int *piInitial,* double *jFinal,* int *piFinal,* double *spin,* int *parity,* double *maxL,* double *totalWidthForCorrection,* double *uncorrTotalWidthForCorrection,* double *uncorrTotalWidthSqrdForCorrection,* TransmissionFunc ∗ *previous*) [inline]

7.15.1.2 EquivSquareWell::∼EquivSquareWell ( ) [inline]

7.15.2 Member Function Documentation

7.15.2.1 double EquivSquareWell::CalcTransmission (double *s,* int *l,* double *energy*) [virtual]

Implements ParticleTransmissionFunc.

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

- EquivSquareWell.h
- EquivSquareWell.cpp

7.16 GammaTransition Class Reference

```
#include <NuclearLevels.h>
```

Public Member Functions

- GammaTransition (int levelIndex, double energy, double probability)

Public Attributes

- int levelIndex_
- double energy_
- double probability_

7.16.1 Constructor & Destructor Documentation

7.16.1.1 GammaTransition::GammaTransition (int *levelIndex,* double *energy,* double *probability*) [inline]

7.16.2 Member Data Documentation

7.16.2.1 double GammaTransition::energy_

7.16.2.2 int GammaTransition::levelIndex_

7.16.2.3 double GammaTransition::probability_

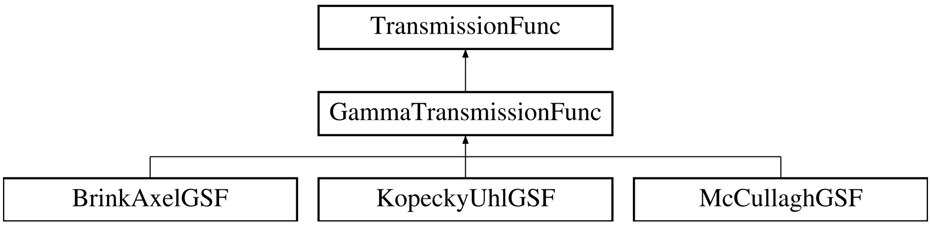
The documentation for this class was generated from the following file:

- NuclearLevels.h

7.17 GammaTransmissionFunc Class Reference

```
#include <GammaTransmissionFunc.h>
```

Inheritance diagram for GammaTransmissionFunc:



Public Member Functions

- GammaTransmissionFunc (int, int, double, int, double, int, double, double, double, double, TransmissionFunc ∗)
- virtual ∼GammaTransmissionFunc ()
- bool IsValid ()
- double operator() (double)
- virtual double CalcStrengthFunction (double)=0

Static Public Member Functions

- static GammaTransmissionFunc ∗ CreateGammaTransmissionFunc (int, int, double, int, double, int, double, LevelDensity ∗, double, double, double, TransmissionFunc ∗, double)
- static void InitializeGDRParameters (std::string)
- static void SetEGDRType (int)
- static void SetPorterThomas (bool)

Protected Attributes

- GDRParameters gdrParameters_

Static Protected Attributes

- static GDRTable gdrTable_
- static int egdrType_
- static const int mgdrType_ =0
- static const int egqrType_ =0
- static bool porterThomas_

7.17.1 Constructor & Destructor Documentation

7.17.1.1 GammaTransmissionFunc::GammaTransmissionFunc (int *z2,* int *m2,* double *jInitial,* int *piInitial,* double *jFinal,* int *piFinal,* double *maxL,* double *totalWidthForCorrection,* double *uncorrTotalWidthForCorrection,* double *uncorrTotalWidthSqrdForCorrection,* TransmissionFunc ∗ *previous*)

7.17.1.2 virtual GammaTransmissionFunc::∼GammaTransmissionFunc ( ) [inline], [virtual]

7.17.2 Member Function Documentation

7.17.2.1 virtual double GammaTransmissionFunc::CalcStrengthFunction (double) [pure virtual]

Implemented in KopeckyUhlGSF, BrinkAxelGSF, and McCullaghGSF.

7.17.2.2 GammaTransmissionFunc * GammaTransmissionFunc::CreateGammaTransmissionFunc (int *z2,* int *m2,* double *jInitial,* int *piInitial,* double *jFinal,* int *piFinal,* double *maxL,* LevelDensity * *levelDensity,* double *totalWidthForCorrection,* double *uncorrTotalWidthForCorrection,* double *uncorrTotalWidthSqrdForCorrection,* TransmissionFunc * *previous,* double *compoundE*) [static]

7.17.2.3 void GammaTransmissionFunc::InitializeGDRParameters (std::string *filename*) [static]

7.17.2.4 bool GammaTransmissionFunc::IsValid ( ) [inline], [virtual]

Implements TransmissionFunc.

7.17.2.5 double GammaTransmissionFunc::operator() (double *energy*) [virtual]

Implements TransmissionFunc.

7.17.2.6 void GammaTransmissionFunc::SetEGDRType (int *type*) [static]

7.17.2.7 void GammaTransmissionFunc::SetPorterThomas (bool *yn*) [static]

7.17.3 Member Data Documentation

7.17.3.1 int GammaTransmissionFunc::egdrType_ [static], [protected]

7.17.3.2 const int GammaTransmissionFunc::egqrType_ =0 [static], [protected]

7.17.3.3 GDRParameters GammaTransmissionFunc::gdrParameters_ [protected]

7.17.3.4 GDRTable GammaTransmissionFunc::gdrTable_ [static], [protected]

7.17.3.5 const int GammaTransmissionFunc::mgdrType_ =0 [static], [protected]

7.17.3.6 bool GammaTransmissionFunc::porterThomas_ [static], [protected]

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

- GammaTransmissionFunc.h
- GammaTransmissionFunc.cpp
- Setup.cpp

7.18 GDRParameters Class Reference

`#include <GammaTransmissionFunc.h>`

Public Member Functions

- GDRParameters ()
- GDRParameters (double eta, double E1, double W1, double kSigmaGamma1, double E2, double W2, double kSigmaGamma2)

Public Attributes

- double eta_

- double E_ [2]
- double W_ [2]
- double kSigmaGamma_ [2]

7.18.1 Constructor & Destructor Documentation

7.18.1.1 GDRParameters::GDRParameters ( ) [inline]

7.18.1.2 GDRParameters::GDRParameters (double *eta,* double *E1,* double *W1,* double *kSigmaGamma1,* double *E2,* double *W2,* double *kSigmaGamma2*) [inline]

7.18.2 Member Data Documentation

7.18.2.1 double GDRParameters::E_[2]

7.18.2.2 double GDRParameters::eta_

7.18.2.3 double GDRParameters::kSigmaGamma_[2]

7.18.2.4 double GDRParameters::W_[2]

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

- GammaTransmissionFunc.h

7.19 gsl_partfunc_params Struct Reference

Public Attributes

- double temperature
- LevelDensity ∗ density

7.19.1 Member Data Documentation

7.19.1.1 LevelDensity∗ gsl_partfunc_params::density

7.19.1.2 double gsl_partfunc_params::temperature

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

- CrossSection.cpp

7.20 gsl_reactionrate_params Struct Reference

Public Attributes

- double temperature
- TGraph ∗ graph
- bool useSpline

7.20.1 Member Data Documentation

7.20.1.1 TGraph∗ gsl_reactionrate_params::graph

7.20.1.2 double gsl_reactionrate_params::temperature

7.20.1.3 bool gsl_reactionrate_params::useSpline

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

- CrossSection.cpp

7.21 std::tr1::hash< MassKey > Struct Template Reference

```
#include <NuclearMass.h>
```

Public Member Functions

- std::size_t operator() (MassKey const &key) const

7.21.1 Member Function Documentation

7.21.1.1 std::size_t std::tr1::hash< MassKey >::operator() (MassKey const & *key*) const [inline]

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

- NuclearMass.h

7.22 InitialNucleusData Class Reference

```
#include <SapphireMPITypes.h>
```

Public Member Functions

- InitialNucleusData ()
- InitialNucleusData (int Z, int A, double J, int Pi, double lowEnergy, double highEnergy, bool preEq)
- bool preEq () const
- int Z () const
- int A () const
- int Pi () const
- double J () const
- double lowEnergy () const
- double highEnergy () const

Friends

- class boost::serialization::access

7.22.1 Constructor & Destructor Documentation

7.22.1.1 InitialNucleusData::InitialNucleusData ( ) [inline]

7.22.1.2 InitialNucleusData::InitialNucleusData (int *Z*, int *A*, double *J*, int *Pi*, double *lowEnergy*, double *highEnergy*, bool *preEq*) [inline]

7.22.2 Member Function Documentation

7.22.2.1 int InitialNucleusData::A ( ) const [inline]

7.22.2.2 double InitialNucleusData::highEnergy ( ) const [inline]

7.22.2.3 double InitialNucleusData::J ( ) const [inline]

7.22.2.4 double InitialNucleusData::lowEnergy ( ) const [inline]

7.22.2.5 int InitialNucleusData::Pi ( ) const [inline]

7.22.2.6 bool InitialNucleusData::preEq ( ) const [inline]

7.22.2.7 int InitialNucleusData::Z ( ) const [inline]

7.22.3 Friends And Related Function Documentation

7.22.3.1 friend class boost::serialization::access [friend]

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

- SapphireMPITypes.h

7.23 int_double_pair_compare Struct Reference

```
#include <CrossSection.h>
```

Public Member Functions

- bool operator() (const int_double_pair &lhs, int_double_pair const &rhs)

7.23.1 Member Function Documentation

7.23.1.1 bool int_double_pair_compare::operator() (const int_double_pair & *lhs*, int_double_pair const & *rhs*) [inline]

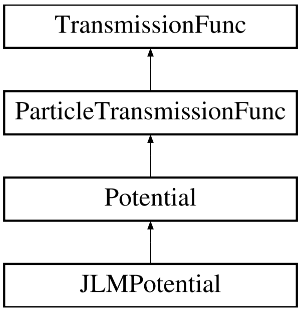
The documentation for this struct was generated from the following file:

- CrossSection.h

7.24 JLMPotential Class Reference

```
#include <JLMPotential.h>
```

Inheritance diagram for JLMPotential:



Public Member Functions

- JLMPotential (int, int, int, int, double, int, double, int, double, int, double, double, double, double, TransmissionFunc ∗)
- double CalculateDensity (double, int) const
- std::complex< double > Calculate (double, int, double, double, double) const

Static Public Member Functions

- static double GetA (int i, int j)

Additional Inherited Members

7.24.1 Constructor & Destructor Documentation

7.24.1.1 JLMPotential::JLMPotential (int *z1,* int *m1,* int *z2,* int *m2,* double *jInitial,* int *piInitial,* double *jFinal,* int *piFinal,* double *spin,* int *parity,* double *maxL,* double *totalWidthForCorrection,* double *uncorrTotalWidthForCorrection,* double *uncorrTotalWidthSqrdForCorrection,* TransmissionFunc ∗ *previous*)

7.24.2 Member Function Documentation

7.24.2.1 std::complex< double > JLMPotential::Calculate (double *r,* int *l,* double *s,* double *j,* double *E*) const `[virtual]`

Implements Potential.

7.24.2.2 double JLMPotential::CalculateDensity (double *r,* int *which*) const

7.24.2.3 static double JLMPotential::GetA (int *i,* int *j*) `[inline]`, `[static]`

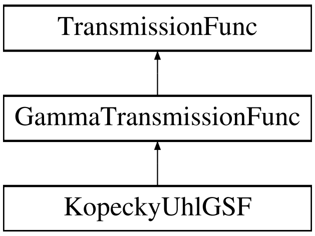
The documentation for this class was generated from the following files:

- JLMPotential.h
- JLMPotential.cpp

7.25 KopeckyUhlGSF Class Reference

```
#include <KopeckyUhlGSF.h>
```

Inheritance diagram for KopeckyUhlGSF:



Public Member Functions

- KopeckyUhlGSF (int, int, double, int, double, int, double, double, double, double, TransmissionFunc ∗, LevelDensity ∗, double)
- double CalcStrengthFunction (double)

Additional Inherited Members

7.25.1 Constructor & Destructor Documentation

7.25.1.1 KopeckyUhlGSF::KopeckyUhlGSF (int *z2,* int *m2,* double *jInitial,* int *piInitial,* double *jFinal,* int *piFinal,* double *maxL,* double *totalWidthForCorrection,* double *uncorrTotalWidthForCorrection,* double *uncorrTotalWidthSqrdForCorrection,* TransmissionFunc ∗ *previous,* LevelDensity ∗ *levelDensity,* double *compoundE*)

7.25.2 Member Function Documentation

7.25.2.1 double KopeckyUhlGSF::CalcStrengthFunction (double *energy*) [virtual]

Implements GammaTransmissionFunc.

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

- KopeckyUhlGSF.h
- KopeckyUhlGSF.cpp

7.26 Level Class Reference

```
#include <NuclearLevels.h>
```

Public Member Functions

- Level (double J, int Pi, double energy)

Public Attributes

- int Pi_
- double J_
- double energy_
- std::vector< GammaTransition > gammas_

7.26.1 Constructor & Destructor Documentation

7.26.1.1 Level::Level (double *J*, int *Pi*, double *energy*) [inline]

7.26.2 Member Data Documentation

7.26.2.1 double Level::energy_

7.26.2.2 std::vector< GammaTransition > Level::gammas_

7.26.2.3 double Level::J_

7.26.2.4 int Level::Pi_

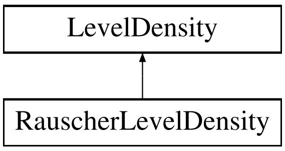
The documentation for this class was generated from the following file:

- NuclearLevels.h

7.27 LevelDensity Class Reference

```
#include <LevelDensity.h>
```

Inheritance diagram for LevelDensity:



Public Member Functions

- LevelDensity (int Z, int A, double J)
- virtual ∼LevelDensity ()
- double operator() (double)
- double TotalLevelDensity (double)

Protected Member Functions

- virtual void CalcBackShift ()=0
- virtual double CalcDensityParam (double)=0
- virtual double CalcNuclearTemp (double)=0
- void CalcConstantTempTerms ()

Protected Attributes

- int Z_
- int A_
- double J_
- double backshift_
- double criticalU_
- double constAngTerm_
- double nuclearTemp_
- double e0_

Static Protected Attributes

- static const double zeta_ = 1.0
- static const double r0_ = 1.25

Friends

- class KopeckyUhlGSF

7.27.1 Constructor & Destructor Documentation

7.27.1.1 LevelDensity::LevelDensity (int *Z*, int *A*, double *J*) [inline]

7.27.1.2 virtual LevelDensity::∼LevelDensity ( ) [inline], [virtual]

7.27.2 Member Function Documentation

7.27.2.1 virtual void LevelDensity::CalcBackShift ( ) [protected], [pure virtual]

Implemented in RauscherLevelDensity.

7.27.2.2 void LevelDensity::CalcConstantTempTerms ( ) [protected]

7.27.2.3 virtual double LevelDensity::CalcDensityParam (double) [protected], [pure virtual]

Implemented in RauscherLevelDensity.

7.27.2.4 virtual double LevelDensity::CalcNuclearTemp (double) [protected], [pure virtual]

Implemented in RauscherLevelDensity.

7.27.2.5 double LevelDensity::operator() (double *E*)

7.27.2.6 double LevelDensity::TotalLevelDensity (double *E*)

7.27.3 Friends And Related Function Documentation

7.27.3.1 friend class KopeckyUhlGSF [friend]

7.27.4 Member Data Documentation

7.27.4.1 int LevelDensity::A_ [protected]

7.27.4.2 double LevelDensity::backshift_ [protected]

7.27.4.3 double LevelDensity::constAngTerm_ [protected]

7.27.4.4 double LevelDensity::criticalU_ [protected]

7.27.4.5 double LevelDensity::e0_ [protected]

7.27.4.6 double LevelDensity::J_ [protected]

7.27.4.7 double LevelDensity::nuclearTemp_ [protected]

7.27.4.8 const double LevelDensity::r0_ = 1.25 [static], [protected]

7.27.4.9 int LevelDensity::Z_ [protected]

7.27.4.10 const double LevelDensity::zeta_ = 1.0 [static], [protected]

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

- LevelDensity.h
- LevelDensity.cpp

7.28 LevelsContainer Class Reference

```
#include <NuclearLevels.h>
```

Public Member Functions

- LevelsContainer ()
- LevelsContainer (std::istream &, int, int)

Public Attributes

- std::vector< Level > levels_

7.28.1 Constructor & Destructor Documentation

7.28.1.1 LevelsContainer::LevelsContainer ( ) [inline]

7.28.1.2 LevelsContainer::LevelsContainer (std::istream & *in,* int *numLevels,* int *numComplete*)

7.28.2 Member Data Documentation

7.28.2.1 std::vector<Level> LevelsContainer::levels_

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

- NuclearLevels.h
- NuclearLevels.cpp

7.29 MassEntry Class Reference

```
#include <NuclearMass.h>
```

Public Member Functions

- MassEntry ()
- MassEntry (double expMass, double thMass, double microEnergyCorr, unsigned int mask)

Public Attributes

- double expMass_
- double thMass_
- double microEnergyCorr_
- unsigned int mask_

7.29.1 Constructor & Destructor Documentation

7.29.1.1 MassEntry::MassEntry ( ) `[inline]`

7.29.1.2 MassEntry::MassEntry (double *expMass*, double *thMass*, double *microEnergyCorr*, unsigned int *mask*) `[inline]`

7.29.2 Member Data Documentation

7.29.2.1 double MassEntry::expMass_

7.29.2.2 unsigned int MassEntry::mask_

7.29.2.3 double MassEntry::microEnergyCorr_

7.29.2.4 double MassEntry::thMass_

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

- NuclearMass.h

7.30 MassKey Class Reference

```
#include <NuclearMass.h>
```

Public Member Functions

- MassKey (int Z, int A)
- bool operator< (const MassKey &right) const

Public Attributes

- int Z_
- int A_

7.30.1 Constructor & Destructor Documentation

7.30.1.1 MassKey::MassKey (int *Z*, int *A*) `[inline]`

7.30.2 Member Function Documentation

7.30.2.1 bool MassKey::operator< (const MassKey & *right*) const `[inline]`

7.30.3 Member Data Documentation

7.30.3.1 int MassKey::A_

7.30.3.2 int MassKey::Z_

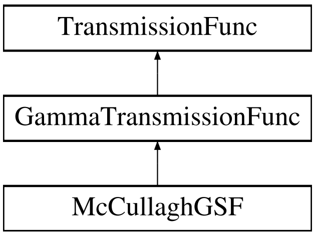
The documentation for this class was generated from the following file:

- NuclearMass.h

7.31 McCullaghGSF Class Reference

```
#include <McCullaghGSF.h>
```

Inheritance diagram for McCullaghGSF:



Public Member Functions

- McCullaghGSF (int, int, double, int, double, int, double, double, double, double, TransmissionFunc ∗)
- double CalcStrengthFunction (double)

Additional Inherited Members

7.31.1 Constructor & Destructor Documentation

7.31.1.1 McCullaghGSF::McCullaghGSF (int *z2,* int *m2,* double *jInitial,* int *piInitial,* double *jFinal,* int *piFinal,* double *maxL,* double *totalWidthForCorrection,* double *uncorrTotalWidthForCorrection,* double *uncorrTotalWidthSqrdForCorrection,* TransmissionFunc ∗ *previous*)

7.31.2 Member Function Documentation

7.31.2.1 double McCullaghGSF::CalcStrengthFunction (double *energy*) [virtual]

Implements GammaTransmissionFunc.

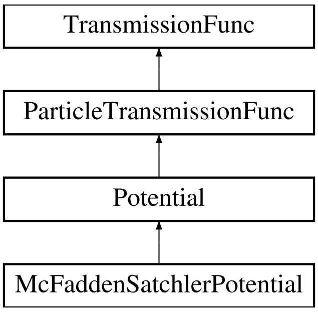
The documentation for this class was generated from the following files:

- McCullaghGSF.h
- McCullaghGSF.cpp

7.32 McFaddenSatchlerPotential Class Reference

```
#include <McFaddenSatchlerPotential.h>
```

Inheritance diagram for McFaddenSatchlerPotential:



Public Member Functions

- McFaddenSatchlerPotential (int, int, int, int, double, int, double, int, double, int, double, double, double, double, TransmissionFunc ∗)
- std::complex< double > Calculate (double, int, double, double, double) const

Additional Inherited Members

7.32.1 Constructor & Destructor Documentation

7.32.1.1 McFaddenSatchlerPotential::McFaddenSatchlerPotential (int *z1*, int *m1*, int *z2*, int *m2*, double *jInitial*, int *piInitial*, double *jFinal*, int *piFinal*, double *spin*, int *parity*, double *maxL*, double *totalWidthForCorrection*, double *uncorrTotalWidthForCorrection*, double *uncorrTotalWidthSqrdForCorrection*, TransmissionFunc ∗ *previous*)

7.32.2 Member Function Documentation

7.32.2.1 std::complex< double > McFaddenSatchlerPotential::Calculate (double *r*, int *l*, double *s*, double *j*, double *energy*) const [virtual]

Implements Potential.

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

- McFaddenSatchlerPotential.h
- McFaddenSatchlerPotential.cpp

7.33 NuclearLevels Class Reference

`#include <NuclearLevels.h>`

Static Public Member Functions

- static void InitializeLevels (std::string levelsDirectory, std::string spinFile)
- static void PrintLevels (int, int)
- static std::vector< Level > FindLevels (int, int)

7.33.1 Member Function Documentation

7.33.1.1 std::vector< Level > NuclearLevels::FindLevels (int *Z*, int *A*) [static]

7.33.1.2 void NuclearLevels::InitializeLevels (std::string *levelsDirectory*, std::string *spinFile*) [static]

7.33.1.3 void NuclearLevels::PrintLevels (int *Z*, int *A*) [static]

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

- NuclearLevels.h
- NuclearLevels.cpp
- Setup.cpp

7.34 NuclearMass Class Reference

```
#include <NuclearMass.h>
```

Static Public Member Functions

- static void InitializeElements ()
- static void InitializeMasses (std::string)
- static int FindZ (std::string)
- static std::string FindElement (int)
- static bool FindMass (int, int, double &)
- static bool MassDifference (int, int, int, int, double &)
- static bool QValue (int, int, int, int, double &)
- static bool NeutronPairingGap (int, int, double &)
- static bool ProtonPairingGap (int, int, double &)
- static bool MicroEnergyCorr (int, int, double &)
- static bool HighestBoundEnergy (int, int, double &)
- static double CalculateLDMMass (int, int)

7.34.1 Member Function Documentation

7.34.1.1 double NuclearMass::CalculateLDMMass (int *Z*, int *A*) [static]

Calculates liquid drop model mass based on TALYS parametrization.

7.34.1.2 std::string NuclearMass::FindElement (int *Z*) [static]

7.34.1.3 bool NuclearMass::FindMass (int *Z*, int *A*, double & *M*) [static]

7.34.1.4 int NuclearMass::FindZ (std::string *element*) [static]

7.34.1.5 bool NuclearMass::HighestBoundEnergy (int *Z*, int *A*, double & *energy*) [static]

7.34.1.6 void NuclearMass::InitializeElements ( ) [static]

7.34.1.7 void NuclearMass::InitializeMasses (std::string *filename*) [static]

7.34.1.8 bool NuclearMass::MassDifference (int *Z1*, int *A1*, int *Z2*, int *A2*, double & *difference*) [static]

7.34.1.9 bool NuclearMass::MicroEnergyCorr (int *Z*, int *A*, double & *correction*) [static]

7.34.1.10 bool NuclearMass::NeutronPairingGap (int *Z*, int *A*, double & *pairingGap*) [static]

7.34.1.11 bool NuclearMass::ProtonPairingGap (int *Z*, int *A*, double & *pairingGap*) [static]

7.34.1.12 bool NuclearMass::QValue (int *Z1*, int *A1*, int *Z2*, int *A2*, double & *qValue*) [static]

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

- NuclearMass.h
- NuclearMass.cpp
- Setup.cpp

7.35 ODE_integration Class Reference

```
#include <ode_int.H>
```

Public Member Functions

- ODE_integration (const std::complex< double > &l_1, const std::complex< double > &two_eta_1)
- void operator() (const std::complex< double > &r0, const std::complex< double > &u0, const std::complex< double > &du0, const std::complex< double > &r, std::complex< double > &u, std::complex< double > &du) const

7.35.1 Constructor & Destructor Documentation

7.35.1.1 ODE_integration::ODE_integration (const **std::complex**< double > & *l_1*, const **std::complex**< double > & *two_eta_1*) [inline]

7.35.2 Member Function Documentation

7.35.2.1 void ODE_integration::operator() (const **std::complex**< double > & *r0*, const **std::complex**< double > & *u0*, const **std::complex**< double > & *du0*, const **std::complex**< double > & *r*, **std::complex**< double > & *u*, **std::complex**< double > & *du*) const

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

- ode_int.H
- ode_int.cpp

7.36 ParticleHoleLevelDensity Class Reference

```
#include <ParticleHoleLevelDensity.h>
```

Public Member Functions

- ParticleHoleLevelDensity (int, int, double, int, int, int, int)
- double operator() (double energy, bool correct=true, bool spin=false)
- double PauliCorrection (int, int, int, int)
- double PairingCorrection (double energy)
- double gNu () const
- double gPi () const
- double FiniteDepth (double)

7.36.1 Constructor & Destructor Documentation

7.36.1.1 ParticleHoleLevelDensity::ParticleHoleLevelDensity (int *Z*, int *A*, double *J*, int *neutronNumber*, int *neutronHoleNumber*, int *protonNumber*, int *protonHoleNumber*)

7.36.2 Member Function Documentation

7.36.2.1 double ParticleHoleLevelDensity::FiniteDepth (double *energy*)

7.36.2.2 double ParticleHoleLevelDensity::gNu ( ) const [inline]

7.36.2.3 double ParticleHoleLevelDensity::gPi ( ) const [inline]

7.36.2.4 double ParticleHoleLevelDensity::operator() (double *energy*, bool *correct* = true, bool *spin* = false)

7.36.2.5 double ParticleHoleLevelDensity::PairingCorrection (double *energy*)

7.36.2.6 double ParticleHoleLevelDensity::PauliCorrection (int *neutronNumber*, int *neutronHoleNumber*, int *protonNumber*, int *protonHoleNumber*)

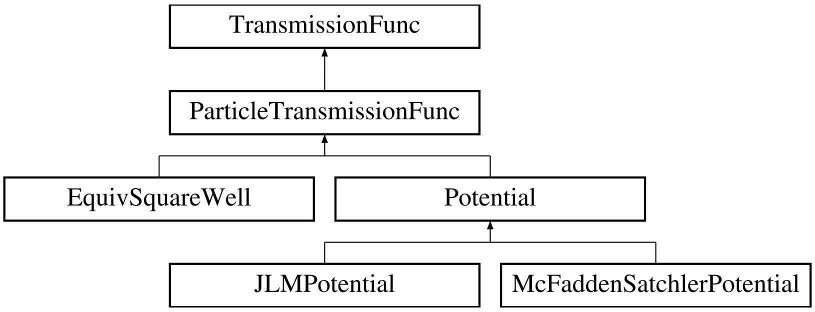
The documentation for this class was generated from the following files:

- ParticleHoleLevelDensity.h
- ParticleHoleLevelDensity.cpp

7.37 ParticleTransmissionFunc Class Reference

```
#include <ParticleTransmissionFunc.h>
```

Inheritance diagram for ParticleTransmissionFunc:



Public Member Functions

- ParticleTransmissionFunc (int z1, int m1, int z2, int m2, double jInitial, int piInitial, double jFinal, int piFinal, double spin, int parity, double maxL, double totalWidthForCorrection, double uncorrTotalWidthForCorrection, double uncorrTotalWidthSqrdForCorrection, TransmissionFunc ∗previous)
- virtual ∼ParticleTransmissionFunc ()
- bool IsValid ()
- double operator() (double)
- double operator() (double, int)
- void CalcSLDependentFunctions (double, std::map< SLPair, double > &)

Static Public Member Functions

- static ParticleTransmissionFunc ∗ CreateParticleTransmissionFunc (int, int, int, int, double, int, double, int, double, int, double, double, double, double, TransmissionFunc ∗)
- static void SetAlphaFormalism (int formalism)
- static void SetNeutronFormalism (int formalism)
- static void SetProtonFormalism (int formalism)
- static void SetPorterThomas (bool)

Protected Member Functions

- virtual double CalcTransmission (double, int, double)=0

Protected Attributes

- int z1_
- int m1_
- int pType_
- int parity_
- double redmass_
- double spin_

7.37.1 Constructor & Destructor Documentation

7.37.1.1 ParticleTransmissionFunc::ParticleTransmissionFunc (int *z1,* int *m1,* int *z2,* int *m2,* double *jInitial,* int *piInitial,* double *jFinal,* int *piFinal,* double *spin,* int *parity,* double *maxL,* double *totalWidthForCorrection,* double *uncorrTotalWidthForCorrection,* double *uncorrTotalWidthSqrdForCorrection,* TransmissionFunc ∗ *previous*) `[inline]`

7.37.1.2 virtual ParticleTransmissionFunc::∼ParticleTransmissionFunc ( ) `[inline], [virtual]`

7.37.2 Member Function Documentation

7.37.2.1 void ParticleTransmissionFunc::CalcSLDependentFunctions (double *energy,* std::map< SLPair, double > & *functions*)

7.37.2.2 virtual double ParticleTransmissionFunc::CalcTransmission (double , int , double) `[protected], [pure virtual]`

Implemented in EquivSquareWell, and Potential.

7.37.2.3 ParticleTransmissionFunc ∗ ParticleTransmissionFunc::CreateParticleTransmissionFunc (int *z1,* int *m1,* int *z2,* int *m2,* double *jInitial,* int *piInitial,* double *jFinal,* int *piFinal,* double *spin,* int *parity,* double *maxL,* double *totalWidthForCorrection,* double *uncorrTotalWidthForCorrection,* double *uncorrTotalWidthSqrdForCorrection,* TransmissionFunc ∗ *previous*) `[static]`

7.37.2.4 bool ParticleTransmissionFunc::IsValid ( ) `[inline], [virtual]`

Implements TransmissionFunc.

7.37.2.5 double ParticleTransmissionFunc::operator() (double *energy*) `[virtual]`

Implements TransmissionFunc.

7.37.2.6 double ParticleTransmissionFunc::operator() (double *energy,* int *which*)

7.37.2.7 static void ParticleTransmissionFunc::SetAlphaFormalism (int *formalism*) [inline], [static]

7.37.2.8 static void ParticleTransmissionFunc::SetNeutronFormalism (int *formalism*) [inline], [static]

7.37.2.9 void ParticleTransmissionFunc::SetPorterThomas (bool *yn*) [static]

7.37.2.10 static void ParticleTransmissionFunc::SetProtonFormalism (int *formalism*) [inline], [static]

7.37.3 Member Data Documentation

7.37.3.1 int ParticleTransmissionFunc::m1_ [protected]

7.37.3.2 int ParticleTransmissionFunc::parity_ [protected]

7.37.3.3 int ParticleTransmissionFunc::pType_ [protected]

7.37.3.4 double ParticleTransmissionFunc::redmass_ [protected]

7.37.3.5 double ParticleTransmissionFunc::spin_ [protected]

7.37.3.6 int ParticleTransmissionFunc::z1_ [protected]

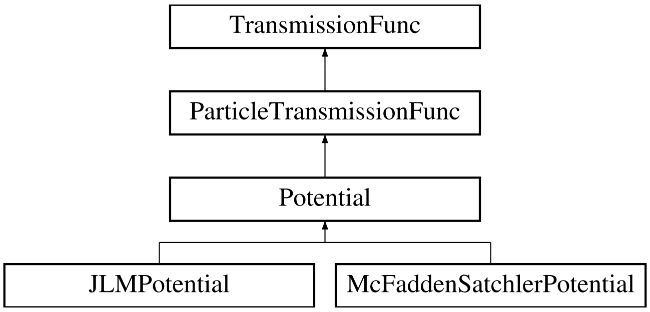
The documentation for this class was generated from the following files:

- ParticleTransmissionFunc.h
- ParticleTransmissionFunc.cpp
- Setup.cpp

7.38 Potential Class Reference

`#include <Potential.h>`

Inheritance diagram for Potential:



Public Member Functions

- Potential (int, int, int, int, double, int, double, int, double, int, double, double, double, double, TransmissionFunc ∗)
- ∼Potential ()
- int GetZ1Z2 () const
- double GetBoundaryRadius () const

- double GetRedMass () const
- double GetRMax () const
- virtual std::complex< double > Calculate (double, int, double, double, double) const =0
- std::complex< double > CalcBeta (double, int, double, double, double) const
- double CalcTransmission (double, int, double)
- void NormalizeInternally (std::vector< std::complex< double > > &, double) const
- void NormalizeOverAllSpace (std::vector< std::complex< double > > &, double) const
- std::vector< std::complex
  < double > > Solve (double, int, double, double, double) const

Protected Attributes

- CoulFunc * coulFunc_
- double boundaryRadius_
- double coulombRadius_

Additional Inherited Members

7.38.1 Constructor & Destructor Documentation

7.38.1.1 Potential::Potential (int *z1,* int *m1,* int *z2,* int *m2,* double *jInitial,* int *piInitial,* double *jFinal,* int *piFinal,* double *spin,* int *parity,* double *maxL,* double *totalWidthForCorrection,* double *uncorrTotalWidthForCorrection,* double *uncorrTotalWidthSqrdForCorrection,* TransmissionFunc * *previous*)

7.38.1.2 Potential::∼Potential ( )

7.38.2 Member Function Documentation

7.38.2.1 std::complex< double > Potential::CalcBeta (double *energy,* int *l,* double *s,* double *j,* double *rStep*) const

7.38.2.2 double Potential::CalcTransmission (double *s,* int *l,* double *energy*) [virtual]

Implements ParticleTransmissionFunc.

7.38.2.3 virtual std::complex<double> Potential::Calculate (double , int , double , double , double) const [pure virtual]

Implemented in JLMPotential, and McFaddenSatchlerPotential.

7.38.2.4 double Potential::GetBoundaryRadius ( ) const [inline]

7.38.2.5 double Potential::GetRedMass ( ) const [inline]

7.38.2.6 double Potential::GetRMax ( ) const [inline]

7.38.2.7 int Potential::GetZ1Z2 ( ) const [inline]

7.38.2.8 void Potential::NormalizeInternally (std::vector< std::complex< double > > & *waveFunction,* double *rStep*) const

7.38.2.9 void Potential::NormalizeOverAllSpace (std::vector< std::complex< double > > & *waveFunction,* double *rStep*) const

7.38.2.10 std::vector< std::complex< double > > Potential::Solve (double *energy*, int *L*, double *S*, double *J*, double *rStep*) const

7.38.3 Member Data Documentation

7.38.3.1 double Potential::boundaryRadius_ [protected]

7.38.3.2 CoulFunc∗ Potential::coulFunc_ [protected]

7.38.3.3 double Potential::coulombRadius_ [protected]

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

- Potential.h
- Potential.cpp

7.39 PreEqCDFEntry Class Reference

```
#include <PreEqDecayer.h>
```

Public Member Functions

- PreEqCDFEntry (int pairIndex, double energy, double value)

Public Attributes

- int pairIndex_
- double energy_
- double value_

7.39.1 Constructor & Destructor Documentation

7.39.1.1 PreEqCDFEntry::PreEqCDFEntry (int *pairIndex*, double *energy*, double *value*) [inline]

7.39.2 Member Data Documentation

7.39.2.1 double PreEqCDFEntry::energy_

7.39.2.2 int PreEqCDFEntry::pairIndex_

7.39.2.3 double PreEqCDFEntry::value_

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

- PreEqDecayer.h

7.40 PreEqDecayer Class Reference

```
#include <PreEqDecayer.h>
```

Public Member Functions

- PreEqDecayer (int initialNeutronNumber, int initialNeutronHoleNumber, int initialProtonNumber, int initialProtonHoleNumber, int Z, int A, double jInitial, int piInitial, double energy)
- ∼PreEqDecayer ()
- bool Decay (int &, int &, double &, int &, int &, int &, int &, int &, double &, double &)
- void PrintCDF ()

Static Public Member Functions

- static void SetCrossSection (bool isCrossSection)
- static void SetMaxL (double maxL)
- static double GetMaxL ()

7.40.1 Constructor & Destructor Documentation

7.40.1.1 PreEqDecayer::PreEqDecayer (int *initialNeutronNumber,* int *initialNeutronHoleNumber,* int *initialProtonNumber,* int *initialProtonHoleNumber,* int *Z,* int *A,* double *jInitial,* int *piInitial,* double *energy*)

7.40.1.2 PreEqDecayer::∼PreEqDecayer ( )

7.40.2 Member Function Documentation

7.40.2.1 bool PreEqDecayer::Decay (int & *Z,* int & *A,* double & *jFinal,* int & *piFinal,* int & *neutronNumber,* int & *neutronHoleNumber,* int & *protonNumber,* int & *protonHoleNumber,* double & *excitationEnergy,* double & *decayEnergy*)

7.40.2.2 static double PreEqDecayer::GetMaxL ( ) `[inline]`, `[static]`

7.40.2.3 void PreEqDecayer::PrintCDF ( )

7.40.2.4 static void PreEqDecayer::SetCrossSection (bool *isCrossSection*) `[inline]`, `[static]`

7.40.2.5 static void PreEqDecayer::SetMaxL (double *maxL*) `[inline]`, `[static]`

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

- PreEqDecayer.h
- PreEqDecayer.cpp
- Setup.cpp

7.41 PreEqSpinRatePair Class Reference

```
#include <PreEqDecayer.h>
```

Public Member Functions

- PreEqSpinRatePair (int neutronNumber, int neutronHoleNumber, int protonNumber, int protonHoleNumber, int Z, int A, double spin, int parity, double qValue, PreEqTransitionRateFunc ∗rateFunc, double integral)

Public Attributes

- PreEqTransitionRateFunc ∗ rateFunc_
- int neutronNumber_
- int neutronHoleNumber_
- int protonNumber_
- int protonHoleNumber_
- int Z_
- int A_
- int parity_
- double spin_
- double qValue_
- double integral_

7.41.1 Constructor & Destructor Documentation

7.41.1.1 PreEqSpinRatePair::PreEqSpinRatePair (int *neutronNumber,* int *neutronHoleNumber,* int *protonNumber,* int *protonHoleNumber,* int *Z,* int *A,* double *spin,* int *parity,* double *qValue,* PreEqTransitionRateFunc ∗ *rateFunc,* double *integral*) [inline]

7.41.2 Member Data Documentation

7.41.2.1 int PreEqSpinRatePair::A_

7.41.2.2 double PreEqSpinRatePair::integral_

7.41.2.3 int PreEqSpinRatePair::neutronHoleNumber_

7.41.2.4 int PreEqSpinRatePair::neutronNumber_

7.41.2.5 int PreEqSpinRatePair::parity_

7.41.2.6 int PreEqSpinRatePair::protonHoleNumber_

7.41.2.7 int PreEqSpinRatePair::protonNumber_

7.41.2.8 double PreEqSpinRatePair::qValue_

7.41.2.9 PreEqTransitionRateFunc∗ PreEqSpinRatePair::rateFunc_

7.41.2.10 double PreEqSpinRatePair::spin_

7.41.2.11 int PreEqSpinRatePair::Z_

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

- PreEqDecayer.h

7.42 PreEqTransitionRateFunc Class Reference

```
#include <PreEqTransitionRateFunc.h>
```

Public Member Functions

- PreEqTransitionRateFunc (int, int, int, int, int, int, int, int, int, int, int, int, double, int, double, int, double, int, double, double, double)
- ∼PreEqTransitionRateFunc ()
- double Integral () const
- std::vector< XYPair > const CumulativeSum ()

7.42.1 Constructor & Destructor Documentation

7.42.1.1 PreEqTransitionRateFunc::PreEqTransitionRateFunc (int *z1*, int *m1*, int *z2*, int *m2*, int *initialNeutronNumber*, int *initialNeutronHoleNumber*, int *initialProtonNumber*, int *initialProtonHoleNumber*, int *finalNeutronNumber*, int *finalNeutronHoleNumber*, int *finalProtonNumber*, int *finalProtonHoleNumber*, double *jInitial*, int *piInitial*, double *jFinal*, int *piFinal*, double *spin*, int *parity*, double *maxL*, double *compoundE*, double *qValue*)

7.42.1.2 PreEqTransitionRateFunc::∼PreEqTransitionRateFunc ( ) `[inline]`

7.42.2 Member Function Documentation

7.42.2.1 std::vector<**XYPair**> const PreEqTransitionRateFunc::CumulativeSum ( ) `[inline]`

7.42.2.2 double PreEqTransitionRateFunc::Integral ( ) const `[inline]`

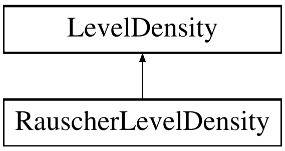
The documentation for this class was generated from the following files:

- PreEqTransitionRateFunc.h
- PreEqTransitionRateFunc.cpp

7.43 RauscherLevelDensity Class Reference

```
#include <RauscherLevelDensity.h>
```

Inheritance diagram for RauscherLevelDensity:



Public Member Functions

- RauscherLevelDensity (int Z, int A, double J)
- ∼RauscherLevelDensity ()
- void CalcBackShift ()
- double CalcDensityParam (double)
- double CalcNuclearTemp (double)

Additional Inherited Members

7.43.1 Constructor & Destructor Documentation

7.43.1.1 RauscherLevelDensity::RauscherLevelDensity (int *Z*, int *A*, double *J*) [inline]

7.43.1.2 RauscherLevelDensity::∼RauscherLevelDensity ( ) [inline]

7.43.2 Member Function Documentation

7.43.2.1 void RauscherLevelDensity::CalcBackShift ( ) [virtual]

Implements LevelDensity.

7.43.2.2 double RauscherLevelDensity::CalcDensityParam (double *u*) [virtual]

Implements LevelDensity.

7.43.2.3 double RauscherLevelDensity::CalcNuclearTemp (double *u*) [virtual]

Implements LevelDensity.

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

- RauscherLevelDensity.h
- RauscherLevelDensity.cpp

7.44 SLPair Class Reference

```
#include <ParticleTransmissionFunc.h>
```

Public Member Functions

- SLPair (double s, int l)
- bool operator< (const SLPair &right) const

Public Attributes

- double s_
- int l_

7.44.1 Constructor & Destructor Documentation

7.44.1.1 SLPair::SLPair (double *s*, int *l*) [inline]

7.44.2 Member Function Documentation

7.44.2.1 bool SLPair::operator< (const SLPair & *right*) const [inline]

7.44.3 Member Data Documentation

7.44.3.1 int SLPair::l_

7.44.3.2 double SLPair::s_

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

- ParticleTransmissionFunc.h

7.45 SpinRatePair Class Reference

```
#include <Decayer.h>
```

Public Member Functions

- SpinRatePair (int Z, int A, double spin, int parity, double qValue, TransitionRateFunc ∗rateFunc, double integral)

Public Attributes

- TransitionRateFunc ∗ rateFunc_
- int Z_
- int A_
- int parity_
- double spin_
- double qValue_
- double integral_

7.45.1 Constructor & Destructor Documentation

7.45.1.1 SpinRatePair::SpinRatePair (int *Z,* int *A,* double *spin,* int *parity,* double *qValue,* TransitionRateFunc ∗ *rateFunc,* double *integral*) [inline]

7.45.2 Member Data Documentation

7.45.2.1 int SpinRatePair::A_

7.45.2.2 double SpinRatePair::integral_

7.45.2.3 int SpinRatePair::parity_

7.45.2.4 double SpinRatePair::qValue_

7.45.2.5 TransitionRateFunc∗ SpinRatePair::rateFunc_

7.45.2.6 double SpinRatePair::spin_

7.45.2.7 int SpinRatePair::Z_

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

- Decayer.h

7.46 TransitionRateFunc Class Reference

```
#include <TransitionRateFunc.h>
```

Public Member Functions

- TransitionRateFunc (int, int, int, int, double, int, double, int, double, int, double, double, double, double, double, double, TransitionRateFunc ∗, bool)
- ∼TransitionRateFunc ()
- std::vector< XYPair > const Function ()
- std::vector< XYPair > const CumulativeSum ()
- double Integral () const
- double CalcLevelDensity (double energy)
- double CalcTransmissionFunc (double energy)
- double CalcTotalLevelDensity (double energy)
- double ExclusiveBranching () const
- double GroundStateTransmission () const

Static Public Member Functions

- static void SetGammaCutoffEnergy (double energy)
- static double GetGammaCutoffEnergy ()

7.46.1 Constructor & Destructor Documentation

7.46.1.1 TransitionRateFunc::TransitionRateFunc (int *z1,* int *m1,* int *z2,* int *m2,* double *jInitial,* int *piInitial,* double *jFinal,* int *piFinal,* double *spin,* int *parity,* double *maxL,* double *compoundE,* double *qValue,* double *totalWidthForCorrection,* double *uncorrTotalWidthForCorrection,* double *uncorrTotalWidthSqrdForCorrection,* TransitionRateFunc ∗ *previous,* bool *isCrossSection*)

7.46.1.2 TransitionRateFunc::∼TransitionRateFunc ( ) [inline]

7.46.2 Member Function Documentation

7.46.2.1 double TransitionRateFunc::CalcLevelDensity (double *energy*) [inline]

7.46.2.2 double TransitionRateFunc::CalcTotalLevelDensity (double *energy*) [inline]

7.46.2.3 double TransitionRateFunc::CalcTransmissionFunc (double *energy*) [inline]

7.46.2.4 std::vector<XYPair> const TransitionRateFunc::CumulativeSum ( ) [inline]

7.46.2.5 double TransitionRateFunc::ExclusiveBranching ( ) const [inline]

7.46.2.6 std::vector<XYPair> const TransitionRateFunc::Function ( ) [inline]

7.46.2.7 static double TransitionRateFunc::GetGammaCutoffEnergy ( ) [inline], [static]

7.46.2.8 double TransitionRateFunc::GroundStateTransmission ( ) const [inline]

7.46.2.9 double TransitionRateFunc::Integral ( ) const [inline]

7.46.2.10 static void TransitionRateFunc::SetGammaCutoffEnergy (double *energy*) [inline], [static]

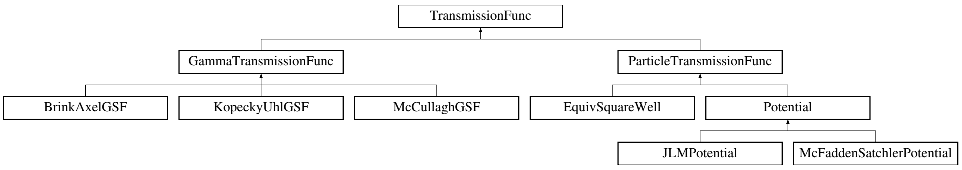
The documentation for this class was generated from the following files:

- TransitionRateFunc.h
- Setup.cpp
- TransitionRateFunc.cpp

7.47 TransmissionFunc Class Reference

```
#include <TransmissionFunc.h>
```

Inheritance diagram for TransmissionFunc:



Public Member Functions

- TransmissionFunc (int z2, int m2, double jInitial, int piInitial, double jFinal, int piFinal, double maxL, double totalWidthForCorrection, double uncorrTotalWidthForCorrection, double uncorrTotalWidthSqrdForCorrection, TransmissionFunc ∗previous)
- virtual ∼TransmissionFunc ()
- virtual double operator() (double)=0
- virtual bool IsValid ()=0

Protected Attributes

- int z2_
- int m2_
- int piInitial_
- int piFinal_
- double jInitial_
- double jFinal_
- double maxL_
- double totalWidthForCorrection_
- double uncorrTotalWidthForCorrection_
- double uncorrTotalWidthSqrdForCorrection_
- TransmissionFunc ∗ previous_

7.47.1 Constructor & Destructor Documentation

7.47.1.1 TransmissionFunc::TransmissionFunc (int *z2*, int *m2*, double *jInitial*, int *piInitial*, double *jFinal*, int *piFinal*, double *maxL*, double *totalWidthForCorrection*, double *uncorrTotalWidthForCorrection*, double *uncorrTotalWidthSqrdForCorrection*, TransmissionFunc ∗ *previous*) [inline]

7.47.1.2 virtual TransmissionFunc::∼TransmissionFunc ( ) [inline], [virtual]

7.47.2 Member Function Documentation

7.47.2.1 virtual bool TransmissionFunc::IsValid ( ) [pure virtual]

Implemented in GammaTransmissionFunc, and ParticleTransmissionFunc.

7.47.2.2 virtual double TransmissionFunc::operator() (double) [pure virtual]

Implemented in GammaTransmissionFunc, and ParticleTransmissionFunc.

7.47.3 Member Data Documentation

7.47.3.1 double TransmissionFunc::jFinal_ [protected]

7.47.3.2 double TransmissionFunc::jInitial_ [protected]

7.47.3.3 int TransmissionFunc::m2_ [protected]

7.47.3.4 double TransmissionFunc::maxL_ [protected]

7.47.3.5 int TransmissionFunc::piFinal_ [protected]

7.47.3.6 int TransmissionFunc::piInitial_ [protected]

7.47.3.7 TransmissionFunc∗ TransmissionFunc::previous_ [protected]

7.47.3.8 double TransmissionFunc::totalWidthForCorrection_ [protected]

7.47.3.9 double TransmissionFunc::uncorrTotalWidthForCorrection_ [protected]

7.47.3.10 double TransmissionFunc::uncorrTotalWidthSqrdForCorrection_ [protected]

7.47.3.11 int TransmissionFunc::z2_ [protected]

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

- TransmissionFunc.h

7.48 XYPair Class Reference

`#include <TransitionRateFunc.h>`

Public Member Functions

- XYPair (double X, double Y)

Public Attributes

- double X_
- double Y_

7.48.1 Constructor & Destructor Documentation

7.48.1.1 XYPair::XYPair (double *X*, double *Y*) [inline]

7.48.2 Member Data Documentation

7.48.2.1 double XYPair::X_

7.48.2.2 double XYPair::Y_

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

- TransitionRateFunc.h

Chapter 8

File Documentation

8.1 BrinkAxelGSF.cpp File Reference

```
#include "BrinkAxelGSF.h"
```

8.2 BrinkAxelGSF.h File Reference

```
#include "GammaTransmissionFunc.h"
```

Classes

- class BrinkAxelGSF

8.3 CMakeCCompilerId.c File Reference

Macros

- #define COMPILER_ID ""
- #define STRINGIFY_HELPER(X) #X
- #define STRINGIFY(X) STRINGIFY_HELPER(X)
- #define PLATFORM_ID
- #define ARCHITECTURE_ID
- #define DEC(n)
- #define HEX(n)
- #define C_DIALECT

Functions

- int main (int argc, char ∗argv[])

Variables

- char const ∗ info_compiler = "INFO" ":" "compiler[" COMPILER_ID "]"
- char const ∗ info_platform = "INFO" ":" "platform[" PLATFORM_ID "]"

- char const ∗ info_arch = "INFO" ":" "arch[" ARCHITECTURE_ID "]"
- const char ∗ info_language_dialect_default

8.3.1 Macro Definition Documentation

8.3.1.1 #define ARCHITECTURE_ID

8.3.1.2 #define C_DIALECT

8.3.1.3 #define COMPILER_ID ""

8.3.1.4 #define DEC(*n*)

Value:

```
('0' + (((n) / 10000000)%10)), \
  ('0' + (((n) / 1000000)%10)),  \
  ('0' + (((n) / 100000)%10)),   \
  ('0' + (((n) / 10000)%10)),    \
  ('0' + (((n) / 1000)%10)),     \
  ('0' + (((n) / 100)%10)),      \
  ('0' + (((n) / 10)%10)),       \
  ('0' +  ((n) % 10))
```

8.3.1.5 #define HEX(*n*)

Value:

```
('0' + ((n)>>28 & 0xF)), \
  ('0' + ((n)>>24 & 0xF)), \
  ('0' + ((n)>>20 & 0xF)), \
  ('0' + ((n)>>16 & 0xF)), \
  ('0' + ((n)>>12 & 0xF)), \
  ('0' + ((n)>>8  & 0xF)), \
  ('0' + ((n)>>4  & 0xF)), \
  ('0' + ((n)     & 0xF))
```

8.3.1.6 #define PLATFORM_ID

8.3.1.7 #define STRINGIFY(*X*) STRINGIFY_HELPER(X)

8.3.1.8 #define STRINGIFY_HELPER(*X*) #X

8.3.2 Function Documentation

8.3.2.1 int main (int *argc,* char ∗ *argv[]*)

8.3.3 Variable Documentation

8.3.3.1 char const∗ info_arch = "INFO" ":" "arch[" ARCHITECTURE_ID "]"

8.3.3.2 char const∗ info_compiler = "INFO" ":" "compiler[" COMPILER_ID "]"

8.3.3.3 const char∗ info_language_dialect_default

Initial value:

```
=
  "INFO" ":" "dialect_default[" C_DIALECT "]"
```

8.3.3.4 char const∗ info_platform = "INFO" ":" "platform[" PLATFORM_ID "]"

8.4 CMakeCXXCompilerId.cpp File Reference

Macros

- #define COMPILER_ID ""
- #define STRINGIFY_HELPER(X) #X
- #define STRINGIFY(X) STRINGIFY_HELPER(X)
- #define PLATFORM_ID
- #define ARCHITECTURE_ID
- #define DEC(n)
- #define HEX(n)
- #define CXX_STD __cplusplus

Functions

- int main (int argc, char ∗argv[])

Variables

- char const ∗ info_compiler = "INFO" ":" "compiler[" COMPILER_ID "]"
- char const ∗ info_platform = "INFO" ":" "platform[" PLATFORM_ID "]"
- char const ∗ info_arch = "INFO" ":" "arch[" ARCHITECTURE_ID "]"
- const char ∗ info_language_dialect_default

8.4.1 Macro Definition Documentation

8.4.1.1 #define ARCHITECTURE_ID

8.4.1.2 #define COMPILER_ID ""

8.4.1.3 #define CXX_STD __cplusplus

8.4.1.4 #define DEC(*n*)

Value:

```
(’0’ + (((n) / 10000000)%10)), \
  (’0’ + (((n) / 1000000)%10)),  \
  (’0’ + (((n) / 100000)%10)),   \
  (’0’ + (((n) / 10000)%10)),    \
  (’0’ + (((n) / 1000)%10)),     \
  (’0’ + (((n) / 100)%10)),      \
  (’0’ + (((n) / 10)%10)),       \
  (’0’ +  ((n) % 10))
```

8.4.1.5 #define HEX(*n*)

Value:

```
(’0’ + ((n)>>28 & 0xF)), \
  (’0’ + ((n)>>24 & 0xF)), \
  (’0’ + ((n)>>20 & 0xF)), \
  (’0’ + ((n)>>16 & 0xF)), \
  (’0’ + ((n)>>12 & 0xF)), \
  (’0’ + ((n)>>8  & 0xF)), \
  (’0’ + ((n)>>4  & 0xF)), \
  (’0’ + ((n)     & 0xF))
```

8.4.1.6 #define PLATFORM_ID

8.4.1.7 #define STRINGIFY(*X*) STRINGIFY_HELPER(X)

8.4.1.8 #define STRINGIFY_HELPER(*X*) #X

8.4.2 Function Documentation

8.4.2.1 int main (int *argc,* char ∗ *argv[]*)

8.4.3 Variable Documentation

8.4.3.1 char const∗ info_arch = "INFO" ":" "arch[" ARCHITECTURE_ID "]"

8.4.3.2 char const∗ info_compiler = "INFO" ":" "compiler[" COMPILER_ID "]"

8.4.3.3 const char∗ info_language_dialect_default

Initial value:

```
= "INFO" ":" "dialect_default["







  "98"

"]"
```

8.4.3.4 char const∗ info_platform = "INFO" ":" "platform[" PLATFORM_ID "]"

8.5 complex_functions.cpp File Reference

```
#include "complex_functions.H"
```

Functions

- std::complex< double > expm1 (const std::complex< double > &z)
- std::complex< double > log1p (const std::complex< double > &z)
- std::complex< double > log_Gamma (const std::complex< double > &z)
- std::complex< double > sigma_l_calc (const std::complex< double > &l, const std::complex< double > &eta)
- std::complex< double > log_Cl_eta_calc (const std::complex< double > &l, const std::complex< double > &eta)
- std::complex< double > log_cut_constant_AS_calc (const int omega, const std::complex< double > &l, const std::complex< double > &eta)
- std::complex< double > log_cut_constant_CFa_calc (const bool is_it_normalized, const int omega, const std::complex< double > &l, const std::complex< double > &eta)
- std::complex< double > log_cut_constant_CFb_calc (const bool is_it_normalized, const int omega, const std::complex< double > &l, const std::complex< double > &eta)
- std::complex< double > sin_chi_calc (const std::complex< double > &l, const std::complex< double > &eta)

- std::complex< double > exp_I_omega_chi_calc (const int omega, const std::complex< double > &l, const std::complex< double > &eta)

8.5.1 Function Documentation

8.5.1.1 **std::complex**<double> exp_I_omega_chi_calc (const int *omega*, const **std::complex**< double > & *l*, const **std::complex**< double > & *eta*)

8.5.1.2 **std::complex**<double> expm1 (const **std::complex**< double > & *z*)

8.5.1.3 **std::complex**<double> log1p (const **std::complex**< double > & *z*)

8.5.1.4 **std::complex**<double> log_Cl_eta_calc (const **std::complex**< double > & *l*, const **std::complex**< double > & *eta*)

8.5.1.5 **std::complex**<double> log_cut_constant_AS_calc (const int *omega*, const **std::complex**< double > & *l*, const **std::complex**< double > & *eta*)

8.5.1.6 **std::complex**<double> log_cut_constant_CFa_calc (const bool *is_it_normalized*, const int *omega*, const **std::complex**< double > & *l*, const **std::complex**< double > & *eta*)

8.5.1.7 **std::complex**<double> log_cut_constant_CFb_calc (const bool *is_it_normalized*, const int *omega*, const **std::complex**< double > & *l*, const **std::complex**< double > & *eta*)

8.5.1.8 **std::complex**<double> log_Gamma (const **std::complex**< double > & *z*)

8.5.1.9 **std::complex**<double> sigma_l_calc (const **std::complex**< double > & *l*, const **std::complex**< double > & *eta*)

8.5.1.10 **std::complex**<double> sin_chi_calc (const **std::complex**< double > & *l*, const **std::complex**< double > & *eta*)

8.6 complex_functions.H File Reference

```
#include <complex>
#include <iostream>
#include <cstdlib>
```

Macros

- #define SIGN(a) (((a) < 0) ? (-1) : (1))

Functions

- double inf_norm (const std::complex< double > &z)
- bool isfinite (const std::complex< double > &z)
- std::complex< double > operator+ (const std::complex< double > &z, const int n)
- std::complex< double > operator- (const std::complex< double > &z, const int n)
- std::complex< double > operator* (const std::complex< double > &z, const int n)
- std::complex< double > operator/ (const std::complex< double > &z, const int n)
- std::complex< double > operator+ (const int n, const std::complex< double > &z)
- std::complex< double > operator- (const int n, const std::complex< double > &z)
- std::complex< double > operator* (const int n, const std::complex< double > &z)

- std::complex< double > operator/ (const int n, const std::complex< double > &z)
- std::complex< double > operator+ (const std::complex< double > &z, const unsigned int n)
- std::complex< double > operator- (const std::complex< double > &z, const unsigned int n)
- std::complex< double > operator∗ (const std::complex< double > &z, const unsigned int n)
- std::complex< double > operator/ (const std::complex< double > &z, const unsigned int n)
- std::complex< double > operator+ (const unsigned int n, const std::complex< double > &z)
- std::complex< double > operator- (const unsigned int n, const std::complex< double > &z)
- std::complex< double > operator∗ (const unsigned int n, const std::complex< double > &z)
- std::complex< double > operator/ (const unsigned int n, const std::complex< double > &z)
- bool operator== (const std::complex< double > &z, const int n)
- bool operator!= (const std::complex< double > &z, const int n)
- bool operator== (const int n, const std::complex< double > &z)
- bool operator!= (const int n, const std::complex< double > &z)
- bool operator== (const std::complex< double > &z, const unsigned int n)
- bool operator!= (const std::complex< double > &z, const unsigned int n)
- bool operator== (const unsigned int n, const std::complex< double > &z)
- bool operator!= (const unsigned int n, const std::complex< double > &z)
- std::complex< double > expm1 (const std::complex< double > &z)
- std::complex< double > log1p (const std::complex< double > &z)
- std::complex< double > log_Gamma (const std::complex< double > &z)
- std::complex< double > sigma_l_calc (const std::complex< double > &l, const std::complex< double > &eta)
- std::complex< double > log_Cl_eta_calc (const std::complex< double > &l, const std::complex< double > &eta)
- std::complex< double > log_cut_constant_AS_calc (const int omega, const std::complex< double > &l, const std::complex< double > &eta)
- std::complex< double > log_cut_constant_CFa_calc (const bool is_it_normalized, const int omega, const std::complex< double > &l, const std::complex< double > &eta)
- std::complex< double > log_cut_constant_CFb_calc (const bool is_it_normalized, const int omega, const std::complex< double > &l, const std::complex< double > &eta)
- std::complex< double > sin_chi_calc (const std::complex< double > &l, const std::complex< double > &eta)
- std::complex< double > exp_I_omega_chi_calc (const int omega, const std::complex< double > &l, const std::complex< double > &eta)

Variables

- const double precision = 1E-10
- const double sqrt_precision = 1E-5

8.6.1 Macro Definition Documentation

8.6.1.1 #define SIGN(*a*) (((a) < 0) ? (-1) : (1))

8.6.2 Function Documentation

8.6.2.1 std::complex<double> exp_I_omega_chi_calc (const int *omega*, const std::complex< double > & *l*, const std::complex< double > & *eta*)

8.6.2.2 std::complex<double> expm1 (const std::complex< double > & *z*)

8.6.2.3 double inf_norm (const std::complex< double > & *z*) [inline]

8.6.2.4 bool isfinite (const std::complex< double > & *z*) [inline]

8.6.2.5 std::complex<double> log1p (const std::complex< double > & *z*)

8.6.2.6 std::complex<double> log_Cl_eta_calc (const std::complex< double > & *l*, const std::complex< double > & *eta*)

8.6.2.7 std::complex<double> log_cut_constant_AS_calc (const int *omega*, const std::complex< double > & *l*, const std::complex< double > & *eta*)

8.6.2.8 std::complex<double> log_cut_constant_CFa_calc (const bool *is_it_normalized*, const int *omega*, const std::complex< double > & *l*, const std::complex< double > & *eta*)

8.6.2.9 std::complex<double> log_cut_constant_CFb_calc (const bool *is_it_normalized*, const int *omega*, const std::complex< double > & *l*, const std::complex< double > & *eta*)

8.6.2.10 std::complex<double> log_Gamma (const std::complex< double > & *z*)

8.6.2.11 bool operator!= (const std::complex< double > & *z*, const int *n*) [inline]

8.6.2.12 bool operator!= (const int *n*, const std::complex< double > & *z*) [inline]

8.6.2.13 bool operator!= (const std::complex< double > & *z*, const unsigned int *n*) [inline]

8.6.2.14 bool operator!= (const unsigned int *n*, const std::complex< double > & *z*) [inline]

8.6.2.15 std::complex<double> operator* (const std::complex< double > & *z*, const int *n*) [inline]

8.6.2.16 std::complex<double> operator* (const int *n*, const std::complex< double > & *z*) [inline]

8.6.2.17 std::complex<double> operator* (const std::complex< double > & *z*, const unsigned int *n*) [inline]

8.6.2.18 std::complex<double> operator* (const unsigned int *n*, const std::complex< double > & *z*) [inline]

8.6.2.19 std::complex<double> operator+ (const std::complex< double > & *z*, const int *n*) [inline]

8.6.2.20 std::complex<double> operator+ (const int *n*, const std::complex< double > & *z*) [inline]

8.6.2.21 std::complex<double> operator+ (const std::complex< double > & *z*, const unsigned int *n*) [inline]

8.6.2.22 std::complex<double> operator+ (const unsigned int *n*, const std::complex< double > & *z*) [inline]

8.6.2.23 std::complex<double> operator- (const std::complex< double > & *z*, const int *n*) [inline]

8.6.2.24 std::complex<double> operator- (const int *n*, const std::complex< double > & *z*) [inline]

8.6.2.25 std::complex<double> operator- (const std::complex< double > & *z*, const unsigned int *n*) [inline]

8.6.2.26 std::complex<double> operator- (const unsigned int *n*, const std::complex< double > & *z*) [inline]

8.6.2.27 std::complex<double> operator/ (const std::complex< double > & *z*, const int *n*) [inline]

8.6.2.28 std::complex<double> operator/ (const int *n*, const std::complex< double > & *z*) [inline]

8.6.2.29 std::complex<double> operator/ (const std::complex< double > & *z*, const unsigned int *n*) [inline]

8.6.2.30 std::complex<double> operator/ (const unsigned int *n*, const std::complex< double > & *z*) [inline]

8.6.2.31 bool operator== (const **std::complex**< double > & *z*, const int *n*) `[inline]`

8.6.2.32 bool operator== (const int *n*, const **std::complex**< double > & *z*) `[inline]`

8.6.2.33 bool operator== (const **std::complex**< double > & *z*, const unsigned int *n*) `[inline]`

8.6.2.34 bool operator== (const unsigned int *n*, const **std::complex**< double > & *z*) `[inline]`

8.6.2.35 **std::complex**<double> sigma_l_calc (const **std::complex**< double > & *l*, const **std::complex**< double > & *eta*)

8.6.2.36 **std::complex**<double> sin_chi_calc (const **std::complex**< double > & *l*, const **std::complex**< double > & *eta*)

8.6.3 Variable Documentation

8.6.3.1 const double precision = 1E-10

8.6.3.2 const double sqrt_precision = 1E-5

8.7 Constants.h File Reference

```
#include <complex>
#include <vector>
#include <cstdlib>
```

Typedefs

- typedef std::complex< double > complex
- typedef std::vector< double > vector_r
- typedef std::vector
  < std::complex< double > > vector_c
- typedef std::vector
  < std::vector< double > > matrix_r
- typedef std::vector
  < std::vector< std::complex
  < double > > > matrix_c
- typedef std::vector
  < std::vector< std::vector
  < double > > > vector_matrix_r
- typedef std::vector
  < std::vector< std::vector
  < std::complex< double > > > > vector_matrix_c

Variables

- const double pi =3.141592650
- const double hbarc =197.32696310
- const double uconv =931.4940880
- const double fstruc =1.00/137.0359996790
- const double boltzConst =8.6171e-2
- const double lightSpeedInCmPerS =29979245800.
- const double avagadroNum =6.02214179e23
- const double eMass = 548.579894

8.7.1 Typedef Documentation

8.7.1.1 typedef std::complex<double> complex

8.7.1.2 typedef std::vector<std::vector<std::complex<double> > > matrix_c

8.7.1.3 typedef std::vector<std::vector<double> > matrix_r

8.7.1.4 typedef std::vector<std::complex<double> > vector_c

8.7.1.5 typedef std::vector<std::vector<std::vector<std::complex<double> > > > vector_matrix_c

8.7.1.6 typedef std::vector<std::vector<std::vector<double> > > vector_matrix_r

8.7.1.7 typedef std::vector<double> vector_r

8.7.2 Variable Documentation

8.7.2.1 const double avagadroNum =6.02214179e23

8.7.2.2 const double boltzConst =8.6171e-2

8.7.2.3 const double eMass = 548.579894

8.7.2.4 const double fstruc =1.00/137.0359996790

8.7.2.5 const double hbarc =197.32696310

8.7.2.6 const double lightSpeedInCmPerS =29979245800.

8.7.2.7 const double pi =3.141592650

8.7.2.8 const double uconv =931.4940880

8.8 CoulFunc.cpp File Reference

```
#include "Constants.h"
#include "CoulFunc.h"
#include <iostream>
#include "cwfcomp.H"
#include <gsl/gsl_sf_coulomb.h>
#include <gsl/gsl_deriv.h>
#include <gsl/gsl_errno.h>
```

8.9 CoulFunc.h File Reference

Classes

- struct CoulWaves
- class CoulFunc

8.10 CrossSection.cpp File Reference

```
#include "NuclearLevels.h"
#include "CrossSection.h"
#include "Decayer.h"
#include "TransitionRateFunc.h"
#include "RauscherLevelDensity.h"
#include "Constants.h"
#include <math.h>
#include <fstream>
#include <iomanip>
#include <time.h>
#include <iostream>
#include <sstream>
#include <gsl/gsl_integration.h>
#include <TGraph.h>
#include <algorithm>
```

Classes

- struct gsl_reactionrate_params
- struct gsl_partfunc_params

Functions

- double gsl_reactionrate_integrand (double x, void ∗p)
- double gsl_partfunc_integrand (double x, void ∗p)

8.10.1 Function Documentation

8.10.1.1 double gsl_partfunc_integrand (double *x*, void ∗ *p*)

8.10.1.2 double gsl_reactionrate_integrand (double *x*, void ∗ *p*)

8.11 CrossSection.h File Reference

```
#include <vector>
#include <map>
#include <string>
```

Classes

- struct int_double_pair_compare
- class CrossSectionValues
- class CrossSection

Typedefs

- typedef std::vector< std::pair
  < Decayer ∗, std::vector
  < SpinRatePair ∗ > > > DecayerVector

- typedef std::pair< int, double > int_double_pair

8.11.1 Typedef Documentation

8.11.1.1 typedef std::vector<std::pair<**Decayer**∗,std::vector<**SpinRatePair**∗> > > **DecayerVector**

8.11.1.2 typedef std::pair<int,double> **int_double_pair**

8.12 cwfcomp.cpp File Reference

```
#include "cwfcomp.H"
```

8.13 cwfcomp.H File Reference

```
#include "ode_int.H"
```

Classes

- class Coulomb_wave_functions

8.14 DecayController.cpp File Reference

```
#include "DecayController.h"
#include "Constants.h"
#include "NuclearMass.h"
#include "PreEqDecayer.h"
#include <iostream>
#include <iomanip>
#include <TVector3.h>
#include <stdlib.h>
#include <omp.h>
```

Variables

- unsigned int randomSeed [12]

8.14.1 Variable Documentation

8.14.1.1 unsigned int randomSeed[12]

8.15 DecayController.h File Reference

```
#include <vector>
#include "Decayer.h"
#include "DecayProduct.h"
```

Classes

- class DecayController

8.16 Decayer.cpp File Reference

```
#include "Decayer.h"
#include "TransitionRateFunc.h"
#include "NuclearMass.h"
#include "NuclearLevels.h"
#include <iostream>
#include <fstream>
#include <stdlib.h>
#include <math.h>
#include <omp.h>
```

Variables

- unsigned int randomSeed [12]

8.16.1 Variable Documentation

8.16.1.1 unsigned int randomSeed[12]

8.17 Decayer.h File Reference

```
#include <vector>
#include <cstdlib>
```

Classes

- class SpinRatePair
- class CDFEntry
- class Decayer

8.18 DecayProduct.h File Reference

Classes

- class DecayData
- class DecayProduct

8.19 DecayResults.cpp File Reference

```
#include "DecayResults.h"
```

```
#include "DecayProduct.h"
#include "NuclearMass.h"
#include <fstream>
#include <iostream>
```

8.20 DecayResults.h File Reference

```
#include <TTree.h>
#include <TFile.h>
#include <vector>
```

Classes

- class DecayResults

8.21 elements.h File Reference

8.22 EquivSquareWell.cpp File Reference

```
#include "EquivSquareWell.h"
```

8.23 EquivSquareWell.h File Reference

```
#include "CoulFunc.h"
#include "ParticleTransmissionFunc.h"
```

Classes

- class EquivSquareWell

8.24 GammaTransmissionFunc.cpp File Reference

```
#include "GammaTransmissionFunc.h"
#include "BrinkAxelGSF.h"
#include "KopeckyUhlGSF.h"
#include "McCullaghGSF.h"
#include "Constants.h"
#include <iostream>
#include <iomanip>
#include <fstream>
#include <sstream>
#include <stdlib.h>
#include <gsl/gsl_rng.h>
#include <gsl/gsl_randist.h>
#include <omp.h>
```

Variables

- unsigned int randomSeed [12]

8.24.1 Variable Documentation

8.24.1.1 unsigned int randomSeed[12]

8.25 GammaTransmissionFunc.h File Reference

```
#include "TransmissionFunc.h"
#include "Constants.h"
#include "NuclearMass.h"
#include <math.h>
```

Classes

- class GDRParameters
- class GammaTransmissionFunc

Typedefs

- typedef
  std::tr1::unordered_map
  < MassKey, GDRParameters > GDRTable

8.25.1 Typedef Documentation

8.25.1.1 typedef std::tr1::unordered_map< MassKey, GDRParameters > GDRTable

8.26 JLMPotential.cpp File Reference

```
#include "JLMPotential.h"
#include <assert.h>
```

8.27 JLMPotential.h File Reference

```
#include "Potential.h"
```

Classes

- class JLMPotential

8.28 KopeckyUhlGSF.cpp File Reference

```
#include "KopeckyUhlGSF.h"
#include "LevelDensity.h"
#include <iostream>
```

8.29 KopeckyUhlGSF.h File Reference

```
#include "GammaTransmissionFunc.h"
```

Classes

- class KopeckyUhlGSF

8.30 LevelDensity.cpp File Reference

```
#include "LevelDensity.h"
#include "Constants.h"
#include <math.h>
```

8.31 LevelDensity.h File Reference

Classes

- class LevelDensity

8.32 McCullaghGSF.cpp File Reference

```
#include "McCullaghGSF.h"
```

8.33 McCullaghGSF.h File Reference

```
#include "GammaTransmissionFunc.h"
```

Classes

- class McCullaghGSF

8.34 McFaddenSatchlerPotential.cpp File Reference

```
#include "McFaddenSatchlerPotential.h"
```

8.35 McFaddenSatchlerPotential.h File Reference

```
#include "Potential.h"
```

Classes

- class McFaddenSatchlerPotential

8.36 NuclearLevels.cpp File Reference

```
#include "NuclearLevels.h"
#include <fstream>
#include <sstream>
#include <iostream>
#include <iomanip>
#include <math.h>
#include <string.h>
```

8.37 NuclearLevels.h File Reference

```
#include "NuclearMass.h"
#include <vector>
#include <string>
```

Classes

- class GammaTransition
- class Level
- class LevelsContainer
- class NuclearLevels

Typedefs

- typedef
  std::tr1::unordered_map
  < MassKey, LevelsContainer > LevelsTable

8.37.1 Typedef Documentation

8.37.1.1 typedef std::tr1::unordered_map<MassKey, LevelsContainer> LevelsTable

8.38 NuclearMass.cpp File Reference

```
#include "NuclearMass.h"
```

```
#include "Constants.h"
#include <sstream>
#include <fstream>
#include <iostream>
#include <stdlib.h>
#include "elements.h"
```

Macros

- #define HAS_EXP_MASS 1
- #define HAS_TH_MASS 2
- #define ELEMENT(Z, EL) {elementTable_[std::string(EL)]=Z;}

8.38.1 Macro Definition Documentation

8.38.1.1 #define ELEMENT(*Z, EL*) {elementTable_[std::string(EL)]=Z;}

8.38.1.2 #define HAS_EXP_MASS 1

8.38.1.3 #define HAS_TH_MASS 2

8.39 NuclearMass.h File Reference

```
#include <tr1/unordered_map>
#include <string>
```

Classes

- class MassKey
- struct std::tr1::hash< MassKey >
- struct std::equal_to< MassKey >
- class MassEntry
- class NuclearMass

Namespaces

- std
- std::tr1

Typedefs

- typedef
  std::tr1::unordered_map
  < MassKey, MassEntry > MassTable
- typedef
  std::tr1::unordered_map
  < std::string, int > ElementTable

8.39.1 Typedef Documentation

8.39.1.1 typedef std::tr1::unordered_map<std::string, int > **ElementTable**

8.39.1.2 typedef std::tr1::unordered_map<**MassKey, MassEntry**> **MassTable**

8.40 ode_int.cpp File Reference

```
#include "ode_int.H"
```

8.41 ode_int.H File Reference

```
#include "complex_functions.H"
```

Classes

- class ODE_integration

8.42 ParticleHoleLevelDensity.cpp File Reference

```
#include "ParticleHoleLevelDensity.h"
#include "gsl/gsl_sf_gamma.h"
#include "math.h"
#include <algorithm>
#include <iostream>
#include "NuclearMass.h"
```

8.43 ParticleHoleLevelDensity.h File Reference

Classes

- class ParticleHoleLevelDensity

8.44 ParticleTransmissionFunc.cpp File Reference

```
#include "ParticleTransmissionFunc.h"
#include "EquivSquareWell.h"
#include "McFaddenSatchlerPotential.h"
#include "JLMPotential.h"
#include "Constants.h"
#include <iostream>
#include <gsl/gsl_rng.h>
#include <gsl/gsl_randist.h>
#include <omp.h>
```

Variables

- unsigned int randomSeed [12]

8.44.1 Variable Documentation

8.44.1.1 unsigned int randomSeed[12]

8.45 ParticleTransmissionFunc.h File Reference

```
#include "TransmissionFunc.h"
#include "NuclearMass.h"
#include "Constants.h"
#include <map>
```

Classes

- class SLPair
- class ParticleTransmissionFunc

8.46 Potential.cpp File Reference

```
#include "Potential.h"
#include "Constants.h"
#include "CoulFunc.h"
#include <iostream>
#include <float.h>
```

8.47 Potential.h File Reference

```
#include <vector>
#include <complex>
#include "ParticleTransmissionFunc.h"
```

Classes

- class Potential

8.48 PreEqDecayer.cpp File Reference

```
#include "PreEqDecayer.h"
```

```
#include "NuclearMass.h"
#include "PreEqTransitionRateFunc.h"
#include <iostream>
#include <math.h>
#include <fstream>
#include <iomanip>
#include <cstdlib>
#include <omp.h>
```

Variables

- unsigned int randomSeed [12]

8.48.1 Variable Documentation

8.48.1.1 unsigned int randomSeed[12]

8.49 PreEqDecayer.h File Reference

```
#include <vector>
```

Classes

- class PreEqSpinRatePair
- class PreEqCDFEntry
- class PreEqDecayer

8.50 PreEqTransitionRateFunc.cpp File Reference

```
#include "PreEqTransitionRateFunc.h"
#include "ParticleTransmissionFunc.h"
#include <iostream>
```

8.51 PreEqTransitionRateFunc.h File Reference

```
#include "TransitionRateFunc.h"
#include "ParticleHoleLevelDensity.h"
```

Classes

- class PreEqTransitionRateFunc

8.52 RauscherLevelDensity.cpp File Reference

```
#include "RauscherLevelDensity.h"
#include <math.h>
```

8.53 RauscherLevelDensity.h File Reference

```
#include "LevelDensity.h"
#include "NuclearMass.h"
#include <iostream>
#include <stdlib.h>
#include <math.h>
```

Classes

- class RauscherLevelDensity

8.54 README.md File Reference

8.55 Sapphire.cpp File Reference

```
#include <iostream>
#include <iomanip>
#include <fstream>
#include <sstream>
#include <time.h>
#include <stdlib.h>
#include <string.h>
#include <math.h>
#include <algorithm>
#include "DecayController.h"
#include "NuclearMass.h"
#include "DecayResults.h"
#include "CrossSection.h"
#include "omp.h"
#include "TransitionRateFunc.h"
#include "ParticleTransmissionFunc.h"
#include "GammaTransmissionFunc.h"
```

Classes

- struct EntrancePairs

Typedefs

- typedef struct EntrancePairs EntrancePairs

Functions

- void Initialize ()
- void printHelp ()
- void parseCommandLineForOptions (std::vector< std::string > &args, int &suffixNo, bool &preEq, int &numPiParticles, int &numPiHoles, int &numNuParticles, int &numNuHoles, bool &calcAverageWidth, bool &calcRates, bool &asciiIn, std::string &inFile, int &entranceState, std::vector< int > &exitStates, bool &printTrans)
- bool parseCommandLineForDecay (std::vector< std::string > &args, int &Z, int &A, double &J, int &Pi, double &lowEnergy, double &highEnergy, int &events)
- bool parseCommandLineForXS (std::vector< std::string > &args, int &Z, int &A, int &pType, std::string &energyFile, bool asciiIn)
- int main (int argc, char ∗argv[])

Variables

- unsigned int randomSeed [12]

8.55.1 Typedef Documentation

8.55.1.1 typedef struct **EntrancePairs EntrancePairs**

8.55.2 Function Documentation

8.55.2.1 void Initialize ( )

... text ...

8.55.2.2 int main (int *argc,* char ∗ *argv[]*)

8.55.2.3 bool parseCommandLineForDecay (std::vector< std::string > & *args,* int & *Z,* int & *A,* double & *J,* int & *Pi,* double & *lowEnergy,* double & *highEnergy,* int & *events*)

8.55.2.4 void parseCommandLineForOptions (std::vector< std::string > & *args,* int & *suffixNo,* bool & *preEq,* int & *numPiParticles,* int & *numPiHoles,* int & *numNuParticles,* int & *numNuHoles,* bool & *calcAverageWidth,* bool & *calcRates,* bool & *asciiIn,* std::string & *inFile,* int & *entranceState,* std::vector< int > & *exitStates,* bool & *printTrans*)

8.55.2.5 bool parseCommandLineForXS (std::vector< std::string > & *args,* int & *Z,* int & *A,* int & *pType,* std::string & *energyFile,* bool *asciiIn*)

8.55.2.6 void printHelp ( )

8.55.3 Variable Documentation

8.55.3.1 unsigned int randomSeed[12]

8.56 SapphireMPITypes.h File Reference

```
#include <boost/serialization/access.hpp>
#include <boost/serialization/vector.hpp>
#include <boost/serialization/utility.hpp>
#include <boost/mpi/datatype.hpp>
#include <vector>
#include "DecayProduct.h"
```

Classes

- class InitialNucleusData

Namespaces

- boost
- boost::serialization

Enumerations

- enum SapphireTags_t { SapphireTagProcess, SapphireTagDone, SapphireTagResults }

Functions

- BOOST_IS_MPI_DATATYPE (InitialNucleusData)
- void boost::serialization::serialize (Archive &ar, DecayData &g, const unsigned int version)
- void boost::serialization::serialize (Archive &ar, DecayProduct &g, const unsigned int version)
- BOOST_IS_MPI_DATATYPE (DecayData)
- BOOST_IS_MPI_DATATYPE (DecayProduct)

8.56.1 Enumeration Type Documentation

8.56.1.1 enum **SapphireTags_t**

Enumerator

SapphireTagProcess

SapphireTagDone

SapphireTagResults

8.56.2 Function Documentation

8.56.2.1 BOOST_IS_MPI_DATATYPE (**InitialNucleusData**)

8.56.2.2 BOOST_IS_MPI_DATATYPE (**DecayData**)

8.56.2.3 BOOST_IS_MPI_DATATYPE (**DecayProduct**)

8.57 Setup.cpp File Reference

```
#include "NuclearMass.h"
```

```
#include "GammaTransmissionFunc.h"
#include "NuclearLevels.h"
#include "Decayer.h"
#include "Sapphire_config.h"
#include "TransitionRateFunc.h"
#include "CrossSection.h"
#include "PreEqDecayer.h"
#include "ParticleTransmissionFunc.h"
#include "CoulFunc.h"
#include <iostream>
#include <gsl/gsl_errno.h>
```

Functions

- void Initialize ()

8.57.1 Function Documentation

8.57.1.1 void Initialize ( )

... text ...

8.58 TransitionRateFunc.cpp File Reference

```
#include "TransitionRateFunc.h"
#include "ParticleTransmissionFunc.h"
#include "GammaTransmissionFunc.h"
#include "RauscherLevelDensity.h"
#include "NuclearLevels.h"
#include <iostream>
#include <stdlib.h>
```

8.59 TransitionRateFunc.h File Reference

```
#include <vector>
#include "LevelDensity.h"
#include "TransmissionFunc.h"
```

Classes

- class XYPair
- class TransitionRateFunc

8.60 TransmissionFunc.h File Reference

Classes

- class TransmissionFunc

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