CUDAProb3++

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Hierarchical Index

1.1 Class Hierarchy

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

Chapter 2

Class Index

2.1 Class List

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

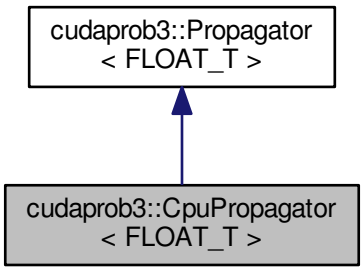
Chapter 3

Class Documentation

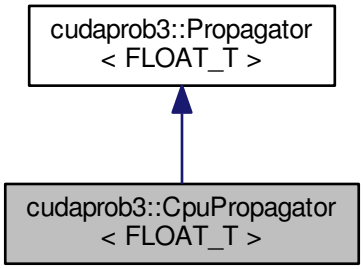
3.1 cudaprob3::CpuPropagator< FLOAT_T > Class Template Reference

Multi-threaded CPU neutrino propagation. Derived from Propagator.

Inheritance diagram for cudaprob3::CpuPropagator< FLOAT_T >:



Collaboration diagram for cudaprob3::CpuPropagator< FLOAT_T >:



Public Member Functions

- CpuPropagator (int n_cosines, int n_energies, int threads)

  Constructor.
- CpuPropagator (const CpuPropagator &other)

  Copy constructor.
- CpuPropagator (CpuPropagator &&other)

  Move constructor.
- CpuPropagator & operator= (const CpuPropagator &other)

  Copy assignment operator.
- CpuPropagator & operator= (CpuPropagator &&other)

  Move assignment operator.
- void calculateProbabilities (NeutrinoType type) override

  Calculate the probability of each cell.
- FLOAT_T getProbability (int index_cosine, int index_energy, ProbType t) override

  get oscillation weight for specific cosine and energy

3.1.1 Detailed Description

template<class FLOAT_T>
class cudaprob3::CpuPropagator< FLOAT_T >

Multi-threaded CPU neutrino propagation. Derived from Propagator.

Parameters

FLOAT_T	The floating point type to use for calculations, i.e float, double

3.1.2 Constructor & Destructor Documentation

3.1.2.1 template<class FLOAT_T > cudaprob3::CpuPropagator< FLOAT_T >::CpuPropagator (int *n_cosines*, int *n_energies*, int *threads*) [inline]

Constructor.

Parameters

n_cosines	Number cosine bins
n_energies	Number of energy bins
threads	Number of threads

3.1.2.2 template<class FLOAT_T > cudaprob3::CpuPropagator< FLOAT_T >::CpuPropagator (const CpuPropagator< FLOAT_T > & *other*) [inline]

Copy constructor.

Parameters

other	

3.1.2.3 template<class FLOAT_T > cudaprob3::CpuPropagator< FLOAT_T >::CpuPropagator (CpuPropagator< FLOAT_T > && *other*) [inline]

Move constructor.

Parameters

other	

3.1.3 Member Function Documentation

3.1.3.1 template<class FLOAT_T > void cudaprob3::CpuPropagator< FLOAT_T >::calculateProbabilities (NeutrinoType *type*) [inline], [override], [virtual]

Calculate the probability of each cell.

Parameters

type	Neutrino or Antineutrino

Implements cudaprob3::Propagator< FLOAT_T >.

3.1.3.2 template<class FLOAT_T > FLOAT_T cudaprob3::CpuPropagator< FLOAT_T >::getProbability (int *index_cosine*, int *index_energy*, ProbType *t*) [inline], [override], [virtual]

get oscillation weight for specific cosine and energy

Parameters

index_cosine	Cosine bin index (zero based)
index_energy	Energy bin index (zero based)
t	Specify which probability P(i->j)

Implements cudaprob3::Propagator< FLOAT_T >.

3.1.3.3 template<class FLOAT_T > CpuPropagator& cudaprob3::CpuPropagator< FLOAT_T >::operator= (const CpuPropagator< FLOAT_T > & *other*) [inline]

Copy assignment operator.

Parameters

other	

3.1.3.4 template<class FLOAT_T > CpuPropagator& cudaprob3::CpuPropagator< FLOAT_T >::operator= (CpuPropagator< FLOAT_T > && *other*) [inline]

Move assignment operator.

Parameters

other	

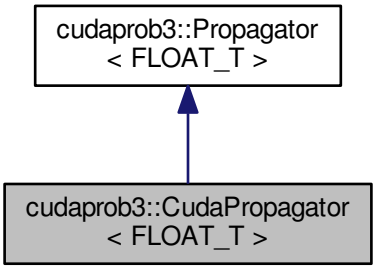
The documentation for this class was generated from the following file:

- cpupropagator.hpp

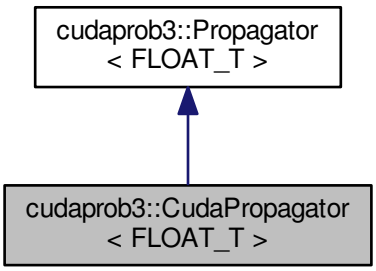
3.2 cudaprob3::CudaPropagator< FLOAT_T > Class Template Reference

Multi-GPU neutrino propagation. Derived from Propagator.

Inheritance diagram for cudaprob3::CudaPropagator< FLOAT_T >:



Collaboration diagram for cudaprob3::CudaPropagator< FLOAT_T >:



Public Member Functions

- CudaPropagator (int nc, int ne)

  Single GPU constructor for device id 0.
- CudaPropagator (const std::vector< int > &ids, int nc, int ne, bool failOnInvalidId=true)

  Constructor.
- CudaPropagator (CudaPropagator &&other)

  Move constructor.
- CudaPropagator & operator= (CudaPropagator &&other)

  Move assignment operator.
- void setDensityFromFile (const std::string &filename) override

  Set density information from file.
- void setDensity (const std::vector< FLOAT_T > &radii, const std::vector< FLOAT_T > &rhos) override

  Set density information from arrays.
- void setNeutrinoMasses (FLOAT_T dm12sq, FLOAT_T dm23sq) override

  Set neutrino mass differences (m_i_j)^2 in (eV)^2. no assumptions about mass hierarchy are made.
- void setMNSMatrix (FLOAT_T theta12, FLOAT_T theta13, FLOAT_T theta23, FLOAT_T dCP) override

  Set mixing angles and cp phase in radians.
- void setEnergyList (const std::vector< FLOAT_T > &list) override

  Set the energy bins. Energies are given in GeV.
- void setCosineList (const std::vector< FLOAT_T > &list) override

  Set cosine bins. Cosines are given in radians.
- void setProductionHeight (FLOAT_T heightKM) override

  Set production height in km of neutrinos.
- void calculateProbabilities (NeutrinoType type) override

  Calculate the probability of each cell.
- FLOAT_T getProbability (int index_cosine, int index_energy, ProbType t) override

  get oscillation weight for specific cosine and energy

3.2.1 Detailed Description

template<class FLOAT_T>
class cudaprob3::CudaPropagator< FLOAT_T >

Multi-GPU neutrino propagation. Derived from Propagator.

This is essentially a wrapper around multiple CudaPropagatorSingle instances, one per used GPU Most of the setters and calculation functions simply call the appropriate function for each GPU

Parameters

FLOAT_T	The floating point type to use for calculations, i.e float, double

3.2.2 Constructor & Destructor Documentation

3.2.2.1 template<class FLOAT_T > cudaprob3::CudaPropagator< FLOAT_T >::CudaPropagator (int *nc,* int *ne*) [inline]

Single GPU constructor for device id 0.

Parameters

nc	Number cosine bins
ne	Number of energy bins

3.2.2.2 template<class FLOAT_T > cudaprob3::CudaPropagator< FLOAT_T >::CudaPropagator (const std::vector< int > & *ids,* int *nc,* int *ne,* bool *failOnInvalidId* = true) [inline]

Constructor.

Parameters

ids	List of device ids of the GPUs to use
nc	Number cosine bins
ne	Number of energy bins
failOnInvalidId	If true, throw exception if ids contains an invalid device id

3.2.2.3 template<class FLOAT_T > cudaprob3::CudaPropagator< FLOAT_T >::CudaPropagator (CudaPropagator< FLOAT_T > && *other*) [inline]

Move constructor.

Parameters

other	

3.2.3 Member Function Documentation

3.2.3.1 template<class FLOAT_T > void cudaprob3::CudaPropagator< FLOAT_T >::calculateProbabilities (NeutrinoType *type*) [inline], [override], [virtual]

Calculate the probability of each cell.

Parameters

type	Neutrino or Antineutrino

Implements cudaprob3::Propagator< FLOAT_T >.

3.2.3.2 template<class FLOAT_T > FLOAT_T cudaprob3::CudaPropagator< FLOAT_T >::getProbability (int *index_cosine*, int *index_energy*, ProbType *t*) [inline], [override], [virtual]

get oscillation weight for specific cosine and energy

Parameters

index_cosine	Cosine bin index (zero based)
index_energy	Energy bin index (zero based)
t	Specify which probability P(i->j)

Implements cudaprob3::Propagator< FLOAT_T >.

3.2.3.3 template<class FLOAT_T > CudaPropagator& cudaprob3::CudaPropagator< FLOAT_T >::operator= (CudaPropagator< FLOAT_T > && *other*) [inline]

Move assignment operator.

Parameters

other	

3.2.3.4 template<class FLOAT_T > void cudaprob3::CudaPropagator< FLOAT_T >::setCosineList (const std::vector< FLOAT_T > & *list*) [inline], [override], [virtual]

Set cosine bins. Cosines are given in radians.

Parameters

list	Cosine list

Reimplemented from cudaprob3::Propagator< FLOAT_T >.

3.2.3.5 template<class FLOAT_T > void cudaprob3::CudaPropagator< FLOAT_T >::setDensity (const std::vector< FLOAT_T > & *radii_*, const std::vector< FLOAT_T > & *rhos_*) [inline], [override], [virtual]

Set density information from arrays.

radii_ and rhos_ must be same size. both radii_ and rhos_ must be sorted, in the same order. The density (g/cm^3) at a distance (km) from the center of the sphere between radii_[i], exclusive, and radii_[j], inclusive, i < j is assumed to be rhos_[j]

Parameters

*radii_*	List of radii
*rhos_*	List of densities

Reimplemented from cudaprob3::Propagator< FLOAT_T >.

3.2.3.6 template<class FLOAT_T > void cudaprob3::CudaPropagator< FLOAT_T >::setDensityFromFile (const std::string & *filename*) [inline], [override], [virtual]

Set density information from file.

File must contain two columns where the first column contains the radius (km) and the second column contains the density (g/cm^3). The first row must have the radius 0. The last row must have to radius of the sphere

Parameters

filename	File with density information

Reimplemented from cudaprob3::Propagator< FLOAT_T >.

3.2.3.7 template<class FLOAT_T > void cudaprob3::CudaPropagator< FLOAT_T >::setEnergyList (const std::vector< FLOAT_T > & *list*) [inline], [override], [virtual]

Set the energy bins. Energies are given in GeV.

Parameters

list	Energy list

Reimplemented from cudaprob3::Propagator< FLOAT_T >.

3.2.3.8 template<class FLOAT_T > void cudaprob3::CudaPropagator< FLOAT_T >::setMNSMatrix (FLOAT_T *theta12,* FLOAT_T *theta13,* FLOAT_T *theta23,* FLOAT_T *dCP*) [inline], [override], [virtual]

Set mixing angles and cp phase in radians.

Parameters

theta12	
theta13	
theta23	
dCP	

Reimplemented from cudaprob3::Propagator< FLOAT_T >.

3.2.3.9 template<class FLOAT_T > void cudaprob3::CudaPropagator< FLOAT_T >::setNeutrinoMasses (FLOAT_T *dm12sq,* FLOAT_T *dm23sq*) [inline], [override], [virtual]

Set neutrino mass differences (m_i_j)^2 in (eV)^2. no assumptions about mass hierarchy are made.

Parameters

dm12sq	
dm23sq	

Reimplemented from cudaprob3::Propagator< FLOAT_T >.

3.2.3.10 template<class FLOAT_T > void cudaprob3::CudaPropagator< FLOAT_T >::setProductionHeight (FLOAT_T *heightKM*) [inline], [override], [virtual]

Set production height in km of neutrinos.

Adds a layer of length heightKM with zero density to the density model

Parameters

heightKM	Set neutrino production height

Reimplemented from cudaprob3::Propagator< FLOAT_T >.

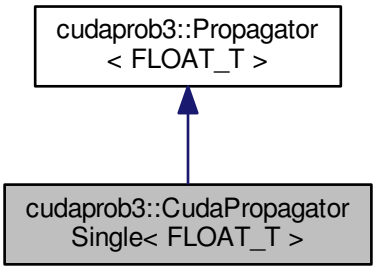
The documentation for this class was generated from the following file:

- cudapropagator.cuh

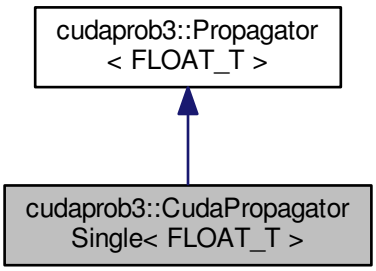
3.3 cudaprob3::CudaPropagatorSingle< FLOAT_T > Class Template Reference

Single-GPU neutrino propagation. Derived from Propagator.

Inheritance diagram for cudaprob3::CudaPropagatorSingle< FLOAT_T >:



Collaboration diagram for cudaprob3::CudaPropagatorSingle< FLOAT_T >:



Public Member Functions

- CudaPropagatorSingle (int id, int n_cosines_, int n_energies_)
  Constructor.
- CudaPropagatorSingle (int n_cosines, int n_energies)
  Constructor which uses device id 0.
- ~CudaPropagatorSingle ()
  Destructor.
- CudaPropagatorSingle (CudaPropagatorSingle &&other)
  Move constructor.
- CudaPropagatorSingle & operator= (CudaPropagatorSingle &&other)
  Move assignment operator.

- void setDensity (const std::vector< FLOAT_T > &radii_, const std::vector< FLOAT_T > &rhos_) override

  Set density information from arrays.
- void setEnergyList (const std::vector< FLOAT_T > &list) override

  Set the energy bins. Energies are given in GeV.
- void setCosineList (const std::vector< FLOAT_T > &list) override

  Set cosine bins. Cosines are given in radians.
- void calculateProbabilities (NeutrinoType type) override

  Calculate the probability of each cell.
- FLOAT_T getProbability (int index_cosine, int index_energy, ProbType t) override

  get oscillation weight for specific cosine and energy

3.3.1 Detailed Description

template<class FLOAT_T>
class cudaprob3::CudaPropagatorSingle< FLOAT_T >

Single-GPU neutrino propagation. Derived from Propagator.

Parameters

FLOAT_T	The floating point type to use for calculations, i.e float, double

3.3.2 Constructor & Destructor Documentation

3.3.2.1 template<class FLOAT_T > cudaprob3::CudaPropagatorSingle< FLOAT_T >::CudaPropagatorSingle (int *id,* int *n_cosines_,* int *n_energies_*) [inline]

Constructor.

Parameters

id	device id of the GPU to use
*n_cosines_*	Number cosine bins
*n_energies_*	Number of energy bins

3.3.2.2 template<class FLOAT_T > cudaprob3::CudaPropagatorSingle< FLOAT_T >::CudaPropagatorSingle (int *n_cosines,* int *n_energies*) [inline]

Constructor which uses device id 0.

Parameters

n_cosines	Number cosine bins
n_energies	Number of energy bins

3.3.2.3 template<class FLOAT_T > cudaprob3::CudaPropagatorSingle< FLOAT_T >::CudaPropagatorSingle (CudaPropagatorSingle< FLOAT_T > && *other*) [inline]

Move constructor.

Parameters

other	

3.3.3 Member Function Documentation

3.3.3.1 template<class FLOAT_T > void cudaprob3::CudaPropagatorSingle< FLOAT_T >::calculateProbabilities (NeutrinoType *type*) [inline], [override], [virtual]

Calculate the probability of each cell.

Parameters

type	Neutrino or Antineutrino

Implements cudaprob3::Propagator< FLOAT_T >.

3.3.3.2 template<class FLOAT_T > FLOAT_T cudaprob3::CudaPropagatorSingle< FLOAT_T >::getProbability (int *index_cosine*, int *index_energy*, ProbType *t*) [inline], [override], [virtual]

get oscillation weight for specific cosine and energy

Parameters

index_cosine	Cosine bin index (zero based)
index_energy	Energy bin index (zero based)
t	Specify which probability P(i->j)

Implements cudaprob3::Propagator< FLOAT_T >.

3.3.3.3 template<class FLOAT_T > CudaPropagatorSingle& cudaprob3::CudaPropagatorSingle< FLOAT_T >::operator= (CudaPropagatorSingle< FLOAT_T > && *other*) [inline]

Move assignment operator.

Parameters

other	

3.3.3.4 template<class FLOAT_T > void cudaprob3::CudaPropagatorSingle< FLOAT_T >::setCosineList (const std::vector< FLOAT_T > & *list*) [inline], [override], [virtual]

Set cosine bins. Cosines are given in radians.

Parameters

list	Cosine list

Reimplemented from cudaprob3::Propagator< FLOAT_T >.

3.3.3.5 template<class FLOAT_T > void cudaprob3::CudaPropagatorSingle< FLOAT_T >::setDensity (const std::vector< FLOAT_T > & *radii_*, const std::vector< FLOAT_T > & *rhos_*) [inline], [override], [virtual]

Set density information from arrays.

radii_ and rhos_ must be same size. both radii_ and rhos_ must be sorted, in the same order. The density (g/cm^3) at a distance (km) from the center of the sphere between radii_[i], exclusive, and radii_[j], inclusive, i < j is assumed to be rhos_[j]

Parameters

*radii_*	List of radii
*rhos_*	List of densities

Reimplemented from cudaprob3::Propagator< FLOAT_T >.

3.3.3.6 template<class FLOAT_T > void cudaprob3::CudaPropagatorSingle< FLOAT_T >::setEnergyList (const std::vector< FLOAT_T > & *list*) [inline], [override], [virtual]

Set the energy bins. Energies are given in GeV.

Parameters

list	Energy list

Reimplemented from cudaprob3::Propagator< FLOAT_T >.

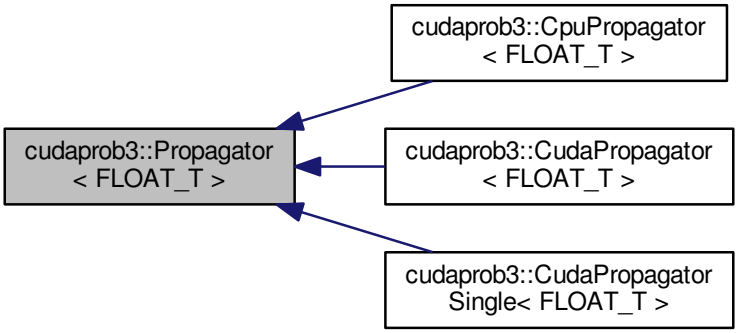
The documentation for this class was generated from the following file:

- cudapropagator.cuh

3.4 cudaprob3::Propagator< FLOAT_T > Class Template Reference

Abstract base class of the library which sets up input parameter on the host. Concrete implementation of calcuations is provided in derived classes.

Inheritance diagram for cudaprob3::Propagator< FLOAT_T >:



Public Member Functions

- Propagator (int n_cosines, int n_energies)

  Constructor.
- Propagator (const Propagator &other)

  Copy constructor.
- Propagator (Propagator &&other)

  Move constructor.
- Propagator & operator= (const Propagator &other)

  Copy assignment operator.
- Propagator & operator= (Propagator &&other)

  Move assignment operator.
- virtual void setDensity (const std::vector< FLOAT_T > &radii_, const std::vector< FLOAT_T > &rhos_)

  Set density information from arrays.
- virtual void setDensityFromFile (const std::string &filename)

  Set density information from file.
- virtual void setMNSMatrix (FLOAT_T theta12, FLOAT_T theta13, FLOAT_T theta23, FLOAT_T dCP)

  Set mixing angles and cp phase in radians.
- virtual void setNeutrinoMasses (FLOAT_T dm12sq, FLOAT_T dm23sq)

  Set neutrino mass differences (m_i_j)^2 in (eV)^2. no assumptions about mass hierarchy are made.
- virtual void setEnergyList (const std::vector< FLOAT_T > &list)

  Set the energy bins. Energies are given in GeV.
- virtual void setCosineList (const std::vector< FLOAT_T > &list)

  Set cosine bins. Cosines are given in radians.
- virtual void setProductionHeight (FLOAT_T heightKM)

  Set production height in km of neutrinos.
- virtual void calculateProbabilities (NeutrinoType type)=0

  Calculate the probability of each cell.
- virtual FLOAT_T getProbability (int index_cosine, int index_energy, ProbType t)=0

  get oscillation weight for specific cosine and energy

3.4.1 Detailed Description

template<class FLOAT_T>
class cudaprob3::Propagator< FLOAT_T >

Abstract base class of the library which sets up input parameter on the host. Concrete implementation of calcuations is provided in derived classes.

Parameters

FLOAT_T	The floating point type to use for calculations, i.e float, double

3.4.2 Constructor & Destructor Documentation

3.4.2.1 template<class FLOAT_T > cudaprob3::Propagator< FLOAT_T >::Propagator (int *n_cosines*, int *n_energies*) [inline]

Constructor.

Parameters

n_cosines	Number cosine bins
n_energies	Number of energy bins

3.4.2.2 template<class FLOAT_T > cudaprob3::Propagator< FLOAT_T >::Propagator (const Propagator< FLOAT_T > & *other*) [inline]

Copy constructor.

Parameters

other	

3.4.2.3 template<class FLOAT_T > cudaprob3::Propagator< FLOAT_T >::Propagator (Propagator< FLOAT_T > && *other*) [inline]

Move constructor.

Parameters

other	

3.4.3 Member Function Documentation

3.4.3.1 template<class FLOAT_T > virtual void cudaprob3::Propagator< FLOAT_T >::calculateProbabilities (NeutrinoType *type*) [pure virtual]

Calculate the probability of each cell.

Parameters

type	Neutrino or Antineutrino

Implemented in cudaprob3::CudaPropagator< FLOAT_T >, cudaprob3::CudaPropagatorSingle< FLOAT_T >, and cudaprob3::CpuPropagator< FLOAT_T >.

3.4.3.2 template<class FLOAT_T > virtual FLOAT_T cudaprob3::Propagator< FLOAT_T >::getProbability (int *index_cosine*, int *index_energy*, ProbType *t*) [pure virtual]

get oscillation weight for specific cosine and energy

Parameters

index_cosine	Cosine bin index (zero based)
index_energy	Energy bin index (zero based)
t	Specify which probability P(i->j)

Implemented in cudaprob3::CudaPropagator< FLOAT_T >, cudaprob3::CudaPropagatorSingle< FLOAT_T >, and cudaprob3::CpuPropagator< FLOAT_T >.

3.4.3.3 template<class FLOAT_T > Propagator& cudaprob3::Propagator< FLOAT_T >::operator= (const Propagator< FLOAT_T > & *other*) [inline]

Copy assignment operator.

Parameters

other	

3.4.3.4 template<class FLOAT_T > Propagator& cudaprob3::Propagator< FLOAT_T >::operator= (Propagator< FLOAT_T > && *other*) [inline]

Move assignment operator.

Parameters

other	

3.4.3.5 template<class FLOAT_T > virtual void cudaprob3::Propagator< FLOAT_T >::setCosineList (const std::vector< FLOAT_T > & *list*) [inline], [virtual]

Set cosine bins. Cosines are given in radians.

Parameters

list	Cosine list

Reimplemented in cudaprob3::CudaPropagator< FLOAT_T >, and cudaprob3::CudaPropagatorSingle< FLOAT_T >.

3.4.3.6 template<class FLOAT_T > virtual void cudaprob3::Propagator< FLOAT_T >::setDensity (const std::vector< FLOAT_T > & *radii_*, const std::vector< FLOAT_T > & *rhos_*) [inline], [virtual]

Set density information from arrays.

radii_ and rhos_ must be same size. both radii_ and rhos_ must be sorted, in the same order. The density (g/cm^3) at a distance (km) from the center of the sphere between radii_[i], exclusive, and radii_[j], inclusive, i < j is assumed to be rhos_[j]

Parameters

*radii_*	List of radii
*rhos_*	List of densities

Reimplemented in cudaprob3::CudaPropagator< FLOAT_T >, and cudaprob3::CudaPropagatorSingle< FLOAT_T >.

3.4.3.7 template<class FLOAT_T > virtual void cudaprob3::Propagator< FLOAT_T >::setDensityFromFile (const std::string & *filename*) [inline], [virtual]

Set density information from file.

File must contain two columns where the first column contains the radius (km) and the second column contains the density (g/cm^3). The first row must have the radius 0. The last row must have to radius of the sphere

Parameters

filename	File with density information

Reimplemented in cudaprob3::CudaPropagator< FLOAT_T >.

3.4.3.8 template<class FLOAT_T > virtual void cudaprob3::Propagator< FLOAT_T >::setEnergyList (const std::vector< FLOAT_T > & *list*) [inline], [virtual]

Set the energy bins. Energies are given in GeV.

Parameters

list	Energy list

Reimplemented in cudaprob3::CudaPropagator< FLOAT_T >, and cudaprob3::CudaPropagatorSingle< FLOA↩ T_T >.

3.4.3.9 template<class FLOAT_T > virtual void cudaprob3::Propagator< FLOAT_T >::setMNSMatrix (FLOAT_T *theta12,* FLOAT_T *theta13,* FLOAT_T *theta23,* FLOAT_T *dCP*) [inline], [virtual]

Set mixing angles and cp phase in radians.

Parameters

theta12	
theta13	
theta23	
dCP	

Reimplemented in cudaprob3::CudaPropagator< FLOAT_T >.

3.4.3.10 template<class FLOAT_T > virtual void cudaprob3::Propagator< FLOAT_T >::setNeutrinoMasses (FLOAT_T *dm12sq,* FLOAT_T *dm23sq*) [inline], [virtual]

Set neutrino mass differences (m_i_j)^2 in (eV)^2. no assumptions about mass hierarchy are made.

Parameters

dm12sq	
dm23sq	

Reimplemented in cudaprob3::CudaPropagator< FLOAT_T >.

3.4.3.11 template<class FLOAT_T > virtual void cudaprob3::Propagator< FLOAT_T >::setProductionHeight (FLOAT_T *heightKM*) [inline], [virtual]

Set production height in km of neutrinos.

Adds a layer of length heightKM with zero density to the density model

Parameters

heightKM	Set neutrino production height

Reimplemented in cudaprob3::CudaPropagator< FLOAT_T >.

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

- propagator.hpp

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