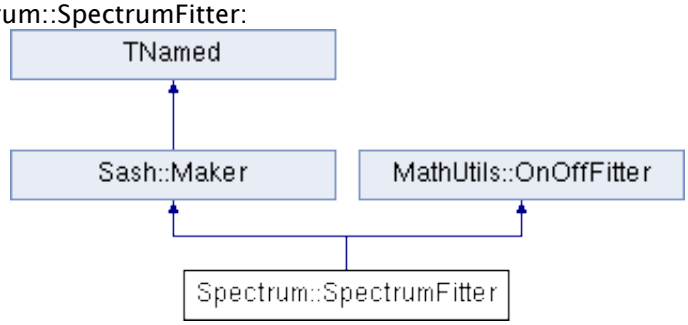
Spectrum::SpectrumFitter Class Reference

Inheritance diagram for Spectrum::SpectrumFitter:



Detailed Description

Definition at line 34 of file SpectrumFitter.hh.

List of all members.

Public Member Functions

	SpectrumFitter (const char *SpectrumName, const char *AcceptanceName, const char *ResolutionName, Bool_t ComputeSpectrumPoints=true, Float_t PointsConfidenceLevel=0.6827, Float_t UpperLimitConfidenceLevel=0.6827, Float_t EnergyThresholdPos=0.2, Bool_t Verbose=true, Float_t NSig=3, Float_t RefEnergy=-1., Bool_t AveragingMode=false) Create a new **SpectrumFitter**.
virtual	**~SpectrumFitter** () Standard desctructor.
Sash::Return	**ProcessData** (Sash::Folder *, Sash::Maker *) Reacts to the data folder, containing the analysis results.
Sash::Return	**ProcessTables** (Sash::Folder *, Sash::Maker *) Calls when receiving a folder containing the resolution and acceptance tables.
Double_t	**GetLogLikelihoodSpectrum** (const TVectorD &**SpectrumParam**, TVectorD &Gradient, TMatrixD &Hessian) const Returns the loglikelyhood value for current spectrum hypothesis, and computes also the derivatives against spectrum parameters.
Double_t	**GetLogLikelihoodNorm** (const TVectorD &**SpectrumParam**, TVectorD &Gradient, TMatrixD &Hessian) const Returns the loglikelyhood value for current spectrum normalisation Used to fit only the flux normalisation.
Double_t	**GetLogLikelihoodNorm** (Double_t Norm) const
Double_t	**GuessDecorrelationEnergy** () Estimates the decorrelation energy, by searching the energy with divides the data sample in two parts with the same significance.
Double_t	**ProcessFit** (bool automaticEnergyThresholds=false) Process fit.
void	**PlotResults** ()

	Plots the fit results.
void	**ComputeResiduals** () Computes the residuals of fit results, i.e.
void	**ComputeResidualsVsZen** () Computes the residuals of fit results versus zenith angle i.e.
void	**ComputeResidualsVsOffAxis** () Computes the residuals of fit results versus zenith angle i.e.
void	**ComputeResidualsVsEfficiency** () Computes the residuals of fit results versus zenith angle i.e.
void	**ComputeSpectrumPoints** () Computes the classical spectrum made of points.
void	**print** (std::ostream &os) const Print some the table definition and variable values.
Double_t	**GetlnEmin** () const Returns fEmin in TeV.
void	**SetlnEmin** (Double_t min) const Set the value of fEmin in TeV.
Double_t	**GetlnEmax** () const Returns fEmax in TeV.
void	**SetlnEmax** (Double_t max) const Set the value of fEmax in TeV.
int	**GetNbinsE** () const Returns the number of bins in ln energy.
void	**SetNbinsE** (int nbinsE) const Set the number of bins in ln energy.

Protected Member Functions

virtual void	**Streamer** (TBuffer &B)

Protected Attributes

std::string	**fSpectrumName**
std::string	**fAcceptanceName**
std::string	**fResolutionName**
std::map< UInt_t, const **Spectrum::AcceptanceBase** * >	**fAcceptances** Acceptance tables vs number of telescopes.
std::map< UInt_t, const **Spectrum::ResolutionBase** * >	**fResolutions** Acceptance tables vs number of telescopes.
Spectrum::SpectrumBase *	**fSpectrum** **Spectrum** shape.
std::map< UInt_t, **Spectrum::DataStorageLinearTable** * >	**fDataTables** Data storage vs number of telescopes.
std::set< UInt_t >	**fValidConfigurations**
Double_t	**flnEmin** Minimum energy for plots (TeV)
Double_t	**flnEmax** Maximum energy for plots (TeV)
int	**fNbinsE** Number of bins in the plots (x-axis in ln(E))
bool	**fComputeSpectrumPoints**

	Switch controlling production of spectrum points.
Float_t	**fPointsConfidenceLevel** Confidence level for spectrum points.
Float_t	**fUpperLimitConfidenceLevel** Confidence level for upper limits.
Float_t	**fEnergyThresholdPos** Position of Energy Threshold (fraction of Max acceptance)
bool	**fVerbose** Verbose option.
Float_t	**fNSig** Average significance per spectrum point.
Bool_t	**fAveragingMode** Averaging Mode (sums all bins)
int	**nCalls** Number of calls of Minuit.
unsigned	**nUsedBins** Number of bin used in the fits.
Float_t	**fRefEnergy** Fix the reference energy.

Constructor & Destructor Documentation

```
Spectrum::SpectrumFitter::SpectrumFitter ( const char *  SpectrumName,
                                           const char *  AcceptanceName,
                                           const char *  ResolutionName,
                                           Bool_t        ComputeSpectrumPoints = true,
                                           Float_t       PointsConfidenceLevel = 0.6827,
                                           Float_t       UpperLimitConfidenceLevel = 0.6827,
                                           Float_t       EnergyThresholdPos = 0.2,
                                           Bool_t        Verbose = true,
                                           Float_t       NSig = 3,
                                           Float_t       RefEnergy = -1.,
                                           Bool_t        AveragingMode = false
                                         )
```

Create a new SpectrumFitter.

Parameters:

SpectrumName	Class name of spectrum shape
AcceptanceName	Name of Spectrum::AcceptanceBase instance
ResolutionName	Name of Spectrum::ResolutionBase instance
ComputeSpectrumPoints	Whether we compute the spectrum points or not
PointsConfidenceLevel	Confidence level for spectrum points determination (default 68%)
UpperLimitConfidenceLevel	Confidence level for upper limit points (default 68%)
EnergyThresholdPos	Position of lower energy threshold (fraction of max. acceptance)
Verbose	Verbosity Flag
NSig	Average significance per spectrum point (default is 3 sigma)
RefEnergy	Reference energy [TeV]. If set to -1 (default), the decorrelation energy will be used
AveragingMode	If true, groups the off-axis and zenith angle bins together

Definition at line 56 of file SpectrumFitter.C.

References Sash::Maker::AddInputFolder(), Sash::Maker::AddOutputFolder(), **ProcessData()**, and **ProcessTables()**.

Member Function Documentation

void Spectrum::SpectrumFitter::ComputeResiduals ( )

Computes the residuals of fit results, i.e.

the ratio of data number of entries over the theoric number of entries The number of entries at every energy are integrated over zenith angle bins

Definition at line 708 of file SpectrumFitter.C.

References Utilities::TextStyle::Blue(), **Spectrum::DataStorageLinearTable::FindHighestUsedEnergyBin()**, **Spectrum::DataStorageLinearTable::FindLowestUsedEnergyBin()**, **Spectrum::ResidualPoint::fNMeasuredGammas**, **Spectrum::ResidualPoint::fNMeasuredOff**, **Spectrum::ResidualPoint::fNMeasuredOn**, **Spectrum::ResidualPoint::fNTheoricGammas**, **Spectrum::ResidualPoint::fNTheoricOn**, **Spectrum::SpectrumParam::fValue**, **Spectrum::DataStorageLinearTable::GetBinLowerEnergy()**, **Spectrum::DataStorageLinearTable::GetBinMeanEnergy()**, **Spectrum::DataStorageLinearTable::GetBinOffaxisAngle()**, **Spectrum::DataStorageLinearTable::GetBinRelativeEfficiency()**, **Spectrum::DataStorageLinearTable::GetBinUpperEnergy()**, **Spectrum::DataStorageLinearTable::GetBinZenithAngle()**, **Spectrum::DataStorageLinearTable::GetEBin()**, **Spectrum::SpectrumBase::GethResDiff()**, **Spectrum::SpectrumBase::GethResOff()**, **Spectrum::SpectrumBase::GethResOn()**, MathUtils::OnOffFitter::GetLogLikelihood(), **Spectrum::DataStorageLinearTable::GetMapDim()**, **Spectrum::DataStorageLinearTable::GetNBins()**, **Spectrum::SpectrumBase::GetNParameters()**, Utilities::TextStyle::Green(), Utilities::Statistics::LiMa_dExcess_Down(), Utilities::Statistics::LiMa_dExcess_Up(), Utilities::TextStyle::Magenta(), **Spectrum::DataStorageTableElement::nNormTheoricGamma**, **Spectrum::DataStorageTableElement::nOff**, **Spectrum::DataStorageTableElement::nOn**, **Spectrum::DataStorageTableElement::nTheoricGamma**, **Spectrum::ResidualPoint::print()**, Utilities::TextStyle::Reset(), and **Spectrum::SpectrumBase::TheoricRate()**.

void Spectrum::SpectrumFitter::ComputeResidualsVsEfficiency ( )

Computes the residuals of fit results versus zenith angle i.e.

the ratio of data number of entries over the theoric number of entries The number of entries at every energy are integrated over zenith angle bins

Definition at line 1288 of file SpectrumFitter.C.

References Utilities::TextStyle::Blue(), **Spectrum::SpectrumParam::fValue**, **Spectrum::DataStorageLinearTable::GetBinRelativeEfficiency()**, **Spectrum::SpectrumBase::GethResVsEfficiencyDiff()**, **Spectrum::SpectrumBase::GethResVsEfficiencyOff()**, **Spectrum::SpectrumBase::GethResVsEfficiencyOn()**, MathUtils::OnOffFitter::GetLogLikelihood(), **Spectrum::DataStorageLinearTable::GetMapDim()**, **Spectrum::DataStorageLinearTable::GetNBins()**, **Spectrum::SpectrumBase::GetNParameters()**, Sash::MonitorBase::GetObjectIdentifier(), **Spectrum::DataStorageLinearTable::GetXMax()**, **Spectrum::DataStorageLinearTable::GetXMin()**, Utilities::Statistics::LiMa_dExcess_Down(), Utilities::Statistics::LiMa_dExcess_Up(), **Spectrum::DataStorageTableElement::nNormTheoricGamma**, **Spectrum::DataStorageTableElement::nOff**, **Spectrum::DataStorageTableElement::nOn**, **Spectrum::DataStorageTableElement::nTheoricGamma**, and Utilities::TextStyle::Reset().

void Spectrum::SpectrumFitter::ComputeResidualsVsOffAxis ( )

Computes the residuals of fit results versus zenith angle i.e.

the ratio of data number of entries over the theoric number of entries The number of entries at every energy are integrated over zenith angle bins

Definition at line **1111** of file **SpectrumFitter.C**.

References Utilities::TextStyle::Blue(), **Spectrum::SpectrumParam::fValue**, **Spectrum::DataStorageLinearTable::GetBinOffaxisAngle()**, **Spectrum::SpectrumBase::GethResVsOffAxisDiff()**, **Spectrum::SpectrumBase::GethResVsOffAxisOff()**, **Spectrum::SpectrumBase::GethResVsOffAxisOn()**, MathUtils::OnOffFitter::GetLogLikelihood(), **Spectrum::DataStorageLinearTable::GetMapDim()**, **Spectrum::DataStorageLinearTable::GetNBins()**, **Spectrum::SpectrumBase::GetNParameters()**, Sash::MonitorBase::GetObjectIdentifier(), **Spectrum::DataStorageLinearTable::GetXMax()**, **Spectrum::DataStorageLinearTable::GetXMin()**, Utilities::Statistics::LiMa_dExcess_Down(), Utilities::Statistics::LiMa_dExcess_Up(), **Spectrum::DataStorageTableElement::nNormTheoricGamma**, **Spectrum::DataStorageTableElement::nOff**, **Spectrum::DataStorageTableElement::nOn**, **Spectrum::DataStorageTableElement::nTheoricGamma**, and Utilities::TextStyle::Reset().

void Spectrum::SpectrumFitter::ComputeResidualsVsZen ( )

Computes the residuals of fit results versus zenith angle i.e.

the ratio of data number of entries over the theoric number of entries The number of entries at every energy are integrated over zenith angle bins

Definition at line **931** of file **SpectrumFitter.C**.

References Utilities::TextStyle::Blue(), **Spectrum::SpectrumParam::fValue**, **Spectrum::DataStorageLinearTable::GetBinZenithAngle()**, **Spectrum::SpectrumBase::GethResVsZenDiff()**, **Spectrum::SpectrumBase::GethResVsZenOff()**, **Spectrum::SpectrumBase::GethResVsZenOn()**, MathUtils::OnOffFitter::GetLogLikelihood(), **Spectrum::DataStorageLinearTable::GetMapDim()**, **Spectrum::DataStorageLinearTable::GetNBins()**, **Spectrum::SpectrumBase::GetNParameters()**, Sash::MonitorBase::GetObjectIdentifier(), **Spectrum::DataStorageLinearTable::GetXMax()**, **Spectrum::DataStorageLinearTable::GetXMin()**, Utilities::Statistics::LiMa_dExcess_Down(), Utilities::Statistics::LiMa_dExcess_Up(), **Spectrum::DataStorageTableElement::nNormTheoricGamma**, **Spectrum::DataStorageTableElement::nOff**, **Spectrum::DataStorageTableElement::nOn**, **Spectrum::DataStorageTableElement::nTheoricGamma**, and Utilities::TextStyle::Reset().

void Spectrum::SpectrumFitter::ComputeSpectrumPoints ( )

Computes the classical spectrum made of points.

Definition at line **1465** of file **SpectrumFitter.C**.

References Utilities::TextStyle::Blue(), **Spectrum::SpectrumBase::E_E2_times_E2Rate()**, **Spectrum::SpectrumBase::E_E2_times_TheoricRate()**, **Spectrum::ResidualPoint::fEMean**, **Spectrum::DataStorageLinearTable::FindHighestUsedEnergyBin()**, **Spectrum::DataStorageLinearTable::FindLowestUsedEnergyBin()**, **Spectrum::ResidualPoint::fNMeasuredGammas**, **Spectrum::ResidualPoint::fNMeasuredOff**, **Spectrum::ResidualPoint::fNMeasuredOn**, **Spectrum::ResidualPoint::fNTheoricGammas**, **Spectrum::ResidualPoint::fNTheoricOn**, **Spectrum::SpectrumPoint::fPhiMin**, **Spectrum::SpectrumPoint::fUpperLimit**, **Spectrum::DataStorageLinearTable::GetBinLowerEnergy()**, **Spectrum::DataStorageLinearTable::GetBinMeanEnergy()**, **Spectrum::DataStorageLinearTable::GetBinOffaxisAngle()**, **Spectrum::DataStorageLinearTable::GetBinRelativeEfficiency()**, **Spectrum::DataStorageLinearTable::GetBinUpperEnergy()**,

Spectrum::DataStorageLinearTable::GetBinZenithAngle(), Utilities::TBoundedGaussian::GetConfidenceInterval(), Spectrum::SpectrumBase::GetDifferentialIndex(), Spectrum::DataStorageLinearTable::GetEBin(), Spectrum::SpectrumBase::GetFlux(), Spectrum::DataStorageLinearTable::GetMapDim(), Spectrum::DataStorageLinearTable::GetNBins(), Spectrum::SpectrumBase::GetResidualPoints(), Spectrum::SpectrumBase::GetSpectrumPoints(), Spectrum::SpectrumBase::GetSpectrumPointsCL(), Spectrum::SpectrumBase::GetSpectrumUpperLimitsCL(), Utilities::Statistics::LiMa_dExcess_Down(), Utilities::Statistics::LiMa_dExcess_Up(), Spectrum::DataStorageTableElement::nOff, Spectrum::DataStorageTableElement::nOn, Spectrum::DataStorageTableElement::nTheoricGamma, Utilities::TextStyle::Reset(), and Utilities::Statistics::Significance().

Double_t Spectrum::SpectrumFitter::GetLogLikelihoodSpectrum (const TVectorD & SpectrumParam, TVectorD & Gradient, TMatrixD & Hessian) const

Returns the loglikelyhood value for current spectrum hypothesis, and computes also the derivatives against spectrum parameters.

Parameters:

SpectrumParam	spectrum parameters
Gradient	Derivatives of likelihood
Hessian	Matrix of second derivatives

Definition at line 284 of file SpectrumFitter.C.

References Spectrum::SpectrumBase::GetNParameters(), Spectrum::SpectrumBase::GetParValue(), Utilities::TextStyle::Magenta(), and Utilities::TextStyle::Reset().

Referenced by ProcessFit().

void Spectrum::SpectrumFitter::PlotResults ( )

Plots the fit results.

The 1 sigma confidence level is drawn as well as the fitted spectrum. The fitted parameters and decorrelation energy are printed in the plot.

The residuals are plotted in another Pad of the same Canvas.

Definition at line 694 of file SpectrumFitter.C.

References Spectrum::SpectrumBase::Display(), Spectrum::SpectrumBase::DisplayResiduals(), Spectrum::SpectrumBase::DisplayResidualsVsEfficiency(), Spectrum::SpectrumBase::DisplayResidualsVsOffAxis(), and Spectrum::SpectrumBase::DisplayResidualsVsZen().

Double_t Spectrum::SpectrumFitter::ProcessFit (bool automaticEnergyThresholds = false)

Process fit.

Parameters:

automaticEnergyThresholds,:	if true, the energy thresholds at every zenith angle are computed so that the fit do not use the bins at lower energies

Definition at line 420 of file SpectrumFitter.C.

References Utilities::TextStyle::Blue(), **Spectrum::DataStorageLinearTable::CheckBinDuration()**, **Spectrum::DataStorageLinearTable::ComputeEnergyThresholdsFromAcceptance()**, **Spectrum::SpectrumParam::fError**, **Spectrum::SpectrumParam::fFixed**, **Spectrum::SpectrumParam::fLowerLimit**, **Spectrum::SpectrumParam::fStartValue**, **Spectrum::SpectrumParam::fUpperLimit**, **Spectrum::SpectrumParam::fValue**, **Spectrum::SpectrumBase::GetChi2()**, **Spectrum::SpectrumBase::GetEMatrix()**, **Spectrum::SpectrumBase::GetEMax()**, **Spectrum::SpectrumBase::GetEMin()**, **Spectrum::DataStorageLinearTable::GetEnergyRange()**, **Spectrum::SpectrumBase::GetFitEMax()**, **Spectrum::SpectrumBase::GetFitEMin()**, **Spectrum::SpectrumBase::GetFluxNorm()**, **Spectrum::SpectrumBase::GetFluxNormStartValue()**, **Spectrum::SpectrumBase::GetLikelihood()**, **GetLogLikelihoodNorm()**, **GetLogLikelihoodSpectrum()**, **Spectrum::SpectrumBase::GetnDOF()**, **Spectrum::SpectrumBase::GetNParameters()**, **Spectrum::SpectrumBase::GetRefEnergy()**, **Spectrum::DataStorageLinearTable::GetTotalExcess()**, **Spectrum::DataStorageLinearTable::GetTotalNOff()**, **Spectrum::DataStorageLinearTable::GetTotalNOn()**, **Spectrum::DataStorageLinearTable::GetTotalSignificance()**, Utilities::TextStyle::Green(), MathUtils::OnOffFitter::LevenbergMarquardt(), Utilities::TextStyle::Magenta(), **Spectrum::SpectrumBase::print()**, Utilities::TextStyle::Reset(), **Spectrum::DataStorageLinearTable::SelectEfficiency()**, **Spectrum::DataStorageLinearTable::SelectOffset()**, **Spectrum::DataStorageLinearTable::SelectZenith()**, **Spectrum::SpectrumBase::SetFluxNormStartValue()**, and **Spectrum::SpectrumBase::SetReferenceEnergy()**.

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

- **SpectrumFitter.hh**
- **SpectrumFitter.C**