Dynamic Kernel Scheduler

DKS 1.1.1

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Contents

Chapter 1

Hierarchical Index

1.1 Class Hierarchy

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

Chapter 2

Class Index

2.1 Class List

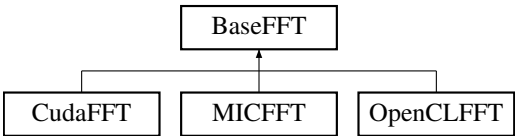
Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 3

Class Documentation

3.1 BaseFFT Class Reference

Inheritance diagram for BaseFFT:



Public Member Functions

- virtual int **setupFFT** (int ndim, int N[3])=0
- virtual int **setupFFTRC** (int ndim, int N[3], double scale=1.0)=0
- virtual int **setupFFTCR** (int ndim, int N[3], double scale=1.0)=0
- virtual int **destroyFFT** ()=0
- virtual int **executeFFT** (void ∗mem_ptr, int ndim, int N[3], int streamId=-1, bool forward=true)=0
- virtual int **executeIFFT** (void ∗mem_ptr, int ndim, int N[3], int streamId=-1)=0
- virtual int **normalizeFFT** (void ∗mem_ptr, int ndim, int N[3], int streamId=-1)=0
- virtual int **executeRCFFT** (void ∗real_ptr, void ∗comp_ptr, int ndim, int N[3], int streamId=-1)=0
- virtual int **executeCRFFT** (void ∗real_ptr, void ∗comp_ptr, int ndim, int N[3], int streamId=-1)=0
- virtual int **normalizeCRFFT** (void ∗real_ptr, int ndim, int N[3], int streamId=-1)=0

Protected Member Functions

- bool **useDefaultPlan** (int ndim, int N[3])

Protected Attributes

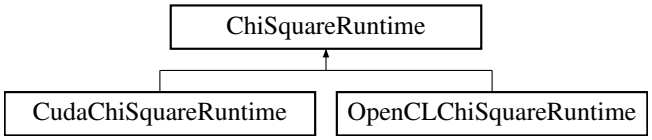
- int **defaultN** [3]
- int **defaultNdim**

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

- /home/l_locans/gitwork/DKS-src/src/Algorithms/FFT.h

3.2 ChiSquareRuntime Class Reference

Inheritance diagram for ChiSquareRuntime:



Public Member Functions

- virtual ~ChiSquareRuntime ()
- virtual int **compileProgram** (std::string function, bool mlh=false)=0
- virtual int **launchChiSquare** (int fitType, void *mem_data, void *mem_err, int length, int numpar, int numfunc, int nummap, double timeStart, double timeStep, double &result)=0
- virtual int **writeParams** (const double *params, int numparams)=0
- virtual int **writeFunc** (const double *func, int numfunc)=0
- virtual int **writeMap** (const int *map, int nummap)=0
- virtual int **initChiSquare** (int size_data, int size_param, int size_func, int size_map)=0
- virtual int **freeChiSquare** ()=0
- virtual int **checkChiSquareKernels** (int fitType, int &threadsPerBlock)=0
- int setConsts (double N0, double tau, double bkg)
- int setConsts (double alpha, double beta)
- int setKernelParams (int numBlocks, int blockSize)
- int getOperations (int &oper)

Protected Member Functions

- void **setN0** (double value)
- void **setTau** (double value)
- void **setBKG** (double value)
- void **setAlpha** (double value)
- void **setBeta** (double value)

Protected Attributes

- double **N0_m**
- double **tau_m**
- double **bkg_m**
- double **alpha_m**
- double **beta_m**
- bool **initDone_m**
- void * **mem_chisq_m**
- void * **mem_param_m**
- void * **mem_func_m**
- void * **mem_map_m**
- int **numBlocks_m**
- int **blockSize_m**
- char * **ptx_m**

Friends

- class **DKSBaseMuSR**

3.2.1 Constructor & Destructor Documentation

3.2.1.1 virtual ChiSquareRuntime::~ChiSquareRuntime ( ) [inline], [virtual]

Default constructor Default destructor

3.2.2 Member Function Documentation

3.2.2.1 int ChiSquareRuntime::getOperations (int & *oper*) [inline]

Get the number of operations in compiled kernel. Count the number of operation in the ptx file for the compiled program.

3.2.2.2 int ChiSquareRuntime::setConsts (double *N0,* double *tau,* double *bkg*) [inline]

Set N0, tau and bgk values to use for the kernel. If values changes between data sets this needs to be called before every kernel call. Returns DKS_SUCCESS.

3.2.2.3 int ChiSquareRuntime::setConsts (double *alpha,* double *beta*) [inline]

Set alpha and beta values to use for the kernel. If values changes between data sets this needs to be called before every kernel call. Returns DKS_SUCCESS.

3.2.2.4 int ChiSquareRuntime::setKernelParams (int *numBlocks,* int *blockSize*) [inline]

Set number of blocks and threads. Used to set parameters obtained from auto-tuning

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

- /home/l_locans/gitwork/DKS-src/src/Algorithms/ChiSquareRuntime.h

3.3 compare_particle Struct Reference

Public Member Functions

- void **set_threshold** (int t)
- __host__ __device__ bool **operator()** (CUDA_PART p1, CUDA_PART p2)
- __host__ __device__ bool **operator()** (CUDA_PART p1)

Public Attributes

- int **threshold**

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

- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaCollimatorPhysics.cu

3.4 compare_particle_small Struct Reference

Public Member Functions

- void **set_threshold** (int t)
- __host__ __device__ bool **operator()** (CUDA_PART_SMALL p1, CUDA_PART_SMALL p2)
- __host__ __device__ bool **operator()** (CUDA_PART_SMALL p1)

Public Attributes

- int **threshold**

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

- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaCollimatorPhysics.cu

3.5 CUDA_PART2 Struct Reference

Public Attributes

- int * **label**
- unsigned * **localID**
- double3 * **Rincol**
- double3 * **Pincol**
- long * **IDincol**
- int * **Binincol**
- double * **DTincol**
- double * **Qincol**
- long * **LastSecincol**
- double3 * **Bfincol**
- double3 * **Efincol**

3.5.1 Detailed Description

Structure for storing particle on GPU

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

- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaCollimatorPhysics.cuh

3.6 CUDA_PART2_SMALL Struct Reference

Public Attributes

- int * **label**
- unsigned * **localID**
- double3 * **Rincol**
- double3 * **Pincol**

3.6.1 Detailed Description

Structure for storing particle on GPU

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

- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaCollimatorPhysics.cuh

3.7 CUDA_PART_SMALL Struct Reference

Public Attributes

- int **label**
- unsigned **localID**
- double3 **Rincol**
- double3 **Pincol**

3.7.1 Detailed Description

Structure for storing particle on GPU

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

- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaCollimatorPhysics.cuh

3.8 CudaBase Class Reference

Public Member Functions

- int cuda_createCurandStates (int size, int seed=-1)
- int cuda_deleteCurandStates ()
- int cuda_createRandomNumbers (void *mem_ptr, int size)
- curandState * cuda_getCurandStates ()
- int cuda_createStream (int &streamId)
- int cuda_addStream (cudaStream_t tmpStream, int &streamId)
- int cuda_deleteStream (int id)
- int cuda_deleteStreams ()
- int cuda_setStream (int id)
- int cuda_getStreamId ()
- int cuda_defaultStream ()
- int cuda_numberOfStreams ()
- cudaStream_t cuda_getStream (int id)
- cublasHandle_t cuda_getCublas ()
- int cuda_getDevices ()
- int cuda_getDeviceCount (int &ndev)
- int cuda_getDeviceName (std::string &device_name)
- int cuda_setDevice (int device)
- int cuda_getUniqueDevices (std::vector< int > &devices)
- int cuda_setUp ()
- void * cuda_allocateMemory (size_t size, int &ierr)
- template<typename T >
  int cuda_allocateHostMemory (T *&ptr, size_t size)

- template<typename T >
  int cuda_zeroMemory (T *mem_ptr, size_t size, int offset=0)
- template<typename T >
  int cuda_zeroMemoryAsync (T *mem_ptr, size_t size, int offset=0, int streamId=-1)
- template<typename T >
  int cuda_writeData (T *mem_ptr, const void *in_data, size_t size, int offset=0)
- template<typename T >
  int cuda_writeDataAsync (T *mem_ptr, const void *in_data, size_t size, int streamId=-1, int offset=0)
- template<typename T >
  int cuda_readData (const T *mem_ptr, void *out_data, size_t size, int offset=0)
- template<typename T >
  int cuda_readDataAsync (const T *mem_ptr, void *out_data, size_t size, int streamId=-1, int offset=0)
- int cuda_freeMemory (void *mem_ptr)
- int cuda_freeHostMemory (void *mem_ptr)
- template<typename T >
  void * cuda_pushData (const void *in_data, size_t size, int &ierr)
- template<typename T >
  int cuda_pullData (T *mem_ptr, void *out_data, size_t size, int &ierr)
- int cuda_executeFunction ()
- int cuda_cleanUp ()
- int cuda_syncDevice ()
- template<typename T >
  int cuda_hostRegister (T *ptr, int size)
- template<typename T >
  int cuda_hostUnregister (T *ptr)
- int cuda_memInfo ()

Protected Attributes

- cublasHandle_t **defaultCublas**
- curandState * **defaultRndState**
- int **defaultRndSet**

3.8.1 Member Function Documentation

3.8.1.1 int CudaBase::cuda_addStream (cudaStream_t *tmpStream,* int & *streamId*)

add existing cuda stream to the list. Return: success or error code.

3.8.1.2 template<typename T > int CudaBase::cuda_allocateHostMemory (T *& *ptr,* size_t *size*) [inline]

Info: allocate host memory in pinned memory Return: success or error code

3.8.1.3 void * CudaBase::cuda_allocateMemory (size_t *size,* int & *ierr*)

Info: allocate memory on cuda device Return: pointer to memory object

3.8.1.4 int CudaBase::cuda_cleanUp ( )

Info: clean up Return: success or error code

3.8.1.5 int CudaBase::cuda_createCurandStates (int *size,* int *seed* = −1)

Init cuda random number (cuRand) states. Create an array of type curandState with "size" elements on the GPU and create a curandState with different seed for each array entry. If no seed is given create a seed based on current time. Return success or error code

3.8.1.6 int CudaBase::cuda_createRandomNumbers (void ∗ *mem_ptr,* int *size*)

Create 'size' random numbers on the device and save in mem_ptr array

3.8.1.7 int CudaBase::cuda_createStream (int & *streamId*)

Create a cuda stream and set streamId to index refering to this stream. Return success or error code

3.8.1.8 int CudaBase::cuda_defaultStream ( )

Info: reset to default stream Return: success or error code

3.8.1.9 int CudaBase::cuda_deleteCurandStates ( )

Delete curandState. Delete curandState array on the GPU and free memory. Return success or error code

3.8.1.10 int CudaBase::cuda_deleteStream (int *id*)

delete cuda stream success or error code

3.8.1.11 int CudaBase::cuda_deleteStreams ( )

delete all streams success or error code

3.8.1.12 int CudaBase::cuda_executeFunction ( )

Info: execute function Return: success or error code

3.8.1.13 int CudaBase::cuda_freeHostMemory (void ∗ *mem_ptr*)

Info: free page locked memory on host Return: success or erro code

3.8.1.14 int CudaBase::cuda_freeMemory (void ∗ *mem_ptr*)

Info: free memory on device Return: success or error code

3.8.1.15 cublasHandle_t CudaBase::cuda_getCublas ( )

Get default cublass handle

3.8.1.16 curandState ∗ CudaBase::cuda_getCurandStates ( )

Get a pointer to curand states

3.8.1.17 int CudaBase::cuda_getDeviceCount (int & *ndev*)

Get CUDA device count. Sets the number of devices on the platform that can use CUDA. Returns DKS_SUCCESS

3.8.1.18 int CudaBase::cuda_getDeviceName (std::string & *device_name*)

Get the name of the device. QUery the device properties of the used device and set the string device_name

3.8.1.19 int CudaBase::cuda_getDevices ( )

Info: get information on cuda devices Return: success or error code

3.8.1.20 cudaStream_t CudaBase::cuda_getStream (int *id*)

Info: get stream Return: stream

3.8.1.21 int CudaBase::cuda_getStreamId ( )

Info: get stream that is used Return: return id of curretn stream

3.8.1.22 int CudaBase::cuda_getUniqueDevices (std::vector< int > & *devices*)

Get unique devices Get array of indeces with the unique CUDA devices available on the paltform

3.8.1.23 template<typename T > int CudaBase::cuda_hostRegister (T * *ptr,* int *size*) [inline]

Page-lock host memory

3.8.1.24 template<typename T > int CudaBase::cuda_hostUnregister (T * *ptr*) [inline]

Release page locked memory

3.8.1.25 int CudaBase::cuda_memInfo ( ) [inline]

Info: print device memory info (total, used, avail) Return: success or error code

3.8.1.26 int CudaBase::cuda_numberOfStreams ( )

Info: get number of streams Return: success or error code

3.8.1.27 template<typename T > int CudaBase::cuda_pullData (T * *mem_ptr,* void * *out_data,* size_t *size,* int & *ierr*) [inline]

Info: read data and free memory (pull) Return: success or error code

3.8.1.28 template<typename T > void* CudaBase::cuda_pushData (const void * *in_data,* size_t *size,* int & *ierr*) [inline]

Info: allcate memory and write data (push) Return: pointer to memory object

3.8.1.29 template<typename T > int CudaBase::cuda_readData (const T * *mem_ptr,* void * *out_data,* size_t *size,* int *offset =* 0) [inline]

Info: read data from memory Return: success or error code

3.8.1.30 template<typename T > int CudaBase::cuda_readDataAsync (const T * *mem_ptr,* void * *out_data,* size_t *size,* int *streamId =* -1, int *offset =* 0) [inline]

Info: read data async from device memory Return: success or error code

3.8.1.31 int CudaBase::cuda_setDevice (int *device*)

Set CUDA device to use. If device passed in is larger than the number of devices use the default:0 and return DKS_ERROR

3.8.1.32 int CudaBase::cuda_setStream (int *id*)

set stream to use success or error code

3.8.1.33 int CudaBase::cuda_setUp ( )

Info: init device Return: success or error code

3.8.1.34 int CudaBase::cuda_syncDevice ( ) [inline]

Info: sync cuda device Return: success or error code

3.8.1.35 template<typename T > int CudaBase::cuda_writeData (T * *mem_ptr,* const void * *in_data,* size_t *size,* int *offset =* 0) [inline]

Info: write data to memory Retrun: success or error code

3.8.1.36 template<typename T > int CudaBase::cuda_writeDataAsync (T * *mem_ptr,* const void * *in_data,* size_t *size,* int *streamId =* -1, int *offset =* 0) [inline]

Info: write data assynchonuously Return: success or error code

3.8.1.37 template<typename T > int CudaBase::cuda_zeroMemory (T * *mem_ptr,* size_t *size,* int *offset =* 0) [inline]

Zero CUDA memory. Set all the elements of the array on the device to zero.

3.8.1.38 template<typename T > int CudaBase::cuda_zeroMemoryAsync (T * *mem_ptr,* size_t *size,* int *offset =* 0, int *streamId =* -1) [inline]

Zero CUDA memory. Set all the elements of the array on the device to zero.

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

- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaBase.cuh
- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaBase.cu

3.9 CudaChiSquare Class Reference

Public Member Functions

- CudaChiSquare (CudaBase ∗base)
- int **cuda_PHistoTFFcn** (void ∗mem_data, void ∗mem_par, void ∗mem_chisq, double fTimeResolution, double fRebin, int sensors, int length, int numpar, double &result)
- int **cuda_singleGaussTF** (void ∗mem_data, void ∗mem_t0, void ∗mem_par, void ∗mem_result, double fTimeResolution, double fRebin, double fGoodBinOffset, int sensors, int length, int numpar, double &result)
- int **cuda_doubleLorentzTF** (void ∗mem_data, void ∗mem_t0, void ∗mem_par, void ∗mem_result, double fTimeResolution, double fRebin, double fGoodBinOffset, int sensors, int length, int numpar, double &result)

3.9.1 Constructor & Destructor Documentation

3.9.1.1 CudaChiSquare::CudaChiSquare (CudaBase ∗ *base*) [inline]

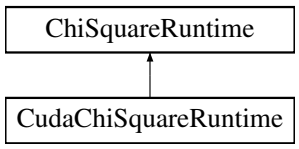
Constructor which gets CudaBase as argument

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

- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaChiSquare.cuh
- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaChiSquare.cu

3.10 CudaChiSquareRuntime Class Reference

Inheritance diagram for CudaChiSquareRuntime:



Public Member Functions

- CudaChiSquareRuntime (CudaBase ∗base)
- CudaChiSquareRuntime ()
- ∼CudaChiSquareRuntime ()
- int compileProgram (std::string function, bool mlh=false)
- int launchChiSquare (int fitType, void ∗mem_data, void ∗mem_err, int length, int numpar, int numfunc, int nummap, double timeStart, double timeStep, double &result)
- int writeParams (const double ∗params, int numparams)
- int writeFunc (const double ∗func, int numfunc)
- int writeMap (const int ∗map, int nummap)
- int initChiSquare (int size_data, int size_param, int size_func, int size_map)
- int freeChiSquare ()
- int checkChiSquareKernels (int fitType, int &threadsPerBlock)

Additional Inherited Members

3.10.1 Constructor & Destructor Documentation

3.10.1.1 CudaChiSquareRuntime::CudaChiSquareRuntime (CudaBase * *base*)

Constructor with CudaBase argument

3.10.1.2 CudaChiSquareRuntime::CudaChiSquareRuntime ( )

Default constructor init cuda device

3.10.1.3 CudaChiSquareRuntime::~CudaChiSquareRuntime ( )

Default destructor

3.10.2 Member Function Documentation

3.10.2.1 int CudaChiSquareRuntime::checkChiSquareKernels (int *fitType*, int & *threadsPerBlock*) [inline], [virtual]

Check if CUDA device is able to run the chi square kernel. Redundant - all new CUDA devices that support RT compilation will also support double precision, there are no other requirements to run chi square on GPU

Implements ChiSquareRuntime.

3.10.2.2 int CudaChiSquareRuntime::compileProgram (std::string *function*, bool *mlh* = false) [virtual]

Compile program and save ptx. Add function string to the calcFunction kernel and compile the program Function must be valid C math expression. Parameters can be addressed in a form par[map[idx]]

Implements ChiSquareRuntime.

3.10.2.3 int CudaChiSquareRuntime::freeChiSquare ( ) [virtual]

Free temporary memory allocated for chi square. Frees the chisq temporary memory and memory for params, functions and maps

Implements ChiSquareRuntime.

3.10.2.4 int CudaChiSquareRuntime::initChiSquare (int *size_data*, int *size_param*, int *size_func*, int *size_map*) [virtual]

Allocate temporary memory needed for chi square. Initializes the necessary temporary memory for the chi square calculations. Size_data needs to the maximum number of elements in any datasets that will be used for calculations. Size_param, size_func and size_map are the maximum number of parameters, functions and maps used in calculations.

Implements ChiSquareRuntime.

3.10.2.5 int CudaChiSquareRuntime::launchChiSquare (int *fitType*, void * *mem_data*, void * *mem_err*, int *length*, int *numpar*, int *numfunc*, int *nummap*, double *timeStart*, double *timeStep*, double & *result*) [virtual]

Launch selected kernel Launched the selected kernel from the compiled code. Result is put in &result variable

Implements ChiSquareRuntime.

3.10.2.6 int CudaChiSquareRuntime::writeFunc (const double * *func*, int *numfunc*) [virtual]

Write functions to device. Write function values from double array to mem_func_m memory on the device.

Implements ChiSquareRuntime.

3.10.2.7 int CudaChiSquareRuntime::writeMap (const int * *map*, int *nummap*) [virtual]

Write maps to device. Write map values from int array to mem_map_m memory on the device.

Implements ChiSquareRuntime.

3.10.2.8 int CudaChiSquareRuntime::writeParams (const double * *params*, int *numparams*) [virtual]

Write params to device. Write params from double array to mem_param_m memory on the device.

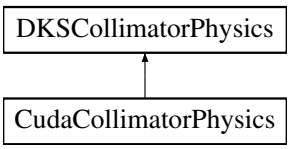
Implements ChiSquareRuntime.

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

- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaChiSquareRuntime.cuh
- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaChiSquareRuntime.cu

3.11 CudaCollimatorPhysics Class Reference

Inheritance diagram for CudaCollimatorPhysics:



Public Member Functions

- CudaCollimatorPhysics (CudaBase *base)
- CudaCollimatorPhysics ()
- ~CudaCollimatorPhysics ()
- int CollimatorPhysics (void *mem_ptr, void *par_ptr, int numpartices, bool enableRutherforScattering=true)
- int **CollimatorPhysicsSoA** (void *label_ptr, void *localID_ptr, void *rx_ptr, void *ry_ptr, void *rz_ptr, void *px_ptr, void *py_ptr, void *pz_ptr, void *par_ptr, int numparticles)
- int CollimatorPhysicsSort (void *mem_ptr, int numparticles, int &numaddback)
- int **CollimatorPhysicsSortSoA** (void *label_ptr, void *localID_ptr, void *rx_ptr, void *ry_ptr, void *rz_ptr, void *px_ptr, void *py_ptr, void *pz_ptr, void *par_ptr, int numparticles, int &numaddback)
- int ParallelTTrackerPush (void *r_ptr, void *p_ptr, int npart, void *dt_ptr, double dt, double c, bool usedt=false, int streamId=-1)
- int **ParallelTTrackerKick** (void *r_ptr, void *p_ptr, void *ef_ptr, void *bf_ptr, void *dt_ptr, double charge, double mass, int npart, double c, int streamId=-1)
- int ParallelTTrackerPushTransform (void *x_ptr, void *p_ptr, void *lastSec_ptr, void *orient_ptr, int npart, int nsec, void *dt_ptr, double dt, double c, bool usedt=false, int streamId=-1)

Additional Inherited Members

3.11.1 Detailed Description

CudaCollimatorPhysics class. Contains kerenls that execute CollimatorPhysics functions form OPAL. For detailed documentation on CollimatorPhysics functions see OPAL documentation

3.11.2 Constructor & Destructor Documentation

3.11.2.1 CudaCollimatorPhysics::CudaCollimatorPhysics (CudaBase * *base*) [inline]

Constructor with CudaBase argument

3.11.2.2 CudaCollimatorPhysics::CudaCollimatorPhysics ( ) [inline]

Constructor - empty.

3.11.2.3 CudaCollimatorPhysics::~CudaCollimatorPhysics ( ) [inline]

Destructor - empty

3.11.3 Member Function Documentation

3.11.3.1 int CudaCollimatorPhysics::CollimatorPhysics (void * *mem_ptr*, void * *par_ptr*, int *numpartices*, bool *enableRutherforScattering* = true) [virtual]

Execute collimator physics kernel.

Implements DKSCollimatorPhysics.

3.11.3.2 int CudaCollimatorPhysics::CollimatorPhysicsSort (void * *mem_ptr*, int *numparticles*, int & *numaddback*) [virtual]

Sort particle array on GPU. Count particles that are dead (label -1) or leaving material (label -2) and sort particle array so these particles are at the end of array

Implements DKSCollimatorPhysics.

3.11.3.3 int CudaCollimatorPhysics::ParallelTTrackerPush (void * *r_ptr*, void * *p_ptr*, int *npart*, void * *dt_ptr*, double *dt*, double *c*, bool *usedt* = false, int *streamId* = -1) [virtual]

BorisPusher push function for integration from OPAL. ParallelTTracker integration from OPAL implemented in cuda. For more details see ParallelTTracler docomentation in opal

Implements DKSCollimatorPhysics.

3.11.3.4 int CudaCollimatorPhysics::ParallelTTrackerPushTransform (void * *x_ptr*, void * *p_ptr*, void * *lastSec_ptr*, void * *orient_ptr*, int *npart*, int *nsec*, void * *dt_ptr*, double *dt*, double *c*, bool *usedt* = false, int *streamId* = -1) [virtual]

BorisPusher push function with transformto function form OPAL ParallelTTracker integration from OPAL implemented in cuda. For more details see ParallelTTracler docomentation in opal

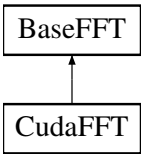
Implements DKSCollimatorPhysics.

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

- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaCollimatorPhysics.cuh
- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaCollimatorPhysics.cu

3.12 CudaFFT Class Reference

Inheritance diagram for CudaFFT:



Public Member Functions

- CudaFFT (CudaBase ∗base)
- CudaFFT ()
- ∼CudaFFT ()
- int setupFFT (int ndim, int N[3])
- int **setupFFTRC** (int ndim, int N[3], double scale=1.0)
- int **setupFFTCR** (int ndim, int N[3], double scale=1.0)
- int destroyFFT ()
- int **executeFFT** (void ∗mem_ptr, int ndim, int N[3], int streamId=-1, bool forward=true)
- int **executeIFFT** (void ∗mem_ptr, int ndim, int N[3], int streamId=-1)
- int **normalizeFFT** (void ∗mem_ptr, int ndim, int N[3], int streamId=-1)
- int **executeRCFFT** (void ∗real_ptr, void ∗comp_ptr, int ndim, int N[3], int streamId=-1)
- int **executeCRFFT** (void ∗real_ptr, void ∗comp_ptr, int ndim, int N[3], int streamId=-1)
- int **normalizeCRFFT** (void ∗real_ptr, int ndim, int N[3], int streamId=-1)

Additional Inherited Members

3.12.1 Constructor & Destructor Documentation

3.12.1.1 CudaFFT::CudaFFT (CudaBase ∗ *base*)

Constructor with CudaBase as argument

3.12.1.2 CudaFFT::CudaFFT ( )

constructor

3.12.1.3 CudaFFT::∼CudaFFT ( )

destructor

3.12.2 Member Function Documentation

3.12.2.1 int CudaFFT::destroyFFT ( ) [virtual]

Info: destroy default FFT plans Return: success or error code

Implements BaseFFT.

3.12.2.2 int CudaFFT::setupFFT (int *ndim*, int *N[3]*) [virtual]

Info: init cufftPlans witch can be reused for all FFTs of the same size and type Return: success or error code

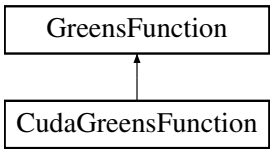
Implements BaseFFT.

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

- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaFFT.cuh
- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaFFT.cu

3.13 CudaGreensFunction Class Reference

Inheritance diagram for CudaGreensFunction:



Public Member Functions

- CudaGreensFunction (CudaBase ∗base)
- int greensIntegral (void ∗tmpgreen, int I, int J, int K, int NI, int NJ, double hr_m0, double hr_m1, double hr_m2, int streamId=-1)
- int integrationGreensFunction (void ∗rho2_m, void ∗tmpgreen, int I, int J, int K, int streamId=-1)
- int mirrorRhoField (void ∗rho2_m, int I, int J, int K, int streamId=-1)
- int multiplyCompelxFields (void ∗ptr1, void ∗ptr2, int size, int streamId=-1)

3.13.1 Constructor & Destructor Documentation

3.13.1.1 CudaGreensFunction::CudaGreensFunction (CudaBase ∗ *base*)

Constructor with CudaBase argument

3.13.2 Member Function Documentation

3.13.2.1 int CudaGreensFunction::greensIntegral (void ∗ *tmpgreen*, int *I*, int *J*, int *K*, int *NI*, int *NJ*, double *hr_m0*, double *hr_m1*, double *hr_m2*, int *streamId* = −1) [virtual]

Info: calc itegral on device memory (taken from OPAL src code) Return: success or error code

Implements GreensFunction.

3.13.2.2 int CudaGreensFunction::integrationGreensFunction (void * *rho2_m*, void * *tmpgreen*, int *I*, int *J*, int *K*, int *streamId* = -1) [virtual]

Info: integration of rho2_m field (taken from OPAL src code) Return: success or error code

Implements GreensFunction.

3.13.2.3 int CudaGreensFunction::mirrorRhoField (void * *rho2_m*, int *I*, int *J*, int *K*, int *streamId* = -1) [virtual]

Info: mirror rho field (taken from OPAL src code) Return: succes or error code

Implements GreensFunction.

3.13.2.4 int CudaGreensFunction::multiplyCompelxFields (void * *ptr1*, void * *ptr2*, int *size*, int *streamId* = -1) [virtual]

Info: multiply complex fields already on the GPU memory, result will be put in ptr1 Return: success or error code

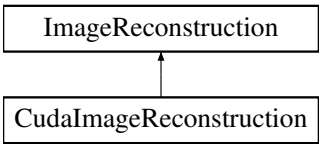
Implements GreensFunction.

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

- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaGreensFunction.cuh
- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaGreensFunction.cu

3.14 CudaImageReconstruction Class Reference

Inheritance diagram for CudaImageReconstruction:



Public Member Functions

- CudaImageReconstruction ()
- CudaImageReconstruction (CudaBase *base)
- ~CudaImageReconstruction ()
- int calculateSource (void *image_space, void *image_position, void *source_position, void *avg, void *std, float diameter, int total_voxels, int total_sources, int start=0)
- int calculateBackground (void *image_space, void *image_position, void *source_position, void *avg, void *std, float diameter, int total_voxels, int total_sources, int start=0)
- int calculateSources (void *image_space, void *image_position, void *source_position, void *avg, void *std, void *diameter, int total_voxels, int total_sources, int start=0)
- int calculateBackgrounds (void *image_space, void *image_position, void *source_position, void *avg, void *std, void *diameter, int total_voxels, int total_sources, int start=0)
- int generateNormalization (void *recon, void *image_position, void *det_position, int total_det)
- int forwardProjection (void *correction, void *recon, void *list_data, void *det_position, void *image_position, int num_events)
- int backwardProjection (void *correction, void *recon_corrector, void *list_data, void *det_position, void *image_position, int num_events, int num_voxels)
- int setDimensions (int voxel_x, int voxel_y, int voxel_z, float voxel_size)

- int setEdge (float x_edge, float y_edge, float z_edge)
- int setEdge1 (float x_edge1, float y_edge1, float z_edge1, float z_edge2)
- int setMinCrystalInRing (float min_CrystalDist_InOneRing, float min_CrystalDist_InOneRing1)
- int setParams (float matrix_distance_factor, float phantom_diameter, float atten_per_mm, float ring_diameter)

Additional Inherited Members

3.14.1 Constructor & Destructor Documentation

3.14.1.1 CudaImageReconstruction::CudaImageReconstruction ( ) [inline]

Constructor

3.14.1.2 CudaImageReconstruction::CudaImageReconstruction (CudaBase * *base*) [inline]

Constructor with base

3.14.1.3 CudaImageReconstruction::~CudaImageReconstruction ( ) [inline]

Destructor

3.14.2 Member Function Documentation

3.14.2.1 int CudaImageReconstruction::backwardProjection (void * *correction*, void * *recon_corrector*, void * *list_data*, void * *det_position*, void * *image_position*, int *num_events*, int *num_voxels*) [virtual]

Calculate backward projection. For image reconstruction calculates backward projections. see recon.cpp for details

Implements ImageReconstruction.

3.14.2.2 int CudaImageReconstruction::calculateBackground (void * *image_space*, void * *image_position*, void * *source_position*, void * *avg*, void * *std*, float *diameter*, int *total_voxels*, int *total_sources*, int *start* = 0) [virtual]

Cuda implementation of calculate background

Implements ImageReconstruction.

3.14.2.3 int CudaImageReconstruction::calculateBackgrounds (void * *image_space*, void * *image_position*, void * *source_position*, void * *avg*, void * *std*, void * *diameter*, int *total_voxels*, int *total_sources*, int *start* = 0) [virtual]

Calculate background for differente sources

Implements ImageReconstruction.

3.14.2.4 int CudaImageReconstruction::calculateSource (void * *image_space*, void * *image_position*, void * *source_position*, void * *avg*, void * *std*, float *diameter*, int *total_voxels*, int *total_sources*, int *start* = 0) [virtual]

CUDA implementation of caluclate source

Implements ImageReconstruction.

3.14.2.5 int CudaImageReconstruction::calculateSources (void * *image_space*, void * *image_position*, void * *source_position*, void * *avg*, void * *std*, void * *diameter*, int *total_voxels*, int *total_sources*, int *start* = 0) [virtual]

Caluclate source for differente sources

Implements ImageReconstruction.

3.14.2.6 int CudaImageReconstruction::forwardProjection (void * *correction*, void * *recon*, void * *list_data*, void * *det_position*, void * *image_position*, int *num_events*) [virtual]

Calculate forward projection. For image reconstruction calculates forward projections. see recon.cpp for details

Implements ImageReconstruction.

3.14.2.7 int CudaImageReconstruction::generateNormalization (void * *recon*, void * *image_position*, void * *det_position*, int *total_det*) [virtual]

Generate normalization. Goes trough detectors pairs and if detector pair crosses image launches seperate kernel that updates voxel values in the image on the slope between these two detectors.

Implements ImageReconstruction.

3.14.2.8 int CudaImageReconstruction::setDimensions (int *voxel_x*, int *voxel_y*, int *voxel_z*, float *voxel_size*) [virtual]

Set the voxel dimensins on device.

Implements ImageReconstruction.

3.14.2.9 int CudaImageReconstruction::setEdge (float *x_edge*, float *y_edge*, float *z_edge*) [virtual]

Set the image edge.

Implements ImageReconstruction.

3.14.2.10 int CudaImageReconstruction::setEdge1 (float *x_edge1*, float *y_edge1*, float *z_edge1*, float *z_edge2*) [virtual]

Set the image edge1.

Implements ImageReconstruction.

3.14.2.11 int CudaImageReconstruction::setMinCrystalInRing (float *min_CrystalDist_InOneRing*, float *min_CrystalDist_InOneRing1*) [virtual]

Set the minimum crystan in one ring values.

Implements ImageReconstruction.

3.14.2.12 int CudaImageReconstruction::setParams (float *matrix_distance_factor*, float *phantom_diameter*, float *atten_per_mm*, float *ring_diameter*) [virtual]

Set all other required parameters for reconstruction.

Implements ImageReconstruction.

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

- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaImageReconstruction.cuh
- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaImageReconstruction.cu

3.15 Device Class Reference

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

- /home/l_locans/gitwork/DKS-src/src/DKSDevice.h

3.16 DKSAutoTuning Class Reference

Public Member Functions

- DKSAutoTuning (DKSBase *base, std::string api, std::string device, int loops=100)
- ~DKSAutoTuning ()
- void setFunction (std::function< int()> f, std::string name, bool evaluate_time=true)
- void **setFunction** (std::function< double()> f, std::string name, bool evaluate_time=false)
- template<typename T1 >
  void addParameter (T1 *value, T1 min, T1 max, T1 step, std::string name)
- void clearParameters ()
- void exaustiveSearch ()
- void lineSearch ()
- void hillClimbing (int restart_loops=1)
- void simulatedAnnealing (double Tstart, double Tstep)

3.16.1 Constructor & Destructor Documentation

3.16.1.1 DKSAutoTuning::DKSAutoTuning (DKSBase * *base*, std::string *api*, std::string *device*, int *loops* = 100)

Constructor

3.16.1.2 DKSAutoTuning::~DKSAutoTuning ( )

Destructor

3.16.2 Member Function Documentation

3.16.2.1 template<typename T1 > void DKSAutoTuning::addParameter (T1 * *value*, T1 *min*, T1 *max*, T1 *step*, std::string *name*) [inline]

Set parameter for auto tuning. Provide a pointer to a parameter that will be changed during auto-tuning and a min-max value for this element

3.16.2.2 void DKSAutoTuning::clearParameters ( )

Delete all added parameters

3.16.2.3 void DKSAutoTuning::exaustiveSearch ( )

Perform exaustive search evaluating all the parameter configurations

3.16.2.4 void DKSAutoTuning::hillClimbing (int *restart_loops* = 1)

Perform hill climbing

3.16.2.5 void DKSAutoTuning::lineSearch ( )

Perform auto-tuning. Perform line-search auto-tuning by variying parameters one at a time and keeping other parameters constant.

3.16.2.6 void DKSAutoTuning::setFunction (std::function< int()> *f*, std::string *name*, bool *evaluate_time* = true) [inline]

Set function to auto tune. Caller of setFunction is responsible to bind the correct parameters to the function with std::bind.

3.16.2.7 void DKSAutoTuning::simulatedAnnealing (double *Tstart*, double *Tstep*)

Perfor simulated annealing to find the parameters

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

- /home/l_locans/gitwork/DKS-src/src/AutoTuning/DKSAutoTuning.h
- /home/l_locans/gitwork/DKS-src/src/AutoTuning/DKSAutoTuning.cpp

3.17 DKSAutoTuningTester Class Reference

Public Member Functions

- double **peaksZ** ()

Friends

- class **DKSBaseMuSR**

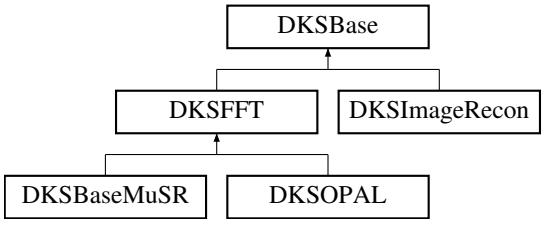
The documentation for this class was generated from the following file:

- /home/l_locans/gitwork/DKS-src/src/AutoTuning/DKSAutoTuningTester.h

3.18 DKSBase Class Reference

`#include <DKSBase.h>`

Inheritance diagram for DKSBase:



Public Member Functions

- DKSBase ()
- DKSBase (const char *api_name, const char *device_name)
- ~DKSBase ()
- int setupDevice ()
- void setAutoTuningOn ()
- void setAutoTuningOff ()
- bool isAutoTuningOn ()
- void setUseConfigOn ()
- void setUseConfigOff ()
- bool isUseConfigOn ()
- int setDevice (const char *device_name, int length=-1)
- int setAPI (const char *api_name, int length=-1)
- int getDevices ()
- int getDeviceCount (int &ndev)
- int getDeviceName (std::string &device_name)
- int setDefaultDevice (int device)
- int getDeviceList (std::vector< int > &devices)
- int initDevice ()
- int createStream (int &streamId)
- int closeHandle (void *mem_ptr)
- int syncDevice ()
- template<typename T >
  void * pushData (const void *data_in, int elements, int &ierr)
- template<typename T >
  int pullData (void *mem_ptr, void *data_out, int elements)
- template<typename T >
  void * allocateMemory (int elements, int &ierr)
- template<typename T >
  int allocateHostMemory (T *&ptr, int size)
- template<typename T >
  int freeHostMemory (T *&ptr, int size)
- template<typename T >
  int registerHostMemory (T *ptr, int size)
- template<typename T >
  int unregisterHostMemory (T *ptr)
- template<typename T >
  int writeData (void *mem_ptr, const void *data, int elements, int offset=0)
- template<typename T >
  int writeDataAsync (void *mem_ptr, const void *data, int elements, int streamId=-1, int offset=0)
- template<typename T >
  int readData (const void *mem_ptr, void *out_data, int elements, int offset=0)
- template<typename T >
  int readDataAsync (const void *mem_ptr, void *out_data, int elements, int streamId=-1, int offset=0)
- template<typename T >
  int freeMemory (void *mem_ptr, int elements)
- int callCreateRandomNumbers (void *mem_ptr, int size)
- int callInitRandoms (int size, int seed=-1)
- int callMemInfo ()
- void oclEventInfo ()
- void oclClearEvents ()

Protected Member Functions

- bool apiOpenCL ()
- bool apiCuda ()
- bool apiOpenMP ()
- bool deviceGPU ()
- bool deviceCPU ()
- bool deviceMIC ()
- int loadOpenCLKernel (const char *kernel_name)
- std::string **getAPI** ()
- std::string **getDevice** ()

Protected Attributes

- DKSConfig **dksconfig**

3.18.1 Detailed Description

DKSBase class. DKSBase.h Author: Uldis Locans Date: 15.09.2014 Base class of Dynamic Kernel Scheduler that handles the function calls from host application to DKSDKSBase class for handling function calls to DKS library

3.18.2 Constructor & Destructor Documentation

3.18.2.1 DKSBase::DKSBase ( )

Default constructor.

3.18.2.2 DKSBase::DKSBase (const char * *api_name,* const char * *device_name*)

Constructor that sets api and devcie to use with DKS.

3.18.2.3 DKSBase::~DKSBase ( )

Destructor. Free DKS resources.

3.18.3 Member Function Documentation

3.18.3.1 template<typename T > int DKSBase::allocateHostMemory (T *& *ptr,* int *size*) [inline]

Allocates host memory as page-locked. Used for memroy allocation on the host side for pointer ptr for size elements. Page locked memory improves data transfer rates between host and device and allows async data transfer and kernel execution. Reurns succes or error code. TODO: opencl and mic implementations needed.

3.18.3.2 template<typename T > void* DKSBase::allocateMemory (int *elements,* int & *ierr*) [inline]

Allocate memory on device and return pointer to device memory. Allocates memory of type T, elements specifies the number of elements for which memory should be allocated. If memory allocation fails ierr is set to error code. Returns void pointer to device memory.

3.18.3.3 bool DKSBase::apiCuda ( ) [protected]

Check if current API is set to CUDA. Return true/false wether curretn api is cuda

3.18.3.4 bool DKSBase::apiOpenCL ( ) [protected]

Check if current API is set to OpenCL Return true/false wether current api is opencl

3.18.3.5 bool DKSBase::apiOpenMP ( ) [protected]

Check if current API is set to OpenMP. Return true/false whether current api is OpenMP

3.18.3.6 int DKSBase::callCreateRandomNumbers (void * *mem_ptr,* int *size*)

Create random numbers on the device and fille mem_data array

3.18.3.7 int DKSBase::callInitRandoms (int *size,* int *seed* = -1)

Init random number states and save for reuse on device. If seed is -1, a random seed based on current time is taken. TODO: opencl and mic implementations.

3.18.3.8 int DKSBase::callMemInfo ( ) [inline]

Print memory information on device (total, used, available) TODO: opencl and mic imlementation

3.18.3.9 int DKSBase::closeHandle (void * *mem_ptr*)

Send pointer to device memory from one MPI process to another. Implemented only if mpi compiler is used to build DKS. Implemented only for cuda. Uses cuda icp. Gets icp handle of memory allocated on device pointed by mem_ptr does MPI_Send to dest process where matching receivePointer should be called. Returns success or error code. TODO: opencl and mic cases still need implementations Receive pointer to device memory from another MPI process. Implemented only if mpi compiler is used to build DKS. Implemented only for cuda. Uses cuda icp. Uses MPI_Recv to get icp handle from another MPI process and opens a reference to this memory. Togeter with sendPointer function allows multiple MPI processes to share one memory region of the device. Returns success or error code. TODO: opencl and mic cases still need implementations Close handle to device memory. If receivePointer is used to open memory handle allocated by another MPI process closeHandle should be called to free resources instead of freeMemory. Returns success or error code. TODO: opencl and mic cases still need implementations.

3.18.3.10 int DKSBase::createStream (int & *streamId*)

Create stream for async execution. Function to create different streams with device to allow assync kernel execution and data transfer. Currently implemented for CUDA with cuda streams. streamId will be can be used later use the created stream. Returns success or error code. TODO: for opencl use different contexts similar as cuda streams to achieve async execution. TODO: for intel mic look at library (libxstream) from Hans Pabst.

3.18.3.11 bool DKSBase::deviceCPU ( ) [protected]

Check if device is CPU

3.18.3.12 bool DKSBase::deviceGPU ( ) [protected]

Check if device is GPU

3.18.3.13 bool DKSBase::deviceMIC ( ) [protected]

Check if device is MIC

3.18.3.14 template<typename T > int DKSBase::freeHostMemory (T *& *ptr,* int *size*) [inline]

Free host page-locked memory. Used to free page-locked memory on the host that was allocated using allocate-HostMemory. ptr is the host pointer where page-locked memory was allocated, size - number of elements held by the memroy.

3.18.3.15 template<typename T > int DKSBase::freeMemory (void * *mem_ptr,* int *elements*) [inline]

Free memory allocated on device. Free memory referenced by mem_ptr, elements - number of elements in memory, T - data type.

3.18.3.16 int DKSBase::getDeviceCount (int & *ndev*)

Returns device count. Saves the number of the devices available on the platform to ndev.

3.18.3.17 int DKSBase::getDeviceList (std::vector< int > & *devices*)

Get unique devices. Get a list of all the unique devices available on the platform. When API and device type for DKS is set, getDeviceList can get all the unique devices available for this API and device type. Used for autotuning if multiple different GPUs are installed on the system.

3.18.3.18 int DKSBase::getDeviceName (std::string & *device_name*)

Get the name of the device in use. Query the device that is used and get the naem of the device. The name is saved in the device_name string. Returns DKS_SUCCESS

3.18.3.19 int DKSBase::getDevices ( )

Prints information about all available devices. Calls CUDA, OpenCL and MIC functions to query for available devices for each framework and pirnts information about each device. Length specifies the number of characters in api_-name array Returns success or error code

3.18.3.20 int DKSBase::initDevice ( )

Inititialize DKS. Set framework and device to use. If OpenCL is used create context with device. Return success or error code.

3.18.3.21 bool DKSBase::isAutoTuningOn ( ) [inline]

Get status of auto tuning

3.18.3.22 bool DKSBase::isUseConfigOn ( ) [inline]

Check if using config file

3.18.3.23 int DKSBase::loadOpenCLKernel (const char * *kernel_name*) [protected]

Get cbase pointerCall OpenCL base to load specified kenrel file.

3.18.3.24 void DKSBase::oclClearEvents ( ) [inline]

Test function to profile opencl kernel calls. Used for debuging and timing purposes only.

3.18.3.25 void DKSBase::oclEventInfo ( ) [inline]

Test function to profile opencl kernel calls. Used for debuging and timing purposes only.

3.18.3.26 template<typename T > int DKSBase::pullData (void * *mem_ptr,* void * *data_out,* int *elements*) [inline]

Read data from device and free device memory. Reads data from device pointed by mem_ptr into data_out pointer. Elements specifies the number of data elements to read, T specifies the datatype of elements to copy. Returns error code if read data or free memory fails.

3.18.3.27 template<typename T > void* DKSBase::pushData (const void * *data_in,* int *elements,* int & *ierr*) [inline]

Allocate memory and transfer data to device. Returns a void pointer which can be used in later kernels to reference allocated device memory. data_in pointer to data to be transfered to device, elements is the number of data elements to transfer, T - type of data to transfer. If memory allocation or data transfer fails ierr will be set to error code.

3.18.3.28 template<typename T > int DKSBase::readData (const void * *mem_ptr,* void * *out_data,* int *elements,* int *offset* = 0) [inline]

Gather 3D data from multiple mpi processes to one memory region. When multiple processes share the same device memory using sendPointer and receivePointer gather3DDataAsync allows each process to write data to its memory region. Uses async writes. mem_ptr - device pointer, data - host pointer, Ng - global dimensions of data, Nl - local data dimensions, id - starting indexes in global domain for each process streamId - stream to use for data transfers. Returns success or error code. Scatter 3D data to multiple MPI processes from one device memory region. When multiple processes share the same device memory using sendPointer and receivePointer scatter3DDataAsync allows each process to read data from its memory region. Uses async reads. mem_ptr - device pointer, data - host pointer, Ng - global dimensions of data, Nl - local data dimensions, id - starting indexes in global domain for each process streamId - stream to use for data transfers. Returns success or error code. Create MPI subarray for 3D data gather and scatter using cuda aware MPI. If multiple MPI processes share device and cuda aware MPI is used for data transfer creates a MPI subarray so each MPI process can write and read to its own memory region. N_global - global domain dimensions, N_local - local domain dimensions, datatype - MPI datatype Gather 3D data from multiple MPI processes to device using cuda aware MPI. Using cuda aware mpi allows to gather data to one device memory region allocated by one of the mpi processes. mem_ptr - device pointer, data - host memory pointer, size - number of elements to transfer, stype - data type of elements, N_global - global dimensions of the domain, N_local - local domain dimensions, idx,idy,idz - starting indexes in global domain for each process, numNodes - number of processes, myNode - current node, rootNode - node that allocated device memory, comm - MPI communicator TODO: opencl and mic implementations (solution other than cuda aware mpi needed). Gather 3D data from multiple MPI processes to device using cuda aware MPI and non blocking gather. For detailed parameter description see gather3DData docs. TODO: opencl and mic implementations (solution other than cuda aware mpi needed). Scatter 3D data from device to multiple MPI processes using cuda aware MPI. If multiple MPI prcesses share one device allows to scatter 3D data regions from device memory allocated by one of the processes to all other MPI processes. For detailed parameter description see gather3DData docs. TODO: opencl and mic implementations (solution other than cuda aware mpi needed). Read data from device memory. Read data referenced by mem_ptr int out_data. Elements indicates the number of data elements to read and offset is the offset on the device from start of the memroy. Data type to read is specified by T. Performs a blocking read.

3.18.3.29 template<typename T > int DKSBase::readDataAsync (const void * *mem_ptr,* void * *out_data,* int *elements,* int *streamId* = −1, int *offset* = 0) [inline]

Performs an async data read from device. Queues data read from device and returns control to host. stream id specifies stream to use for the read. Device async read can be performed if host memroy is page-locked and strema

other than default -1 is used. For other parameter detailed description see readData function. TODO: opencl and mic implementations (currently reverts to blocking reads).

3.18.3.30 template<typename T > int DKSBase::registerHostMemory (T * *ptr,* int *size*) [inline]

Page lock allocated host memory. Page locked memory improves data transfer between host and device (true for cuda and opencl, maybe also mic). ptr - pointer to memory that needs to be page locked, size - number of elements in array. TODO: mic and opencl implementations needed

3.18.3.31 int DKSBase::setAPI (const char * *api_name,* int *length* = -1)

Set framework to use with DKS. Sets framework and API that DKS uses to execute code on device. Supported API's are OpenCL, CUDA and OpenMP. Returns success or error code. Length specifies the number of characters in api_name array (length - deprecated).

3.18.3.32 void DKSBase::setAutoTuningOff ( ) [inline]

Turn of auto tuning

3.18.3.33 void DKSBase::setAutoTuningOn ( ) [inline]

Turn on auto tuning

3.18.3.34 int DKSBase::setDefaultDevice (int *device*)

Set the device to use. Pass the index of the device to use by dks.

3.18.3.35 int DKSBase::setDevice (const char * *device_name,* int *length* = -1)

Set device to use with DKS. Sets specific device to use with DKS. Supported devices are -gpu and -mic. Length specifies the number of characters in device_name array (length - deprecated). Return success or error code.

3.18.3.36 int DKSBase::setupDevice ( )

Function to initialize objects based on the device used.

3.18.3.37 void DKSBase::setUseConfigOff ( ) [inline]

Turn off use of config file

3.18.3.38 void DKSBase::setUseConfigOn ( ) [inline]

Turn on use of config file

3.18.3.39 int DKSBase::syncDevice ( )

Wait till all tasks running on device are completed. Forces a device synchronization - waits till all tasks on the device are complete. Implemented for cuda. Forces sync only in context in witch it is called - only waits for tasks launched by process calling syncDevice. If multiple processes launch different tasks each process is responsible for its own synchronization. Returns success or error code. TODO: opencl and mic implementations still necessary

3.18.3.40 template<typename T > int DKSBase::unregisterHostMemory (T * *ptr*) [inline]

Unregister page locked memory. TODO: opencl and mic implementations needed·

3.18.3.41 template<typename T > int DKSBase::writeData (void * *mem_ptr,* const void * *data,* int *elements,* int *offset* = 0) [inline]

Write data from host to device. Write data from data to device memory referenced by mem_ptr. Elements spicify the number of elements to write, offset specifies the offset from the first element. Returns success or error code. Performs a blocking write - control to the host is returned only when data transfer is complete.

3.18.3.42 template<typename T > int DKSBase::writeDataAsync (void * *mem_ptr,* const void * *data,* int *elements,* int *streamId* = -1, int *offset* = 0) [inline]

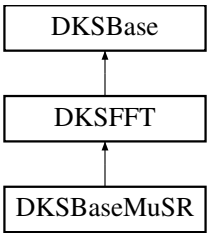
Write data to device using async write. Queue a async data write and return control to host imediately. mem_ptr - device memory pointer, data - host memory pointer, elements - number of data elements to write stremaId - stream id to use, offset - offset on device from first element For trully async execution on cuda stream other than default needs to be created and device memory must be page-locked. Otherwise functions just asynchronosly with respect to host. TODO: mic and opencl implementations needed (goes to blocking writes)

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

- /home/l_locans/gitwork/DKS-src/src/DKSBase.h
- /home/l_locans/gitwork/DKS-src/src/DKSBase.cpp

3.19 DKSBaseMuSR Class Reference

Inheritance diagram for DKSBaseMuSR:



Public Member Functions

- int callCompileProgram (std::string function, bool mlh=false)
- int callLaunchChiSquare (int fitType, void *mem_data, void *mem_err, int length, int numpar, int numfunc, int nummap, double timeStart, double timeStep, double &result)
- int callAutoTuningChiSquare (int fitType, void *mem_data, void *mem_err, int length, int numpar, int numfunc, int nummap, double timeStart, double timeStep, double &result, std::vector< int > &config)
- int callSetConsts (double N0, double tau, double bkg)
- int callSetConsts (double alpha, double beta)
- int initChiSquare (int size_data, int size_param, int size_func, int size_map)
- int freeChiSquare ()
- int writeParams (const double *params, int numparams)
- int writeFunctions (const double *func, int numfunc)
- int writeMaps (const int *map, int numfunc)
- int checkMuSRKernels (int fitType)
- int checkMuSRKernels (int fitType, int &threadsPerBlock)

- int testAutoTuning ()
- int getOperations (int &oper)

Additional Inherited Members

3.19.1 Member Function Documentation

3.19.1.1 int DKSBaseMuSR::callAutoTuningChiSquare (int *fitType*, void * *mem_data*, void * *mem_err*, int *length*, int *numpar*, int *numfunc*, int *nummap*, double *timeStart*, double *timeStep*, double & *result*, std::vector< int > & *config*)

Launch auto-tuning of chisquare function for the selected device. Creates a function pointer to callLaunchChiSquare with necessary arguments bind to function call. CUDA and OpenCL version - gives AutoTuning class access to numThreads parameter which is varied to find the optimal value by AutoTuning class. Uses brute force method to test all the values.

3.19.1.2 int DKSBaseMuSR::callCompileProgram (std::string *function*, bool *mlh* = `false`)

Compile the program with kernels to be run. String function contains the string that will be added to the code to compile in the function: **device** double fTheory(double t, double *p, double *f, int *m); Function string must be a valid C math expression. It can contain operators, math functions and predefined functions listed in: http://lmu.web.psi.ch/musrfit/user/MUSR/MusrFit.html#A_4.3_The_THEORY-_Block Predifined functions can be accessed by the abbreviation given in the table Parameters can be accesed in form p[idx] or p[m[idx]] - where p represents parameter array m represents map array and idx is the index to use from the maps. Precalculated function values can be accessed the same way - f[idx] or f[m[idx]]. Returns DKS_SUCCESS if everythin runs successfully, otherwise returns DKS_ERROR. If DKS is compiled with debug flag enabled prints DKS error message in case something fails

3.19.1.3 int DKSBaseMuSR::callLaunchChiSquare (int *fitType*, void * *mem_data*, void * *mem_err*, int *length*, int *numpar*, int *numfunc*, int *nummap*, double *timeStart*, double *timeStep*, double & *result*)

Launch chi square calculation on data set writen in mem_data memory on device. mem_par, mem_map and mem_func hold pointers to parameter, function and map values for this data set (parameter array is one for all the data sets, maps and functions change between data sets). Resulting chi square value for this dataset will be put in result variable. Returns DKS_SUCCESS if everythin runs successfully, otherwise returns DKS_ERROR. If DKS is compiled with debug flag enabled prints DKS error message in case something fails

3.19.1.4 int DKSBaseMuSR::callSetConsts (double *N0*, double *tau*, double *bkg*)

Set N0, tau and BKG values for the run. Needs to be called before kernel launch if these values are changing

3.19.1.5 int DKSBaseMuSR::callSetConsts (double *alpha*, double *beta*)

Set alpha and beta values for the run. Needs to be called before kernel launch if these values are changing

3.19.1.6 int DKSBaseMuSR::checkMuSRKernels (int *fitType*)

Check if device can run necessary kernels. Check selected device properties to see if device suports double precision and if device can run the necessary number of work_items / work_groups to successfully execute CUDA/OpenCL kernels.

3.19.1.7 int DKSBaseMuSR::checkMuSRKernels (int *fitType,* int & *threadsPerBlock*)

Perform the same check as checkMuSRKernels(int fitType) and return max threads per block. Used for autotuning to check what is the device limit for threads per block to correctly set the upper bound when searching the parameter space.

3.19.1.8 int DKSBaseMuSR::freeChiSquare ( )

Free temporary device storage allocated for chi^2 kernel. Return error code if freeing the device fails.

3.19.1.9 int DKSBaseMuSR::getOperations (int & *oper*)

Get the number of operations in compiled kernel.

3.19.1.10 int DKSBaseMuSR::initChiSquare (int *size_data,* int *size_param,* int *size_func,* int *size_map*)

Init chisquare calculations. Size is the maximum number of elements in any of the data sets used.

3.19.1.11 int DKSBaseMuSR::testAutoTuning ( )

Debug function to test auto-tuning search functions

3.19.1.12 int DKSBaseMuSR::writeFunctions (const double * *func,* int *numfunc*)

Write function values to device. Write precalculated function values to device, memory for functions on device is handled by DKS.

3.19.1.13 int DKSBaseMuSR::writeMaps (const int * *map,* int *numfunc*)

Write map indexes to device. Write map indexes to use in defined theory function to devive. Memory for map indexes is handeld by DKS.

3.19.1.14 int DKSBaseMuSR::writeParams (const double * *params,* int *numparams*)

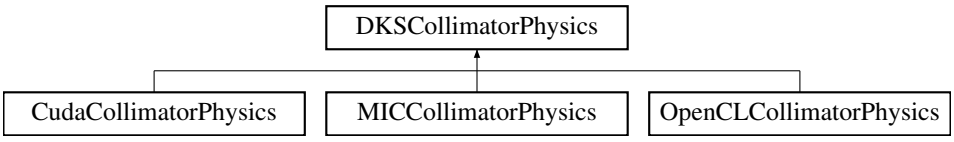
Write params to device. Write pramas from double array to device, params device memory is managed by DKS.

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

- /home/l_locans/gitwork/DKS-src/src/DKSBaseMuSR.h
- /home/l_locans/gitwork/DKS-src/src/DKSBaseMuSR.cpp

3.20 DKSCollimatorPhysics Class Reference

Inheritance diagram for DKSCollimatorPhysics:



Public Member Functions

- virtual int **CollimatorPhysics** (void ∗mem_ptr, void ∗par_ptr, int numpartices, bool enableRutherforScattering=true)=0
- virtual int **CollimatorPhysicsSoA** (void ∗label_ptr, void ∗localID_ptr, void ∗rx_ptr, void ∗ry_ptr, void ∗rz_ptr, void ∗px_ptr, void ∗py_ptr, void ∗pz_ptr, void ∗par_ptr, int numparticles)=0
- virtual int **CollimatorPhysicsSort** (void ∗mem_ptr, int numparticles, int &numaddback)=0
- virtual int **CollimatorPhysicsSortSoA** (void ∗label_ptr, void ∗localID_ptr, void ∗rx_ptr, void ∗ry_ptr, void ∗rz_ptr, void ∗px_ptr, void ∗py_ptr, void ∗pz_ptr, void ∗par_ptr, int numparticles, int &numaddback)=0
- virtual int **ParallelTTrackerPush** (void ∗r_ptr, void ∗p_ptr, int npart, void ∗dt_ptr, double dt, double c, bool usedt=false, int streamId=-1)=0
- virtual int **ParallelTTrackerKick** (void ∗r_ptr, void ∗p_ptr, void ∗ef_ptr, void ∗bf_ptr, void ∗dt_ptr, double charge, double mass, int npart, double c, int streamId=-1)=0
- virtual int **ParallelTTrackerPushTransform** (void ∗x_ptr, void ∗p_ptr, void ∗lastSec_ptr, void ∗orient_ptr, int npart, int nsec, void ∗dt_ptr, double dt, double c, bool usedt=false, int streamId=-1)=0

Protected Attributes

- int **numBlocks_m**
- int **blockSize_m**

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

- /home/l_locans/gitwork/DKS-src/src/Algorithms/CollimatorPhysics.h

3.21 DKSConfig Class Reference

Public Member Functions

- DKSConfig ()
- int loadConfigFile ()
- int saveConfigFile ()
- int addConfigParameter (const std::string api, const std::string device, const std::string name, const std::string func, int size, std::string param, int value)
- int getConfigParameter (const std::string api, const std::string device, const std::string name, const std::string func, int size, std::string param, int &value)

3.21.1 Constructor & Destructor Documentation

3.21.1.1 DKSConfig::DKSConfig ( )

Constructor, set home variable. If home directory is not set config file can not be read or saved

3.21.2 Member Function Documentation

3.21.2.1 int DKSConfig::addConfigParameter (const std::string *api,* const std::string *device,* const std::string *name,* const std::string *func,* int *size,* std::string *param,* int *value*)

Add config parameter to tree

3.21.2.2 int DKSConfig::getConfigParameter (const std::string *api,* const std::string *device,* const std::string *name,* const std::string *func,* int *size,* std::string *param,* int & *value*)

Get config parameter from the tree

3.21.2.3 int DKSConfig::loadConfigFile ( )

Load autotuinig.xml into tree variable if this file exists

3.21.2.4 int DKSConfig::saveConfigFile ( )

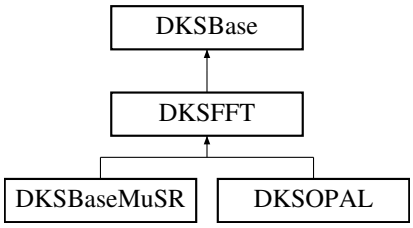
Save autotuning.xml file

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

- /home/l_locans/gitwork/DKS-src/src/AutoTuning/DKSConfig.h
- /home/l_locans/gitwork/DKS-src/src/AutoTuning/DKSConfig.cpp

3.22 DKSFFT Class Reference

Inheritance diagram for DKSFFT:



Public Member Functions

- int setupFFT (int ndim, int N[3])
- int **setupFFTRC** (int ndim, int N[3], double scale=1.0)
- int **setupFFTCR** (int ndim, int N[3], double scale=1.0)
- int callFFT (void ∗data_ptr, int ndim, int dimsize[3], int streamId=-1)
- int callIFFT (void ∗data_ptr, int ndim, int dimsize[3], int streamId=-1)
- int callNormalizeFFT (void ∗data_ptr, int ndim, int dimsize[3], int streamId=-1)
- int callR2CFFT (void ∗real_ptr, void ∗comp_ptr, int ndim, int dimsize[3], int streamId=-1)
- int callC2RFFT (void ∗real_ptr, void ∗comp_ptr, int ndim, int dimsize[3], int streamId=-1)
- int callNormalizeC2RFFT (void ∗real_ptr, int ndim, int dimsize[3], int streamId=-1)

Additional Inherited Members

3.22.1 Member Function Documentation

3.22.1.1 int DKSFFT::callC2RFFT (void ∗ *real_ptr,* void ∗ *comp_ptr,* int *ndim,* int *dimsize[3],* int *streamId* = −1)

Call complex to real iFFT. Executes out of place complex to real ifft, real_ptr points to real data, comp_pt - points to complex data, ndim - dimension of data, dimsize size of each dimension. real_ptr size should be dimsize[0]∗dimsize[1]∗disize[2], comp_ptr size should be atleast (dimsize[0]/2+1)∗dimsize[1]∗dimsize[2] TODO: opencl and mic implementations.

3.22.1.2 int DKSFFT::callFFT (void * *data_ptr,* int *ndim,* int *dimsize[3],* int *streamId* = -1)

Call complex-to-complex fft. Executes in place complex to compelx fft on the device on data pointed by data_ptr. stream id can be specified to use other streams than default. TODO: mic implementation

3.22.1.3 int DKSFFT::callIFFT (void * *data_ptr,* int *ndim,* int *dimsize[3],* int *streamId* = -1)

Call complex-to-complex ifft. Executes in place complex to compelx ifft on the device on data pointed by data_ptr. stream id can be specified to use other streams than default. TODO: mic implementation.

3.22.1.4 int DKSFFT::callNormalizeC2RFFT (void * *real_ptr,* int *ndim,* int *dimsize[3],* int *streamId* = -1)

Normalize compelx to real ifft. Cuda, mic and OpenCL implementations return ifft unscaled, this function divides each element by fft size. TODO: opencl and mic implementations.

3.22.1.5 int DKSFFT::callNormalizeFFT (void * *data_ptr,* int *ndim,* int *dimsize[3],* int *streamId* = -1)

Normalize complex to complex ifft. Cuda, mic and OpenCL implementations return ifft unscaled, this function divides each element by fft size TODO: mic implementation.

3.22.1.6 int DKSFFT::callR2CFFT (void * *real_ptr,* void * *comp_ptr,* int *ndim,* int *dimsize[3],* int *streamId* = -1)

Call real to complex FFT. Executes out of place real to complex fft, real_ptr points to real data, comp_pt - points to complex data, ndim - dimension of data, dimsize size of each dimension. real_ptr size should be dimsize[0]*dimsize[1]*disize[2], comp_ptr size should be atleast (dimsize[0]/2+1)*dimsize[1]*dimsize[2] TODO: opencl and mic implementations

3.22.1.7 int DKSFFT::setupFFT (int *ndim,* int *N[3]*)

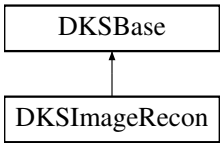
Setup FFT function. Initializes parameters for fft executuin. If ndim $>$ 0 initializes handles for fft calls. If ffts of various sizes are needed setupFFT should be called with ndim 0, in this case each fft will do its own setup according to fft size and dimensions. TODO: opencl and mic implementations

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

- /home/l_locans/gitwork/DKS-src/src/DKSFFT.h
- /home/l_locans/gitwork/DKS-src/src/DKSFFT.cpp

3.23 DKSImageRecon Class Reference

Inheritance diagram for DKSImageRecon:



Public Member Functions

- int callCalculateSource (void *image_space, void *image_position, void *source_position, void *avg, void *std, float diameter, int total_voxels, int total_sources, int start=0)

- int callCalculateBackground (void *image_space, void *image_position, void *source_position, void *avg, void *std, float diameter, int total_voxels, int total_sources, int start=0)
- int callCalculateSources (void *image_space, void *image_position, void *source_position, void *avg, void *std, void *diameter, int total_voxels, int total_sources, int start=0)
- int callCalculateBackgrounds (void *image_space, void *image_position, void *source_position, void *avg, void *std, void *diameter, int total_voxels, int total_sources, int start=0)
- int callGenerateNormalization (void *recon, void *image_position, void *det_position, int total_det)
- int callForwardProjection (void *correction, void *recon, void *list_data, void *det_position, void *image_position, int num_events)
- int callBackwardProjection (void *correction, void *recon_corrector, void *list_data, void *det_position, void *image_position, int num_events, int num_voxels)
- int setDimensions (int voxel_x, int voxel_y, int voxel_z, float voxel_size)
- int setEdge (float x_edge, float y_edge, float z_edge)
- int setEdge1 (float x_edge1, float y_edge1, float z_edge1, float z_edge2)
- int setMinCrystalInRing (float min_CrystalDist_InOneRing, float min_CrystalDist_InOneRing1)
- int setParams (float matrix_distance_factor, float phantom_diameter, float atten_per_mm, float ring_diameter)

Additional Inherited Members

3.23.1 Member Function Documentation

3.23.1.1 int DKSImageRecon::callBackwardProjection (void * *correction*, void * *recon_corrector*, void * *list_data*, void * *det_position*, void * *image_position*, int *num_events*, int *num_voxels*)

Image reconstruction - backward projection.

3.23.1.2 int DKSImageRecon::callCalculateBackground (void * *image_space*, void * *image_position*, void * *source_position*, void * *avg*, void * *std*, float *diameter*, int *total_voxels*, int *total_sources*, int *start* = 0)

Image reconstruction analaysis calculate source.

3.23.1.3 int DKSImageRecon::callCalculateBackgrounds (void * *image_space*, void * *image_position*, void * *source_position*, void * *avg*, void * *std*, void * *diameter*, int *total_voxels*, int *total_sources*, int *start* = 0)

Image reconstruction analaysis calculate source.

3.23.1.4 int DKSImageRecon::callCalculateSource (void * *image_space*, void * *image_position*, void * *source_position*, void * *avg*, void * *std*, float *diameter*, int *total_voxels*, int *total_sources*, int *start* = 0)

Image reconstruction analaysis calculate source.

3.23.1.5 int DKSImageRecon::callCalculateSources (void * *image_space*, void * *image_position*, void * *source_position*, void * *avg*, void * *std*, void * *diameter*, int *total_voxels*, int *total_sources*, int *start* = 0)

Image reconstruction analaysis calculate source.

3.23.1.6 int DKSImageRecon::callForwardProjection (void * *correction*, void * *recon*, void * *list_data*, void * *det_position*, void * *image_position*, int *num_events*)

Image reconstruction - forward correction.

3.23.1.7 int DKSImageRecon::callGenerateNormalization (void * *recon,* void * *image_position,* void * *det_position,* int *total_det*)

Image reconstruction - generate normalization.

3.23.1.8 int DKSImageRecon::setDimensions (int *voxel_x,* int *voxel_y,* int *voxel_z,* float *voxel_size*)

Set the voxel dimensins on device. Values are stored in GPU memory and used in forward and backward projection calculations. Call set function once to transfer the values from host side to GPU. If value changes on the host side set functions needs to be called again to update GPU values.

3.23.1.9 int DKSImageRecon::setEdge (float *x_edge,* float *y_edge,* float *z_edge*)

Set the image edge. Values are stored in GPU memory and used in forward and backward projection calculations. Call set function once to transfer the values from host side to GPU. If value changes on the host side set functions needs to be called again to update GPU values.

3.23.1.10 int DKSImageRecon::setEdge1 (float *x_edge1,* float *y_edge1,* float *z_edge1,* float *z_edge2*)

Set the image edge1. Values are stored in GPU memory and used in forward and backward projection calculations. Call set function once to transfer the values from host side to GPU. If value changes on the host side set functions needs to be called again to update GPU values.

3.23.1.11 int DKSImageRecon::setMinCrystalInRing (float *min_CrystalDist_InOneRing,* float *min_CrystalDist_InOneRing1*)

Set the minimum crystan in one ring values. Values are stored in GPU memory and used in forward and backward projection calculations. Call set function once to transfer the values from host side to GPU. If value changes on the host side set functions needs to be called again to update GPU values.

3.23.1.12 int DKSImageRecon::setParams (float *matrix_distance_factor,* float *phantom_diameter,* float *atten_per_mm,* float *ring_diameter*)

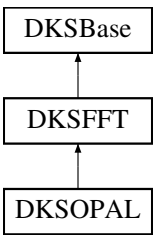
Set all other required parameters for reconstruction. Values are stored in GPU memory and used in forward and backward projection calculations. Call set function once to transfer the values from host side to GPU. If value changes on the host side set functions needs to be called again to update GPU values.

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

- /home/l_locans/gitwork/DKS-src/src/DKSImageReconstruction.h
- /home/l_locans/gitwork/DKS-src/src/DKSImageReconstruction.cpp

3.24 DKSOPAL Class Reference

Inheritance diagram for DKSOPAL:



Public Member Functions

- **DKSOPAL** (const char *api_name, const char *device_name)
- int **initDevice** ()
- int callGreensIntegral (void *tmp_ptr, int I, int J, int K, int NI, int NJ, double hz_m0, double hz_m1, double hz_m2, int streamId=-1)
- int callGreensIntegration (void *mem_ptr, void *tmp_ptr, int I, int J, int K, int streamId=-1)
- int callMirrorRhoField (void *mem_ptr, int I, int J, int K, int streamId=-1)
- int callMultiplyComplexFields (void *mem_ptr1, void *mem_ptr2, int size, int streamId=-1)
- int callCollimatorPhysics (void *mem_ptr, void *par_ptr, int numparticles, int numparams, int &numaddback, int &numdead, bool enableRutherfordScattering=true)
- int callCollimatorPhysics2 (void *mem_ptr, void *par_ptr, int numparticles, bool enableRutherfordScattering=true)
- int callCollimatorPhysicsSoA (void *label_ptr, void *localID_ptr, void *rx_ptr, void *ry_ptr, void *rz_ptr, void *px_ptr, void *py_ptr, void *pz_ptr, void *par_ptr, int numparticles)
- int callCollimatorPhysicsSort (void *mem_ptr, int numparticles, int &numaddback)
- int callCollimatorPhysicsSortSoA (void *label_ptr, void *localID_ptr, void *rx_ptr, void *ry_ptr, void *rz_ptr, void *px_ptr, void *py_ptr, void *pz_ptr, void *par_ptr, int numparticles, int &numaddback)
- int callParallelTTrackerPush (void *r_ptr, void *p_ptr, int npart, void *dt_ptr, double dt, double c, bool usedt=false, int streamId=-1)
- int callParallelTTrackerPushTransform (void *x_ptr, void *p_ptr, void *lastSec_ptr, void *orient_ptr, int npart, int nsec, void *dt_ptr, double dt, double c, bool usedt=false, int streamId=-1)
- int callParallelTTrackerPush (void *r_ptr, void *p_ptr, void *dt_ptr, int npart, double c, int streamId=-1)
- int callParallelTTrackerKick (void *r_ptr, void *p_ptr, void *ef_ptr, void *bf_ptr, void *dt_ptr, double charge, double mass, int npart, double c, int streamId=-1)

Additional Inherited Members

3.24.1 Member Function Documentation

3.24.1.1 int DKSOPAL::callCollimatorPhysics (void * *mem_ptr*, void * *par_ptr*, int *numparticles*, int *numparams*, int & *numaddback*, int & *numdead*, bool *enableRutherfordScattering* = `true`)

Monte carlo code for the degrader from OPAL classic/5.0/src/Solvers/CollimatorPhysics.cpp on device. For specifics check OPAL docs and CudaCollimatorPhysics class documentation. TODO: opencl and mic implementations.

3.24.1.2 int DKSOPAL::callCollimatorPhysics2 (void * *mem_ptr*, void * *par_ptr*, int *numparticles*, bool *enableRutherfordScattering* = `true`)

Monte carlo code for the degrader from OPAL classic/5.0/src/Solvers/CollimatorPhysics.cpp on device. For specifics check OPAL docs and CudaCollimatorPhysics class documentation. TODO: opencl and mic implementations.

3.24.1.3 int DKSOPAL::callCollimatorPhysicsSoA (void * *label_ptr*, void * *localID_ptr*, void * *rx_ptr*, void * *ry_ptr*, void * *rz_ptr*, void * *px_ptr*, void * *py_ptr*, void * *pz_ptr*, void * *par_ptr*, int *numparticles*)

Monte carlo code for the degrader from OPAL classic/5.0/src/Solvers/CollimatorPhysics.cpp on device. For specifics check OPAL docs and CudaCollimatorPhysics class documentation. Test function for the MIC to test SoA layout vs AoS layout used in previous versions

3.24.1.4 int DKSOPAL::callCollimatorPhysicsSort (void * *mem_ptr*, int *numparticles*, int & *numaddback*)

Monte carlo code for the degrader from OPAL classic/5.0/src/Solvers/CollimatorPhysics.cpp on device. For specifics check OPAL docs and CudaCollimatorPhysics class documentation. TODO: opencl and mic implementations.

3.24.1.5 int DKSOPAL::callCollimatorPhysicsSortSoA (void * *label_ptr*, void * *localID_ptr*, void * *rx_ptr*, void * *ry_ptr*, void * *rz_ptr*, void * *px_ptr*, void * *py_ptr*, void * *pz_ptr*, void * *par_ptr*, int *numparticles*, int & *numaddback*)

Monte carlo code for the degrader from OPAL classic/5.0/src/Solvers/CollimatorPhysics.cpp on device. For specifics check OPAL docs and CudaCollimatorPhysics class documentation. TODO: opencl and mic implementations.

3.24.1.6 int DKSOPAL::callGreensIntegral (void * *tmp_ptr*, int *I*, int *J*, int *K*, int *NI*, int *NJ*, double *hz_m0*, double *hz_m1*, double *hz_m2*, int *streamId* = `-1`)

Integrated greens function from OPAL FFTPoissonsolver.cpp put on device. For specifics check OPAL docs. TODO: opencl and mic implementations.

3.24.1.7 int DKSOPAL::callGreensIntegration (void * *mem_ptr*, void * *tmp_ptr*, int *I*, int *J*, int *K*, int *streamId* = `-1`)

Integrated greens function from OPAL FFTPoissonsolver.cpp put on device. For specifics check OPAL docs. TODO: opencl and mic implementations.

3.24.1.8 int DKSOPAL::callMirrorRhoField (void * *mem_ptr*, int *I*, int *J*, int *K*, int *streamId* = `-1`)

Integrated greens function from OPAL FFTPoissonsolver.cpp put on device. For specifics check OPAL docs. TODO: opencl and mic implementations.

3.24.1.9 int DKSOPAL::callMultiplyComplexFields (void * *mem_ptr1*, void * *mem_ptr2*, int *size*, int *streamId* = `-1`)

Element by element multiplication. Multiplies each element of mem_ptr1 with corresponding element of mem_ptr2, size specifies the number of elements in mem_ptr1 and mem_ptr2 to use. Results are put in mem_ptr1. TODO: opencl and mic implementations.

3.24.1.10 int DKSOPAL::callParallelTTrackerKick (void * *r_ptr*, void * *p_ptr*, void * *ef_ptr*, void * *bf_ptr*, void * *dt_ptr*, double *charge*, double *mass*, int *npart*, double *c*, int *streamId* = `-1`)

Integration code from ParallelTTracker from OPAL. For specifics check OPAL docs and CudaCollimatorPhysics class docs

3.24.1.11 int DKSOPAL::callParallelTTrackerPush (void * *r_ptr*, void * *p_ptr*, int *npart*, void * *dt_ptr*, double *dt*, double *c*, bool *usedt* = `false`, int *streamId* = `-1`)

Integration code from ParallelTTracker from OPAL. For specifics check OPAL docs and CudaCollimatorPhysics class docs

3.24.1.12 int DKSOPAL::callParallelTTrackerPush (void * *r_ptr*, void * *p_ptr*, void * *dt_ptr*, int *npart*, double *c*, int *streamId* = `-1`)

Integration code from ParallelTTracker from OPAL. For specifics check OPAL docs and CudaCollimatorPhysics class docs

3.24.1.13 int DKSOPAL::callParallelTTrackerPushTransform (void * *x_ptr*, void * *p_ptr*, void * *lastSec_ptr*, void * *orient_ptr*, int *npart*, int *nsec*, void * *dt_ptr*, double *dt*, double *c*, bool *usedt* = `false`, int *streamId* = `-1`)

Integration code from ParallelTTracker from OPAL. For specifics check OPAL docs and CudaCollimatorPhysics class docs

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

- /home/l_locans/gitwork/DKS-src/src/DKSOPAL.h
- /home/l_locans/gitwork/DKS-src/src/DKSOPAL.cpp

3.25 DKSSearchStates Class Reference

Public Member Functions

- DKSSearchStates (Parameters params)
- void setCurrentState (Parameters current_state)
- void setCurrentState (States current_state)
- void initCurrentState ()
- States getCurrentState ()
- States getNextNeighbour ()
- States getRandomNeighbour ()
- void getNeighbours (int dist=1)
- bool nextNeighbourExists ()
- void moveToNeighbour ()
- void saveCurrentState (double current_time)
- void printCurrentState (double time=0.0)
- void printNeighbour (double time=0.0)
- void printInfo ()
- void printBest ()

3.25.1 Constructor & Destructor Documentation

3.25.1.1 DKSSearchStates::DKSSearchStates (Parameters *params*)

Constructor alwats takes params array as variable. Params array is needed to know how many params will be searched and what are thou bounds of each parameter.

set the current state so that number of parameters and parameter bounds are known

3.25.2 Member Function Documentation

3.25.2.1 States DKSSearchStates::getCurrentState ( )

get current state

3.25.2.2 void DKSSearchStates::getNeighbours (int *dist* = `1`)

calculate all the neighbour states

Get all the possible neighbours of the current state

3.25.2.3 States DKSSearchStates::getNextNeighbour ( )

get next neighbour state. if there are no next neighbore stay at the curretn neighbour

3.25.2.4 States DKSSearchStates::getRandomNeighbour ( )

get random neighbour state

3.25.2.5 void DKSSearchStates::initCurrentState ( )

init random current state

3.25.2.6 void DKSSearchStates::moveToNeighbour ( )

move to next neighbour. set the current state as the next neighbour, calculate the neighbours of the new current state.

3.25.2.7 bool DKSSearchStates::nextNeighbourExists ( )

Chech if there are more neighbours to evaluate Return true if more neighbors exist, false if we are at the last neighbour

3.25.2.8 void DKSSearchStates::printBest ( )

Print the best saved state

3.25.2.9 void DKSSearchStates::printCurrentState (double *time* = 0.0)

Print current state. cout the current state. Mostly used for debuging purposes

3.25.2.10 void DKSSearchStates::printInfo ( )

Print info. Print the whole info about the search: current state, current neighbour, total neighbors

3.25.2.11 void DKSSearchStates::printNeighbour (double *time* = 0.0)

Print current neighbour info

3.25.2.12 void DKSSearchStates::saveCurrentState (double *current_time*)

Save the current state and the evaluation time of the current state. If evaluation time of the current state is better than the evaluation time of the best state, save the current state as best.

3.25.2.13 void DKSSearchStates::setCurrentState (Parameters *current_state*)

Set current state using parameter vector

3.25.2.14 void DKSSearchStates::setCurrentState (States *current_state*)

set current state using the state vector

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

- /home/l_locans/gitwork/DKS-src/src/AutoTuning/DKSSearchStates.h
- /home/l_locans/gitwork/DKS-src/src/AutoTuning/DKSSearchStates.cpp

3.26 DKSStream Class Reference

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

- /home/l_locans/gitwork/DKS-src/src/DKSStream.h

3.27 DKSTimer Class Reference

Public Member Functions

- DKSTimer ()
- void init (std::string n)
- void start ()
- void stop ()
- void reset ()
- double gettime ()
- void print ()

3.27.1 Constructor & Destructor Documentation

3.27.1.1 DKSTimer::DKSTimer ( )

Init DKSTimer by seting timer to zero

3.27.2 Member Function Documentation

3.27.2.1 double DKSTimer::gettime ( )

Return elapsed time in seconds. Return the value of timervalue

3.27.2.2 void DKSTimer::init (std::string *n*)

Init the timer Set the name for timer and clear all values

3.27.2.3 void DKSTimer::print ( )

Print timer. Print the elapsed time of the timer

3.27.2.4 void DKSTimer::reset ( )

Reset timervalue to zero. Set timervalue, timeStart and timeEnd to zero

3.27.2.5 void DKSTimer::start ( )

Start the timer. Get the curret time with gettimeofday and save in timeStart

3.27.2.6 void DKSTimer::stop ( )

Stop the timer Get the curretn time with gettimeofday and save in timeEnd Calculate elapsed time by timeEnd - timeStart and add to timervalue

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

- /home/l_locans/gitwork/DKS-src/src/Utility/DKSTimer.h
- /home/l_locans/gitwork/DKS-src/src/Utility/DKSTimer.cpp

3.28 Double3 Struct Reference

Public Attributes

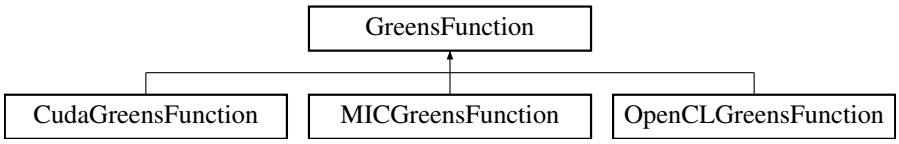
- double **x**
- double **y**
- double **z**

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

- /home/l_locans/gitwork/DKS-src/src/OpenCL/OpenCLCollimatorPhysics.h

3.29 GreensFunction Class Reference

Inheritance diagram for GreensFunction:



Public Member Functions

- virtual int greensIntegral (void *tmpgreen, int I, int J, int K, int NI, int NJ, double hr_m0, double hr_m1, double hr_m2, int streamId=-1)=0
- virtual int integrationGreensFunction (void *rho2_m, void *tmpgreen, int I, int J, int K, int streamId=-1)=0
- virtual int mirrorRhoField (void *rho2_m, int I, int J, int K, int streamId=-1)=0
- virtual int multiplyCompelxFields (void *ptr1, void *ptr2, int size, int streamId=-1)=0

3.29.1 Member Function Documentation

3.29.1.1 virtual int GreensFunction::greensIntegral (void * *tmpgreen,* int *I,* int *J,* int *K,* int *NI,* int *NJ,* double *hr_m0,* double *hr_m1,* double *hr_m2,* int *streamId* = -1) [pure virtual]

calc greens integral, as defined in OPAL

Implemented in CudaGreensFunction, OpenCLGreensFunction, and MICGreensFunction.

3.29.1.2 virtual int GreensFunction::integrationGreensFunction (void * *rho2_m,* void * *tmpgreen,* int *I,* int *J,* int *K,* int *streamId* = -1) [pure virtual]

integration if rho2_m, see OPAL for more details

Implemented in CudaGreensFunction, OpenCLGreensFunction, and MICGreensFunction.

3.29.1.3 virtual int GreensFunction::mirrorRhoField (void * *rho2_m,* int *I,* int *J,* int *K,* int *streamId* = -1) [pure virtual]

mirror rho2_m field

Implemented in CudaGreensFunction, OpenCLGreensFunction, and MICGreensFunction.

3.29.1.4 virtual int GreensFunction::multiplyCompelxFields (void * *ptr1,* void * *ptr2,* int *size,* int *streamId* = -1) [pure virtual]

multiply two complex fields from device memory

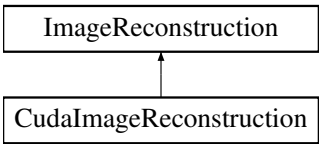
Implemented in CudaGreensFunction, OpenCLGreensFunction, and MICGreensFunction.

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

- /home/l_locans/gitwork/DKS-src/src/Algorithms/GreensFunction.h

3.30 ImageReconstruction Class Reference

Inheritance diagram for ImageReconstruction:



Public Member Functions

- virtual int calculateSource (void *image_space, void *image_position, void *source_position, void *avg, void *std, float diameter, int total_voxels, int total_sources, int start=0)=0
- virtual int calculateBackground (void *image_space, void *image_position, void *source_position, void *avg, void *std, float diameter, int total_voxels, int total_sources, int start=0)=0
- virtual int calculateSources (void *image_space, void *image_position, void *source_position, void *avg, void *std, void *diameter, int total_voxels, int total_sources, int start=0)=0
- virtual int calculateBackgrounds (void *image_space, void *image_position, void *source_position, void *avg, void *std, void *diameter, int total_voxels, int total_sources, int start=0)=0
- virtual int generateNormalization (void *recon, void *image_position, void *det_position, int total_det)=0
- virtual int forwardProjection (void *correction, void *recon, void *list_data, void *det_position, void *image_position, int num_events)=0
- virtual int backwardProjection (void *correction, void *recon_corrector, void *list_data, void *det_position, void *image_position, int num_events, int num_voxels)=0
- virtual int setDimensions (int voxel_x, int voxel_y, int voxel_z, float voxel_size)=0
- virtual int setEdge (float x_edge, float y_edge, float z_edge)=0
- virtual int setEdge1 (float x_edge1, float y_edge1, float z_edge1, float z_edge2)=0
- virtual int setMinCrystalInRing (float min_CrystalDist_InOneRing, float min_CrystalDist_InOneRing1)=0
- virtual int setParams (float matrix_distance_factor, float phantom_diameter, float atten_per_mm, float ring_diameter)=0

Protected Attributes

- void * **m_event_branch**

3.30.1 Member Function Documentation

3.30.1.1 virtual int ImageReconstruction::backwardProjection (void * *correction*, void * *recon_corrector*, void * *list_data*, void * *det_position*, void * *image_position*, int *num_events*, int *num_voxels*) [pure virtual]

Calculate backward projection. For image reconstruction calculates backward projections. see recon.cpp for details

Implemented in CudaImageReconstruction.

3.30.1.2 virtual int ImageReconstruction::calculateBackground (void * *image_space*, void * *image_position*, void * *source_position*, void * *avg*, void * *std*, float *diameter*, int *total_voxels*, int *total_sources*, int *start* = 0) [pure virtual]

Calculate background. Places two sphere at each voxel position, calculates the avg value and std value of pixels that are inside the larger sphere, but are outside of the smaller sphere. The diameter of the smaller speher is given by parameter diameter, diameter of the larger sphere is 2∗diameter.

Implemented in CudaImageReconstruction.

3.30.1.3 virtual int ImageReconstruction::calculateBackgrounds (void * *image_space*, void * *image_position*, void * *source_position*, void * *avg*, void * *std*, void * *diameter*, int *total_voxels*, int *total_sources*, int *start* = 0) [pure virtual]

Places two sphere at each voxel position, calculates the avg value and std value of pixels that are inside the larger sphere, but are outside of the smaller sphere. The diameter of the smaller sphere is given by ∗diameter array, diameter of the larger sphere is 2∗diameter of the smaller sphere.

Implemented in CudaImageReconstruction.

3.30.1.4 virtual int ImageReconstruction::calculateSource (void * *image_space*, void * *image_position*, void * *source_position*, void * *avg*, void * *std*, float *diameter*, int *total_voxels*, int *total_sources*, int *start* = 0) [pure virtual]

Caluclate source. Places a sphere at each voxel position and calculate the avg value and std value of pixels that are inside this sphere. All the sphere used have the same diameter.

Implemented in CudaImageReconstruction.

3.30.1.5 virtual int ImageReconstruction::calculateSources (void * *image_space*, void * *image_position*, void * *source_position*, void * *avg*, void * *std*, void * *diameter*, int *total_voxels*, int *total_sources*, int *start* = 0) [pure virtual]

Caluclate source using differente sources. Places two sphere at each voxel position, calculates the avg value and std value of pixels that are inside the larger sphere, but are outside of the smaller sphere. The diameter of the each sphere is given by ∗diameter array.

Implemented in CudaImageReconstruction.

3.30.1.6 virtual int ImageReconstruction::forwardProjection (void * *correction*, void * *recon*, void * *list_data*, void * *det_position*, void * *image_position*, int *num_events*) [pure virtual]

Calculate forward projection. For image reconstruction calculates forward projections. see recon.cpp for details

Implemented in CudaImageReconstruction.

3.30.1.7 virtual int ImageReconstruction::generateNormalization (void * *recon*, void * *image_position*, void * *det_position*, int *total_det*) [pure virtual]

Generate normalization. Goes trough detectors pairs and if detector pair crosses image launches seperate kernel that updates voxel values in the image on the slope between these two detectors.

Implemented in CudaImageReconstruction.

3.30.1.8 virtual int ImageReconstruction::setDimensions (int *voxel_x*, int *voxel_y*, int *voxel_z*, float *voxel_size*) [pure virtual]

Set the voxel dimensins on device.

Implemented in CudaImageReconstruction.

3.30.1.9 virtual int ImageReconstruction::setEdge (float *x_edge*, float *y_edge*, float *z_edge*) [pure virtual]

Set the image edge variables on the device.

Implemented in CudaImageReconstruction.

3.30.1.10 virtual int ImageReconstruction::setEdge1 (float *x_edge1*, float *y_edge1*, float *z_edge1*, float *z_edge2*) [pure virtual]

Set the image edge1 on the device.

Implemented in CudaImageReconstruction.

3.30.1.11 virtual int ImageReconstruction::setMinCrystalInRing (float *min_CrystalDist_InOneRing*, float *min_CrystalDist_InOneRing1*) [pure virtual]

Set the minimum crystan in one ring values on the device.

Implemented in CudaImageReconstruction.

3.30.1.12 virtual int ImageReconstruction::setParams (float *matrix_distance_factor*, float *phantom_diameter*, float *atten_per_mm*, float *ring_diameter*) [pure virtual]

Set all other required parameters for reconstruction.

Implemented in CudaImageReconstruction.

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

- /home/l_locans/gitwork/DKS-src/src/Algorithms/ImageReconstruction.h

3.31 less_then Struct Reference

Public Member Functions

- __host__ __device__ bool **operator()** (int x)

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

- /home/l_locans/gitwork/DKS-src/src/CUDA/CudaCollimatorPhysics.cu

3.32 ListEvent Struct Reference

Public Attributes

- unsigned **detA**: 16
- unsigned **detB**: 16

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

- /home/l_locans/gitwork/DKS-src/src/Algorithms/ImageReconstruction.h

3.33 MICBase Class Reference

Public Member Functions

- int **mic_createRandStreams** (int size)
- int **mic_deleteRandStreams** ()
- int **mic_createStream** (int &streamId)
- int & **mic_getStream** (int id)
- int **mic_deleteStreams** ()
- int **mic_setDeviceId** (int id)
- int **mic_getDevices** ()
- template<typename T >
  void * **mic_allocateMemory** (int size)
- template<typename T >
  int **mic_writeData** (void *data_ptr, const void *data, int size, int offset=0)
- template<typename T >
  int **mic_writeDataAsync** (void *data_ptr, const void *data, int size, int streamId=-1, int offset=0)
- template<typename T >
  int **mic_readData** (const void *data_ptr, void *result, int size, int offset=0)
- template<typename T >
  int **mic_readDataAsync** (const void *data_ptr, void *result, int size, int streamId=-1, int offset=0)
- int **mic_syncDevice** ()
- template<typename T >
  int **mic_freeMemory** (void *data_ptr, int size)
- template<typename T >
  void * **mic_pushData** (const void *data, int size)
- template<typename T >
  int **mic_pullData** (void *data_ptr, void *result, int size)

Public Attributes

- void * **defaultRndStream**
- void * **testPtr**
- int **m_device_id**

Protected Attributes

- int **defaultRndSet**

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

- /home/l_locans/gitwork/DKS-src/src/MIC/MICBase.h
- /home/l_locans/gitwork/DKS-src/src/MIC/MICBase.cpp

3.34 MICChiSquare Class Reference

Public Member Functions

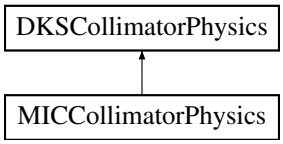
- **MICChiSquare** (MICBase ∗base)
- int **mic_chi2** (double ∗O, double ∗E, double ∗result, int size)
- int **mic_Nt** (double ∗nt, double ∗p, int psize, int nsize, int jsize, double deltaT=1)
- int **mic_sum** (double ∗data, double ∗result, int size)

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

- /home/l_locans/gitwork/DKS-src/src/MIC/MICChiSquare.h
- /home/l_locans/gitwork/DKS-src/src/MIC/MICChiSquare.cpp

3.35 MICCollimatorPhysics Class Reference

Inheritance diagram for MICCollimatorPhysics:



Public Member Functions

- **MICCollimatorPhysics** (MICBase ∗base)
- int **CollimatorPhysics** (void ∗mem_ptr, void ∗par_ptr, int numparticles, bool enableRutherforScattering=true)
- int **CollimatorPhysicsSoA** (void ∗label_ptr, void ∗localID_ptr, void ∗rx_ptr, void ∗ry_ptr, void ∗rz_ptr, void ∗px_ptr, void ∗py_ptr, void ∗pz_ptr, void ∗par_ptr, int numparticles)
- int **CollimatorPhysicsSort** (void ∗mem_ptr, int numparticles, int &numaddback)
- int **CollimatorPhysicsSortSoA** (void ∗label_ptr, void ∗localID_ptr, void ∗rx_ptr, void ∗ry_ptr, void ∗rz_ptr, void ∗px_ptr, void ∗py_ptr, void ∗pz_ptr, void ∗par_ptr, int numparticles, int &numaddback)
- int **ParallelTTrackerPush** (void ∗r_ptr, void ∗p_ptr, int npart, void ∗dt_ptr, double dt, double c, bool usedt=false, int streamId=-1)
- int **ParallelTTrackerPushTransform** (void ∗x_ptr, void ∗p_ptr, void ∗lastSec_ptr, void ∗orient_ptr, int npart, int nsec, void ∗dt_ptr, double dt, double c, bool usedt=false, int streamId=-1)

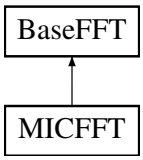
Additional Inherited Members

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

- /home/l_locans/gitwork/DKS-src/src/MIC/MICCollimatorPhysics.h
- /home/l_locans/gitwork/DKS-src/src/MIC/MICCollimatorPhysics.cpp

3.36 MICFFT Class Reference

Inheritance diagram for MICFFT:



Public Member Functions

- **MICFFT** (MICBase ∗base)
- int **setupFFT** (int ndim, int N[3])
- int **setupFFTRC** (int ndim, int N[3], double scale=1.0)
- int **setupFFTCR** (int ndim, int N[3], double scale=1.0)
- int **executeFFT** (void ∗mem_ptr, int ndim, int N[3], int streamId=-1, bool forward=true)
- int **executeIFFT** (void ∗mem_ptr, int ndim, int N[3], int streamId=-1)
- int **executeRCFFT** (void ∗in_ptr, void ∗out_ptr, int ndim, int N[3], int streamId=-1)
- int **executeCRFFT** (void ∗in_ptr, void ∗out_ptr, int ndim, int N[3], int streamId=-1)
- int **normalizeFFT** (void ∗mem_ptr, int ndim, int N[3], int streamId=-1)
- int destroyFFT ()
- int **normalizeCRFFT** (void ∗real_ptr, int ndim, int N[3], int streamId=-1)

Additional Inherited Members

3.36.1 Member Function Documentation

3.36.1.1 int MICFFT::destroyFFT ( ) [inline], [virtual]

Info: destroy default FFT plans Return: success or error code

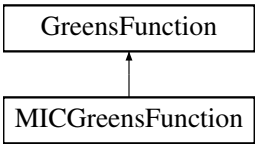
Implements BaseFFT.

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

- /home/l_locans/gitwork/DKS-src/src/MIC/MICFFT.h
- /home/l_locans/gitwork/DKS-src/src/MIC/MICFFT.cpp

3.37 MICGreensFunction Class Reference

Inheritance diagram for MICGreensFunction:



Public Member Functions

- **MICGreensFunction** (MICBase *base)
- int greensIntegral (void *tmpgreen_, int I, int J, int K, int NI, int NJ, double hr_m0, double hr_m1, double hr_m2, int streamId=-1)
- int integrationGreensFunction (void *rho2_m, void *tmpgreen, int I, int J, int K, int stremaId=-1)
- int mirrorRhoField (void *rho2_m, int I, int J, int K, int streamId=-1)
- int multiplyCompelxFields (void *ptr1, void *ptr2, int size, int streamId=-1)

3.37.1 Member Function Documentation

3.37.1.1 int MICGreensFunction::greensIntegral (void * *tmpgreen*, int *I*, int *J*, int *K*, int *NI*, int *NJ*, double *hr_m0*, double *hr_m1*, double *hr_m2*, int *streamId* = -1) [virtual]

calc greens integral, as defined in OPAL

Implements GreensFunction.

3.37.1.2 int MICGreensFunction::integrationGreensFunction (void * *rho2_m*, void * *tmpgreen*, int *I*, int *J*, int *K*, int *streamId* = -1) [virtual]

integration if rho2_m, see OPAL for more details

Implements GreensFunction.

3.37.1.3 int MICGreensFunction::mirrorRhoField (void * *rho2_m*, int *I*, int *J*, int *K*, int *streamId* = -1) [virtual]

mirror rho2_m field

Implements GreensFunction.

3.37.1.4 int MICGreensFunction::multiplyCompelxFields (void * *ptr1*, void * *ptr2*, int *size*, int *streamId* = -1) [virtual]

multiply two complex fields from device memory

Implements GreensFunction.

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

- /home/l_locans/gitwork/DKS-src/src/MIC/MICGreensFunction.hpp
- /home/l_locans/gitwork/DKS-src/src/MIC/MICGreensFunction.cpp

3.38 OpenCLBase Class Reference

Public Member Functions

- int **ocl_createRndStates** (int size)
- int **ocl_createRandomNumbers** (void *mem_ptr, int size)
- int **ocl_deleteRndStates** ()
- int **ocl_getAllDevices** ()
- int ocl_getDeviceCount (int &ndev)
- int ocl_getDeviceName (std::string &device_name)
- int ocl_setDevice (int device)
- int ocl_getUniqueDevices (std::vector< int > &devices)

- int **ocl_setUp** (const char *device_name)
- int **ocl_loadKernel** (const char *kernel_file)
- int ocl_loadKernelFromSource (const char *kernel_source, const char *opts=NULL)
- cl_mem **ocl_allocateMemory** (size_t size, int &ierr)
- cl_mem **ocl_allocateMemory** (size_t size, int type, int &ierr)
- template<typename T >
  int ocl_fillMemory (cl_mem mem_ptr, size_t size, T value, int offset=0)
- int **ocl_writeData** (cl_mem mem_ptr, const void *in_data, size_t size, size_t offset=0, int blocking=CL_TRUE)
- int **ocl_copyData** (cl_mem src_ptr, cl_mem dst_ptr, size_t size)
- int **ocl_createKernel** (const char *kernel_name)
- int **ocl_setKernelArg** (int idx, size_t size, const void *arg_value)
- int **ocl_executeKernel** (cl_uint, const size_t *work_items, const size_t *work_grou_size=NULL)
- int **ocl_readData** (cl_mem mem_ptr, void *out_data, size_t size, size_t offset=0, int blocking=CL_TRUE)
- int **ocl_freeMemory** (cl_mem mem_ptr)
- int **ocl_cleanUp** ()
- int **ocl_deviceInfo** (bool verbose=true)
- int **ocl_checkKernel** (const char *kernel_name, int work_group_size, bool double_precision, int &threads-PerBlock)
- void **ocl_clearEvents** ()
- void **ocl_eventInfo** ()
- cl_command_queue **ocl_getQueue** ()

Static Public Attributes

- static cl_context **m_context** = NULL
- static cl_command_queue **m_command_queue** = NULL

Protected Attributes

- int **defaultRndSet**
- cl_mem **defaultRndState**

3.38.1 Member Function Documentation

3.38.1.1 template<typename T > int OpenCLBase::ocl_fillMemory (cl_mem *mem_ptr,* size_t *size,* T *value,* int *offset* = 0) [inline]

Zero OpenCL memory buffer Set all the elemetns in the device array to zero

3.38.1.2 int OpenCLBase::ocl_getDeviceCount (int & *ndev*)

Get the OpenCL device count for the set type of device

3.38.1.3 int OpenCLBase::ocl_getDeviceName (std::string & *device_name*)

Get the name of the device used

3.38.1.4 int OpenCLBase::ocl_getUniqueDevices (std::vector< int > & *devices*)

Get a list of all the unique devices of the same type that can run OpenCL kernels Used when GPUs of different types might be pressent on the system.

3.38.1.5 int OpenCLBase::ocl_loadKernelFromSource (const char * *kernel_source,* const char * *opts* = NULL)

Build program from kernel source. Builds a program from source code provided in kernel_source. If compilation fails will return DKS_ERROR

3.38.1.6 int OpenCLBase::ocl_setDevice (int *device*)

Set the device to use for OpenCL kernels. device id to use is passed as integer.

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

- /home/l_locans/gitwork/DKS-src/src/OpenCL/OpenCLBase.h
- /home/l_locans/gitwork/DKS-src/src/OpenCL/OpenCLBase.cpp

3.39 OpenCLChiSquare Class Reference

Public Member Functions

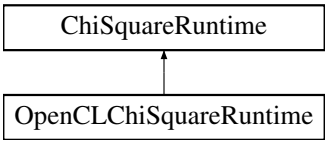
- **OpenCLChiSquare** (OpenCLBase *base)
- int **ocl_PHistoTFFcn** (void *mem_data, void *mem_par, void *mem_result, double fTimeResolution, double fRebin, int sensors, int length, int numpar, double &result)
- int **ocl_singleGaussTF** (void *mem_data, void *mem_t0, void *mem_par, void *mem_result, double fTimeResolution, double fRebin, double fGoodBinOffset, int sensors, int length, int numpar, double &result)
- int **ocl_doubleLorentzTF** (void *mem_data, void *mem_t0, void *mem_par, void *mem_result, double fTimeResolution, double fRebin, double fGoodBinOffset, int sensors, int length, int numpar, double &result)

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

- /home/l_locans/gitwork/DKS-src/src/OpenCL/OpenCLChiSquare.h
- /home/l_locans/gitwork/DKS-src/src/OpenCL/OpenCLChiSquare.cpp

3.40 OpenCLChiSquareRuntime Class Reference

Inheritance diagram for OpenCLChiSquareRuntime:



Public Member Functions

- OpenCLChiSquareRuntime (OpenCLBase *base)
- OpenCLChiSquareRuntime ()
- ~OpenCLChiSquareRuntime ()
- int compileProgram (std::string function, bool mlh=false)
- int launchChiSquare (int fitType, void *mem_data, void *mem_err, int length, int numpar, int numfunc, int nummap, double timeStart, double timeStep, double &result)
- int writeParams (const double *params, int numparams)
- int writeFunc (const double *func, int numfunc)
- int writeMap (const int *map, int nummap)

- int initChiSquare (int size_data, int size_param, int size_func, int size_map)
- int freeChiSquare ()
- int checkChiSquareKernels (int fitType, int &threadsPerBlock)

Additional Inherited Members

3.40.1 Constructor & Destructor Documentation

3.40.1.1 OpenCLChiSquareRuntime::OpenCLChiSquareRuntime (OpenCLBase * *base*)

Constructor wiht openclbase argument

3.40.1.2 OpenCLChiSquareRuntime::OpenCLChiSquareRuntime ( )

Default constructor

3.40.1.3 OpenCLChiSquareRuntime::~OpenCLChiSquareRuntime ( )

Default destructor

3.40.2 Member Function Documentation

3.40.2.1 int OpenCLChiSquareRuntime::checkChiSquareKernels (int *fitType*, int & *threadsPerBlock*) [virtual]

Check MuSR kernels for necessary resources. Query device properties to get if sufficient resources are available to run the kernels

Implements ChiSquareRuntime.

3.40.2.2 int OpenCLChiSquareRuntime::compileProgram (std::string *function*, bool *mlh* = false) [virtual]

Compile program and save ptx. Add function string to the calcFunction kernel and compile the program Function must be valid C math expression. Parameters can be addressed in a form par[map[idx]]

Implements ChiSquareRuntime.

3.40.2.3 int OpenCLChiSquareRuntime::freeChiSquare ( ) [virtual]

Free temporary memory allocated for chi square. Frees the chisq temporary memory and memory for params, functions and maps

Implements ChiSquareRuntime.

3.40.2.4 int OpenCLChiSquareRuntime::initChiSquare (int *size_data*, int *size_param*, int *size_func*, int *size_map*) [virtual]

Allocate temporary memory needed for chi square. Initializes the necessary temporary memory for the chi square calculations. Size_data needs to the maximum number of elements in any datasets that will be used for calculations. Size_param, size_func and size_map are the maximum number of parameters, functions and maps used in calculations.

Implements ChiSquareRuntime.

3.40.2.5 int OpenCLChiSquareRuntime::launchChiSquare (int *fitType*, void * *mem_data*, void * *mem_err*, int *length*, int *numpar*, int *numfunc*, int *nummap*, double *timeStart*, double *timeStep*, double & *result*) [virtual]

Launch selected kernel Launched the selected kernel from the compiled code. Result is put in &result variable

Implements ChiSquareRuntime.

3.40.2.6 int OpenCLChiSquareRuntime::writeFunc (const double * *func*, int *numfunc*) [virtual]

Write functions to device. Write function values from double array to mem_func_m memory on the device.

Implements ChiSquareRuntime.

3.40.2.7 int OpenCLChiSquareRuntime::writeMap (const int * *map*, int *nummap*) [virtual]

Write maps to device. Write map values from int array to mem_map_m memory on the device.

Implements ChiSquareRuntime.

3.40.2.8 int OpenCLChiSquareRuntime::writeParams (const double * *params*, int *numparams*) [virtual]

Write params to device. Write params from double array to mem_param_m memory on the device.

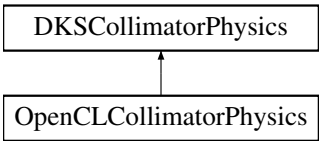
Implements ChiSquareRuntime.

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

- /home/l_locans/gitwork/DKS-src/src/OpenCL/OpenCLChiSquareRuntime.h
- /home/l_locans/gitwork/DKS-src/src/OpenCL/OpenCLChiSquareRuntime.cpp

3.41 OpenCLCollimatorPhysics Class Reference

Inheritance diagram for OpenCLCollimatorPhysics:



Public Member Functions

- **OpenCLCollimatorPhysics** (OpenCLBase *base)
- int **CollimatorPhysics** (void *mem_ptr, void *par_ptr, int numparticles, bool enableRutherforScattering=true)
- int **CollimatorPhysicsSoA** (void *label_ptr, void *localID_ptr, void *rx_ptr, void *ry_ptr, void *rz_ptr, void *px_ptr, void *py_ptr, void *pz_ptr, void *par_ptr, int numparticles)
- int **CollimatorPhysicsSort** (void *mem_ptr, int numparticles, int &numaddback)
- int **CollimatorPhysicsSortSoA** (void *label_ptr, void *localID_ptr, void *rx_ptr, void *ry_ptr, void *rz_ptr, void *px_ptr, void *py_ptr, void *pz_ptr, void *par_ptr, int numparticles, int &numaddback)
- int **ParallelTTrackerPush** (void *r_ptr, void *p_ptr, int npart, void *dt_ptr, double dt, double c, bool usedt=false, int streamId=-1)
- int **ParallelTTrackerPushTransform** (void *x_ptr, void *p_ptr, void *lastSec_ptr, void *orient_ptr, int npart, int nsec, void *dt_ptr, double dt, double c, bool usedt=false, int streamId=-1)

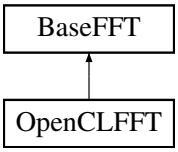
Additional Inherited Members

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

- /home/l_locans/gitwork/DKS-src/src/OpenCL/OpenCLCollimatorPhysics.h
- /home/l_locans/gitwork/DKS-src/src/OpenCL/OpenCLCollimatorPhysics.cpp

3.42 OpenCLFFT Class Reference

Inheritance diagram for OpenCLFFT:



Public Member Functions

- **OpenCLFFT** (OpenCLBase ∗base)
- int **executeFFT** (void ∗data, int ndim, int N[3], int streamId=-1, bool forward=true)
- int **executeIFFT** (void ∗data, int ndim, int N[3], int streamId=-1)
- int **normalizeFFT** (void ∗data, int ndim, int N[3], int streamId=-1)
- int **setupFFT** (int ndim, int N[3])
- int **setupFFTRC** (int ndim, int N[3], double scale=1.0)
- int **setupFFTCR** (int ndim, int N[3], double scale=1.0)
- int **destroyFFT** ()
- int **executeRCFFT** (void ∗real_ptr, void ∗comp_ptr, int ndim, int N[3], int streamId=-1)
- int **executeCRFFT** (void ∗real_ptr, void ∗comp_ptr, int ndim, int N[3], int streamId=-1)
- int **normalizeCRFFT** (void ∗real_ptr, int ndim, int N[3], int streamId=-1)

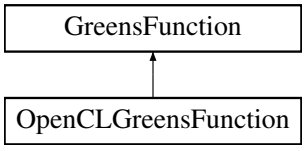
Additional Inherited Members

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

- /home/l_locans/gitwork/DKS-src/src/OpenCL/OpenCLFFT.h
- /home/l_locans/gitwork/DKS-src/src/OpenCL/OpenCLFFT.cpp

3.43 OpenCLGreensFunction Class Reference

Inheritance diagram for OpenCLGreensFunction:



Public Member Functions

- OpenCLGreensFunction (OpenCLBase *base)
- OpenCLGreensFunction ()
- ~OpenCLGreensFunction ()
- int buildProgram ()
- int greensIntegral (void *tmpgreen, int I, int J, int K, int NI, int NJ, double hr_m0, double hr_m1, double hr_m2, int streamId=-1)
- int integrationGreensFunction (void *rho2_m, void *tmpgreen, int I, int J, int K, int streamId=-1)
- int mirrorRhoField (void *rho2_m, int I, int J, int K, int streamId=-1)
- int multiplyCompelxFields (void *ptr1, void *ptr2, int size, int streamId=-1)

3.43.1 Constructor & Destructor Documentation

3.43.1.1 OpenCLGreensFunction::OpenCLGreensFunction (OpenCLBase * *base*)

Constructor with OpenCLBase argument

3.43.1.2 OpenCLGreensFunction::OpenCLGreensFunction ( )

Default constructor

3.43.1.3 OpenCLGreensFunction::~OpenCLGreensFunction ( )

Destructor

3.43.2 Member Function Documentation

3.43.2.1 int OpenCLGreensFunction::buildProgram ( )

Load OpenCL kernel file containing greens function kernels. m_base takes the kernel file and compiles the OpenCL programm.

3.43.2.2 int OpenCLGreensFunction::greensIntegral (void * *tmpgreen*, int *I*, int *J*, int *K*, int *NI*, int *NJ*, double *hr_m0*, double *hr_m1*, double *hr_m2*, int *streamId* = -1) [virtual]

Info: calc itegral on device memory (taken from OPAL src code) Return: success or error code

Implements GreensFunction.

3.43.2.3 int OpenCLGreensFunction::integrationGreensFunction (void * *rho2_m*, void * *tmpgreen*, int *I*, int *J*, int *K*, int *streamId* = -1) [virtual]

Info: integration of rho2_m field (taken from OPAL src code) Return: success or error code

Implements GreensFunction.

3.43.2.4 int OpenCLGreensFunction::mirrorRhoField (void * *rho2_m*, int *I*, int *J*, int *K*, int *streamId* = -1) [virtual]

Info: mirror rho field (taken from OPAL src code) Return: succes or error code

Implements GreensFunction.

3.43.2.5 int OpenCLGreensFunction::multiplyCompelxFields (void * *ptr1*, void * *ptr2*, int *size*, int *streamId* = -1) [virtual]

Info: multiply complex fields already on the GPU memory, result will be put in ptr1 Return: success or error code

Implements GreensFunction.

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

- /home/l_locans/gitwork/DKS-src/src/OpenCL/OpenCLGreensFunction.h
- /home/l_locans/gitwork/DKS-src/src/OpenCL/OpenCLGreensFunction.cpp

3.44 Parameter Class Reference

Public Member Functions

- **Parameter** (int *_value, int _min, int _max, int _step, std::string _name)
- **Parameter** (double *_value, double _min, double _max, double _step, std::string _name)
- template<typename T >
  void **setValue** (T v)
- double **getValue** ()

Public Attributes

- double **min**
- double **max**
- double **step**
- std::string **name**

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

- /home/l_locans/gitwork/DKS-src/src/AutoTuning/DKSSearchStates.h

3.45 PART Struct Reference

Public Attributes

- int **label**
- unsigned **localID**
- double **Rincol** [3]
- double **Pincol** [3]
- long **IDincol**
- int **Binincol**
- double **DTincol**
- double **Qincol**
- long **LastSecincol**
- double **Bfincol** [3]
- double **Efincol** [3]
- int * **label**
- unsigned * **localID**
- double * **rx**
- double * **ry**
- double * **rz**

- double * **px**
- double * **py**
- double * **pz**

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

- /home/l_locans/gitwork/DKS-src/auto-tuning/testCollimatorPhysics.cpp
- /home/l_locans/gitwork/DKS-src/test/testCollimatorPhysicsMPI.cpp
- /home/l_locans/gitwork/DKS-src/test/testCollimatorPhysicsSoA.cpp

3.46 Part Struct Reference

Public Attributes

- double **x**
- double **y**
- double **z**

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

- /home/l_locans/gitwork/DKS-src/test/testMICPush.cpp

3.47 PART_OPENCL Struct Reference

Public Attributes

- int **label**
- unsigned **localID**
- Double3 **Rincol**
- Double3 **Pincol**

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

- /home/l_locans/gitwork/DKS-src/src/OpenCL/OpenCLCollimatorPhysics.h

3.48 PART_SMALL Struct Reference

Public Attributes

- int **label**
- unsigned **localID**
- double **Rincol** [3]
- double **Pincol** [3]

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

- /home/l_locans/gitwork/DKS-src/test/testCollimatorPhysics.cpp

3.49 RNDState Struct Reference

Public Attributes

- double **s10**
- double **s11**
- double **s12**
- double **s20**
- double **s21**
- double **s22**
- double **z**
- bool **gen**

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

- /home/l_locans/gitwork/DKS-src/src/OpenCL/OpenCLBase.h

3.50 State Struct Reference

Public Attributes

- double **value**
- double **min**
- double **max**
- double **step**

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

- /home/l_locans/gitwork/DKS-src/src/AutoTuning/DKSSearchStates.h

3.51 Vector Struct Reference

Public Attributes

- double **x**
- double **y**
- double **z**

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

- /home/l_locans/gitwork/DKS-src/test/testCollimatorPhysics.cpp
- /home/l_locans/gitwork/DKS-src/test/testTimeIntegration.cpp

3.52 VoxelPosition Struct Reference

Public Attributes

- float **x**
- float **y**
- float **z**

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

- /home/l_locans/gitwork/DKS-src/src/Algorithms/ImageReconstruction.h

3.53 voxelPosition Struct Reference

Public Attributes

- float **x**
- float **y**
- float **z**

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

- /home/l_locans/gitwork/DKS-src/test/testImageReconstruction.cpp

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