**collective module**

The collective module needs to be described.

**Classes**

*class* **Distributed\_rectangular\_grid**

*Public Functions*

**Distributed\_rectangular\_grid**(std::vector< double > const & physical\_size, std::vector< double > const & physical\_offset, std::vector< int > const & grid\_shape, bool periodic, int lower, int upper, [*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_sptr, std::string const solver = “hockney”)

**Distributed\_rectangular\_grid**([*Rectangular\_grid\_domain\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid__domain_8h_1a297fcce958d441def83fd1c1e5e687ab) rectangular\_grid\_domain\_sptr, int lower, int upper, [*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_sptr, std::string const solver = “hockney”)

**Distributed\_rectangular\_grid**([*Rectangular\_grid\_domain\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid__domain_8h_1a297fcce958d441def83fd1c1e5e687ab) rectangular\_grid\_domain\_sptr, int lower, int upper, std::vector< int > const & padded\_shape, [*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_sptr)

[*Rectangular\_grid\_domain*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid__domain) const & **get\_domain**()

[*Rectangular\_grid\_domain*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid__domain) & **get\_domain**()

[*Rectangular\_grid\_domain\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid__domain_8h_1a297fcce958d441def83fd1c1e5e687ab) **get\_domain\_sptr**()

[*Rectangular\_grid\_domain\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid__domain_8h_1a297fcce958d441def83fd1c1e5e687ab) **get\_domain\_sptr**()

int **get\_lower**()

int **get\_upper**()

int **get\_lower\_guard**()

int **get\_upper\_guard**()

std::vector< int > const & **get\_uppers**()

std::vector< int > const & **get\_lengths**()

[*MArray3d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9febc18851e0710136053f19d4d3d068) const & **get\_grid\_points**()

[*MArray3d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9febc18851e0710136053f19d4d3d068) & **get\_grid\_points**()

[*MArray2dc\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a639587aeb9cc120ca9f62ff4a8978da9) const & **get\_grid\_points\_2dc**()

[*MArray2dc\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a639587aeb9cc120ca9f62ff4a8978da9) & **get\_grid\_points\_2dc**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const & **get\_grid\_points\_1d**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) & **get\_grid\_points\_1d**()

void **set\_normalization**(double val)

double **get\_normalization**()

[*Commxx*](http://compacc.fnal.gov/~amundson/html/utils.html#project0class_commxx) const & **get\_comm**()

[*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) **get\_comm\_sptr**()

void **fill\_guards**()

*class* **ECloudEFieldVORPAL2D**

*Public Functions*

**ECloudEFieldVORPAL2D**()

**ECloudEFieldVORPAL2D**(const char \* archiveName)

**ECloudEFieldVORPAL2D**([*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_sptr, const char \* archiveName)

**~ECloudEFieldVORPAL2D**()

**ECloudEFieldVORPAL2D**(const [*ECloudEFieldVORPAL2D*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_e_cloud_e_field_v_o_r_p_a_l2_d) &)

[*ECloudEFieldVORPAL2D*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_e_cloud_e_field_v_o_r_p_a_l2_d) & **operator=**(const [*ECloudEFieldVORPAL2D*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_e_cloud_e_field_v_o_r_p_a_l2_d) &)

bool **loadFromFile**(const char \* archiveName)

double **GetFieldEX**(double x, double y, double dz)

double **GetFieldEY**(double x, double y, double dz)

bool **loadSynergia**(const char \* archiveName, boost::shared\_ptr< [*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) > sGridEx, boost::shared\_ptr< [*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) > sGridEy)

bool **loadSynergia**(boost::shared\_ptr< [*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) > sGridEx, boost::shared\_ptr< [*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) > sGridEy)

void **cleanup**()

[*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) **getComm**()

std::string **getVersion**()

std::string **getVORPALJobName**()

int **getVerticalChebychevOrder**()

std::vector< [*YXScanAtdZ*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_e_cloud_e_field_v_o_r_p_a_l2_d_1_1_y_x_scan_atd_z) > **getData**()

double **getYLow**()

double **getYUp**()

int **getNumPtDZ**()

int **getNumPtX**()

int **getNumChebCoef**()

int **getNumDoubles**()

void **loadOneScan**(bool isEX, double dz, double x, double yLow, double yUp, size\_t chebOrder, gsl\_cheb\_series \* chebSerie)

void **archiveIt**(const char \* fNameOut)

void **setVersion**(const char \* c)

void **setVORPALJobName**(const char \* c)

void **setYLimits**(double l, double u)

*class* **YScanAtX**

*Public Functions*

**YScanAtX**()

template < class Archive >

void **serialize**(Archive & ar, const unsigned int)

*Public Members*

double **x**

std::vector< double > **coefChebEX**

std::vector< double > **coefChebEY**

*class* **YXScanAtdZ**

*Public Functions*

**YXScanAtdZ**()

template < class Archive >

void **serialize**(Archive & ar, const unsigned int)

*Public Members*

double **dz**

std::vector< [*ECloudEFieldVORPAL2D::YScanAtX*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_e_cloud_e_field_v_o_r_p_a_l2_d_1_1_y_scan_at_x) > **data**

*class* **Ecloud\_from\_vorpal**

*Public Functions*

**Ecloud\_from\_vorpal**([*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_sptr, const std::string & file\_name\_archive, const std::string aDeviceName = std::string(“all”))

**Ecloud\_from\_vorpal**()

[*Ecloud\_from\_vorpal*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_ecloud__from__vorpal) \* **clone**()

void **apply**([*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) & bunch, double time\_step, [*Step*](http://compacc.fnal.gov/~amundson/html/simulation.html#project0class_step) & step, int verbosity, [*Logger*](http://compacc.fnal.gov/~amundson/html/utils.html#project0class_logger) & logger)

std::string **get\_field\_name**()

std::string **get\_file\_name\_archive**()

size\_t **get\_number\_devices**()

std::string **get\_device\_name**(size\_t k = 0)

void **add\_device**(const std::string & device)

void **set\_enhancing\_factor**(double f)

double **get\_enhancing\_factor**()

template < class Archive >

void **save**(Archive & ar, const unsigned int version)

template < class Archive >

void **load**(Archive & ar, const unsigned int version)

**~Ecloud\_from\_vorpal**()

*class* **Fftw\_rectangular\_helper**

*Public Functions*

**Fftw\_rectangular\_helper**(std::vector< int > const & grid\_shape, [*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_f\_sptr)

[*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) **get\_comm\_sptr**()

void **reset\_comm\_f**([*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_sptr)

ptrdiff\_t **get\_local\_nx**()

ptrdiff\_t **get\_local\_x\_start**()

void **transform**([*MArray3d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9febc18851e0710136053f19d4d3d068) & in, [*MArray3d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9febc18851e0710136053f19d4d3d068) & out)

void **inv\_transform**([*MArray3d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9febc18851e0710136053f19d4d3d068) & in, [*MArray3d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9febc18851e0710136053f19d4d3d068) & out)

**~Fftw\_rectangular\_helper**()

*class* **Impedance**

*Public Functions*

**Impedance**()

**Impedance**(std::string const & wake\_file, std::string const & wake\_type, int const & zgrid, double const & orbit\_length, double const & bunchsp, int const nstored\_turns, bool full\_machine = false, std::vector< int > wn = std::vector< int >())

**Impedance**(std::string const & wake\_file, std::string const & wake\_type, int const & zgrid, double const & orbit\_length, int const & num\_buckets, int const nstored\_turns, bool full\_machine = false, std::vector< int > wn = std::vector< int >())

**Impedance**([*Impedance*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_impedance) const & impedance)

[*Impedance*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_impedance) \* **clone**()

void **set\_z\_grid**(int const & zgrid)

int **get\_z\_grid**()

Wake\_field\_sptr **get\_wake\_field\_sptr**()

double **get\_orbit\_length**()

double **get\_wake\_factor**()

double **get\_bunch\_spacing**()

int **get\_num\_buckets**()

std::vector< int > **get\_train\_wave**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) & **get\_xmom**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) & **get\_ymom**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) & **get\_zdensity**()

[*MArray1int\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a69e792def9ba26e24a548542dd2539cc) & **get\_bin\_partition**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const & **get\_xmom**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const & **get\_ymom**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const & **get\_zdensity**()

[*MArray1int\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a69e792def9ba26e24a548542dd2539cc) const & **get\_bin\_partition**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) & **get\_xwake\_leading**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const & **get\_xwake\_leading**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) & **get\_xwake\_trailing**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const & **get\_xwake\_trailing**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) & **get\_ywake\_leading**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const & **get\_ywake\_leading**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) & **get\_ywake\_trailing**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const & **get\_ywake\_trailing**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) & **get\_zwake0**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const & **get\_zwake0**()

std::list< std::vector< Bunch\_properties > > & **get\_stored\_vbunches**()

bool **is\_full\_machine**()

int **get\_nstored\_turns**()

void **apply**([*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) & bunch, double time\_step, [*Step*](http://compacc.fnal.gov/~amundson/html/simulation.html#project0class_step) & step, int verbosity, [*Logger*](http://compacc.fnal.gov/~amundson/html/utils.html#project0class_logger) & logger)

void **apply**([*Bunch\_train*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch__train) & bunch\_train, double time\_step, [*Step*](http://compacc.fnal.gov/~amundson/html/simulation.html#project0class_step) & step, int verbosity, Train\_diagnosticss const & per\_operation\_train\_diagnosticss, [*Logger*](http://compacc.fnal.gov/~amundson/html/utils.html#project0class_logger) & logger)

template < class Archive >

void **serialize**(Archive & ar, const unsigned int version)

**~Impedance**()

*class* **Rectangular\_grid**

*Public Functions*

**Rectangular\_grid**(std::vector< double > const & physical\_size, std::vector< double > const & physical\_offset, std::vector< int > const & grid\_shape, bool periodic\_z, storage3d storage = boost::c\_storage\_order())

**Rectangular\_grid**([*Rectangular\_grid\_domain\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid__domain_8h_1a297fcce958d441def83fd1c1e5e687ab) rectangular\_grid\_domain\_sptr, storage3d storage = boost::c\_storage\_order())

[*Rectangular\_grid\_domain*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid__domain) const & **get\_domain**()

[*Rectangular\_grid\_domain*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid__domain) & **get\_domain**()

[*Rectangular\_grid\_domain\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid__domain_8h_1a297fcce958d441def83fd1c1e5e687ab) **get\_domain\_sptr**()

[*Rectangular\_grid\_domain\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid__domain_8h_1a297fcce958d441def83fd1c1e5e687ab) **get\_domain\_sptr**()

[*MArray3d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9febc18851e0710136053f19d4d3d068) const & **get\_grid\_points**()

[*MArray3d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9febc18851e0710136053f19d4d3d068) & **get\_grid\_points**()

[*MArray2dc\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a639587aeb9cc120ca9f62ff4a8978da9) const & **get\_grid\_points\_2dc**()

[*MArray2dc\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a639587aeb9cc120ca9f62ff4a8978da9) & **get\_grid\_points\_2dc**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const & **get\_grid\_points\_1d**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) & **get\_grid\_points\_1d**()

void **set\_normalization**(double val)

double **get\_normalization**()

storage3d **get\_storage**()

double **get\_interpolated**(std::vector< double > location)

double **get\_interpolated\_coord**(double x, double y, double z)

*class* **Rectangular\_grid\_domain**

*Public Functions*

**Rectangular\_grid\_domain**(std::vector< double > const & physical\_size, std::vector< double > const & physical\_offset, std::vector< int > const & grid\_shape, bool periodic\_z)

**Rectangular\_grid\_domain**(std::vector< double > const & physical\_size, std::vector< double > const & physical\_offset, std::vector< int > const & grid\_shape)

**Rectangular\_grid\_domain**(std::vector< double > const & physical\_size, std::vector< int > const & grid\_shape, bool periodic\_z)

std::vector< double > const & **get\_physical\_size**()

std::vector< double > const & **get\_physical\_offset**()

std::vector< int > const & **get\_grid\_shape**()

std::vector< double > const & **get\_cell\_size**()

bool **is\_periodic**()

std::vector< double > const & **get\_left**()

bool **get\_leftmost\_indices\_offsets**(double x, double y, double z, int & ix, int & iy, int & iz, double & offx, double & offy, double & offz)

void **get\_cell\_coordinates**(int ix, int iy, int iz, double & x, double & y, double & z)

*class* **Space\_charge\_2d\_bassetti\_erskine**

*Public Functions*

**Space\_charge\_2d\_bassetti\_erskine**()

[*Space\_charge\_2d\_bassetti\_erskine*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__2d__bassetti__erskine) \* **clone**()

void **set\_sigma**(double sigma\_x, double sigma\_y, double sigma\_cdt)

std::vector< double > **normalized\_efield**(double x, double y)

void **normalized\_efield**(double x, double y, double & E\_x, double & E\_y)

void **apply**([*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) & bunch, double time\_step, [*Step*](http://compacc.fnal.gov/~amundson/html/simulation.html#project0class_step) & step, int verbosity, [*Logger*](http://compacc.fnal.gov/~amundson/html/utils.html#project0class_logger) & logger)

**~Space\_charge\_2d\_bassetti\_erskine**()

template < class Archive >

void **serialize**(Archive & ar, const unsigned int version)

*class* **Space\_charge\_2d\_open\_hockney**

Note: internal grid is stored in [z][y][x] order, but grid shape expects [x][y][z] order.

*Public Type*

**Green\_fn\_type enum**

*Values:*

* pointlike = = 1 -
* bruteforce = = 2 -

**Charge\_density\_comm enum**

*Values:*

* reduce\_scatter = = 1 -
* charge\_allreduce = = 2 -

**E\_force\_comm enum**

*Values:*

* gatherv\_bcast = = 1 -
* allgatherv = = 2 -
* e\_force\_allreduce = = 3 -

*Public Functions*

**Space\_charge\_2d\_open\_hockney**([*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_sptr, std::vector< int > const & grid\_shape, bool need\_state\_conversion = true, bool periodic\_z = false, double z\_period = 0.0, bool grid\_entire\_period = false, double n\_sigma = 8.0)

**Space\_charge\_2d\_open\_hockney**([*Distributed\_fft2d\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0distributed__fft2d_8h_1a370ec972e83032203adcd74fe5039b72) distributed\_fft2d\_sptr, bool need\_state\_conversion = true, bool periodic\_z = false, double z\_period = 0.0, bool grid\_entire\_period = false, double n\_sigma = 8.0)

Note: Use Space\_charge\_2d\_open\_hockney::get\_internal\_grid\_shape for [*Distributed\_fft2d*](http://compacc.fnal.gov/~amundson/html/utils.html#project0class_distributed__fft2d).

**Space\_charge\_2d\_open\_hockney**()

[*Space\_charge\_2d\_open\_hockney*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__2d__open__hockney) \* **clone**()

bool **get\_need\_state\_conversion**()

double **get\_n\_sigma**()

void **set\_green\_fn\_type**([*Green\_fn\_type*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__2d__open__hockney_1a596cb14930b01958eb53b110a130192a) green\_fn\_type)

[*Green\_fn\_type*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__2d__open__hockney_1a596cb14930b01958eb53b110a130192a) **get\_green\_fn\_type**()

void **set\_charge\_density\_comm**([*Charge\_density\_comm*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__2d__open__hockney_1acfe5afc8ee508626df346ca6aabfd26e) charge\_density\_comm)

[*Charge\_density\_comm*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__2d__open__hockney_1acfe5afc8ee508626df346ca6aabfd26e) **get\_charge\_density\_comm**()

void **set\_e\_force\_comm**([*E\_force\_comm*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__2d__open__hockney_1a42f29dfbd7de21a481d0fb9d6cf6dcd3) e\_force\_comm)

[*E\_force\_comm*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__2d__open__hockney_1a42f29dfbd7de21a481d0fb9d6cf6dcd3) **get\_e\_force\_comm**()

void **auto\_tune\_comm**(bool verbose = false)

void **set\_fixed\_domain**([*Rectangular\_grid\_domain\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid__domain_8h_1a297fcce958d441def83fd1c1e5e687ab) domain\_sptr)

void **update\_domain**([*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) const & bunch)

[*Rectangular\_grid\_domain*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid__domain) const & **get\_domain**()

[*Rectangular\_grid\_domain\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid__domain_8h_1a297fcce958d441def83fd1c1e5e687ab) **get\_domain\_sptr**()

[*Rectangular\_grid\_domain\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid__domain_8h_1a297fcce958d441def83fd1c1e5e687ab) **get\_doubled\_domain\_sptr**()

[*Distributed\_rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0distributed__rectangular__grid_8h_1ab0a5adffc63889d2ce24fde4e4b7f797) **get\_global\_charge\_density2\_reduce\_scatter**([*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) const & local\_charge\_density, [*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_sptr)

Returns global charge density on doubled grid in [C/m^3].

[*Distributed\_rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0distributed__rectangular__grid_8h_1ab0a5adffc63889d2ce24fde4e4b7f797) **get\_global\_charge\_density2\_allreduce**([*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) const & local\_charge\_density, [*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_sptr)

Returns global charge density on doubled grid in [C/m^3].

[*Rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid_8h_1a327ba9455a3684d410607c46d2286a73) **get\_local\_charge\_density**([*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) const & bunch)

Returns local charge density on doubled grid in [C/m^3].

[*Distributed\_rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0distributed__rectangular__grid_8h_1ab0a5adffc63889d2ce24fde4e4b7f797) **get\_global\_charge\_density2**([*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) const & local\_charge\_density, [*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_sptr)

Returns global charge density on doubled grid in [C/m^3].

[*Distributed\_rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0distributed__rectangular__grid_8h_1ab0a5adffc63889d2ce24fde4e4b7f797) **get\_green\_fn2\_pointlike**()

Returns Green function on the doubled grid in [1/m^3].

[*Distributed\_rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0distributed__rectangular__grid_8h_1ab0a5adffc63889d2ce24fde4e4b7f797) **get\_green\_fn2\_brute\_force**()

[*Distributed\_rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0distributed__rectangular__grid_8h_1ab0a5adffc63889d2ce24fde4e4b7f797) **get\_local\_force2**([*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) & charge\_density2, [*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) & green\_fn2)

[*Rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid_8h_1a327ba9455a3684d410607c46d2286a73) **get\_global\_electric\_force2\_gatherv\_bcast**([*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) const & dist\_force)

[*Rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid_8h_1a327ba9455a3684d410607c46d2286a73) **get\_global\_electric\_force2\_allgatherv**([*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) const & dist\_force)

[*Rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid_8h_1a327ba9455a3684d410607c46d2286a73) **get\_global\_electric\_force2\_allreduce**([*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) const & dist\_force)

[*Rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid_8h_1a327ba9455a3684d410607c46d2286a73) **get\_global\_electric\_force2**([*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) const & dist\_force)

void **apply\_kick**([*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) & bunch, [*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) const & rho2\_1d, [*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) const & Fn, double delta\_tau)

void **apply**([*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) & bunch, double time\_step, [*Step*](http://compacc.fnal.gov/~amundson/html/simulation.html#project0class_step) & step, int verbosity, [*Logger*](http://compacc.fnal.gov/~amundson/html/utils.html#project0class_logger) & logger)

void **set\_files**(std::string const & xfile, std::string const & yfile)

template < class Archive >

void **save**(Archive & ar, const unsigned int version)

template < class Archive >

void **load**(Archive & ar, const unsigned int version)

**~Space\_charge\_2d\_open\_hockney**()

*class* **Space\_charge\_3d\_open\_hockney**

Note: internal grid is stored in [z][y][x] order, but grid shape expects [x][y][z] order.

*Public Type*

**Green\_fn\_type enum**

*Values:*

* pointlike = = 1 -
* linear = = 2 -

**Charge\_density\_comm enum**

*Values:*

* reduce\_scatter = = 1 -
* charge\_allreduce = = 2 -

**E\_field\_comm enum**

*Values:*

* gatherv\_bcast = = 1 -
* allgatherv = = 2 -
* e\_field\_allreduce = = 3 -

*Public Functions*

**Space\_charge\_3d\_open\_hockney**(std::vector< int > const & grid\_shape, bool longitudinal\_kicks = true, bool periodic\_z = false, double z\_period = 0.0, bool grid\_entire\_period = false, double n\_sigma = 8.0)

**Space\_charge\_3d\_open\_hockney**(Commxx\_divider\_sptr commxx\_divider\_sptr, std::vector< int > const & grid\_shape, bool longitudinal\_kicks = true, bool periodic\_z = false, double z\_period = 0.0, bool grid\_entire\_period = false, double n\_sigma = 8.0)

**Space\_charge\_3d\_open\_hockney**([*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_sptr, std::vector< int > const & grid\_shape, bool longitudinal\_kicks = true, bool periodic\_z = false, double z\_period = 0.0, bool grid\_entire\_period = false, double n\_sigma = 8.0)

Deprecated. The comm\_sptr argument is ignored.

**Space\_charge\_3d\_open\_hockney**()

Note: Use Space\_charge\_3d\_open\_hockney::get\_internal\_grid\_shape for [*Distributed\_fft3d*](http://compacc.fnal.gov/~amundson/html/utils.html#project0class_distributed__fft3d).

jfa: unnecessary complication

[*Space\_charge\_3d\_open\_hockney*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__3d__open__hockney) \* **clone**()

void **setup\_communication**([*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) const & bunch\_comm\_sptr)

void **setup\_derived\_communication**()

double **get\_n\_sigma**()

void **set\_green\_fn\_type**([*Green\_fn\_type*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__3d__open__hockney_1a6dff617478f36e8a61fa53aa186703cc) green\_fn\_type)

[*Green\_fn\_type*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__3d__open__hockney_1a6dff617478f36e8a61fa53aa186703cc) **get\_green\_fn\_type**()

void **set\_charge\_density\_comm**([*Charge\_density\_comm*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__3d__open__hockney_1aaebaf0b6c6955a16261cfdd96b02e9c2) charge\_density\_comm)

[*Charge\_density\_comm*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__3d__open__hockney_1aaebaf0b6c6955a16261cfdd96b02e9c2) **get\_charge\_density\_comm**()

void **set\_e\_field\_comm**([*E\_field\_comm*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__3d__open__hockney_1a6ac154b96fe004f0e25ea70c7d73d11d) e\_field\_comm)

[*E\_field\_comm*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__3d__open__hockney_1a6ac154b96fe004f0e25ea70c7d73d11d) **get\_e\_field\_comm**()

void **auto\_tune\_comm**([*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) & bunch, bool verbose = false)

void **set\_fixed\_domain**([*Rectangular\_grid\_domain\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid__domain_8h_1a297fcce958d441def83fd1c1e5e687ab) domain\_sptr)

void **update\_domain**([*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) const & bunch)

[*Rectangular\_grid\_domain*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid__domain) const & **get\_domain**()

[*Rectangular\_grid\_domain\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid__domain_8h_1a297fcce958d441def83fd1c1e5e687ab) **get\_domain\_sptr**()

[*Rectangular\_grid\_domain\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid__domain_8h_1a297fcce958d441def83fd1c1e5e687ab) **get\_doubled\_domain\_sptr**()

[*Distributed\_rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0distributed__rectangular__grid_8h_1ab0a5adffc63889d2ce24fde4e4b7f797) **get\_global\_charge\_density2\_reduce\_scatter**([*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) const & local\_charge\_density, [*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_sptr)

Returns global charge density on doubled grid in [C/m^3].

[*Distributed\_rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0distributed__rectangular__grid_8h_1ab0a5adffc63889d2ce24fde4e4b7f797) **get\_global\_charge\_density2\_allreduce**([*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) const & local\_charge\_density, [*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_sptr)

Returns global charge density on doubled grid in [C/m^3].

[*Rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid_8h_1a327ba9455a3684d410607c46d2286a73) **get\_local\_charge\_density**([*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) const & bunch)

Returns local charge density on original grid in [C/m^3].

[*Distributed\_rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0distributed__rectangular__grid_8h_1ab0a5adffc63889d2ce24fde4e4b7f797) **get\_global\_charge\_density2**([*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) const & local\_charge\_density, [*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_sptr)

Returns global charge density on doubled grid in [C/m^3].

[*Distributed\_rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0distributed__rectangular__grid_8h_1ab0a5adffc63889d2ce24fde4e4b7f797) **get\_green\_fn2\_pointlike**()

Returns Green function on the doubled grid in [1/m^3].

[*Distributed\_rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0distributed__rectangular__grid_8h_1ab0a5adffc63889d2ce24fde4e4b7f797) **get\_green\_fn2\_linear**()

[*Distributed\_rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0distributed__rectangular__grid_8h_1ab0a5adffc63889d2ce24fde4e4b7f797) **get\_scalar\_field2**([*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) & charge\_density22, [*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) & green\_fn2)

[*Distributed\_rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0distributed__rectangular__grid_8h_1ab0a5adffc63889d2ce24fde4e4b7f797) **extract\_scalar\_field**([*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) const & scalar\_field2)

[*Distributed\_rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0distributed__rectangular__grid_8h_1ab0a5adffc63889d2ce24fde4e4b7f797) **get\_electric\_field\_component**([*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) const & scalar\_field, int component)

Returns component of electric field [V/m].

**Parameters**

* scalar\_field -

the scalar field [V]

* component -

which component (0=x, 1=y, 2=z)

[*Rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid_8h_1a327ba9455a3684d410607c46d2286a73) **get\_global\_electric\_field\_component\_gatherv\_bcast**([*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) const & dist\_field)

[*Rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid_8h_1a327ba9455a3684d410607c46d2286a73) **get\_global\_electric\_field\_component\_allgatherv**([*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) const & dist\_field)

[*Rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid_8h_1a327ba9455a3684d410607c46d2286a73) **get\_global\_electric\_field\_component\_allreduce**([*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) const & dist\_field)

[*Rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid_8h_1a327ba9455a3684d410607c46d2286a73) **get\_global\_electric\_field\_component**([*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) const & dist\_field)

void **apply\_kick**([*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) & bunch, [*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) const & En, double delta\_tau, int component)

void **apply**([*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) & bunch, double time\_step, [*Step*](http://compacc.fnal.gov/~amundson/html/simulation.html#project0class_step) & step, int verbosity, [*Logger*](http://compacc.fnal.gov/~amundson/html/utils.html#project0class_logger) & logger)

template < class Archive >

void **save**(Archive & ar, const unsigned int version)

template < class Archive >

void **load**(Archive & ar, const unsigned int version)

**~Space\_charge\_3d\_open\_hockney**()

*class* **Space\_charge\_rectangular**

*Public Functions*

**Space\_charge\_rectangular**([*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_f\_sptr, std::vector< double > const & pipe\_size, std::vector< int > const & grid\_shape, bool equally\_spread)

**Space\_charge\_rectangular**(std::vector< double > const & pipe\_size, std::vector< int > const & grid\_shape)

**Space\_charge\_rectangular**()

[*Space\_charge\_rectangular*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__rectangular) \* **clone**()

void **set\_fftw\_helper**([*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) comm\_sptr, bool equally\_spread)

[*Commxx\_sptr*](http://compacc.fnal.gov/~amundson/html/utils.html#project0commxx_8h_1a8e4a45ebebd319814e88c81a65f0dbd9) **get\_comm\_sptr**()

std::vector< double > **get\_pipe\_size**()

std::vector< int > **get\_grid\_shape**()

[*Rectangular\_grid\_domain*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid__domain) const & **get\_domain**()

[*Rectangular\_grid\_domain\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid__domain_8h_1a297fcce958d441def83fd1c1e5e687ab) **get\_domain\_sptr**()

[*Fftw\_rectangular\_helper\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0fftw__rectangular__helper_8h_1a4669ce73a5e3c87279c9821aa5b487e8) **get\_fftw\_helper\_sptr**()

[*Rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid_8h_1a327ba9455a3684d410607c46d2286a73) **get\_charge\_density**([*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) const & bunch)

[*Distributed\_rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0distributed__rectangular__grid_8h_1ab0a5adffc63889d2ce24fde4e4b7f797) **get\_phi\_local**([*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) & rho)

[*Rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid_8h_1a327ba9455a3684d410607c46d2286a73) **get\_En**([*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) & phi\_local, int component)

std::vector< [*Rectangular\_grid\_sptr*](http://compacc.fnal.gov/~amundson/html/collective.html#project0rectangular__grid_8h_1a327ba9455a3684d410607c46d2286a73) > **get\_Efield**([*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) & rho, [*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) const & bunch, int max\_component)

void **apply\_kick**([*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) & bunch, [*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) const & En, double time\_step, int component)

void **apply**([*Bunch*](http://compacc.fnal.gov/~amundson/html/bunch.html#project0class_bunch) & bunch, double time\_step, [*Step*](http://compacc.fnal.gov/~amundson/html/simulation.html#project0class_step) & step, int verbosity, [*Logger*](http://compacc.fnal.gov/~amundson/html/utils.html#project0class_logger) & logger)

template < class Archive >

void **save**(Archive & ar, const unsigned int version)

template < class Archive >

void **load**(Archive & ar, const unsigned int version)

**~Space\_charge\_rectangular**()

*class* **Wake\_field**

*Public Functions*

**Wake\_field**()

**Wake\_field**(std::string const & wake\_file, std::string const & wake\_type)

std::string **get\_wake\_type**()

std::string **get\_wake\_file\_name**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const **get\_z\_coord**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const **get\_xw\_lead**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const **get\_xw\_trail**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const **get\_yw\_lead**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const **get\_yw\_trail**()

[*MArray1d\_ref*](http://compacc.fnal.gov/~amundson/html/utils.html#project0multi__array__typedefs_8h_1a9326a326b0bb8363bac5c6dc1feba89b) const **get\_z\_wake**()

int **get\_istart**()

double **get\_zstart**()

double **get\_delta\_z**()

void **multiply\_xw\_lead**(double mltp)

void **multiply\_xw\_trail**(double mltp)

void **multiply\_yw\_lead**(double mltp)

void **multiply\_yw\_trail**(double mltp)

void **multiply\_z\_wake**(double mltp)

template < class Archive >

void **serialize**(Archive & ar, const unsigned int version)

**~Wake\_field**()

Warning

doxygenclass: Cannot find class “YScanAtX” in doxygen xml output for project “project0” from directory: xml

Warning

doxygenclass: Cannot find class “YXScanAtdZ” in doxygen xml output for project “project0” from directory: xml

**Typedefs**

typedef boost::shared\_ptr< [*Distributed\_rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_distributed__rectangular__grid) > **Distributed\_rectangular\_grid\_sptr**

typedef boost::shared\_ptr< [*Ecloud\_from\_vorpal*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_ecloud__from__vorpal) > **Ecloud\_from\_vorpal\_sptr**

typedef boost::shared\_ptr< [*Fftw\_rectangular\_helper*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_fftw__rectangular__helper) > **Fftw\_rectangular\_helper\_sptr**

typedef boost::shared\_ptr< [*Impedance*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_impedance) > **Impedance\_sptr**

typedef boost::shared\_ptr< [*Rectangular\_grid\_domain*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid__domain) > **Rectangular\_grid\_domain\_sptr**

typedef boost::shared\_ptr< [*Rectangular\_grid*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_rectangular__grid) > **Rectangular\_grid\_sptr**

typedef boost::shared\_ptr< [*Space\_charge\_2d\_bassetti\_erskine*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__2d__bassetti__erskine) > **Space\_charge\_2d\_bassetti\_erskine\_sptr**

typedef boost::shared\_ptr< [*Space\_charge\_2d\_open\_hockney*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__2d__open__hockney) > **Space\_charge\_2d\_open\_hockney\_sptr**

typedef boost::shared\_ptr< [*Space\_charge\_3d\_open\_hockney*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__3d__open__hockney) > **Space\_charge\_3d\_open\_hockney\_sptr**

typedef boost::shared\_ptr< [*Space\_charge\_rectangular*](http://compacc.fnal.gov/~amundson/html/collective.html#project0class_space__charge__rectangular) > **Space\_charge\_rectangular\_sptr**