Advanced source definitions

Colliding beams

Synchrotron radiation

Cosmic rays

Multiple beam spots

USRBIN source

Special sources

Input card: `SPECSOUR`

Note that any arbitrary source term can be defined in the `source.f` routine (not covered here)

The `SPECSOUR` card allows to use pre-defined special sources that cannot be described by the simple cards like: `BEAM`, `BEAMPOS` and `BEAMAXES`

Special source types:

- Colliding beams
- Synchrotron radiation
- Cosmic rays

- Multiple beam spots
- USRBIN source

} Available in the new FLUKA release

Colliding beams

Type: **PPSOURCE**, **CROSSASY** or **CROSSSYM**

Special sources – *Colliding beams*

Input card: `SPECSOUR` – PPSOURCE

SPECSOUR	Type: PPSOURCE ▾		
	P1x:	P1y:	P1z:
	P2x:	P2y:	P2z:
	σx:	σy:	σz:
limit-σ:	Part: ▾	A:	Z:
σθC_1:	σ0_1:	σθC_2:	σ0_2:
	NonElastic: off ▾	Elastic: off ▾	EM dissociation: off ▾

Simulates a collision between two beams:

- 1st beam: Hadrons (including protons and heavier nuclei)
- 2nd beam: Only proton or heavier nuclei

Two section of the card:

- **Top**: Beam momenta and directions of the two colliding beams
- **Bottom**: Volume of interaction, beam particles and divergences, physics interactions

Special sources – *Colliding beams*

Input card: **SPECSOUR – PPSOURCE**

Beam momentum and direction:

- Based on the **Type**, 3 different option

Type: **PPSOURCE**

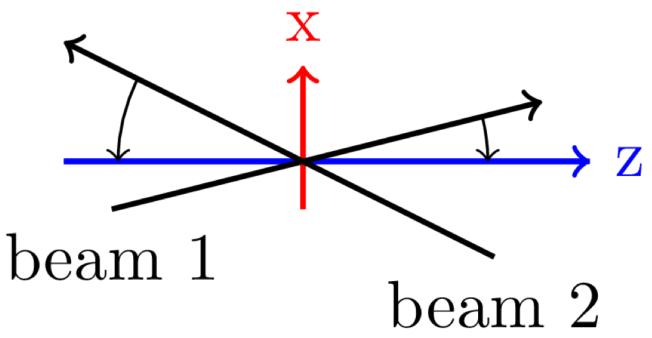
SPECSOUR	Type: PPSOURCE ▾		
	P1x:	P1y:	P1z:
	P2x:	P2y:	P2z:

- Momentum and direction are defined with the **x**, **y** and **z** components of the **total laboratory momentum** of either beams [GeV/c]

Special sources – *Colliding beams*

Input card: **SPECSOUR – CROSSASY**

Beam momentum and direction:



Type: **CROSSASY**

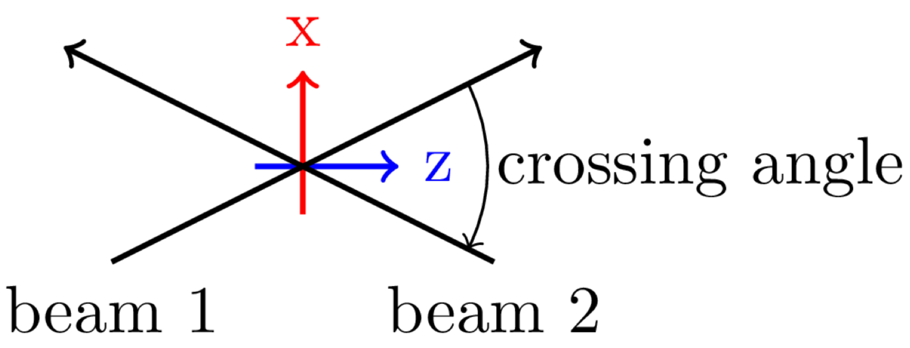
SPECSOUR	Type: CROSSASY ▾		
	P1lab:	Polar1:	Azimuthal:
	P2-lab:	Polar2:	

- **P1lab, P2lab**: **Total laboratory momentum** of beam 1 and 2, respectively [GeV/c]
- **Polar1, Polar2**: Polar angle between beam 1 (2) direction and positive (negative) z direction. [radians] (between: 0 … π/2)
- **Azimuthal**: Azimuthal angle defining the crossing plane [*degrees (!)*]

Special sources – *Colliding beams*

Input card: **SPECSOUR – CROSSSYM**

Beam momentum and direction:



Type: **CROSSSYM**

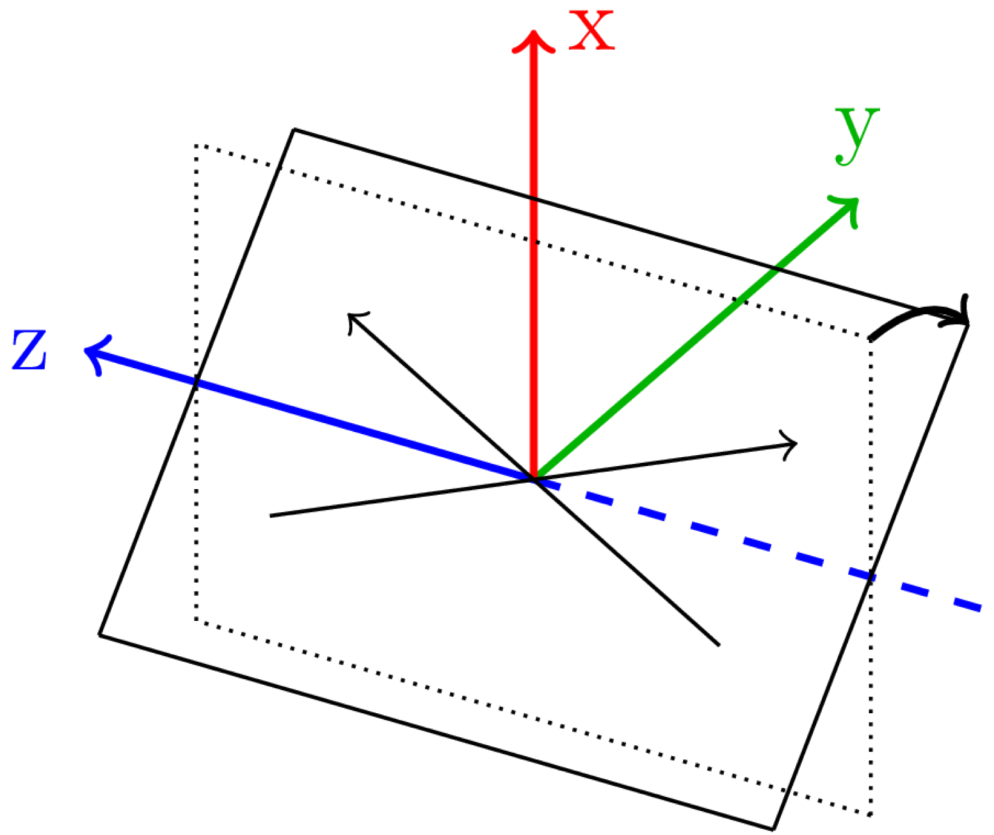
SPECSOUR	Type: CROSSSYM ▾		
	Plab:	CrossAng/2:	Azimuthal:

- **Plab**: **Total laboratory momentum** of beam 1 and 2, respectively [GeV/c]
- **CrossAng/2**: Half of the crossing angle [radians] (between: 0 … π/2)
- **Azimuthal**: Azimuthal angle defining the crossing plane [*degrees (!)*]

Special sources – *Colliding beams*

Crossing plane:

- The two beam direction define the crossing plane. In case of **Type**: **CROSSASY** and **CROSSSYM** the crossing plane is parallel to the **z** axis



Azimuth angle:

- Defines the rotation of the crossing plane around the **z** axis
  - 0°: **x-z** plane, towards positive **x** (*Default*)
  - 90°: **y-z** plane, towards positive **y**
  - 180°: **x-z** plane, towards negative **x**
  - 270°: **y-z** plane, towards negative **y**

Note: **BEAMAXES** card is disregarded

Special sources – *Colliding beams*

Input card: **SPECSOUR – PPSOURCE**

Volume of interaction:

	σx:	σy:	σz:
limit-σ:	Part: ▼	A:	Z:

- **σx, σy, σz**: for the Gaussian sampling of the interaction position around the interaction point, along the **x**, **y** and **z** axes [cm]
  Note that it is independent of the geometry region
- **limit-σ**: sampling limit, *in sigma*, applied along **x**, **y**, and **z axes**

Beam particles:

	σx:	σy:	σz:
limit-σ:	Part: ▼	A:	Z:

- **Part**: Particle type of beam 1
  Default: Particle defined on the **BEAM** card
- **A, Z**: Mass and atomic number of beam 2
  Default: A=1, Z=1 (**PROTON**)

Special sources – *Colliding beams*

Input card: **SPECSOUR – PPSOURCE**

Divergences:

σθC_1: σ0_1: σθC_2: σ0_2:

- **σθC_1, σθC_2**: Divergence in the crossing plane for beam 1 and beam 2 respectively [radians]
- **σO_1, σO_2**: Divergence in the orthogonal plane for beam 1 and beam 2 respectively [radians]

Physics interactions:

NonElastic: off ▾ Elastic: off ▾ EM dissociation: off ▾

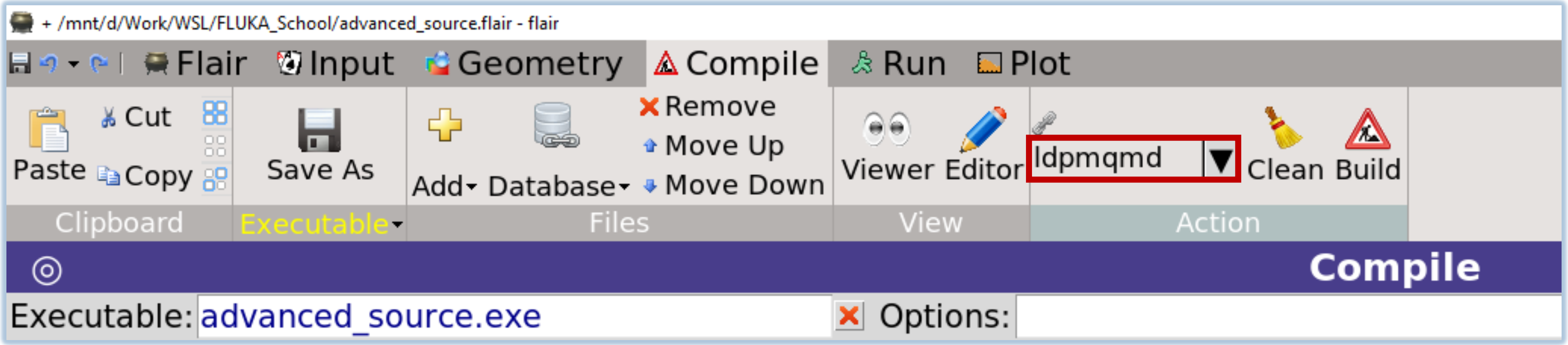
- Select different physics interactions.
  Note: Elastic interactions are not available with heavy ions
- *Default*: **Non elastic** interaction, plus **EM dissociation** if enabled with a **PHYSICS** (**EM-DISSO**) card

Special sources – *Colliding beams*

Input card: **SPECSOUR – PPSOURCE**

Additional requirements:

- DPMJET must be linked by selecting the ***ldpmqmd*** linker on the *Compile* tab:



- A **PHYSICS** (**LIMITS**) card has to be present, to initialize DPMJET, with a value greater than the maximum nucleon centre-of-mass momentum [GeV/c]

Special sources – *Colliding beams*

Input card: `SPECSOUR` – **CROSSSYM**

Example:

- **LHC**:
  - pp collision, 7 TeV, y-z plane (vertical crossing), 285 μrad crossing angle
  - Interaction volume: **σx = σy** = 12 μm, **σz** = 5 cm
  - Divergence: 1.057e-2 mrad (both beams, both planes)
  - Non elastic interactions

SPECSOUR	Type: CROSSSYM ▾		
	Plab: 7000.0	CrossAng/2: 142.5e-6	Azimuthal: 90.0
	σx: 12.0e-4	σy: 12.0e-4	σz: 5.0
limit-σ:	Part: PROTON ▾	A: 1	Z: 1
σθC_1: 1.057e-5	σ0_1: 1.057e-5	σθC_2: 1.057e-5	σ0_2: 1.057e-5
	NonElastic: On ▾	Elastic: off ▾	EM dissociation: off ▾

Synchrotron radiation

Type: **SYNC-RAD**, **SYNC-RDN**, **SYN-RAS** or **SYNC-RDS**

Special sources – *Synchrotron radiation*

Input card: **SPECSOUR – SYNC-RAD**

If a charged particle moves on a curved trajectory (due to a magnetic field), it emits synchrotron (photon) radiation

FLUKA can model the synchrotron radiation up to two circular arcs (or helical paths)

- Accounting for the emitted photon polarization
- Sampling the photon energy and angle

Note:

- The emitting charged particles are not simulated, **the emitted photons are directly sampled as primary particles**
- The **magnetic field**, if relevant for secondary particles transport, has to be declared via the **MGNFIELD** card and assigned to any magnetic region via the **ASSIGNMA** card

Special sources – *Synchrotron radiation*

Input card: **`SPECSOUR` – SYNC-RAD**

SPECSOUR		Type:	SYNC-RAD ▾	Part:	▾		
		Z:	0	A:	0	Isomer:	0
E/p:	Momentum ▾	p:		R/B:	Radius ▾	R:	
Eγmin:		Bx:		By:		Length:	
		x2:		y2:		z2:	
		cosx2:		cosy2:			

Particle definition:

- **Part**: Emitting particle type, if not selected, a heavy ion can be specified with:
- **Z** (atomic), **A** (mass number), **Isomer**: Specify a heavy ion

  Default: **ELECTRON** (if no **Part** selected and no heavy ion specified)
- **E/p**: Defines the **Momentum** [GeV/c] or **Energy** [GeV] of the emitting particle

Note: The starting point and direction of the first arc, is defined on the **`BEAMPOS`** card, **`BEAMAXES`** card is disregarded

Special sources – *Synchrotron radiation*

Input card: `SPECSOUR` – SYNC-RAD

SPECSOUR	Type: SYNC-RAD ▾	Part: ▾	
	Z: 0	A: 0	Isomer: 0
E/p: Momentum ▾	p:	R/B: Radius ▾	R:
Eγmin:	Bx:	By:	Length:
	x2:	y2:	z2:
	cosx2:	cosy2:	

Arc definition and sampling limit:

- **Length**: Defines the length of both arcs [cm]
- **Eγmin**: Defines the minimum energy of the emitted photons [GeV]. *Default:* 100 eV

Second arc (*optional*):

- **x2**, **y2**, **z2**: x, y and z coordinates of the starting point of arc two
- **cosx2**, **cosy2**: x and y components of the emitting particle direction versor at the beginning of arc two

Special sources – *Synchrotron radiation*

Input card: `SPECSOUR` – **SYNC-RAD**

SPECSOUR		Type:	SYNC-RAD ▾	Part:	▾		
		Z:	0	A:	0	Isomer:	0
E/p:	Momentum ▾	p:		R/B:	Radius ▾	R:	
Eymin:		Bx:		By:		Length:	

Magnetic field definition:

- **R/B**: Defines the curvature **Radius** [cm] of the trajectory or the absolute value of the bending magnetic field (**MagField**) [T]
- **Bx**, **By**: x and y components of the magnetic field versor
- **Type**: Selects the sign of the z component of the magnetic field versor (Bz)

  SYNC-RAD: Bz > 0 for both arc

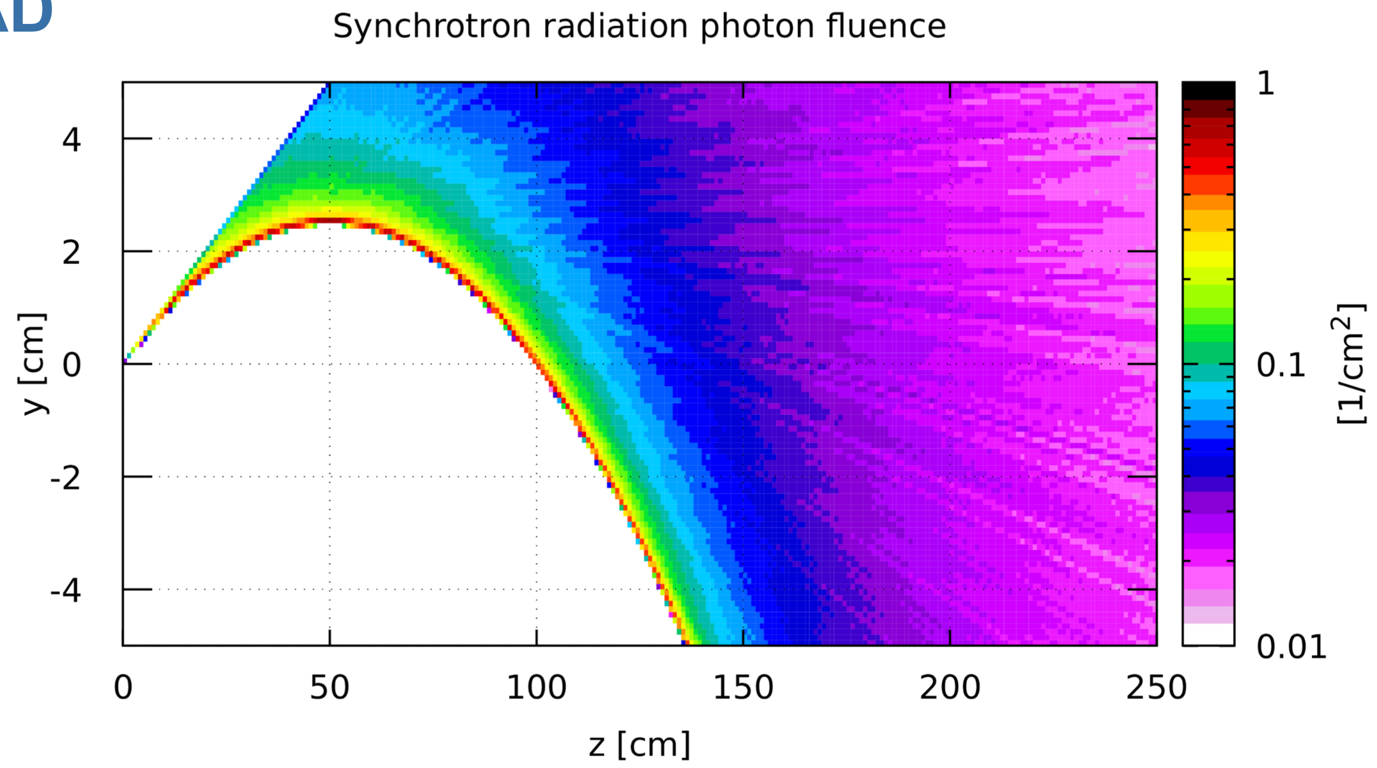
  SYNC-RAS: Bz > 0 for arc one and Bz < 0 for arc two

  SYNC-RDN: Bz < 0 for both arc

  SYNC-RDS: Bz < 0 for arc one and Bz > 0 for arc two

Special sources – *Synchrotron radiation*

Input card: **SPECSOUR – SYNC-RAD**



Example:

- 3 GeV/c electron
- 2 T magnetic field
- 150 cm arc length

SPECSOUR	Type: SYNC-RAD ▾	Part: ELECTRON ▾	
E/p: Momentum ▾	p: 3.0	R/B: MagField ▾	B: 2.0
Eymin:	Bx: 1.0	By: 0.0	Length: 150.0
	x2:	y2:	z2:
	cosx2:	cosy2:	

Special sources – *Synchrotron radiation*

Input card: `SPECSOUR` – SYNC-RAD

Normalization:

The results for the synchrotron radiation are per ***emitted photon***

To normalize the result for one emitting (charged) particle, we need to look inside the output (*.out*) file

Normalization factor:
actual arc length * linear density of photons above threshold

150 [cm] * **9.3061e-2** [1/cm]

```
<<< Synchrotron radiation source n.   1 >>>
 Emitting particle: ELECTRON P:      3.00000 GeV/c
   Initial position :    0.0000000       0.0000000       0.0000000      cm
   Initial direction:    0.0000000       0.10000000      0.99498744

 Magnetic field:    2.0000000       0.0000000       0.0000000      T
 Nominal curvature radius:    500.34614     cm
 Nominal arc:    150.00000     cm
 Arc angle:   0.29979246     rad
 Actual  curvature radius:    500.34614     cm
 Actual arc:    150.00000     cm
 Transverse p_T:      3.00000 GeV/c  and gamma:      5870.85237

 Critical energy:    0.0000119705 GeV

 Photon emission threshold        :   1.00000000E-07 GeV
 Photons >1 eV/nominal unit length:   0.11693748     cm^-1
 Photons/unit length 1 eV - thres.:   2.38764527E-02 cm^-1
 Photons/unit length above  thres.:   9.30610323E-02 cm^-1

 Total energy/nominal unit length:   4.55537630E-07 GeV/cm
 Energy/unit length below thresh.:   7.54228751E-10 GeV/cm
 Energy/unit length above thresh.:   4.54783401E-07 GeV cm
```

Cosmic rays

Type: **GCR-IONF, GCR-SPEC, GCR-ALLF,**
SPE-SPEC, **SPE-2003**, **SPE-2005**

Special sources – *Cosmic rays*

Cosmic rays sources reaching Earth that can be simulated in FLUKA:

- Galactic Cosmic Rays
- Solar Particle Events

The FLUKA implementation:

- determines the spectrum and composition of cosmic rays at the local interstellar medium
- takes in to account the solar wind magnetic field and the resulting interaction with the inward flow of galactic cosmic rays from the local interstellar medium
- calculates the trajectories of cosmic rays through the Earth's geomagnetic field
- transports the surviving incident cosmic rays through the Earth's atmosphere to various depths.

The detailed discussion of the cosmic rays is beyond the scope of this lecture

For further details please have a look on the FLUKA manual

Special sources – *Cosmic rays*

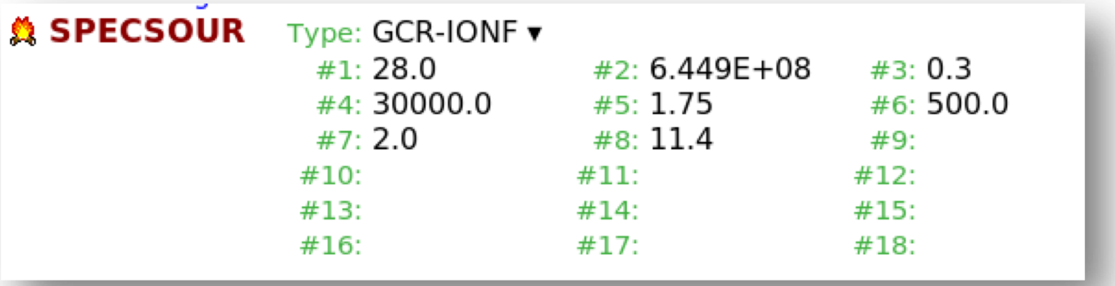
A number of tools and packages have been developed for the FLUKA environment to simulate the production of secondary particles by primary cosmic rays interacting with the Earth's atmosphere:

- atmomat.cards: it contains the material definitions for the density profile of the US Standard Atmosphere
- atmogeo.cards: it contains an example of a 3D geometrical description of the Earth atmosphere
- atmloc.f: it prepares the description of the local atmosphere geometry with the atmospheric shells initialised by option GCR-SPE
- <iz>phi<MV>.spc: GCR All-Particle-Spectra for the iz_th ion species (iz=1,...,28), modulated for the solar activity corresponding to a Phi parameter <Mv> MegVolt. Phi=500 MV roughly corresponds to solar minimum, while Phi=1400 MV roughly corresponds to solar maximum.
- allnucok.dat: GCR All-Nucleon Spectra
- sep20jan2005.spc: spectra for the Solar Particle Event of Jan 20th, 2005
- sep28oct2003.spc: spectra for the Solar Particle Event of Oct 28th, 2008

- Data files are available in `<fluka dir>/data/gcr/`
- An example is available in `<fluka dir>/examples/gcr/AllParticleExample/`

Special sources – *Cosmic rays*

Input card: `SPECSOUR` – GCR-IONF (All-particle flux)



What(1): Z-range (28 = read all *.spc files)

What(2): Spectra Injection Radius

What(3) & What(4): minimum & maximum energy (GeV)

What(5): Spectral index for sampling (below transition energy)

What(6): Transition energy for sampling (above it, sample from 1/E)

Continuation card

What(7): if 2.0, vertical geomagnetic cut-off read from What(2)

What(8): Vertical geomagnetic cut-off at central latitude

Special sources – *Cosmic rays*

Input card: **`GCR-SPE` (Initialises Galactic Cosmic Ray or Solar Particle Event calculations)**

```
        100 atm shells, dipole field, read spectra from zzphi0465.spc
GCR-SPE                 Type: Spectra ▾
      Field: naive dipole ▾ Shells: 101      Radius:
Equatorial Field:   Dump shell: 0            Unit: 0         DateFile: phi0465
```

Type: Read all *.spc files

DateFile (SDUM): Read the corresponding data files (*.sur) for a given solar potential. These files contains the normalization factors for the standard 100 atmospheric shells!

Shells: if 101 → 100 atmospheric shells

Field: Dipole field

Multiple beam spots

Type: **BEAMSPOT**

Special sources – *Multiple beam spots*

Input card: **SPECSOUR – BEAMSPOT**

Allows to define multiple beam spots

Can be used where the capabilities of the **BEAM**, **BEAMPOS**, and **BEAMAXES** are sufficient, but one than one beam is required, like radiotherapy.

SPECSOUR Type: BEAMSPOT ▾ # spots: Sampling: Random ▾

- # spots: Number of defined beam spots, up to 15000
- Sampling: How primaries sampled between the individual beam spots
  - **Random**: The beam spots are sampled randomly, according to their weights
  - **Sequentially weighted**: The beam spots are sampled sequentially each with a number of primaries proportional to its weight
  - **Sequentially equal**: The beam spots are sampled sequentially, all with the same number of primaries, ignoring their weights

Beam spots are defined with **SPOTBEAM**, **SPOTPOS** and **SPOTDIR** cards

Special sources – *Multiple beam spots*

Input card: **SPOTBEAM**

Spot definition:

- **spot_id**: ID number of the beam spot. Numbering has to be continuous, starting from 1
  Note the unusual location of the input field
- **Spot weight**: Relative intensity of the beam spot

Particle type:

- **Part**: Spot’s particle type. If not selected, a heavy ion can be specified with:
- **Z** (atomic), **A** (mass number), **Isomer**: Specify a heavy ion

Default: Particle defined on the **BEAM** card (if no **Part** selected and no heavy ion specified)

Special sources – *Multiple beam spots*

Input card: **SPOTBEAM**

Momentum / energy:

- **Beam**: Defines the **Momentum** [GeV/c] or **Energy** [GeV] or the emitting particle

Default: Momentum / energy defined on the **BEAM** card

Momentum distribution:

- **Δp**: Defines the beam's momentum distribution as:
  - **Flat**: Full width of a rectangular **momentum** distribution centred at beam momentum [GeV/c]
  - **Gaussian**: FWHM of a Gaussian **momentum** distribution [GeV/c]

Default: 0.0 **(!)**

Special sources – *Multiple beam spots*

Input card: **SPOTBEAM**

SPOTBEAM	spot_id	Beam:	Momentum ▾	p:		Part:	▾
		Z:	0	A:	0	Isomer:	0
Δp:	Flat ▾	Δp:		Spot Weight:			
Δϕx:	Flat ▾	Δϕx:		Δϕy:	Flat ▾	Δϕy:	

Angular distribution:

- **ΔΦx, ΔΦy**: Defines the beam's angular distribution in the **x/y** plane, as:
  - **Flat**: Full width of a rectangular angular distribution centred around the beam axis [mrad]
  - **Isotropic**: Isotropic distribution (Input as **Flat** distribution with angle larger than 2π [rad])
  - **Gaussian**: FWHM of a Gaussian angular distribution [mrad]

Default: **ΔΦx** = 0.0, **ΔΦy = ΔΦx**

Special sources – *Multiple beam spots*

Input card: **SPOTPOS** (optional)

SPOTPOS spot_id	x:	y:	z:
Shape(X): Rectangular ▾	Δx:	Shape(Y): Rectangular ▾	Δy:

Spot definition:

- **spot_id**: ID number of the beam spot, which this card applies to
  Note the unusual location of the input field

Beam spot position:

- **x, y, z**: Position of the beam spot along the **x**, **y**, and **z** axes [cm]

Beam spot shape:

Shape(X), Shape(Y): Defines the spatial distribution of the beam spot, as:

- **Rectangular**: Full beam width in **x/y** direction centred at the beam axis [cm]
- **Gaussian**: FWHM of a Gaussian distribution in x/y direction centred at the beam axis [cm]

Default: **Δx** = 0.0, **Δy = Δx**

Special sources – *Multiple beam spots*

Input card: **SPOTPOS** (optional)

SPOTPOS spot_id	x:	y:	z:
Shape(X): Annular ▾	Rmin:	Rmax:	

Beam spot shape (cont.):

Shape(X): Defines the spatial distribution of the beam spot, as:

- **Annular**: Defines a cylindrical beam shape in the **x-y** plane

  Rmin and **Rmax** are the radii of the distribution

  For circular beam use **Rmin** = **0**

Defaults:

If no values or **SPOTPOS** card provided, then the position and shape is taken from the **BEAM** and **BEAMPOS** cards

Special sources – *Multiple beam spots*

Input card: **SPOTDIR** (optional)

SPOTDIR spot_id	cosx:	cosy:	cosz:
	cosBxx:	cosBxy:	cosBxz:

Spot definition:

- **spot_id**: ID number of the beam spot, which this card applies to
  Note the unusual location of the input field

Beam spot direction:

- **cosx**, **cosy**, **cosz**: Defines the direction cosines of the beam

Default: Beam direction specified on the **BEAMPOS** card is used

Special sources – *Multiple beam spots*

Input card: **SPOTDIR** (optional)

SPOTDIR spot_id	cosx:	cosy:	cosz:
	cosBxx:	cosBxy:	cosBxz:

Beam spot coordinate system:

- **cosBxx**, **cosBxy**, **cosBxz**: Defines the direction cosines of the x axis of the beam coordinate system

  Default: Beam coordinate system defined on the **BEAMAXES** card is used

If the x axis of the beam spot coordinate system is specified, the z axis will be the beam spot direction, and the y axis will be automatically computed

Special sources – *Multiple beam spots*

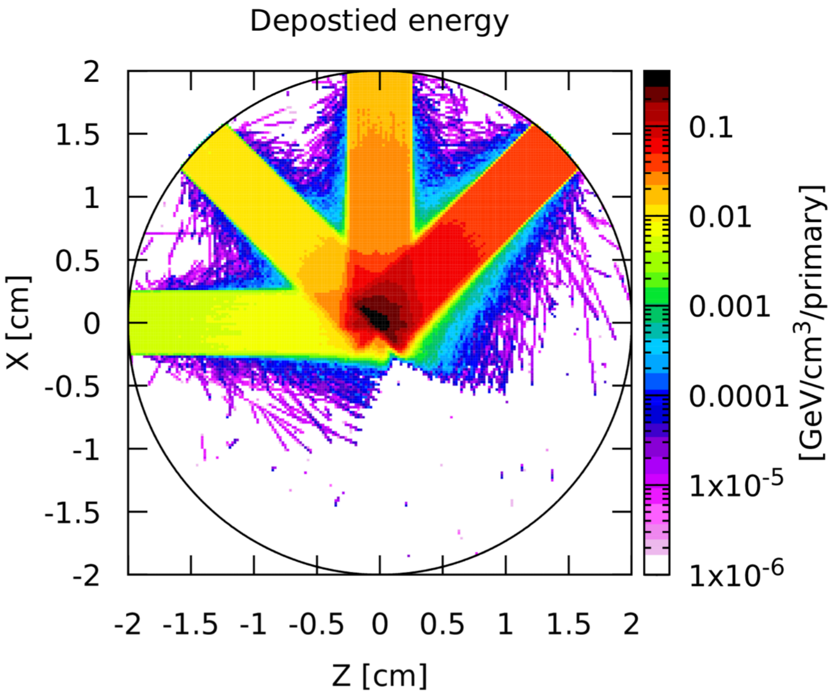
Input card: **SPECSOUR – BEAMSPOT**

Example:

R = 2 cm water sphere

47.5 MeV, 2.5 mm cylindrical, proton beams

4 spots, in 45° steps, with 2^n weight




```
BEAM                      Beam: Energy ▾            E: 0.0475               Part: PROTON ▾
          Δp: Flat ▾        Δp:                    Δϕ: Flat ▾               Δϕ:
   Shape(X): Rectangular ▾  Δx:              Shape(Y): Rectangular ▾        Δy:
SPECSOUR                  Type: BEAMSPOT ▾     # spots: 4               Sampling: Random ▾
SPOTBEAM 1                Beam: Momentum ▾          p:                      Part: ▾
                            Z: 0                    A: 0                  Isomer: 0
          Δp: Flat ▾        Δp:               Spot Weight: 1
         Δϕx: Flat ▾       Δϕx:                   Δϕy: Flat ▾               Δϕy:
SPOTPOS 1                    x:                     y:                         z: -5
   Shape(X): Annular ▾    Rmin:                  Rmax: 0.25
SPOTDIR 1                 cosx:                  cosy:                      cosz:
                        cosBxx:                cosBxy:                    cosBxz:
SPOTBEAM 2                Beam: Momentum ▾          p:                      Part: ▾
                            Z: 0                    A: 0                  Isomer: 0
          Δp: Flat ▾        Δp:               Spot Weight: 2
         Δϕx: Flat ▾       Δϕx:                   Δϕy: Flat ▾               Δϕy:
SPOTPOS 2                    x: 5                   y:                         z: -5
   Shape(X): Annular ▾    Rmin:                  Rmax: 0.25
#define angle2               : -45
SPOTDIR 2                 cosx: =sind(angle2)    cosy: 0                    cosz: =cosd(angle2)
                        cosBxx: =cosd(angle2)  cosBxy: 0                  cosBxz: =-sind(angle2)
SPOTBEAM 3                Beam: Momentum ▾          p:                      Part: ▾
                            Z: 0                    A: 0                  Isomer: 0
          Δp: Flat ▾        Δp:               Spot Weight: 4
         Δϕx: Flat ▾       Δϕx:                   Δϕy: Flat ▾               Δϕy:
SPOTPOS 3                    x: 5                   y:                         z:
   Shape(X): Annular ▾    Rmin:                  Rmax: 0.25
#define angle3               : -90
SPOTDIR 3                 cosx: =sind(angle3)    cosy: 0                    cosz: =cosd(angle3)
                        cosBxx: =cosd(angle3)  cosBxy: 0                  cosBxz: =-sind(angle3)
SPOTBEAM 4                Beam: Momentum ▾          p:                      Part: ▾
                            Z: 0                    A: 0                  Isomer: 0
          Δp: Flat ▾        Δp:               Spot Weight: 8
         Δϕx: Flat ▾       Δϕx:                   Δϕy: Flat ▾               Δϕy:
SPOTPOS 4                    x: 5                   y:                         z: 5
   Shape(X): Annular ▾    Rmin:                  Rmax: 0.25
#define angle4               : -135
SPOTDIR 4                 cosx: =sind(angle4)    cosy: 0                    cosz: =cosd(angle4)
                        cosBxx: =cosd(angle4)  cosBxy: 0                  cosBxz: =-sind(angle4)
```

USRBIN source

Type: **BIN-SOUR**

Special sources – *USRBIN source*

Input card: **SPECSOUR – BIN-SOUR**

Allows to use the result of an **USBRIN** scoring as a volumetric source distribution

SPECSOUR Type: BIN-SOUR ▾ Unit: ▾ Det Id:
Rot-before: ▾ Rot-after: ▾

- **Unit**: Logical unit of the **USRBIN** file, specified on a **OPEN** card
- **Det Id**: Detector index in the specified **USRBIN** file
- **Rot-before**: Rotation / translation applied before the sampling, specified with a **ROT-DEFI** card
- **Rot-after**: Rotation / translation applied after the sampling, specified with a **ROT-DEFI** card

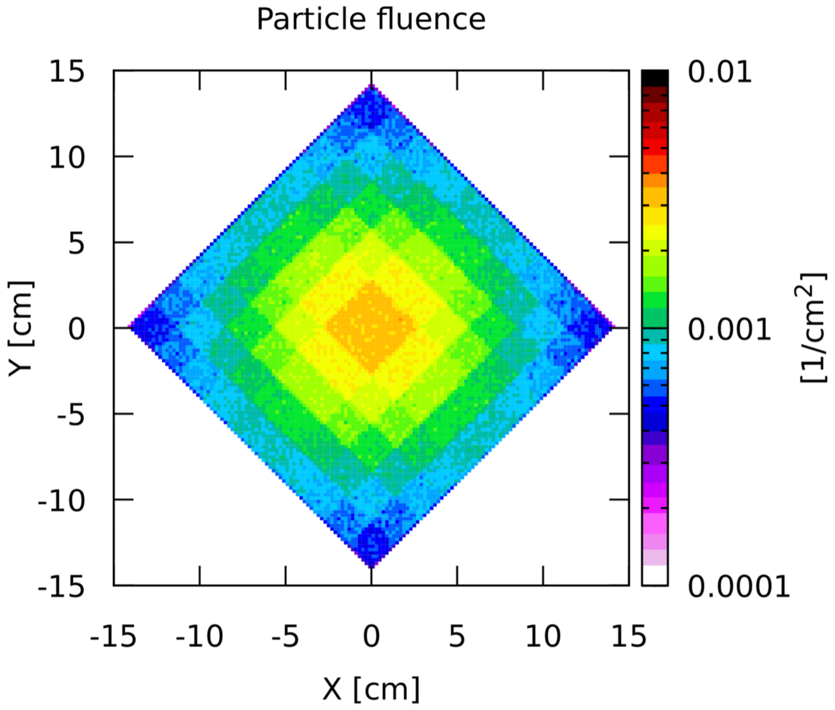
Notes:

- The scored quantity in the **USRBIN** file doesn't matter, it only provides the probability of each bin
- Only Cartesian scorings can be used
- The starting location in each bin sampled uniformly
- Sampled particles are defined with the **BEAM** card
- **BEAM-POS** and **BEAMAXES** cards still apply after the sampling (before **Rot-after**)

- Possible use to sample a radioactive source

Special sources – *USRBIN source*

Input card: `SPECSOUR`



Example:

USRBIN file opened with logical unit 99 and rotated around the Z axis.

(Beam direction along Z axis)

OPEN	Unit: 99 BIN ▾	Status: OLD ▾	
	File: bin-sour_source.bnn ▾		
SPECSOUR	Type: BIN-SOUR ▾	Unit: 99 ▾	Det Id: 1
	Rot-before: Pre ▾	Rot-after: ▾	
ROT-DEFI	Axis: Z ▾	Id: 0	Name: Pre
	Polar:	Azm: 45	
	Δx:	Δy:	Δz:

FLUKA