

The slide features a decorative layout of thin blue lines. A vertical line on the left and a horizontal line at the top intersect at a small circle in the upper-left corner. Another horizontal line is positioned below the title. A vertical line on the right and a horizontal line at the bottom intersect at a small circle in the lower-right corner.

# FLUKA: Flair Plots

4<sup>th</sup> FLUKA Course  
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# Plot List

- Plots can be created in the “Plot” list frame. Either Add new plots or Clone from existing ones.
- It is important to set a unique filename for each plot. This filename will be used for every auxiliary file that the plot needs (the extension will change)
- Do not forget to set the plot type
  - Geometry For geometry plots
  - USRBIN For plotting the output of USRBIN
  - USR-1D To plot single differential quantities from cards **USRBDX, USRTRACK, USRCOLL, USRYIELD**
  - RESNUCLE To plot 1d or 2d distributions of RESNUCLEi
  - USERDUMP To plot the output of USERDUMP. Useful for visualizing the source distribution (ToDo)

# General Tips

- All plot types share some common fields: Title + options, Filename, Axis Labels, Keys and Gnuplot Commands.
- **Plot** button (Ctrl-Enter) will generate all the necessary files to display the plot, ONLY if they do not exist.
- **Re-Plot** will force the creation of all files regardless their state
- Check the gnuplot manual to provide additional customization commands: e.g. To change the title font to Times size=20, add in the Opt: field the command: `font 'Times,20'`
- To set some default parameters for gnuplot create a file called `~/.gnuplot`
- The **output window** displays all the commands that are sent to gnuplot. As well the errors. In case of problem always consult the output window!

# Geometry plotting

- For geometry plotting the following information is needed (Fields with white background):
  - Center  $(x,y,z)$  point defining the center of your plot
  - Basis  $(U,V)$ : Two perpendicular axis vectors defining the new system
  - Extends  $(DU, DV)$  of the plot. The total width/height will be **twice** the extends
  - Scanning grid  $(NU, NV)$ : how many points to scan
  - Plotting type (Only borders, Regions, Materials, ...)
- All input fields with **light-yellow** background are used to perform operations on the previous fields. e.g. to rotate the basis-vectors
- When the **"Plot"** button is pressed, flair will create a temporary input file containing only the geometry and the related information together with the appropriate PLOTGEOM card. It will start a FLUKA run, and on exit it will convert the PLOTGEOM file in a format that gnuplot understands

# USRBIN

- Set the usrbn summary file in the **File:** field
- Select from **Det:** the detector to use.
- Select the projection axis and limits
- **Norm:** is the **normalization value or expression**. You can even define a function to use as normalization using as argument **x**: e.g.  $5*x**2+4*x$
- **Min:** is the minimum value to use in the color scale.
- **CPD:** Colors per decade
- Superimpose the geometry can be done either automatically or manually.
  - **Auto:** Select **-Auto-** in the **Use:** field of the Geometry and the program will try to draw the geometry at the middle of the limits on the projection axis. To change the position modify the **Pos:** value
  - **Manual:** The dropdown listbox will display also a list of all geometry plots in the flair project. Select the one you prefer and the plotting axis. The manual mode can be used in special cases when the usrbn file do not contain the absolute coordinates
- The color palette is predefined in flair, but the user can modify it with the **"set palette"** gnuplot command. See gnuplot help page for more info.

# USR-1D Single Differential Plot

- USR-1D is able to plot the 1D single differential information from the **USRBDX**, **USRCOLL**, **USRTRACK** and **USRYIELD** cards (The 2D information is not handled).
  - The file type in use should have the extension **\_tab.lis** and are generated by the FLUKA data merging tools (See Data Frame)
  - You can superimpose many scoring output in a single plot.
  - The basic steps to create a plot are:
    - Add or Clone a **\_tab.lis** file, in the Detectors listbox.
    - Select the detector to be used from the Det: dropdown listbox
    - Set a name in the **Name:** field. Names starting with **#** will not be displayed as keys in the plot
    - Select the **X:** and **Y:** information to plot as well the **Style:** **X,Y,Style** have different values.
- Note:** Different combination will be interpreted in different way from gnuplot, resulting to maybe unwanted results

# USR-1D Plots

- X: choices:  
[ $x_l$ ,  $x_h$  refer to the limits of each individual bin of the histogram]
  - GeoMean [ $\sqrt{x_l \cdot x_h}$ ] Geometrical mean. Should be used if X is **scored** as a log-histogram
  - Mean [ $(x_l + x_h)/2$ ] Normal mean. For **linear** scoring
  - Low [ $x_l$ ] Low value of the bin
  - High [ $x_h$ ] High value of the bin
- Y: choices:
  - Y Y-bin value as given by FLUKA
  - $Y \times \langle X \rangle$  Y-bin value multiplied by the **mean X value** of the bin (Isolethargic)
  - $Y \times \langle X_{geo} \rangle$  Y-bin value multiplied by the **geometrical X-mean** of the bin (Isolethargic)
  - $Y \times X_l$  -//- with the **X-low** value of the bin
  - $Y \times X_h$  -//- with the **X-high** value of the bin
  - $Y \times DX$  -//- with the **width** of the bin

# USR-1D Plots

- **Style:** has a huge list of choices as given by gnuplot. You can consult gnuplot manual for the description of the options. Some suggested settings are the following:
  - To make a **line/scatter plot with or without errors**
    - X: **GeoMean** (if scored in log), **Mean** (if scored in linear)
    - Y:  **$Y \times \langle X_{\text{geo}} \text{ or } X \rangle$** , for isoethargic plotting
    - Style: **lines, linespoints, dots, errorbars, yerrorbars, errorlines...**
  - To make a histogram
    - X: **Xlow [xl]**
    - Y: what ever choice you want to plot
    - Style: **steps**
    - or
    - X: **Xhigh [xh]**
    - Style: **histeps**
- You have the possibility to superimpose plots. Useful if you want to show a histogram with the errorbars superimposed.

# USERDUMP

- Still under development
- Particle tracks (use with care)
- Visualize the source particles distribution, as well superimposed with the geometry.