Simulation of Uniform Muon Flux

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Aim’s of Simulation

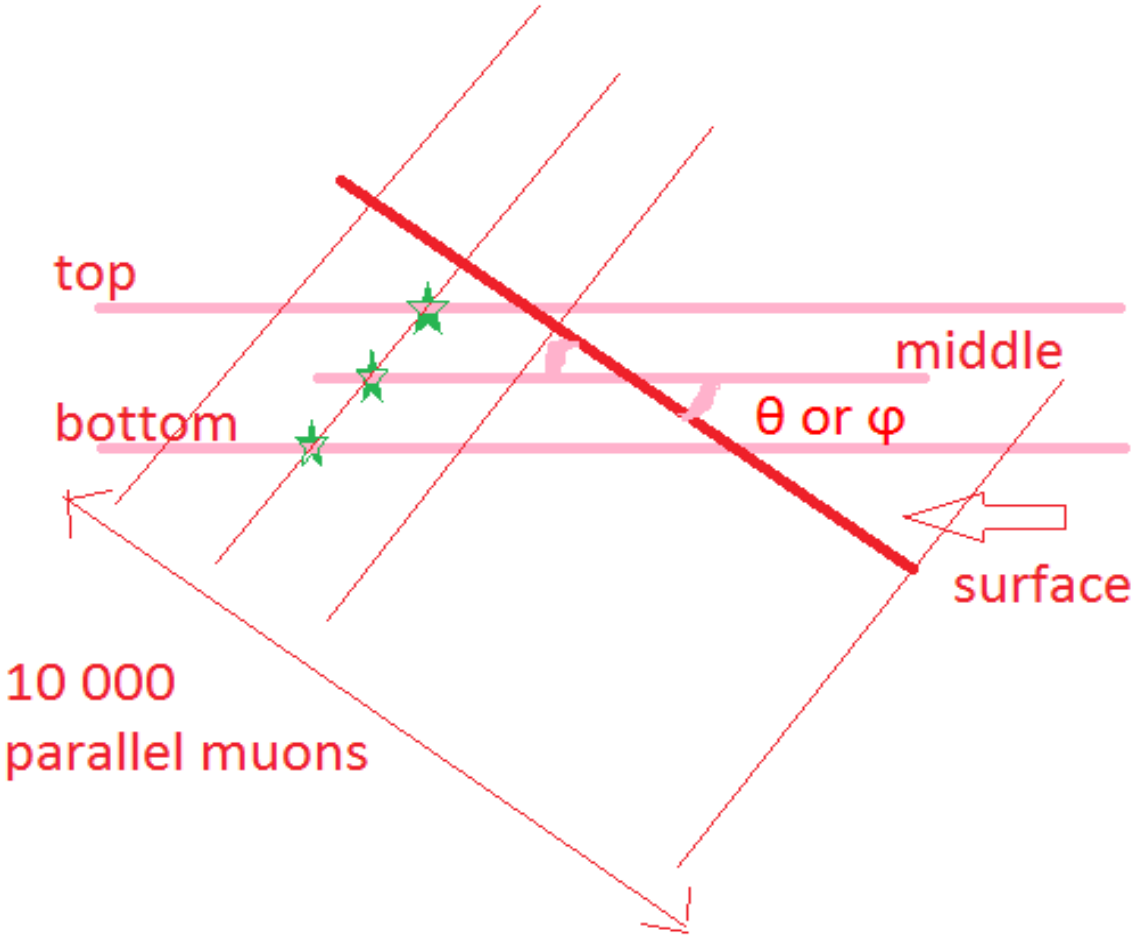
Create uniform flux of muon

- a lot of muons for each direction
- variable sampling steps for azimuth and zenith angles
- diapason: azimuth (0, 2π), zenith (0, π/2)
- cos-distribution for zenith angle

Angle statistics

- count of events for each 3-sets of pixels in top, middle and bottom levels
- this data need to avoid influence of instrumental function on experimental data

How muons are created



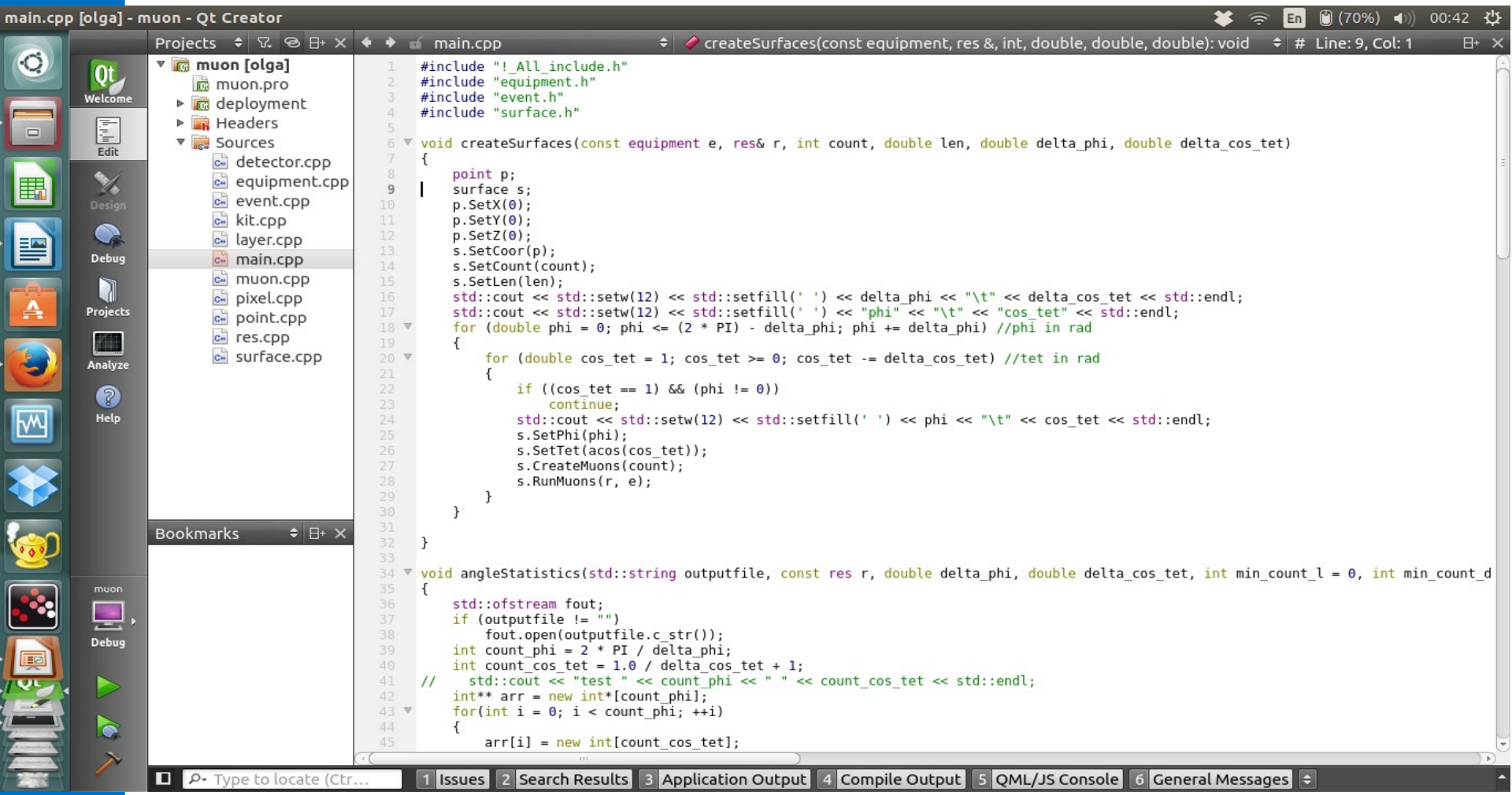
Simulation’s Assumption

- for each pair of angles 10 000 muons are simulated
- muon have high energy -> It is not dissipated and is not inhibited in detectors

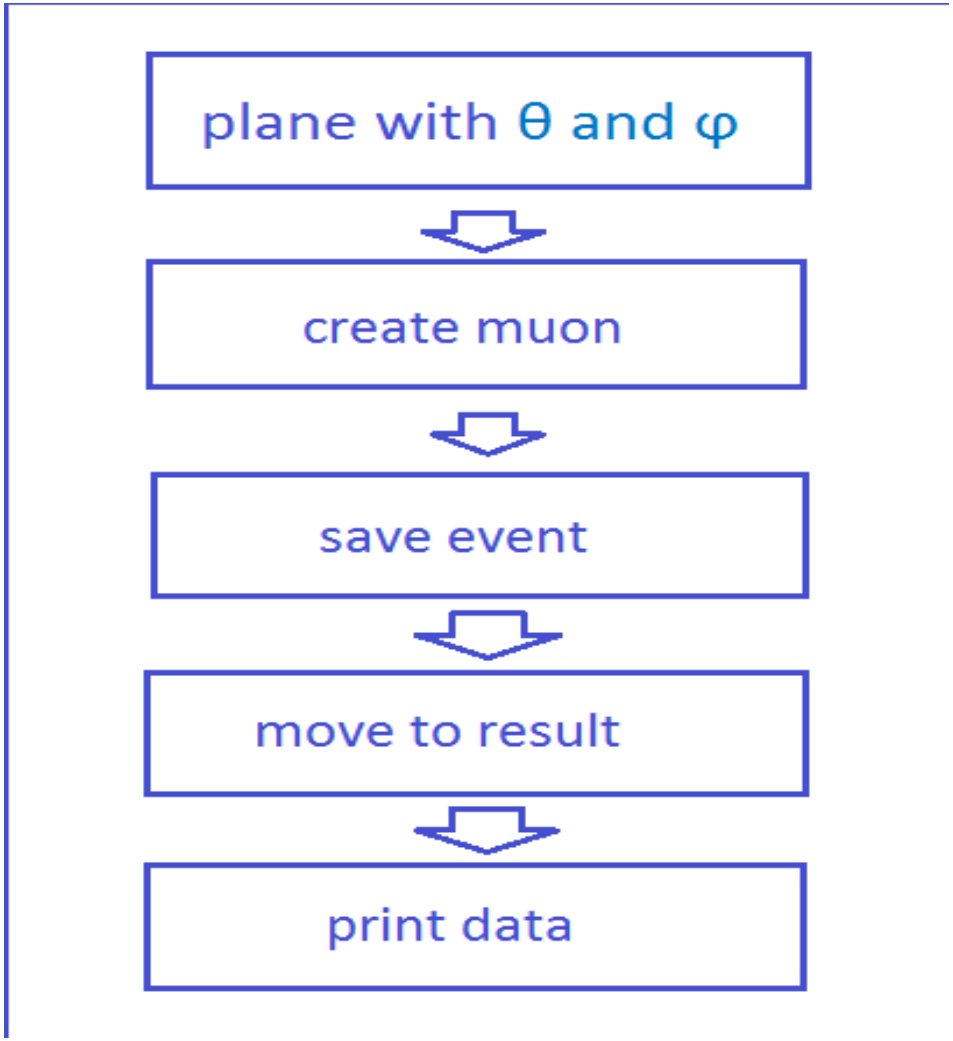
Input Fomat

```
--Place-|-SC16-|-TB-CHN-|-HB-CHN-|-X-coord-|-Y-coord-|-Z-coord-|-Theta-|-Phi
-------------------------------------------------------------------------------
 RT100      SC86      3         0         0      1000         0       0      270
 RT100      SC87      6         1         0       500         0       0      270
 RT100      SC88      8         2         0         0         0       0      270
 RT100      SC91      9         3       500      1000         0       0      270
 RT100      SC92     10         4       500       500         0       0      270
 RT100      SC93     11         5       500         0         0       0      270
 RT100      SC94     12         6      1000      1000         0       0      270
 RT100      SC85     13         7      1000       500         0       0      270
 RT100      SC96     15         8      1000         0         0       0      270
###
 RT100      SC81     26        12       250       750       180       0      270
 RT100      SC82     27        11       250       250       180       0      270
 RT100      SC83     28        23       750       750       180       0      270
 RT100      SC84     29         9       750       250       180       0      270
###
 RT100      SC72     80        21      1000         0       346       0      270
 RT100      SC73     79        20      1000       500       346       0      270
 RT100      SC74     78        19      1000      1000       346       0      270
 RT100      SC75     77        18       500         0       346       0      270
 RT100      SC76     84        17       500       500       346       0      270
 RT100      SC77     75        16       500      1000       346       0      270
 RT100      SC78     74        15         0         0       346       0      270
 RT100      SC79     73        14         0       500       346       0      270
 RT100      SC80     72        13         0      1000       346       0      270
STOP
```

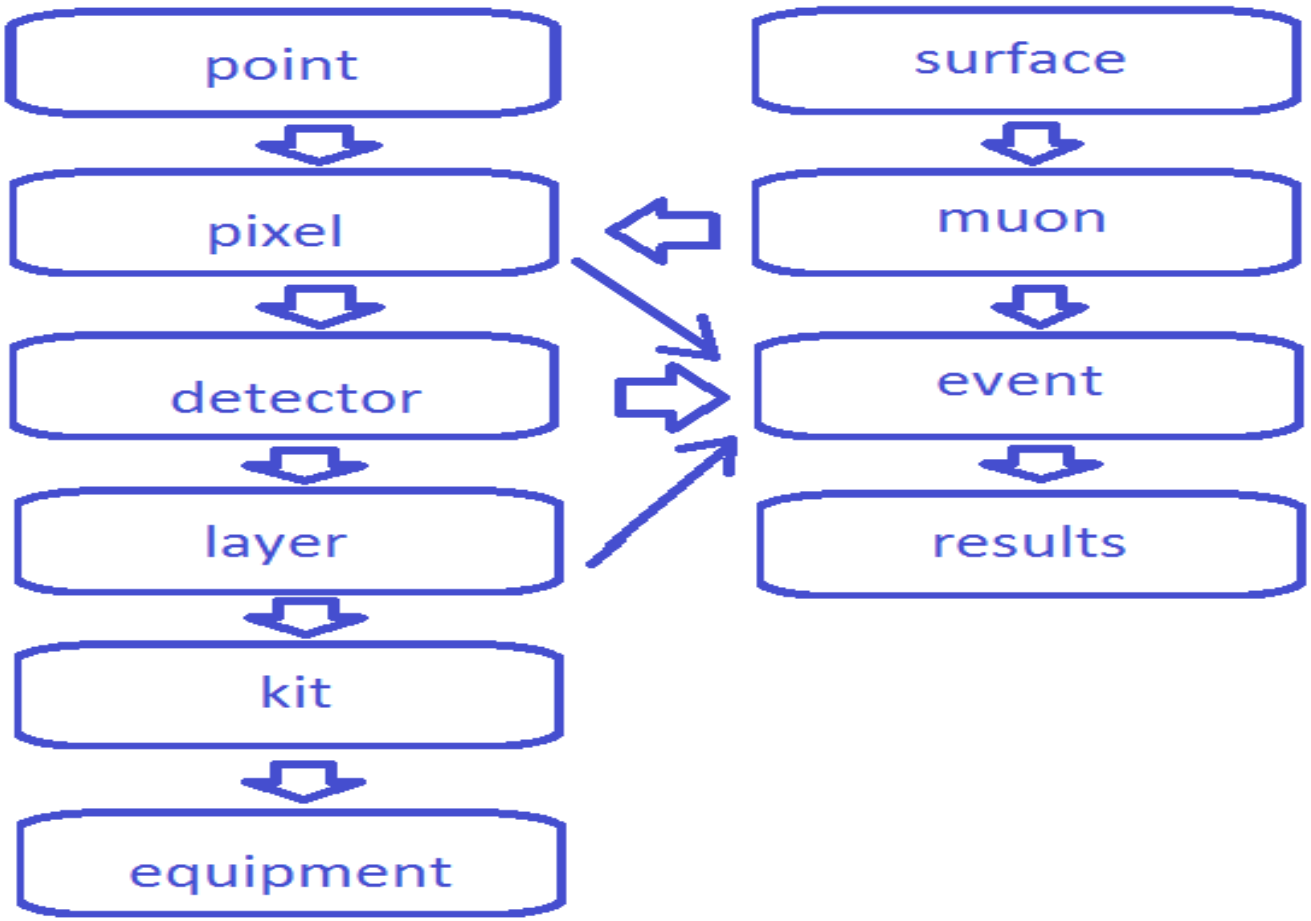
Input Fomat


main.cpp [olga] - muon - Qt Creator
Projects
muon [olga]
muon.pro
deployment
Headers
Sources
detector.cpp
equipment.cpp
event.cpp
kit.cpp
layer.cpp
main.cpp
muon.cpp
pixel.cpp
point.cpp
res.cpp
surface.cpp
Bookmarks
Welcome
Edit
Design
Debug
Projects
Analyze
Help
muon
Debug
main.cpp
createSurfaces(const equipment, res &, int, double, double, double): void
Line: 9, Col: 1
#include "!_All_include.h"
#include "equipment.h"
#include "event.h"
#include "surface.h"
void createSurfaces(const equipment e, res& r, int count, double len, double delta_phi, double delta_cos_tet)
{
point p;
surface s;
p.SetX(0);
p.SetY(0);
p.SetZ(0);
s.SetCoor(p);
s.SetCount(count);
s.SetLen(len);
std::cout << std::setw(12) << std::setfill(' ') << delta_phi << "\t" << delta_cos_tet << std::endl;
std::cout << std::setw(12) << std::setfill(' ') << "phi" << "\t" << "cos_tet" << std::endl;
for (double phi = 0; phi <= (2 * PI) - delta_phi; phi += delta_phi) //phi in rad
{
for (double cos_tet = 1; cos_tet >= 0; cos_tet -= delta_cos_tet) //tet in rad
{
if ((cos_tet == 1) && (phi != 0))
continue;
std::cout << std::setw(12) << std::setfill(' ') << phi << "\t" << cos_tet << std::endl;
s.SetPhi(phi);
s.SetTet(acos(cos_tet));
s.CreateMuons(count);
s.RunMuons(r, e);
}
}
}
void angleStatistics(std::string outputfile, const res r, double delta_phi, double delta_cos_tet, int min_count_l = 0, int min_count_d
{
std::ofstream fout;
if (outputfile != "")
fout.open(outputfile.c_str());
int count_phi = 2 * PI / delta_phi;
int count_cos_tet = 1.0 / delta_cos_tet + 1;
// std::cout << "test " << count_phi << " " << count_cos_tet << std::endl;
int** arr = new int*[count_phi];
for(int i = 0; i < count_phi; ++i)
{
arr[i] = new int[count_cos_tet];
Type to locate (Ctr...
1 Issues
2 Search Results
3 Application Output
4 Compile Output
5 QML/JS Console
6 General Messages

General Plan of The Program



Relationships between Classes



Output data

ut_1.txt (~/!_Programming/muon/build-Desktop-Debug) - gedit

Открыть | Сохранить | Отменить

Документы

testout_1.txt

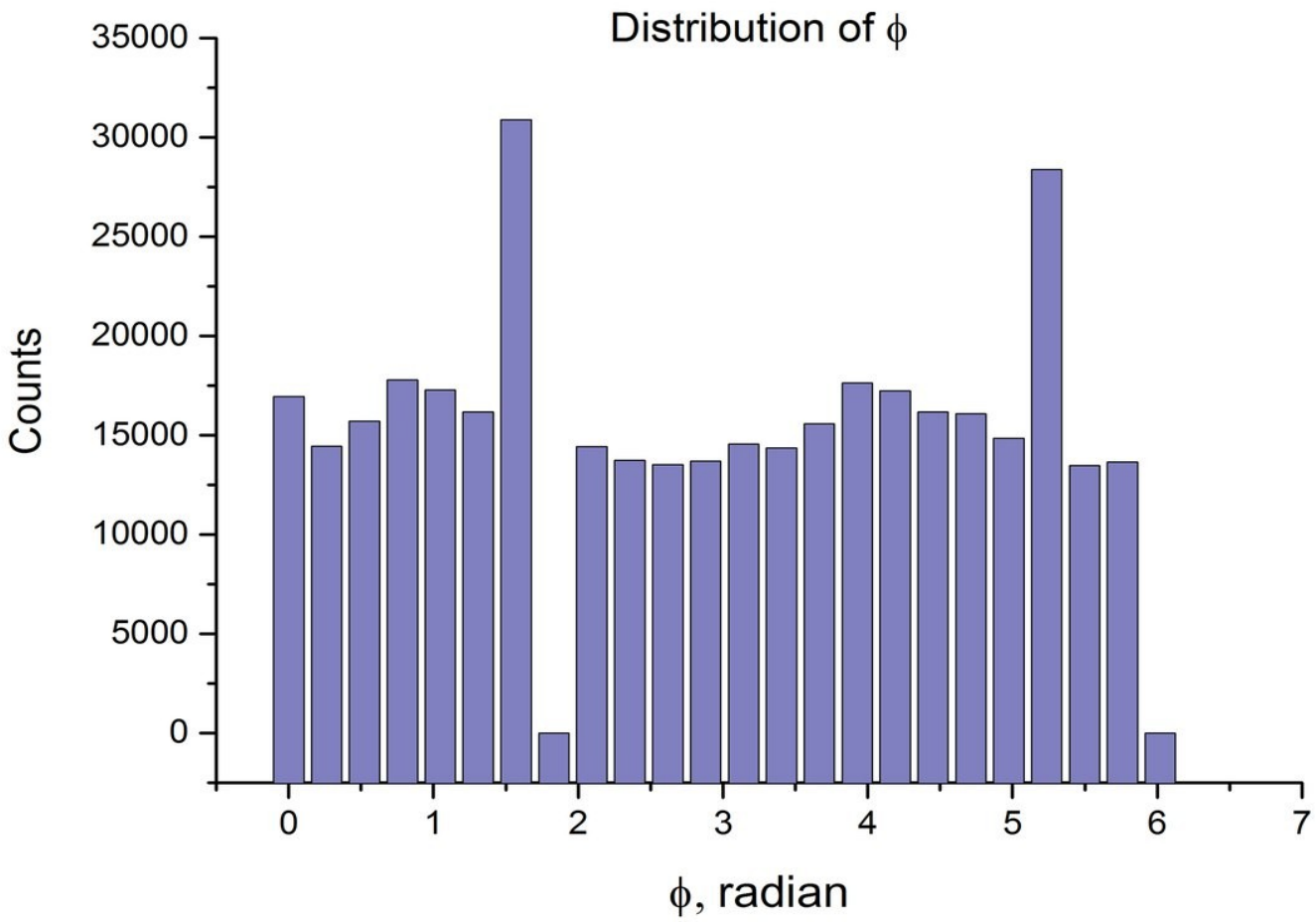
testout_1.txt

.2661	1.15928	1.0472	0.927295	0.795399	0.643501	0.451027	0
599	1478	1924	2472	2778	2795	2600	2304
606	1481	2197	2501	2654	2632	2387	0
841	1725	2632	2693	2769	2634	2386	0
1264	2189	2965	2959	3011	2660	2368	0
958	2084	2984	3146	2996	2684	2398	0
652	1599	2649	3133	3023	2733	2390	0
1205	3010	4660	5664	5864	5492	4990	0
0	0	0	0	0	0	0	0
718	1459	2212	2486	2645	2540	2365	0
456	1288	2160	2371	2658	2495	2322	0
583	1204	1942	2319	2566	2544	2365	0
651	1256	1841	2317	2585	2651	2388	0
598	1477	1916	2430	2756	2777	2600	0
606	1481	2174	2462	2625	2626	2386	0
843	1710	2603	2653	2741	2613	2387	0
1272	2163	2894	2935	2965	2666	2368	0
958	2075	2989	3123	2975	2680	2398	0
658	1607	2641	3125	3016	2729	2391	0
598	1526	2389	3006	3111	2853	2600	0
606	1481	2302	2687	2755	2635	2386	0
1180	2781	4496	4915	5291	5032	4685	0
585	1151	1898	2350	2592	2545	2358	0
636	1218	1812	2347	2602	2647	2389	0
0	0	0	0	0	0	0	0

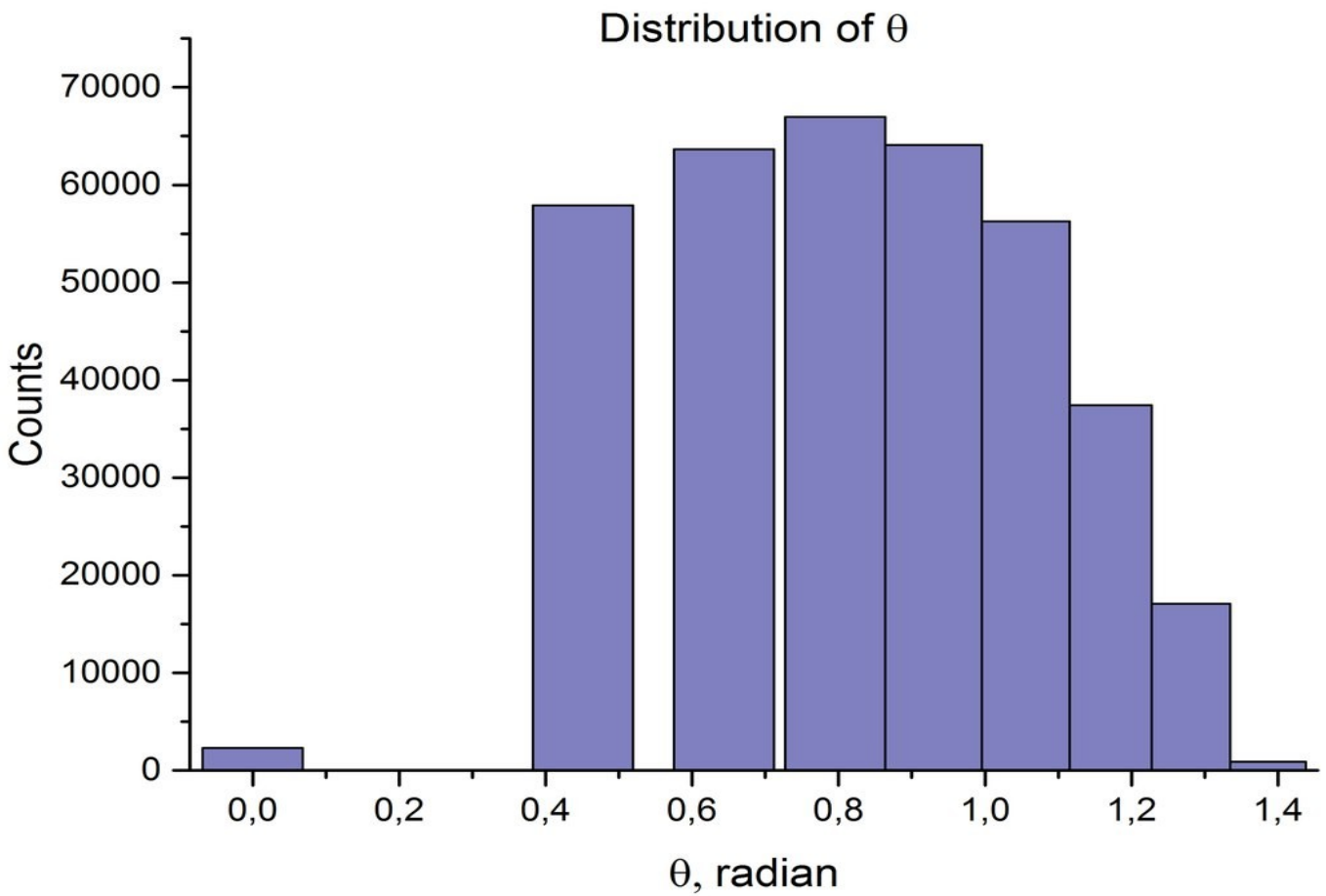
Geany

Текст | Ширина табуляции: 8 | Стр 25, Стлб 193 | ВСТ

Azimuthal distribution



Zenithal distribution



Conclusions

- ✓We have created the program simulating muon flux and the response of the detector installation
- ✓The program is modular: we are free to change amount of detectors and layers. Also, program allows to observe several installations
- ✓In order to find angle distribution function we will normalize share of 3-evens for each 3-pixel-sets of total amount of 3-event in experiment on the same share in simulation

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Thank you!!