

GEANT4 - A MONTE CARLO SIMULATION TOOLKIT PART I

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Latin American alliance for
Capacity building in Advanced physics
LA-CoNGA physics



Cofinanciado por el
programa Erasmus+
de la Unión Europea



RUN EXAMPLE B1 with TRACKING VERBOSE

```
./exampleB1
```

In idle state

```
/tracking/verbose 1
```

```
/run/beamOn 1
```



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WHAT IS GEANT4

```
1 [laconga2021@localhost build]$ ./exampleB1
2 Available UI session types: [ Qt, GAG, tcsh, csh ]
3 Warning: Ignoring XDG_SESSION_TYPE=wayland on Gnome. Use QT_QPA_PLATFORM=wayland to run on Wayland anyway.
4
5 *****
6 Geant4 version Name: geant4-10-07-patch-01 [MT]    (5-February-2021)
7 << in Multi-threaded mode >>
8     Copyright : Geant4 Collaboration
9     References : NIM A 506 (2003), 250-303
10                : IEEE-TNS 53 (2006), 270-278
11                : NIM A 835 (2016), 186-225
12                WWW : http://geant4.org/
13 *****
14
15 <<< Reference Physics List QBBC
16 Visualization Manager instantiating with verbosity "warnings (3)"...
17 Visualization Manager initialising...
18 Registering graphics systems...
19
20 You have successfully registered the following graphics systems.
21 Registered graphics systems are:
22   ASCIIITree (ATree)
23   DAWNFILE (DAWNFILE)
24   G4HepRep (HepRepXML)
25   G4HepRepFile (HepRepFile)
26   RayTracer (RayTracer)
27   VRML1FILE (VRML1FILE)
28   VRML2FILE (VRML2FILE)
29   gMocrenFile (gMocrenFile)
30   OpenGLImmediateQt (OGLIQt, OGLI)
31   OpenGLStoredQt (OGLSQt, OGL, OGLS)
32   OpenGLImmediateX (OGLIX, OGLIQt_FALLBACK)
33   OpenGLStoredX (OGLSX, OGLSQt_FALLBACK)
34
35 Registering model factories...
```



WHAT IS GEANT4 (Cont.)

```
35 Registering model factories...
36
37 You have successfully registered the following model factories.
38 Registered model factories:
39   generic
40   drawByAttribute
41   drawByCharge
42   drawByOriginVolume
43   drawByParticleID
44   drawByEncounteredVolume
45
46 Registered models:
47   None
48
49 Registered filter factories:
50   attributeFilter
51   chargeFilter
52   originVolumeFilter
53   particleFilter
54   encounteredVolumeFilter
55
56 Registered filters:
57   None
58
59 You have successfully registered the following user vis actions.
60 Run Duration User Vis Actions: none
61 End of Event User Vis Actions: none
62 End of Run User Vis Actions: none
63
64 Some /vis commands (optionally) take a string to specify colour.
65 "/vis/list" to see available colours.
66 /control/saveHistory
67 /run/verbose 2
68 #
69 # Change the default number of threads (in multi-threaded mode)
70 #/run/numberOfThreads 4
71 #
```



WHAT IS GEANT4 (Cont.)

```
72 # Initialize kernel
73 /run/initialize
74 userDetector->Construct() start.
75 Checking overlaps for volume Envelope (G4Box) ... OK!
76 Checking overlaps for volume Shape1 (G4Cons) ... OK!
77 Checking overlaps for volume Shape2 (G4Trd) ... OK!
78 World is registered to the default region.
79 physicsList->Construct() start.
80 ### HadronInelasticQBBC Construct Process:
81   Emin(FTFP)= 3 GeV; Emax(FTFP)= 100000 GeV
82   Emin(BERT)= 1 GeV; Emax(BERT)= 6 GeV; Emax(BERTpions)= 12 GeV;
83   Emin(BIC) = 0 GeV; Emax(BIC)= 1.5 GeV.
84 ### Adding tracking cuts for neutron TimeCut(ns)= 10000 KinEnergyCut(MeV)= 0
85 physicsList->CheckParticleList() start.
86 physicsList->setCut() start.
87 /run/physicsModified
88
89 phot:  for gamma SubType=12 BuildTable=0
90   LambdaPrime table from 200 keV to 100 TeV in 61 bins
91   ===== EM models for the G4Region DefaultRegionForTheWorld =====
92   LivermorePhElectric : Emin=  0 eV  Emax= 100 TeV  SauterGavrila Fluo
93
94 compt:  for gamma SubType=13 BuildTable=1
95   Lambda table from 100 eV to 1 MeV, 7 bins/decade, spline: 1
96   LambdaPrime table from 1 MeV to 100 TeV in 56 bins
97   ===== EM models for the G4Region DefaultRegionForTheWorld =====
98   Klein-Nishina : Emin=  0 eV  Emax= 100 TeV
99
100 conv:  for gamma SubType=14 BuildTable=1
101   Lambda table from 1.022 MeV to 100 TeV, 18 bins/decade, spline: 1
102   ===== EM models for the G4Region DefaultRegionForTheWorld =====
103   BetheHeitlerLPM : Emin=  0 eV  Emax= 100 TeV  ModifiedTsai
104
105 Rayl:  for gamma SubType=11 BuildTable=1
106   Lambda table from 100 eV to 100 keV, 7 bins/decade, spline: 0
107   LambdaPrime table from 100 keV to 100 TeV in 63 bins
108   ===== EM models for the G4Region DefaultRegionForTheWorld =====
109   LivermoreRayleigh : Emin=  0 eV  Emax= 100 TeV  CullenGenerator
110
111 msc:  for e- SubType= 10
112   ===== EM models for the G4Region DefaultRegionForTheWorld =====
113   UrbanMsc : Emin=  0 eV  Emax= 100 MeV  Nbins=42 100 eV - 100 MeV
```



WHAT IS GEANT4 (Cont.)

```
111 msc: for e- SubType= 10
112 ===== EM models for the G4Region DefaultRegionForTheWorld =====
113     UrbanMsc : Emin= 0 eV Emax= 100 MeV Nbins=42 100 eV - 100 MeV
114         StepLim=UseSafety Rfact=0.04 Gfact=2.5 Sfact=0.6 DispFlag:1 Skin=1 Llimit=1
115     WentzelVIUni : Emin= 100 MeV Emax= 100 TeV Nbins=42 100 MeV - 100 TeV
116         StepLim=UseSafety Rfact=0.04 Gfact=2.5 Sfact=0.6 DispFlag:1 Skin=1 Llimit=1
117
118 eIoni: for e- SubType=2
119     dE/dx and range tables from 100 eV to 100 TeV in 84 bins
120     Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
121     StepFunction=(0.2, 1 mm), integ: 1, fluct: 1, linLossLim= 0.01
122     ===== EM models for the G4Region DefaultRegionForTheWorld =====
123     MollerBhabha : Emin= 0 eV Emax= 100 TeV
124
125 eBrem: for e- SubType=3
126     dE/dx and range tables from 100 eV to 100 TeV in 84 bins
127     Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
128     LPM flag: 1 for E > 1 GeV, VertexHighEnergyTh(GeV)= 100000
129     ===== EM models for the G4Region DefaultRegionForTheWorld =====
130     eBremSB : Emin= 0 eV Emax= 1 GeV ModifiedTsai
131     eBremLPM : Emin= 1 GeV Emax= 100 TeV ModifiedTsai
132
133 CoulombScat: for e-, integral:1 SubType=1 BuildTable=1
134     Lambda table from 100 MeV to 100 TeV, 7 bins/decade, spline: 1
135     ThetaMin(p) < Theta(degree) < 180; pLimit(GeV^1)= 0.139531
136     ===== EM models for the G4Region DefaultRegionForTheWorld =====
137     eCoulombScattering : Emin= 100 MeV Emax= 100 TeV
138
139 msc: for e+ SubType= 10
140 ===== EM models for the G4Region DefaultRegionForTheWorld =====
141     UrbanMsc : Emin= 0 eV Emax= 100 MeV Nbins=42 100 eV - 100 MeV
142         StepLim=UseSafety Rfact=0.04 Gfact=2.5 Sfact=0.6 DispFlag:1 Skin=1 Llimit=1
143     WentzelVIUni : Emin= 100 MeV Emax= 100 TeV Nbins=42 100 MeV - 100 TeV
144         StepLim=UseSafety Rfact=0.04 Gfact=2.5 Sfact=0.6 DispFlag:1 Skin=1 Llimit=1
145
146 eIoni: for e+ SubType=2
147     dE/dx and range tables from 100 eV to 100 TeV in 84 bins
148     Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
149     StepFunction=(0.2, 1 mm), integ: 1, fluct: 1, linLossLim= 0.01
150     ===== EM models for the G4Region DefaultRegionForTheWorld =====
151     MollerBhabha : Emin= 0 eV Emax= 100 TeV
152
153 eBrem: for e+ SubType=3
154     dE/dx and range tables from 100 eV to 100 TeV in 84 bins
155     Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
156     LPM flag: 1 for E > 1 GeV, VertexHighEnergyTh(GeV)= 100000
157     ===== EM models for the G4Region DefaultRegionForTheWorld =====
158     eBremSB : Emin= 0 eV Emax= 1 GeV ModifiedTsai
159     eBremLPM : Emin= 1 GeV Emax= 100 TeV ModifiedTsai
160
161 annihil: for e+, integral:1 SubType=5 BuildTable=0
162     ===== EM models for the G4Region DefaultRegionForTheWorld =====
163     eplus2gg : Emin= 0 eV Emax= 100 TeV
164
165 CoulombScat: for e+, integral:1 SubType=1 BuildTable=1
166     Lambda table from 100 MeV to 100 TeV, 7 bins/decade, spline: 1
167     ThetaMin(p) < Theta(degree) < 180; pLimit(GeV^1)= 0.139531
168     ===== EM models for the G4Region DefaultRegionForTheWorld =====
169     eCoulombScattering : Emin= 100 MeV Emax= 100 TeV
```



WHAT IS GEANT4 (Cont.)

```
171 msc: for proton SubType= 10
172 ===== EM models for the G4Region DefaultRegionForTheWorld =====
173   WentzelVIUni : Emin=    0 eV Emax= 100 TeV Nbins=84 100 eV - 100 TeV
174   StepLim=Minimal Rfact=0.2 Gfact=2.5 Sfact=0.6 DispFlag:0 Skin=1 Llimit=1
175
176 hIoni: for proton SubType=2
177   dE/dx and range tables from 100 eV to 100 TeV in 84 bins
178   Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
179   StepFunction=(0.2, 0.1 mm), integ: 1, fluct: 1, linLossLim= 0.01
180   ===== EM models for the G4Region DefaultRegionForTheWorld =====
181     Bragg : Emin=    0 eV Emax=    2 MeV
182     BetheBloch : Emin=    2 MeV Emax= 100 TeV
183
184 hBrems: for proton SubType=3
185   dE/dx and range tables from 100 eV to 100 TeV in 84 bins
186   Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
187   ===== EM models for the G4Region DefaultRegionForTheWorld =====
188     hBrem : Emin=    0 eV Emax= 100 TeV ModifiedMephi
189
190 hPairProd: for proton SubType=4
191   dE/dx and range tables from 100 eV to 100 TeV in 84 bins
192   Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
193   Sampling table 17x1001; from 7.50618 GeV to 100 TeV
194   ===== EM models for the G4Region DefaultRegionForTheWorld =====
195     hPairProd : Emin=    0 eV Emax= 100 TeV ModifiedMephi
196
197 CoulombScat: for proton, integral:1 SubType=1 BuildTable=1
198   Lambda table from threshold to 100 TeV, 7 bins/decade, spline: 1
199   ThetaMin(p) < Theta(degree) < 180; pLimit(GeV^1)= 0.139531
200   ===== EM models for the G4Region DefaultRegionForTheWorld =====
201     eCoulombScattering : Emin=    0 eV Emax= 100 TeV
202
203 msc: for GenericIon SubType= 10
204 ===== EM models for the G4Region DefaultRegionForTheWorld =====
205   UrbanMsc : Emin=    0 eV Emax= 100 TeV
206   StepLim=Minimal Rfact=0.2 Gfact=2.5 Sfact=0.6 DispFlag:0 Skin=1 Llimit=1
207
208 ionIoni: for GenericIon SubType=2
209   dE/dx and range tables from 100 eV to 100 TeV in 84 bins
210   Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
211   StepFunction=(0.2, 0.1 mm), integ: 1, fluct: 1, linLossLim= 0.02
212   Stopping Power data for 17 ion/material pairs
213   ===== EM models for the G4Region DefaultRegionForTheWorld =====
214     BraggIon : Emin=    0 eV Emax=    2 MeV
215     BetheBloch : Emin=    2 MeV Emax= 100 TeV
```



WHAT IS GEANT4 (Cont.)

```
217 msc: for alpha SubType= 10
218     ===== EM models for the G4Region DefaultRegionForTheWorld =====
219         UrbanMsc : Emin=    0 eV Emax=  100 TeV Nbins=84 100 eV - 100 TeV
220         StepLim=Minimal Rfact=0.2 Gfact=2.5 Sfact=0.6 DispFlag:0 Skin=1 Llimit=1
221
222 ionIoni: for alpha SubType=2
223     dE/dx and range tables from 100 eV to 100 TeV in 84 bins
224     Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
225     StepFunction=(0.2, 0.1 mm), integ: 1, fluct: 1, linLossLim= 0.02
226     ===== EM models for the G4Region DefaultRegionForTheWorld =====
227         BraggIon : Emin=    0 eV Emax=7.9452 MeV
228         BetheBloch : Emin=7.9452 MeV Emax=  100 TeV
229
230 msc: for anti_proton SubType= 10
231     ===== EM models for the G4Region DefaultRegionForTheWorld =====
232         WentzelVIUni : Emin=    0 eV Emax=  100 TeV Nbins=84 100 eV - 100 TeV
233         StepLim=Minimal Rfact=0.2 Gfact=2.5 Sfact=0.6 DispFlag:0 Skin=1 Llimit=1
234
235 hIoni: for anti_proton SubType=2
236     dE/dx and range tables from 100 eV to 100 TeV in 84 bins
237     Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
238     StepFunction=(0.2, 0.1 mm), integ: 1, fluct: 1, linLossLim= 0.01
239     ===== EM models for the G4Region DefaultRegionForTheWorld =====
240         ICRU73QO : Emin=    0 eV Emax=    2 MeV
241         BetheBloch : Emin=    2 MeV Emax=  100 TeV
242
243 hBrems: for anti_proton SubType=3
244     dE/dx and range tables from 100 eV to 100 TeV in 84 bins
245     Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
246     ===== EM models for the G4Region DefaultRegionForTheWorld =====
247         hBrem : Emin=    0 eV Emax=  100 TeV ModifiedMephi
248
249 hPairProd: for anti_proton SubType=4
250     dE/dx and range tables from 100 eV to 100 TeV in 84 bins
251     Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
252     Sampling table 17x1001; from 7.50618 GeV to 100 TeV
253     ===== EM models for the G4Region DefaultRegionForTheWorld =====
254         hPairProd : Emin=    0 eV Emax=  100 TeV ModifiedMephi
255
256 CoulombScat: for anti_proton, integral:1 SubType=1 BuildTable=1
257     Lambda table from threshold to 100 TeV, 7 bins/decade, spline: 1
258     ThetaMin(p) < Theta(degree) < 180; pLimit(GeV^1)= 0.139531
259     ===== EM models for the G4Region DefaultRegionForTheWorld =====
260     eCoulombScattering : Emin=    0 eV Emax=  100 TeV
```




WHAT IS GEANT4 (Cont.)

```
262 msc: for kaon+ SubType= 10
263 ===== EM models for the G4Region DefaultRegionForTheWorld =====
264 WentzelVIUni : Emin= 0 eV Emax= 100 TeV Nbins=84 100 eV - 100 TeV
265 StepLim=Minimal Rfact=0.2 Gfact=2.5 Sfact=0.6 DispFlag:0 Skin=1 Llimit=1
266
267 hIoni: for kaon+ SubType=2
268 dE/dx and range tables from 100 eV to 100 TeV in 84 bins
269 Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
270 StepFunction=(0.2, 0.1 mm), integ: 1, fluct: 1, linLossLim= 0.01
271 ===== EM models for the G4Region DefaultRegionForTheWorld =====
272 Bragg : Emin= 0 eV Emax=1.05231 MeV
273 BetheBloch : Emin=1.05231 MeV Emax= 100 TeV
274
275 hBrems: for kaon+ SubType=3
276 dE/dx and range tables from 100 eV to 100 TeV in 84 bins
277 Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
278 ===== EM models for the G4Region DefaultRegionForTheWorld =====
279 hBrem : Emin= 0 eV Emax= 100 TeV ModifiedMephi
280
281 hPairProd: for kaon+ SubType=4
282 dE/dx and range tables from 100 eV to 100 TeV in 84 bins
283 Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
284 Sampling table 18x1001; from 3.94942 GeV to 100 TeV
285 ===== EM models for the G4Region DefaultRegionForTheWorld =====
286 hPairProd : Emin= 0 eV Emax= 100 TeV ModifiedMephi
287
288 CoulombScat: for kaon+, integral:1 SubType=1 BuildTable=1
289 Lambda table from threshold to 100 TeV, 7 bins/decade, spline: 1
290 ThetaMin(p) < Theta(degree) < 180; pLimit(GeV*1)= 0.139531
291 ===== EM models for the G4Region DefaultRegionForTheWorld =====
292 eCoulombScattering : Emin= 0 eV Emax= 100 TeV
293
294 msc: for kaon- SubType= 10
295 ===== EM models for the G4Region DefaultRegionForTheWorld =====
296 WentzelVIUni : Emin= 0 eV Emax= 100 TeV Nbins=84 100 eV - 100 TeV
297 StepLim=Minimal Rfact=0.2 Gfact=2.5 Sfact=0.6 DispFlag:0 Skin=1 Llimit=1
298
299 hIoni: for kaon- SubType=2
300 dE/dx and range tables from 100 eV to 100 TeV in 84 bins
301 Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
302 StepFunction=(0.2, 0.1 mm), integ: 1, fluct: 1, linLossLim= 0.01
303 ===== EM models for the G4Region DefaultRegionForTheWorld =====
304 ICRU73QO : Emin= 0 eV Emax=1.05231 MeV
305 BetheBloch : Emin=1.05231 MeV Emax= 100 TeV
306
307 hBrems: for kaon- SubType=3
308 dE/dx and range tables from 100 eV to 100 TeV in 84 bins
309 Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
310 ===== EM models for the G4Region DefaultRegionForTheWorld =====
311 hBrem : Emin= 0 eV Emax= 100 TeV ModifiedMephi
312
313 hPairProd: for kaon- SubType=4
314 dE/dx and range tables from 100 eV to 100 TeV in 84 bins
315 Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
316 Sampling table 18x1001; from 3.94942 GeV to 100 TeV
317 ===== EM models for the G4Region DefaultRegionForTheWorld =====
318 hPairProd : Emin= 0 eV Emax= 100 TeV ModifiedMephi
319
320 CoulombScat: for kaon-, integral:1 SubType=1 BuildTable=1
321 Used Lambda table of kaon+
322 ThetaMin(p) < Theta(degree) < 180; pLimit(GeV*1)= 0.139531
323 ===== EM models for the G4Region DefaultRegionForTheWorld =====
324 eCoulombScattering : Emin= 0 eV Emax= 100 TeV
```



WHAT IS GEANT4 (Cont.)

```
326 msc: for mu+ SubType= 10
327 ===== EM models for the G4Region DefaultRegionForTheWorld =====
328 WentzelVIUni : Emin= 0 eV Emax= 100 TeV Nbins=84 100 eV - 100 TeV
329 StepLim=Minimal Rfact=0.2 Gfact=2.5 Sfact=0.6 DispFlag:0 Skin=1 Llimit=1
330
331 muIoni: for mu+ SubType=2
332 dE/dx and range tables from 100 eV to 100 TeV in 84 bins
333 Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
334 StepFunction=(0.2, 0.1 mm), integ: 1, fluct: 1, linLossLim= 0.01
335 ===== EM models for the G4Region DefaultRegionForTheWorld =====
336 Bragg : Emin= 0 eV Emax= 200 keV
337 BetheBloch : Emin= 200 keV Emax= 1 GeV
338 MuBetheBloch : Emin= 1 GeV Emax= 100 TeV
339
340 muBrems: for mu+ SubType=3
341 dE/dx and range tables from 100 eV to 100 TeV in 84 bins
342 Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
343 ===== EM models for the G4Region DefaultRegionForTheWorld =====
344 MuBrem : Emin= 0 eV Emax= 100 TeV ModifiedMephi
345
346 muPairProd: for mu+ SubType=4
347 dE/dx and range tables from 100 eV to 100 TeV in 84 bins
348 Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
349 Sampling table 21x1001; from 1 GeV to 100 TeV
350 ===== EM models for the G4Region DefaultRegionForTheWorld =====
351 muPairProd : Emin= 0 eV Emax= 100 TeV ModifiedMephi
352
353 CoulombScat: for mu+, integral:1 SubType=1 BuildTable=1
354 Lambda table from threshold to 100 TeV, 7 bins/decade, spline: 1
355 ThetaMin(p) < Theta(degree) < 180; pLimit(GeV^1)= 0.139531
356 ===== EM models for the G4Region DefaultRegionForTheWorld =====
357 eCoulombScattering : Emin= 0 eV Emax= 100 TeV
358
359 msc: for mu- SubType= 10
360 ===== EM models for the G4Region DefaultRegionForTheWorld =====
361 WentzelVIUni : Emin= 0 eV Emax= 100 TeV Nbins=84 100 eV - 100 TeV
362 StepLim=Minimal Rfact=0.2 Gfact=2.5 Sfact=0.6 DispFlag:0 Skin=1 Llimit=1
363
364 muIoni: for mu- SubType=2
365 dE/dx and range tables from 100 eV to 100 TeV in 84 bins
366 Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
367 StepFunction=(0.2, 0.1 mm), integ: 1, fluct: 1, linLossLim= 0.01
368 ===== EM models for the G4Region DefaultRegionForTheWorld =====
369 ICRU73Q0 : Emin= 0 eV Emax= 200 keV
370 BetheBloch : Emin= 200 keV Emax= 1 GeV
371 MuBetheBloch : Emin= 1 GeV Emax= 100 TeV
372
373 muBrems: for mu- SubType=3
374 dE/dx and range tables from 100 eV to 100 TeV in 84 bins
375 Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
376 ===== EM models for the G4Region DefaultRegionForTheWorld =====
377 MuBrem : Emin= 0 eV Emax= 100 TeV ModifiedMephi
378
379 muPairProd: for mu- SubType=4
380 dE/dx and range tables from 100 eV to 100 TeV in 84 bins
381 Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
382 Sampling table 21x1001; from 1 GeV to 100 TeV
383 ===== EM models for the G4Region DefaultRegionForTheWorld =====
384 muPairProd : Emin= 0 eV Emax= 100 TeV ModifiedMephi
385
386 CoulombScat: for mu-, integral:1 SubType=1 BuildTable=1
387 Used Lambda table of mu+
388 ThetaMin(p) < Theta(degree) < 180; pLimit(GeV^1)= 0.139531
389 ===== EM models for the G4Region DefaultRegionForTheWorld =====
390 eCoulombScattering : Emin= 0 eV Emax= 100 TeV
```



WHAT IS GEANT4 (Cont.)

```
392 msc: for pi+ SubType= 10
393 ===== EM models for the G4Region DefaultRegionForTheWorld =====
394   WentzelVIUni : Emin= 0 eV Emax= 100 TeV Nbins=84 100 eV - 100 TeV
395   StepLim=Minimal Rfact=0.2 Gfact=2.5 Sfact=0.6 DispFlag:0 Skin=1 Llimit=1
396
397 hIoni: for pi+ SubType=2
398   dE/dx and range tables from 100 eV to 100 TeV in 84 bins
399   Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
400   StepFunction=(0.2, 0.1 mm), integ: 1, fluct: 1, linLossLim= 0.01
401   ===== EM models for the G4Region DefaultRegionForTheWorld =====
402   Bragg : Emin= 0 eV Emax=297.505 keV
403   BetheBloch : Emin=297.505 keV Emax= 100 TeV
404
405 hBrems: for pi+ SubType=3
406   dE/dx and range tables from 100 eV to 100 TeV in 84 bins
407   Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
408   ===== EM models for the G4Region DefaultRegionForTheWorld =====
409   hBrem : Emin= 0 eV Emax= 100 TeV ModifiedMephi
410
411 hPairProd: for pi+ SubType=4
412   dE/dx and range tables from 100 eV to 100 TeV in 84 bins
413   Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
414   Sampling table 20x1001; from 1.11656 GeV to 100 TeV
415   ===== EM models for the G4Region DefaultRegionForTheWorld =====
416   hPairProd : Emin= 0 eV Emax= 100 TeV ModifiedMephi
417
418 CoulombScat: for pi+, integral:1 SubType=1 BuildTable=1
419   Lambda table from threshold to 100 TeV, 7 bins/decade, spline: 1
420   ThetaMin(p) < Theta(degree) < 180; pLimit(GeV*1)= 0.139531
421   ===== EM models for the G4Region DefaultRegionForTheWorld =====
422   eCoulombScattering : Emin= 0 eV Emax= 100 TeV
423
424 msc: for pi- SubType= 10
425 ===== EM models for the G4Region DefaultRegionForTheWorld =====
426   WentzelVIUni : Emin= 0 eV Emax= 100 TeV Nbins=84 100 eV - 100 TeV
427   StepLim=Minimal Rfact=0.2 Gfact=2.5 Sfact=0.6 DispFlag:0 Skin=1 Llimit=1
428
429 hIoni: for pi- SubType=2
430   dE/dx and range tables from 100 eV to 100 TeV in 84 bins
431   Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
432   StepFunction=(0.2, 0.1 mm), integ: 1, fluct: 1, linLossLim= 0.01
433   ===== EM models for the G4Region DefaultRegionForTheWorld =====
434   ICRU73QO : Emin= 0 eV Emax=297.505 keV
435   BetheBloch : Emin=297.505 keV Emax= 100 TeV
436
437 hBrems: for pi- SubType=3
438   dE/dx and range tables from 100 eV to 100 TeV in 84 bins
439   Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
440   ===== EM models for the G4Region DefaultRegionForTheWorld =====
441   hBrem : Emin= 0 eV Emax= 100 TeV ModifiedMephi
442
443 hPairProd: for pi- SubType=4
444   dE/dx and range tables from 100 eV to 100 TeV in 84 bins
445   Lambda tables from threshold to 100 TeV, 7 bins/decade, spline: 1
446   Sampling table 20x1001; from 1.11656 GeV to 100 TeV
447   ===== EM models for the G4Region DefaultRegionForTheWorld =====
448   hPairProd : Emin= 0 eV Emax= 100 TeV ModifiedMephi
449
450 CoulombScat: for pi-, integral:1 SubType=1 BuildTable=1
451   Used Lambda table of pi+
452   ThetaMin(p) < Theta(degree) < 180; pLimit(GeV*1)= 0.139531
453   ===== EM models for the G4Region DefaultRegionForTheWorld =====
454   eCoulombScattering : Emin= 0 eV Emax= 100 TeV
```



WHAT IS GEANT4 (Cont.)

```
456 -----
457 HADRONIC PROCESSES SUMMARY (verbose level 1)
458 -----
459
460 Hadronic Processes for neutron
461
462 Process: hadElastic
463   Model:      hElasticCHIPS: 0 eV ---> 100 TeV
464   Cr_sctns:   G4NeutronElasticXS: 0 eV ---> 100 TeV
465
466 Process: neutronInelastic
467   Model:      FTFP: 3 GeV ---> 100 TeV
468   Model:      BertiniCascade: 1 GeV ---> 6 GeV
469   Model:      Binary Cascade: 0 eV ---> 1.5 GeV
470   Cr_sctns:   G4NeutronInelasticXS: 0 eV ---> 100 TeV
471
472 Process: nCapture
473   Model:      nRadCapture: 0 eV ---> 100 TeV
474   Cr_sctns:   G4NeutronCaptureXS: 0 eV ---> 100 TeV
475
476 Process: nKiller
477 -----
478 Hadronic Processes for B-
479
480 Process: hadElastic
481   Model:      hElasticLHEP: 0 eV ---> 100 TeV
482   Cr_sctns:   Glauber-Gribov: 0 eV ---> 100 TeV
483
484 Process: B-Inelastic
485   Model:      FTFP: 0 eV ---> 100 TeV
486   Cr_sctns:   Glauber-Gribov: 0 eV ---> 100 TeV
487
488
489 Hadronic Processes for D-
490
491 Process: hadElastic
492   Model:      hElasticLHEP: 0 eV ---> 100 TeV
493   Cr_sctns:   Glauber-Gribov: 0 eV ---> 100 TeV
494
495 Process: D-Inelastic
496   Model:      FTFP: 0 eV ---> 100 TeV
497   Cr_sctns:   Glauber-Gribov: 0 eV ---> 100 TeV
498
499 -----
500 Hadronic Processes for GenericIon
501
502 Process: ionInelastic
503   Model:      Binary Light Ion Cascade: 0 eV /n ---> 6 GeV/n
504   Model:      FTFP: 3 GeV/n ---> 100 TeV/n
505   Cr_sctns:   Glauber-Gribov Nucl-nucl: 0 eV ---> 25.6 PeV
506
507 Process: ionElastic
508   Model:      NNDiffuseElastic: 0 eV /n ---> 100 TeV/n
509   Cr_sctns:   Glauber-Gribov Nucl-nucl: 0 eV ---> 25.6 PeV
510
511
```



WHAT IS GEANT4 (Cont.)

```
512 -----
513           Hadronic Processes for He3
514
515 Process: hadElastic
516   Model:      hElasticLHEP: 0 eV /n ---> 100 TeV/n
517   Cr_sctns:   Glauber-Gribov Nucl-nucl: 0 eV ---> 25.6 PeV
518
519 Process: He3Inelastic
520   Model:      Binary Light Ion Cascade: 0 eV /n ---> 6 GeV/n
521   Model:      FTFP: 3 GeV/n ---> 100 TeV/n
522   Cr_sctns:   G4ParticleInelasticXS: 0 eV ---> 25.6 PeV
523 -----
524           Hadronic Processes for alpha
525
526 Process: hadElastic
527   Model:      hElasticLHEP: 0 eV /n ---> 100 TeV/n
528   Cr_sctns:   Glauber-Gribov Nucl-nucl: 0 eV ---> 25.6 PeV
529
530 Process: alphaInelastic
531   Model:      Binary Light Ion Cascade: 0 eV /n ---> 6 GeV/n
532   Model:      FTFP: 3 GeV/n ---> 100 TeV/n
533   Cr_sctns:   G4ParticleInelasticXS: 0 eV ---> 25.6 PeV
534 -----
535           Hadronic Processes for anti_He3
536
537 Process: hadElastic
538   Model:      hElasticLHEP: 0 eV /n ---> 100.1 MeV/n
539   Model:      AntiAElastic: 100 MeV/n ---> 100 TeV/n
540   Cr_sctns:   AntiAGlauber: 0 eV ---> 25.6 PeV
541
542 Process: anti_He3Inelastic
543   Model:      FTFP: 0 eV /n ---> 100 TeV/n
544   Cr_sctns:   AntiAGlauber: 0 eV ---> 25.6 PeV
545
546 Process: hFritiofCaptureAtRest
547 -----
548           Hadronic Processes for anti_alpha
549
550 Process: hadElastic
551   Model:      hElasticLHEP: 0 eV /n ---> 100.1 MeV/n
552   Model:      AntiAElastic: 100 MeV/n ---> 100 TeV/n
553   Cr_sctns:   AntiAGlauber: 0 eV ---> 25.6 PeV
554
555 Process: anti_alphaInelastic
556   Model:      FTFP: 0 eV /n ---> 100 TeV/n
557   Cr_sctns:   AntiAGlauber: 0 eV ---> 25.6 PeV
558
559 Process: hFritiofCaptureAtRest
560 -----
561           Hadronic Processes for anti_deuteron
562
563 Process: hadElastic
564   Model:      hElasticLHEP: 0 eV /n ---> 100.1 MeV/n
565   Model:      AntiAElastic: 100 MeV/n ---> 100 TeV/n
566   Cr_sctns:   AntiAGlauber: 0 eV ---> 25.6 PeV
567
568 Process: anti_deuteronInelastic
569   Model:      FTFP: 0 eV /n ---> 100 TeV/n
570   Cr_sctns:   AntiAGlauber: 0 eV ---> 25.6 PeV
571
572
573
574
```



WHAT IS GEANT4 (Cont.)

```
579 | | | | | Hadronic Processes for anti_lambda
580 | | | | |
581 | Process: hadElastic
582 |   Model:           hElasticLHEP: 0 eV ---> 100 TeV
583 |   Cr_sctns:       Glauber-Gribov: 0 eV ---> 100 TeV
584 | | | | |
585 | Process: anti_lambdaInelastic
586 |   Model:           FTFP: 0 eV ---> 100 TeV
587 |   Cr_sctns:       Glauber-Gribov: 0 eV ---> 100 TeV
588 | | | | |
589 | Process: hFritiofCaptureAtRest
590 | | | | |
591 | | | | | Hadronic Processes for anti_neutron
592 | | | | |
593 | | | | |
594 | Process: hadElastic
595 |   Model:           hElasticLHEP: 0 eV ---> 100.1 MeV
596 |   Model:           AntiAElastic: 100 MeV ---> 100 TeV
597 |   Cr_sctns:       AntiAGlauber: 0 eV ---> 25.6 PeV
598 | | | | |
599 | Process: anti_neutronInelastic
600 |   Model:           FTFP: 0 eV ---> 100 TeV
601 |   Cr_sctns:       AntiAGlauber: 0 eV ---> 25.6 PeV
602 | | | | |
603 | Process: hFritiofCaptureAtRest
604 | | | | |
605 | | | | | Hadronic Processes for anti_proton
606 | | | | |
607 | | | | |
608 | Process: hadElastic
609 |   Model:           hElasticLHEP: 0 eV ---> 100.1 MeV
610 |   Model:           AntiAElastic: 100 MeV ---> 100 TeV
611 |   Cr_sctns:       AntiAGlauber: 0 eV ---> 25.6 PeV
612 | | | | |
613 | Process: anti_protonInelastic
614 |   Model:           FTFP: 0 eV ---> 100 TeV
615 |   Cr_sctns:       AntiAGlauber: 0 eV ---> 25.6 PeV
616 | | | | |
617 | Process: hFritiofCaptureAtRest
618 | | | | |
619 | | | | | Hadronic Processes for anti_triton
620 | | | | |
621 | | | | |
622 | Process: hadElastic
623 |   Model:           hElasticLHEP: 0 eV /n ---> 100.1 MeV/n
624 |   Model:           AntiAElastic: 100 MeV/n ---> 100 TeV/n
625 |   Cr_sctns:       AntiAGlauber: 0 eV ---> 25.6 PeV
626 | | | | |
627 | Process: anti_tritonInelastic
628 |   Model:           FTFP: 0 eV /n ---> 100 TeV/n
629 |   Cr_sctns:       AntiAGlauber: 0 eV ---> 25.6 PeV
630 | | | | |
631 | Process: hFritiofCaptureAtRest
632 | | | | |
633 | | | | | Hadronic Processes for deuteron
634 | | | | |
635 | | | | |
636 | Process: hadElastic
637 |   Model:           hElasticLHEP: 0 eV /n ---> 100 TeV/n
638 |   Cr_sctns:       Glauber-Gribov Nucl-nucl: 0 eV ---> 25.6 PeV
639 | | | | |
640 | Process: dInelastic
641 |   Model:           Binary Light Ion Cascade: 0 eV /n ---> 6 GeV/n
642 |   Model:           FTFP: 3 GeV/n ---> 100 TeV/n
643 |   Cr_sctns:       G4ParticleInelasticXS: 0 eV ---> 25.6 PeV
```



WHAT IS GEANT4 (Cont.)

```
645 -----
646 Hadronic Processes for e+
647
648 Process: electronNuclear
649   Model:   G4ElectroVDNuclearModel: 0 eV ----> 1 PeV
650   Cr_sctns: ElectroNuclearXS: 0 eV ----> 100 TeV
651 -----
652 Hadronic Processes for e-
653
654 Process: electronNuclear
655   Model:   G4ElectroVDNuclearModel: 0 eV ----> 1 PeV
656   Cr_sctns: ElectroNuclearXS: 0 eV ----> 100 TeV
657 -----
658 Hadronic Processes for gamma
659
660 Process: photonNuclear
661   Model:   GammaNPreco: 0 eV ----> 200 MeV
662   Model:   BertiniCascade: 199 MeV ----> 6 GeV
663   Model:   TheoFSGenerator: 3 GeV ----> 100 TeV
664   Cr_sctns: PhotoNuclearXS: 0 eV ----> 100 TeV
665 -----
666 Hadronic Processes for kaon+
667
668 Process: hadElastic
669   Model:   hElasticLHEP: 0 eV ----> 100 TeV
670   Cr_sctns: Glauber-Gribov: 0 eV ----> 100 TeV
671 -----
672 Process: kaon+Inelastic
673   Model:   FTFP: 3 GeV ----> 100 TeV
674   Model:   BertiniCascade: 0 eV ----> 6 GeV
675   Cr_sctns: Glauber-Gribov: 0 eV ----> 100 TeV
676 -----
677 Hadronic Processes for kaon-
678
679 Process: hadElastic
680   Model:   hElasticLHEP: 0 eV ----> 100 TeV
681   Cr_sctns: Glauber-Gribov: 0 eV ----> 100 TeV
682 -----
683 Process: kaon-Inelastic
684   Model:   FTFP: 3 GeV ----> 100 TeV
685   Model:   BertiniCascade: 0 eV ----> 6 GeV
686   Cr_sctns: Glauber-Gribov: 0 eV ----> 100 TeV
687 -----
688 Process: hBertiniCaptureAtRest
689 -----
690 Hadronic Processes for lambda
691
692 Process: hadElastic
693   Model:   hElasticLHEP: 0 eV ----> 100 TeV
694   Cr_sctns: Glauber-Gribov: 0 eV ----> 100 TeV
695 -----
696 Process: lambdaInelastic
697   Model:   FTFP: 3 GeV ----> 100 TeV
698   Model:   BertiniCascade: 0 eV ----> 6 GeV
699   Cr_sctns: Glauber-Gribov: 0 eV ----> 100 TeV
700 -----
701 Hadronic Processes for mu+
702
703 Process: muonNuclear
704   Model:   G4MuonVDNuclearModel: 0 eV ----> 1 PeV
705   Cr_sctns: KokoulinMuonNuclearXS: 0 eV ----> 100 TeV
706 -----
707 Hadronic Processes for mu-
708
709 Process: muonNuclear
710   Model:   G4MuonVDNuclearModel: 0 eV ----> 1 PeV
711   Cr_sctns: KokoulinMuonNuclearXS: 0 eV ----> 100 TeV
712 -----
713 Process: muMinusCaptureAtRest
714 -----
715 -----
716 -----
717 -----
718 -----
719 -----
720 -----
```



WHAT IS GEANT4 (Cont.)

```
722 -----
723 Hadronic Processes for pi+
724
725 Process: hadElastic
726   Model:      hElasticGlauber: 0 eV ---> 100 TeV
727   Cr_sctns:   BarashenkovGlauberGribov: 0 eV ---> 100 TeV
728
729 Process: pi+Inelastic
730   Model:      FTFP: 3 GeV ---> 100 TeV
731   Model:      BertiniCascade: 1 GeV ---> 12 GeV
732   Model:      Binary Cascade: 0 eV ---> 1.5 GeV
733   Cr_sctns:   BarashenkovGlauberGribov: 0 eV ---> 100 TeV
734
735 -----
736 Hadronic Processes for pi-
737
738 Process: hadElastic
739   Model:      hElasticGlauber: 0 eV ---> 100 TeV
740   Cr_sctns:   BarashenkovGlauberGribov: 0 eV ---> 100 TeV
741
742 Process: pi-Inelastic
743   Model:      FTFP: 3 GeV ---> 100 TeV
744   Model:      BertiniCascade: 1 GeV ---> 12 GeV
745   Model:      Binary Cascade: 0 eV ---> 1.5 GeV
746   Cr_sctns:   BarashenkovGlauberGribov: 0 eV ---> 100 TeV
747
748 Process: hBertiniCaptureAtRest
749
750 -----
751 Hadronic Processes for proton
752
753 Process: hadElastic
754   Model:      hElasticCHIPS: 0 eV ---> 100 TeV
755   Cr_sctns:   BarashenkovGlauberGribov: 0 eV ---> 100 TeV
756
757 Process: protonInelastic
758   Model:      FTFP: 3 GeV ---> 100 TeV
759   Model:      BertiniCascade: 1 GeV ---> 6 GeV
760   Model:      Binary Cascade: 0 eV ---> 1.5 GeV
761   Cr_sctns:   G4ParticleInelasticXS: 0 eV ---> 100 TeV
762
763 -----
764 Hadronic Processes for sigma-
765
766 Process: hadElastic
767   Model:      hElasticLHEP: 0 eV ---> 100 TeV
768   Cr_sctns:   Glauber-Gribov: 0 eV ---> 100 TeV
769
770 Process: sigma-Inelastic
771   Model:      FTFP: 3 GeV ---> 100 TeV
772   Model:      BertiniCascade: 0 eV ---> 6 GeV
773   Cr_sctns:   Glauber-Gribov: 0 eV ---> 100 TeV
774
775 Process: hBertiniCaptureAtRest
776
777 -----
778 Hadronic Processes for triton
779
780 Process: hadElastic
781   Model:      hElasticLHEP: 0 eV /n ---> 100 TeV/n
782   Cr_sctns:   Glauber-Gribov Nucl-nucl: 0 eV ---> 25.6 PeV
783
784 Process: tInelastic
785   Model:      Binary Light Ion Cascade: 0 eV /n ---> 6 GeV/n
786   Model:      FTFP: 3 GeV/n ---> 100 TeV/n
787   Cr_sctns:   G4ParticleInelasticXS: 0 eV ---> 25.6 PeV
```




WHAT IS GEANT4 (Cont.)

```
790 =====
791 ===== Pre-compound/De-excitation Physics Parameters =====
792 =====
793 Type of pre-compound inverse x-section          3
794 Pre-compound model active                      1
795 Pre-compound excitation low energy (MeV)      0.1
796 Pre-compound excitation high energy (MeV)    30
797 Type of de-excitation inverse x-section       3
798 Type of de-excitation factory                  Evaporation+GEM
799 Number of de-excitation channels              68
800 Min excitation energy (keV)                  0.01
801 Min energy per nucleon for multifragmentation (MeV) 2e+05
802 Limit excitation energy for Fermi BreakUp (MeV) 20
803 Level density (1/MeV)                       0.075
804 Use simple level density model               1
805 Use discrete excitation energy of the residual 0
806 Time limit for long lived isomeres (ns)      1000
807 Isomer production flag                      1
808 Internal e- conversion flag                  1
809 Store e- internal conversion data             0
810 Electron internal conversion ID              2
811 Correlated gamma emission flag              0
812 Max 2J for sampling of angular correlations  10
813 =====
814 Start closing geometry.
815 G4GeometryManager::ReportVoxelStats -- Voxel Statistics
816
817 Total memory consumed for geometry optimisation:  0 kByte
818 Total CPU time elapsed for geometry optimisation: 0 seconds
819
820 Voxelisation: top CPU users:
821 Percent    Total CPU    System CPU    Memory    Volume
822 -----
823 | 0.00      0.00      0.00      0k Envelope
824
825 Voxelisation: top memory users:
826 Percent    Memory    Heads    Nodes    Pointers    Total CPU    Volume
827 -----
828 | 100.00    0k      1      3      4      0.00    Envelope
829
830
831 --> G4MTRunManager::CreateAndStartWorkers() --> Initializing workers...
832 =====
833
834 G4WT1 > /control/saveHistory
835 G4WT1 > /run/verbose 2
836 G4WT1 > /run/initialize
837 G4WT1 > /run/physicsModified
838 G4WT0 > /control/saveHistory
839 G4WT0 > /run/verbose 2
840 G4WT0 > /run/initialize
841 G4WT0 > /run/physicsModified
842 #
```



WHAT IS GEANT4 (Cont.)

```
843 # Visualization setting
844 /control/execute vis.mac
845 # Macro file for the visualization setting in the initialization phase
846 # of the BI example when running in interactive mode
847 #
848 # Use these open statements to open selected visualization
849 #
850 # Use this open statement to create an OpenGL view:
851 /vis/open OGL 600x600-0+0
852 /vis/sceneHandler/create OGL
853 /vis/viewer/create !! 600x600-0+0
854 /vis/viewer/refresh
855 #
856 # Use this open statement to create an OpenInventor view:
857 #/vis/open OI
858 #
859 # Use this open statement to create a .prim file suitable for
860 # viewing in DAWN:
861 #/vis/open DAWNFILE
862 #
863 # Use this open statement to create a .heprep file suitable for
864 # viewing in HepRApp:
865 #/vis/open HepRepFile
866 #
867 # Use this open statement to create a .wrl file suitable for
868 # viewing in a VRML viewer:
869 #/vis/open VRML2FILE
870 #
871 # Disable auto refresh and quieten vis messages whilst scene and
872 # trajectories are established:
873 /vis/viewer/set/autoRefresh false
874 /vis/verbose errors
875 Visualization verbosity changed to errors (2)
876 #
877 # Draw geometry:
878 /vis/drawVolume
879 /vis/scene/create
880 /vis/scene/add/volume world -1 -1 none m 0 0 0 0 0
881 /vis/sceneHandler/attach
882 #
883 # Specify view angle:
884 /vis/viewer/set/viewpointVector -1 0 0
885 /vis/viewer/set/lightsVector -1 0 0
886 #
887 # Specify style (surface, wireframe, auxiliary edges,...)
888 /vis/viewer/set/style wireframe
889 /vis/viewer/set/auxiliaryEdge true
890 /vis/viewer/set/lineSegmentsPerCircle 100
```



WHAT IS GEANT4 (Cont.)

```
892 # Draw smooth trajectories at end of event, showing trajectory points
893 # as markers 2 pixels wide:
894 /vis/scene/add/trajectories smooth
895 /tracking/storeTrajectory 2
896 Attributes available for modeling and filtering with
897 "/vis/modeling/trajectories/create/drawByAttribute" and
898 "/vis/filtering/trajectories/create/attributeFilter" commands:
899 G4TrajectoriesModel:
900   Event ID (EventID): G4int
901   Run ID (RunID): G4int
902 G4SmoothTrajectory:
903   Charge (Ch): unit: e+ (G4double)
904   Track ID (ID): G4int
905   Initial kinetic energy (IKE): G4BestUnit (G4double)
906   Initial momentum magnitude (IMag): G4BestUnit (G4double)
907   Initial momentum (IMom): G4BestUnit (G4ThreeVector)
908   No. of points (NTP): G4int
909   PDG Encoding (PDG): G4int
910   Parent ID (PID): G4int
911   Particle Name (PN): G4String
912 G4SmoothTrajectoryPoint:
913   Auxiliary Point Position (Aux): G4BestUnit (G4ThreeVector)
914   Step Position (Pos): G4BestUnit (G4ThreeVector)
915 /vis/scene/notifyHandlers
916 /vis/modeling/trajectories/create/drawByCharge
917 /vis/modeling/trajectories/drawByCharge-0/default/setDrawStepPts true
918 /vis/scene/notifyHandlers scene-0
919 /vis/modeling/trajectories/drawByCharge-0/default/setStepPtsSize 2
920 /vis/scene/notifyHandlers scene-0
921 # (if too many tracks cause core dump => /tracking/storeTrajectory 0)
922 #
923 # Draw hits at end of event:
924 #/vis/scene/add/hits
925 #
926 # To draw only gammas:
927 #/vis/filtering/trajectories/create/particleFilter
928 #/vis/filtering/trajectories/particleFilter-0/add gamma
929 #
930 # To invert the above, drawing all particles except gammas,
931 # keep the above two lines but also add:
932 #/vis/filtering/trajectories/particleFilter-0/invert true
933 #
934 # Many other options are available with /vis/modeling and /vis/filtering.
935 # For example, to select colour by particle ID:
936 #/vis/modeling/trajectories/create/drawByParticleID
937 #/vis/modeling/trajectories/drawByParticleID-0/default/setDrawStepPts true
938 # To select or override default colours (note: e+ is blue by default):
939 #/vis/modeling/trajectories/list
940 #/vis/modeling/trajectories/drawByParticleID-0/set e+ yellow
```



WHAT IS GEANT4 (Cont.)

```
942 # To superimpose all of the events from a given run:
943 /vis/scene/endOfEventAction accumulate
944 #
945 # Decorations
946 # Name
947 /vis/set/textColour green
948 /vis/set/textLayout right
949 /vis/scene/add/text2D 0.9 -.9 24 !! exampleB1
950 /vis/scene/notifyHandlers
951 # or, if your system does not support right-adjustment
952 #/vis/scene/add/text2D 0 -.9 24 !! exampleB1
953 /vis/set/textLayout
954 /vis/set/textColour
955 #
956 # Axes, scale, etc.
957 /vis/scene/add/scale
958 /vis/scene/notifyHandlers
959 /vis/scene/add/axes
960 /vis/scene/notifyHandlers
961 /vis/scene/add/eventID
962 /vis/scene/notifyHandlers
963 /vis/scene/add/date
964 /vis/scene/notifyHandlers
965 /vis/scene/add/logo2D
966 /vis/scene/notifyHandlers
967 /vis/scene/add/logo
968 /vis/scene/notifyHandlers
969 #
970 # Frame
971 /vis/set/colour red
972 /vis/set/lineWidth 2
973 /vis/scene/add/frame
974 /vis/scene/notifyHandlers
975 /vis/set/colour
976 /vis/set/lineWidth
977 #
978 # Attach text to one edge of Shape1, with a small, fixed offset
979 /vis/scene/add/text 0 6 -4 cm 18 4 4 Shape1
980 /vis/scene/notifyHandlers
981 # Attach text to one corner of Shape2, with a small, fixed offset
982 /vis/scene/add/text 6 7 10 cm 18 4 4 Shape2
983 /vis/scene/notifyHandlers
984 #
985 # To get nice view
986 # Make the "World" box invisible
987 /vis/geometry/set/visibility World 0 false
988 /vis/scene/notifyHandlers
989 # "Envelope" is transparent blue to represent water
990 /vis/geometry/set/colour Envelope 0 0 1 .3
991 /vis/scene/notifyHandlers
992 /vis/viewer/set/style surface
993 /vis/viewer/set/hiddenMarker true
994 /vis/viewer/set/viewpointThetaPhi 120 150
995 #
996 # Re-establish auto refreshing and verbosity:
997 /vis/viewer/set/autoRefresh true
998 /vis/viewer/refresh
999 /vis/verbose warnings
1000 Visualization verbosity changed to warnings (3)
1001 #
1002 # For file-based drivers, use this to create an empty detector view:
1003 #/vis/viewer/flush
```



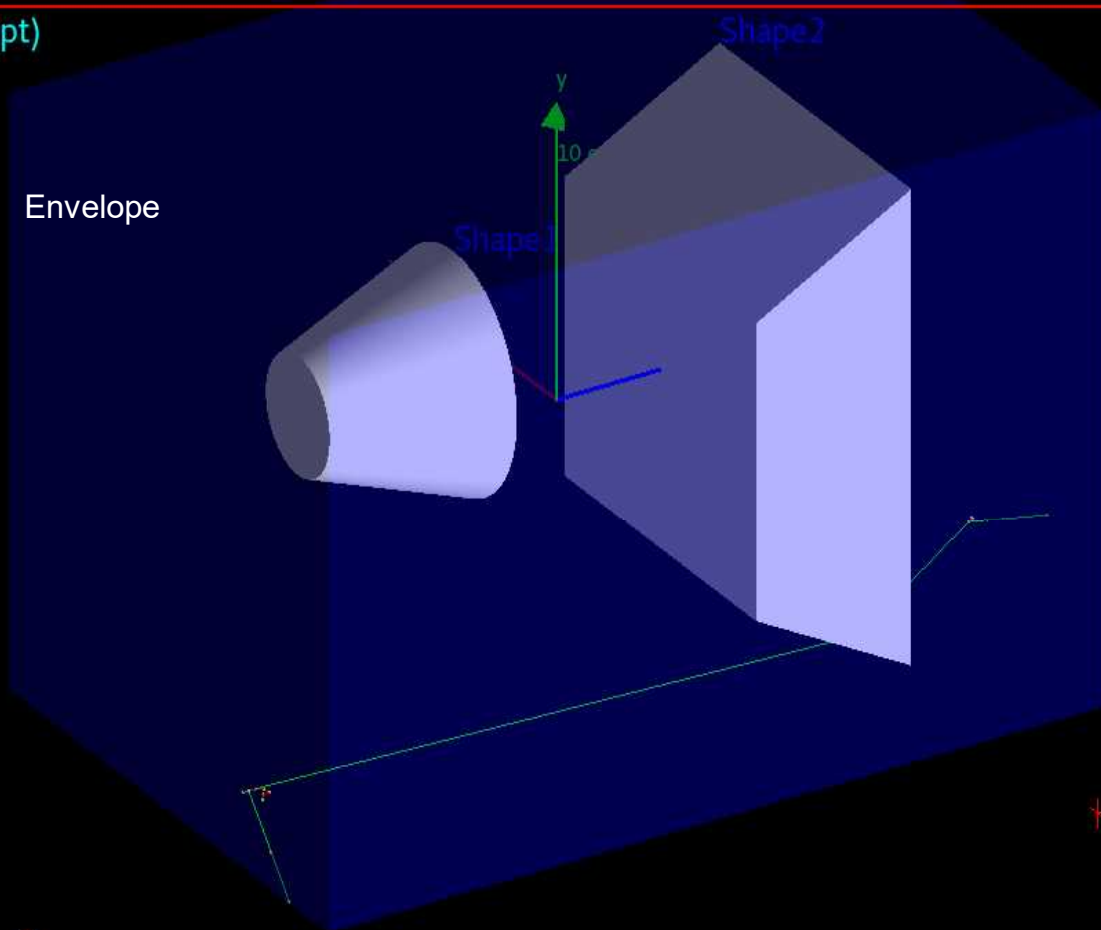
WHAT IS GEANT4 (Cont.)

```
1005 /tracking/verbose 1
1006 /run/beamOn 1
1007
1008 Region <DefaultRegionForTheWorld> -- -- appears in <World> world volume
1009 This region is in the mass world.
1010 Root logical volume(s) : World
1011 Pointers : G4VUserRegionInformation[0], G4UserLimits[0], G4FastSimulationManager[0], G4UserSteppingAction[0]
1012 Materials : G4_AIR G4_WATER G4_A-150_TISSUE G4_BONE_COMPACT_ICRU
1013 Production cuts :   gamma 700 um      e- 700 um      e+ 700 um  proton 700 um
1014
1015 Region <DefaultRegionForParallelWorld> -- -- is not associated to any world.
1016 Root logical volume(s) :
1017 Pointers : G4VUserRegionInformation[0], G4UserLimits[0], G4FastSimulationManager[0], G4UserSteppingAction[0]
1018 Materials :
1019 Production cuts :   gamma 700 um      e- 700 um      e+ 700 um  proton 700 um
1020
1021 ===== Table of registered couples =====
1022
1023 Index : 0      used in the geometry : Yes
1024 Material : G4_AIR
1025 Range cuts   :   gamma 700 um      e- 700 um      e+ 700 um  proton 700 um
1026 Energy thresholds : gamma 990 eV      e- 990 eV      e+ 990 eV  proton 70 keV
1027 Region(s) which use this couple :
1028     DefaultRegionForTheWorld
1029
1030 Index : 1      used in the geometry : Yes
1031 Material : G4_WATER
1032 Range cuts   :   gamma 700 um      e- 700 um      e+ 700 um  proton 700 um
1033 Energy thresholds : gamma 2.51944 keV  e- 276.265 keV  e+ 270.751 keV proton 70 keV
1034 Region(s) which use this couple :
1035     DefaultRegionForTheWorld
1036
1037 Index : 2      used in the geometry : Yes
1038 Material : G4_A-150_TISSUE
1039 Range cuts   :   gamma 700 um      e- 700 um      e+ 700 um  proton 700 um
1040 Energy thresholds : gamma 2.27786 keV  e- 299.466 keV  e+ 293.489 keV proton 70 keV
1041 Region(s) which use this couple :
1042     DefaultRegionForTheWorld
1043
1044 Index : 3      used in the geometry : Yes
1045 Material : G4_BONE_COMPACT_ICRU
1046 Range cuts   :   gamma 700 um      e- 700 um      e+ 700 um  proton 700 um
1047 Energy thresholds : gamma 3.95224 keV  e- 397.122 keV  e+ 384 keV  proton 70 keV
1048 Region(s) which use this couple :
1049     DefaultRegionForTheWorld
1050
1051 =====
```



WHAT IS GEANT4 (Cont.)

Run 0 (1 event, 1 kept)



Geant4

10 cm
G4

exampl



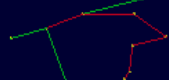
WHAT IS GEANT4 (Cont.)

Run 0 (1 event, 1 kept)

Sun 3

Geant4

exampl

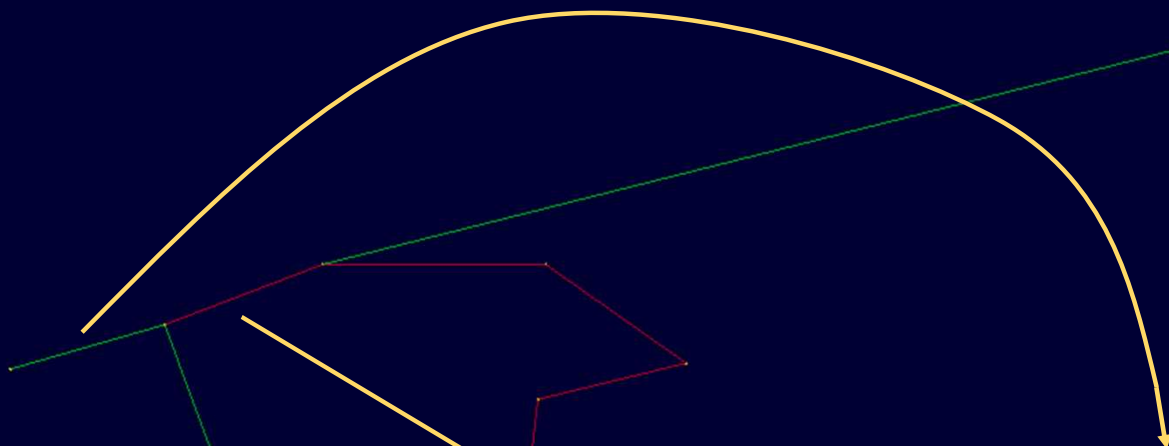




WHAT IS GEANT4 (Cont.)

Run 0 (1 event, 1 kept)

Sun



```
1063 G4WT1 > Number of events processed : 0
1064 G4WT0 > *****
1065 G4WT0 > * G4Track Information: Particle = gamma, Track ID = 1, Parent ID = 0
1066 G4WT0 > *****
1067 G4WT0 >
1068 G4WT0 > Step# X (mm) Y (mm) Z (mm) KinE (MeV) dE (MeV) StepLeng TrackLeng NextVolume ProcName
1069 G4WT0 > 0 -46.6 -75 -150 6 0 0 0 Envelope initStep
1070 G4WT0 > 1 -46.6 -75 -148 0.75 0 2.35 2.35 Envelope compt.
1071 G4WT1 > User=0.000000s Real=0.000001s Sys=0.000000s [Cpu=0.0%]
1072 G4WT0 > 2 -42.5 -100 -136 0.75 0 27.7 30 World Transportation
1073 G4WT0 > 3 -39.2 -120 -128 0.75 0 22.2 52.2 OutOfWorld Transportation
1074 G4WT0 >
1075 G4WT0 > *****
1076 G4WT0 > * G4Track Information: Particle = e-, Track ID = 2, Parent ID = 1
1077 G4WT0 > *****
1078 G4WT0 >
1079 G4WT0 > Step# X (mm) Y (mm) Z (mm) KinE (MeV) dE (MeV) StepLeng TrackLeng NextVolume ProcName
1080 G4WT0 > 0 -46.6 -75 -148 5.25 0 0 0 Envelope initStep
1081 G4WT0 > 1 -46.4 -74.9 -145 2.23 0.375 2.55 2.55 Envelope eBrem
1082 G4WT0 > 2 -46.1 -75.9 -142 1.61 0.626 3.87 6.42 Envelope eIoni
1083 G4WT0 > 3 -46.3 -77.7 -140 1.11 0.503 3.1 9.52 Envelope eIoni
1084 G4WT0 > 4 -45.2 -78.2 -141 0.707 0.4 2.46 12 Envelope eIoni
1085 G4WT0 > 5 -45.5 -79.5 -141 0.31 0.397 1.89 13.9 Envelope eIoni
1086 G4WT0 > 6 -45.4 -79.9 -142 0 0.31 0.893 14.8 Envelope eIoni
```

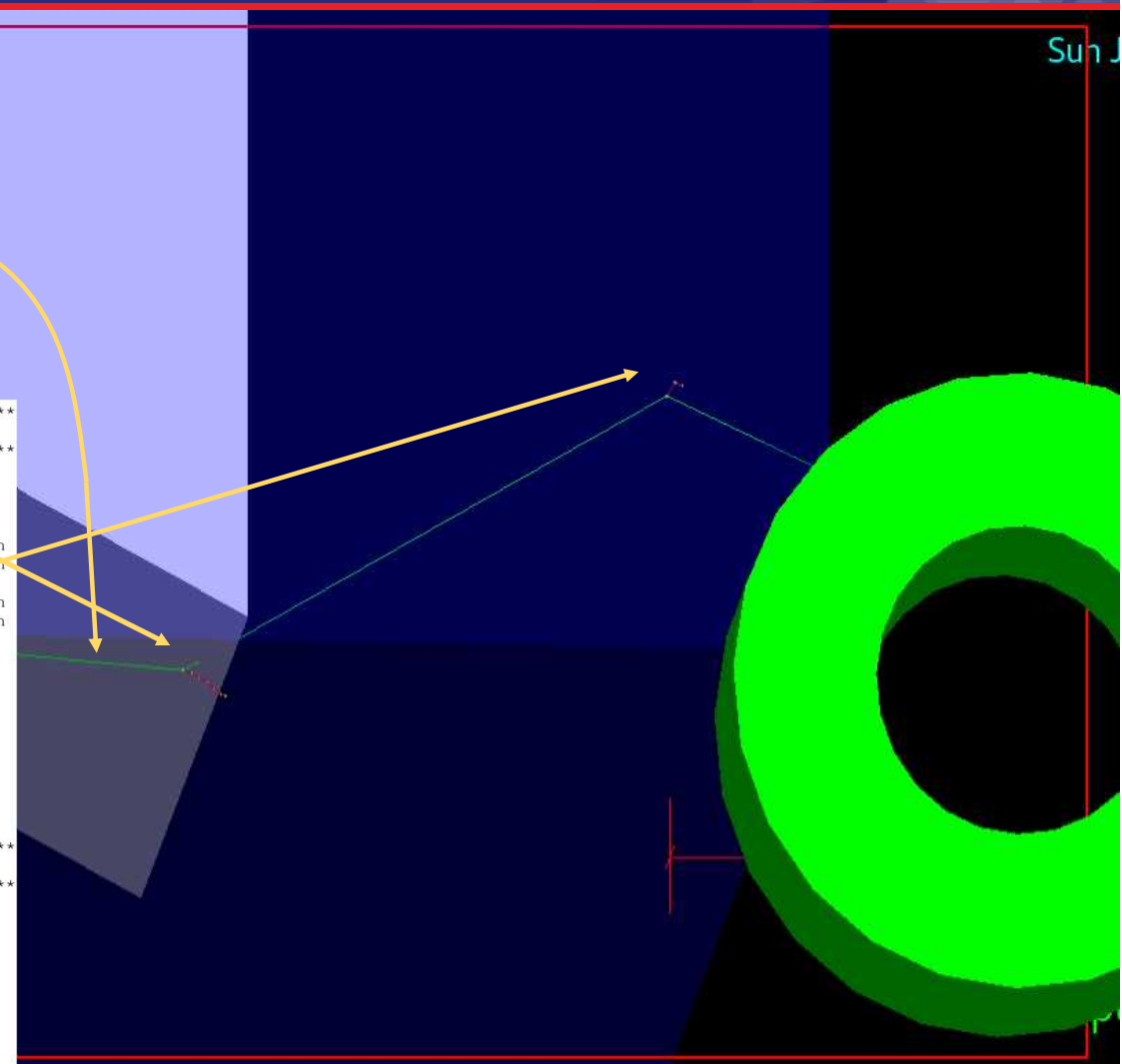
Geant4



WHAT IS GEANT4 (Cont.)

Run 0 (1 event, 1 kept)

```
1088 G4WTO > *****  
1089 G4WTO > * G4Track Information: Particle = gamma, Track ID = 3, Parent ID = 2  
1090 G4WTO > *****  
1091 G4WTO >  
1092 G4WTO > Step#    X(mm)    Y(mm)    Z(mm) KinE(MeV)  dE(MeV) StepLeng TrackLeng  NextVolume ProcName  
1093 G4WTO > 0      -46.4    -74.9    -145   2.64         0         0         0         Envelope initStep  
1094 G4WTO > 1      -33.9    -89.4    96.2   1.46         0         242        242        Envelope compt  
1095 G4WTO > 2      -33.8    -88.7    97.4   1.46         0         1.44       243        Shape2 Transportation  
1096 G4WTO > 3      -33.6    -87.3    100    1.46         0         2.96       246        Envelope Transportation  
1097 G4WTO > 4      -29.9    -64.4    141    0.733        0         .47        293        Envelope compt  
1098 G4WTO > 5      -26.5    -67.6    150    0.733        0         10.2       304        World Transportation  
1099 G4WTO > 6      -15.4    -77.8    180    0.733        0         33.6       337        OutOfWorld Transportation  
1100  
1101  
1102  
1103  
1104  
1105  
1106  
1107  
1108  
1109  
1110  
1111 G4WTO > *****  
1112 G4WTO > * G4Track Information: Particle = e-, Track ID = 4, Parent ID = 3  
1113 G4WTO > *****  
1114 G4WTO >  
1115 G4WTO > Step#    X(mm)    Y(mm)    Z(mm) KinE(MeV)  dE(MeV) StepLeng TrackLeng  NextVolume ProcName  
1116 G4WTO > 0      -33.9    -89.4    96.2   1.18         0         0         0         Envelope initStep  
1117 G4WTO > 1      -33.9    -89.7    97     1.03         0.15       0.858     0.858     Envelope msc  
1118 G4WTO > 2      -33.7    -90     97.6   0.862        0.172      0.73      1.59      Envelope msc  
1119 G4WTO > 3      -33.3    -90.3    98.4   0.69         0.172      0.991     2.58      Envelope msc  
1120 G4WTO > 4      -33.2    -90.7    99.1   0.49         0.2        0.879     3.46      Envelope msc  
1121 G4WTO > 5      -32.7    -91.1    99.7   0.323        0.167      0.973     4.43      Envelope msc  
1122 G4WTO > 6      -32.5    -91.3    100    0            0.323     0.949     5.38      Envelope eIoni
```



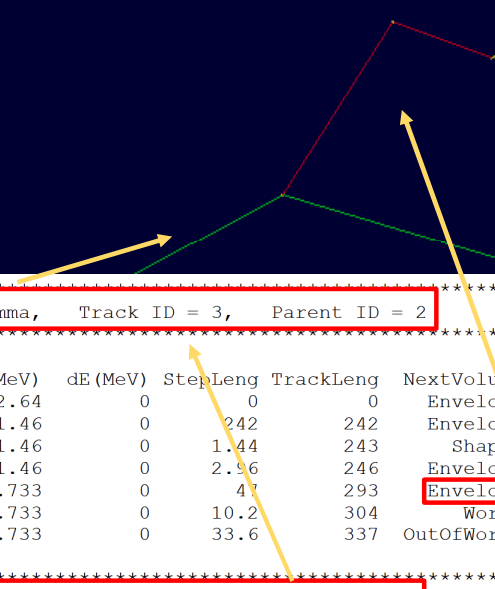


WHAT IS GEANT4 (Cont.)

Run 0 (1 event, 1 kept)

Sun J

```
1088 G4WTO > *****
1089 G4WTO > * G4Track Information: Particle = gamma, Track ID = 3, Parent ID = 2 *****
1090 G4WTO > *****
1091 G4WTO >
1092 G4WTO > Step#    X (mm)    Y (mm)    Z (mm)  KinE (MeV)  dE (MeV)  StepLeng  TrackLeng  NextVolume  ProcName
1093 G4WTO > 0         -46.4     -74.9     -145    2.64        0          0          0          Envelope  initStep
1094 G4WTO > 1         -33.9     -89.4     96.2    1.46        0          242        242        Envelope  compt
1095 G4WTO > 2         -33.8     -88.7     97.4    1.46        0          1.44       243        Shape2    Transportation
1096 G4WTO > 3         -33.6     -87.3     100     1.46        0          2.96       246        Envelope  Transportation
1097 G4WTO > 4         -29.9     -64.4     141     0.733       0          4          293        Envelope  compt
1098 G4WTO > 5         -26.5     -67.6     150     0.733       0          10.2       304        World    Transportation
1099 G4WTO > 6         -15.4     -77.8     180     0.733       0          33.6       337        OutOfWorld Transportation
1100 G4WTO >
1101 G4WTO > *****
1102 G4WTO > * G4Track Information: Particle = e-, Track ID = 5, Parent ID = 3 *****
1103 G4WTO > *****
1104 G4WTO >
1105 G4WTO > Step#    X (mm)    Y (mm)    Z (mm)  KinE (MeV)  dE (MeV)  StepLeng  TrackLeng  NextVolume  ProcName
1106 G4WTO > 0         -29.9     -64.4     141     0.722       0          0          0          Envelope  initStep
1107 G4WTO > 1         -30       -63.3     142     0.387       0.336     1.91       1.91       Envelope  eIoni
1108 G4WTO > 2         -29.9     -63.5     142     0.0518      0.335     1.2        3.11       Envelope  eIoni
1109 G4WTO > 3         -29.9     -63.5     142     0           0.0518    0.0463     3.16       Envelope  eIoni
```



example



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lacongaphysics



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Capacity building in Advanced physics

LA-CoNGA physics



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