b-baryon problem in mokka

T. Tanabe

2011.2.25

b-baryon problem in mokka

- b-baryon lifetime problem: b-baryons are not properly propagated during detector simulation
  - reported by TT Nov 2010 for Xi_b
  - reported again by T.Suehara last week for general b-baryons
- this is a **big problem**! since ~10% of b-jets contain b-baryons, b-tagging performance is severely penalized
- another (unrelated) problem which confused people**: decay vertex** information from the event generator was previously **ignored** by mokka
  - **this was fixed** in the latest mokka release
  - … BUT NOT FOR B-BARYONS!
- tokyo group agreed to try to fix this issue in mokka at the software management meeting yesterday
- we use single particle (Lambda_b) STDHEP file generated by M. Berggren for testing

EVENT #1

STDHEP

#	parent	PDG	V_X	V_Y	V_Z
1	n/a	5122	0.	0.	0.
2	1	4122	73.43	219.06	-3.67
3	1	-211	73.43	219.06	-3.67
4	1	223	73.43	219.06	-3.67
5	2	-11	73.84	220.52	-3.69
6	2	12	73.84	220.52	-3.69

MCParticles

#	parent	PDG	V_X	V_Y	V_Z
1	n/a	5122	0.	0.	0.
2	1	4122	0.	0.	0.
3	1	-211	0.	0.	0.
4	1	223	0.	0.	0.
5	2	-11	0.41	1.56	-0.02
6	2	12	0.41	1.56	-0.02

c-baryons are simulated properly but b-baryons are not !!
we are currently investigating the mokka code…

possible fix

- c-baryons are treated properly but b-baryons are not
- one strategy is to check the difference in how mokka treats c-baryons and b-baryons

```
Idle> /particle/list
                B+,                B-,                B0,               Bs0
                D+,                D-,                D0,               Ds+
               Ds-,       GenericIon,               He3,             J/psi
         N(1440)+,          N(1440)0,         N(1520)+,         N(1520)0
         N(1535)+,          N(1535)0,         N(1650)+,         N(1650)0
         N(1675)+,          N(1675)0,         N(1680)+,         N(1680)0
```

- mokka (geant4) does not know about b-baryons!
  - entries are available for c-baryons
- possible fix:
  - update the particle table to make G4 aware of b-baryons
  - mokka should then be able to handle b-baryon decays properly