Subject: MVD covariance matrix = 0.
Posted by Lia Lavezzi on Mon, 04 Jul 2011 14:50:00 GMT
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Hi MVD experts,
   I am running some tests and I see several crashes in genfit, but after looking at the problem I think that this is caused by the sds covariance matrix, when it happens to have all the elements equal to 0:

-I- PndSdsRecoHit::PndSdsRecoHit: Wrote a hit with
(x,y) = (0.2535,-0.2925).
Covariance Matrix is
2x2 matrix is as follows

```
      |   0   |   1   |
------------------------------
  0 |     0         0
  1 |     0         0
```

this turns out in the crash

```
#10 0xb2454dd5 in GFTools::invertMatrix (mat=..., inv=...)
    at /home/lavezzi/test_dev/trunk/genfit/GFTools.cxx:288
#11 0xb244b438 in GFKalman::chi2Increment (this=0x8ab4208, r=..., H=...,
    cov=..., V=...) at /home/lavezzi/test_dev/trunk/genfit/GFKalman.cxx:200
#12 0xb244c4b5 in GFKalman::processHit (this=0x8ab4208, tr=0x12bc0090, ihit=3,
    irep=0, direction=1)
    at /home/lavezzi/test_dev/trunk/genfit/GFKalman.cxx:313
#13 0xb244b27d in GFKalman::fittingPass (this=0x8ab4208, trk=0x12bc0090,
    direction=1) at /home/lavezzi/test_dev/trunk/genfit/GFKalman.cxx:169
#14 0xb244aacb in GFKalman::processTrack (this=0x8ab4208, trk=0x12bc0090)
    at /home/lavezzi/test_dev/trunk/genfit/GFKalman.cxx:77
#15 0xafb6c461 in PndRecoKalmanFit::Fit (this=0x8ab41d8, tBefore=0xfd188a0,
    PDG=13)
    at /home/lavezzi/test_dev/trunk/GenfitTools/recotasks/PndRecoKalmanFit.cxx:282
```

since at that point, in the invertMatrix function, there is 1./mat[0][0] and mat[0][0] is equal to 0. I am using rev 12447.

Could you please fix this? Or is it fixed in the latest revision?
Thank you in advance,
Lia.

Subject: Re: MVD covariance matrix = 0.
Posted by Tobias Stockmanns on Mon, 04 Jul 2011 15:14:42 GMT
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Dear Lia,

which simulation chain are you using which causes these crashes?

Ciao,

Tobias

Subject: Re: MVD covariance matrix = 0.
Posted by Lia Lavezzi on Mon, 04 Jul 2011 15:50:56 GMT
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Hi Tobias,
   I am using the macros from macro/pid: run_sim_sttcombi_pgun, run_digi_sttcombi.C,
run_reco_sttcombi.C

I generate muons with momentum in the range [1, 1.5] GeV/c and theta in the range [21, 133]
deg and I commented out all the detectors in digi and reco except for stt and mvd.
                                                                                              Lia.

Subject: Re: MVD covariance matrix = 0.
Posted by Tobias Stockmanns on Tue, 05 Jul 2011 09:07:37 GMT
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Dear Lia,

I simulated 1000 events with the pid macros given by you without any problems.
All covariance matrizes have at least one value different from zero.

Can you please have a look at the Dx, Dy, Dz values for the MVDHitsPixel / MVDHitsStrips if
there are any zeros. They are the basis for the calculation of the cov matrizes.

How often does this crash happen?

Cheers,

Tobias

Subject: Re: MVD covariance matrix = 0.
Posted by Lia Lavezzi on Tue, 05 Jul 2011 09:50:45 GMT
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Hi Tobias,

I checked the Dx, Dy, Dz and I have some of them equal to 0, exactly in the event where the
crash happens, for example in one test I have from the cbmsim->Scan, looking for small dx,

---

dy, dz (below 1e-8):

```
*************************************************************
*   Row   * Instance * MVDHitsSt * MVDHitsSt * MVDHitsSt *
*************************************************************
*    110 *       0 * 0.0086602 *       0 *       0 *
*    220 *       0 * 0.0086602 * 7.178e-17 * 3.347e-17 *
*    361 *       6 * 0.0086602 *       0 *       0 *
*    876 *       0 * 1.952e-17 * 1.512e-17 * 0.0086602 *
*************************************************************
```

and the crash is exacly in event 110.

It happens quite often: I made some tests with 2000 muons each, at low momenta (around 0.2 GeV/c) and higer momenta (around 1 GeV/c) and on 7 tests, 3 crashed this way (2 crashed in the mvd riemann track finder, I will post the crash on the forum too).

I scanned the cbmsim also for the files where the riemann track finder crashed and also there I found errors equal to 0. I post here and example:

```
*************************************************************
*   Row   * Instance * MVDHitsSt * MVDHitsSt * MVDHitsSt *
*************************************************************
*    423 *       0 * 0.0086602 * 1.575e-16 * 3.061e-17 *
*    511 *       0 * 0.0086602 *       0 *       0 *
*   1243 *       0 * 0.0086602 *       0 *       0 *
*   1481 *       0 * 0.0086602 * 4.763e-17 * 4.442e-17 *
*************************************************************
```

I guess this means that if the mvdriemann didn' t crash it could crash in genfit as in the other cases...

Moreover I looked also in the files where reconstruction went fine to the end and I have errors equal to 0 also there:

```
*************************************************************
*   Row   * Instance * MVDHitsSt * MVDHitsSt * MVDHitsSt *
*************************************************************
*   1317 *       7 * 0.0086602 * 1.335e-19 * 9.140e-20 *
*   1535 *       1 * 0.0086602 *       0 *       0 *
*************************************************************
```

My idea is that it did not crash here because this hit is not assigned to any track and so it does not enter in kalman calculation... I can check this if you think it is useful.

One more information: I get the same results on openSuse and Scientific Linux Cern.

    Cheers,
     Lia.

Subject: Re: MVD covariance matrix = 0.
Posted by StefanoSpataro on Tue, 05 Jul 2011 10:48:33 GMT

Which trunk version?
There was a bug in mvd digitization that now should be fixed.
Could it be this the reason?

Subject: Re: MVD covariance matrix = 0.
Posted by Lia Lavezzi on Tue, 05 Jul 2011 12:38:16 GMT

Hi Stefano,
   I am using an updated trunk, but for sds, mvd, PndTools and pnddata I am using revision
12447, the one chosen for the last grid release.
If all the problems are solved now, I can update everything and rerun the tests with the last
version of trunk... what do you think?
 Ciao,
  Lia.

Subject: Re: MVD covariance matrix = 0.
Posted by Lia Lavezzi on Tue, 05 Jul 2011 13:03:46 GMT

Hi again,
   I updated my whole trunk to the last revision and rerun digitization and reconstruction but I
still get the crash
                                        Lia.

Subject: Re: MVD covariance matrix = 0.
Posted by StefanoSpataro on Tue, 05 Jul 2011 13:36:03 GMT

Hi,
I think it is fine.
The other thing I could suggest is to use the may11 release, instead of the trunk. In reality
there could be still some problems with the new base.

Subject: Re: MVD covariance matrix = 0.
Posted by Tobias Stockmanns on Tue, 05 Jul 2011 13:38:02 GMT

Are you sure that this is the right topic or should your reply be part of "Number of entries in
tree"?

Cheers,

Tobias

Subject: Re: MVD covariance matrix = 0.
Posted by Tobias Stockmanns on Tue, 05 Jul 2011 13:39:45 GMT

Dear Lia,

actually I do not know how to solve this problem. Maybe Ralf can have a look. These zeros are comming from the strip part of the MVD.

Cheers,

Tobias

Subject: Re: MVD covariance matrix = 0.
Posted by StefanoSpataro on Tue, 05 Jul 2011 14:18:12 GMT

I was speaking about this topic.

Subject: Re: MVD covariance matrix = 0.
Posted by Lia Lavezzi on Wed, 06 Jul 2011 10:07:11 GMT

Hi,
  I downloaded the may11 release and run the macros there, but I still get all the crashes.
I thought that it might be something wrong in the macros (maybe I changed something and did not remember), so I took the macro/run/tdrct/eta_c macros for the stt and just changed the generator part to simulate single muon tracks instead of etac events, but I still get the crashes.
I run six tests and only one arrived to the end without problems.

Ralf, can you please have a look into this, as Tobias suggested?

An alternative solution could be to put inside genfit some protection against the division by 0 in the invertMatrix function of GFTools.cxx, but the strip errors equal to 0 would be still there.
What do genfit people think about this?
                         Cheers,
                            Lia.

Subject: Re: MVD covariance matrix = 0.
Posted by Ralf Kliemt on Wed, 06 Jul 2011 11:16:04 GMT

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Lia Lavezzi wrote on Wed, 06 July 2011 12:07
Ralf, can you please have a look into this, as Tobias suggested?

Hi,

I was already (silently) looking at the code. However I found no sign where that could happen, yet. Tomorrow I'll run some tests.

Ralf

PS: Could you pleas post that scan command you used?

Subject: Re: MVD covariance matrix = 0.
Posted by Lia Lavezzi on Wed, 06 Jul 2011 11:30:13 GMT
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Hi Ralf,
  thank you very much!

Here is the command:
cbmsim.Scan("MVDHitsStrip.fDx:MVDHitsStrip.fDy:MVDHitsStrip.fDz", "MVDHitsStrip.fDx < 1e-8 || MVDHitsStrip.fDy < 1e-8 || MVDHitsStrip.fDz < 1e-8")
        Cheers,
          Lia.

Subject: Re: MVD covariance matrix = 0.
Posted by Ralf Kliemt on Mon, 11 Jul 2011 12:10:31 GMT
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Hi Lia,

The issue should be fixed now.
Ralf

Subject: Re: MVD covariance matrix = 0.
Posted by Lia Lavezzi on Mon, 11 Jul 2011 17:13:44 GMT
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Hi Ralf,
  I run some tests on the files previously crashing and I can confirm that the problem is no longer there.
        Thank you very much!
                Lia.

Subject: Re: MVD covariance matrix = 0.
Posted by StefanoSpataro on Mon, 11 Jul 2011 17:27:07 GMT

Trying to understand,
does it mean that now , with the latest tunk, the code stt+mvd tracking gives the same results as before, w/o crashes? because in may11 we are still using the old version before the time stamps upgrade.

Subject: Re: MVD covariance matrix = 0.
Posted by Lia Lavezzi on Tue, 12 Jul 2011 08:49:52 GMT

Hi Stefano,
   I did not check the results yet, just checked that the crash was gone... now I can run a couple of tests at different momenta and compare them to our previous results to confirm that everything is fine.
        Ciao,
         Lia.

Subject: Re: MVD covariance matrix = 0.
Posted by Lia Lavezzi on Wed, 13 Jul 2011 09:46:58 GMT

After the tests I confirm that the momentum resolution are still good after the last changes.
        Lia.