# MAUS Update

## A. Dobbs

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# Current Release

- MAUS is currently on version 0.9.3
  - `bzr branch lp:maus`
  - See http://micewww.pp.rl.ac.uk/projects/maus/wiki
- Now supports building with multiple cores (use `-j N`)
- G4BeamLine now fully incorporated for upstream beamline simulation
- GRID running now working with a full release
- Physics Block Challenge data produced using release 0.9.2
  - http://www.ppe.gla.ac.uk/~rbayes/MICE_6pi200_1/pass2_
    simulation_mausv0p9p2.tar.gz
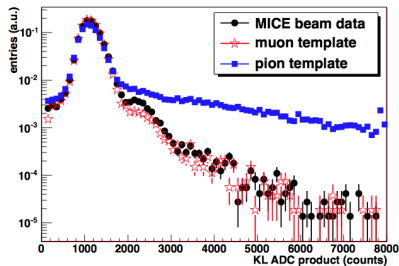
# EMR

*F. Drielsma*

- MC: Complete
- MC digitisation: Complete
- Real data unpacking: Complete
- Reconstruction: 80% complete
- Calibration needs to go to CDB
- See EMR talks
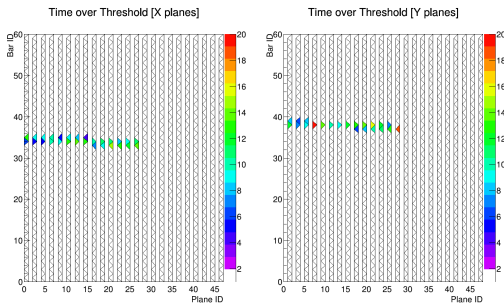


250 MeV/c Muon Event

# KL

*M. Bogomilov, J. Nugent*

- MC: Complete
- MC data digitisation: Virtually complete
- Real data digitisation: Complete
- Reconstruction: Complete
- MC validation: Complete

| Current Release | Detectors | Global | Tests | Summary |
|:---:|:---:|:---:|:---:|:---:|
| O | OOO●OO | O | OOO | OO |

CKOV

# CKOV

*L. Cremaldi, D. Rajaram*
- MC: 30% complete.
    - Material characterization/layers are complete
    - Photon bouncing will not be implemented, but data-driven model of PE production used instead
- MC data digitisation: 0% complete
    - Private model made, but not in MAUS, hoping to get student to implement.
- Real data digitisation: 50% complete
    - Re-written the fadc integrators and pedestal finders
- Reconstruction: 25% complete
    - PE counts from the PMTs used for a while to make $e/\mu/\pi$ predictions using Poisson algorithms for producing likeihoods, but no MAUS implementation

## Tracker

*D. Adey, A. Dobbs, C. Heidt, C. Hunt, M. A. Uchida*

- MC: Complete (perhaps a bit of tinkering with the noise algorithm)
- MC data digitisation: Complete
- Unpacking: Broken post release 0.7.3 (fix done?)
- Real data digitisation: Status unsure due to unpacking problem
- Reconstruction: Almost complete. Final track fit algorithms being refined and tuned.
- MC validation: Mostly complete.
- Online displays: 60% complete

# TOF

*D. Rajaram*

- MC: Complete
- MC digitisation: Mostly complete. MC trigger work ongoing.
- Unpacking: Complete
- Real data digitisation: Complete
- Reconstruction: Complete
- Online displays: Complete

# Global

*M. A. Uchida, C. Pidcott, J. Greis*

- 3 PID variables now in release
- Tracking being overhauled, switching from transfer matrix method to Runge-Kutta
- Downstream: Tracks and PID
- Upstream: Tracks
- Requires detector output in global coordinate system
- Good progress being made, estimate 50% complete, expected completetion date of 30th June 2015
- See dedicated Global talks for details

# Test Coverage I

| Directory | Line Coverage ⬍ | | Functions ⬍ | | Branches ⬍ | |
|---|---|---|---|---|---|---|
| src/common_cpp/API | 74.2 % | 230 / 310 | 76.4 % | 178 / 233 | 44.2 % | 99 / 224 |
| src/common_cpp/Converter | 92.5 % | 49 / 53 | 66.5 % | 149 / 224 | 40.2 % | 53 / 132 |
| src/common_cpp/Converter/DataConverters | 88.7 % | 204 / 230 | 59.7 % | 105 / 176 | 47.6 % | 81 / 170 |
| src/common_cpp/DataStructure | 27.8 % | 12585 / 45322 | 25.5 % | 2270 / 8889 | 11.2 % | 1756 / 15740 |
| src/common_cpp/DataStructure/Global | 95.3 % | 548 / 575 | 83.9 % | 151 / 180 | 77.0 % | 137 / 178 |
| src/common_cpp/DetModel | 100.0 % | 23 / 23 | 90.0 % | 9 / 10 | 70.0 % | 7 / 10 |
| src/common_cpp/DetModel/EMR | 1.7 % | 3 / 180 | 15.4 % | 6 / 39 | 14.3 % | 6 / 42 |
| src/common_cpp/DetModel/SciFi | 62.1 % | 64 / 103 | 55.0 % | 11 / 20 | 38.9 % | 14 / 36 |
| src/common_cpp/FieldTools | 93.8 % | 316 / 337 | 90.7 % | 49 / 54 | 75.8 % | 135 / 178 |
| src/common_cpp/Globals | 97.9 % | 95 / 97 | 100.0 % | 12 / 12 | 73.6 % | 53 / 72 |
| src/common_cpp/JsonCppProcessors | 95.0 % | 1168 / 1230 | 74.3 % | 1848 / 2486 | 39.8 % | 739 / 1855 |
| src/common_cpp/JsonCppProcessors/Common | 81.3 % | 157 / 193 | 68.3 % | 569 / 833 | 37.6 % | 258 / 686 |
| src/common_cpp/JsonCppProcessors/Common /ObjectProcessorNS | 83.0 % | 190 / 229 | 91.0 % | 1842 / 2025 | 54.4 % | 319 / 586 |
| src/common_cpp/JsonCppProcessors/Global | 92.9 % | 78 / 84 | 65.0 % | 39 / 60 | 46.2 % | 24 / 52 |
| src/common_cpp/JsonCppStreamer | 60.3 % | 149 / 247 | 62.7 % | 52 / 83 | 31.2 % | 116 / 372 |
| src/common_cpp/Maths | 88.5 % | 1735 / 1961 | 85.7 % | 355 / 414 | 79.1 % | 800 / 1012 |
| src/common_cpp/Optics | 92.7 % | 558 / 602 | 79.1 % | 87 / 110 | 75.7 % | 156 / 206 |
| src/common_cpp/Plotting/SciFi | 44.1 % | 520 / 1179 | 62.2 % | 56 / 90 | 28.6 % | 170 / 594 |
| src/common_cpp/Recon/Bayes | 54.5 % | 54 / 99 | 64.7 % | 11 / 17 | 57.1 % | 16 / 28 |
| src/common_cpp/Recon/Global | 86.5 % | 787 / 910 | 82.9 % | 126 / 152 | 63.0 % | 298 / 473 |
| src/common_cpp/Recon/Kalman | 92.7 % | 999 / 1078 | 94.0 % | 125 / 133 | 76.4 % | 165 / 216 |
| src/common_cpp/Recon/SciFi | 85.7 % | 1317 / 1536 | 93.2 % | 138 / 148 | 61.1 % | 615 / 1006 |
| src/common_cpp/Simulation | 88.8 % | 1359 / 1530 | 93.8 % | 182 / 194 | 62.8 % | 511 / 814 |
| src/common_cpp/Utils | 70.2 % | 1239 / 1764 | 79.5 % | 245 / 308 | 54.4 % | 636 / 1170 |

# Test Coverage II

| Directory | Line Coverage ↕ | | Functions ↕ | | Branches ↕ | |
|-----------|------------:|------------:|--------:|--------:|--------:|--------:|
| src/input/InputCppDAQData | 58.5 % | 637 / 1089 | 72.4 % | 89 / 123 | 40.9 % | 235 / 575 |
| src/input/InputCppDAQOfflineData | 85.1 % | 40 / 47 | 88.9 % | 8 / 9 | 43.5 % | 20 / 46 |
| src/input/InputCppRoot | 91.0 % | 141 / 155 | 92.6 % | 25 / 27 | 63.4 % | 109 / 172 |
| src/legacy/BeamTools | 46.1 % | 1063 / 2306 | 45.9 % | 162 / 353 | 39.0 % | 450 / 1155 |
| src/legacy/Config | 35.9 % | 745 / 2073 | 49.8 % | 148 / 297 | 31.4 % | 423 / 1346 |
| src/legacy/DetModel/Ckov | 1.2 % | 2 / 169 | 20.0 % | 4 / 20 | 8.7 % | 4 / 46 |
| src/legacy/DetModel/KL | 2.1 % | 3 / 145 | 30.0 % | 6 / 20 | 8.6 % | 6 / 70 |
| src/legacy/DetModel/TOF | 2.6 % | 1 / 38 | 25.0 % | 2 / 8 | 20.0 % | 2 / 10 |
| src/legacy/DetModel/Virtual | 42.7 % | 53 / 124 | 52.9 % | 9 / 17 | 34.1 % | 15 / 44 |
| src/legacy/EngModel | 28.0 % | 103 / 368 | 56.6 % | 30 / 53 | 28.3 % | 73 / 258 |
| src/legacy/Interface | 40.3 % | 1406 / 3489 | 33.2 % | 230 / 693 | 37.6 % | 606 / 1612 |
| src/legacy/Interface/Interpolation | 73.7 % | 112 / 152 | 61.5 % | 24 / 39 | 59.2 % | 45 / 76 |
| src/legacy/Interface/Meshing | 76.8 % | 209 / 272 | 62.3 % | 43 / 69 | 81.7 % | 116 / 142 |
| src/legacy/Optics | 1.3 % | 29 / 2311 | 7.4 % | 30 / 404 | 3.1 % | 32 / 1029 |
| src/legacy/Simulation | 100.0 % | 257 / 257 | 100.0 % | 3 / 3 | 67.6 % | 23 / 34 |

# Test Coverage III

| Directory | Line Coverage ↕ | | Functions ↕ | | Branches ↕ | |
|---|---|---|---|---|---|---|
| src/map/MapCppEMRPlaneHits | 94.5 % | 172 / 182 | 73.3 % | 11 / 15 | 71.3 % | 67 / 94 |
| src/map/MapCppEMRRecon | 93.2 % | 382 / 410 | 82.6 % | 19 / 23 | 77.2 % | 224 / 290 |
| src/map/MapCppExampleMAUSDataInput | 100.0 % | 17 / 17 | 90.0 % | 9 / 10 | 43.8 % | 7 / 16 |
| src/map/MapCppGlobalPID | 94.5 % | 69 / 73 | 70.0 % | 7 / 10 | 67.2 % | 39 / 58 |
| src/map/MapCppGlobalReconImport | 93.6 % | 44 / 47 | 70.0 % | 7 / 10 | 56.2 % | 18 / 32 |
| src/map/MapCppGlobalTrackMatching | 90.9 % | 30 / 33 | 70.0 % | 7 / 10 | 41.7 % | 10 / 24 |
| src/map/MapCppKLCellHits | 93.9 % | 77 / 82 | 75.0 % | 9 / 12 | 48.1 % | 26 / 54 |
| src/map/MapCppKLDigits | 92.6 % | 88 / 95 | 69.2 % | 9 / 13 | 51.9 % | 28 / 54 |
| src/map/MapCppKLMCDigitizer | 82.6 % | 176 / 213 | 80.0 % | 12 / 15 | 54.4 % | 86 / 158 |
| src/map/MapCppSimulation | 96.4 % | 27 / 28 | 77.8 % | 7 / 9 | 33.3 % | 6 / 18 |
| src/map/MapCppTOFDigits | 90.8 % | 148 / 163 | 87.5 % | 14 / 16 | 66.0 % | 70 / 106 |
| src/map/MapCppTOFMCDigitizer | 87.6 % | 227 / 259 | 81.2 % | 13 / 16 | 56.2 % | 126 / 224 |
| src/map/MapCppTOFSlabHits | 97.2 % | 106 / 109 | 91.7 % | 11 / 12 | 56.9 % | 33 / 58 |
| src/map/MapCppTOFSpacePoints | 91.7 % | 143 / 156 | 94.1 % | 16 / 17 | 50.4 % | 67 / 133 |
| src/map/MapCppTrackerDigits | 47.6 % | 10 / 21 | 54.5 % | 6 / 11 | 6.2 % | 2 / 32 |
| src/map/MapCppTrackerMCDigitization | 68.7 % | 92 / 134 | 58.8 % | 10 / 17 | 39.2 % | 29 / 74 |
| src/map/MapCppTrackerMCNoise | 90.5 % | 38 / 42 | 66.7 % | 8 / 12 | 33.3 % | 14 / 42 |
| src/map/MapCppTrackerRecon | 98.7 % | 74 / 75 | 86.7 % | 13 / 15 | 43.1 % | 25 / 58 |
| src/output/OutputCppRoot | 83.7 % | 128 / 153 | 96.6 % | 28 / 29 | 49.8 % | 128 / 257 |
| src/output/OutputCppRoot/build | 25.2 % | 362 / 1436 | 28.3 % | 41 / 145 | 14.5 % | 154 / 1059 |
| src/py_cpp | 76.7 % | 415 / 541 | 89.8 % | 53 / 59 | 55.4 % | 133 / 240 |
| src/reduce/ReduceCppGlobalPID | 79.1 % | 87 / 110 | 85.7 % | 6 / 7 | 61.4 % | 43 / 70 |
| src/reduce/ReduceCppGlobalPID/build | 25.9 % | 290 / 1121 | 29.7 % | 33 / 111 | 14.4 % | 121 / 843 |
| src/reduce/ReduceCppPatternRecognition | 69.2 % | 36 / 52 | 21.9 % | 7 / 32 | 37.5 % | 3 / 8 |
| src/reduce/ReduceCppPatternRecognition/build | 25.0 % | 290 / 1160 | 29.2 % | 33 / 113 | 14.2 % | 124 / 871 |
| src/reduce/ReduceCppTofCalib | 44.6 % | 79 / 177 | 29.4 % | 10 / 34 | 10.5 % | 4 / 38 |
| src/reduce/ReduceCppTofCalib/build | 26.8 % | 305 / 1137 | 32.1 % | 36 / 112 | 14.8 % | 126 / 849 |

# To Do for Step IV

Towards **MAUS 1.0**:

- Tracker real data unpacking broken post release 0.7.3

- Tracker finalisation

- Slow memory leaks still present

- Detector output in global coordinate frame

- Finish Global PID and track reconstruction

- Online displays

## Questions