Analysis of ATLAS Muon Data from runs in the cavern

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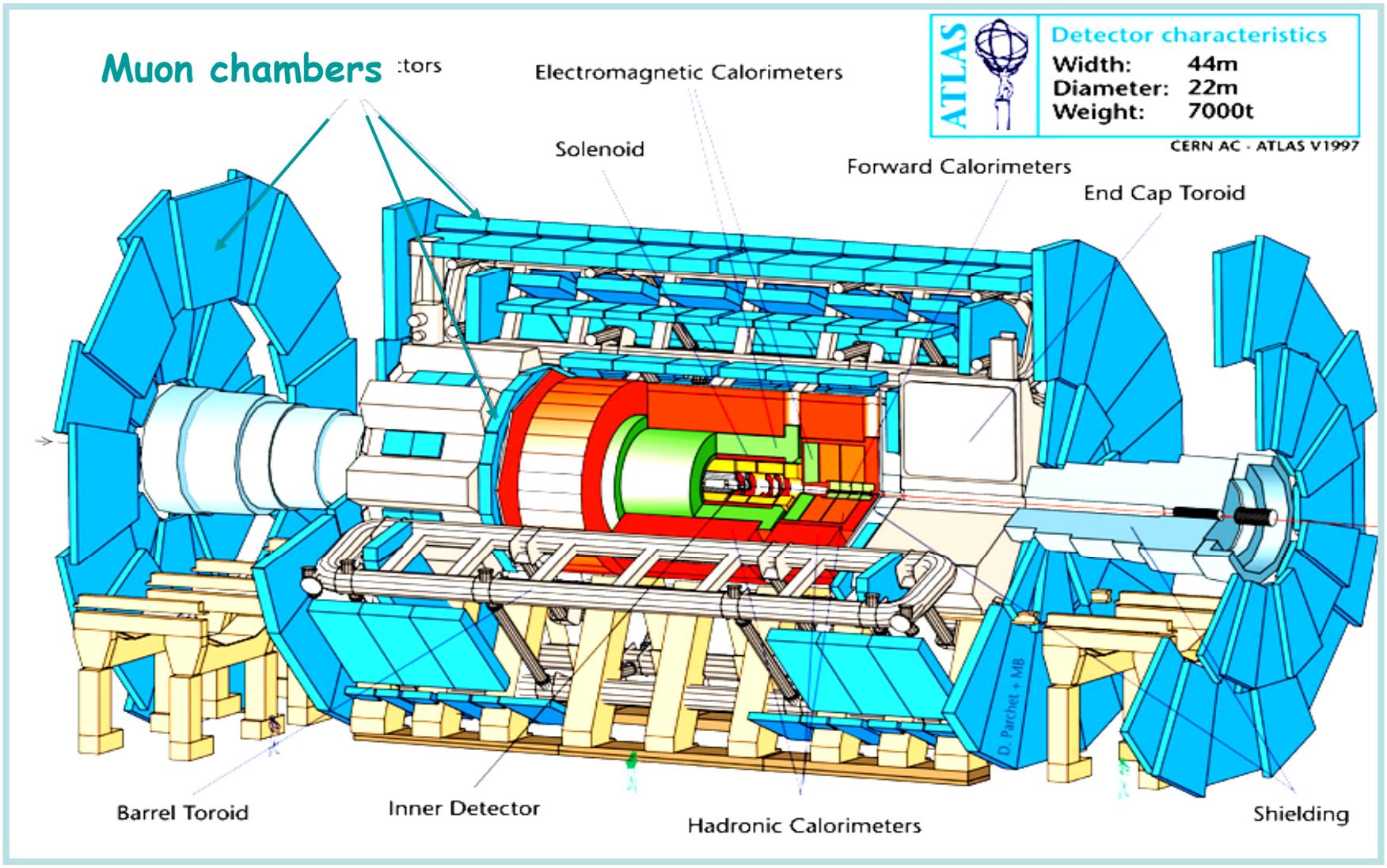
Project Overview

- ATLAS is already exercising its detectors, data acquisition, monitoring tools and offline analysis using cosmic rays
  - M3 run period June 4^{th} – 17^{th}
  - Next run (M4) begins end of August
    - Focus on online monitoring and data quality checks
- My project is to look at the data taken during M3
  - Debug the online monitoring software
  - Look at the quality of the detectors' data (from online and offline sources)
  - Focus on MDT chambers

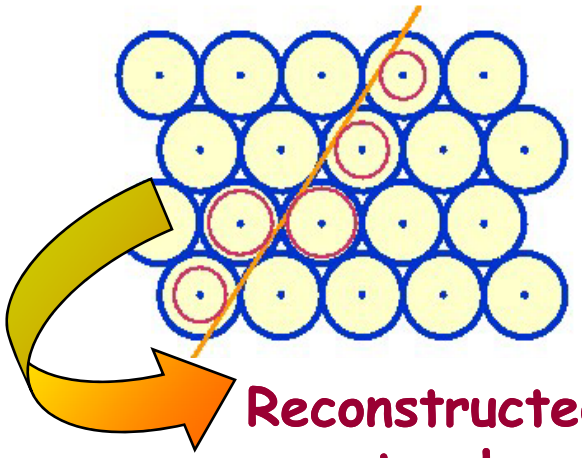
Goals

- Learn how online monitoring works
- Aiming to give feedback and have better online monitoring before the next common ATLAS run (M4, Aug 23)
- working with the commissioning community and learn how to look at data

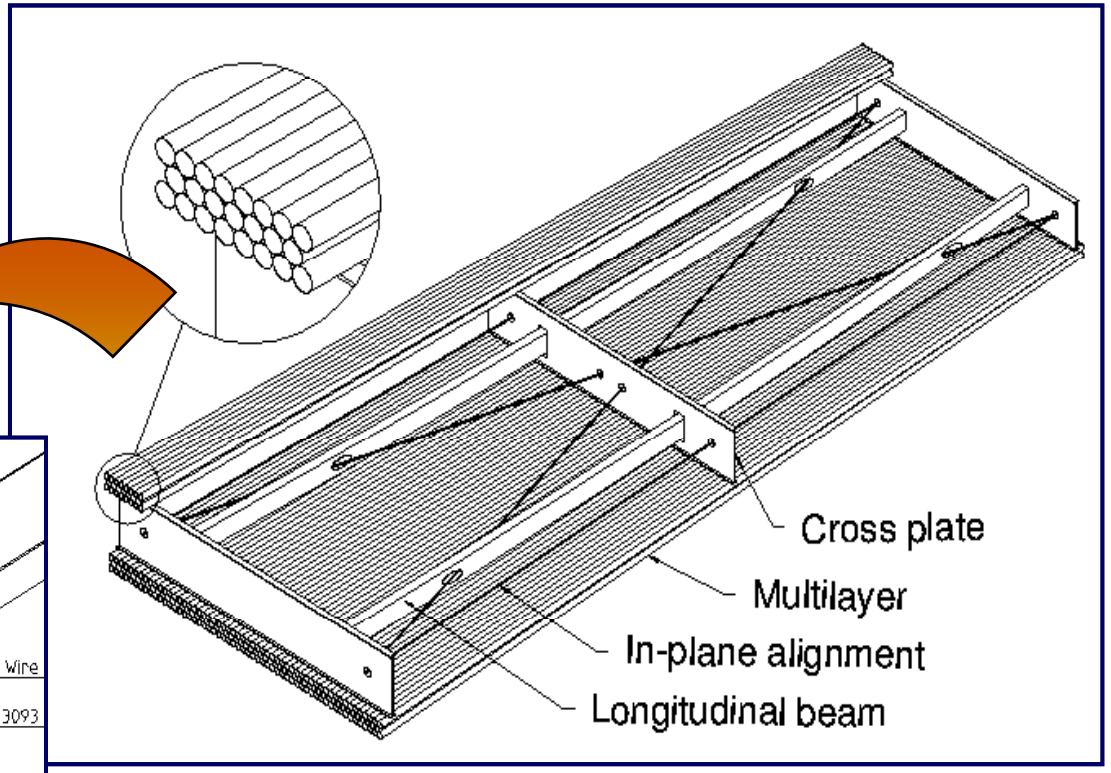
ATLAS Muon Spectrometer

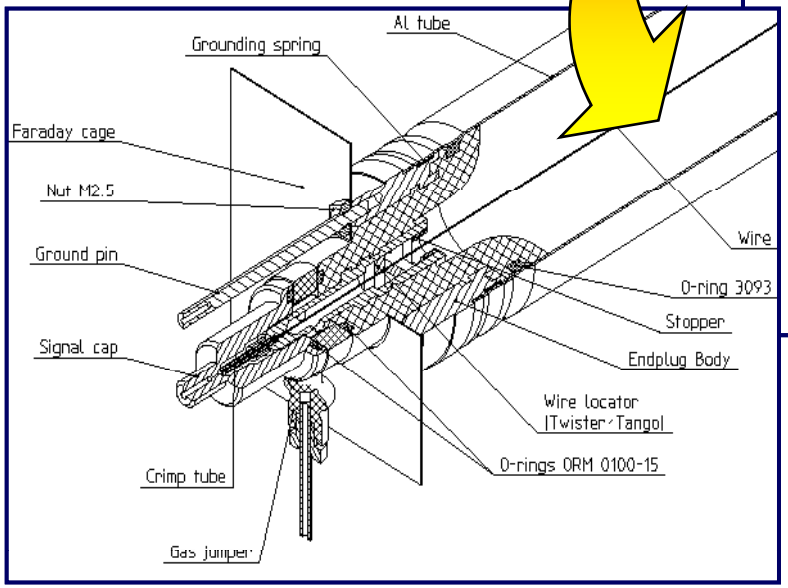


Monitored Drift Tube (MDT) Chambers



Reconstructed track





Monitored Drift Tubes chambers are used for precision tracking in the ATLAS Muon Spectrometer

Debugging work on online monitoring

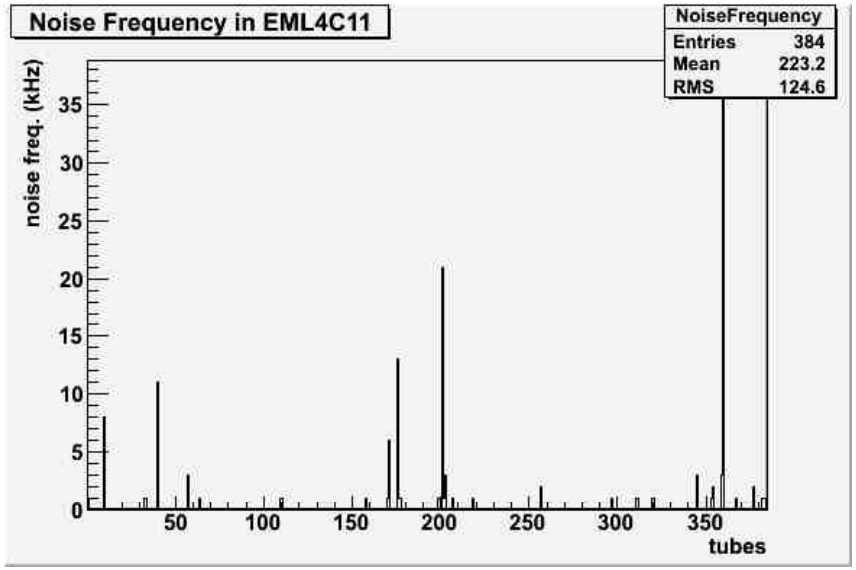
- the online monitoring normally runs during data acquisition, but can also be run afterwards on a data file:
  - this is used to check what happens when you modify the code
- I learned to run the online monitoring in offline mode
  - Basically simulating a run in the cavern

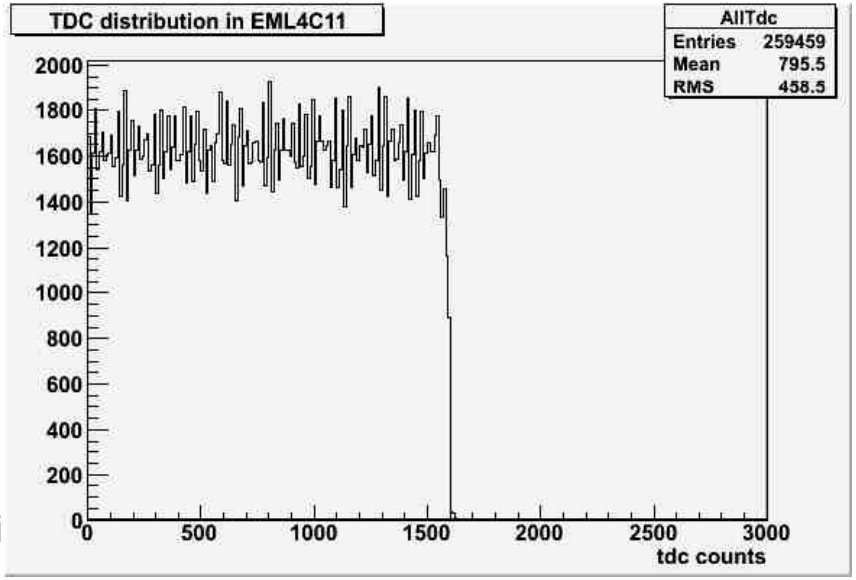
Debugging work on online monitoring

- I focused on debugging the computation of the chamber noise during runs at HV off:
  - I’ve been running the online monitoring on data already taken at HV off with a random trigger

Debugging work..

- There are far too many zeros in the channel for the huge number of events that were acquired
- all these zeros were traced to an error in filling the histograms
  - the monitoring people were filling the histograms with integers (in stead of floats) and so they were cutting everything which was below the KHz level of noise





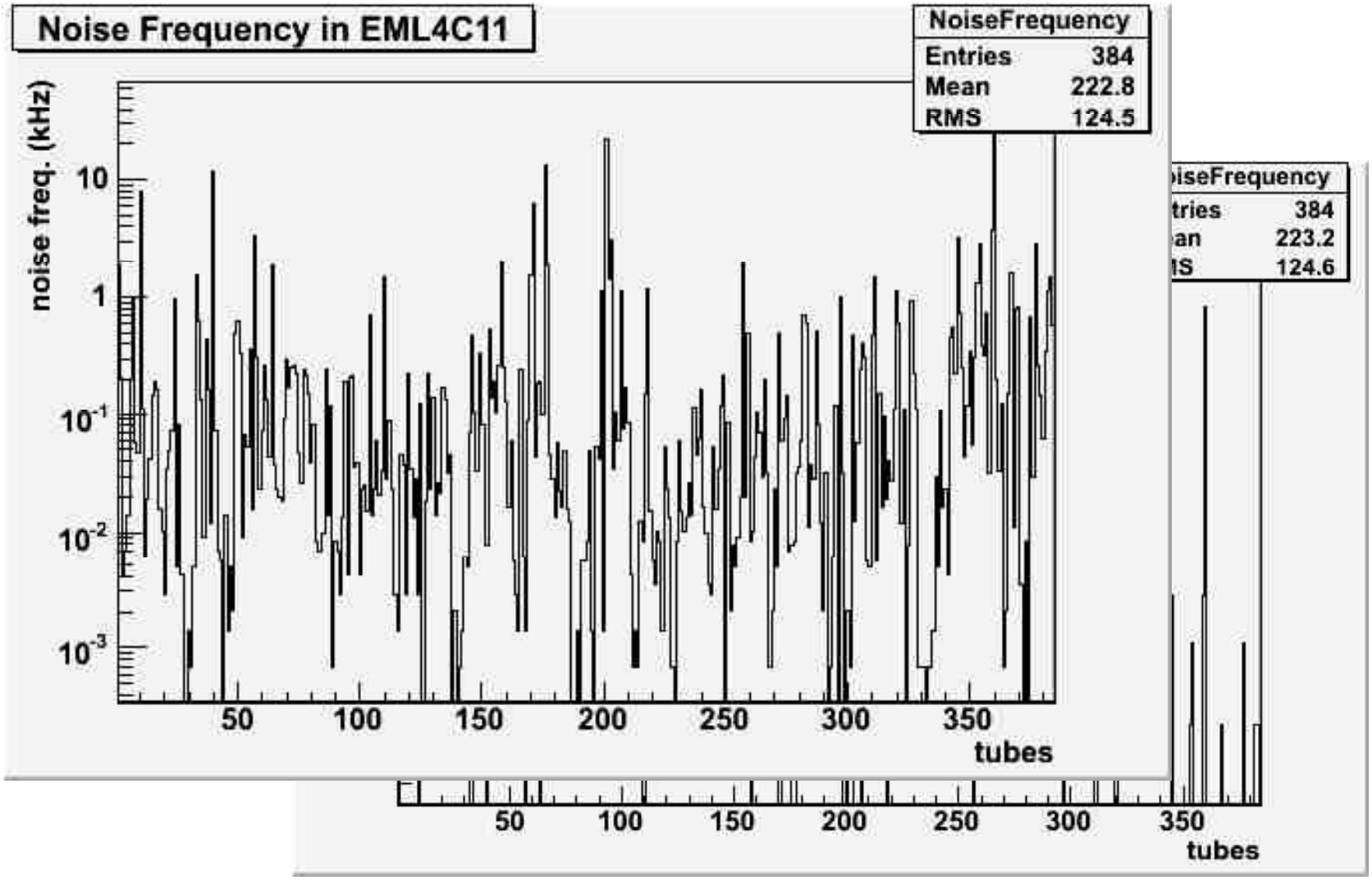
Results of offline run

- The monitoring code was modified to actually fill floating point numbers
- I re-ran the code offline and I obtained a different result

Number of triggers 1131942

tube	AtlasId	hits	noise counts	noise frequency(kHz)	
1	1101	2586	2585	1.79884	
2	1102	331	331	0.230335	
3	1103	0	0	0	<--- DEAD TUBE
4	1104	2	2	0.00139175	
5	1105	14	14	0.00974228	
6	1106	265	265	0.184407	
7	1107	1341	1341	0.933171	
8	1108	75	75	0.0521908	
9	1109	74	74	0.0514949	
10	1110	11520	11520	8.0165	
11	1111	199	199	0.13848	
12	1112	15	15	0.0104382	
13	1113	29	29	0.0201804	
14	1114	66	66	0.0459279	
15	1115	223	223	0.155181	
16	1116	289	289	0.201108	
17	1117	238	238	0.165619	
18	1118	14	14	0.00974228	
19	1119	14	14	0.00974228	
20	1120	7	7	0.00487114	
21	1121	42	42	0.0292268	
22	1122	87	87	0.0605413	
23	1123	116	116	0.0807217	
24	1124	1412	1412	0.982578	
25	1125	14	14	0.00974228	
26	1126	101	101	0.0702836	
27	1127	4	4	0.00278351	
28	1128	0	0	0	<--- DEAD TUBE
29	1129	0	0	0	<--- DEAD TUBE
30	1130	1	1	0.000695877	
31	1131	0	0	0	<--- DEAD TUBE
32	1132	3	3	0.00208763	
33	1133	2192	2192	1.52536	
34	1134	839	839	0.583841	
35	1135	196	196	0.136392	
36	1136	18	18	0.0125258	
37	1137	668	668	0.464846	
38	1138	240	240	0.16701	
39	1139	20	20	0.0139175	
40	1140	16405	16405	11.4159	<--- NOISY TUBE
41	1141	109	109	0.0758506	
42	1142	5	5	0.00347938	
43	1143	15	15	0.0104382	
44	1144	0	0	0	<--- DEAD TUBE
45	1145	21	21	0.0146134	
46	1146	1	1	0.000695877	
47	1147	9	9	0.00626289	
48	1148	7	7	0.00487114	

Before and After



Debugging work

- now I am comparing these results to those obtained with a standalone analysis program
- there are discrepancies in the number of noise hits per tube and we are now investigating these discrepancies

Discrepancies in Noise Hits/Tube

Standalone Program

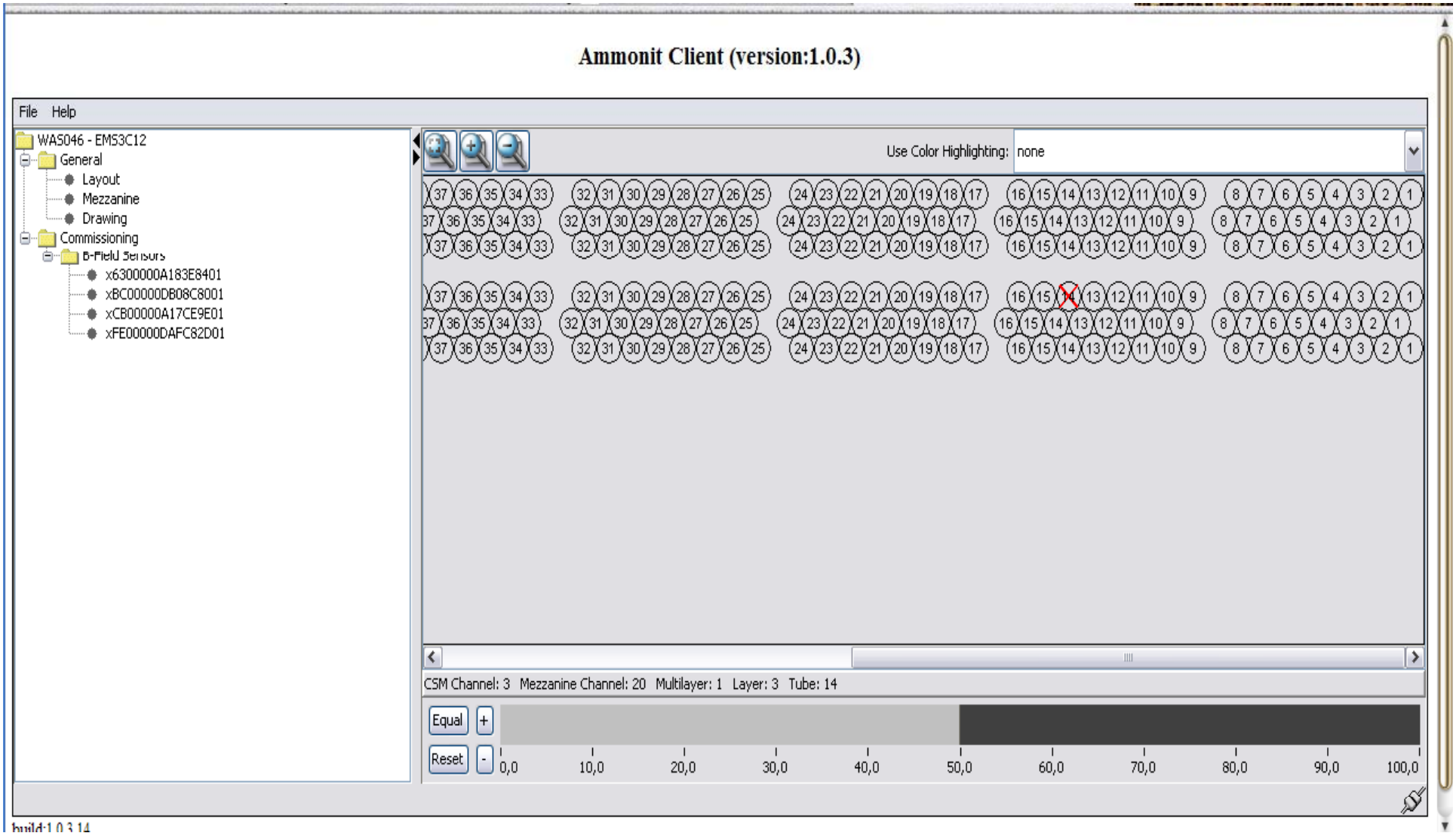
Mezz	Ch	NumberHits	NoiseRate(KHz)	ASDNoise(KHz)	Row	Tube
0	0	0	0.00000	1.11859	3	6
0	1	1	0.00069	0.95295	3	1
0	2	2	0.00139	1.34799	3	8
0	3	7	0.00485	1.92600	3	2
0	4	5	0.00347	0.44910	3	7
0	5	1	0.00069	0.29801	3	3
0	6	0	0.00000	0.14000	3	5
0	7	0	0.00000	0.04089	3	4
0	8	13	0.00901	0.40821	2	6
0	9	0	0.00000	0.14485	2	1
0	10	1	0.00069	0.41791	2	8
0	11	1	0.00069	0.11990	2	2
0	12	40	0.02772	0.22455	2	7
0	13	0	0.00000	0.05822	2	3
0	14	21	0.01455	0.11297	2	5
0	15	0	0.00000	0.02218	2	4
0	16	17	0.01178	0.55930	1	6
0	17	7	0.00485	2.14501	1	1
0	18	1	0.00069	0.49043	1	8
0	19	12	0.00832	0.41653	1	2
0	20	188	0.13029	1.11305	1	7
0	21	0	0.00000	0.10950	1	3
0	22	0	0.00000	0.04643	1	5
0	23	0	0.00000	0.01247	1	4
1	0	28	0.01941	1.37779	6	8
1	1	0	0.00000	1.87541	6	1
1	2	46	0.03188	2.03204	6	7
1	3	0	0.00000	2.39243	6	2
1	4	171	0.11851	1.29116	6	6
1	5	13	0.00901	0.48098	6	3
1	6	7	0.00485	0.16287	6	5
1	7	0	0.00000	0.02010	6	4
1	8	2	0.00139	0.20930	5	8
1	9	28	0.01941	2.20669	5	1
1	10	1	0.00069	0.30910	5	7
1	11	1	0.00069	0.14346	5	2

Multilayer 1, Layer 1, Tube 7

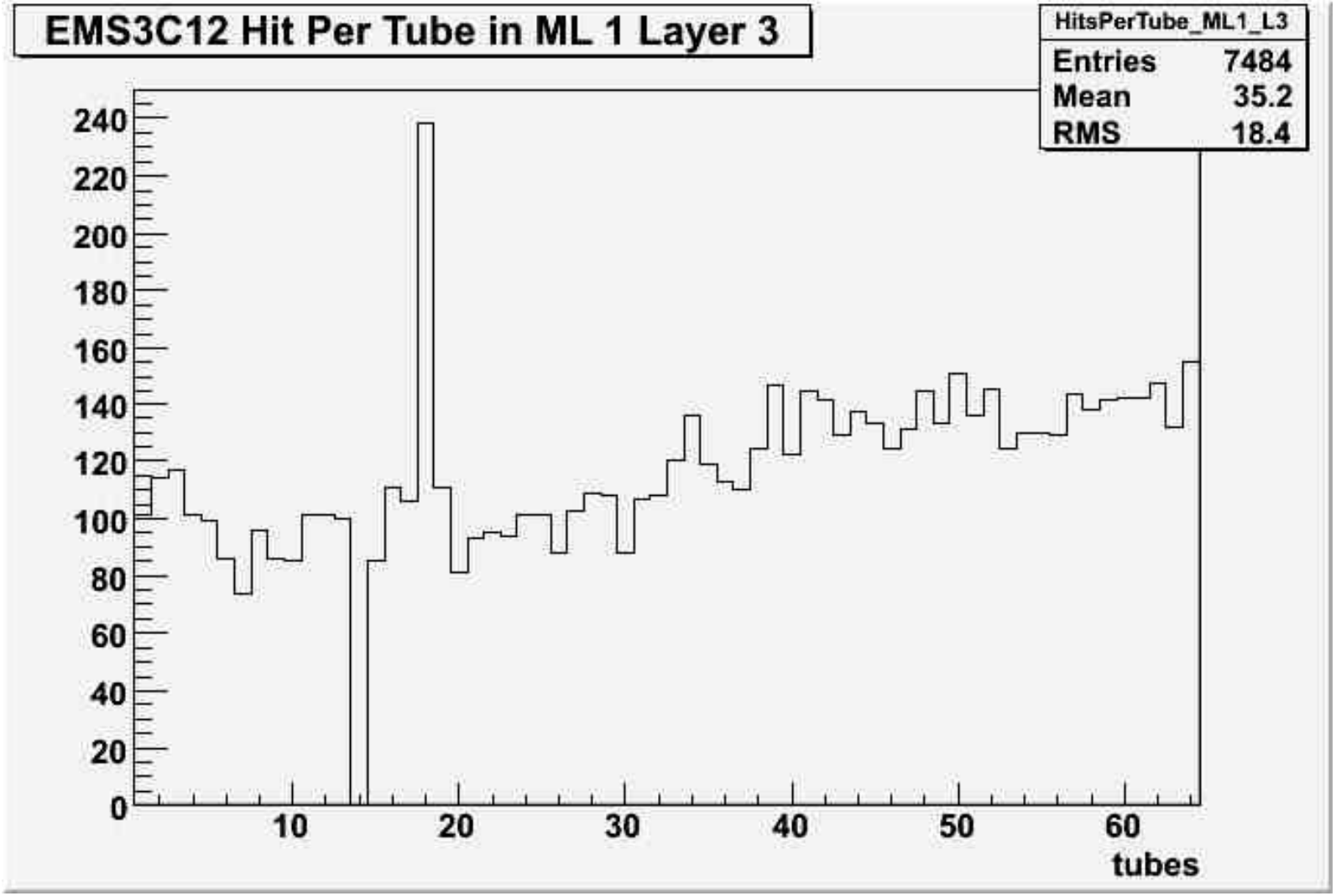
Online Monitoring

tube	AtlasId	hits	noise counts	noise frequency(kHz)	
1	1101	2669	2669	1.85681	
2	1102	298	298	0.207317	
3	1103	6	6	0.00417418	
4	1104	10	10	0.00695696	
5	1105	20	20	0.0139139	
6	1106	282	282	0.196186	
7	1107	1375	1375	0.956582	
8	1108	83	83	0.0577428	
9	1109	68	68	0.0473073	
10	1110	11494	11494	7.99633	
11	1111	158	158	0.10992	
12	1112	9	9	0.00626127	
13	1113	27	27	0.0187838	
14	1114	60	60	0.0417418	
15	1115	212	212	0.147488	
16	1116	273	273	0.189925	
17	1117	233	233	0.162097	
18	1118	23	23	0.016001	
19	1119	15	15	0.0104354	
20	1120	4	4	0.00278278	
21	1121	50	50	0.0347848	
22	1122	69	69	0.048003	
23	1123	103	103	0.0716567	
24	1124	1363	1363	0.948234	
25	1125	7	7	0.00486987	
26	1126	117	117	0.0813965	
27	1127	6	6	0.00417418	
28	1128	0	0	0	<--- DEAD TUBE
29	1129	0	0	0	<--- DEAD TUBE
30	1130	2	2	0.00139139	
31	1131	1	1	0.000695696	
32	1132	7	7	0.00486987	
33	1133	2172	2172	1.51105	
34	1134	889	889	0.618474	

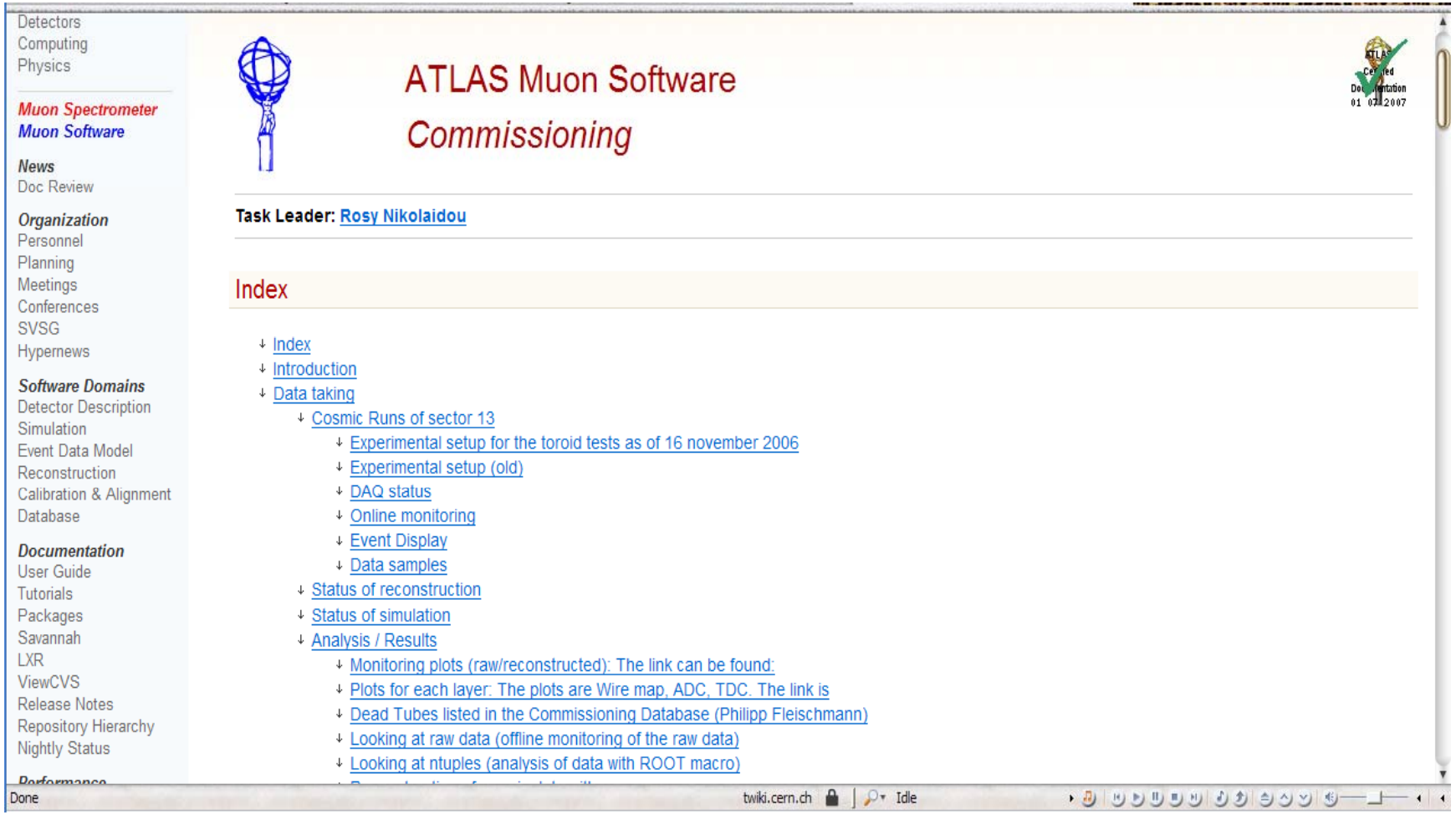
Updating the MDT Dead Tubes List



Updating the Dead Tubes List



Redesigning the Muon Commissioning TWiki page



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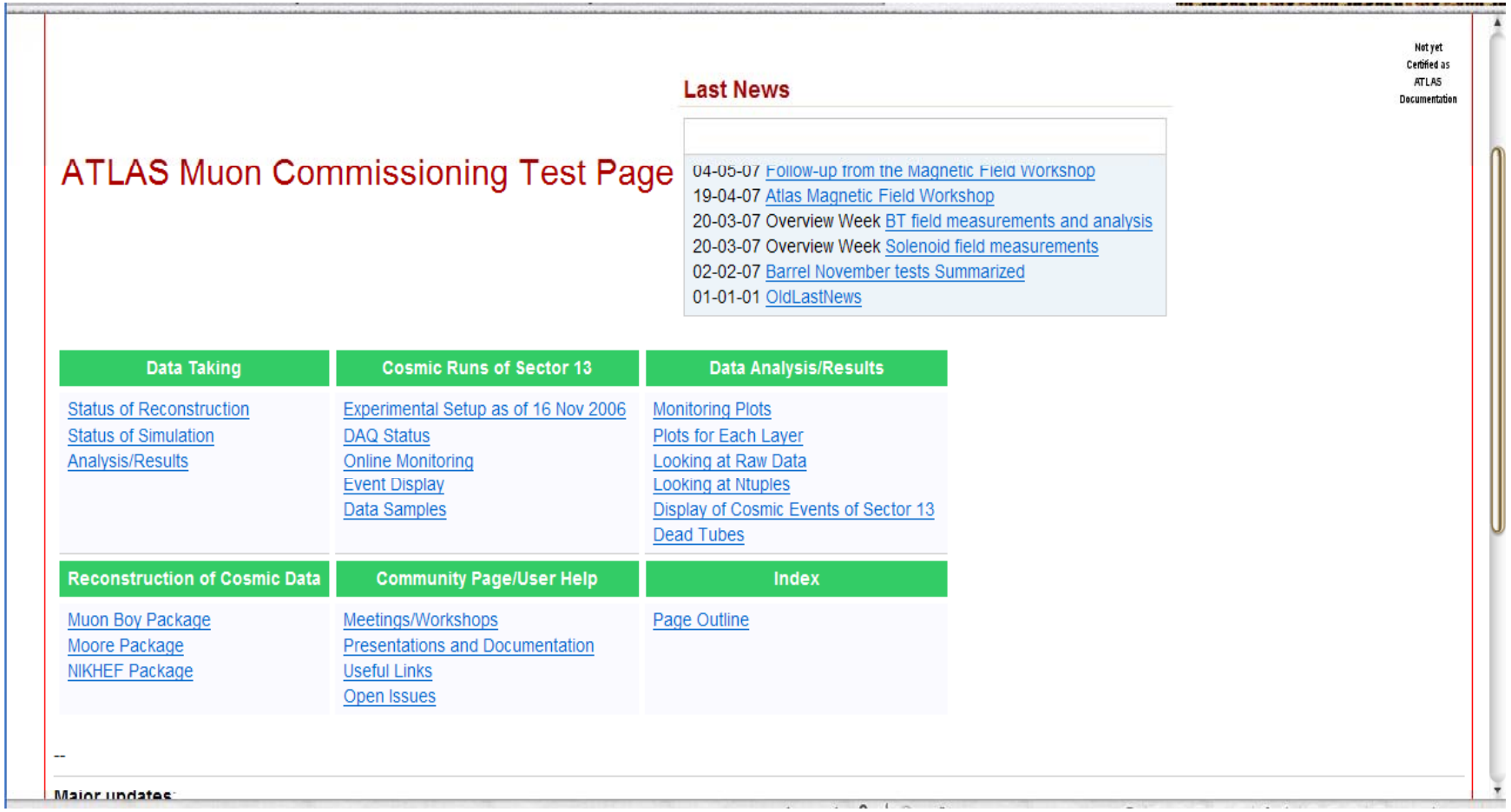

Not yet Certified as ATLAS Documentation

ATLAS Muon Commissioning Test Page

Last News

04-05-07 Follow-up from the Magnetic Field Workshop
19-04-07 Atlas Magnetic Field Workshop
20-03-07 Overview Week BT field measurements and analysis
20-03-07 Overview Week Solenoid field measurements
02-02-07 Barrel November tests Summarized
01-01-01 OldLastNews

Data Taking	Cosmic Runs of Sector 13	Data Analysis/Results
Status of Reconstruction	Experimental Setup as of 16 Nov 2006	Monitoring Plots
Status of Simulation	DAQ Status	Plots for Each Layer
Analysis/Results	Online Monitoring	Looking at Raw Data
	Event Display	Looking at Ntuples
	Data Samples	Display of Cosmic Events of Sector 13
		Dead Tubes

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Muon Boy Package	Meetings/Workshops	Page Outline
Moore Package	Presentations and Documentation	
NIKHEF Package	Useful Links	
	Open Issues	

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Major updates:

Cultural Experiences & Travel

Summer Students

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