Erratum:

System Tests, Initial Operation and First Data of the AMIGA Muon Detector for the Pierre Auger Observatory,

M. Pontz, Universität Siegen, Siegen, 2012.

An update of the analysis software in June 2013 and its application to the initial dataset results in Figure 6.25. Before the update, about every second event was accidentally skipped in the analysis. This results in a random choice of 50 % of all muon detector (MD) events. Since this cut was not applied to the surface detector (SD) data, about 50 % of these lacked their equivalent in the MD data. After the software update, almost all SD events have their equivalent in the MD data. This is a proof and a consequence of the correct functionality of the trigger processing and the event identification algorithms of the MD data acquisition software.

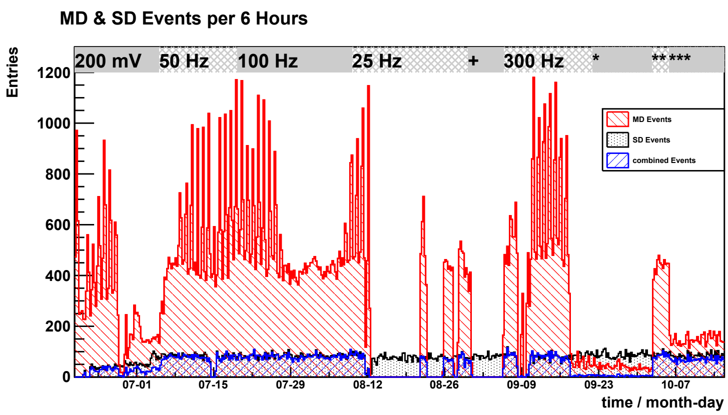

Figure 6.25: Updated analysis. Number of recorded events per six hours for the SD (black dotted area) and for the MD (red hatched area, see legend). Events that were recorded in the same GPS second are drawn as combined events (blue hatched area, see legend).

Further, values of the newly defined MD observable N_{Trig} were partly underestimated due to a misinterpretation of 64 bit long integer values with the most significant bit being set. This effect does not prefer any range of values in N_{trig} but is homogeneously distributed in the full range. Therefore, no significant impact on the correlation calculation as presented in Section 6.6.8 is expected. Updated versions of the Figures 6.29 through 6.32 are shown below.

One of the main parts of the analysis is the investigation of correlation between the signal strengths $S_{LDF}(r)$ in the SD station and N_{Trig} in the associated MD module. The results of this analysis can be found in Tables 6.6 and 6.5. The analysis was repeated with the increased statistics and the updated analysis software. In agreement with the expectation, the updated results do not differ significantly from the earlier ones. In particular, the correlation between the signal strength N_{Trig} for the MD module and the azimuth angle of the incoming air shower, as derived from the SD event reconstruction, remains compatible with zero, whereas the correlation between N_{Trig} and the reconstructed signal strength $S_{LDF}(r)$ at the position of the SD station stays the same.

I would like to express my gratitude to my colleague Dr. Uwe Fröhlich for his collaboration on the update of the analysis software.

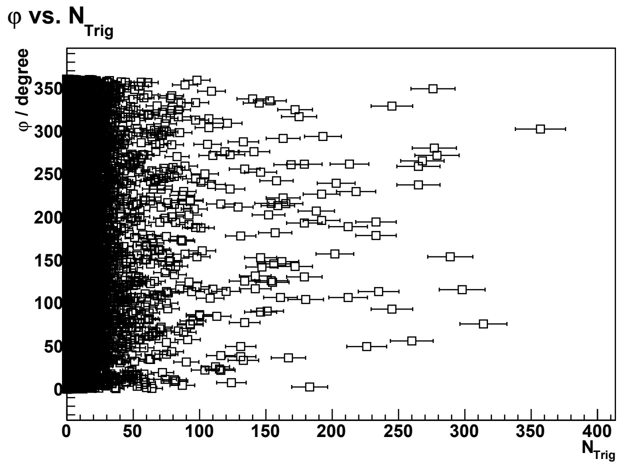

Figure 6.29: Updated analysis. Scatter plot of the two observables N_{Trig} and φ. The azimuth angle φ covers all possible values between 0 and 2π isotropically.

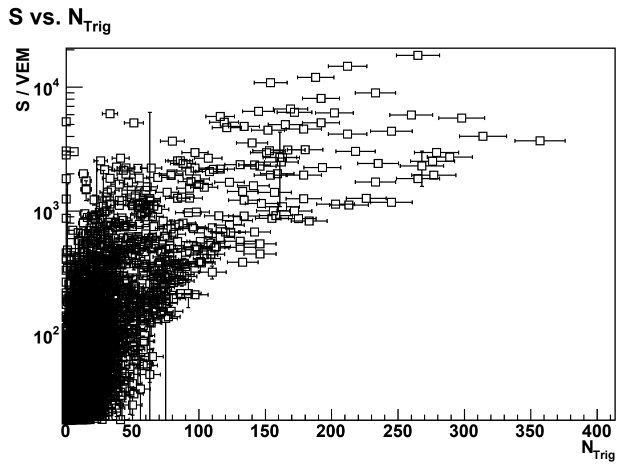

Figure 6.31: Updated analysis. Scatter plot of the two observables N_{Trig} and $S_{LDF}(r)$.

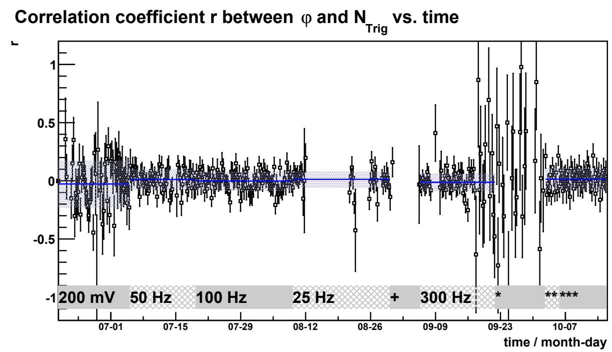

Figure 6.30: Updated analysis. Correlation coefficient r_{φ} between φ and N_{Trig} in bins of six hours. The uncertainties are calculated as explained in the thesis. Different measurement and maintenance periods are shown according to Table 6.4. The weighted means are compatible with zero, which is in agreement with the expectation.

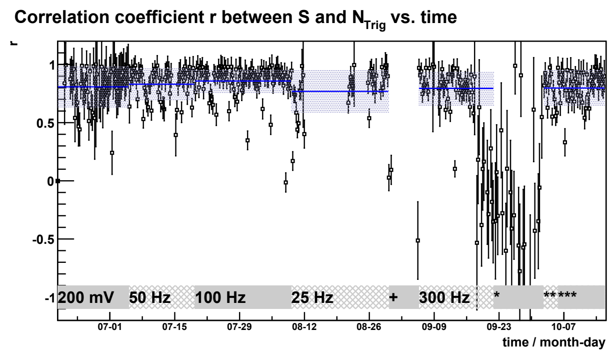

Figure 6.32: Updated analysis. Correlation coefficient r_S between $S_{LDF}(r)$ and N_{Trig} in bins of six hours. The uncertainties are calculated as explained in the text. Different measurement and maintenance periods are shown according to Table 6.4.