A Study of Aging Effects in Gas–Monitoring Proportional Counters of the BAC Calorimeter of the ZEUS Experiment

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The multi-cell proportional chambers at the backing calorimeter of the ZEUS experiment at the storage ring HERA are supplied with an Ar/CO_2 gas mixture by an open gas system. Flushed proportional counters with built-in ^{55}Fe sources are used as gas system monitoring detectors. The results of measurements of aging effects for the gas–monitoring counters will be presented.

Summary of Poster: Due to the structure of the ZEUS detector the whole BAC calorimeter gas system has been divided into 79 branches. Each branch consists of about 65 proportional chambers connected in parallel. There are monitoring proportional counters both at the input of each branch and at the output of "the last chamber" of the branch, i.e. the chamber placed at the longest distance from the gas inlet. For these chambers the worst conditions of gas exchange occur. Overall, in the BAC calorimeter there are 79 input- and 79 output counters. For all these counters the pulse height distributions of a ^{55}Fe line were measured during the counter operation. The characteristic behavior of degradation for the OUTPUT counters is dramatically demonstrated by the deterioration of the ^{55}Fe X-ray spectrum on the lower energy side of the main peak. These observations are in a good agreement with those presented by others. However, it should be strongly pointed out that for the INPUT counters the degradation behavior is in contradiction to that for the OUTPUT counters: An unexpected peak degradation is measured. The undesirable changes in pulse height distribution appear in this case on the higher energy side of the main peak. An increase in gas gain is observed. Some idea of explanation of this phenomenon will be given. The BAC gas system is open so that the working gas pressure follows the atmospheric pressure. The response of aged counters to pressure variation will also be presented.