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Delay's calibration of data collected in 2008 and 2009 with Scfi and DeDx

Pavla Doškářová[a], Valeri Yazkov[b]

[a]*Czech Technical University, Prague, Czech Republic*
[b]*Skobeltsin Institute for Nuclear Physics of Moscow State University, Moscow, Russia*

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Abstract

This note deals with delay's calibration of Scfi and DeDx from years 2008 and 2009. More detailed description of procedure and results follows.

1 Introduction

In 2009 description of time measured by X-plane of ScFi and all planes of DeDx has been improved. Measured charge value allows to estimate relative amplitudes of signals and could be used for correction of measured times. This procedure was not used for calibration of data collected in 2008, because it was not ready to the moment of calibration start. Now calibration was repeated taking into account this correction.

The delays for Scfi and DeDx were only calibrated for regular runs (non pedestal) and for year 2009 runs with 1 subrun were excluded. Finally 479 runs were calibrated for year 2008 (all mixt trigger runs in order to provide dedicated measurements with time-of-flight) and 175 runs for year 2009 (runs which demonstrate changes of VH delays).

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2   Conditions

Conditions, which were used in the analysis, were the same both for ScFi and DeDx for both years:

1. delays with error less or equal 0.1e-09 were only used to find change of delays sufficiently big for definition of new set of delays for ScFi or DeDx,

2. for each slab program calculates a difference between delays for current run and delays which are defined in previous set of delays. Absolute value of this difference should be less or equal than the sum of the delay error and the critical value which was 0.3e-09. $|delay1(slab, plane) - delay0(slab, plane)| \leq error1(slab, plane) + 0.3\text{e-}09$.

If the difference was greater, then delays, obtained for current run (delay 1), were used to prepare new set of delays.

3   Results

For ScFi detector sets of delays had been defined for 295 runs in 2008 and for 99 runs in 2009.

List of runs for 2008 is: 7867, 7868, 7870, 7873, 7875, 7876, 7877, 7879, 7880, 7882, 7886, 7887, 7889, 7891, 7895, 7896, 7897, 7899, 7900, 7905, 7941, 7942, 7947, 7948, 7950, 7952, 7954, 7959, 7970, 7971, 7972, 7975, 7982, 7983, 7985, 7986, 7988, 8006, 8018, 8020, 8021, 8024, 8025, 8027, 8034, 8037, 8039, 8043, 8046, 8047, 8049, 8052, 8054, 8055, 8057, 8058, 8061, 8063, 8066, 8068, 8070, 8071, 8077, 8079, 8082, 8085, 8086, 8088, 8089, 8091, 8092, 8094, 8095, 8096, 8098, 8099, 8100, 8102, 8103, 8106, 8114, 8117, 8120, 8122, 8128, 8130, 8133, 8135, 8137, 8140, 8142, 8144, 8145, 8147, 8149, 8150, 8152, 8166, 8170, 8173, 8175, 8176, 8178, 8179, 8181, 8182, 8186, 8187, 8189, 8190, 8193, 8199, 8200, 8206, 8208, 8209, 8212, 8213, 8217, 8218, 8220, 8221, 8224, 8226, 8227, 8229, 8232, 8233, 8235, 8241, 8242, 8246, 8247, 8249, 8252, 8259, 8260, 8263, 8265, 8267, 8270, 8271, 8273, 8274, 8276, 8277, 8283, 8285, 8289, 8293, 8295, 8296, 8299, 8303, 8305, 8306, 8308, 8311, 8312, 8315, 8317, 8318, 8323, 8324, 8326, 8327, 8337, 8338, 8339, 8341, 8343, 8345, 8346, 8349, 8350, 8352, 8353, 8355, 8356, 8357, 8359, 8363, 8369, 8373, 8374, 8376, 8377, 8379, 8382, 8383, 8385, 8386, 8388, 8390, 8392, 8393, 8395, 8398, 8399, 8402, 8408, 8409, 8412, 8414, 8418, 8419, 8425, 8427, 8430, 8431, 8433, 8434, 8436, 8437, 8439, 8442, 8445, 8446, 8449, 8452, 8453, 8455, 8456, 8458, 8462, 8465, 8470, 8471, 8473, 8477, 8479, 8480, 8483, 8485, 8486, 8489, 8491, 8492, 8494, 8495, 8496, 8498, 8499, 8501, 8502, 8504, 8506, 8508, 8509, 8511, 8512, 8513, 8517, 8519, 8520, 8522, 8523, 8525, 8526, 8528, 8529, 8531, 8539, 8542, 8543, 8545, 8546, 8549, 8552, 8553, 8555, 8557, 8560, 8561, 8563, 8564, 8567, 8568, 8572, 8574, 8575, 8577, 8580, 8581, 8583, 8584, 8587, 8588, 8591, 8594, 8595, 8598, 8600, 8601 and 8603.

List of runs for 2009 is: 8606, 8608, 8617, 8623, 8626, 8629, 8636, 8640, 8641, 8652, 8653, 8654, 8658, 8666, 8669, 8672, 8673, 8675, 8677, 8685, 8691, 8709, 8736, 8767, 8769, 8775, 8781, 8783, 8784, 8787, 8790, 8793, 8795, 8797, 8823, 8843, 8855, 8864, 8867, 8903, 8910, 8913, 8930, 8965, 8977, 8980, 8983, 8991, 9018, 9078, 9093, 9109, 9112, 9122, 9170, 9183, 9191, 9199, 9208, 9217, 9222, 9268, 9270, 9278, 9298, 9306, 9313, 9328, 9330, 9343, 9361, 9372, 9375, 9387, 9433, 9437, 9438, 9441, 9443, 9444, 9470, 9471, 9495, 9498, 9521, 9575, 9578, 9593, 9603, 9641, 9647, 9654, 9679, 9690, 9708, 9795, 9802, 9806 and 9814.

For DeDx detector new set of delays had been defined for 20 runs in 2008 and for 10 runs in 2009.

List of runs for 2008 is: 7867, 7899, 8018, 8057, 8108, 8159, 8292, 8293, 8296, 8303, 8396, 8453, 8455, 8477, 8483, 8485, 8502, 8553, 8554, 8555.

List of runs for 2009 is: 8606, 8608, 8673, 8675, 8767, 9208, 9433, 9441, 9471, 9641.

All set of delays are included to official detector data files
/afs/cern.ch/user/d/diracoff/public/offline/ariane/data/2008/det2008_131.dat
and
/afs/cern.ch/user/d/diracoff/public/offline/ariane/data/2009/det2009_110.dat

This calibration allows to use amplitude corrections for X-plane of ScFi and DeDx at the data analysis and as result to improve time resolution.

In Figure 1, we can see difference of time measure by VH and planes of ScFi. Y- and W-planes has hardware PSC circuit which selects column with maximal amplitude from neighbours and uses constant fraction discriminator. It is seen that this distribution is non-symmetric and relatively wide (>1ns). X-plane uses new electronics which allows measure not only time, but also amplitudes. One distribution were filled with raw data, and another is after software PSC algorithm.

Figure 2 shows the distribution for X-plane after PSC[1] and an amplitude correction and finally after additionally correction on coordinate along slab.

		RMS
Figure 1	Graph 1	1.363
	Graph 2	1.257
	Graph 3	1.200
	Graph 4	0.6837
Figure 2	Graph 1	0.5875
	Graph 2	0.4844

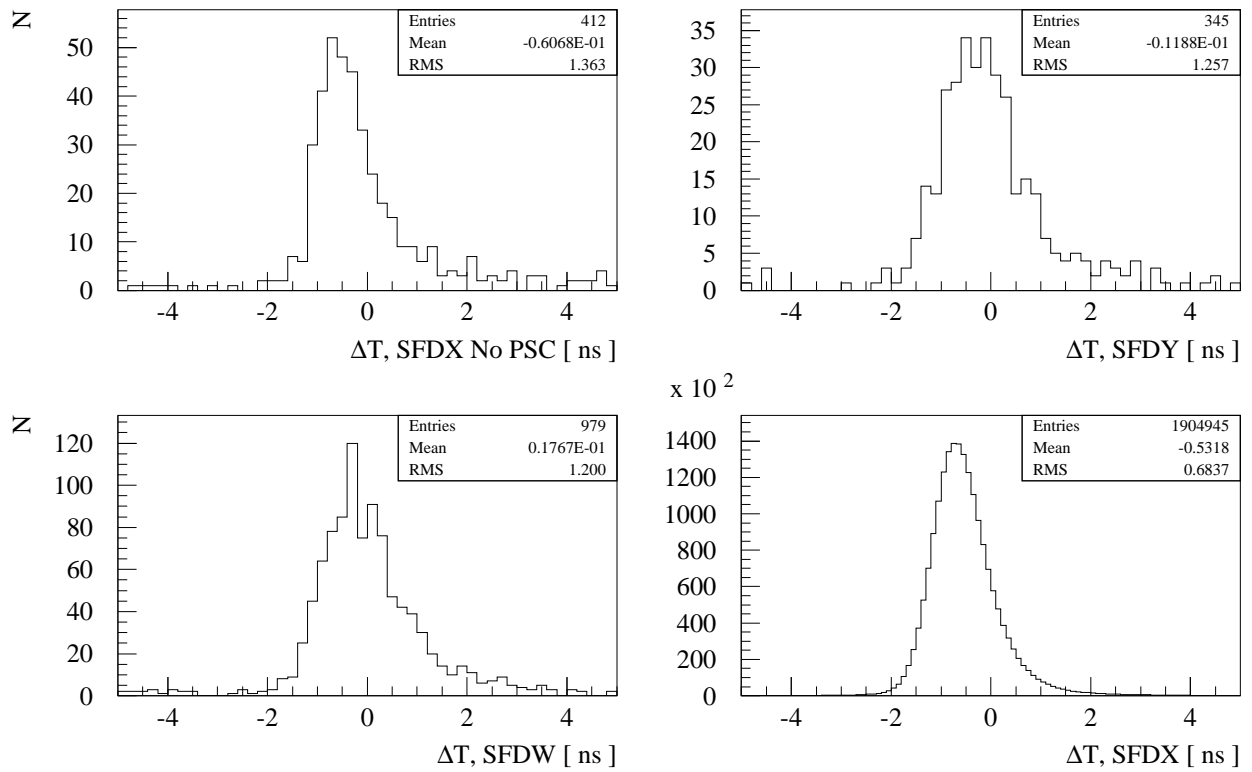Table 1: RMS values of the individual graphs.

Figure 1: Difference of time measure by VH and planes of ScFi. Y- and W-planes has hardware PSC circuit which selects column with maximal amplitude from neighbours and uses constant fraction discriminator.
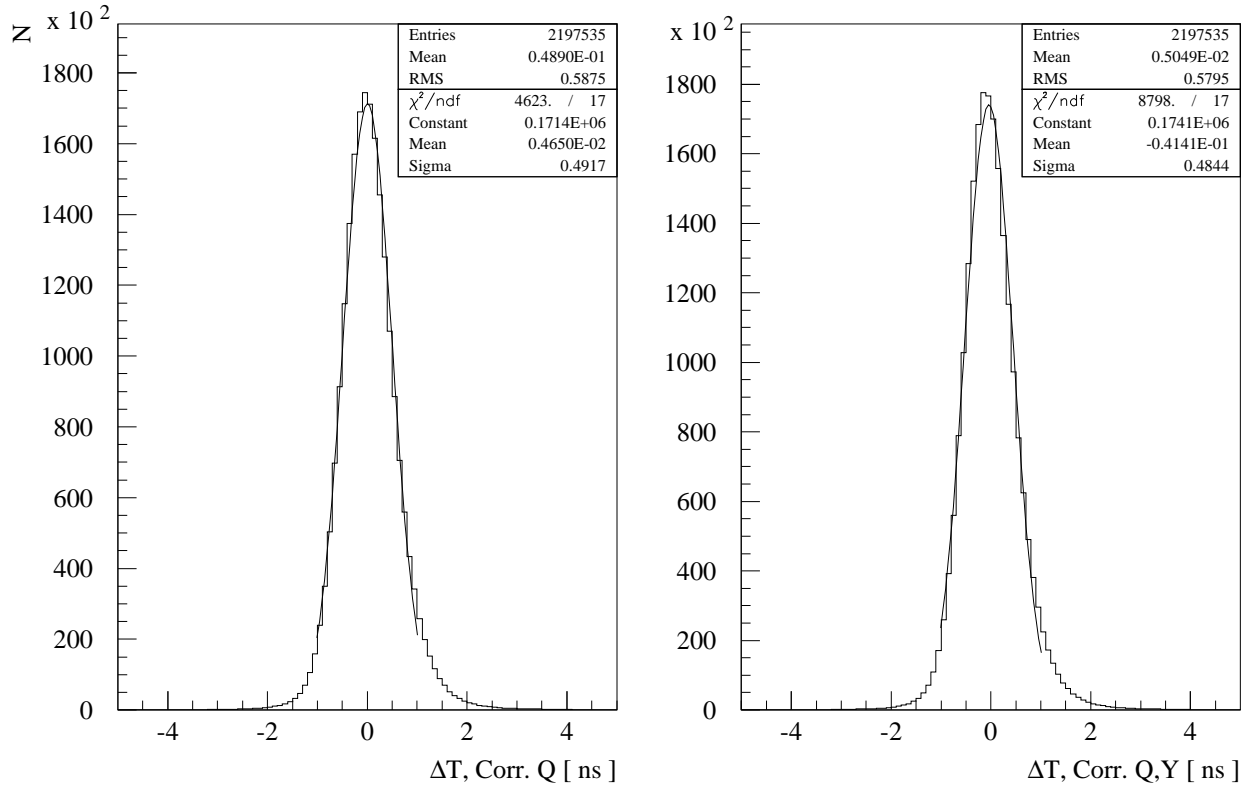
Time difference SFDX-VH. Runs 8658-8695.

Left plot stats box:

Entries	2197535
Mean	0.4890E-01
RMS	0.5875
χ^2/ndf	4623. / 17
Constant	0.1714E+06
Mean	0.4650E-02
Sigma	0.4917

Left plot x-axis: ΔT, Corr. Q [ns]

Right plot stats box:

Entries	2197535
Mean	0.5049E-02
RMS	0.5795
χ^2/ndf	8798. / 17
Constant	0.1741E+06
Mean	-0.4141E-01
Sigma	0.4844

Right plot x-axis: ΔT, Corr. Q,Y [ns]

Figure 2: The distribution for X-plane after PSC and an amplitude correction and finally after additionally correction on coordinate along slab.

References

[1] B. Adeva et al., "DIRAC: A high resolution spectrometer for pionium detection", Nucl. Instr. Meth. A515 (2003) 467