Contribution ID : **686** Type : **Oral talk**

Analytical solutions at amplitude and time measurements from discrete sampling of pseudo-Gaussian signals

Friday, 9 October 2020 18:10 (15)

Amplitude and time measurements from digitized signals of the pseudo-Gaussian shape are considered. This form covers a big part of applications. The least squares method (l.s.m.) is chosen as the optimal algorithm for determining signal amplitude A and timestamp t_0. For a pseudo-Gaussian profile with an uncorrelated sampling the l.s.m. is reduced to analytical formulas for A and t_0 consistent with experimental data. This permits to estimate the desired number of points N_s on a profile depending on electronic noise, required accuracy of A, t_0 and electronic filter parameters. The obtained results for N_s are illustrated with qualitative estimates in accordance with the Nyquist-Shannon-Kotelnikov sampling theorem. The optimality of electronic filter forming the waveform is analyzed in terms of the excess noise factor with calculation of the autocorrelation function from stochastic noise sources. It permits to define non-diagonal weight matrix elements in the l.s.m. with formulation of requirements for neglecting of sampling correlations desired for application of the analytical solution. This solution is convenient for a use in processing of signal profile data and it can be a candidate for an algorithm embedded into chips to transmit to the external world required values A, t_0, χ^2 and number of degrees of freedom N_d.

Primary author(s) : Dr. BOGOLYUBSKY, Mikhail (National Research Center Kurchatov Institute - Institute for High Energy Physics, Protvino, Moscow region); Dr. SKVORTSOV, Victor (National Research Center Kurchatov Institute - Institute for High Energy Physics, Protvino, Moscow region)

Co-author(s) : Prof. VOLKOV, Alexey (National Research Center Kurchatov Institute - Institute for High Energy Physics,Protvino, Moscow region); Dr. ELUMAKHOV, Dmitriy (National Research Center Kurchatov Institute - Institute for High Energy Physics, Protvino, Moscow region); Dr. KALININ, Alexey (National Research Center Kurchatov Institute - Institute for High Energy Physics, Protvino, Moscow region); Dr. KRINITSYN, Alexander (National Research Center Kurchatov Institute - Institute for High Energy Physics, Protvino, Moscow region)

Presenter(s) : Dr. BOGOLYUBSKY, Mikhail (National Research Center Kurchatov Institute - Institute for High Energy Physics, Protvino, Moscow region)

Session Classification : Facilities and Advanced Detector Technologies

Track Classification : Facilities and advanced detector technologies