G P8 Statistics of non-equidistantly sampled time series – estimating peak significance in the frequency domain

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A significant improvement in the computation of the false alarm probability associated to a peak in an amplitude spectrum generated by a non-equidistantly sampled time series is achieved by the consideration of an individual frequency instead of the treatment of this peak as the highest one in the entire Fourier spectrum. The introduction of the phase angle in Fourier space as an additional independent parameter of the Probability Density Function (PDF) permits a theoretical solution for this function, hence providing an answer to one of the crucial questions in Fourier spectrum analysis of non-equidistant datasets.

Numerical simulations are presented, showing excellent agreement to the predictions based on theoretical statistics. Furthermore, a convenient and easy-to-use software package is introduced, providing the computation of false alarm probability vs. frequency for a given set of measurements within a reasonable time. The capabilities of this data analysis method are presented in some examples.