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New measurement method of estimation signal / noise parameter

Sergej Belov
Moscow State University, Physics, Russian Federation (belov_sergej@mail.ru)

Ionospheric echo signal/noise ratio β_k is of interest as the ionospheric plasma concentration measure of disturbance, as well as the communication (or diagnostic) channel characteristic. The paper presents the results of comparison of the measurement methods from the point of view of their admissible relative analytical errors. The new method is suggested [2]. The subscript k=E,R2,R4 indicates the primary parameter recorded (E - quadrature, R - envelope of ionospheric echo), and the method used (E-coherent; R2,R4 - noncoherent). Usually in use: 1) the standard R2-method, where β_{R2}= $f_{R2}(\alpha_{R2})$ [1]; 2) the coherent E-method, β_E= $f_E(\alpha_E)$ [2]. The paper presents the new R4-method, where β_{R4}= $f_{R4}(\alpha_{R4})$. Above α_k are the values measured and f_k are the known functions. The comparative analysis of the normalized relative analytical errors ε_k^* = $(1/g\beta_k)$ $df_k/d\alpha_k$ of the known methods and the new one was performed. It was shown that the errors $\varepsilon_E^*$and $\varepsilon_{R4}^*$are of the same order (ε_{R4}^*= 3/2 ε_E^*) and both are less by one order in comparison with the standard R2-method error ε_{R2}^*[1]. As a result, the sufficient analytical precision of the β_k measurement may be achieved with the simple noncoherent R4-method.

But the coherent E-method reserves the possibility of statistical error optimization with a special processing of ionospheric echo.

Thus, proposed method can be used in study of global problems dealing with distant diagnostic “rough” Earth surface and subsurface dielectric structure in SW radiowae propagation Also recent results can be used as apriori information for inverse problems of radiosounding or interpretation of observations.

References:

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