MULTIPROBE MICROWAVE MULTIMETER FREQUENCY PROPERTIES

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Multiprobe microwave multimeter is new measurtement device, which one is not manufactured yet by industry and are not let out, though there are many versions of their construction depending on the requirements of practice and ways of implementation of idea of reconstruction of a standing wave on several reading discretely arranged alongside tract sensors. The frequency properties MMM are determined mainly by two factors by a way of obtaining of the information about distribution of a VHF field in a tract, i.e. by mean of arrangement of power sensor along it and degree of their transformation coefficient dependence from frequency, by a equations set describing through sensors signals amplitude-phase distribution of an electromagnetic field in the waveguide in a function of frequency solution precision. On a type sensors dislocation distinguish equidistant and not equidistant arrangement with large (up to 16 pieces) and their small quantity (3-4-5-6 pieces) correspondingly. Thus algorithmic maintenance of a signal processing is different in this two case: in the former the parameters receive through definition of average and in the later a hardware representation of precise algorithms with the help of microcontrollers or PC.

In this report the multimeter frequency properties, described in the literature be considered, in supposition that sensor transformation coefficient in given frequency band is fixed. The aim of report is working out methodic for algorithm comparence. Multimeter has the mathematical description as systems of linearized equations relatively intermediate variables. The matrix of a system is written down through trigonometrical expression, which arguments are intervals between sensors, phase spacing is connected to frequency. Therefore frequency change is simulated with the help of the description of change of phase spacing interval between sensors in a matrix of a system. The matrix of a system determines as error primary sensor is transformed to error of intermediate variables.

The frequency properties in multimeter influence accuracy of calculation, but the accuracy also is influenced by an algorithm. It is possible to determine weighting coefficients, grounding of the formulas connecting intermediate variables to unknown quantities of passing power, and reflection coefficient , that opens an opportunity for comparing different algorithms.

To create identical conditions for comparison different algorithm it is necessary to secure an identical arrangement of sensors ensuring identical stability, characterized by a conditionality number, and should be to identical quantity of sensors There is variance and covariance matrix.

$$D = \sigma_{\partial am} \begin{bmatrix} \frac{2\cos^2 x + 1}{2(\cos x - 1)^2} & \frac{-(2\cos x + 1)}{2(\cos x - 1)^2} & 0 \\ \frac{-(2\cos x + 1)}{2(\cos x - 1)^2} & \frac{3}{2(\cos x - 1)^2} & 0 \\ 0 & 0 & \frac{1}{\sin^2 x} \end{bmatrix}$$

Weighting coefficients are

$$w1 = \frac{-\Gamma}{P_{na\partial}(1+\Gamma^2)}, \qquad w2 = \frac{\cos\varphi(1+\Gamma^2)}{2P_{na\partial}(1-\Gamma^2)}, \qquad w3 = \frac{\sin\varphi(1+\Gamma^2)}{2P_{na\partial}(1-\Gamma^2)}$$

Are obtained by derivation of expressions connecting intermediate variables to required parameters

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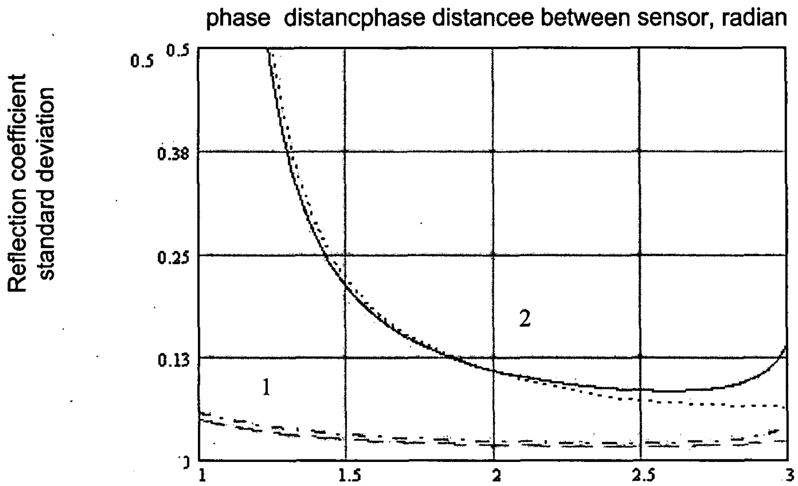
$$\Gamma = \sqrt{\frac{P_{omp}}{P_{na\partial}}},$$

From here

$$\sigma_\Gamma = \sqrt{(w1)^2(\sigma P_1) \; + (w2)^2(\sigma P_2)^2 + (w3)^2(\sigma P_3)^2}$$

The calculation results are given on the chart.



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