

# Algorithms for Complete Analysis of Vhf Transmission Lines Junction Twoport With Vibrator-Type Exciter

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**Abstract** – Designing of junction twoport for VHF transmission lines demands sufficient high calculation accuracy for input impedance of junction element threeport, and waveband breadth of line/waveguide junction (twoport). Therefore in analysis it is necessary all influence factors to consider. Correspondingly algorithms for separate factors calculation are in an single complete junction twoport algorithm united.

**Keywords**-vibrator-type junction.

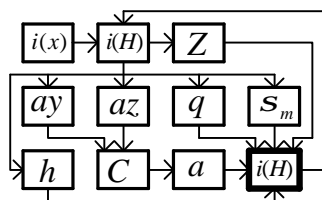
## I. INTRODUCTION

The design of VHF transmission lines junction twoport (JT) is actual still to day. The published works frequently refer only to analysis and calculation of exciter (JE) input impedance (IM) with concerning the longitudinal current in JE. The most possibilities for IM of JE complete analysis gives the filament model analysis method. Proposed in the paper algorithms for thin vibrator exciter, for vibrator with enlarged and great diameter are on the named above analysis method based. Mathematical expressions, necessary for analysis, are given in quoted literature.

## II. ABOUT ALGORITHM

Here we name the junction twoport with vibrator-type exciter analysis problems: (1) choice of adequate JE structure model; (2) approximation of vibrator-exciter longitudinal current distribution in choosed model; (3) analysis of the radiation from real vibrator exciter feed structure (feed aperture) radiation; (4) considering of longitudinal uneven on the vibrator perimeter current distribution in analysis; (5) influence analysis of transverse currents on the exciter-vibrator surface; (6) influence analysis of vibrator-top charge on IM value; (7) calculation of JT waveband.

By separated blocks in the graphically algorithm interpretation is the calculation of JT parameters from standard mathematical procedure (solving of equation system, transcendental equations, summarising procedure, a.a.) denoted. Peculiarity of presented algorithms is filament-model use for



electrical and magnetic surface currents radiation analysis. Such modeling give the possibility irregularity of longitudinal current on vibrator-perimeter, and also transverse current, influence on IM to consider. In algorithms are standard programs for transcendental equation solving used, separately, for analysis of vibrator-top charge influence, whose graphical interpretation is given bellow, for calculation of scattering JE matrix elements, for determining of JT waveband width.

As an example the algorithm for calculation of vibrator-top charge influence on current distribution in one filament model of vibrator-type JE in graphical interpretation is shown here. Function of longitudinal current distribution  $i(x)$  is known. The unknown is the value of that function ( $i(H)$ ) at the vibrator-top height ( $x = H$ ). At the presence of vibrator-top charge  $i(H) > 0$ . Determining of  $i(H)$ -value the corresponding algorithm realize by transcendental equation solution relative  $i(H)$ . In the block of solving such equation ( $i(H)$ ) are the necessary values of electrical field tension at the height  $H$  introduced: radiated by the longitudinal current ( $h$ ), radiated by vibrator-feed aperture ( $a$ ), radiated by vibrator-top charge ( $q$ ), and also value of IM for given  $i(H)$ . Named tensions determine the maximum of charge density on the vibrator-top surface correspondingly to the boundary condition. The same density ( $S_m$ ) is determined on ground of known charge distribution on vibrator-top surface and accepted value of  $i(H)$ . The identity of both charge density values is by block of  $i(H)$  verified and accepted  $i(H)$  corrected. Mathematical expressions for calculation, use described algorithm, are given in: Вісник НУ «Львівська політехніка» № 518, 2008 p., С. 31-36.

## III. CONCLUSION

Proposed algorithms help in the elaboration of JT analysis programs, help to separate standard blocks for mathematical operations, and blocks for programs compilation. In algorithms the blocks are formed with possibility to adjoin them to other blocks of complete JT analysis algorithm. The realizing of complete algorithm provides the sufficient high JT analysis rate.

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