Software for Tolerance Design

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Abstract – **Software for tolerance assignment and element selection is presented in the paper. Methods of tolerance design apply mathematical models of tolerance regions in shapes of hyperparallelepiped and hyperellipsoid which makes possible to take into consideration distribution laws of element parameters. The methods allow carrying element selection and tolerance assignment taking into account external influences. Specification of software functional characteristics and input data presentation were stated to provide integration with existing CAD-systems.**

Keywords – **tolerance design, radio-electronic devices, CAD systems, output functions, external influences, input data.**

I. Introduction

During design and production of electronic devices general-purpose CAD-systems and specified CAD-systems for electronic devices are used [1]. One of substantial problems of electronic devices design is assurance of specified accuracy and reliability. Tolerance design and element selection by accuracy parameters are applied for the problem decision. But most of existing CAD-systems don't allow to carry tolerance assignment and to take into consideration external influences which effect on output characteristics during devices operation. The purpose of the paper is software developing for tolerance design and element selection taking into account external influences.

II. Tolerance design methods

High accuracy of tolerance design under interval and normal distribution law is assured by geometrical methods [2]. The methods are based on tolerance regions forming by tangent points of tolerance regions and operability region. The models of tolerance regions which are shaped as hyperellipsoid under normal distribution and hyperparallelepiped under interval distribution make possible to take into account changes of parameters under external influences. The methods are applied for tolerance assignment and analysis taking into account external influences, for element selection by parameters which define its accuracy and stability while product life cycle. Element selection is developed with different criteria: cost (minimal cost, minimal cost/quality), maximum volume of tolerance region, equal tolerances [3].

III. Requirements for software

Therefore developed software provides such problems of tolerance design: analysis of output characteristic deviations taking into account external influences under normal and interval parameter distribution law; tolerance assignment under given coefficients of external influences by different criteria; element selection by tolerances and external influences coefficients by different criteria; element selection of standard elements by different criteria.

Some output characteristics of electronic devices are represented as functional relations. Therefore formulas analyzer is embedded into the software. It gives possibility for user to enter functional expression which describes output characteristic. Though most electronic devices consist of quantity of elements and its output characteristics can not always be represented as functional relations. Therefore software procedures of tolerance design and element selection use data taken by modeling of electronic circuits by CAD systems.

Therefore in the general case the input data is: output characteristic submitted as functional relation or tabular data which are taken from computer modeling of device; nominal values of main element parameters and corresponding nominal value of the output function; external influences data given as ranges of its possible values during operating. For every task of tolerance design additional sets of output data are formed. Therefore for element selection the additional data is: operating boundary values of output function and given list of elements. List of elements is the set of parameter deviations, characteristics of element parameters stability under external influences, its prices. The result of element selection is the set of parameter tolerances, coefficients of external influence or boundary parameter deviation within given range of external influences.

IV. Conclusion

In this paper brief overview of requirements to functional characteristics and input data representation of software for electronic devices tolerance design is presented.

References

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