Optimization of the reliability ensuring of radio-electronic equipment

Leonid Nedostup, Myroslav Kiselychnyk, Pavlo Zayarnyuk
Department of Theoretical Radio Engineering and Measuring, Lviv polytechnic National university, Bandery str. 12, Lviv, Ukraine, e-mail: zayarnyukpm@gmail.com, mkiselychnyk@polynet.lviv.ua

Abstract: In this paper presents proposals for the REE reliability ensure methods supplement, which allows to optimize the manufacturing process, to calculate the impact of defects, to predicting parametrical reliability. This will improve overall reliability and reduce the cost of its maintenance.

Key words: reliability, optimization of manufacturing, defectiveness, parametrical reliability

I. INTRODUCTION

Radio-electronic equipment (REE) reliability is a complex characteristic that is provided and maintained at all stages of the equipment life cycle.

To date, there is no generally accepted methods of reliability ensure with the calculations of defects influence and REE parameters drifts. Existing methods are based on calculations of load distribution to the elements and components of devices, previous generation REE reliability statistical data. Such methods have disadvantages such as: used a range of different safety factor, which often are redundant; and require a separate calculation of reliability at every stage of the REE life cycle.

Aim of this work is the optimization of the REE reliability ensuring process, which takes into account manufacturing defects and would allow to predict the parametric reliability (PR) by the determinative parameters (DP).

II. METHODS OF ENSURING RELIABILITY

Schematic representation of innovation in reliability ensuring process throughout the full life cycle of REE, especially at the stages of manufacture and exploitation shown in Fig. 1.

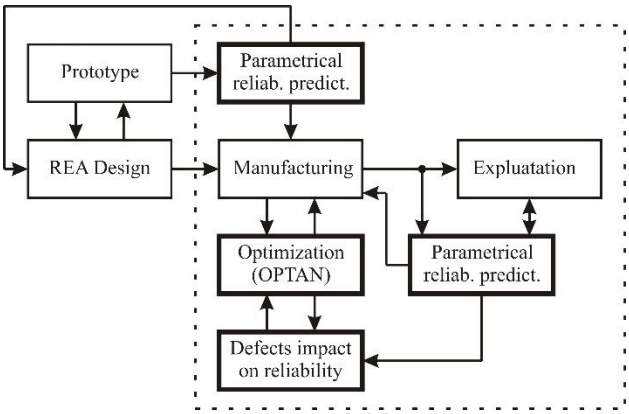

Fig. 1. Innovation in REE reliability ensuring process.

By this scheme proposed to do extra following steps for REE reliability ensure:

1) Perform prediction of PR by statistics of VP drift of prototype [1], [2]

2) Perform multi-criteria optimization of REE manufacturing process with using the software OPTAN [3] and get the real meaning of REE defects according to selected technological process with predetermined characteristics.

3) Calculate the failure rate caused by defects and make conclusions about reliability ensuring according to the technical specifications [4], [5].

4) Perform prediction of serial devices PR, adjusting the finished REE, make adjustments of DP and reduce defects on the manufacture.

Each step can be repeated several times to ensure of the necessary level of REE reliability. Prediction parametric reliability of prototyping and finished REE should perform by one of the developed methods [2], [3] according to the nature of DP drift.

If the drifting process is quasi-deterministic, it is appropriate to use the method of quantile areas [2]. When the processes is stationary and quasi-stationary should be use parameter drift forecasting method based on the theory of emissions [3].

To perform the calculation of defects should be use analytical and graphical dependencies described in [4], [5].

III. CONCLUSIONS

Developed methods allows to use methods of parametrical reliability predicting, to optimize of equipment manufacturing process and calculate of the defects impact on its reliability.

Applying these methods can reduce costs on manufacturing and maintenance of equipment and ensure improvement of its reliability.

IV. REFERENCE

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