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DEFINITION OF A STRIP OF CAPTURE OF PULSE SYSTEMS OF PHASE SYNCHRONIZATION

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ABSTRACT

In given article authors make calculation of systems of phase synchronisation, strips of deduction and capture are defined with various initial mismatch. Also it`s offered possibility of synthesis of systems on the basis of areas of strips of capture in parametres of designed system.

Index Terms – strip of capture, system of phase synchronization, transient, mono-periodic capture, poly-periodic capture.

1. INTRODUCTION

One of the major problems of designing of pulse systems of phase synchronization (PSPS) is definition of a strip of capture. Authors the computer-based method of the analysis which allows settling an invoice a strip of capture of systems of any order with pulse integrated modulation on the basis of numerical modeling of transients at various initial options is offered.

2. DETERMINATION OF SYNCHRONISM AND ENTRAPMENT FIELDS

Accuracy and efficiency of the offered method is defined by characteristics of mathematical model of calculation of transients in PSPS. Authors carry out the analysis of block diagrams and time diagrams of systems of phase synchronization. The models considering nonlinear and pulse properties of systems which are described by the difference-iterative equations and system of inequalities are received. Program realization of a method consists in block modeling of physical processes: blocks of comparing devices are modeled by means of logic inequalities, blocks of filters and links of correction by means of programs of the decision of systems difference the equations, blocks of objects of management and devices of a feedback by means of the unique programs considering physical properties of described devices.

For calculation of a strip of capture (SC) it is necessary to know a strip of frequencies in which the mode of synchronous work (a synchronism strip) is possible. This strip is defined on analytical expression for phase detectors of various types and is starting-point for calculation SC. The analysis of convergence of transient is carried out by two criteria.

The first criterion. It is applied to the convergence analysis at mono-periodic capture. If target frequency is in a range of the set deviation from the established value and does not leave it in a current $3T_{max}$ (T_{max} - the greatest constant of time of a denominator of transfer function of a continuous linear part of system) process converges.

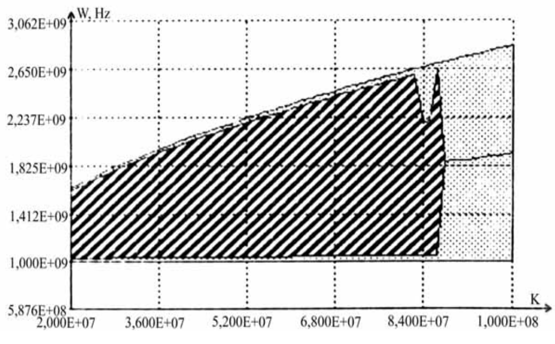

Fig. 1

The second criterion. It is applied to the convergence analysis at poly-periodic capture. In this mode the working point of system passes from one site of the periodic characteristic of the detector to other site. At the moment of transition of a working point to a detector exit occurs voltage races, and the target co-ordinate (ω) during these moments reaches local extrema. We will note three next values of local extrema - time t_1, t_2, t_3; time intervals $\Delta t_1 = t_2 - t_1$ and $\Delta t_2 = t_3 - t_2$, and also average value of frequency on these intervals ω_{2c}, ω_{3c}. On these values the convergence analysis is carried out:

- $\Delta t_1 = \Delta t_2$ and $\omega_{2c} = \omega_{3c} = \omega^*$ - process converges (ω^* - the established value of a target signal). An interval Δt in this case - the period of fading fluctuations in system;
- $\omega_{2c} > \omega_{3c} > \omega^*$ or $\omega_{2c} < \omega_{3c} < \omega^*$ - process does not converge. In system there comes a periodic mode of beatings;
- $\omega_{2c} = \omega_{3c} < \omega^*$ or $\omega_{2c} = \omega_{3c} > \omega^*$ - process does not converge. In system arises quasi-periodic mode of beatings.

Criteria allow reducing expenses of time for the convergence analysis.

Borders of a strip of capture are defined by repeated modeling of transients. Changing from experience to experience initial detuning and analyzing convergence of process, we define borders initial detuning at which processing the system is included into synchronism.

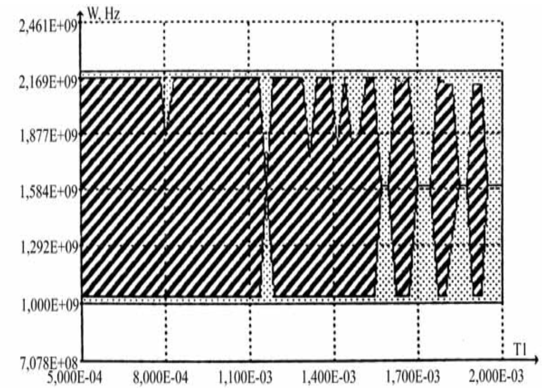

Fig. 2

By means of the offered technique authors receive dependences of strips of synchronism and capture on values of parameters of system.

On fig. 1 dependence of area of synchronism (it is noted by points) and capture areas (is noted by shading) from value of factor of strengthening of a continuous linear part (k) is shown. With growth of factor of a strip of synchronism and capture increase, but at achievement $k = 8.5*10^7$ Hz/V system does not enter into a mode of synchronism and a capture strip does not exist.

On fig. 2 areas of synchronism and capture depending on the greatest constant of time (T_1) a denominator of transfer function of a continuous linear part are represented.

3. CONCLUSION

Thus, authors offer a technique allowing by means of program modeling to define area of synchronism and area of capture of systems of phase synchronization. The received areas give the chance a choice of parameters of designed system from a condition of maintenance of a demanded strip of capture.

4. REFERENCES

[1] Batura M. , Kuznetsov A., Shilin L. “Analys and parametrical synthesis of pulse systems with phase management.” – Minsk: Science and technics, 1993. – 224 p.

Figure 1 IWK Logo