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COMPUTER-AIDED DESIGN RADIO EQUIPMENT ASSEMBLIES FOR EMC

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ABSTRACT

Increasing the speed of digital systems and ensuring electromagnetic compatibility in the design of printed circuit boards. One of the main directions in the design of the electromagnetic compatibility of digital systems is the use of CAD. The emergence of new materials, the development of technology mikroperehodov, increased resolution and other technical factors contribute to the production of more advanced e sun dress design. Thus, the developer of the board must decide whether the use of a mathematical method in each case and then make a rational choice of a software environment that allows an analysis based on the selected method.

KEYWORDS: *Printed Circuit Board, Electronic Equipment, Automatic Design, Electromagnetic Compatibility.*

1. INTRODUCTION

In the design of electronic equipment (CEA) is mandatory accounting requirements for electromagnetic compatibility (EMC), ever escalating with increasing density and the upper frequency range of useful and interfering signals in the line, as well as a decrease in the levels of mineral and rising levels of interfering signals. Full-scale tests CEA EMC and its re-design due to dissatisfaction with increasingly stringent requirements of EMC substantial rise and slow design, creating serious obstacles to the production of finished products to market. Therefore, it is urgent modeling EMC problems at the design stage of CEA.

2. The purpose of the task

A very important step in the design of the equipment shall be the means of the automatic design (CAD) to predict the emission of radio frequency interference and susceptibility with sufficient

accuracy for the goals, based on the design parameters of the product. This will apply the appropriate technology EMC and avoid costly rework later.

Designed equipment requires a minimum number of errors, or that their absence. The solution lies in the proper organization of the development and addressing these issues early in the design. When designing high-speed electronic equipment has become virtually mandatory provision neiskazh e n tion signal, and therefore, no circuit board can be manufactured without the use of specialized software to facilitate the analysis of signal integrity and EMC.

Any problem of EMC can be represented in terms of the interference source and receptor path interference. The structure of the communication path may include as a mechanism of radiation and conductive, and it is often to be analyzed, such as voltage and current at the interface equipment is the result of communication equipment with an external field.

Analysis of EMC electronics assemblies for a comprehensive assessment of the quality of the design development, confirming the correctness of design and technological solutions for the operation of RES in the given conditions and with the required quality. EMC analysis is based on computer modeling. Initial data for the performance of the EMC analysis: a circuit diagram; List of electronic components; PCB design; a complete set of design documentation; technical project, which will include EMC requirements.

For modeling the electronic system on a virtual prototyping stage mainly used software packages. In these stages of circuit simulation and PCB layout design of integrated circuits or separated. First performed simulations of electronic circuits without parasitic effects inherent in the actual topology, and then after repeated simulation of designs with their account. This procedure is covered with a particular task to ensure the completeness of signal integrity and EMC. Below is a brief overview of the most well-known programs design and analysis of printed circuit boards with a view to illustrate the possibilities of CAD in this area.

Prospective CAD systems

CAD Company MENTOR GRAPHICS

CAD Mentor Graphics allows a full cycle of the verification fee. It uses the following subsystems:

- HyperLynx, ICX / Tau, Quiet Expert - analysis of signal integrity and electromagnetic compatibility;
- BetaSoft Board - analysis of the thermal regime of the printing unit;
- IDF Interface - bi-directional interface to CAM / CAD
- Fablink XE / Pro - post-processing to enhance manufacturability.

Package HyperLynx - the most powerful in the analysis of signal integrity. It has modules predtopologicheskogo (HyperLinks LineSim) and posttopologicheskogo (HyperLinks BoardSim) analysis (see. Above), works closely with the monitoring system limitations.

Package ICX performs verification signal integrity analysis of high accuracy, including the worst case. Analysis can be done for multcard systems in interactive and batch modes. An important feature is the ability to analyze component placement and routing of the electrical requirements.

Tau performs a comprehensive package of verification before and after tracing board.

The Mentor Graphics Design Kit are ready library blocks and component models, which are used for signal integrity analysis. This model Spice, IBIS, VHDL-AMS and others supplied by the manufacturers of chips.

CAD firm CADENCE

Another power of the proposed solutions is the company CADENCE. For top-level design of the proposed package PCB Design Studio. As an editor of printed circuit boards are used program Allegro, allows the development of multi-layer and high-speed, high-density components. As a full-time module auto placement and auto routing are using a program SPECCTRA, operates an extensive set of design rules and technology limitations. Analysis of signal integrity and EMC PCB layout is done using a special module SPECCTRA Quest SI Expert, and for a preliminary analysis of the project and preparation of sets of design rules used module Sig Explorer.

CAD firms ZUKEN

The third most popular in the world is quite powerful product - Visula company ZUKEN. The products the company provides through the design cycle and offer an effective means of simulation and synthesis of programmable logic with the subsequent development of the PCB. There is a standard set of tools, as well as its own funds autoplacement and autorouting. It should be noted that the company ZUKEN also offers users integrated tools for solid modeling developed devices.

CAD firms ALTIUM

In 2002 the company released a ALTIUM package Protel DXP, which is a continuation of their own original product line Protel. This package provides a through-cycle design of mixed analog-digital circuit boards. All the tools implemented on the basis of an integrated design environment Design Explorer, running the operating system Windows XP. By means of the previously existing posttopologicheskogo signal integrity analysis added the ability to perform predtopologicheskoy analysis (Fig. 2). But the main innovation of Protel DXP was supposed to be a topological auto router Situs, designed to implement a new approach to the automatic wiring boards.

CAD Quantic EMC

Compliance - System posttopologicheskogo electromagnetic compatibility analysis on printed circuit boards. Compliance Package allows you to assess the impact of structural features of printed circuit boards on their electrical characteristics (Fig. 3), as well as simulate the electromagnetic compatibility of devices even to the actual manufacture of structures, thereby reducing the time and cost of designing with a significant increase in quality.

Designing high-speed circuit boards requires the construction of adequate models for the analysis of signal integrity and EMC. Levels of performance achieved increase the sensitivity of the design to various variations of materials, dimensions of structural elements and characteristics of the components. The emergence of new materials, the development of technology mikroperehodov, increased resolution and other technical factors contribute to the production of more advanced e sun dress design. Thus there is a refinement of models to be analyzed. For

example, if a relatively low-frequency circuit board calculation capacity between conductors can be carried out under the simplified expressions, which do not take into account the thickness of the wire, then the convergence of the values of the gaps between the conductors and the thickness of the account of the last parameter is mandatory.

3. CONCLUSION

EMC problem is complex, requiring provision of the necessary requirements at all levels of modularity in the design of equipment. Increasing the level of modularity leadsto increasing costs and reduced EMC measures available. EMC achieved by different design and technological measures, including the choice of the element base, rational layout elements, shielding individual circuit elements, modeling of the interference field elements, etc. The absence of algorithms for the optimal placement of ERE on the board with uch e ensure that their EMC unwieldiness and complexity of the mathematical description of the use of different CAD systems require for a quick and high-quality design of electronic digital devices.

As seen from the survey, unfortunately, there is no universal product for analyzing signal integrity and EMC estimates of the parameters. Thus, the developer of the board must decide whether the use of a mathematical method in each case and then make a rational choice of a software environment that allows an analysis based on the selected method. The most optimal solution is still a combined method of using multiple software products in the design board.

LITERATURE

1. Knyazev, A. D. Designing of radio-electronic and electronic-computing equipment taking into account electromagnetic compatibility [Text] / A. D. Knyazev, L. N. Kechiev, B. V. Petrov. M.: Radio and communication, 1989. 224 p.
2. Chermoshentsev S.F. Information Technology Electromagnetic Compatibility of Electronic Means: Tutorial. - Kazan: KSTU, 2000. - 152 p.
3. Habiger, E. Electromagnetic Compatibility. Fundamentals of its provision in engineering / E. Habiger; per. with him. I.P. Kuzhekin; by ed. B.K. Maximov. - M.: Energoatomizdat, 1995. - 304 pp., Ill.
4. Paul, Clayton R. Introduction to electromagnetic compatibility [Text] / Clayton R. Paul.-2nd ed. Wiley Interscience. 2006
5. The physical basis of the design of radio-electronic means: proc. Method. complex for students of the specialty 1-39 02 01 "Modeling and computer design of RES". In 2 hours. Part 2 / T. V. Molodechkina, V.F. Alekseev, M.O. Molodechkin. - Novopolotsk: PGU, 2013. - 224 with
6. Fomin, A.V. Engineering quality assurance methods for design / A.V. Fomin, O.N. Umrikhin, M.F. Mityushin. - M.: Publishing House of the MAI, 2007. - 276 p.