

Comparison of Simulation Tools ATP-EMTP and MATLAB-Simulink for Time Domain Power System Transient Studies

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Abstract - Continuous development of appropriate software packages makes simulation of power engineering problems more and more effective. However, these analysis tools differ from each other considerably from the point of view of the applicability to a special problem. The authors compare two widespread environments: MATLAB-SIMULINK, which can be used to simulate a wide spectrum of dynamic systems, and ATP-EMTP, which is specific software to simulate power system transient problems. In the first part of the paper the components (function-blocks) that can be used to build a circuit, are listed. Then three examples are presented which demonstrate the capabilities and underline the advantages and drawbacks of both programs.

Keywords: ATP-EMTP, MATLAB-Simulink, time domain simulation, educational use

1 Introduction

There are numerous widespread commercial software tools used by power engineers for electrical circuit simulation purposes. It is, however, a challenging and time consuming task to get acquainted with all the details and specialities of such a program, that's why the majority of the users is not inclined to keep tabs on the evolution of similar products or does not even know them.

This paper aims to compare the capabilities of two of such software packages: ATP-EMTP/ATPDRAW and MATLAB-SIMULINK. The first one is a universal program system for digital simulation of transient phenomena of electromagnetic as well as electromechanical nature, whereas SIMULINK was created to model general dynamic systems using MATLAB simulation engine.

2 Comparison of the elements of the two programs

Both programs are block-oriented simulators with a graphical user interface. In both cases there are two types of connections between the blocks: electrical and signal wires. Former ones link blocks like transformers, lines etc. while the latter ones connect the signal processing units. In ATP-EMTP these blocks can be TACS or MODELS objects.

The following tables summarise the most important built-in elements (blocks) of the two program packages. Only objects supported by ATPDraw have been considered in the ATP-EMTP column of the next tables.

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Understanding transient phenomena in electric power systems and the harmful impact of resulting disturbances is an important aspect of power system operation and resilience Bridging the gap from theory to practice this guide introduces the fundamentals of transient phenomena affecting electric power systems using the numerical analysis tools Alternative Transients Program Electromagnetic Transients Program ATP EMTP and ATP DRAW This technology is widely applied to recognize and solve transient problems in power networks and components giving readers a highly practical and relevant perspective and the skills to analyse new transient phenomena encountered in the field Key features Introduces novice engineers to transient phenomena using commonplace tools and models as well as background theory to link theory to practice Develops analysis skills using the ATP EMTP program which is widely used in the electric power industry Comprehensive coverage of recent developments such as HVDC power electronics with several case studies and their practical results Provides extensive practical examples with over 150 data files for analysing transient phenomena and real life practical examples via a companion website Written by experts with deep experience in research teaching and industry this text defines transient phenomena in an electric power system and introduces a professional transient analysis tool with real examples to novice engineers in the electric power system industry It also offers instruction for graduates studying all aspects of power systems

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