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Design and Implementation of a Hierarchical Control System Architecture for a Modular Pulsed Power Supply System

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Using generalized building blocks for the design of power electronics converters is advantageous in terms of scalability, modularity, power density, and reliability. For the control of those power electronic converters composed of Power Electronics Building Blocks (PEBBs), an easily scalable and modular control system should also be integrated. In this paper, a hierarchical control system architecture together with both communication and protection means is proposed for a modular Pulsed Power Supply (PPS) for the implementation of Electromagnetic Launcher (EML) system. An isolated interface between high voltage control system elements on each PPS module and main control system is recommended and implemented for the EML system. The proposed control system architecture is formed via modular PXI based control hardware of National Instruments. The proposed hierarchical control system architecture is an industry application of the control system architecture suggested in IEEE Standard [1] to the PEBB based modular PPS with some application specific contributions of authors to the subject.

Keywords: Hierarchical Control System Architecture, Power Electronics Building Blocks (PEBB), Pulsed Power Supply (HAPF), High Voltage Isolated Control System

[1] IEEE Guide for Control Architecture for High Power Electronics (1 MW and Greater) Used in Electric Power Transmission and Distribution Systems," in IEEE Std 1676-2010 , vol., no., pp.1-47, Feb. 11 2011.

Author: Mr DURNA, Emre (Aselsan Inc.)

Co-authors: Mr CIVIL, Anıl (Aselsan Inc.); Mr KARAGÖZ, Mustafa (Aselsan Inc.); Mr ÇEVIK, Yasin (Aselsan Inc.)

Presenter: Mr CIVIL, Anıl (Aselsan Inc.)

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