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Application of Efficiency Energy Generation ofMicro-Grid from Solar Power Plant

Dillip Kumar Nayak
Aryan Institute of Engineering & Technology, Bhubaneswar

Abstract
The Solar Energy is created by the Sunlight is a non-disappearing sustainable wellspring of energy which is liberated from ecofriendly. Consistently enough daylight energy arrives at the earth to satisfy the world's energy need for an entire year. In the present age we required Electricity consistently. This Solar Energy is produced by according to applications like mechanical, business, and private. It jars effectively energy drawn from direct daylight. So it is very proficiency and free climate contamination for encompassing. In this article, we have investigated about the Solar Energy from Sunlight and examined about their future patterns and angles. circulated sun oriented force plants, a framework energy-saving stockpiling gadget (ES) is establishment framework prosped A particular element of the proposed model is the limitation of spots for the establishment of force dynamic channel remunerating gadgets, the utilization of which permits giving the vital nature of electric energy and accomplishing the base energy misfortunes in the components of the energy supply framework. As per the aftereffects of the reproduction, the correlation of the energy proficiency of the customary energy supply framework and Smart Grid has been made.

Key Words: Solar, MPPT, ESS, Grid,Battery

I INTRODUCTION

Nowadays, due to the decreasing amount of renewable energy resources, the last ten years become more important for per watt cost of solar energy device. It is definitely set to become economical in the coming years and growing as better technology in terms of both cost and applications. Everyday earth receives sunlight above (1366W This is an unlimited source of energy which is available at no cost. The major benefit of solar energy over other conventional power generators is that the sunlight can be directly converted into solar energy with the use of smallest photovoltaic (PV) solar cells. There have been a large amount of research activities to combine the Sun’s energy process by developing solar cells/panels/module with high converting form. the most advantages of solar energy is that it is free reachable to common people and available in large quantities of supply compared to that of the price of various fossil fuels and oils in the past ten years. Moreover, solar energy requires considerably lower manpower expenses over conventional energy production technology Structural changes in the electricity market, where the Consumer acquires additional functionalities and partial energy independence, contributed to the emergence of a new concept of energy development – Smart Grid. The most significant feature of Smart Grid is the presence of a bi-directional energy flow in the elements of the energy supply system (ESS) [3, 10]. Operation of the Smart Grid ESS is conditioned by the operation of the industrial network, renewable energy sources and variable load profiles. In the intelligent ESS with small solar power plants, the combination of such modes causes some difficulties in implementing an information management system that would ensure not only high reliability of power supply but also increase its energy efficiency [11–15]. Therefore, at the pre-design stage, close attention should be paid to the means of computer simulation to study the work of the smart ESS in operating and emergency modes.

System Designing: The formed network structure allows implementing separately the energy supply system of direct current (Fig. 1). The system energy storage is charged from distributed solar power plants, and in case of full charge, network inverters are switched on, and renewable sources give energy to the AC network. In offline mode, when the automatic switch in the beginning of the AC supply lines is open, with the help of a stand-alone inverter, the sinusoidal voltage is formed with a frequency of 50 Hz and the energy supply of the loads connected to the microgrid is carried out from the system ES. Independent DC power can be connected by the appropriate low-power load or electric vehicles, both for recharging onboard batteries and as additional backup sources. The diversity of the modes of operation of microgrid is provided by an additional information level , which collects information about the status of each element of the system and, in accordance with the priority algorithms, control impacts are formed, which are worked out by power
Semiconductor converters.

II PROPOSED SYSTEM

The efficiency of solar power plants depends to a The efficiency of solar power plants depends to a large extent on weather conditions and seasons. Therefore, during the implementation of microgrid the solar irradiance level in a particular region, which is often presented as a daily graph for each calendar month, should be taken into account? Also, during the calendar year, the daily load profile changes. The overlay of these two charts allows predicting the share of electricity that will be consumed by microgrid objects from the industrial network, taking into account the generation of alternative sources, and

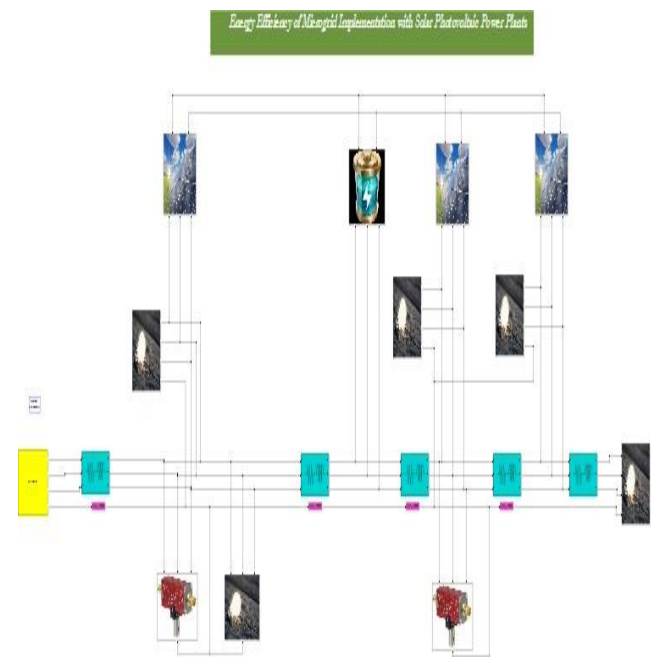

Fig.1 proposed simulink model

hence the reduction of the current density in the supply cable and the losses power from its flow. Figure 2 shows a daily graph of solar insolation (E) for a July day, typical for eastern Ukraine, and a daily load profile in the fractions of the maximum installed power P* = P/PH, which is typical for household loading

III MODULES

- Solar panel
- Maximum power point Tracking(MPPT)
- DC-DC Boost converter
- DC/AC multilevel inverter
- Pulse Width Modulation(PWM)
- AC Grid
- Non-linear load

MTTP Algorithm : Maximum power point tracking (MPPT) is an algorithm implemented in photovoltaic (PV) inverters to continuously adjust the impedance seen by the solar array to keep the PV system operating at, or close to, the peak power point of the PV panel under varying conditions, like changing solar irradiance, temperature, and load. Engineers developing solar inverters implement MPPT algorithms to maximize the power generated by PV systems. The algorithms control the voltage to ensure that the system operates at “maximum power point” (or peak voltage) on the power voltage curve, as shown below. MPPT algorithms are typically used in the controller designs for PV systems. The algorithms account for factors such as variable irradiance (sunlight) and temperature to ensure that the PV system generates maximum power at all times. Maximum power point tracking is a technique used commonly with wind turbines and photovoltaic (PV) solar systems to maximize power extraction under all conditions. Although solar power is mainly covered, the

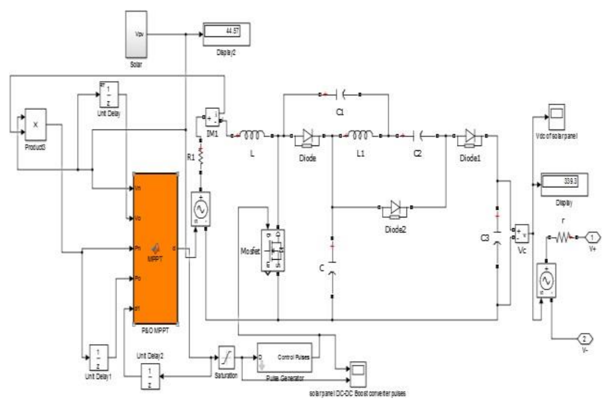

Fig 2 MPPT model

Principle applies generally to sources with variable power: for example, optical power transmission and thermo photo voltaics. PV solar systems exist in many different configurations with regard to their relationship to inverter systems, external grids, battery banks, or other electrical loads. Regardless of the ultimate destination of the solar power, though, the central problem addressed by MPPT is that the efficiency of power transfer from the solar cell depends on both the amount of sunlight falling on the solar panels and the electrical characteristics of the load

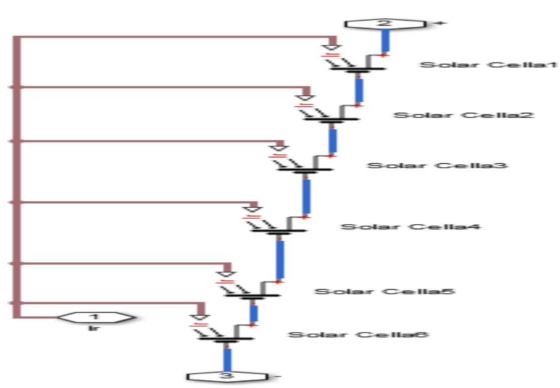

Fig.3 Solar cell

This block models a solar cell as a parallel combination of a current source, two exponential diodes and a parallel resistor, Rp that are connected in series with a resistance Rs. The output current I is given by

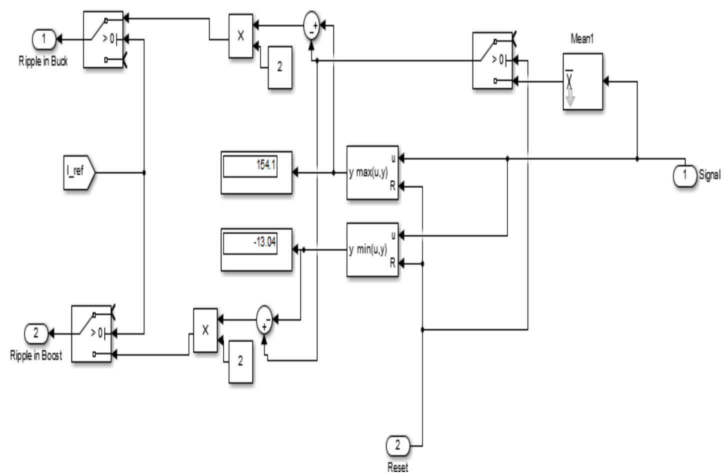

Fig 4 Buck Boost Sub System

IV SIMULATION RESULT

PV system will continue to produce electricity as long as there is sufficient sunlight to generate and sufficient load or battery capacity to absorb it. The energy storage system acts as a buffer between the PV and the load so that the user doesn't notice any fluctuation in power as a result of unstable sky conditions. The duration that the energy supply will last is difficult to predict because it is a function of the amount of sunlight available, the demand of the selected back-up loads and the state of charge of the battery system at the moment of isolation from the grid.

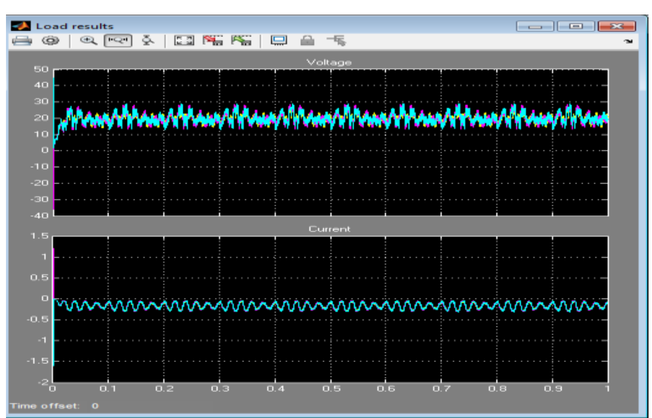

Fig.5 Load result of solar plant 1

It is a class of switched-mode power supply (SMPS) containing at least two semiconductors (a diode and a transistor) and at least one energy storage element: a

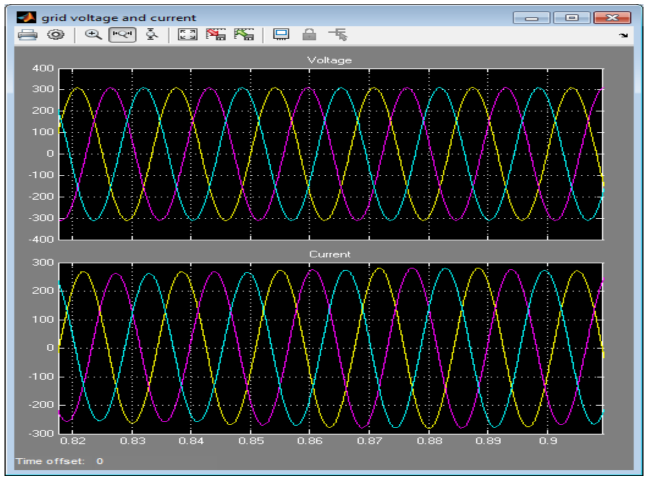

Fig. 6 grid voltage and current

Capacitor, inductor, or the two in combination. To reduce voltage ripple, filters made of capacitors (sometimes in combination with inductors) are normally added to such a converter's output (load-side filter) and input (supply-side filter). The control system is designed to always prioritize the use of the inverter capacity for the solar the battery system is less active, but when the PV system is not utilizing the majority of the inverter capacity (i.e. at night) it is able to actively participate in fast response frequency regulation. In grid-interactive mode the battery system operates in parallel with the PV system. The PV system operates normally as a typical grid-tied solar PV system. During peak sun hours of the PV generation first, then the remainder is utilized for frequency regulation participation. In full sun the PV system will normally require approximately 325 kW of AC capacity, leaving 175 kW of inversion capacity available for participation in the frequency regulation market. When there is a grid outage the microgrid system senses the loss of grid and signals the isolation breaker to open and convert to Islanded mode. The system adjusts automatically from a grid-tied current source to an islanded voltage source in a few cycles In grid-interactive mode the battery system operates in parallel with the PV system. The PV system operates normally as a typical grid-tied solar PV system. During peak sun hours of the

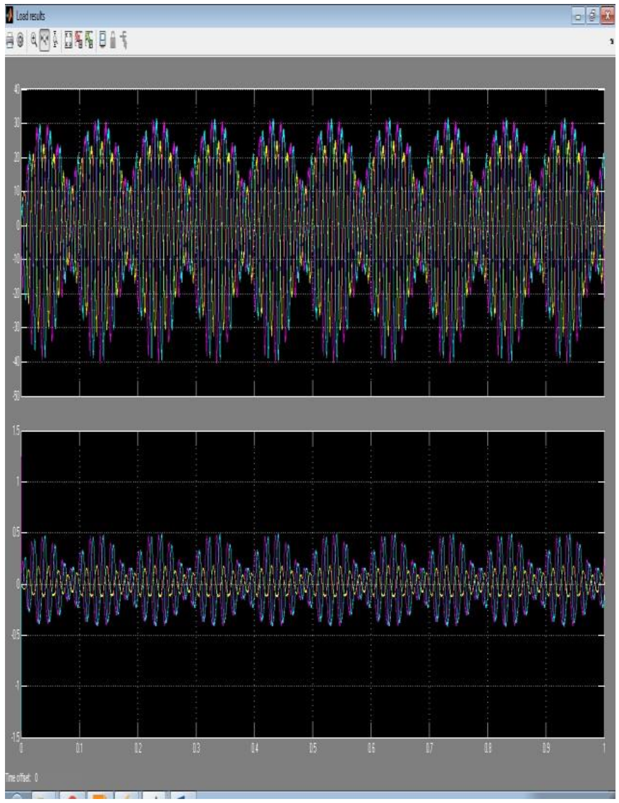

Fig. 7 Load result of solar plant 2

Implements a three-phase parallel RLC load. Nominal phase-to-phase voltage 400Vn (VrmsNominal frequency fn (Hz):50 Inductive reactive Power QL (positive var): Implements a three-phase circuit breaker. When the external switching time mode is selected, a Simulink logical signal is used to control the breaker operation. Switching times (s): [4/60 10/60] Breaker resistance Ron (Ohm) 0.001

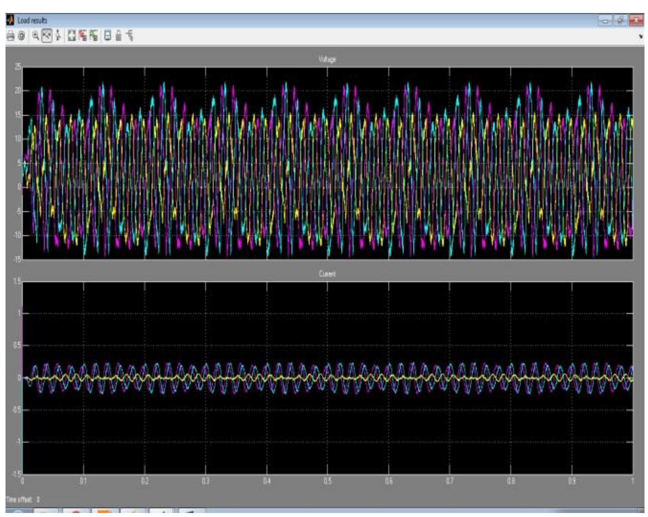

Fig.8 Load result of solar plant 3

Implements a three-phase parallel RLC load. The block can output the voltages and currents in per unit values or in volts and amperes. Inductive reactive Power QL (positive var): Active power P (W):100 Inductive reactive Power QL (positive var):

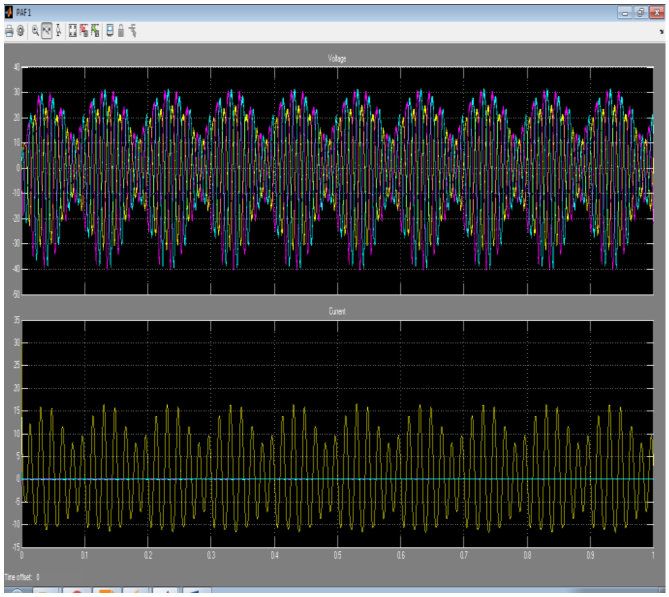

Fig.9 voltage and current of system

Battery or solar in power systems often stack cells in series to achieve higher voltage. However, sufficient stacking of cells is not possible in many high voltage applications due to lack of space. Boost converters can increase the voltage and reduce the number of cells. and boosts the battery voltage from 202 V to 500 V. Boost converters also power devices at smaller scale applications, such as portable lighting systems. A white LED typically requires 3.3 V to emit light, and a boost converter can step up the voltage from a single 1.5 V alkaline cell to power the lamp. An unregulated boost converter is used as the voltage increase mechanism in the circuit known as the 'Joule thief'. This circuit topology is used with low power battery applications, and is aimed at the ability of a boost converter to 'steal' the remaining energy in a battery.

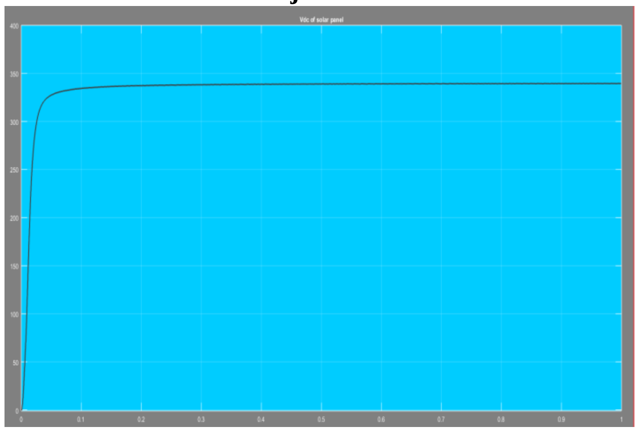

Fig10 VDC from Solar Panel

The power delivered by a PV cell attains a maximum value at the points The short circuit current is measured by shorting the output terminals and measuring the terminal current PV cells are made of semiconductor materials with crystalline and thin films being the dominant materials.

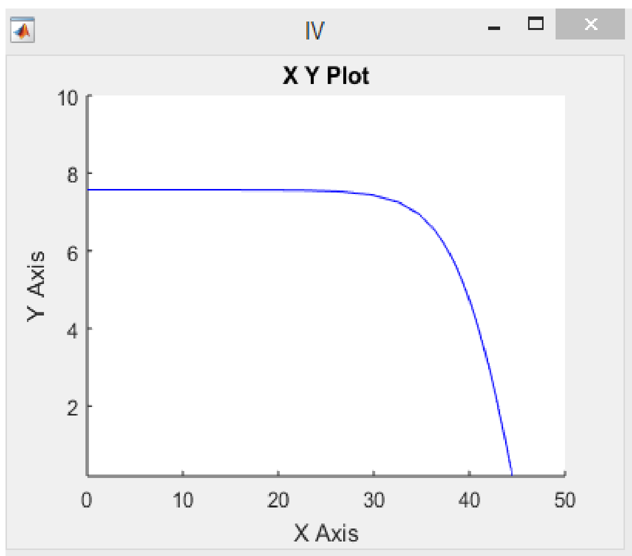

Fig. 11 PV Characteristics Waveform

in figure 4.17 show PV characteristics and there are X-Y coordinates voltage Vs current plotted. The maximum power is generated 230 Kw by the solar cell at point of the current-voltage characteristic where product of *V* and *I* is maximum shown in fig 4.18Y Axis plotted 230Kw and x-axis point maximum 44I

V CONCLUSION

The implementation of microgrid with solar power plants allows increasing the efficiency of the ESS. The reserve for increasing the efficiency through the implementation of microgrid has two components, the first one is related to the normalization of the power consumption mode, and the second one to the optimization of the structure of the network, when the distances between energy sources and consumers are reduced, and the density of the network energy flow and trunk line decreases. Moreover, the second component makes a more significant contribution to increasing the efficiency of the energy supply system. the implementation of microgrid has two components, the first one is related to the normalization of the power consumption mode, and the second one to the optimization of the structure of the network, when the distances between energy sources and consumers are reduced, and the density of the network energy flow and trunk line decreases. Moreover, the second component makes a more significant contribution to increasing the efficiency of the energy supply system.

VI REFERENCE

1. *M. Islam, S. Mekhilef, and M. Hasan, "Single phase transformer less inverter topologies for grid-tied photovoltaic system: A review," Renewable and Sustainable Energy Reviews, vol. 45, pp. 69 – 86, 2015.*
2. *Kadam and A. Shukla, "A multilevel transformerless inverter employing ground connection between PV negative terminal and grid neutral point," IEEE Transactions on Industrial Electronics, vol. 64, no. 11, pp. 8897–8907, Nov 2017.*
3. *E. Romero-Cadaval, G. Spagnuolo, L. G. Franquelo, C. A. Ramos-Paja, T. Suntio, and W. M. Xiao, "Grid-connected photovoltaic generation plants: Components and operation," IEEE Industrial Electronics Magazine, vol. 7, no. 3, pp. 6–20, Sept 2013.*
4. *W. Li, Y. Gu, H. Luo, W. Cui, X. He, and C. Xia, "Topology review and derivation methodology of single-phase transformerless photovoltaic inverters for leakage current suppression," IEEE Transactions on Industrial Electronics, vol. 62, no. 7, pp. 4537–4551, July 2015.*
5. *T. K. S. Freddy, N. A. Rahim, W. P. Hew, and H. S. Che, "Comparison and analysis of single-phase transformerless grid-connected PV inverters," IEEE Transactions on Power Electronics, vol. 29, no. 10, pp. 5358– 5369, Oct 2014.*
6. *R. Gonzalez, E. Gubia, J. Lopez, and L. Marroyo, "Transformerless single-phase multilevel-based photovoltaic inverter," IEEE Transactions on Industrial Electronics, vol. 55, no. 7, pp. 2694–2702, July 2008.*
7. *O. López, F. D. Freijedo, A. G. Yepes, P. Fernández-Comesaña, J. Malvar, R. Teodorescu, and J. Doval-Gandoy, "Eliminating ground current in a transformerless photovoltaic application," IEEE Transactions on Energy Conversion, vol. 25, no. 1, pp. 140–147, March 2010.*
8. *L. Zhang, K. Sun, L. Feng, H. Wu, and Y. Xing, "A family of neutral point clamped full-bridge topologies for transformerless photovoltaic grid-tied inverters," IEEE Transactions on Power Electronics, vol. 28, no. 2, pp. 730–739, Feb 2013.*

9. *N. Vázquez, M. Rosas, C. Hernández, E. Vázquez, and F. J. PerezPinal, "A new common-mode transformerless photovoltaic inverter," IEEE Transactions on Industrial Electronics, vol. 62, no. 10, pp. 6381– 6391, Oct 2015.*
10. *H. Xiao and S. Xie, "Leakage current analytical model and application in single-phase transformerless photovoltaic grid-connected inverter," IEEE Transactions on Electromagnetic Compatibility, vol. 52, no. 4, pp. 902– 913, Nov 2010*