RECENT DEVELOPMENTS OF TRANSMITTER AND RECEIVER INTEGRATED CIRCUITS FOR OPTICAL FRONT-ENDS

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Power line Communications (PLC) technology is a front runner in providing communication solution for smart grid (SG) services. Distribution Line Carrier (DLC), also called high-speed narrow-band PLC system, is different from the broadband PLC because it operates within the 9 - 500 kHz range, although this is restricted to frequency range between 9 – 148.5 kHz in Europe. Achievable data rate goes up to 100s of kbps.

Distribution Line Carrier: Verification, Integration and Test of PLC Technologies and IP Communication for Utilities (DLC+VIT4IP) [1]- is a EU funded project under the FP7 which aims to extend the existing PLC technologies developing efficient transport of IPv6 protocol, automatic measurement, configuration and management, security, etc. by exploiting frequency ranges up to 500kHz to support SG applications that require higher bandwidth. By operating under 1MHz, it avoids electromagnetic interference (EMI) problems associated with broadband PLC (BPLC) [2]. In addition, it is able to achieve higher bit rate in comparison to the traditional narrowband PLC which operates in a much narrower frequency band. On the application side, the system is based on the Internet Protocol (IPv6). IP is an increasingly used protocol stack in many supervisory and control application fields, including the energy sector, and has been predicted to take a prominent role in future smart grid communication solutions . With IPv6, future smart grid applications, such as asset control/management, can be supported, with a flexible communication platform and improved interoperability.

Recent survey shows that of the 24 existing smart metering projects in Germany the majority (13) use PLC. The others use Digital Subscriber Line (DSL), General Packet Radio Service (GPRS) or other communication solution. The dominance of PLC in the smart metering projects can also be observed in other European countries, e.g., Spain, Italy, and the Netherlands [3,4]. Apparently, PLC technology is the favourite solution from the power utilities perspective. Since PLC infrastructure is owned by utilities, they have complete access and control. PLC is also an inexpensive means of providing new and intelligent applications to and from the last mile of the distribution grid, because it uses existing (cabling) infrastructure that covers a wider area than any other traditional communication network. DLC is therefore a promising communication platform for SG offering advantages in coverage, costs and availability.

In this talk, a general overview of the DLCVIT4IP smartgrid project will be given. 12 key application services for automating the Medium Voltage (MV) and Low Voltage (LV) Distribution Grid as shown in a survey made by the council on large electric systems, Conseil International des Grands Reseaux Électriques (CIGRE) in [5] will be presented. Those applications that will especially benefit from PLC and are targeted by DLC+VIT4IP will be discussed in detail. Table 1 presents a summary of traffic characteristics to the above application services and are key requirements for the DLC+VIT4IP solutions. Furthermore, lessons learnt from DLCVIT4IP in the areas of modem installation in MV and LV real life scenarios will be discussed and some measurement results including channel attenuation, input impedance, EMC, and BER performance will be presented. It will be shown that Important services based on the DLC+VIT4IP project has further strengthen PLC as a suitable technology for providing the much needed communication solution for the smart grid vision.

Figure 1: Modem Installations; Performance and EMC Measurements

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