EXECUTIVE SUMMARY

Session 2 – POWER QUALITY AND ELECTROMAGNETIC COMPATIBILITY

SUMMARY

This conference 125 papers have been submitted to session 2. Of these contributions, 30 have been presented in main sessions and RIF and 108 as posters. The main focus of the session were the developments in power quality driven by energy transition and digitalisation, as well as advances in earthing and EMC. The paper "Impact of Reserve Market Participation on Power Quality of Flexibility Resources and Local Electricity Networks" (paper 10618) by Antti Hildén received the BYAA of Session 2.

MAIN SESSION 2 - BLOCK 1

EMC, Earthing and Safety

The majority of the papers in block 1 was addressing the design of earthing systems as well as the assessment of earth potential rise and verification of safety criteria like touch voltage. New challenges were identified for instance in case of large-scale PV installations. There seems to be a consensus that in general the bonding of different earthing systems improves safety. A future challenge could be the connection of DC and AC earthing systems. Switching and lightning transients and remedial measures like RC snubbers and surge arrestors have been discussed during the poster tour. Electric and magnetic fields played a minor role in this year's conference.

MAIN SESSION 2 - BLOCK 2

Equipment related Power Quality Aspects

This main session was dedicated to equipment's influence on power quality. This included measurements of railways psophometric current limits and troubleshooting of solar generation connections. Furthermore, the charging frequency standards of grid-connected PV and battery inverters in LV grids have been addressed. Grid stability is an upcoming topic with presentations on grid-supporting inverters and overvoltage ride through requirements. PLC remains a challenge and was addressed in a presentation on the modelling of power cables for PLC simulation.

MAIN SESSION 2 - BLOCK 3

System related Power Quality Aspects

The majority of papers allocated to Block 3 deals with harmonics (frequencies below 2 kHz) and supraharmonics (frequencies above 2 kHz) from different perspectives, like measurement and simulation as well as allocation of limits and assessment of contribution of harmonic emission from customer installations. Many papers highlight the importance, but also the challenges related to the frequency-dependent impedance. Remaining papers deal with established phenomena like unbalance, voltage variations (voltage band), flicker and voltage dips, but considering new perspectives. Emerging topics are PQ aspects related to LVDC grids, AC microgrids and the impact of active customers (prosumers) on PQ in LV networks.

MAIN SESSION 2 - BLOCK 4

Standards, Measurements, Regulation and Advanced Data Analysis

This block focused on new developments in standards, measurements, regulation and advanced data analysis. This included the impact of frequency reserve participation by flexible resources on PQ and the monitoring of voltage quality by the regulator as well as issues and challenges, related to new interharmonic limits for

standardization. Advanced data analysis, dealing with the impact of missing data on trend analysis, application of machine learning to automated load control detection and graphical representation of long-term PQ data.

ROUND TABLES

Safety and Earthing Facing Modern Technologies

This round table discussed the issues and challenges of safety and earthing facing modern technologies. Five speakers discussed possible applications of risk analysis, the change from resonant to low impedance grounding for a MV grid, the benefits of connecting earthing systems and findings from earth potential rise monitoring.

Power Quality and Other Challenges in DC Grids

In this round table, six experts explained the challenges and bottlenecks in the use of DC grids and presented their views on power quality-related aspects, both in LV and MV networks. The aspects and challenges with respect to the standardization of DC networks both in topologies and advisable voltage levels were discussed. Furthermore, the advantages of the use of DC networks, especially related to the use of renewable energy from energy efficiency point of view were highlighted.

Turning Data into Information – Future Needs in Power Quality Data Analysis

This round table discussed the current status and future perspective of PQ data analysis with six speakers representing the major stakeholders in this topic, namely distribution system operators, transmission system operators, consultants, academia, power quality instrument manufacturers and test and monitoring equipment manufacturers. While there was a common understanding that further analysis tools are needed in order to make the most of the information contained in the continuously increasing amount of power quality data, it was emphasized that clear use cases for the application should be carefully defined before starting a monitoring activity.

RESEARCH & INNOVATION FORUM

Power Quality Challenges related to E-mobility

The focus of this year's RIF were challenges related to fast charging of electric vehicles, mainly with regard to harmonics and supraharmonics. Next to the findings of long-term measurement campaigns challenges and approaches in modelling and simulation have been presented and discussed. The contributions also confirmed that next to the emission itself the frequency-dependent input impedance is of crucial importance for accurate models and better understanding of propagation in the network.

POSTER TOURS

In four tours dedicated to the four blocks of the session, the authors presented 108 posters briefly and got questions from a very interested audience. The tours covered a large variety of topics related to earthing, EMC and power quality.

CONCLUSIONS

The session experience was very good with a high number of delegates in each of the slots. Especially the round tables dedicated to specific topics received rising interest. In the main sessions the actual developments in earthing and EMC, equipment and system related PQ as well as standards, measurements, regulation and advanced data analysis were presented by selected papers and have been discussed lively by the audience both live and via Q&A. The poster tours had many interested participants and the authors gave a broad overview on many different aspects and innovations in the field of power quality and EMC.