EMRP Project: "Next generation of power and energy measuring techniques"

THE DEVELOPMENT AND CHARACTERIZATION OF AN ON-SITE HIGH CURRENT MEASURING SYSTEM BASED ON ROGOWSKI COIL

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Measurement system design and prezentation

- *Measurement system based on Rogowski coil uses electro-optical transfer of the measured signal;*
- *The HV current sensor is based on patented multi-winding technique of Rogowski coil; the sensing coil consists of two wire groups wound in opposite direction on the same supporting core;*
- *Rogowski coil is characterized for currents up to 10 kA at frequency 50 Hz;*
- *Figure 1 describes the structure of complete sensor cable with sensor coil and electrical shielding coil;*
- *Figure 2 represents a comercial available Rogowski coil produced by Applied Precison Ltd.*

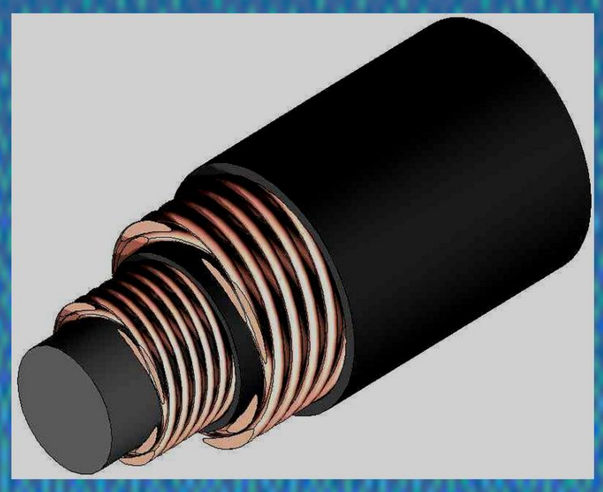

Fig. 1

Fig. 2

Rogowski coil calibration on winding toroidal

- *The measurement of linearity was performed in the range of current (1 –10) kA at frequency 50 Hz;*
- *A power source type 8120B and a standard of power and energy meter type RS2310E (products of Applied Precision Ltd), wich are shown in figure 3, are used for a calibration of the Rogowski coil;*
- *High current for calibration of the Rogowski coil is generated in the toroidal arrangement;*
- *The air core toroid coil generates homogeneous circular magnetic field simulating the field of ideal infinite wire;*
- *Linearity characterization (ratio error) of the measurement system with the Rogowski coil is presented in figure 4.*

Fig. 3

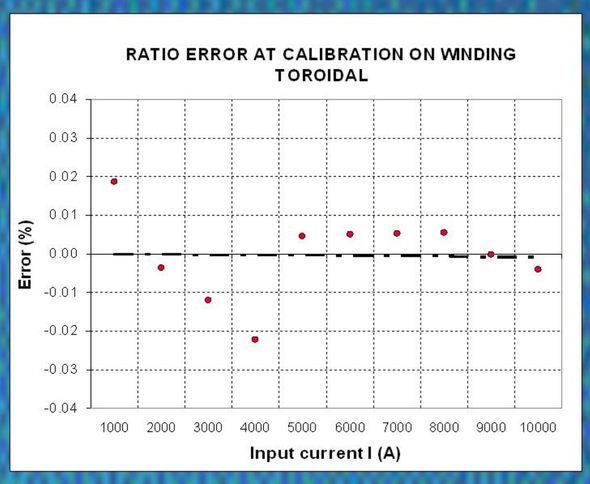

Fig. 4

Rogowski coil calibration on busbar

- *The measurement of linearity was performed in the range of current (1 –10) kA at frequency 50 Hz;*
- *A high current source, a standard current transformer and a standard of power and energy meter type RS2310E, wich are shown in figure 5, are used for a calibration of the Rogowski coil;*
- *High current for calibration of the Rogowski coil is generated in a linear busbar by a high current source;*
- *Rogowski coil accuracy is calibrated with the busbar centered in the coil window;*
- *Linearity characterization (ratio error) of the measurement system with the Rogowski coil is presented in figure 6.*

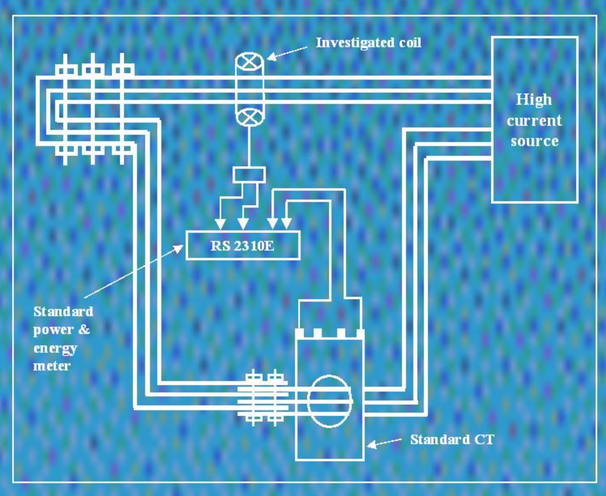

Fig. 5

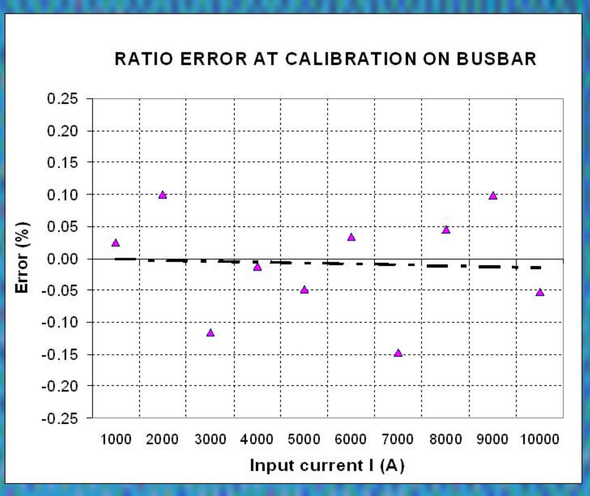

Fig. 6

Influence of a position of the coil on busbar

- *In practice a Rogowski coil hangs on the busbar, as presented in figure 7, which introduce measurement errors;*
- *The position of the busbar in relation to the Rogowski coil connector effects the overall accuracy of the coil readings;*
- *A Rogowski coil accuracy was study when coil's conector was placed around a busbar;*
- *The error is greatest when the coil connector is on the busbar;*
- *In figure 8 is presented the errors chart due to position of coil conector on the busbar at different currents.*

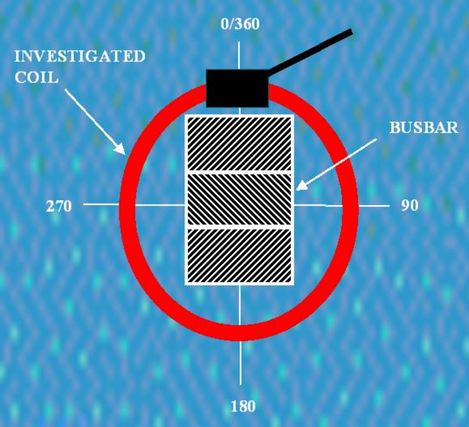

Fig. 7

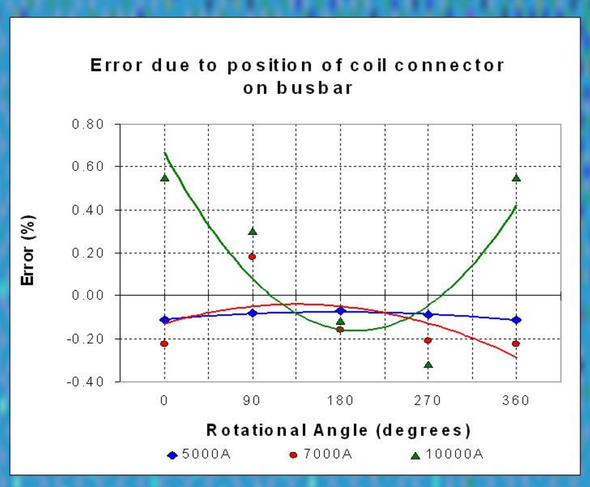

Fig. 8

Conclusions

- *The high current measurement system for on-site application using Rogowski coil was designed, manufactured and calibrated;*
- *The Rogowski coil designed and manufactured by Applied Precision Ltd is suitable for on-site precision measurements;*
- *The galvanic separation of the Rogowski coil and the output unit was achieved using the optical fibers for data and power transfer;*
- *The system was characterized within the current range (1 – 10) kA by measurement of linearity for ratio error and phase error.*