



Geomagnetically induced currents recorded in the Czech power lines

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Geomagnetically induced currents (GICs) are generated in power networks as well as in long oil or gas pipelines. In the latter case the GIC are manifested by voltage change in the cathodic protection installed by pipeline operator. The system for detection of GICs in the power lines was developed at the Faculty of Electrical Engineering of the Czech Technical University. The measurement system consists of two current sensors. The first is commercially available split core sensor LEM HOP 800 with Hall probe. Next, the fluxgate based current sensor consisting of sixteen DRV425 integrated fluxgate magnetic sensors was developed. The sensors are placed around the measurement bus bar (100 x 10 mm) and integrate the magnetic field in discrete points. The measurement system was installed in the neutral line of the distribution transformer located in the station Mirovka near Havlickuv Brod in the center of Czech Republic (GPS: N 49°34.84', E 15°35.95'). The lines go north-west direction about 200 km without any grounding connection.

The data from both current sensors are available via LTE (wireless communication standard) and can be analyzed online or offline later. The current flowing through the neutral line of the distribution transformer consists of two parts. The main AC component is created by the non-perfectly balanced distribution network. The DC or quasi-DC component is caused by the different electrical potentials between two transformers. It is caused by the return or stray currents or by geomagnetic activity.

Relation between the geomagnetic activity and current between the neutral point of the distribution transformer and ground was investigated. The geomagnetic activity was characterized by the time changes of the horizontal components of geomagnetic field, dB_x/dt , dB_y/dt , observed at the Geomagnetic Observatory Budkov, and by a simple planar model of geoelectric field E_x , E_y .

The measured data were filtered with low-pass filter 0.45Hz to get only the quasi-DC currents. The data were correlated with the variation of geomagnetic field. The preliminary results show that distinctive affect was observed by high geomagnetic activity characterized by Kp-index 6 or higher.

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