

Interactive comment on “Protection against lightning on the geomagnetic observatory” by R. Čop et al.

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Thanks for your opinion, questions and suggestions.

On our observatory we use two isolation transformers in cascade for very effective galvanic isolation of all devices from the public electric power line. Each of them functions like limiter, in serial connection compose very robust electric filter and offer overvoltage protection. In case of lightning fuse of 10 A reacts (blows) on the primary side of first transformer in cascade and not standard and obligatory SPD element (Figure 5).

Last year we tested overvoltage protection for one of ours three-ax fluxgate magnetometers. We added quick diodes TVS type P6KE11 to +15 V and Schottky barrier

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rectifier type 1N5819 to 0 V between the connector on its electronic box and the cable to the sensor. We had defined the protection elements but the right connection between wires and wires to virtual ground defined the constructor of instrument. The diodes for overvoltage protection are no-linear elements connected parallel to the coils of sensor. This protection caused nonlinear drift of measuring results for 14 nT near zero value of the instrument and introduced offset was not effective all over the scale. With other words it coursed change of scale-factor. In the test period for safety's sake we used two equal electronic boxes for the same variometer: one without overvoltage protection during absolute measuring and other only for the test of overvoltage protection in rest of time for continuous recording.

The evaluation of the influence of each separate lightning stroke comes from Equation 1. This equation is presented in text in wrong form. Its final right form for induced voltage is $u_i(t) = -k \frac{1}{L} \frac{dI}{dt}$. It was used for calculation of ratio presented in the last column of Table 2.

After the positive result with the new overvoltage protection we decided to order new variometer for reserve location with adequate request at the beginning of this year. We will put it in function in next two months. Its producer made all necessary laboratory tests and I hope that the results of these tests will be published together with results of continuous measurements.

Observation of the secondary effects of lightning was really very interesting in the time of testing of overvoltage protection. The presentations of all observed effects exceed this article. The importance of this knowledge to understand local conditions is notified also in abstract. From our observatory is possible to transmit on another location only principles of technical solution but not specific condition for formation of lightning neither in advance prescript necessary additional knowledge.

To mark the position of observatory on Figure 3 the statistical data mentioned already in Chapter 2 will be presented more clearly. Absolute value of geomagnetic field in Figure

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4 is possible to get as the result of the direct measurement or as the calculation from the measurement results of two different variometers with different standard orientation. For verification we used all three possibilities.

Best regards, Rudi Čop

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