Overview and first results of the Polish-Hungarian ELF instrumentation campaign carried out in the Bieszczady Mountains in May 2025

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Objectives



Main objective: to test the sensitivity, calibration and timing accuracy of the induction coil magnetometers used by the three groups in the same electromagnetic environment.
 Further goal: to assess the possible impact of local ground conductivity structures on the ELF measurements.

Timeline

Session 1	Session 2	Session 3	Session 4	Session 5
 May 19 afternoon Installation + preliminary checking of the functioning of the probes Parallel configuration Sampling: 4 kHz 	 May 19-20 night Checking the sensitivity and calibration of the probes Parallel configuration Sampling: 4 kHz 	 May 20 morning Checking the timing with artificially generated impulses Parallel configuration Sampling: 4 kHz 	 May 20 afternoon Further data collection Parallel configuration Sampling 1000 Hz 	 May 20-21 night Data collection in normal operation Perpendicular configuration Sampling 500 Hz

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Dynamic spectrum (E11 system)



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Comparison of the transfer functions*



* This information is not yet available for the recording system used by the Belsk group.

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Calibration test (Session 2)



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Calibration test (Session 2)



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Calibration test (Session 4)*



* From now on, the E11 data are multiplied by 2 to take into account this calibration difference.

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Example events (Session 2)



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Example events (Session 3)

t0 = 2025-05-20 10:05:05



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Example events (Session 3)

t0 = 2025-05-20 10:15:02



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Example events (Session 4)

t0 = 2025-05-20 11:08:49.001778



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Example events (Session 5)

t0 = 2025-05-20 15:22:56.874522



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Sensitivity test (Session 2)



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Sensitivity test (Session 4)



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Comparison of spectra (Session 2)



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Comparison of spectra (Session 4)



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Comparison of spectra (Session 5)



Timing test (Session 3)



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Motivation for the MT measurements



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Preliminary conclusions

- There is a factor of 2 difference in the (amplitude) calibration of the two systems.
- There seems to be a problem with the timing accuracy of the LEMI system, which could be as large as 60 ms (depending on the measurement session).
- The noise level at 10 Hz is approximately the same in the two systems (the LEMI-120 coils needed several hours to calm down.).
- The upper cut-off of the LEMI system changes by changing the sampling frequency.
- It seems that we couldn't catch an ELF transient with long continuing current to demonstrate the advantageous properties of the broadband E11 system.

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Thank you for your attention!

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