

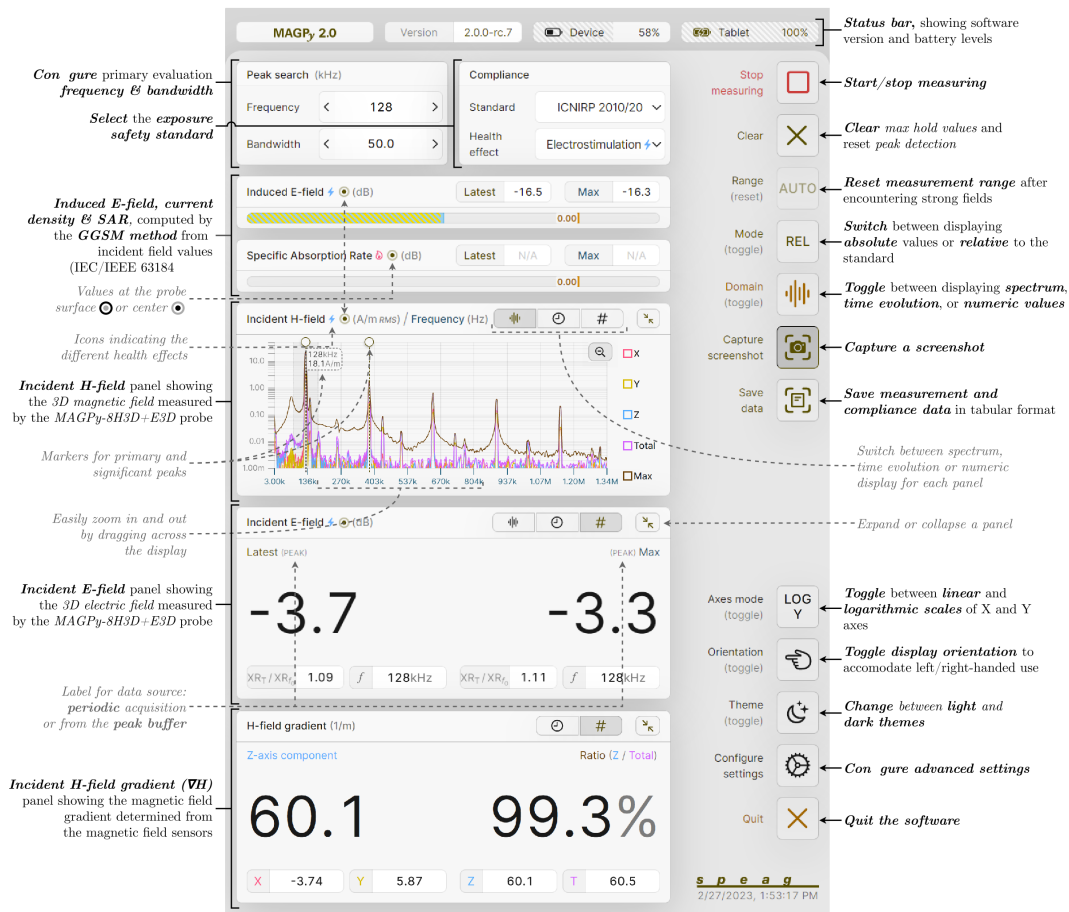
# MAGPy

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## MAGPy Version 2 for *In Situ* Evaluations of WPT and other Sources

The Magnetic Amplitude and Gradient Probe System MAGPy Version 2 was specifically developed for exposure and compliance evaluations of wireless power transfer (WPT) systems and any other strong magnetic near-field sources operating at frequencies from 3 kHz – 10 MHz with respect to reference levels and basic restrictions. The probe is constructed of 24 small time-domain loop sensors arranged on the corners of a cube for determining the magnetic (H/B-) field amplitude and gradient, and of two dipole sensors and a monopole sensor to measure the electric (E-) field amplitude simultaneously. Conservative estimates of the induced E-field, current density, and specific absorption rate (SAR) in the human body at any position are compared to basic restrictions, while the incident H/B- and E-fields measured are compared to reference levels and displayed in real time in the time domain or frequency domain on the intuitive graphical user interface (GUI). By comparison with basic restrictions, MAGPy Version 2 reduces the exposure overestimation introduced by compliance testing with reference levels by up to 40 dB. MAGPy Version 2 is fully compatible with IEC PAS 63184 (Clause 5.2.3 and 5.2.4) and enables compliance testing compatible with FCC KDB 680106 D01 and ISED Canada SPR-002 for devices with large coils (>100mm). The device may also be applied to validate the numerical device under test (DUT) model (see Application Note: Testing Compliance of WPT Devices by Simulations: Best Practice).





MAGPy Version 2 (top: device with redesigned probe Version 2; bottom : GUI SW V2.4+)

<p><b>System</b></p>	<p>MAGPy is composed of the redesigned MAGPy-8H3D+E3D probe Version 2 and the MAGPy Data Acquisition System (MAGPy-DAS), connected to the tablet PC with the intuitive browser-based GUI. The induced E-field, current density, and SAR are assessed by using the novel generic gradient source model (GGSM).</p>
<p><b>Applications</b></p>	<p>MAGPy is optimized for <i>in situ</i> exposure and compliance evaluations at any location with high fields, including:</p> <ul style="list-style-type: none"> <li>▪ Automotive/vehicular/train WPT</li> <li>▪ Industrial and utility (e.g., industrial welding, induction cooking, electronic article surveillance, and WPT)</li> <li>▪ Energy supply (e.g., installation and operators of WPT networks)</li> <li>▪ Ubiquitous devices equipped with WPT technologies (e.g., mobile phones, implantable medical devices, wearable devices, and Internet of Things (IoT))</li> <li>▪ High power electromagnetic (EM) sources</li> </ul>
<p><b>Basic Configuration</b></p>	<p>MAGPy basic configuration:</p> <ul style="list-style-type: none"> <li>▪ MAGPy-8H3D+E3D Probe Version 2 (Flat Tip)</li> <li>▪ MAGPy-DAS</li> <li>▪ Surface Pro Tablet PC incl. handheld-mount-adaptor</li> <li>▪ Cables and chargers</li> <li>▪ Calibration certificate</li> <li>▪ Device case</li> <li>▪ Manual</li> </ul>

MAGPy-DAS	<p>MAGPy Data Acquisition System specifications:</p> <ul style="list-style-type: none"> <li>▪ 27 14-bit ADC channels with 25 MSPs</li> <li>▪ Peak detection stage</li> <li>▪ Hardware supervising unit</li> <li>▪ Data transfer to backend</li> <li>▪ 22 tap FIR filter</li> </ul>
MAGPy-8H3D+E3D Probe	<p>Probe design (Version 2):</p> <ul style="list-style-type: none"> <li>▪ Diameter: 60 mm</li> <li>▪ 8H3D: 8 isotropic H-field sensors (loop: 1 cm<sup>2</sup>; arranged at the corners of a cube of 22 mm side length)</li> <li>▪ E3D: 1 isotropic E-field sensor (dipole/monopole)</li> <li>▪ Virtual center of all sensors: 18.5 mm from the tip</li> <li>▪ Lowest H-field sensors: 7.5 mm from the flat tip</li> <li>▪ Dimension: 110 mm x 635 mm x 35 mm (MAGPy-8H3D+E3D and MAGPy-DAS combined)</li> </ul> <p>Sensor specifications:</p> <ul style="list-style-type: none"> <li>▪ Frequency range: 3 kHz – 10 MHz</li> <li>▪ H-field dynamic range: 0.1 – 3200 A/m, 0.12 μT – 4 mT</li> <li>▪ H-field gradient range: 0 – 80 T/m/T</li> <li>▪ E-field dynamic range: 0.08 V/m – 2000 V/m</li> </ul>
Software V2.6+	<p>The MAGPy software (SW) V2.6+ is easy to use via its intuitive GUI installed on the tablet PC. The following is displayed in real-time:</p> <ul style="list-style-type: none"> <li>▪ Status bar (SW version, device/tablet battery statuses)</li> <li>▪ Evaluation frequency &amp; bandwidth</li> <li>▪ Safety standard (RL and BR)</li> <li>▪ Induced E-field/current density &amp; SAR</li> <li>▪ Time-domain 3D E-field (switchable to FFT spectrum)</li> <li>▪ Time-domain 3D H-field (switchable to FFT spectrum)</li> <li>▪ Time-domain H-field gradient</li> <li>▪ Settings (recording, snapshot / replay option, standard selection, etc.)</li> </ul> <p>The latest software and firmware can be downloaded <a href="#">here</a>.</p>

## Application Programming Interface

The MAGPy V2.6+ desktop application includes an HTTP server that exposes a REST-like application programming interface (API; Representational State Transfer). The API allows controlling parts of the application via HTTP requests as well as obtaining the same readings as those displayed in the user interface.

The interchange data format for both inputs and outputs is JavaScript Object Notation (JSON). The ubiquity of REST-like APIs and JSON allows easy integration in other services.

The MAGPy-API enables:

- complex scanning with a robot, e.g., below a car or inside the car
- remote or long-term monitoring of field levels
- monitoring in high field strength or hazardous environments
- applications where the field is to be measured at several peak frequencies under automated control

Watch this [video](#) to experience the MAGPy-API.

Calibration	MAGPy-8H3D+E3D probe calibrated according to IEC PAS 63184 (ISO/IEC 17025 accredited)
Verification	See <a href="#">verification sources</a>
Dimensions & Weight	200 mm x 635 mm x 44 mm 2.2 kg (including tablet PC)
Temperature range	0 °C – 35 °C
MAGPy2 Validation	Validation documentation are available
EM Safety Guideline Compatibility	MAGPy2 Version 2.4+ enables exposure evaluation and compliance assessment against reference values and basic restrictions according to: <ul style="list-style-type: none"><li>▪ ICNIRP 1998</li><li>▪ ICNIRP 2010/2020</li><li>▪ IEEE 2019</li><li>▪ FCC 2020</li><li>▪ HC Code 6</li></ul>
Standard Compatibility	MAGPy2 Version 2.4+ is fully compliant with: <ul style="list-style-type: none"><li>▪ IEC PAS 63184 for WPT (Tier 3 and Tier 2)</li><li>▪ Induction heating (LF): EN 50519</li><li>▪ Electric arc or induction smelting</li><li>▪ Household appliances: IEC/EN 62233</li><li>▪ RFID/EAS: EN 50364, IEC/EN 62369-1</li><li>▪ Medical devices: IEC 60601</li><li>▪ Electronic/electrical equipment: IEC/EN 62311</li><li>▪ Workplace assessment: EN 50499</li><li>▪ Assessment of workers bearing AIMDs: EN 50527-1</li><li>▪ Human exposure assessment: EN 50413</li><li>▪ FCC KDB 680106 D01 (coils &gt;100mm)</li><li>▪ ISED Canada SPR-002 (coils &gt;100mm)</li></ul>

## Unique Features

Wide Frequency Range	3 kHz – 10 MHz
H-Field Sensors	Multiple 1 cm <sup>2</sup> loop sensors
E-Field Sensors	Sensors integrated in the probe sphere
Measurement Range	0.1 – 3200 A/m (0.12 μT – 4 mT) 0.08 V/m – 2000 V/m
Gradient Range	0 – 80 T/m/T
Sampling Rate	25 MHz (real-time decimation supported for H/B-field sensors)
GUI	Easy to use
API Interface	Python based

### Benefits

Basic Restrictions & Reference Levels	The only instrument that can determine compliance with basic restrictions <i>in situ</i> (reduction in exposure overestimation compared to reference-level-based approach in high gradients > 40 dB)
Increased Accuracy	High spatial resolution (1 cm <sup>2</sup> ) Excellent isotropy in near-field (errors of large probes > 4 dB) Determination of field gradients
Large Dynamic & Frequency Range	Covers the major range of near-field WPT sources Measures fields from <1% to up to four times the occupational limits
Novel Standardized Compliance Testing Method	Estimation of induced fields with amplitude and gradient information of incident fields (GGSM method)
Reduced Interference	Low interaction with the measured fields
All-in-One Device	Measures incident (H/B/E-) fields for assessment of compliance with reference levels and basic restrictions
Turnkey	Fully equipped with web-based GUI and embedded software for compliance testing
Standard Compatible	Compliance testing procedure in line with the latest standards (IEC PAS 63184)
Trusted	Confidence in capturing all fields close to source and with small measurement uncertainty

### Compatibility

[DASY8 Module R&D](#)

### Product History

The measurement technology and method were developed in collaboration with the IT'IS Foundation, ETH Zurich and were co-financed by INNOSUISSE.

MAGPy1 is discontinued and upgrades to MAGPy Version 2 are available

### Release Date

March 2023