WAVECONTROL

Measurement Capacities

SMP2 + WP400 or WP400-3

APPLICATION NOTE

AN_SMP2+WP400-WP400-3_MC_EN_V1.01

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Index

Application Note
SMP2 + WP400 or WP400-3: Measurement Capacities

1. INTRODUCTION

The **SMP2** + **WP400** or **WP400-3** field probe combination is the most complete and compact available on the market for evaluation of human exposure to low frequency electromagnetic fields. It allows evaluation of the electric **field (E)** and the magnetic **field (H)** using a single probe, over a frequency range of **1 Hz to 400 kHz**.

This document describes the different measurement options available:

- **Broadband**
- **Selective (FFT)**
- **Single frequency evaluation**

The choice of option will depend upon the specific application and the objective of the measurement or evaluation.

This document also describes the **Weighted Peak Method (WPM)**, which may be used with any of those three options.

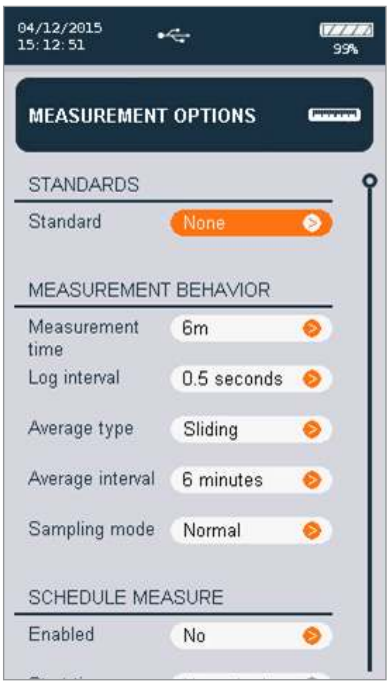
2. MEASUREMENT METHODS

The **SMP2** + **WP400** or **SMP2** + **WP400-3** combination allows you to choose any of **3 measurement methods**.

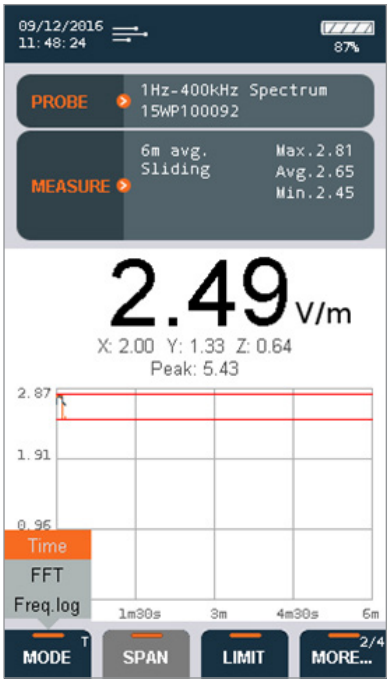
2.1 Broadband measurement

Broadband measurements may be made of the electric **field (E)** and the magnetic **field (H)**. In this case, the device takes the full spectrum into account, measuring all the energy present within the **1 Hz to 400 kHz** frequency range. The result is a single value in units of electric field intensity or magnetic flux density, for aggregate exposure across the full range.

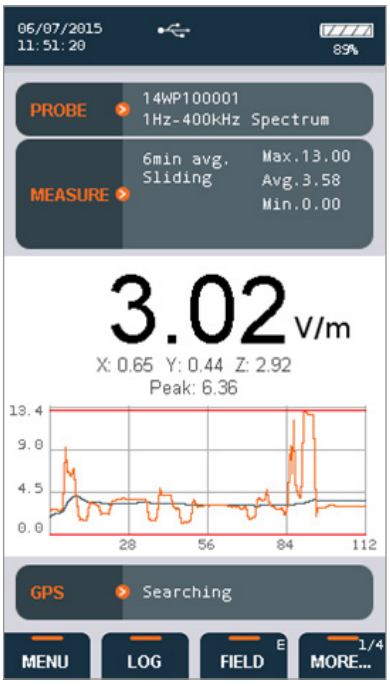
The "**MEASUREMENT OPTIONS**" menu is used to select the measurement time, the log interval, the average interval and the average type, as shown in the figure below. Special averages may also be made using the "**Sampling mode**" option:



Once the measurement behavior is defined, the next step is to choose the "**Time**" option on the "**MODE**" dynamic menu:



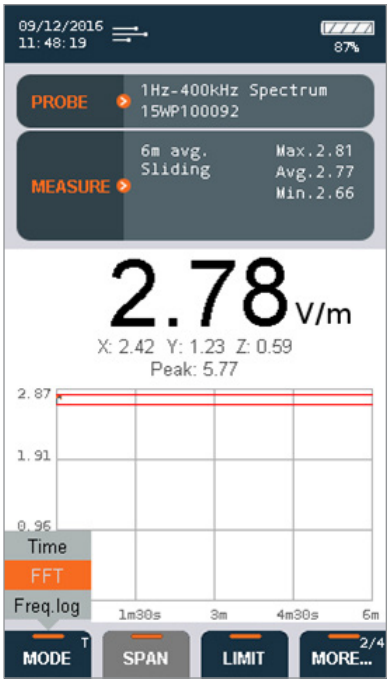
To start the measurement, now all that you need to do is select "**LOG**" on the dynamic menu:



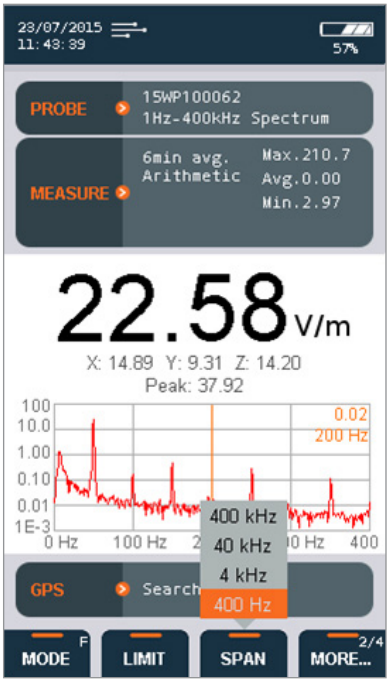
2.2 Selective measurement (FFT)

The **SMP2** + **WP400** or **SMP2** + **WP400-3** allows you to make selective measurements by means of real-time **FFT**-based signal analysis using digital signal processing techniques. This can be done for both the **E field** and the **H field**, over different frequency spans: 400 Hz, 4 kHz, 40 kHz or 400 kHz.

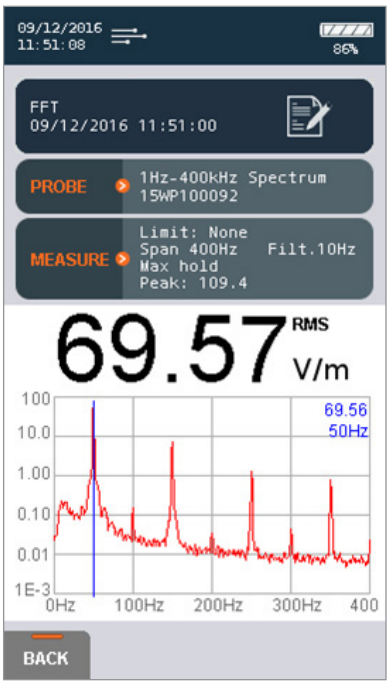
First of all, select the "**FFT**" option on the "**MODE**" dynamic menu:



The spectrum then appears on the **SMP2** display. You may now select the desired span:



If you then press "**LOG**" on the dynamic menu, the **FFT** of the signal will be saved:

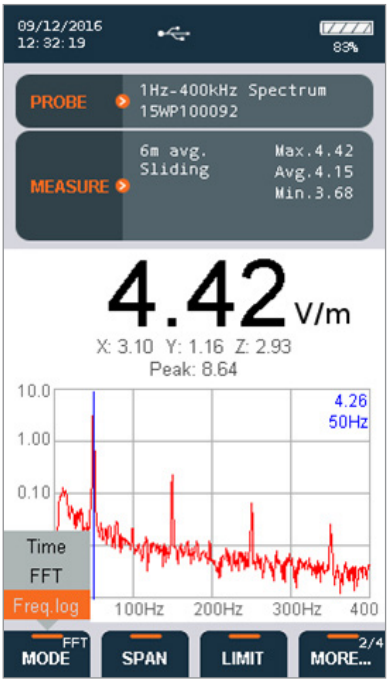


2.3 Single frequency evaluation

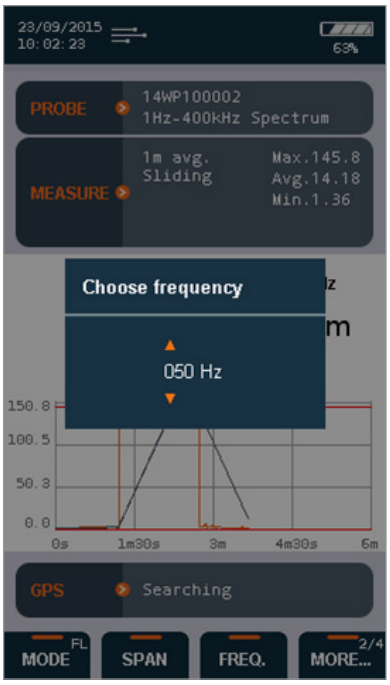
This measurement mode allows you to track changes in a given frequency over time. The display shows the values in real time as they are obtained (each second).

This tracking can be done in two ways:

- In **FFT** mode place the cursor on the desired frequency and change to "**Freq. log**" on the "**MODE**" menu:



- Select the "**Freq. log**" mode directly on the "**MODE**" menu, then specify the desired frequency:



3. WEIGHTED PEAK METHOD

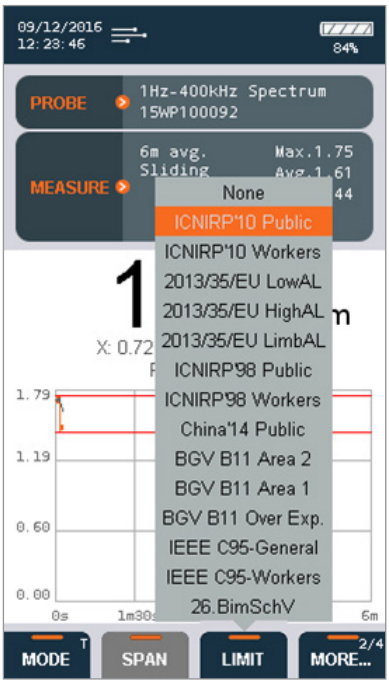
In the area of low frequencies considered here, which affects a wide variety of industrial processes, it is normal to find complex non-sinusoidal signals that are difficult to measure.

The **Weighted Peak Method (WPM)** is the most appropriate method to obtain the best results. There are other methods, such as the multifrequency fields summation method, which may give gross overestimates, since they fail to take signal phase into account.

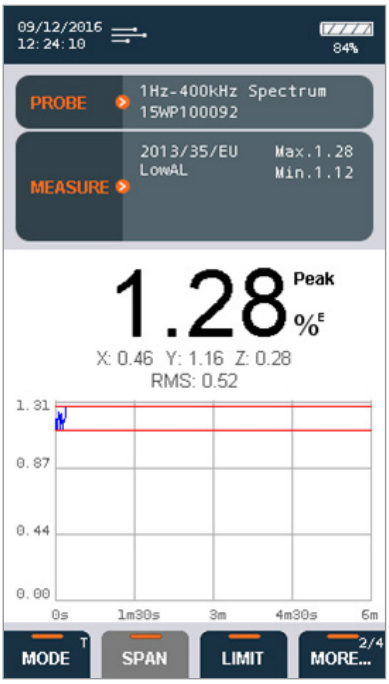
WPM performs inverse digital filtering, using a function that is the complement or inverse of the reference limits curve that we wish to use (**selectable**). This gives a result directly as a percentage (**%**) of the limits for which we are measuring exposure.

The **SMP2** offers an extensive list of limits corresponding to the different standards or laws of different countries. You can use **WPM** for any existing limits.

Weighted measurements using **WPM** can be taken with any of the three measurement methods mentioned above. All you need to do is select the reference limit from the list of available limits, then take the measurement as indicated for each method. To choose a limit, select "**LIMIT**" on the dynamic menu, as shown below:

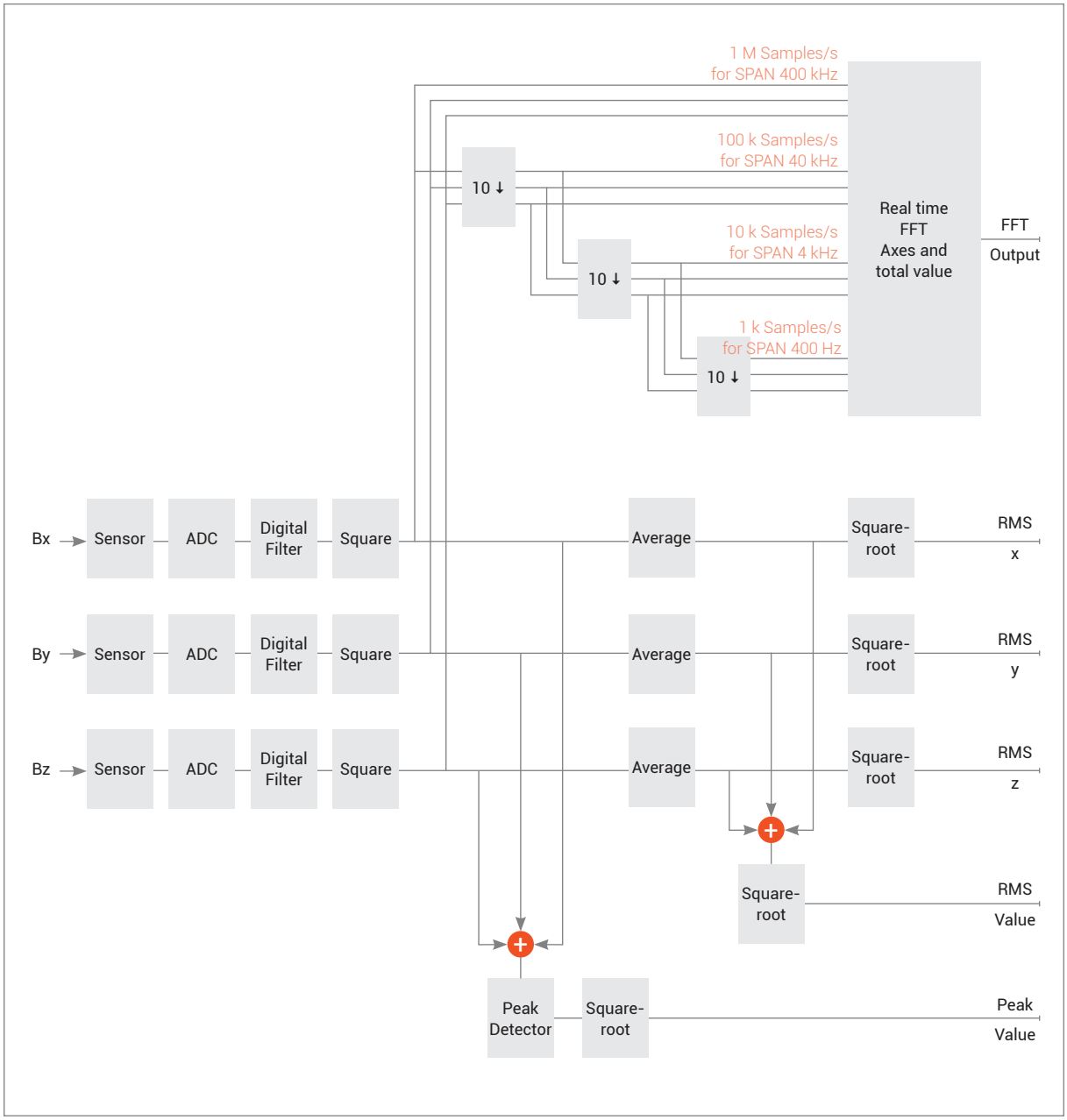


The figure below shows the weighted result for the broadband electric field in respect of the "**Low AL**" limits of Directive 2013/35/EU.



NOTE: *Please remember that this document is merely a summary of the different measurement methods and it is not meant to replace the recommended reading of the SMP2 User's Manual, which provides further information and details for proper use of the device.*

4. Simplified block diagram of RMS-Peak-FFT analysis



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