



# MTX 1050-PC

## 1 GHz Spectrum Analyzer

User's manual



CHAUVIN-ARNOUX Test and Measurement Division  
Parc des Glaisins  
6, avenue du Pré de Challes  
F - 74940 ANNECY-LE-VIEUX  
Tel. +33 (0)4.50.64.22.22 - Fax +33 (0)4.50.64.22.00

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## General Instructions

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### Introduction

Thank you for purchasing this METRIX spectrum analyzer. This device complies with safety standard EN 61010-1: 2001 applicable to electronic measuring instruments. For optimum service, read this manual carefully and comply with the operating precautions.

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### Symbols used on the instrument



#### **Warning: Risk of danger.**

Refer to the operating manual to find out the nature of the potential hazards and the action necessary to avoid such hazards.



In accordance with the WEEE 2002/96/EC directive

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### Precautions and safety measures



- This spectrum analyzer meets safety standard EN 61010-1. It is designed for use:
  - indoors,
  - in an environment with level-2 pollution,
  - at an altitude of less than 2000m.
- The operating temperature is between 0°C and 40°C, with a relative humidity of less than 80%.
- Its measurement input must not receive signals greater than + 25dBm and 30VDC.
- Read carefully all notes preceded by the symbol opposite.
- If you use this instrument in a manner that is not specified, the protection it provides may be compromised, putting you in danger.
- The safety of any system incorporating this instrument lies within the responsibility of the system's assembler.

#### **Prior to use**

- Do not place heavy objects on the instrument.
- Avoid knocks and rough handling that could damage the analyzer.
- For safety purposes, use only the appropriate power cord supplied with the instrument.

#### **Power supply**

- The power supply must be in the 230V range  $\pm 10\%$ .

#### **Ground**

- To avoid electric shock, the power cord must be connected to the ground. Make sure that it is in good condition.

#### **Fuse**

- The instrument is fitted with a fuse: 230V; 0.125A, slow-blow.
- Replace it only with a fuse of the same type.

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## General Instructions (contd.)

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### Warranty

This equipment is warranted to be free of defects in materials or workmanship, in accordance with the general terms and conditions of sale.

During the warranty period, repairs to the instrument may be carried out by the manufacturer only, who, at its sole discretion, may either repair the instrument or replace all or part of it. In the event that the equipment is returned to the manufacturer, initial transport costs shall be borne by the customer.

The warranty does not apply following:

1. *improper use of the equipment or use in connection with an incompatible device*
2. *modification of the equipment without explicit authorization from the manufacturer's technical services*
3. *repair carried out by a person not certified by the manufacturer*
4. *adaptation to a specific application not provided for in the definition of the equipment or in the operating instructions*
5. *an impact, a fall or a flooding.*

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### Metrological verification

Like all measuring or testing devices, regular instrument verification is necessary.

Information and address details available on request:

Tel. 02.31.64.51.55 - Fax 02.31.64.51.09

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### Instrument disassembly

Adjustments, maintenance or repair work on the instrument must only be carried out by qualified personnel.

A "**qualified person**" is a person who is familiar with the installation, its construction, its use and the hazards that exist.

They are authorized to activate and deactivate the installation and equipment, in compliance with the safety instructions.

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### Cleaning

Unplug the instrument then clean it with a cloth moistened with soapy water. Leave to dry before use.

Never use abrasive products or solvents.

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### Storage

After a period of storage in extreme environmental conditions, to ensure that the instrument is operating with its rated specifications, wait for the instrument to return to normal measuring conditions.

In particular, a violent change in ambient temperature (from cold to hot) can cause condensation inside the device and provoke short circuits.

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### Unpacking and repacking

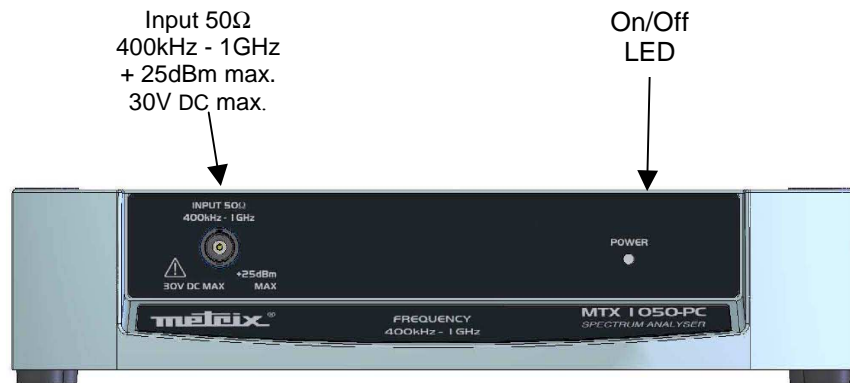
Perform a quick check for any damage that may have been caused during transport.

In you need to return equipment, use the original packaging and enclose written advice of the reasons for the return.

## Description of the instrument

### Front panel

#### Illustration

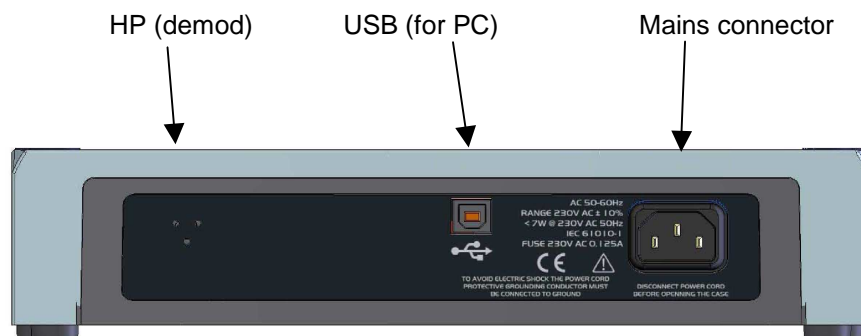


#### Markings



### Rear panel

#### Illustration



#### Markings



## Description of the instrument (contd.)

### Presentation

This spectrum analyzer is a bench-top device used in conjunction with a PC connected by a USB cable.

The user interface is not displayed directly on the instrument, but as part of the operating software.

This device measures the amplitude of HF signals up to 1GHz.

Capture occurs in the spectrum analyzer unit; the data is processed and displayed by software on the PC.

Signals are input through a 50Ω BNC connector on the front panel.

### Software

The MTX 1050 software must be installed in order to:

- control the spectrum analyzer
- supply the USB driver to the PC on the first connection

This software provides the graphic representation and the communication interface. It runs under Windows 98, Millennium, 2000 and XP.

Displayed data can be backed up, recorded and/or printed out.

### First USB connection to the PC

Once the MTX 1050 software has been installed, connect the analyzer to the PC's USB port:

Step	Action
1	The PC has detected the USB connection and will add a new device.
2	Select: "Do not connect to "Windows Update" to search for updates".
3	Choose: "Install from a specified location".
4	Select: <ul style="list-style-type: none"> <li>• "Find the best driver in these locations".</li> <li>• "Include this location in the search".</li> </ul> Specify: "C:\MTX1050\Driver".



***There may be a message to the effect that the driver is not Microsoft®-certified (WHQL); proceed with the installation nevertheless. The driver is stable and provides communication between the PC and the analyzer***

### Graphic representation

- The y-axis shows the dBm or dBμV levels.
- The x-axis shows the frequencies in MHz.

### Power supply

A removable power cord connects the instrument to the electricity mains (230V, 50Hz) through the mains connector situated on the front panel.

A red LED on the front panel indicates that the device is on.

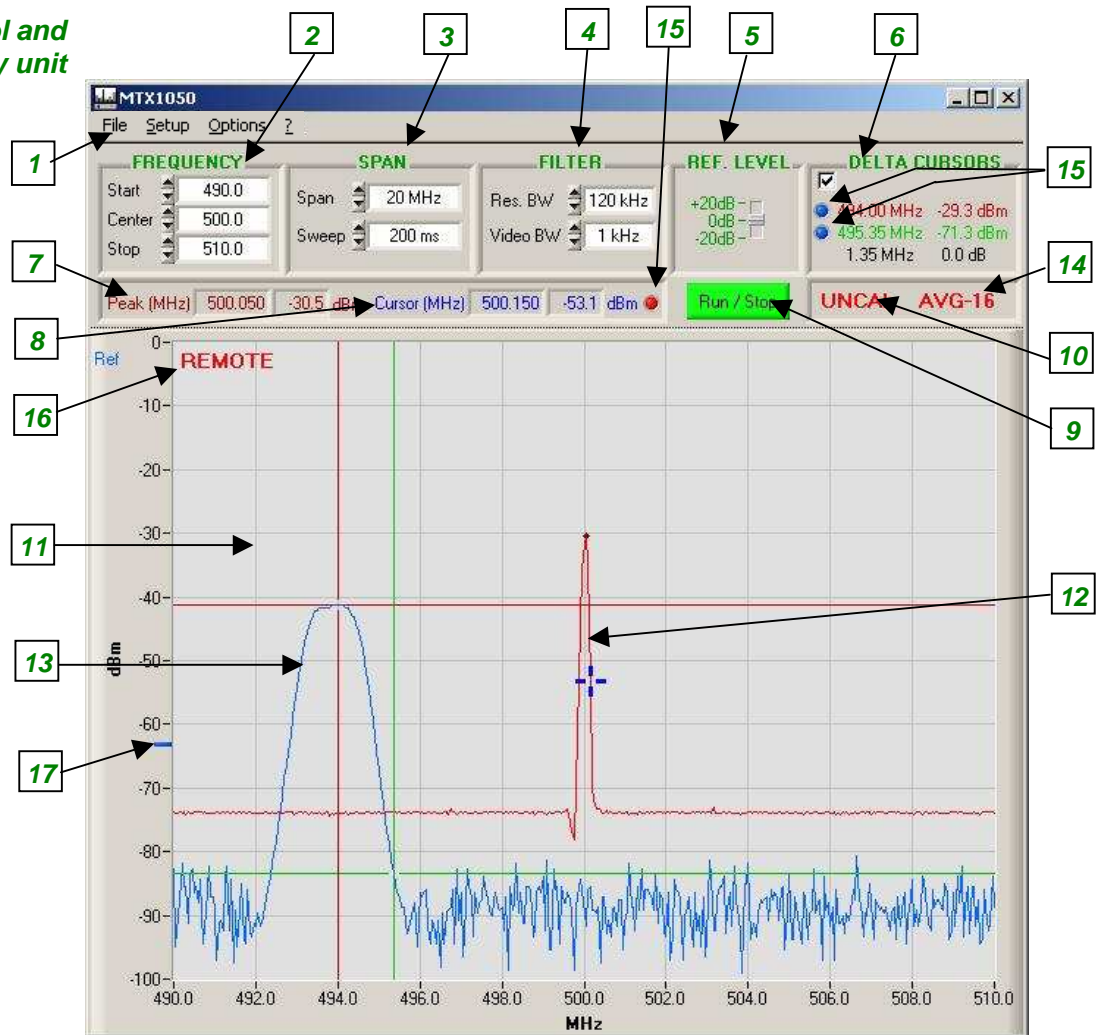
### HF connection

The analyzer's HF port is used to connect it to a circuit for testing or an antenna.

The frequency and level of the signals received are detected, then represented on the PC's screen, using the software.

## Description of the instrument (contd.)

Control and display unit



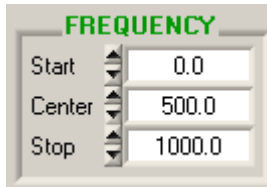
Key

Item	Explanation
1	Menus
2	Span frequencies
3	Span type and speed
4	Filters
5	Reference level
6	Delta cursor data
7	Peak cursor
8	Free cursor
9	RUN / STOP button
10	UNCAL message
11	Graph
12	Spectrum
13	Memory spectrum
14	Averaging coefficient
15	Visual indicators of the selected spectrum
16	Visual indicator of the REMOTE mode
17	Memory spectrum offset

# Functional Description

## Detailed description of the fields

### Start Center Stop frequencies



These 3 values characterize the frequency sweep for the span selected:

- **Start** indicates the span's start frequency
- **Center** indicates the span's center frequency
- **Stop** indicates the span's stop frequency

When one of the 3 frequencies is changed, the other 2 are automatically recalculated on the basis of the span.

#### Increment:

**Start, Center and Stop** can be adjusted by increments of  $\pm 0.1$  MHz

#### Dynamic:

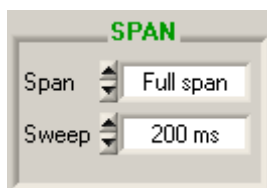
- Start** from 0 to (1000 - span) MHz
- Center** from (span/2) to 1000 - (span/2) MHz
- Stop** from span to 1000 MHz

*Example* The span is 100 MHz with:

- **Start** at 200 MHz
- **Center** at 250 MHz
- **Stop** at 300 MHz

If ...	Then ...
<b>Center</b> is set to 500MHz,	<b>Start</b> changes to 450 MHz (500 - 100/2). <b>Stop</b> changes to 550 MHz (500 + 100/2).

### SPAN frequency range



The **SPAN** represents the frequency band covered by the analyzer as it sweeps its reception signal.

There is a pre-defined list of spans:

- Full span
- 1000 MHz
- 500 MHz
- 200 MHz
- 100 MHz
- 50 MHz
- 20MHz
- 10 MHz
- 5 MHz
- 2 MHz
- 1 MHz
- Zero span (fixed frequency)

At each change of span, the

- **Start**
- **Center**
- **Stop**

frequencies are automatically updated, taking the last frequency modified as a reference point.



## Functional Description (contd.)

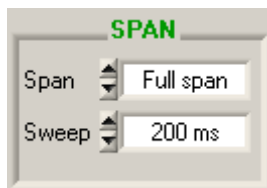
 *Example* The span is 100MHz with:

- **Start** at 200 MHz
- **Center** at 250 MHz
- **Stop** at 300 MHz

If the span changes to 50 MHz, there are 3 possibilities, depending on the last frequency modified:

If the last frequency modified is...	Then ...
the <b>Start</b> frequency,	<b>Start</b> remains at 200 MHz. <b>Center</b> changes to 225 MHz. <b>Stop</b> changes to 250 MHz.
the <b>Center</b> frequency,	<b>Start</b> changes to 225 MHz. <b>Center</b> remains at 250 MHz. <b>Stop</b> changes to 275 MHz.
the <b>Stop</b> frequency,	<b>Start</b> changes to 250 MHz. <b>Center</b> changes to 275 MHz. <b>Stop</b> remains at 300 MHz.

### SWEEP rate



The **SWEEP** rate represents the speed at which the frequency band (span) is swept.

The slower the sweep, the more accurate the representation of the spectrum in terms of level and frequency.

There is a pre-defined list of sweep rates:

- 30 ms
- 50 ms
- 100 ms
- 200 ms
- 500 ms
- 1 s

### Filter Res. BW Video BW



Two filters can be configured:

- the **RBW** resolution filter selects the resolution bandwidth in which the spectrum analysis is to be performed.

There are 3 RBW filters: 1 MHz (default value)  
120 kHz  
12 kHz

The latter 2 filters are used only with the appropriate spans and sweeps.

If the span is too great or the sweep too fast, the resolution filter returns to its default value (1 MHz).

- the **Video BW** video filter selects the filter at the end of the analysis in order to eliminate noise for the spectrum representation.

There are 3 video filters: 300 kHz (default value)  
10 kHz  
1 kHz

If the last filter (1 kHz) is activated with a sweep that is too fast, it may distort the level representation. If so, an "UNCAL" message appears to notify the user (see following page).

## Functional Description (contd.)

### Reference level REF LVL



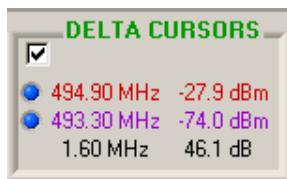
This field indicates the maximum level that can be analyzed and represented on the graph.

The default reference level is 0dBm.

Users should choose:

- a REF. LEVEL of +20dBm to analyze strong signals
- a REF. LEVEL of -20dBm to analyze weak signals

### DELTA Cursors



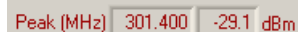
The **Delta Cursors** field displays the data for the 2 cursors on the graph.

These cursors are tied to the plot. Their coordinates are precise spectrum measurement points.

The following data are displayed:

- the frequency values of the 2 cursors,
- the level values of the 2 cursors,
- the difference (DELTA) in frequency and level between the 2 cursors level.

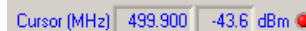
### PEAK cursor



The **Peak** cursor indicates the peak value measured on each new spectrum.

It gives the frequency and the level.

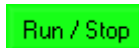
### Free cursor



The **free** cursor is tied to the plot; the user positions it at will on the entire spectrum.

It returns the frequency and the level.

### RUN / STOP button



The **Run / Stop** button is used to either freeze or reinitialize the spectrums.

If the analyzer is in "single" mode, pressing the Run / Stop button reinitializes a spectrum measurement.

The [ESC] button on the PC is a keyboard shortcut that serves the same purpose.

### UNCAL message



The **UNCAL** message appears if the Span, Sweep, RBW and VBW settings are incompatible with each other.

It notifies the user that the spectrum representation may be inaccurate with regard to level.

### AVG message



The **AVG-'n'** message appears when the "Averaging" function is activated.

'n' takes the following values: 2, 4, 8, 16, 32 or 64.

## Menus

---

<i>File</i>	File	Setup	Options	?
	Open Span ...			Ctrl+O
	Save Span ...			Ctrl+S
	Open Configuration ...			
	Save Configuration ...			
	Default configuration			
	Print ...			Ctrl+P
	1 c:\Data\mtx1050\p4-1M-F.spn			
	2 c:\Data\mtx1050\p3-1M-F.spn			
	3 c:\Data\mtx1050\p2-1M-F.spn			
	4 c:\Data\mtx1050\p2-1M-C.spn			
	Exit			

**Open Span ...** opens a \*.spn file.

The recorded spectrum is displayed in a different color on the graph and the analyzer is restored to the same configuration as that of the recorded spectrum.

The 2 spectrums can then easily be compared one above the other. The name of the open file is displayed in the title bar.

**Save Span ...** writes to a \*.spn file:

- all of the points of the spectrum displayed on the screen
- all of the analyzer's configuration parameters.

**Open Configuration ...** opens the \*.cfg files and restores the analyzer to the saved configuration.

**Save Configuration ...** saves the entire device configuration to a \*.cfg file.

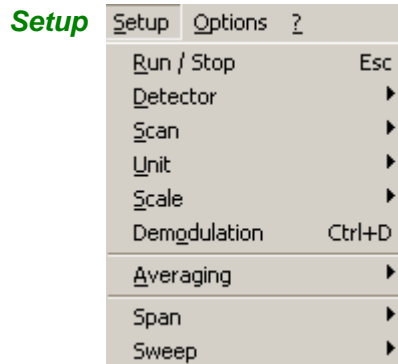
**Default Configuration** restores the analyzer to the default configuration at any time.


**Print ...** sends a screen capture.

**List of the last files opened** displays the last 4 files opened for rapid recall.

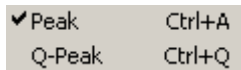
**Exit** exits the application. The device is no longer controlled, but is still on.

## Menus (contd.)



**Run / Stop** This submenu serves the same purpose as the  button on the front panel. It freezes or reinitializes the spectrums.

**Detector** selects the type of measurement: Peak or Quasi-Peak (Q-Peak).

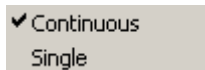



The Peak detector is used by default. The Q-Peak detector is reserved for EMC measurements where the rate is 1 measurement/second.

When Q-Peak measurement is activated:

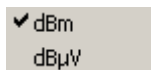
- the sweep and the video filter are no longer configurable
- the span is limited to a maximum of 100MHz
- the resolution filter is 120kHz

**Scan** This submenu selects the span display mode:

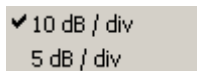


- continuous mode: the spans are displayed in succession
- single mode: after each span, the display has to be reinitialized by pressing the  button.

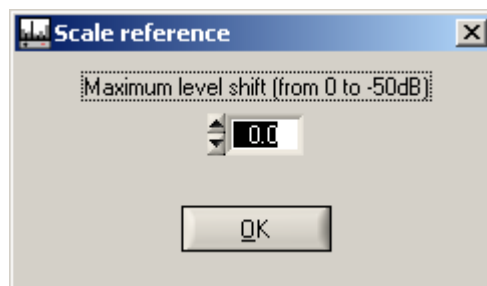
**Unit** selects the unit of measurement: dBm or dBμV.



**Scale** dilates the vertical scale and represents 5dB/division instead of 10.



The user chooses the max. scale level to represent (between 0 and -50 dB).



**Demodulation** activates FM demodulation on the analyzer's speaker.

## Menus (contd.)

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### Averaging

activates averaging of the spectrum's values.

- ✓ None
- × 2
- × 4
- × 8
- × 16
- × 32
- × 64

The possible coefficients are: x 2, x 4, x 8, x 16, x 32, x 64.

The average is calculated after each new acquisition.

It is calculated as follows:

Average = Previous average x (n-1) / n + new acquisition / n

"n" is the coefficient, ranging from 2 to 64.

### Span

Shortcut keys:

Next F4

Back F3

- |      |    |
|------|----|
| Back | F3 |
| Next | F4 |

### Sweep

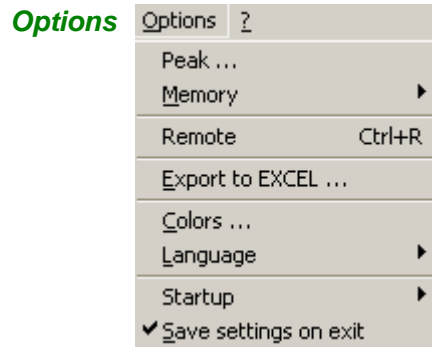
Shortcut keys:

Next F6

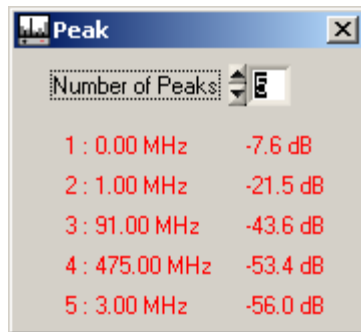
Back F5

- |      |    |
|------|----|
| Back | F5 |
| Next | F6 |

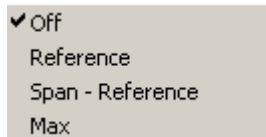
## Menus (contd.)



**Peak** Search function of all Peaks (from 1 to 10)



**Memory** These submenus configure the spectrum's management in the memory.

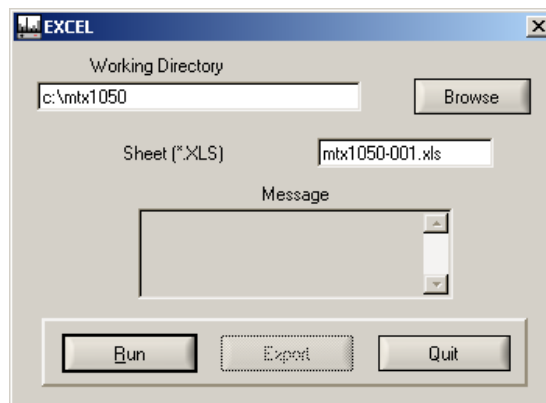


The options are:

- "Off" erases the memory
- "Reference" represents the memory only
- "Span - Reference" represents the difference between the current spectrum and the memory. In this case, the reference is deliberately shifted 50 dB to have an accurate representation within the graph.
- "Max" represents the maximum of each frequency

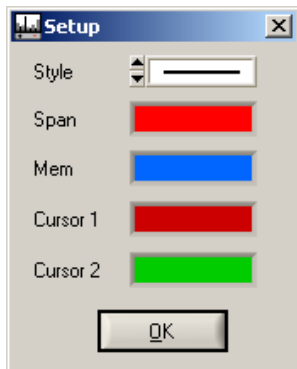
**Remote** activates the "Remote" mode of the device. Each "Span" is stored in a "remote.txt" file in the installation directory of MTX 1050.

**Export to Excel ...** activates transfer of the measurement points into Excel.




## Menus (contd.)

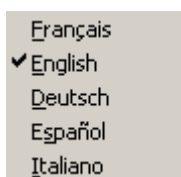
### Colors



This submenu configures:

- the style of the waveform: 
- the color of the waveform on the graph
- the color of the cursors.

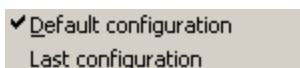
### Language



This submenu configures the software in 1 of the 5 languages available:

- French
- English
- Deutsch
- Español
- Italiano

### Startup



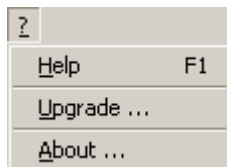
It is possible to start the device either:

- in the default configuration
- in the last utilisation configuration.

### Save settings on exit

The different parameters are saved, then restored on the next application startup.

### ? menu



**Help** displays the analyzer's operating manual.

**Upgrade ...** displays the web page for downloading software upgrades.

**About ...** provides information about the software.

## Technical Specifications

- Only values assigned tolerances or limits are guaranteed values.
- These values are established after a minimum warm-up time of 30 minutes.
- Values without a tolerance are provided for information purposes only.

<b>Frequency</b>	
<b>Range of use</b>	400 kHz - 1 GHz
<b>Accuracy</b>	0.625 10 <sup>-6</sup> except in Full Span (sweep: 30ms, 50ms, 100ms) and in 500MHz Span (sweep: 30ms, 50ms)
<b>Frequency stability</b>	± 5ppm/yr 50ppm from 0°C to 40°C
<b>Display window</b>	Full Span (0Hz - 1GHz), 500MHz, 200MHz, 100MHz, 50MHz, 20MHz, 10MHz, 5MHz, 2MHz, 1MHz, Zero Span (only one fixed frequency)
<b>Sweep rate</b>	30ms, 50ms, 100ms, 200ms, 500ms, 1s
<b>Filters</b>	
<b>RBW analysis filter</b>	1MHz, 120kHz, 12kHz
<b>VBW video filter</b>	300kHz, 10kHz, 1kHz
<b>Amplitude</b>	
<b>Reference level accuracy</b>	± 1dB to 300MHz at 23°C for an input level of -20dBm RBW analysis filter 1MHz VBW video filter 300kHz
<b>Flatness</b>	± 1.5dB at 23°C for -20dBm input (except in "UNCAL" configuration ) for ranges 500kHz - 1 GHz with 120kHz, 12kHz filters 5MHz - 1 GHz with 1MHz filter
<b>Linearity</b>	± 2dB to 23°C
<b>Ranges</b>	+ 20dBm to - 50dBm (attenuator 20 ± 1dB) + 0dBm to - 70dBm - 20dBm to - 90dBm (amplifier 20 ± 2dB )
<b>Noise floor (measurement dynamic)</b>	<u>without amplifier</u> - 80dBm typ. 12kHz filter AVG -16 <u>with amplifier</u> - 95dBm typ. 12kHz filter AVG -16
<b>Unit</b>	Log scale 10dB/div. or 5dB/div.
<b>Temperature impact</b>	± 0.25dBm/°C from 0°C to 40°C (typ. for 12 kHz filter)
<b>Resolution</b>	0.3dB and 0.1dB with averaging
<b>Harmonic distortion</b>	< -40dBc for -20dBm input
<b>Non-harmonic distortion</b>	< -70 dBc ( < -60 dBc : 3,2 MHz, 21,7 MHz, 237,5 MHz, 286 MHz, 512,5 MHz, 550 MHz, 750 MHz, 814,5 MHz, 887,5 MHz)



## Technical Specifications (contd.)

<b>Input</b>	
<b>Max. input voltage</b>	30VDC, + 25dBm
<b>Impedance</b>	50Ω
<b>Attenuator</b>	20dB
<b>Connector</b>	BNC
<b>Cursors</b>	
<b>Quantity</b>	3
<b>Resolution</b>	0.3dB / 10kHz and 0.1dB / 10kHz with averaging
<b>Mode</b>	Relative (delta function)
<b>Accuracy</b>	Identical to the accuracy of the signal amplitude
<b>Functions</b>	
<b>Demodulation</b>	Tone: Reduced BW (approx. 300Hz, 5kHz) Power: 0.2W
<b>PC communication</b>	
<b>Interface</b>	USB
<b>Software</b>	Supplied on CD; upgrades supplied through support site

## General Specifications

<b>General</b>	
<b>Power supply</b>	230V AC, $\pm 10\%$ , approx. 50Hz 7W
<b>Dimensions (mm)</b>	270 (L) x 63 (H) x 215 (W)
<b>Weight</b>	< 1.7kg
<b>Environment</b>	<ul style="list-style-type: none"> <li>• Reference temperature            18°C to 28°C</li> <li>• Storage temperature                -20°C to 70°C</li> <li>• Operating temperature              0°C to 40°C</li> <li>• Operating range                      0°C to 50°C</li> <li>• Utilisation                              indoors</li> <li>• Altitude                                 &lt; 2 000m</li> <li>• Relative humidity                    &lt; 80%, from 0°C to 40°C</li> </ul>
<b>Electromagnetic compatibility</b>	
	<p>NF EN 61326-1: 98</p> <p>Influence at 3V/m:</p> <ul style="list-style-type: none"> <li>- Radiated immunity                66dB typ. rejection (device situated 3m from the emission source)</li> <li>- Conducted immunity                100dB typ. rejection</li> </ul>
<b>Accessories</b>	
<b>supplied with the instrument</b>	<ul style="list-style-type: none"> <li>• CD (software and manual)        X02827A00</li> <li>• Power cord                            X01147A00A</li> <li>• USB cable                              541519</li> </ul>