PMM 9010/30P

EMI RECEIVER 9010/30P

014 011

## EMI Measuring Receiver & Analyzer 10 Hz-3 GHz

Full CISPR 16-1-1 Compliant 9 kHz-30 MHz Field Upgradable up to 6 GHz (CISPR 16-1-1 Compliant) All new CISPR detectors included







## PMM 9010/30P: one instr



Manual mode



Spectrum mode



<u>Conducted emissions</u> can be the most critical part of the interference to measure, particularly for industrial equipments and household appliances with switching power supplies, motors, contactors, speed regulators etc.

General purpose and pre-test instruments may be quite ineffective for correct evaluation of such complex disturbance signals; meantime, building a fullcompliant test setup is accessible to all (see example at page 4).

PMM 9010/30P features full-compliance to CISPR-16-1-1 and MIL-STD 461 for conducted measurements from 10 Hz up to 30 MHz. The required accessories are summarized at page 10.

## ument, many applications



**Radiated emissions** may require specific setups to be performed in full compliance mode, e.g. in an anechoic chamber; viceversa pre-test measurements can be carried out with less expensive methods (see example at page 5). A specifically designed pre-test EMI Receiver like the PMM 9010/30P used in debugging can significantly improve the results and speed up the development time of new products. PMM 9010/30P's High Frequency section allows for Radiated Emissions pre-testing in the frequency range 30 MHz-3 GHz, featuring all the CISPR and MIL-STD RBW filters and Detectors, including those of recent introduction in standards (C-AVG, RMS AVG, APD).

The new model PMM 9010/30P is based on the same structure of the PMM 9010: the first compact, worldwide successful **Fully Digital EMI Receiver.** 



# Conducted

Conducted emission in Full Compliance mode		
Reference Standard	Generic Standards	Product Standards
Receiver: CISPR 16-1-1 AMN (Artificial Mains Network) Voltage & Current Probes CISPR 16-1-2	IEC61000-6-3 IEC61000-6-4 EN MIL-STD 461 Interference Voltage 0,15 - 30 MHz	EN 55011-CISPR 11 EN 55014- CISPR 14 EN 55015-CISPR 15 EN 55022-CISPR 22 Interference Voltage 0,15 - 30 MHz

Remark: All above Standards appears as undated for the PMM 9010/30P can be updated to future changes.

Typical set-up configuration for EMI conducted measurements; construction details can be found in CISPR-16-1-2. Its realization can be afforded by most of the laboratories and industries with limited costs.

#### TIPS:

- Care perfect groundings: loose or longer connections are likely to cause severe measuring errors
- · Replace any cable looking crushed, overbent or scratched
- Make sure of all connections being tightened and efficient
   Make sure that LISNs are compliant to CISPR-16-1-2. Most of the old PMM
- LISN you may own can be upgraded: contact Factory for details
- LISNs ground currents may be hazardous and/or cause ground protection systems to switch off. An isolation transformer of rated current adequate to the equipment under test between mains and LISN input is recommended or mandatory
- Keep connections between Receiver and LISN as short as possible; 9010/30P can be easily placed close by it and operated by battery
- EUT line voltage transients may cause RF noise exceeding the receiver max input level: make sure there are no heavy machinery, contactors, power inverters, inductive or capacitive loads etc. on the same power line or nearby
- An external attenuator at RF input may be useful in case of doubt about the max noise level
- EMI mains filters can be useful to avoid noise pick-up by LISN & cables. Excessive ambient noise may require moving into a shielded room
- Sweep mode + Smart Detector function can dramatically reduce the test time
- Analyzer and Manual modes allow for debugging critical frequencies or spectrum portions
- The Audio Output can be helpful in debugging to discriminate the noise source (other machinery connected to the same line, broadcast, etc.)





Radiated emission measurements of luminaries by means of the Loop Antenna according to CISPR15/EN 55015.

# Radiated

### - Radiated Emissions in Pre-Test mode (VHQP-C) -

	Reference Standard	Generic Standards	Product Standards
	•	-	-
	Receiver: CISPR 16-1-1	IEC61000-6-3 IEC61000-6-4 EN	EN 55014- CISPR 14 EN 55015-CISPR 15 EN 55022-CISPR 22
	Clamp: CISPR 16-1-3	MIL-STD 461	EN 55025-CISPR 25
	Test Site: CISPR 16-1-4	Radiated power and emissions 30 MHz - 3 GHz	Radiated power and emissions 30 MHz - 3 GHz
Remark: All above Standards appears as undated for the PMM 9010/30P can be updated to future changes.			

Open Air Test Site (OATS) for radiated emissions





Radiated power measurement set-up with absorbing clamp

#### TIPS:

- Optimal conditions may allow for debugging even in unshielded environment
- Reduce ambient noise by proper antenna orientation
- Care perfect grounding
- Keep cable connection between receiver and antenna as short as possible: PMM 9010/30P can be easily placed near the antenna
- To save time start tests in Analyzer mode with selected Limit & max hold on, then use Sweep mode with Smart Detector to focus on critical frequencies only
- Measurements should be taken at min. two heights on four sides, possibly at 3 m distance
- Biconic and Log-periodic antennas are most suitable; see PMM AS-02 Antenna Set
- Consider G-TEM cells for both emission (debugging) and immunity (full compliance)
- For better repeatability reduce variables (e.g. same equipments positioning, cables layout, etc.)
- Demodulated AF output can be helpful to discriminate the noise source (e.g. other machinery, broadcast, etc.) in debugging
- Ambient reflections can increase or decrease results unpredictably
- Recognize other possible RF sources hidden in the environment
- Noise cancellation methods (e.g. via pre-scan and post-processing) may be uneffective if not leading to wrong measurements
- Near field probes may be useful for bench debugging of subassemblies
- In case of excessive ambient noise move into a shielded/anechoic room



G-TEM cell for emission and immunity



Compact Shielded Room



# PMM 9010/30P helps saving your time & money, today and tomorrow

- Expandable any time, in any place, by yourself
- Fits in all requirements, from debugging to final, full compliant tests
- Brings innovation, quality, reliability
- More value-added than any other solution



PMM's unique Extension Receiver Modules are real EMI Receivers fully compliant to CISPR 16-1-1 that boost the performance of PMM 9010/30P main unit to the edge of the most sophisticated radiated emission measurements up to 6 GHz. Higher frequency bands are planned.

- · Fiber Optic Digital Link for interference-free measurements
- Direct connection to the antenna
- Better overall uncertainty without cable loss
- Automatic Discontinuous Disturbance (Click) Analyzer full compliant to CISPR 14-1, including all latest Exceptions requirements (C-AVG detector)

For further details please consult the brochure PMM 9010/9030/9060 downloadable from our web page: www.narda-sts.it

### **Technical** specifications

	10 Hz – 30 MHz Input	30 MHz – 3 GHz Input
Operating modes	Scanning receiver Manual tuning receiver Analyzer	
Frequency range Resolution Accuracy	10 Hz to 30 MHz 0,1 Hz <1 ppm	30 MHz to 3 GHz 100 Hz <2 ppm
<b>RF input</b> VSWR Attenuator Pulse limiter Preamplifier	50 Ω, BNC female <1,2 (10 dB RF att.) 0 to 35 dB, 5 dB step Built-in, selectable 20 dB	50 Ω, N-F <1,2 ; <2 over 1 GHz 0 to 50 dB, 2 dB step n.a. n.a.
<b>Max input level</b> without damage Sinewave AC voltage Pulse spectral density	137 dbμV - 1 W 97 dbμV/MHz	
Preselector	1 x LP; 6 x BP filters	n.a.
IF RBW 6 dB bandwidth CISPR-16-1-1 MIL-STD-461 (option)	3, 10, 30, 100, 300 kHz 200 Hz; 9 kHz 10, 100 Hz; 1, 10 kHz	3, 10, 30, 100, 300 kHz, 1 MHz 9 kHz (1), 120 kHz, 1 MHz 100 kHz, 1 MHz
Noise level	(Preamplifier ON) 9 – 150 kHz RBW 200 Hz, QP <-8 dBμV RBW 200 Hz, Avg <-15 dBμV 0.15 – 30 MHz	30 MHz – 3 GHz RBW 120 kHz, QP <8 dBµV RBW 120 kHz, Avg <4 dBµV
	RBW 9 kHz, QP <-4 dBμV RBW 9 kHz, Avg <-10 dBμV	
Spurious response	<0 dBµV; < 10 dBµV over 150 kHz	< 15 dBµV
<b>Detectors</b> (simultaneous on PMM Emission Suite)	Peak, Quasi-Peak C-Average, Average RMS Average, RMS APD	
Hold time	Smart Detector function 1 ms to 30 s	
Stand-alone display & measure functions	Marker; marker peak; marker to center; highest peaks; move peak to Analyzer & Manual modes Store & Load: - up to 11 traces (sweep mode) - two panels - 4 conversion factors Built-in limits: CISPR 11, 14, 22 Battery charge and voltage Display style, contrast, backlight Click functions (option required)	
Measuring units		
Stand-alone PMM Emission Suite	dBm, dBμV dBμA, dBμV/m. dBμA/m	
Displayed dynamic	80, 100, 120 dB selectable	
Measurement accuracy	S/N > 20 dB 10 Hz to 9 kHz ±1,0 dB 9 kHz to 30 MHz ±1,0 dB	S/N > 20 dB 30 MHz to 1 GHz ±1,0 dB 1 to 3 GHz ±1,5 dB
Autocalibration (2) Demodulation	Internal reference source AM with variable volume	n.a.
I/O Interface	USB; RS-232 High Speed Optical User Port (drives PMM LISNs/accessories) Bluetooth (optional)	
<b>RF output, rear panel</b> Frequency range Level Level accuracy (10 Hz to 30 MHz)	50 Ω, BNC fem. CW: 10 Hz to 50 MHz;Tracking mode: 10 Hz-30 MHz 60 to 90 dBμV (0.1 dB step) ± 0,5 dB	
Operating temperature Power supply	0° to 40°C AC universal adapter/charger External 10 - 15 Vdc, 2.5 A Li-lon rechargeable plug-in battery (Option)	
Battery operation time (typical)	8 h 3 h (3)	
Dimensions	235x105x335 mm	
Weight (including battery option)	4,95 kg	

(1) Available from February, 2010
 (2) RF front-end only. All RBW filters and detectors are digital and do not require any re-calibration, any time.
 (3) May vary in relation with the selected operating mode





Powerful SCAN TABLE that meets the most demanding applications for flexibility

### PMM's PC Emission Suite

The PMM Emission Suite comes with PMM 9010/30P EMI receiver to expand its applications:

- Full control of all auto and manual Receiver functions
- Real-time display on PC
- One-click operating mode change: Scan/Sweep, Analyzer, Manual
- Editing of Standard Limits
- Creation of Correction Factors Tables for ancillary equipments (antennas, cables, etc.)
- Retrieve, save, recall and compare measurements
- Simultaneous Marker on all Detectors and Zoom
- "n" Highest Peaks Finder and Scan Table generation
- Measured LISN lines scroll by mouse wheel
- GTEM correlation to OATS
- Warning messages for incorrect settings

The pictures show examples of the most commonly used functions, some of them peculiar of PMM's receivers.

### Spectrum Analyzer Function

The very high scan speed (<100 ms for fullspan 10 Hz-30 MHz @ IF resolution 300 kHz), is very useful for any kind of debugging with the outstanding performances of an EMIspecific instrument.

# Scalar Network Analyzer Function

A powerful function useful for designers and test engineers provides an easy-to-use scalar network analyzer for characterizing components, filters and much more.

### G-TEM Correlation Program

Correlates radiated emission tests to those performed in an OATS. Fast and precise, this feature is already built in the PMM software.



MANUAL mode: up to four simultaneous detectors



PEAKS FINDER with generation of Frequency tables



COMPARE function of stored measurements



ANALYZER mode for fast and accurate debugging



Just one click to move across functions



### **Ancillary Equipment & Accessories**

#### Conducted measurements

#### **AMN-Artificial Mains Networks**

Also known as LISN (Line Impedance Stabilization Networks), these equipments are used for RF interference measurements in the frequency range from 9 kHz to 30 MHz on AC single and three-phase lines, from DC to 60 Hz. The V-network design is fully compliant with latest CISPR publ. 16 and FCC part 15 regulation.

General features:

- automatic line switching control from PMM EMI receivers
- artificial hand circuit
- 150 kHz high-pass filter control

#### Most common models:

Model L2-16A Single-phase 230 V/16 A





Model L1-150 Single-phase 250 VAC/600 VDC, 150 A



Models L3-64, L3-100 3-ph. 4-wires 400 V/64 A, 100 A 3-phase 4-wires 400 V/32 A

> Other models up to 350 A on request

**Passive Probes mod. SHC** 

When LISN are not applicable (higher line current) the conducted interferences are measured by means of a high impedance voltage probe.

- compliant with CISPR 16-1-2
- internal resistance >1500  $\Omega$
- 1 kV AC max. voltage



#### Radiated measurements

#### **Measuring Antennas**

Measuring antennas of excellent electrical performances and mechanical stability are essential in radiated measurements for repeatable and reliable results.

General features:

- Robust construction in passivated Aluminium
- Weather-resistant paint
- Lightweight
- Hi-quality RF connectors
- · Easy to assembly and store

The following models are perfect for operation in conjunction with the EMI Analyzer PMM 9010/30P:



### Other EMC valuable solutions by PMM



### Services for your PMM EMI Receiver

- Free updating of PC Software and instrument Firmware from our web page.
- Failsafe, User-upgradeable Firmware whenever required by future standards, measuring features and test solutions. An exclusive "parking memory" makes upgrading the PMM Receivers Firmware totally failsafe.
- The fastest and most convenient recalibration and service ever seen before, thanks to the modular construction and pre-calibrated subassemblies; provided by our Qualified Sales Partners worldwide network.

### **Other Services**

- · Calibration of antennas in OATS in the 20 MHz 18 GHz frequency range.
- Accredited calibrations for RF power, Frequency, Electric and Magnetic fields strength.
- Notified Body NB 2050 as per 2004/108/EC directive.

### Ordering information

9010-30P	EMI receiver 10 Hz - 3 GHz, two RF inputs: - 9 kHz - 30 MHz, CISPR 16-1-1 full-compliance - 30 MHz - 3 GHz, Pre-compliance with CISPR 16-1-1 RBW and Detectors	
	<b>Including:</b> - internal tracking generator 10 Hz- 30 MHz - AC adapter (mod. 9010/AC) - PC software PMM Emission Suite - Standard Calibration Certificate	- RS232/USB adapter (for FW upgrades) - N-BNC adapter - Control cables (USB, RS-232), BNC-BNC cable

#### Optional accessories and functions

9010/MII	MIL-STD-461 RBW Filters	
9010/CLICK	1-channel Click Analyzer function. CISPR 14-1 full-compliance, including:	
	- Switching Operation Box, control cables - 2x20 dB attenuator	
	NOTE: field-installable function (advice S/N for upgrading confirmation)	
9010/CLICK4E	External box to connect to a receiver equipped with 9010/click option.	
	Allows four-channel simultaneous click measurements according to CISPR-14-1. AC power only	
9010/BTA	RS-232 to BlueTooth adapter for 9010	
BP01	Li-lon Battery Pack	
9010/AC	Additional AC adapter/charger for BP01 (one already supplied with 9010/30P)	
9010/CC	Rigid carrying case	
9010/UKAS	UKAS CISPR-16-1-1 accredited calibration certificate for Bands A, B (9 kHz - 30 MHz)	
9010/UKAS-Click	UKAS accredited calibration certificate for 9010 + 9010/Click to CISPR-16-1-1 & CISPR-14-1	

#### Bands C – D – E upgrades to full CISPR-16-1-1 9030 Extension unit 30 MHz - 3 GHz (UKAS accredited calibration on

9030	Extension unit 30 MHz - 3 GHz (UKAS accredited calibration on option)
9060	Extension unit 30 MHz - 6 GHz (UKAS accredited calibration on option)

#### Ancillary equipments

LISN - controlled by the PMM 9010/3	OP receiver to automatically select the lines to measure	
·	• L1-150 Single line LISN, 150A	• L3-64 Four lines, 3-phase, 64A LISN
	• L2-16A Two lines, Single phase, 16A LISN	• L3-100 Four lines, 3-phase, 100A LISN
	• L3-32 Four lines, 3-phase, 32A LISN	• L3-500 Four lines, 3-phase, 350A LISN
CISPR 16-1-2 Voltage Probes		
	• SHC-1 35 dB CISPR, 1500 Ω, 300 V	• SHC-1/1000 35 dB CISPR, 1500 Ω, 1 kV
	• SHC-2 30 dB CISPR, 1500 Ω, 300 V	
Antennas		
	• RA-01 Rod Antenna 9 kHz-30 MHz	• LP-02 Log Periodic Antenna 200 MHz - 3 GHz
	<ul> <li>BC-01 Biconical Antenna 30-200 MHz</li> </ul>	• LP-03 Log Periodic Antenna 800 MHz - 6 GHz
	<ul> <li>TR-01 Tripod for PMM Antennas</li> </ul>	
EN 55015 (CISPR 15) components		
	• F-300M-16 CDN 150 kHz - 300 MHz; 250 VAC - 16A, 50/60 H	lz
	for power circuitry testing with phase, neutral and PE	
	• RF-300 3-axis Loop Antenna System for CISPR 15 EN 5501	5
	<ul> <li>RF-300C Calibration kit for RF-300</li> </ul>	
	<ul> <li>TRF-1 Balance/unbalance transformer</li> </ul>	
	<ul> <li>DL-xx Dummy Lamps according to the Standard</li> </ul>	



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