PMM 9010/30P

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

Save Time & Money!
Conducted emissions 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.
Radiated emissions may require specific setups to be performed in full compliance mode, e.g. in an anechoic chamber; vice versa 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).

REVOLUTIONARY CONCEPT

PMM 9010/30P is the first EMI Receiver that fits in any budget and grows with your needs:

- On-field expandable to Radiated Full Compliance (see page 6)
- Safe and easy Firmware and Software upgrading from Web
- Digital Technology for best reliability
- Reduced turnaround time and cost for periodic re-calibration
- Full choice of Ancillary Equipments
- Powerful PC Software included
- Small size, lightweight, AC/DC and battery for portable operation

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 emission in Full Compliance mode

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<td>Receiver:</td>
<td>IEC61000-6-3</td>
<td>EN 55011-CISPR 11</td>
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<td>CISPR 16-1-1</td>
<td>IEC61000-6-4</td>
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<td>EN...</td>
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<td>Interference Voltage</td>
<td>Interference Voltage</td>
</tr>
<tr>
<td></td>
<td>0,15 - 30 MHz</td>
<td>0,15 - 30 MHz</td>
</tr>
</tbody>
</table>

**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
- ELUT 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 Emissions in Pre-Test mode (VHQP-C)

#### Reference Standard
- **Receiver:** CISPR 16-1-1
- **Clamp:** CISPR 16-1-3
- **Test Site:** CISPR 16-1-4

#### Generic Standards
- IEC61000-6-3
- IEC61000-6-4
- EN...
- MIL-STD 461

#### Product Standards
- Radiated power and emissions 30 MHz - 3 GHz
- EN 55014- CISPR 14
- EN 55015-CISPR 15
- EN 55022-CISPR 22
- EN 55025-CISPR 25

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

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### Open Air Test Site (OATS) for radiated emissions

![Open Air Test Site](image)

**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 ineffective 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

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![Radiated power measurement set-up with absorbing clamp](image)

![G-TEM cell for emission and immunity](image)

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![Compact Shielded Room](image)
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

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<th>30 MHz – 3 GHz Input</th>
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<tr>
<td><strong>Frequency range</strong></td>
<td>10 Hz to 30 MHz</td>
<td>30 MHz to 3 GHz</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.1 Hz</td>
<td>100 Hz</td>
</tr>
<tr>
<td>Accuracy</td>
<td>&lt; 1 ppm</td>
<td>&lt; 2 ppm</td>
</tr>
<tr>
<td><strong>RF input</strong></td>
<td>50 Ω, BNC female</td>
<td>50 Ω, N-F</td>
</tr>
<tr>
<td>VSWR</td>
<td>&lt; 1.2 (10 dB RF att.)</td>
<td>&lt; 1.2, &lt; 2 over 1 GHz</td>
</tr>
<tr>
<td>Attenuator</td>
<td>0 to 35 dB, 5 dB step</td>
<td>0 to 50 dB, 2 dB step</td>
</tr>
<tr>
<td>Pulse limiter</td>
<td>Built-in, selectable</td>
<td>n.a.</td>
</tr>
<tr>
<td>Preamplifier</td>
<td>20 dB</td>
<td>n.a.</td>
</tr>
<tr>
<td><strong>Max input level without damage</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinewave AC voltage</td>
<td>137 dBµV - 1 W</td>
<td>97 dBµV/MHz</td>
</tr>
<tr>
<td>Pulse spectral density</td>
<td>137 dBµV</td>
<td>97 dBµV/MHz</td>
</tr>
<tr>
<td><strong>Preselector</strong></td>
<td>1 x LP; 6 x BP filters</td>
<td>n.a.</td>
</tr>
<tr>
<td><strong>Noise level</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(Preamplifier ON)</td>
<td>9 – 150 kHz</td>
<td>30 MHz – 3 GHz</td>
</tr>
<tr>
<td>RBW 200 Hz, QP &lt; 8 dBµV</td>
<td>RBW 120 kHz, QP &lt; 8 dBµV</td>
<td></td>
</tr>
<tr>
<td>RBW 200 Hz, Avg &lt; 15 dBµV</td>
<td>RBW 120 kHz, Avg &lt; 4 dBµV</td>
<td></td>
</tr>
<tr>
<td>0,15 – 30 MHz</td>
<td>3, 10, 30, 100, 300 kHz</td>
<td></td>
</tr>
<tr>
<td>RBW 9 kHz, QP &lt; 4 dBµV</td>
<td>3, 10, 30, 100 kHz, 1 MHz</td>
<td></td>
</tr>
<tr>
<td>RBW 9 kHz, Avg &lt; 10 dBµV</td>
<td>100 kHz, 1 MHz</td>
<td></td>
</tr>
<tr>
<td><strong>Spurious response</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 0 dBµV; &lt; 10 dBµV over 150 kHz</td>
<td>&lt; 15 dBµV</td>
<td></td>
</tr>
<tr>
<td><strong>Detectors</strong></td>
<td>Peak, Quasi-Peak, C-Average, Average, RMS Average, APD, Smart Detector function, Marker: marker peak; marker to center; highest peaks; move peak to Analyzer &amp; Manual modes, Store &amp; Load: - up to 11 traces (sweep mode), - 4 conversion factors, Built-in limits: CISPR 11, 14, 22, Battery charge and voltage, Display style, contrast, backlight, Click functions (option required)</td>
<td></td>
</tr>
<tr>
<td>Hold time</td>
<td>1 ms to 30 s</td>
<td></td>
</tr>
<tr>
<td><strong>Stand-alone display &amp; measure functions</strong></td>
<td>Marker: marker peak; marker to center; highest peaks; move peak to Analyzer &amp; Manual modes, Store &amp; Load: - up to 11 traces (sweep mode), - 4 conversion factors, Built-in limits: CISPR 11, 14, 22, Battery charge and voltage, Display style, contrast, backlight, Click functions (option required)</td>
<td></td>
</tr>
<tr>
<td><strong>Measurement units</strong></td>
<td>Stand-alone dBm, dBµV, dBA, dBmW, dBµV/m, dBA/m</td>
<td></td>
</tr>
<tr>
<td><strong>Displayed dynamic</strong></td>
<td>80, 100, 120 dB selectable</td>
<td></td>
</tr>
<tr>
<td><strong>Measurement accuracy</strong></td>
<td>S/N &gt; 20 dB, 10 kHz to 9 kHz, 9 kHz to 30 MHz</td>
<td>S/N &gt; 20 dB, 30 MHz to 1 GHz</td>
</tr>
<tr>
<td></td>
<td>± 1.0 dB</td>
<td>± 1.5 dB</td>
</tr>
<tr>
<td><strong>Auto calibration</strong></td>
<td>Internal reference source AM with variable volume</td>
<td>n.a.</td>
</tr>
<tr>
<td><strong>Demodulation</strong></td>
<td>I/O Interface</td>
<td>USB; RS-232, High Speed Optical, User Port (drives PMM LISNs/accessories), Bluetooth (optional)</td>
</tr>
<tr>
<td><strong>RF output, rear panel</strong></td>
<td>50 Ω, BNC fem.</td>
<td></td>
</tr>
<tr>
<td>Frequency range</td>
<td>CW: 10 Hz to 50 MHz, Tracking mode: 10 Hz to 30 MHz, 60 to 90 dBµV (0.1 dB step)</td>
<td>± 0.5 dB</td>
</tr>
<tr>
<td>Level</td>
<td>± 0.5 dB</td>
<td></td>
</tr>
<tr>
<td>Operating temperature</td>
<td>0° to 40°C</td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td>AC universal adapter/charger External 10 - 15 Vdc, 2.5 A, Li-ion rechargeable plug-in battery (Option)</td>
<td></td>
</tr>
<tr>
<td><strong>Battery operation time (typical)</strong></td>
<td>8 h</td>
<td>3 h (3)</td>
</tr>
<tr>
<td><strong>Dimensions</strong></td>
<td>235x105x335 mm</td>
<td>4,95 kg</td>
</tr>
</tbody>
</table>

(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
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 full-span 10 Hz-30 MHz @ IF resolution 300 kHz), is very useful for any kind of debugging with the outstanding performances of an EMI-specific 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

Just one click to move across functions

PEAKS FINDER with generation of Frequency tables

COMPARE function of stored measurements

ANALYZER mode for fast and accurate debugging
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-phase 4-wires 400 V/64 A, 100 A
- Model L3-32
  - 3-phase 4-wires 400 V/32 A

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 Ω
- 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 assemble and store

The following models are perfect for operation in conjunction with the EMI Analyzer PMM 9010/30P:
- Model BC-01
  - Biconical Antenna
  - 30-200 MHz
- Model LP-02
  - Log Periodic Antenna
  - 200-3000 MHz
- Model TR-01
  - Antenna Tripod Extensible 60 - 180 cm
  - Mounting adapter for quick horizontal to vertical polarization change

PMM AS-02 is a complete, convenient Antenna System inclusive of the models BC-01, LP-02 and RF cable stored in a practical, robust soft carrying case.
Other EMC valuable solutions by PMM

RF Generators up to 3 GHz

USB RF Power Meters 9 kHz-3 GHz

Conducted Immunity System for IEC-EN 61000-4-6

Isotropic RF Field Probes up to 40 GHz. Accredited calibration

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

**Including:**
- 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

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<th>Description</th>
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<tr>
<td>9010/MIL</td>
<td>MIL-STD-461 RBW Filters</td>
</tr>
</tbody>
</table>
| 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-Ion 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

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9030</td>
<td>Extension unit 30 MHz - 3 GHz (UKAS accredited calibration on option)</td>
</tr>
<tr>
<td>9060</td>
<td>Extension unit 30 MHz - 6 GHz (UKAS accredited calibration on option)</td>
</tr>
</tbody>
</table>

### Ancillary equipments

- **LISN** - controlled by the PMM 9010/30P receiver to automatically select the lines to measure
  - L1-150 Single line LISN, 150A
  - L2-16A Two lines, Single phase, 16A LISN
  - L3-32 Four lines, 3-phase, 32A LISN
- **CISPR 16-1-2 Voltage Probes**
  - SHC-1 35 dB CISPR, 1500 Ω, 300 V
  - SHC-2 30 dB CISPR, 1500 Ω, 300 V
  - SHC-1/1000 35 dB CISPR, 1500 Ω, 1 kV
- **Antennas**
  - RA-01 Rod Antenna 9 kHz-30 MHz
  - BC-01 Biconical Antenna 30-200 MHz
  - TR-01 Tripod for PMM Antennas
  - LP-02 Log Periodic Antenna 200 MHz - 3 GHz
  - LP-03 Log Periodic Antenna 800 MHz - 6 GHz
- **EN 55015 (CISPR 15) components**
  - RF-300C Calibration kit for RF-300
  - TRF-1 Balance/unbalance transformer
  - DL-xx Dummy Lamps according to the Standard

Specifications may change without prior notice. - 01/2010

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