

CDD-4

Continuous and Discontinuous Disturbances Analysis and Verification Set



EXCLUSIVE ALL-IN-ONE CONDUCTED EMISSION TEST SET

INTERNAL SWITCHING OPERATION DETECTION

APPLICATIONS

The innovative Analysis and Verification Set PMM CDD finds its application in the Continuous and Discontinuous Disturbance Tests required for:

- household appliances in general;
- electric tools;
- power controllers, toys, entertainment equipment, vending machines, infotainment devices, regulators...

REFERENCE STANDARDS

The CDD set covers all CISPR and IEC/EN standards relevant to the RF conducted emissions:

CISPR 16-2-1/11/12/13/14-1/15/22/32 and the corresponding IEC/EN.

Particularly for the Click test, CISPR 14-1—IEC/EN55014-1 defines the measurement methods, the emission limits and the statistical evaluation criteria.

CISPR 16-1-1 defines the disturbances characteristics and dictates the measuring instruments specifications and compliance evaluation procedure.

CLICKS: A COMPLEX TEST MADE EASY

Discontinuous disturbances - also known as “Clicks” - are typically generated by fast transients like the switching of power supply lines. The Click test is not just as simple as measuring amplitudes and frequencies to compare with limits. Instead, the actual emission limits are variable in function of the number of Clicks (Click Rate) recognized in a first run during a set time interval. A second run compares the disturbance levels at the preset frequencies (150 & 500 kHz, 1.4 & 30 MHz) with the new limits. The process includes several variables and exceptions to take into account depending on the equipment under test (EUT).

A true Automatic Click Analyzer like the CA0010 is designed for simplifying the test just as PASS/FAIL evaluation, as well as for providing all the details useful in debugging the EUT.

SINGLE RUN TEST

Thanks to its sophisticated characteristics, CA0010 allows for using the first run data set stored in memory also for the comparison with the new limits, thus halving the test time.

DEBUGGING AT HAND

Through the detailed time history, the designer can easily correlate the clicks with the EUT operating cycles.

OPEN TO THE FUTURE

As standards may vary in time, CA0010 design is so flexible that it can be set for all the Click calculation methods of today and tomorrow.

RELIABLE FOREVER

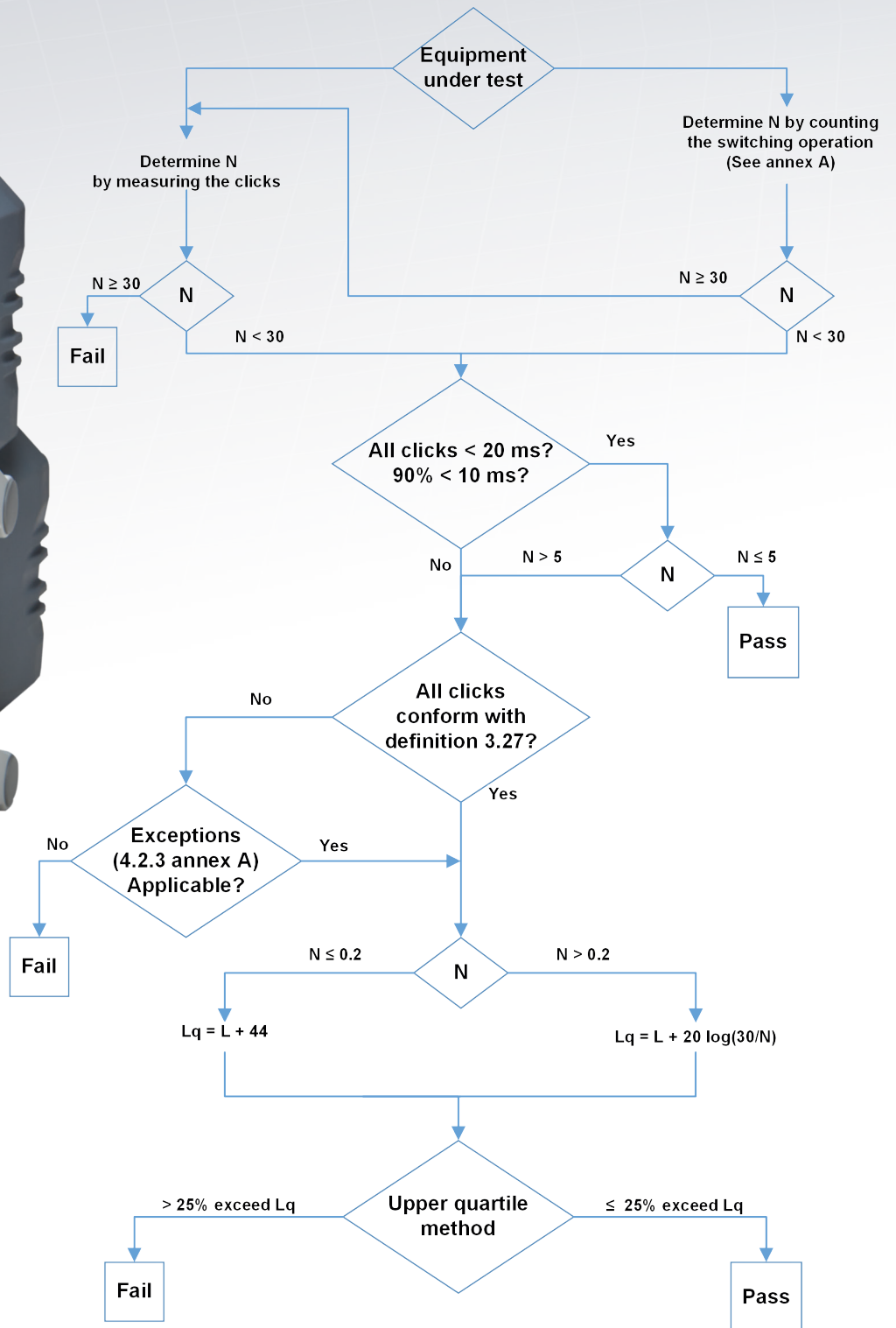
The Click Analyzer CA0010 and the EMI Receiver 9010F do not have commercial operating systems inside to be free of IT threats, obsolescence, vulnerabilities and hangouts.



CCD-4: the ultimate solution for Discontinuous (Clicks) and Continuous Disturbances measurements

The Click Analyzer Unit CA0010 operates in conjunction with the FFT-based, real-time gapless EMI receiver PMM 9010F. This unique combination allows full CISPR compliant measurements of both conducted emissions and clicks in a single, powerful solution for unsurpassed versatility.

The CA0010 internal LISN features full CISPR compliance in the frequency range 150 kHz—30 MHz; if required, external LISNs are available for extending the frequency range down to 9 kHz and/or line currents and voltages (see last page).

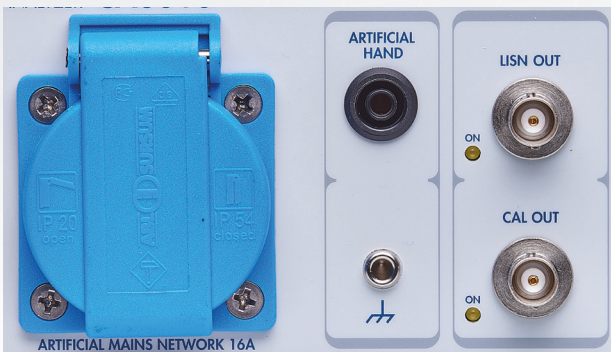


CA0010 Click Analyzer & Verification unit

CA0010 main features:

- Internal 16 A single-phase LISN, fully CISPR 16-1-2 compliant 150 kHz – 30 MHz: just plug the EUT power cord and go!
- RF in front-end with preselection filters and individual auto-attenuators for each of the four frequencies, to guarantee the best dynamic range as required by the challenging discontinuous disturbances
- Auxiliary External LISN RF input, to be used whenever an external, three-phase LISN is required.
- Internal Switching Operations counter with variable current threshold
- CISPR compliant Pulse and Click Sequences Generator for performance verification tests
- Unique feature: three user-selectable Click evaluation methods
- Proprietary software inside
- Time saving Single Run capability

INTERNAL ARTIFICIAL MAINS NETWORK (LISN)



The CA0010 unique design includes a CISPR-compliant internal LISN to be used for single-phase EUT with line currents up to 16 A and line voltages to 250 VAC, 50/60 Hz 350 VDC.

- Artificial Hand circuit for testing electric tools
- LISN RF output
- Switching operations counter circuit with variable threshold

NOTE:

As for all LISNs, a suitable isolation transformer at the mains side is required for user's safety.

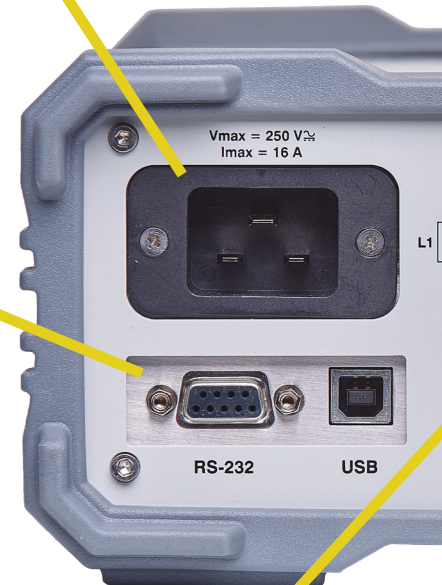
Internal 16 A/230 V LISN and Switching Operations Box



LISN of EMI Re Condu

LISN AC mains input

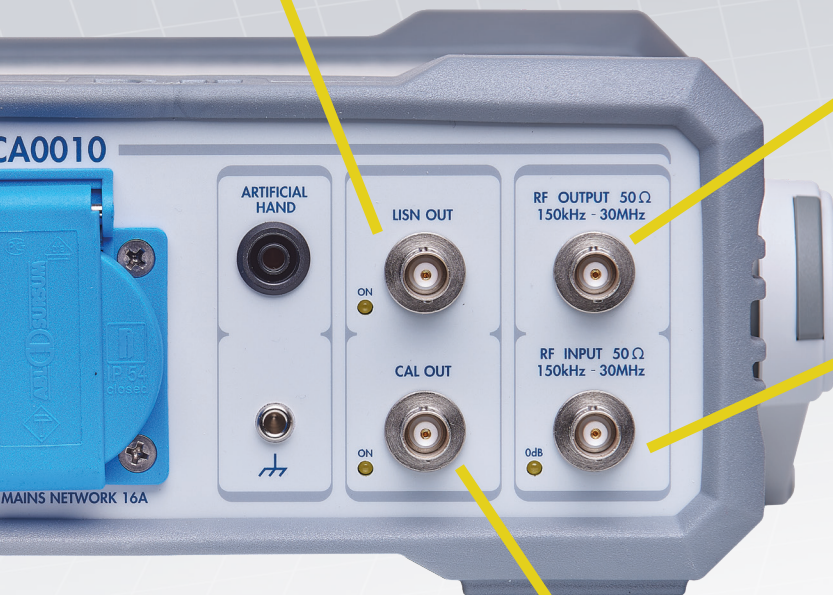
I/O interfaces



Grounding

Output to
Receiver for Continuous
Conducted Emission Test

RF output to
9010F EMI Receiver for
Discontinuous (Clicks)
Disturbances Tests



RF input
from external LISN

Click Generator Output

CA0010 features a complete CISPR compliant Pulse and Click Sequences generation for performance verification tests, controlled by the supplied software PCG—PMM Click Generator.

It includes three generators working in synergy:

- Precise and stable RF CW source
- CISPR Pulse generator
- Click Sequences generator
-

The system generates all the test signals as required by the standard CISPR 16-1-1, Annex-F included, to be used for verifying any click meter.

CISPR verification Test Sequences are preset as default; user-defined tests can be easily added.

The Click Generator is used in the auto-calibration routine and for periodic self-check.



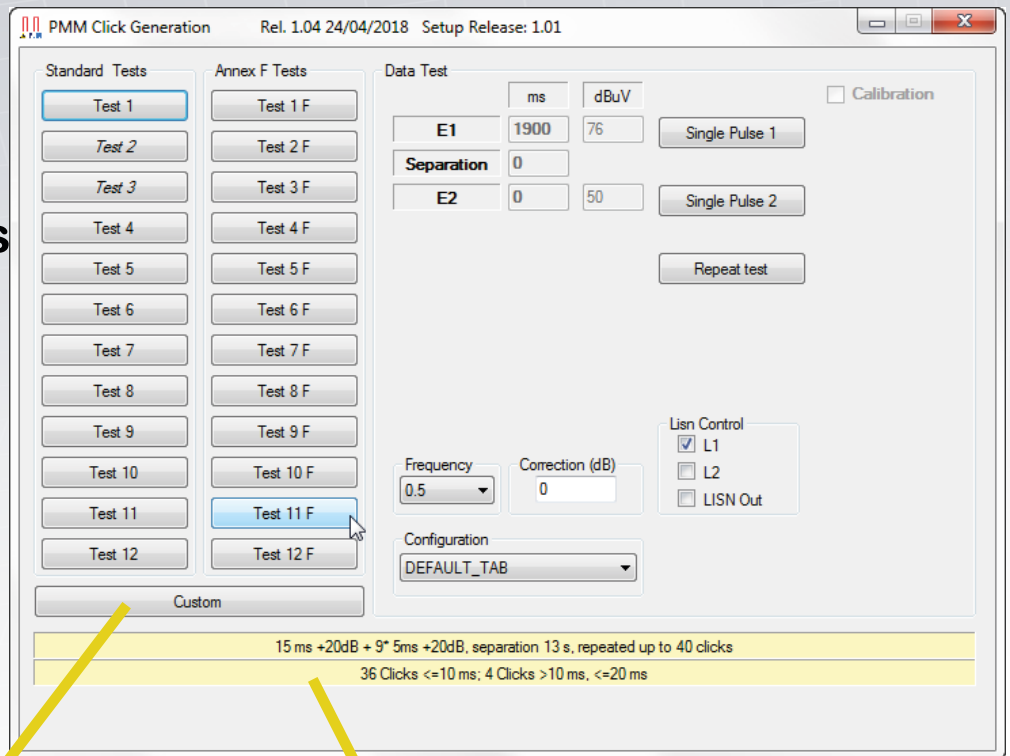
Instrument DC power supply

RADIATED EMISSION TESTS IN GTEM CELL

PCG: PMM Click Generation Software

The PCG comes with the CA0010 as standard. All the standard tests listed in CISPR 16-1-1, Tables 17 and F-1, are preset. It is possible to set custom tests too.

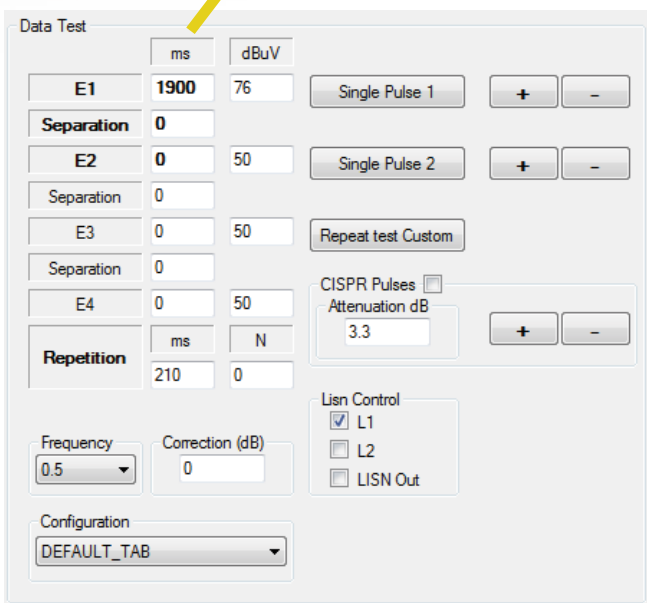
Just One
Click To Move
Across Functions



Preset Test

Upper line: set values

Lower line: expected result from Clickmeter under evaluation



Example of customized test setting

RF CONDUCTED EMISSIONS TESTS

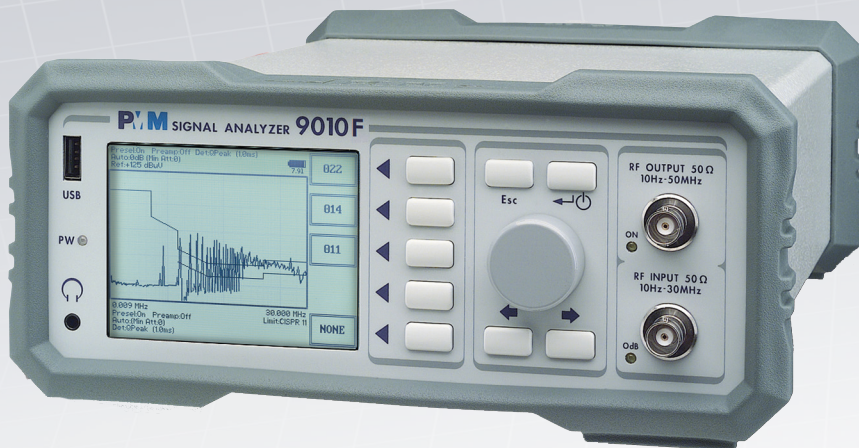
The possibility of making both continuous and discontinuous disturbances tests by a single set is a real added value enhancing the EMC laboratory's productivity.

EMI RECEIVER 9010F

A top-class, ultra-fast full CISPR & MIL-STD EMI Receiver that works in conjunction with the CA0010.

Main features:

- Real-time, Gapless FFT technology
- Frequency range: 10 Hz—30 MHz
- All CISPR detectors simultaneously
- Full scan in only 20 seconds, with 1 s Hold time.
- Extensions to 3/6/18 GHz
- Rechargeable battery
- Compact, lightweight, robust
- USB interface to PC
- Supplied with PMM Emission Software



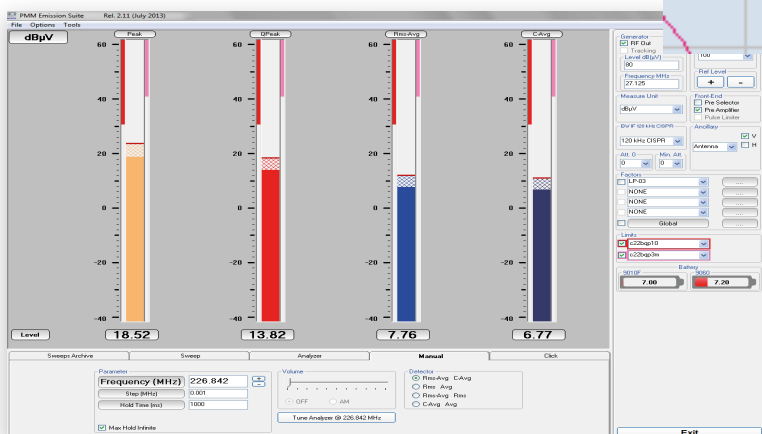
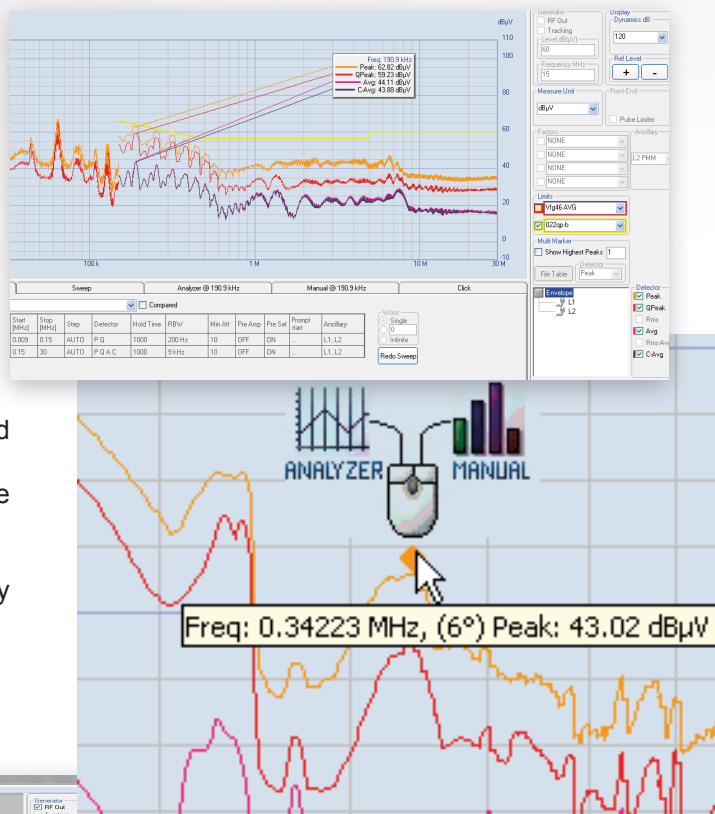
Direct Conversion And FFT

9010F is a true digital receiver: signals are directly sampled after the RF front-end by an A/D converter of very high dynamic range matching the severe criteria of full CISPR compliance. Among the many advantages of this technique in comparison with conventional receivers, the higher protection against overloading and possible damages.

Real time means that the FFT calculation is as fast as the incoming data are sampled, so that no data are missed in the analyzed band.

Gapless means that the consecutive time windows are sampled without time gaps between each other.

Optional modules allow for extending the frequency range to Radiated Emission tests to 3, 6 and 18 GHz.



PCA: PMM CLICK ANALYSIS SOFTWARE - OPEN TO THE FUTURE!

Click Setup

Frequency 1:	MHz	0.150
Frequency 2:	MHz	0.500
Frequency 3:	MHz	1.400
Frequency 4:	MHz	30.000
Extrenal Att.:		0
Limit:		NONE
Calc N on:		Clicks
Factor f:		1.00
Stop on FAIL:		End Of Step
Terminate on:		40 Clicks/Time

Line: NONE

L2 PMM		L3 PMM		L2 CA0010	
<input type="checkbox"/> L1	<input type="checkbox"/> L2	<input type="checkbox"/> L1	<input type="checkbox"/> L2	<input type="checkbox"/> L1	<input type="checkbox"/> L2
<input type="checkbox"/> L2		<input type="checkbox"/> L3	<input type="checkbox"/> N		

Max Time:		120
Idle/Search Freq:	MHz	0.500
Idle lev:	dBuV	56.00
Single RUN:		Yes
USE E4:		Yes
Rates/Quartiles:		2/2 [STD]

Set Click Setup Default

Measurement Name
Untitled

Start Idle Exit

The PCA software comes with the Click Analyzer CA0010 as standard.

Based on decades-long experience in this type of tests and having in mind both occasional and continuative users, it is complete though of immediate operability.

All parameters to set for the Click test are shown clearly and unmistakably.

When selecting the Idle mode, the user can check in real time the amplitude variations of the IF (peak) and QP detector prior to starting the test, as well as in the EUT debugging phase.

All measurement data and settings are saved automatically in proprietary format to prevent any possible file mismatch or deletion.

The fully detailed test report is displayed with clear indications of Pass/Fail results; it can be saved in various formats.

Untitled Click Report

Untitled Click Report

Lq Calculation										
Frequency MHz	Limit dBuV	<=10ms	<=20ms	<=0.2s	From Exception E4	Other than click ms	Total Clicks	Time min.	N rate	+Lq dB
0.15	56.0	0	0	1	0	0	1	0.9	1.1	28.6
0.50	56.0	0	0	1	0	0	1	0.9	1.1	28.6
1.40	56.0	0	0	1	0	0	1	0.9	---	28.6
30.00	56.0	0	0	4	0	0	4	0.9	---	28.6

Final Test Report										
Frequency MHz	Limit Quartile dBuV	<=10ms	<=20ms	<=0.2s	From Exception E4	Other than click ms	Total Clicks	Time min.	Max Click Allowed	Pass Fail
0.15	84.6	0	0	0	0	0	0	0.9	0	Pass
0.50	84.6	0	0	0	0	0	0	0.9	0	Pass
1.40	84.6	0	0	0	0	0	0	0.9	0	Pass
30.00	84.6	0	0	2	0	0	2	0.9	0	FAIL

Save Report Copy BMP To Clipboard Save As BMP or JPG File

Save TXT Lq Calculation Lq Calculation

Save RTF Final Test Report Final Test Report

Save RTF and highlights All Table All Table

Exit

PCA: PMM CLICK ANALYSIS SOFTWARE

Understanding the reasons behind a Click test fail is the first step to find the required countermeasures to apply to the EUT.

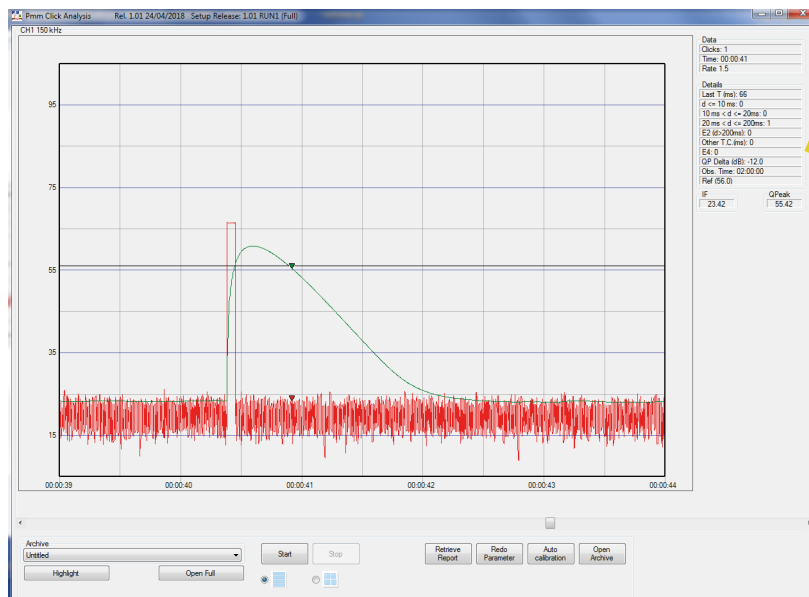
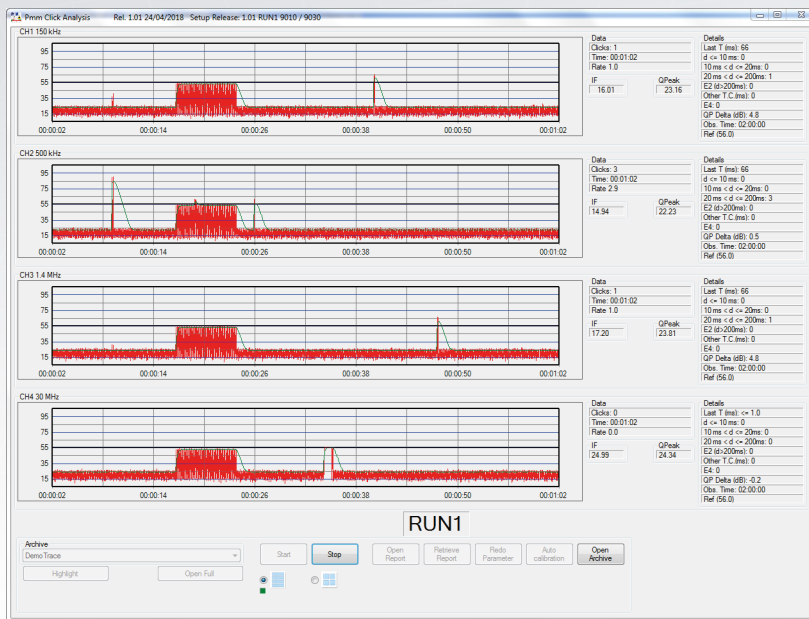
PCA is designed for this purpose: the time history of the events that determined the Click counting can be displayed in its totality for all of the four frequencies, or zoomed down to the single details.

Because of the time resolution as high as 500 μ S, and the test time as long as 2 hours, the data stored are too many to be displayed conveniently. Therefore a special algorithm is applied in order to show only the data consistent with the clicks.

The traces displayed show:

- Output of the IF (digital Intermediate Frequency)
- Output of the Quasi-Peak detector
- Limit

The precise event time can be read by the marker, for an immediate correlation with the EUT operation cycles. It is therefore possible to recognize immediately the operating condition that generated undesired clicks.



Data	
Clicks: 1	
Time: 00:00:41	
Rate: 1.5	
Details	
Last T (ms): 66	
d <= 10 ms: 0	
10 ms < d <= 20ms: 0	
20 ms < d <= 200ms: 1	
E2 (d>200ms): 0	
Other T.C.(ms): 0	
E4: 0	
QP Delta (dB): -12.0	
Obs. Time: 02:00:00	
Ref (56.0)	
IF: 23.42	QPeak: 55.42

SPECIFICATIONS CA0001

Frequency range	150 kHz; 500 kHz; 1,4 MHz; 30 MHz
RF input VSWR	Zin 50 Ω, Internal switch from LISN or BNC fem. < 1.2
Attenuator Preamplifier	0 dB to 35 dB (5dB steps) one per channel, independent setting 15 dB, one per channel, independent setting
RF output VSWR	Zout 50 Ω, BNC fem. < 1.2
Max input level (without equipment damage)	140 dBuV (2 W)*
Preselector (permanent built-in) Four bandpass filters	150 kHz / 60 kHz BW@6dB 500 kHz / 120 kHz BW@6dB 1,4 MHz / 220 kHz BW@6dB 30 MHz / 180 kHz BW @6dB
Insertion loss (with 0 dB Attenuation)	< 10 dB
RF generator CW Frequency range Frequency resolution Accuracy Amplitude range Amplitude resolution Click (OOK) Minimum ON time Minimum separation Time resolution CISPR PULSES Spectral density range Amplitude resolution Flatness PRF PRF resolution RF output	150 kHz to 30 MHz 100 Hz 10 ppM 20 to 95 dBμV 0,1 ppm 100 μs 100 μs 10 μs 80 to 101 dBμV/MHz 0,1 dB 1.8 dB from 150 kHz to 30 MHz 1 to 500 Hz 1 Hz Internal switch or BNC-f.
Autocalibration	Embedded generator for autocalibration and system test
CISPR compliance	CISPR 14-1, CISPR 16-1-1, CISPR 16-1-2
I/O interface	USB
Application software	PCA - PMM Click Analysis software. Four channels IF and QP time diagram, with click detection and analysis. Measurement log and report. PCG - PMM Click Generation software. CISPR 16-1-1 standard, annex F and user's definable test generation.
Power supply	12 Vdc, 0,7 A
Built-in LISN Measuring frequency range Continuous rated output current Max permissible operating voltage AC supply frequency range CISPR equivalent circuit Test socket Line plug Artificial hand RF output	150 kHz to 30 MHz 16 A 250 Vac – 350 Vdc DC to 60 Hz 50 Ω // 50 μH SCHUKO 2P+E IEC 60320 C20 4 mm plug Internal switch or BNC fem.
Operating temperature	-5° to 45°C
Dimensions	235 x 105 x 335 mm
Weight	4.1 kg
Standard accessories	LISN mains cable, 25 cm BNCm - BNCm cable, 25 cm DB9m - DB9m cable, USB cable, AC/DC power adapter, PCA PMM Click Analysis software, PCG PMM Click Generation software, user's manual, standard calibration certificate, accessories pouch.

SPECIFICATIONS 9010F

Frequency range Resolution Frequency accuracy	10 Hz to 30 MHz 0.1 Hz < 1 ppm		
RF input VSWR	Zin 50 Ω, BNC fem. 10 dB RF att. : < 1.2 0 dB RF att. : < 1.6		
Attenuator Preamplifier Gain Pulse limiter	0 dB to 35 dB (5dB steps) 20 dB (after preselector) Built in (selectable)		
Max input level (without equipment damage) Sinewave AC voltage Pulse spectral density	137 dBμV (1 W)* 97 dBμV/MHz		
Preselector	One Low Pass and six Band Pass filters		
IF bandwidth	6 dB bandwidth: 1, 3, 10, 30, 100, 300 kHz (CISPR 16-1-1; 200 Hz, 9 kHz) 6 dB bandwidth: 10, 100 Hz; 1, 10 kHz (MIL-STD option)		
Noise level @ hold time 1s		Quasi-peak (dBμV)	Average (dBμV)
Preselector OFF, Preamplifier OFF	9 kHz to 150 kHz (200 Hz RBW) 0.15 to 30 MHz (9kHz RBW)	< -13 < 5	< -16 < 0
Preselector OFF, Preamplifier ON	9 kHz to 150 kHz (200 Hz RBW) 0.15 to 30 MHz (9kHz RBW)	< -27 < -9	< -30 < -14
Preselector ON, Preamplifier OFF	9 kHz to 150 kHz (200 Hz RBW) 0.15 to 30 MHz (9kHz RBW)	< -7 < 5	< -10 < 0
Preselector ON, Preamplifier ON	9 kHz to 150 kHz (200 Hz RBW) 0.15 to 30 MHz (9kHz RBW)	< -24 < -7	< -27 < -12
Spurious response	Peak, Hold time 100 ms < -7 dBμV, < 3 dBμV, above 150 kHz		
Detectors	Peak, Quasi-Peak, Average, RMS, RMS-Average, C-Average, APD ⁽¹⁾		
Scan time SWEEP MODE FULL CISPR: preselector ON, QP detector	A band (9 - 150 kHz) B band (150 kHz - 30 MHz)	< 5 s < 20 s	Hold time 1 s, 200 Hz RBW Hold time 1 s, 9 kHz RBW
ANALYZER MODE preselector OFF, Peak detector	A band (9 - 150 kHz) B band (150 kHz - 30 MHz)	< 0.5 s 1 s 1 s < 0.1 s	Hold time 0.15 s, 200 Hz RBW Hold time 1 s, 300 kHz RBW Hold time 50 ms, 9, 10 kHz RBW Hold time AUTO, 30 kHz RBW
Level measuring time (Hold time)	CISPR 16-1-1 as default 0.1 ms to 120 s		
Stand alone & 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. Others and custom limits: make and upload by PMM Emission Suite Battery charge and voltage Display style, contrast, backlight CISPR 14-1 compliant Discontinuous disturbance (Click) measurement (optional)		
Display units Stand Alone With PMM Emission Suite software	dBm, dBμV (80 to 120 dB display dynamic) dBm, dBμV, dBμA, dBpW, dBμV/m, dBμA/m, dBpT (80 to 200 dB display dynamic)		
Measurement accuracy S/N > 20dB	10 Hz to 9 kHz: ± 1.0 dB Typ 9 kHz to 30 MHz: ± 0.8 dB		
RF output Frequency range Level range Level accuracy (10 Hz to 30 MHz)	Tracking (manual mode) & CW generator, Z _{out} 50 Ω, BNC-f. 10 Hz to 50 MHz 60 to 90 dBμV (0.1 dB step) 0.5 dB		
Autocalibration	Internal reference source		
I/O interface	RS-232, High speed Optical (2 channels), USB rear (front for future extension), User port (Drives PMM LISNs and accessories), Bluetooth (optional), IEEE-488 (optional)		
Operating temperature	-5° to 45°C		
Dimensions	235 x 105 x 335 mm		
Weight	4.3 kg		

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