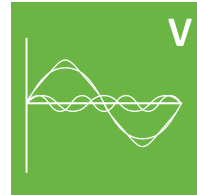
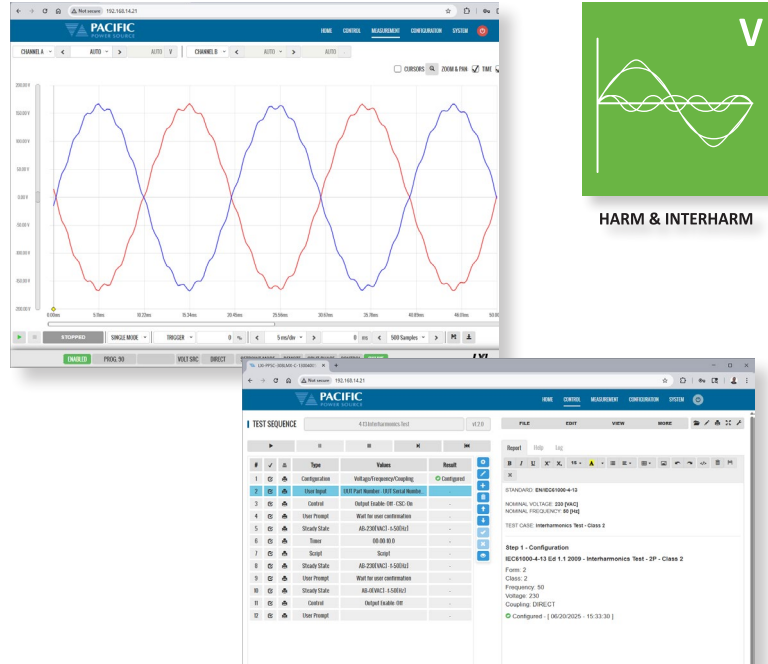




International
Electrotechnical
Commission

Pacific Power Source offers IEC61000-4-13 Option C to simplify EMC compliance testing.

Web based test sequences and Interharmonics Generator for the IEC 61000-4 Power Line Immunity Test Standard included.



HARM & INTERHARM

IEC61000-4-13

Harmonics and inter harmonics

Key Features:

- Test levels for ALL EUT classes 1, 2, 3 and X.
- Pre-set test sequences conform to IEC 61000-4 test standards.
- Run all IEC 61000-4-13 Immunity tests in sequence or individually.
- Comprehensive measurements are recorded (e.g. AC source voltage distortion, resonance currents).
- User prompts guide operator during the entire test procedure.
- Rich text generated reports are compatibility with most word processors for easy customization.

Option available on AFX, AGX, AZX, LSX and LMX Series Power Source Models. Standard on RGS and GSZ Series.

IEC 61000-4-13 Immunity Testing

The EMC Directive is part of the European Union's "New Approach" Directives and applies across all 27 EU member states. It covers all electronic and electrical equipment that may generate or be affected by electromagnetic interference (EMI). As a result, manufacturers in these industries must ensure their products comply with the Directive's requirements and be able to demonstrate compliance in order to affix the CE Mark.

One key compliance standard is IEC 61000-4-13, which addresses immunity to harmonics and interharmonics commonly found on public utility power networks.

Pacific Power Source offers the -413 Test Option on several of its model series, complete with Windows-based control software to execute the required tests and generate detailed reports for compliance documentation.

Advantages:

- Accommodates changing IEC standards and ALL EUT classes
- Ready to test out of the box. No programming required saves time and increases productivity
- Documents and validates AC source compliance and EUT behavior *during* test
- User-friendly prompts reduces user-error. No detailed IEC standards knowledge required.
- Easily meet documentation requirements and augment technical construction files with test reports

IEC 61000-4-13 Harmonics and Inter Harmonics

The objective of the IEC 61000-4-13 standard is to ensure that products are impervious to the effects of signaling frequencies that may be present on the public utility power grid. Signaling over AC power lines is often used to remotely control switch gear or other devices.

The IEC 61000-4-13 test requirements are rather extensive compared to the other IEC 61000-4 tests. It also requires a second, asynchronous wave form generator capable of generating inter harmonics. Inter harmonics are not harmonically related to the fundamental power frequency (50Hz or 60Hz) and therefore, it is mandatory that a separate oscillator is used to generate these frequencies. AC power source models can be ordered with the -413 interharmonics generator, option C, and is standard on RGS and GSZ Grid simulator models.

The IEC 61000-4-13 test required are implemented using the web browser based IEC61000-4-13 test sequences. This test sequence covers all defined EUT classes and nominal voltage and frequency combinations for single, split or three phase EUTs.

Harmonics and Inter Harmonics frequency ranges are swept using pre-scribed frequency step sizes resulting in long test times.

The appropriate IEC 61000-4-13 EUT class and type of test can be selected from the test sequence's CONFIGURATION dialog based on nominal voltage, frequency and phase mode (FORM). Once selected, the selected test or tests can be started.

A typical IEC 61000-4-13 three phase interharmonic frequency sweep tests is shown in Figure 2.

Browser Sequence User Interface

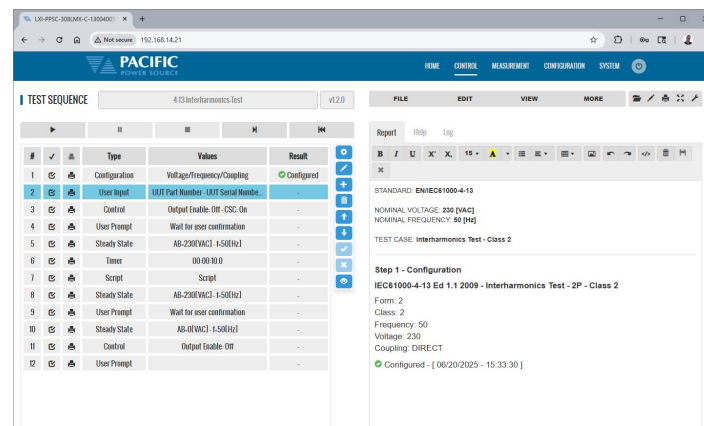


Figure 1: IEC 61000-4-13 GUI Test Configuration Screen

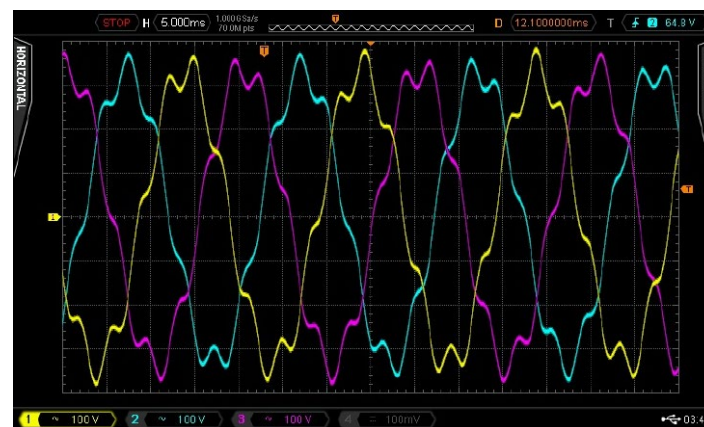


Figure 2: IEC 61000-4-13 Inter Harmonic Frequency Sweep Test

IEC 61000-4-13 Table	Test	Voltage V_{LN} / V_{LL} (RMS)	Frequency (Hz)	Class/Test Level	Phase Mode
Table 1, 2 & 3	Odd Harmonics	115 / 208Vac	60 Hz	Class 1, 2 & 3	1 ϕ , 2 ϕ , 3 ϕ
		230 / 400Vac	50 Hz	Class 1, 2 & 3	
Table 4	Inter Harmonics	115 / 208Vac	60 Hz	Class 1, 2 & 3	
		230 / 400Vac	50 Hz	Class 1, 2 & 3	
Table 7	Flat Curve	115 / 208Vac	60 Hz	Class 1, 2 & 3	
		230 / 400Vac	50 Hz	Class 1, 2 & 3	
Table 8	Over Swing	115 / 208Vac	60 Hz	Class 1, 2 & 3	
		230 / 400Vac	50 Hz	Class 1, 2 & 3	
Table 9	Frequency Sweep	115 / 208Vac	60 Hz	Class 1, 2 & 3	
		230 / 400Vac	50 Hz	Class 1, 2 & 3	
Table 11	Meister Curve	115 / 208Vac	60 Hz	Class 2	
		230 / 400Vac	50 Hz	Class 2	

Table 1: IEC 61000-4-13 Test Coverage

IEC 61000-4-13 AC Source Requirements

Table 5 of the IEC 61000-4-13 standard specifies AC generator performance requirements. All Pacific Power Series AC power sources meet or exceed these requirements as indicated in table 5.

In addition to the AC Source requirements shown in Table 5, the AC voltage distortion of the AC Power Source output under load must meet the same requirements as for IEC 61000-3-2 Harmonics emissions testing. All Pacific Power Sources listed here have been verified to meet these distortion requirements.

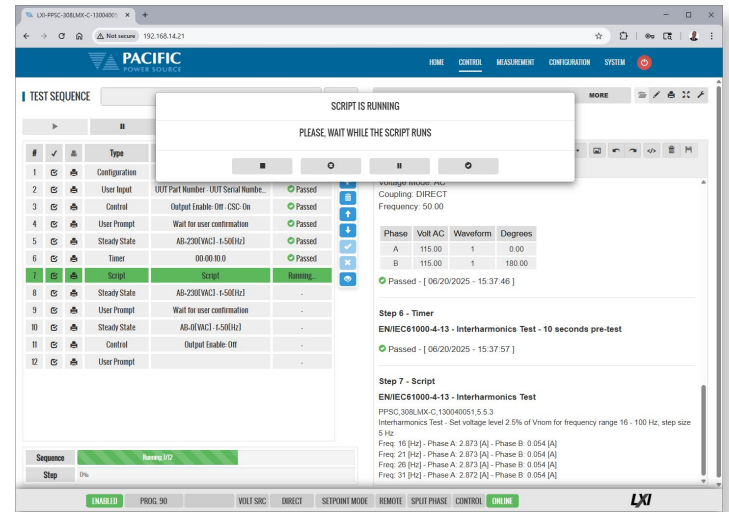
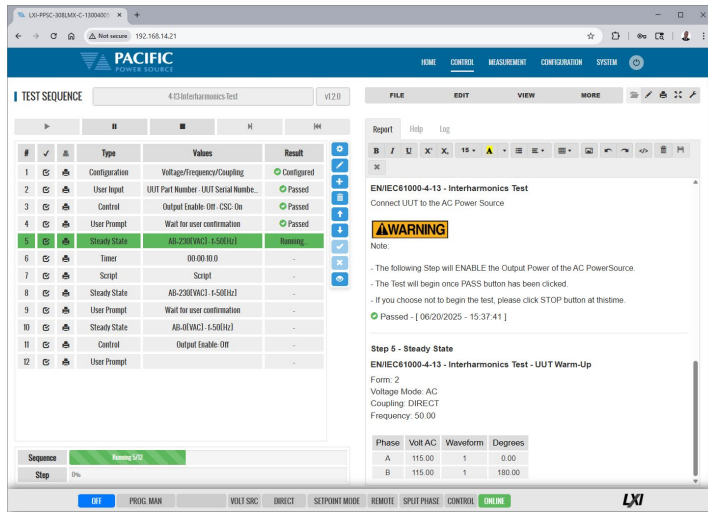
Parameter	IEC 61000-4-13 Requirement	Pacific Power AC Source Compliance
Fundamental Voltage:		
- Magnitude U ₁	Nominal main voltage $\pm 2\%$ single phase Nominal main voltage $\pm 2\%$ three phase	Voltage Accuracy: $\pm 0.5\%$ single phase Voltage Accuracy: $\pm 0.5\%$ three phase
- Frequency	50Hz $\pm 0.5\%$ or 60Hz $\pm 0.5\%$	50Hz $\pm 0.01\%$
- Angle between phases	120° $\pm 1.5^\circ$ (star connection)	120° $\pm 0.5^\circ$
Individual Harmonics:		
- Order	2 to 40	2 to 51
-Magnitude U _h Range Accuracy	0% - 14% Larger of $\pm 5\%$ of U _n or $\pm 0.1\%$ of U ₁	0% to 100% < 3% of U _n
- Phase angle h = 2 to 9	0°, 180°	Programmable 0° to 359°
- Accuracy of zero phase crossing with respect to fundamental	$\pm 2^\circ$ of fundamental	$\pm 0.5^\circ$ of fundamental
Inter Harmonics		
-Magnitude Range Accuracy	0% to 10% Larger of $\pm 5\%$ of U _n or $\pm 0.1\%$ of U ₁	0% to 100% < 3% of U _n
-Frequency Range Steps for adjusting Maximum error of adjusted value	0.33 x f ₁ to 40 x f ₁ 0.1 x f ₁ to 0.5 x f ₁ $\pm 0.5\% f$	0.33 x f ₁ to 80 x f ₁ Exceeds requirements $\pm 0.01\% f$

Table 2: IEC 61000-4-13, Table 5 Generator Requirements

IEC413 Option Graphical User Interface

The included web browser based test sequences guide the operator through the relevant test parameters, EUT classes and tests for execution. Once a test is completed, a

comprehensive test report is generated to document all test parameters and results. The following control and display screen are part of the web based test sequence.



Test Configuration Dialog

The configuration dialogs allows the operator to select the following settings:

- EUT Test Class 1, 2 3 or User (X)
- Nominal Voltage and Frequency
- Phase Mode (FORM) - 1, 2 or 3 Phase
- Tests to be Included
 - Flat Top Curve Test
 - Frequency Sweep Test
 - Individual Harmonics Test
 - Meister Curve Test
 - Interharmonics Test
 - Over Swing Curve Test
 - AC Source Voltage Distortion Verification (Vthd)

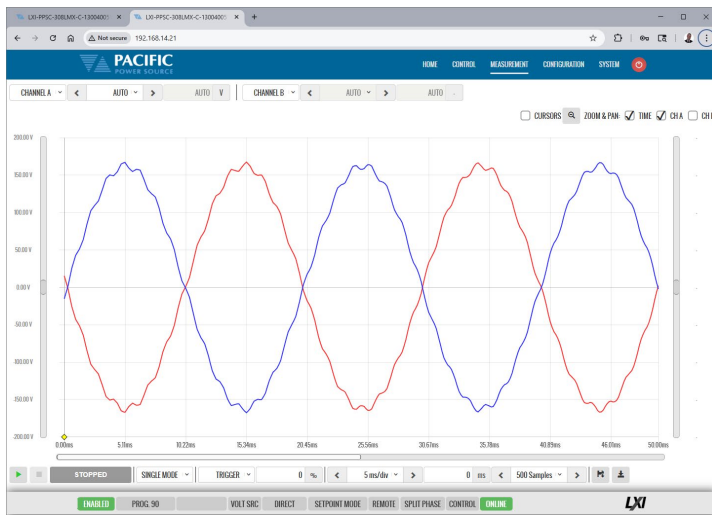
EUT Classes

Harmonics and Interharmonics levels differ for different EUT classes. For class 1, 2 and 3, the levels and frequency ranges are fixed per the IEC 61000-4-13 test standard.

Dwell times for each frequency range and any delay time between successive ranges during execution can be adjusted by the user if desired.

For the User Class X, the operator can set custom test levels based on the relevant IEC product category standard if test levels other than for Class 1, 2 or 3 EUTs are called out.

IEC61000-4-13 Option Web Browser based Test Sequence

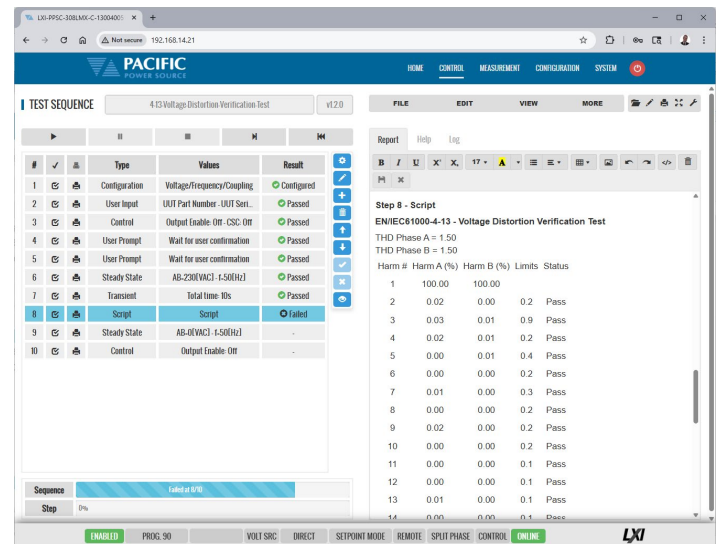


Test Waveforms Screen

The Waveform display screen voltage and current waveforms on all available phases to be captured and displayed. .

All relevant Test waveform are included, e.g.:

- Flat Top Curve
- Meister Curve
- Over Swing Curve



Voltage THD Check Test

It is important that the AC power source used has a sufficiently low output impedance so it does not affect the harmonics current caused by generating the harmonics and interharmonics during the test. This ensures that results obtained on different EMC test systems are comparable.

To this end, the voltage distortion of the AC Power source must be checked. This is done by running the "Voltage Distortion Verification Test". The voltage harmonics from H2 through H40 are measured and compared against the maximum allowable limits per the IEC 61000-4-13 standard.

A pass or fail results is recorded and included in the test report. The example above shows a passing result.

IEC61000-4-13 Option Web Browser Test Reports

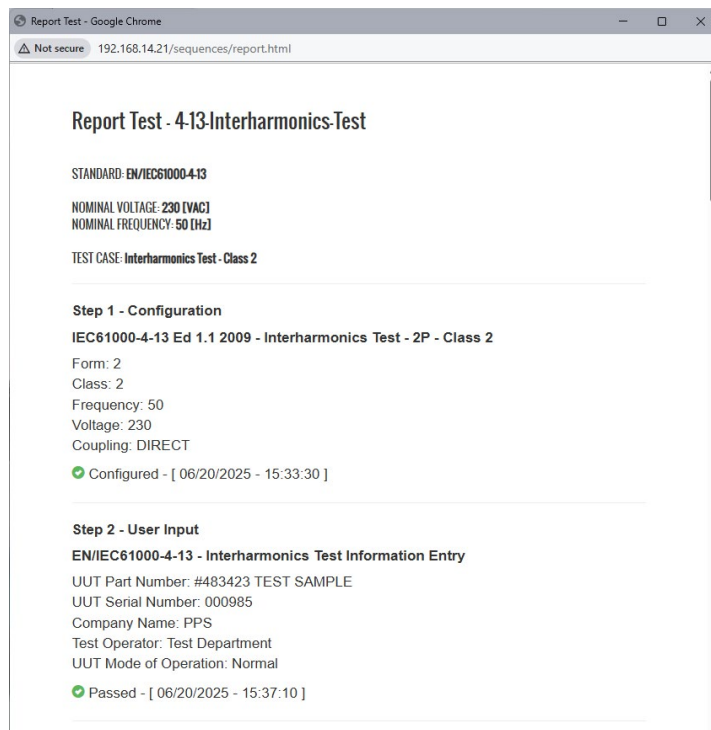
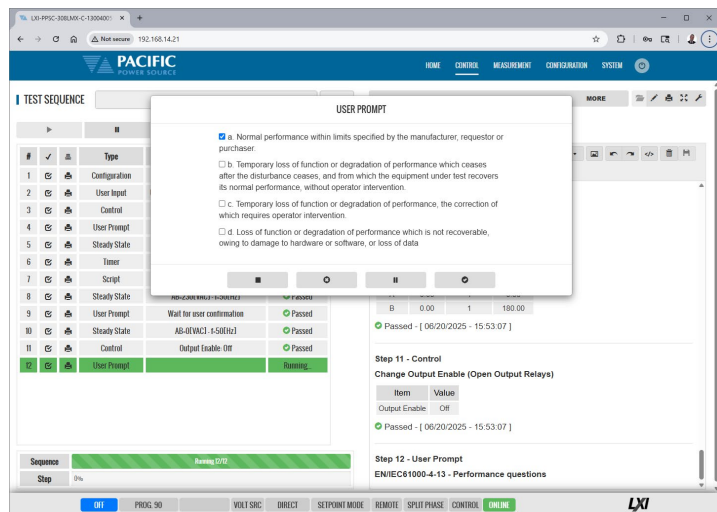


Figure 4: Sample IEC 61000-4-13 EUT Test Report Pages

Resonance Points

A current resonance can occur when the inductive and capacitive components of the EUT impedance cancel each other out. If the harmonic or inter harmonic current at a constant harmonic voltage amplitude reaches a maximum value at a frequency f_{res} , and the current decreases by 3 dB in the frequency range f_{res} to $1.5 f_{res}$. A resonance frequency can cause significant thermal disturbances. Thermal effects are not considered in this standard.

When using an AC power source with a very low output impedance like those made by Pacific Power Source, it may be necessary to use an impedance network to find resonance conditions. In that case, the IEC product committee for a given EUT category may recommend the use of an IEC 60725 impedance network. This is the same impedance network found in Pacific's EMC Test Systems (LFZ Series).

During the Frequency test, the AC power source is used to measure current and look for resonance conditions.

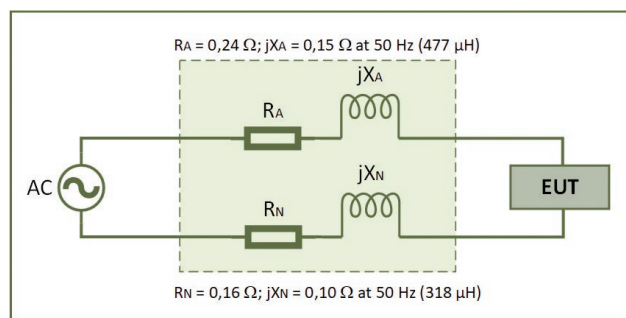


Figure 3: IEC 60725 Lumped Impedance Network

Report Generation Tab

Test reports are important to show compliance to required CE mark test standards. The test sequence provides a comprehensive multiple pages test report in html Format that can easily be converted to other formats as needed or used as is.

Test reports include all EUT information entered by the operator, EUT class selection, tests performed, any Vthd check data, resonance current data and pass or fail criteria as determined by the test operator at the end of each test.

A sample report is shown above.

Test Coverage By Source Model Series

IEC 61000-4 Test	Mode	AFX, AGX, AZX, LSX & LMX Series	GSZ & RGS Series
IEC 61000-4-13	AC	Option C	Standard

Ordering Information

Order Example

Option C (Appends letter C to applicable Power Source Model.)

- IEC 61000-4-13 Test Option

Note: This option must be ordered with the AC Power Source or ECTS2 System. Existing PPS AC Power Source owners can contact customer service for upgrade information.

Parts of the Standard Delivery

- Interharmonic Generator installed in AC Power Source
- IEC61000-4-13 web browser based Test Sequences P/N 149301
- Ects_413Gui for Windows 10 Software (download). License key provided + PDF Manual.

Compatible with these AC Power Source Series



LMX & LSX Series - 500VA to 30kVA



AFX Series - 6kVA to 180kVA



AGX Series - 6kVA to 756kVA

RGS Series - 12kVA to 756kVA



AZX Series - 30kVA to 1.1MVA

GSZ Series - 30kVA to 1.1MVA



2802 Kelvin Avenue, Suite 100
 Irvine, CA 92614 USA
 Phone: +1 949.251.1800
 Fax: +1 949.756.0756
 Toll Free: 800.854.2433
 E-mail: sales@pacificpower.com
 www.pacificpower.com