

SIM[®] 3 Audio Analyzer: Unconventional. Evolutionary.

Pioneered by Meyer Sound, SIM is a Meyer Sound trademark for a highly developed analyzer for source independent measurement.

The technique is a dual-channel acoustical analysis method in which the excitation signal may be independent of – not generated or determined by – the measurement system.

Source independent measurement uses faster, high-resolution algorithms that substantially decrease errors and achieve more precision than conventional dual-FFT techniques. Source independent measurement provides the information required to verify the components of a sound system including polarity, distortion, dynamic range, coverage and more.

The combined components can then be precisely aligned using SIM 3's capability to guide the process of setting crossover parameters, delay times, equalization, level and speaker positioning.

Built on almost 20 years of research and development, ongoing worldwide field testing and award-winning, breakthrough technology, the SIM 3 audio analyzer is the newest generation of acoustical audio analysis in an integrated hardware and software package. In the field or on the bench, SIM 3 analyzes entire sound systems as easily as it verifies the performance of individual electronic components.

Made for the road, equipped with a fast flash hard drive and blazing fast processing speed — more than 50 times that of SIM II — SIM 3 provides capabilities far beyond those of existing audio measurement systems. For example, under windy conditions the extraordinary speed of SIM 3 enables it to successfully take measurements when the wind subsides for one brief moment. And measurements using voice as the source for microphone equalization that formerly took minutes now take seconds.

This dedicated 2-space rack-mount hardware running proprietary software features:

- *The ability to test entire acoustical/electronic systems or individual electronic components*
- *Unprecedented power and speed with more than 2,000 FFTs per second: results at high resolution in less than one second*
- *Voltage and SPL calibrated measurements*
- *Two line level and mic inputs with instrumentation grade preamps*
- *Optional external line or microphone signal switchers to expand the number of signal branches to be measured without any re-patching*
- *Optional internal 2-channel switcher ideal for studio work*
- *CD-RW storage for analysis data and export to other environments*
- *Digital signal generator capable of creating a wide variety of test signals*

In addition, SIM 3's high-quality 24-bit converters and ability to make measurements with over 110 dB of dynamic range enable THD (Total Harmonic Distortion) measurements down to .001%. For frequency response, SIM 3 displays information above 1 kHz (averaged 16 times) in less than one second, while frequencies from 250 Hz to 1 kHz are displayed in less than three.



1986

Based on the Hewlett-Packard 3582A dual-channel FFT analyzer, the first generation SIM's novel source independent measurement capability immediately garners Mix magazine's prestigious TEC Award for Outstanding Technical Achievement (in) Acoustics Technology.



1991

The SIM II FFT analyzer, released in 1991, receives the prestigious R&D 100 Award from R&D Magazine, for such innovations as its three simultaneous transfer functions.

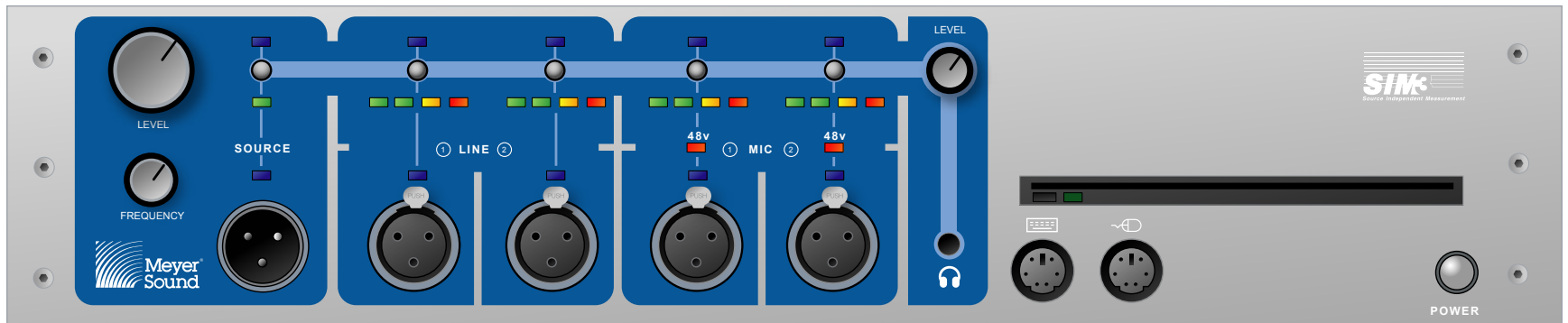
(Pictured: SIM II unit with multi-channel line/mic switcher and monitor)



2003

SIM 3 launches, representing a major advance, greatly increased power and added features at a fraction of the original size and cost.

(Pictured: SIM 3 unit with multi-channel line switcher, two mic switchers, flatscreen monitor, and keyboard/mouse)



Transfer Functions

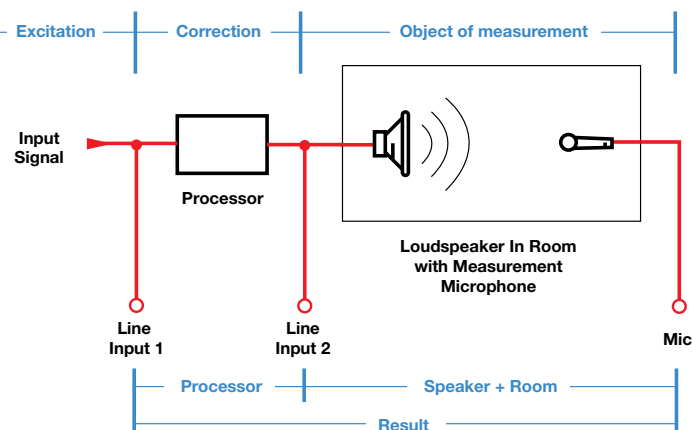
The innovation of source independent measurement is not just that it displays the transfer function across any two points in the signal chain, but that it distinguishes the effects of each component, enabling you to tune the system to precisely what you want the audience to hear.

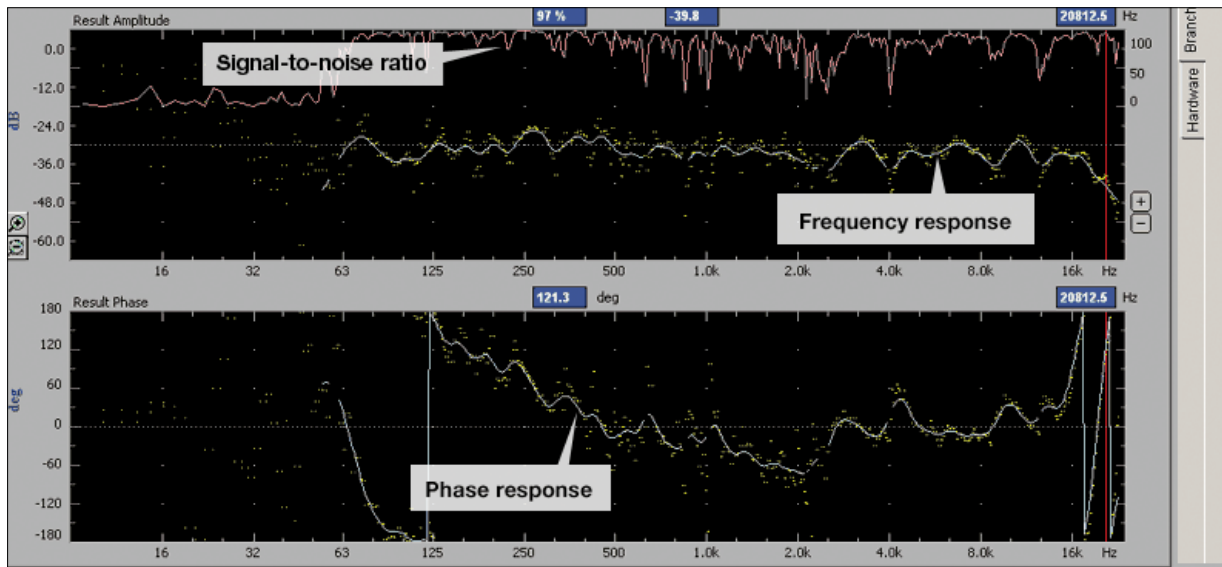
Frequency Response: Amplitude and Phase vs. Frequency

In Frequency Response mode, SIM 3 displays amplitude, phase and coherence (or signal-to-noise ratio) data from the transfer function computations between any two of the measurement inputs. Unlike conventional audio analyzers that give you only part of the picture and leave you to draw your own conclusions, SIM 3 lets you see measurements using real program material, such as a live musical performance, in addition to showing you the results of internally-generated test signals like pink noise or a sine wave.

- *SIM 3 shows you exactly what is going on within the system in both frequency and time domains*
- *Ultra-flexible software alternates between viewing pertinent frequency spectra, impulse response, and frequency response at key points in the system*
- *Measures and displays multiple transfer functions at the same time for thorough system analysis*

By comparing the input and output signals of each component in the system, the system's effect on the signal – the transfer function – can be obtained and displayed as frequency, phase response and signal-to-noise ratio.



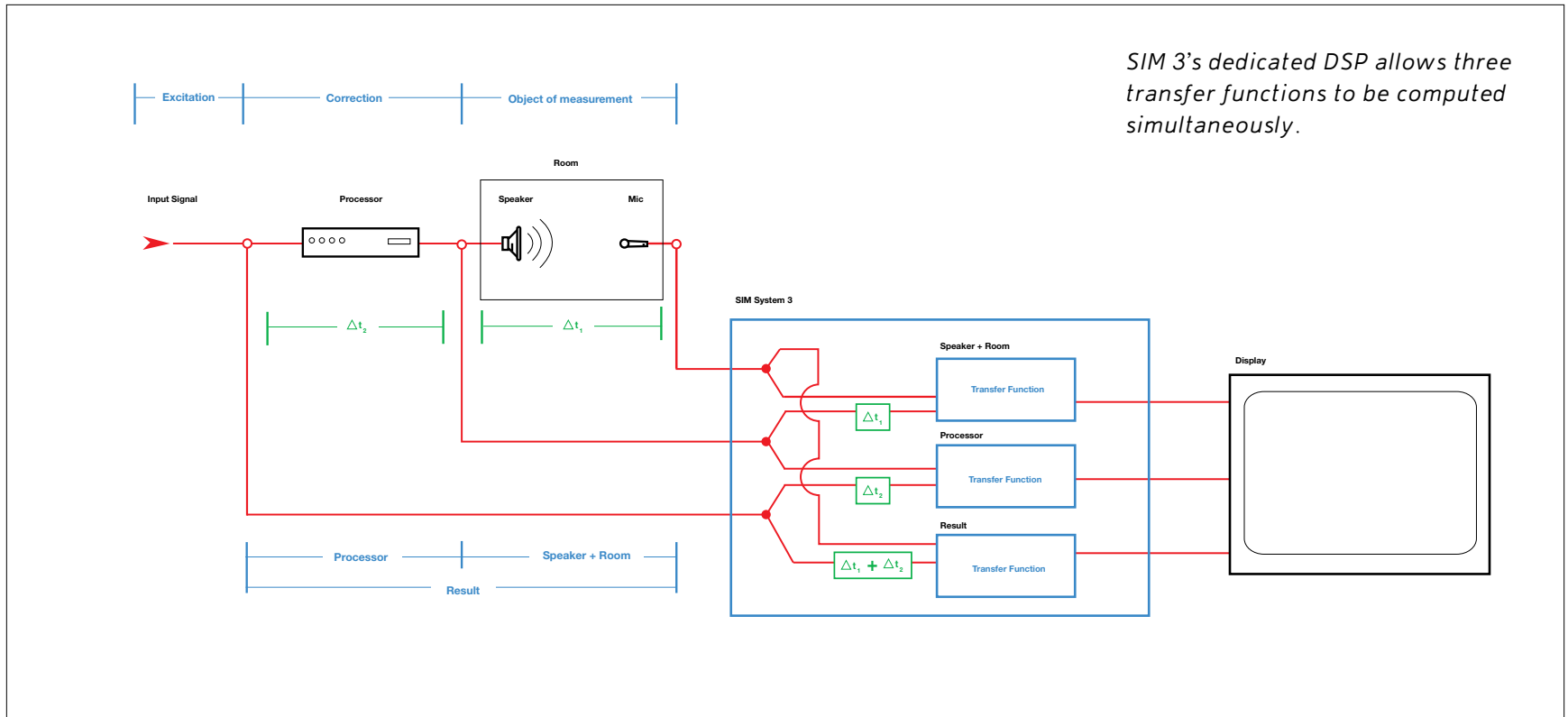


3 is the Magic Number

A capability unique to SIM 3, these three transfer functions work simultaneously to provide real-time data acquisition. SIM 3 starts by measuring the effects of the electronic or acoustical signal path through a comparison of two points in the signal chain, most commonly combinations of the mixing console output, equalizer or digital signal processor output, and a microphone placed in the room to capture the sound as heard by the audience. Three transfer functions using state-of-the-art, dedicated hardware and software processing make possible a slew of computations and measurements, delivering a wealth of information in both frequency and time domains.

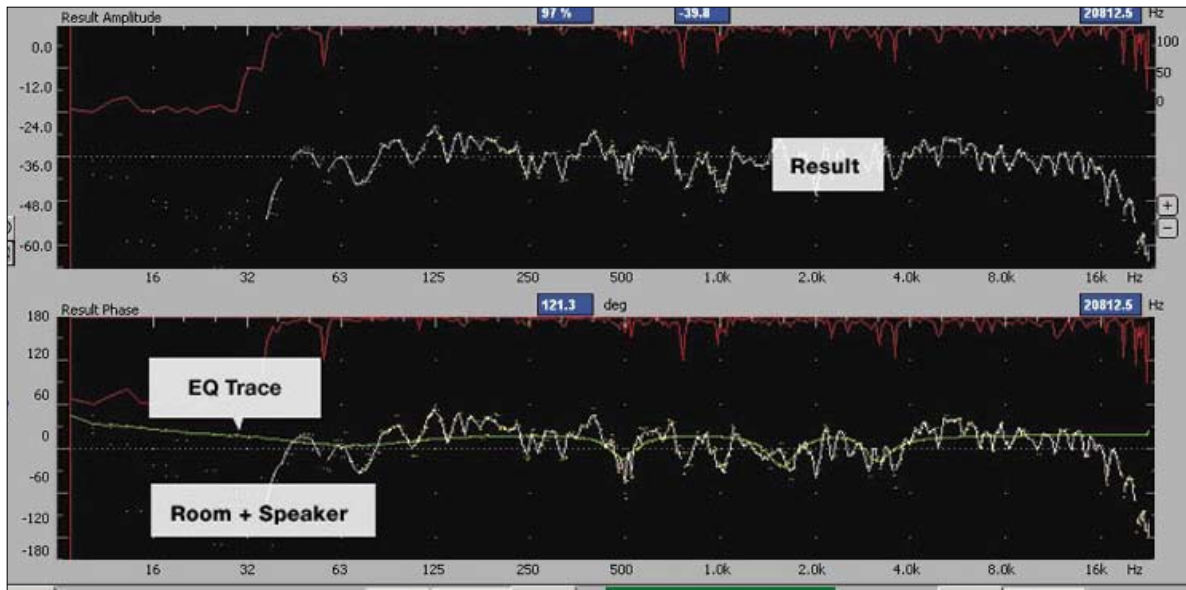
You can select three different frequency response measurement views:

- *Room + Speaker* – the unfiltered system response, measured by comparing the signal processor output and microphone
- *Processor* – the signal processor and inverse processor response, measured across the processor from input to output
- *Result* – the corrected system response, measured by comparing the processor input and microphone



In addition, you can select Group view to instantly see these three frequency response measurements at the same time. Zoom features can also be used to display the measurement with a different amplitude scale or a smaller range of frequencies to reveal fine details of the system response. In Group view the result is a crystal clear display of not only what is really going on acoustically, but the effects of each component identified by SIM 3 in the system.

You apply the correction you need to obtain your desired frequency and phase response while the software measures the effects of your changes in real-time. Since the test signal is what you are actually hearing, analysis and correction can be performed dynamically throughout the course of an event. In contrast, traditional analyzers, using only pink noise or sine waves, cannot be used during the most critical phase of the sound system's work: the performance.



The SIM 3 Frequency Response group display. The lower pane shows frequency response of the speakers and room in white (processor output to microphone), processor curve in green (inverse trace shown), and signal coherence in red. The top pane shows frequency response for the whole system, or Result (console output to microphone) including the signal coherence also in red

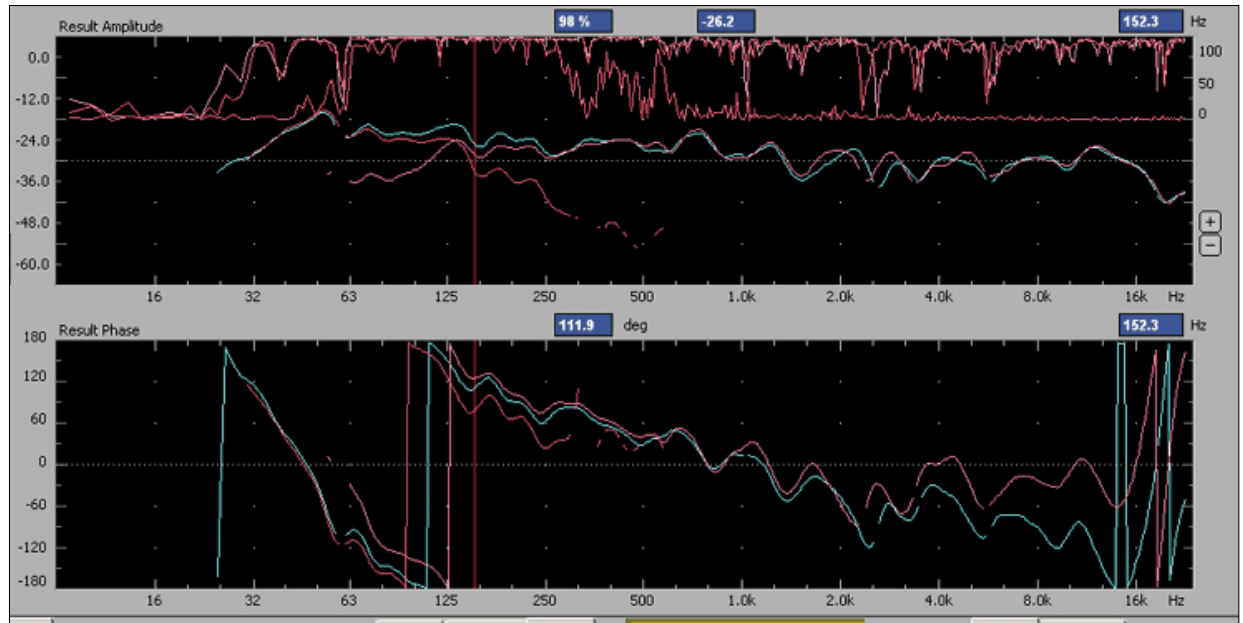
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Simultaneous viewing of frequency responses throughout the system allows you to compare and understand the effects on the signal of the EQ or processor chain, the loudspeakers and room, or both (system response). Each transfer function is calculated and displayed at an unheard of resolution of 48 points per octave – double that of SIM II and other software-based analyzers. Smoothing functions can be applied to the display to show the data at lower resolutions, such as 1/6 or 1/3 of an octave.

All of this – blazing speed, ultra-high resolution and multiple simultaneous transfer functions – is possible because SIM 3 uses dedicated processors for DSP and display.

Rig It, Measure It, Analyze It!

SIM 3's unique ability to calculate and display all three transfer functions at the same time makes access to important data easy. By using any two of three measurement points, you can analyze a single component or a complete sound system. In addition, up to four memory traces can be displayed, enabling a quick comparison of measurements.

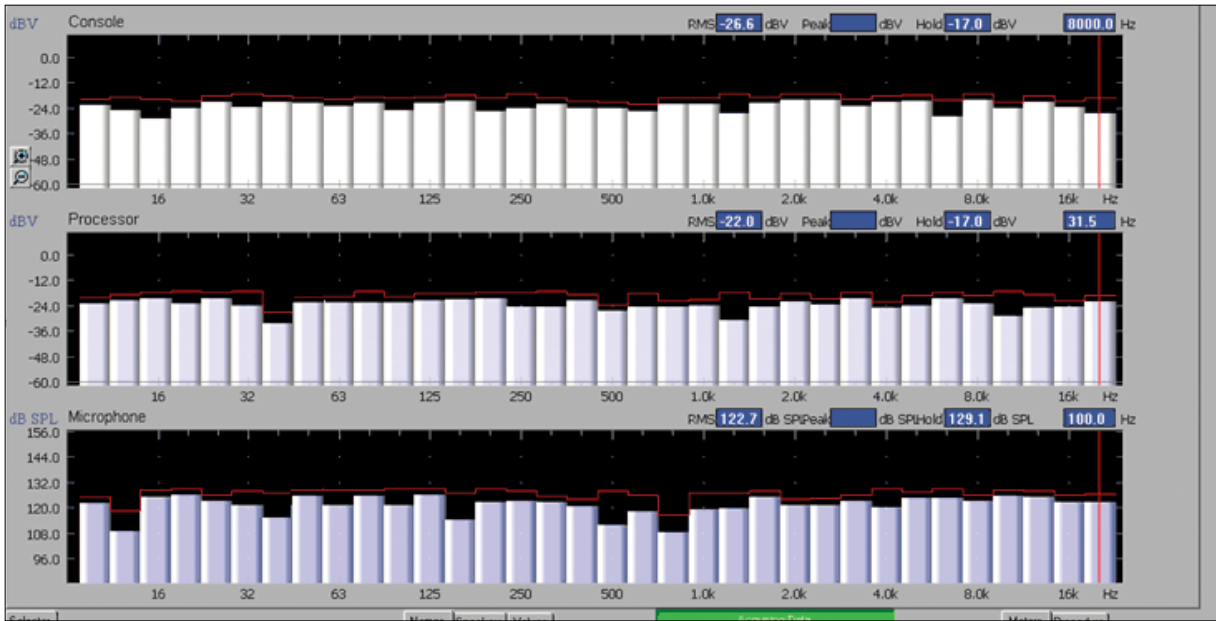


Multiple overlaid memory traces allow for comparison and crossover adjustments.

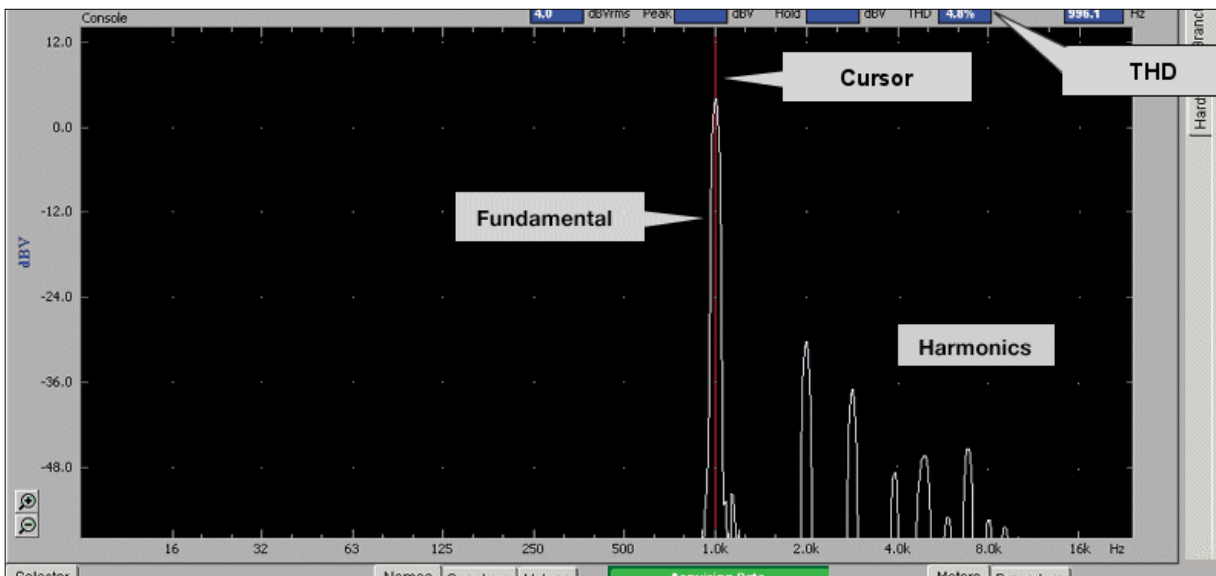
In addition to the frequency and phase response measurements SIM 3 allows you to do other amplitude and time-related meaningful measurements.

Band and Line Spectrum: Amplitude vs. Frequency

The Band Spectrum measurement calculates the spectral content of each point in the system — console output, processor output and microphone, and displays them individually or simultaneously. The ANSI 1/3 octave displays allow you to do calibrated measurements or help you quickly verify signal presence throughout the system. SIM 3 can concurrently display both peak and average readings. Microphone measurements can be displayed in a linear or A, B, or C-weighted SPL calibrated scales.



The high resolution Band Spectrum displays console, processor and mic frequency spectra on a single screen.



Optimized for sine wave stimulus, SIM 3's Line Spectrum measurement can be used for distortion analysis down to .001% THD. SIM 3's high-quality preamps allow it to measure the noise floor of system components. Signal verification is instantaneous, overall frequency content of the signal being used is clearly shown, and distortion components are summed and displayed as a percentage relative to the amplitude at the cursor position. This makes amplitude vs. frequency and harmonic distortion analysis quick and simple.

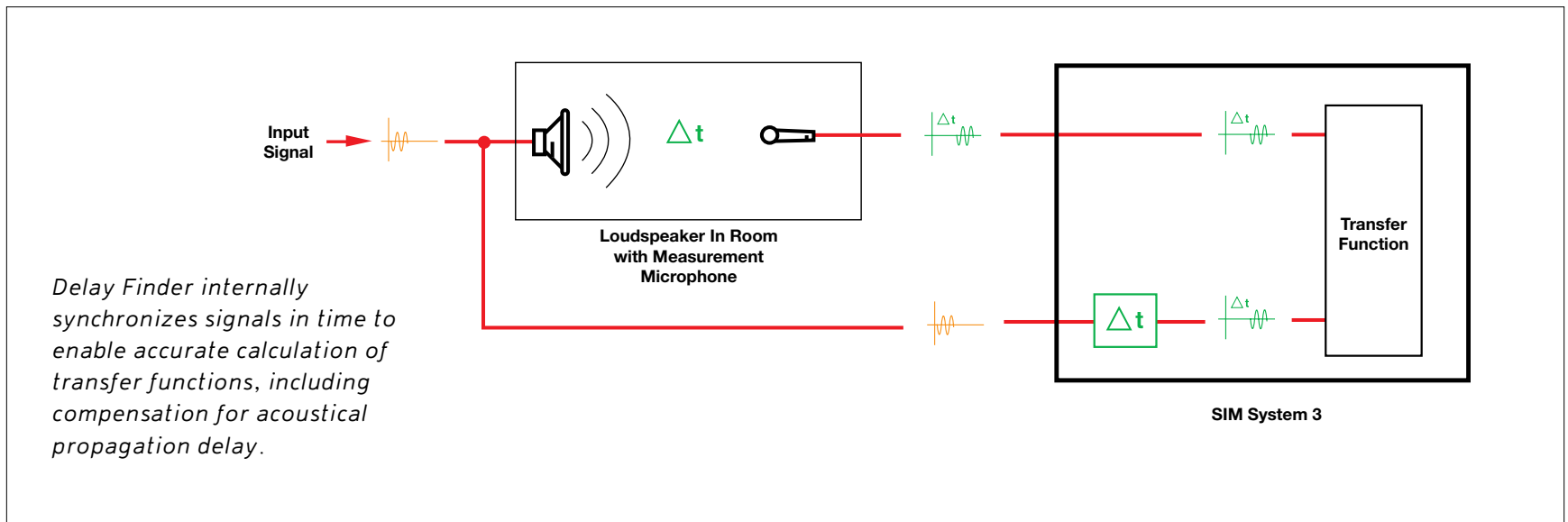
In Spectrum view, using a sine wave as test signal, you can see the fundamental plus harmonics, while calculating THD.

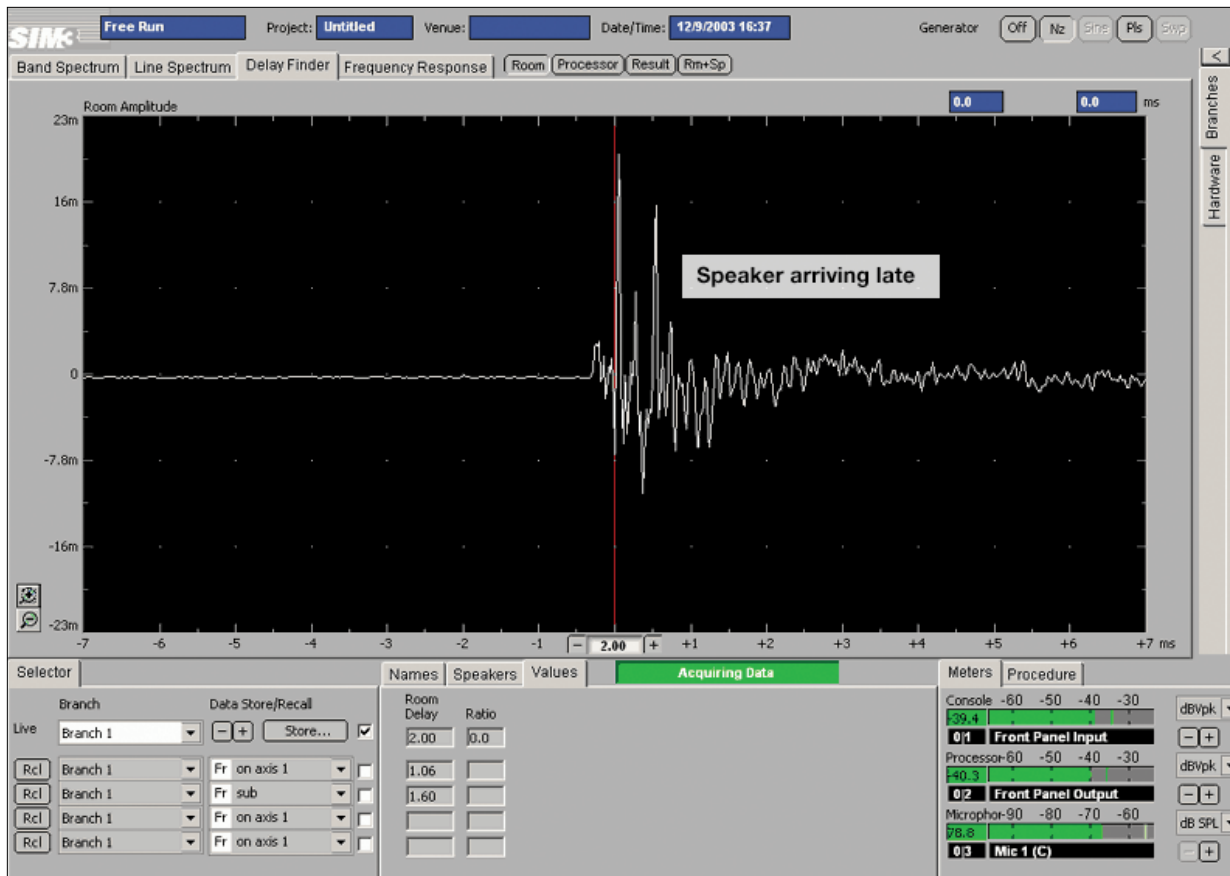
Delay Finder: Time vs. Energy

The Delay Finder function has many uses:

- Identifies the propagation delay from the loudspeaker to the microphone and internally synchronizes signals in time to enable accurate calculation of transfer functions.
- Identifies the differing arrival times of the direct sound and sounds from other loudspeakers in the system. This time vs. energy display helps to identify problems in the time domain and gives you information to solve them by adding the correct amount of delay to synchronize the loudspeaker system.
- Identifies the differing arrival times of the direct sound and reflections in the room from floor, ceiling, walls etc. This time vs. energy display helps to identify problems in the time domain and gives you information to solve them by re-aiming the loudspeakers and/or possibly using absorptive materials in the room.

In addition, Delay Finder identifies the latency delay in digital signal processors and internally synchronizes signals in time to enable accurate calculation of transfer functions between points in the system. Delay Finder will even show you polarity information to help locate miswired loudspeakers and electronic components that are reversed in polarity from the rest of the system.





Understanding the acoustical environment and determining optimal loudspeaker placement has never been easier. The Set System Delay procedure gives you the information to set delay times for proper synchronization of all loudspeakers in a system.

Power, Speed and Accuracy

The SIM 3 audio analyzer is more than a sound system alignment tool – it can be used to typify the effects of any system. For example, by comparing the outputs of a lavalier microphone and a reference microphone, SIM 3 can show the correction necessary to match the sound of the lavalier to the reference in seconds. The extreme precision and wide-ranging analytical capabilities of SIM 3 can be applied to an electronic device to see its actual performance in areas such as latency, distortion products, impulse response, phase, stereo operation (left/right channel comparisons), noise, simple gain, and clip points.

SIM 3 can verify the performance of a piece of equipment in rental inventory by comparing the device's transfer function with a reference measurement made on the same device when it was first put into service, or determine the actual signal level that causes clipping at a device's input, output or even within its internal signal path, regardless of what the device's metering or user interface might say. Latency in a digital processor or equalizer at different settings can be quantified easily, as can ringing or phase shift in a filter.

Advanced algorithms running at 32-bit floating-point resolution function accurately even with signals contaminated by reverberation or noise, and have been accelerated to provide immediate results, displaying, in less than one second, initial curves based on averaging more than 2,000 FFTs per second. Time is spent making important decisions about the sound of the venue instead of waiting and worrying about the reliability (or stability) of the software and computer. With dedicated hardware the reliability and stability is rock solid.

- *Real-time data acquisition*
- *Calibrated 1/3-octave real-time analyzer*
- *Precision line-spectrum analyzer*
- *Up to 48 points per octave frequency response*

The SIM 3 audio analyzer's calculations meet the true instrumentation definition of "real-time": All data presented at the analyzer's input is used in the analysis. SIM 3 uses overlapping windows for its FFTs, so that no data is lost.

SIM 3 displays information above 1 kHz (averaged 16 times) in less than one second, while frequencies from 250 Hz to 1 kHz are displayed in less than three. Frequencies down to 10 Hz take up to 10 seconds to capture (averaging at 16 times).

Real-time data acquisition is key to accuracy in spectral analysis. In a system that is not truly real-time, significant spectral events can be ignored if they occur at the wrong time.

Hardcore Hardware: Built for the Real World



*SIM 3 Unit
(2 rack space unit)*

Most basic source independent measurement operations can be completed using only these onboard facilities, but when larger systems or more sophisticated needs are involved, optional line-level and microphone switchers can be added to allow monitoring of multiple points in the signal chain. The versatile single rack, 16 line-level switcher allows immediate switching of analysis to multiple signal processing channels. The switcher can be configured as 8 inputs/8 outputs, 4 inputs/12 outputs, or all 16 outputs. The single half-rack 8-input mic-level switcher enables measurements in several places (zones) of the room being analyzed.

Once patched, measuring any point in the system can be accomplished without ever needing to touch a patch cable again, since processor and microphone inputs and outputs are software-selected through the switchers. In addition, their single and half-rack sizes provide complete flexibility for locating the switchers where you need them, whether front of house, a remote equipment room or other location.

The SIM 3 audio analyzer is optimized to be a truly multi-channel instrument so that your time is spent measuring and not setting up or patching a single channel unit. The processor unit includes:

- Two line-level inputs
- Two microphone inputs with 48 V phantom power and instrumentation-quality preamplifiers
- Multi-function high-precision signal generator
- Professional-grade XLR connectors on all inputs and outputs
- Headphone jack (1/4") with level control
- Onboard CD-RW drive for quick and easy data export and storage
- Optional external mic and line multi-channel switchers
- Optional internal two-channel switcher
- Dedicated operating system and application software



*SIM mic switcher
(1/2 rack space unit)*



*SIM line switcher
(1 rack space unit)*

SIM 3 switchers not only facilitate much greater mobility in changing test points, but, when isolating single loudspeakers or speaker arrays for test, they automatically handle muting of loudspeakers excluded from the test, and even switch monitoring points in the processing chain to appropriately follow the loudspeaker selection. With a switcher patched, nearly any point in a system can be measured without anyone plunging into the back of a heavily wired rack.

Total System Approach

On the road, reliability always triumphs over perceived convenience. While it may seem the easiest approach to install a software-only tool on a laptop computer, the well-known reality is that general-purpose systems such as personal computers are a Pandora's box of problems with compatibility, stability, operating system and security updates, and the computational demands of serious acoustical audio analysis.

The embedded operating system in SIM 3 is much smaller than commercial operating systems, meaning faster boot up times and a lean, mean system without extraneous software to steal processor cycles or cause instability. SIM 3's dedicated processor hardware is built to exacting Meyer Sound standards for complete software stability, using ruggedized industrial format PC boards to ensure survival day after day in the field.

The roadworthy rack mount package is compact and highly portable and the only moving parts in the entire unit are in the onboard CD-RW drive; the operating system and application are stored in a 1 GB Fast Flash Disk, which is faster and more robust than conventional hard disks, so that important software components are secure and protected at all times.

The software is bulletproof and 100% compatible with other units: In the event that your SIM 3 rig should become damaged or lost in transit, all that is needed for recovery is to obtain another unit and load data saved onto CD-RW. Since each processor unit is identical, there are no software configuration or hardware compatibility issues to address and the user interface and connections will always be the same.

Support

SIM 3 is a highly sophisticated tool that must be well understood to be fully utilized. Meyer Sound regularly holds comprehensive training seminars on the use of Meyer Sound SIM audio analyzers, which are available worldwide.

- *Real-time, guided procedures to step you through important test sequences*
- *Backed by Meyer Sound's well-known support – long after the sale*
- *Useful with any loudspeaker system, but promotes best use of Meyer Sound products in practice*

While Meyer Sound supports measurement of a sound system's performance in practice with its SIM audio analyzers, Meyer Sound's MAPP Online® acoustical prediction program is provided by Meyer Sound to enable you to accurately predict how a given complement of Meyer Sound loudspeakers will work in an environment before the products are purchased. In fact, MAPP Online even contains a Virtual SIM environment to further reinforce its predictive capabilities.

Meyer Sound is committed to supplying tools that ensure that the best possible fidelity is achieved in actual practice. To this end, development on SIM analyzers, MAPP Online and other products is ongoing.

SIM School

The SIM System is widely accepted as the world's most accurate acoustical analysis and equalization tool for applications in studios, live performance spaces and permanent installations throughout the world.

Meyer Sound is pleased to offer SIM training courses around the world. Open to anyone involved in professional audio, this course is recommended for audio engineers interested in maximizing the performance of sound systems and audio equipment.

To receive detailed information on SIM School (including fee and hotel information), as well as the enrollment form, please visit www.meyersound.com/sim3 and complete the SIM School Request Form. For any other questions regarding SIM School, email us at sim@meyersound.com. Please check our Seminar/SIM School calendar for a listing of upcoming classes in your area.

Advance registration is strongly recommended as classes fill up quickly. Meyer Sound reserves the right to cancel or reschedule a class without notice. Should Meyer Sound cancel or reschedule a class, a refund of the registration fee will be made or the registration fee may be applied to a future class.



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