MLSSA
Acoustical Measurement System

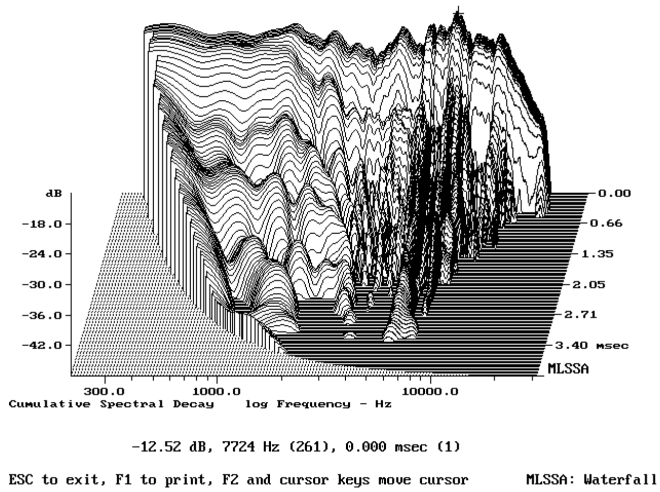
- Industry Standard
- Pink-MLS and White-MLS Outputs
- Adjustable Bandwidth: 1 kHz to 40 kHz
- Loudspeaker Measurements
- Integrated QC PASS/FAIL Functions
- Thiele-Small Parameters with SPO Option
- Speech Intelligibility per IEC 60268-16
- Room Acoustics per ISO 3382
- Room EQ Using the Adaptive Window

Industry Standard

Since its introduction in 1987, *MLSSA* (pronounced "Melissa") has become the loudspeaker industry's standard measuring system as recognized by the world's leading loudspeaker designers and manufacturers. *MLSSA* is also the system chosen by automakers, academicians, acousticians, recording studios and government agencies for many other applications including room equalization, room acoustics measurements and speech intelligibility measurements. *MLSSA*, an acronym of Maximum-Length Sequence System Analyzer, pioneered the MLS (Maximum-Length Sequence) measurement method, which offers an unsurpassed combination of speed, noise immunity and time-bandwidth product. The user-friendly *MLSSA* software offers a rich set of post-processing functions to satisfy the needs of a wide range of audio professionals including loudspeaker designers, sound engineers and acoustical consultants.

Loudspeaker Designers and Manufacturers

Loudspeaker designers find *MLSSA* indispensable for producing competitive designs especially for the high-end audio market. *MLSSA's* 40 kHz measurement bandwidth is essential for characterizing tweeter resonances and, its integrated 3-D waterfall display of loudspeaker sound decay (see figure) is much valued by loudspeaker designers and reviewers alike. When interfaced to a motorized turntable *MLSSA* performs automated polar measurements to completely characterize loudspeaker dispersion and directivity. *MLSSA* also performs loudspeaker impedance measurements. Other measurements are provided to assess loudspeaker time-coherence. Integrated QC PASS/FAIL functions are included for production testing of loudspeakers or drivers.



Room and Loudspeaker Equalization

The advent of surround sound and digital equalizers has created an urgent need for fast accurate in-room frequency response measurements. *MLSSA* provides a solution through its innovative Adaptive Window measurement method which is psycho-acoustically more accurate than conventional real-time analyzer (RTA) measurements. If desired, RTA-type room frequency response measurements can also be performed by *MLSSA*. In either case, spatial averaging of room measurements taken at different microphone locations is directly supported and functions are provided to perform surround-sound EQ as well as surround-sound level adjustments.

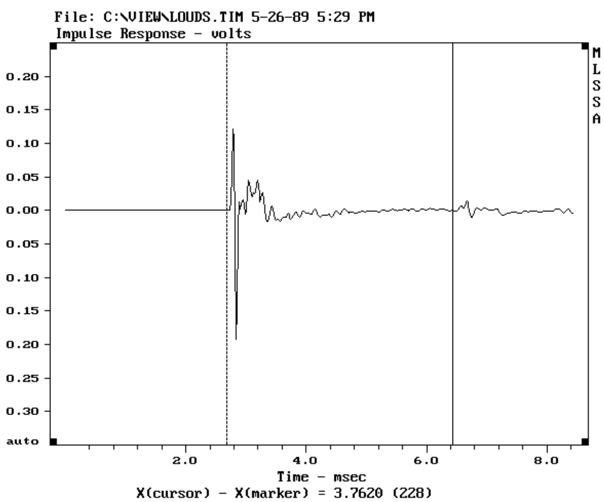
Sampling at exactly 96 kHz is supported to facilitate the use of fast convolution processors to perform room and loudspeaker equalization.

Acoustical Consultants

MLSSA provides an array of measurements required by acoustical consultants. Measure room and performance hall acoustics, noise levels as well as speech intelligibility. *MLSSA* measures room acoustics according to ISO 3382 in 1/1, 1/2 or 1/3-octave bands. You can also measure noise levels in 1/1, 1/2, 1/3 or 1/6-octave bands as well as the noise criterion (NC) rating. STI and RASTI measurements properly account for the effects of reverberation, echoes, loudspeaker distortion and the background noise. Portable DAT recorders can be used to perform STI and acoustical measurements in large spaces and/or at remote locations without moving *MLSSA* to the site.

Anechoic Frequency Response

A primary application of *MLSSA* is measuring the anechoic frequency response of loudspeakers without an anechoic chamber. To measure the anechoic frequency response of a loudspeaker *MLSSA* uses cursors to select only the initial portion of the measured impulse response before the arrival of any room reflections (see figure below). *MLSSA* then applies an FFT to the selected segment to yield the anechoic frequency response of the loudspeaker (see figure right). Because *MLSSA* measures directly in the time domain, it is a simple matter to discover any room reflections that might contaminate the measurement and then window them out of the results. Methods that measure directly in the frequency domain, such as TDS, gated-sinewave or dual-channel FFT, require more complicated procedures for insuring that room reflections are excluded. Moreover, unlike gated-sinewave analyzers, *MLSSA* also correctly measures true loudspeaker phase response.

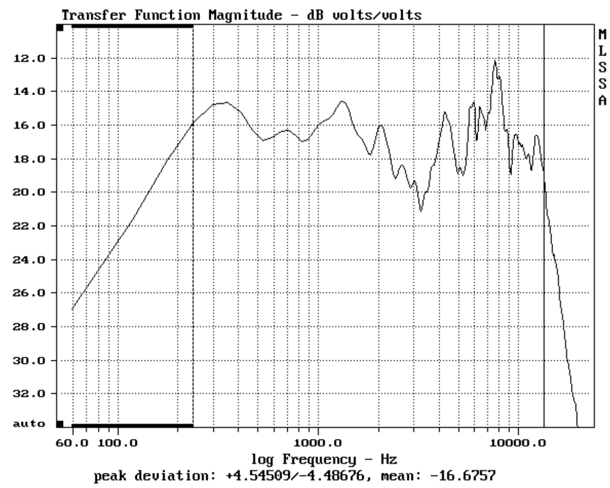


Near-field Bass Response

Unfortunately, in typical rooms, such windowed anechoic measurements are valid only down to about 200 Hz using *any* method. To obtain the anechoic frequency response in the bass region *MLSSA* uses a near-field measurement method and then splices this result to the anechoic free-field high-frequency measurement to cover the full audio range. *MLSSA* therefore allows you to determine the full-range anechoic frequency response and anechoic phase response of even the most complex loudspeaker systems having any number of drivers, ports or passive radiators, all without an anechoic chamber.

Cumulative Spectral Decay Plots

A cumulative spectral decay (CSD) plot is a 3-dimensional display that reflects a loudspeaker's frequency response as well as its phase response. A CSD plot resembles a waterfall and shows how a loudspeaker's acoustic output decays, at each frequency, in response to a steady-state sinewave input that is suddenly turned off. CSD plots reveal otherwise hidden enclosure or other resonances and are used to assess loudspeaker transient response. A CSD waterfall is illustrated on the front cover of this brochure.



Time Coherence and Acoustic Center

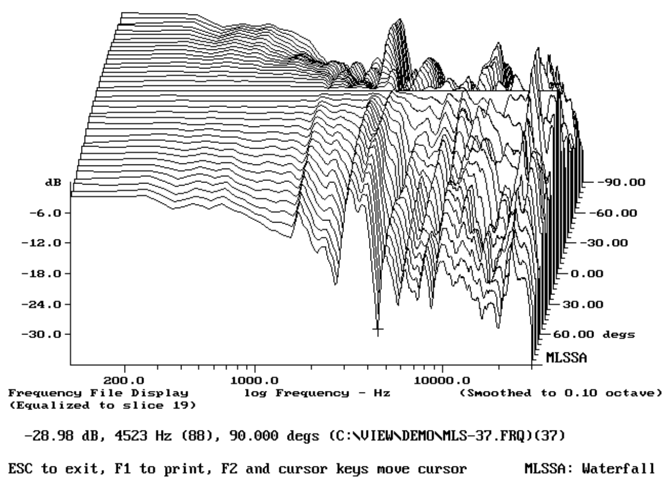
MLSSA includes special measurements to assess loudspeaker time coherence. In the time domain the step response is provided. More comprehensive frequency domain measures of loudspeaker time coherence are the excess phase and excess group delay. Excess phase is the difference between the loudspeaker's actual measured phase and its theoretically minimum phase as calculated from its frequency response. Similarly, excess group delay is the difference between the loudspeaker's actual group delay and its theoretically minimum group delay. *MLSSA* also calculates the acoustical centers of drivers based on the measured excess phase.

Impedance Measurements

MLSSA performs fast accurate impedance measurements of speaker drivers and loudspeaker systems. Both impedance magnitude and phase are measured. The *MLSSA Speaker Parameter Option (SPO)* makes full use of *MLSSA*'s accurate impedance measurements to determine the Thiele-Small parameters of dynamic drivers.

Loudspeaker Polar Response

MLSSA conveniently measures free-field loudspeaker polar response either manually or using a motorized turntable. Polar frequency response curves are normally plotted using a special waterfall display. You can optionally equalize all the off-axis measurements to the on-axis response thus showing only the change in the loudspeaker's frequency response for the off-axis angles (see figure below). The waterfall data can easily be imported into MS Excel to generate circular polar plots at selected frequencies (see figure right). Optional smoothing of the polar response data from 0.01 to 1.0 octave is provided. *MLSSA* also calculates loudspeaker sound power response, directivity index and directivity Q from measurements of vertical and horizontal polar frequency response.



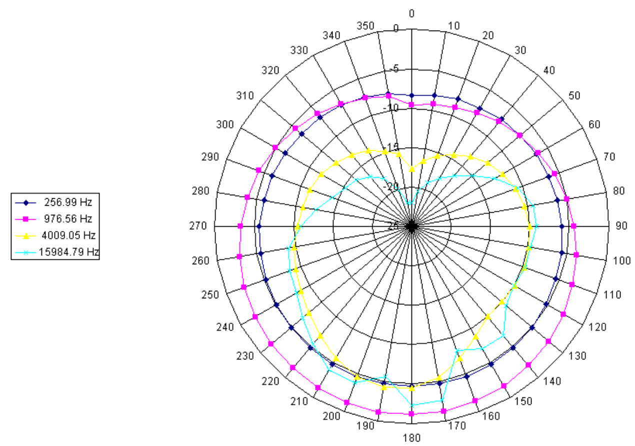
Distortion Measurements

MLSSA calculates even, odd and total harmonic distortion from power-spectrum measurements taken in the near field or in an anechoic chamber, using an external sinewave generator. Harmonic distortion results can be exported to a text file for display and further analysis by other programs.

MLSSA also determines multi-tone intermodulation (IM) distortion vs. frequency from MLS measurements taken in the near field or in an anechoic chamber. Because an MLS contains many thousands of pure tones, much like music, MLS IM distortion measurements are more representative of loudspeaker distortion than either harmonic distortion or conventional two-tone IM distortion measurements.

QC PASS/FAIL Functions

In the frequency domain, *MLSSA* provides for comprehensive automated QC PASS/FAIL testing. An unlimited number of arbitrary upper and lower QC limits curves can be pre-defined and stored on disk. Both fixed and floating limit curves are supported. A third optional limit curve provides for distortion and/or buzz testing. You can also optionally store a reference measurement of a "sweet" loudspeaker or driver. Thereafter, *MLSSA* will display the decibel difference between the reference unit and the unit under test and then the QC PASS/FAIL functions will operate on this difference curve instead of on the measured curve. *MLSSA* will also automatically check for correct loudspeaker and/or driver polarity.



Post-processing Functions

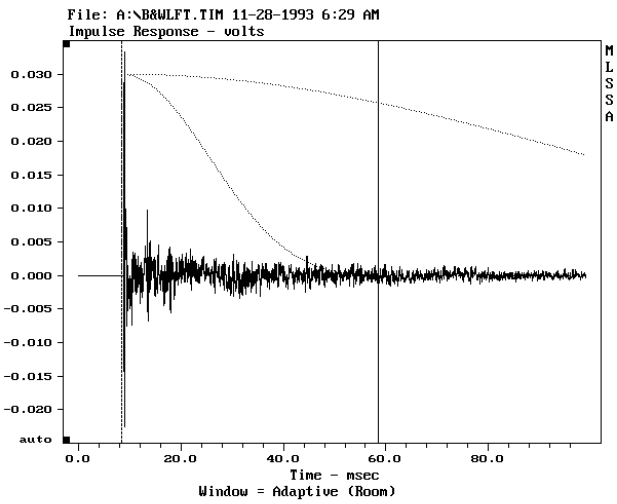
MLSSA offers a comprehensive set of post-processing functions for testing loudspeakers. In the time domain, *MLSSA* will compute loudspeaker energy-time curves from the measured impulse response. In the frequency domain, you can display phase, unwrapped phase, minimum phase, excess phase, group delay and excess group delay. You can also smooth any frequency response curve from 0.01 to 1.0 octave. A special command computes driver acoustic center from the excess phase curve.

Thiele-Small Parameter Option

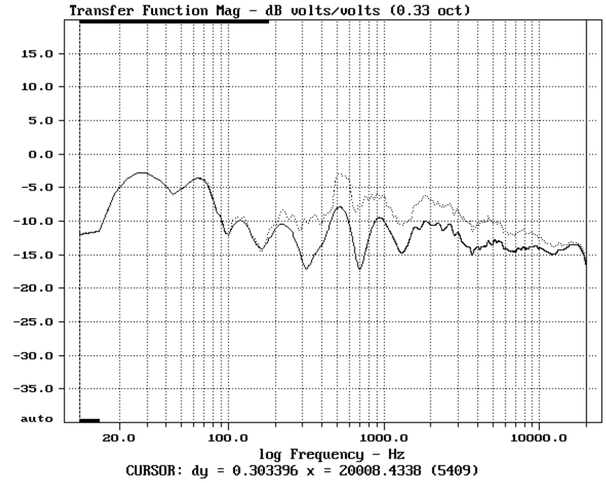
The *MLSSA Speaker Parameter Option (SPO)* is an optional software module for *MLSSA*. *MLSSA SPO* measures the Thiele-Small driver parameters by analyzing the measured complex driver impedance. See the *MLSSA SPO* brochure for details.

The Innovative Adaptive Window

Sound engineers who have attempted to equalize a room to a flat frequency response using an RTA and a pink noise source have long realized that RTA measurements are often an unreliable guide to making proper EQ adjustments. In typical rooms, such attempts can result in overly bright sound or other problems. The solution is to adapt our instrumentation to our ears so that measurements of room frequency response more closely reflect our perception of it. When assessing the spectrum of a sound source (as opposed to the spectrum of room reverberation), the ear tends to ignore late reflections in the treble region while giving them some weight in the mid-range and much more weight in the bass region. The Adaptive Window is a frequency-variable time window that emulates this behavior to yield room frequency response curves that, finally, look like they sound.



MLSSA's Adaptive Window feature essentially varies, smoothly and continuously, the length of the time window applied to the measured room impulse response between two pre-defined lengths (see figure above). The short window is normally set manually using cursors to include just the first 50 ms of the measured impulse response. The long window starts at the same position as the short window but is normally long enough to include nearly all the late arriving room reflections, up to about 200 ms to insure good accuracy in the bass region. In the frequency range between these two extremes, *MLSSA* automatically varies the time window length to yield a frequency resolution of 1/3 octave, which approximately corresponds to the width of the ear's critical bands.



The adaptively windowed room frequency response (see second figure above) therefore excludes all but the earliest room reflections at high frequencies, gradually includes more reflections in the midrange and finally includes nearly all room reflections in the bass region. The result is fundamentally different from RTA measurements, which include all room reflections at all frequencies. *MLSSA* can also emulate ordinary RTA measurements and such a measurement is shown plotted as the dotted curve in the figure above for comparison purposes.

Surround Sound EQ and Level Adjustments

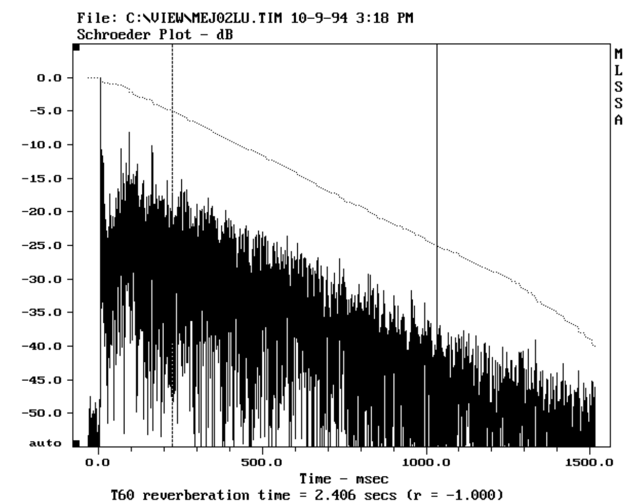
MLSSA correctly measures the spatially averaged room response as required for proper surround-sound EQ adjustments. Due to fast measurements and advanced post-processing, manual positioning of a single high-quality instrumentation microphone is made practical with *MLSSA*. After measuring the spatially averaged room response, EQ adjustments are performed by measuring the equalizer separately; that is, without the need to re-measure the room response each time you do an EQ tweak. *MLSSA* automatically combines the uncorrected room response with the EQ response and displays the result you will achieve once the EQ is inserted back into the sound system. Detailed procedures are also provided for setting specified SPL reference levels of Dolby and other surround-sound systems. Use of the Adaptive Window in these procedures results in subjectively improved channel balance as compared to conventional methods.

Room Impulse Response

MLSSA can measure and display room impulse response (RIR) curves up to 65535 points in length with a maximum time-bandwidth product of 20,000. This allows a four second RIR duration to be measured over a 5 kHz bandwidth or, a two second RIR duration over a 10 kHz bandwidth. Room impulse response measurements can be stored on disk and later retrieved for further analysis. Room impulse response measurements can also be exported.

Energy-Time Curves

MLSSA computes both wideband and narrowband (filtered) energy-time curves (ETCs) with a choice of ETC frequency domain window functions. ETCs can locate room reflections or assist in time delay adjustments of loudspeaker clusters. The figure below shows a wideband reverberant decay curve or Schroeder plot (dotted) displayed simultaneously with a wideband energy-time curve (solid).



Energy-Time-Frequency Plots

Reverberant decay can be visualized through the 3-D energy-time-frequency (ETF) plot. *MLSSA* also provides this function complete with 3-D cursor readout, optional smoothing and optional equalization of all slices by a reference slice.

Room Noise and NC Ratings

MLSSA measures sound or noise levels in IEC-standard 1/1, 1/2, 1/3, 1/6 octave bands. *MLSSA* also determines the NC (noise criteria) rating of rooms from measured octave-band noise levels and measures A-, B-, and C-weighted sound levels.

IEC 1/1-Octave Band Acoustical Parameters

Band Parameter	3 125	4 250	5 500	6 1000	7 2000	8 4000	9 8000	500- 4000
S [dB-SPL]	60.2	64.3	68.5	73.7	78.8	78.9	79.4	SPL-
N [dB-SPL]	33.4	34.1	38.3	43.1	43.6	44.8	49.6	weighted
SNR [dB]	26.8	30.2	30.3	30.6	35.1	34.1	29.7	Averages
C50 [dB]	-6.85	-4.15	-1.69	-0.41	4.76	5.30	8.81	3.442
C80 [dB]	-0.51	-0.21	1.01	2.23	7.04	7.80	11.94	5.846
D50 [%]	17.1	27.8	40.4	47.7	75.0	77.2	88.4	63.439
TS [ms]	114.7	108.1	104.2	88.2	43.9	36.8	15.3	62.548
EDT-10dB [s]	1.390	1.630	1.670	1.487	0.939	0.864	0.939	1.182
RT-20dB [s]	1.614	1.308	1.293	1.296	1.270	1.198	0.861	1.265
(-5:-25) r	-0.996	-0.995	-0.999	-0.999	-0.999	-0.998	-0.996	-0.999
RT-30dB [s]	1.560	1.332	1.342	1.284	1.247	1.166	0.841	1.254
(-5:-35) r	-0.997	-0.998	-0.999	-1.000	-1.000	-0.999	-0.999	-1.000
RT-USER [s]	1.705	1.258	1.322	1.297	1.237	1.178	0.895	1.253
(-10:-25) r	-0.992	-0.993	-0.999	-0.999	-0.999	-0.998	-0.995	-0.999

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Sarasota Opera House

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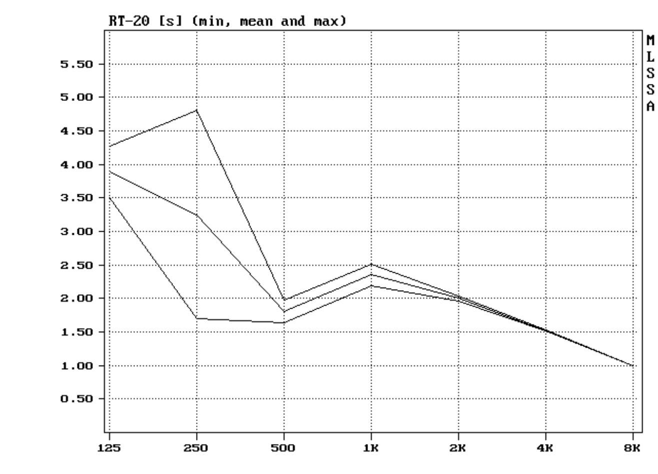
F1 for Help or ESC to exit MLSSA: Lib Acoustics

Room Acoustical Parameters

MLSSA measures the spatially averaged room acoustical parameters in IEC-standard 1/1, 1/2 or 1/3-octave bands according to ISO 3382. These include early decay time (EDT), clarity (C80 and C50), center time (TS), definition (D50) and reverberation times (RTs) computed over three different decay ranges. The results are presented in tabular form for easy interpretation and documentation (see figure above). For highest accuracy, all parameter calculations are corrected for room noise. The spatially averaged RTs can also be graphed as a function of frequency. The figure below graphs the minimum, average and maximum RT-20 values measured at several room locations. Lateral energy fraction can also be measured using a figure-of-eight microphone.



Speech Transmission Index

The Speech Transmission Index or STI is an objective measure of speech intelligibility widely recognized as being highly accurate in predicting subjective speech intelligibility. *MLSSA* computes STI from the measured impulse response and properly accounts for reverberation, echoes, nonlinear distortion as well as both stationary and non-stationary interfering background noise.

MTF Matrix (Calibrated)

Frequency-Hz	125	250	500	1000	2000	4000	8000
level dB	-24.5	-22.9	-23.2	-24.8	-26.4	-32.2	-65.5
m-correction	1.000	1.000	1.000	1.000	1.000	0.999	0.605
0.63	0.988	0.987	0.977	0.936	0.791	0.552	0.071
0.80	0.982	0.984	0.975	0.933	0.794	0.542	0.067
1.00	0.982	0.984	0.975	0.933	0.794	0.542	0.067
1.25	0.978	0.982	0.974	0.935	0.793	0.553	0.068
1.60	0.978	0.982	0.974	0.935	0.793	0.553	0.068
2.00	0.973	0.979	0.973	0.936	0.798	0.548	0.068
2.50	0.967	0.976	0.972	0.933	0.793	0.545	0.052
3.15	0.958	0.971	0.968	0.930	0.791	0.558	0.058
4.00	0.946	0.967	0.966	0.929	0.787	0.535	0.047
5.00	0.935	0.961	0.962	0.929	0.793	0.536	0.060
6.30	0.920	0.952	0.958	0.925	0.787	0.544	0.072
8.00	0.905	0.946	0.953	0.923	0.786	0.555	0.074
10.00	0.880	0.933	0.947	0.920	0.786	0.549	0.059
12.50	0.854	0.920	0.940	0.918	0.786	0.551	0.057
octave TI	0.926	0.967	0.975	0.874	0.693	0.528	0.109

STI value= 0.704 (0.751 modified) ALcons= 3.8% Rating= GOOD

ESC to exit or F1 to print. MLSSA: STI

MLSSA's STI function (see figure above) correctly accounts for nonlinear distortion and background noise based on a single impulse response measurement provided only that the MLS stimulus is first passed through a simple speech-weighting filter prior to applying it to the system under test. Software correction for any errors in the response of the speech-weighting filter is also provided. Correct accounting for distortion and background noise was previously available only on costly dedicated RASTI instruments.

In addition to rooms, *MLSSA* correctly measures the STI of digital audio devices such as codecs. *MLSSA* has been approved to measure the STI of both digital and analog cockpit voice recorders used in commercial aircraft.

Portable DAT recorders can be used to perform STI measurements in large spaces and/or remote locations without the need to move *MLSSA* to the test site. Field-recorded data can later be played back into *MLSSA* to determine the STI value.

MLSSA supports the latest official STI calculations as specified by IEC 60268-16, which also defines separate STI values for male and female talkers.

Rapid Speech Transmission Index

MLSSA can also measure the less accurate Rapid Speech Transmission Index or RASTI according to IEC 60268-16 (see figure below). Like STI, the RASTI function also correctly accounts for nonlinear distortion and interfering background noise provided a speech-weighting filter is used to shape the spectrum of the MLS stimulus.

MTF Matrix (Calibrated)

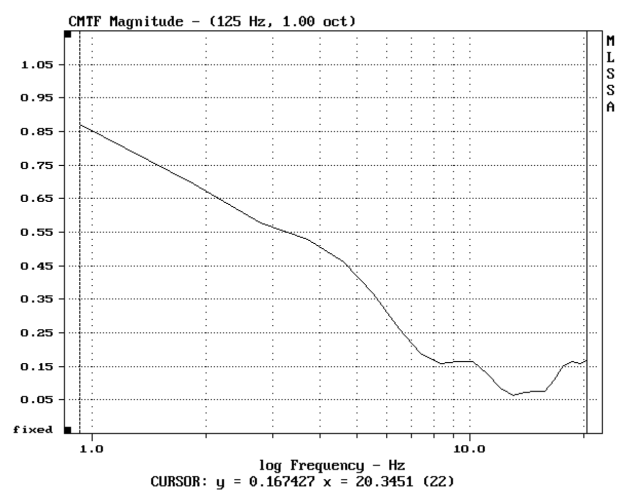
Frequency-Hz	125	250	500	1000	2000	4000	8000
level dB			-23.1		-26.2		
0.71					0.786		
1.00			0.979				
1.41					0.797		
2.00			0.980				
2.80					0.800		
4.00			0.978				
5.60					0.797		
8.00			0.976				
11.20					0.797		

RASTI value= 0.831 ALcons= 1.9% Rating= EXCELLENT

ESC to exit or F1 to print. MLSSA: RASTI

Modulation Transfer Functions

For more detailed analysis than is possible using STI or RASTI, *MLSSA* provides wideband and fractional-octave MTF measurements. *MLSSA*'s MTF measurements also correctly account for reverberation, echoes, nonlinear distortion and background noise. The figure below shows an MTF measurement taken of a system for a 1-octave band centered at 125 Hz.



Analog Input Resolution and Autorange

The software uses the programmable gain feature of *MLSSA*'s 8^{th}-order antialiasing filter to perform autoranging during signal acquisition. Autoranging automatically accommodates input signal levels ranging from under 10 mv to 20 volts RMS with virtually no loss in effective A/D resolution. Autoranging insures that a signal level 60 dB below maximum will still be digitized with at least 11 bits and usually 12 bits of effective resolution. Unlike the most commonly available 16-bit A/D converters, which use a sigma-delta conversion algorithm, *MLSSA*'s 12-bit A/D is a successive approximation type that does not produce any pre-ringing in the measured impulse response. Pre-ringing can complicate determining the exact acoustical arrival time as well as proper windowing of the impulse response.

Pink-MLS and White-MLS Outputs

MLSSA includes an on-board quasi-pink filter to output a pink-weighted MLS. This Pink-MLS stimulus is normally used for acoustical measurements for its superior immunity to room noise while the White-MLS stimulus is preferable for impedance measurements. Measurements made using the Pink-MLS stimulus are corrected via a fast time-domain digital filter.

Data Export and Import

MLSSA will export measurement data in a standard text file format for importing into loudspeaker CAD packages such as *CALSOD* or *LEAP*. You can also import text files into *MLSSA*. Exported waterfall data can be imported into MS Excel.

Integrated Macro Processor

MLSSA contains an integrated macro processor. A complex series of *MLSSA* commands can be recorded as a macro and then played back later through the action of one or two keystrokes. No programming skills are required to create macros. Special macro commands are used to synchronize *MLSSA* with a motorized turntable.

Integrated Screen Capture

An integrated utility captures any graphics screen to a PCX file in full color or black and white for importing *MLSSA* screens into desktop publishing programs or word processors. Text screens can be captured to plain text files for exporting STI, RASTI or the acoustical parameter screens.

Windows 98SE

It is recommended that *MLSSA* be run under Windows 98SE. Under Windows, you can set up and run multiple copies of *MLSSA* each configured to perform different types of measurements. You can also run *MLSSA* macros in the background while other Windows applications are open and running simultaneously. *MLSSA* is not compatible with Windows NT, Windows 2000 or Windows XP.

Microphone Calibration

You can enter microphone sensitivity and preamp gain data on up to 16 microphone/preamp combinations. *MLSSA* will also optionally calibrate your microphones using an external microphone calibrator.

Integrated Math Operations

MLSSA performs many powerful math operations on both time and frequency data files including weighted-average, add, subtract, multiply, divide, smoothing, convolution, correlation and the inverse FFT. The math operations commands, for example, are used to compute loudspeaker power response and directivity from a set of polar frequency response measurements.

Color and Monochrome Printer Support

MLSSA includes printer drivers supporting a wide variety of color and monochrome printers. Fastest printer output is achieved with the HP LaserJet series III or better laser printers.

Computer Requirements

MLSSA consists of a full-length ISA card and software designed to run on industry standard PCs under Windows 98SE or MS-DOS version 6.22 or above. The card is compatible with all full-length ISA and EISA expansion slots.

Your computer must contain a math coprocessor chip except on 486DX and Pentium PCs, which already include the math coprocessor on the main CPU chip. Your computer must also include CGA, EGA or VGA graphics, a 20 MB hard disk and at least 640 kilobytes of memory.

For optimum performance when running under Windows 98SE, a Pentium class PC is recommended having at least 24 megabytes of memory, a 100 MB hard disk.

Hardware

Antialiasing Filter: Fully programmable 8th-order lowpass filter can be programmed by software for a Chebyshev, Bessel or Butterworth response. Programmable cut-off frequency from 1 to 40 kHz and programmable passband gain from -14 dB to +54 dB.
Acquisition: Data acquisition to memory via DMA at up to 160 kHz sampling rate using a successive approximation 12 bit A/D converter. Sampling rate on typical ISA-bus computers is limited to 120 kHz due to computer DMA rate limits. EISA-bus computers are recommended to obtain the rated maximum sampling rate.
MLS Stimuli: Maximum-length sequences of 4095, 16383, 32767 and 65535 points.
Analog Input: Accommodates inputs ranging from 10 mv to 20 volts RMS. Input impedance of 13 kohm. Maximum safe input voltage rating of 35 volts peak.
Analog Outputs: Separate Pink-MLS and White-MLS outputs. Output amplitude is programmable from 0 to 5.25 volts. Output impedance is 75.5 ohms 0.1% and output current is limited to 100 ma. max.
Trigger: Triggered by the internal MLS stimulus generator or by an external TTL trigger source. Hardware also supports pre-trigger mode and trigger delays to ± 65535 samples.
Input Noise: Input noise floor is -80 dB of FSR including the antialiasing filter when filter gain is 0 dB.
Residual Distortion: Residual total harmonic distortion of 0.015% or -76 dB including the antialiasing filter.

Software

General: *MLSSA* is DOS program which can also be run under Windows 95, 98, and 98SE.
Time Domain: In the time domain, *MLSSA* measures and displays the impulse response, step response, energy-time curves, Schroeder plots, cumulative energy and raw input data (Scope mode).
Digital Filter: Programmable sixth order Butterworth digital bandpass filter for octave and fractional octave time domain analysis. Meets IEC-225 requirements.
Frequency Domain: The frequency domain is entered using an optimized FFT routine operating on time domain data. Non-power-of-two FFTs are also possible using an integrated chirp-z algorithm. FFT lengths range from 32 to 65536 points. Computes and displays the real part, imaginary part, magnitude, smoothed magnitude, phase (wrapped and unwrapped), minimum phase, excess phase, group delay, excess group delay, Bode and Nyquist plots. Phase curves can be delay corrected. *MLSSA* also measures power spectrum, power spectral density (PSD), coherence function, incoherency and the complex modulation transfer function (CMTF).
Waterfall Plots: *MLSSA* provides 3-D cumulative spectral decay (CSD), Wigner distribution and energy-time frequency (ETF) plots computed from time domain measurements. A special frequency file display (FFD) waterfall mode displays loudspeaker polar response measurements.
Statistics: *MLSSA* calculates these statistics on all displayed curves: mean, RMS, standard deviation, variance, peak deviation from mean, max, min, peak-to-peak, crest factor and slope by linear regression. *MLSSA* also calculates these special values in the time domain: STI, RASTI, RT, EDT, SPL, reverberant/direct ratio, clarity, definition, center time and strength. In the frequency domain: acoustic center, A-, B-, C-weighted SPL, NC rating, as well as odd, even and total harmonic distortion (THD).
Online Help: *MLSSA* provides online help screens for all function keys and menu commands. Contextual help is provided for all menu commands.
Setup Files: Setup files store all the options and modes you select. Once *MLSSA* is configured for a specific application, a single command stores all the details in a setup file. Later, another command reads the setup file and reinstates the configuration.
Graphics: Any displayed curve can be zoomed, compressed or panned. Individual data points can be located with a cursor and read out numerically. Both linear and logarithmic scales are supported. Printouts of all graphs can be made using standard laser printers. Measurements can be overlaid over a second one for making comparisons. With an overlay present, *MLSSA* automatically reads out the difference between the two curves as the cursor is moved from point to point. An overplot feature allows the display of an unlimited number of curves simultaneously.
Data Files: *MLSSA* normally saves or loads time-domain or frequency-domain data using binary files, which are fully documented so they can be read by other programs. Standard ASCII text files are also supported for importing or exporting measurement data.
Equalization: Equalization and inverse equalization of frequency domain data, based upon up to two reference measurements.
Units: *MLSSA* features fully programmable units. Acquisition, stimulus, time and frequency units are all programmable. Phase can be displayed in units of either radians or degrees.