



SIEMENS

Ingenuity for life

LMS Test.Lab HD Acoustic Camera

HD Acoustic Camera



- **Testlab Signature Testing**
 - Channel Setup
 - Calibration
 - Tracking Setup
 - Acquisition Setup
 - Online Processing
 - Measure

- **Testlab HD Acoustic Camera**
 - Measurement
 - Analysis

Where to find the HD Camera application

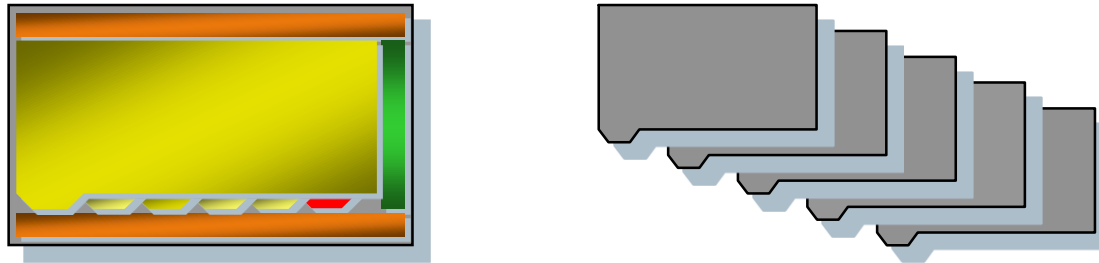
Name	Date modified	Type	Size
3D Acoustic Camera	21/12/2016 11:34	Shortcut	3 KB
Exterior Pass-by Noise Testing	21/12/2016 11:34	Shortcut	3 KB
HD Acoustic Camera	21/12/2016 11:34	Shortcut	3 KB
In-room Pass-by Noise Testing	21/12/2016 11:34	Shortcut	3 KB
Jury Testing - Execution	21/12/2016 11:35	Shortcut	2 KB
Jury Testing	21/12/2016 11:35	Shortcut	2 KB
OPAX	21/12/2016 11:33	Shortcut	3 KB
Sound Absorption Testing in Room	21/12/2016 11:34	Shortcut	3 KB
Sound Absorption Testing using impeda...	21/12/2016 11:34	Shortcut	3 KB
Sound Diagnosis	21/12/2016 11:34	Shortcut	3 KB
Sound Intensity Analysis	21/12/2016 11:34	Shortcut	3 KB
Sound Intensity Testing	21/12/2016 11:34	Shortcut	3 KB
Sound Transmission Loss Testing using r...	21/12/2016 11:34	Shortcut	3 KB
Sound Transmission Loss using impedan...	21/12/2016 11:34	Shortcut	3 KB
Stationary Array-based Acoustic Source I...	21/12/2016 11:34	Shortcut	3 KB
Tracked Array-b			
Transfer Path Ar			
Virtual car sound			

Array : HDCam36
 Sensor : HDCam36_IR
 Microphone : HDcam54
 Celerity : HDCam54_IR, HDCamV2, HDCamV2_45, HDCamV2_54, PBCam54_0deg, PBCam54_0deg_IR

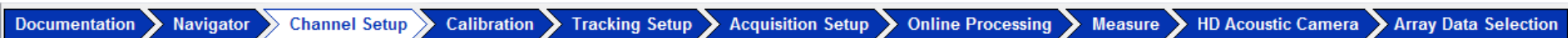
**Same shortcut for all arrays,
choose array type during setup**

Signature Acquisition & Processing – Workflow

Workbook consisting of a number of worksheets



- Each worksheet corresponds to a separate task in the signature measurement process
- Worksheets are sequentially placed to guide you through the test setup, measuring, and processing phases



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Channel Setup

Select the ChannelGroupId:
Vibration / Acoustic /
Tacho / Other / Static

Select the InputMode:
Voltage DC, Voltage AC,
ICP,...

Select the Measured
Quantity: Acceleration,
Pressure, Voltage,...

Channel Setup										
Status: ■ Verification OK										
	PhysicalChannelId	OnOff	ChannelGroupId	Point	Direction	InputMode	Measured Quantity	Electrical Unit	Actual Sensitivity	F
1	Tacho1	<input type="checkbox"/>	Tacho	Tacho1	None	Voltage DC				
2	Tacho2	<input checked="" type="checkbox"/>	Tacho	Tacho2	None	Voltage DC				
3	Input1	<input checked="" type="checkbox"/>	Vibration	Point1	+X	Voltage AC	Acceleration	mV	100	mV/g
4	Input2	<input checked="" type="checkbox"/>	Vibration	Point2	+Y	Voltage AC	Acceleration	mV	100	mV/g
5	Input3	<input checked="" type="checkbox"/>	Vibration	Point3	+Z	Voltage AC	Acceleration	mV	100	mV/g
6	Input4	<input checked="" type="checkbox"/>	Vibration	Point4	None	Voltage AC	Acceleration	mV	100	mV/g
7	Input5	<input type="checkbox"/>	Vibration	Point5	None	Voltage AC	Acceleration	mV	100	mV/g
8	Input6	<input checked="" type="checkbox"/>	Acoustic	Point6	None	ICP	Pressure	mV	100	mV/Pa
9	Input7	<input checked="" type="checkbox"/>	Acoustic	Point7	None	ICP	Pressure	mV	100	mV/Pa
10	Input8	<input checked="" type="checkbox"/>	Acoustic	Point8	None	ICP	Pressure	mV	100	mV/Pa
11	Inout9	<input type="checkbox"/>	Vibration	Point9	None	Voltage AC	Acceleration	mV	100	mV/g

Activate the channels

Define Point and
Direction

Set the Sensor
Sensitivity

Channel Setup

Documentation Navigator Channel Setup Calibration Tracking Setup Acquisition Setup Online Processing Measure HD Acoustic Camera Array Data Selection

The screenshot shows the 'Channel Setup' window in the LMS Test.Lab software. The window title is 'LMS Test.Lab Signature Acquisition - TMU_Sig - Section1'. The menu bar includes File, Edit, View, Data, Tools, Window, and Help. The toolbar contains various icons for file operations and analysis. The main area is titled 'Channel Setup' and includes buttons for 'Save as Reference', 'Load Channel Setup...', 'Show OnOff', 'Show On', 'Channel Setup', and 'Print Screen'. The status bar shows 'Status: Verification OK'. A table lists channels with columns for PhysicalChannelId, OnOff, ChannelGroup, Point, Direction, InputMode, Measured Quantity, and Sensitivity. A context menu is open over the table, with 'Use Database' highlighted.

	PhysicalChannelId	OnOff	ChannelGroup	Point	Direction	InputMode	Measured Quantity	Sensitivity	Front
1	Tacho1	<input type="checkbox"/>	Tacho	Tacho1	None	Voltage DC			
2	Tacho2	<input checked="" type="checkbox"/>	Tacho	Tacho2	None	Voltage DC			
3	Input1	<input checked="" type="checkbox"/>	Vibration	Point1	+X	Voltage AC	Acceleration		
4	Input2	<input checked="" type="checkbox"/>	Vibration	Point2	+Y	Voltage AC	Acceleration		mV/g
5	Input3	<input checked="" type="checkbox"/>	Vibration	Point3	+Z	Voltage AC	Acceleration		mV/g
6	Input4	<input checked="" type="checkbox"/>	Vibration	Point4	None	Voltage AC	Acceleration	mV	100
7	Input5	<input type="checkbox"/>	Vibration	Point5	None	Voltage AC	Acceleration	mV	100

- Use Database: use of databases for sensors and measurement points/directions
- Read Teds: use of Teds sensors
- Use Geometry: use of points and directions from an existing Geometry
- CAN/FlexRay Settings: setup of the Vehicle Bus
- Virtual Channels: setup of extra channels derivated from the main physical channels

Channel Setup – Use Database

Transducers Database

The screenshot shows the 'Channel Setup' window in LMS Test.Lab. It features two main tables:

PhysicalChannelId	OnOff	ChannelGroupId	Point	Direction	MultiChannel	InputType
1	<input type="checkbox"/>	Tacho	Tacho1	None	Mono	Voltage
2	<input checked="" type="checkbox"/>	Tacho	Tacho2	None	Mono	Voltage
3	<input checked="" type="checkbox"/>	Vibration	Point1	+X	Triax-RH	Voltage
4	<input checked="" type="checkbox"/>	Vibration	Point1	+Y	Triax-RH	Voltage
5	<input checked="" type="checkbox"/>	Vibration	Point1	+Z	Triax-RH	Voltage
6	<input checked="" type="checkbox"/>	Vibration	Point4	None	Mono	Voltage
7	<input type="checkbox"/>	Vibration	Point5	None	Mono	Voltage
8	<input checked="" type="checkbox"/>	Acoustic	Point6	None	Mono	ICP
9	<input checked="" type="checkbox"/>	Acoustic	Point7	None	Mono	ICP
10	<input checked="" type="checkbox"/>	Acoustic	Point8	None	Mono	ICP

Manufacturer of ...	Type of transduc...	Serial number	Transducer desc...	Measured QTS	Nominal sensitivity	Nominal offset
Manu1	Accelerometer	Number1	Accel	g (Acceleration)	100 mV/g	10000 mV
Manu1	Accelerometer	12345A	Accel	m/s ² (Acceleration)	100 mV/(m/s ²)	10000 mV
Manu1	Velocity Transducer	123456	Vel	m/s (Velocity)	100 mV/(m/s)	10000 mV
Manu1	Displ. Transducer	234567	Displ	m (Length)	100 mV/m	10000 mV
Manu1	Pressure Transdu	345678	Press	Pa (Pressure)	100 mV/Pa	10000 mV
Manu1	Temperature Trans	456789	Hot	K (Temperature)	100 Unknown	10000 mV
Manu1	Force Cell	A123	Force	N (Force)	100 mV/N	10000 mV
Manu1	Voltaoe	A124	Volts	V (Voltaoe)	1000 mV/V	10000 mV

Callout boxes and arrows indicate the following steps:

1. Select "Transducer" (points to the 'Transducer' dropdown menu)
2. Click on "Open" (points to the 'Open' button)
3. Select the sensor and the channel (points to row 6 in the Channel Setup table and row 3 in the Database table)
4. Click on "INSERT" (points to the 'INSERT' button)

Channel Setup – Virtual Channels



Virtual channel: additional channel, calculated from mathematical operation on hardware channel.

Properties:

- Stored as a time trace in the throughput file
- Can be used for tracking and axis annotation
- Can be processed into waterfalls and sections

Frequent use case:
increase the number
of available tacho
channels.

Channel Setup Save as Reference Load Channel Setup... Show OnOff Show On **Virtual Channels** Print Screen ?

Hardware Channels

Status: ■ Verification OK Clock sync: None

	PhysicalChannelId	OnOff	ChannelGroupId	Point	Direction	InputMode	Measured Quantity	Electrical Unit	Actual Sensitivity	Fro
1	Tacho1	<input checked="" type="checkbox"/>	Tacho	Tacho1	None	Voltage DC				
2	Tacho2	<input checked="" type="checkbox"/>	Tacho	Tacho2	None	Voltage DC				
3	Input1	<input checked="" type="checkbox"/>	Vibration	Tacho3	None	ICP	Acceleration	mV	100	mV/g
4	Input2	<input checked="" type="checkbox"/>	Vibration	Point2	None	ICP	Acceleration	mV	100	mV/g
5	Input3	<input checked="" type="checkbox"/>	Vibration	Point3	None	ICP	Acceleration	mV	100	mV/g
6	Input4	<input checked="" type="checkbox"/>	Vibration	Point4	None	ICP	Acceleration	mV	100	mV/g

Virtual Channels

Function: INTEGRATE(Ch3;1) Edit...

	Ok	OnOff	Id	Formula	Unit	Point Id	Point Dir	Channelgroup
1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	V1	TACHO_PULSE_TO_RPM(CH1;1;0;0;0;0...		VirtualTacho3	None	Tacho
2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	V2	CH2*2	g	Virtual2	None	Vibration
3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	V3	INTEGRATE(Ch3;1)	m/s	Virtual3	None	Other

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Calibration

- AC calibration → absolute calibration with a calibrator
- Relative calibration → calibrate a force sensor
- Bridge calibration → calibrate a strain gauge

Calibration Save as Reference AC Calibration Print Screen ?

Settings

Unit: Advanced...

Frequency: Hz Measurement info...

Level: Rms

Max. calibration time: s

Channels

	On/Off	Physical Chan...	Point	Direction	Transducer ...	Channel Status	Actual Se ...	New Sens ...	Sensitivity U
1	<input type="checkbox"/>	Input1	disk:9	-Z		Not Active	12.16		mV/g
2	<input checked="" type="checkbox"/>	Input2	disk:27	+Z		OK	100	99.87444	mV/g
3	<input type="checkbox"/>	Input3	disk:3	+Z		Not Active	100		mV/g
4	<input type="checkbox"/>	Input4	Point4	None		Not Active	100		mV/g
5	<input type="checkbox"/>	Input5	Point5	None		Not Active	100		mV/g
6	<input type="checkbox"/>	Input6	Point6	None		Not Active	100		mV/g
7	<input type="checkbox"/>	Input7	Point7	None		Not Active	100		mV/g
8	<input type="checkbox"/>	Input8	Point8	None		Not Active	100		mV/g

Calculate channel ranges Use channel list ranges

Status

FINISHED

Save as Reference AC Calibration Print Screen ?

- AC Calibration
- Rel Calibration
- Bridge Settings

Advanced... Measurement info...

Check Start Break Accept Reject

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Tracking Setup – Measurement mode

Documentation Navigator Channel Setup Calibration Tracking Setup Acquisition Setup Online Processing Measure HD Acoustic Camera Array Data Selection

‘Tracked’ acquisition

- Free run
- Tacho
- Time
- Static
- Event

‘Stationary’ acquisition

- Free run
- Time

‘Manual’ acquisition

Measurement mode:	<input type="text" value="Tracked"/>
Tracking method:	<input type="text" value="Tacho"/>
Tacho:	<input type="text" value="Tacho1 (T1)"/>
Slope method:	<input type="text" value="Up"/>
Minimum:	<input type="text" value="1500"/> rpm
Maximum:	<input type="text" value="3000"/> rpm
Increment:	<input type="text" value="25"/> rpm

Tracking Setup – Tracked Acquisition

Documentation Navigator Channel Setup Calibration Tracking Setup Acquisition Setup Online Processing Measure HD Acoustic Camera Array Data Selection

Tracking method:

- **Free run:** Acquires blocks with a specified overlap over the specified duration
- **Tacho:** Acquires at specified, regular rpm intervals over the specified range. Time interval depends on rpm/time function
- **Time:** Acquires blocks at specified, regular time intervals over the specified duration
- **Static:** Similar to tacho. Thresholds and increments based on static channels. Eg. GPS speed or CAN channel.
- **Event:** Acquisition begins at a particular event (level crossing) on one of the measurement channels

The screenshot displays the configuration for the 'Tracked' measurement mode. The 'Measurement mode' is set to 'Tracked'. The 'Tracking method' is 'Tacho', with 'Tacho1 (T1)' selected for the 'Tacho' parameter and 'Up' for the 'Slope method'. The 'Minimum' value is 1500 rpm, the 'Maximum' is 3000 rpm, and the 'Increment' is 25 rpm.

Measurement mode:	Tracked
Tracking method:	Tacho
Tacho:	Tacho1 (T1)
Slope method:	Up
Minimum:	1500 rpm
Maximum:	3000 rpm
Increment:	25 rpm

Tracking Setup

Tracking Setup

Tacho Displays: 1 Tacho Display

Y-axis: V Real (range: -1.00 to 1.00)

X-axis: Time (s) (range: 0.00 to 0.32)

Signal: Time Tacho1

Status: Tacho1 (T1) 3108 rpm

Tacho Settings

- Minimum: 600 rpm
- Maximum: 6000 rpm
- Pulses per rev: 1.0000 (More...)
- Pulse correction:
- Mode: Standard
- Double pulse correction:
- Number of missing pulses: 0
- Skip neighboring pulses: None
- Pulse correction factor: 1
- Reference pulse:
- Sense of rotation: [Dropdown]
- Linear smoothing factor: 0.0
- Hysteresis: 0.01 %
- Torsion slope: Down

Tracking Settings

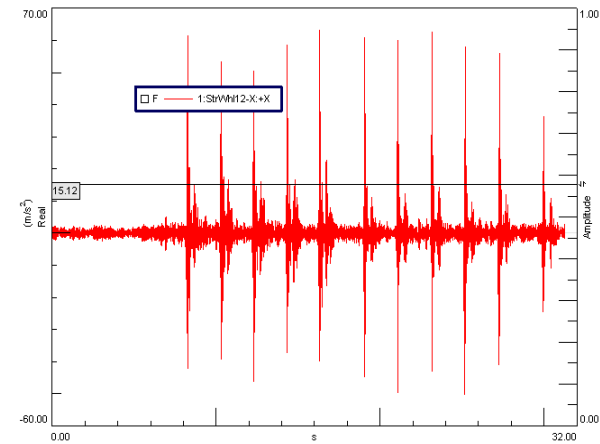
- Use triggered start: (More...)
- Edit throughput prestart: 0.040 s
- Use triggered stop: (More...)
- Edit throughput poststop: 0.040 s
- Measurement mode: Tracked
- Tracking method: Time
- Duration: 30 s
- Increment: 0.5 s
- Use Semi-Stationary Averaging: (More...)
- Autoranging QTV:

Buttons: Close, Print Screen

Tracking Setup – Tracked on event

Event: Tracking on a dynamic channel

Example: Track on accelerometer response on steering wheel of car that drives over a speed bump. Acquisition blocks start as the car drives over the bump



Measurement mode: Tracked

Tracking method: Event

Tracking channel: Point1:+X (CH1)

Level: 0.101972 g

Slope method: Up

Hysteresis: 0.01 g

Minimum duration: 1 s

Events to skip: 0

Number of events: 10

Slope method: up or down

Minimum level change needed before TL looks for another event

Minimum time before looking for another event

Event: crossing of a defined level

Number of events to skip before another event can be registered

Number of events to be measured before the acquisition stops

Tracking Setup – Stationary Acquisition

Documentation Navigator Channel Setup Calibration Tracking Setup Acquisition Setup Online Processing Measure HD Acoustic Camera Array Data Selection

Stationary method:

- **Free run:** Average acquisitions taken at a defined overlap
- **Time:** Average acquisitions taken at a defined acquisition rate

Measurement mode:	Stationary
Tracking method:	Time
Duration:	30 s
Acquisition rate:	2 avg/s
Number of averages:	61
Averaging type:	Energy average
Exponential parameter:	50 %

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Acquisition Setup

Acquisition Setup

Overview Input1

Scope Overview

Detail Input33

Scope Detail

Channel Range

Acquisition parameters

View settings

Scope Control

Tracking Tacho
Tacho1 (T1)

Multiple Sample Rates

Acquisition Parameters
Bandwidth: 6400 Hz
Resolution: 12.5 Hz
Frequency lines: 512
Static Bandwidth: 100 Hz
CAN Bandwidth: Static

Trigger settings
Free Run
Use Pretrigger: 50 %
Start X-axis from zero

View Settings
Function: Time
Window: Hanning
Spectrum Format: Peak
Display mode: Eng Unit
Format: Linear

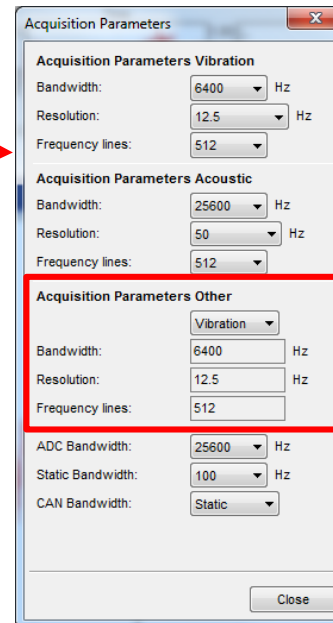
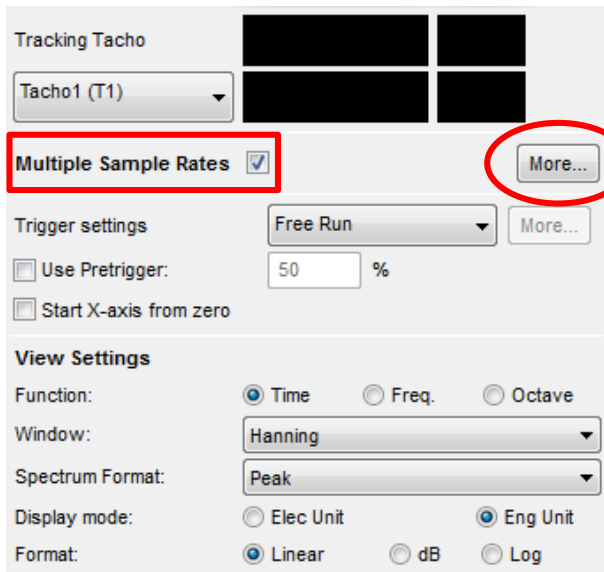
Other Settings
Shunt on: Fan Control

Acquisition Setup – (Multiple) Sample Rates

Multiple sample rates (f_s) possible

- One f_s per ChannelGroupId
- ChannelGroupId set in Channel Setup

Channel Setup					
Status: ■ Verification OK					
	PhysicalChannelId	OnOff	ChannelGroupId	Point	InputMode
1	Tacho1	<input checked="" type="checkbox"/>	Tacho	Tacho1	Voltage DC
3	Input1	<input checked="" type="checkbox"/>	Vibration	Accelerometer1	ICP
4	Input2	<input checked="" type="checkbox"/>	Acoustic	Microphone1	ICP
5	Input3	<input checked="" type="checkbox"/>	Other	Accelerometer2	ICP
13	Input11	<input checked="" type="checkbox"/>	Static	Thermocouple1	Voltage DC



For "Other" channels, f_s equals "Acoustic" or "Vibration" f_s

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Online Processing

Channel Processing:

- Set processing parameters for data blocks
- Define derived channels

Different processing per ChannelGroup possible

Section:

- Define section calculations from waterfall

Online Processing

Channel Processing: Acoustic | Vibration | Other | Derived

Compute Fixed Sampled Data

Function: AutoPowers Linear | Format: Peak

Window: Hanning | More... | References: No ref ch selected. | Define...

Final weighting: No change | Reference window: Hanning | More...

First bins to clear: 0 | Only applied on reference channels of this channel group.

Save waterfalls | Phase referenced spectra

Estimation method: H1 | Number of Poles: 5

Section | Order Sections | Frequency Sections | Octave Sections | Frame Statistics | Overall Level | Map Statistics | Level Calculation

Fixed Sampling: For each tacho, enter orders separated by semicolons. For example 3; 5; 7

Tacho1 (T1): 1;2;4;10

	Tacho	Order	Mode	Bandwidth	Lower	Upper	Offset (Hz)
1	Tacho1 (T1)	1	Order	0.5	0.75	1.25	0
2	Tacho1 (T1)	2	Order	0.5	1.75	2.25	0
3	Tacho1 (T1)	4	Order	0.5	3.75	4.25	0
4	Tacho1 (T1)	10	Order	0.5	9.75	10.25	0

Online Processing – Define Online Sections

Sections available:

- Order
- Frequency
- Octave
- Overall Level
- Level Calculation
- Octave Maps
- Map Statistics
- Psychoacoustic Metrics
- Critical Band Maps
- ...

Section Order Sections Frequency Sections Octave Sections Frame Statistics Overall Level Map Statistics Level Calculation Psychoacoustic Metrics Octave Maps Critical Band Maps

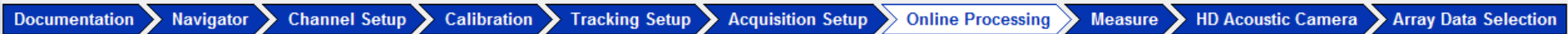
Fixed Sampling For each tacho, enter orders separated by semicolons. For example 3; 5; 7

Tacho1 (T1) 1;2;4;10

	Tacho	Order	Mode	Bandwidth	Lower	Upper	Offset (Hz)
1	Tacho1 (T1)	1	Order	0.5	0.75	1.25	0
2	Tacho1 (T1)	2	Order	0.5	1.75	2.25	0
3	Tacho1 (T1)	4	Order	0.5	3.75	4.25	0
4	Tacho1 (T1)	10	Order	0.5	9.75	10.25	0

- Multiple sections can be calculated at the same time
- Orders are relative to selected Tacho channels

Online Processing – Psychoacoustic Metrics



Select the type of sections to be made during acquisition for each specific Channel Group

Section	Order Sections	Frequency Sections	Octave Sections	Frame Statistics	Overall Level	Map Statistics	Level Calculation	Psychoacoustic Metrics	Octave Maps
<p>Functions</p> <p>Level Metrics</p> <input type="checkbox"/> Loudness ISO 532A <input type="checkbox"/> Loudness ISO 532B - diffuse field <input type="checkbox"/> Loudness ISO 532B - free field <p>Annoyance Metrics</p> <input type="checkbox"/> Sharpness - diffuse field <input type="checkbox"/> Sharpness - free field <p>Speech Metrics</p> <input type="checkbox"/> Articulation index <input type="checkbox"/> Open articulation index <p>Maps</p> <input type="checkbox"/> Specific Loudness ISO 532B DF Map <input type="checkbox"/> Specific Loudness ISO 532B FF Map <p>Channel Group</p> <input checked="" type="checkbox"/> Acoustic <input type="checkbox"/> Vibration <input type="checkbox"/> Other <input type="checkbox"/> Derived									

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Measure – Overview

The screenshot displays the Siemens Measure software interface for 'Section1 - Run 1'. The main window is divided into several sections:

- Top Panel:** Includes navigation buttons like 'Channel Overview', 'Data Explorer', 'Online Processing Settings', and 'Print Screen'. A toolbar with various icons is also present.
- Central Plot:** A 2D heatmap showing 'AutoPower ta WF 60 [93.231-1575.1 rpm]'. The x-axis is labeled 'Hz' (0.00 to 2100.00) and the y-axis is labeled 'rpm' (40.00 to 60.00). A color scale on the right ranges from -70.00 to 30.00. A callout box points to the plot with the text 'Online view of data buildup'.
- Right Panel (Control Panel):**
 - Buttons for 'F3 Ranges', 'F4 Tracking', 'F5 Acq.', and 'F6 Project'.
 - Run Name: 1/1 Run 1
 - Tracking tacho: 1587 rpm
 - Time elapsed: 51.63 s
 - Acquisitions done: 60 / 97
 - Slope method: Up (with a 'Select' button)
 - From/to/incr.: 100.0 2500.0 25.0 rpm
 - Buttons: 'More...', 'Listen to channel' (unchecked), 'Save Throughput' (checked)
 - Status indicators: 'Measuring Runup...' (green), 'OVERLOAD' (red), 'Sufficient disk space left' (green).
 - Control buttons: 'Arm/Disarm', a play button, and a stop button.
 - Callout boxes: 'Monitor acquisition progress' points to the top right, and 'Control acquisition' points to the bottom right.
- Bottom Panel:**
 - 'Channel Overview' section with four colored bars (green, grey, red, grey).
 - 'Progress' section with a green progress bar and a callout box stating '1 channel in overload'.
 - 'Keyboard Information' section.
 - Bottom navigation bar with buttons: 'Navigator', 'Channel Setup', 'Calibration', 'Tracking Setup', 'Acquisition Setup', 'Online Processing', 'Measure', and 'LMS Test.Lab'.

Measure – Online Visualization

1. Click 'Data Explorer' link

2. Expand 'Online Data' folder

3. Select data and drop into display

The screenshot shows the 'LMS Test.Lab Signature Acquisition - TMU_Sig - Section1' window. The main display area contains a large plot of a signal waveform and three smaller plots below it, all showing amplitude over time. The 'Channel Overview' section at the bottom left shows a row of 12 channel indicators, each with a red box around it. The 'Data Explorer' window is open in the foreground, showing a tree view of data folders. The 'Online Data' folder is expanded, revealing a list of frequency points. The 'Data Explorer' window also shows a search results section on the right.

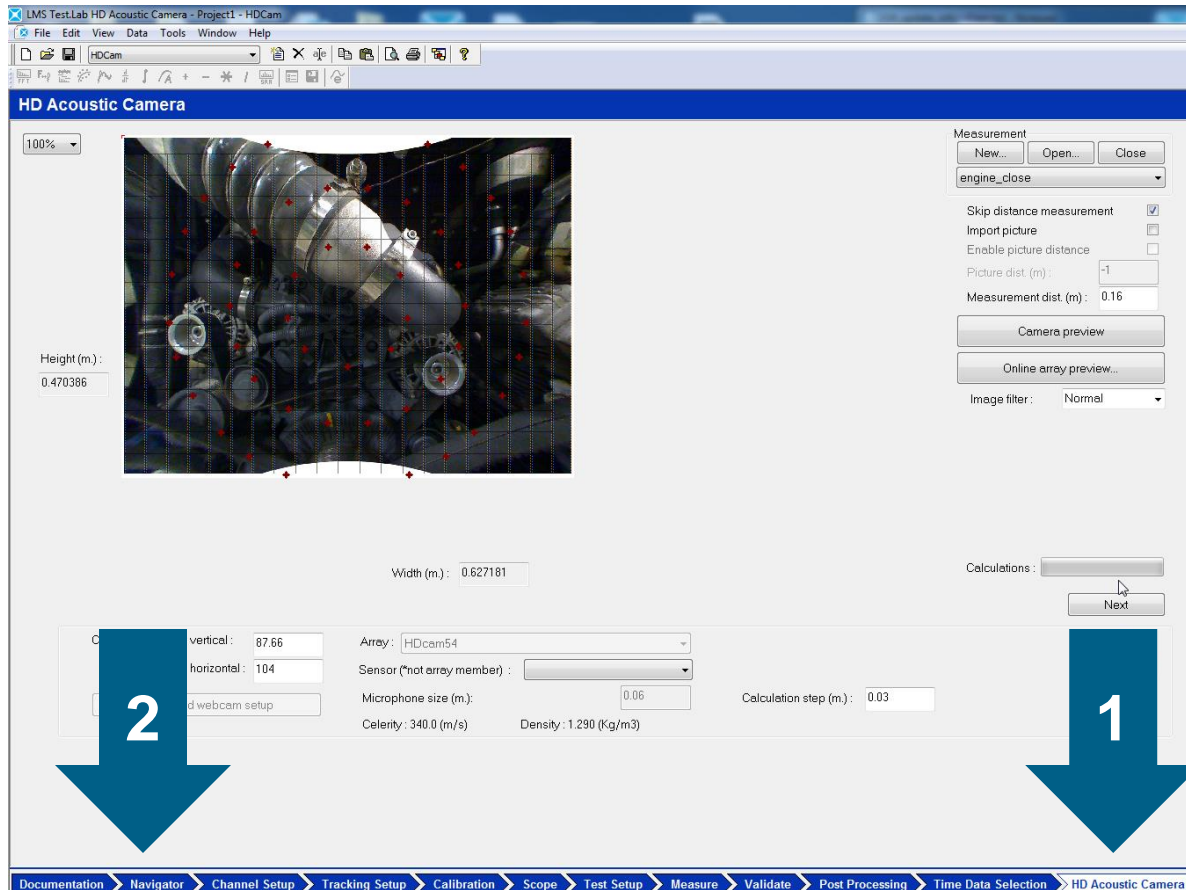
HD Acoustic Camera



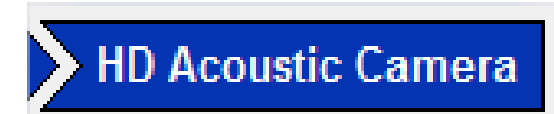
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Software workflow

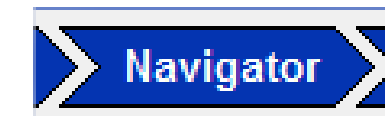


- HD Acoustic Camera is the main worksheet



- Automatically configures data acquisition settings, no manual setup needed

- Data management in Navigator



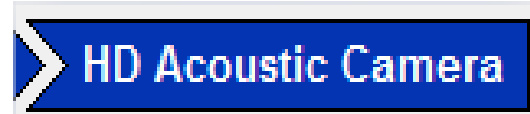
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Measurement setup

Open **HD Acoustic Camera** worksheet



HD Acoustic Camera

100%

Height (m) : 0.470386



Width (m) : 0.627181

Calculations :

Next

Measurement

New... Open... Close

engine_close

Skip distance measurement

Import picture

Enable picture distance

Picture dist (m) : -1

Measurement dist (m) : 0.16

Camera preview

Online array preview...

Image filter : Normal

Camera angles : vertical : 87.66

Wide horizontal : 104

Advanced webcam setup

Array : HDcam54

Sensor (*not array member) :

Microphone size (m.) : 0.06

Celerity : 340.0 (m/s) Density : 1.290 (Kg/m3)

Calculation step (m.) : 0.03

?

Measurement setup

HD Acoustic Camera worksheet

HD Acoustic Camera

1

Measurement

New... Open... Close

engine_close

2

Skip distance measurement

Import picture

Enable picture distance

Picture dist. (m): -1

Measurement dist. (m): 0.3

3

Camera preview

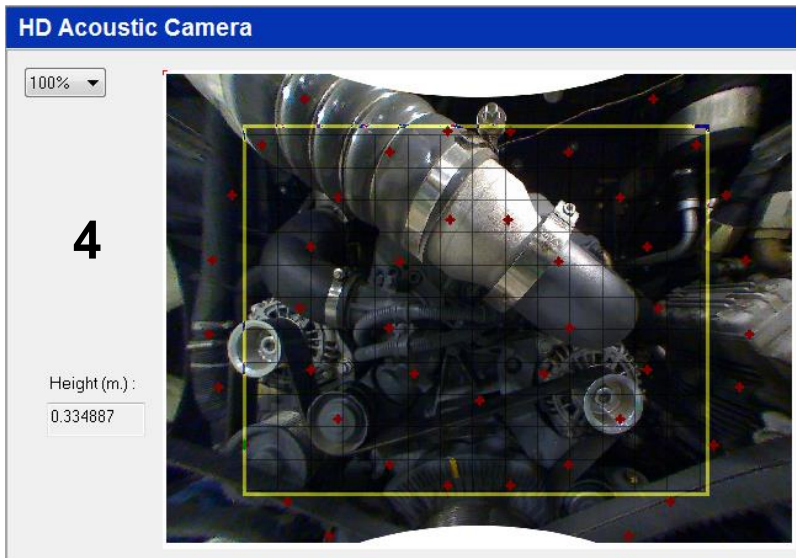
Online array preview...

Image filter: Normal

1. Create a new database (.bdd)
2. Enter distance to the object
3. Save a picture of the object or import a picture (details later on)

Online preview shows real-time sound source localization on top of camera picture.

Measurement setup



- Adapt calculation area to object. Grid size depends on calculation step
- Choose array type to determine microphone placement

Calculation step (m.): 0.03

Array: HDCamV2 **5**

Sensor (*not array member):

Microphone size (m.): 0.09

Celerity: 340.0 (m/s) Density: 1.290 (Kg/m³)

Camera angles are reminded, but should be left to their default values

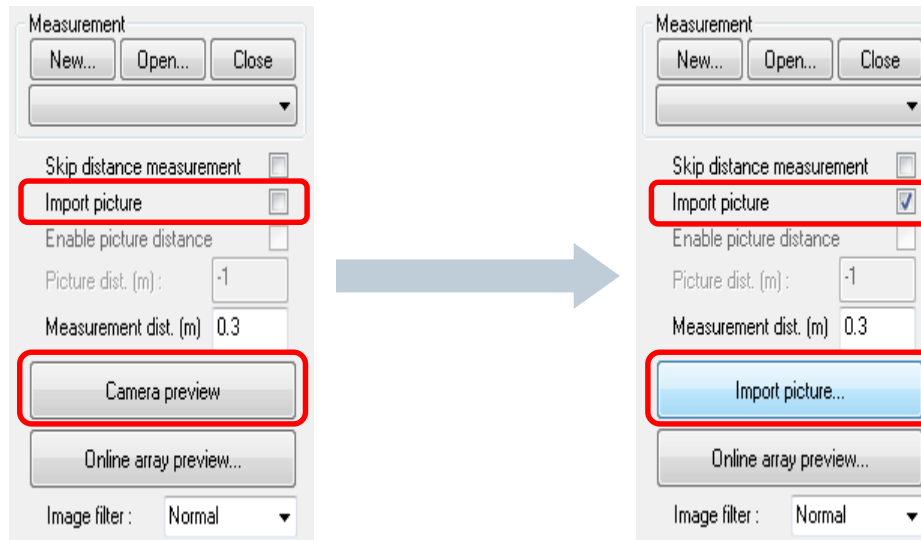
Camera angles : vertical : 87.66

Wide horizontal : 104

Advanced webcam setup

Making/Importing a picture

- Import picture disabled:
“Camera preview” button (to take a picture)
- Import picture enabled:
“Camera preview” is replaced by the “Import picture...” button

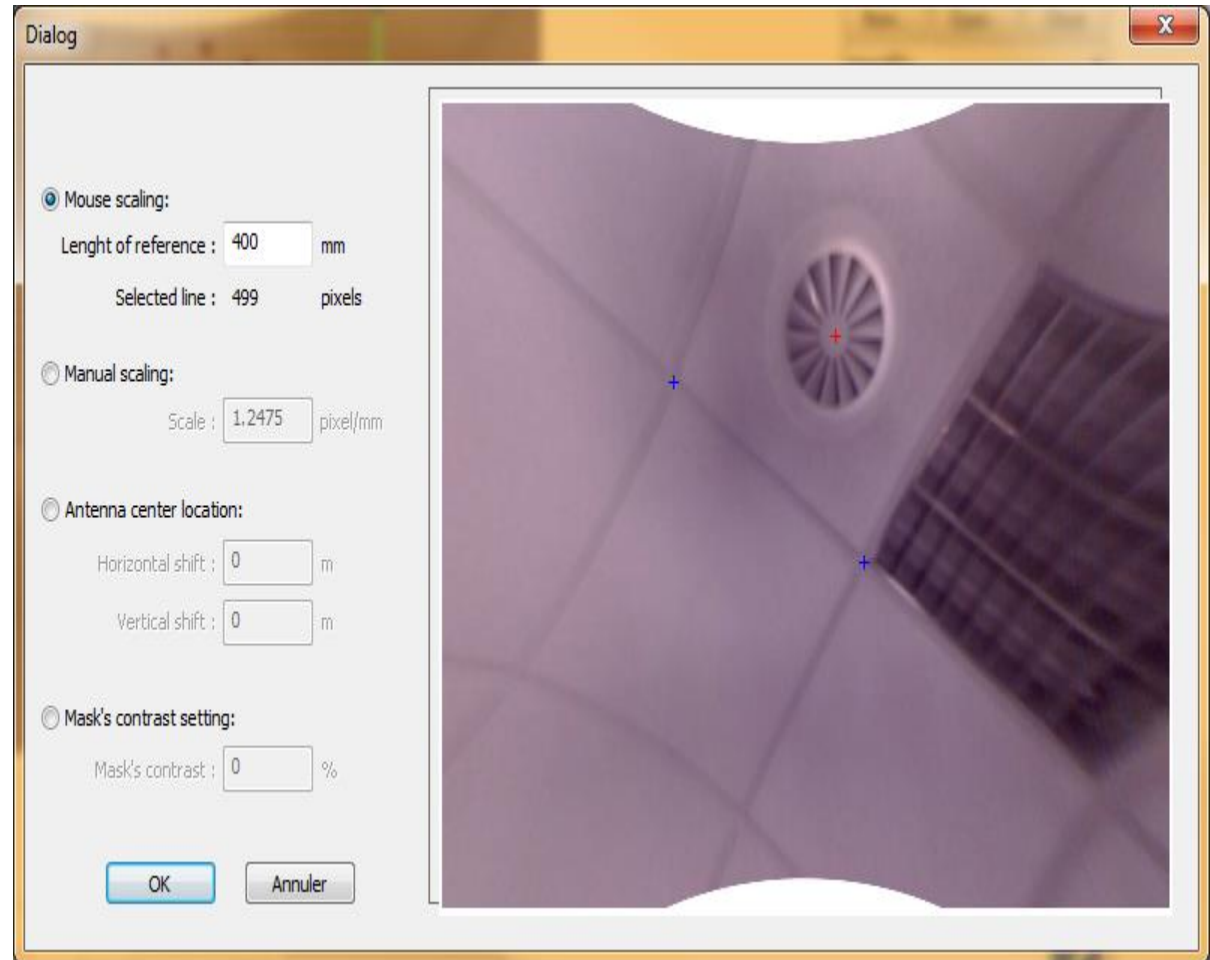


Importing a picture

- “Import picture...” → opens panel to set dimensions

Mouse scaling:

1. Select a reference line (here 400mm)
2. Move the mouse (left button pushed) → 2 blue cross markers
3. Check if “Manual scaling” makes sense

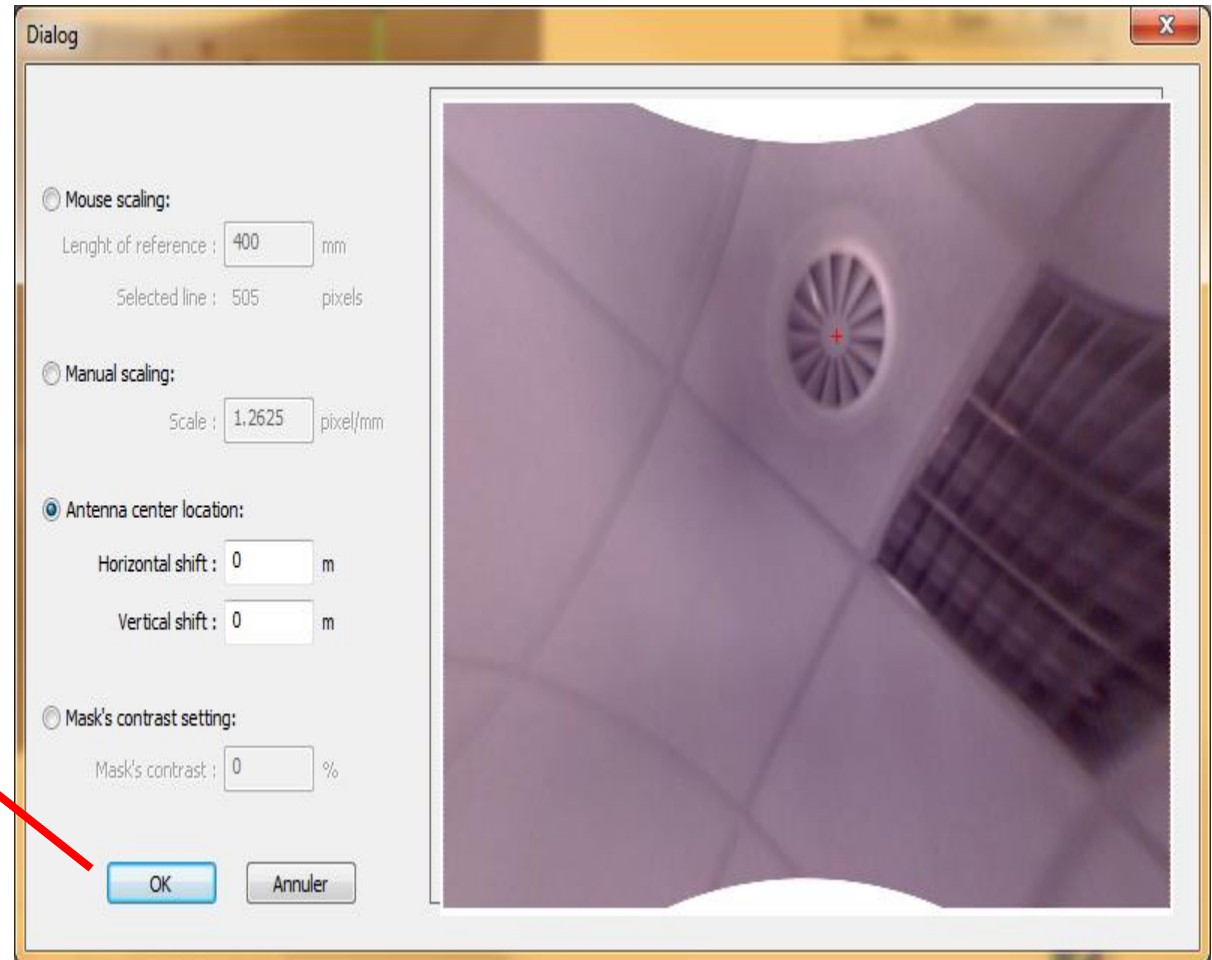
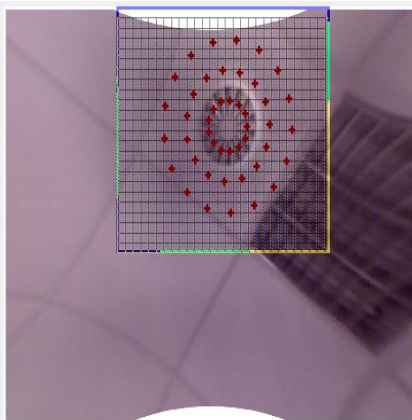


Importing a picture

- “Import picture...” → opens panel to set dimensions

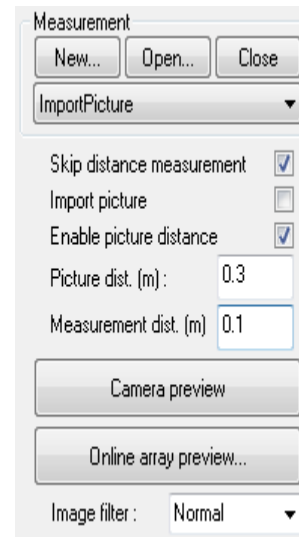
Array center:

1. Red cross
2. Choose offset
3. Resulting grid on Setup:



Picture distance

- Not very wide angle camera in near field (f.e. *IDS uEye*)
 - the area on picture may be smaller than the array coverage
- Corrective actions
 1. Place the array at a large enough distance ($\geq 30\text{cm}$) and take a picture;
 2. Select “Enable picture distance” and enter correct value
 3. Place the array near field (i.e. 10-15 cm) and measure the acoustic response



(a)
Position for camera picture (d=30cm)



(b)
Position for measurement (d=10cm)

Note: in case “Enable picture distance” is not selected, the entry “Measurement dist. ” is used for both the *picture* and the *acoustic measurement*

Acquisition

Move to the **acquisition sheet**

Next

HD Acoustic Camera

100%

Pressure (Pa)

Time (s)

mic1

Pressure (dBx)

Freq. (Hz)

mic1

Control of Channel :

Apply dismiss

Measurement

New... Open... Close

engine_close

Preview...

Record

Movie during acquisition

Array view from back

Calculation:

Previous Next

Weighting :
A weighted

Time data : mic1

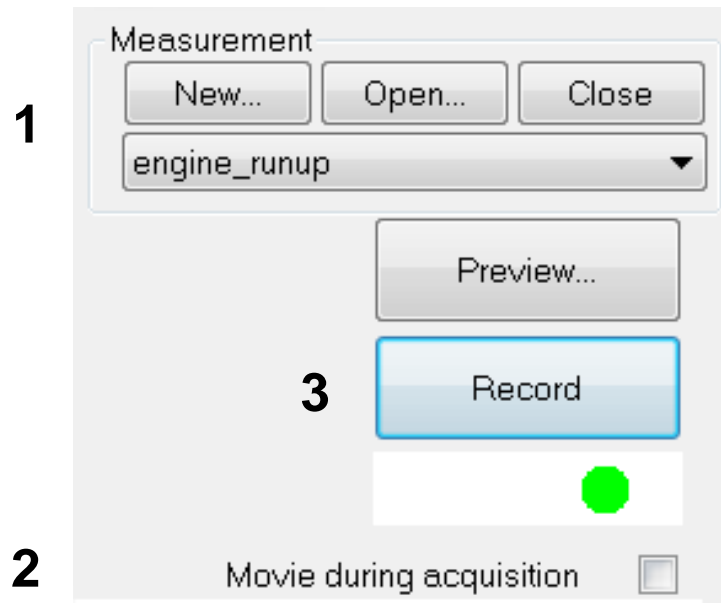
Spectral reference : mic1

Resolution (Hz) : 10

?

Acquisition

Acquisition sheet

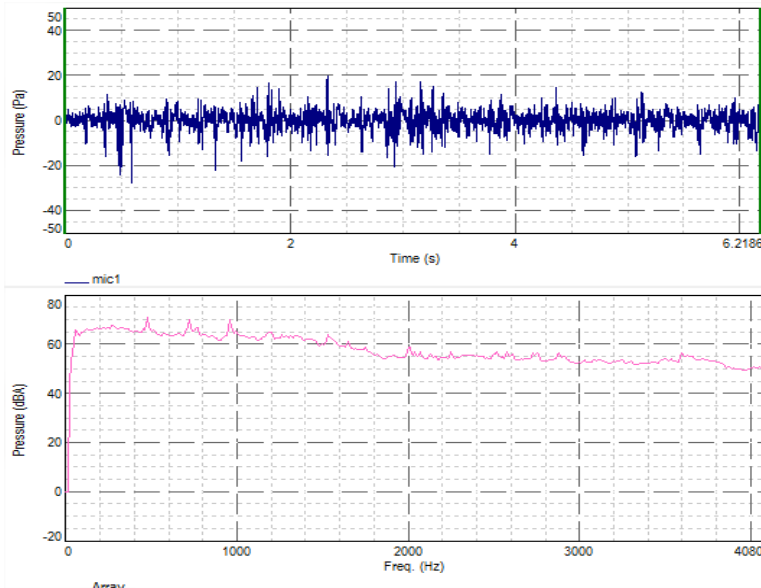


Possible to import an existing LDSF instead of measuring

1. Ability to create new measurements (with identical setup), or open existing ones
2. Enable recording of video (transient sound source localization)
3. Start measurement

Acquisition

Acquisition sheet



4

Time data :

Spectral reference :

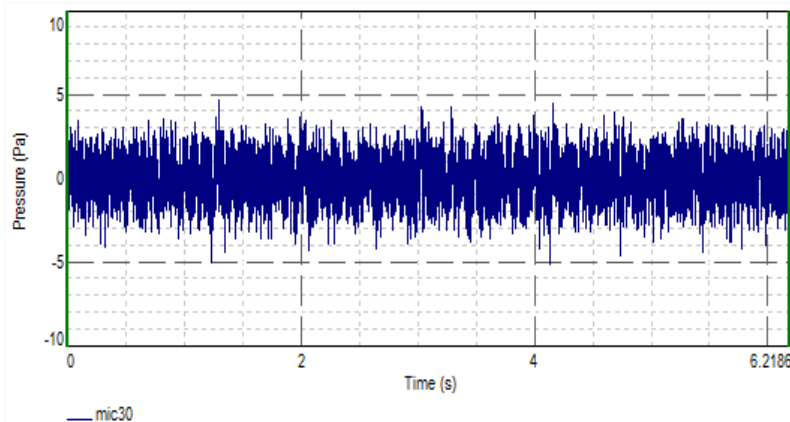
Resolution (Hz) :

4. Display measured time and frequency data
5. Automated display of all measured channels for data verification

Control of Channel : **5**

Acquisition

Acquisition sheet



In case of noisy data:

- Sensor or cable damaged
- No ICP
- ...

Dismiss channel(s) from processing instead of performing a new measurement

HD Acoustic Camera



- Testlab Signature Testing
 - Channel Setup
 - Calibration
 - Tracking Setup
 - Acquisition Setup
 - Online Processing
 - Measure
- Testlab HD Acoustic Camera
 - Measurement
 - **Analysis**

Processing

Move to the **analysis worksheet**

Previous

Next

HD Acoustic Camera

100% ▾

Time data: mic33 ▾ >> || < > +

Spectrum: mic27 ▾ >> || < > +

Measurement

Open... Close

engine_close ▾

Processing selection

Selection segment: 0 - 6.21863

Freq 1/3 Oct

Range selection (Hz): 910 - 1010

Map averaging: Hologram ▾

Reference: mic1 ▾

Action

Display Result list...

Compute and Save

Calculation: ▾

Previous Stop

Data Type Selection

Raw data Back propagated

Volume: ▬

Setting...

Animation parameters

Time window size (s): 0.2

Time window overlap (%): 50

Frequency window size (Hz): 100

Spectrum averaging

Resolution (Hz): 10

Spectrum Overlap (%): 0

Number of averages: 2

Video synchro. recovery delay (s): 0

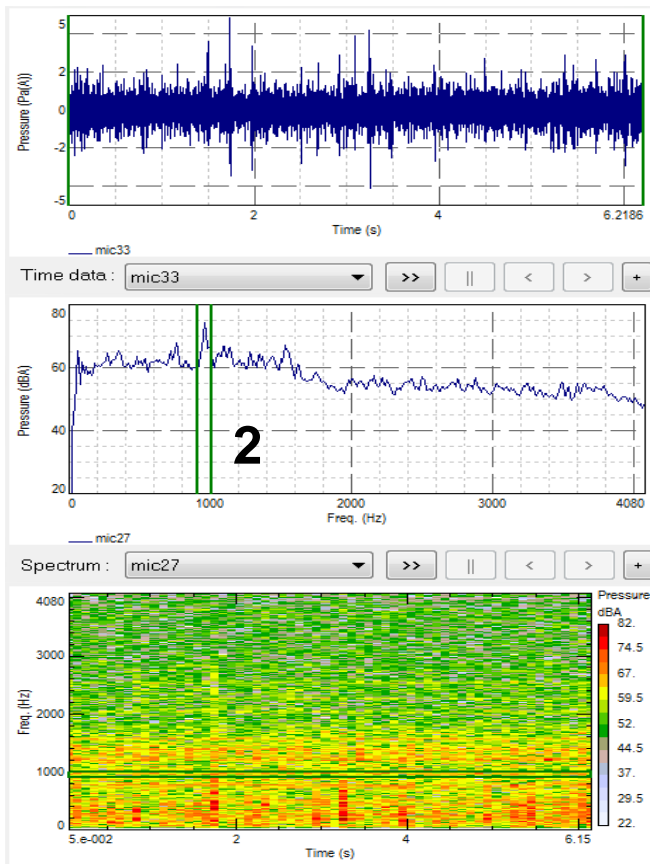
Distance: 0.16

Weighting: A weighted ▾

Processing

Analysis sheet

1



1. Time, frequency and spectrogram of selected channels
2. Drag display cursors to select ranges, or fill in manually for more precision

Selection segment:

0 - 6.21863

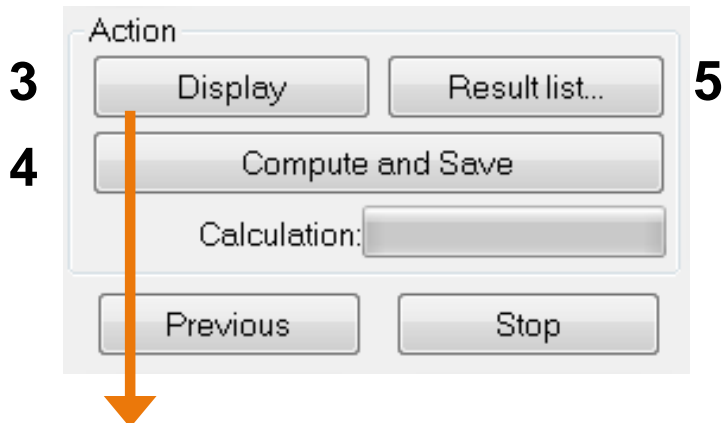
Freq 1/3 Oct **2**

Range selection (Hz):

910 - 1010

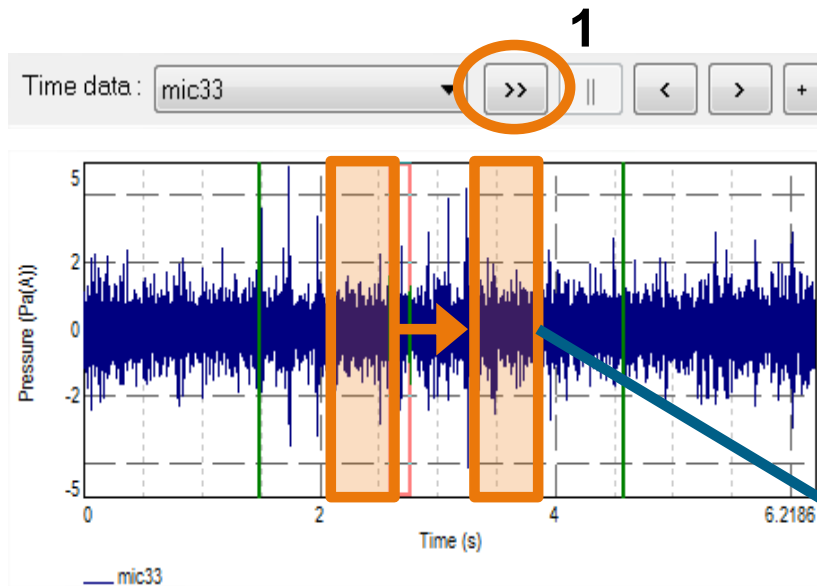
Processing

Analysis sheet



3. 'Display' to only show hologram for selected ranges
4. 'Compute and Save' also saves the result to the database
5. 'Results list' shows overview of saved data

Animation



1. Animation of time sweep using animation controls
2. Configure animation via Animation parameters



Animation parameters

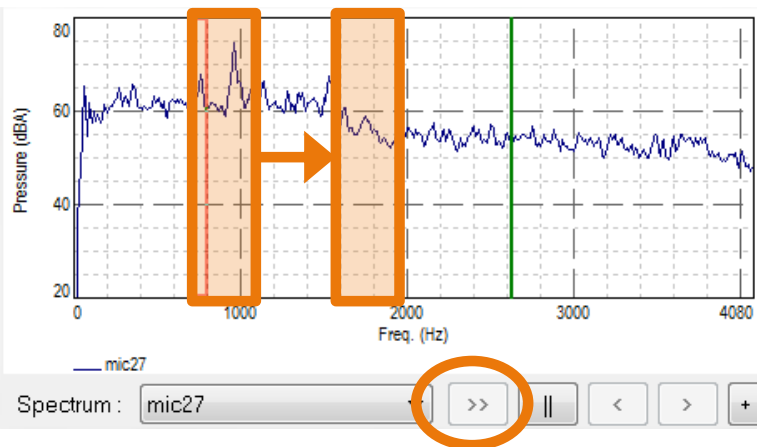
Time window size (s) :	<input type="text" value="0.2"/>
Time window overlap (%) :	<input type="text" value="50"/>
Frequency window size (Hz) :	<input type="text" value="100"/>

2

Animation

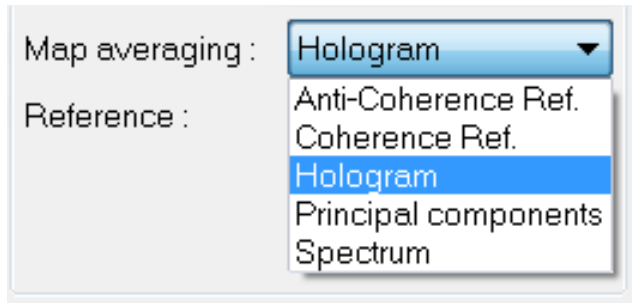
Movie during acquisition

Video synchro. recovery delay (s):

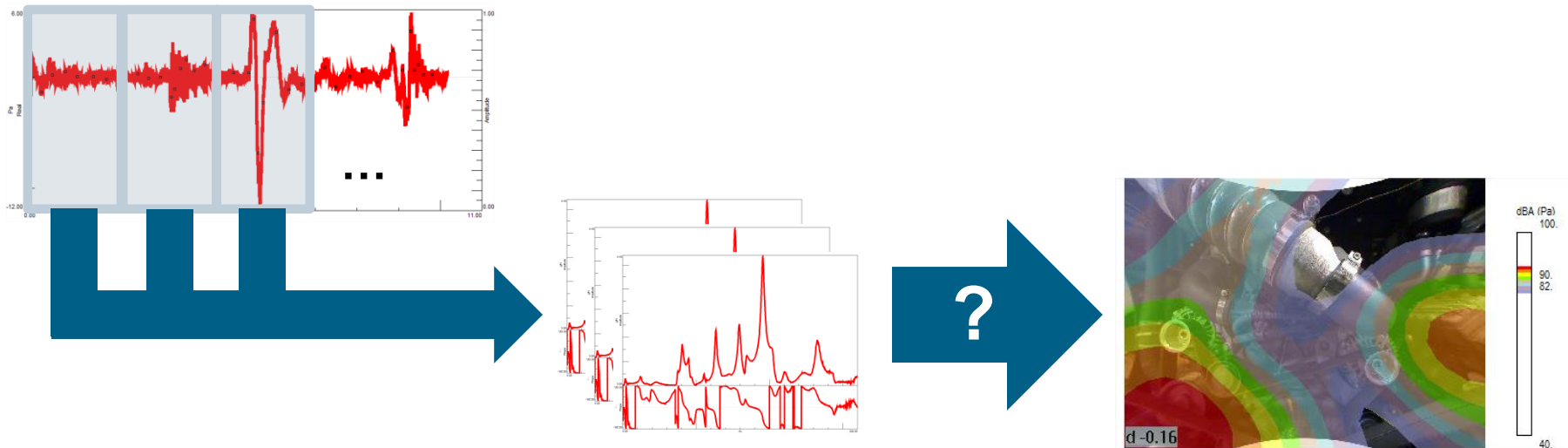


- Replay video during time animation if 'Movie during acquisition' was checked
- Video needs to be synced to data
Reason: datastream via USB
- Same controls for animating a frequency sweep

Map averaging methods



Map averaging methods define how **one hologram** is calculated from **multiple data blocks**



Map averaging methods

Map averaging : Hologram ▼
Reference :
Anti-Coherence Ref.
Coherence Ref.
Hologram
Principal components
Spectrum

Map averaging : Anti-Coherence Ref. ▼
Reference : mic1 ▼

Map averaging : Coherence Ref. ▼
Reference : mic1 ▼

- Anti-Coherence: shows which sound sources are **not coherent** with the reference
- Coherence: complementary to anti-coherence

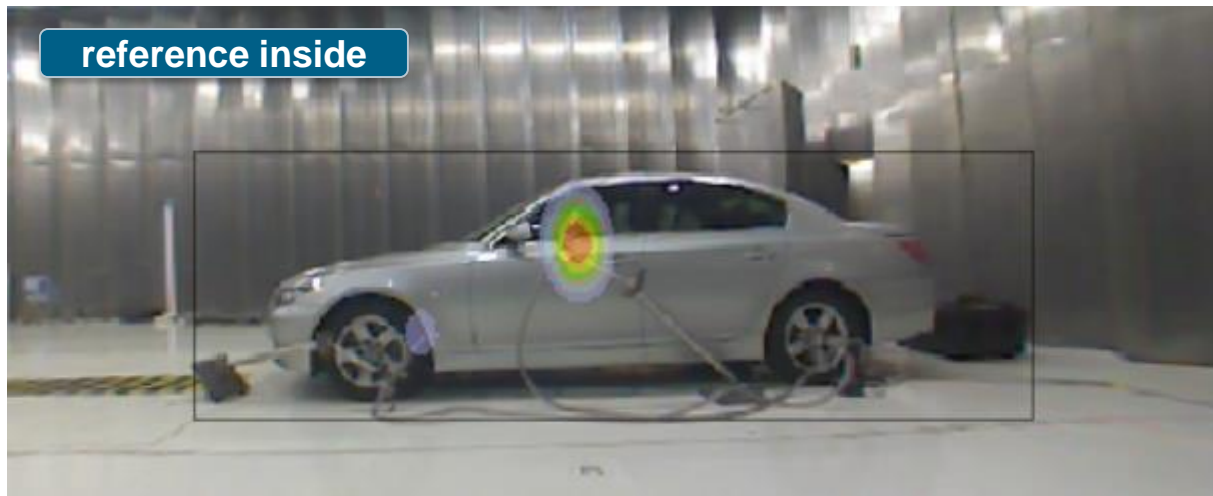
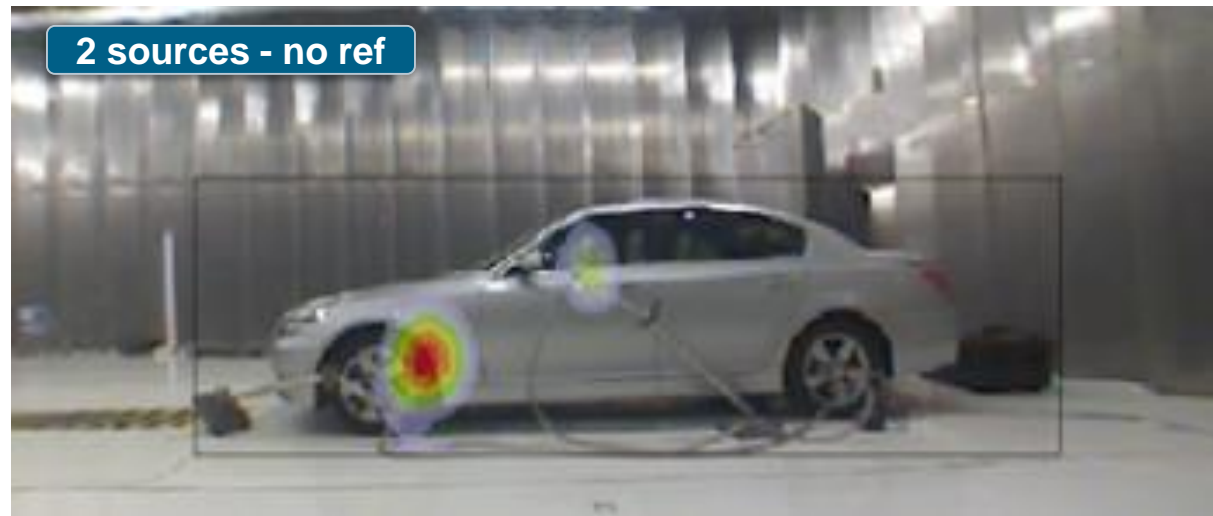
Coherence reference example

Using a reference channel

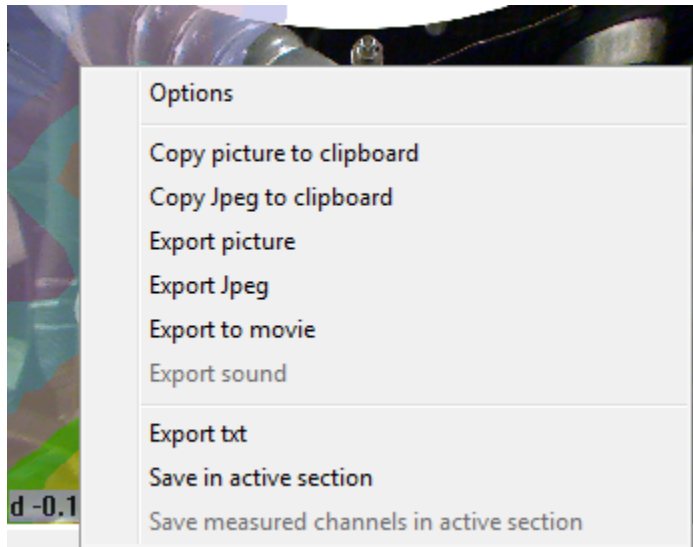
- Microphone
- Accelerometer
- Shows sound sources (un)correlated to this reference signal

Example application

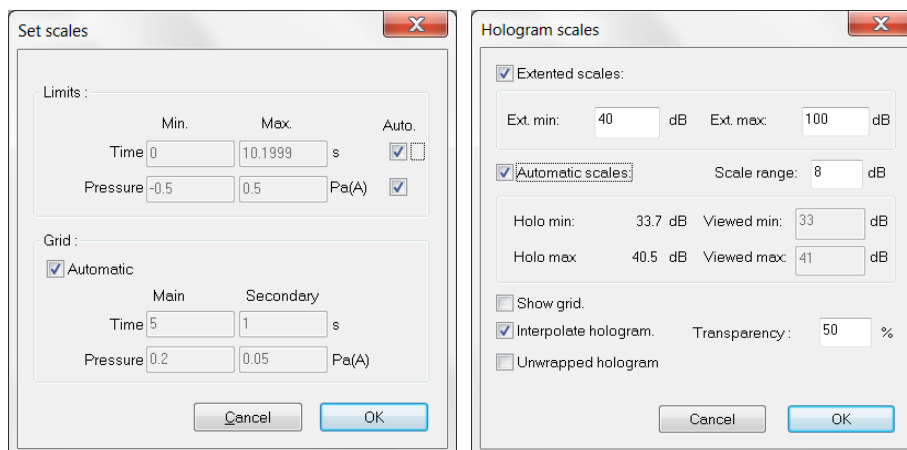
- Correlate sources on the outside with audible sources on the inside
- Detect which source is contributing most: e.g. airborne or structure borne noise



Options



- Easy reporting of holograms by copying to picture or movie
- Set display scales in Options menu



- Save copy of frequency block to Test.Lab project with 'Save in active section'

Thank you