

NVH Simulator

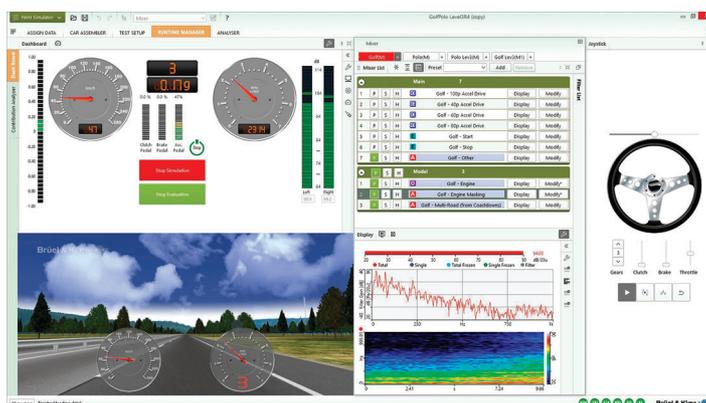
Know the outcome of your NVH design through the use of virtual NVH prototypes

While developing a vehicle, useful information on the sounds generated by the vehicle can be gained by looking at data in graphs and plots. But this visual data cannot answer holistic and subjective questions like: Does it sound good? or Does it sound better than the competitor?

The sound and vibration of a vehicle are key. Not only do they convey (sometimes important) information about the vehicle to its occupants and bystanders, but also affect the overall perception of the vehicle and help establish the brand image.

The NVH Simulator enables automakers to know the outcome of their NVH design – to answer subjective questions – before they start; to know that the NVH targets and content are correct; and to get these agreed and approved through the actual experience of sound and vibration using NVH virtual prototypes.

The results: Reduced R&D expenditure, achievement of NVH design goals, reduced time to market by minimising the production of NVH physical prototypes, and meeting or exceeding customer expectations.



Uses, Benefits and Features

Uses

- Benchmark testing of NVH characteristics from various vehicles
- Jury testing and customer clinics of NVH prototypes
- Design assessment – evaluating the effect of individual component designs on the overall sound experience
- Target setting and validation of NVH goals throughout the development process – from pre-concept through to launch

Benefits

- Allows you to build and experience the sound and vibration of NVH virtual prototypes
- Increases confidence in the NVH decision-making process
- New vehicles can be ‘driven’ and assessed well in advance of first physical prototypes
- Drastically reduces the time taken to assess multiple driving conditions
- Enables partial load conditions to be included in assessments of powertrain sound quality
- Bridges the gap between test and simulation, allowing CAE analysts to appreciate the relative benefits of different designs
- Enables integration of data from multiple sources, including in-vehicle and test bench recordings, and multiple CAE analysis result types

- Enables accurate virtual prototype assessments for traditional IC-engine vehicles, EVs, hybrids, or other vehicles of any propulsion system type

Features

- Creation of NVH Simulator models:
 - Models can be assembled using any available NVH data, from simple recordings of the whole vehicle, to an engineering model including path or contribution data, modified components, etc.
 - New vehicle models become more complete and accurate as you move from high-level target setting through target cascading and concept evaluation to detailed design phase
- Can incorporate NVH data from computer aided engineering (CAE) predictions, allowing subjective evaluations of new design long before prototyping
- NVH Simulator database ensures that a vehicle is always available to be driven, unaffected by effects of modifications to the physical vehicle, weather, age, etc.
- Multiple solutions and configurations to suit your NVH needs – from full vehicle immersion, to desktop-based vehicle sound experiences and exterior observer simulation
- Tools for preparing and combining data from multiple sources
- Electric vehicles (EVs), hybrids and other powertrain systems supported

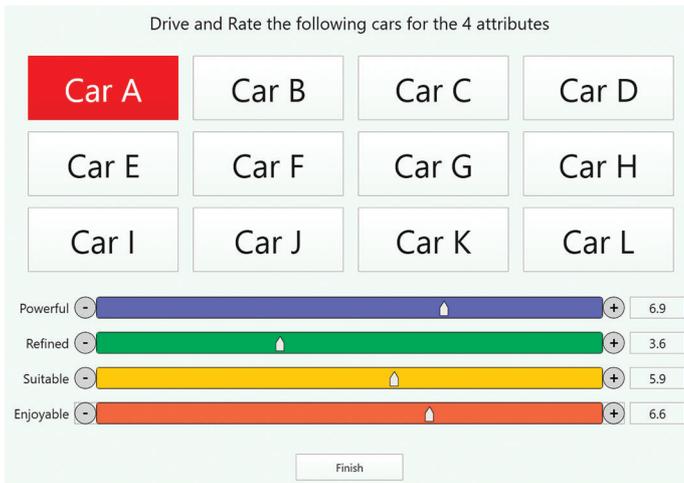
The NVH Vehicle Simulator accurately recreates the NVH parameters of a vehicle in the context of real driving conditions. As the driver increases or decreases speed and changes gears, the NVH Simulator responds instantly to the input, synthesizing and reproducing the correct sound and vibration. And just as in a real vehicle, the stimuli are affected by changes in the road surface, vehicle speed, engine speed and throttle position.

The NVH Simulator provides managers, customers and other stakeholders with a common tool to evaluate vehicles back-to-back, selecting similar or dissimilar models with simple clicks, thus saving test time and multiple prototype testing.

From these benchmarks, engineers can set targets that ensure that the overall NVH design supports the brand image and matches or exceeds customer expectations.

Development engineers can use the NVH Simulator to make and validate engineering changes at any time in a vehicle's development. This is useful to evaluate the effects of alterations and try out alternative design solutions and modified components in a virtual prototype.

Fig. 1 Evaluation of the sound and vibration of 12 vehicles



Driving Modes

Vehicle evaluators can 'drive' the NVH Simulator in three different ways:

- **Direct event replay** of a set of time histories, for example, a 3rd gear WOT (wide open throttle) including contributions of different sources. This allows standard analysis techniques for traditional jury evaluation to be used
- **Totally free driving** where all the stimuli are created in real time in response to throttle, gear, and brake and steering inputs. This requires the engine- and vehicle-speed-related constituents of the sound to be represented independently over the full driving envelope
- **Synthesis of a predetermined event** from the free-driving data set. This allows any fixed driving envelope to be predefined in terms of vehicle parameters (speed, load, gear profiles) and visual and traffic scenarios

The data used in the NVH Simulator can be freely configured to create models optimized to assess a specific area of interest or solve a particular problem.

Data Preparation

The NVH Simulator platform includes the tools to extract both NVH and vehicle performance characteristics from test track or test bench recordings. These tests provide data to allow the powertrain and masking sound signatures to be separated into:

- Complex orders for the harmonic components over the full driving envelope
- Complex spectra or waveforms for the masking over the full driving envelope
- Time histories for each individual event such as key on/off

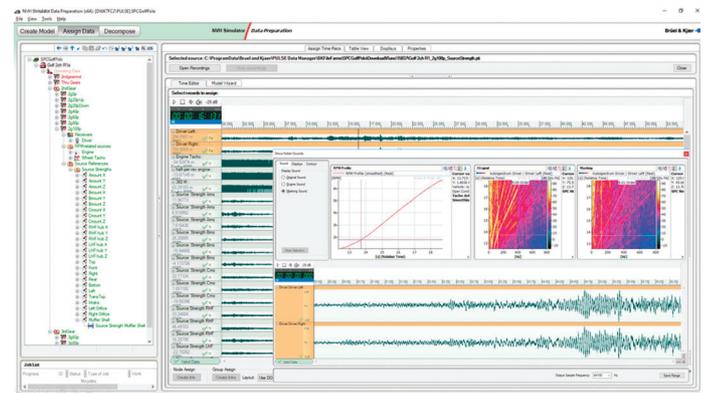
During driving, the sounds are reconstituted in real time from the separated components. This decomposed data can be:

- Actual data measured on specific vehicles
- Modified or filtered versions of measured data
- Artificially created data, for example, from target curves
- Data generated by CAE analysis of new or existing designs

Since the masking and order data can be mixed in any combination, it is possible to carry out evaluations that cannot be performed in real vehicles, such as experiencing the power train sound of different vehicles with the same masking sound.

NVH Simulator's Data Preparation software handles the extraction of vehicle performance and NVH characteristics and decomposition of stimuli into data for later mixing into subjective combinations for 'driven' evaluation.

Fig. 2 Vehicle and source level data preparation

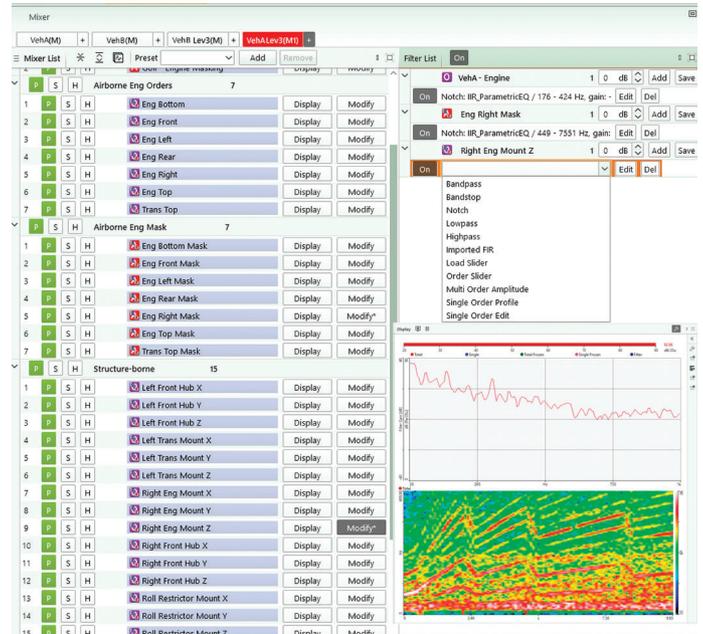


Engineering While Driving

The NVH Simulator platform also includes tools that enable the NVH engineer to manipulate and modify components used in the NVH Simulator model as he drives, thus immediately experience the effects of the changes.

With these tools, filters can be applied to represent new components in the vehicle, such as new exhaust or intake systems. Different sound contributions (engine mount contributions, exhaust noise, etc.) can be turned on and off, grouped together, filtered or replaced by alternatives. Even different operational modes can be simulated. This could be the number of activated cylinders for variable displacement engines or a position change of an active or passive exhaust valve. The transition points are precisely tuned relative to rpm and engine load, and for each gear (1st, 2nd, 3rd, etc.) independently.

Fig. 3 A single component or selected groups can be played, compared, displayed and modified

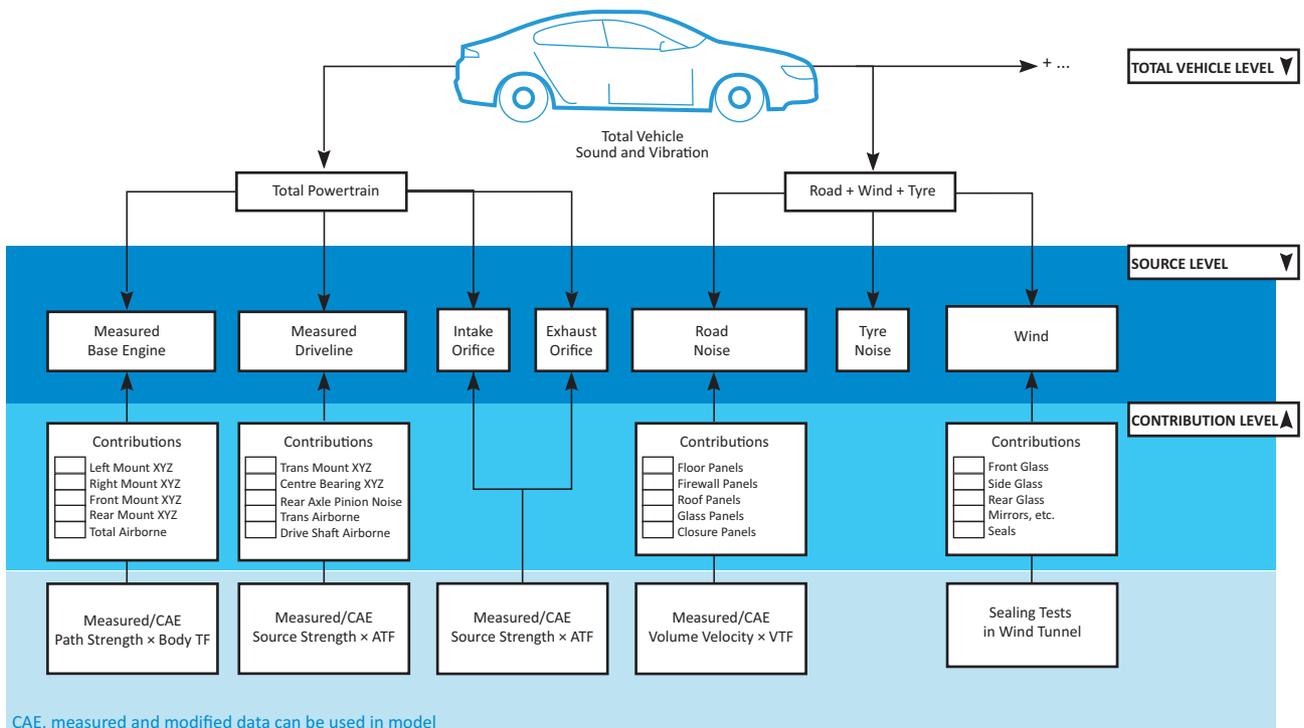


Creating the Model

NVH Simulator models can be as simple or as complex as needed for the task at hand. They can range from simple vehicle-level models (Level 1 model) created from measurements or analytical result data at only the driver or passenger response locations, to very complex source-path-

contribution models (Level 3 models) containing hundreds of sound components describing the source levels, path sensitivities and contributions from each source at the driver/passenger position.

Fig. 4 Create models with the right amount of detail for your project or process using the operation levels (1, 2 and 3) of the NVH Simulator



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Level 1 models are often used for benchmark comparisons and target setting. More complex models are typically used to perform target cascades and validation, to assess effects of specific components, and to assess engineering changes to components. Data from multiple sources of measurements or CAE analyses can be combined to create the final virtual NVH prototype.

The NVH Vehicle Simulator Platform

Desktop Simulator

The Desktop NVH Simulator is a complete system that enables you to evaluate, modify and design NVH data interactively by 'driving' through a virtual scenario shown on a PC monitor.

A wide range of modules means that a system can be customized to meet your specific requirements.

A typical system consists of the following components:

- **Main PC:** This high-end performance PC runs the audio and visual engines and provides the master screen, which is used to prepare the model, set up an evaluation and monitor use. It also drives the monitors on which the visual scenario and virtual IP are shown. The PC can also be taken to meetings for interactive presentations of NVH data
- **Driver interface:** High-quality steering wheel and pedals
- **Video interface:** A single 27" monitor, resolution: 2560 × 1440 (recommended for simple desktop systems)
- **Audio interface:** High-quality, precision headphones, either dynamic or electrostatic



When creating Level 3 (source-path-contribution) models from measured data, [Source Path Contribution Type 7798 \(SPC\)](#) is typically used. The SPC software, NVH Simulator Data Preparation software and NVH Simulator are designed to work together for an easy, efficient streamlined workflow in creating source-path-contribution NVH Simulator models.

On-road Simulator

The On-road NVH Simulator allows vehicle sounds created with Desktop NVH Simulator software to be transferred to and evaluated on a vehicle during road tests. Sound is generated in real time based on the CAN bus signals responding to the driver inputs. Multiple sound models can be evaluated, switching instantly from one to another. Sound can be modified with filters in real time. Any modification possible on the Desktop Simulator can be performed in-vehicle with the On-road Simulator.



VSound

Vsound is a PC-free, DSP-based, in-vehicle real-time sound generation system that allows you to evaluate targets, candidate sounds and sound delivery strategies on a real vehicle. The system's DSP Box connects to the vehicle CAN bus system for vehicle parameters and from one to eight outputs are then sent to the existing audio system of the vehicle, a completely separate set of speakers or dynamic actuators.

Operation of the VSound system, including selecting the virtual vehicle sound and monitoring the functions, is performed via a wireless connection to an iPhone or iPod touch that has the VSoundRC app installed.

Exterior Sound Simulator

The Exterior Sound Simulator module is used for auralising the exterior sound of a moving vehicle as it would be experienced by an external observer. The vehicle can be performing any driving manoeuvre in any scenario and the observer can be stationary, or a pedestrian walking through the scenario.



Full-vehicle Simulator

The Full Vehicle NVH Simulator is a project-based, multi-sensory solution, combining a full vehicle body, calibrated, independent multi-axial vibration at all driver touchpoints (seat, steering wheel and floor pan), and a large visual display.



NVH Simulator software can also be integrated with existing driving simulators to add NVH evaluation capability. This can be done in two ways:

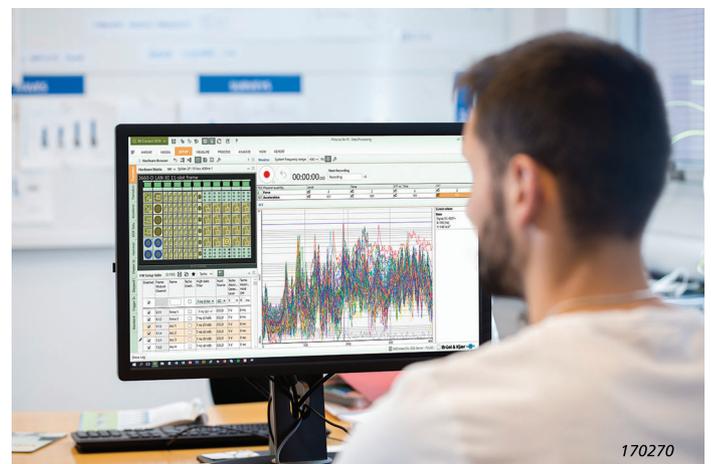
- SimSound can be used to play models created in the NVH Simulator on virtually any existing driving simulator. Like the NVH Simulator, SimSound generates sound in real time based on inputs from the driving simulator. This results in playing not just sound, but the right sound in any simulator.
- SimSound, however, does not include the ability to edit or modify the sounds played. For that, the full NVH Simulator can be connected to another driving simulator, producing sound in real time based on the parameters communicated by the driving simulator. With the NVH Simulator software operating in this way, the sound can be modified and different vehicle sounds can be played back-to-back

Fig. 5 The NVH Simulator integrated with a VI-grade driving simulator



Real-time Data Streaming from NVH Simulator to BK Connect®

The NVH Simulator can be coupled with and stream data in real time directly to BK Connect software for additional real-time displays, in-depth analysis and reporting. Leveraging the power and flexibility of BK Connect, sound quality metrics, order plots, spectrum maps, and other complex analyses can be performed directly from the NVH Simulator output – as the NVH Simulator is running. These results can then be documented in Microsoft® PowerPoint®, Word or Excel® format using the BK Connect reporting tools.



Recommended PC Specifications

- Intel® Core™ i7 Quad core 3 GHz processor, or better
- 32 GB RAM
- Minimum 480 GB solid state drive (SSD) with 20 GB of free or better
- 1 Gbit Ethernet network
- Microsoft® Windows® 10 Pro or Enterprise (x64) with Current Branch
- Screen resolution of 1920 × 1080 pixels (full HD) minimum
- Dedicated graphics card with minimum 2 GB on-board VRAM, or better
- Microsoft® Office 2016 (x32) for systems with BK Connect

Monitors for Desktop Configurations:

- 1 or 2 × 27", 2560 × 1440 pixels (QHD)
- 1 × 34" ultra-wide
- 1 × 10" touchscreen

Please Note:

- Greater processor speed/more cores will enable larger models to run
- Faster disk/SSD will enable faster loading time (less time waiting to start simulation) – 1 TB NVMe SSD or better recommended
- More RAM will enable larger models to run
- Larger SSD or additional drives will enable more data and model storage
- NVIDIA® GTX1060 graphics card recommended, or better

Evaluation Software

NVH SIMULATOR CORE AND VISUALS TYPE 8601-A

Type 8601-A is the core module for the NVH Vehicle Simulator system. Type 8601-A is the base module, and a requirement to run all other modules.

With Type 8601-A, you can:

- Set up the NVH Simulator
- Manage the NVH data
- Build vehicle models
- Model the vehicle performance (data is prepared in Type 8601-C)
- Create binaural sound and visual stimuli in real-time
- Display spectra of the data user is experiencing
- Define the visual stimuli
- Set up and manage a database of jurors

NVH SIMULATOR ADVANCED JURY EVALUATION TYPE 8601-H

Prerequisites: Jury Evaluation Type 8601-G

Type 8601-H provides multi-juror capability allowing many people to vote simultaneously in a NVH Simulator Jury Evaluation test via an iOS-based mobile device. The voting data is recorded in the NVH Simulator project file as is done for a single juror in Type 8601-G.

NVH Simulator Multi Juror is available as a free app and supports any iOS-based mobile device.

A Type 8601-H licence is required for functionality on a NVH Simulator control PC to receive voting data and store them in NVH Simulator

NVH SIMULATOR JURY EVALUATION TYPE 8601-G

Type 8601-G provides a selection of customizable, evaluation interfaces for performing jury evaluation experiments such as paired comparison, semantic differential and others. The stimuli for the experiments can either be created in real-time under the control of the juror or can be prepared from user-defined events (fixed driving, that is, as a passenger). The final votes for each juror can be stored together with the complete evaluation history and a recording of the driving behaviour

Data Preparation Software

NVH SIMULATOR PERFORMANCE DATA PREPARATION TYPE 8601-C

Type 8601-C enables configuration of free-driving performance models from a simple set of prescribed on-road recordings of engine speed and vehicle speed at different pedal positions in each gear. Existing models can be edited to meet new design criteria. Free-driving performance models can also be created from the basic physical parameters of the vehicle, such as engine torque, vehicle mass, etc. Fixed driving performance profiles for any condition within the driving envelope can be generated from the free-driving models

NVH SIMULATOR SOURCE LEVEL DATA PREPARATION TYPE 8601-L

Prerequisites: Vehicle Level Data Preparation Type 8601-K

Type 8601-L extends Vehicle Level Data Preparation Type 8601-K to create a source level model to include sources such as intake and exhaust orifice source strengths or contributions. Type 8601-L also provides a multiple coherence technique for separating non-coherent sources, for example decomposing vehicle masking noise into wind, road and tyre contributions. Datasets created by Type 8601-L, as a result of processing the set of recorded operating conditions, can be loaded directly into Core and Visuals Type 8601-A and assigned to a vehicle for assessment and evaluation.

For more information, see product data [BP 2226](#)

NVH SIMULATOR VEHICLE LEVEL DATA PREPARATION TYPE 8601-K

Type 8601-K separates harmonic-related sound (orders of the engine, motor, gears, etc.) from masking sound (road, wind and powertrain masking noise) using a highly refined, very precise order extraction technique specially developed and adapted for NVH Simulator data preparation. The results, in the form of accurate harmonic content as represented by orders, and masking sounds with no order content remaining, are used by the NVH Simulator in creating accurate dynamic vehicle sound simulations

NVH SIMULATOR CAE AUDITIONER TYPE 8601-X

Type 8601-X combines source strengths and transfer functions from contributions to create models that can be used directly in any NVH Simulator module or Insight Type 8601-S.

Type 8601-X can import CAE results from standard CAE tools, as well as test results in order to create the contributions or import contributions created outside of the Auditor. Type 8601-X is also used to automate the creation of NVH Simulator car models from large sets of SPC-based measurements containing dozens or even hundreds of individual source-path-receiver contributions.

For more information, see product [BP 2525](#)

Engineering Modification Software

NVH SIMULATOR ENGINEERING TYPE 8601-B

Prerequisites: Core and Visuals Type 8601-A

Type 8601-B enables the NVH engineer to manipulate and modify components used in the Simulator model. Features include:

- Filters can be applied to represent new components in the vehicle
- Different sound contributions can be turned on and off, grouped together, filtered or replaced by alternatives
- Different operational modes of a vehicle can be simulated
- Mixer user interface with control over each component of the model

NVH SIMULATOR CONTRIBUTION ANALYZER TYPE 8601-P

Prerequisites: Core and Visuals Type 8601-A and Engineering Type 8601-B
Type 8601-P extends the NVH Simulator Engineering system's capabilities to use a contribution level model by calculating path contributions from source strength and transfer function data directly in the Assign Data task of the NVH Simulator, with visualization and replay of the resulting contributions as well as visualization of the source data. The noise and vibration contributions from the various sources to the driver and passenger positions can be determined using [source path contribution tools](#) or CAE models. For more information, see product data [BP 2229](#)

Simulation Options

NVH SIMULATOR ROAD CREATOR TYPE 8601-M

Type 8601-M generates a visual scenario automatically from GPS or ASCII file input data of x, y and z coordinates. Capabilities include:

- Display and edit
- Define road and scenario parameters
- Apply smoothing
- Add road signs (control the speed of the traffic)
- Assign road surfaces
- Auto-create NVH Simulator visual files

For more information, see product data [BP 2227](#)

NVH SIMULATOR ON-ROAD SIMULATOR TYPE 8601-N

Prerequisites: Core and Visuals Type 8601-A

When operating in-vehicle, Types 8601-A and 8601-N must be installed on the in-vehicle PC. To perform in-vehicle engineering modifications to sound objects, Engineering Type 8601-B must be installed. To perform in-vehicle source path contribution modifications, Contribution Analyzer Type 8601-P, must be installed.

Type 8601-N provides real-time sound creation in a car as it is being driven. The existing sound is modified in real-time, and the resultant target sound is heard by the driver. The control parameters for the sound synthesis are taken directly from the vehicle.

For more information, see product data [BP 2228](#)

NVH SIMULATOR EXTERIOR SOUND SIMULATOR TYPE 8601-T

Prerequisites: Core and Visuals Type 8601-A

Type 8601-T is used for auralising the exterior sound that would be experienced by a pedestrian as a vehicle is driven around a realistic virtual scenario.

For more information, see product data [BP 2396](#)

SIMSOUND TYPE 8601-U

Type 8601-U is a sound generation system for driving simulators that are typically not NVH-focused. Type 8601-U is delivered pre-configured, ready to go.

The SimSound package includes two datasets that can be selected from a database currently with 12 vehicles of differing types and sound quality (additional models can be purchased from Brüel & Kjær). Alternatively, if you have NVH Simulator, export models to SimSound directly to enable use of your own sound models.

For more information, see product data [BP 2499](#)

V SOUND

- Type 8601-V: VSound PC software
- Type 3115: VSound DSP Box
- Type 3115-A: VSound System (software and hardware)

A sound-generating system for experiencing new vehicle sounds from both a vehicle interior and exterior perspective. Its primary purpose is in-vehicle virtual NVH prototype evaluation. Seamlessly integrated with the NVH Simulator's Desktop Simulator and Exterior Sound Simulator, VSound is part of a suite of tools engineers use to design, check, evaluate and deliver interior and exterior vehicle sounds for vehicles of any configuration, including electric, hybrid, conventional internal combustion (IC) powertrains, and any other vehicle/powertrain design.

For more information, see product data see [BP 2563](#)

Ordering Information

For more information on an individual product, click the link, where available, to view its product data.

Software with an -x suffix are available either as a node-locked or floating licence. Please include licence type when ordering:

- N: node-locked, permanent (example: 8601-A-N)
- FYG: annual floating lease, global (example: 8601-A-FYG)
- FYL: annual floating lease, local site (example: 8601-A-FYL)
- FY1: annual floating lease, Region 1, Americas (example: 8601-A-FY1)
- FY2: annual floating lease, Region 2, Europe (example: 8601-A-FY2)
- FY3: annual floating lease, Region 3, Asia (example: 8601-A-FY3)

Software with an -y suffix indicates permanent licences that are either N: node-locked or F: floating (not a lease licence)

Recommended NVH Simulator Configurations

TYPICAL DESKTOP NVH SIMULATOR

Type 8601-A-x	NVH Simulator Core and Visuals
Type 8601-B-x	NVH Simulator Engineering
Type 8601-C-x	NVH Simulator Performance Data Preparation
Type 8601-G-x	NVH Simulator Jury Evaluation
Type 8601-K-x	NVH Simulator Vehicle Level Data Preparation
Type 8601-L-x	NVH Simulator Source Level Data Preparation (see BP 2226)
Type 8601-P-x	NVH Simulator Contribution Analyzer (see BP 2229)
Type 8601-X-x	NVH Simulator CAE Auditor (see BP 2525)

TYPICAL DESKTOP NVH SIMULATOR WITH SOURCE PATH CONTRIBUTION FOR FULL SOURCE-LEVEL MODELLING

Type 8601-A-x	NVH Simulator Core and Visuals
Type 8601-B-x	NVH Simulator Engineering
Type 8601-C-x	NVH Simulator Performance Data Preparation
Type 8601-G-x	NVH Simulator Jury Evaluation
Type 8601-K-x	NVH Simulator Vehicle Level Data Preparation
Type 8601-L-x	NVH Simulator Source Level Data Preparation
Type 8601-P-x	NVH Simulator Contribution Analyzer
Type 8601-X-x	NVH Simulator CAE Auditor
Type 7798-A-x	SPC Viewer (see BP 2086)
Type 7798-E-x	SPC Time Domain (see BP 2086)

DESKTOP NVH SIMULATOR FOR VEHICLE-LEVEL ENGINEERING

Type 8601-A-x	NVH Simulator Core and Visuals
Type 8601-B-x	NVH Simulator Engineering
Type 8601-C-x	NVH Simulator Performance Data Preparation
Type 8601-G-x	NVH Simulator Jury Evaluation
Type 8601-K-x	NVH Simulator Vehicle Level Data Preparation

Recommended Hardware for Desktop NVH Simulator

UA-1692	ECCI Steering Wheel and Pedals Set
ZH-0677	RME® Fireface UC Audio Interface
ZE-0769-004	Headphone Amplifier
6 × HT-0017	Sennheiser HD650 Headphones
2 × AO-0849-D-050	Signal Cable, ¼" jack to ⅜" jack (to connect ZH-0677 to ZE-0769), 5 m (16.7 ft)

Full Vehicle NVH Simulator

Full Vehicle NVH Simulator Type 3644-W is **always** handled as a customer-specified project. Please contact your local Brüel & Kjær representative

Optional and Recommended Products

OTHER NVH SIMULATOR SOFTWARE

Type 8601-H-x	NVH Simulator Advanced Jury Evaluation
Type 8601-M-x	NVH Simulator Road Creator (see BP 2227)
Type 8601-N-x	NVH Simulator On-Road Simulator (see BP 2228)
Type 8601-S-x	SPC Time Insight – requires Types 7798-A and -E (see BP 2340)
Type 8601-T-x	NVH Simulator Exterior Sound Simulator (see BP 2396)
Type 8601-U-N	SimSound, node-locked only (see BP 2499)

RECOMMENDED SOFTWARE

BZ-5950-L	Sonoscout NVH Recorder, licence (see BP 2463)
Type 8400-y	BK Connect Data Viewer (see BP 0005)
Type 8400-B-y	BK Connect Native File Importers, for importing other Brüel & Kjær data
Type 8400-C-y	BK Connect External File Importers
Type 8401-V-y	BK Connect Virtual Hardware Setup (see BP 2602)
Type 8403-y	BK Connect Data Processing, includes synthesized CPB, not IEC/ANSI, (see BP 2604)
Type 8403-A-y	BK Connect Data Processing (advanced)
Type 8405-C-y	BK Connect CPB Option, if IEC/ANSI octave-band calculation needed
Type 8405-E-y	BK Connect Order Analysis Option
Type 8405-F-y	BK Connect Order Tracking Option
Type 8405-G-y	BK Connect Sound Quality Metrics Option

RECOMMENDED HARDWARE

UA-1709	Logitech® Racing Wheel
Type 3663-B-080	8-ch. Sonoscout System, with LAN-XI 8-ch. input + 2-ch. CAN input module, battery module, WLAN frame, and Sonoscout licence in one portable case (see BP 2463)
Type 4100	Head and Torso Simulator (see BP 1436)
Type 4101-B	Binaural Recording Headset (see BP 2562)

SOUND GENERATING SYSTEM

Type 3115-A	VSound System (see BP 2563)
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Services

SOFTWARE MAINTENANCE

Software maintenance and support is included in all annual floating lease licences. For permanent, node-locked licences, the following software maintenance products are required:

M1-8601-A-N	Software Maintenance & Support Agreement for Type 8601-A-N
M1-8601-B-N	Software Maintenance & Support Agreement for Type 8601-B-N
M1-8601-C-N	Software Maintenance & Support Agreement for Type 8601-C-N
M1-8601-G-N	Software Maintenance & Support Agreement for Type 8601-G-N
M1-8601-H-N	Software Maintenance & Support Agreement for Type 8601-H-N
M1-8601-K-N	Software Maintenance & Support Agreement for Type 8601-K-N
M1-8601-L-N	Software Maintenance & Support Agreement for Type 8601-L-N
M1-8601-M-N	Software Maintenance & Support Agreement for Type 8601-M-N
M1-8601-N-N	Software Maintenance & Support Agreement for Type 8601-N-N
M1-8601-P-N	Software Maintenance & Support Agreement for Type 8601-P-N
M1-8601-S-N	Software Maintenance & Support Agreement for Type 8601-S-N
M1-8601-T-N	Software Maintenance & Support Agreement for Type 8601-T-N
M1-8601-U-N	Software Maintenance & Support Agreement for Type 8601-U-N
M1-8601-X-N	Software Maintenance & Support Agreement for Type 8601-X-N

CONSULTANCY AND SYSTEM RENTAL

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Brüel & Kjær Sound & Vibration Measurement A/S
DK-2850 Nærum · Denmark · Telephone: +45 77 41 20 00 · Fax: +45 45 80 14 05
www.bksv.com · info@bksv.com
Local representatives and service organizations worldwide

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