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# MANATEE software

- Products - MANATEE -

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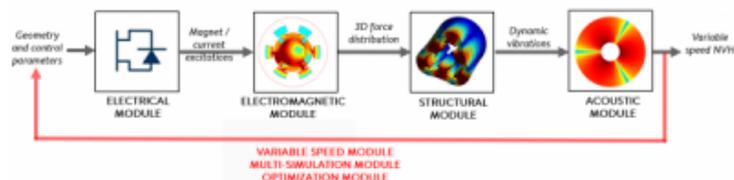
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Developed and distributed by EOMYS, MANATEE (Magnetic Acoustic Noise Analysis Tool for Electrical Engineering) is the only simulation software dedicated to the **fast electromagnetic and vibroacoustic design optimization of electrical machines**.

Based on powerful calculation algorithms such as [Electromagnetic Vibration Synthesis](#) and [Spectrogram Synthesis](#), acoustic noise and vibrations due to Maxwell forces can be quickly calculated both in **basic design and detailed design phase** at all the operating points of the e-machine. A unique combination of electrical engineering and vibro-acoustic know-how allows to understand the [root cause of Noise Vibration Harshness](#), and implement several [acoustic noise mitigation techniques](#) during the electromagnetic and structural design of electric motors. MANATEE can also be used **after manufacturing** as a **fault diagnosis tool** of noisy electrical machines.



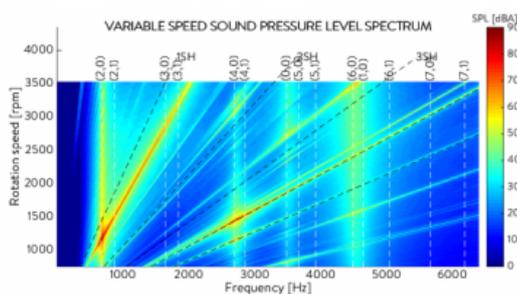
## MANATEE NVH simulation workflow

MANATEE specific features are

- a **fast and accurate simulation workflow with predefined multiphysic coupling**: electromagnetic noise and vibrations can be calculated along torque speed curve in a few seconds up to 20 kHz
- specialized built-in post-processing to **understand Noise, Vibration, Harshness (NVH) root-cause** ([more than 120 plot commands](#)) and implement relevant [e-NVH control techniques](#) (e.g. skewing, pole shaping, slot/pole combination optimization, notching, RPWM)
- **different electromagnetic and vibro-acoustic modeling levels** to choose the most relevant accuracy / computing time tradeoff according to the different NVH design stages of e-machines (quick noise ranking of concepts Vs detailed noise calculation on a complex CAD model)
- a **reliable and robust** software (publication of [reproducible validation cases](#), regular [technical publications](#) based on MANATEE), adapted for [research and development](#) as well as [teaching](#) purposes

These features make MANATEE a must-have tool for electrical machine designers who need to **include the NVH criterion at design stage**, but also an electromagnetic design software that is more open, flexible and cost competitive than other numerical software suite (see our special article on [MANATEE differences with other e-NVH software](#)). The [coupling of MANATEE with FEMM](#) allows efficient hybridation of numerical and semi-analytical magnetic models for the fast and accurate assessment of acoustic noise radiated by electrical machines.

The mechanical and acoustic models of MANATEE help finding **the optimal trade-off between electromagnetic and vibro-acoustic performances** of an electrical machine, avoiding extra costs (e.g. change of rotor, rewinding of stator, use of acoustic insulation or vibration dampers) when sound or vibration level is unexpectedly high after manufacturing. This unique model gives the acoustic pressure and power level up to 20 kHz at variable speed within a few seconds:



Variable speed sound pressure level spectrum

Contrary to a finite-element-based multiphysic simulation chain, MANATEE can be used during **early electromagnetic design optimization loops** (e.g. optimization of the slot and pole number combination, optimization of the magnet shape), and calculates the vibroacoustic behaviour over the **full operational range** of the machine ([noise maps](#)) within a reasonable time. Electromagnetic, structural and acoustic models are automatically coupled.

A general presentation of MANATEE software is available here:



### **MANATEE NVH simulation software of e-motors**

MANATEE includes more than 120 plot commands giving **physical insights in simulation results** (e.g. FFTs, operational deflection shape, order tracking, analytical harmonic expressions). They are accessible in command line and are detailed in [Plot commands](#) part.

An online help is available as short questions and answers in the [HowTos](#) part. They cover all functionalities of MANATEE.

Some more advanced tutorials covering the full simulation process from electromagnetics to vibroacoustics on different machine topologies can be found in the [Tutorials](#) section.

All the electrical, electromagnetic, mechanical and acoustic validations of MANATEE can be found in the [Validations](#) part.

Licensing information can be found in part [License](#).

Other documentation (e.g. installation guide) on MANATEE is available in [Resources](#) part.

For an official quotation request, you can contact us through the [contact form](#).

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