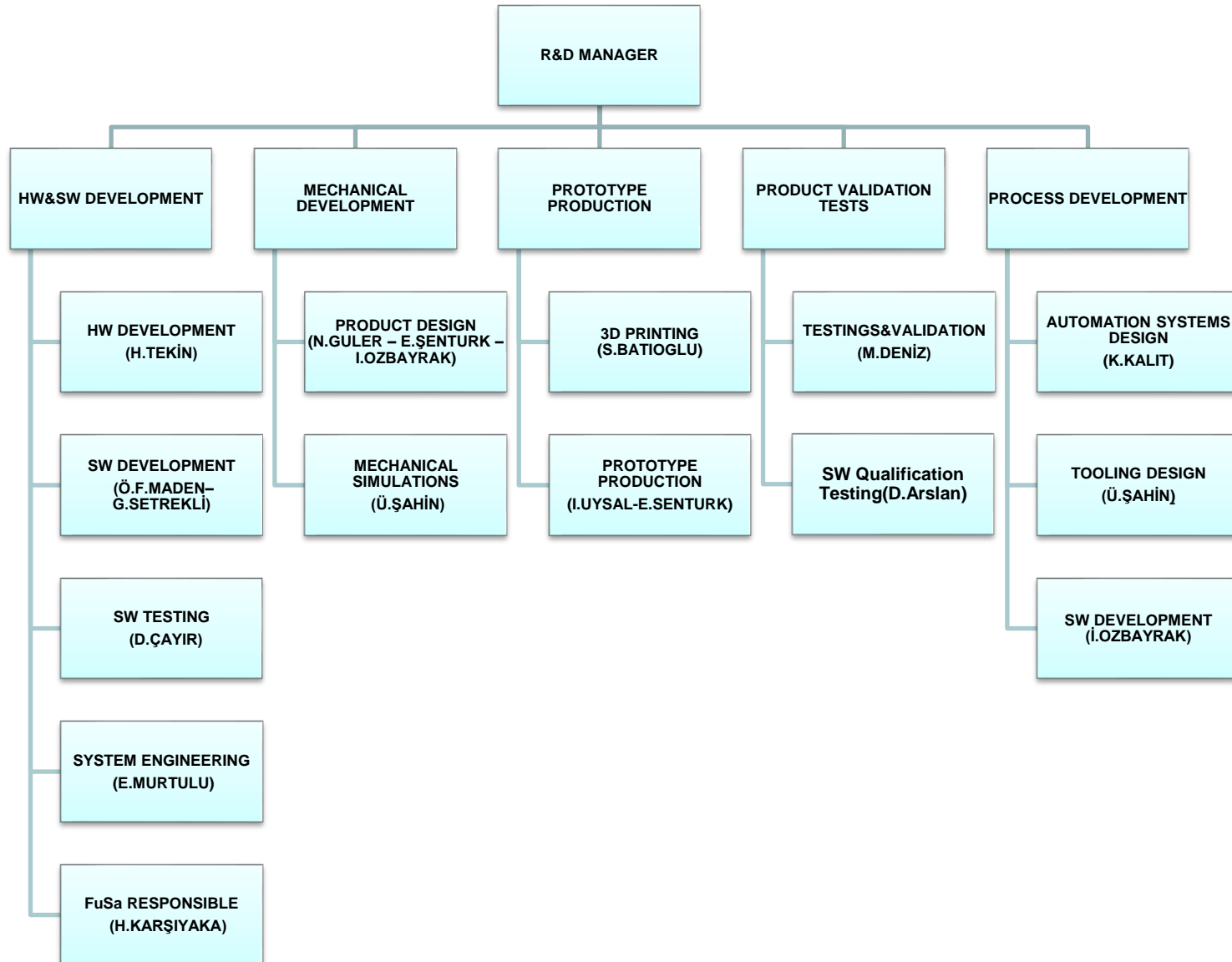


R&D Activities

SEGER

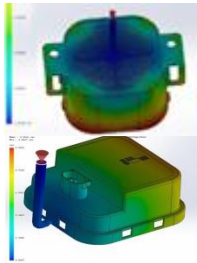
As of April 2023, the **Seger Design Center** has been approved by the Ministry of Industry and Technology under Law No. 5746.



Electronic Component Design

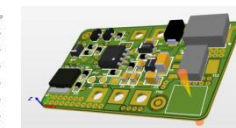
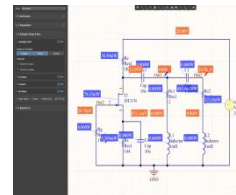
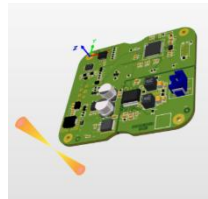
Mechanical

- Cover Designs
- Connector Designs
- Mech. Simulations



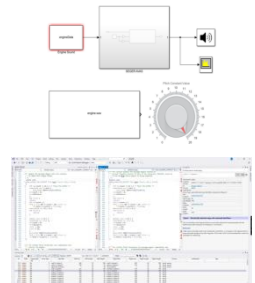
Hardware

- PCB Design
- Component Selection
- Spice Simulations
- Thermal Analysis
- EMC tests



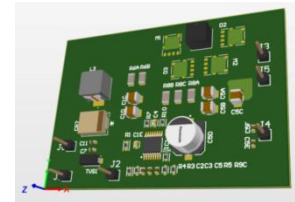
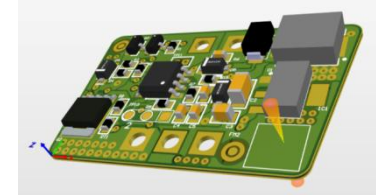
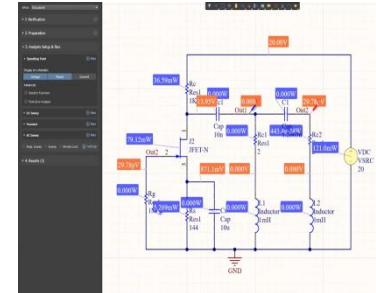
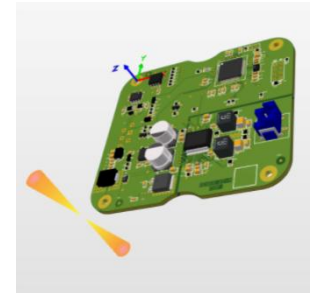
Software

- Modelling
- Embedded Coding
- Interface Coding
- SW Testings



HW Design

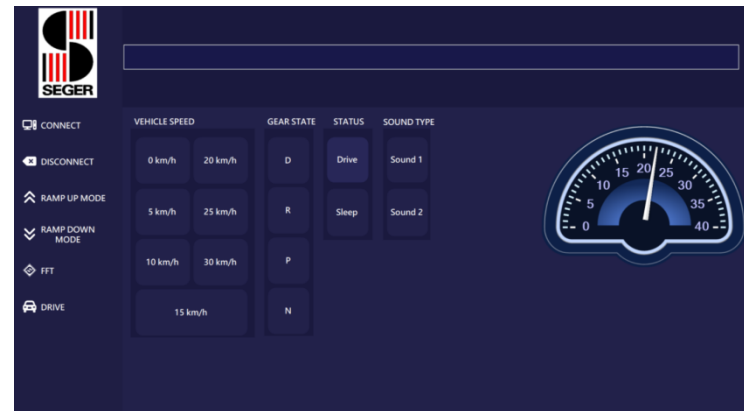
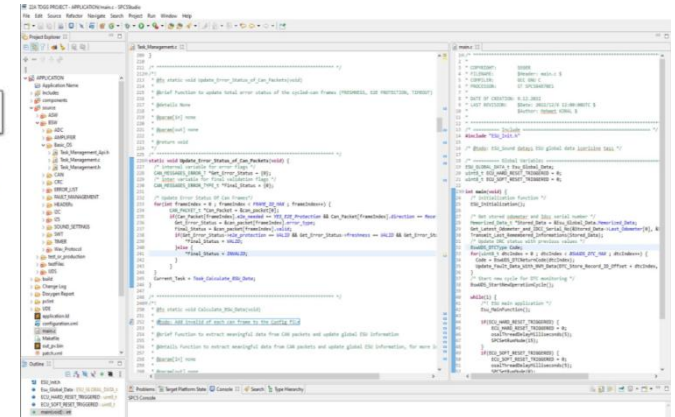
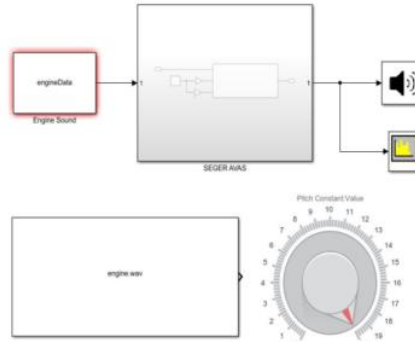
- PCB Design
- Component Selection
- Spice Simulations
- Thermal Analysis
- EMC tests



All HW Requirements are managed in Stakeholder document acc.to Customer Specification and All versioning is done with Sourcetree.

Software Design

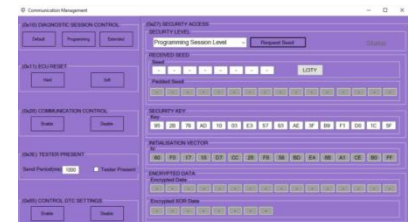
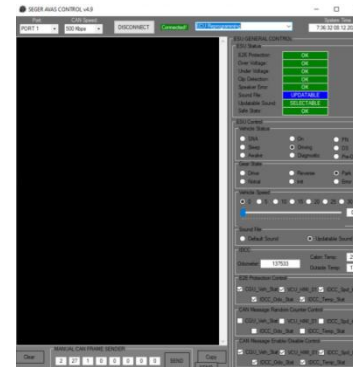
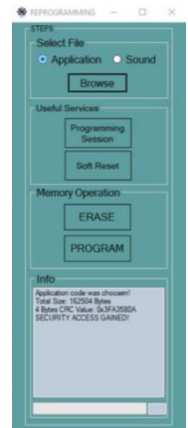
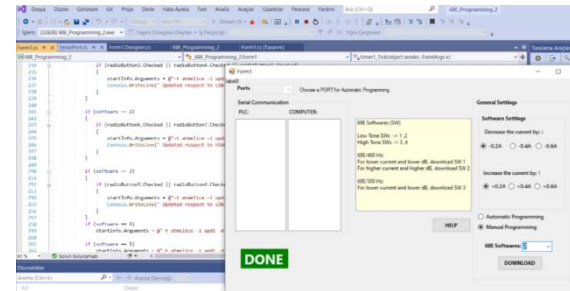
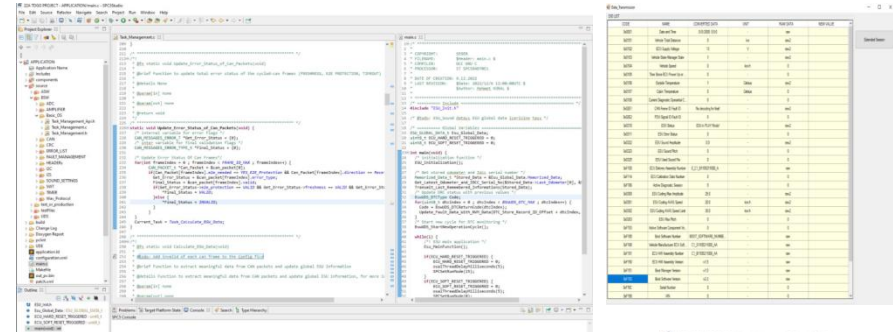
- Modelling
- Embedded Coding
- GUI Coding(Interface)
- SW Testings



All SW Requirements are managed in Stakeholder document acc.to Customer Specification and All versioning is done with Sourcetree.

Software Design Capabilities

- Software Development
 - ASW
 - BSW
 - Auto-code Generation
 - UDS acc.to ISO 14229-1
 - Bootloader
 - Verification, Integration, Testing
- Cybersecurity Development
 - Software Signing & Verification
 - Service 27
 - HSM
 - Secureboot
 - Jtag Protection
- GUI Developments
 - Vehicle Simulations
 - Diagnostic Testing



How we manage?

SEGER

Seger follows V-Cycle

Seger uses Ansys

- Scade Architect
- Scade Suite Advanced
- Scade KCG Code Generator
- Scade LifeCycle Reporter
- Scade Test Environment & Model Coverage

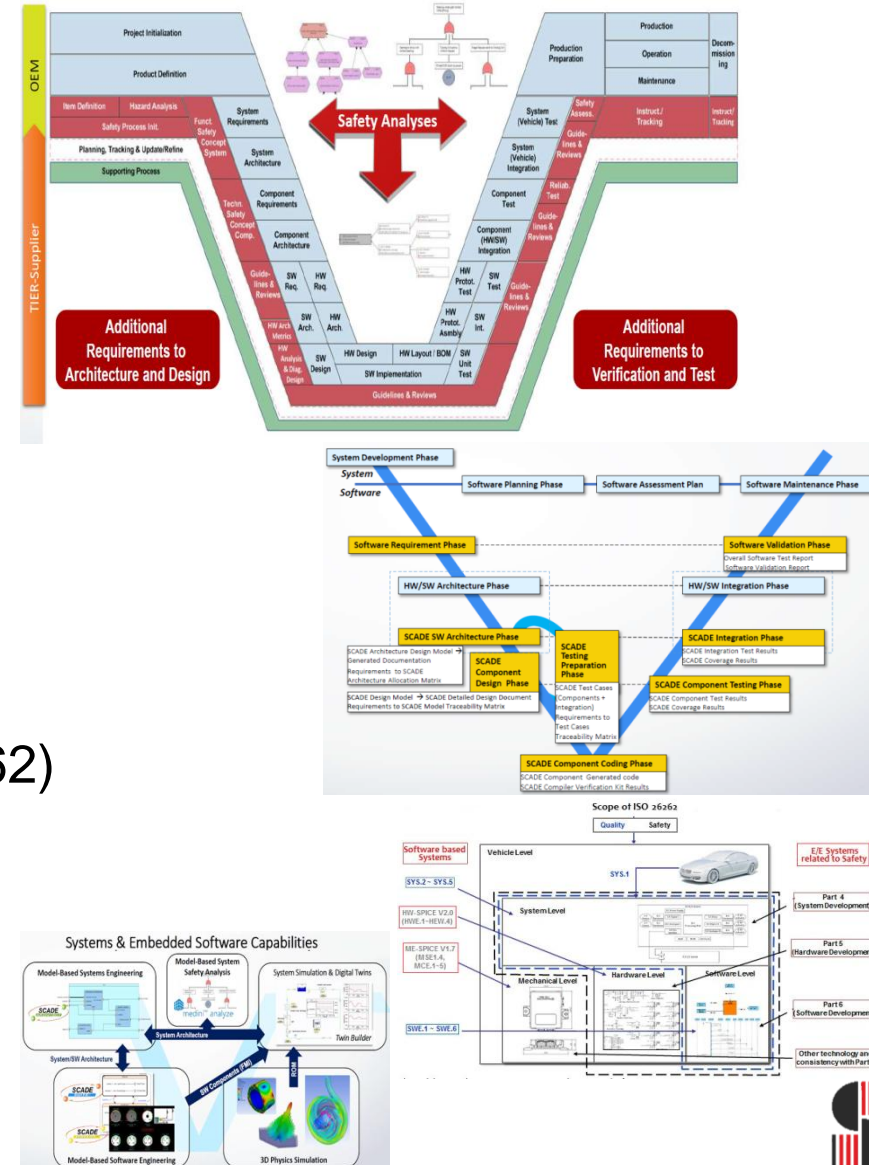
Versioning SourceTree

Functional Safety Management(ISO 26262)

- Scade Medini Analyze Premium

Cybersecurity Management (ISO 21434)

- Scade Medini Analyze Expertise

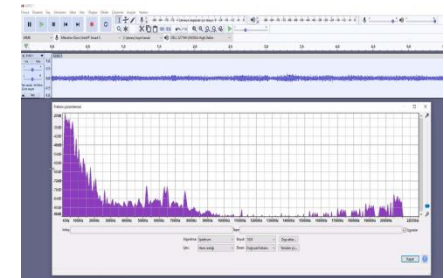
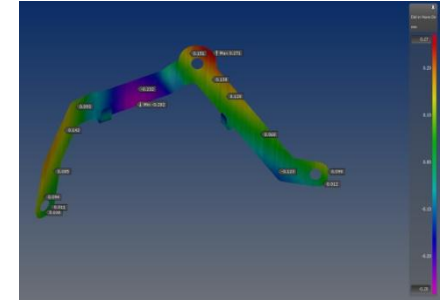
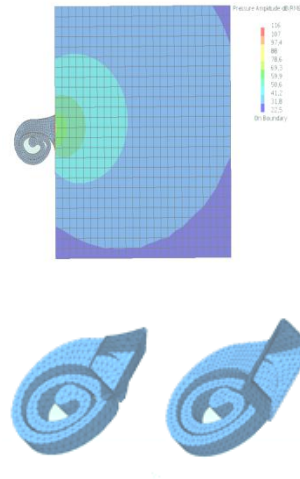


Mechanical Design

- 2D & 3D Modelling
- CAD/CAM
- Acoustical Simulations
- FEA Simulations
- Fast 3D Prototyping

SIEMENS
NX

SOLIDWORKS
PLASTICS



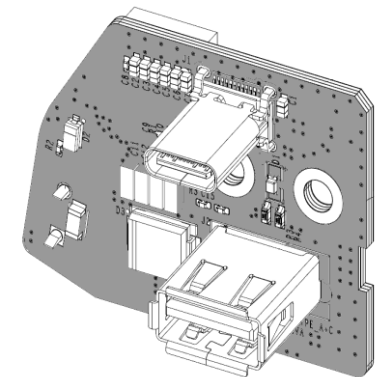
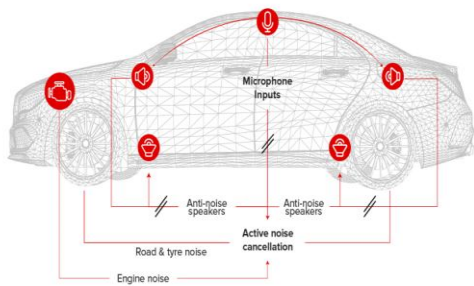
Content	Approved	On Pending
Patents	8	7
Design Registration	4	0
Brand Registration	2	0
Article	4	2

Product Name
Electromechanical Horn
Electronic Horn
Air Horn
Back-Up Alarm
Acoustic Vehicle Alerting System(AVAS)



Project Name	Stage
Active Noise Cancellation(ANC)	R&D
Smart Seat Controller (Heater)	A-Sample
Exciter Systems	A-Sample
USB Charger	R&D

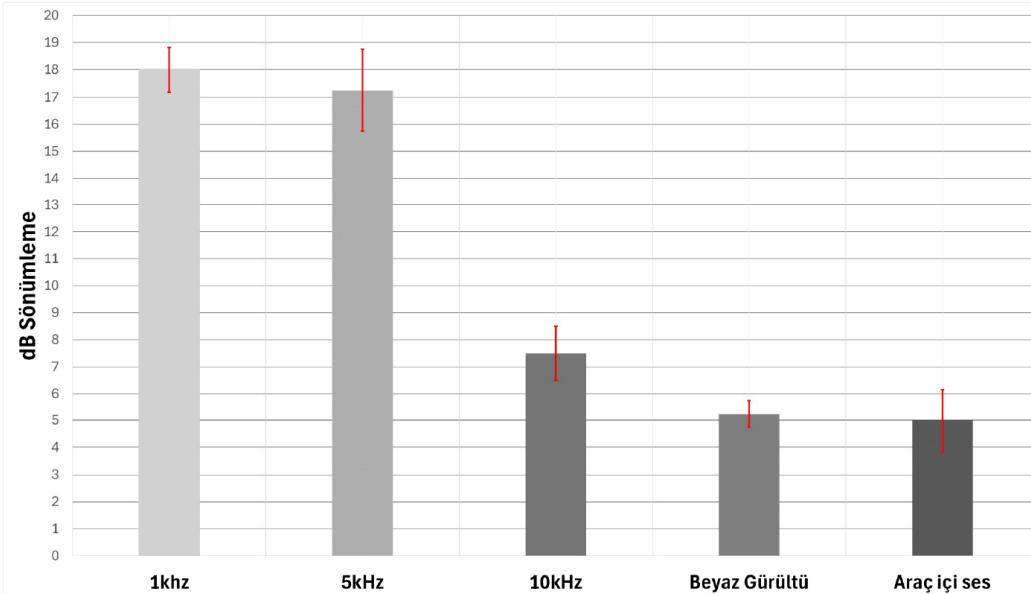
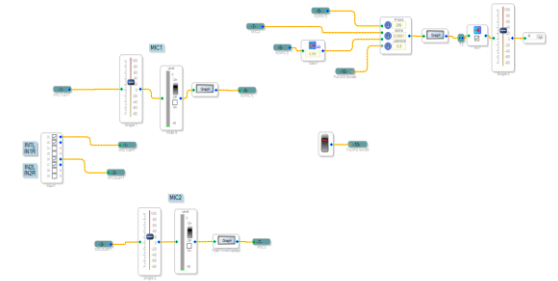
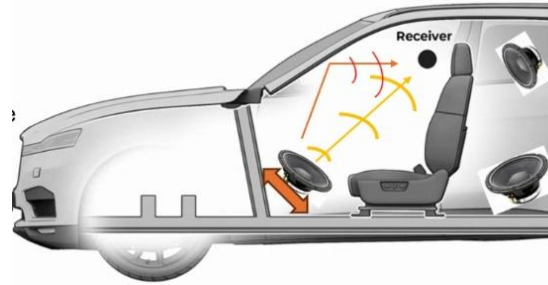
How Active **Road Noise**
Cancellation Works in Cars



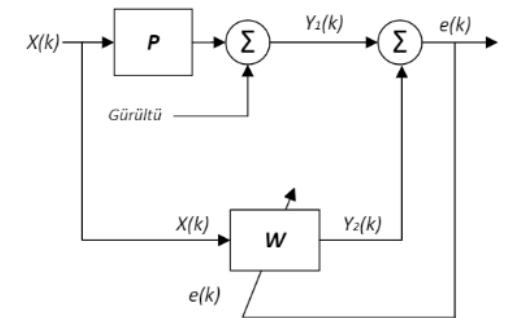
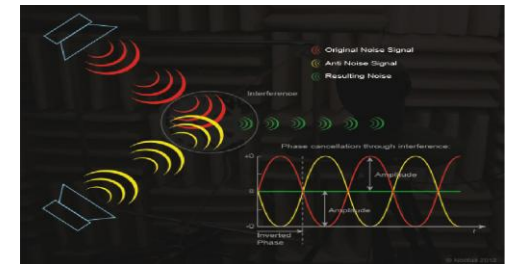
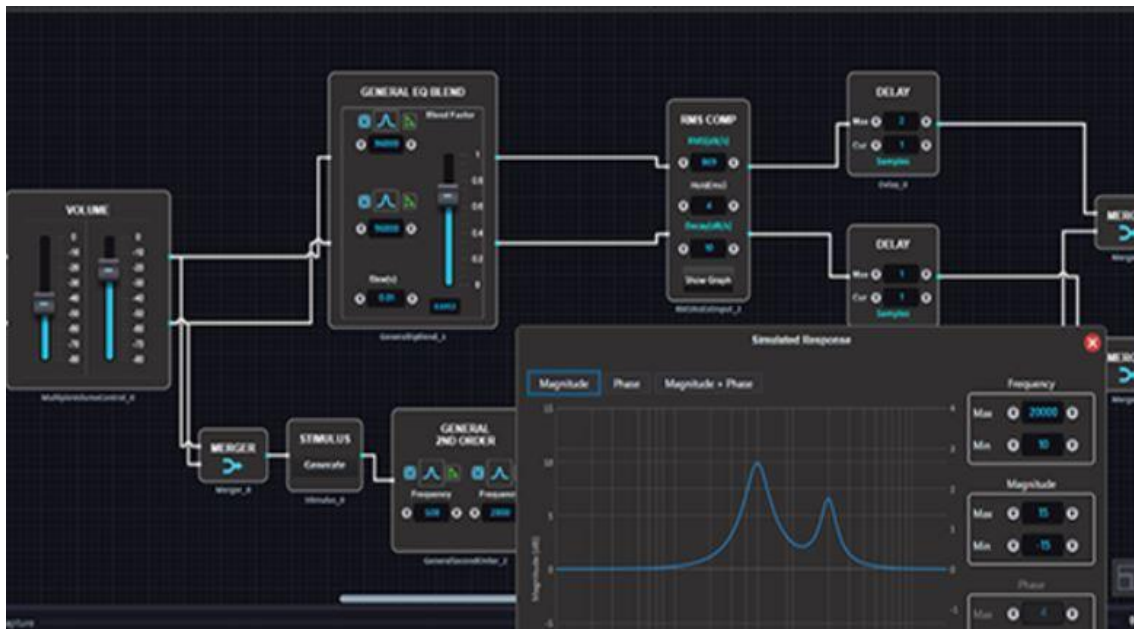
The ANC system aims to reduce or cancel specific sound characteristics within a vehicle by collecting data through microphones installed inside the vehicle and using an ECU with software-defined settings. To utilize this product, microphones are placed in areas where sound attenuation is desired, and speakers are installed in regions where the sound needs to be reduced or canceled.

Product Components:

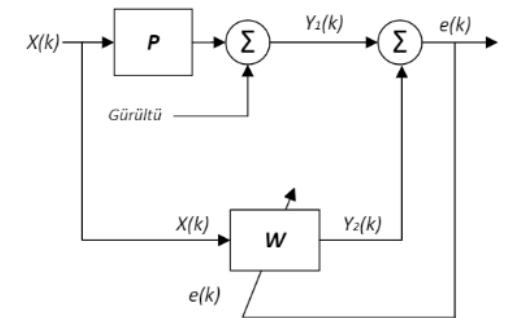
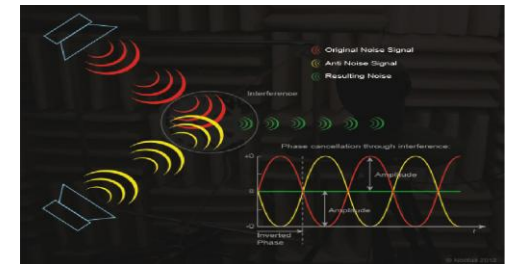
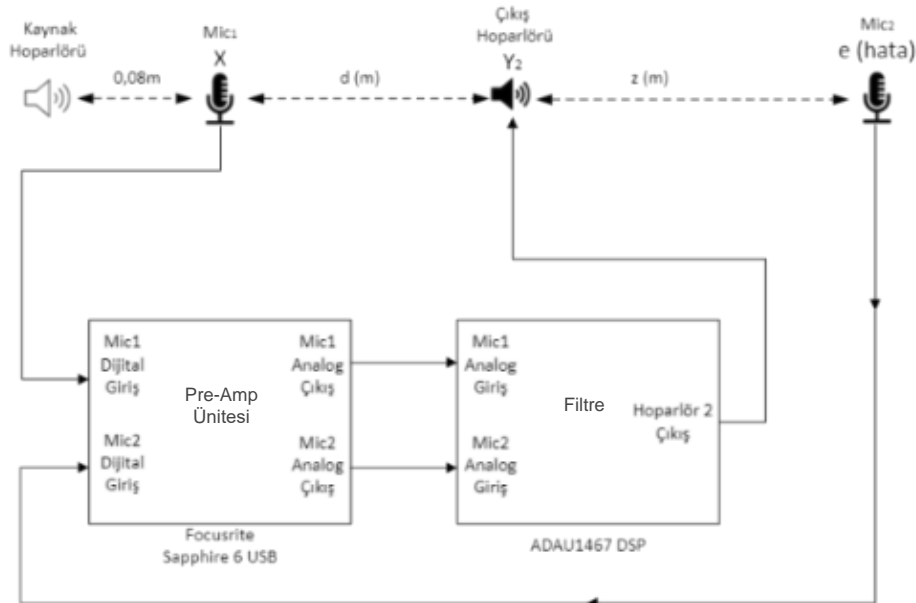
- Control Unit
- Model Based Software



In our project, we developed a model-based active noise cancellation system. To achieve optimal performance and improve the adaptive capabilities of the system, we utilized adaptive filter algorithms to create a dynamic model. This allows our ANC system to respond effectively to varying environmental conditions and different frequency noises.



To validate the performance of our ANC system, we conducted numerous measurements in a specially designed test room. Over four different days, more than 200 measurements were taken to assess the stability and consistency of our algorithms. As a result of these measurements, the average attenuation values of five different sounds were calculated based on the microphone's positioning, and standard deviation analyses were performed. Each measurement was meticulously documented to evaluate not only the short-term performance of the ANC system but also its long-term stability and adaptability under different acoustic loads. The system was tested with a diverse range of frequencies to simulate common automotive noise sources, such as engine, tire, and wind noises, ensuring a thorough validation process.



The collected data was then used to analyze the system's behavior and fine-tune the adaptive algorithms. Average attenuation values of five distinct sounds were computed by considering the distance between the error-canceling microphone and the target sound source. Furthermore, standard deviation analyses were conducted to identify the consistency and reliability of the ANC system in maintaining optimal noise reduction levels. This in-depth evaluation allowed us to confirm that our system operates at peak efficiency under various conditions, and it provided critical insights into areas of further improvement for future iterations.

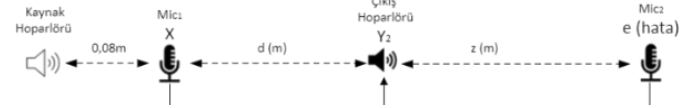
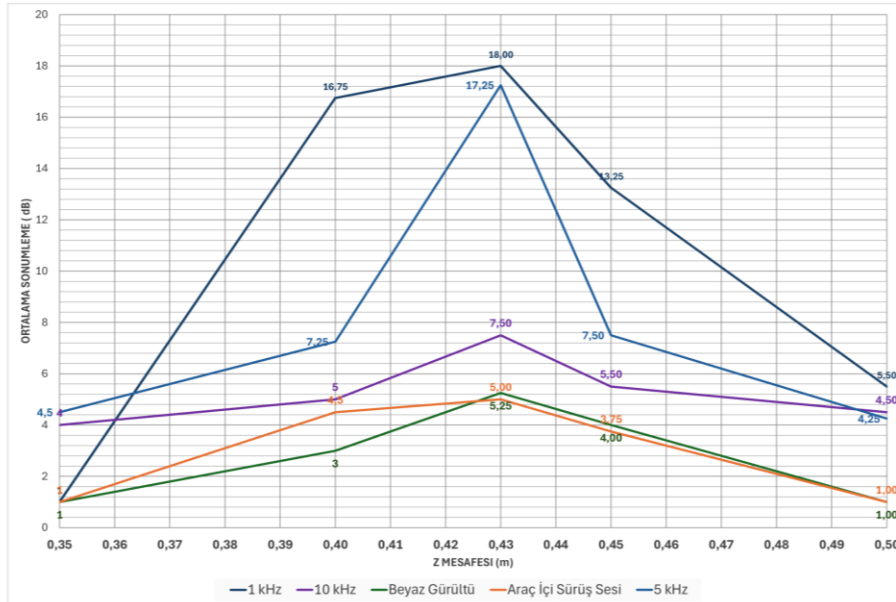


Project is reliable for noise cancellation. Spectral range as followed For each sound specification;

- **Tire Noise:** 150 Hz – 1500 Hz
- **Road Noise:** 20 Hz – 3000 Hz
- **Wind Noise:** 200 Hz – 5000 Hz

Software can approximately deduct 5 dB(A) for **20 Hz – 5000 Hz** spectral range together with reliable speaker and microphone solutions.

Seeger is able to support OEM Customers for Software Development for the above algorithms.

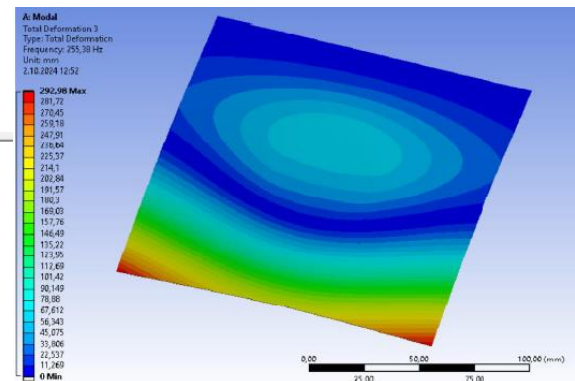
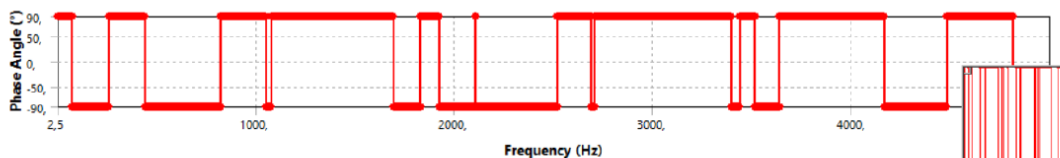
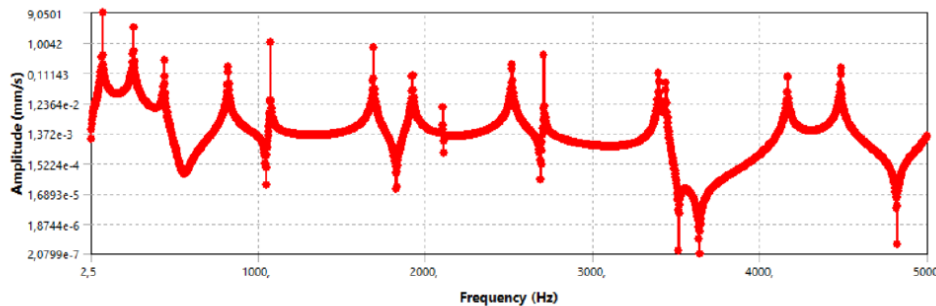


Sound	z (m)	ANC Off (dB)	ANC On (dB)	Sound	z (m)	ANC Off (dB)	ANC On (dB)
1kHz	0,35	-8	-9	5kHz	0,35	-14	-18
	0,40	-7	-24		0,40	-13	-22
	0,43	-7	-26		0,43	-13	-31
	0,45	-7	-20		0,45	-13	-21
	0,50	-7	-12		0,50	-13	-19
10kHz	0,35	-23	-28	White Noise	0,35	-18	-19
	0,40	-24	-29		0,40	-17	-20
	0,43	-24	-32		0,43	-18	-24
	0,45	-24	-30		0,45	-18	-22
Road Noise	0,50	-23	-28		0,50	-18	-19
	0,35	-18	-19				
	0,40	-17	-22				
	0,43	-17	-23				
	0,45	-17	-21				

The aim of the project is to design an innovative acoustic system that can replace traditional speaker structures used in the automotive industry. This system generates sound waves by vibrating the surfaces it is attached to, thereby utilizing the surface itself as a speaker. The project aims to provide a lighter, more cost-effective, and sustainable solution for use in audible warning and entertainment systems.

Product Components:

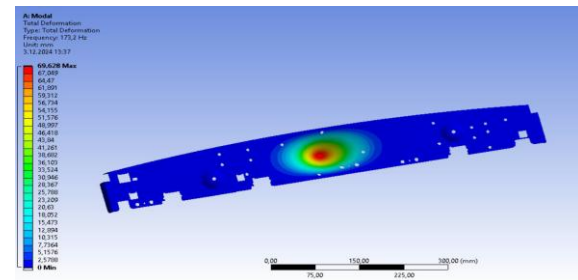
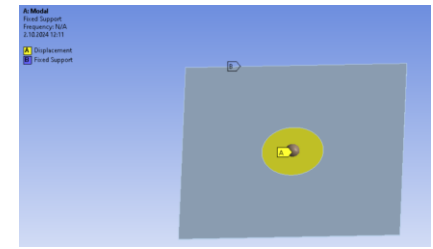
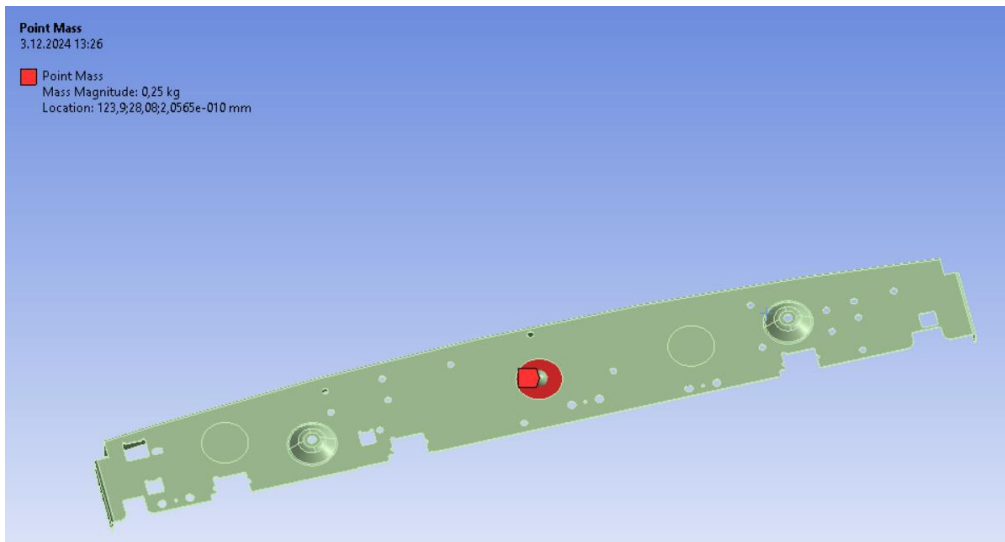
- Exciter Unit
- Diaphragm Material (Additional)



Throughout the project, the material selection and structural properties of the developed system will be optimized through various simulations and analyses, followed by prototype production and testing processes. During this phase, the vibration and sound-producing capabilities of materials such as steel, plastic, and glass will be evaluated, and the most suitable combinations will be determined. By the end of the project, a more efficient and cost-effective acoustic system, compared to existing speaker systems, is expected to be developed. This effort will enhance R&D capabilities of SEGER, enabling the company to create more innovative and value-added products. Additionally, national and international patent applications and academic publications are planned as part of the project.

Benefits of Exciter System:

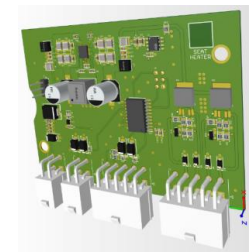
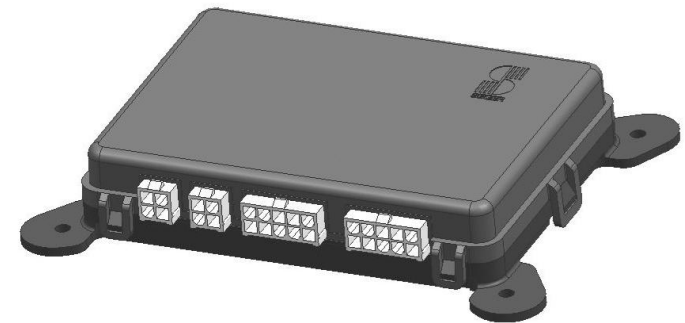
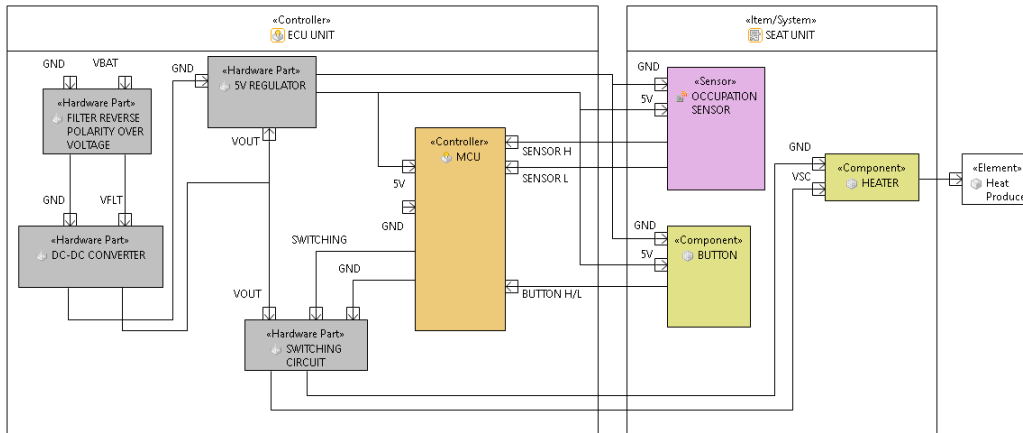
- Lightweight.
- Higher SPL (up to +8 dB) than traditional Loudspeakers.
- Less THD (Total Harmonic Disorder) than traditional Loudspeakers.



To enhance modern automotive comfort, our developed seat heaters aim to provide superior comfort for both drivers and passengers. The product operates through the activation of Thermal Pads when the Presence Detection Sensor and the user activate the button. Additionally, the product includes thermal protection to prevent overheating. New features can be added to our system like Cooling, Massage and etc.

Product Components:

- Electronic Control Unit
- Plastic Housing
- Connectors



- **MULTIPLE VOLTAGE RANGE**

Stable operation between 9-32V

- **ADJUSTABLE HEATING**

3-stage temperature adjustment

- **MORE DURABLE**

at High Temperature Tests

- **COMPACT DESIGN**

Medium size & Weight , easy installations

- **PROTECTION**

Against short circuit, reverse polarity, high temperature

- **ECU CONTROLLED**

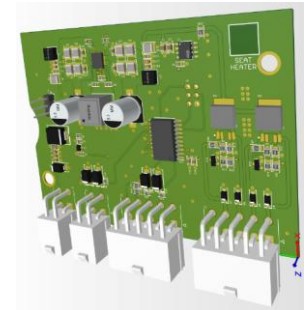
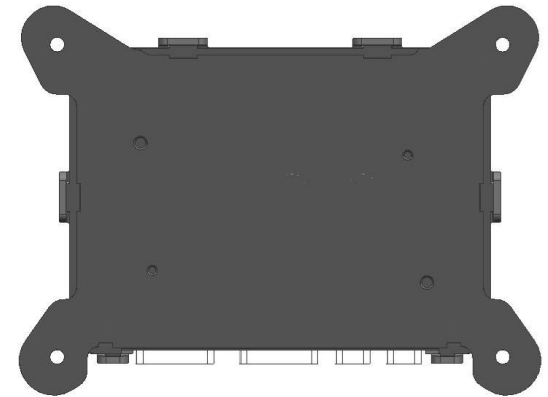
Controls 4 heat pads at the same time with pushbutton

- **ENERGY SAVING**

Energy saving with occupancy sensor

- **CUSTOMIZABLE**

Product can be customized acc.to customer requests
adding Seat cooling, Massage and etc.



This is used at Seats and assembled to rear side of Seat.

- **MULTIPLE USAGE**

Type A + Type C support at the same time

- **QUICK CHARGE**

USB-PD Technology is used

- **MORE DURABLE**

at High Temperature Tests

- **PROTECTION**

against short circuit, reverse polarity, high temperature

- **LOW STANDBY POWER CONSUMPTION**

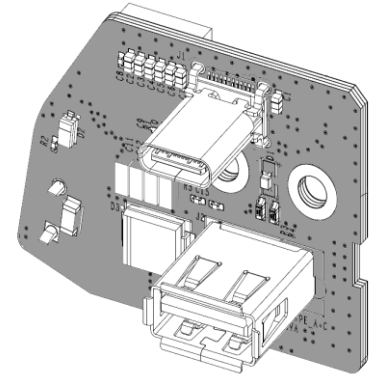
Energy consumed when idle should be kept to a minimum.

- **COMPACT DESIGN**

Medium size & Weight, easy installations

- **CUSTOMIZABLE**

Product can be customized acc.to customer expectations for Type A + A & Type C + C



Project Name	Stage
SMT Production Lines for Automotive	Feasibility Stage



Programs & Equipments

SEGER

Hardware & Acoustics



Software



Mechanical



Testing



SW DEVELOPMENT



UNIVERSITY

