

Sonus faber

ARTISAN OF SOUND

DUETTO

When tradition and new technologies meet into the first
stereo wireless speakers of Sonus faber's family



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INTRODUCTION

A brief description and main specifications.



Duetto is the **first stereo active speaker** system of Sonus faber. It is a two-way loudspeaker system, in a vented box with a **curved vent integrated to the heatsink** design. Very **powerful**, it ensures a surprisingly **very low frequency response** for its size.

One of its strength is its **ultra-connectivity**. It has **built on board all the mains streaming services** (Airplay, Chromecast, Spotify, Tidal connect, Roon Ready, Qobuz, Bluetooth Aptx HD). More than these streaming services, you have on the rear input boards, a set of **analog/digital physical inputs** to complete the all-in-one feature : Line In, Phono In (preamplifier built in for MM cartridge), Optical In, HDMI ARC/EARC, Subwoofer Output.

This ultimate feature allows you to connect an active **subwoofer** and an **automatic recognition** will apply a high pass filter where you decided on the webpage to cut off the subwoofer. More than that, the subwoofer gain and delay can be adjusted to get the perfect integration with your Duetto system.

Introduction

SYSTEM	2 way Curved Vented box
LOUDSPEAKERS	Tw: Ferrite Magnet system with copper cap, Silk dome and dedicated Waveguide Mw: Neodymium Magnet system with copper cap and Aluminum ring, Long excursion design
CROSSOVER	1900Hz – Designed with Sf know-how Phase Coherent
FREQUENCY RESPONSE	37 Hz – 30.000 Hz
MAX SPL	105 dB SPL @1m
ON BOARD AMPLIFIERS	Tw: 100W Class AB Mw: 250W Class D
DAC	SABRE, (AKM for Sub out)
CONNECTIVITY	RCA Line/Phono IN Optical HDMI ARC/EARC SUB Output
BUILT IN STREAMING	Airplay Chromecast Spotify Tidal connect Roon Ready QQMusic Bluetooth Aptx HD
DEDICATED STAND	Yes



NEW CABINET STRUCTURE

Wood cabinet with gorgeous veneer curved shape to diminish the standing waves.



The cabinet material, shape and structure has been chosen to fit the Sonus faber standard of excellence.

The wood **material** was an evidence for us, for its musicality, the way it resonates and lives together with the music. The Duetto cabinet is made of MDF panels, being a very **dense** wood type, it has the benefit to be less prone to seasonal change (contraction/expansion) since its doesn't have fibers along a direction. It is a **homogeneous**, isotropic material.

The **shape** of the cabinet has been also specifically simulated to ensure a mix of **rigidity** and optimal **internal acoustic performances**.

New cabinet structure The lute shape



Lute shape, historical design element for Sonus faber, to avoid annoying standing waves inside the cabinet, also called internal resonances.

The **experience** earned with these kinds of woods structures allows us to propose two different types of beautiful **45° veneers** finishing: walnut and graphite.

1. WALNUT FINISH



2. GRAPHITE FINISH



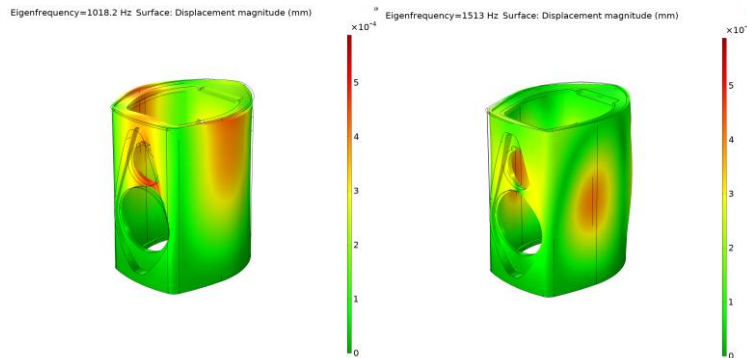
New cabinet structure

Vented Box

The shape of the cabinet has been specifically simulated with F.E.M. COMSOL Multiphysics software with a dual purpose: ensure a mix of rigidity and optimal internal acoustic performances.

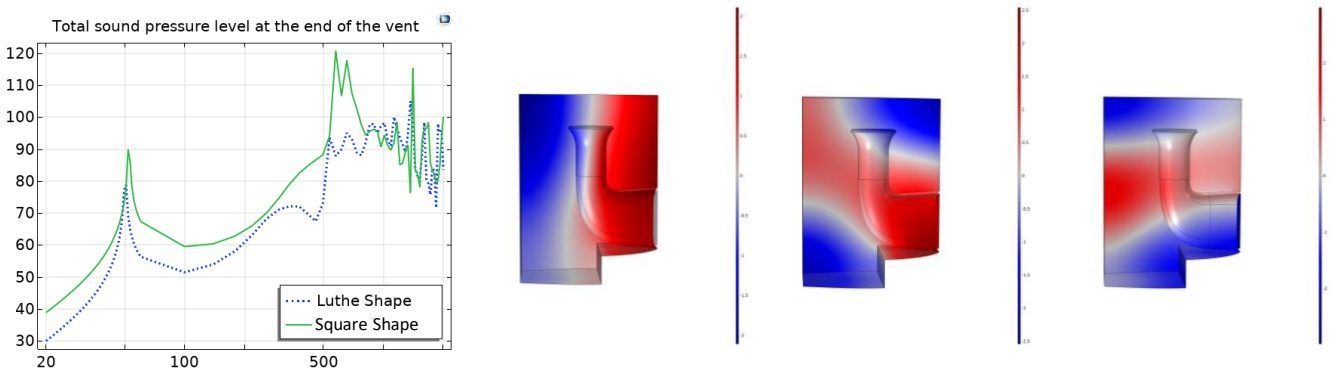
1.MAINTAIN A STIFF STRUCTURE

By identifying the **natural modes of vibration** of the cabinet structure, we could have anticipated in advance the weakest parts of the enclosure and their corresponding eigen frequencies. This is an important point to also understand where to place the electronics inside the cabinet.

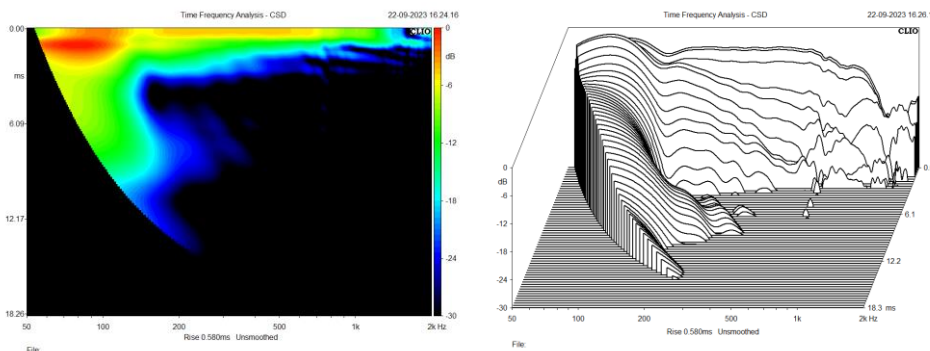


1.OPTIMIZING THE INTERNAL STANDING WAVES

For vented box systems, it is important to look inside the cabinet to see how the **standing waves** (acoustical resonances/antiresonances) behaves. If not, some resonances can sound through the reflex port and create an unpleasant sound. This is why our reflex port was designed together with the cabinet shape thanks to advanced **F.E.M** simulation software Comsol Multiphysics.



These studies result in a quite smooth and **free of perturbation** response of the woofer in the cabinet in the mid bass region.



DRIVERS

Both tweeter and midwoofer have been fully engineered from scratch in Italy.
No compromises were done on these driver's design.



The deep bass reproduction is ensured by a 5,25" **long excursion paper pulp** midwoofer. Featuring a powerful **Neodymium** magnet system, it reaches a force factor of 5,4 T.m. To balance all the power from the motor, and keep an under-controlled excursion, the suspensions have been engineered with the **F.E.M** simulation software *Comsol Multiphysics*.

The tweeter features also a **copper cap** to obtain a better low range feeling. The higher register, the finesse of the sound and the non-fatigue listening is ensured by its **silk dome**. Here, the brand manifest of natural material to procure natural sound has all its sense.

We have engineered a proper **waveguide** for the tweeter to gather the out-of-axis frequency responses at high frequency. The profile has been designed by the R&D team in Italy and covering the surround allows us to avoid interferences of radiation with the dome and then unwanted gaps of sound pressure level.



Drivers

Tweeter

The high frequencies reproduction are carried by a new tweeter, featuring three elements:

1. COPPER CAP

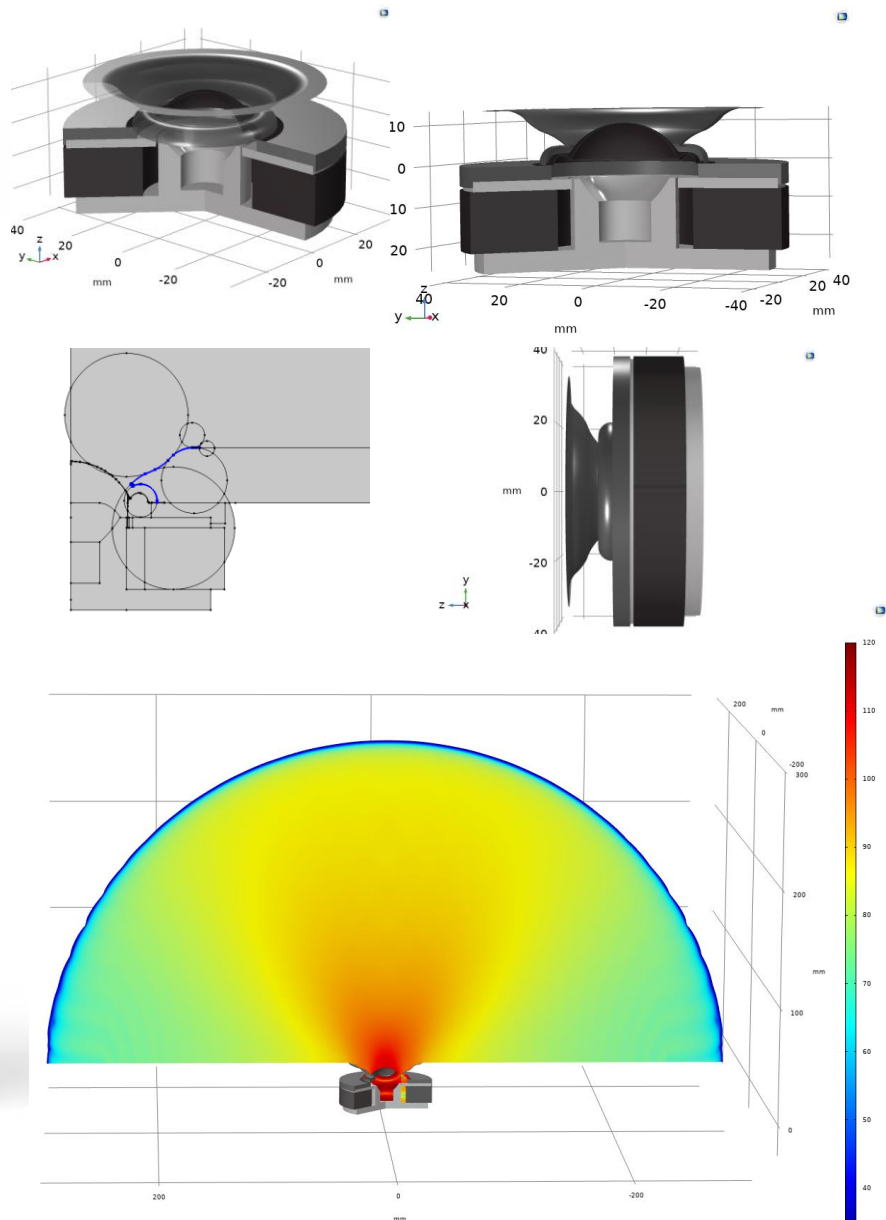
Improve non linearities and tweeter sound in mid-high section

2. SILK DOME

Brand's manifest, of natural sound, procures a smooth and pleasant listening experience

3. OPTIMIZED WAVEGUIDE

Ensure good and controlled out of axis



Drivers

Midwoofer

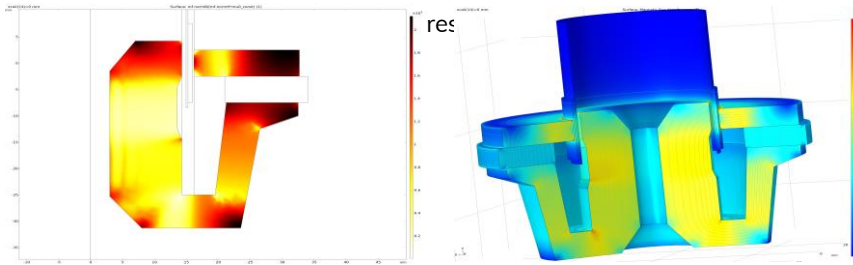
The low frequency reproduction is carried by a brand new midwoofer driver, simulated to get perfect matching of force and control by engineered motor and suspension systems:



1. COPPER CAP + AL RING

It improved the non linearities, diminishing the final distortion of the driver at high excursion. It allows to flatter the induction level at highest excursion and procure a warm and free of perturbations sound in the mid-bass section.

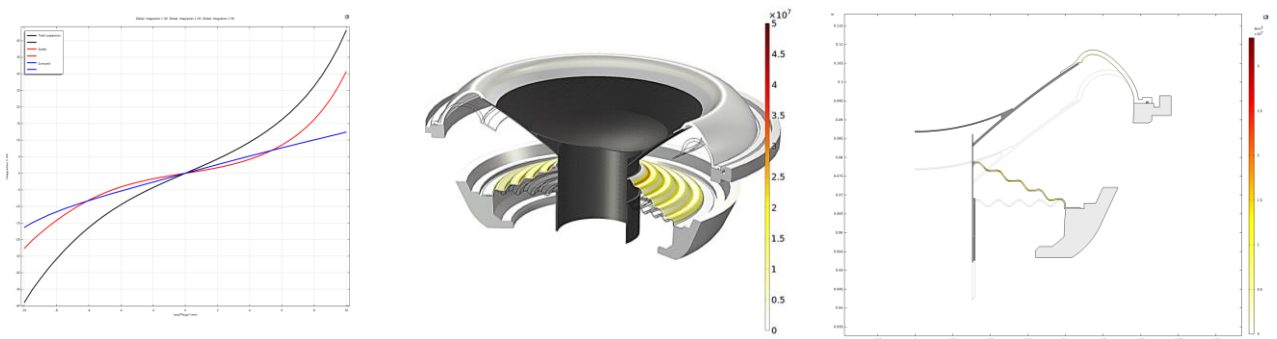
2. NEODYMIUM MOTOR



The motor and suspensions are the two most non-linear parts of a driver. This is why we took a particular attention to design the profile of the Spider and surround and to include to our motor system.

3. SIMULATED SUSPENSIONS

They are strongly linked to the motor force and need to break the excursion accordingly. A well-designed spider and surround keep a good centering of mobile parts, and becomes stiff enough at high excursion to avoid over excursion of the driver



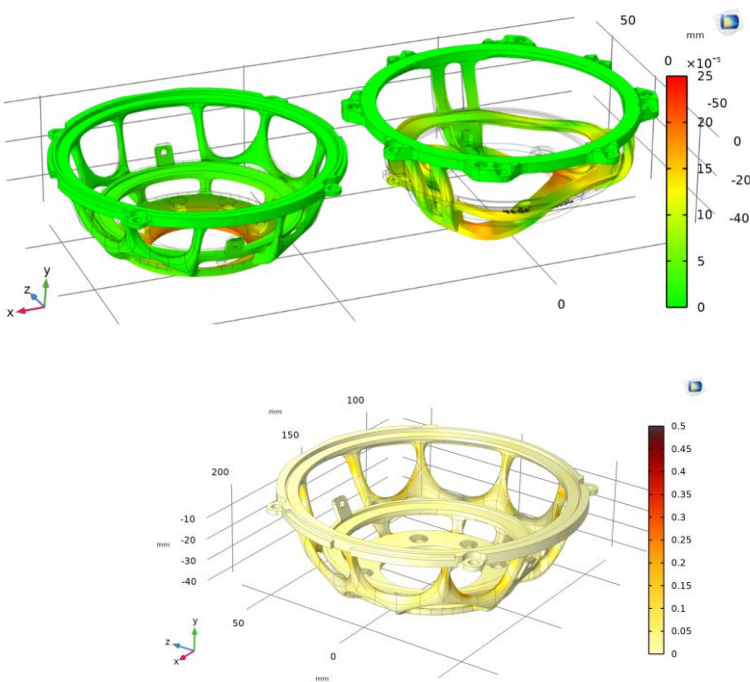
Drivers

Midwoofer

4. ORGANIC BASKET

The Duetto's midwoofer is one of the first of Sonus faber's family to exhibit our new **organic basket**. Fully designed in Italy, it follows a non symmetric pattern that gives more structural stiffness to the basket and at the same time lets the cone free to move as it should be.

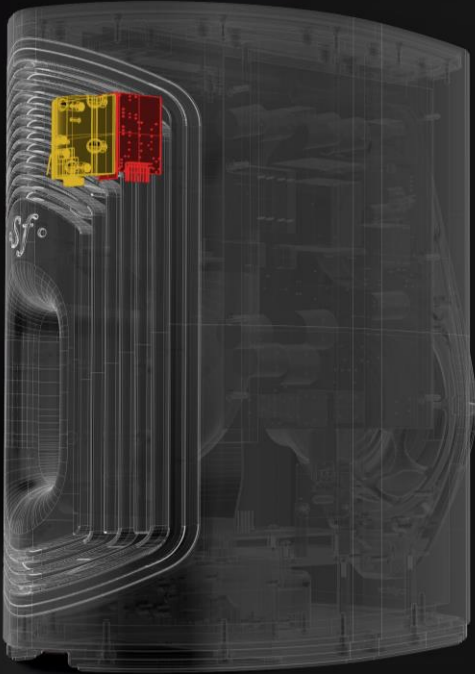
If the basket was too closed at the rear of the driver, it would create an additional air stiffness and would disturb the cone's movement. This issue is solved with the pattern created on the organic basket



FREE OF PERTURBATION SOUND

ELECTRONICS

The state-of-the-art electronic components have been used inside Duetto.



Sabre and **AKM** DAC ensure very high-performance, audiophile-grade conversions. Ending to a **bi-amplification**, Duetto offers to the listener the finesse, the higher fidelity and efficiency of a **100W CLASS AB** amplifier for the reproduction of high frequencies on the tweeter and the reactivity and power of a **250W Class D** amplifier for the midwoofer.

This amount of almost unbelievable power for such a small speaker is carried by a specifically designed in Italy **Heatsink**.

Amplifiers have been wisely chosen for fitting the best to the drivers needs and capability :

1. BI AMPLIFICATION

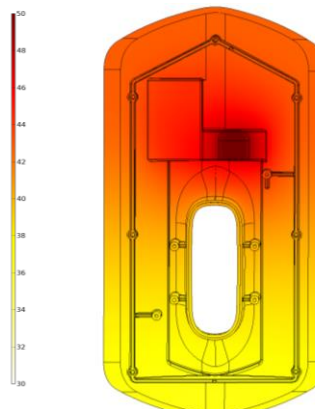
It appeared as a certitude that this high-end loudspeaker system had to get the amplifiers dedicated for the best reproduction of frequencies for the drivers we are using. The power and class of amplifiers were motivated after diverse listening session and chosen accordingly to the Sonus faber's team feedbacks and experience afterwards.

2. HIGH DEDICATED HEATSINK DESIGNED

Having chosen the Class AB amplifier leads to heat dissipation queries.

How to dissipate the heat generated in a nice looking and effective way ?

We thus have designed a dedicated heatsink as the prolongation of the vent at the rear of the speaker. The heat dissipation was firstly simulated and then measured and tested with thermo cameras to verify the efficiency of our design



Electronics

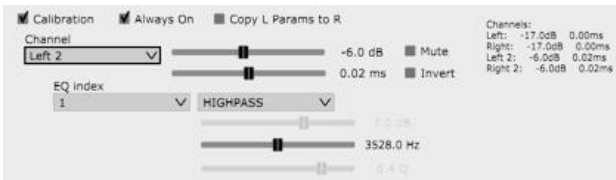
Crossover network / DSP

The Duetto's crossover has been designed as an analogical one. We used the guidelines of our passive speakers in terms of module and phases, and then, translated into the digital world.

Doing so, the experience of Sonus faber's acoustic team has been employed and the liberty that offers digital filtering allowed us to go even further :

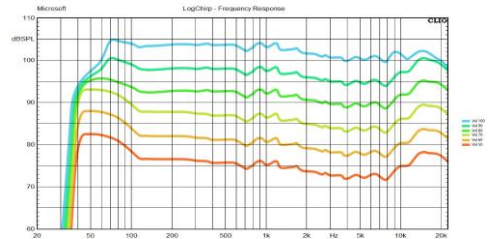
1. TIMBER AND SOUND STAGE OPTIMIZATION

Keeping the phases of each drivers filtered in a certain way from one to the other results in a wide and coherent soundstage reproduction. It also procures a good out of axis behavior of the speaker.



2. HIGH VOLUME PROTECTION

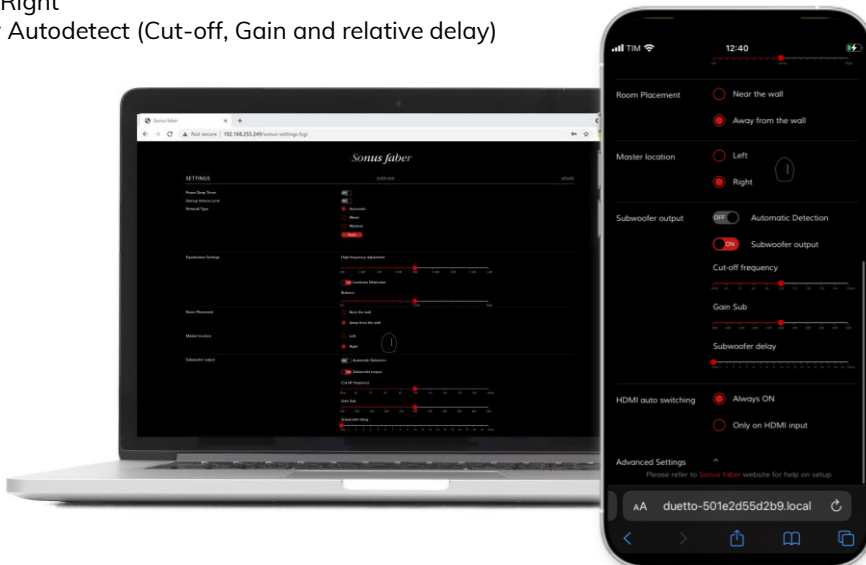
A bass control is smoothly applied at the louder volume to avoid over excursion of the driver without the use of limiters/compressors.



3. WEBPAGE EQ SETTINGS POSSIBILITIES

A wide availability to EQ personalization is disponsible on the webpage, on which :

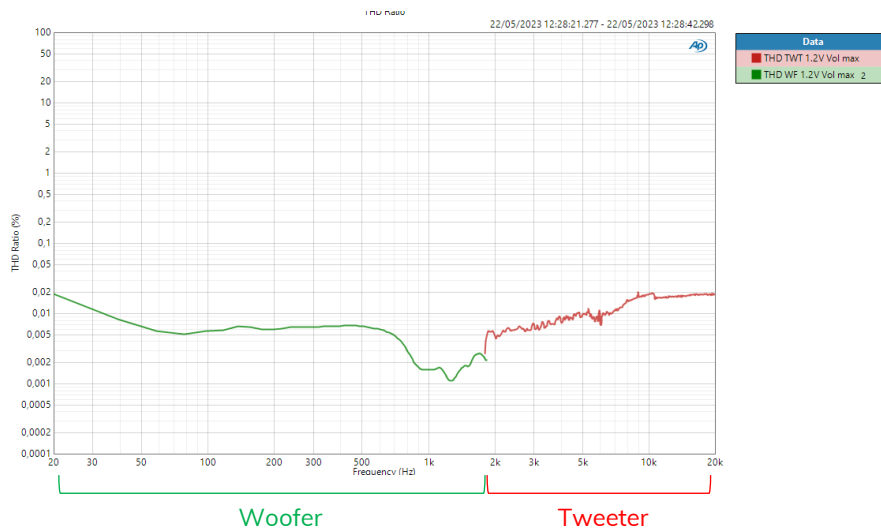
- High frequency adjustment (-2dB to +2dB).
- Near Wall / Far Wall
- Loudness Maximizer
- Pan
- Swap Left/Right
- Subwoofer Autodetect (Cut-off, Gain and relative delay)



Electronics Distortion



The entire electronic components chain, on its useful frequency bandwidth and up to the speaker's terminals, exhibits a very low distortion with a measured THD of less than 0,02%. Test condition has been chosen as the most extreme as possible, so is related to the average level of output of standards CD player / Streamers on the LINE IN input of Duetto, at its maximum volume level.



ACOUSTICS

Loudspeakers



After the correct set of simulations on the drivers, they were both tested in the appropriate ways in Sonus faber lab.

Burn in, infinite baffle measurements, Klippel LPM and LSI, Power tests all these measurements were done before mounting the drivers onto the cabinet in order to validate the performances.

It results in a low Total Harmonic distortion of the entire speaker system (electronics included) from 0,05% to 1% on the mid-high section at 90dB at 1m.



ACOUSTICS

Bass Reflex system

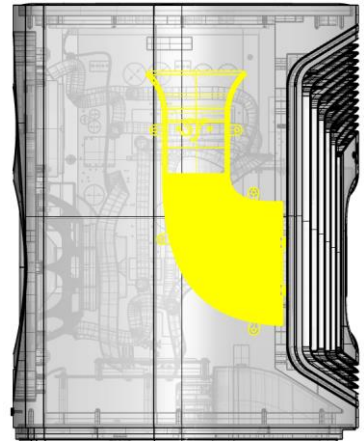
The desire to obtain deep bass reproduction in a small volume is and remains a challenge nowadays.

A well-known system to enhance the low frequency region is the bass reflex configuration. However, the physical limits of volume of the enclosure, duct dimensions and driver used can reduce this extension.

Indeed, featuring an 8L enclosure. The Duetto's reflex port should have been very long to achieve a low frequency tuning. Instead, by curving the port and finishing its start at a clever position inside the cabinet, we were able to get the optimal performances without introducing unwanted resonances to be played through the duct.

The ducts area, was also a challenge since a too small area leads to turbulences and airflow noises. It was studied and simulated thanks to advanced F.E.M simulation software a changing profile of this area, starting from a rounded one and ending as a flared racetrack to keep the optimal tuning without generating too much noise.

Finally, its integration together with the heatsink helps the electronics to cool as the airflow goes inside the port.



CURVED VENT DESIGN

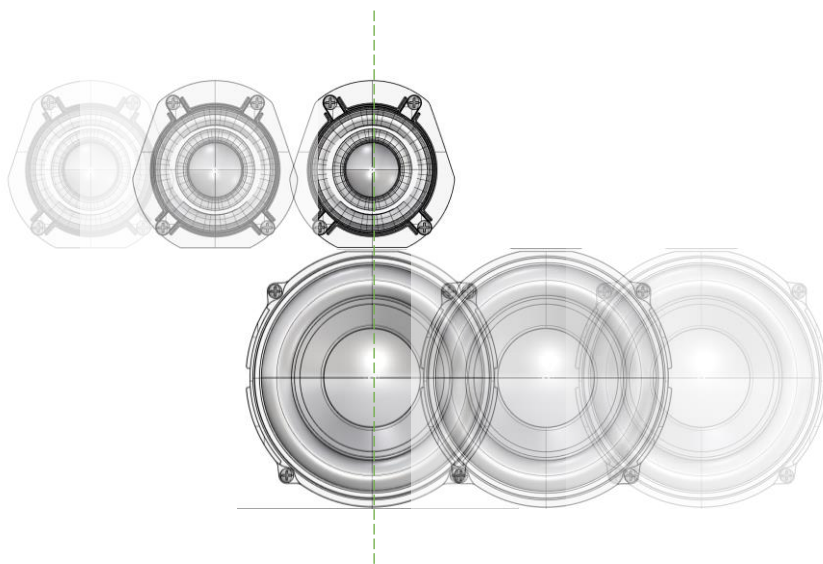
ACOUSTICS

Tuning



Based on the **know-how** for creating passive crossover at Sonus faber, we have decided to use this knowledge for DUEETTO. This is how, the crossover network of DUEETTO has been firstly simulated and tested as an analogical one, and then, translated into the digital world. Doing so, the experience of Sf acoustic team has been used and we were able to implement some very important features to us such as the “**Phase Coherent**” philosophy : in order to ensure an **optimal timber and sound stage**.

Listening sessions were a part of the tuning process. Sonus faber's historical and recognizable sound has been reproduced in this compact loudspeaker system.

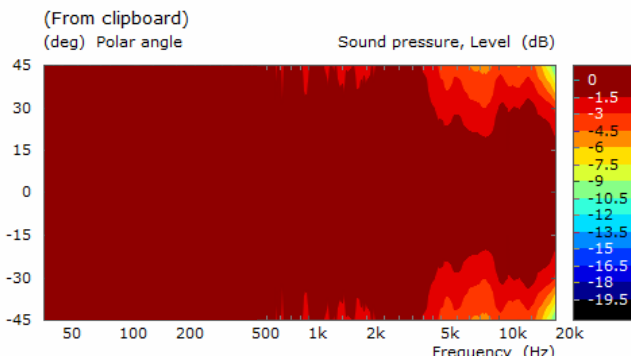
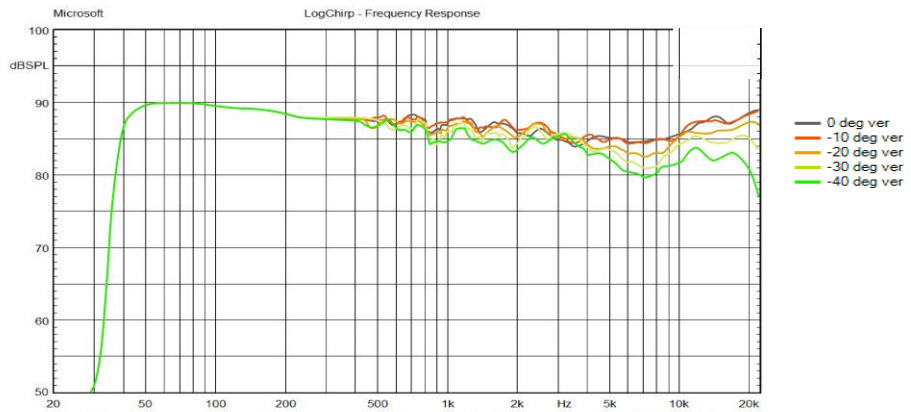


ACOUSTICS

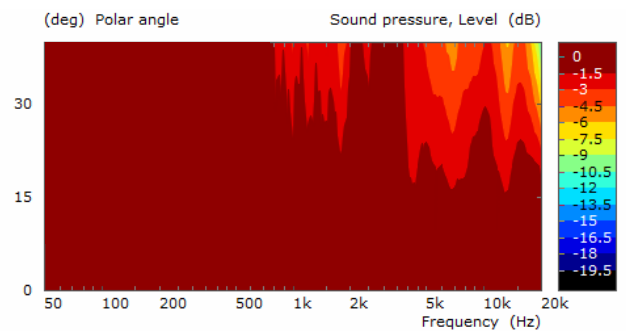
Measurements



The addition of a well studied waveguide for the tweeter and a crossover developed taking into account out of axis measurements and phases responses lead to beautiful frequency response in and out of axis.



Out of axis horizontal measurements



Out of axis positive vertical measurements

WIRELESS

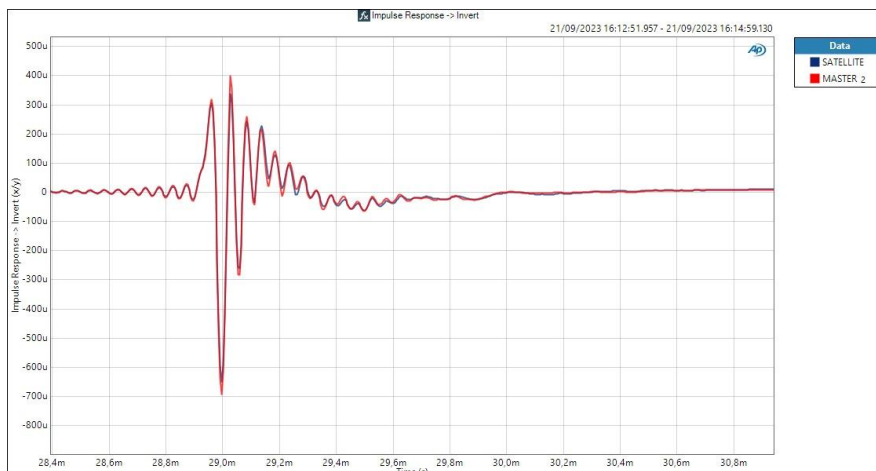
Ultra Wide Band Transmission



The Sonus faber's dream was to make a lossless low latency wireless link that was reliable and audible brilliant.

Looking to the future we found a wireless lossless low latency audio solution. A fully supported and state of the art Ultra Wide Band technology (from Spark microsystems) has been implemented and when combined with the knowledge learnt from Omnia to create an adaptive wireless link solution that supports lossless audio and data at a very low power level (-41dBm/MHz) - meaning minimal interference on the audio stages in the product whilst achieving up to 8meters of separation between the two units, in the proper environment *. The solution operates at 7.2GHz, above the usual Wi-Fi bands, with a real time adaptive selection of band of operation within a 1GHz band*, to achieve interference robustness

A stereo pair is transmitted over the air from the Master Duetto to the Satellite Duetto, giving us precise timing alignment control for both the tweeter and the woofer. We have then calibrated within the system the synchronization between master and satellite achieving an insignificant timing difference, for all supported inputs and sample rates.



WIRELESS

Connectivity



ROON
READY



TURNTABLE READY
PHONO STAGE BUILT IN



The ultra-connectivity of Duetto makes it ready for any kind of music lover. It has built on board all of the mains streaming services (*Airplay2, Chromecast, Spotify, Tidal connect, Roon Ready, Bluetooth Aptx HD, ...*). But even more than these streaming services, it features on the rear input boards, a set of analog / digital physical inputs to complete the all-in-one feature : Line In, Phono In (preamplifier built in for MM cartridge), Optical In, HDMI ARC/EARC and Subwoofer Output.

Thank you.