In September 2011 a SpatialSound Wave system was installed in the show room of Shure Europe GmbH. The system was embedded into Q-Sys, the digital QSC audio network by Shure, which allows to integrate and centrally control different components, ranging from analogue or digital input signals to loudspeakers.

### Challenges

- develop a 3D sound system allowing virtual room acoustics simulation and reverberation time extension,
- port this system onto Q-Sys, the digital QSC audio network by Shure, which allows to integrate and centrally control different components, ranging from analogue or digital input signals to loudspeakers,
- reproduction of sound from pre-produced demo material, live music performances on stage, or speech,
- reproduction of direction adequate and true-to-life sound using virtual sound sources,
- integration of sound material from own studio,
- simulation of room acoustics,
- positioning of sound sources and room reflections in real-time,
- operation via an intuitive user interface.

### Technical Solution

**Sound System**

SpatialSound Wave allows

- regenerative and convolution based room acoustics simulation via an integrated system,
- real-time audio signal processing in Q-Sys Core using additional tools from Q-Sys.
Loudspeakers

The following speaker setup has been chosen for installing SpatialSound Wave in Shure’s showroom:

- thirty-five QSC AD-C152ST speakers plus fourteen x Shure KSM 137 studio microphones for the ceiling,
- one surrounding speaker ring featuring sixty x AD-S82H speakers,
- two x QSC KLA181 subwoofers.

Room Acoustics Simulation and Reverberation Time Extension

SpatialSound Wave offers both regenerative and convolution based room acoustics simulation and allows switching between preconfigured room acoustics settings, ranging from small rooms to concert halls to churches and cathedrals.

Convolution-based Room Acoustics Simulation

Specific room acoustics are created by convoluting the original signal (speech, for example) by means of the »acoustic fingerprint« (the impulse response) of the room. The original sound and its reflections are being emitted in a direction adequate manner (i.e. from all walls and the ceiling). Reflections are being decomposed into their constituent elements (early, late, diffuse) and reproduced separately as virtual sound sources. Users may choose from a number of presets of both simulated or actually measured room acoustics.

Regenerative Room Acoustics Simulation

Sound is being recorded by means of microphones integrated in the room’s ceiling. It is then emitted back into the room by means of a specific signal processing method. The sound then appears as if it is being reproduced in a different room. A wide range of room sizes and forms can be configured by positioning the virtual reflections at will, using special filters that allow for high-end sound quality. Users may choose from a number of presets of typical room acoustics.

“What can be achieved by the combination of Shure’s audio platform and the Fraunhofer system is really impressive. With this package being integrated in Q-Sys, the digital audio platform by QSC, our customers will highly benefit from this collaboration in the future.”

Markus Winkler, Managing Director of Shure Europe GmbH

About Shure

- Shure is an American manufacturer of microphones and professional audio technology with company headquarters being located in Niles, Illinois (USA).
- Shure Europe GmbH is located in Eppingen, Germany.
- Shure Distribution GmbH, also located in Eppingen, is the exclusive distributor for Shure and QSC Audio in Germany.

Showroom of Shure Europe GmbH:

- Area: 800 square meters
- Stage dimensions: 8 x 6 meters
- Room acoustics with adaptable reverberation time ranging from 0,8 to 1,5 sec.