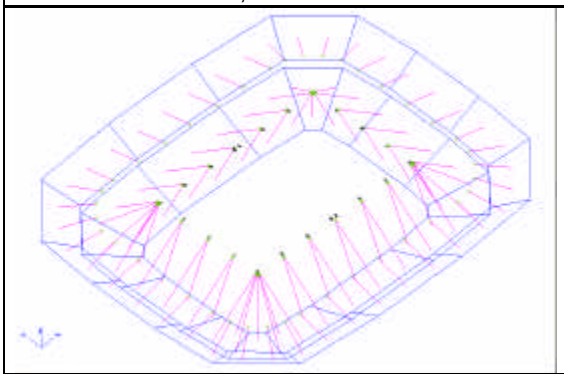
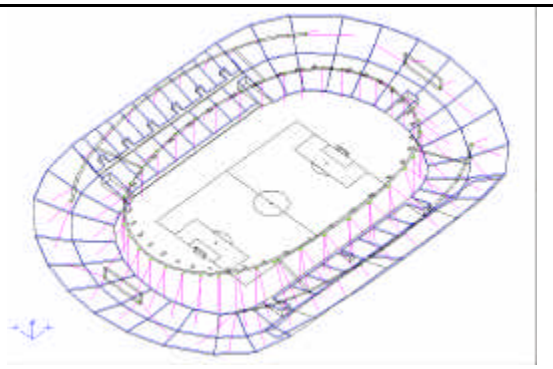
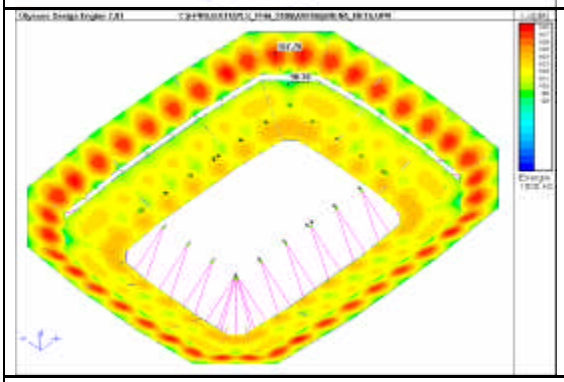
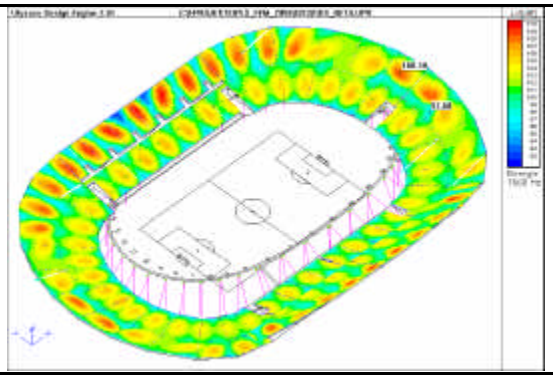
Direct SPL and Acoustic Power

Examples of typical sound pressure levels and sound quality parameters are presented referring to the “Gottlieb Daimler Stadion” in Stuttgart and the Arena “AufSchalke”, now “Veltins Arena” Gelsenkirchen.

Arena “AufSchalke”, now “Veltins Arena”	“Gottlieb Daimler Stadion”
	
	
+60.000 seats Direct SoundPressure Level Ld = 98-107 dB SPL @ 1 kHz Pacoustic = 1400 Watt	+50.000 seats Direct SoundPressure Level Ld = 96-107 dB SPL @ 1 kHz Pacoustic = 800 Watt

It is shown that the total sound power level may not only be a fundamental parameter for noise pollution potential, but may as well be used being one of the basic criteria for evaluating and comparing sound system design quality for in- and outdoor applications.

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Design Goals

Sound system design goals are addressed using samples of existing multi purpose arenas.

Typical design goals are:

- Speech
- Music
- Paging
- Voice-Alarm
- Live
- Recorded
- Ease of operation
- Flexibility

Design approaches, Design Considerations, Design Decisions

It is shown that it is essential how the desired Direct Sound Level is generated:

- More or less number of sources?
- Long Throws, short throws?
- Steep aiming angles?
- Low or high directivity devices?
- Coverage according to listening area or shotgun design?

Every design leads to a specific acoustic power output. The comparison of the acoustic power outputs of the different sound system design approaches may be used as an important criteria for decision making as it will directly affect::

- Direct Sound Level Ld
- Reflection Potential
- Reverberation Level (Lr)
- Intelligibility (Ld vs. Lr)
- Total Sound Pressure Level (Lt = Ld+Lr)
- Noise Pollution Potential

Sound Reinforcement & Acoustics in Multi-Purpose Arenas

Sound system design approaches of “Gottlieb Daimler Stadion” in Stuttgart and the Arena “AufSchalke”, now “Veltins Arena” in Gelsenkirchen

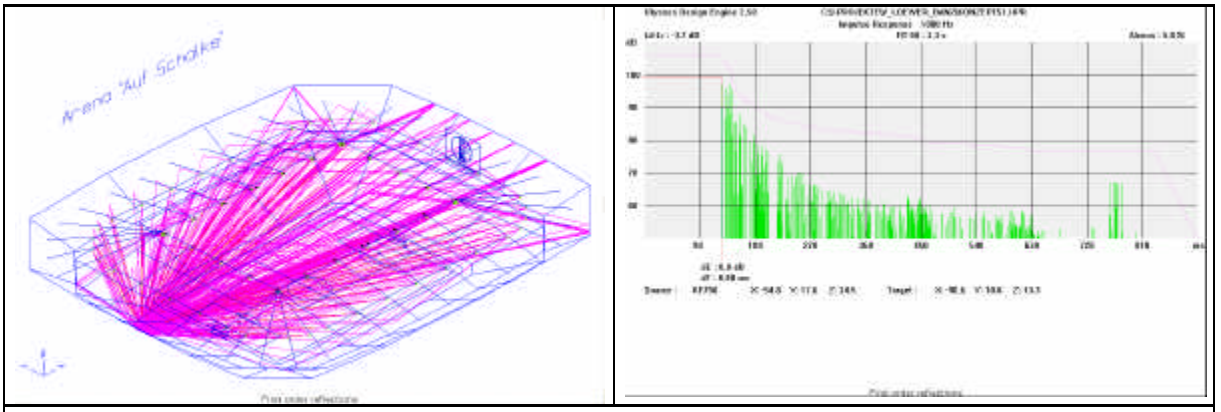
Presented by: Volker Löwer, IFB Consulting

Main issues: Interaction and dependencies of total sound power level, sound quality and noise pollution potential in typical multi purpose arenas

Multi Purpose Arenas have become common during the last years. These facilities actually serve as multi purpose event locations for huge crowds from a several thousand to 50.000 and more spectators. The range of events ranks from soccer to indoor motocross, ice hockey, rock music, musicals and even opera events. Multi purpose arenas have been built as open stadiums, semi-open or closed spaces some of them using retractable roofs. The range of events require enormous flexibility of installed sound reinforcement systems and high quality, as well as high power output systems.

Some basic sound system engineering issues like the following are adressed briefly:

- SPLmax
- Frequency Response
- Phase Response
- STI
- Background Noise
- Reverberation
- Reflections
- Noise Pollution



Reflection pattern and Energy-Time-Curve