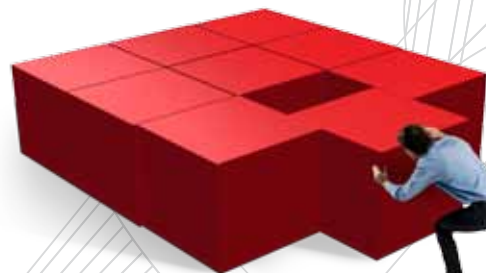


Indoor Radio Network Planning

Professional Planning, Design and
Implementation of Radio Coverage
in Buildings and Tunnel Systems



Radio Coverage in Buildings and Tunnel Systems

Buildings are the final frontier before reaching ubiquitous network coverage, which is becoming increasingly important in all countries – including indoor and in-building coverage at airports, in shopping centres, conference centres, tunnel systems and railway stations, etc.

Higher safety standards and new technologies, paralleled by an increasing demand of consumers have placed even more extensive requirements on indoor network coverage.

Depending on factors, such as characteristics and size of the premises as well as its distance to the next base station, indoor coverage of a building or underground facility often cannot be accomplished through the outdoor network. Increasing the density of base stations in order to achieve full coverage is neither an economical nor a technically feasible solution and would only be partially viable. Reinforced concrete constructions, exterior metal wall cladding and mirrored window panes, let alone separate basement areas, explosion-proof buildings and tunnel systems, make it even more difficult to implement indoor coverage via the outdoor network. In this case, the limits of technical capability are reached quickly.

This is where tailored indoor network infrastructure comes in, which has to be individually planned, designed and implemented for all premises. Only a detailed and high-quality planning and design concept will guarantee optimal indoor coverage and the best possible integration with the outdoor network.

We are vendor-independent and your partner for any advice in indoor network coverage issues. **Quality, efficiency and cost effectiveness** is our priority!



Consistent and Safe Communication Everywhere - for Property Owners and Radio Network Operators

It's your job to ensure radio coverage inside your facilities?

LS telcom supports you from A to Z and addresses all issues in the planning and implementation of your indoor radio coverage.

Indoor Radio Coverage for Professional Mobile Radio Networks/Security Authorities

Governments and authorities need professional network indoor coverage for police, fire brigade and rescue forces to communicate in case of emergencies, such as fire, bomb threats or terrorist attacks.

With the transition from analogue to digital networks, indoor radio infrastructure becomes a real issue for property owners and managers as well as planners of large premises.

The planning and implementation of individual indoor radio infrastructure facilities is in general their responsibility because of fire protection and safety issues. The integration of the indoor infrastructure into the outdoor network, on the other hand, remains with the network operator.

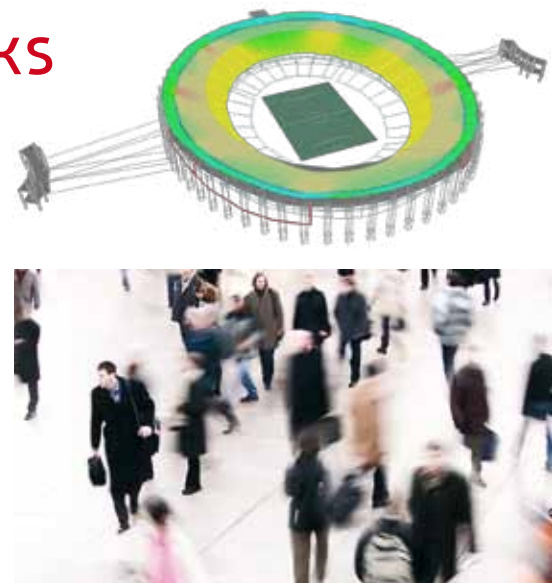
The network operator also defines and communicates to the property owners the guidelines, necessary for the indoor radio system planning, such as the connection mode between the indoor system and the outdoor network as well as the repeater performance.

Attention has to be paid, in particular, that the indoor network does not cause interference to the outdoor network.



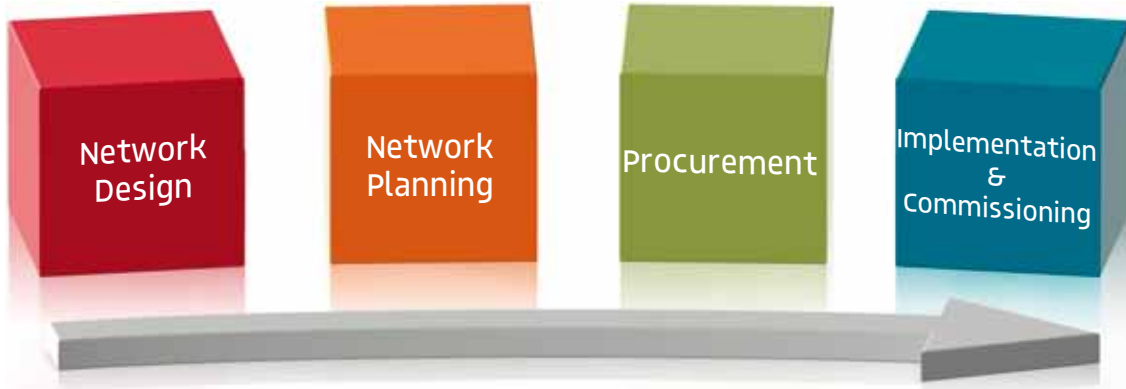
Indoor Radio Coverage for Commercial Mobile Networks

Customers of commercial mobile telecom operators want to talk on the phone, surf the internet or send text messages, while waiting at the airport, sitting on an underground train or strolling around in a shopping centre. This is why mobile operators have to offer excellent customer service including reliable indoor coverage quality and high data rates to retain their subscribers and generate new profit. This requires the use of latest wireless technologies and a well-planned indoor radio coverage with a sufficient receiving level to be able to achieve the desired data transmission rates.



Our Indoor Coverage Product Portfolio

LS telcom supports you during the complete network lifecycle of your project



Design

- Definition of communication needs
- Definition of coverage requirements
- Inventory of existing infrastructure
- Design of indoor coverage
- Development of redundancy concepts
- Initial radio design

Procurement

- Tender support
- Preparation of specifications for tenders
- Creation of tender documents
- Response to bidders
- Evaluation of bids
- Development of tender proposals

Planning

- Creation of link budgets
- Dimensioning of the active radio components
- Dimensioning of the passive feeder and distributed antenna system (DAS)
- Dimensioning of supply units
- Detailed implementation planning
- Cost assignment and estimation

Implementation & Commissioning

- Site surveys
- Project management
- Support during network roll-out
- System integration and commissioning
- System acceptance
- Project documentation

Only through conscientious and high-quality planning and design, using state-of-the-art software, can the enormous requirements be met and indoor coverage optimised, while eliminating interference on the outdoor network.

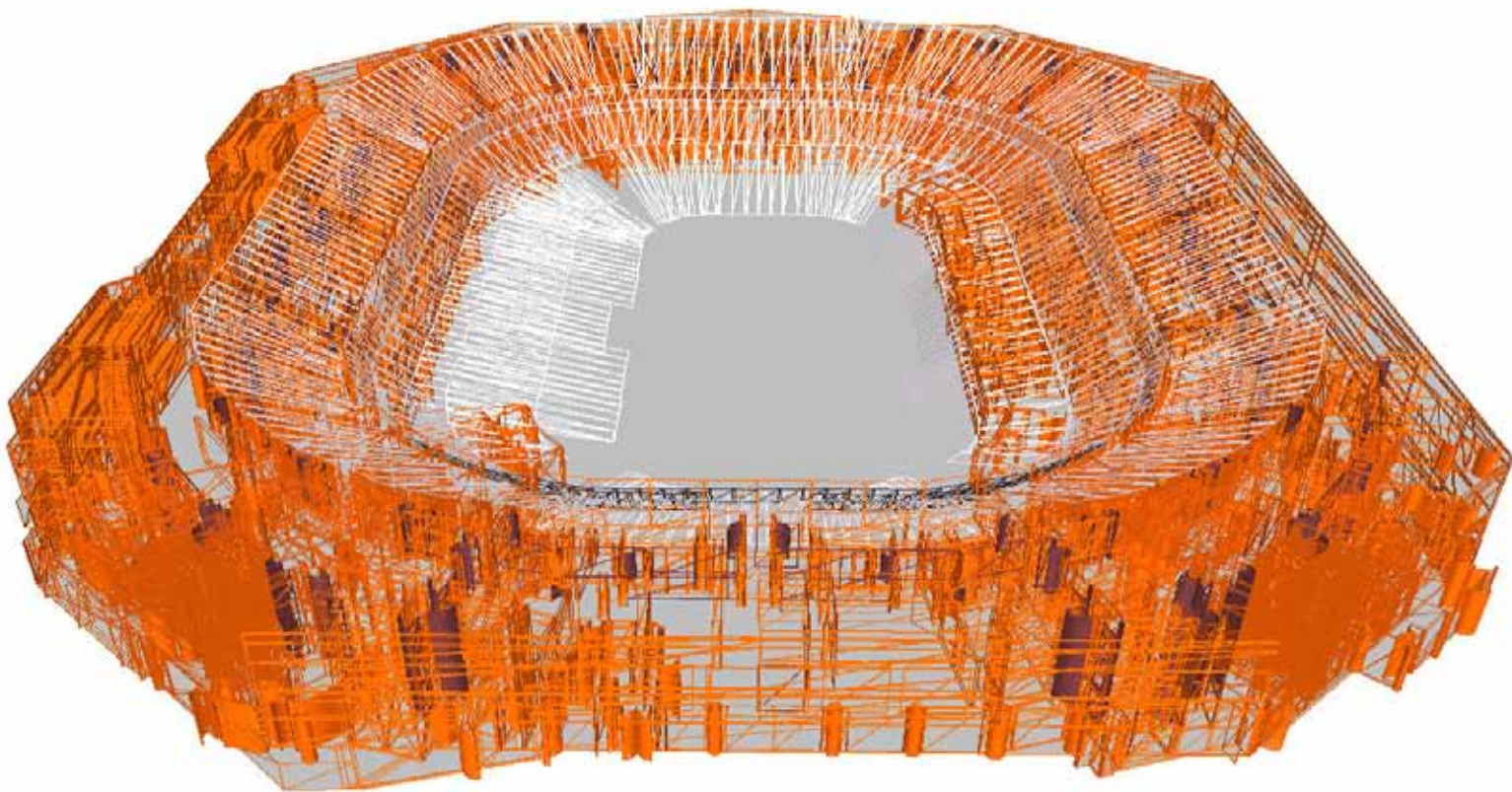
Benefit from our multifaceted and long-standing experience and know-how when planning and implementing your indoor radio network.

We know what it's all about and design, plan and implement your network with pinpoint accuracy in terms of technical and cost efficiency!

Radio Measurement Services

LS telcom is your powerful and vendor-independent partner for any measurement exercise. We carry out all kinds of radio measurements, including the full radio spectrum and all common technologies:

- Continuous-wave (CW) measurements
- Radio coverage measurements
- Interference measurements
- EMF measurements & electromagnetic emissions compliance reporting
- Spectrum monitoring measurements
- Measurements for commissioning and acceptance testing



Indoor network planning for professional (PMR) as well as private mobile networks will increase in significance. Manifold structures of buildings and indoor premises and very different requirements as well as a large selection of relevant radio services and standards having to operate interference-free and right next to each other, render indoor network planning more and more complex and require well-tailored indoor radio network infrastructure. Only through conscientious and high-quality planning and design, using state-of-the-art software can the requirements be met and indoor coverage be optimised, while eliminating interference on the outdoor network.

Indispensable: the State-of-the-Art Network Planning Tool

While the network planner could possibly do without a tool when planning an analogue network, in the digital world the planning of an indoor network cannot be mastered without an efficient network planning tool.

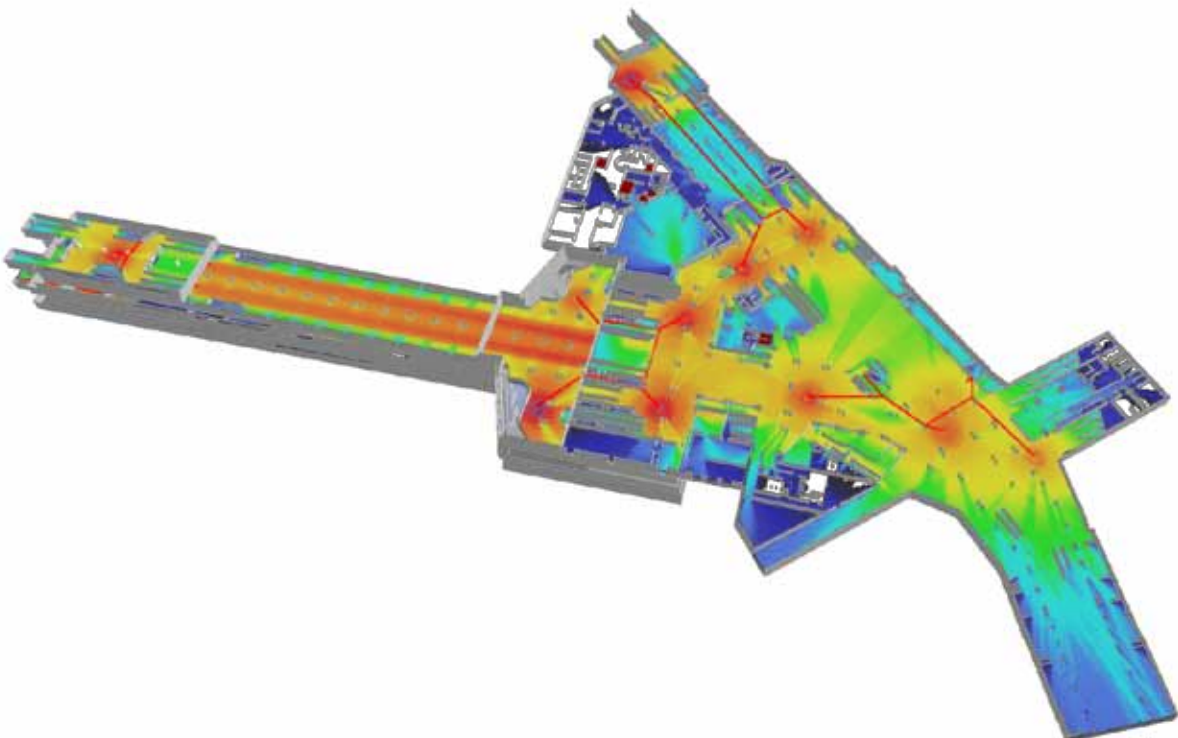
The indoor network planning software **iBwave Design** supports the complete network lifecycle, including the design, planning and implementation through to commissioning, operation and maintenance. Floor plans for an accurate view of your building can be easily imported into these tools and adapted.

With the network components database you can efficiently plan the distributed antenna system, dragging and dropping components and interconnections for your network as well as simulate coverage using 3D wave propagation models. This way you can find the most cost-efficient solution. Besides the indoor coverage planning, the impact of the outdoor network on the quality of the indoor system can also be simulated, which helps finding the signal-to-noise ratio and the required data rate.

In addition, for verification during commissioning, measurement data can be imported into the software for comparison of predictions and measured data reports. Further reports provided by the software are notes on changes, equipment lists, and bills of material, coverage plots, link budgets, cost calculations and cable routing plans.



Coverage simulation for underground station with tunnel system



Software Solutions for Planning, Design and Optimisation of Mobile Networks

With the LS telcom network planning tool suite you can **accurately plan and optimise** all networks from the outdoor radio network to the access network and finally your indoor network in buildings and tunnel systems.

With xG-Planner you can carry out all the planning tasks for surface networks, such as coverage simulation, capacity and frequency planning.

The interface between xG-Planner and the indoor network planning tool iBwave Design allows for easy import of outdoor network planning results into iBwave Design. This enables the quick determination of the facility's indoor coverage level achieved through the outdoor network, and minimises interference and the impact of the indoor radio infrastructure onto the outdoor network from the very beginning of the planning exercise.



Professional Planning and Consulting – Independent & Competent

For reliable communication - on time and within your budget.



LS telcom is widely recognised in the industry for its radio planning and optimisation expertise and has a proven track record of delivering quality results in radio network planning, design, engineering and frequency coordination of broadcast, mobile and microwave networks.

Our experienced radio engineers with thorough knowledge of specific technology characteristics and technical planning parameters work in close cooperation with our customers to guarantee successful projects with sustainable results.

We combine long-term experience in both, network planning software and services. Our approved software solutions and our highly-educated engineers who are always up-to-date with latest technology and standards make us your powerful and reliable partner for the planning of all your digital radio networks.



Amongst our customers are

- Ministries
- Security Authorities and Organisations
- Military Organisations
- Regulatory Authorities
- Public Administrations
- Utility Companies
- Public Transport Companies
- Industrial Companies
- Network Operators
- System Providers



Memberships:



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