KESS® NT

The Innovative Software System for
Radio Deployment Planning and Radio Simulation

THALES

Radio deployment planning

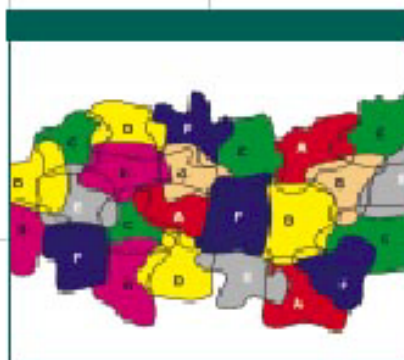## KESS – innovative software for total control

The ability to realistically simulate the behaviour of radio waves within a certain area using electronic data processing is like a trump card when it comes to the analysis and design of radio networks. The greater the fidelity achieved by radio wave propagation modelling and the more precise the calculation of the

KESS Features:

Generic example for frequency planning

Receiver contribution 3D component

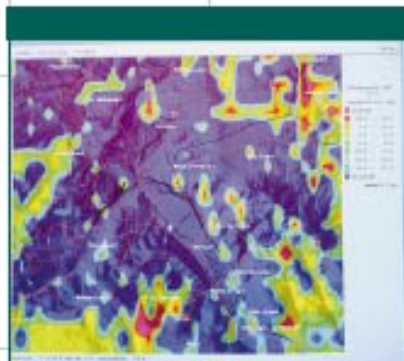radio link section, the more functional and efficient the network.

KESS is an innovative new tool for situation depiction, analysis, evaluation, simulation and assessment in geographical and radio engineering terms within any optionally definable area. The software makes use of new, three-dimensional techniques for modelling radio wave propagation.

KESS – the comprehensive radio network management system

Thanks to its innovative functional characteristics, KESS permits
- precise, full-coverage calculation of local receiver power
- precise, full-coverage prognosis of field intensity difference in networks with several transmitters (interference analysis)
- calculation of the three-dimensional expansion of the service area
- optimum selection of transmitting frequencies and transmitter locations
- minimisation of the number of transmitter locations

Here at long last is a system able to take into account three-dimensional landscape structures and buildings lying beyond the scope of the two-dimensional terrain profile conventionally used for radio deployment planning. The multi-path propagation of radio waves brought about by deflection against obstacles in the terrain can now be seen and registered, so allowing a large number of previously existing error sources to be eliminated.

KESS is able to calculate at high speed to supply essential results and data, allowing urgent decisions to be taken without delay.

The 2- and 3-dimensional propagation models provided by KESS are suitable for a frequency range from 1 MHz up to 60 GHz. Sections of this wide frequency range have been verified by field measurements in different landscapes. **KESS is the universal Information Management Tool for the Analysis of operation options and alternatives for decision support functions in communications as well as electronic warfare.**
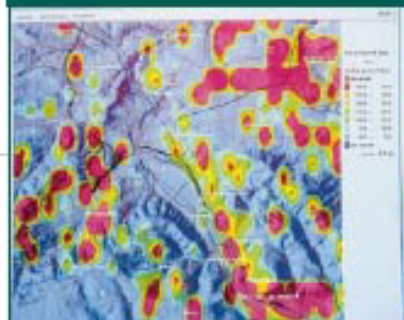
Local distribution delay spread
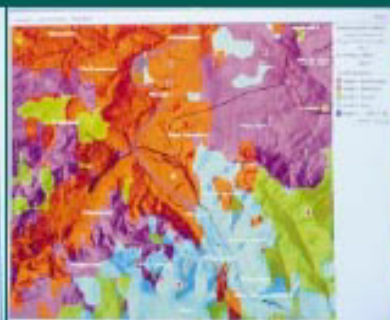
Receiving ranges of several (4) transmitters
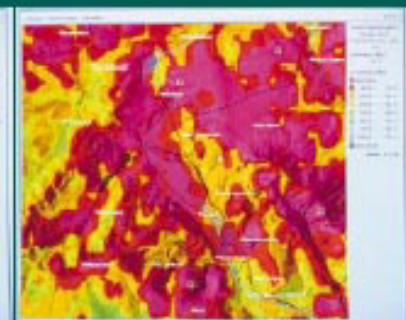
Area coverage of several (4) transmitters

with unique precision based on

KESS – wide-ranging field of application

e.g. combat net radio
KESS calculates the geographical expansion of radio coverage in the respective deployment area. A graphical display of the distribution in the deployment area indicates accessibility by radio and highlights critical reception situations such as radio dead spots.

e.g. sensor deployment planning
KESS determines the most favourable locations for optical and radar sensors as well as sensors for reconnaissance of enemy radio connections.

e.g. HF radio
KESS calculates the availability of long-range HF radio connections dependent on frequency, day time and season.

e.g. planning of jamming operations
KESS permits jamming strategies to be tested and critically analysed in advance.

e.g. interference analysis
KESS determines the occurrence of inadmissible interference to armed service or civilian radio systems.

e.g. directional radio
KESS calculates terrain sections, Fresnel zones, mounting locations, transmission loss and receiving power taking account of aerial characteristics.

e.g. radio relay stations
KESS determines where the relay stations should ideally be placed – by simply displacing the relay station on-screen using the mouse.

e.g. line of sight
KESS calculates on the side the line of sight to each point in the terrain.

e.g. radio simulation
KESS simulates the physical link layer (layer 1 in OSI reference model) of wireless networks true to life. Based on this precise assessments of bit loss rate and network availability (layer 2) are possible.

e.g. radio access points
KESS is able to ascertain where radio access points for wireless automatic networks should ideally be placed in order to achieve the required coverage with minimum effort.

e.g. frequency management
KESS supports a network overlapping frequency optimization under consideration of spectral and geographical constraints. The result is minimal network interference as well as maximum frequency economy.

## KESS – scope for endless possibilities

- Advance and mission planning of radio and telecommunication resources for directional radio networks, wireless automatic networks, field radio networks, electronic combat warfare

- network planning, network analysis and administration
  - Compilation of network diagrams
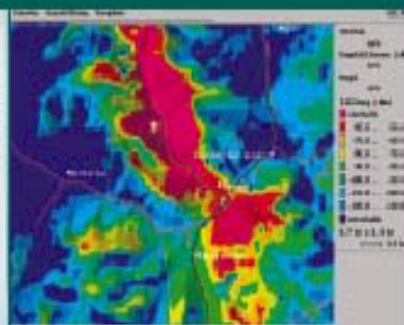 - Planning of mounting locations, movement and displacement of telecommunication nodes
  - Coordination and management of "high points" (e.g. telecommunication points)
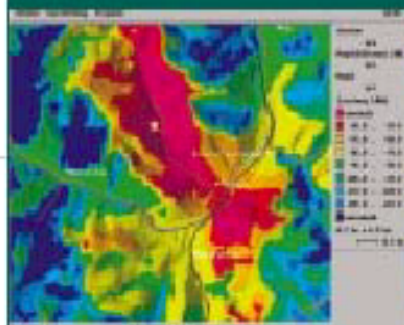
Receiving range, 3D radio propagation model
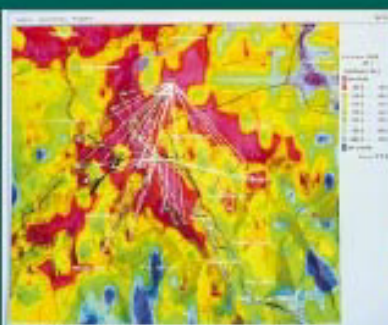
Multi-path propagation situation, transmitter-receiver constellation 1

Receiving range, 2D radio

3D propagation models

– Consideration of important
infrastructure facilities and
transfer possibilities to other
telecommunication networks
– Calculation of radio accessibil-
ity of stationary and mobile
users (e.g. convoys, mobile
communication)

• Frequency planning, fre-
quency allocation, interfer-
ence and interference suscept-
ibility analysis (information
management)

• Digital terrain models
Terrain depiction, terrain relief,
map representation on different
scales (e.g. 1:50,000,
1:100,000), terrain profiles,
Fresnel zones, position indica-
tions (geographic, UTM, ...),
distance calculation.

• System Integration
In all C²I, BMIS- and Electronic
Warfare systems possible

• Database function
Aerial library, appliance data,
resource library, data from sites
and/or command posts.

• Data import and export
To and from other systems
(database interface)

• Data exchange
With standard office applica-
tions such as Word, Excel and
Access

Screenwindow for Land Mobile Radio Planning

Screenwindow for Radio Relay Planning
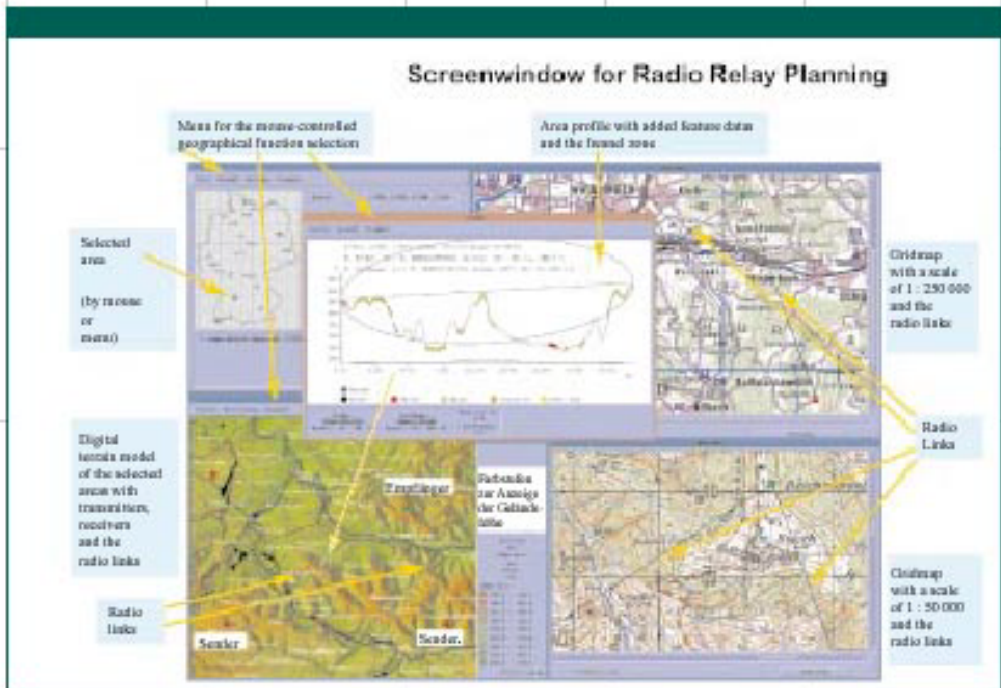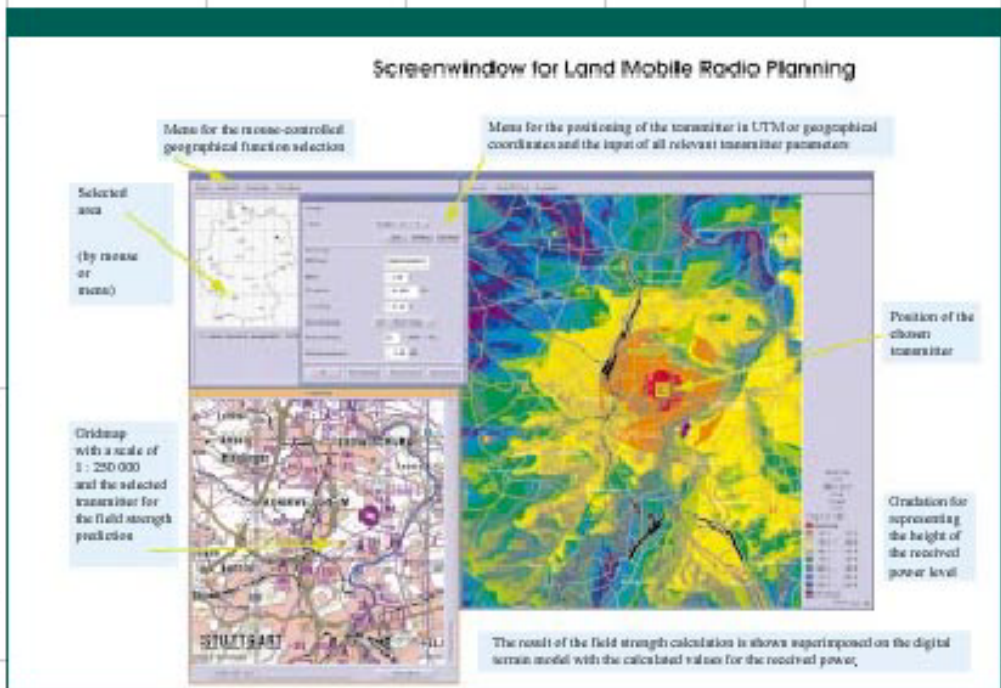
in a new dimension

KESS – designed for outstanding user convenience

KESS provides a standardised interactive graphic user interface. The tool is simple to use and calls for no knowledge of programming languages, operating systems or similar. The different software levels communicate via standard interfaces – for trouble-free data exchange.

Level 1
User interface with selection menus and switches.
This is where the user configures the individual functions he or she will require.

Level 2
Application-specific modules. These are used for the execution of analyses or planning tasks.

Level 3
Algorithms.
These permit the relevant calculations for the terrain profile and the Fresnel ellipse for directional radio planning, as well as full-coverage radio link section calculation for radio network planning.

Level 4
Object-oriented database. This offers ready accessibility of all the necessary information such as
• height data
• data relating to vegetation or buildings
• map material
• appliance data relating to radio stations
• system data
• aerial library

KESS – for simple, fast operation

All actions are initiated from a main window. The menu bar contains items permitting area selection, definition of transmitter and receiver locations and calculation parameters for the required radio link section calculations.

Parameters include, for example,
• Terrain data processed by the database routine (height values, morphography, additional heights)
• Transmitter and receiver-related data: Locations, aerial heights, aerial type (polarization, alignment, directional characteristic, gain), transmitter power, operating frequency
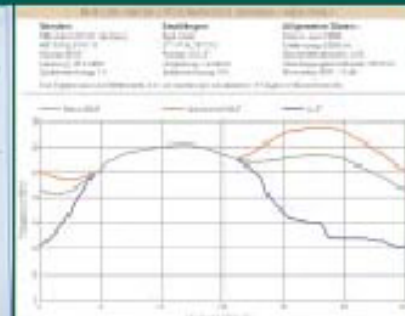
• Process parameters: These offer the opportunity to choose between a variety of propagation models. Data which depends on terrain characteristics or determines the computation time can be adjusted to the user's requirements.

Relief image as the basis for digital terrain models
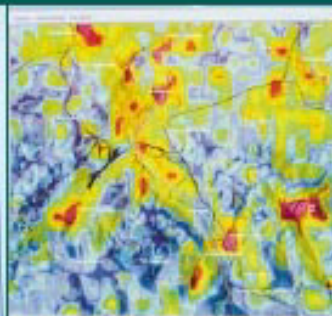
Local distribution CII ratio.

HF radio planning

KESS – the essential data

Frequency range:	1 MHz to 60 GHz, verification by measurement from 20 MHz to 1 GHz
Transmitter power:	ERP in W or dBm No limitation, freely selectable
Aerial height:	No limitation, freely selectable
Transmitting aerial:	No limitation, freely selectable, flying objects (drones, helicopters, etc.) are also possible
Receiving aerial:	No limitation, freely selectable, flying objects (drones, helicopters, etc.) are also possible also freely selectable for surface area prognosis
Aerial characteristics:	Accessible from aerial library or adjustable in the form of a measured value with optionally assignable increment (horizontal/vertical)
DTM grid:	variable grid width down to 1 m processable
Effective aerial height:	Calculation possible, but not necessary
Terrain section:	Variable, no distance limitation
Aera size:	Variable, no surface area size limitation
Graphic representation:	See examples
Fields of application:	Point-to-point connection, e.g. directional radio Point-to-multipoint Broadcasting, e.g. DAB Mobile radio, e.g. GSM, DCS 1800 Radio trunking Public safety authorities radio

Hardware requirements

	minimum	recommended	
Processor	Pentium II 266 MHz	Pentium III 450 MHz	SUN Ultra10 300 MHz
Main memory	128 MB	256 MB	256 MB
Hard disk	2.1 GB	4.3 GB	4.3 GB
Disk drive	3.5 inch	3.5 inch	3.5 inch
CD-ROM drive	8-speed	20-speed	20-speed
Colour monitor	17 inch	20 inch	20 inch

Software requirements

MS Windows NT 4.0 (server or workstation), LINUX (Unix operating system for PC) with X.11 and OSF/MOTIF, SOLARIS 2.6, SUN OS with X.11 and OSF/MOTIF, HP-UX with X.11 and OSF/MOTIF