



Optimizing Mining Communications with Advanced Network Planning

April 2024



Webinar Agenda

- **Housekeeping and Introduction to ATDI**
- **Seamless conversion of survey data into the digital terrain model (DTM)**
- **Using state-of-the-art deterministic propagation models for accurate coverage predictions**
- **Effortless modelling of multiple technologies across one easily managed project**
- **Identifying coverage gaps and determining optimal locations for trailer placements**
- **Identifying and mitigating interference areas.**

About ATDI

- ❑ Incorporated in 1991 in Paris, France
- ❑ Global leader in spectrum engineering and spectrum management solutions
- ❑ Main products
 - HTZ Communications: Network planning tool (2G/3G/4G/5G/IoT/..)
 - ICS Manager: Spectrum management solution (sites, licenses, etc ...)
- ❑ Specialty: 3D predictions & Propagation model development
- ❑ Technologies: 2G/3G/4G/5G/IoT/P2P...

Our Services

Washington London Madrid **Paris** Warsaw Kiev Sydney



Training

Customised training service online or onsite.



Support

24/7 global technical support via phone, email and web-conference



System Customisation

Business analysis, system design, architecture, customisation, integration, and configuration.



Spectrum consulting

Provide professional consulting services in spectrum engineering and management to solve any spectrum issues.



Cartographic data

Medium to High resolution DTM and Clutter library.
Cloud base digital map image streaming and cache support.



System Deployment & Maintenance

Support on Go-Live, Testing, and bug fixing.
On-going maintenance support with software updates.

RF Planning & Spectrum Management Solutions

- HTZ Communications
- HTZ Automation
- HTZ Web API
- RRL Plugin
- ICS Manager
- ICS Portal

ATDI Mining Customers



HTZ Communications

Complete out of the box RF planning and optimization solution

- Supporting all wireless technologies from a few kHz to 1 THZ
- Massive library of propagation models as an all-in-one package - including deterministic, empirical and custom models. Our deterministic models generate coverage prediction with accuracy greater than 90%, with no tuning required.
- Comes out of the box with global cartographic datasets including DTM and Clutter
- RF Engineering tool combined with a powerful GIS Engine allowing advanced GIS manipulation. Features advanced 3D GIS data utilization including 3D-Ray tracing to improve modelling accuracy
- Automates for any planning calculations and analysis including coverage, interference and frequency assignments
- Enables parallel processing to run computations faster on machines with several processors for larger network calculations to improve calculation efficiency
- Integrates with Google Earth and other online maps, to overlay coverage plots and station lists, including an editable user palette and threshold legend

Multiple Technologies in an All-in-One Solution

- Fixed wireless access: P2P, P2MP, LMDS, WLL, BWA, WiFi, WiMAX
- Mobile: 2G, 3G, 4G, 5G, WiMAX, DVB-H, LTE
- DSA, Cognitive Radio, TV White Spaces
- PMR: Analog, TETRA, Tetrapol
- Broadcast : FM analog and digital, TVA, DAB, DRM, DVB-T/T2, ISDB-T
- Tactical communications, Electronic warfare
- Radar and direction finders
- HF, Aeronautical, UAVs
- Satellite Communications
- IoT: LoRa, NB-IOT

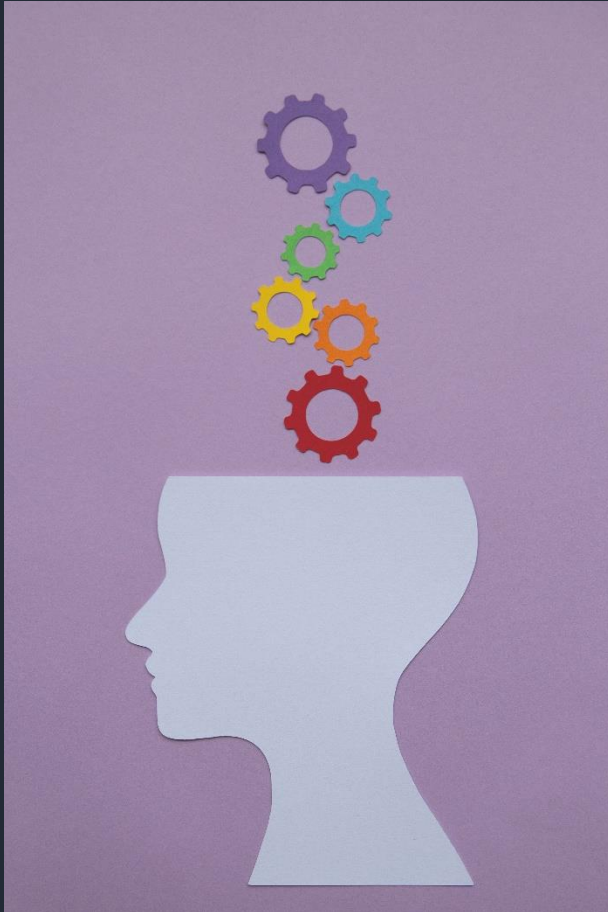


NB-IoT

LIVE DEMO

- Prop Models
- GIS Functions
- Site Search / Acquisition
- Network Modelling (Private LTE/5G, LMR, MW Links)
- Network Optimization
- Coverage Outputs
- Interference Analysis

Expanding Scope of Knowledge



- Geographic Information System
 - Coordinate codes
 - Datums and ellipsoids
 - Cartographic conversions
- Desktop Planning
 - Pre-planning
 - Site acquisition
 - Measurement correlation
- Network Configuration
 - Parameter identification
 - Network modelling
 - Coverage predictions
- Testing and Optimization
 - FSR, RSSI, RSRP, RSRQ, SNIR predictions/analysis
 - Capacity
 - Quality of Service

Propagation Models

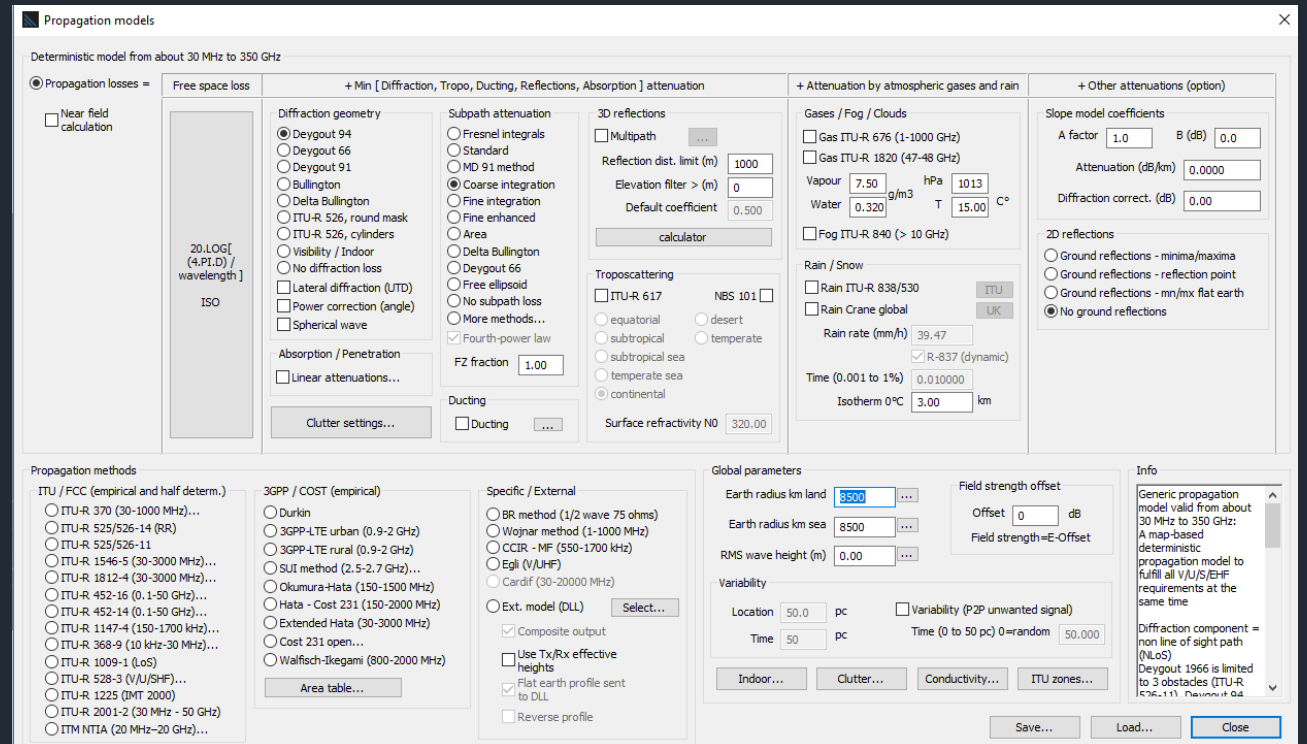
A comprehensive advanced propagation model library as all-in-one package

HTZ Communications includes a comprehensive set of propagation models as part of its standard licence package.

Propagation components are added to a base model (2D) to create flexible 3D models covering from 30 MHz to 450 GHz.

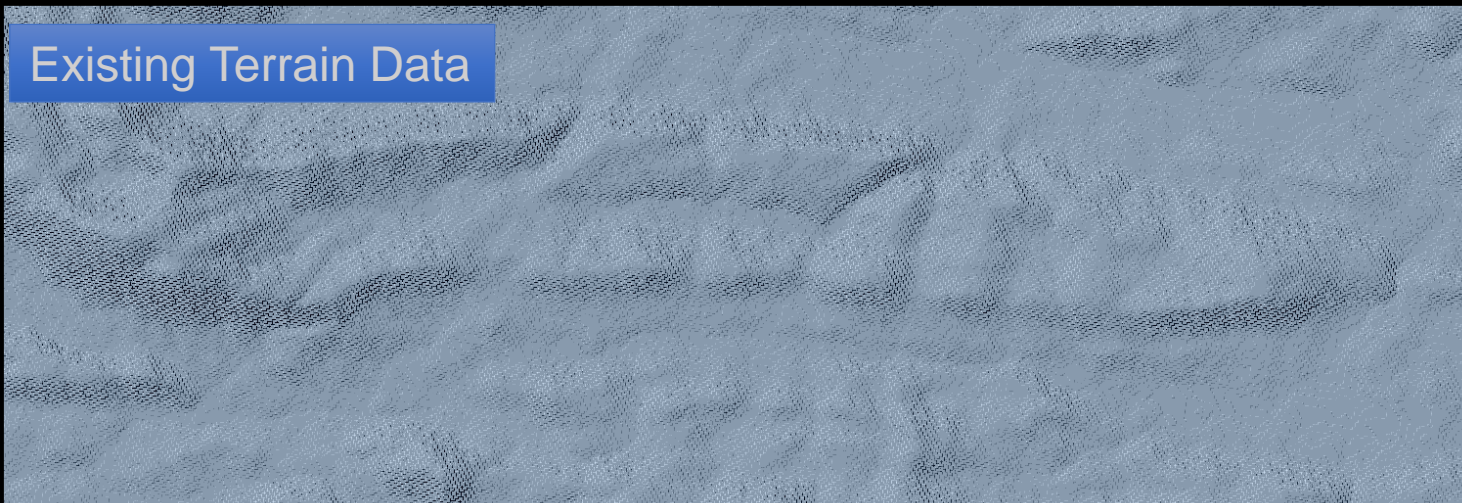
Below is a list of available propagation components.

- Vertical diffraction
- Lateral diffraction (on/off)
- Angular correction (on/off)
- Subpath attenuations (obstacles in the first Fresnel zone)
- Troposcattering
- Ducting effect
- Rain and gas attenuations
- Gradient influence
- 2D reflections (on/off)
- 3D reflections (specular or Lambertian)

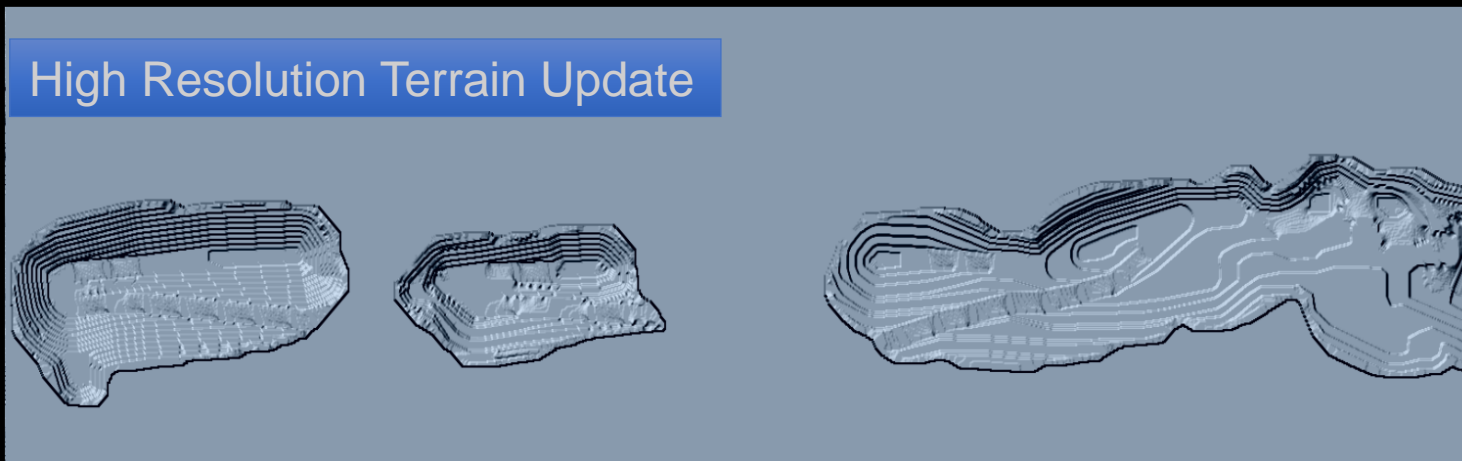


Advanced GIS Capabilities

Existing Terrain Data



High Resolution Terrain Update



Raster map converter

Download Digital Terrain Data / Lidar info

Links... Raster info... LAZ/LAS info...

Blank matrix

From file list... From coordinates...

Archives

Unzip Aster (zip)... Unzip (*.zip)... Unzip (gz/tar)... Zip to IC2... Rename...

Unzip Aster: Extract and delete _num files, Unzip: Extract and rename files if same names, Unzip gz/tar: Extract and delete unused files, Convert ZIP to IC2: Extract raster files (ADF/BIL/TIF) and convert to IC2 format (16 bits)

Miscellaneous

Check ICx file headers... Modify ICx header... Create UTM folders... IC2 <> IC1

LAZ/LAS->XYZC... LAZ/LAS to PTCx... XYZ[C] to PTCx...

Update PTCx headers... Binary XYZC files. Use default coordinate code. Terrain data and metadata located in same folder

Raster converters

TIF to ASCIIGrid... BIL to ASCIIGrid... DEM to ASCIIGrid... Raster24 to RGB... Step 1

GRD to ASCIIGrid... GRC to ASCIIGrid... IMGrd to ASCIIGrid... HGT to ASCIIGrid...

ADF to ASC (hdr)... Raster to TIF... Raster to ASCIIGrid... TIFF8 to IMG/RIM... Step 2

ASCIIGrid to IC2... ASCIIGrid to IC1... RGB to IMG/RIM/RI3... IMG/IC1 to RIM...

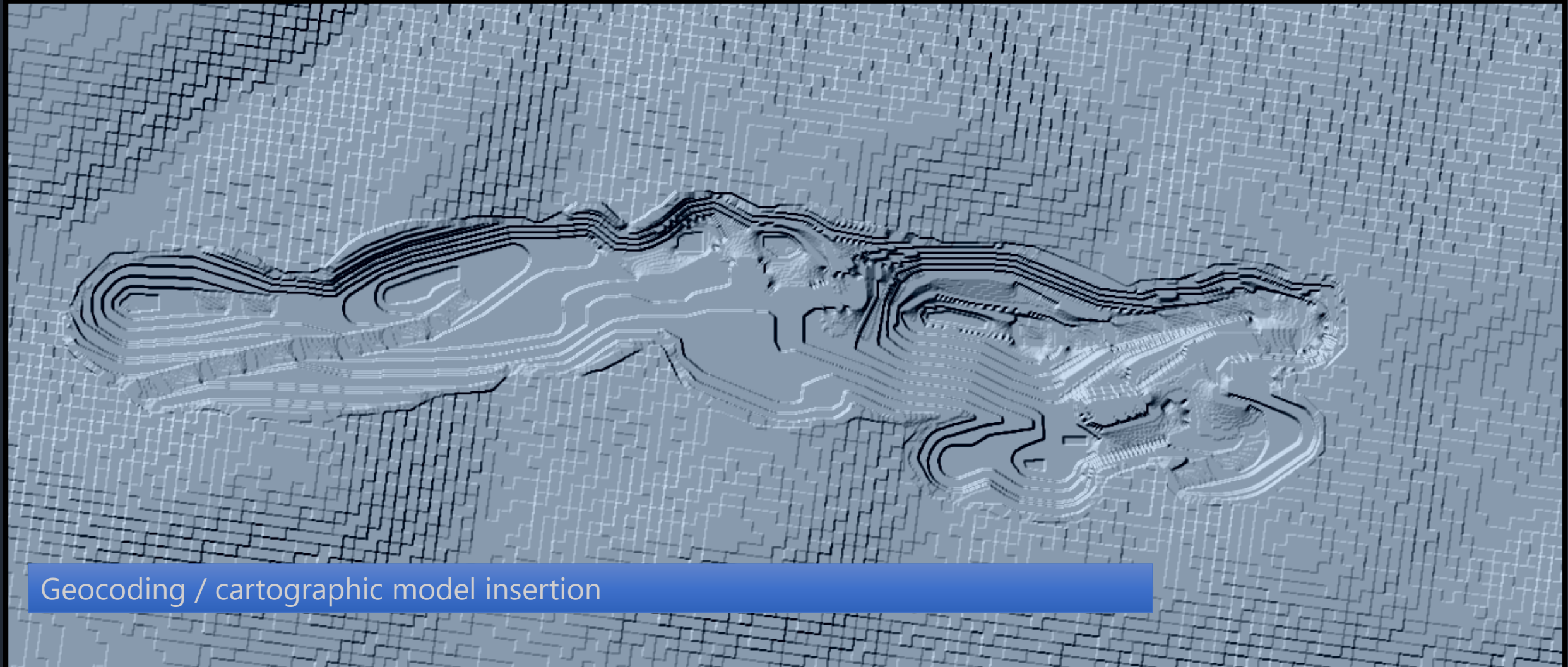
ICx to Rx... ICx to Rx (folder)...

IC1=IMG/SOL/BLG/COD
IC2=GEO/IDR/FTR
RGB/RIM/RI3=Image
Rx=Compressed format

Default coordinate code 4DEC ...

Download building files... Batch vector converter (to .SHP)... Download file from URLs... Close

Advanced GIS Capabilities



Geocoding / cartographic model insertion

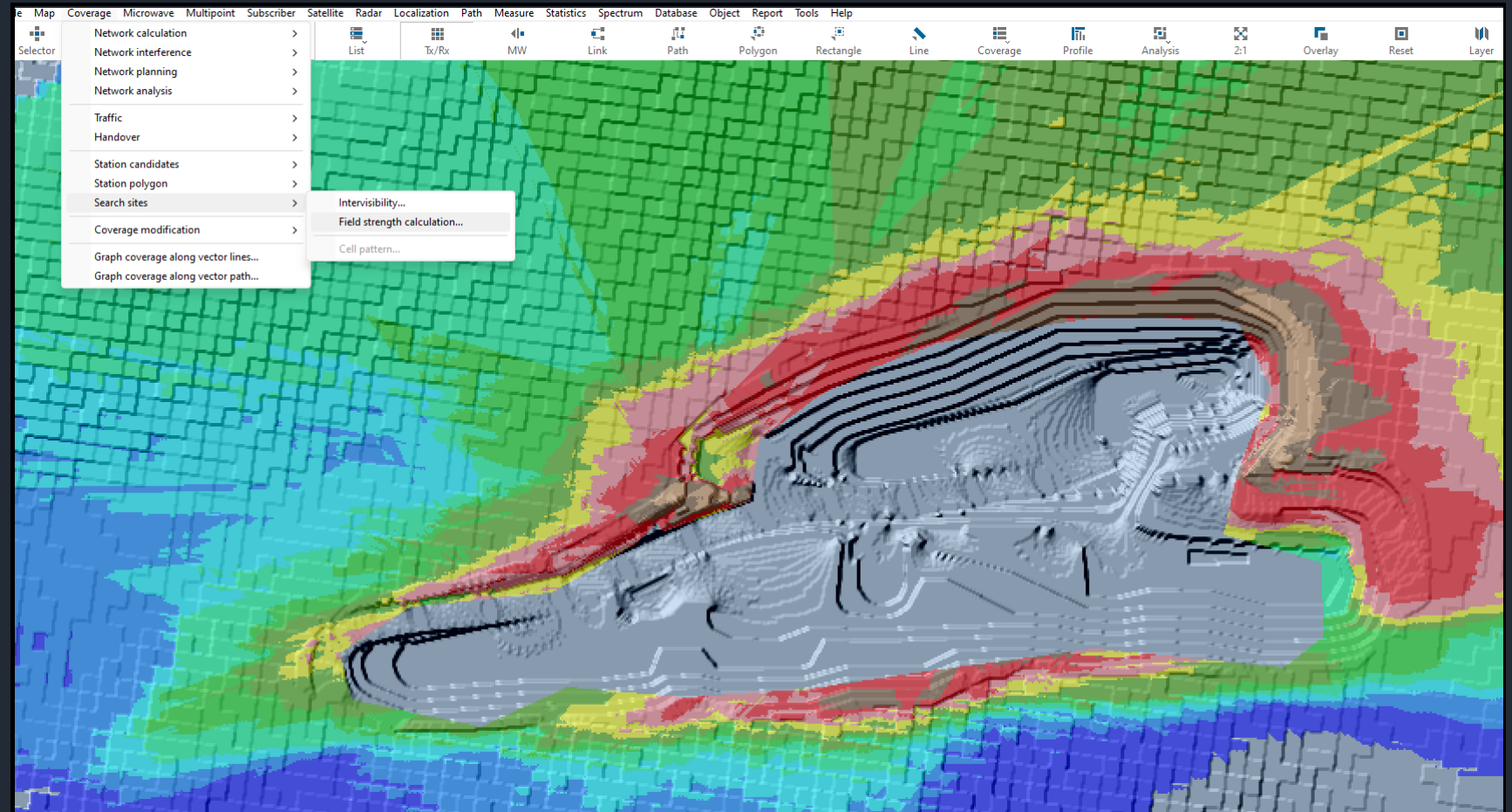
Streamlined Planning Functions

Site Planning

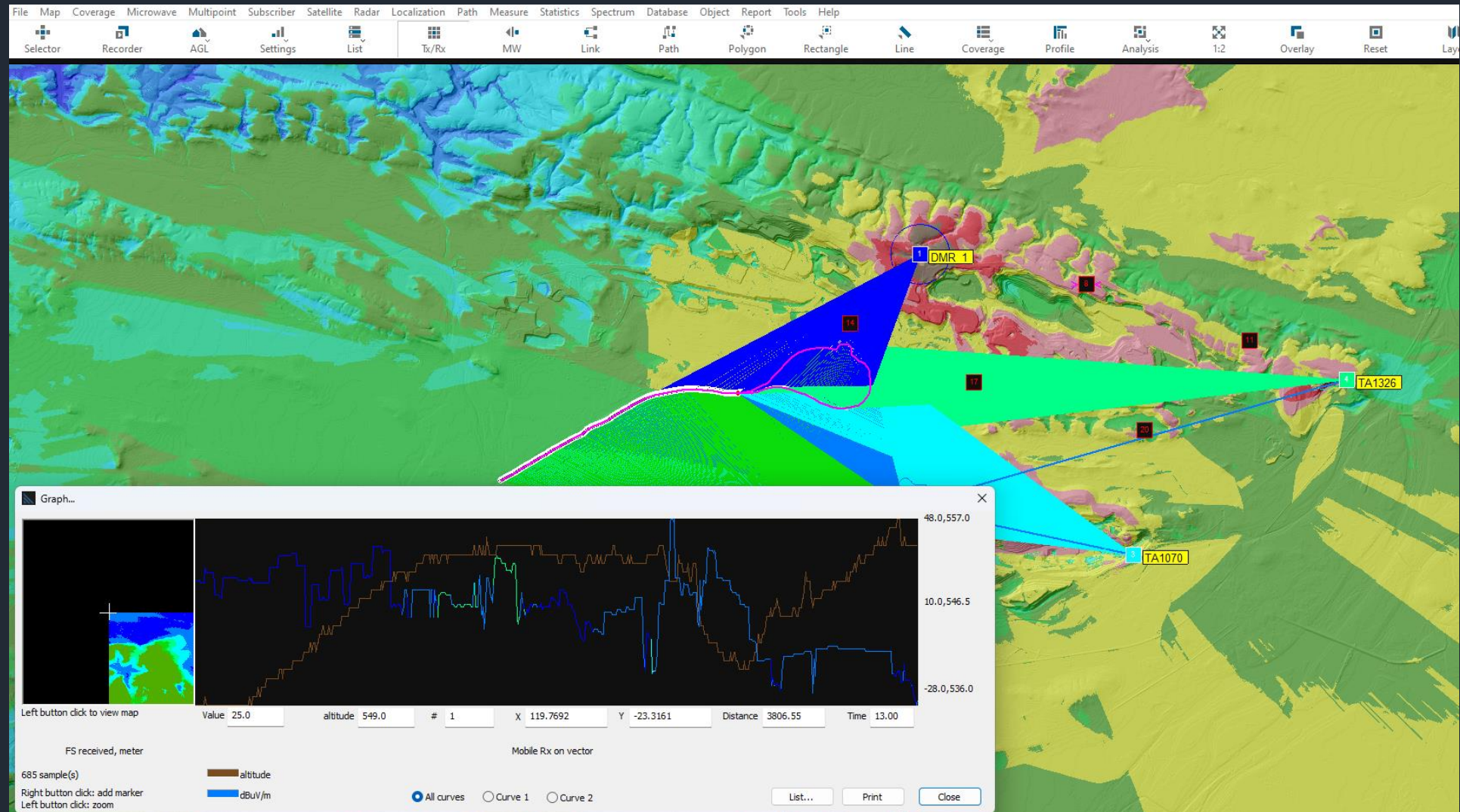
- Site Search
- LOS Search
- FS Search
- Intervisibility

Point Planning

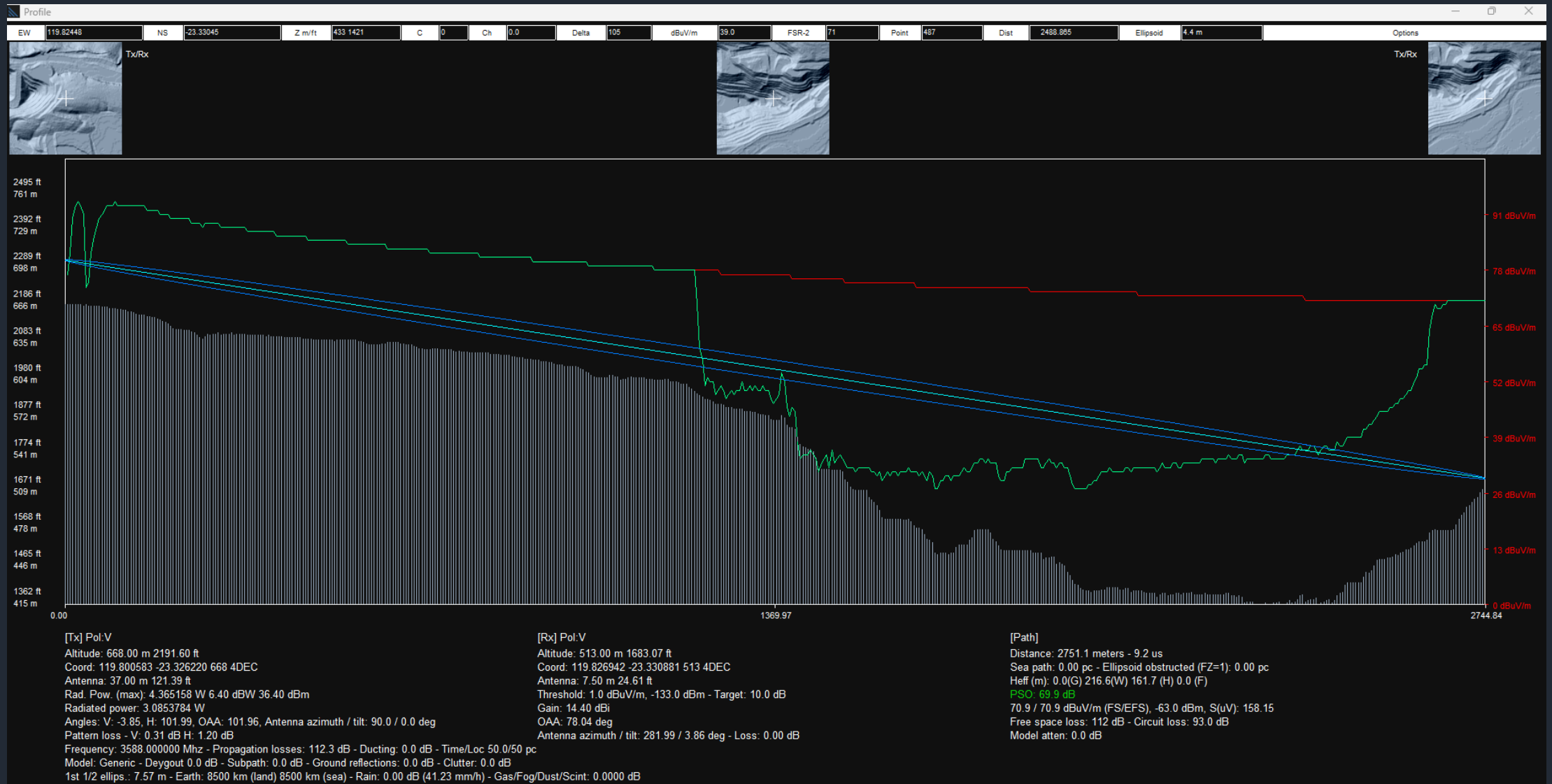
- Prospective
- Parenting
- Mesh/Link



On Path Coverage Analysis



Profile / Cross-Section Analysis



Tx/Rx Modelling

Tx/Rx parameters: 1 Tx_1

General Patterns Channels Site eNB

MSI/RPE 2D reverse tilt Antenna file must be reloaded 2D antenna H+V (1 polarization) ... View

Tx pol V H C M
Rx pol V H C M
X polar. disc. (dB) 0
Tx ant gain (dBi) 17.50
Rx ant gain (dBi) 17.50
RS gain reduction (dB) 0

Horizontal pattern -90 Vertical pattern +90

Sat: #0 del

Azimuth (0-359°) 0.00
Tilt (-90 +90°) 0.000 Sat..

Standard antenna
 SU-MIMO SD
 SU-MIMO SM
 MU-MIMO SM
 SIMO
 AAS

Arrays T/R 2 / 4
Layers / MU 2 / 1 Gain...
0.0 3.0 dB

BSR H/V +- 0 / 0 deg
Beam step H/V 0 / 0 deg
BSR=Beam steering range in degrees

Diameter or size (m) 0.10 ...
Beamwidth (°) 0.00 ...
Crossover distance between near and far fields (m) 0.29
Two-line element set - Satellite catalog number 0 ...

Antenna database

Save .TRX Load .TRX 3D creation... Modify coverage* < >

OK Cancel

Tx/Rx parameters: 1 Tx_1

General Patterns Channels Site eNB

Type (0) Signal (60) Modulation (3) NFD / TS-RIF
Tx/Rx A (0) LTE FDD (60) QPSK (3) ...

Threshold parameters
Cov. threshold (dBm) -93 upd...
Rx threshold (dBm) -102
RS threshold (dBm) 0
KTBF (dBm) -97 calc...
Launch delay (us) 0
C/I req N=0/N=1 -127.0 / -127.0
Mean DL (kbps) 100000.00 <
Mean UL (kbps) 50000.00
Tx bandwidth (kHz) 20000.00
Rx bandwidth (kHz) 20000.00 >

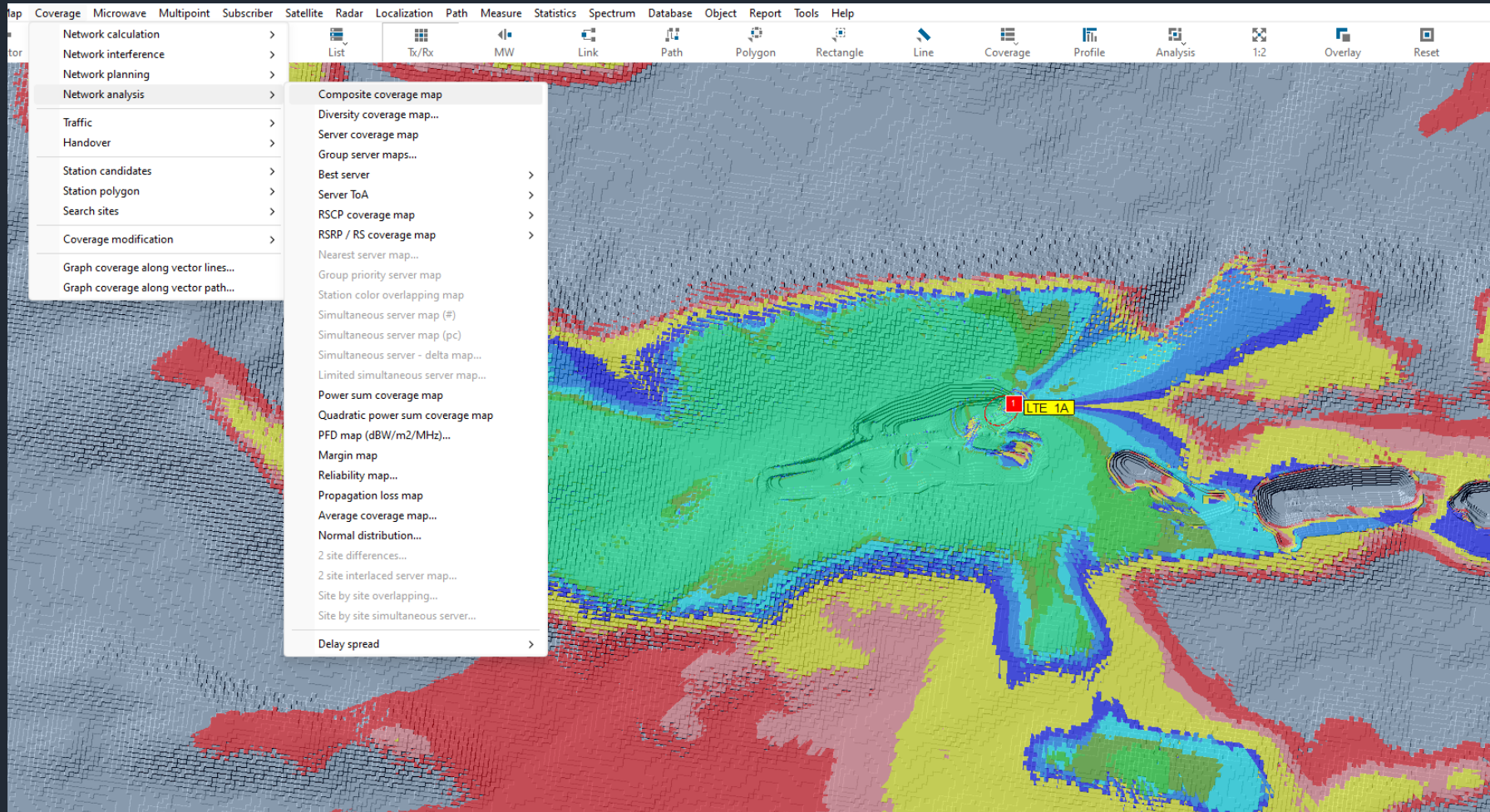
Options
Floor offset 0
Handover 0 dB
Neighbour list ...
RSI ...
PHY_CELL_ID 0
PCIMODn 0
Activity UL 100 %
Activity DL 100 %

Power channel settings
RS boost 0 dB
% Ref. Signal 4.762 ...
% PDSCH 88.950
% PDCCH 5.952
% PBCH 0.164
% PSS 0.086
% SSS 0.086
Total % 100.000
DL/UL ratio (pc) 100.00
System overhead calculator...

< >

OK Cancel

Coverage KPI's



Coverage

- Composite
- Simultaneous
- Best Server (1st, 2nd, etc...)
- Overlapping

Interference

- C/I
- SNIR
- IRF
- Threshold Degradation
- Intermodulation

Composite Coverage (dBm)

The image shows a software interface with a menu open. The menu is titled 'Composite Coverage (dBm)' and lists various analysis options. The background is a terrain map with a color-coded coverage overlay. A red circle highlights a specific location on the map, labeled 'DMR 1'.

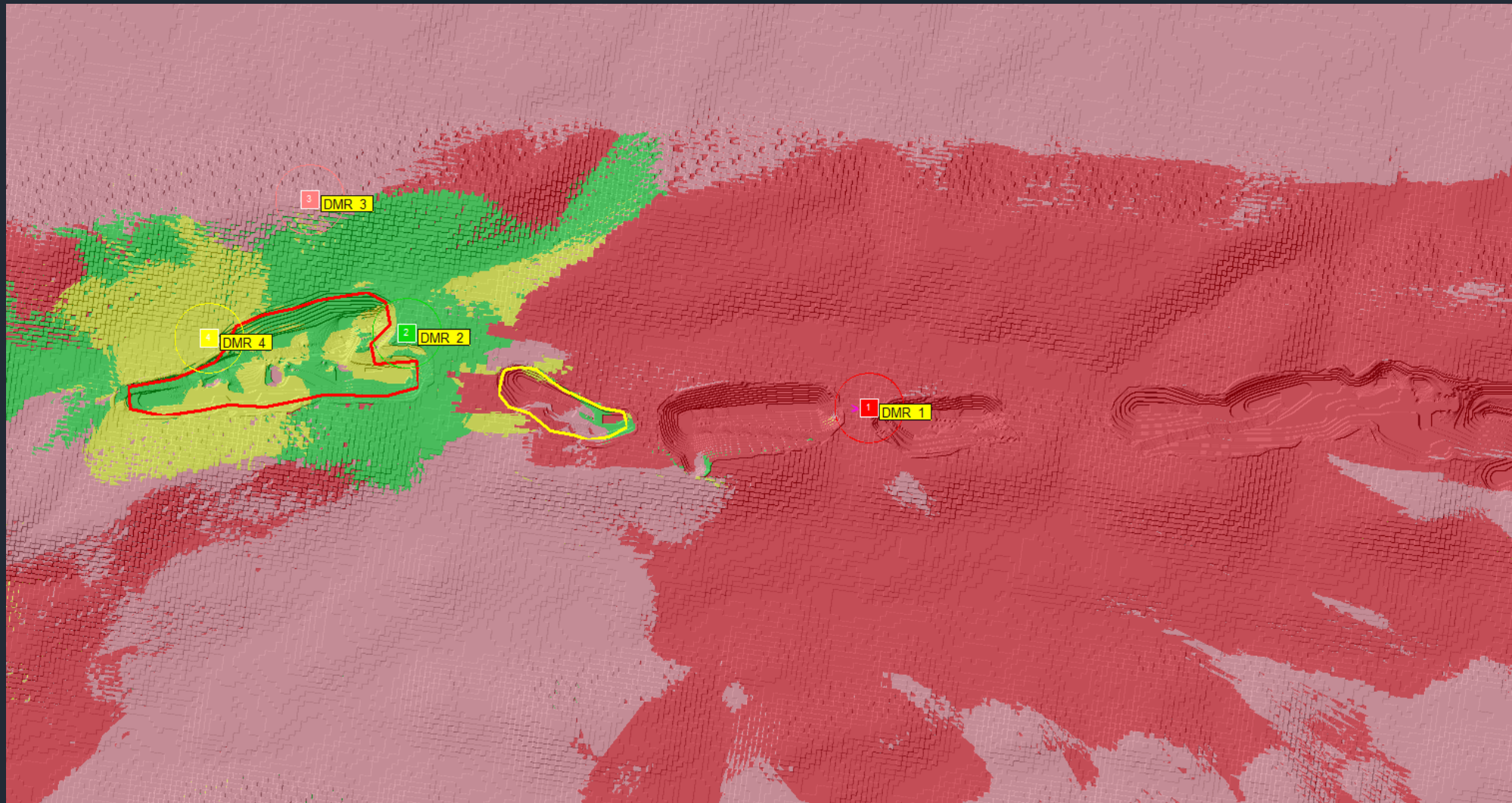
Menu Items:

- Network calculation >
- Network interference >
- Network planning >
- Network analysis >
 - Composite coverage map
 - Diversity coverage map...
 - Server coverage map
 - Group server maps...
 - Best server >
 - Server ToA >
 - RSCP coverage map >
 - RSRP / RS coverage map >
 - Nearest server map...
 - Group priority server map
 - Station color overlapping map
 - Simultaneous server map (#)
 - Simultaneous server map (pc)
 - Simultaneous server - delta map...
 - Limited simultaneous server map...
 - Power sum coverage map
 - Quadratic power sum coverage map
 - PFD map (dBW/m2/MHz)...
 - Margin map
 - Reliability map...
 - Propagation loss map
 - Average coverage map...
 - Normal distribution...
 - 2 site differences...
 - 2 site interlaced server map...
 - Site by site overlapping...
 - Site by site simultaneous server...
- Traffic >
- Handover >
- Station candidates >
- Station polygon >
- Search sites >
- Coverage modification >
 - Graph coverage along vector lines...
 - Graph coverage along vector path...

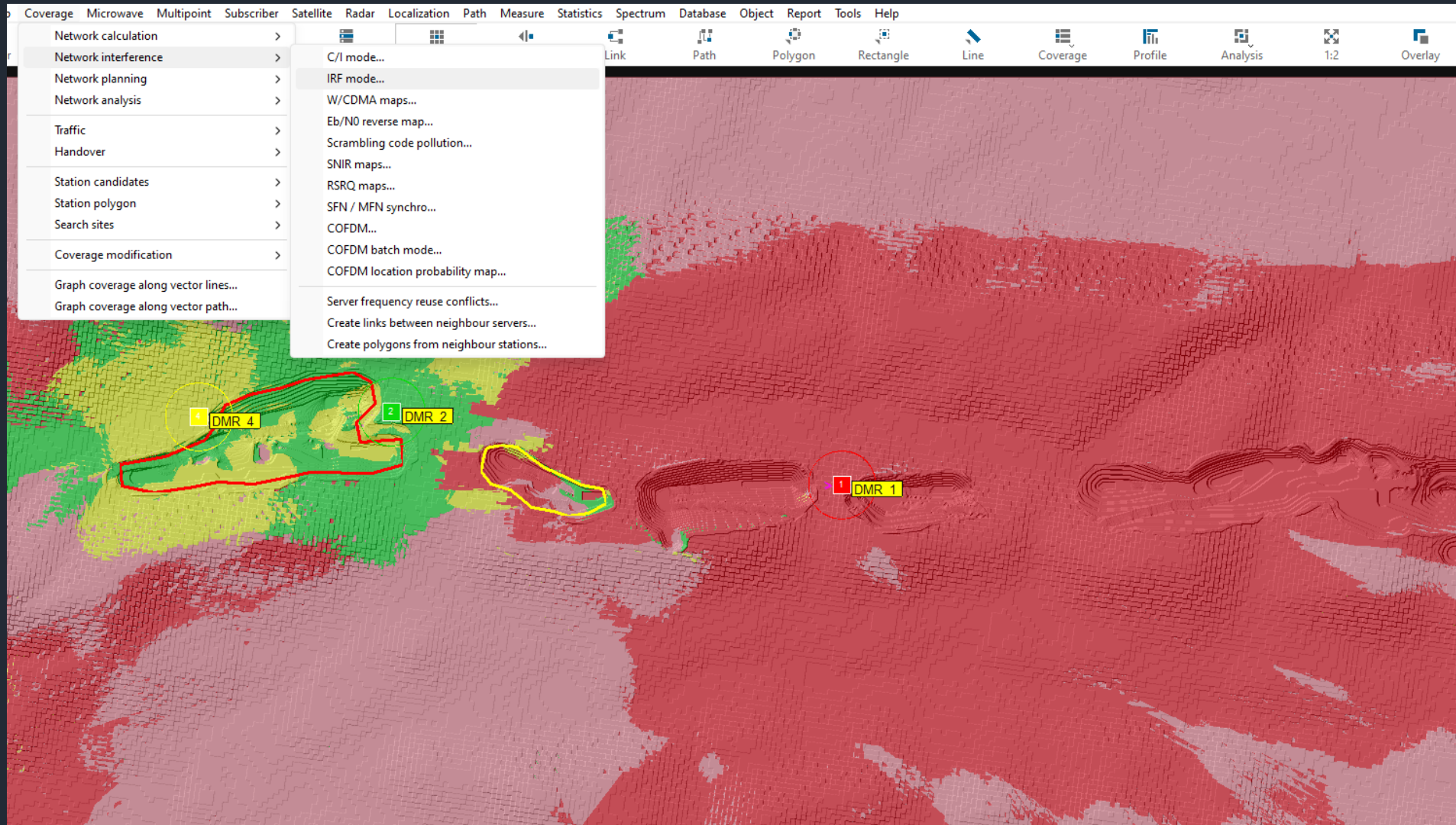
Toolbar:

- List
- Tx/Rx
- MW
- Link
- Path
- Polygon
- Rectangle
- Line
- Coverage
- Profile
- Analysis

Best Server Coverage



Multiple Interference Analysis Functions



Advanced Planning Functions

4G/5G calculator

Item	Value
Reference frequency (MHz)	2100.000000
Bandwidth (MHz)	10.00000000
Probability to achieve (pc)	95.00 <small>0 = not used</small>
RSRQ required (dB)	-19
STDDEV / Slow fade margin (dB)	3.00 / 4.9
Numerology: <input type="radio"/> 0 <input type="radio"/> 1 <input type="radio"/> 2 <input type="radio"/> 3 <input type="radio"/> 4 <input type="radio"/> 5 <input type="radio"/> 6 <input checked="" type="radio"/> 4G	
<input type="radio"/> TDD DL/UL ratio	54.29
<input checked="" type="radio"/> FDD PDSCH (pc)	86.00

Item	eNodeB	UE
Transmit power / port (dBm)	43.0	23.0
Tx gain (dB)	17.00	0.00
Rx gain (dB)	17.00	0.00
Tx losses (dB)	1.00	0.00
Rx losses (dB)	1.00	0.00
Tx gain mimo (dB)*	3.00	0.00
Rx gain mimo (dB)*	6.00	0.00

Item	Downlink	Uplink
Min throughput per user (kbps)	1000.0	1000.0
RBs available	43	50
SNIR required for throughput (dB)	-5	-5
Noise figure (dB)	5.0	4.5
KTBF (dBm)	-99.46	-99.96
Coverage / Rx thresholds (dBm)	-99.56	-100.06
Min RSRP (dBm)	-126.68	

Item	Downlink	Uplink
Max permissible pathloss (dB)	161.56	145.06
Balanced thresholds: DL/UL (dBm)	-83.06	-100.06

Assign balanced thresholds to activated eNodeB

Strategy

User defined RBs
 Lowest SNIR and min RBs
 Available RBs

Buttons: SNIR vs Throughput..., Stations..., Compute, OK, Cancel

RF Calculators

- Threshold
- Power converters
- MCS/MCL

Reports

- 3D Coverage
- Legend Color
- % Covered

Q & A



THANK YOU FOR YOUR ATTENTION

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3 YEARS
OF EXPERIENCE

ATDI