COMLAB
radio frequency technology

About us

About us

Haag-Streit International Group

SWITZERLAND

Haag-Streit Holding AG
Holding

Haag-Streit AG
Ophthalmic products

Spectros AG
Optics

COMLAB AG
Radio Frequency Technology

ASETRONICS
LED Technology

GREAT BRITAIN

Clement Clarke International Ltd.
Ophthalm. and respiratory products

John Weiss & Son Ltd.
Surgical instruments

GERMANY

MOELLER-WEDEL GmbH
Operating microscopes, ophthalm. products

Ipro GmbH
Software for optometrists

Haag-Streit Deutschland GmbH
Ophthalmic products

USA

Haag-Streit USA
Ophthalmic Products

Reliance Medical Products Inc.
Equipment for medical offices

Respiratory Division of Haag-Streit USA
(former Clement Clarke, Inc.)
Respiratory products

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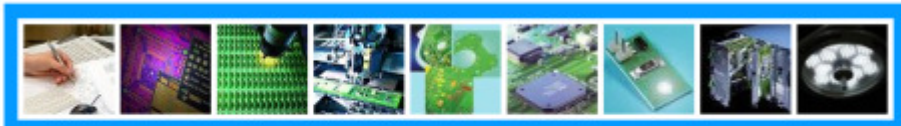
About us

Haag-Streit International -- Ophtalmology

About us

Asetronics – LED Technology



asetronics
Advanced Swiss Electronics

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  - Telecom
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RoHS

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Market Segments

We expect electronics to carry out all the functions demanded of it faultlessly and without interruptions. Even under the toughest conditions, we must be able to count on electronics in terms of high operating reliability and a long service life. It's therefore no coincidence that our company boasts a wide customer network in strategically important market segments:

About us

Contact

Headquarter Switzerland

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About us

Company profile

100 distributors and partners worldwide

Turnover mio 200-300 Swiss francs

1500 employees

Portfolio

Portfolio Overview

System solutions

Permit Mobile Communication

Turnkey projects (All-In-One, partnerships)	>10 Projects
Railways Communication Systems (realiable)	> 820km tunnel
Onboard Train Solutions (SDR applied)	> 1000 Repeaters
Subway Communication Systems (powerful)	> 15 Metro lines
Motorway Communication Systems (modular)	> 320km tunnel
In-Building Communication Systems (compact)	> 80 projects
Work- & Mine Communication Systems (solid)	> 60km tunnel

Prohibit Mobile Communication

Modular Jamming for Prison (terrorism prevention)	> 20 projects
Convoy Jamming (savety transport)	
Portable Jamming (prevention)	
Remote Power Supply (Electrical Power transmission)	> 30 Systems
Security Solutions for Military, Defense, Government	> 30 years experience

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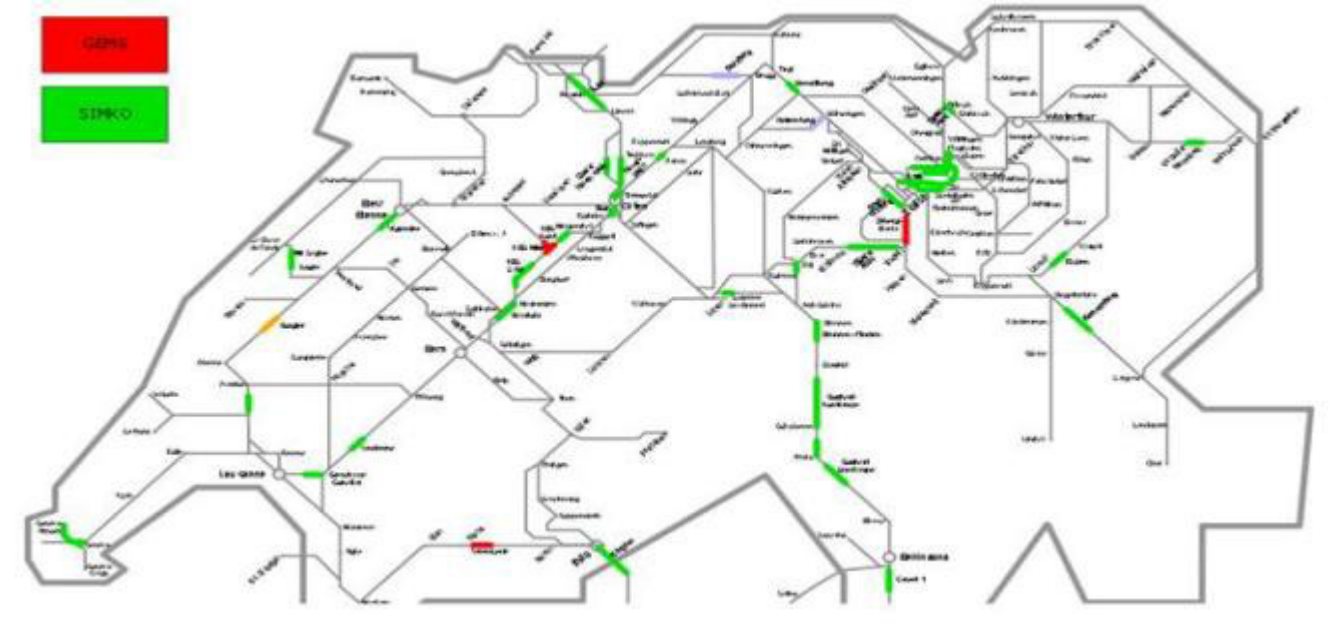
Portfolio

Products & Systems

Experience

Experience

Switzerland

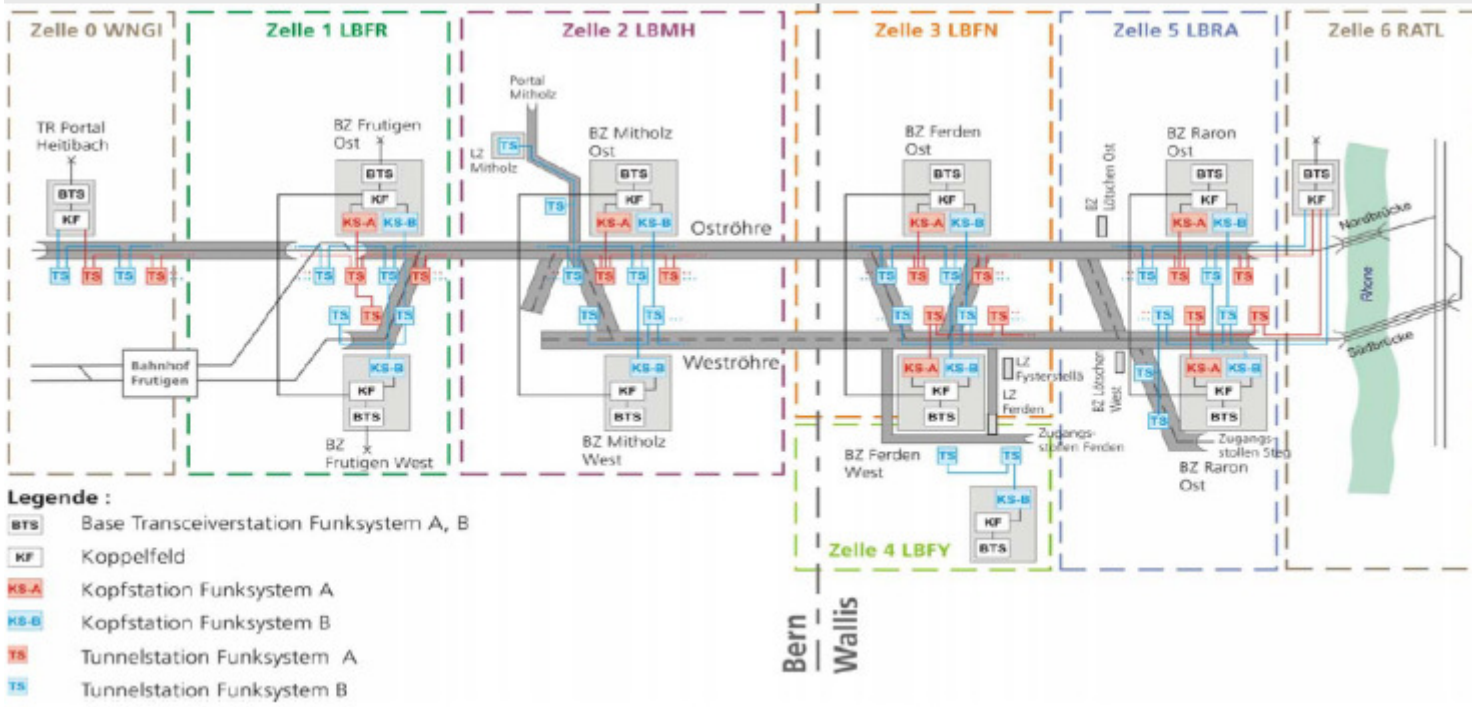


- 660 Multiband Repeater (RU), >3000 Singleband
- 124 Multiband Master (MU)
- Customer: SBB, BLS, Zentralbahn, Südostbahn, Forchbahn
- Redundante& non- redundant Architecture
- Spare Parts Stock Comlab

Experience

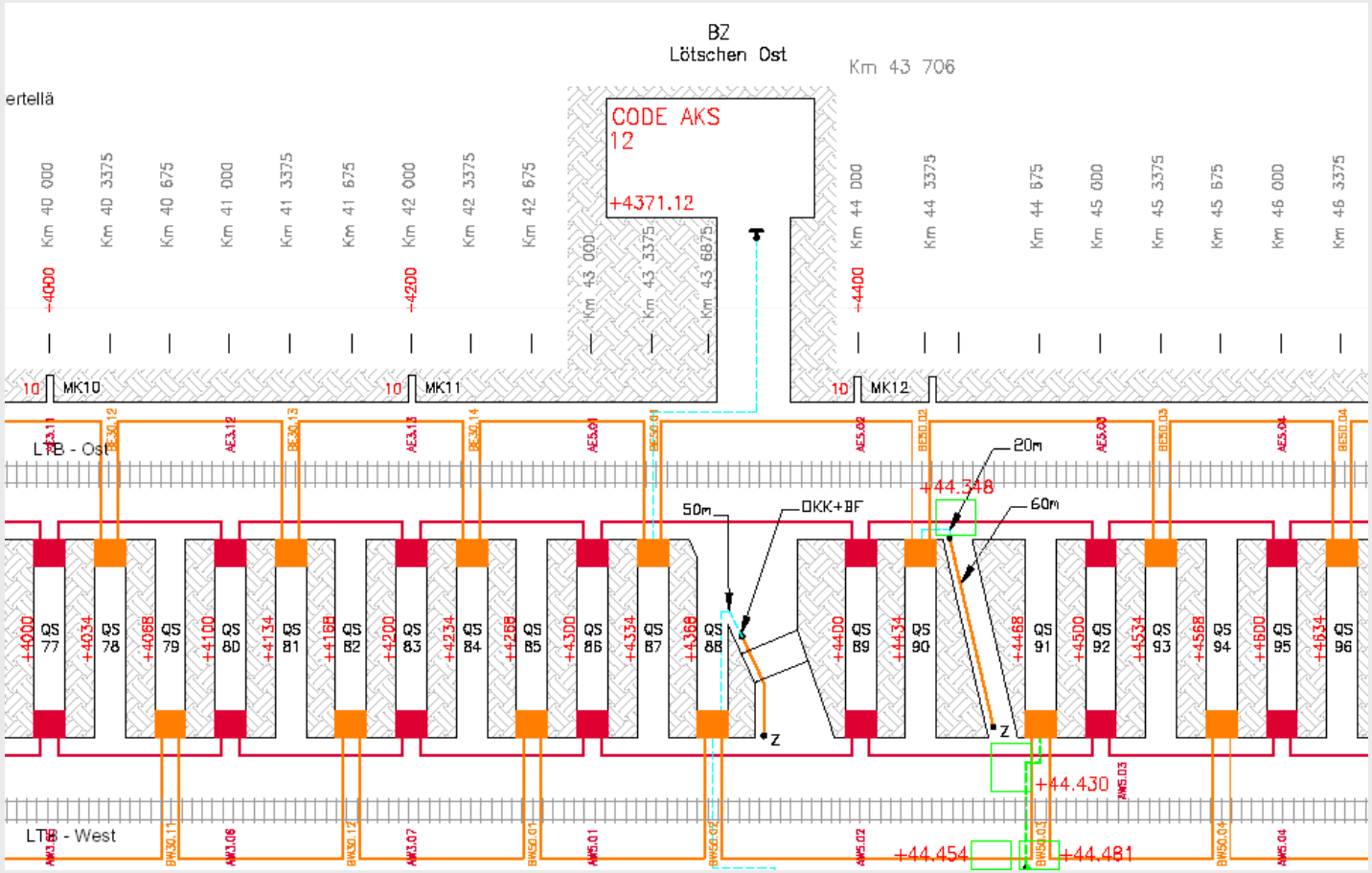
Major Reference Lötschberg

- 4 carriers 410-430MHz
- 16 carriers TETRAPOL 380-400MHz (incl data transmission)
- 4 carriers GSM-Railways (system MTBF >230 years)
- 16 carriers GSM/UMTS900 (data transmission 384kbps)
- Approved RAM (selftested), Safety (90min fire), Durability (15years)



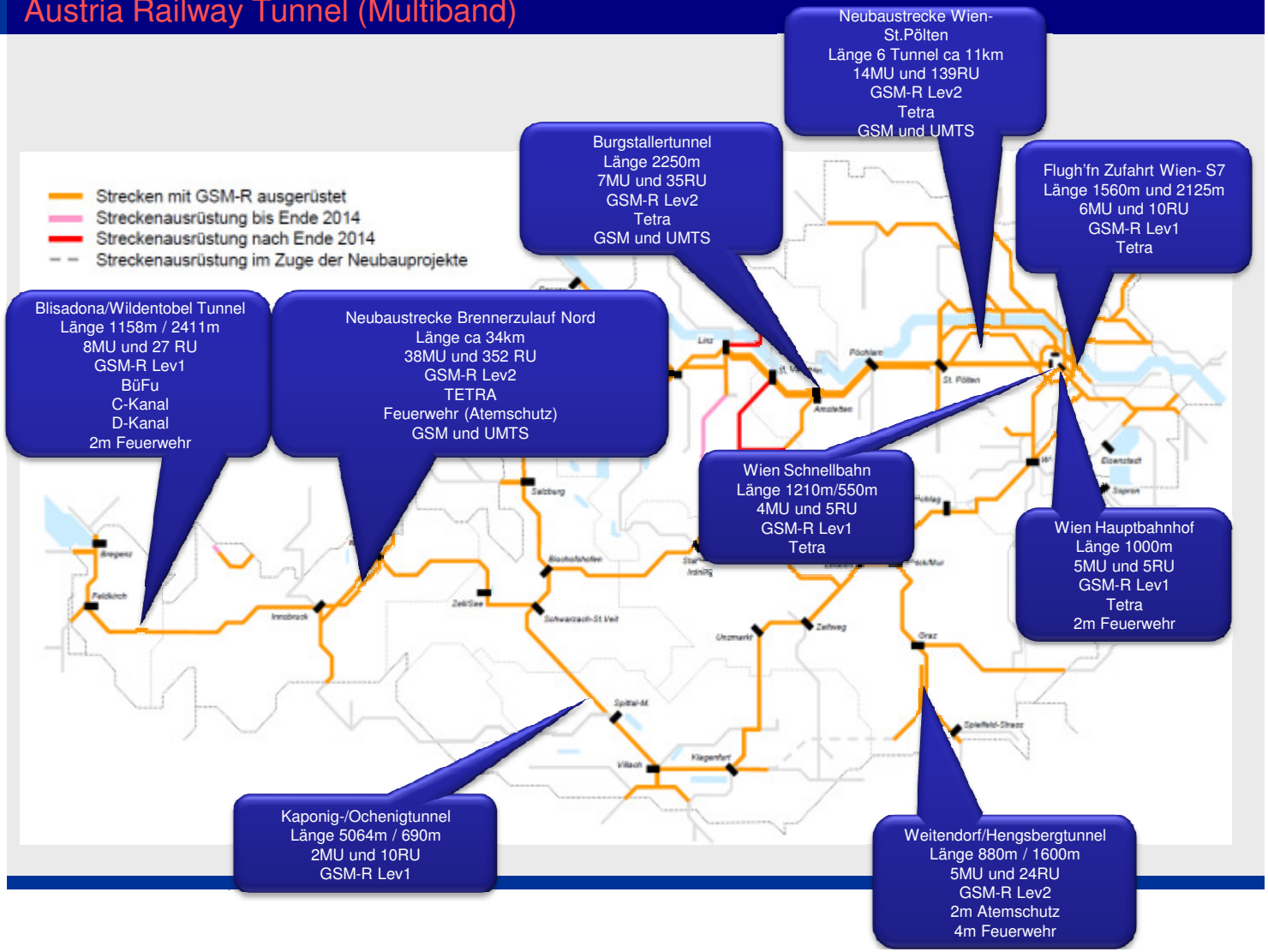
Experience

Topology



Experience

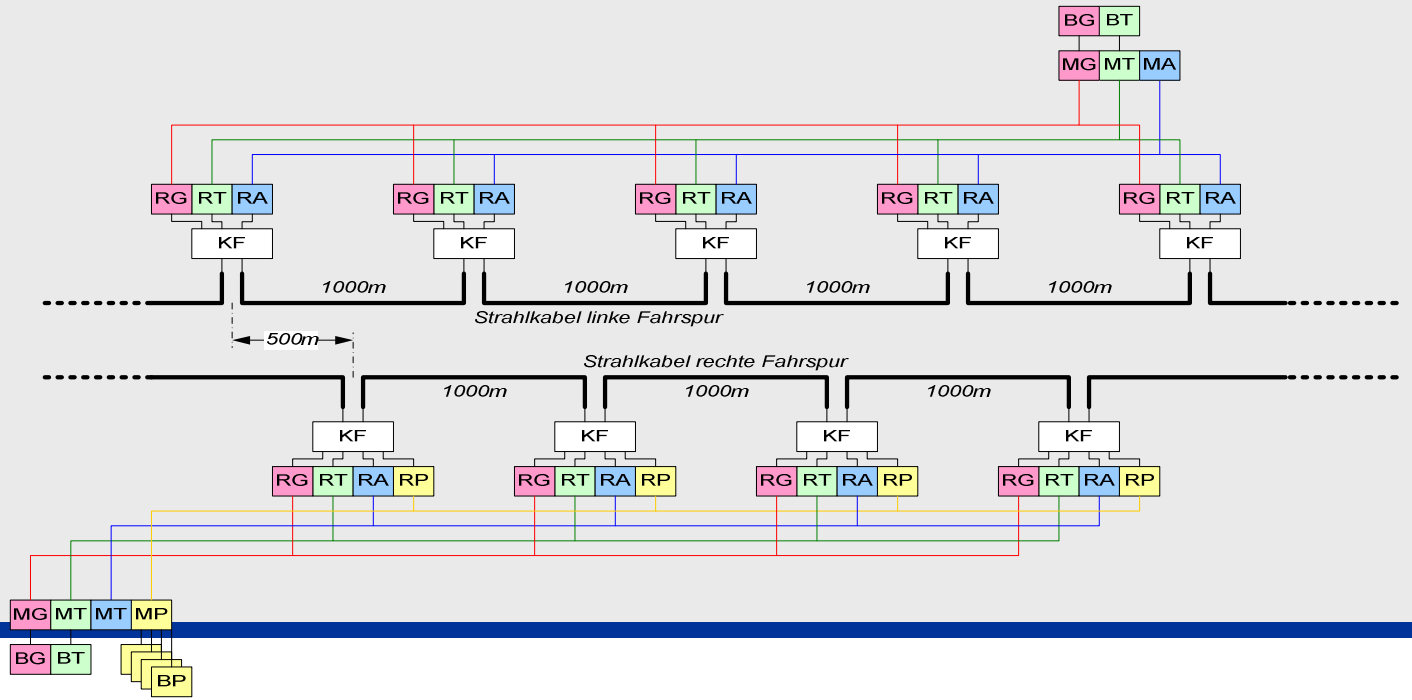
Austria Railway Tunnel (Multiband)



Experience

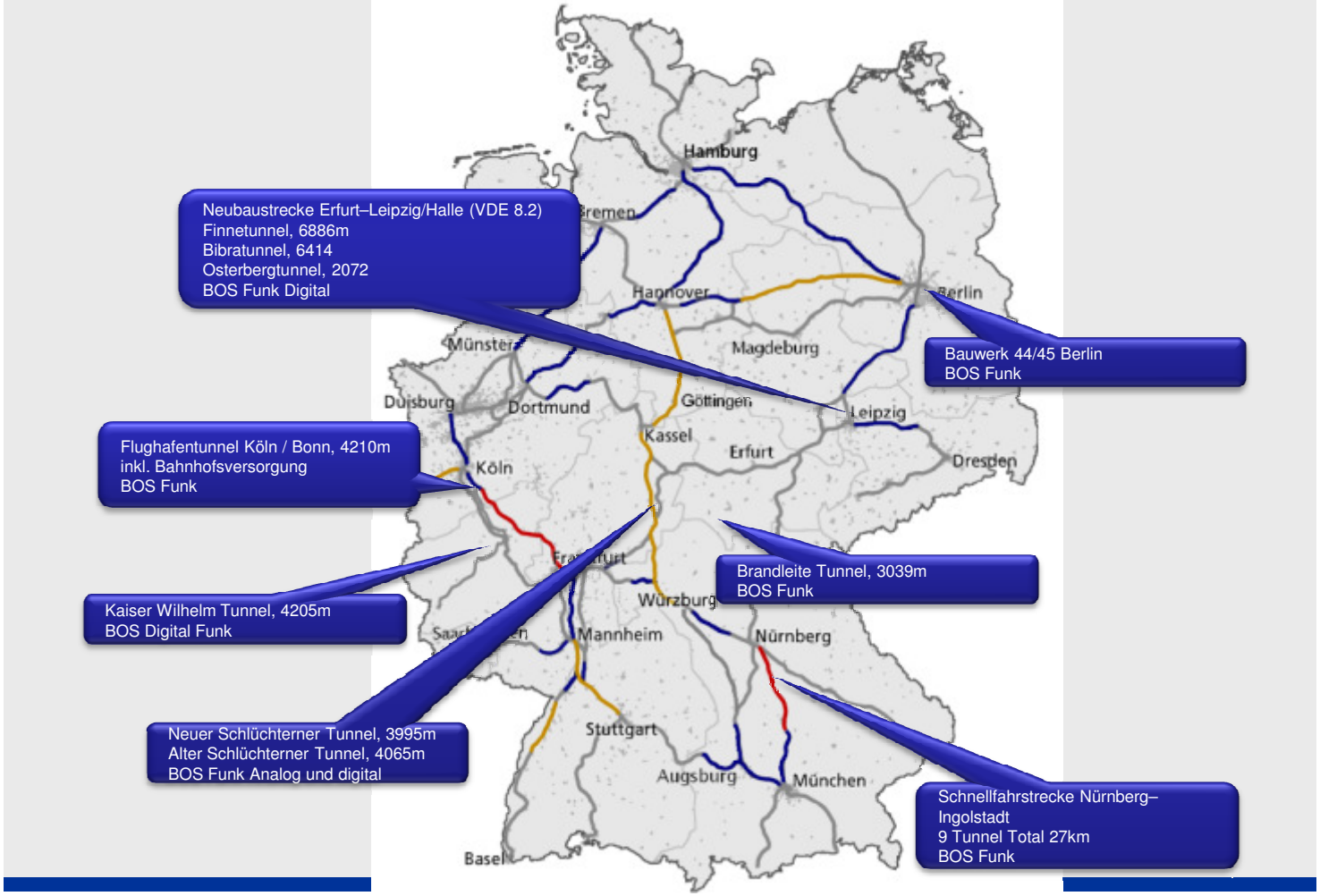
Major Reference Austria

- 1 carrier 440-450MHz
- 2 carriers TETRA 380-400MHz
- 4 carriers GSM-Railways
- 16 carriers GSM/UMTS900
- 8 carrier UMTS2100



Experience

Germany, Railway References (BOS)



Experience

China, High Speed Railway lines (GSM-R)

- 95% Market share high sped lines
- 10 Railway Stations
- 2514 Repeater (RU) GSM-R
- 897 Master (MU) GSM-R

Experience

Major References Russia

Metro Lines TETRA (Ministry of internal Affairs)

- Ekaterinburg ~12km Tunnel Coverage
- Kazan ~8km Tunnel Coverage
- Nizhniy Novgorod ~6km Tunnel Coverage
- Volvograd ~6km Tunnel Coverage
- Samara ~10km Tunnel Coverage

Metro Lines TETRA (Metro Operator)

- Nizhniy Novgorod ~6km Tunnel Coverage

Experience

Major References Russia

- Stadler Altenrhein AG „Swissness in Rail“
- Moscow Aeroexpress,
- Train: KISS Double Floor, 16x 4 Wagon, 9x 6 Wagon, Total 25
- Capacity: 158 Millionen Passengers
- Mobile Operator Services onboard: 2G, 3G, 4G
- Lines:

  Sheremetyevo-Moscow,

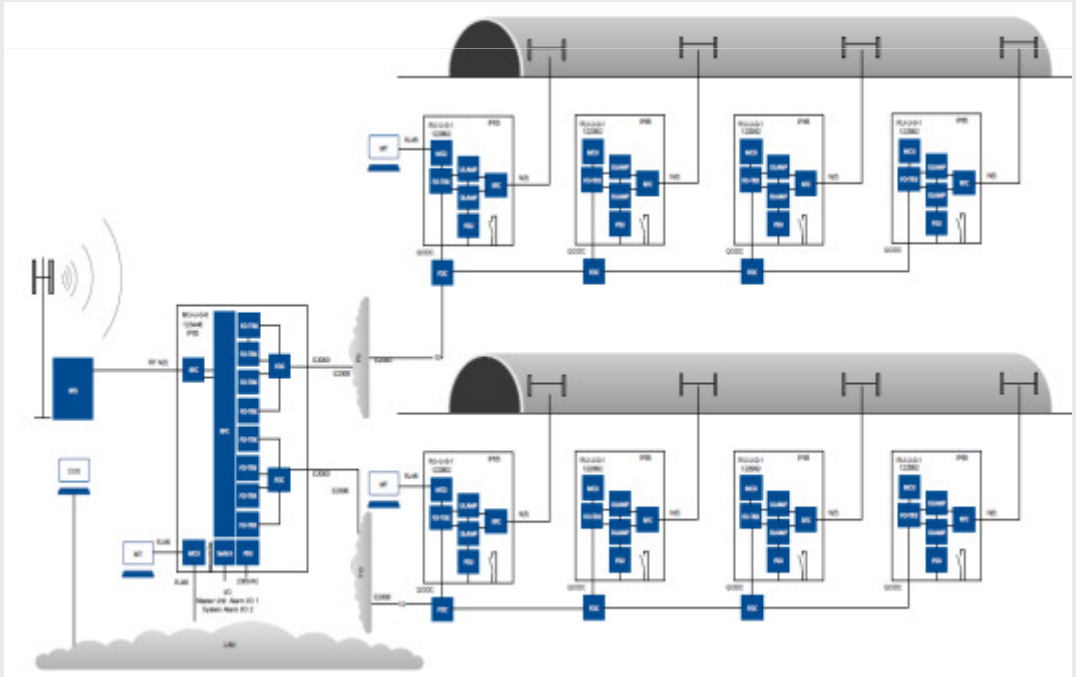
  Domodedovo-Moscow,

  Vnukovo-Moscow

Experience

Major References Singapore

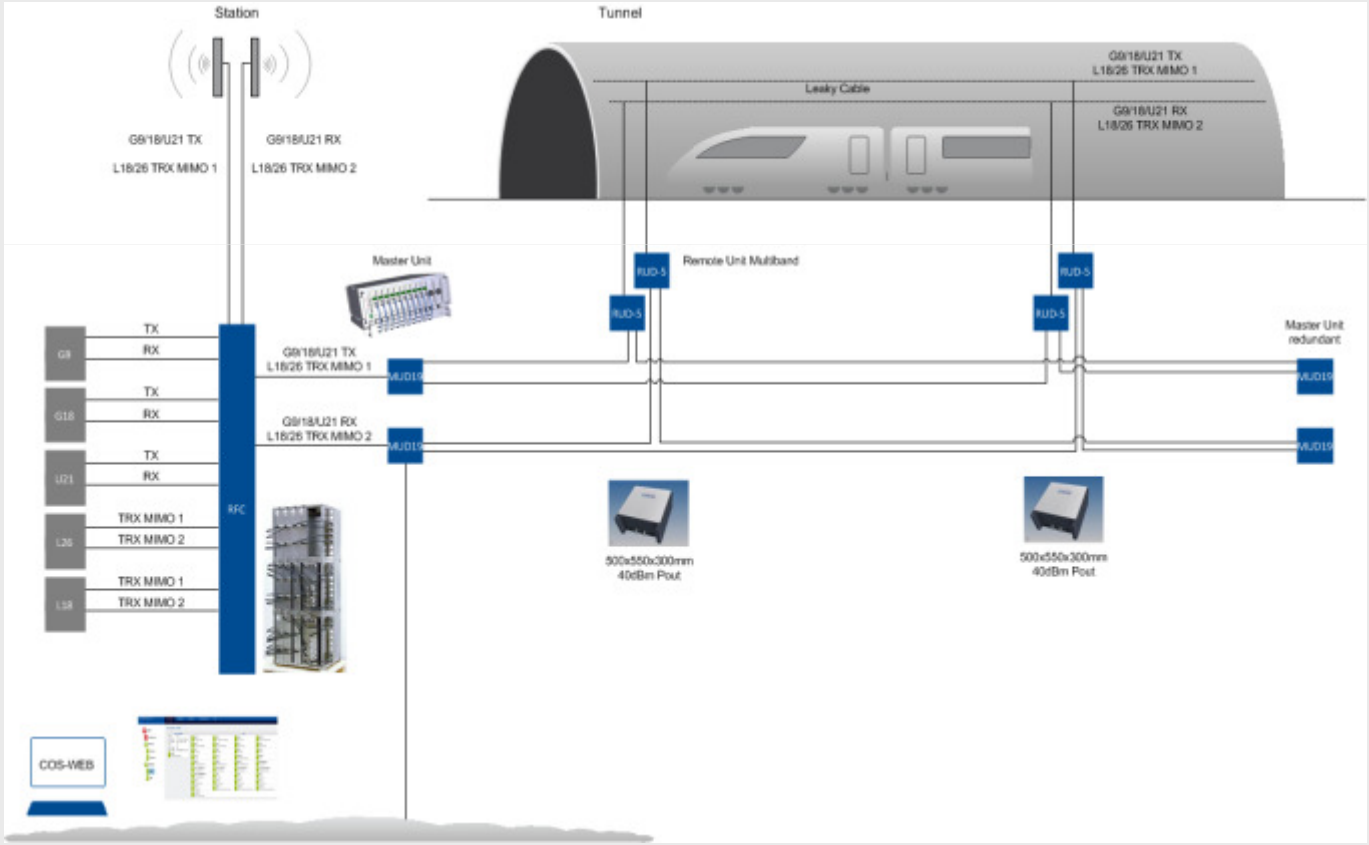
- Light Rail Transit Singapore
- System Integrator: Singapore Technology
- Customer: Land Transport Authority
- Sengkang-Punggol line, ~11km Coverage



Experience

Major References Singapore

- Thomson line Singapore, GSM, UMTS, LTE MIMO 50km



Experience

Major References

- Russia, Germany, Poland, Swiss Intrain Repeater, >200 Systems
- NSN, Stadler, PESA, NEWAG, Intrain Repeater, >961 Systems
- China MOR, >1200km railways solutions
- Austria ÖBB, general contract, >40 railways projects
- Austria Rhomberg-DB, Brenner Nord, 33.9km tunnel
- Switzerland Roadtunnel Graubünden, Bern Tetrapol and FM > 60km
- Switzerland Alpine, Gotthard base tunnel >55km tunnel security radio
- Switzerland SBB, Tetrapol extention >250km tunnel
- Switzerland Major privat Railways projects (ZB,SOB,RBS)
- Switzerland Public operators, UMTS and BTS coupling
- Switzerland Railcity and DML Zürich
- Germany DB, BBI Airport and several lines
- Germany JSA Berlin Reactive Mobile Radio Jamming
- Norway, 8 Tunnel VHF, FM and DAB-T
- Russia, 5 Metro lines TETRA

…

- > 150 other international projects

Portfolio

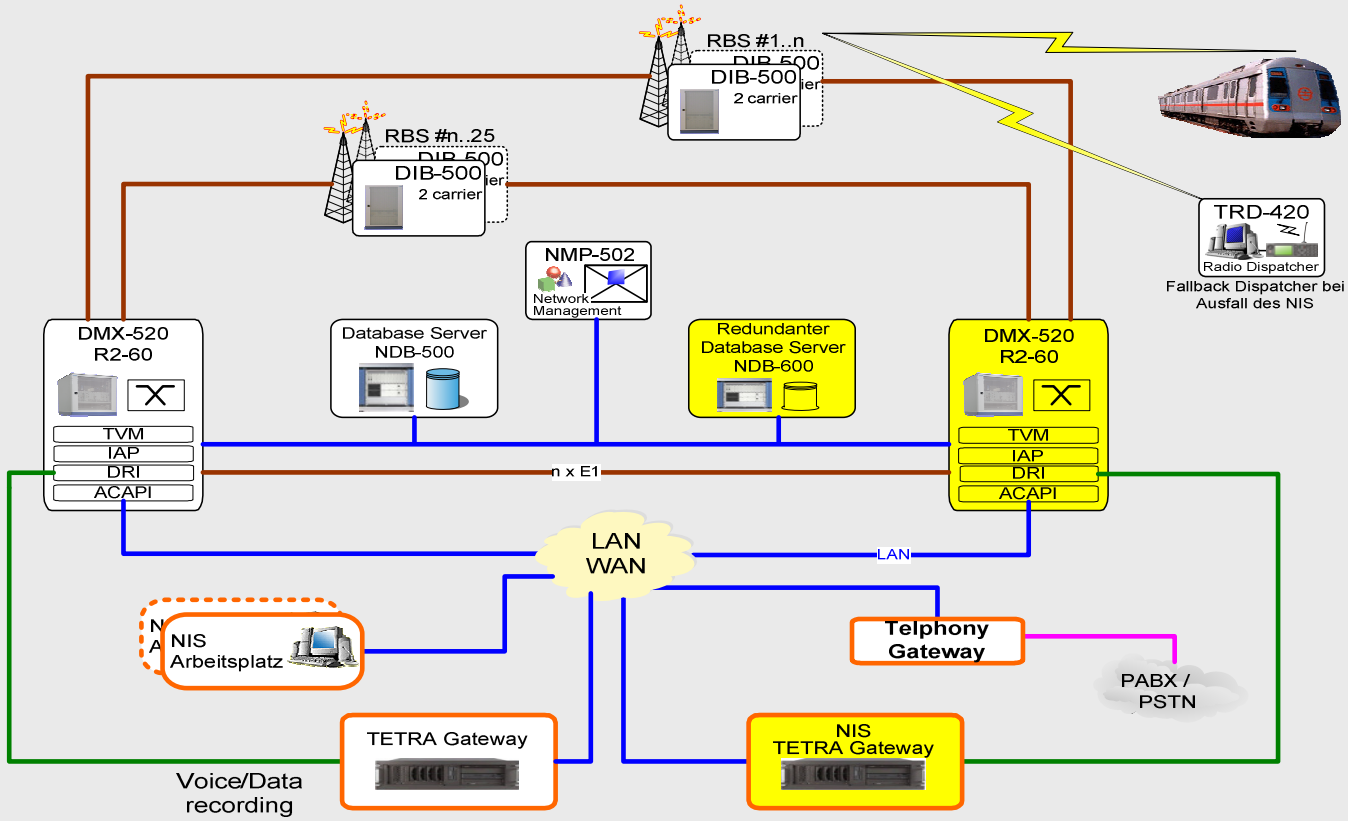
Products & Systems

Turnkey Solutions

Portfolio Turnkey

Solutions with Partners

Turnkey projects (All-In-One, partnerships)



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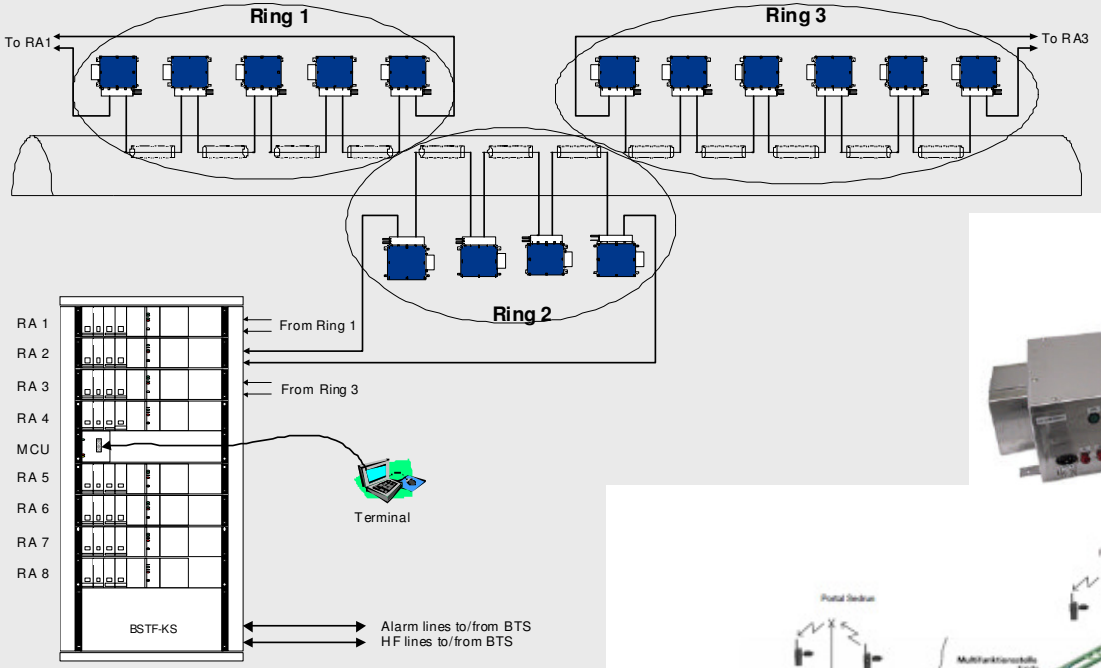
Portfolio

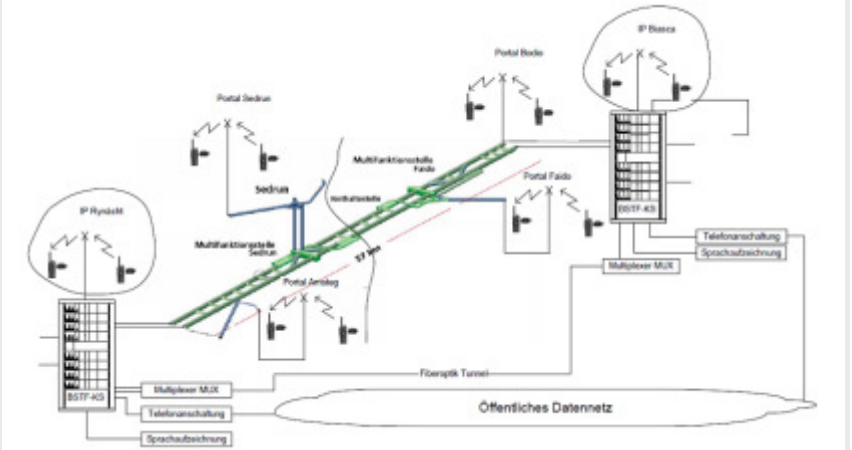
Products & Systems

Temporary Radio Systems

Portfolio

Temporary mobile communication solutions





Portfolio

Products & Systems

Jamming

Portfolio

Jamming

- Secret Service
- Military
- Defence
- Police
- Airforces
- Government
- Closed Public Areas
- Private Porperties Owners

Portfolio

Jamming

- **Modular Jamming System**
- Prison
- Churche and Mosque
- Metro and Railroad
- Embassy, Hospitals…

- **Convoy Jamming System**
- for secure travel
- avoids Radio Controlled Improvised Explosive Devices (RCIED)
- avoids excesses by demonstration

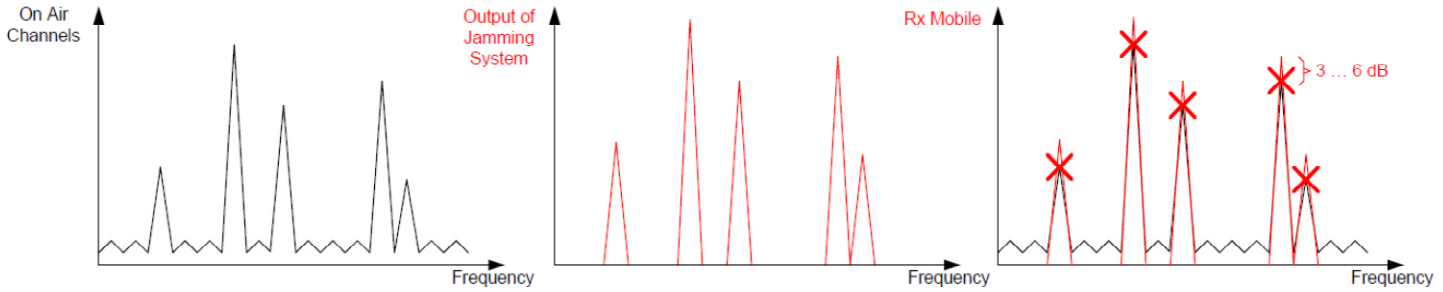
- **Portable Jamming System (Manpack)**
- Bomb deactivation
- supports to arrest
- temporary disruption

Portfolio

Jamming

- Powerful durable Jamming
- Base Station simulation
- Low power decentralized jamming concepts

- Reactive transmission disruption (20…500MHz)
- Durable Jamming with auto cellular carrier detection (cellular services 500..2500MHz)
- Durable Jamming (2500…6000MHz)



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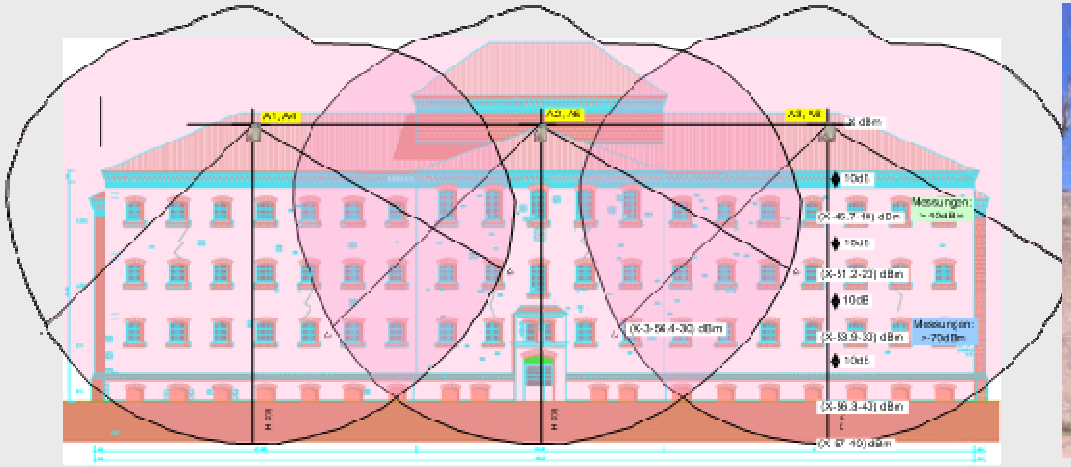
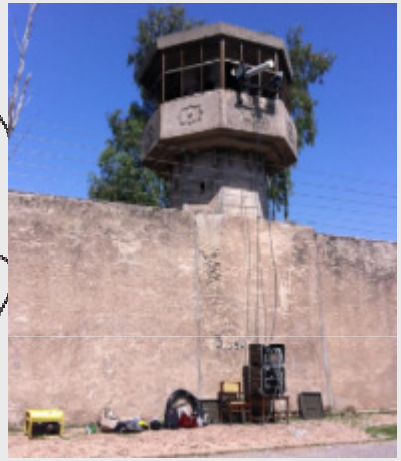
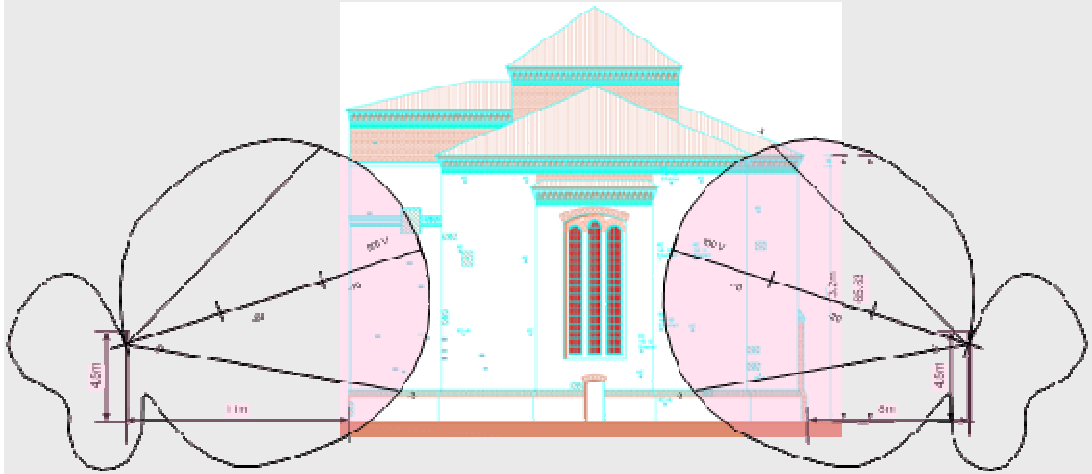
Portfolio

Jamming

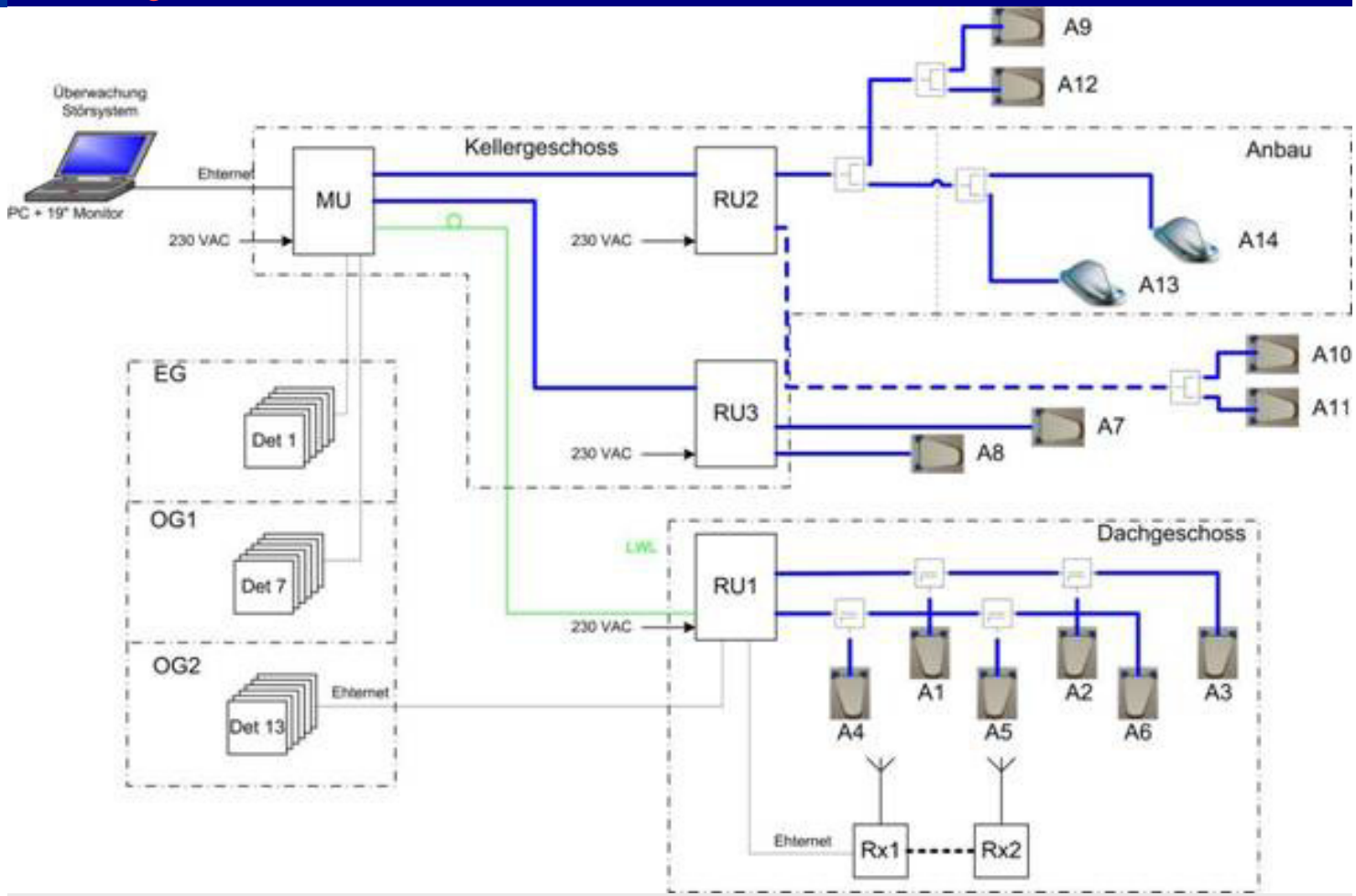






Portfolio

Jamming



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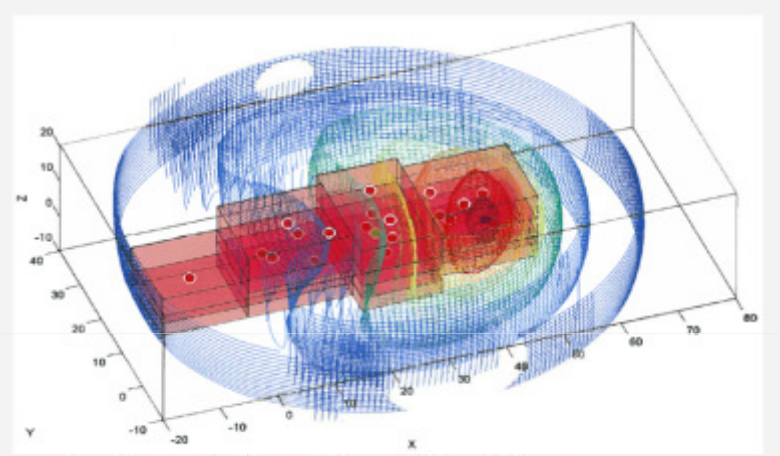
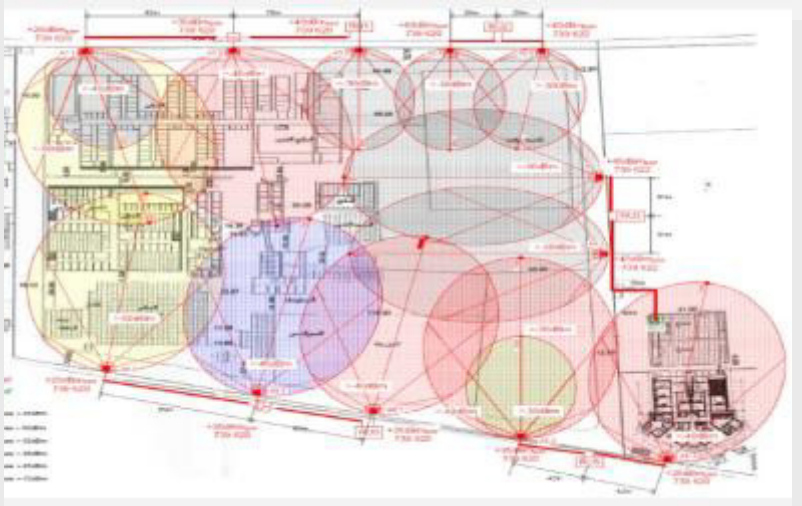
Portfolio

Jamming

- Simulation
- Calculation
- Engineering
- Design
- Site surveys
- Consulting





Portfolio

Jamming

German MJS Certificate

Bundesnetzagentur
für Elektrizität, Gas, Telekommunikation, Post und Eisenbahnen

Zustimmung

Gemäß § 55 Absatz 1 Satz 4 und 5 Telekommunikationsgesetz (TKG) vom 22.06.2004 (BGBl. I S.1190) zuletzt geändert durch Gesetz vom 21.12.2007 (BGBl.I S. 3198) i.V.m Punkt 5.13 der „Vorläufigen Rahmenbedingungen gem. § 55 Abs. 1 Satz 5 Telekommunikationsgesetz (TKG) für die Nutzung von Mobilfunkblockern in Justizvollzugsanstalten (Stand: 16.12.2008)" wird hiermit dem

Senatsverwaltung für Justiz und Verbraucherschutz
Salzburger Straße 21-25
10825 Berlin – Schöneberg

die Zustimmung für den Regelbetrieb von Mobilfunkblockern in der

Jugendstrafanstalt Berlin-Plötzensee
Friedrich-Olbricht-Damm 40
13627 Berlin

auf Grundlage des bei der Bundesnetzagentur vorgelegten Konzeptes vom 25.05.2012 sowie dem Antrag der Senatsverwaltung für Justiz und Verbraucherschutz vom 27.02.2013 unter den in der Anlage genannten Bedingungen und Auflagen erteilt.

Die bestehenden Mobilfunknetzbetreiber hatten während des Testbetriebs Gelegenheit zur Stellungnahme. Hierbei sind keine Aspekte vorgetragen worden, die dieser Zustimmung entgegenstünden.

Der endgültige Betrieb beginnt mit Ablauf des Testbetriebs am

Sonntag, den 17.03.2013

und ist auf 10 Jahre, mit der Option auf eine Verlängerung, befristet.

Mainz, 20.03.2013

Dienstgebäude Mainz

Im Auftrag

(Dienststempel)

Pranke

Anlage
Bedingungen und Auflagen

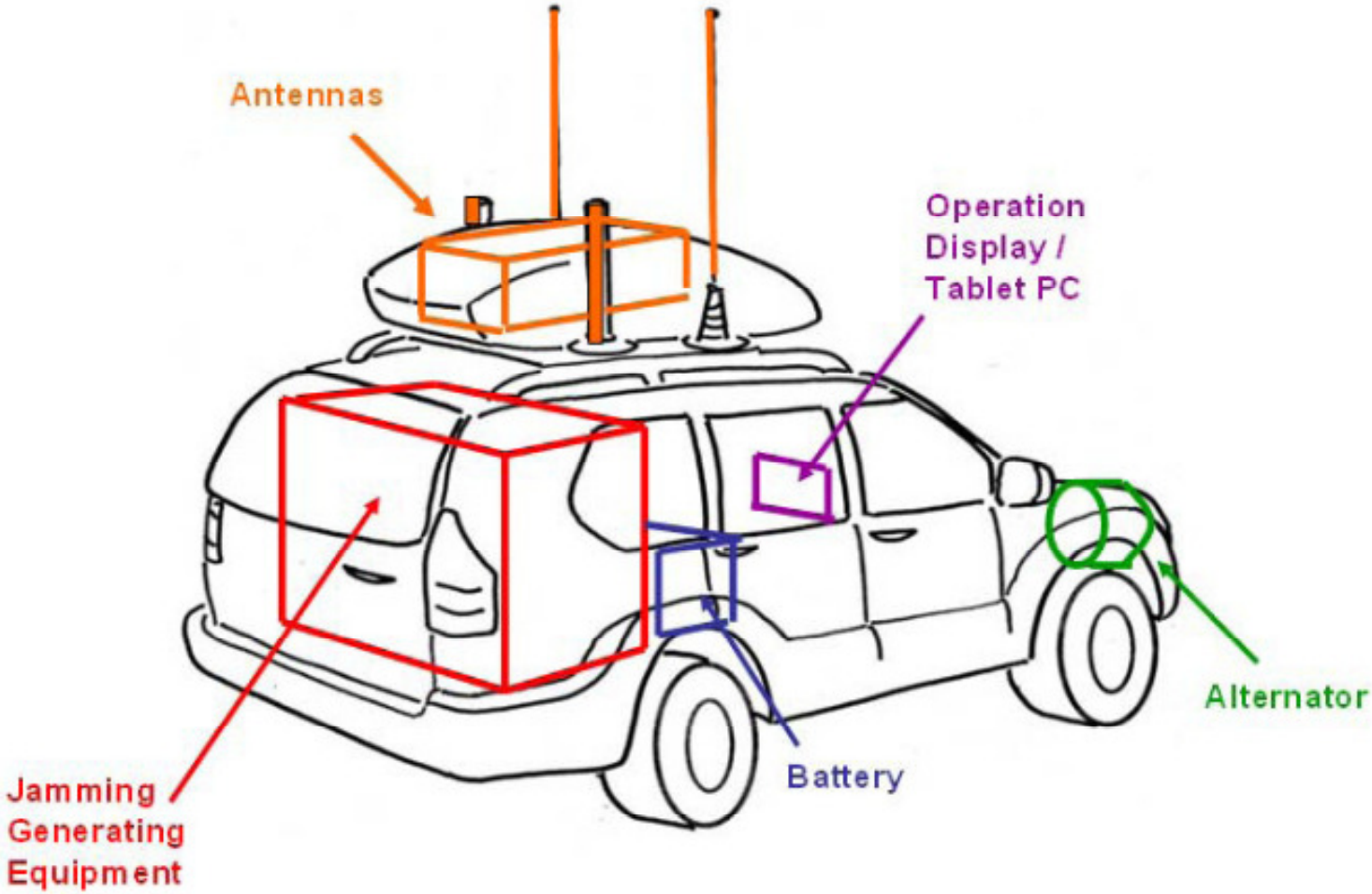
Portfolio

Jamming

Comlab	Other Jamming vendors
Signal power allocation according to the cellular carrier measured outside the prison (MU) + efficient power usage + no out of band disruption (DECT, GPS…)	Signal sweeping technology¨ - missing time frame of jamming - not enough power for BCCH or TCCH carriers - out of band disruption
Efficient Antenna allocation and Antenna diversity with best coverage range inside with isolation outside + less signal cap + less signal power outside the area	Just few Antennas with high power - Signal cap inside - High power outside
Uplink signal detection option used in city areas + it jammes only the time slot from the signal inside prison + no disruption when someone out of the prison uses the cellular phone	Continous jamming - risk of signal disruption outside prison - no improvement of jamming efficiency inside prison

Portfolio

Jamming



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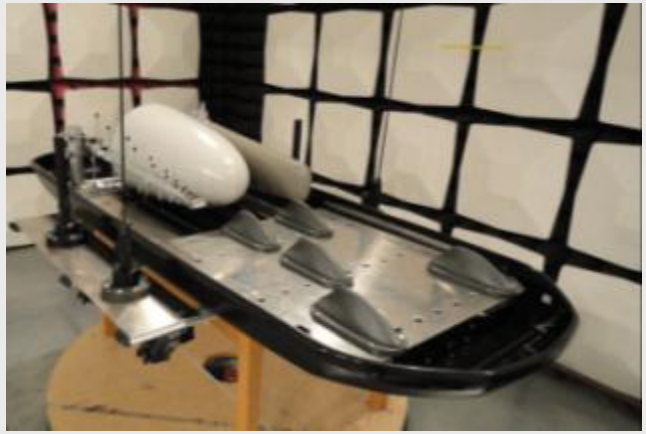
Portfolio

Jamming



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Portfolio

Jamming

Portfolio

Jamming

- 20 – 6000MHz Application
- Compact design
- Cellular phone jamming
- Protection against RCIED

Application range:

- 30…100m radius near BTS
- 100…750m rural area

- Remote control
- Chargable
- LED status Indicator

Portfolio

Jamming Free Field Measurements

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radio frequency technology

Portfolio

Jamming

- Reactive system
- Compact/Transportable
- High efficient
- Fast readiness
- Battery >2h
- Jamming range 1:1-1:3
- PJS R4, UHF-VHF-GSM-DCS
- PJS R4, UHF-VHF-UMTS-WLAN-LTE
- PJS R4, GSM-DCS-UMTS-WLAN-LTE

Portfolio

Jamming

- Mini Jammer
- Office Jammer
- Different OEM Jammer

- Small range
- Low power
- Remote control

Portfolio

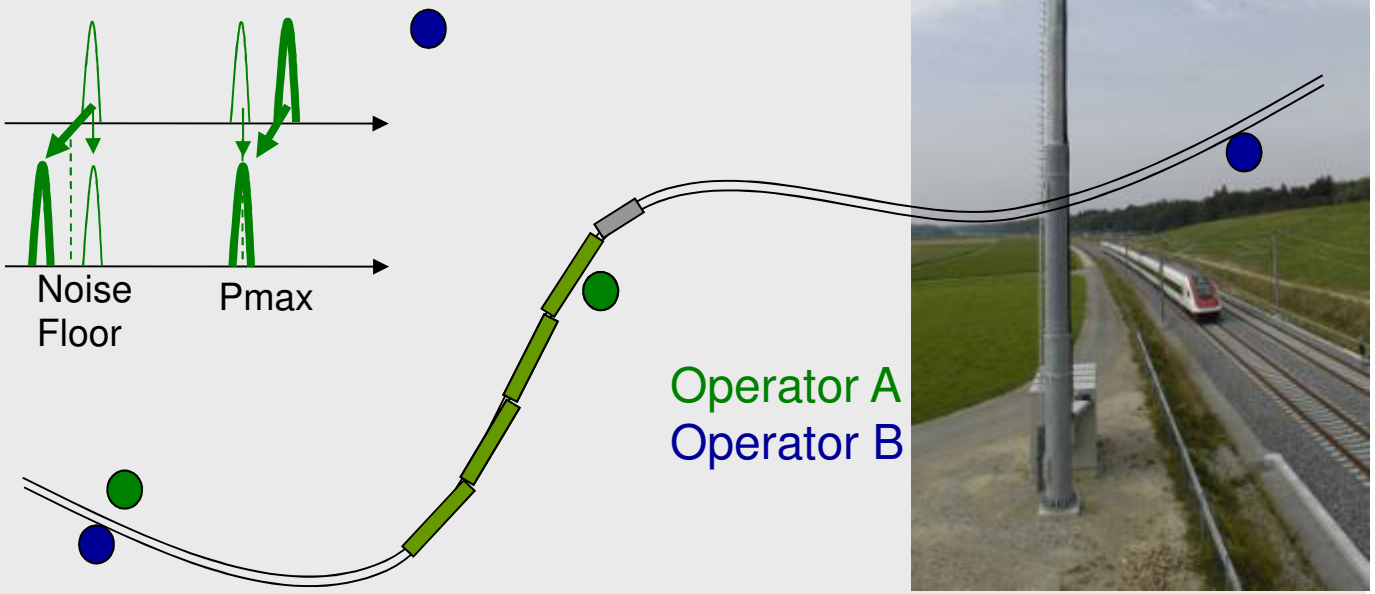
Products & Systems

Intrain and Inboat Application

Portfolio

Intrain Coverage

Gain Trailing
- near far effect is compensated
- no desensitizing of BTS
- each operator has its one multi-subband gain
 (e.g. multiple GSM900 subbands are gaintrailed)

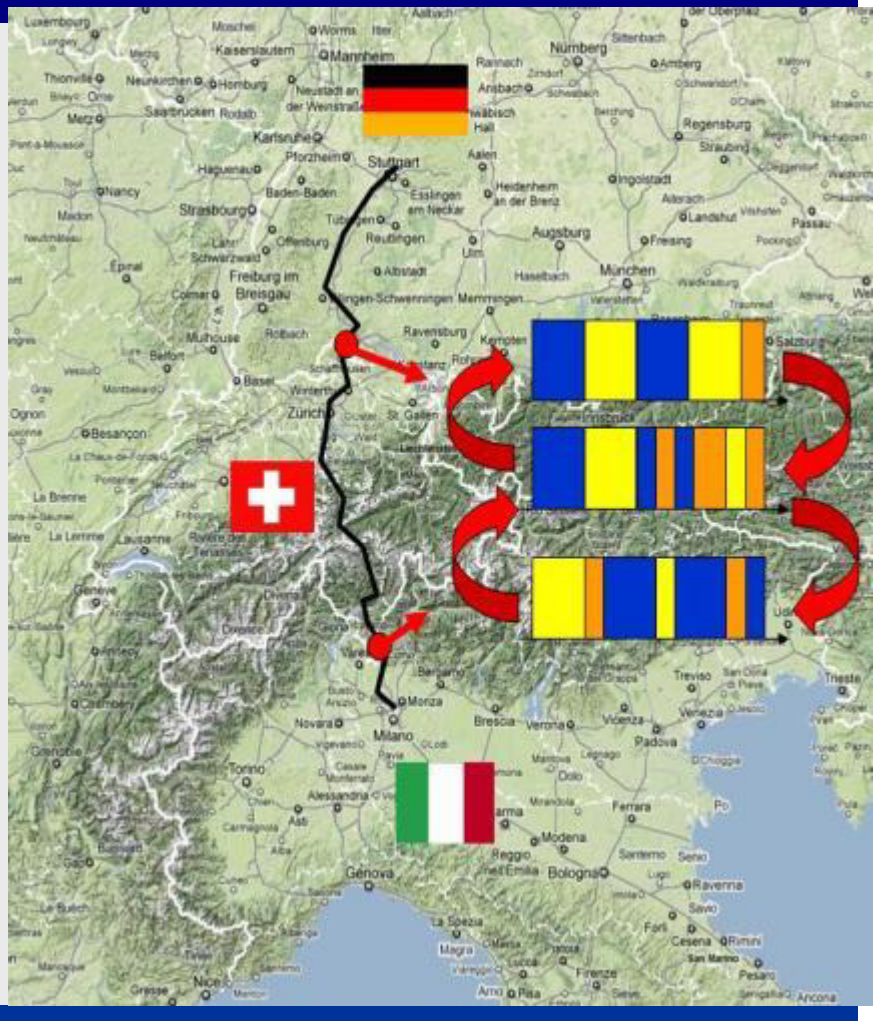


Portfolio

Intrain Coverage

Frequency Switching

- At borders
- Entering areas with different frequency plan

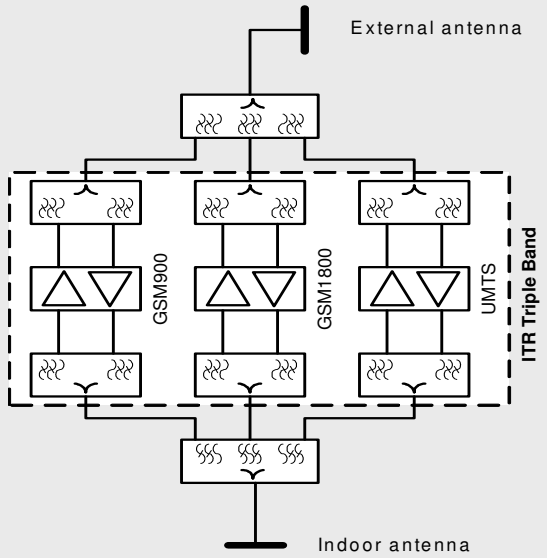


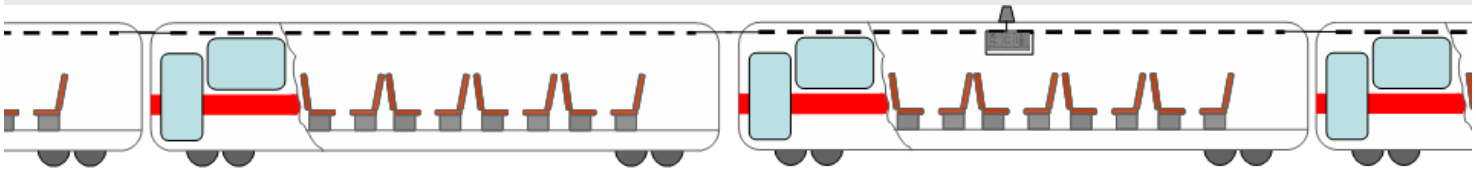
•Polygon set example

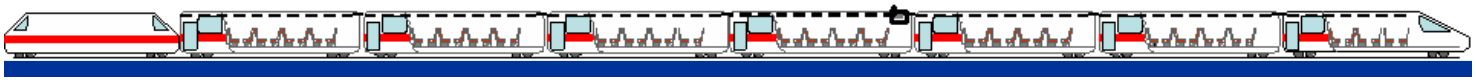
Polygon Number: 001
Polygon Name: Abstellgleis
Vertices: 52.321N, 13.554E; 52.224N, 13.115E, …
Frequency Set: 2 (relates to a frequency band set)
Bands: 1,2,3,4,5,6,7,8,9
DRU: 1,2,3
Band deactivation: no
Gain reduction per band: no (when yes: 10/10/12/12/15/0/10/0/10dB)
DRU deactivation: no
Repeater deactivation: yes
OMC detach: yes
Time Period: none
Delay: 2minutes
Max speed: 30km/h

Portfolio

Intrain Coverage





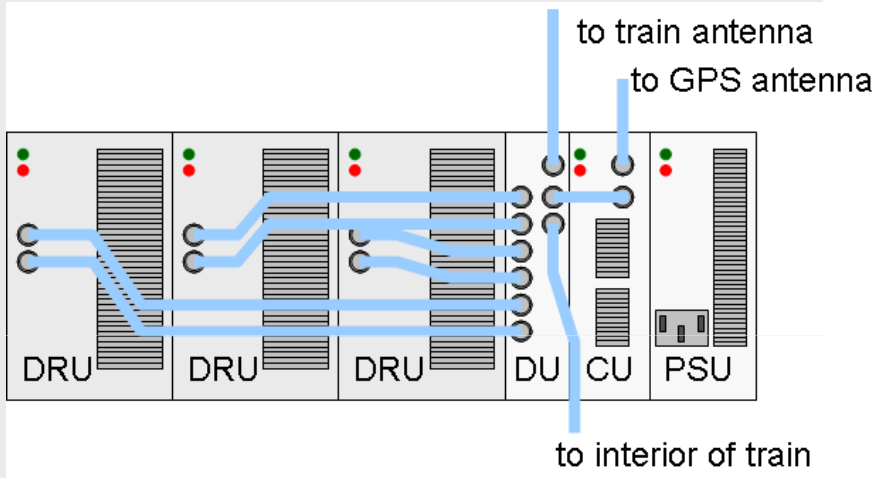


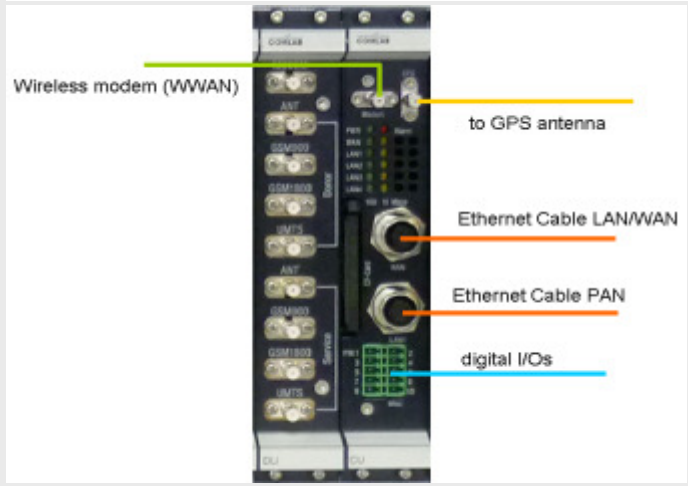
Intrain Coverage

Repeater Concept

Digital Multiband Repeater
- **1…3** Digital Repeater Unit
  up to 15 Subbands available
  gain 45-85dB (DRU)
- Distribution Unit (DU)
- Control Unit (CU) M12 Socket
- Power Supply Unit (PSU)
  24-48VDC, 50.4-137VDC
  90-132VAC, 180-264VAC

Features:
- FPGA for each Band
- Hot Swap capability (front)
- 2 External I/O
- Repeater setting on Flash Card



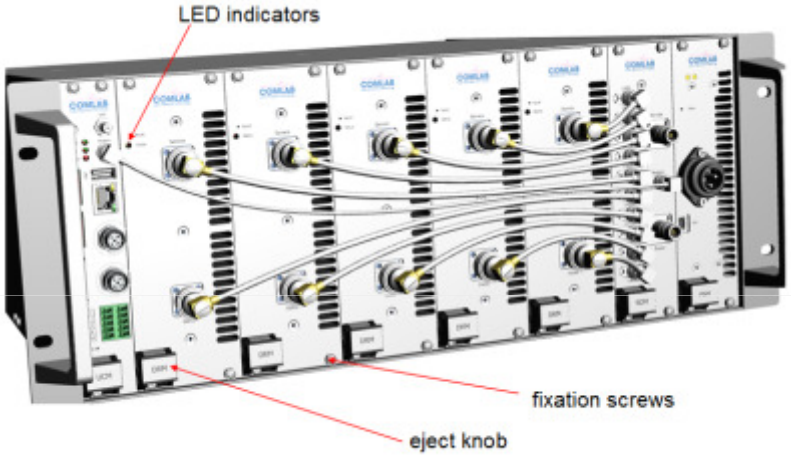


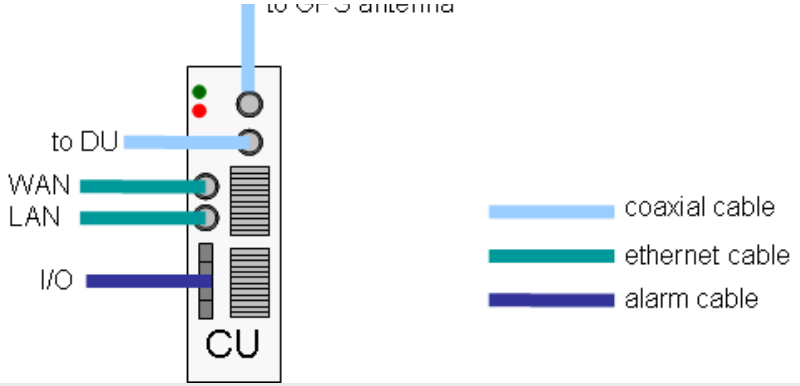
Intrain Coverage

Repeater Concept

Digital Multiband Repeater
- **1…5** Digital Repeater Unit
  up to 15 Subbands available
  gain 45-85dB (DRU)
- Distribution Unit (DU)
- Control Unit (CU) M12 Socket
- Power Supply Unit (PSU)
  24-48VDC, 50.4-137VDC
  90-132VAC, 180-264VAC

Features:
- FPGA for each Band
- Hot Swap capability (front)
- 2 External I/O
- Repeater setting on Flash Card





Portfolio

Intrain Coverage

Features:

- Flexible frequency setup
- provider power share subbands
- Gain setting
- Gain trail offset
- Complex filter configurations possible (near-far, channel spacing)
- Multiple standards in the same band (e.g. GSM,UMTS900)
- Filter changes when crossing borders
- Different Filter Grades on the same module (low, medium, high)
- Remote fleet mass upgrade during frequency refarming

Portfolio

Intrain Coverage

Features:

- Provider specific gain and output power setting
- TDMA Uplink noise muting (no desensibilisation BTS or Repeater system)
- Echo cancellation
- TETRA and TETRAPOL Band expansion
- Hot Swap capability (front)
- 2 External I/O
- Repeater setting on Flash Card

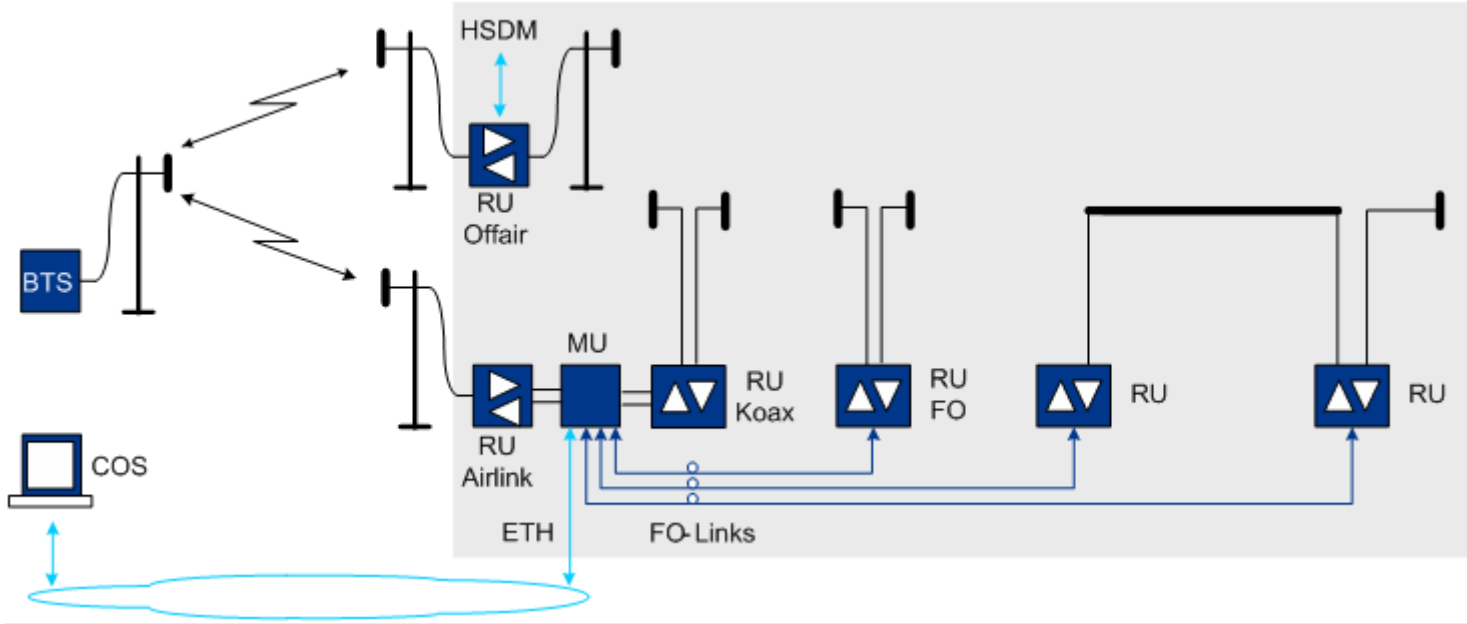
Indoor and Tunnel Applications

Portfolio in General

Repeater Types

Repeater Types

- Offair channel selectiv
- Airlink band selectiv
- Airlink channel selectiv
- Fiber Optical channel or band selectiv



Portfolio in General

Supported Frequency Bands

Analogue and digital Radio:

- 40MHz Radio, SD
- 8m Radio, S/SD
- 2m Radio, S/SD
- 70cm Radio, S/SD
- TETRA, TETRAPOL

Broadcast:

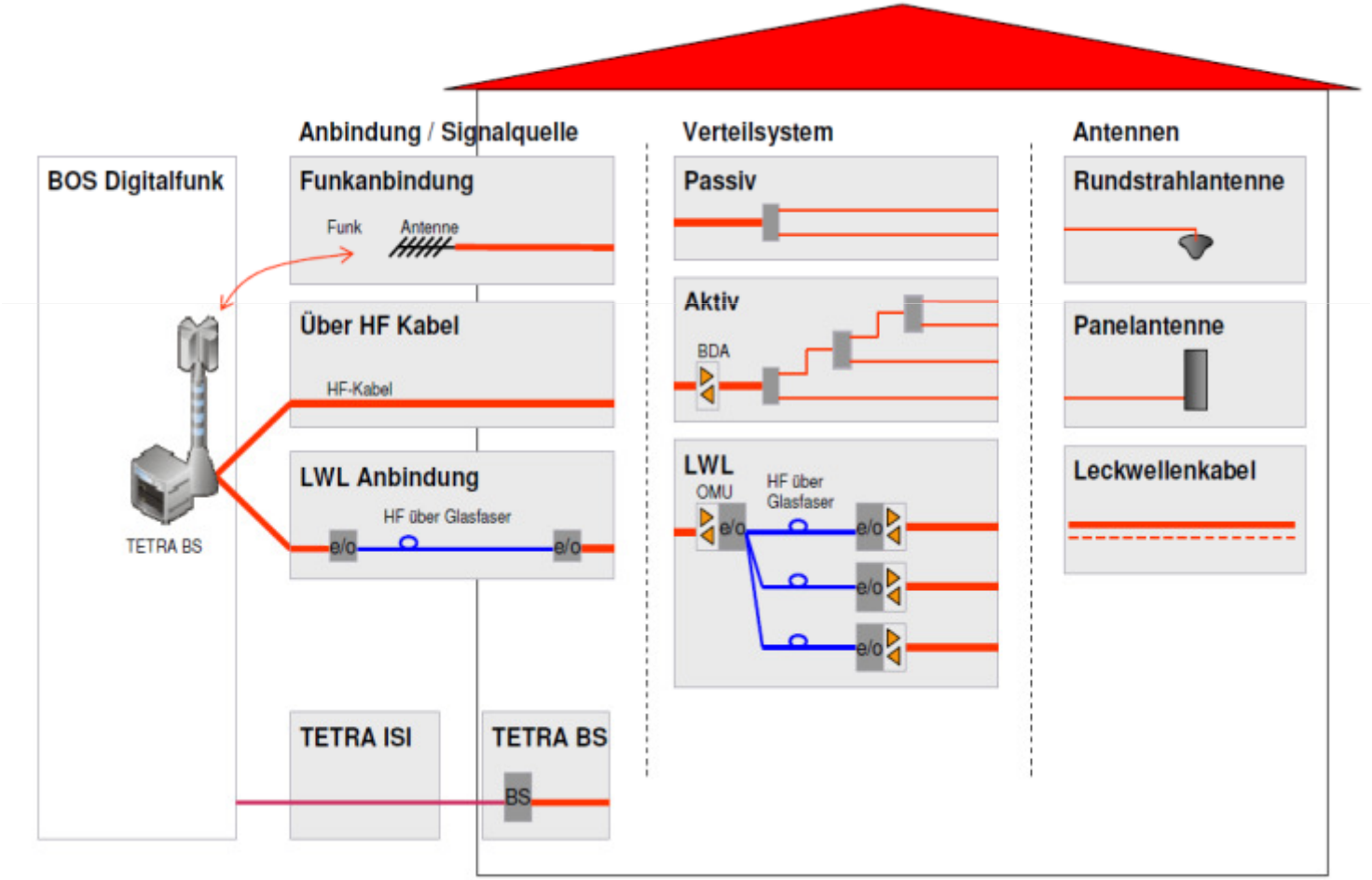
- FM, FM-Info, DAB, DAB-Info, DVB-T, ISDB-T

Cellular phone services:

- CDMA 410, 430, 450MHz
- GSM-Railways
- LTE-800, GSM/UMTS-900, GSM/LTE-1800, UMTS2100, LTE-2600
- LTE-700, SMR800, AMPS850, SMR900, PCS1900, AWS17/21
- Others on request…

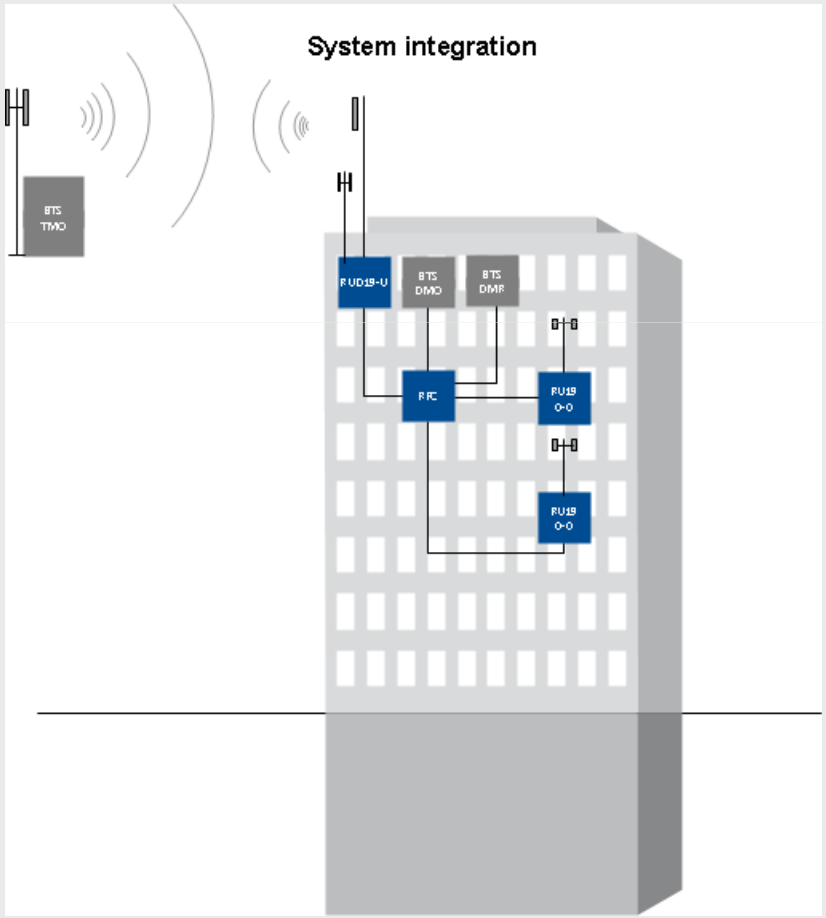
Portfolio Indoor

Repeater Systems



Portfolio Indoor

Singelband Repeater Systems

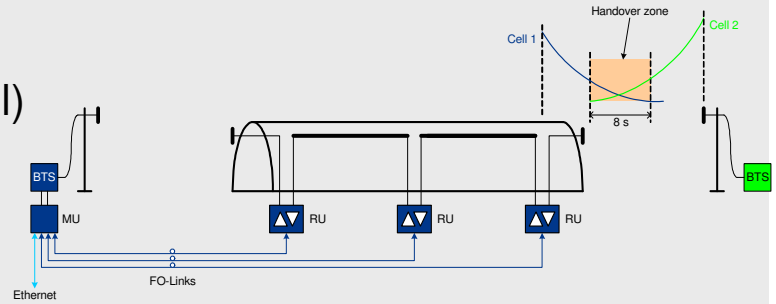


Portfolio Tunnel

Repeater Systems

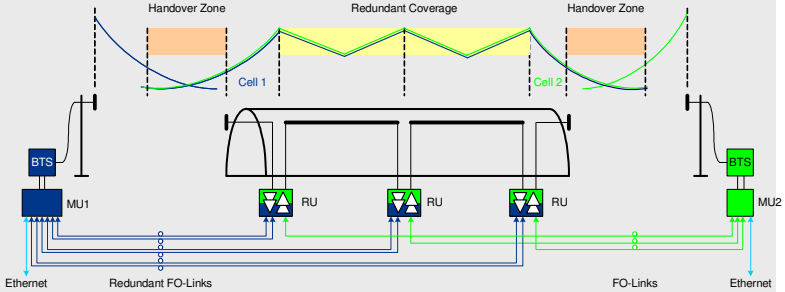
Coverage concepts:

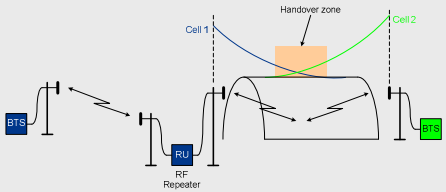
- 1 BTS (Handover inside Tunnel)
- 2 BTS (Handover outside Tunnel)

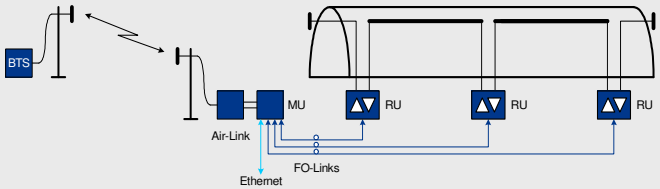


Interface BTS - Repeater:

- Koaxial cabel
- Fiber optic link
- Airlink band selectiv
- Airlink channel selectiv
- Offair channel selectiv





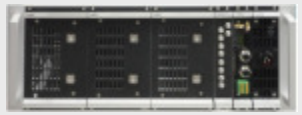


Portfolio

Singelband Repeater Digital

Features:

- **DL BCCH Monitoring, UL TDMA Muting**
- **Digital Subband ALC**
- **Frequency shift Function**



Versions:

- 1 Band Repeater 19, 25, 40dBm
- 3 Band Repeater 25/25dBm
- 5 Band Repeater 25/40dBm

Application:

- Inhouse Coverage
- Tunnel coverage
- Singleband BTS Airlink, Offair

Application Frequencies:

- FM, DAB, VHF&UHF Radio, Tetrapol, Tetra, GSM-R, LTE-800, GSM/UMTS900, GSM/LTE-1800, UMTS2100, LTE-2600

Fiberoptical Repeater

Master Unit Single Band

Features:

- 19“-Rack concept
- MU Frequency range **68-1000 and 380-2700MHz**
- MU input power range **10…35dBm**
- 10dBm FO-TRX Power with **10dB Optical loss compensation**
- Wide primary voltage range **33..75VDC, 90..264VAC**
- Repeater **easy to replace modules**
- **Integrated 10MB Ethernet** in WWDM FO
- I/O Interface **8IN** / **8OUT**

Fiberoptical Repeater

Remote Unit Single Band

Features:

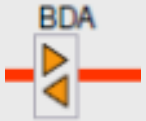
- RU19 = IP43, RU = **IP67 case, 6kPa 3sec (EIRENE)**
- **Lightest and smallest box** available on the market (17kg)
- 10dBm FO-TRX Power with **10dB Optical loss compensation**
- Wide primary voltage range **33..75VDC, 90..264VAC**
- Uplink gain range 25…45dB (optimized dynamic range)
- **DC blocks already installed** (up to 3kV) for transient peak voltage protection (high speed line applications)
- Repeater **easy to replace (connectors)**
- **Integrated 10MB Ethernet** in WWDM FO
- I/O Interface **8IN / 8OUT**
- Power class **25, 36 and 40dBm**

Fiberoptical Repeater

Repeater Types Single Band

Single Band IP67

- RU(D)-x-0-2- 25/36/40
- Option **46dBm**



Single Band 19“Rack

- RU19(D)-x-0-2-25/36/40
- Option **46dBm**

Frequencies:

- LTE, CDMA 410, 430, 450MHz
- GSM-Railways GSM-R900, GSM-R1800
- LTE-800, GSM/UMTS-900, GSM/LTE-1800, UMTS2100, LTE-2600
- LTE-700, SMR800, AMPS850, SMR900, PCS1900, AWS17/21
- TETRA, TETRAPOL

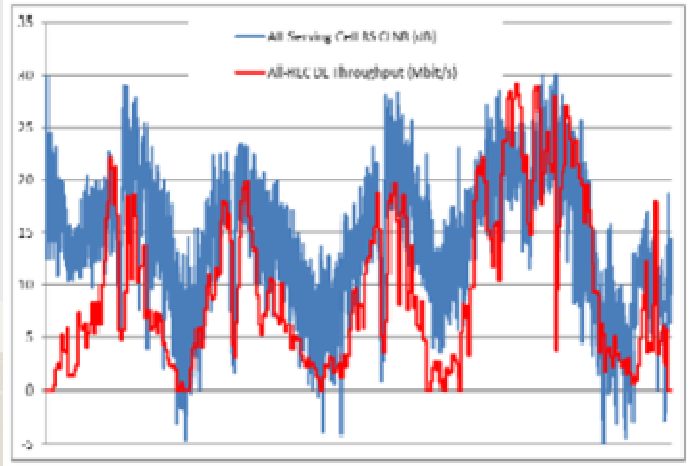
Portfolio

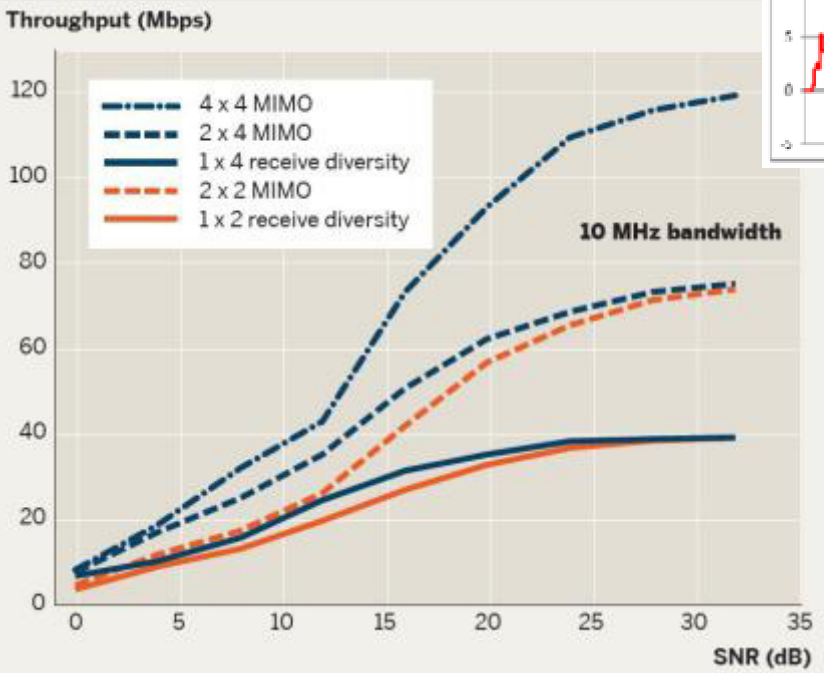
Installation inside tunnel

- Wall or cabinet mounting solution

Portfolio

Multibandrepeater Digital

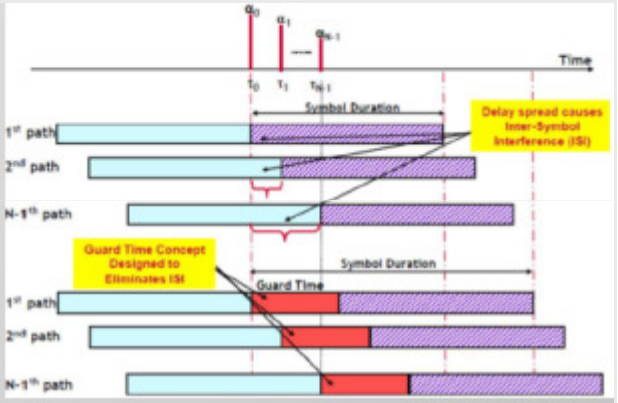




Portfolio

Multibandrepeater Digital

- **Inter Symbol Interference (ISI)**
  - Mehrwegausbreitung führt zu ISI
  - Degradation von SINR, CQI
  - Gegenmassnahme: CP (Guard Time)

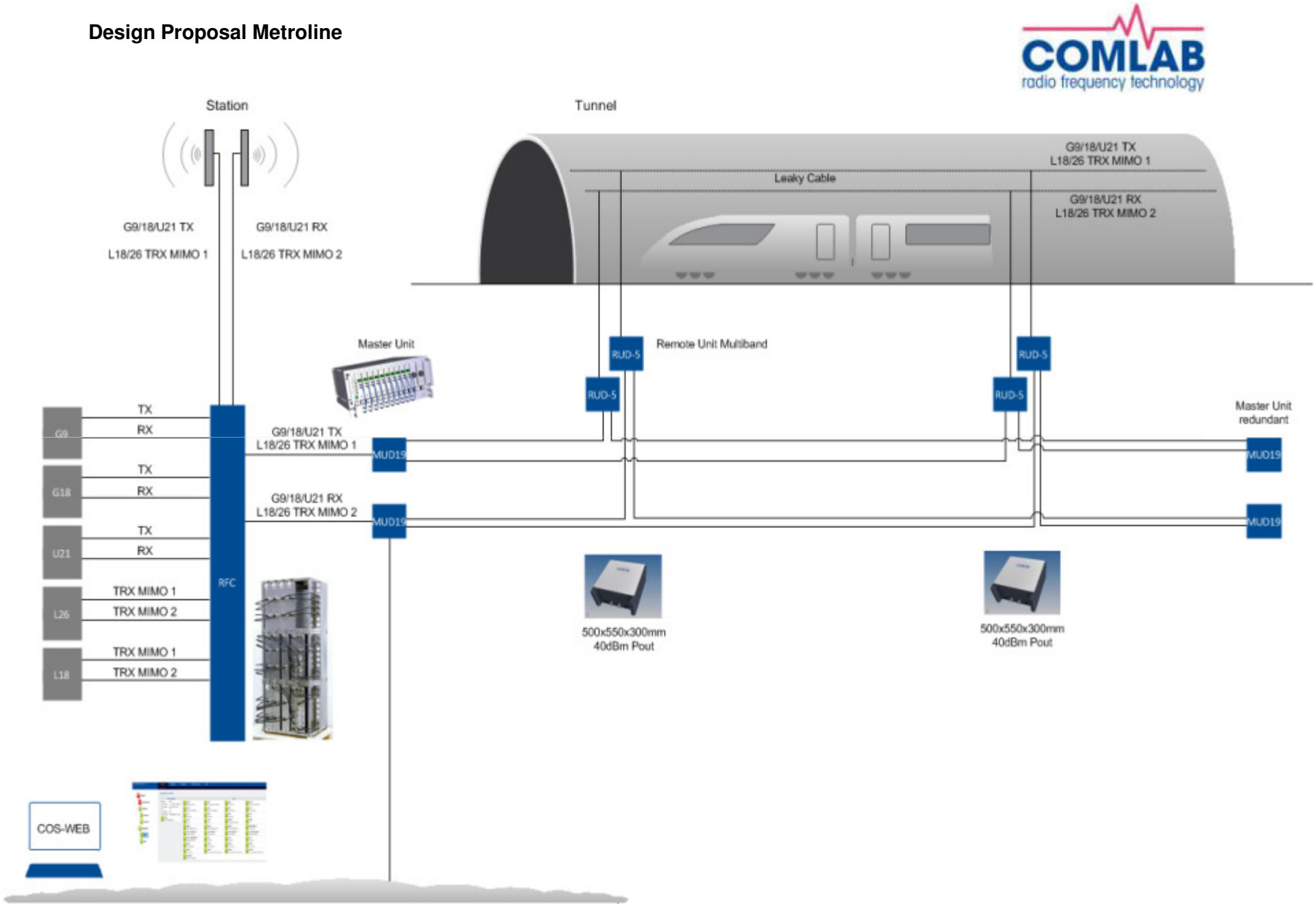


© Dr. Doru Calin, Introduction to WiMAX and LTE Systems, Columbia University

- **Cyclic Prefix (CP)**
  - Normal CP: 4.7 µs (Indoor)
  - Extended CO: 16.7 µs (Urban)
  - zulasten Datenrate

- **Distanz zwischen Tunnelstationen**
  - 1 km ergibt ca. 5 µs Propagation Delay zwischen Tunnelstationen
  - dies führt zu ISI bei Normal CP (Degradation von SINR, CQI)

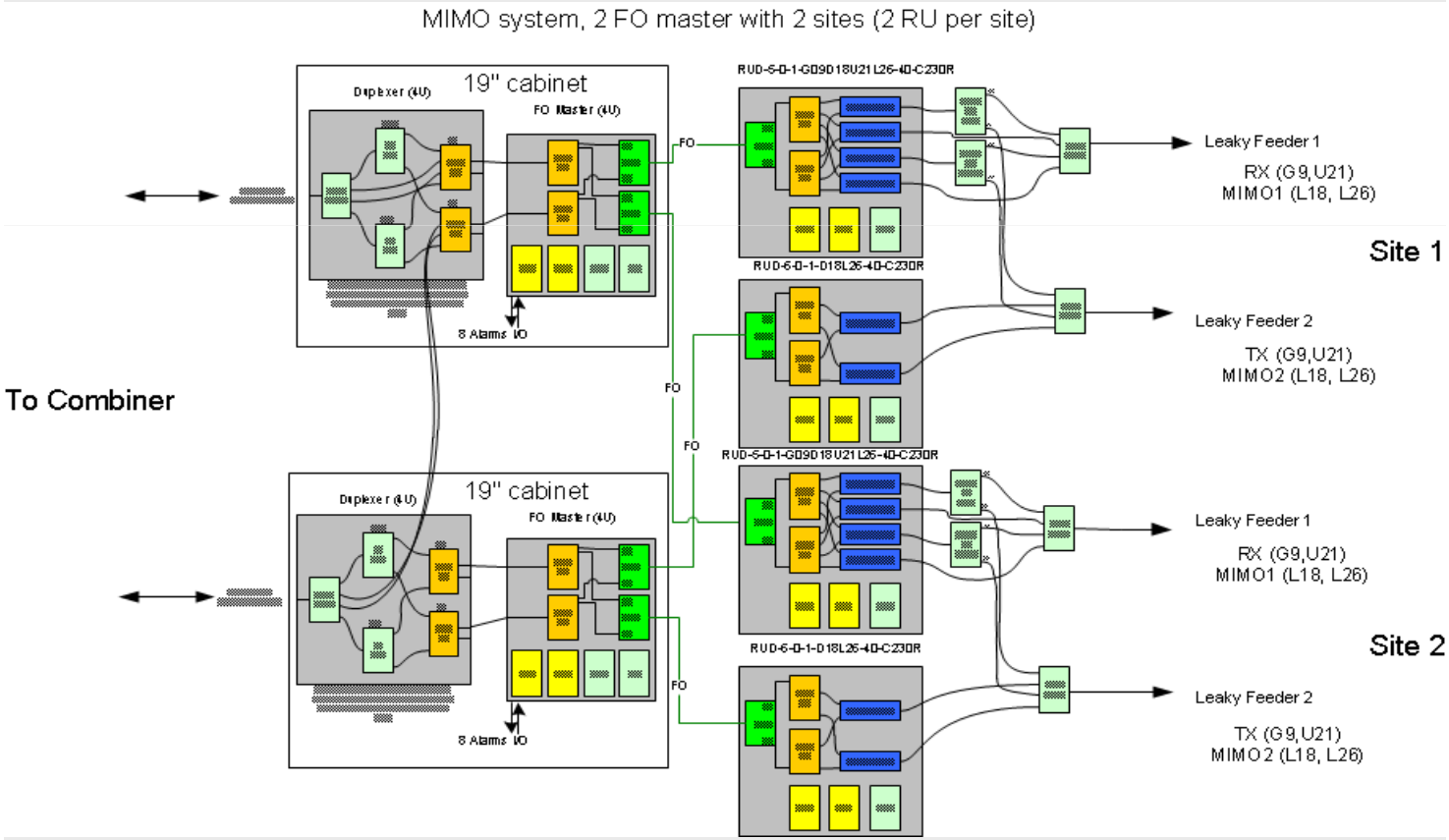
Design Proposal Metroline



Experience

Major References Singapore

- Thomson line Singapore, GSM, UMTS, LTE MIMO 50km



Fiberoptical Repeater

Repeater Types Multiband

- 5-Band System Digital
- LTE SISO and MIMO Function

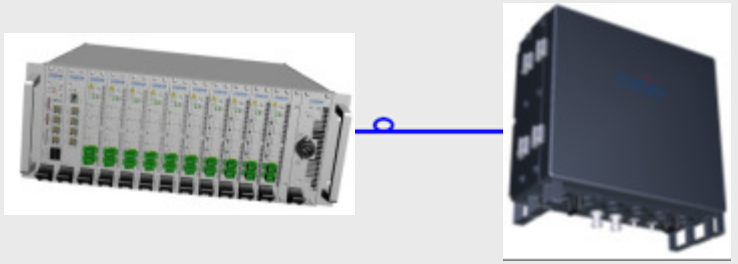
Multiband Repeater Lower Band RUD-5 LB				Strahlungskabel Typ F-RMC158-B oder U		Multiband Repeater Upper Band RUD-5 UB				
FM / DAB	TETRA	DMR	GSM-R			800	900	1800	2100	2600
x	x	x	x			x	x	x	x	x
						MIMO		MIMO		MIMO

Portfolio

Multibandrepeater Digital

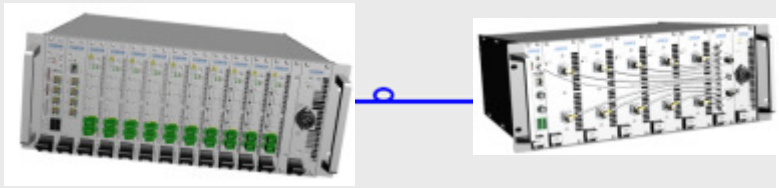
Multiband IP67

- RUD-5 **40dBm**



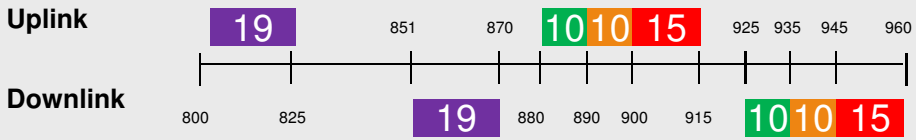
Multiband 19“Rack

- RUD19-5 **40dBm**



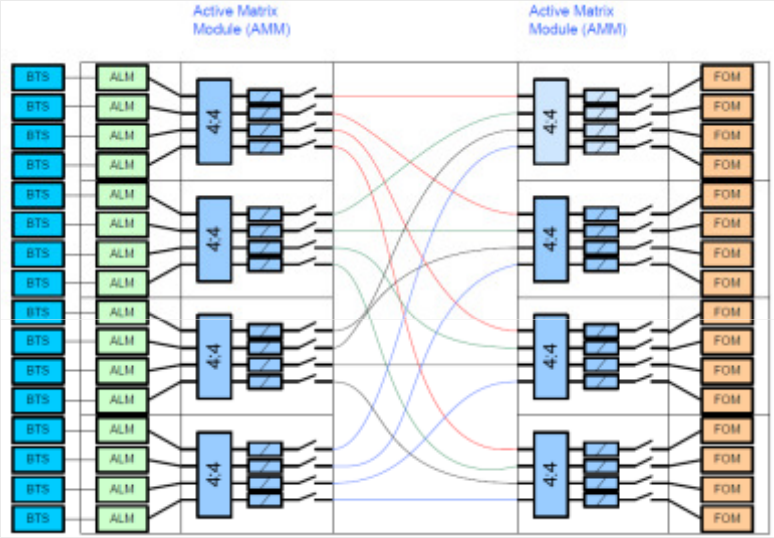
Advantages:

- BCCH Detection, TDMA Muting, Leacky Feeder Monitoring
- Auto Setup and BTS Link adjustment (easy setup on site)
- 1 Fiberoptical Link 14dB WWDM (daisy chain up to 4 Remote)
- Operator selectivity



Portfolio

Multibandrepeater Digital



Master Unit Digital MUD19-5:

Advantages:

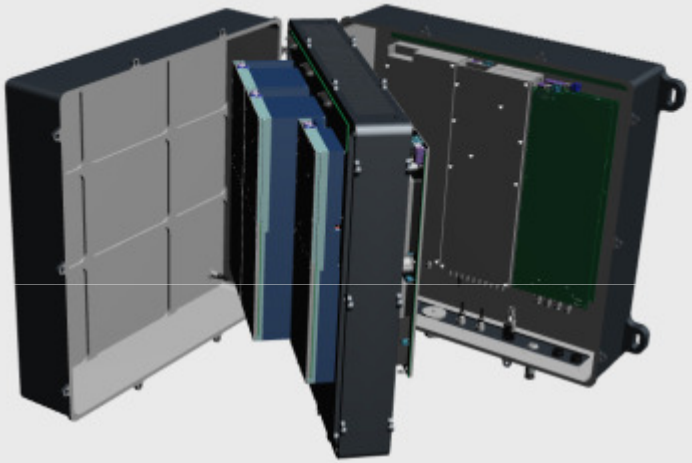
- Handover and Power level allocation in Master Unit
- Up to 2 Fiberoptical link each FOM (redundant, non-redundant)
- Redundant and reliable Power Supply Units
- Up to 20 Remote Unit with one 19“Rack, 4HU
- GBit Switch integrated, 2 Alarm I/O
- Modul hot-swap exchangable (add and remove RUDs easy)

Portfolio

Multibandrepeater Digital

Repeater Unit Digital 5-Band 40dBm:

- Very high efficiency (DPD, FFPA)
- Modul hot-swap replaceable
- Easy to setup
- IP66 Enclosure 500x550x300mm
- 10 Alarm I/O



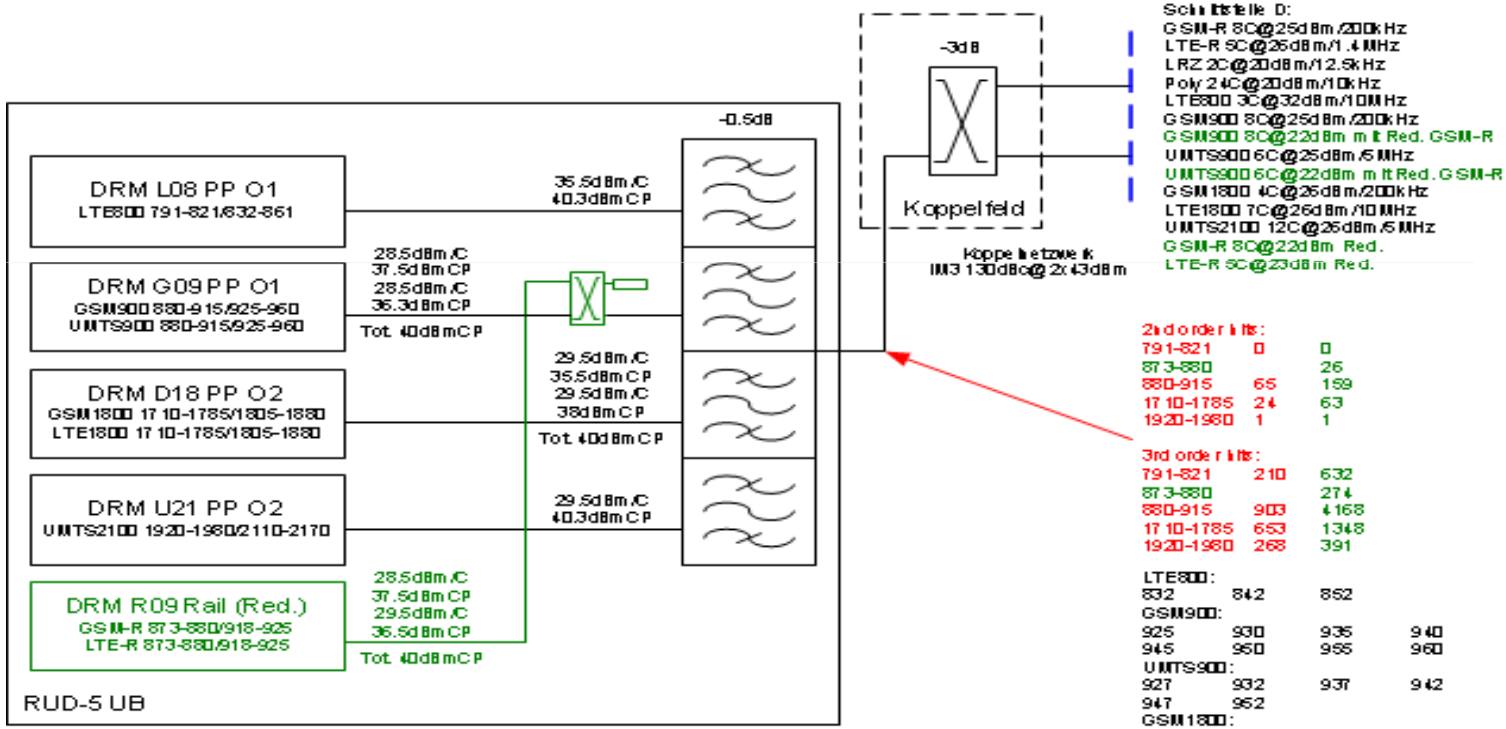
Advantages:

- Up to 16 Subband each Modul
- Up to 3 Fiberoptical link in Remote Unit Digital
- Redundant and reliable Power Supply Units
- 5dB Noise Figure, 40dBm Composite Power
- BCCH, Link and Leacky cable monitoring
- Auto PIM detection Antenna and Leacky Cable

Portfolio

Multibandrepeater Digital

Specification RF-Combiner Out IM3 = 130dBc@2x43dBm



COMLAB
radio frequency technology

Portfolio

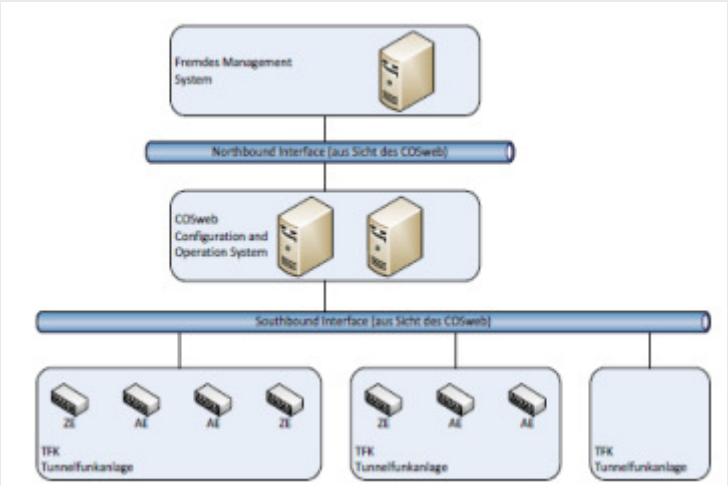
Products & Systems

Configuration and Monitoring Software

Portfolio

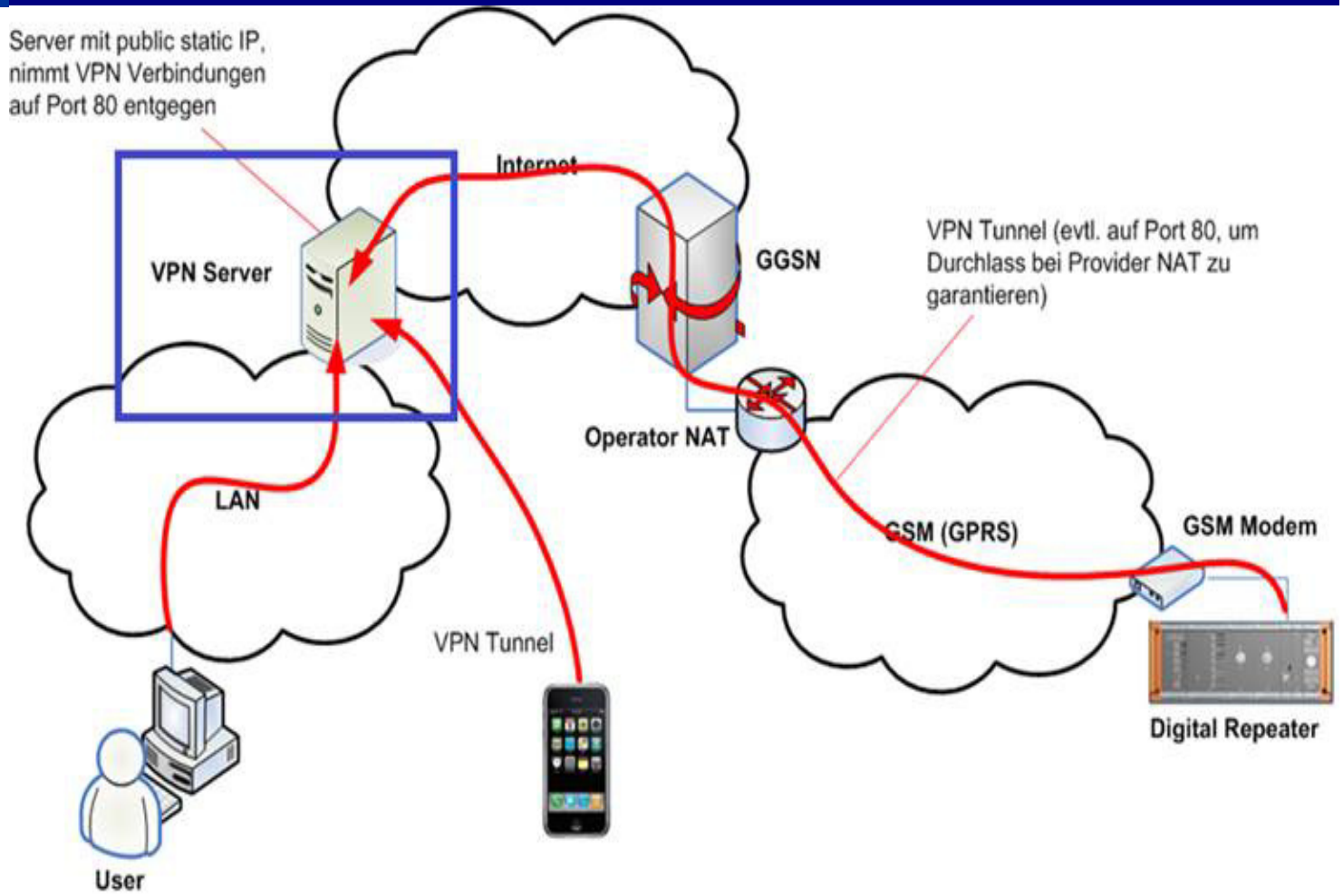
Configuration and Operation Software

- User Gui Webbrowser, COS-Web Software
- Alarmmanagement SNMPv2
- Konfigurationsmanagement HTTPs
- Inventory Management HW & SW, Discovery COS
- Performance Management, local Data storage
- Reporting Format xls, csv, pdf
- Security Management, SBIF & NBIF
- User: Admin, Operator & Observer
- Redundant COS-Web Server
- Documentation pdf on screen



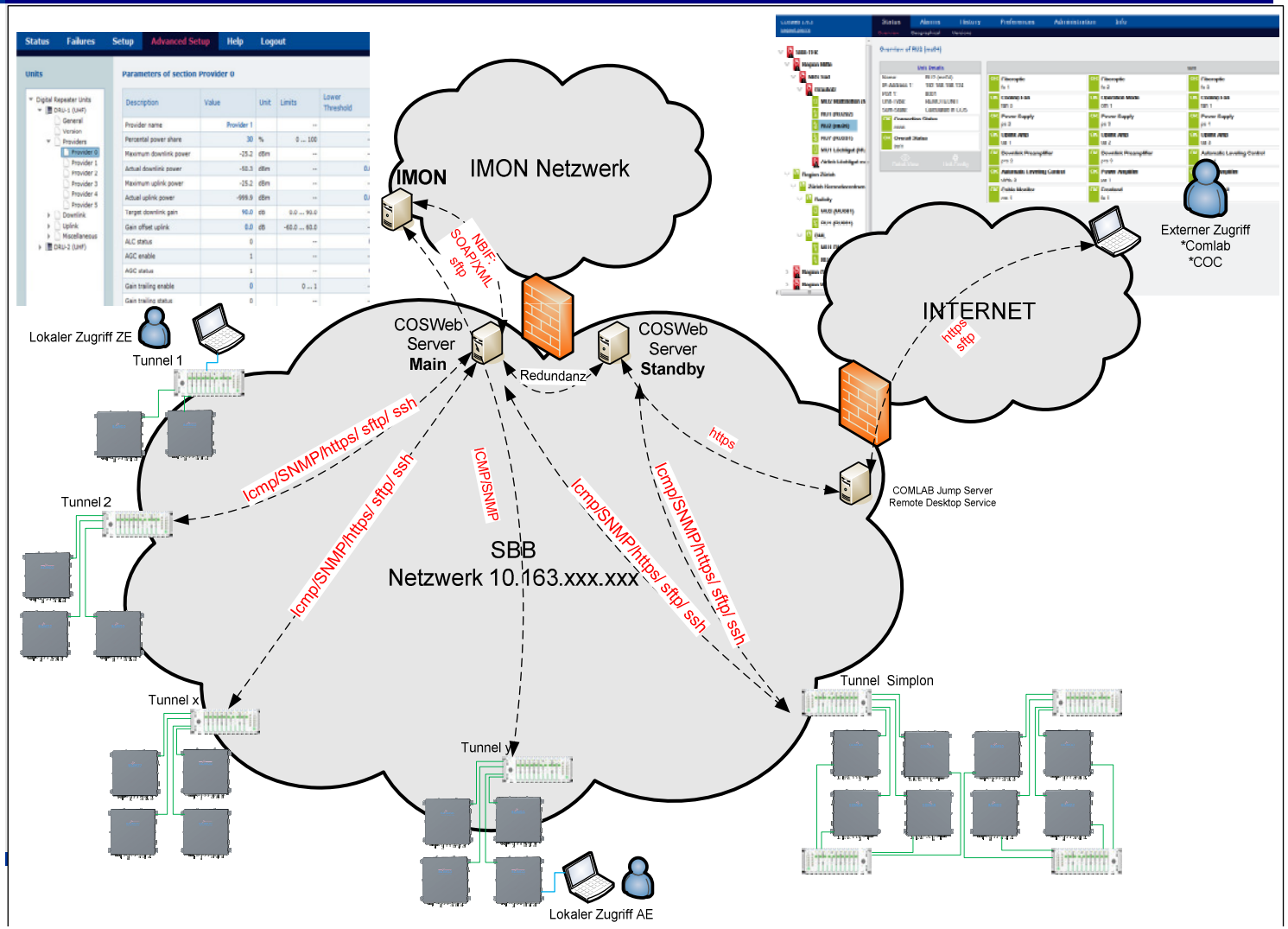
Portfolio

COMLAB



Portfolio

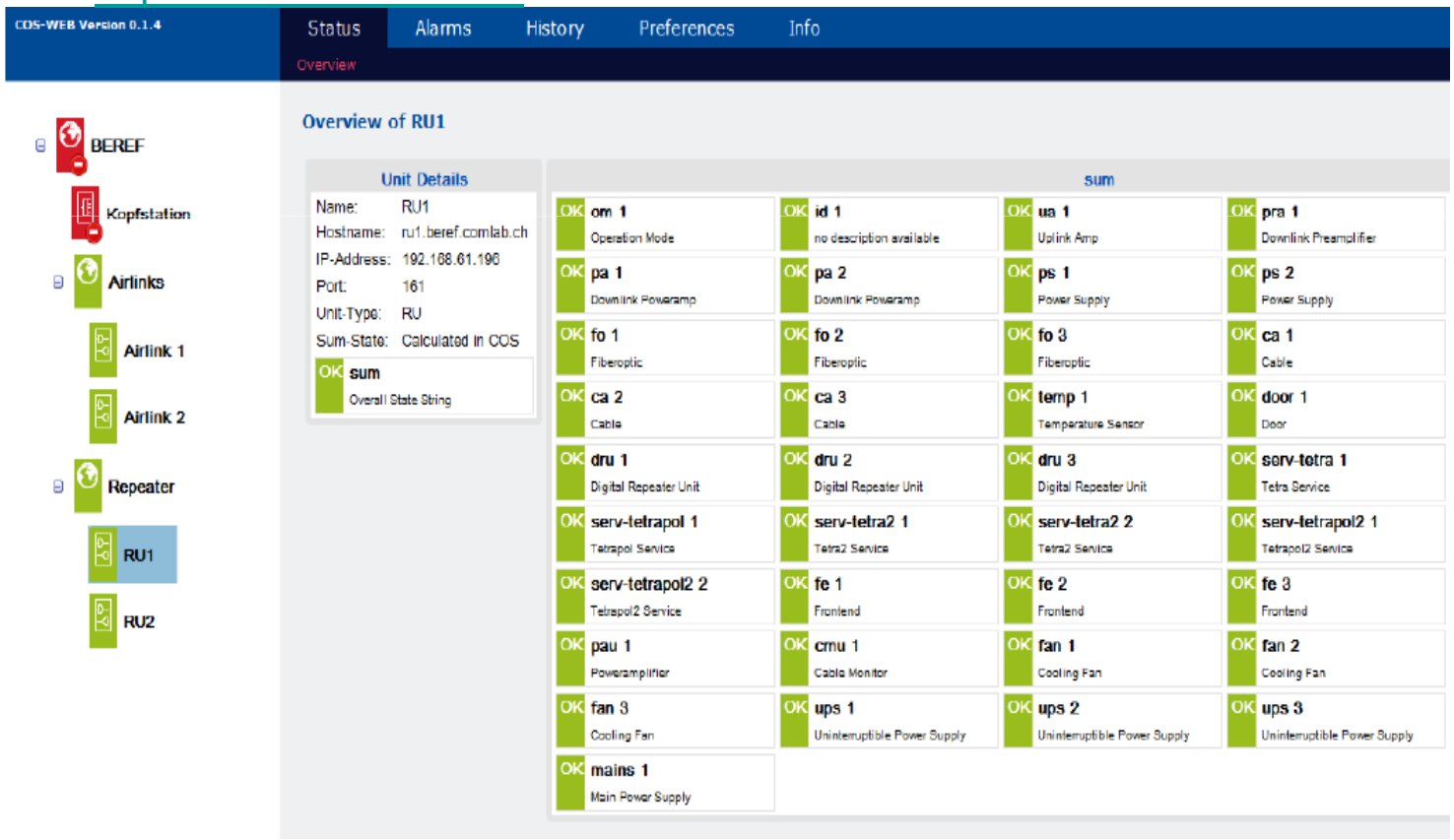
Configuration and Monitoring Software



Portfolio

Configuration and Monitoring Software (Webinterface)

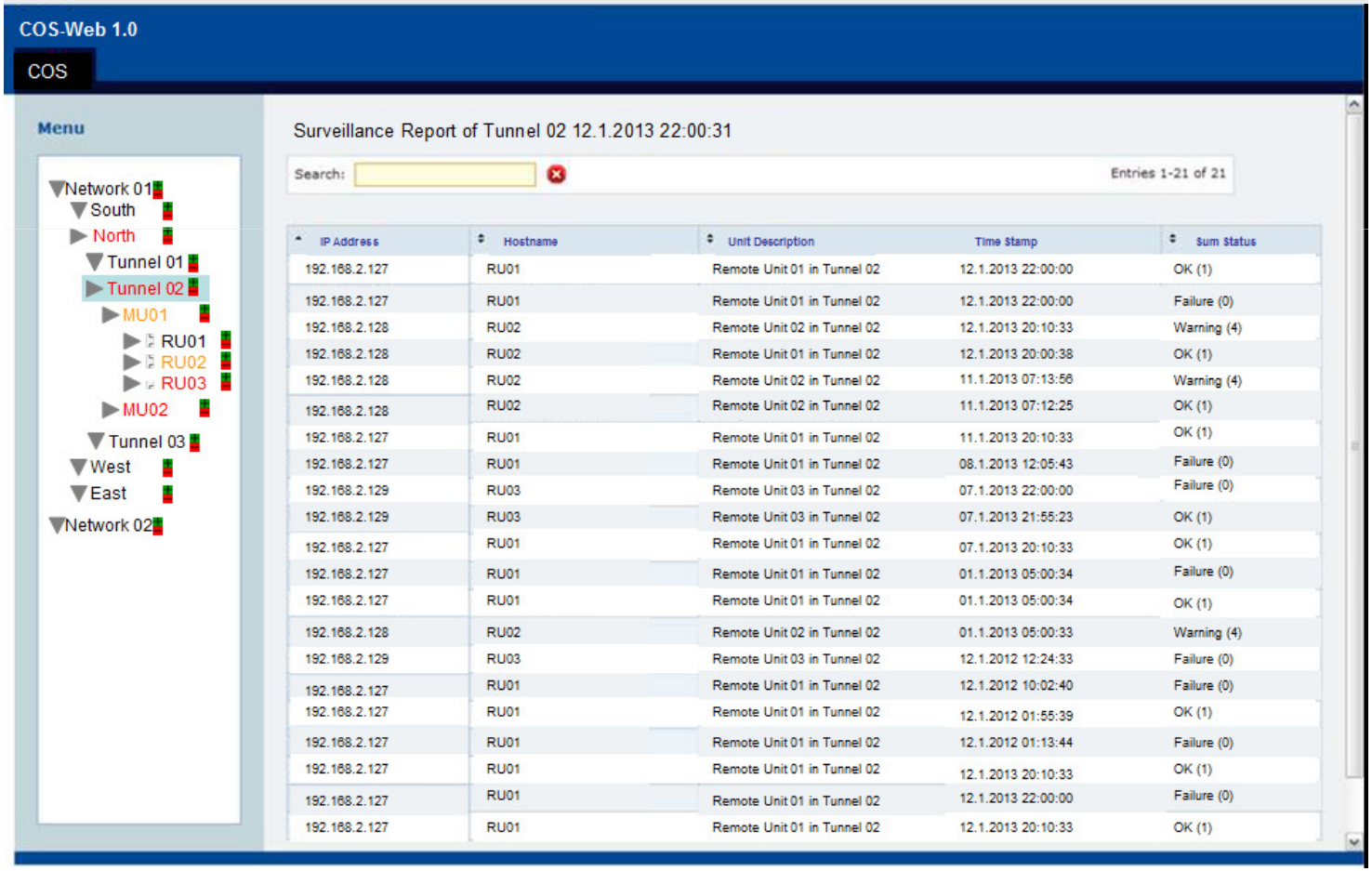
- Repeater Monitoring
- https://192.168.198.40/ or www.cosweb.comlab.ch



Portfolio

Configuration and Monitoring Software (Webinterface)

- Repeater Status log



Portfolio

Products & Systems

Unique Selling Proposition

COMLAB

Quality and Functionality

USP

Why not remote base stations:

- Technology independent (2G, 3G, 4G, 4G Advanced, future technology)
- All operator licence in one single box (small, easy, IP66)

Why COMLAB Repeaters:

- Developed and manufactured in Switzerland (Swiss Quality)
- 5 years system and 15 years replaceability garantee
- Technology advance (efficiency, form factor, monitoring..)
- Auto PIM measurement in operation
- Auto link control DL and UL
- Auto MTBF indicator (temparature and traffic log)
- Proven less than 50 failure a year of 5000 units installed in Europe (<1%)
- Low skill required to replace units on site (no measurement, auto config)
- Repair and Return center in Moscow (modules on stock)

Economic Value Added

USP

Savings on investment:

- Lowest investment cost
- Only 1 fiber optical link for all services
- Prefinanced by Comlab mother company (HS Holding), no interrest rates

Savings over life cycle:

- Smallest box for 5 Band 50Watt on the market
- Lowest power consumption for 5 Band (200W MUD, 600W RUD)
- Lowest proven failure rate
- Load (carrier) monitoring on each RUD
- Maintenance free system (low operation cost)

Portfolio

Questions and Answers