

07 March 2018

Challenges of Multi Band/Multi Technology Cellular installation

Kathrein/Deltronic – Telecom Infra Event, Rotterdam, 7th March 2018



BUSINESS SOLUTIONS



MOBILE COMMUNICATION



SAT



SPECIAL COMMUNICATION



BROADCAST



AUTOMOTIVE



KATHREIN

> Actively Shaping the Connected World

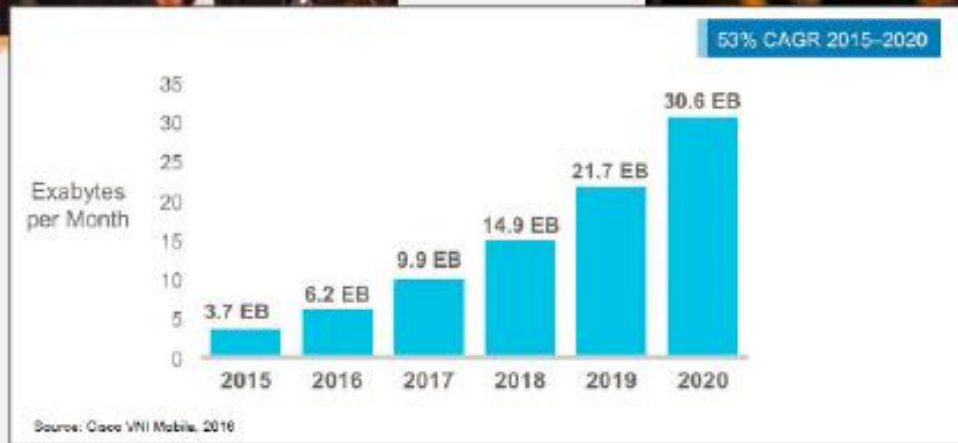


We solve the most complex requirements and challenges.

We use this deep-rooted strength to act as a driving force in shaping the world of tomorrow, where technologies converge.

1. Trends in Mobile Communication Industry

> Data tsunami – the world is changing...

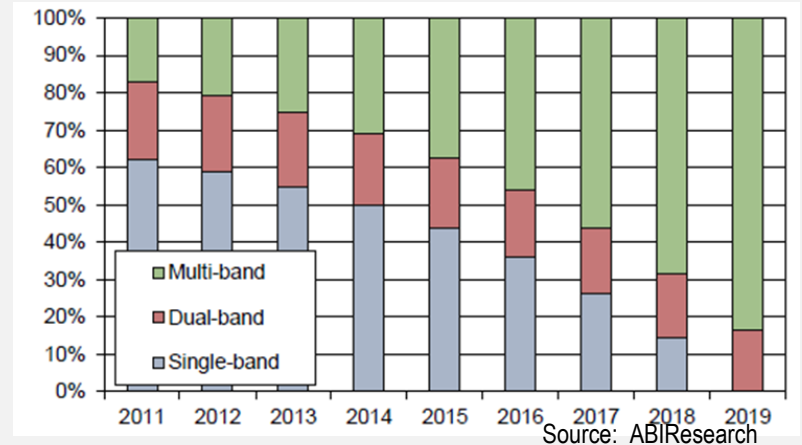


Source: Cisco

> Trends: Multi-Array / Multi-Band Antennas

Increased need for Multiband Antennas

- Permission for additional sites in Europe is hard to get
- Operators normally have more than one license
- Acceptance of new antennas on sites decreases

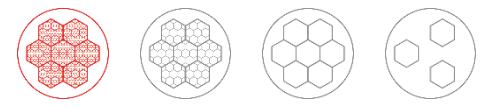
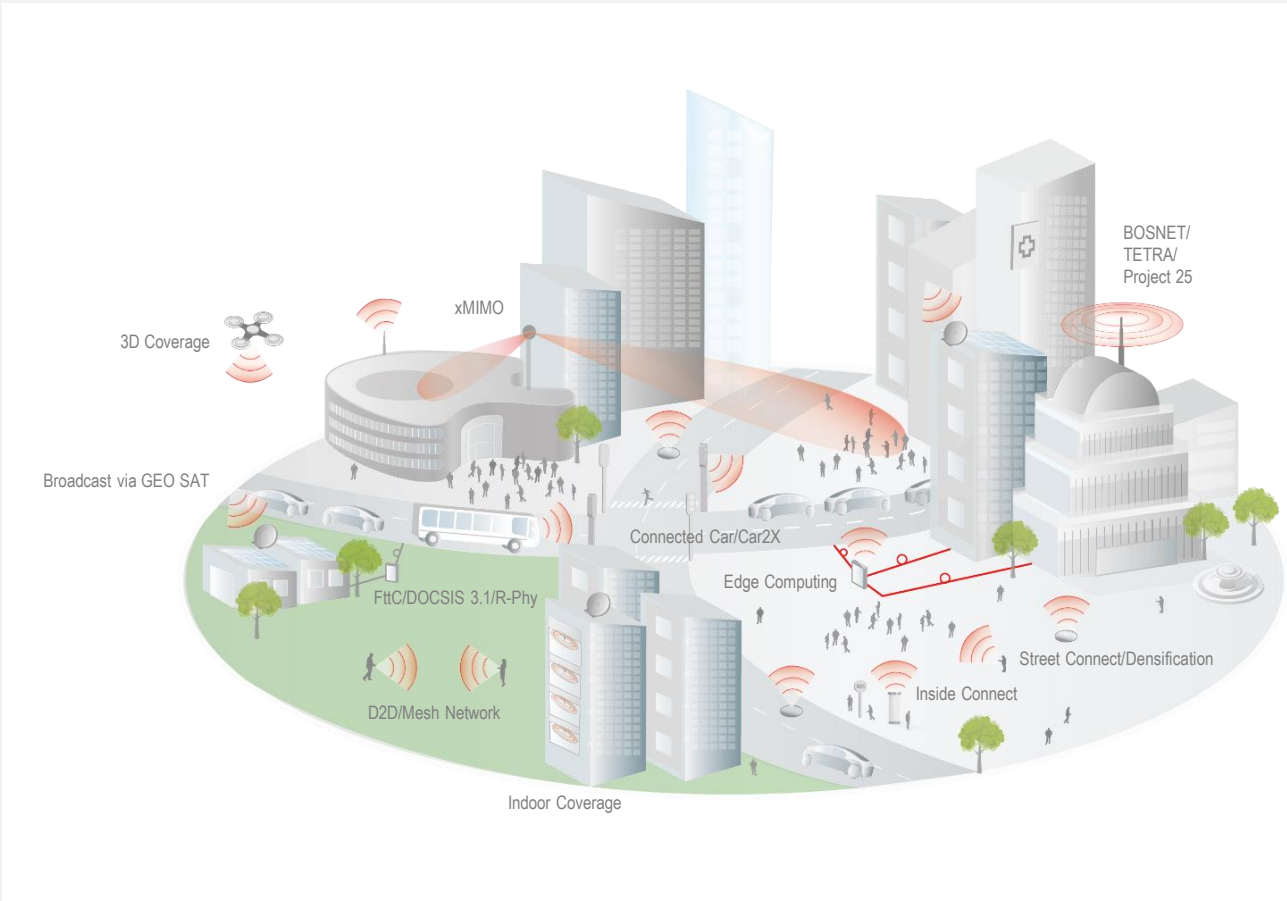


KATHREIN's Multiband Antenna Portfolio for LTE

- covers all bands
- Compact design with high integration
- independant Remote Electrical Tilt



> Network Vision 2022 – Urban Area



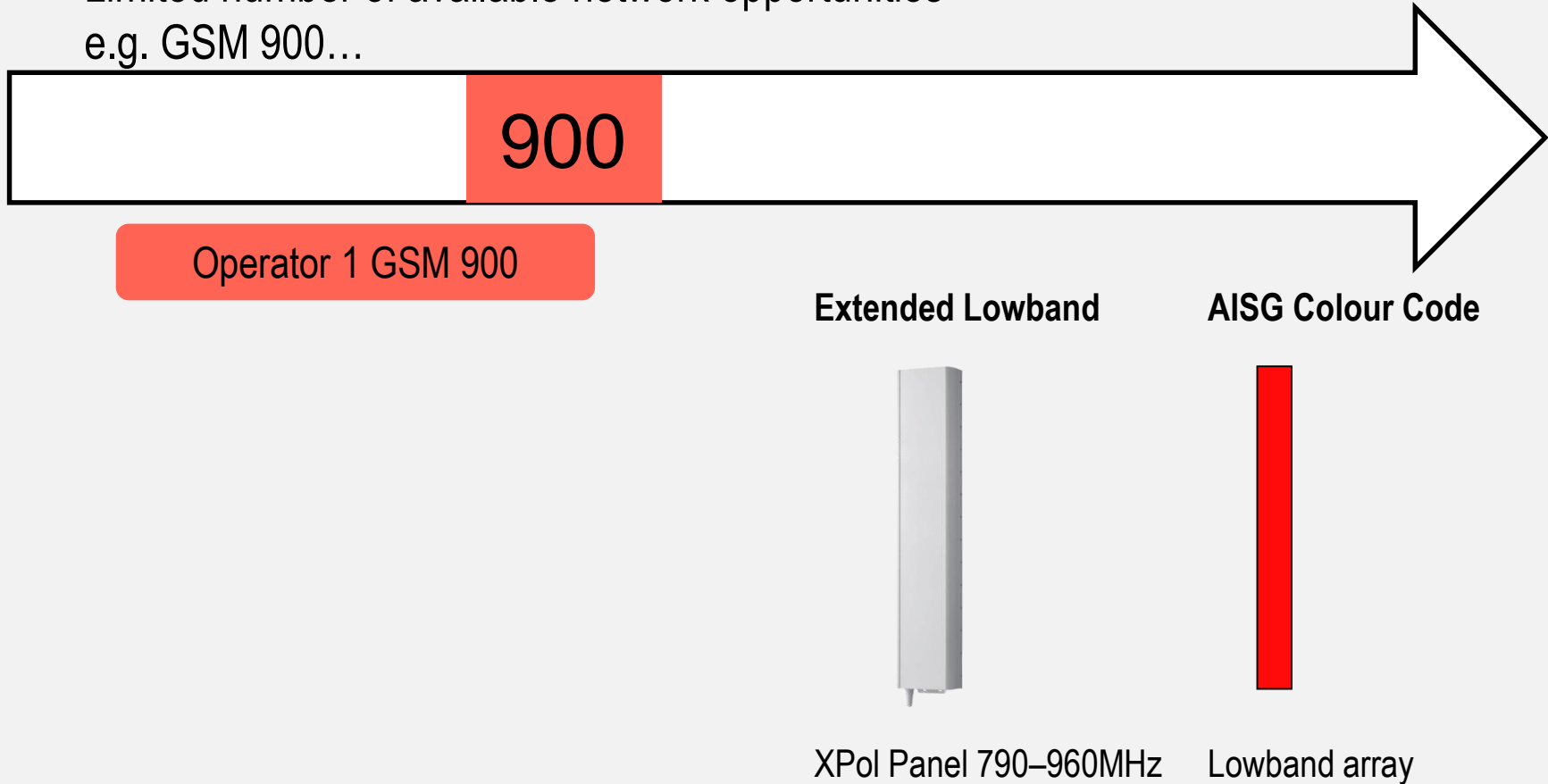
Urban areas will serve the most use cases with the latest technologies installed.

2. Antenna Trends

> Antenna Complexity

HISTORY

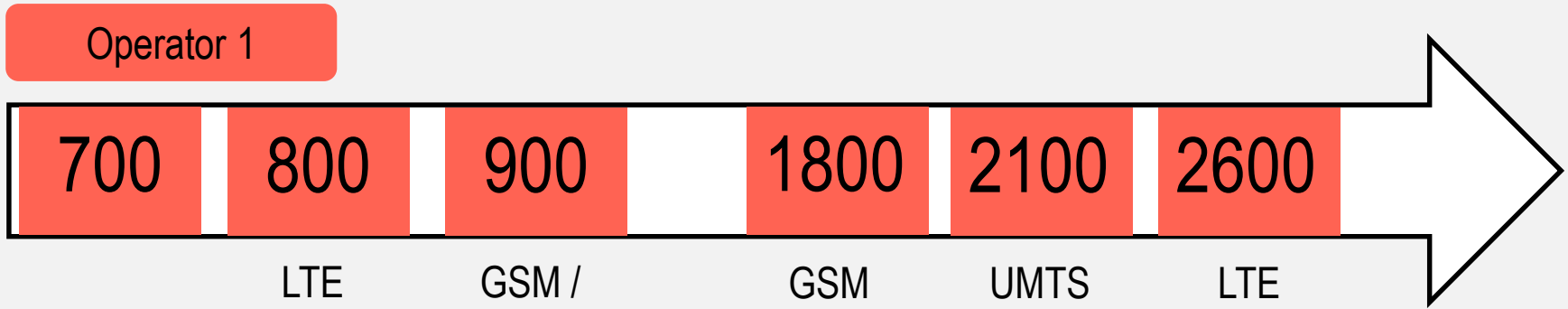
- Limited number of available network opportunities
e.g. GSM 900...



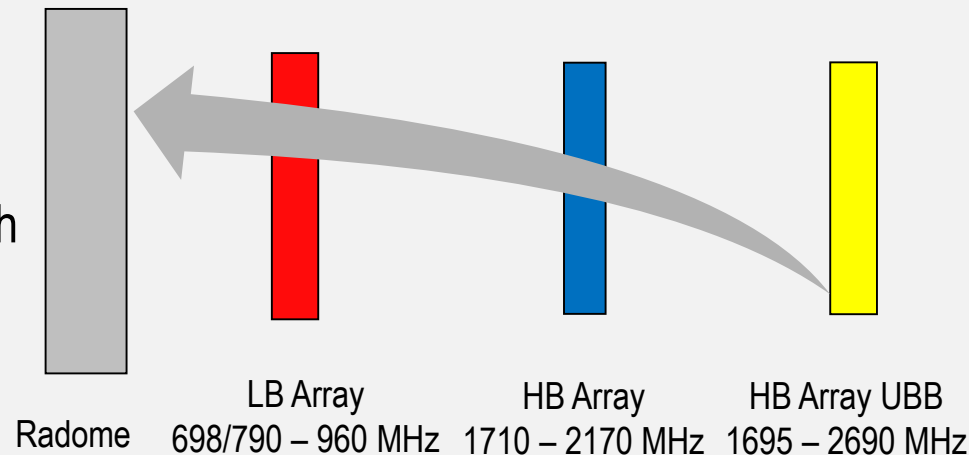
> Antenna Complexity

PRESENT

- Growing number of different frequency ranges for Mobile Communication Systems
e.g. GSM900 → GSM1800 → UMTS 2100 → LTE 700 2600



- Demand: different bands in one antenna
- Solution: create multi-band antennas with different antenna arrays

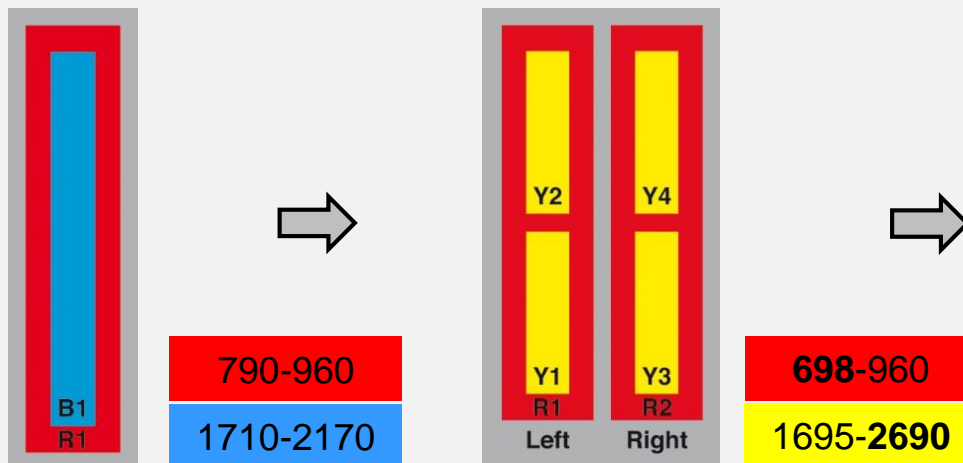


> Antenna Complexity

Upgrades / Expansions

- From 2RxDiv to 4RxDiv
- From 2 x 2 MIMO to 4 x n MIMO → 8 x n MIMO?
- New licence – new requirements on site

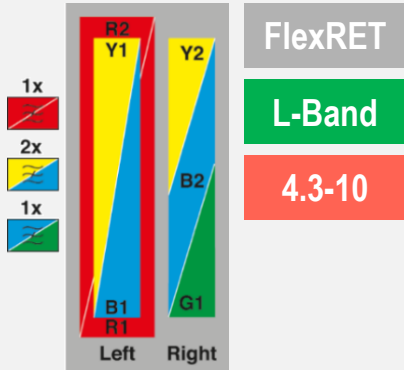
Mult-Array, Ultra-Broadband Kathrein Design = **Superintegration**



Future-proof roll-out
= no additional CAPEX and OPEX

Less wind load + weight = lower CAPEX

Kathrein L-Band 14-Port Antenna



FlexRET
L-Band
4.3-10

698-862	880-960
1695-2180	2490-2690
1427-1518	1695-2180
2490-2690	

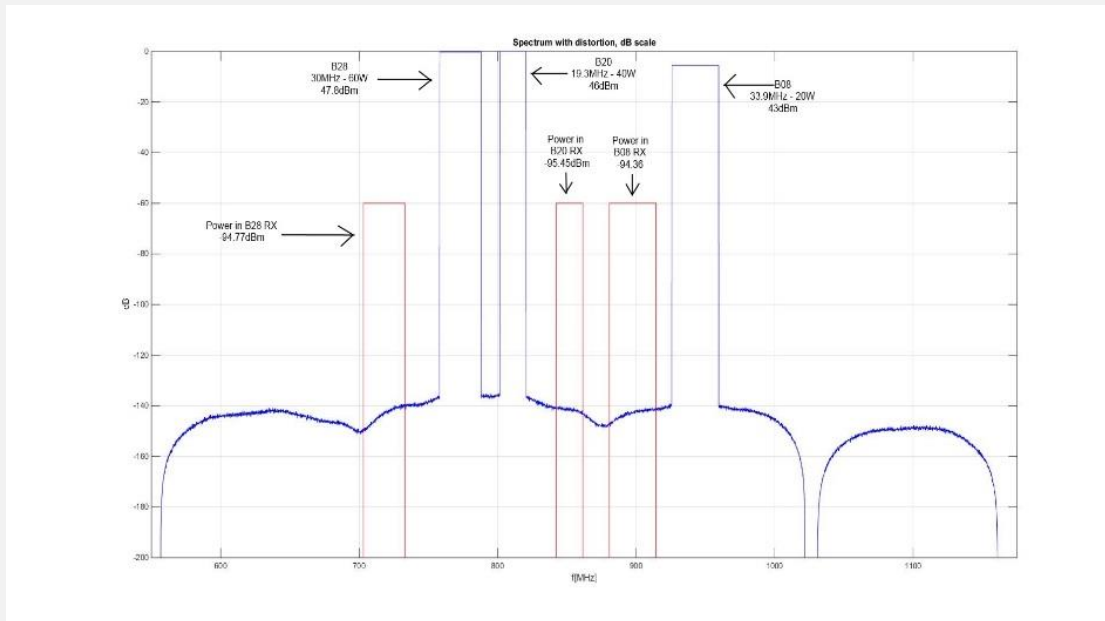
80011878							1Q18
698-862 (R1)	880-960 (R2)	1695-2180 (B1)	2490-2690 (Y1)	1427-1518 (G1)	1695-2180 (B2)	2490-2690 (Y2)	
16 dBi	16 dBi	17.5 dBi	17.5 dBi	17 dBi	17.5 dBi	18 dBi	
65°	65°	65°	65°	65°	65°	65°	
2°-12° T	2°-12° T	2.5°-12° T	2.5°-12° T	2.5°-12° T		2.5°-12° T	
1999 / 378 / 164 mm							

	698-862	880-960	1695-2180	2490-2690	1695-2180	2490-2690	1427-1518
2 x 2	x	x	x	x	x	x	x
4 x 4			x	x	x	x	

> What about PIM in a „Single Radome“ solution?

Lowband:

- problem with filtered lowband solution, one must combine 700 and 800 → possible PIM right away
- also, filtered lowband means that all lowband carriers are combined after the diplexer Proposal: split up lowbands in two columns OR don't use 800 MHz band!



3. Network Quality

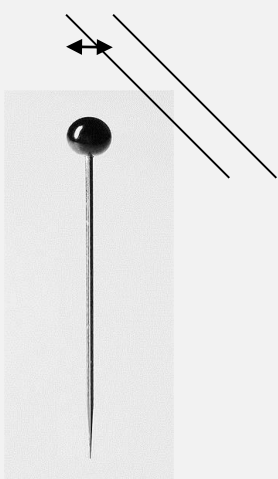
> Intermodulation distance of -150 dBc

$$\underline{\Delta 150 \text{ dB} = 10^{15}}$$

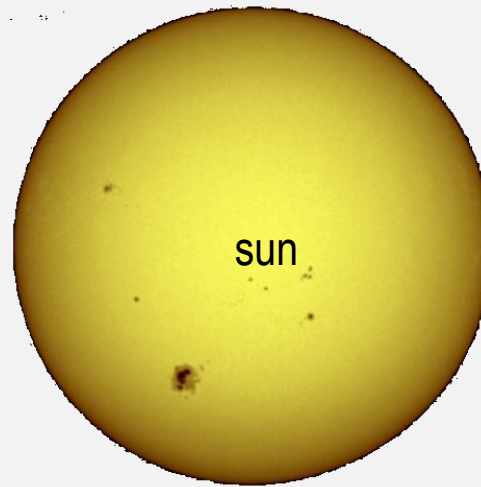
$$\frac{10 * \text{distance earth to sun}}{\text{diameter pinhead}} = 10^{15} = 150 \text{ dB}$$

Diameter pinhead:

~1,5 mm



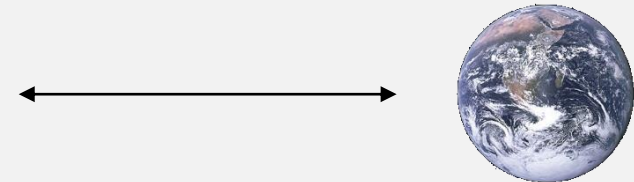
200000000000000



Distance earth to sun:

~150 Mio km

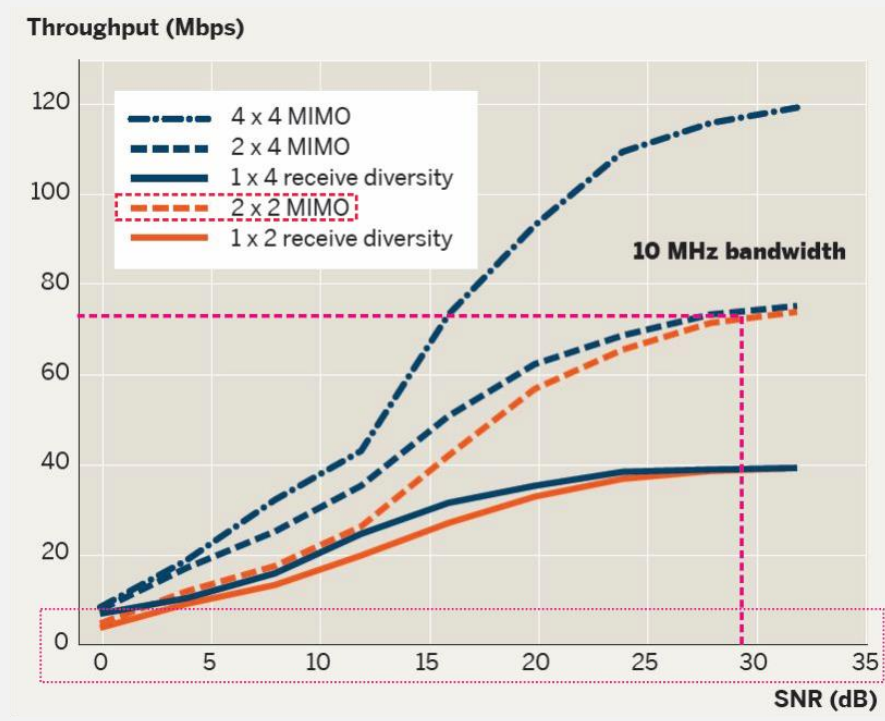
earth



> Intermodulation

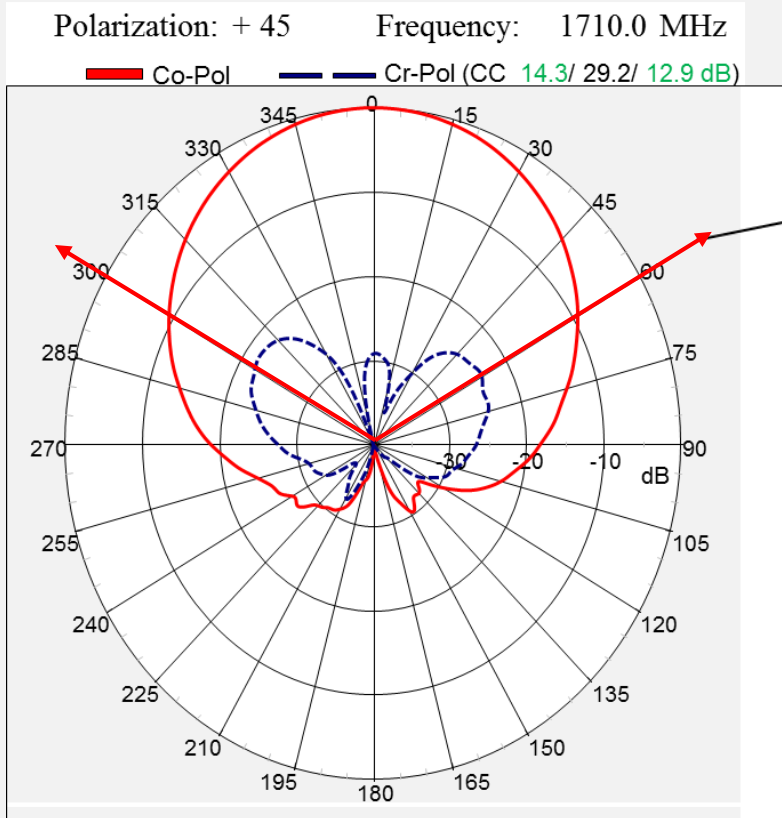
What are the results of bad PIM performance?

- Interference respectively SNR is dependent on PIM, tilt accuracy, HPBW,
 - Low SNR end up in less data throughput



[Source: Ericsson]

> CrossPolarRatio - CPR

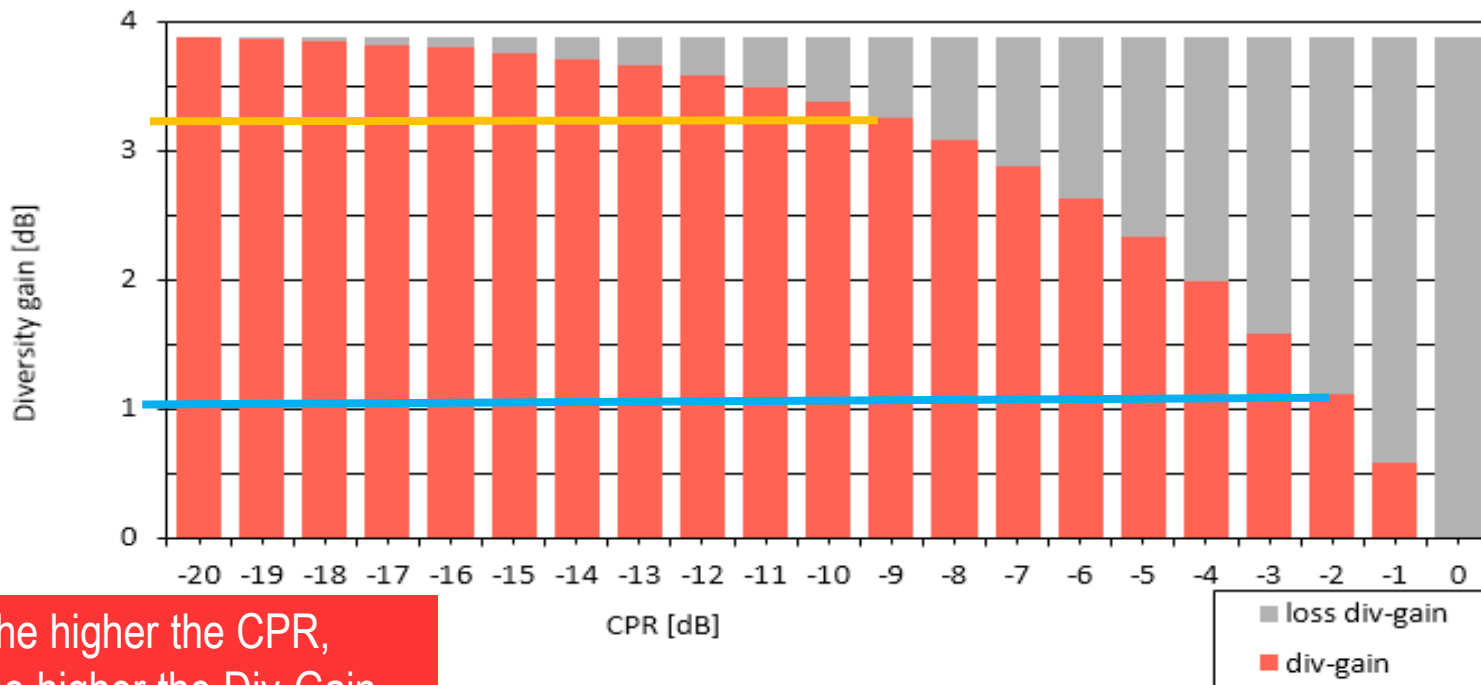


Sector Boundary

Bad CPR → bad receive diversity and MIMO performance
 Recommendation: 8-10 dB within sector [2]

[2] N-P-BASTA White Paper, January 2013

CrossPolarRatio directly influences the network performance

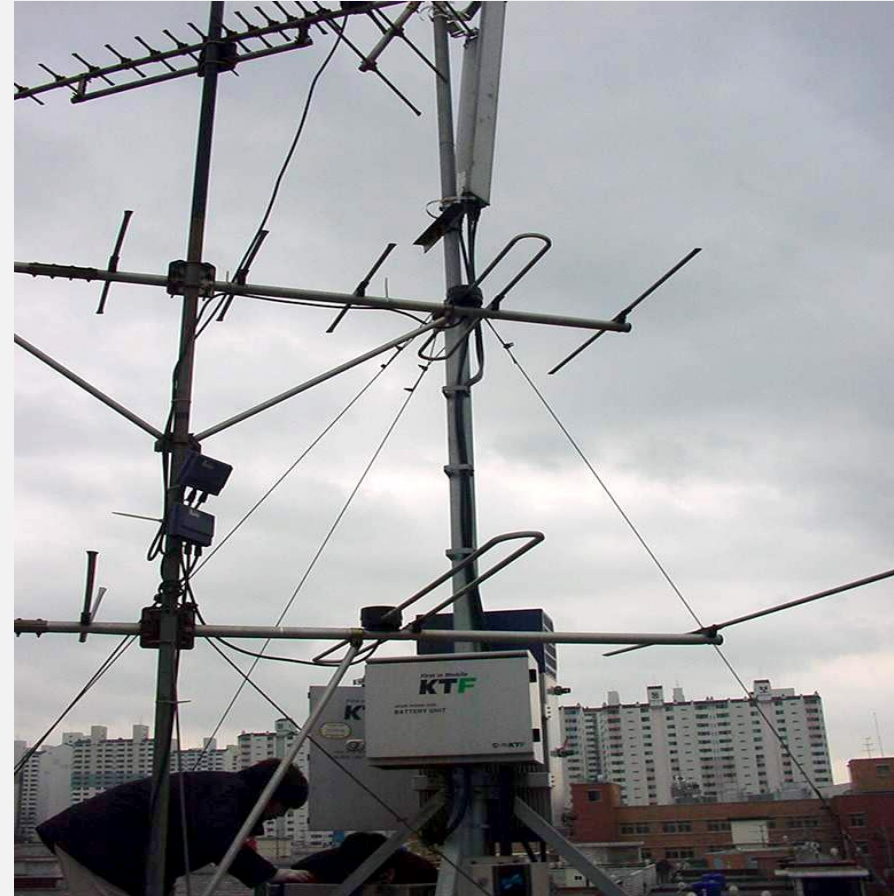


The higher the CPR,
the higher the Div-Gain

> Examples for IM causes

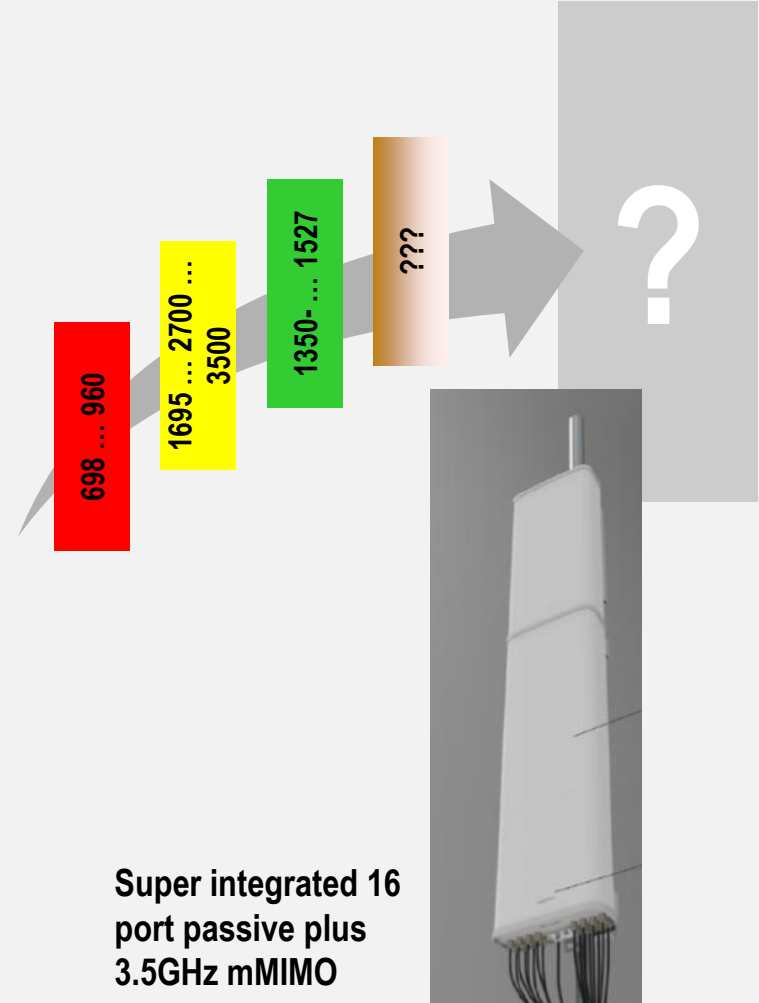


Antenna environment



> Challenges for the Future

- Recognize trends
 - New Frequency usage, e.g. 3.5 GHz for LTE
 - Combination of TDD / FDD systems
 - Supplemental Downlink
 - 5 G – Ultra High Frequencies?
- Which frequency combinations in one radome?
- Small Cell configurations



Thank you very much for your
attention!

Any questions?

