

Review of current macro network site types and designs

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Contents

- High-level macro-cell design consideration
- Macro-cell site evolution:
 - GSM
 - Space and polarisation diversity
 - UMTS
 - Introduction of network sharing
 - LTE
 - Adding even more frequency bands
- 5G macro-cell trials and site design
- 5G demos
- Summary



High-level macro cell site design considerations



* Includes fibre and DC power in addition to coaxial transmission line - dictated by location of Radio Units



GSM - a massive civil engineering programme









Single band GSM antenna system



• Space diversity receive systems and tower mounted low noise amplifiers improved the uplink (prior to polarisation diversity systems)

Prior to the Bias-T implementation, a separate DC power cable would be installed between a power distribution unit in the cabin and each amplifier
Single transmit antenna illustrated however dual duplex configuration was implemented by some vendors/operators to scale capacity
Antennas had fixed electrical tilt, mechanical tilt was a common RF optimisation technique, early sector antennas had wide beam-width



Space and polarisation diversity systems







Space and polarisation diversity systems







UMTS - different approaches - single band or dual band antennas...







Structures and antenna systems



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Dual band single polarisation (space diversity)

Dual band cross polarisation (polarisation diversity)

Dual band cross polarisation (polarisation diversity)

Single band cross polarisation

GSM 1800 and UMTS 2100 antenna system

- Dual band cross polarisation antennas
 - 1800MHz
 - 2100MHz
- Single port MHA for UMTS 2100
- Dual port MHA for GSM 1800
- 4 Coaxial feeder cables per cell sector
- Microwave radio for backhaul connection





Example site configurations for shared GSM/UMTS site



Adding 4G LTE...









Providing DC power and fibre (fronthaul) to external remote radio units







LTE adds more frequency bands



- Antenna systems must support the following frequency bands:
 - 800 MHZ
 - 1800 MHz
 - 2100 MHz
 - 2600 MHz
- Note the misalignment between antenna ports colour scheme and feeder tags, this is by design, our (MBNL) colour scheme came first...





Multi-band, multi-RAT, multi-operator antenna system

Note: There are many possible solutions to this radio configuration, including separate antennas.



15 British Telecommunications plc 2018

Introducing 5G @ 3500 MHz - radio trials with 8T8R and 64T64R systems





5G demo at Canary Wharf



• 4T4R LTE (15 MHz 2100 + 15 MHz 2600) with 64T64R NR



Summary

- Macro-cells have provided the vast majority of cellular coverage and capacity for many years a trend which will continue with 5G
- Small cells will have a significant role to play in the fulness of time
- Macro-cells are a cost optimised solution for delivering 5G to a large geographically dispersed subscriber base
- Site solutions need to be plug and play, simple installation requirements results in less errors - get it right in one visit!
- Solutions between 8T8R and 64T64R are required, 16T16R and 32T32R use cases
- Single passive antenna for all radios is required on some sites
- Hybrid active/passive antennas will be a solution for some sites
- More than two antennas per sector is a challenge 1 x active and 1 x passive at most
- This presentation has focused on one aspect of macro-cell design, there are many other considerations...
- 5G TDD radio interface requires frequency and phase sync, this must be resilient
- 5G will drive significant upgrades to transmission fronthaul, midhaul and/or backhaul
- BT/EE is actively upgrading its macro-cell footprint in accordance with our 5G rollout plans





Thank You Any questions?

