800 MHz Coexistence: Practical experience from deployments and trials

Simon Pike – Vodafone 18th October 2012
800MHz deployments and trials

- Germany
  - Over 4600 base station sites, in cities, urban, suburban and rural areas
- Sweden
  - Many hundreds of base station sites
- France
  - Extensive trial in Laval
- USA (700MHz band)
  - This is the US ‘Digital Dividend’ band
  - It has similar interference scenarios to European 800MHz band
  - 700MHz LTE networks have been extensively deployed
    - Especially by Verizon Wireless
  - There has not been significant interference to UHF TV reception (DTT) or to cable networks.
Germany – network deployment

- More than 4600 800MHz base station sites have been deployed
  - In cities, urban, suburban and rural areas
  - This includes the most critical case (lower LTE block and TV channel 60)
    - O2 started operations in Nuremberg in July 2012
- Interference cases are reported initially to BNetzA
- The number of cases is very low:
  - 6 into DTT reception
  - None into cable reception (the only reported case was due to defective cabling)
  - 22 involving wireless microphones
    - (which had not migrated to other frequencies, as requested by BNetzA)
  - 6 to other radio services and applications

(figures for October 2012)
Many hundreds of 800MHz base station sites have been deployed

‘First-line’ response to interference cases is managed jointly by operators
  - During Q1, 2012, there were ~40 contacts from viewers per month
  - Most of these are resolved by supplying a filter

Up to April 2012, around ten cases had been referred to PTS because ‘first-line’ mitigation had not been effective

PTS has conducted measurements at around ten affected locations
  - It was unable to establish that the 800MHz transmissions have caused television interference
    - ‘Television interference’ is defined in the 800MHz licences

Figures from PTS Report PTS-ER-2012-19
France – Laval trial

- The trial took place in an area where CH60 is used for DTT
- It was conducted by French MNOs and TDF, supervised by ANFR
- Eight base station sites were operated, in sequence
  - Over a period of six weeks
  - The bottom LTE block was used
- Viewers were informed of the trial, and a call centre was set up
- Reports of interference were 2.3 per thousand households
  - The actual rate will be higher, due to constraints of the trial
  - RF amplifiers were found to be a significant factor
- A low-cost filter was found to restore good TV reception
  - Including interference to channel 60
  - These were supplied in response to customer contact

Information from ANFR report and French operators
TV receiver filters

- RF filters in TV receiver downleads can cure almost all cases of interference
- They are available from several manufacturers
- Their performance is better than expected
  - They often need to be fitted in the signal path before the RF amplifier
    - This is often next to a rooftop antenna
    - which will require fitting by an aerial installer.
Equipment standards - LTE

- Base station emissions for 800MHz band are regulated by Commission Decision 2010/267/EU.
- These limits are implemented and enforced through national spectrum licences.
  - These limits are substantially tighter than other frequency bands, to protect DTT reception.
- The corresponding requirements are defined for LTE by 3GPP and included in the ETSI Harmonised Standard.
  - TS 36.104 Rel-9, Annex G and EN 301 908-14 (v5.2.1)
- Terminal emissions for 800MHz band are defined in CEPT Report 30.
- The corresponding requirement is defined for LTE by ETSI in the Harmonised Standard.
  - EN 301 908-13 (v5.2.1), section 4.2.4
CISPR has developed a new standard for EMC of multimedia equipment – CISPR 35

- This is applicable to TV receivers, and is intended to supersede EN 55020
  - It contains a requirement for radiated immunity
  - This addresses interference for cable reception
- *It does not contain any requirement* for antenna port immunity
- This is needed to address interference for DTT reception
  - In CISPR terminology, this is ‘differential immunity of the broadcast receiver tuner port’
- CISPR 35 is currently being undergoing vote as a CENELEC standard

There is no standard for TV RF amplifiers

- These make a significant contribution to interference
  - Both through overloading themselves and causing the TV set to overload
Conclusions

- There are already extensive 800MHz LTE network deployments in several countries
- Up to now there have been fewer cases of DTT interference than forecasted. However, they vary depending on:
  - The proportion of the population that use the DTT platform
  - The DTT network topology
- RF amplifiers are a more significant factor than anticipated
- RF Filters can solve the majority of interference cases
- So far, there has been no interference to cable networks
- LTE Base stations and terminals implement the emissions masks in the Commission Decision and defined by CEPT
- There has not been the same progress on standards for TV equipment
  - CISPR 35 does not contain any requirement for antenna port immunity
  - There is no standard for RF amplifiers
Next Steps

- Operators will continue to conduct trials:
  - **Saint Etienne, France**
    - Pilot network deployment
    - 100 base station sites, involving all three 800MHz operators
    - This will specifically address DTT interference mitigation techniques
    - There will be up to three other smaller scale trials
  - **Zamora, Spain**
    - 6 base station sites
  - The optimum approach to mitigation depends on the expected number of interference cases
    - In Germany and Sweden, a reactive approach has been satisfactory
    - In UK, Ofcom has decided on a pro-active approach to supplying filters
- Adequate standards need to be developed for TV receivers and RF amplifiers