

# EMC of wired networks

a personal view

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# Overview

- EMC issues for wired networks in the UK
- Why do we consider the EMC of networks?
- Activity in the UK
- Activity at the European level
- Changes to equipment standards

# Why EMC of networks?

- Harmonised standards deal with apparatus
- Conducted limits for apparatus
  - assume particular characteristics of the cabling
  - measure common mode
- Real networks may not behave as simulated
  - mode conversion
- Interference potential may be greater
- Immunity of network not considered relevant
  - covered by immunity of connected apparatus

# Existing networks - 1

- Telecommunications local loop
  - designed for 3.4 kHz voice service
  - fax speeds
    - 1968 Group 1 - analogue 6 minutes per page
    - 1976 Group 2 - analogue 3 minutes per page
    - 1980 Group 3 - digital 14.4 kb/s 30 seconds per page
    - 1984 Group 4 - digital - ISDN 64 kb/s
  - modems now up to 56 kb/s
  - ISDN 144 kb/s
  - ADSL from 512 kb/s to potentially 8 Mb/s
  - higher rates planned

# Existing networks - 2

- Mains wiring
  - designed for 50 Hz power distribution
  - mains signalling
    - used by power companies
    - not between customers
    - sinusoidal < 95 kHz
  - “baby alarms” and remote control, etc.
    - in-house low power
    - sinusoidal 95 to 150 kHz
  - PLC developments up to several Mb/s

# Existing networks - 3

- It is desirable to offer new services over old networks
  - reduces cost
  - reduces time to implementation
  - reduces disruption
  - increases competition
- But EMC aspects must be considered

# MPT 1570

- Concerns that higher bitrates would increase potential for interference
- Radiocommunications Agency specification
  - electromagnetic radiation in the range 9 kHz to 1.6 MHz from material substances forming part of a telecommunications system
  - limits and test methods
- Enforcement standard for the whole system
- Intended to be enforced by SI under WT Act
  - draft regulations produced 2001

# No SI for MPT 1570

- Hansard 16 December 2003 written statement
  - MPT 1570 not to be given statutory force
  - only one case of interference from ADSL
    - to MW broadcast reception
    - none to any other radio service
  - disproportionate to proceed with SI
  - ADSL operators will take reasonable steps
    - to resolve any interference problems that arise
    - voluntary commitment
  - contribution to European work

# Status of MPT 1570

- Specification with no legal force
- Could be considered relevant in voluntary action
- Ofcom expected to keep the matter under review
- SI could be re-introduced if necessary
  - no conflict with EMC Directive

# Mandate M313

- Commission mandate to CENELEC and ETSI
  - joint responsibility
  - EMC harmonised standards for telecommunication networks
    - wireline telecommunications networks
    - includes in-house extensions
    - currently operational and under development
  - Examples
    - power lines (PLC)
    - coaxial cables (CaTV)
    - classical telephone wires (xDSL)
  - Not equipment connected to the networks

# Harmonised standards

- Compliance standard(s) under 89/336/EEC
  - limits and test methods for presumption of conformity
  - take into account existing technical specifications
  - protect frequencies used by safety and emergency services
  - coherent with generic standards
  - take into account other harmonised standards
    - for equipment connected to the networks
    - harmonised under 89/336/EEC or 1999/5/EC
  - technology-neutral
    - generic limits applicable to all wire-line telecom networks

# CENELEC/ETSI JWG

- Charged with producing the standards
- Approval to publish required from both
  - CENELEC vote via TC210
  - ETSI vote via ERM
- JWG has drafted a standard
  - for informal consultation
  - questionnaire on radiated limits
  - separate paper on emergency services protection
  - consultation period has just ended

# Draft standard

- Frequency range 150 kHz to 1 GHz
  - measurements at 3 m test distance
- Conducted or radiated limits below 30 MHz
  - subject of a separate questionnaire
- Measurement methods described
  - loop antenna or current probe < 30 MHz
  - electric field strength > 30 MHz
- Alternative test method from aircraft at 475 m

# Complications

- Equipment connected to networks
  - already meets product (family) standard
  - generally conducted limits < 30 MHz
  - test methods and limits could be in conflict
- Responsibilities between parties unclear
  - network equipment supplier
  - customer equipment supplier
  - network operator
    - network unbundling

# Conflicts

- Radio services need to be protected
  - what is a reasonable level of emissions?
- Commission and UK Government wish to enable Power Line Communications (PLC)
- PLC needs a signal to noise margin to operate
  - compared with spurious emissions
  - is this reasonable?
  - can existing limits be relaxed?

# Revised mandate - 1

- Commission letter January 2004
  - to CENELEC and ETSI
- Original Mandate M313 issued August 2001
- No standard has been developed to date
  - complexity of subject
  - apparent divergence of views
- Therefore the EMC Directive might be interpreted differently between Member States

# Revised mandate - 2

- Regulatory uncertainty
  - “may prevent the deployment of alternative telecommunications infrastructures, such as powerline communications”
- Commission is of the opinion
  - “a cautious and controlled rollout of powerline communication infrastructure with close interference reporting should be encouraged”
- Commission will issue a recommendation
  - on broadband communications through powerlines

# Revised mandate - 3

- Objectives of the recommendation
  - make available relevant data to standards bodies
    - conducted and radiated disturbance levels
    - interference levels
    - unwanted emission levels
  - related to powerline communications networks
  - allow “CENELEC and ETSI to converge towards the development of a stable and widely accepted standard”
- Recommendation to be based on a sound technical specification

# Technical specification - 1

- Based on technical work performed to date by the JWG
- Test methods and limits for radiated disturbance
  - plus possibly consistent conducted disturbance limits
  - compatible with state of the art powerline communication infrastructure
- To be made available by 31 March 2004!

# Technical specification - 2

- TS will not be a harmonised standard
  - Purpose is to allow rollout of PLC
- Test methods should allow consistent data collection
  - Member States expected to
    - collect data during deployment and operation of these networks
    - make results available to CENELEC and ETSI
  - CENELEC and ETSI expected to
    - take account of this data “if and when proposing to revise the technical specification and proposing a standard for harmonisation”

# Where are we now?

- JWVG editing group has considered comments
  - radiated limits seem to be preferred below 30 MHz
  - special provisions for safety and emergency services not to be included
  - New draft prepared at meeting first week of March
- Next JWVG meeting is 17-18 March 2004
  - agenda will be to
    - consider revised draft harmonised standard
    - consider how to deal with revised Commission request

# What might happen next?

- JWG reports to CENELEC TC210 and ETSI ERM
- If work continues on harmonised standard
  - will need approval from both bodies to circulate for enquiry
  - if comments favourable, circulation for vote
  - approval process still unclear
- JWG will have to initiate a TS
  - agree appropriate timescale with Commission
  - approval process very unclear

# Equipment standards

- Draft amendment to CISPR 22, CISPR/I/89/CD
  - may eventually affect EN 55022
- Concept of a Multi Purpose Port for PLC
  - PLC needs a positive signal to noise ratio to function
  - needs a higher emission level on the mains
- Interference potential is measured twice
  - to CISPR 22 mains limits when PLC function is disabled
  - to CISPR 22 telecom limits when PLC is functional

# Measurement method

- Effectively allows greater emission when in PLC mode
- Draft declares that the method is only suitable for LV networks where conductors do not separate
- The (unbalanced) artificial mains network is used with PLC function disabled
- The (balanced) T-ISN is used when PLC function is operating

# Progress on the draft

- The closing date for comment was 20 February
- Collation of comments not yet available
- Next stage may be CDV or another CD
  - this was the second CD
  - prior to the first CD there had been a CD and a CDV in CISPR/G
- This is a very controversial subject

# Conclusion

- The subject of EMC of networks presents a complex technical and regulatory problem
- There is a need to consider the implications of new services over old networks
- The implications for apparatus approvals and the effect on radio services must be considered

Questions? Comments?