

BBC Contribution to European Commission Workshop on Interference Emissions from Powerline Communication networks

1. The BBC and New Technology

The BBC has been at the forefront of developing digital broadcasting systems both within Europe and Internationally. In particular, it has been a significant player in the development and deployment of digital television systems (DVB), digital radio (DAB and DRM) and online services. The BBC has also been a strong supporter of the policy of the UK Government and the European Commission to roll out broadband access for the consumer.

While deploying these new services the BBC has endeavoured to ensure that, as far as possible, the rollout of the new technology does not cause interference to consumers using the existing analogue services. The BBC has also been anxious to develop strategies that encourage the migration of services and users from analogue to digital technology quickly, but without inconvenience.

2. Broadband Wireline Networks for Consumer Access

The BBC welcomes the technical development of broadband networks for consumer access. As the operator of the largest content website in Europe, the BBC is already providing a range of rich and varied services to broadband users, and is ready and willing to expand those services as broadband access becomes more widespread. We also fully support the idea that there should be a range of competing technology and infrastructures from which the consumer can get services.

However, we believe it is important that the rollout of such networks should not significantly damage the reception of analogue radio services or the introduction of new digital broadcast systems. Unfortunately some of the new broadband wireline systems currently being proposed for deployment in Europe and elsewhere are capable of causing significant interference to radio, especially to the many services that operate below 30 MHz.

3. The BBC's Concerns

The BBC's concerns are particularly focussed on the development of Powerline Communication (PLC) systems, which use the mains power network to distribute broadband data signals to consumers' premises. Owing to the characteristics of the power wiring, PLC signals tend to be radiated at quite high levels from the cables and therefore create a significant source of radio interference. The nature of the interference generated by such networks is likely to be particularly damaging as the network is always active and the radiated signal covers a wide range of frequencies below 30 MHz.

Unfortunately many PLC systems operate in the same part of the High Frequency radio bands as used by BBC World Service. Some 150 million people across the world listen

regularly to BBC World Service, which broadcasts globally in 43 languages. Over two thirds of all listening is via HF. The BBC is keen to migrate these listeners from the analogue HF broadcasts to other, largely digital, transmission systems that will offer improved quality. The most significant new transmission system is DRM, which offers an extremely attractive conversion route to digital HF broadcasting, but other distribution systems will be used including:

- § DAB
- § FM
- § Online
- § Digital TV multiplexes (satellite, terrestrial and cable)

The DRM system is a recently developed digital radio system, which is designed to replace the present AM radio broadcasting systems. It offers a route for migrating the existing analogue HF service to a very much better quality and more robust service based on digital modulation & coding (see www.drm.org).

Of the digital transmission systems listed above, only DRM and DAB are true “Radio” systems (i.e. they offer mobile and wires-free reception), and of these, only DRM retains the unique advantages of analogue HF transmission, namely:

- § transmission over long distances without gatekeeper issues
- § reception on simple, cheap, wires-free equipment free from “editorial” control in the target country.

It is hoped that DRM will replace all AM analogue radio broadcasting over a timescale of some 20 years. Currently it is estimated that there are some 2 billion AM radios in use around the world. So this migration offers enormous commercial opportunities for receiver manufacturers. Additionally it also offers opportunities for transmitter manufacturers and network operators. The BBC has an investment of about £240m in HF transmission equipment around the world, much of which will be replaced with digital-capable kit over the next decade. Other international broadcasters can be expected to be making similar investments over a similar timescale (see <http://www.broadcast.be/>).

However, DRM reception would be completely destroyed by interference at the levels currently being discussed in relation to PLC networks. The BBC is therefore concerned that the widespread introduction of interfering PLC systems could put the investment required to establish DRM at risk and jeopardise the rollout of this promising new technology.

4. BBC Measurements of PLC Systems

During November 2002 the BBC was invited, by courtesy of the operator Scottish & Southern Electricity, to make measurements of two different PLC technologies, which were being used in a trial in Crieff, Scotland. The BBC measurements confirmed that the forms of Access PLT employed in Crieff have the potential to cause significant interference to indoor reception of broadcasts in relevant bands:

- § Where the PLC system was operating in the broadcast band then severe interference was caused to broadcast services in that band. This condition applied both within the PLC subscriber's home and the neighbouring properties.
- § Where the PLC operated outside the broadcast band, reception of broadcast services was still impaired, but to a lesser extent

The BBC report on its findings in Crieff has been published: BBC R&D White Paper WHP 067, "The effects of power-line telecommunications on broadcast reception: brief trial in Crieff" by Jonathan Stott and John Salter. The report is available from the BBC Web site at <http://www.bbc.co.uk/rd/pubs/whp/> from where it can be downloaded with supporting audio files.

5. Possible Ways Forward

The BBC has been actively and constructively engaged in the process of seeking a standard for emissions from wireline networks. We have participated in the work of CEPT looking at the issue and have been active in CENELEC/ETSI Joint Working Group, which is developing the standard. Our role in this work is not to thwart the introduction of broadband wireline systems, but to find acceptable solutions that will allow such systems to be introduced while preserving the reception of radio services.

Currently the radiated emission limits being proposed for wireline systems are higher than the minimum field strengths at which broadcast signals are expected to be receivable. Therefore very significant interference would be generated in the broadcast bands if such systems were to be brought into service operating at, or close to, these limits. Licensed broadcast signals above the minimum field strength should be entitled to protection under the ITU-R Radio Regulations and under the EU EMC Directive, which requires that apparatus (including radio receivers) should be allowed to function as intended.

On the other hand, we appreciate that some existing PLC systems cannot operate successfully if the limits are set at a level that guarantees the reception of all radio broadcast services. The central issue is that we have two technologies utilising the same spectrum in the same location, i.e. listeners' homes. It is therefore imperative, if we are to make progress, that some practical work-around be identified.

We are suggesting three possible ways forward:

a. Frequency separation

It may be possible to allot a number of frequency ranges for PLC networks below 30 MHz. These allotments would include mainly frequencies that are not used in domestic and urban environments. They would therefore need to avoid frequencies used for broadcasting, amateur radio, low power applications such as anti-theft devices and safety of life services.

Although the BBC and others have made this proposal on a number of occasions, we believe it has not been studied in any depth by any of the Frequency Managing Administrations. We would ask the Commission to encourage the Administrations to study this proposal to see whether it is a feasible solution to the problem.

We appreciate that Administrations would be reluctant to consider formally allocating spectrum for PLC. However, we would encourage the Administrations and the relevant EU bodies to consider the development of a set of guidance documents to advise PLC operators and equipment manufacturers on the most appropriate spectrum-power mask to be employed on PLC systems when operating within Europe.

b. Separation of Limits

Currently much of the debate has been centred on the wide gap between the possible radiated emission level generated by PLC and the maximum interference level that radio services can accept. Briefly, PLC proponents are proposing emission limits around 60 dB μ V/m, while HF broadcasters are seeking to keep interference to 20 dB μ V/m or lower. Clearly these two requirements are completely incompatible.

The BBC considers that it is inappropriate to specify a field strength emission limit below 30 MHz and has proposed to the JWG that only conduction limits should be used for this frequency range. This would keep the wireline emission standard wholly in line with the EN 55022 product limit, on which the new draft standard is largely based. The detailed BBC case for arguing for conduction limits only is shown in Annex 1.

The BBC believes that the adoption of conduction limits below 30 MHz could allow a way forward by separating the network compliance limit from the issue of interference. Whilst network compliance would be based on the measurement of a conduction limit, interference issues would be dealt with under the provisions of the field strength limits laid down in frequency regulations and in licensing conditions applicable for that service in that location.

c. Use of Wireless Access Systems

PLC is designed as a wireline service, but, for technical reasons described above, it requires an acceptance of radiated emissions of the order 60dBuV/m over a band of frequencies some 10MHz wide. In effect it has “accidentally commandeered” this spectrum within the locality of the network.

It would seem a more efficient use of spectrum if the access system from the substation to the consumer’s home were engineered to operate as a wide-area Radio frequency LAN, which utilised the most appropriate co-ordinated spectrum. This would give all the benefits of PLC, but removes a number of significant technical problems, and also potential safety issues with mains-borne signalling.

6. PLC Trials

The BBC supports the controlled trials of PLC services in Europe. Such trials will provide an opportunity to test the standardisation regime as well as the technical and commercial aspects of such systems.

However, to test the standardisation regime effectively, a number of conditions must be applied to these trials:

- § All trials must provide, on request, information regarding the compliance status of the network relative to the provisions of the emerging CENELEC/ETSI draft standard, e.g. conductive measurement results or radiated emissions, if applicable.
- § Where interference measurements are made of the actual network used in the trial, they must be made available to all interested parties.
- § Contact points for complaints about interference must be made readily available in publicity material, etc.
- § All trials must be required to conduct audits to assess the impact of their operation on the radio spectrum in the locality. An initial pre-trial audit should be made to establish the initial conditions and this should be repeated after 1 year of operation. The audit will assess the usability of spectrum before and after the trial started and must include any complaints and remedial action taken.

Annex 1

Removal of radiated emission limits below 30MHz

Henry Price, BBC World Service

The BBC requests the JWG to consider removing all reference to radiated emission limits for frequencies below 30MHz from the draft standard. This would leave just the common mode current limit to be employed below 30MHz, and would entail removing the limits specified in Table 2 and all reference to relevant measurement techniques and equipment discussed in section 6.3 and elsewhere.

There are number of reasons for asking for this change to the draft standard:

1. It would bring the specification of emission limits and measurement techniques below 30MHz in line with the EN 55022 product emission standard.
2. It is more difficult to achieve repeatable and verifiable measurement of radiated emissions below 30MHz than it is for measurements of common mode current.
3. Having two different techniques available for verifying network compliance could lead to conflicting results and therefore disputes as to whether or not a network is in compliance with the standard
4. The techniques and equipment to be employed for measuring radiated emissions below 30MHz are subject to significant debate, which it has proved difficult to resolve. Such topics include:
 - § The relationship between the measured H field and E field close to the radiating network cables
 - § Accounting for the effects of local topography of the network cabling, conducting objects and other structures such walls, etc.
 - § Quantifying the reduction of radiated field with distance from the network cabling
 - § Receiving equipment sensitivity
 - § Accounting for interference from external signals
5. By defining the permitted level of “accidental” radiation that a network can emit as similar to or higher than that utilised by radio services using the same frequency range, the standard could be regarded as a “spectrum polluter’s charter”.