



18 June 2003

EBU STATEMENT ON PLT, CABLE, ETC. LIMITS

The Radio Regulations require that Radiocommunication services shall be protected from harmful interference due to '... *power and telecommunication distribution networks ...*' (RR S15.12 § 8), and that Administrations '... *shall cooperate in the elimination of harmful interference ...*' (RR S15.25 § 17). It is the task of the JWG ETSI/CENELEC to establish radiation limits which will **protect** Radiocommunication services from radiation emitted by cables transferring digital signals.

The EBU feels that radiation limits are, by definition, established in order **to protect** a radiocommunication service from harmful interference emanating from another service or 'installations'. Therefore, such limits must be based on the existing protection criteria, taking account of the particular type of radiation or other disturbance which is under consideration.

It is important to remember that the LF/MF/HF Bands have specific, unique propagation features. This means that there are applications using these bands which cannot be transposed to other bands. The reason is that frequencies in other bands do not have the same propagation characteristics, and therefore cannot support these specific applications. Therefore the requirement for the use of these bands by radiocommunication services will continue.

Values for radiation limits at various distances from radiating cables have been considered. In keeping with the spirit of this approach, the EBU and other radiocommunication services have proposed radiation limits for PLC/Cables, etc., which do not increase the noise level by more than 0.5 dB at 10 m from the offending cable: these limits will effectively **protect** users of radio services. Limits more relaxed will lead to an unacceptable degradation in broadcast reception and the performance of radiocommunication services in general.

Suitable limits proposed by the EBU are (these limits are also proposed by the Belgium Administration, BBC, NATO, NAFRA, and many other HF users):

The proposed magnetic field limit (which is what is measured, and is thus the definitive proposal) is:

$$H_n \text{ (dBmA / m) (in 9 kHz, peak) } = -29.7 - 8.15 \text{ Log}_{10} [f_{\text{MHz}}]$$

The corresponding equivalent-electric-field strength limit can be obtained by adding the familiar factor of 51.5 dB for the impedance of free space:

$$E_n \text{ (dBmV / m) (in 9 kHz, peak) } = 21.8 - 8.15 \text{ Log}_{10} [f_{\text{MHz}}]$$

It must be recognised that this proposal is a compromise and can result in a loss of coverage for broadcasting services. Furthermore, the increase of 0.5 dB of the noise floor at 10 m from the cable, necessarily causes a higher increase at smaller distances (e.g., between 1 and 10 m from the cable). This could pose significant problems for indoor reception, a mode of broadcast reception that is widely relied upon by the listening public.

It must be emphasized that HF Users base their services on a minimum S/N ratio, and that any increase of the noise level will either

- reduce coverage, or
- reduce/inhibit reception quality, or

- require a corresponding proportional increase in transmission power which would be ecologically unsound as well as economically prohibitive, and in most cases would contravene international agreements, or
- all of the above.

The Annex contains more details.

BACKGROUND INFORMATION TO EBU STATEMENT ON PLT, CABLE, ETC. LIMITS

1. INTRODUCTION

In February 2000, the SE Working Group established Project Team SE35 dealing with Power Line Telecommunications (PLT).

Two of the Project Team's objectives are:

'to identify those services that are likely to be affected by PLT and cable transmissions in general (broadcasting, maritime, radionavigation, radioamateurs...) and evaluate their protection needs, and

'to derive limiting values for emissions from PLT and cable transmissions to protect primary services'.

With respect to these important tasks related to 'protection' it should be recalled that the Radio Regulations state that Administrations:

'shall take all practicable and necessary steps to ensure that the operation of electrical apparatus or installations of any kind, including power and telecommunication distribution networks ... does not cause harmful interference to a radiocommunication service ... operating in accordance with the provisions of these Regulations' (RR S15.12 § 8) and

'shall cooperate in the detection and elimination of harmful interference ...' (RR S15.25 § 17)

Since radiocommunications services are to be protected by Administrations in this way, according to the Radio Regulations, it follows that if new services are to be introduced (such as telecommunication in conductor systems), adequate limits must be derived in order to continue to maintain protection of radiocommunication services.

The present document makes proposals for radiation limits which will protect Broadcasting services (and perhaps thereby other Radiocommunication services) operating in the bands below 30 MHz, and gives a brief overview of the technical basis upon which these proposals are based. More detailed technical details are given in Ref.1.

The detailed technical analysis has been largely missing until now, but it is certainly necessary to form valid conclusions and develop protection criteria (e.g., radiation limits) based upon well-based technical facts. Furthermore, Administrations should be aware of these facts before making their judgement, owing to the severe implications of an incorrect decision.

2. PURPOSE

The EBU feels that radiation limits are, by definition, established in order protect a radiocommunication service from harmful interference emanating from another service or 'installations'. Therefore, such limits must be based on the existing protection criteria, taking account of the particular type of radiation or other disturbance which is under consideration.

The purpose of this document is to establish a set of radiation limits which will effectively protect users of radio services. In particular, any limits more relaxed than those proposed here will lead to an unacceptable degradation in broadcast reception. In fact, these proposals already represent some degree of compromise for indoor broadcast reception.

3. DERIVATION

The derivation of these limits has a general validity and is not restricted to protecting broadcasting services only. The same approach could also be used to determine radiation limits suitable for protecting other services using the bands below 30 MHz.

Because the radiation from a cable will have digitally modulated signals as its source, it is assumed that the 'electromagnetic pollution' it causes is noise-like. It is then easy to continue to protect broadcasting as in the past from the 'noise'.

The proposed limits allow a moderate degradation (0.5 dB) in the existing noise floor for reception at 10 m from a potentially-radiating cable. The limits are based on the (multiple) ITU noise curves, by defining a new intermediate curve ('M') which is effectively representative of many receiving situations, including broadcasting. The proposal implies greater levels indoors, but is nevertheless considered to be an acceptable compromise for indoor broadcast reception.

An increase in the noise floor of 0.5 dB is likely to protect other radio services also. We believe the proposed limit could be appropriate to protect all types of users of frequencies below 30 MHz.

In order to facilitate measurement procedures, the limits are specified at 1 m. The full derivation is given in Ref. 1

4. FUTURE USE OF THE SPECTRUM BY RADIOCOMMUNICATION SERVICES

It is important to remember that the LF/MF/HF Bands have specific, unique propagation features. This means that there are applications using these bands which cannot be transposed to other bands. The reason is that frequencies in other bands do not have the same propagation characteristics, and therefore cannot support these specific applications. Therefore the requirement for the use of these bands by radiocommunication services will continue.

New digital technology is being developed to further exploit the potential of these radiofrequencies. For example, for the Broadcasting service DRM is being developed. Similarly, the fixed and mobile services will also be making increased use of digital technology. These new systems should not be precluded from the outset by radiation limits which are too high, and which may therefore thwart the introduction of these important new services.

ITU-R Study Group 6 established Task Group 6/7 to determine the relevant technical and planning parameters for DRM. As in the past, the technical parameters for such emerging systems will be based on existing ITU-R defined noise levels. Any large increase in effective 'noise' level due to power line (or similar) radiation will certainly 'doom' the possibility to implement these new digital services. This will be true not only for the broadcasting service.

5. PROPOSAL FOR A LIMIT

Values for radiation limits at 10 m from radiating cables have been considered. In keeping with the spirit of this approach, it is proposed here to introduce radiation limits which do not increase the noise level by more than 0.5 dB at 10 m from the offending cable. Because of the low field strengths involved, a measurement distance of 1 m is proposed here, to ensure that the measurements are not masked by the ambient noise. Thus, 1 m is the distance from the potentially-emitting cable to the centre of the measuring loop. In this way, using the limits below, a maximum 0.5 dB increase in noise level at 10 m from the cable can be ensured

The proposed magnetic field limit (which is what is measured, and is thus the definitive proposal) is:

$$H_n \text{ (dB}\mu\text{A / m) (in 9 kHz, peak)} = -29.7 - 8.15 \text{ Log}_{10} [f_{\text{MHz}}]$$

The corresponding equivalent-electric-field strength limit can be obtained by adding the familiar factor of 51.5 dB for the impedance of free space:

$$E_n \text{ (dB}\mu\text{V / m) (in 9 kHz, peak)} = 21.8 - 8.15 \text{ Log}_{10} [f_{\text{MHz}}]$$

6. IMPLICATIONS

It must be recognised that the above proposal is a compromise and can result in a loss of coverage for broadcasting services. Furthermore, the increase of 0.5 dB of the noise floor at 10 m from the cable, necessarily causes a higher increase at smaller distances (e.g., between 1 and 10 m from the cable). This could pose significant problems for indoor reception, a mode of broadcast reception that is widely relied upon by the listening public.

In order for the broadcaster (also true for providers of other services) to overcome significant coverage losses arising from further increases in the effective noise floor, it would be necessary to increase the transmission powers radiated, and thus increase significantly the running costs.

Even this possibility, however, is not feasible due to the restrictions on existing broadcast frequency plans, in which the ERPs are well defined. On the practical level, any increase in ERP would require the agreement of 'concerned' parties, which is a lengthy process, with no guarantee of success. On the technical level, any increase in 'local' ERP would necessitate a corresponding increase in neighbouring transmissions in order to avoid increasing mutual interference. This effect would 'snowball', eventually affecting distant areas where (possibly) no PLT or the like is to be implemented. It should be also noted that substantial increases in power are not possible from an environmental point of view.

7. CONCLUSIONS

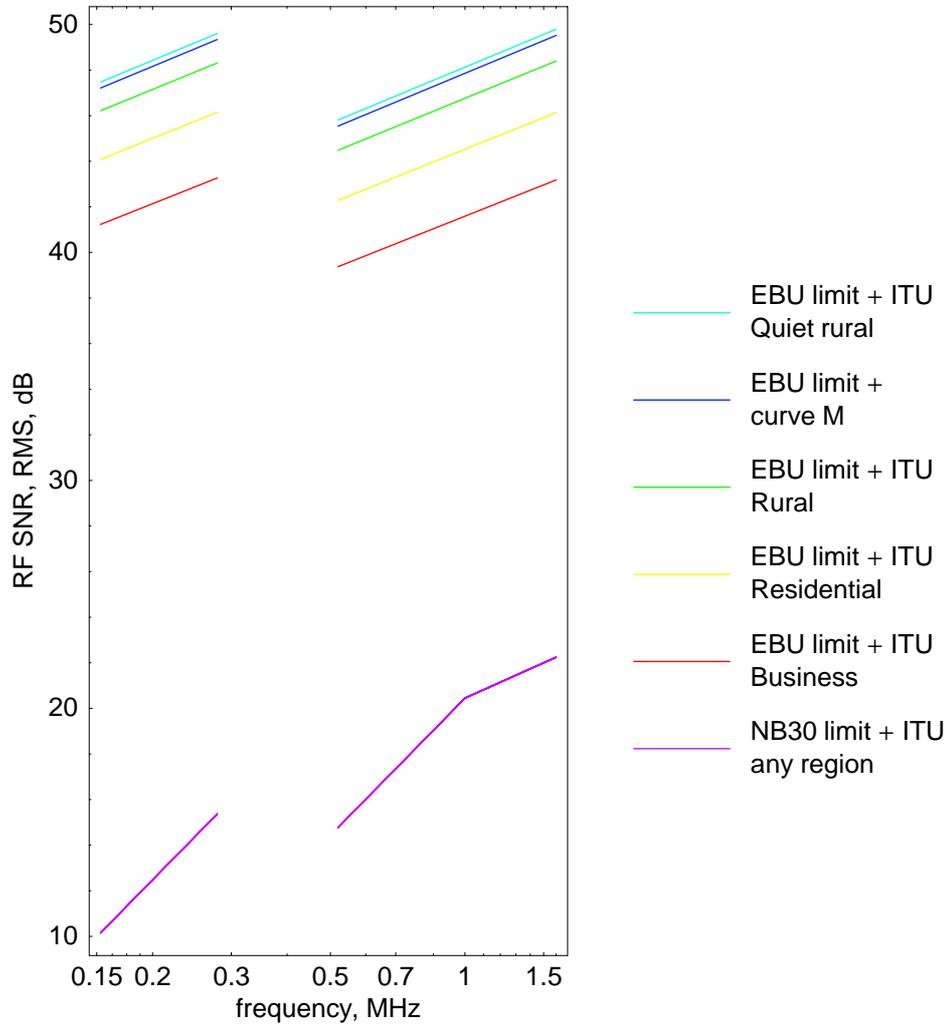
The Radio Regulations require that Radiocommunication services be protected. It is the task of the JWG ETSI/CENELEC to establish radiation limits which will protect Radiocommunication services from radiation emitted by cables transferring digital signals.

Now that technical investigations have been concluded (Ref. 1), a technical basis can be used to establish the necessary protective limits. Suitable radiation limits to protect broadcasting services are proposed in section 5 above. It may be that other services can use the same limits, or perhaps apply the same basis for deriving protective limits. If the resulting limits would be lower than those proposed here, the EBU would support the recommendation of the lower limits, in order to protect all services concerned by a common limit.

Reference

1. Emission limits - A new proposal based on a limited increase in the noise floor - Jonathan Stott (BBC).

reception of broadcasting at 1 m, wanted signal at min FS,
emissions at EBU or NB30 limit plus noise of ITU etc curves,
receiving-antenna pattern equivalent to half-wave dipole



reception at 1MHz, with wanted signal at min broadcast FS,
emissions at proposed EBU limit plus noise of ITU etc curves,
receiving-antenna pattern equivalent to half-wave dipole

