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The Institute of Sound and Communications Engineers

Engineering Note 23.1

New AFILS standard – how strong is *your* magnetic field?

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People who know about AFILS in depth have long been concerned about the confusion over the requirements for magnetic field strength in the first edition of IEC/EN 60118-4. The major emphasis is on 100 mA/m, with just a passing reference to a value 12 dB higher, i.e. 400 mA/m.

In fact, this passing reference is really about the amplifier capability; it has to be able to create a field strength of 400 mA/m for at least 0.125 s, in order to handle peaks of speech signals without significant distortion and achieve, if possible, a reasonable signal-to-magnetic noise ratio without overloading hearing aids. The 100 mA/m figure is a long-term average, and long-term means at least 60 s. For some speech signals with noticeable pauses, a longer period is necessary in order to obtain a stable average value. Furthermore, only SOME signals create both a short-term value of 400 mA/m AND a long-term value of 100 mA/m; some have a larger ratio than 4:1 and some have a smaller ratio. This applies to 'natural' signals with no non-linear processing. Add in compression and noise-gating, and even AGC, (which is only truly linear processing under ideal conditions), and quite large differences from simple assessments occur.

AFILS field strength meters have until now followed the apparent requirement in the standard for a field strength of 100 mA/m, and that is labelled '0 dB'. Many people have interpreted that to mean that if the meter reads 0 dB sometimes, the AFILS is set up correctly. It isn't: the reading should reach +12 dB occasionally; that's 400 mA/m. Only a meter with at least a 60 s averaging time would be required to read 0 dB = 100 mA/m, but there ARE no such meters because the reading would be so sluggish as to be unusable. If the level changed, you'd have to wait for up to 3 minutes for it to settle to the new value!

The new edition of IEC/EN 60118-4 (now published by IEC), on the other hand, puts most emphasis on 400 mA/m and makes that the 0 dB reference. Meters conforming to the new standard will have 0 dB corresponding to that field strength, not 100 mA/m. The Neutrik Minilyser, in 'loop' mode, already has this set up.

However, the new standard does NOT say that any particular AFILS must be set up to produce 400 mA/m. It only says that the amplifier must be capable of producing that field strength. (This is tied in with manufacturers' specifications of the space that can be served.) There are many reports of systems set up to 400 mA/m being assessed as 'too loud' by the people who use them, and their judgement is of course very important. The standard therefore allows a lower field strength to be set up if the USERS require it.

Because of the effects of different signals and processing in loop amplifiers, the new standard puts very much emphasis, too, on FOLLOWING THE MANUFACTURER'S INSTRUCTIONS on how to set up the system. It simply isn't possible for the standard to specify just one type of test signal and one set of target values, because they would work for some amplifiers but not for some other, equally satisfactory ones.

In particular, it is necessary to be very careful when using pink noise as a test signal, as is widely favoured. Pink noise resembles speech in respect of frequency spectrum (to some extent) and in not having a specific frequency or a constant voltage. But in other respects. it's quite different. For example, its 0.125 s value and its 60 s value are very little different, certainly not 12 dB or so. It's OK to use pink noise to set up an AFILS, but it IS necessary to understand what you are doing and why.