Guidance Note on Amplifiers, Repeaters & Signal Boosters

Introduction

This TGN concerns equipment used to improve performance of radio communications in areas where reception & transmission is poor, for example, tunnels, underground facilities and certain buildings. Such equipment may be described as an amplifier, (on-frequency) repeater, signal booster or cell enhancer. It is typically used for commercial PMR radio, mobile telephones, public utilities, emergency services radio and some television services.

All such equipment falls within the scope of the R&TTE Directive. However, it must be noted that some national authorities will not authorise the use of this type of equipment (i.e. issue it with a licence) even if it complies with the requirements of the R&TTED.

Equipment that employs frequency translation, demodulation or modulation can usually be assessed against the relevant standards for transmitters of the corresponding service or may even have its own standard. It is not further considered here.

For other implementations, any signal appearing at the input port and within the pass-band of the device will be reproduced at the output port. Systems can be uni-directional or bi-directional, in which latter case both the down link and up link performance need to be assessed. Systems typically receive signals from a base station, re-radiate these signals via an antenna or 'leaky' feeder to mobile / portable transceivers located in the area of poor reception and, conversely, receive signals from the portable client devices and transmit them back to the base station.

Guidance

This TGN is for equipment that does not provide any channel defining circuitry other than a filter that encompasses the band of use. This 'roofing' filter will typically accommodate a number of communication channels. The communication channel performance and characteristics of the original transmission will ideally be faithfully reproduced at the output port. The principal performance criteria for this type of device is that the signals at the input port are faithfully reproduced at the output port (with possibly a signal level change), and that no signal shall be generated at the output port that did not appear at the input. If this objective is to be achieved then the following criteria need to be addressed by a Notified Body when designing a test plan of essential requirements or reviewing a set of test results.

Inter-modulation	A three-tone CW test or two-tone CW tests at lower, mid and upper band edge
Spurious emissions[1]	Conducted and radiated
Output power	Use manufacturers declared maximum output power
Control of output power	Test performance of AGC
Maximum gain & output power	Test for no saturation at maximum gain and output level
In-band performance	Compare plots of modulated input / output signal at maximum gain & input level
Out of band gain	Plots of 'roofing' filter performance

This guidance note is not intended to be a technical specification. It aims to identify the parameters that must be considered by a manufacturer or notified body when assessing whether equipment within its scope meets the essential requirement set out in Article 3.2 of the R&TTE Directive.

Test conditions should reflect the intended operating conditions and performance characteristics declared by the manufacturer.

Systems may consist of a single equipment enclosure, or could contain a number of distributed units connected via co-ax or optical fibre. Whatever the configuration, tests should be made on a complete system from RF input to RF output for both up and down link paths.

Test limits should take into consideration the specifications for transmitters for the corresponding radio services. The magnitude of spurious and inter-modulation products permitted will require technical interpretation according to the band of operation.

Disclaimer

This guidance document does not replace the text of the R&TTE Directive and is for guidance only. In legal disputes the text of the Directive or its implementation in National legislation takes precedence.

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[1] Some generic information can be found in CEPT/ERC/Recommendation 74-01E "Unwanted Emissions in the Spurious Domain" (http://www.ero.dk/documentation/docs/doc98/official/pdf/REC7401E.PDF)