

The statistical Evaluation Of the Effective Spectrum Availability

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An overcrowded spectrum:

Systems performances are more and more limited by the jamming power level produced by other users transmissions, in or out their allocated frequency band. As the elimination of all possible inter-system jamming is no more possible, it is mandatory to be able to predict the effective spectrum availability for all possible frequency allocation strategies.

Since many years, the radioelectric spectrum is overcrowded by more and more services. However, ITU find frequencies for more and more systems, as for example the second and third generations of cellular mobile telephone.

However, the present spectrum management techniques are reaching their limits. To cope with that request for more and more frequency allocations, it will be necessary to adopt new spectrum management methods.

An improved system behaviour:

The only long-term solution to cope with that complex environment is to adopt real time adaptive techniques based on the effective spectrum availability. The test of these new techniques needs the statistical evaluation of jamming power density including unintentional interference, spurious transmissions and inter-modulation products. However, that key parameter is highly scenario dependent.

A first paper entitled "*Evaluation methods for spectrum management strategies*" and presented in the ICTS Newsletter 8 shows the more promising ways to improve the global spectrum availability: improvement of signals technical parameters and better evaluation of unintentional interference, more realistic interference scenarios and precise estimation of user's needs...

A statistical evaluation of the received spectral power density:

In each specific case, the selection of the best frequency allocation strategy supposes the availability of a reference evaluation method. This method must be able to assess the relative merits of the various possible management strategies.

Today, simulation seems the only available evaluation method. However, in many random scenarios used for electromagnetic compatibility evaluation, analytical computation produces better results than simulation.

A second paper entitled "Evaluation method for spectrum management strategies" published in the Newsletter "Special edition" presents the relative merits of these two methods for various types of evaluation scenarios: deterministic scenarios, partially random scenarios and random scenarios.

A new frequency management strategy:

In the past, fixed frequency allocations, mainly to fixed links or RADAR stations, was defined accordingly to predicted propagation losses. The remaining jamming were eliminated by local adjustments.

In the future overcrowded radio-electric spectrum, the channel availability will be only statistically known. New systems will have to adapt to that environment and simultaneously to offer more and more reliable final user quality of service.

The definition of both new systems and spectrum management techniques able to increase the overall spectral efficiency is an interactive process. A global optimisation can only be achieved on the basis of an internationally agreed statistical evaluation method of the effective spectrum availability.

The definition of this method is a very important goal.