Broadband Wireless Standards

Outputs

- Preparation of technical standards and documents for the ITU-R that support the U.S. interest in broadband wireless systems.
- Development of new radio propagation algorithms or methods that improve spectrum usage of wireless systems.

Wireless communication has seen tremendous growth in recent years, in both the number of users and the types of new services, beyond simply voice communications. In particular, there has been an emphasis on Internet uses. These additional users and new services require greater bandwidths than before, which for wireless users means more radio spectrum. As more users require more spectrum, it is necessary to be able to predict signal coverage for various wireless services more accurately, so that everyone can share the available spectrum and peacefully co-exist without interference. The development of radio-wave propagation prediction models for accurate prediction of signal coverage supports broadband wireless standards for these broadband wireless systems.

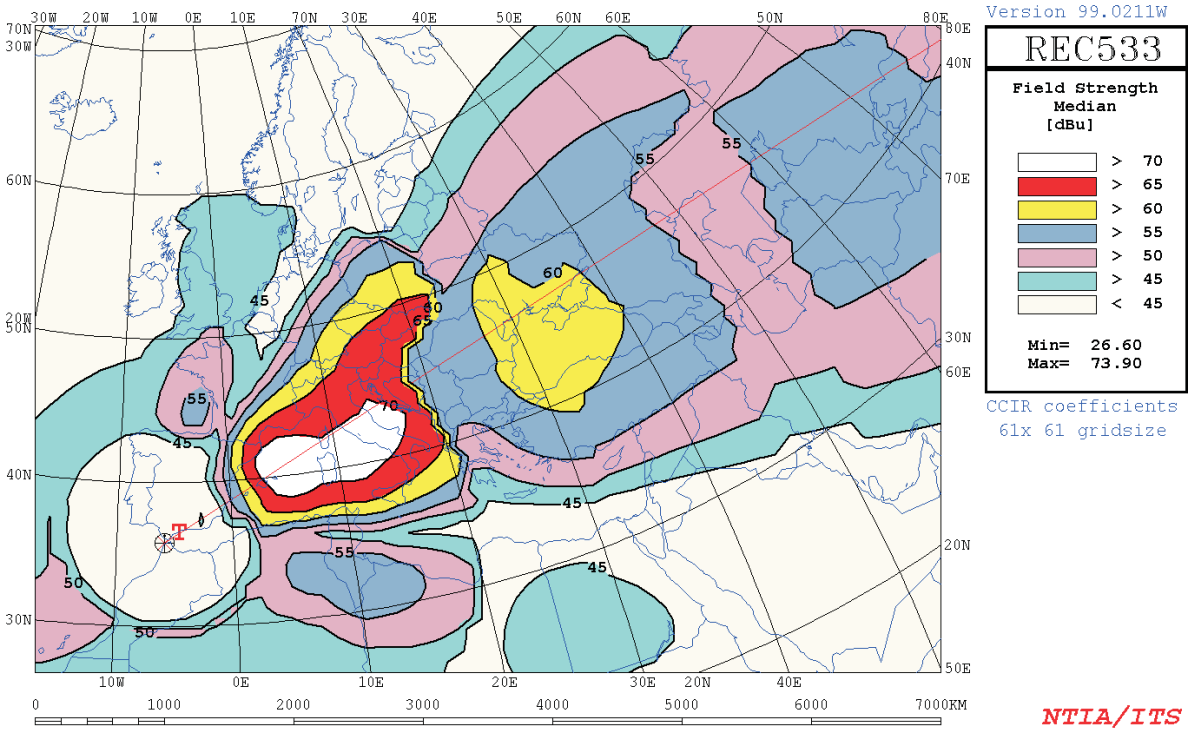
ITS and other research organizations have been developing and evaluating propagation models to predict wireless signal coverage more accurately. These propagation models are more responsive to the needs of cellular and private land mobile radio service providers, which make up the vast majority of wireless communications systems in use today and in the future. A common model used by system planners is the ITS Irregular Terrain Model (ITM), also known as the Longley-Rice model. It can analyze wireless communications systems at frequencies from 20 MHz to 20 GHz.

While a good predictor in irregular terrain, ITM does not have the capability to utilize land-use, land-cover databases to predict losses due to man-made objects, such as buildings and bridges. ITS is evaluating the incorporation of land-use, land-cover databases into the ITM propagation prediction model to provide more accurate predictions than those calculated without knowledge of the obstacles. The improved predictions will allow service providers to better evaluate locations for base stations and to predict where additional base stations might be needed to fill in areas of inadequate signal coverage. Since better databases are now available for land-use, land-cover descriptions, the predictions of signal loss associated with the various land-use, land-cover categories could provide better agreement with measurements. An effort is also currently underway at ITS to develop an improved effective antenna height algorithm in ITM, to make more accurate propagation loss predictions over irregular terrain.

Another common model is the Okumura-Hata model. It is a good predictor in urban and suburban environments, but it does not handle irregular terrain nor does it handle changing environments, e.g., from urban to suburban to rural. ITS is also evaluating the means of incorporating terrain obstacle information into the Okumura-Hata model, to make it more responsive to the changing environment.

ITS participates in the international development of propagation prediction models that can be used by spectrum managers and system planners of land mobile, terrestrial broadcast, maritime mobile, and certain applicable fixed (e.g., point-to-multipoint) services. ITS supports this effort by participation in the International Telecommunication Union — Radiocommunication Sector (ITU-R) Study Group 3 (Radiowave Propagation). An ITS staff engineer is the Chair of the U.S. contingent of Study Group 3. Study Group 3 has recently developed and adopted such a model, ITU-R Recommendation P.1546, which blends features that the services had previously used independently of one another, thereby clarifying and unifying planning and coordination activities across the services.

ITS is a member of ITU-R Study Group 3 Working Parties 3K and 3M. Working Party 3K deals with point-to-area propagation where propagation aspects concerning terrestrial path-general and path-specific prediction methods in the frequency range 30 MHz to 3 GHz are addressed. In addition, Working Party 3K deals with propagation aspects of short-path personal communications and wireless local area networks (LAN) in the frequency range 300 MHz to 100 GHz, and terrestrial wireless access systems.



Output from the High Frequency propagation software for international frequency coordination, developed by the ITU and maintained by ITS.

Working Party 3M deals with propagation aspects of terrestrial point-to-point communication, Earth-space communication, interference, and coordination.

ITS also participates in ITU-R Study Group 3 Working Party 3J. Working Party 3J deals with the propagation effects of clear atmosphere, clouds, precipitation, noise, vegetation, and obstacle diffraction. Working Party 3J involvement also includes ground-wave propagation, global mapping, and the statistics of radio-wave propagation.

ITS is also a member of ITU-R Study Group 3 Working Party 3L. Working Party 3L deals with ionospheric propagation above and below 2 MHz, in addition to trans-ionospheric propagation. In its membership of the ITU-R Study Group 3 Working Party 3L (Ionospheric Propagation), ITS is responsible for maintaining the High Frequency (HF) (3-30 MHz) propagation software developed by the ITU for international frequency coordination. The ITU website:

http://www.itu.int/ITU-R/software/study-groups/rsg3/databanks/ionosph/index.html

links to an ITS web site with the following reference: HF sky-wave propagation (Rec. P.533) (available from the ITS website)

http://elbert.its.bldrdoc.gov/hf.html

An example of the type of output the software can produce is shown in the above figure.

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