Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: **Language revision for the US proposal for item 1.6 of the WRC-2012 relating to THz frequency considerations**

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Re: IEEE 802.15-09-0230-00-0thz

Abstract: Latest language status for US WRC 2012 draft proposal item 1.6, RR 5.565

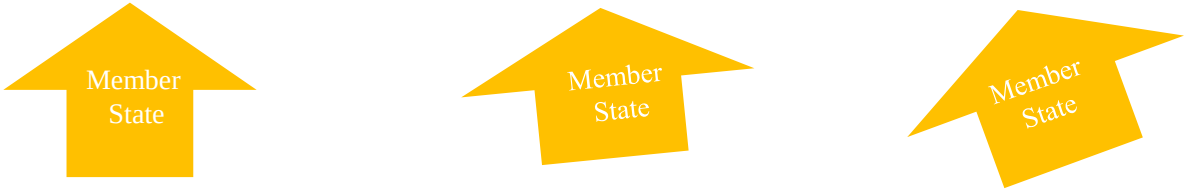
Purpose: Submit to 802.15 THz IG document archive and ongoing discussion towards WRC 2012

ITU – International Telecommunications Union

Is a standards development organization and specialized agency of the UN charted to develop global "open standards" for Telecommunications (ITU-T) and radio spectrum management (ITU-R)

WRC - ITU World Radio communications Conference 2003, 07 , 12, 16…..

World conference and meeting of member states who gather to revise an international treaty known as Radio Regulations that define 40 Radio-communication services and spectrum considerations ranging from amateur to professional (commercial) services such as mobile and satellite communications driven by the growth and challenges of the information and communication technologies



USG – United States Gov.

FCC – Federal Communications Commission
NTIA - National Telecommunications and Information Administration
NASA – National Aeronautics and Space Administration
WAC – Wireless Advisory Committee
IWG-4 Informal Working Group -4

US spectrum considerations

The US Department of State relies upon the National Telecommunication and Information Administration (NTIA) and the Federal Communications Commission(FCC) as the expert agencies on the WRC agenda items and global spectrum considerations. These agencies will draw upon the expert knowledge of other organizations such as NASA to help define the US position on telecommunications and spectrum issues.
The governments of other countries have their own agencies that perform similar tasks. And engage in Working Groups.

Recent changes in the US proposals language for WRC-2012 agenda item 1.6, Radio Reg. 5.565

The issue

The earlier US position regarding the draft language and content of the US draft submission for WRC2012 item 1.6, Radio Regulation 5.565, included and acknowledged in the body of the text, the potential for "active" services at terahertz frequencies (0.275 -3THz) and for experimentation and development at these frequencies.

This position in more recent US drafts was revised and reversed so that any mention of "active" services, experimentation and development at 0.275-1THz frequencies was deleted. Language identifying active services at frequencies from 1-3THz was still retained in body of the text as it was generally recognized that at these frequencies and associated atmospheric losses, that there was little threat of interference to passive (science) services from active sources.

The reason provided

WRC2012 agenda item 1.6 and Radio Reg. 5.565 were intended to only address passive services (science), where as WRC-2016, (with suitable new agenda item inclusion in WRC 2012), could be the first opportunity to address active (commercial) services at THz frequencies. Therefore the inclusion of language related to active services in WRC2012 was considered to be confusing to the intent and focus of WRC2012, and was thus deleted.

Why we should be attentive about the proposed US - WRC 2012 language

The removal of language inclusive of "active" THz services in specific frequency bands of the THz spectrum has been proposed in the US WRC2012 agenda item 1.6 contribution. The successful deletion of this active service language would likely generate confusion and concern from the perspective of THz communications advocates and investors. This especially at a time when governments and the global communications industry are struggling to provide more broadband spectrum to satisfy societies demand for more bandwidth intensive wireless services.

1. The removal of active service language in agenda 1.6 as proposed by the US IWG-4, though logical in function , has seeded confusion within the THz commercial research and development community, and specifically as to the long term availability of this spectrum for commercial activities. Additionally, there is as yet no definite scheduled agenda items to address active services in up coming WRC's. This unresolved status could consequently discourage vital near term intellectual investment and critical R&D capital for the emerging THz commercial and communications market.

2 The recent proposed language changes in the US WRC agenda item 1.6 draft, and in addition, statements by other spectrum interested organizations such as the International Amateur Radio Union, have clearly identified the THz spectrum as a spectrum of great interest. Without some closure regarding active services, this then leads to questions as to how this spectrum will be eventually apportioned to all the interested parties. This especially as THz markets begin to blossom over the next few years and likely prior to 2016.

3. Many other ITU member states to date, seemed to have taken a largely neutral position or were in step with the recent US proposals removing active service language. To their credit, a few member states have included pro-active service agenda item 1.6 language in their proposals for the upcoming WRC2012 meeting.

4. Assuming the adoption of proposed passive services language in item 1.6 for WRC2012, that deletes active service language between 0.275 - 1 THz, what scale of coordinated effort then would be required to create a new pro-active service agenda item in WRC 2012, and for eventual for address and consideration in WRC 2016 or some future WRC.

   From the 802.15 THz IG perspective, it would be prudent, (and more likely successful for the commercial THz industry), if the pro- active services language were re-inserted back into the US draft document, adopted and retained by the WRC2012 assembly. Thereby such pro-active language would be already established and recognized prior to the creation of a new "active" service agenda items proposed for WRC2016. The addition of active service language would come at little cost to WRC2012's agenda item 1.6.

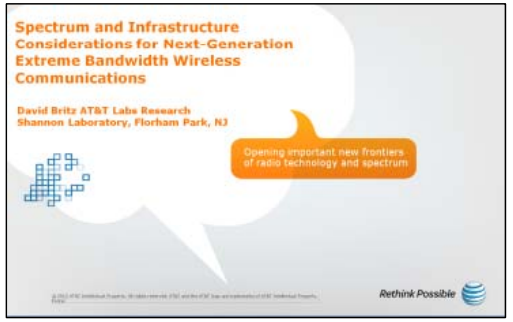
What to do? A little recent history

•In January of 2008, the 802.15 THz IG successfully lobbied 802.18 ITU Radio Regulatory TAG to issue a letter to the US Working Group 1A, via the 802 chairperson, to formally express 802.15 THz IG's concern as to the status of the US draft language in agenda item 1.6 and Radio Reg. 5.565, pertaining to language eliminated from draft agenda item 1.6 that had recognized active THz services and development – this letter though received was not formally responded to.

•In 2009, due to the unsuccessful letter response, the author being US based and in discussions with the 802.18 and 802.15 THz IG membership and leadership, elected to take a more direct approach and engage the US Working Groups 7D,C directly by participating in their meetings where possible.

•As someone unfamiliar with the WG process, the author required some time to learn the procedures and to track down the key individuals and processes required to address the language issues within the relevant US WG's regarding agenda item 1.6, Radio Reg. no.5.565 language.

•The author quickly accessed it would be more effective to have a larger and more officially recognized contact organization, familiar with the US WG's and WRC processes, to represent his concerns to over the agenda item 1.6 language to the USG and IWG-4 . More so, this connected USG facing internal organization could identify critical groups and individuals within the USG and WRC active community to approach and discuss the language concerns. The author successfully engaged his companies internal corporate ITU-T&R facing organization in May-June of 2010, and which then lead to meetings with the NTIA, FCC, NASA and the IWG-4 in late July 2010.



Critical meeting schedule

Meeting Tuesday July 20th

Location; Conference call between NTIA, FCC, NASA and AT&T

Purpose;

- For AT&T to present a perspective of a possible future THz based communications industry market and revenue opportunity **(My special thanks to Ho-Jin Song NTT Corp. for providing critical NTT THz market source material for this meeting)**
- Provide an AT&T sponsored (crafted) submission to modify language in WRC 12 agenda item 1.6, Radio Regulation 5.565 that adds suitable language back into the draft proposal to recognize experimental and technological development of "active" services between 275-3000GHz

Meeting Wednesday July 21st - Informal Working Group IWG -4 Meeting

Attending; USG and IWG-4, AT&T and interested parties

Purpose;

- For IWG to review and modify AT&T proposed language with AT&T representatives in real time
- Vote on AT&T's proposed item 1.6, Radio Regulation 5.565 language modifications Resolution for addition in and agenda proposals for the US proposal for WRC2012 **. IWG-4 approved AT&T language proposal.**

Meeting Wednesday July 28st

WRC Advisory Committee (WAC) meeting at the FCC

- IWG-4 presented the AT&T draft proposal among many others for consideration and approval by the WAC for inclusion in the US proposals for WRC-2012.
- There were no comments or objections related to the AT&T THz language changes and **the proposal was approved unanimously**.

Going forward to WRC-2012

•Proposals approved by the WAC now move forward for language reconciliation between the FCC and NTIA. Given NTIA and NASA support for AT&T's modified language in Item 1.6, it is hopeful that the language proposals will be accepted (as approved by IWG-4 and the WAC).

•**This review among many other language proposals modifications is still in process**

Edited Language to NTIA proposal regarding Agenda Item 1.6, Radio Regulation No. 5.565

Document 69/Rev1

July 20, 2010
AT&T Proposed Modification to NTIA Draft Proposal (see highlighted text)

UNITED STATES OF AMERICA
DRAFT PROPOSAL FOR THE WORK OF THE CONFERENCE

Agenda Item 1.6: to review No. **5.565** of the Radio Regulations in order to update the spectrum use by the passive services between 275 GHz and 3 000 GHz, in accordance with Resolution **950 (Rev.WRC 07)**, and to consider possible procedures for free-space optical-links, taking into account the results of ITU R studies, in accordance with Resolution **955 (WRC 07)**

Background Information: Agenda item 1.6 addresses two distinct issues. The content of this proposal addresses only the updating of No. **5.565** in accordance with Resolution **950 (Rev. WRC-07)**. The Table of Frequency Allocations establishes allocations at frequencies between 9 kHz and 275 GHz. No allocations currently exist above 275 GHz, although an entry in the Table for the range 275-1 000 GHz contains a reference to No. **5.565**.

Resolution **950 (Rev. WRC-07)** calls for a re-examination of the frequency bands contained in No. **5.565** with a view to updating this footnote, including advice on the applications suitable for the range 275-3 000 GHz. Passive services such as the Earth exploration-satellite service (EESS), space research service (SRS), and radio astronomy service (RAS) already utilize portions of the 275-3 000 GHz range for scientific observation. Some of these operations measure spectral line and continuum emissions from space while others measure atmospheric and climate-related natural emissions from the Earth and its atmosphere. Resolution **950 (Rev. WRC-07)** resolves to review No. **5.565** to update the information on spectrum use in the frequency range 275-3 000 GHz by the passive services, but specifically excludes allocations in this range. Although the focus of the agenda item is spectrum use by passive services, it is important to recognize that this frequency range concurrently is used for experimentation with, and development of, an array emerging active service applications.

ITU-R studies of current and projected scientific needs for passive use of the frequency range 275-3 000 GHz resulted in new recommendations and reports. These studies revealed a need to update No. **5.565** through the addition of some new bands of interest and the deletion of some existing bands. Technical factors strongly influence use of the range 275-3 000 GHz. First, the Earth's atmosphere absorbs signals at these frequencies, especially in the range 1 000-3 000 GHz where the atmosphere is nearly opaque. Second, antenna beamwidths are extremely narrow at such high frequencies.

Interference from non-geostationary satellites into terrestrial stations is highly unlikely due to the above factors and the speed of the spacecraft relative to Earth. With regard to geostationary satellites, coordination would resolve the potential interference from the unlikely scenario of transmissions with maximum antenna coupling and minimum propagation loss. As a result, passive and active services can share frequencies above 1 000 GHz without constraints.

Proposal:

ARTICLE 5
Frequency allocations

Section IV – Table of Frequency Allocations
(See No. **2.1**)

MOD USA/AI 1.6/1

5.565 A number of frequency bands in ~~T~~the ~~frequency band~~ range 275-~~1~~3 000 GHz ~~may be~~ are used by administrations for ~~experimentation with, and development of, various active and~~ passive service~~s~~ applications. This frequency range also is used for experimentation with, and development of, various active service applications. In the~~is band~~ frequency range 275-1 000 GHz a need has been identified for the following frequency bands for measurements by ~~spectral line measurements for~~ passive services:

- radio astronomy service: 275-323 GHz, 327-371 GHz, 388-424 GHz, 426-442 GHz, 453-510 GHz, 623-711 GHz, 795-909 GHz and 926-945 GHz;

- Earth exploration-satellite service (passive) and space research service (passive): 275-~~277~~286 GHz, ~~294~~296-306 GHz, ~~316~~313-~~334~~356 GHz, ~~342-349 GHz, 363~~361-365 GHz, ~~371~~369-~~389~~392 GHz, 397-399 GHz, 409-411 GHz, 416-434 GHz, ~~442~~439-~~444~~467 GHz, ~~496~~477-~~506~~502 GHz, 523-527 GHz, ~~546~~538-~~568~~581 GHz, ~~624~~611-~~629~~630 GHz, 634-654 GHz, ~~659~~657-~~661~~692 GHz, ~~684-692 GHz~~713-718 GHz, ~~730~~729-~~732~~733 GHz, 750-754 GHz, 771-776 GHz, 823-846 GHz, ~~851~~850-~~853~~854 GHz, 857-862 GHz, 866-882 GHz, 905-928 GHz, ~~and~~ 951-956 GHz, 968-973 GHz and 985-990 GHz.

In the frequency range 1 000-3 000 GHz, passive services may use any band segment for ground- and space-based experimentation without constraints on any other services operating in this range.

~~Future research in this largely unexplored spectral region may yield additional spectral lines and continuum bands of interest to the passive services.~~ Administrations are urged to take all practicable steps to protect ~~these~~ passive services from harmful interference until the date when the allocation ~~T~~table is established in the ~~above-mentioned~~ 275-3 000 GHz frequency range~~band~~.

Reasons: Based on the studies performed, the list of EESS and SRS bands of interest in the range 275-1 000 GHz need to be updated in No. **5.565**. ITU-R studies have shown that unconstrained sharing between passive and active services in the frequency range 1 000-3 000 GHz is feasible; therefore passive services should have use of any band segment in this frequency range for experimentation.

SUP USA/AI 1.6/2

Conclusion

Though we have managed to insert pro-active service language back into the US draft for agenda item 1.6, Radio Reg. 5.565. The new US position must still be supported, approved and retained by the rest of the member states in the finalized language of the upcoming WRC 2012 meeting. This is not a foregone conclusion.

Additionally a new agenda item focusing on "active services" at THz frequencies must be scheduled for WRC 2016. This new agenda item must be initiated and approved via agenda item AI8.2 in WRC2012, This process has been started by Dr. Thomas Kuerner.

More so!

Hopefully with approval in WRC2012 for a new "active" services THz agenda item, the real work for the successful development of THz communications technology and infrastructure will ensue. After 2012, and with an "active" services agenda item in place, the relevant WRC member states working groups will begin to focus critically on the language and technical detail regarding the coexistence between proposed "active" (commercial) services and existing passive (science) THz services, including emission methods and system architecture.

How should the 802.15THz IG respond and engage the THz community and the WRC-WG's going forward?

Phase 1) In preparation for the WRC "active" services THz agenda item schedule, the 802.15 THz IG membership (or its decedent), in collaboration with the greater THz research, science (active and passive services) and industry should find means to work together and coordinate through 802.15THz IG to define a viable THz communications system architecture. This THz architecture, at least to a the high level, would define the science, engineering and market details of an indoor and outdoor open air communications architecture utilizing the lower path-loss THz bands between 0.275THz and 1THz. In parallel, this architectural definition should stimulate the initiation of supportive 802.15 THz device and operations standards.

Phase2) It will likely be necessary that some "real world" testing and evaluation of coexistence between active and passive services will be necessary to provide viable evaluative data. The 802.15 THz IG must consider the means to build and demonstrate such a THz communications demonstration platform, (perhaps through collaboration between one or more of its member institutions). This platform could then be used to evaluate the feasibility of co-existence between existing passive and active services in partnership with passive services representative organizations. Results from such a platform will help the relevant WRC craft the most viable and mutually acceptable decisions and policy for the coexistence between passive and active THz services going *forward*.