IEEE P802.22  
Wireless RANs

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**IEEE 802.22TM-2011 STANDARD FOR WIRELESS REGIONAL AREA NETWORKS IN TV WHITESPACES COMPLETED**

**PISCATAWAY, N.J., USA, XX Month 2011** – IEEE, the world's largest professional association advancing technology for humanity, today announced that it has published the IEEE 802.22TM standard[1]. IEEE 802.22 standards based systems have a potential to provide broadband access to wide regional areas around the world to bring information and communication technologies to unserved and under-served communities.

The IEEE Standard 802.22-2011 on Wireless Regional Area Networks (WRAN) takes advantage of the favorable propagation characteristics in the VHF and low UHF TV bands to provide broadband wireless access under Line of Sight (LoS) and Non Line of Sight (NLoS) conditions over a large area (10 km - 100 km), while operating on a strict non-interference basis in spectrum assigned to, but unused by, the incumbent licensed services also known as the Television Whitespaces (TVWS). Based on the regulatory domain and propagation characteristics, a single WRAN Base Station can provide a coverage over 300 – 30,000 sq. kms. New approaches using purpose-designed cognitive radio techniques enable 802.22-based systems to avoid interference to themselves and to other licensed services that exist in the same bands while making optimal use of the available spectrum.

Use cases for the IEEE 802.22 based devices include broadband access over large distances and Non Line of Sight conditions, broadband access for remote and rural areas, live-stock monitoring, monitoring of the rain-forests, long-range backhaul, smart grid and critical infrastructure monitoring, defense, homeland security, healthcare, small office home office, campus wide broadband wireless access and a variety of others.

IEEE 802.22 incorporates cognitive radio capabilities such as dynamic spectrum access (DSA), access to the incumbent database, accurate geolocation techniques, spectrum sensing, primary user protection beacon, regulatory domain dependent policies, spectrum etiquette, and coexistence. The standard also provides broadband access while protecting incumbent users and using the spectrum efficiently.

The IEEE 802.22 Working Group (WG) started its work in January 2005 following the Notice of Inquiry (NOI) issued by the United States’ Federal Communications Commission (“FCC”)[2] and the first NPRM[3] on unlicensed’ operation in the TV broadcast bands.

IEEE 802.22 WG has developed a point-to-multipoint wireless broadband air interface standard optimized for operation in the VHF and UHF TV bands, in the frequency range between 54 MHz and 862 MHz. The standard is especially useful for serving less densely populated areas (e.g., rural areas) where most empty TV channels can be found and where population is mostly unserved or underserved by Internet broadband access services. The base station (BS) can be accessed by fixed customer premise equipment (CPE) as well as portable devices as per local regulatory requirements.

A messaging interface for the purpose of accessing an incumbent database service is included in the IEEE 802.22 standard to accommodate new United States regulatory requirements. It should be noted that since the BS controls the DSA operation in this point-to-multipoint operation, the BS is used as the central point for querying the database service. This is done by acquiring the location of each CPE and portable terminal early in the process of association, querying the database service on behalf of these terminals and locally managing the responses from the database service to decide on the next DSA action for the specific CPE or the entire network.

The IEEE 802.22 standard contains mechanisms for the BS to control sensing operation taking place at the CPEs and portable devices, and to report sensing results to the BS. Furthermore, regulatory dependent policies used at the BS to control the DSA behavior under various conditions are embedded in the standard. Satellite and terrestrial geolocation techniques have been incorporated into the standard. The IEEE 802.22 WG took special care in embedding security features for not just the data, control and management functions, but also for cognitive functions. ***Based on the regulatory requirements, certain features, (e.g., sensing) can be disabled if they are not required***.

Recognizing the difficulty of reliably sensing wireless microphone operations in the TV bands, a parallel standardization activity was undertaken under the IEEE 802.22.1TM Task Group to develop a related standard for a radio frequency (RF) beacon to signal the presence of wireless microphone operation in a more reliable manner. This has resulted in the publication of the IEEE 802.22.1-2010 in November 2010[4].

Besides being able to detect broadcast incumbents to avoid interference, a spectrum efficient mechanism is included to detect other 802.22 WRAN operations to implement self-coexistence. This is achieved by having the available channels properly distributed among 802.22 WRAN’s operating in the same area and, if needed, distributing frame capacity amongst co-channel operating 802.22 systems for more efficient use of the spectrum.

Additional information on the standard can be found at the [IEEE 802.22 WG](http://www.ieee802.org/22/) page. To purchase the standard, visit the [IEEE Standards Store](http://standards.ieee.org/store" \t "_blank).

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