SUMMARY PAPER IMPROVEMENT

Author:

**Title in the proceeding of IES-ETA 2018** : A Spots Independent for NVIS Channels

Observation

**Title to be submitted to the journal of EMITTER** : A Simplified Sounding System for Finding NVIS Channel Availability to Support Government Radio Networks in Indonesia

**Summary of the previous paper in IES-ETA 2018 proceeding:**

1. A simple and spot-independent WSPR sounding system for probing NVIS channels propagation condition have been done by using a frequency in 40 meter band, during the condition of a minimum in the cycle of solar activity.
2. The NVIS channels simulation has been carried out by using VOACAP. Data from VOACAP simulation system have been compared with the result of WSPR sounding system.
3. The comparison result shows that the sounding by using WSPR is able to provide relatively a proper data that figure the behavior of NVIS channel.
4. The result of measurement showed that there was no significant difference data between line-of-sight spots and mountain-covered spots. This result implied that the only signal present during sounding processes is sky waves, or in the other words could say that there is absolute isolation occurred to the ground wave. The most reasonable cause of this phenomenon is that the transmitter is using inverted-V antenna, therefore the radio frequency transmitted signal will have a horizontal polarization in which only could be effectively received by the antenna that have the same polarization too.

**Summary of the paper to be submitted to the journal of EMITTER:**

1. How important the usage of sub-10 MHz HF band for humanitarian purposes have been analyzed by the regulatory consideration. Based on official views of attended Administration/State members during WRC-2015, could be concluded that they have the same spirit to use this sub-10 MHz band for PPDR and other humanitarian purposes, as the prominent usage.
2. The data of radio frequency usage licenses holder in the 3 - 10MHz band are listed on the Database Frequency Register managed by the Indonesian frequency authority (SDPPI). Data analysis and categorizing have been done. The results show that the dominant users are fixed service users. The number of those users are declining continuously. Means, the channels availability of frequency below 10 MHz is getting better.
3. WSPR (Weak Signal Propagation Reporter) is a narrow bandwidth, small power and reliable beacon system. More a bit review has been done toward the inside algorithm that make WSPR so reliable
4. A simple propagation measurement by using WSPR sounding system have been done during minimum solar cycle by using three frequency in the band of 80m, 60m and 40m respectively. The measurements have been done for three difference day with approximately 3-months period. The NVIS channels simulation has been carried out by using VOACAP. Data from VOACAP simulation system have been compared with the result of WSPR sounding system. The comparison result shows that the sounding by using WSPR is able to provide relatively a proper data that figure the behaviour of NVIS channel.
5. Discrepancies between simulation and measurement are occurred mainly because of sporadic data in the band of 60m and 80m. However, all of the measurement results and simulations almost have the same agreement regarding the quiet period between local midnight to local sunrise.
6. The results of measurements show that 60m band is the most reliable NVIS channel between local sunrise until local midnight. Furthermore, 100 watts is a proper transmitter power to reach the required SNR for reliable voice communication.
7. The result of this study will become a platform of the recommendation to the Government, in order to decide a moratorium for a new fixed service frequency assignment for sub-10 MHz band, except only for humanitarian and PPDR purposes.

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