

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

Submission Title: Frequency considerations in the 900MHz frequency bands

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Source: [Jung Yeol Oh, Jae Hwan Kim, Cheolhyo Lee, Hyung Soo Lee, Sang Sung Choi]

Company: [ETRI]

Address: [ETRI, 138 Gajeong-ro, Yuseong-gu, Deajeon, 305-700, South Korea]

Voice: [+82-42-860-1531], **FAX:** [+82-42-823-5218]

E-mail: [jyoh@etri.re.kr, kimj@etri.re.kr, cle7@etri.re.kr, hsulee@etri.re.kr, sschoi@etri.re.kr]

Re: [Contribution to IEEE 802.15.6 Meeting, July 2010]

Abstract: [This document presents regulations for 900 MHz frequency band in Korea and suggests a proposal of frequency channel plan for the IEEE 802.15.6]

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900 MHz Frequency Band Utilization for IEEE 802.15.6 in Korea

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PHY Regulation for 902-928 MHz Band

- 902-928 MHz bands has different modulation parameters from those of the 863-870 and 950-963 MHz bands.
- The current channel plan for 902-928 MHz band in Korea does not well match with that of the RFID/USN regulatory requirements.
- If we modify the modulation parameters for the 902 MHz to 928 MHz bands into the same parameters of the 863-870 and 950-963 MHz bands, we can adjust the channels to fit the channels of the RFID/USN in Korea.

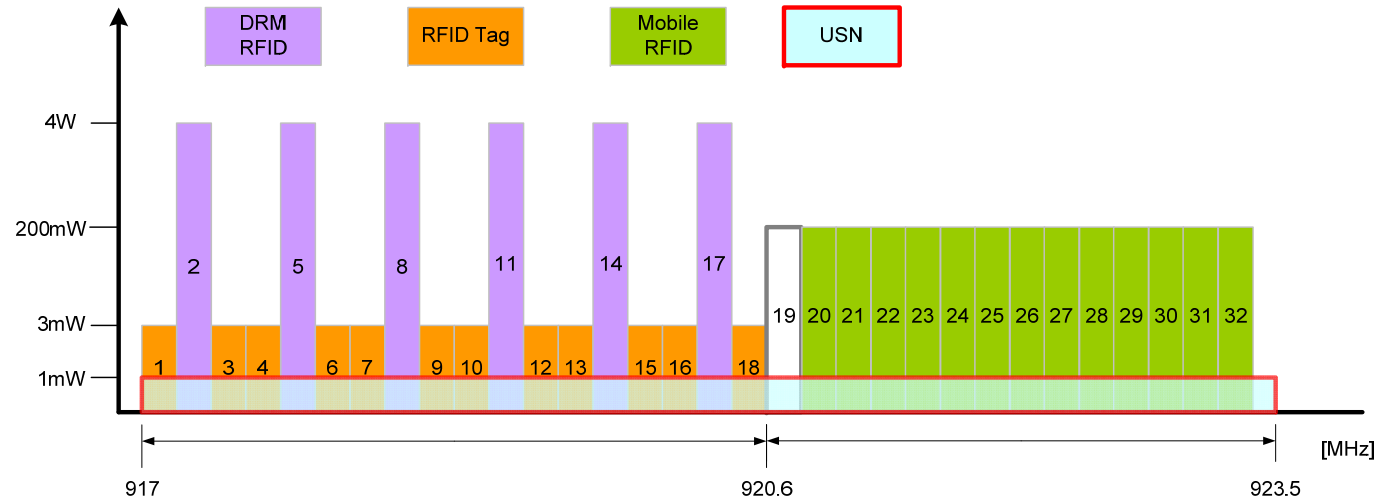
Packet Component	Modulation	Symbol Rate (ksps)	Information Data Rate (kbps)	Support
PLCP Header	$\pi/2$ -DBPSK	300	91.9	Mandatory
PSDU	$\pi/2$ -DBPSK	300	121.4	Mandatory
PSDU	$\pi/2$ -DBPSK	300	242.9	Mandatory
PSDU	$\pi/4$ -DQPSK	300	485.7	Mandatory
PSDU	$\pi/8$ -D8PSK	300	728.6	Optional

[902-928 MHz Bands]

Packet Component	Modulation	Symbol Rate (ksps)	Information Data Rate (kbps)	Support
PLCP Header	$\pi/2$ -DBPSK	250	76.6	Mandatory
PSDU	$\pi/2$ -DBPSK	250	101.2	Mandatory
PSDU	$\pi/2$ -DBPSK	250	202.4	Mandatory
PSDU	$\pi/4$ -DQPSK	250	404.8	Mandatory
PSDU	$\pi/8$ -D8PSK	250	607.1	Optional

[863-870 MHz, 950-956 MHz Bands]

RFID/USN Frequency Regulation in Korea



- 900MHz New Band RFID/USN Technical Regulation
 - 917~920.6 MHz for the Channelization of the fixed RFID systems
 - DRM(Dense Reader Mode) RFID & Tag Band
 - 18 Channels (CH#1 ~ CH#18)
 - 920.6~923.5 MHz for the Channelization of the mobile RFID systems
 - Low transmission power RFID Channelization
 - 13 Channels (CH#20 ~ CH#32)
 - 917~923.5 MHz USN Channelization
 - Guard Channel : CH#19

Detailed Technical Descriptions

- 917~920.6 MHz DRM(Dense Reader Mode) RFID Channelization
 - Separates powerful Readers and weak tags spectrally to prevent reader-tag interference
 - RFID Readers use 6 fixed high power channels of 200KHz spacing and each of 600 KHz apart
 - Therefore interrogator transmissions may take place on the same channel and it reduces interference to tag transmissions
 - Fixed type DRM 6 Channels (CH# 2, 5, 8, 11, 14, 17)
 - Transmit level is up to 4 watts EIRP Frequency Hopping
 - Frequency accuracy : ± 10 ppm
 - In the channels 1, 3, 4, 6, 7, 9, 10, 12, 13, 15, 16, 18 the transmission power is restricted to 3 mW for the tag's backscatter reply signals
- 920.6~923.5 MHz Mobile RFID & Low Tx power RFID Channelization
 - Max. transmission power : 200 mW EIRP
 - Low transmission power for the hand/mobile RFID Readers
- 917~923.5 MHz USN Channelization
 - Generic USN devices can share the channels with spectrum access methods
 - Max. transmission power : 10mW EIRP
 - Frequency accuracy : ± 40 ppm

Sharing Conditions for RFID/USN

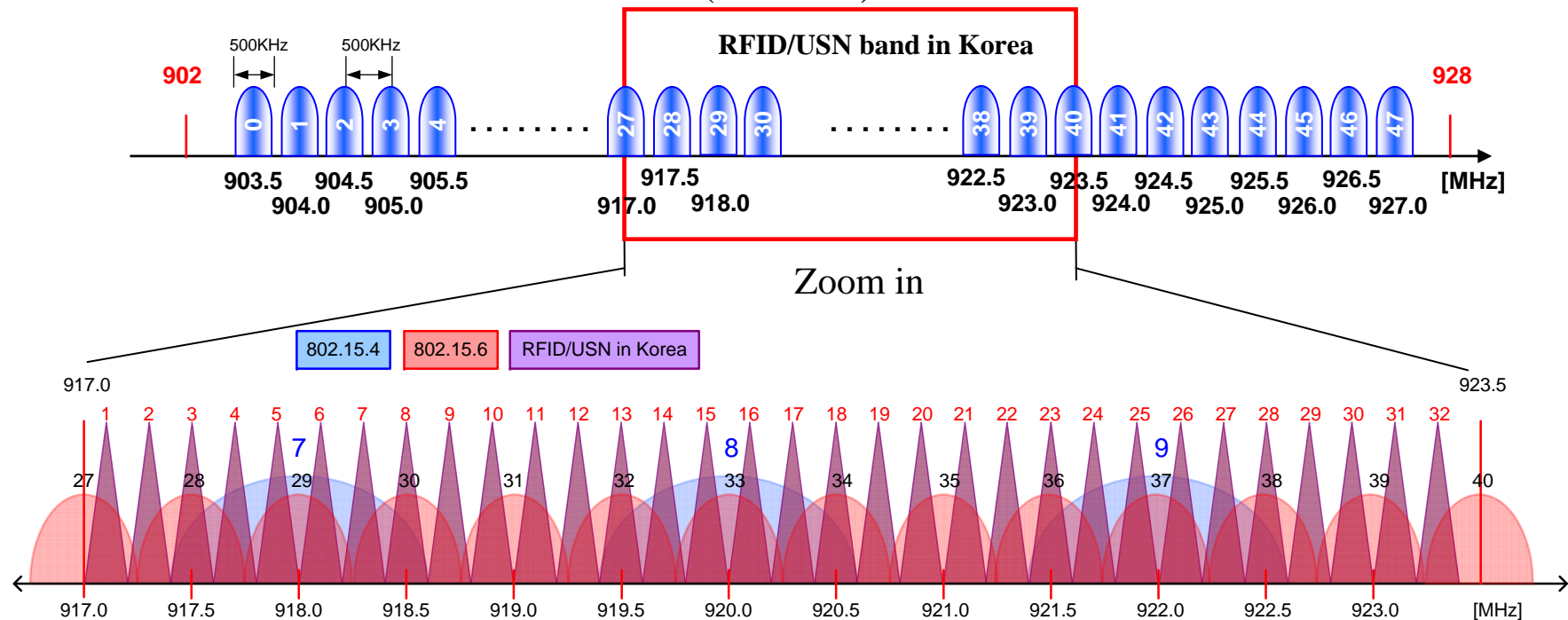
- FHSS (Frequency Hopping Spread Spectrum)
 - No. of hopping channels for RFID should be more than 16.
 - No. of hopping channels for DRM RFID should be more than 6.
 - Max. hopping time should be less than or equal to 0.4 second.
- LBT (Listen Before Transmission)/CSMA-CA
 - Maximum period of continuous transmission should be 4 seconds.
 - Transmission is required to cease for a period of not less than 50 ms.
 - Carrier sensing time should be greater than 5 ms.
 - Only transmit if no signals are detected at levels greater than -65 dBm.
- Other devices without LBT and FH schemes should observe Duty Cycle Criteria.
 - It must be lower than 2% for any 20 sec.

More than 5ms , -65 dBm



The Problem of Current Channelization

- 12 channels in 900 MHz band are available in Korea
 - Channels # 28th through #39th are available
 - The high power RFID channels (200 kHz) are not well aligned with the channels for IEEE 802.15.6 (500 kHz).



Proposed Channel Plan for 902-928 MHz

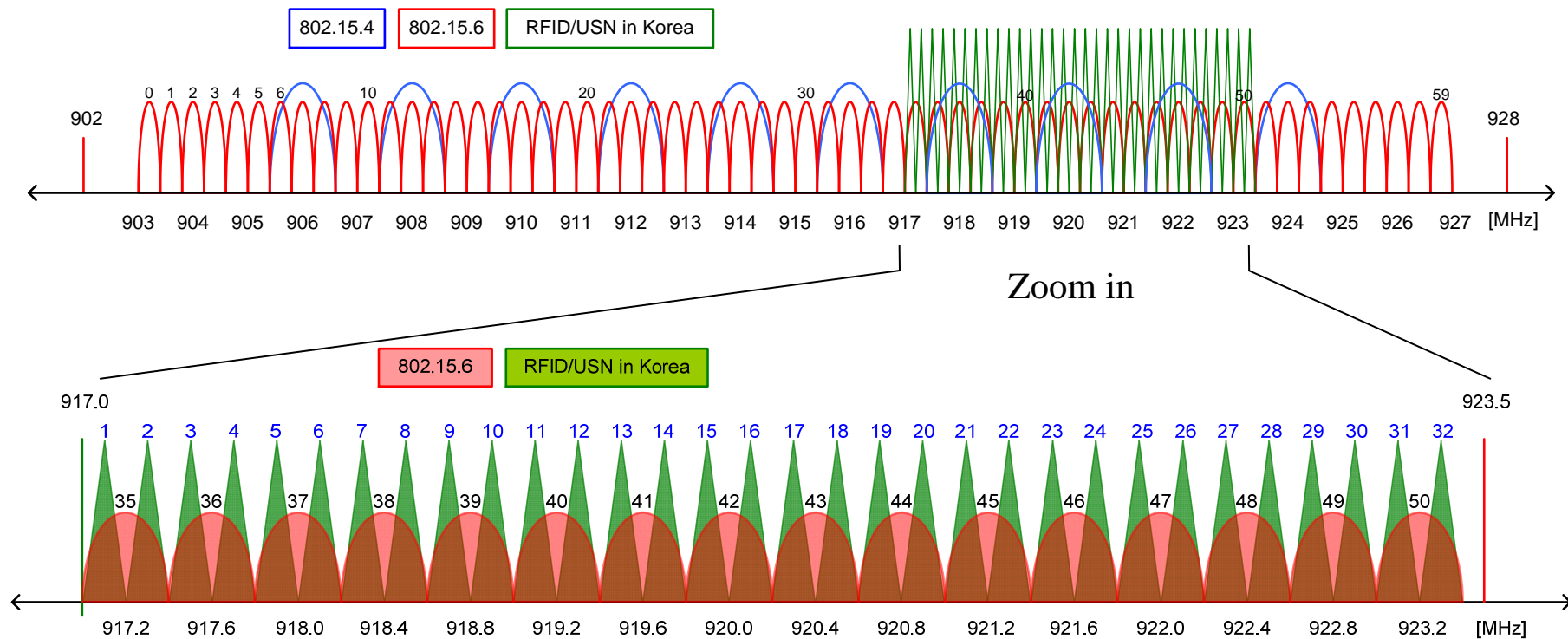
- We propose to assign 60 channels at the frequency range from 902 MHz through 928 MHz, whose modulation parameters are the same as those of the 863-870 and 950-963 MHz bands
- The proposed channel plan is as follows

$$f_c = 903.20 + 0.40 \times n_c \text{ (MHz)}, n_c = 0, \dots, 59$$

- 16 channels (6.4 MHz) can be available in RFID/USN bands of Korea with the proposed plan.
 - Channels # 35th through #50th are available

Proposed WBAN Channel Plan in Korea

- 16 WBAN channels can be available in RFID/USN bands of Korea
 - They are well aligned with the RFID/USN Channels.



Summary

- The present document gives information on the regulatory issues in the frequency range from 917 MHz to 923.5 MHz of Korea.
- RFID/USN devices can co-exist within the band if using LBT or other spectrum access methods such as duty cycle.
- The channel plan of 902-928 MHz frequency bands of the WBAN narrowband specification is not appropriate for the frequency regulation of Korea.
- It is proposed to alter the current modulation parameters for bands of 902-928 MHz into the same parameters of the 863-870 and 950-963 MHz bands.
- The present document also proposes a new channel plan of 902-928 MHz frequency bands to be adequate for the regulations of RFID/USN band in Korea.
- The proposed plan designates 60 available channels and adopting the same modulation parameters would be more advantageous to implement multiple frequency systems at the multiple bands.