

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

Submission Title: Needs of High-data-rate In-body WBAN

Date Submitted: July 16, 2009

Source: [Jaehwan Kim, Jung Yeol Oh, Cheolhyo Lee, Hyung Soo Lee, Jae Young Kim]

Company: [ETRI]

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

Voice: [+82-42-860-5338], **FAX:** [+82-42-823-5218]

E-mail: [kimj@etri.re.kr, jyoh@etri.re.kr, clee7@etri.re.kr, hsulee@etri.re.kr, jyk@etri.re.kr]

Re: This document is ETRI's response to the Call For Proposal from the IEEE P802.15 Task Group 6 on BAN.

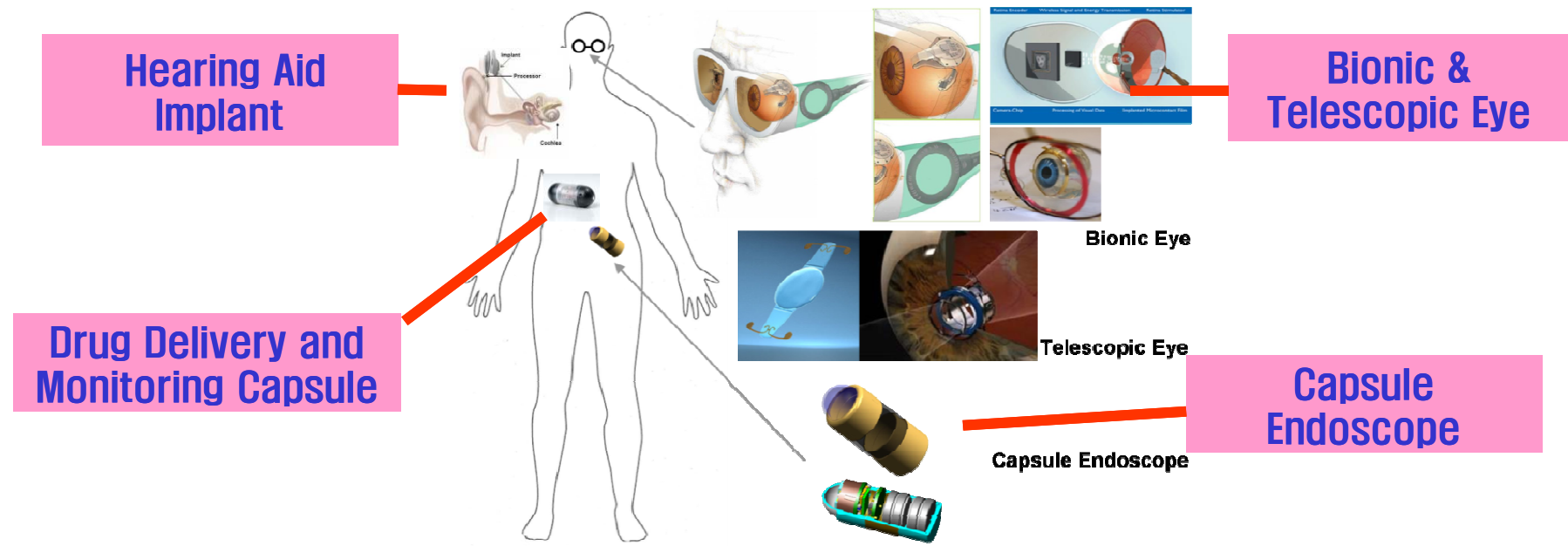
Abstract: This document presents needs of High-data-rate In-body WBAN and summary of ETRI's.

Notice: This document has been prepared to assist the IEEE P802.15. It is offered as a basis for discussion and is not binding on the contributing individual(s) or organization(s). The material in this document is subject to change in form and content after further study. The contributor(s) reserve(s) the right to add, amend or withdraw material contained herein.

Release: The contributor acknowledges and accepts that this contribution becomes the property of IEEE and may be made publicly available by P802.15.

Importance of High-data-rate In-body WBAN

- Applications of Implantable BAN
 - Capsule Endoscope
 - Drug Delivery & Monitoring Capsule
 - Bionic & Telescopic Eye
 - Implant Hearing Aid
- Image resolution
 - Image quality at least 2Mbps
 - Enlarge the image for specific symptom
 - HD image : up to 20Mbps



Review of PHY Proposals for High-data-rate In-body System

- Ultrawideband proposals
 - Focused on on-body applications

- Narrowband proposals
 - Most of them, low data rate systems are proposed
 - High data rate (greater than 10 Mbps) proposals
 - Frequency bands : 900 MHz, 2.4 GHz
 - Due to the In-body propagation loss, these frequency bands are not acceptable
 - Link budget for about 15 cm inside body propagation case is not provided

ETRI's In-body High Data Rate PHY Proposal

- Data rates
 - 5 Mbps ~ 20 Mbps
- Frequency band
 - 270 ~ 310 MHz
- Modulation
 - Phase Silence Shift Keying (PSSK)
- Receiver sensitivity
 - -84 dBm

Frequency Band

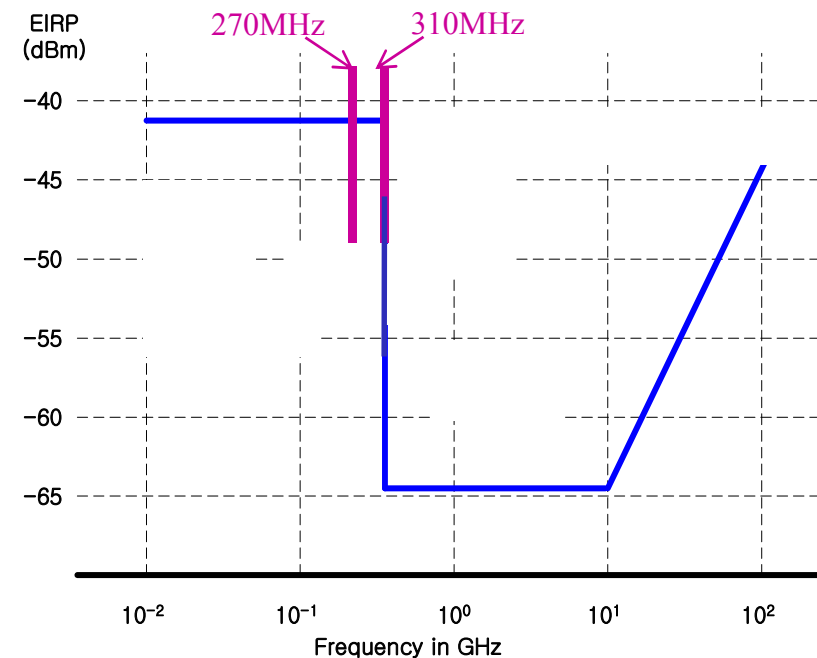
- Korea regulation
 - Unlicensed general requirements

Frequency (MHz)	Electric field strength (uV/m)	Measuring distance (m)	EIRP (dBm)
~322MHz	500	3	-41.25
322MHz ~ 10 GHz	35	3	-64.35
10 GHz ~ 150 GHz	$3.5 \times f(\text{GHz})$ Max. 500	3	$-84.35 + 20\log(f)$

* Power regulation in Japan is the same as in Korea

Recommended Frequency Band in Korea

- Unlicensed ultra low-power transmission
 - -41.25dBm(Korea)
- Consideration of in-body transmission
 - Small antenna size
- Frequency band
 - 270~310MHz



FCC Regulation

- FCC Part15.209 (Radiated emission limits)
 - Unlicensed general requirements

Frequency (MHz)	Electric field strength (uV/m)	Measuring distance (m)	EIRP (dBm)
30 ~ 88	100	3	-55.3
88 ~ 216	150	3	-51.7
216 ~ 960	200	3	-49.2
Above 960	500	3	-41.25

Conclusion

- A lot of future applications of In-body systems need higher rate than the systems which are developed in these days.
- In-body high data rate standard is essential for WBAN.
- We suggest that In-body high data rate proposal should be developed separately in narrowband group.