

# Human Body Communication

AMPLET Communication Laboratory



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## Abstract

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Human body communications (HBC) attracts attention as short range wireless communication technology to meet the recently increased demand for low – power in wireless body area networks for wearable – device applications. IEEE 802 has established a Task Group called IEEE 802.15.6 for the standardization of WBAN covers UHF narrow band radio, UWB and HBC.

Chungnam National University concluded an Education Agreement on HBC design with AMPLET Communication Laboratory in January of 2017.

Dr. Hideyuki Nebiya (President of AMPLET Communication Laboratory) will explain the basic technology of HBC, electrode design, and new HBC application as ECG sensor utilizing the HBC receiver at this seminar.

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# Human Body Communication

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1. Human Body Communication ( IEEE 802.15.6 )
2. What is Electric Field ?
3. Suitable Frequency for Human Body Communication
4. How to design an Electrodes ?
5. Communication between Person and Robot using Human Body Communication
6. Body as a Transmitter
7. Next Generation Human Body Communication
8. Joint Study on Human Body Communication between Korea and Japan
9. Our Dream using HBC Technology



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## 1. Human Body Communication ( IEEE 802.15.6 )

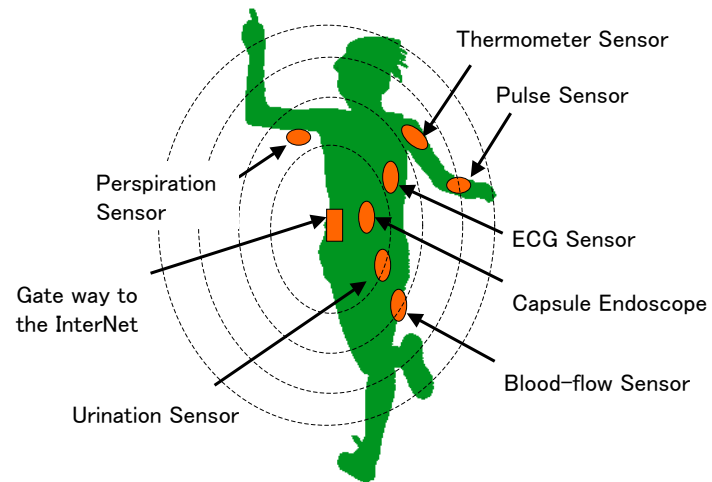
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## Medical and Healthcare Short Range Wireless Communication (IEEE 802.15.6)

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## 2. What is Electric Field ?

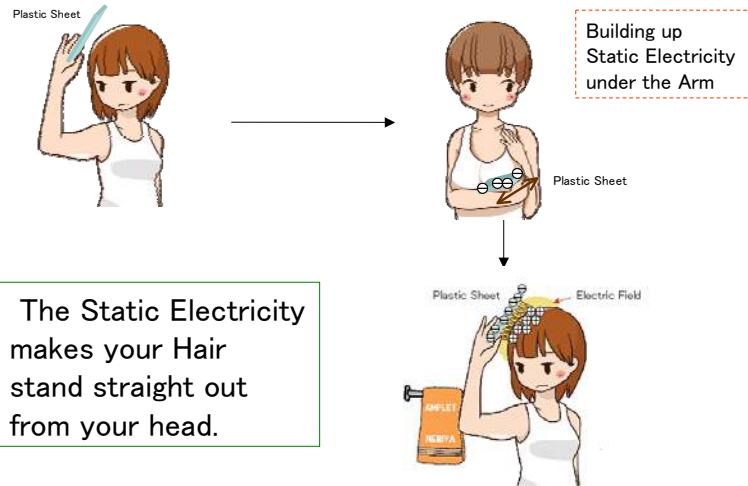
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## Experiment using Static Electricity

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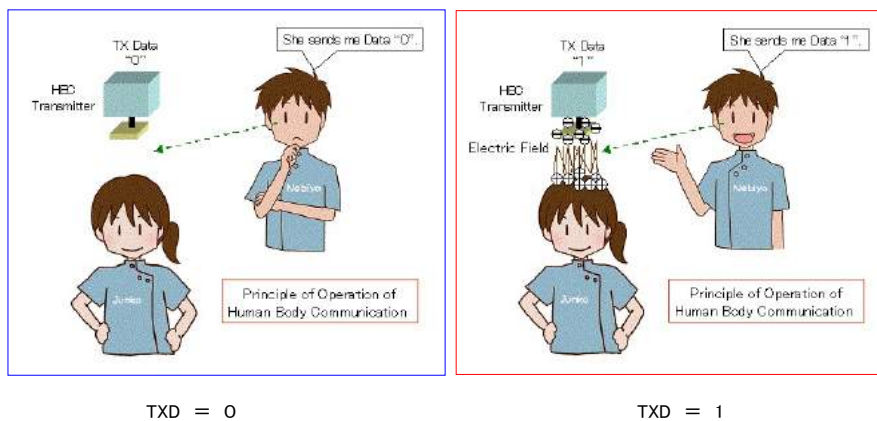
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## Concept of HBC

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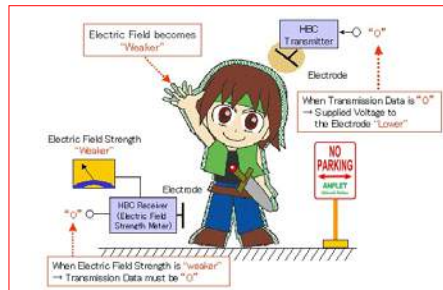
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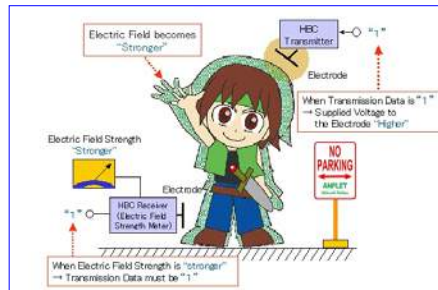
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## Operation Principle of HBC

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TXD = 0



TXD = 1

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## 3. Suitable Frequency for Human Body Communication

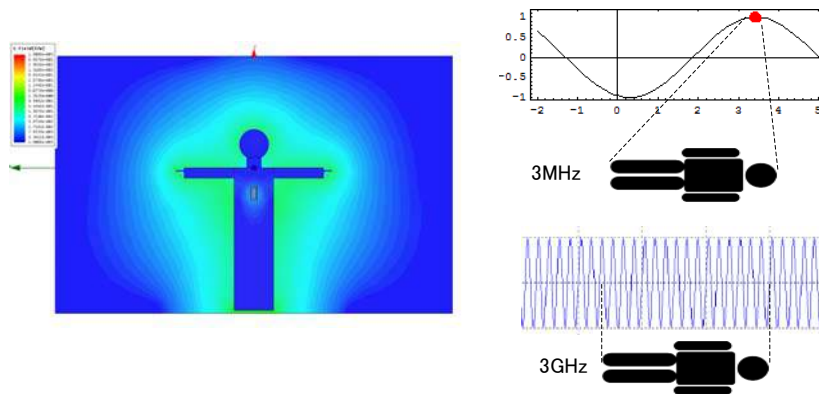
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## Radiation from the Body (PC Simulation)

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Suitable Frequency for "Electric Field Communication System" is HF.

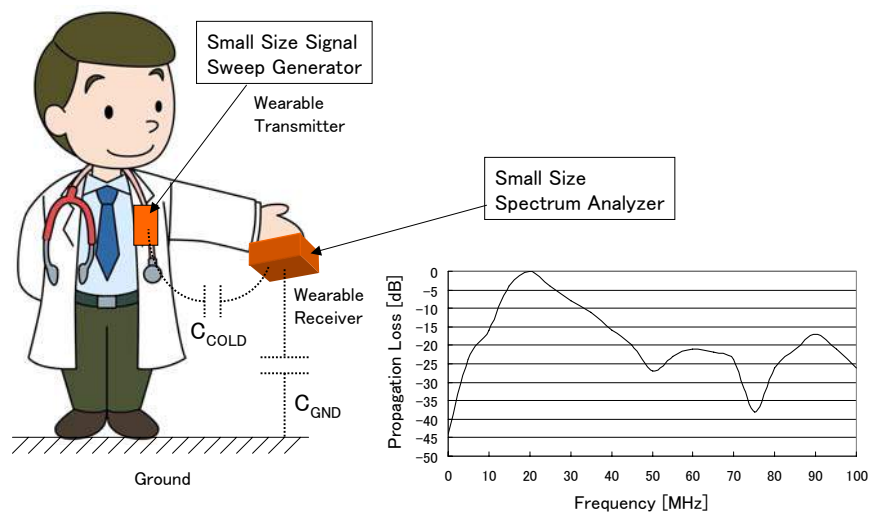
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## Normalized Propagation Characteristics by Experiment between a Wearable Transmitter and a Wearable Receiver

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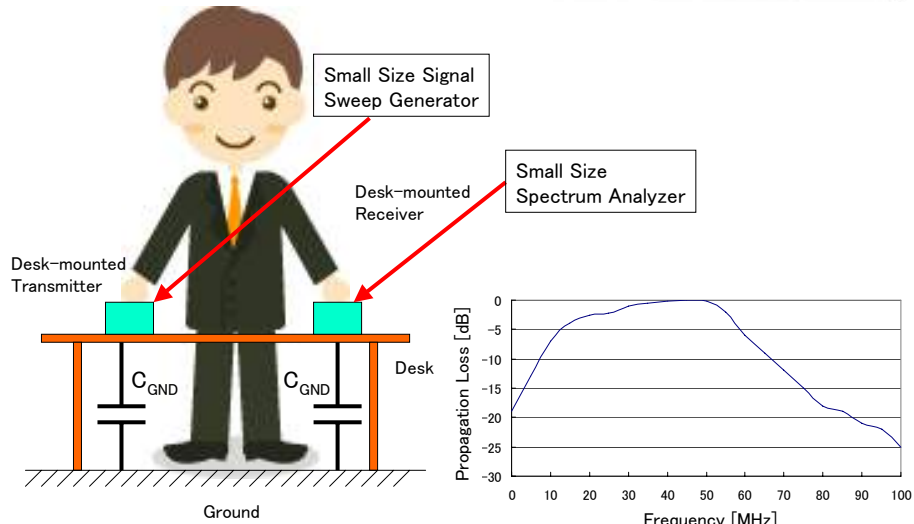
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## Normalized Propagation Characteristics by Experiment between a Desk-mounted Transmitter and a Desk-mounted Receiver

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## 4. How to design an Electrodes ?

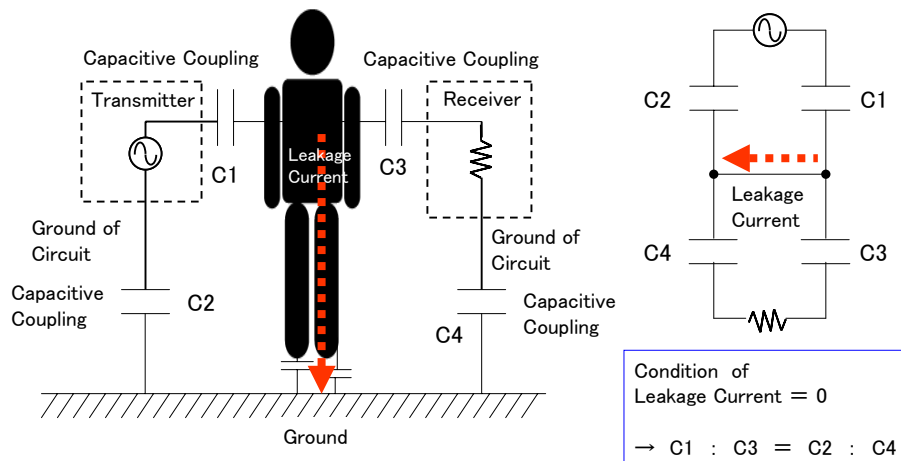
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## How to design an Electrodes ?

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## 5. Communication between Person and Robot using Human Body Communication

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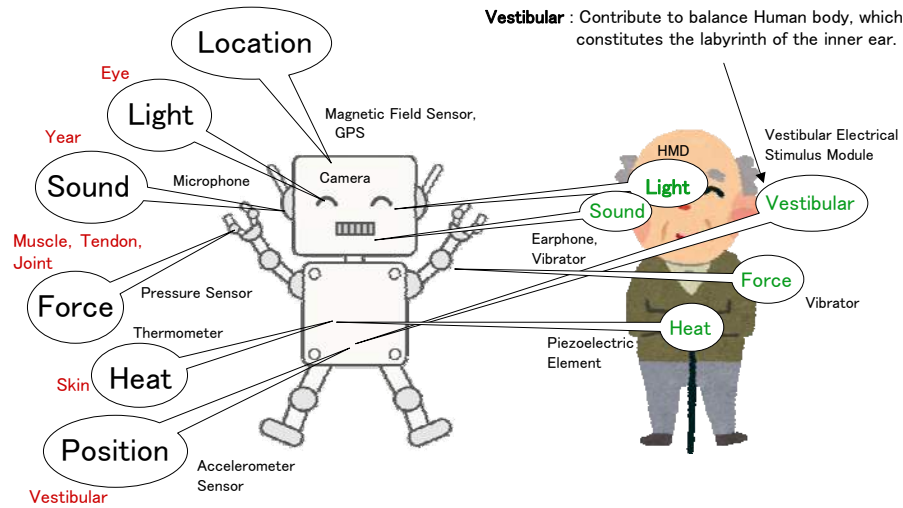
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## The Personal Care Robot for aged Person

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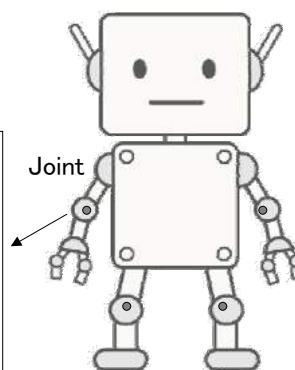
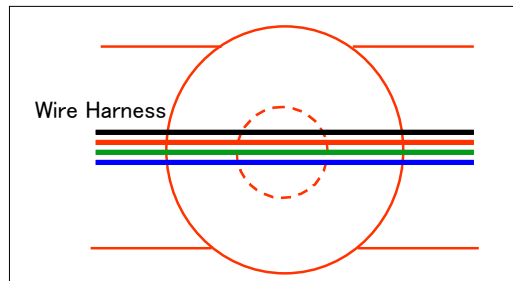
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## The Issue of Wire Harness Breakage at Joints of a Robot

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After many times bending Arms of the Robot ...  
Wire Harness Breakage at the Joint should happen to occur. It is a Problem !!



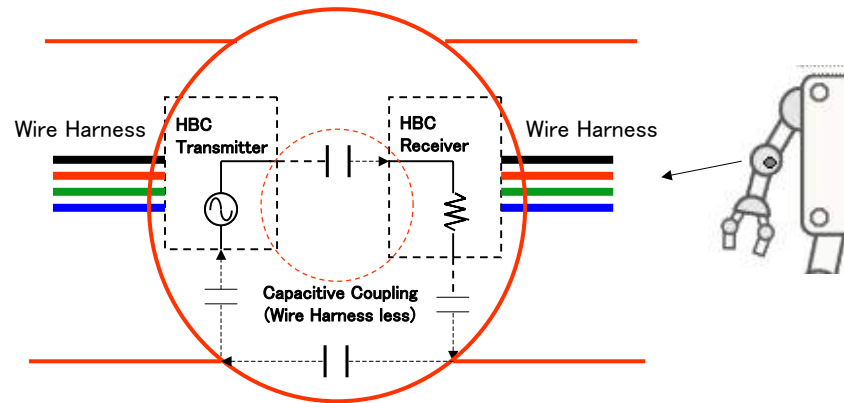
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## The Solution of Wire Harness Breakage using Human Body Communication Technology

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## 6. Body as a Transmitter

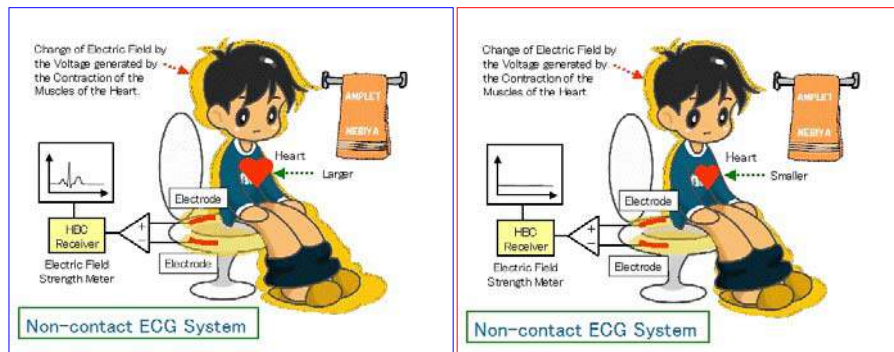
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## Body as a Transmitter

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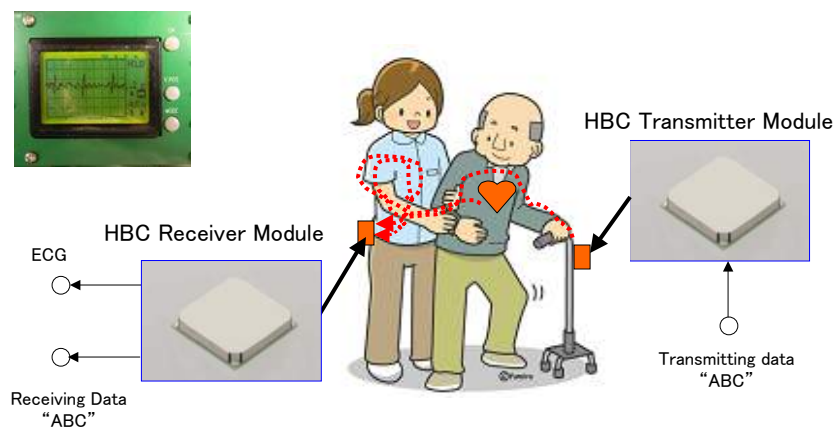
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## HBC System with ECG (electrocardiogram)

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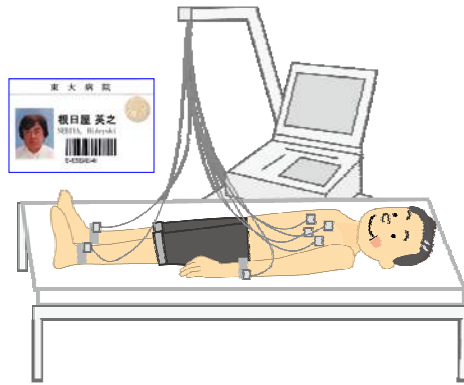
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## HBC Applications for Medical

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침대 위의 환자가 이동 할 경우 우선, 유선 의료기기의 장치를 제거 한 후 이동할 수 있다.

**HBC** 가 무선이라면 이러한 수고를 덜 수 있으며 환자의 자유로운 이동이 가능해 진다.

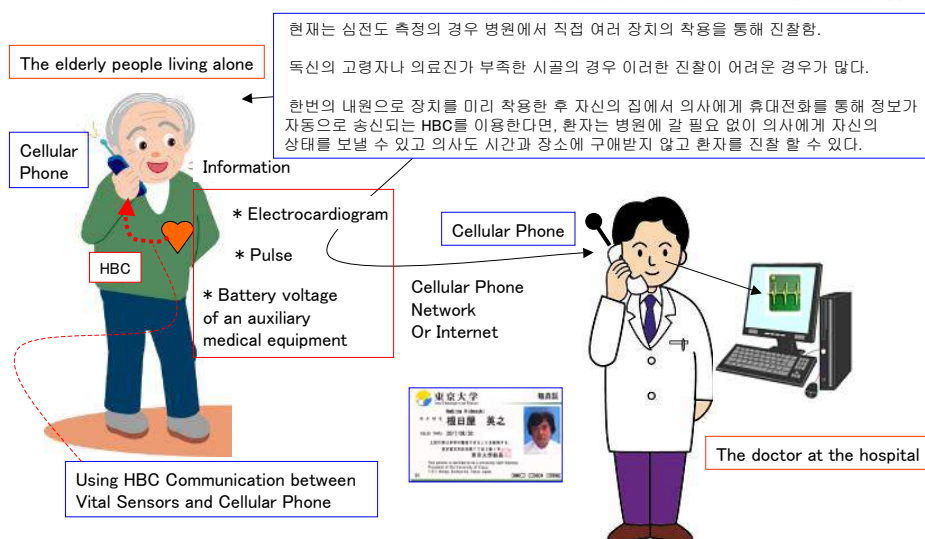
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## The HBC Project at the University of Tokyo Hospital

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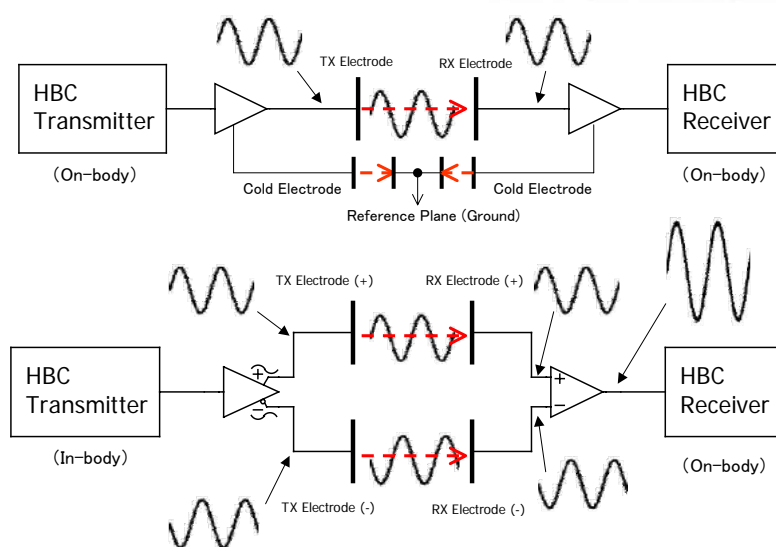
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## 7. Next Generation Human Body Communication

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## On-body Communication / In-body Communication

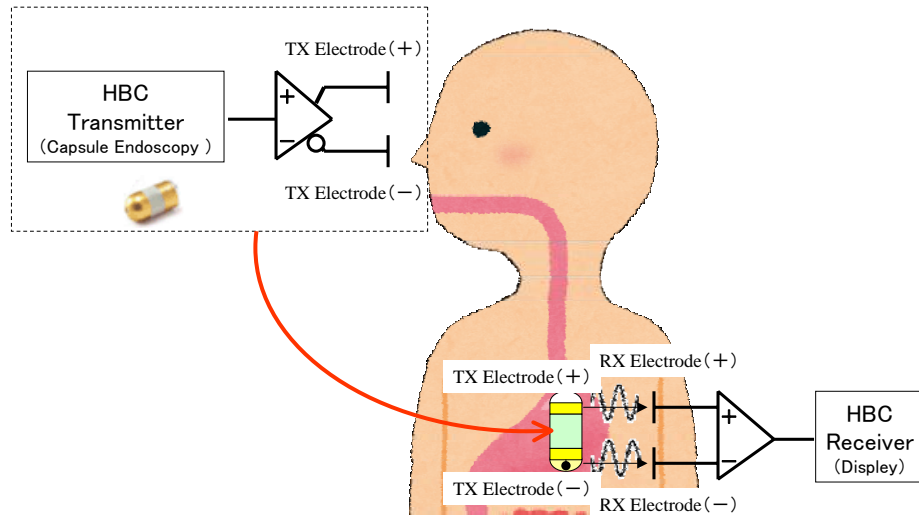
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## In-body Communication (Capsule Endoscopy)

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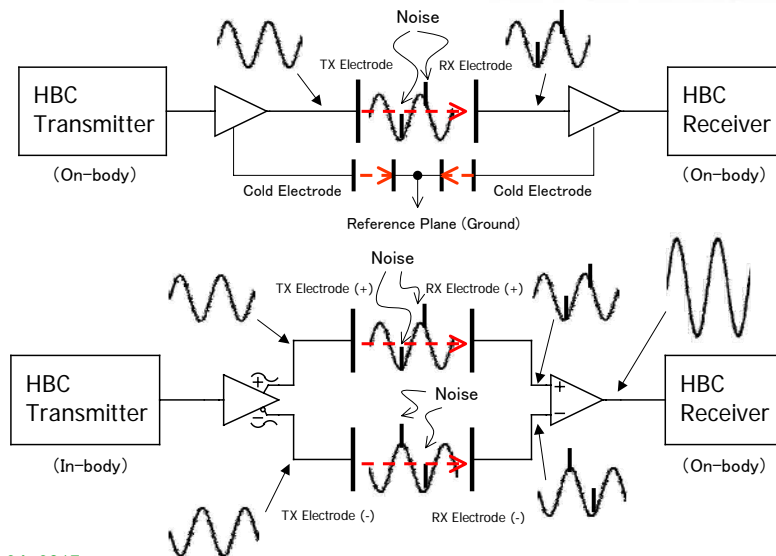
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## Noise Suppression using Differential Electrodes

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## Capsule Endoscopy using Human Body Communication

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### - IntroMedic (Korea)

- IntroMedic is a medical device manufacturer specializing in the field of capsule endoscopy. Since 2000, IntroMedic continuously developed the capsule endoscope using the human body communication technology.
- MiroCam® is the capsule utilizing human body communication for transmission of the images from the capsule to the receiver

### - Product

- MiroCam®
  - size = 11mm x 24mm, 3-frame image per sec.
  - Intended for visualization of the small bowel mucosa as an adjunctive tool
  - The device contains a light source, camera, transmitter, battery.
  - operation time > 11hrs.
  - The patient can enjoy a normal daily life during examination.



※ courtesy of IntroMedic Co., Ltd. (Korea)

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## 8. Joint Study on Human Body Communication Between Korea and Japan

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## Joint Seminar on Human Body Communication MoU between ETRI, Korea and AMPLET, Japan

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Organizer of Korea: Dr. Byong Nam Lee ( ETRI )

Organizer of Japan : Dr. Hideyuki Nebiya ( AMPLET Communication Laboratory )



1st in Seoul  
(Nov., 2011)



2nd in Tokyo  
(Feb., 2012)



3rd in Jeju  
(Oct., 2012)



4th in Yokohama  
(Jul., 2013)



5th in Daejeon  
(Mar., 2015)



6th in Tokyo  
(May, 2016)

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5月22~23日

Organizer (Korea) : Dr. Byong Nam Lee (ETRI) , Dr. Hideyuki Nebiya (AMPLET Communication Laboratory)

### The 7th Joint Seminar on Human Body Communication (HBC) Standards, Collaboration between Korea and Japan in 2017



- |   |   |
|---|---|
| (1) Welcome Address   | Byoung Nam Lee (ETRI)                             |
| (2) IEC TC 47 Activities on HBC Interface for Capsule Endoscopy         | Kwang Il Oh (ETRI)                                |
| (3) Current Implant Medical Devices utilizing In-body Communication     | Jun Yokota (The University of Tokyo Hospital)     |
| (4) Applications using Human Body Communication                         | Sung Weon Kang (ETRI)                             |
| (5) Pannel Discussion Collaboration in IEC and other SDO                |   |
| (6) HBC Application for a Vehicle                                       | Yuka Takase (Aisin Seiki)                         |
| (7) ISO/IEC JTC 1 SC 6 Activities on HBC Protocol for Capsule Endoscopy | Hyung Il Park (ETRI)                              |
| (8) HBC X RFID = Trend in Japan   | Hideyuki Nebiya (AMPLET Communication Laboratory) |
| (9) Recent Report of Prominent Capsule Endoscopy Vendors in Japan       | Hideyuki Nebiya (AMPLET Communication Laboratory) |
| (10) Applications using Human Body Communication                        | Sung Weon Kang (ETRI)                             |

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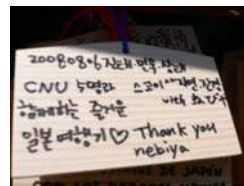


## Education Agreement on Human Body Communication MoU between CNU, Korea and AMPLET, Japan

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Korea : Prof. Jong Myung Woo ( CNU )

Japan : Dr. Hideyuki Nebiya ( AMPLET Communication Laboratory )



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## 9. Our Dream using HBC Technology

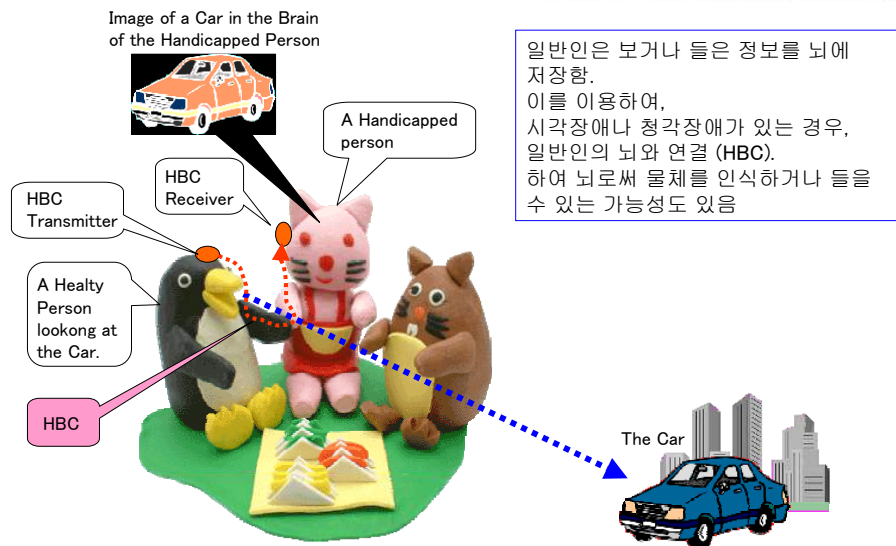
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## Our Dream using the HBC Technology

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## HBC Technical Book by Hideyuki Nebiya as Editorial Supervisor

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人体通信の最新動向と応用展開

50 シーエムシー出版  
先端技術と産業のたしかな情報をお届けして50年

The Latest Trends and Applications of Human Body Communication

NEW

★日本で初の人体通信の技術書!

★人体通信とは、人の身体と機器が接することで通信する技術。ドアノブを手で触れるだけで入退室を管理するシステムなど、これまでにない新しい概念の通信が次々と提案され、様々な分野から注目を集めています。

★本書は要素技術や開発動向、セキュリティ・安全性などの基礎から、企業・大学などによる応用研究例を掲載しています。



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Thank you for your attention.

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