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**IEEE P802.15**  
**Wireless Personal Area Networks**

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Project	IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)		
Title	<b>PicoCast MAC Specification</b>		
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Re:	IEEE 802.15 TG6 Body Area Networks (BAN).		
Abstract	PicoCast MAC protocol support most of WBAN requirements. Container (Synchronous Frame Set) concept is suitable to support user oriented service convergence and avoid mutual interference. PicoCast single MAC can support multi PHYs and scalable different speed		
Purpose	[Description of what the author wants P802.15 to do with the information in the document.]		
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## 1 Scope

This proposal is the specification of the PicoCast MAC design for the Wireless Body Area Networks (WBAN) in IEEE P801.15.

## 2 Overview

WBAN's requirements can be classified according to the data rate and applications. Generally, in wearable PC, high speed data rate is required to send voices and images, and in medical appliance, low data rate and efficient power consumption is required to deliver the signals of human body.

In order to satisfy the various requirements of WBAN, one single PHY cannot be used but Multi-PHY of 400MHz, 2.4GHz and UWB must be used to satisfy the entire requirement and Single-MAC method is desirable way to process Multi-PHY. The Single-MAC must support Multi-PHY, resolve the problems of Near/Far interference, support both low power consumption and high speed delivery, and support both medical and Non-Medical applications.

PicoCast MAC satisfies these requirements of Single MAC. PicoCast MAC is a synchronized container structure which supports scalable data. Because it uses synchronized same size container, it can avoid Near/Far interference between users. Within the size of container, any size or shape of boxes can be loaded. Therefore, low data and low power consumption sensor and high multimedia information can be delivered in same structure and method.

In order to sustain this container structure synchronization, preamble size has been changed from 64 bit to 128bit. PicoCast MAC with 128bit preamble has superior performance compare to 64 bit preamble. Therefore, it can be used for the synchronization between devices and to use as a multi preamble functions to deliver 127 kinds information. These structures are suitable for Emergency application in WBAN and in Multi-PHY structure, it's possible to assign each RF to use different preamble. All these makes it possible to apply in many various cases.

Because PicoCast MAC has container structure, it does not depend on PHY except the RF ramp up/down time. Therefore, any PHY which can satisfy the container requirement can work with PicoCast MAC. PicoCast MAC inside Box supports scalable data to provide various speeds according to the application and when 128bit preamble is used for information delivery purpose, 20db process gain will be obtained. Therefore, it can be applied to all applications if it's medical or nonmedical applications.

### 3 Definitions

Pico-net	A small operational range for wireless transmissions within about 10 meters in radius from the user or his/her devices.
Group	Devices interoperable within a Pico-net, with their usage of the same group code separating them from other devices in different groups.
Master/slave	All devices within a group use the same group code and remain synchronized with each other centring on the master. Except for the master, all the devices within the given group serve as slaves; any slaves may take the role of master if the master disappears.
Scan	The master within a group regularly transmits synchronising signals; slaves are operated in accordance with synchronizing signals sent by the master. Therefore, the slaves need to search for their master, and this searching process is called 'scan.'
Container	A container is the basic unit of box operation, consisting of one control box and one or more payload boxes; sixteen container constitute a vessel.
Box	A basic frame structure loaded within container
Vessel	Sixteen containers constitute a vessel. The vessel is the overall operational unit of pico-net MAC operations.

## 7 MAC-PHY Interface

The PicoCast MAC is ready to adapt any kinds of PHY layer. This clause describes the requirement of PHY for PicoCast MAC.

### 7.1 PHY requirements for PicoCast MAC

- Any PHY shall satisfy WBAN Requirement(TG6 Technical Requirements Document)
- Support the operation of Box structure
  - Box Size : 400  $\mu$ sec ~ 15.2msec
  - Basic Data Rate : 1Mbps
  - Scalable Data Rate : 250K,500K,1M, 2M,4M,8M,16Mbps (option)
  - Lock Time : Less than 500 $\mu$ sec (230 $\mu$ sec recommended)
  - End of Box (EOB) : Less than 300 $\mu$ sec (40 $\mu$ sec recommended)
  - Operation Mode : Tx / Rx / Idle / Sleep / Power-off
  - Write Parameters : Frequency, Power
  - Read Parameters : RSSI, Frequency Drift
  - Clock Stability : Less than 20ppm
- Special Requirements for low speed MICS Frequency
  - Basic Data Rate : 125Kbps
  - Minimum Box Size : 1.3msec (single Command Box)
  - Linear Modulation to achieve spread spectrum process gain
  - Control Box slot would be reserved for future usage

## Appendix

### A. Example usage of multiple preambles

This table is an example of the scan code list.

$C_1$	Remarks
1 ~ 8 (8)	General Box purpose (Control, Payload)
9 ~ 12 (4)	Hierarchy Beacon Box for synchronization
13 ~ 16 (4)	Pairing (Grouping) Box
17 ~ 18 (2)	Sounding Box
19	Reliable Medical 1bit/symbol data transmit
20 ~ 35 (16)	Reliable Medical 4bit/symbol data transmit ※ would be substituted by the best code set after simulation study.
36 ~ 41 (16)	Hands over for the local broadcasting
42 ~ 49 (8)	Define Multi-RF to indicate sequence order
50 ~ 127 (except 119)	TBD
<b>119</b>	<b>Emergency</b>