

**Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)****Submission Title:** [ Considerations for PHY design of TG3c]**Date Submitted:** [March 13, 2007]**Source:** [Hiroshi Harada<sup>1</sup>, Yoza Shoji<sup>1</sup>, Ryuhei Funada<sup>1</sup>, Chang-soon Choi<sup>1</sup>, Yoshinori Nishiguchi<sup>1</sup>, Ming Lei<sup>1</sup>, Hirokazu Sawada<sup>1</sup>, Masahiro Umehira<sup>1</sup>, Shuzo Kato<sup>1</sup>, Ichihiko Toyoda<sup>2</sup>, Kenichi Kawasaki<sup>3</sup>, Kazuaki Takahashi<sup>4</sup>, Hiroyuki Nakase<sup>5</sup>]Company [NICT<sup>1</sup>, NTT<sup>2</sup>, SONY<sup>3</sup>, Panasonic(Matsushita)<sup>4</sup>, Tohoku University<sup>5</sup> ]Address<sup>1</sup>[3-4 Hikari-no-oka, Yokosuka-shi, Kanagawa 239-0847, Japan]<sup>2</sup>[1-1 Hikari-no-oka, Yokosuka-shi, Kanagawa 239-0847, Japan]<sup>3</sup>[6-7-35 Kitashinagawa, Shinagawa-ku, Tokyo 141-0001, Japan] <sup>4</sup>[4-12-4, Higashi-Shinagawa, Shinagawa-ku, Tokyo 140-8587, Japan] <sup>5</sup>[2-1-1 Katahira, Aoba-ku, Sendai-shi, Miyagi 980-8577, Japan]Voice:[+81-46-847-5295<sup>1</sup>, +81-46-859-2366<sup>2</sup>, +81-3-5795-7879<sup>3</sup>, +81-3-6710-2029<sup>4</sup>, +81-22-217-5531<sup>5</sup> ]FAX: [+81-46-847-5440<sup>1</sup>, +81-46-855-1497<sup>2</sup>, +81-3-5795-7385<sup>3</sup>, +81-3-6710-3915<sup>4</sup>, +81-22-217-5533<sup>5</sup> ]E-Mail:[harada@nict.go.jp<sup>1</sup>, shoji@nict.go.jp, funada@nict.go.jp, cschoi@nict.go.jp<sup>1</sup>, nishghchi@nict.go.jp, minglei@nict.go.jp, sawahiro@nict.go.jp<sup>1</sup>, umehira@mx.ibaraki.ac.jp<sup>1</sup>, shu.kato@nict.go.jp<sup>1</sup>, toyoda.ichihiko@lab.ntt.co.jp<sup>2</sup>,Kenichi.Kawasaki@jp.sony.com<sup>3</sup>, takahashi.kazu@jp.panasonic.com<sup>4</sup>, nakase@riec.tohoku.ac.jp<sup>5</sup> ]**Re:** []**Abstract:** [Describing the considerations of PHY design]**Purpose:** [To be considered in IEEE802.15.3c Alternative PHY standard]**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 contributors acknowledge and accept that this contribution becomes the property of IEEE and may be made publicly available by P802.15.

# Considerations for PHY design of TG3c

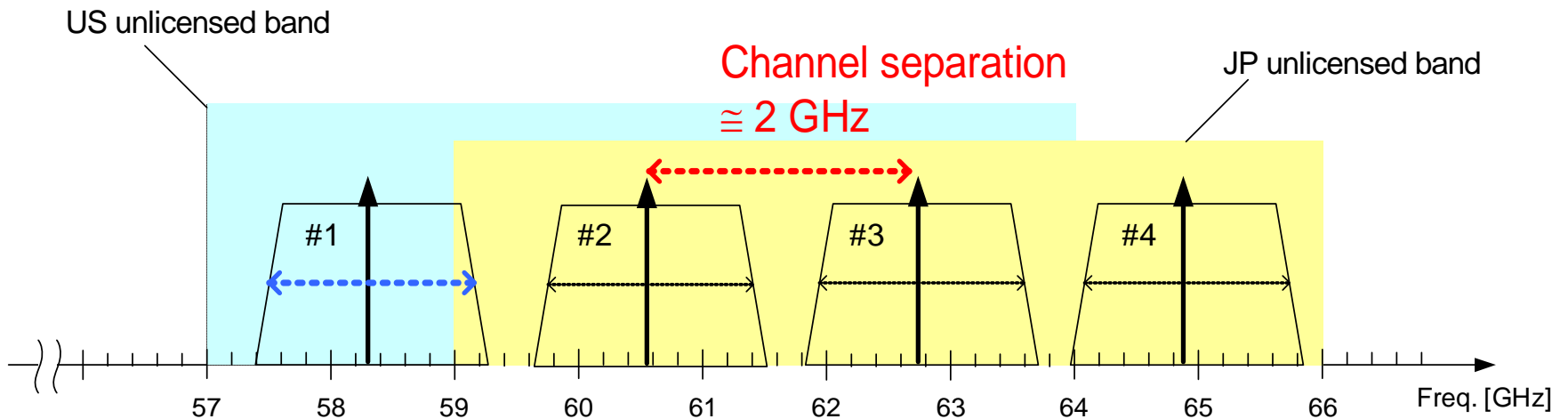
Hiroshi Harada, Yozo Shoji, Ryuhei Funada, Yoshinori Nishiguchi,  
Chang-soon Choi, Ming Lei, Hirokazu Sawada,  
Masahiro Umehira, Shuzo Kato, (NICT)  
Ichihiko Toyoda (NTT) , Kenichi Kawasaki (SONY) ,  
Kazuaki Takahashi (Panasonic), Hiroyuki Nakase (Tohoku University)

# Summary

- Channelization:
  - Channel separation  $\cong 2$  GHz for channelization of 4 channels / 9 GHz
- Needs for “Common-mode”
  - SC-PHY (Single-Carrier PHY) is promoted fundamentally for UM1 and UM5 applications
  - Market will decide the best air-interface
  - Other air-interfaces are accepted flexibly by “Common-mode”
- Two examples of “Common-mode” level for the multiple PHY support
  - Level 1: Use of PHY-mode oriented channel
  - Level 2: Declaration of the using PHY-mode with SC-based preamble

# Overview of Channelization

- Based on SC-PHY
- 4 channels / 9 GHz bandwidth
  - Channel Separation  $\cong 2$  GHz
  - 3dB bandwidth examples
    - ✓  $\cong 1.6$  GHz for Roll-off factor = 0.25
    - ✓  $\cong 1.5$  GHz for Roll-off factor = 0.35

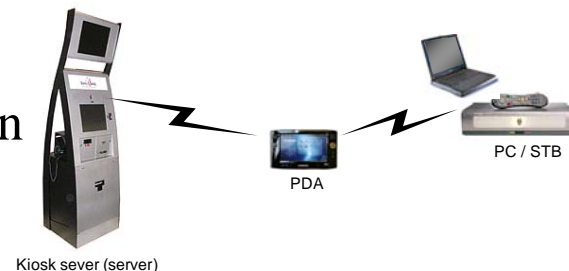


# Introduction for multiple PHY support standard

■ **SC-PHY** is promoted fundamentally, but other air-interfaces are accepted by “Common-mode” flexibly

- Short range file down/up loading
  - Likely to be installed in portable devices
  - Simple, low cost, and low power consumption

  
**SC-PHY**



- Uncompressed video signal transmission
  - High-data-rate
  - Operability in NLOS environment

  
**SC-PHY with FDE**



- Market may employ other air-interfaces such as OFDM or ASK

  
**“Common-mode”**

## “Common-mode” for multiple PHY support

Why “Common-mode” is needed?

- Market will decide the best air-interface

(Level #1)

PNC uses its PHY-mode oriented channel along with carrier sense

(Level #2)

PNC declares its PHY-mode with “Common-mode” identifier in a preamble (Any type of PHY-mode device can recognize this part by decoder)

# Example of “Common-mode” installation in Level #2

- Embed a “Common-mode identifier” in PHY preamble to distinguish the using PHY-mode so that every device decoder can distinguish the PHY-mode of received signals

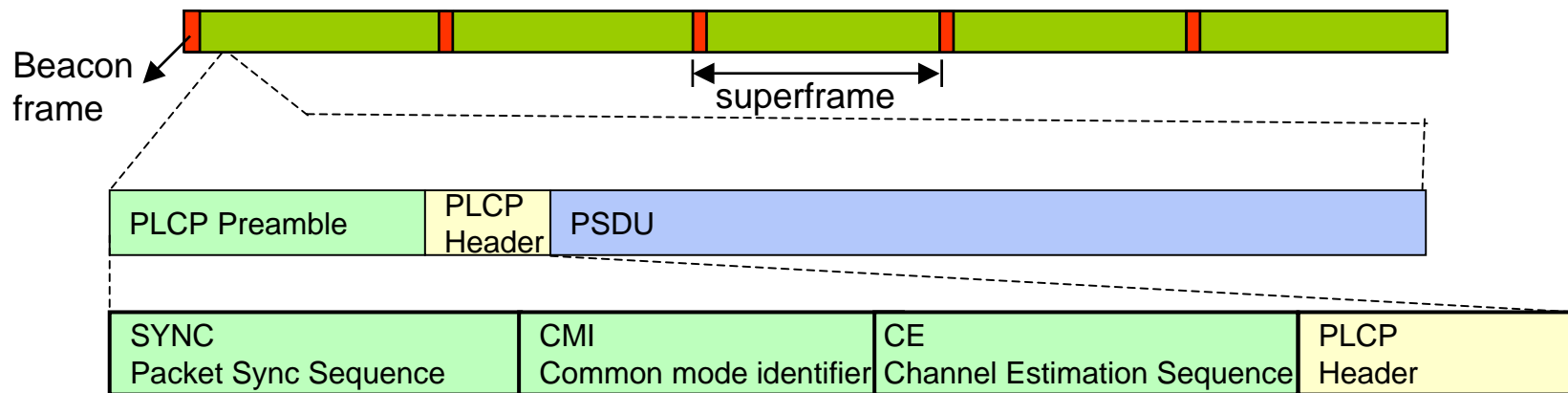


Figure: PHY frame format example for “Common-mode”

## Summary

- Channel separation  $\cong 2$  GHz for channelization of 4 channels / 9 GHz will be fine
- “Common-mode” to accept non-SC-PHY air-interfaces
  - SC-PHY is promoted but market will decide the best air-interface
- Two “Common-mode” levels for the multiple PHY support have been shown as examples
  - Level 1: Use of PHY-mode oriented channel
  - Level 2: Declaration of its PHY-mode with “Common-mode” identifier in a preamble