

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

Submission Title: [The Protocol Requirements for VLC PHY/MAC]

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Abstract: [This document presents key requirements for the protocols of VLC PHY/MAC]

Purpose: [To PAR/5C discussion on the protocol requirements for VLC PHY/MAC]

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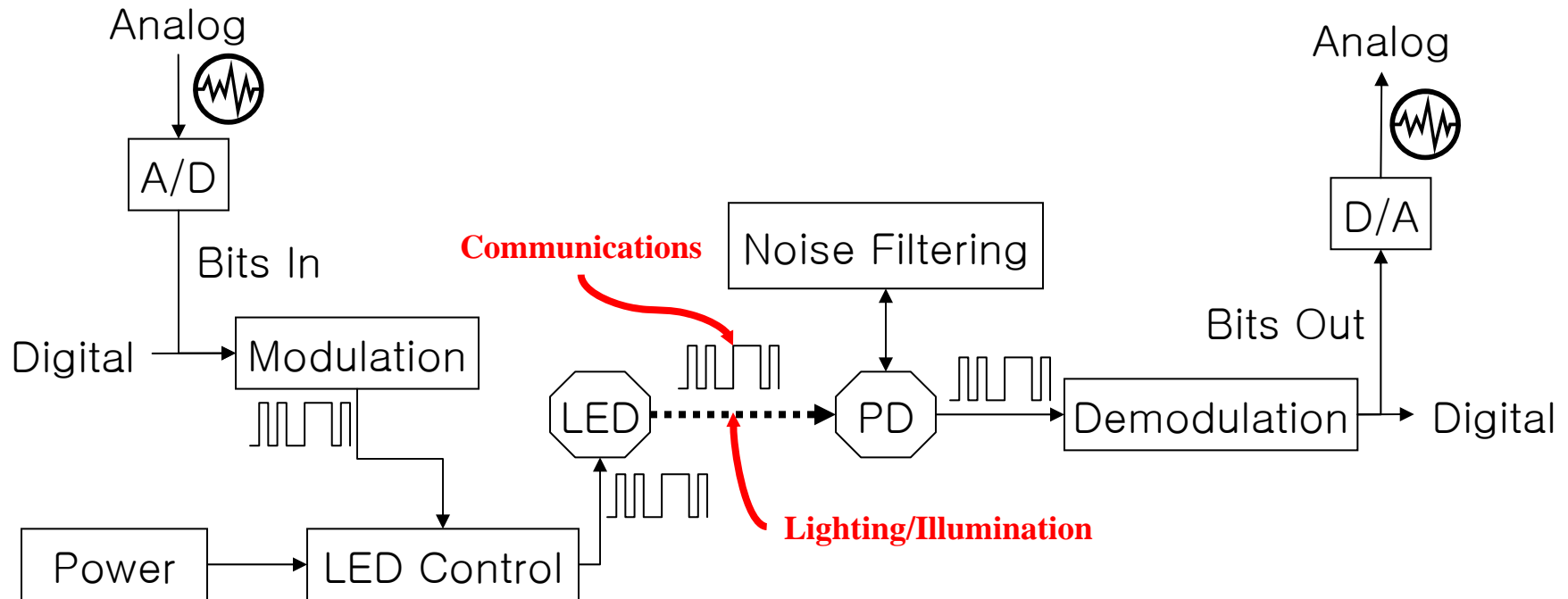
The Protocol Requirements for VLC PHY/MAC

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VLC Basic Principle

VLC Sending Part

VLC Receiving Part



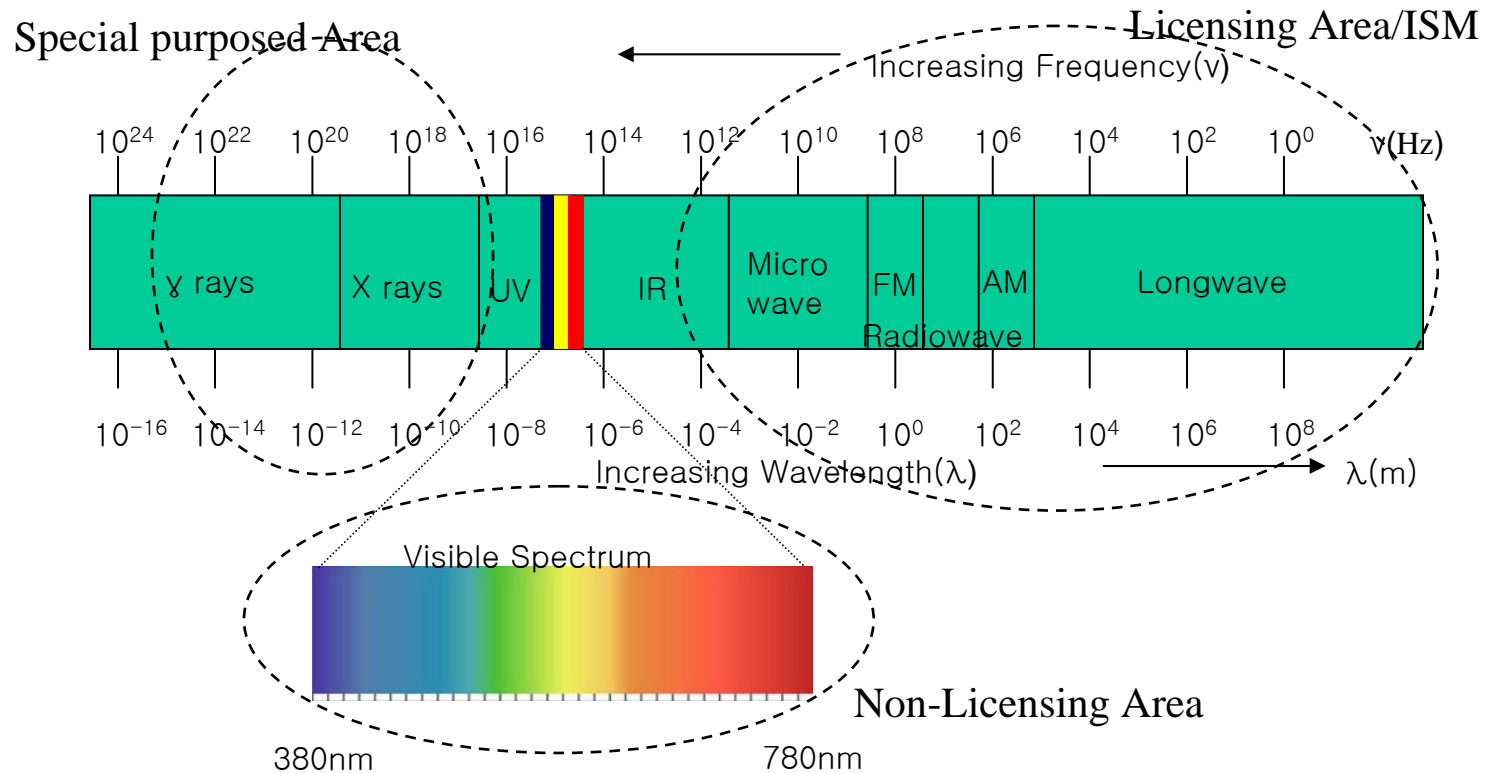
VLC Key Standard Parts

- Sending Part
 - LED standard interface
 - Illumination/transmission performance
- Receiving Part
 - PD standard interface
 - Avoidance from any other light interference
- Common Part
 - VLC PHY and MAC
 - VLC Architecture

Key Factors for VLC PHY/MAC

- Key different characteristics
 - Co-operations with LED illumination
 - Light Color communication
- VLC PHY/MAC
 - LED Compatibility
 - LED Interfaces with illumination
 - Light Interference Robustness
 - Light interferences among many different lights

Applicable Wavelengths: 380 - 780



Visible Light Communications should be used visible light: The wavelength covers from 380 to 780.

Candidates for VLC MAC on VLC email

- 802.15.4a for long range (still on going)
- 802.15.3a for short range (aborted)
 - that it could be very difficult to cover all the VLC applications with one MAC, or it will become inefficient.
- New MAC for VLC
 - LED Lighting Communications

MAC Requirements for VLC applications

- Distance
 - Long Range Low speed
 - Short Range High speed
- Performance
 - Multiple channels
 - One-way/two-way
 - Symmetry/asymmetry speed
- Applications
 - Lighting communications
 - Infrastructure mode/Peer-to-peer mode
 - ITS, LBS, Machine-to-Machine, Sensor, and so on.

VLC Application Areas

- Inter Mobile handsets
 - Mobile handset, MP3, Notebook
- LED Display to handset
 - Handset, TV, Signboard
- Inter Vehicles
 - Taillight, Headlight, On-and-off light
- Lamp applications
 - Indoor illumination, Traffic signal, Route beacon

5 Requirements for VLC PHY/MAC

- Visible Light Wavelength
- Compatibility Lighting System
- Wide Applicable Area
- Technical Feasibility
- Different Application Service

Visible Light Wavelength

- Wavelength Scope
 - 380 – 780 nm
- Color communication
 - Different information depending on color
 - Choice, verify
- LOS (Line of Sight)
 - Safe communication due to no transparency

Compatibility Lighting System

- Share lighting system
 - Lighting and communication as same time
Concurrently
 - Sustainable lighting function
- Compatibility LED Interface
 - Same standard interface for lighting and communications

Wide Applicable Area

- Everywhere
 - Any place using LED lighting Infrastructure
- Any field
 - Car lamp, traffic signal, light house, signboard, and so on
- Different capabilities
 - Short, long, bright, dimming

Technical Feasibility

- Same lighting source
 - Both lighting and communication
- Digital control
 - Programmable the lighting
- Fast switching on/off
 - 10 – 200 nm switching

Different Application Service

- Digital communication
 - Sending and receiving
- LBS
 - Useful for Location Based Service
- Restricted Area Broadcasting
 - Providing information depending on area
- Advance Sensing
 - LOS sensing with digital information

Conclusion : VLC PAR/5C Considerations

- Object
 - Developing Visible Light Communication PHY/MAC
 - Wavelength 380 to 780nm
- Scope
 - VLC PHY
 - VLC MAC
- Functions
 - Lighting Communication with one lighting
 - Light Interference Robustness
 - Compatibility for LED/PD Interfaces
 - Features for different application services