



Building First-Generation Certified Wireless USB Devices

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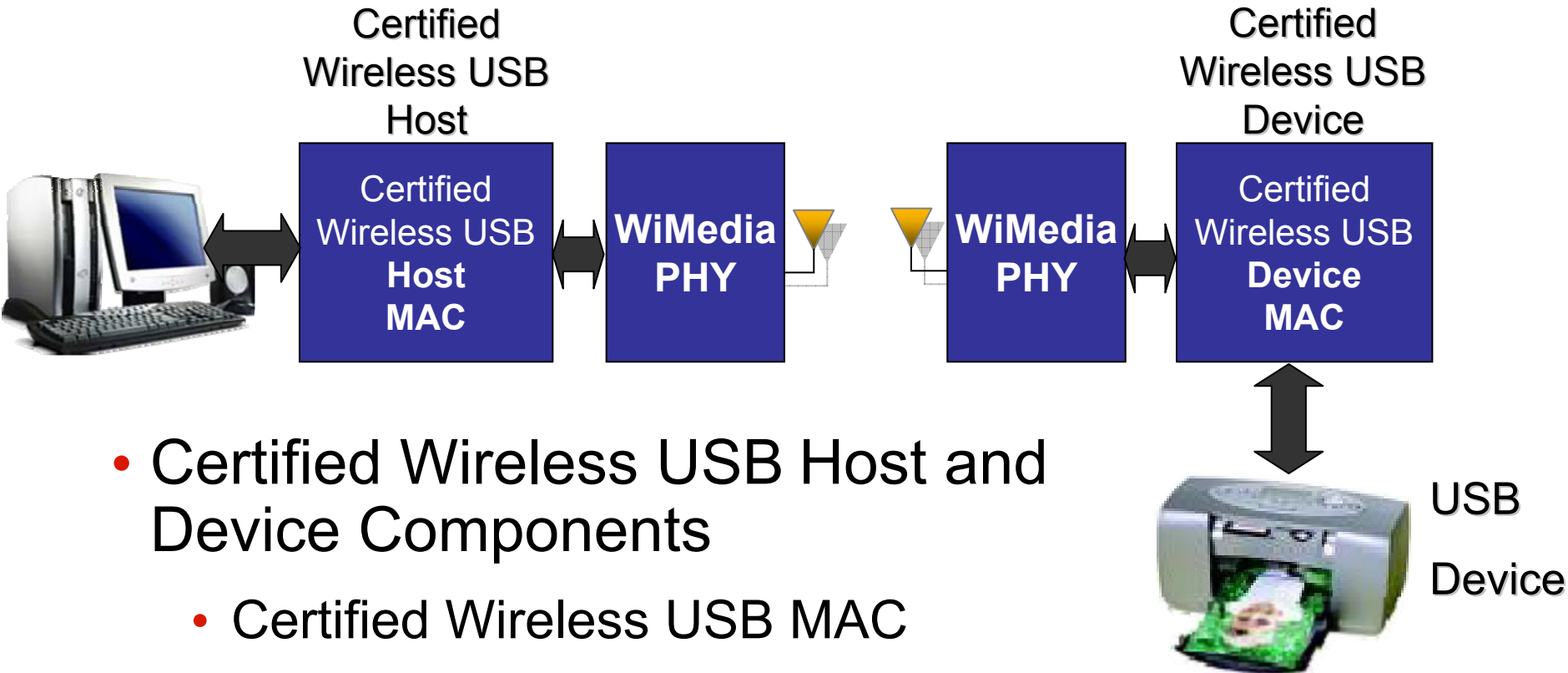
*Content also provided by:
Jim Choate, Intel Corporation*

Agenda



- Certified Wireless USB Overview
- What is New for Certified Wireless USB
- Certified Wireless USB Building Blocks
- Testing Certified Wireless USB
- Getting Started

Certified Wireless USB Product Overview



- Certified Wireless USB Host and Device Components
 - Certified Wireless USB MAC
 - WiMedia PHY
 - UWB Antenna

Host Side Options

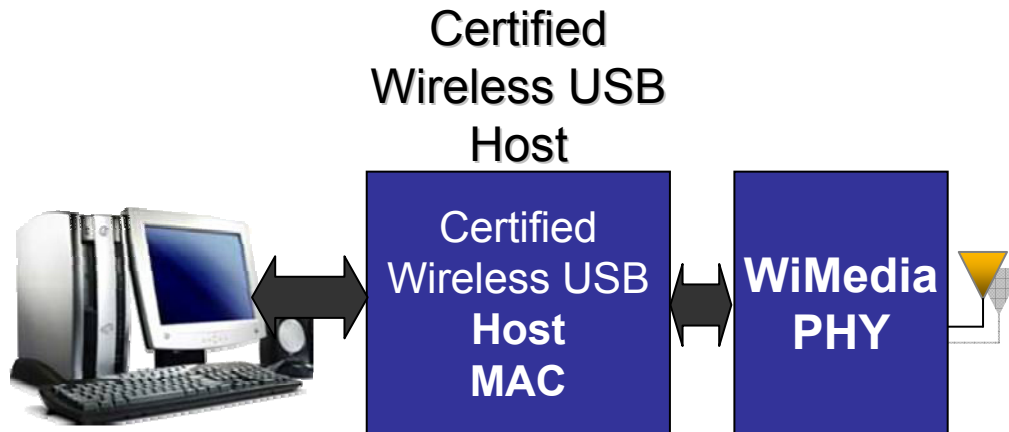


Host wire adaptor (HWA)

- USB 2.0 Host Dongle

Wireless Host Controller Interface (WHCI)

- PCI or PCI Express interface

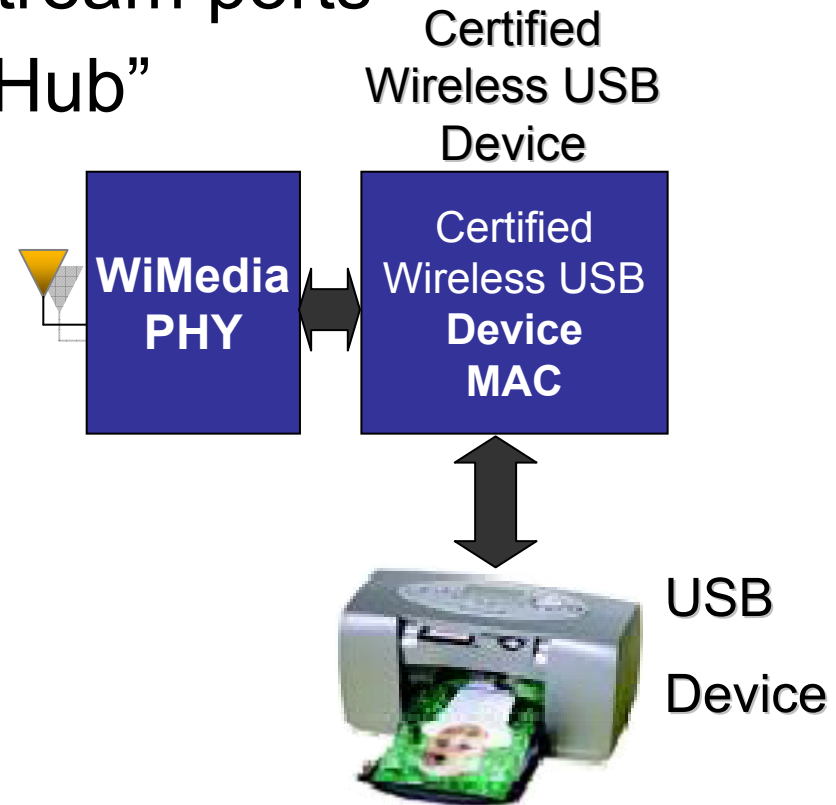


Cost
Time to Market
Performance

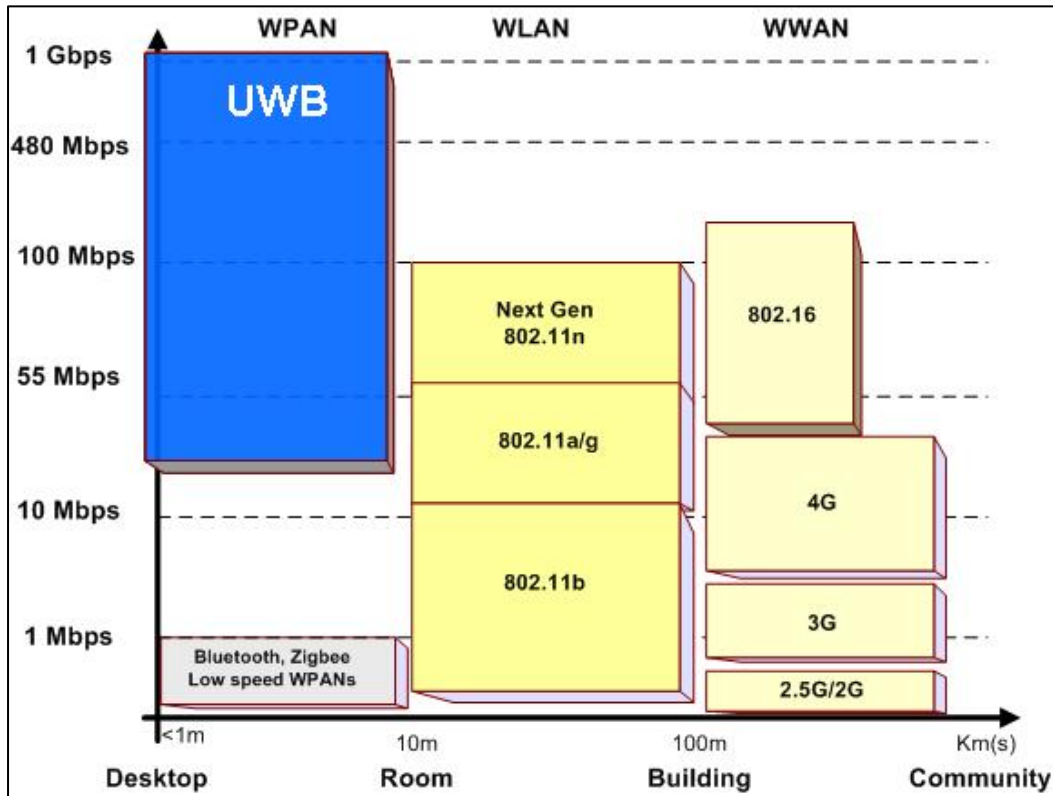
Device Side Options



- Device Wire Adaptor
 - Single or multiple downstream ports
 - Certified Wireless USB “Hub”
 - Internal or external
- Integrated solutions
 - Proprietary or other non-USB interface



Why WiMedia UWB for Certified Wireless USB

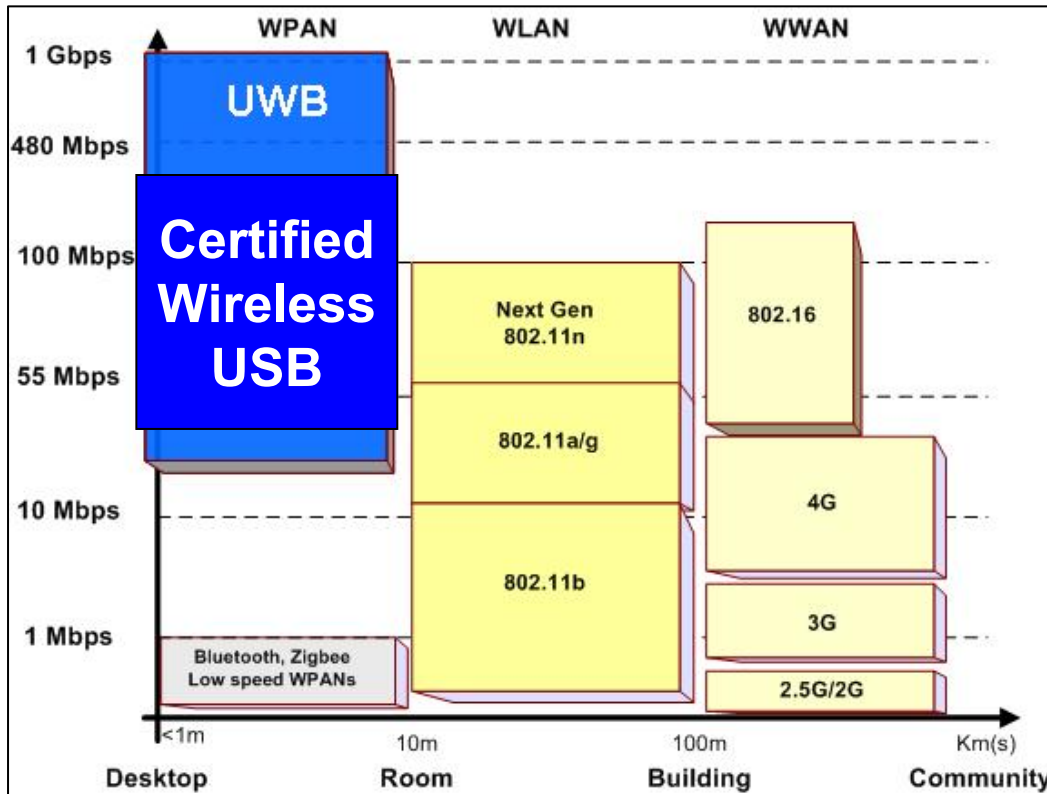


Certified Wireless USB

- Up to 480Mbps
- WPAN range

UWB fills short distance performance gap

Why WiMedia UWB for Certified Wireless USB



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- WPAN range

UWB fills short distance performance gap

Hardware Design Considerations



Wired USB

- Old Challenges
 - Board routing/placement
 - EMI/EMC requirements
 - Connector selection & placement
- Intel has design guides in these areas

Certified Wireless USB

- New challenges
 - MAC-PHY Interop
 - Antenna placement & connection
- WiMedia PHY Testing
- Regulatory Requirements
- Intel will provide design guides/whitepapers in such areas

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What's New in Certified Wireless USB



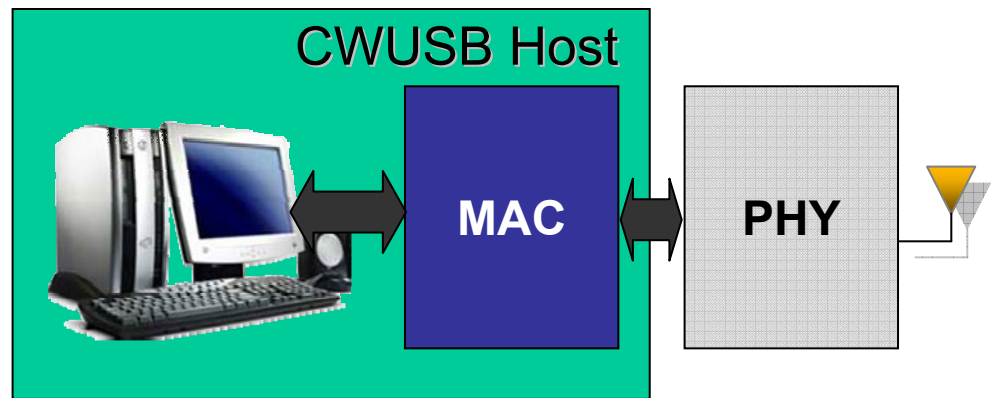
- Intel Certified Wireless USB PDK available from USB-IF
- Certified Wireless USB MAC-PHY interface connector specification at rev 0.95
 - www.intel.com/technology/comms/wusb/index.htm
- WHCI spec at rev 0.95
 - www.intel.com/go/whci
- Certified Wireless USB Association Spec at Rev 1.0 (RC)
- Reference designs available from multiple companies
 - Host and Device
- Device controller IP cores
- RF Test equipment and test sw available for WiMedia PHYs
- WUSB Protocol Analyzers available
- Interoperable WiMedia UWB Radios

Agenda



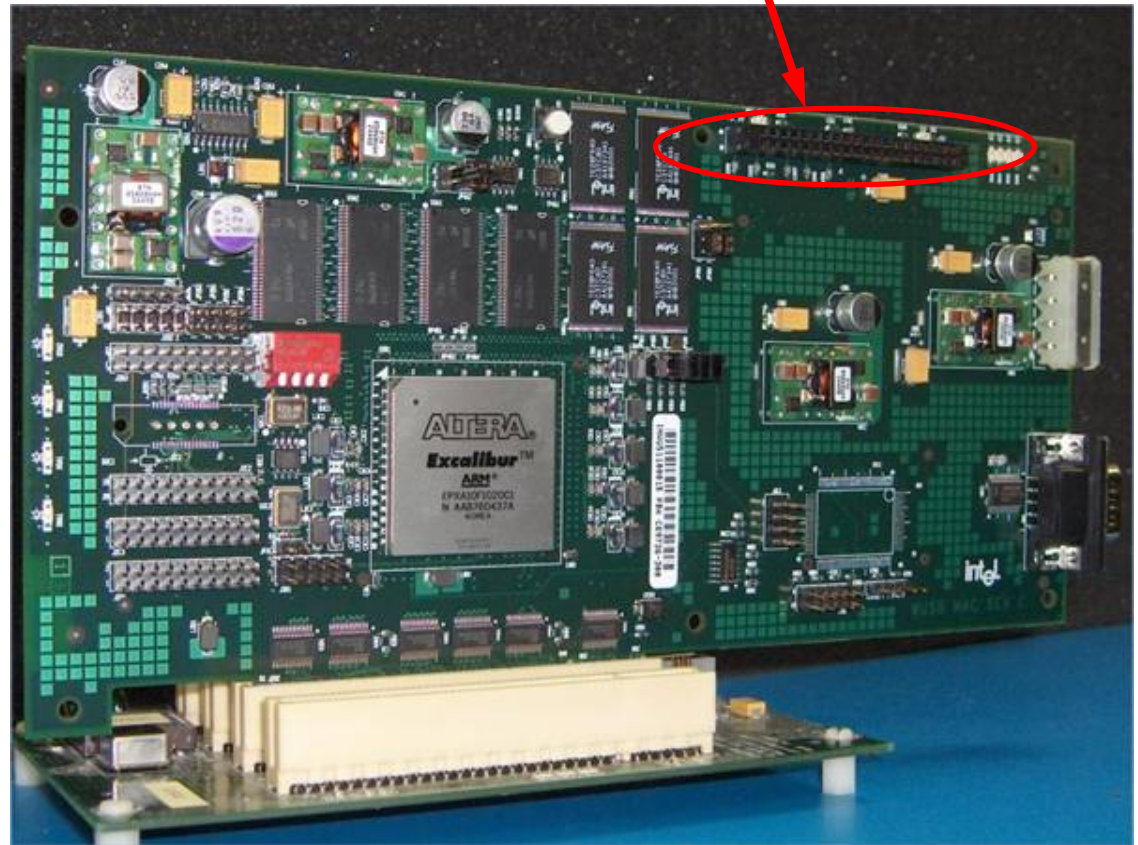
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Certified Wireless USB Intel PDK MAC Board

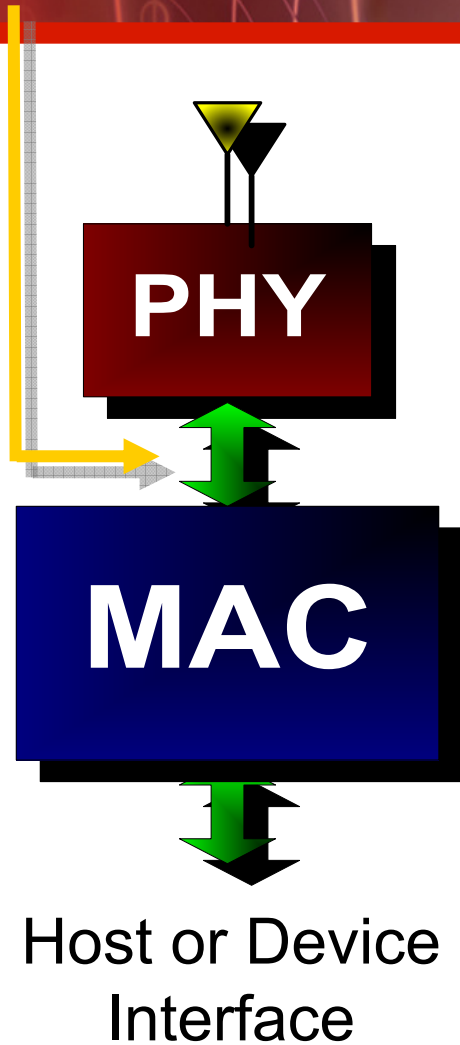


40 pin 2x20 connector

- 33 MHz PCI Interface, 5V Key
- Altera Excalibur* FPGA
 - ARM CPU
- 128MB SDRAM
- 32MB Flash
- UART



Certified Wireless USB MAC-PHY Interface (MPI)



- MPI Electrical and Logical Spec
 - WiMedia (MBOA) MAC-PHY Interface specification
 - Defines logical and timing interface
- MPI Prototyping Mechanical Interface specification
 - Mechanical and Physical Spec
 - Includes power delivery to PHY
 - Uses readily available connector
 - Supports cabling option
 - Make strong physical connection

Basic PDK Functionality



- All packet formats (over the air) match Rev 1.0 spec
- Supports all PHY vendors (PHY interop has been achieved)
- No association model support
 - Will be added
- No WiMedia MAC support
 - Beacons and DRP optional
- Timing can be relaxed
 - Next MMC pointer accuracy limited
 - IFS control to slow things down for early silicon
- Basic connection process
 - DNTS in MMC
 - Receive DN_Connects
 - Respond with Connect Acknowledge IE
- Control transfers
 - Setups of all kinds
- Bulk transfers
 - No flow control initially
 - Bursting is supported
- Interrupt transfers
 - Support using bulk to begin with
- Security

PDK Capabilities will increase over time

Expected Device Capability

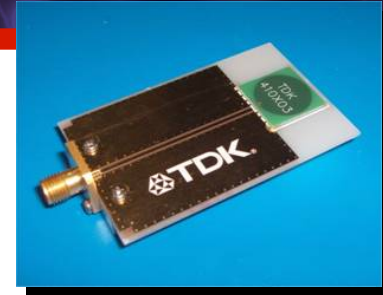
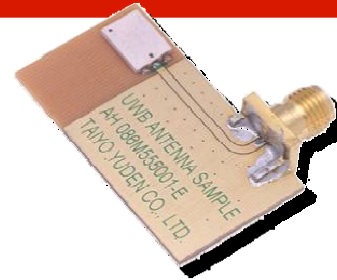
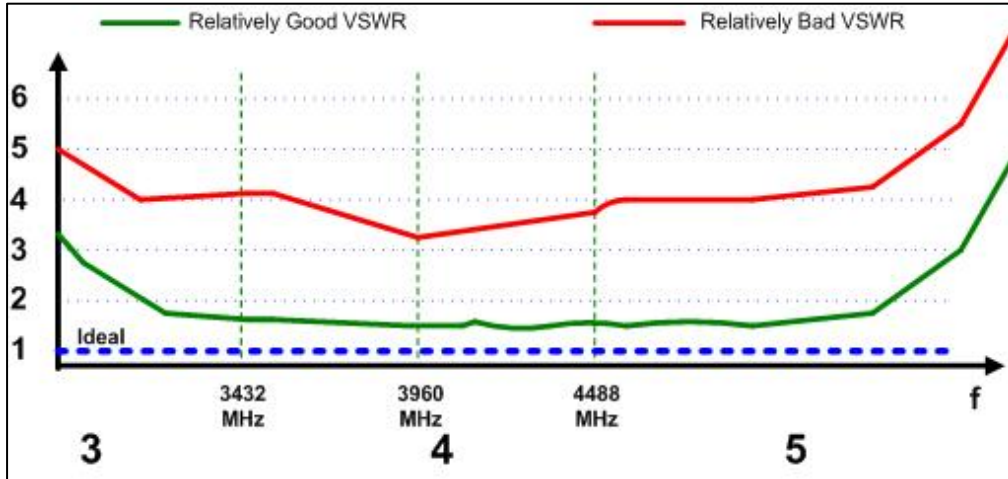
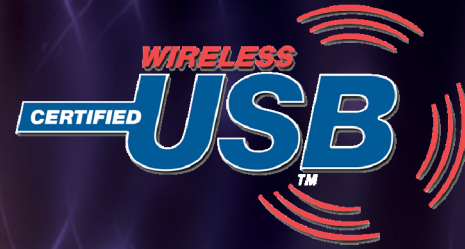


- Capable of basic connection process
 - Host sends MMC with DNTS
 - Device sends DN_Connect_Req
 - Connect_ACK IE from host (included CDID verification)
- Supports Control transfers
 - Set Address, Get Descriptor, Set Config, ...
- Supports Bulk transfers (if appropriate)
 - Device may support bursting
 - No flow control
 - Includes driver and app to do some testing (we can easily provide)
- Certified Wireless USB Channel Time
 - Will pay attention to CTA times
 - Times may not be dead-on accurate
 - nextMMC times are a don't care

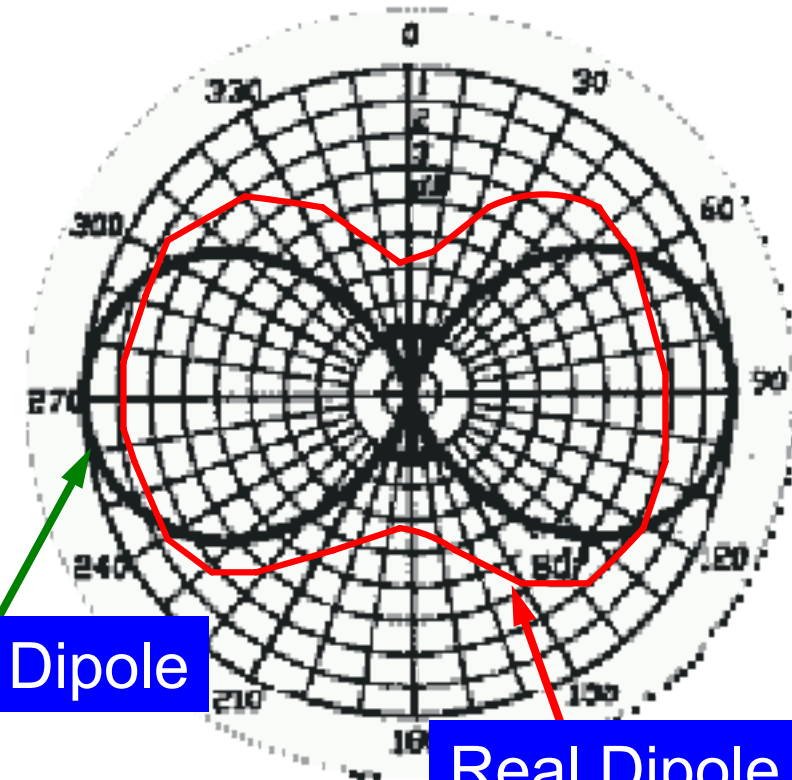


Certified
Wireless
USB
Device

Antenna Selection



- VSWR – Voltage standing wave ratio
- Antenna Gain
 - Decibels (dB) = $10 \cdot \log(P_{out}/P_{in})$
 - dBi (relative to isotropic)
 - dBd (relative to Dipole)



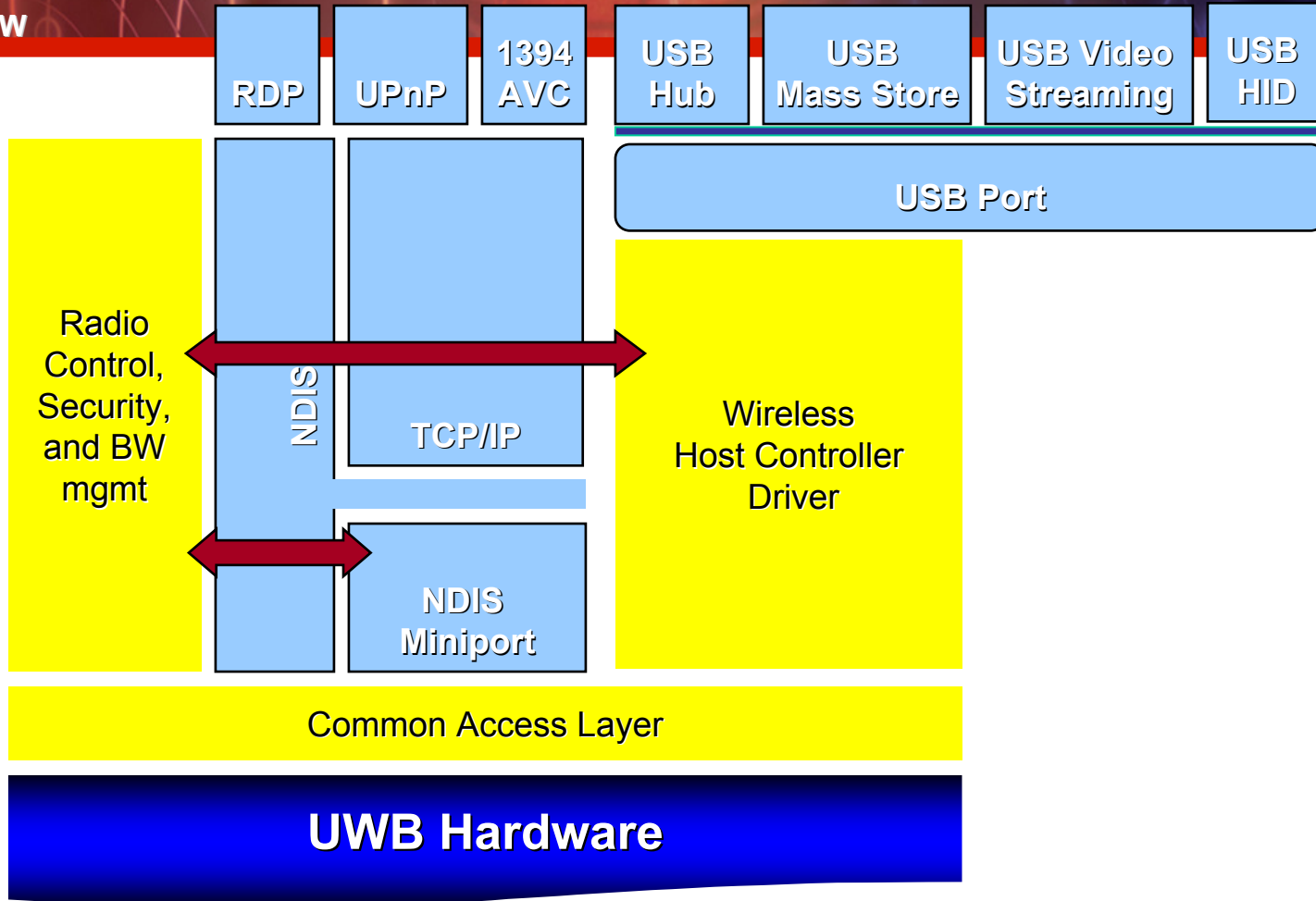
Ideal Dipole

Real Dipole

SW Design Considerations



- Existing SW
- New SW



Etc.

No device driver changes needed for existing USB products

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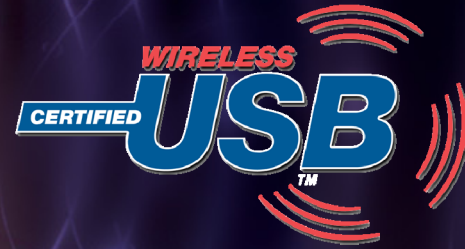
Compliance Program Goals



- High Quality Certified Wireless USB Products
- Stable, Repeatable, Well Documented Tests
 - Documented Test Procedures
 - Documented Test Assertions and Descriptions
- Instantly Available Testing (Qualified Test Houses)
- Leverage USB 2.0 Compliance Program
 - Extend and Reuse USBCV
 - Reuse Compliance Devices (DWA testing)
 - Extend Compliance Device Infrastructure (HWA testing)
- Minimize Test Equipment Costs
 - Use Over the Air Test Methods
 - Leverage WiMedia certification work
 - Avoid Expensive Equipment As Possible
- Full End Product Test Coverage Provided at Workshops



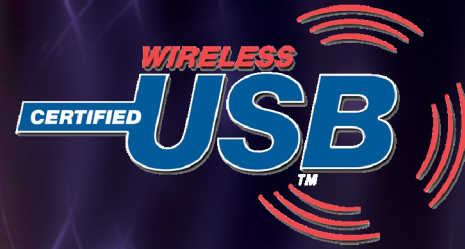
USB-IF Certification



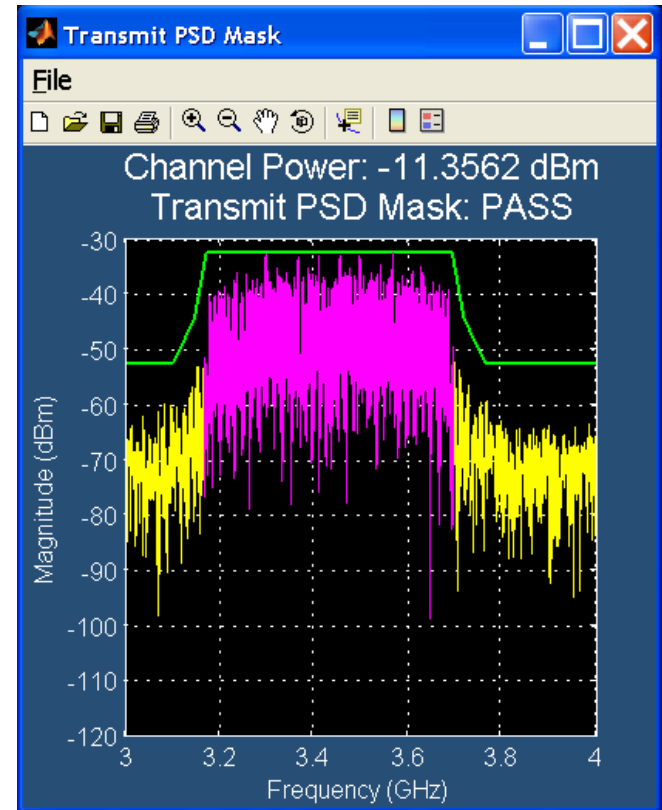
- Certified Wireless USB compliance program will follow USB 2.0 model
 - Repeatable tests and procedures
 - High level of testing with initial product rollout
 - Trademarked logo For compliance
- USB-IF will provide all required testing at USB-IF workshops
- Review test specs and provide feedback
 - WiMedia PHY Test Specification
 - WiMedia Platform Test Specification
 - Certified Wireless USB Test Specifications
- Attend Compliance Workshops

**Test and certify
your products!**

RF Testing



- Transmitter test challenges
- What do I need to test?
 - Transmitter power control
 - Power mask
 - Pulse shape
 - Adjacent Channel Power (ACPR)
 - Error Vector Magnitude (EVM)
 - WiMedia PHY specification compliance (PHY interoperability)
 - TX PER
 - RX PER

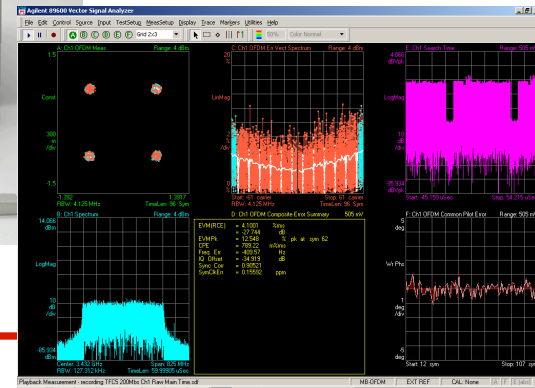
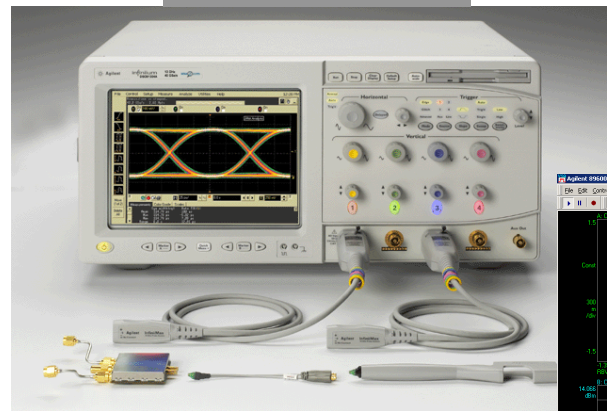


UWB ACPR Demo Using Agilent Real Time Oscilloscope



- Demo of UWB spectral analysis and ACPR test
- Equipment used:
 - Agilent Infiniium* DSO81304A 13GHz Oscilloscope
 - Agilent 89601A VSA* Software
 - Alereon UWB PHY
 - Intel PDK

DSO81304A



* Other names and brands may be claimed as the property of others

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Getting Started



- Get the Specifications
- Get the building blocks
 - Intel Certified Wireless USB PDK
 - Reference Designs
 - Test Equipment
- Add knowledge and stir
- Test your products

Summary



- Certified Wireless USB uses WiMedia UWB radios (3.1 – 10.6 GHz)

Wired Performance without the Wire (480Mbps)

- Intel Certified Wireless USB PDK available now
 - NEC based PDK available in July
 - Intel HWA PDK available in July
- The USB-IF and WiMedia are developing the compliance program and tools for Certified Wireless USB products

Certify Your Products Based on Certified Wireless USB



Developers Conference 2006

Taipei, Taiwan