



Wireless USB Compliance
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Agenda

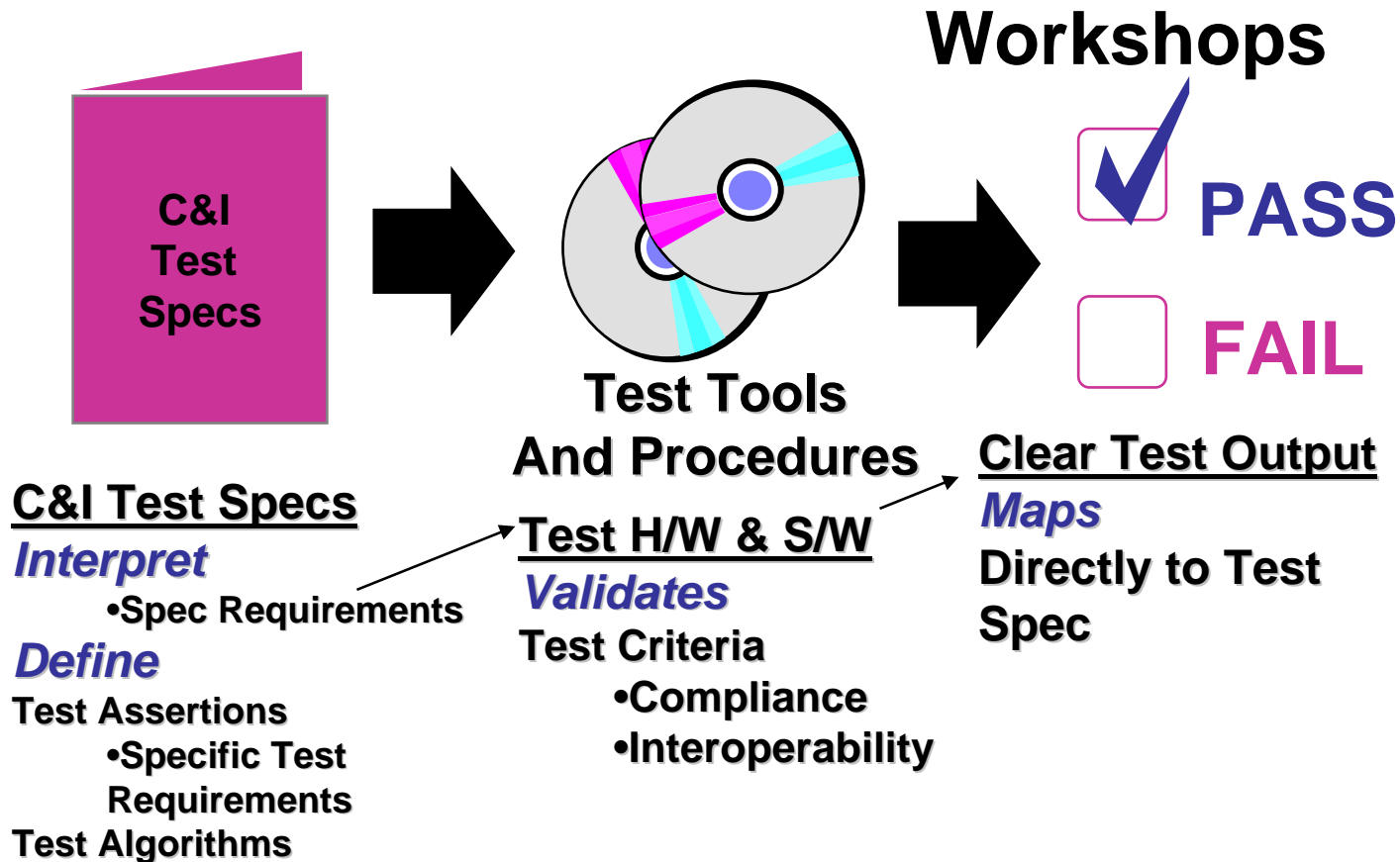
- Compliance Program Goals
- Compliance Process
- Test Areas
 - WiMedia
 - WiMedia Mac
 - WiMedia Coexistence (Mac Convergence Architecture)
 - Wireless USBCV
 - HWA
 - DWA
 - Physical Layer
- Compliance Devices
- Summary



Compliance Program Goals

- High Quality 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 Existing Compliance Devices (DWA testing)
 - Extend Compliance Device Infrastructure (HWA testing)
 - Extend and Reuse Test Services Infrastructure
- Minimize Test Equipment Costs
 - Use Over the Air Test Methods
 - Avoid Expensive Equipment As Possible
- Full End Product Test Coverage Provided at Workshops
 - USB Workshops Provide WiMedia Compliance Tests

Wireless USB Compliance Process



Predictable Path To Compliance
Same Model as USB 2.0 Compliance Program

Wireless USB Logo



Passing Compliance Enables Use Of Logo



Test Spec – Test Assertions

- Test assertions provide specific test requirements with spec references
- Simple set of ‘yes/no’ questions
- Test specs will be available on USB-IF website

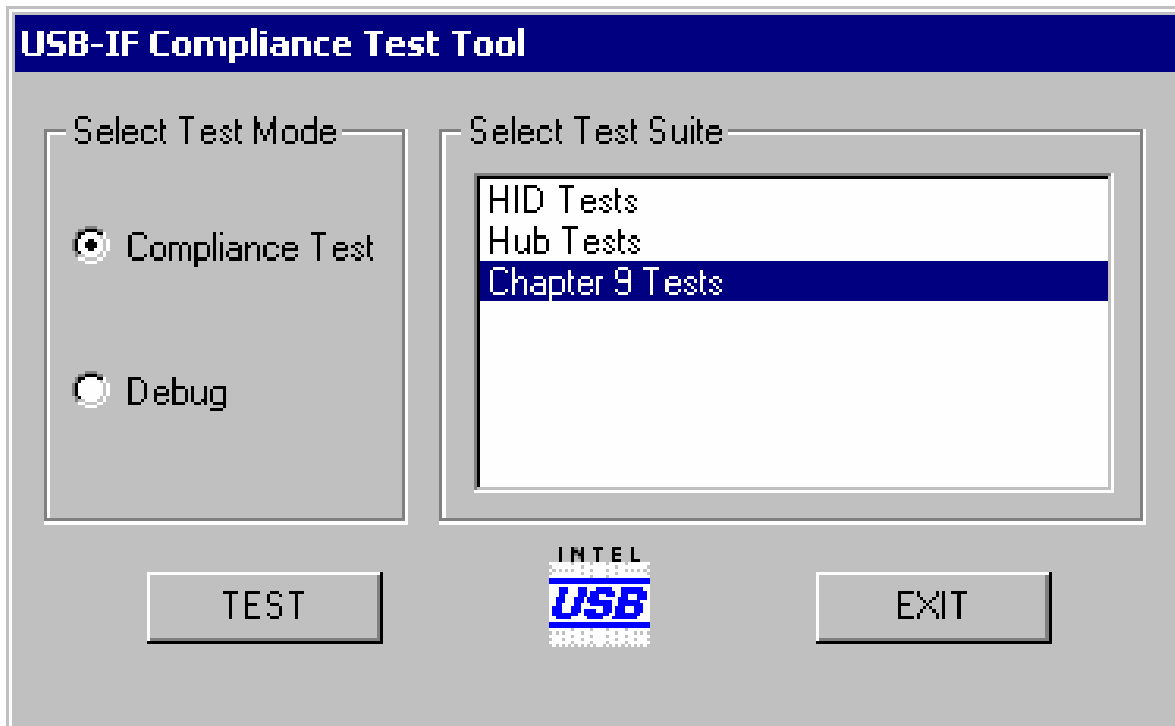
7.3.1.8#6	A device must support Loopback_Data_Read() for any data length less than or equal to the largest max packet size of all of the devices endpoints.	
7.3#2	All devices must use the base rate for all standard requests (except for data loopback requests).	



Test Spec – Test Descriptions

- Test descriptions provide detailed algorithmic level descriptions of how test suites test specific test assertions.
- Example test description (Summary)
- Explicit host initiated disconnect test
 - Place device in desired starting state
 - Send 3 consecutive MMCs with WDEV_DISCONNECT_IEs.
 - Vary MMC Size
 - Vary MMC Spacing
 - Verify device does not respond to standard requests

Wireless USB Extends USBCV



- Single Test Execution App For All Test Suites
- Adds Chapter 7 Tests For Wireless USB Specification
 - Security Framework
 - Directed Beaconing Commands
 - Wireless USB Specific Descriptors
 - Information Element Processing
 - Device Notifications

Wireless USBCV Extends Existing USBCV Tool

Wireless USB CV Parameter Details



- Does Device Properly Handle Information Elements (IEs)?
 - Maximum MMC size in tests
 - IE Frequency
 - Are IEs sent in every MMC (every other, etc)?
 - Maximum size of IEs (maximum arrays, etc).
 - MMC Spacing
- Does Device Properly Handle Standard Requests?
 - MMC Spacing
 - MMC Frequency
 - Does control request use every MMC (every other, etc)?
 - MMC Size
 - How big is the overall MMC?
 - How much information comes before information relevant to device under test?
 - Single MMC Use
 - As many steps as possible in single MMC
 - Minimum steps in each MMC



Compliance Devices

- Transmit Capabilities
 - All specified data rates
 - All required transmit power control states
 - Transmit time control
 - Transmit packets at specified microsecond
 - Queue multiple packets and transmit times to allow full superframe control
 - Full control of transmitted data (except PHY headers)
 - Inject errors
- Receive Capabilities
 - Full receive at speed
 - All data (except PHY headers) available to software
 - Reuse existing framework
 - Wireless USB Extensions
 - LQI measurement (and reporting)
- Framework
 - USB 2.0 Compliance device framework
 - Extensions for Wireless specific testing
- USB 2.0 Compliance Device (wired)
 - HWA Testing



WiMedia Testing

- WiMedia Mac
 - Beacon Protocol
 - DRP Protocol
- WiMedia WiMCA (Coexistence)
 - Interference Mitigation
 - Transmit Power Control
 - Channel Selection
 - Bandwidth Sharing
 - Allocation limits
 - Reservation form

**USB-IF will include WiMedia test suites at USB-IF events.
WiMedia level tests apply directly only to host controllers and
self beaconing devices.**

Example WiMedia Test – Channel Selection



- Mobile (battery powered) devices are required to select channels in a specified order.
- Test Algorithm
 - Test Device(s) reserve all bandwidth leaving a specific subset of channels available
 - Test device demonstrates operation
 - Channel selection must match correct channel
- Test variations
 - All channels available
 - First channel in selection order is partially available
 - Leaves sufficient bandwidth for Device Under Test
 - Various pairs of channels are available



HWA Testing

- WiMedia Tests
 - Beacon protocol
 - WiMCA policy
- Device Class Framework
 - USBCV Extensions
- Protocol Tests
 - Wireless USB compliance devices
 - Loopback tests, bursting, etc.
 - Protocol test suite will use USB 2.0 hub TT test model.
 - Silicon only requirement



DWA Testing

- Standard device WUSBCV tests
- DWA Device Class Framework
 - USBCV Extensions
- Protocol Tests
 - USB 2.0 compliance devices
 - Loopback tests, etc.
 - Protocol test suite will use USB 2.0 hub TT test model.
 - Silicon only requirement



Physical Layer - Approach

- All end product testing will be performed over the air using the products shipping antenna (if possible).
 - Doesn't require dedicated test equipment
 - Measures real end product behavior
 - Testing to looser requirements with the real product is more valuable than controlled tests (without antenna, etc) that may not predict actual end product behavior.
- Test equipment will be evaluated to see if significant interop problem can be predicted through spectrum analysis, etc.



Physical Layer Tests

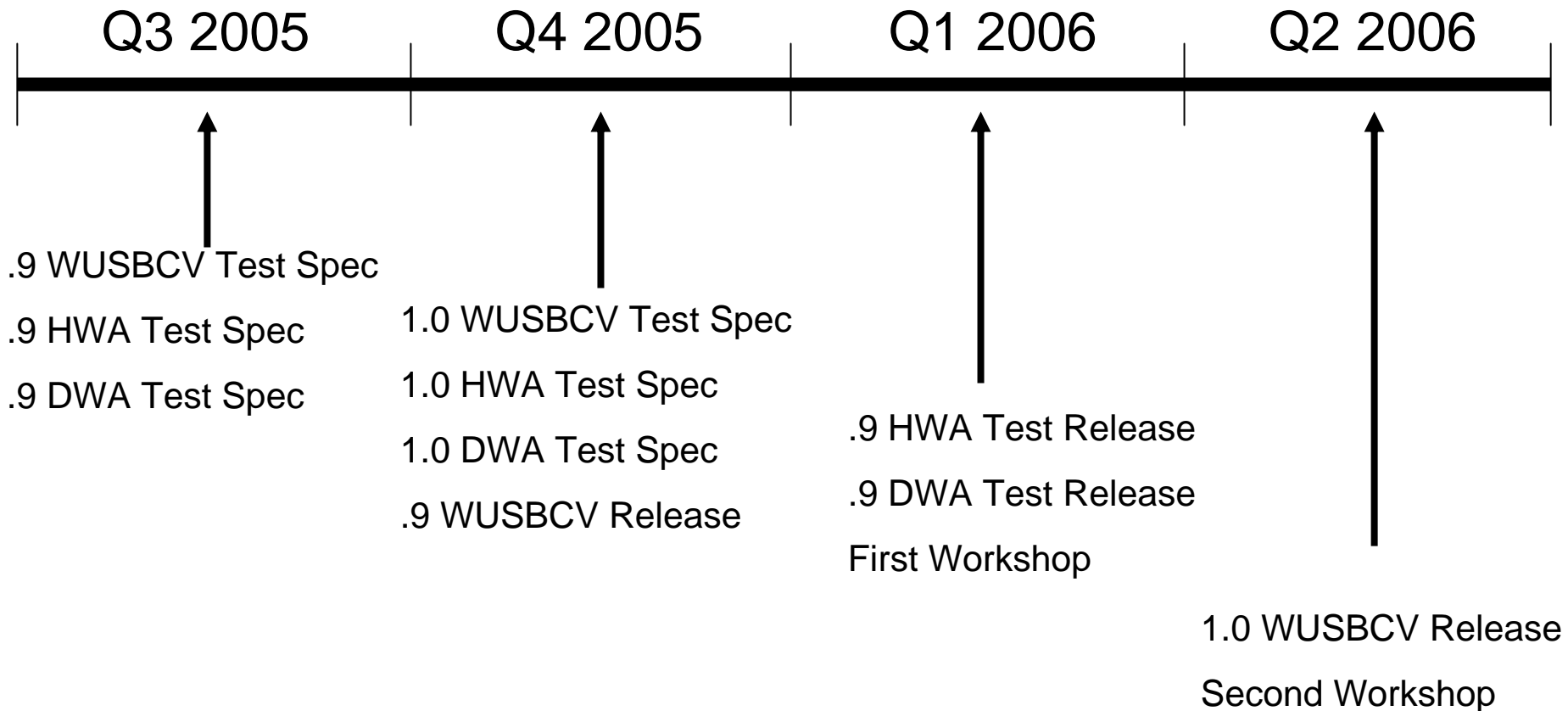
- Required Data Rates
- Advertised Data Rates
- Bit Error Rate
 - Test bit error rate at various rates and distances with reference host(s)
 - Verify transmitter/receiver performance meets minimum requirements
- Transmit Power Control
 - Required level support
 - Level accuracy
- LQI Support



Physical Layer Example – Transmit Power Control

- Test device is programmed to listen to all packets and report LQI values.
- Standard host enumerates device under test.
- Standard host issues loopback read requests specifying power level X.
- Standard host issues loopback read requests specifying power level Y.
- The difference between LQI readings for power levels X and Y is computed and checked against transmit power control accuracy requirements.

Wireless USB Compliance Timeline





Summary and Call to Action

- Wireless USB Compliance Program Will Follow USB 2.0 Model
 - Trademarked Logo For Compliance
 - High level of testing with initial product rollout
 - Repeatable tests and procedures
- USB-IF will provide all required testing at USB-IF workshops.
- Review Test Specs and Provide Feedback
 - Available on USB-IF website starting in Q3
- Download WUSBCV when available
- Attend Compliance Workshops