



# FCC/FDA Wireless Medical Test Beds Workshop

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Session Three

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## Wireless Medical Communications

- Mission critical
- Multiple wireless technologies operating in hostile wireless environments
- No coexistence standards
- No test standards specific to medical wireless



Does the world need a wireless medical testbed standard?  
Or are we putting the cart before the horse?

# Key Industry Test Standards

2G/3G/LTE	Wi-Fi	Data transport	Applications	Smart Grid
3GPP RAN5 →ETSI →PTCRB/GCF (conformance, interoperability)  CTIA (TIS/TRP MIMO-OTA SAR)	Wi-Fi Alliance (WMM, WPA, etc.)  IEEE 802.11.2 (range, throughput, latency)	IETF RFC 2285, 2544, 2889 (packet loss, latency, jitter)	ITU-T Voice Quality P.800 (MOS); P.862 (PESQ); G.107 (R- Factor)  IETF video quality RFC 4445 (MDI MLR, DF)	NIST SEP 2 interoperability

3GPP = 3<sup>rd</sup> generation partnership project  
 RAN = radio access network  
 IETF = internet engineering task force  
 RFC = request for comments  
 GCF = global certification forum  
 ITU = international telecommunication union  
 ETSI = European Telecommunications Standards Institute  
 CTIA = cellular telecommunications internet association

TIS = total isotropic sensitivity  
 TRP = total radiated power  
 MIMO = multiple input multiple output  
 OTA = over the air  
 SAR = specific absorption ratio  
 WMM = wireless multimedia  
 WPA = wireless protected access

NIST = national institute of standard and technology  
 SEP = smart energy profile  
 MOS = mean opinion score  
 PESQ = perceptual speech quality measure  
 R-Factor = rating factor  
 MDI = Media Delivery Index  
 MLR = media loss rate  
 DF = delay factor

## Wi-Fi Alliance Certification

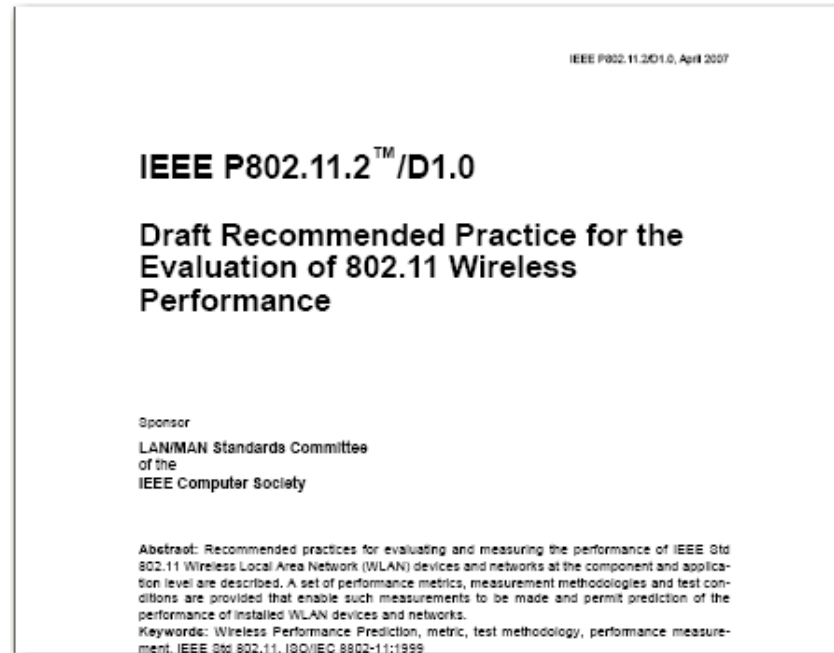
- The Wi-Fi Alliance is a certification organization for the 802.11 industry
- Responsible for certification testbed, test standards
- Recently also created its own standard – Wi-Fi Direct – outside of the IEEE 802.11



# 802.11 Performance Test Methodology

IEEE 802.11.2, a recommended practices document, was developed by TGT

Defines methods and metrics for evaluating performance of 802.11 devices and systems



# Medical Interoperability Forums and SDOs

- ISO/IEEE 11073
- IEEE 802.15.6 (released), 802.15.4j, 802.15.4n
- IHE PCD
- Continua
- MDPnP program
  - Group that developed the ICE Standard which was published as ASTM 2761
  - Funded by grants to develop and demonstrate interoperable solutions
- FDA facilitates interoperability forums
  - MDICC
  - AAMI's HITI workgroup
    - <http://www.aami.org/>
  - MDPnP

IHE= Integrating the Healthcare Enterprise  
PCD = Patient Care Device  
MDPnP = medical device plug and play  
MDICC = Medical Device Interoperability Coordination Council  
SDO = standards defining organization  
ICE = Integrated Clinical Environment

## IEEE 11073

- 11073-10404 = Pulse Oximeter
- 11073-10406 = Pulse / Heart Rate
- 11073-10407 = Blood Pressure
- 11073-10408 = Thermometer
- 11073-10415 = Weighing Scale
- 11073-10417 = Glucose
- 11073-10441 = Cardiovascular Fitness Monitor
- 11073-10442 = Strength Fitness Equipment
- 11073-10471 = Independent Living Activity
- 11073-10472 = Medication Monitor
- 11073-20601 = Base Framework Protocol

- [www.ihe.net](http://www.ihe.net)
- Formed in 2005 to address issues related to integration of Point-of-Care medical devices
- Out of the box, open, interoperable solutions
- PCD Profiles use HL7 and IEEE 11073 Nomenclature (11073.10101) and DIM (11073.10201)

## Integrating the Healthcare Enterprise (IHE)

IHE is an initiative by healthcare professionals and industry to improve the way computer systems in healthcare share information. IHE promotes the coordinated use of established standards such as DICOM and HL7 to address specific clinical needs in support of optimal patient care. Systems developed in accordance with IHE communicate with one another better, are easier to implement, and enable care providers to use information more effectively.

IHE= Integrating the Healthcare Enterprise  
PCD = Patient Care Device  
DIM = Domain Information Model

ISO/IEEE 11073   MDPnP   IHE PCD   Continua

Applications, services and protocols...

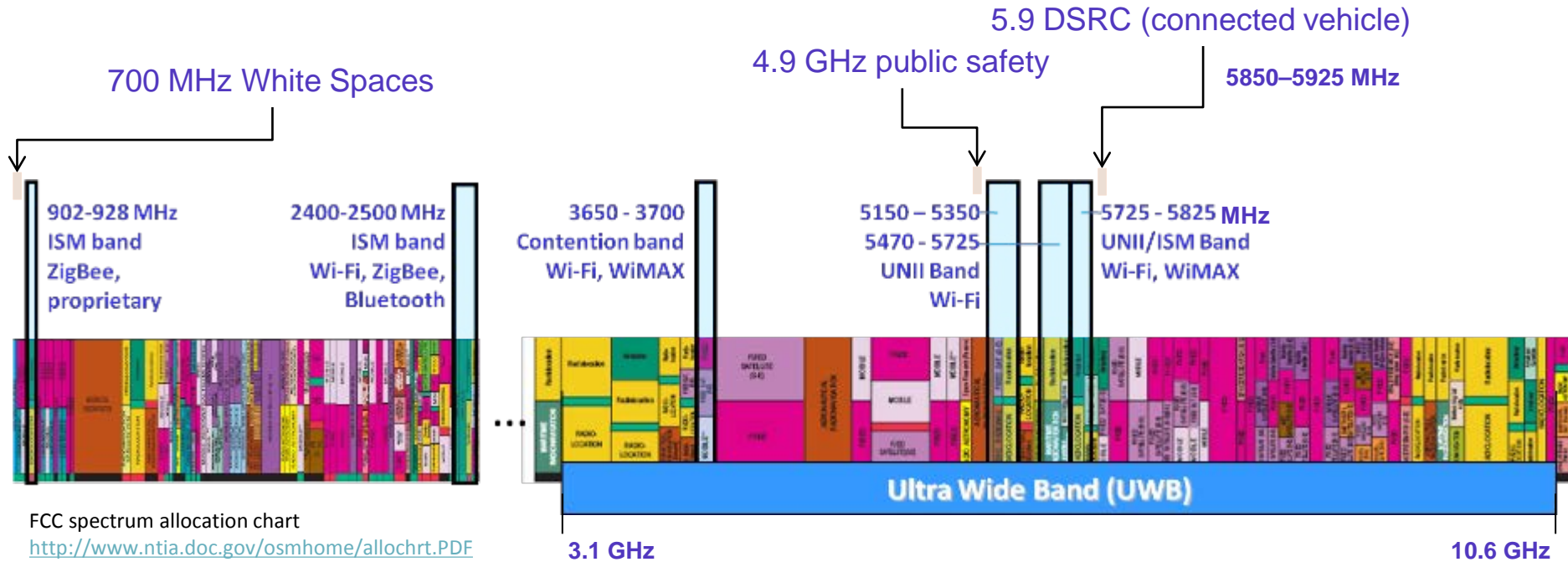
IEEE 802.15   IEEE 802.11   3GPP 2G/3G   3GPP LTE   Bluetooth   ZigBee

... depend on the physical layer to deliver messages among devices and systems

Issue: No protection from other services in unlicensed bands...  
Coverage not guaranteed in the licensed bands...



# Issues in the Unlicensed Bands



- Access protocol is unregulated
- Wi-Fi with its contention based access is vulnerable to scheduled services and to a multitude of devices with no access protocol (e.g. baby monitors, phones)

## Medical BAN

- GE Healthcare petitioned the US Federal Communications Commission to use the 2.36 to 2.4 GHz band for Medical BAN
  - Band to be used only for medical applications
  - This band is primarily allocated to AMT, radio astronomy and amateur
  - MBAN will use band on a secondary basis and must defer to primary users

<b>Federal Communications Commission</b>		<b>FCC 14-124</b>
<hr/>		
<b>Before the Federal Communications Commission Washington, D.C. 20554</b>		
In the Matter of	)	
	)	
Amendment of the Commission's Rules to Provide	)	ET Docket No. 08-59
Spectrum for the Operation of Medical Body Area	)	
Networks	)	
	)	
<b>ORDER ON RECONSIDERATION AND SECOND REPORT AND ORDER</b>		
<b>Adopted: August 20, 2014 Released: August 21, 2014</b>		

AFTRCC = Aerospace & Flight Test Radio Coordinating Council  
NPRM = notice of proposed rule making  
AMT = aeronautical mobile telemetry  
BAN = body area network

## Questions To Think About

- Does the world need a dedicated medical band?
- Do we need the FCC to manage service coexistence in the unlicensed bands?
- Do we need a standard for wireless medical communications?
- And if yes, what organization should be in charge?



[octoBox](#)® controlled environment wireless testbed for testing real devices under controlled conditions, including interference, signal loss and multipath; ideal for interoperability, performance and coexistence testing

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