



NDIA ATC Meeting Commercial Liaison Report

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March 29th 2017

AGENDA

- **News** (Mergers/Acquisitions/Spin Offs/Announcements)
- **Advancing Instrumentation in the 5G Era**
- **PXI, VXI, AXIe, LXI Refresh**

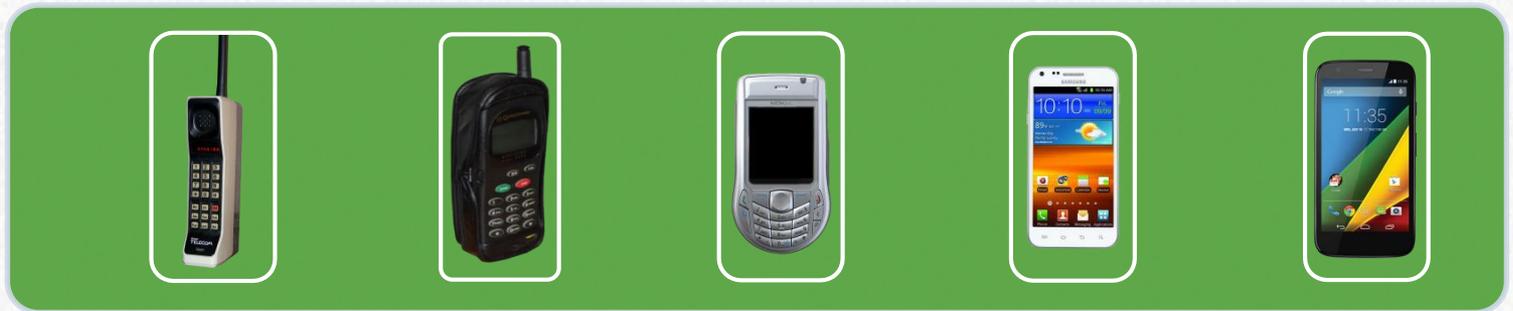
News

- National Instruments – Jan 1, 2017. Dr. James Truchard retired as CEO, remaining active on Board of Directors announcing Alex Davern as the new CEO
- Avera – March 14, 2016 developer of test solutions announced acquisition of Europe-based Test & Measurement Solutions.
- Teledyne LeCroy Inc.- April 2016. Acquired Frontline Test Equipment, Inc a provider of wireless protocol analysis test tools.
- Danaher Corporation May 4, 2016. Spun-off Fortive Corporation which includes the Tektronix, Fluke, and Keithley brands.
- Anritsu Corporation Sept 26, 2016, Acquired Azimuth Systems, Inc. a provider of automated RF test solutions
- EXFO Inc. - Oct 31, 2016 acquired Absolute Analysis Inc, provider of RF testing for fiber-based RANs
- Keysight Technologies - Jan 30 , 2017 reached a deal to buy Ixia in a move to expand its software-centric business.

From 1G to 5G

How Moore's Law is Advancing
Instrumentation in the 5G Era

Wireless Evolution



Year	1984	1991	2001	2009	2015
Technology	1G	2G	3G/3G+	3.9G/LTE	4G/LTE-Adv
Bitrate	N/A	300 kbps	42 kbps	129 Mbps	300 Mbps
Ch. BW	30 kHz	200 kHz	5 MHz	20 MHz	100 MHz
Price	\$4K*		\$400	\$ 0†	\$ 0†

Chip	\$20	\$5	\$1
	1983	1999	2015

*≈ \$10K in 2016 \$

†with service contract

The Proliferation of Wireless Adds Complexity

AMPS

GSM through EDGE

UMTS through HSPA+

LTE

5G

802.11-1997

802.11a/b

802.11g

802.11n

802.11p

802.11ac

802.11ad

802.11ax

Bluetooth

Bluetooth Extended Data Rate (EDR)

Bluetooth High Speed (HS)

Bluetooth Low Energy (LE)

1980

1990

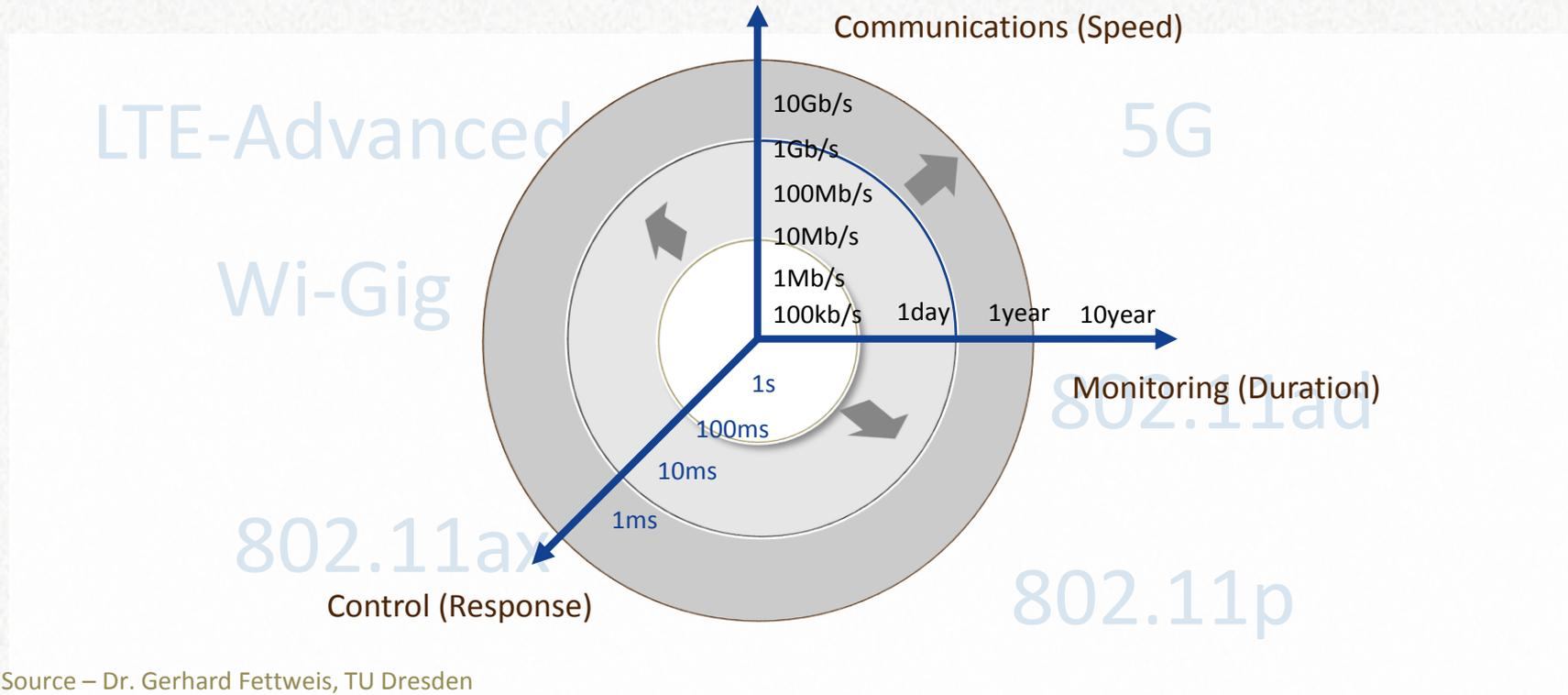
2000

2010

2020



The Next Frontier of Wireless



Source – Dr. Gerhard Fettweis, TU Dresden

FCC Embraces mmWave

FCC issued a Notice of Proposed Rule Making (NPRM) that proposes new flexible service rules among the 28 GHz, 37 GHz, 39 GHz, and 64-71 GHz bands.

Bands Above 24 GHz for Possible Mobile Use

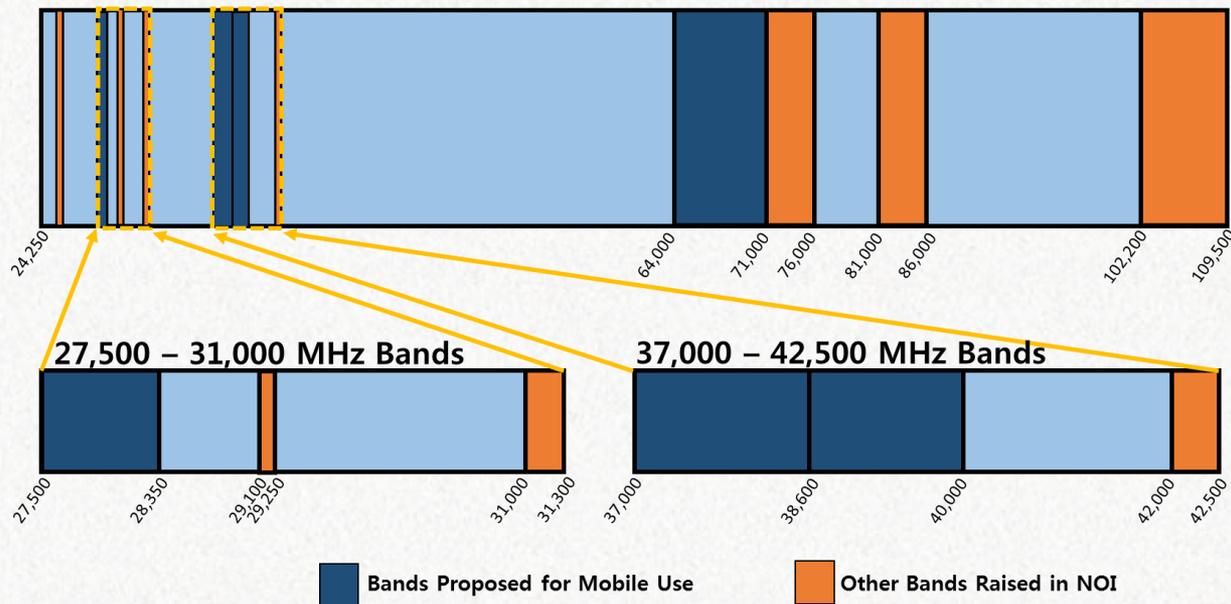


Image Source: FCC 15-138, Page 12, Oct 23, 2015

<https://www.fcc.gov/document/fcc-promotes-higher-frequency-spectrum-future-wireless-technology-0>

Oct 23, 2015

6x the Commercial Spectrum for 5G

“... Let me just put in perspective what's going on here. We are talking about **3850 megahertz of spectrum** that we are proposing today. **That's six times all of the commercial spectrum that this agency has ever authorized.**”

Tom Wheeler, FCC Chairman

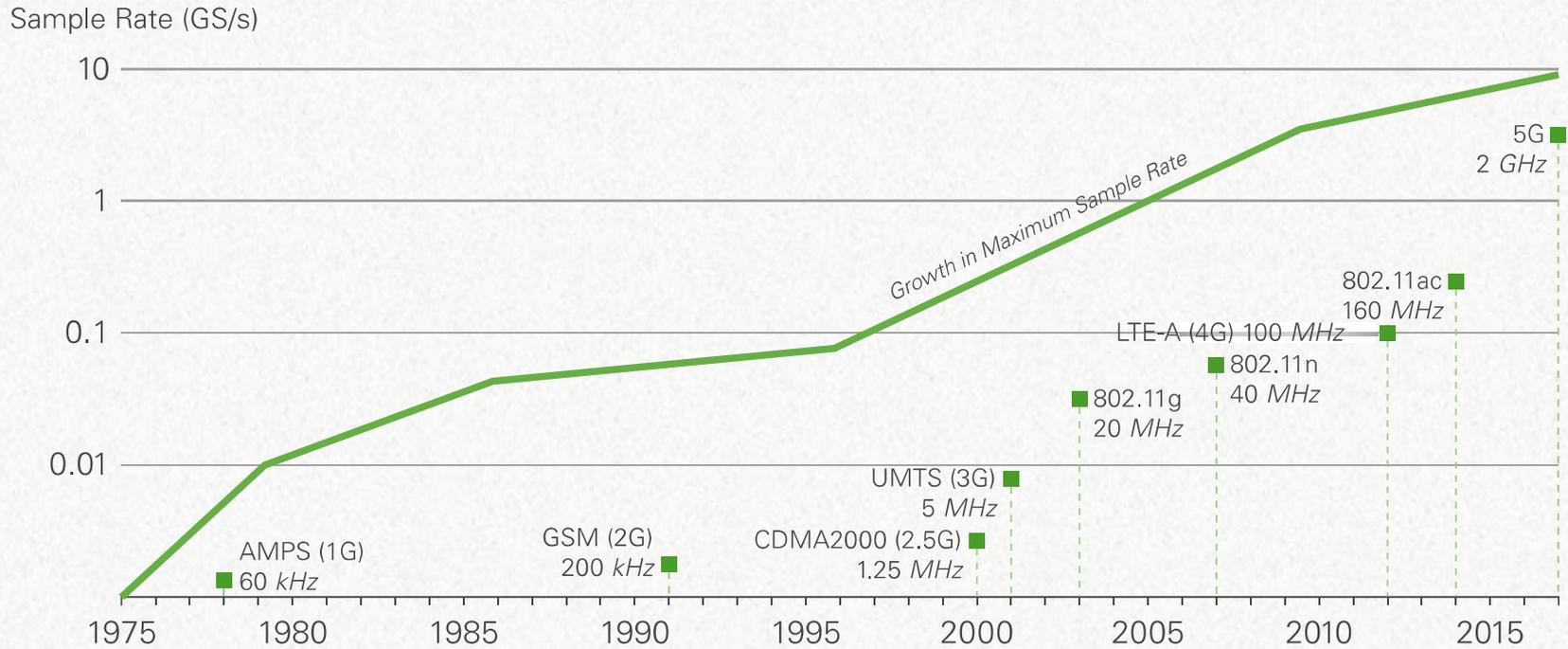


“With the [5G] race on, today’s rulemaking gets us out of the gate.”

Jessica Rosenworcel, FCC Commissioner

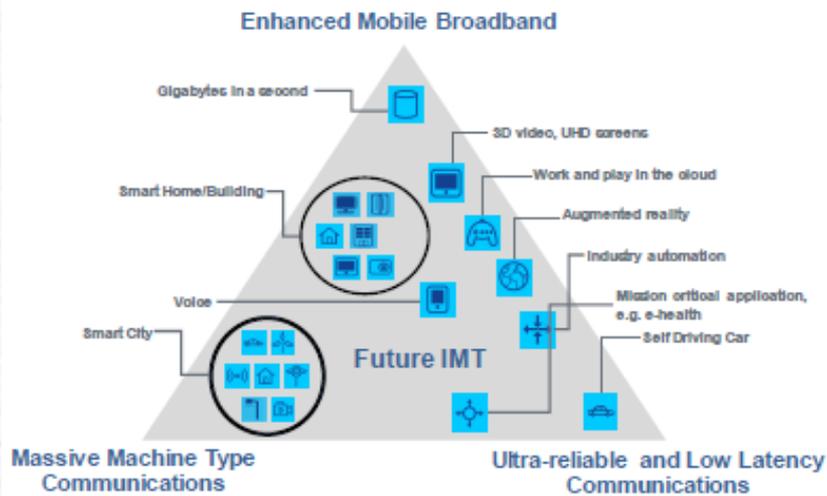


From 1G to 5G

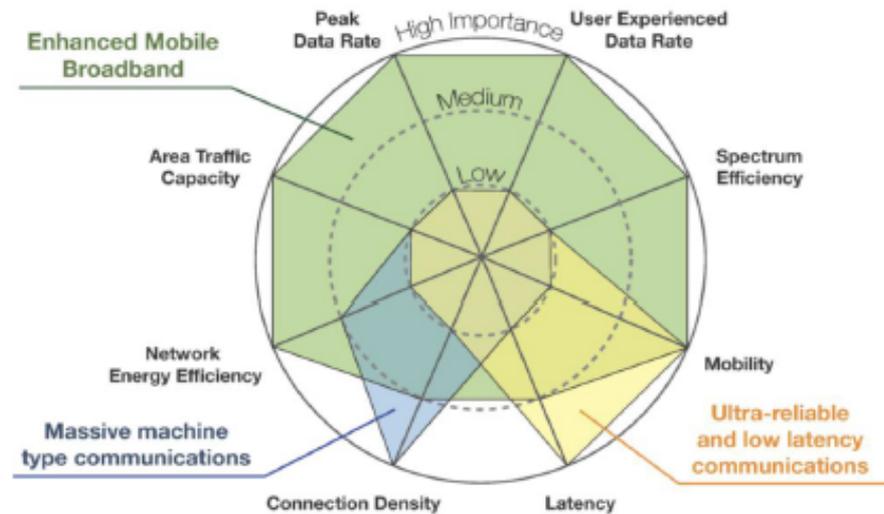


5G Defined | 3 Use Cases, 8 Key Capabilities

ITU-R vision for IMT*²⁰²⁰ and beyond



Three use case categories



Eight Key Capabilities

“Framework and overall objectives of the future development of IMT for 2020 and beyond”

This year's progress in 5G development will continue to be a group effort, involving standards organizations, infrastructure companies, silicon providers, component manufacturers, service operators, and test-and-measurement companies.

“It is going to take the entire industry to bring 5G to reality, and as such there are many challenges throughout the ecosystem,” concluded Cameron at Analog Devices.

“2017 should see great strides made in 5G standards activities that, in conjunction with field trails, should propel us to solid requirements and specifications for 5G systems.”

<https://www.evaluationengineering.com/special-reports2>

VXI & PXI Refresh



- VXI Bus Consortium:
 - 13 Members
 - > 1500 Products
 - 394 Mfg. ID's issued
 - VXI 4.0
 - <http://www.vxibus.org>
 - Products at <http://vxibus.org/products.html>
 - Annual Meeting
- PXI Systems Alliance (PXISA):
 - 68 Members (10/2/2015)
 - PXI-7: PXI Multicomputing HW Spec, Rev 1.0
 - PXI -8: PXI Multicomputing SW Spec ,Rev 1.0
 - PXI-9: PXI & PXI Express Trigger Management Spec ,Rev 1.0
 - www.pxisa.org
 - New products
 -

AXIe & LXI Refresh



- AXIe Consortium:
 - 11 Members (10/2/2015)
 - 29 Products (10/2/2015)
 - AXIe 1.0 Base Arch Spec, Rev 2.0
 - AXIe 2.0 Base Software Spec, Rev 1.0
 - AXIe 3.1: Semiconductor Test Extension, Rev 1.0
 - AXIe-0: Low Cost Instrumentation and Switch Architecture
 - AXIe Wide PCI Express available soon
 - www.axiestandard.org for overview presentation



LAN eXtensions for Instrumentation

- LXI Consortium
 - 53 Members (10/2/2015)
 - 2728 products(10/2/2015)
 - LXI 1.4 (Core + 7 Extended Functions)
 - New LXI Reference Design
 - Soon to be released
 - Available to members only
 - <http://lxistandard.org>
 - PlugFest 2016
 - Date: 10/17 – 10/19
 - Place: Boston, MA

Questions/Discussion?