



# **RichWave Technology Corp.**

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Outlooks for 2017Q4 & 2018

Dec 2017

# COMPANY OVERVIEW

SHANGHAI  
SHENZHEN  
SUWON  
TAIPEI  
CHUPEI

LOS ANGELES



Founded  
**Jan. 2004**



Listed in TSE  
**Nov. 2015**

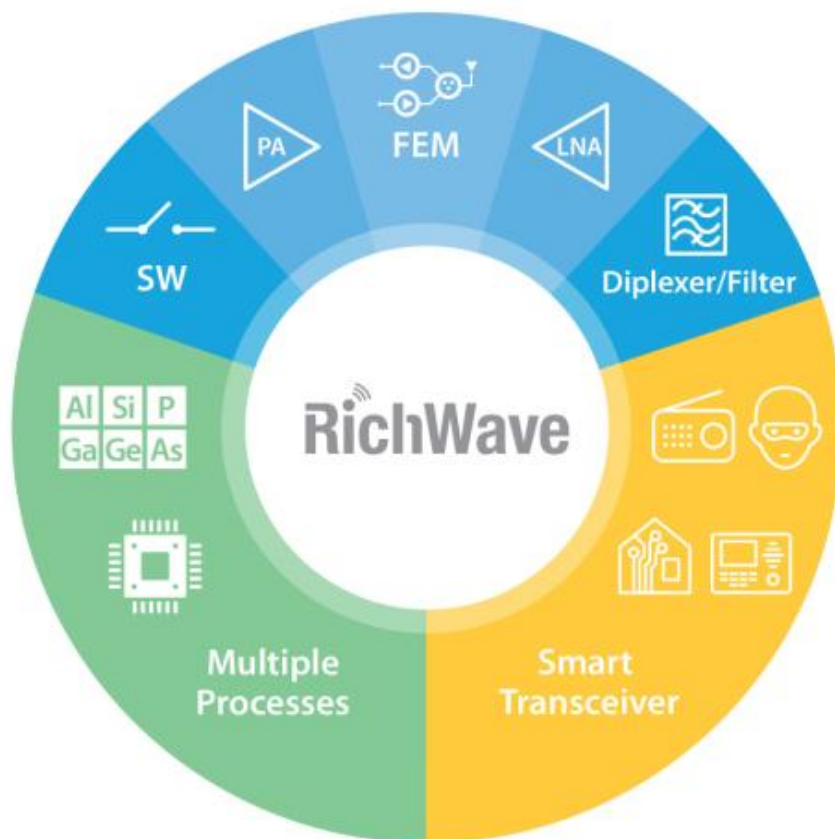


Customers  
**350**



Products  
**270**

# Continue Innovation and Brand Recognition



- 2008 Q3 **FOXCONN**
- 2011 Q3 **BROADCOM**
- 2012 Q1 **MARVELL**
- Q2 **LG Innotek** **SAMSUNG**
- 2014 Q4 **amazon.com** **HUMAX**  
**verizon**
- 2015 Q4 **muRata**
- 2017 Q4 **TEXAS INSTRUMENTS**

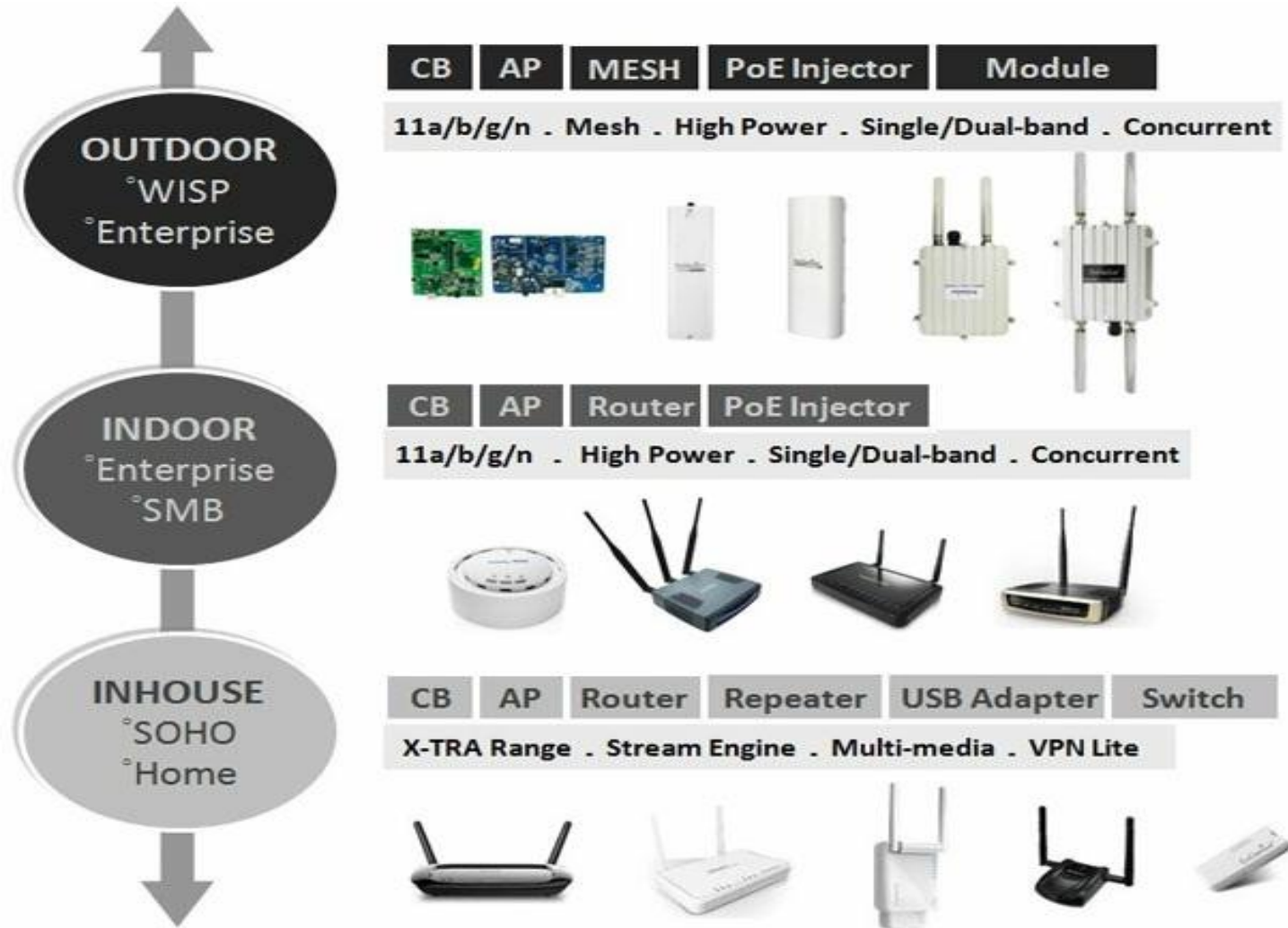
# Embedded-WiFi Connects IoT

## Point to Multi-Point – Enterprise Outdoor/Indoor Applications



Source: SIPSS-GLOBAL

# Product Range



Source: SIPSS-GLOBAL



# Segments Embedding WiFi & Players

<b>Retail Router</b>	• TP-Link, ASUS, Netgear, Belkin, Buffalo...
<b>Enterprise Router</b>	• Cisco, HP/Aruba, HUAWEI
<b>IP Cam</b>	• Hike-Vision, Netgear, Nest
<b>STB/ OTT</b>	• Roku, Xiaomi
<b>Gaming</b>	• Nintendo, SONY, Microsoft
<b>Smart Speaker</b>	• Amazon, Google, Harman, Xiaomi, Alibaba
<b>Smart TV</b>	• Samsung, LG, Xiaomi
<b>Smart Phone</b>	• ASUS, Samsung, LG, TCL, Xiaomi, Meizu
<b>Automotive</b>	• KOR/JPN module companies
<b>AI/ Robotics</b>	• ASUS- Zenbo, Softbank- Pepper, Anki- Cozmo
<b>IoT</b>	• Gemtek, Azureware, WNC, Fujitsu, Panasonic



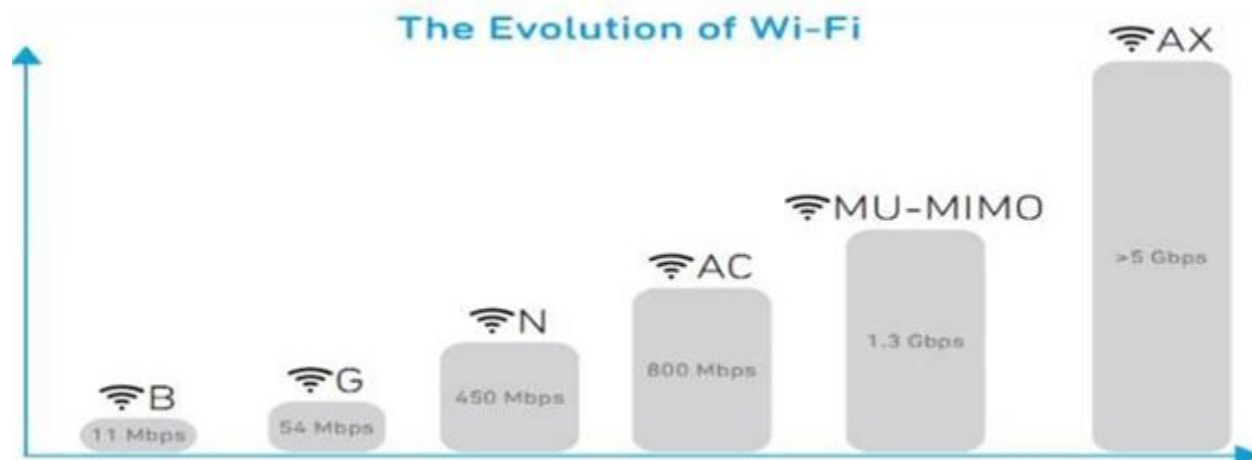
# Total Addressable Market for RichWave in next 3 years

Our market share is around 8% in WIFI RFFE , around 40% in SW

Segments	2017 (f)	2020 (f)	Growth (%)	Remarks
<b>AP Router (DSL, Cable, PON)</b>	350	400	14%	M units
<b>STB/OTT</b>	380	460	21%	M units, 2020
<b>Smart Phone</b>	1,517	1,697	11.91%	M units
<b>Game Consoles</b>	135.2	184	36%	M units
<b>Smart Speaker</b>	8.3	94	1075%	M units, US,2016
<b>IoT</b>	20,000	30,000	50%	M units
<b>Smart TV</b>	104	114	9.6%	M units, 2018
<b>Smart Home</b>	65	320	392%	M units
<b>Automotive (info..)</b>	1,062	7,914	645%	US\$M, 2016
<b>PC/Laptop/ Tablet</b>	435	433	-0.5%	M units, 2016

Source: IDC, IHS, Accelerating Biz analysis, frost & Sullivan, Ovum, Statista, IDATE, artner, Voicebot.ai, Edison Research, Digital Market Outlook, ABI Research

# Wi-Fi standards of 11.ac / 11ax keep multiples growth in MIMO for Speed & Capacity

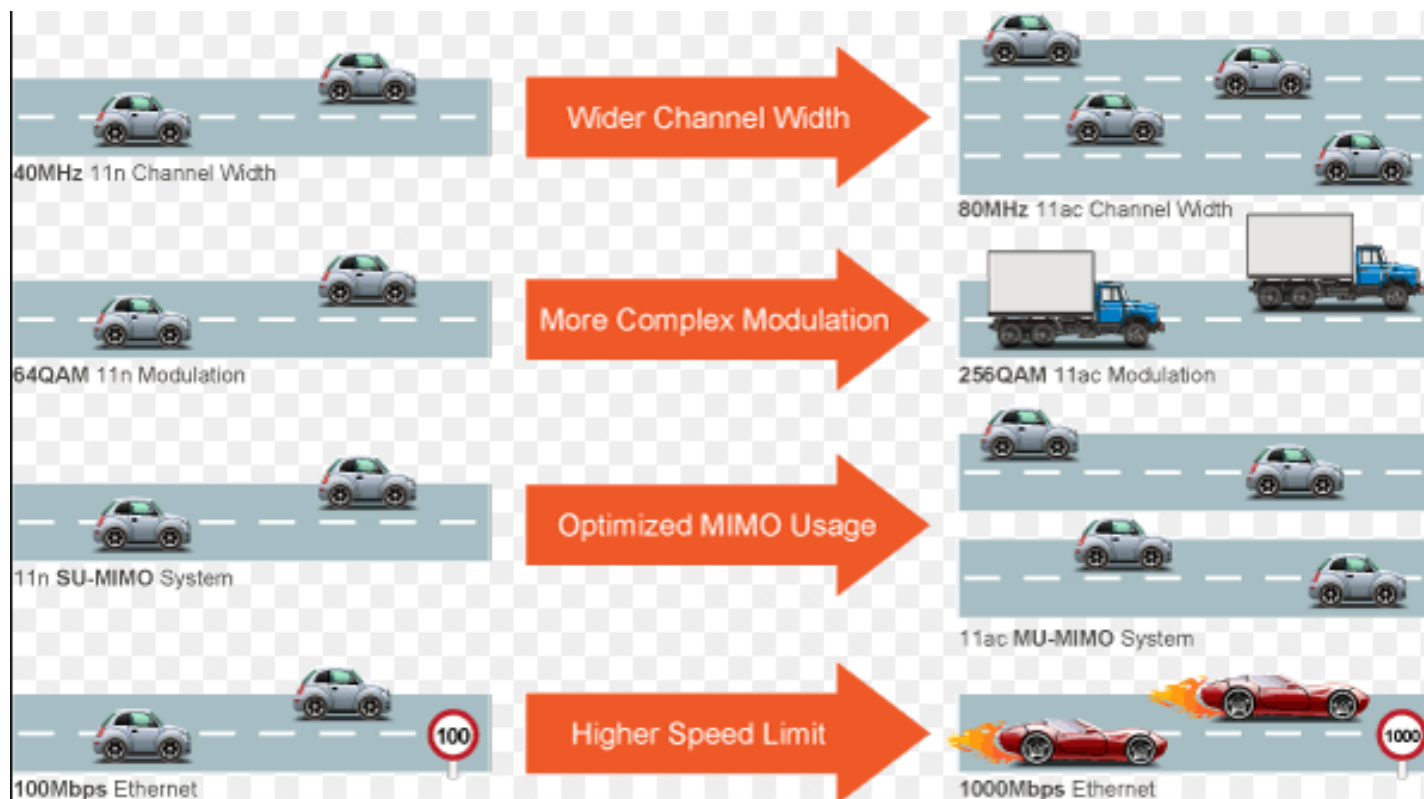


	802.11g	802.11n	802.11ac	802.11ax
使用頻段	2.4GHz	2.4GHz和5GHz	5GHz	2.4/5 GHz
使用頻寬	20MHz	20MHz 40MHz	20MHz 80MHz 40MHz 160MHz	20MHz 80MHz 40MHz 160MHz
最高天線數	1x1 SISO	4x4 MIMO	8x8 MIMO(MU-MIMO)	12x12 MIMO
現有標準速度 (理論值)	54Mbps	150Mbps 300Mbps 450Mbps (頻寬40MHz)	433 Mbps 867 Mbps 1300 Mbps (頻寬80MHz)	600.4 Mbps 9607.8 Mbps
最高速率(理論值)	54Mbps	600Mbps	6.93Gbps	9.6 Gbps

Source: [adrenaline.uol.com.br](http://adrenaline.uol.com.br)



# WiFi Generation Migration: Increasing Bandwidth, Modulation & MIMO



**Go faster in wired & wireless**

Take Advantage of 11ac to Optimize Data Link Speed

## Number of connected devices/things by technology worldwide from 2015 to 2021 (in millions)\*

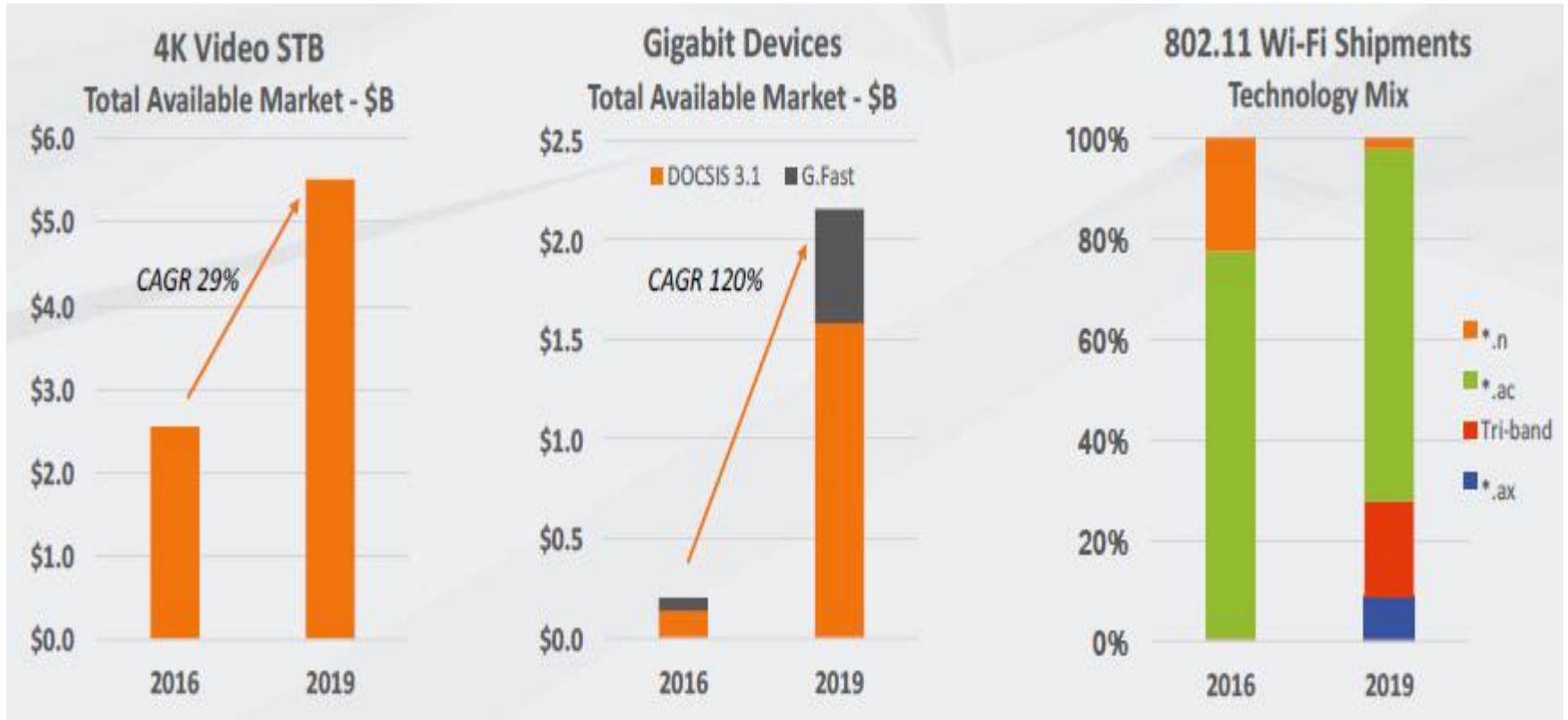


Source  
Berg Insight  
© Statista 2017

Additional Information:  
Worldwide; Berg Insight; 2015 to 2016

statista

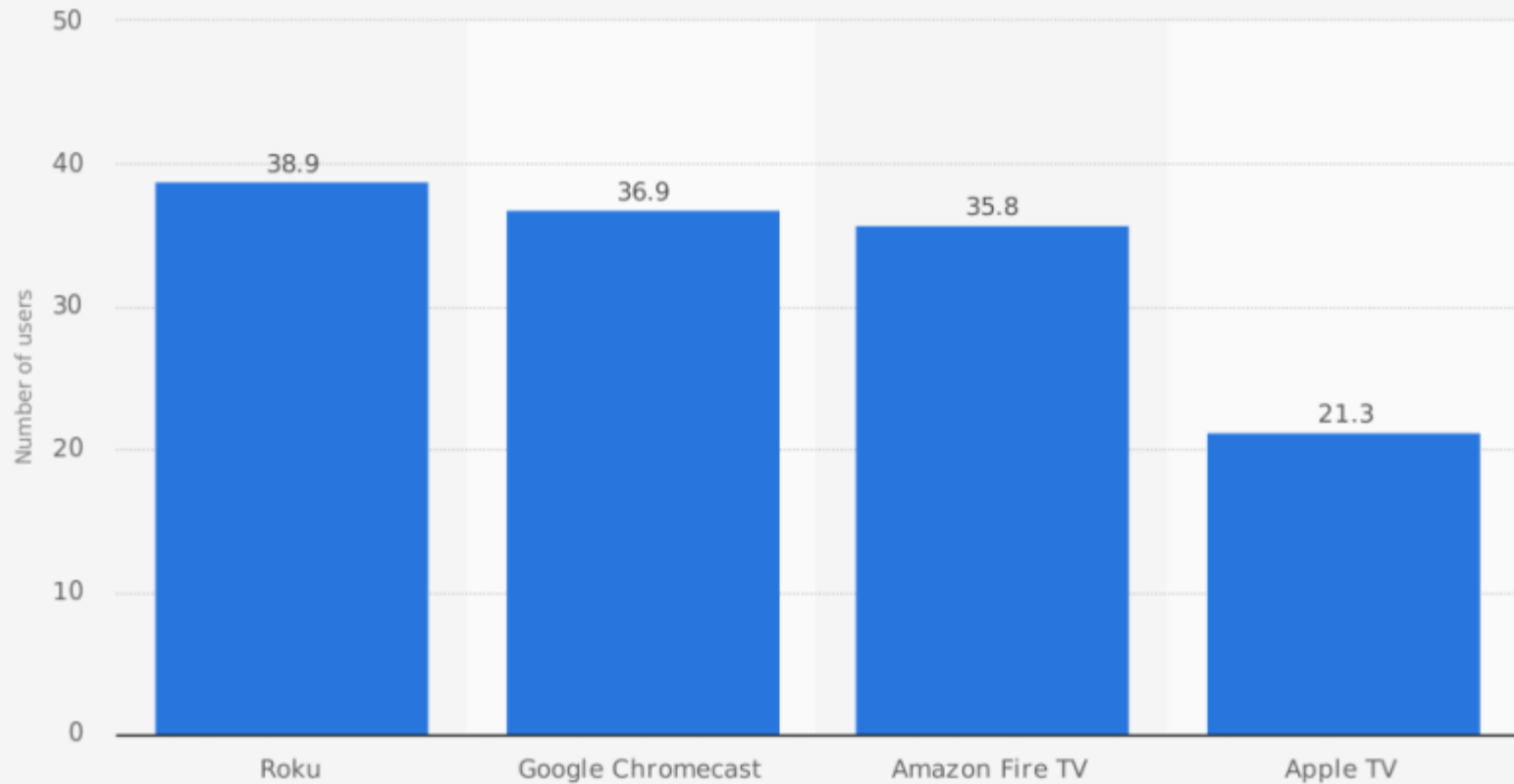
# Cable & STB Drives WiFi Adoption



Source: ARRIS Investor Day 2017



## Number of connected TV users in the United States as of July 2017, by brand

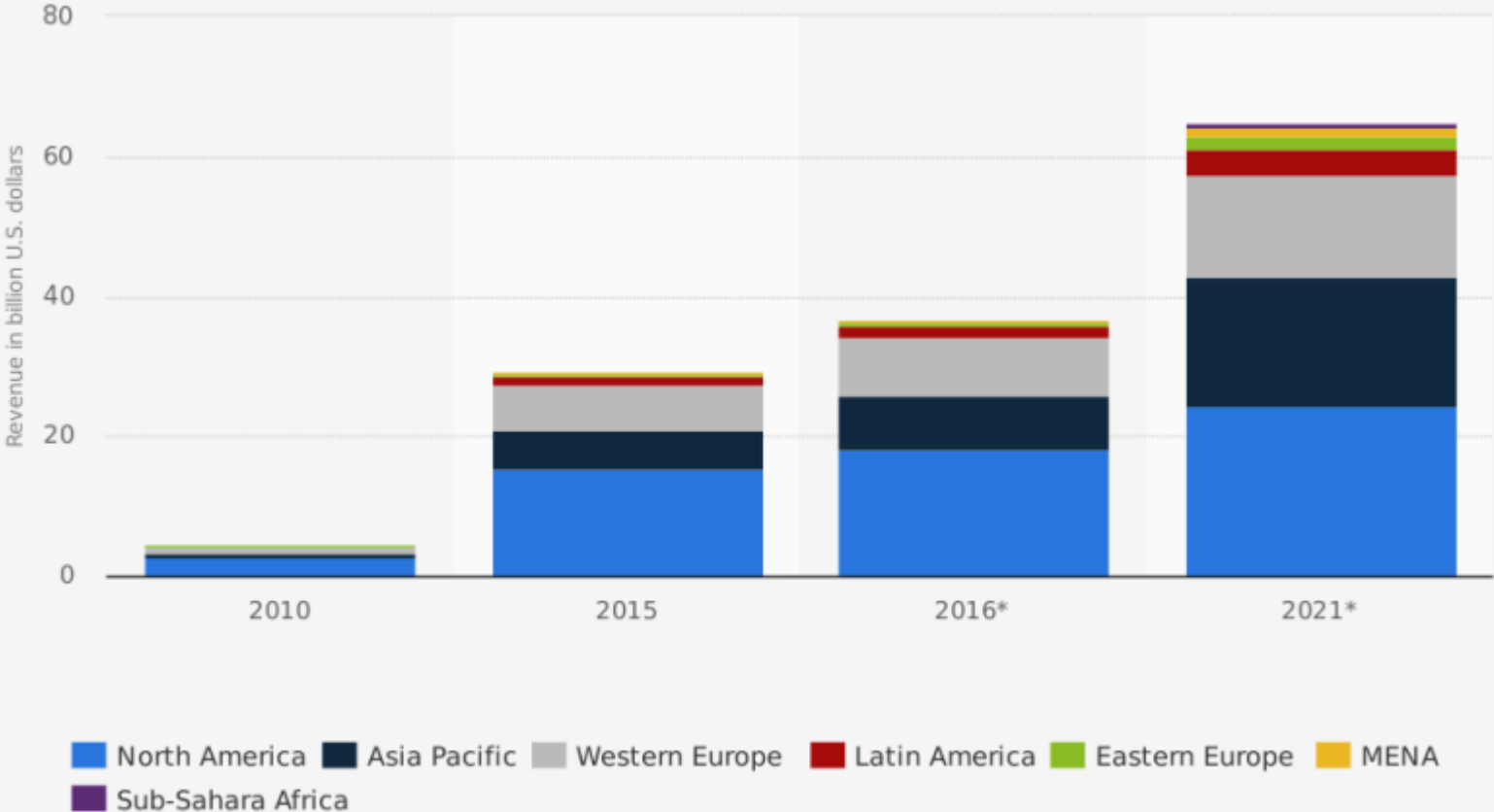


Source  
eMarketer  
© Statista 2017

**Additional Information:**  
Worldwide; July 2017; based on individuals of any age who use the internet through each device at least once per month

statista

# Over-the-top (OTT) TV and video revenue worldwide from 2010 to 2021, by region (in billion U.S. dollars)



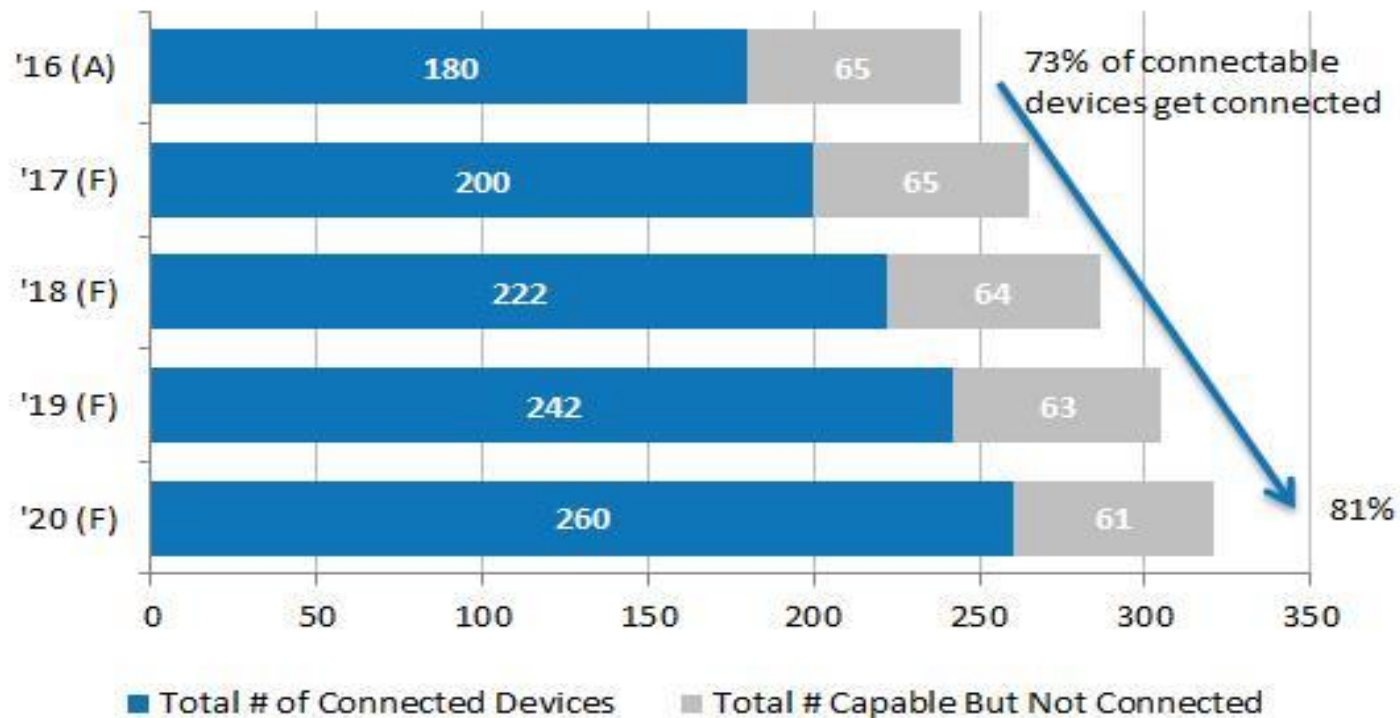
Source  
Digital TV Research  
© Statista 2017

Additional Information:  
2010 and 2015



# Living-Room WiFi-Connectivity Fast Increase

**Internet Connectable Device Forecast**  
(Connectable TVs, Blu-ray Disc Players, Game Consoles, & Streaming Media Players)

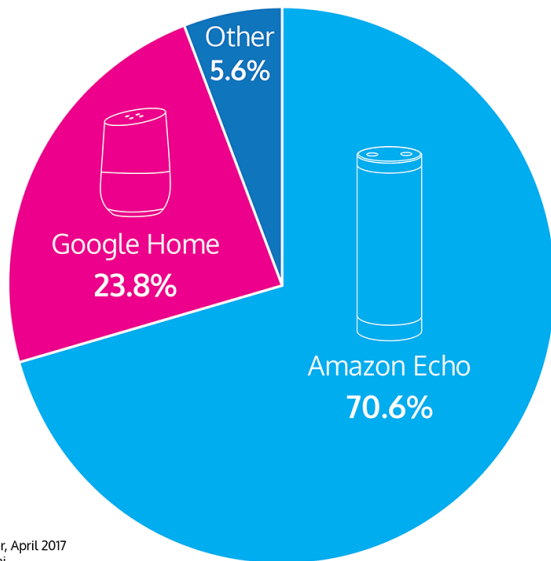


*Base: U.S. Internet households*

*Source: The NPD Group/Connected Intelligence, TV-Connected Device Forecast  
Includes a small percent of game consoles that are non-connectable*

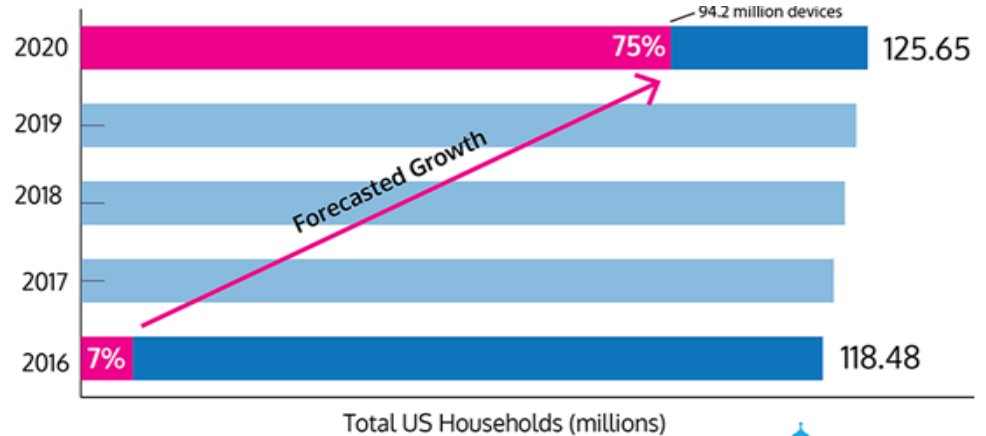
# WiFi-in-Smart Speaker Grows Rapidly

US Voice-Enabled Speaker User Share by Player, 2017



Source: eMarketer, April 2017  
Image: Voicebot.ai

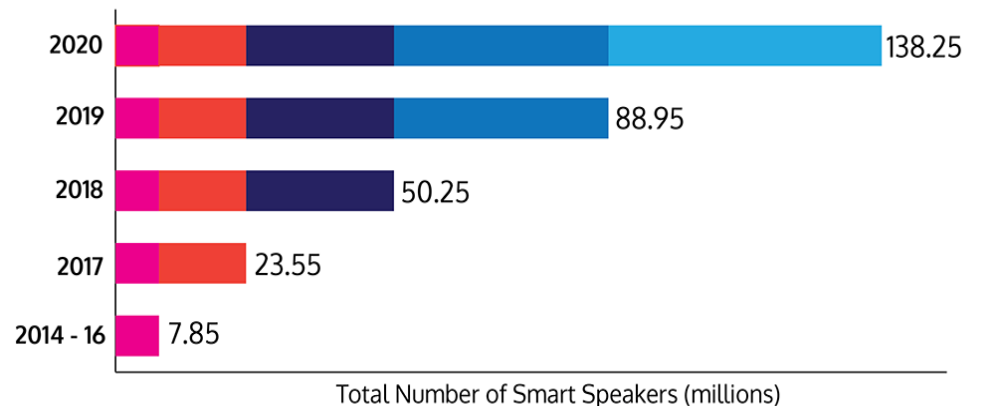
US Household Smart Speaker Ownership 2016-2020



Source: US Census, Gartner, Edison Research, Voicebot.ai



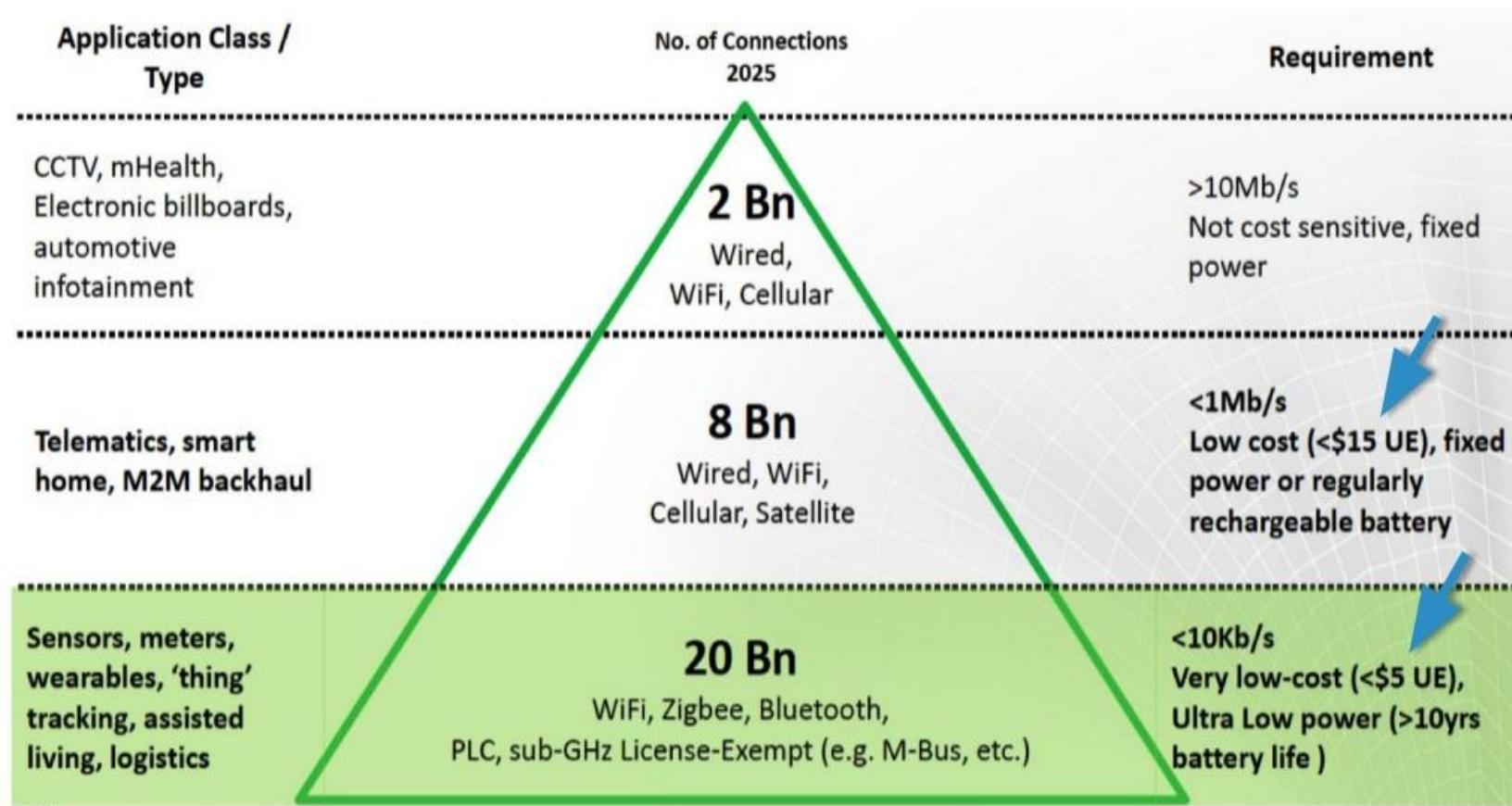
US Smart Speaker Installed Base - 2016 to 2020



Source: CIRP, VoiceLabs, Statista, Edison Research, Voicebot.ai



# WiFi is Adopted from IOT, Home, M2M to Cloud and Everywhere





# Growth Strategy & Advantages

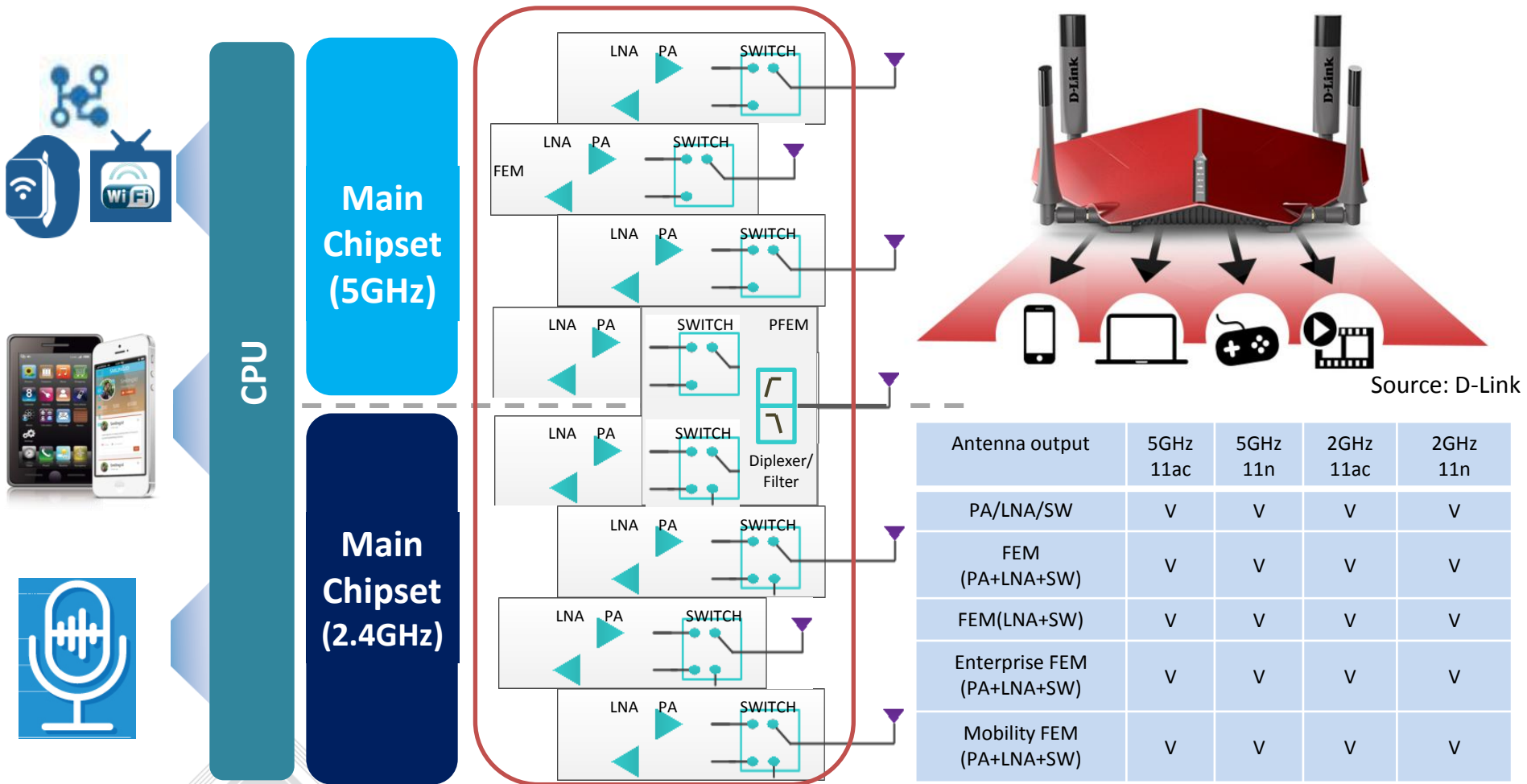
# Armed with over 100 Design References by Main-Chip partners





# RichWave has Complete WiFi RFFE Solutions

WiFi RFFE is Key for Performance: MU- MIMO Features Increase # RF Front End PA for range, LNA for Sensitivity. RFFE Quantity Proportional to MIMO



Source: D-Link

# Our WiFi 802.11ac Win by Performance

## Output Power

H



Video Stream



Data Connected



Set-top box



Data Connected



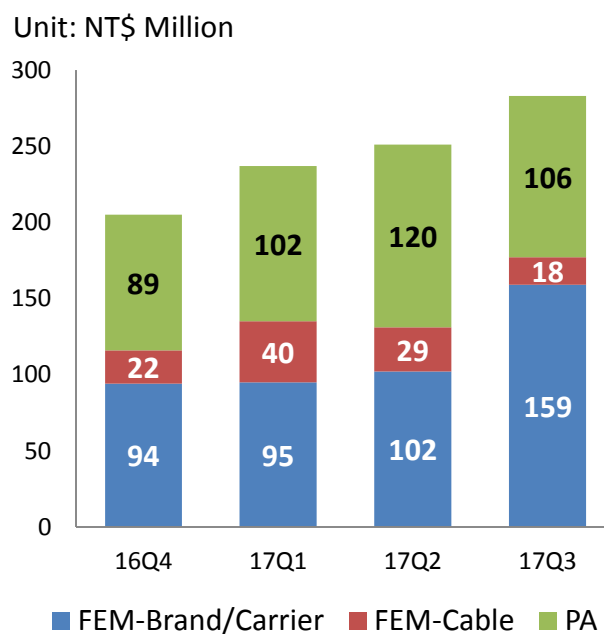
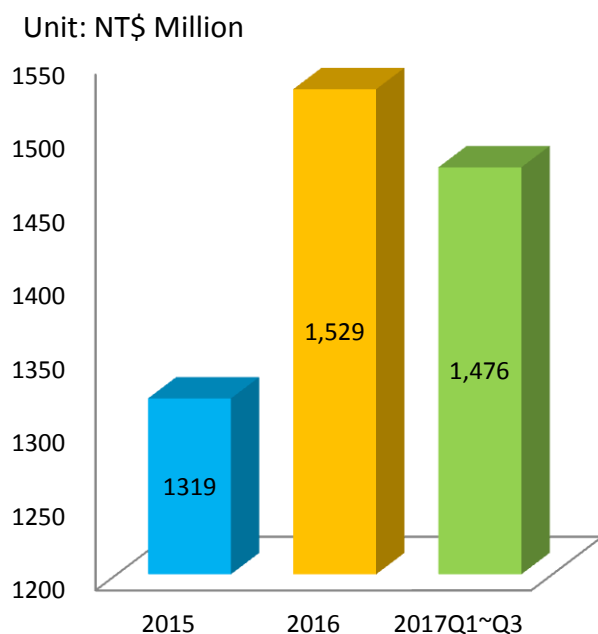
IOT

	Parameter		RichWave	Ref.
5GH FEM	H	Pout @1.8% EVM	<b>22.5dBm</b>	22.5dBm
	M	Pout @1.8% EVM	<b>20dBm</b>	19dBm
	L	Pout @1.8% EVM	<b>16dBm</b>	16dBm
2GHz FEM	Pout @3% EVM		<b>27dBm</b>	26dBm

L

# Annually Solid Growth over 30% in WiFi

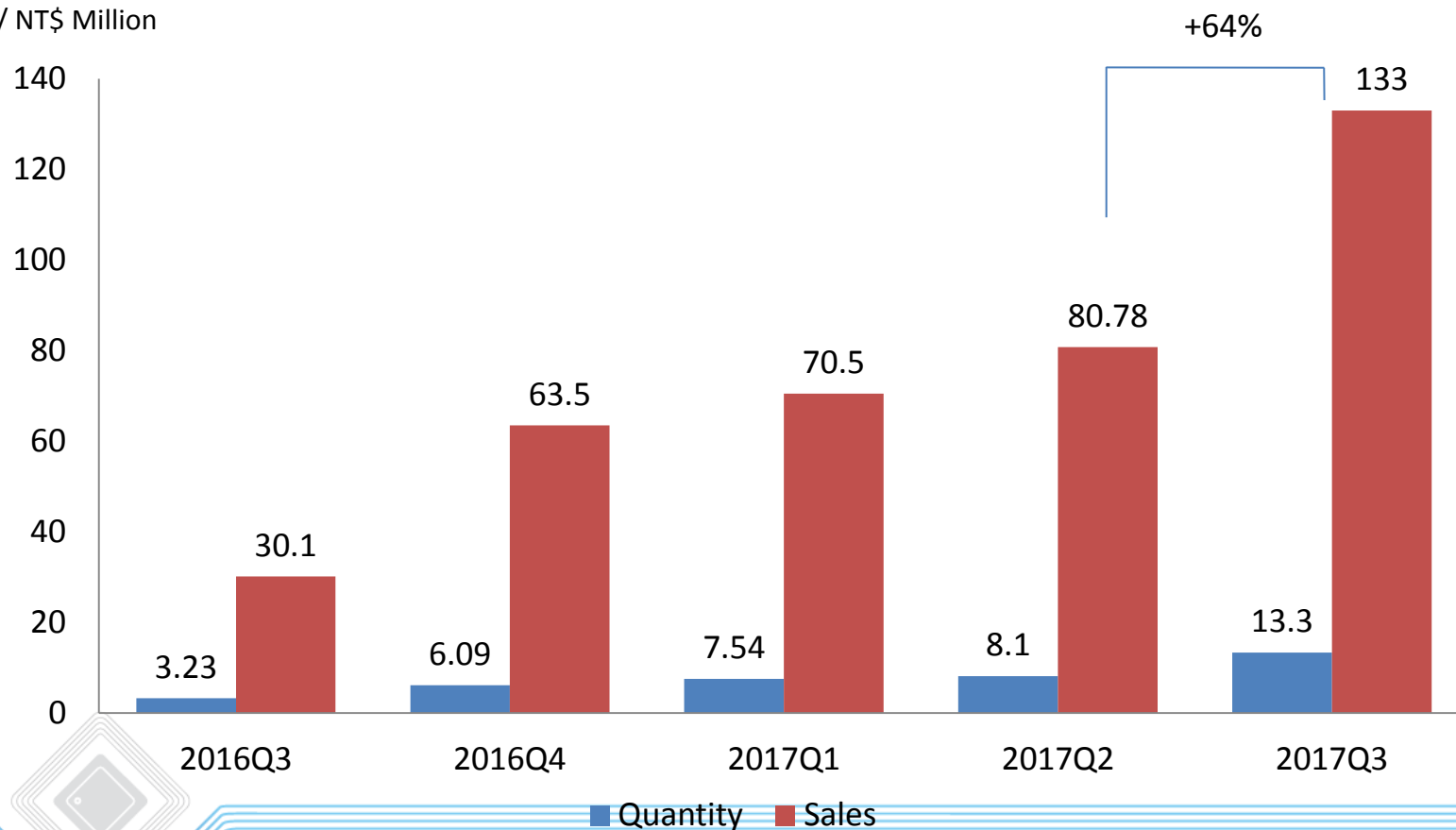
- 2017Q3 FEM with QoQ growth is over 55% by 802.11ac Brand/Carriers.
- 2017Q3 WiFi Overall QoQ growth is 14%, YoY growth is over 30%.
- Driven by 11ac worldwide share, MIMO 2x2 and 3x3, and increasing Range-coverage.



# FEM engaged in Router & STB/OTT with Big Brands worldwide

- Our quality and performance are armed with the world level.
- Q4 revenue will increase over Q3 QoQ both in China & Europe.

M Units/ NT\$ Million



# Smart speakers Grab in USA & China brands

- Amazon Echo extended voice assistant from home to Business and the era of intelligent assistant is coming!
- Xiaomi AI Speaker [Small Love Classmate] The millet family can control 85 million IoT devices to create the "IoT + AI" ecosystem.



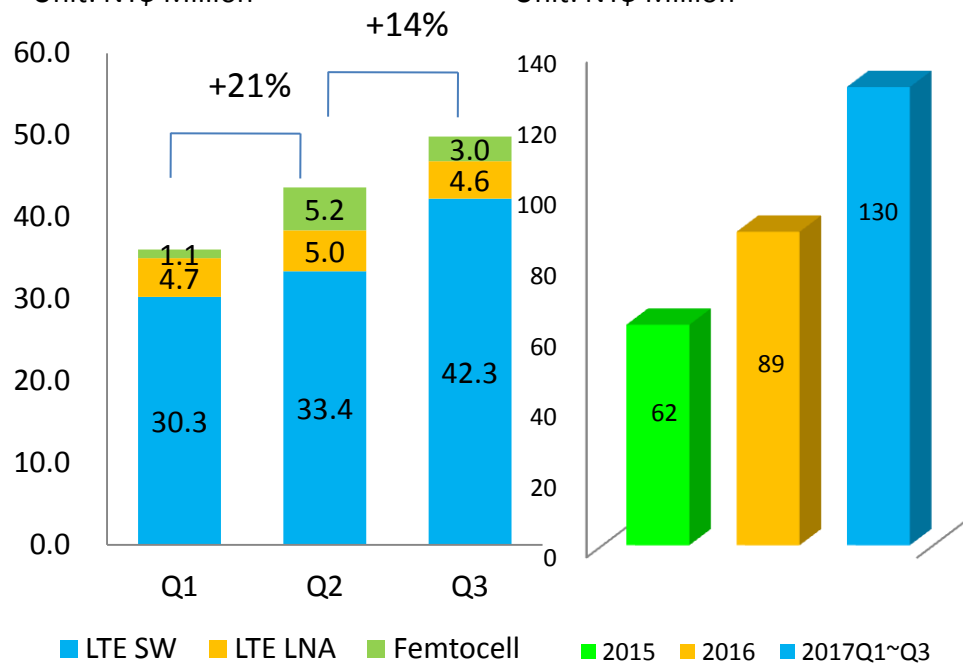


# Win 27% Growth on Brand Players in LTE

- LTE SW growth 27% QoQ mainly come from China top brand.
- Continue penetrating into global brands in 2017 2H.

Unit: NT\$ Million

Unit: NT\$ Million



Top Five Smartphone Companies in PRC, Shipments, Market Share, and Year-Over-Year Growth, 2017Q1 Preliminary Data (Units in Millions)

Company	2017Q1 Shipment Volumes	2017Q1 Market Share	2016Q4 Market Share	2016Q1 Market Share	Year-Over-Year Unit Change (2017Q1 over 2016Q1)
Huawei	20.8	20.0%	16.8%	16.0%	25.5%
OPPO	18.9	18.2%	18.1%	15.3%	19.5%
vivo	14.6	14.1%	16.0%	13.2%	7.6%
Apple	9.6	9.2%	11.0%	12.7%	-26.7%
Xiaomi	9.3	9.0%	7.4%	9.8%	-7.5%
Others	30.8	29.6%	30.7%	33.0%	-9.6%
Total	104.1	100%	100%	100%	0.8%

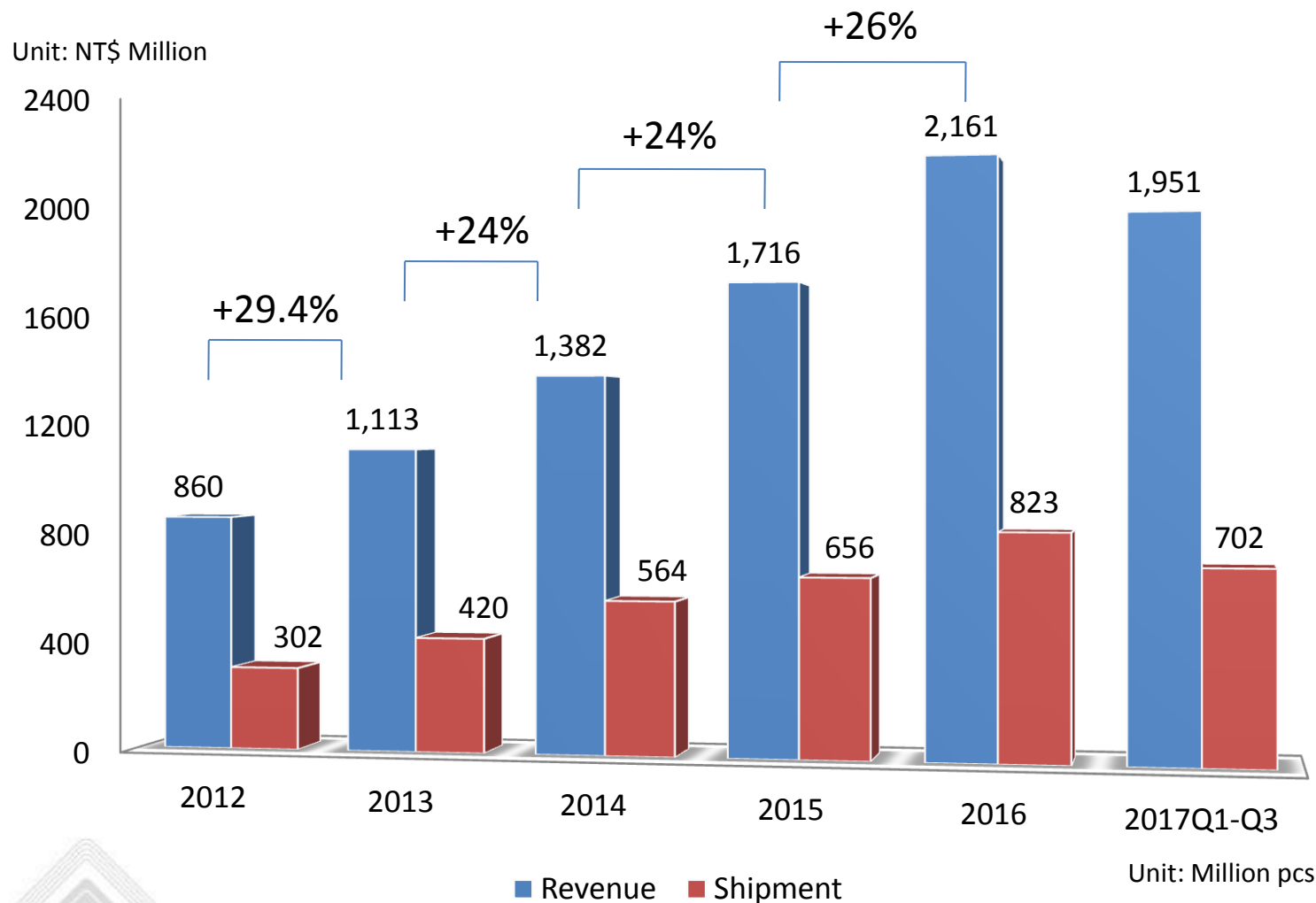
Source: IDC Quarterly Mobile Phone Tracker, May 4, 2017

# SoC Projects keep increasing shipments in H2

- FM continues to win in Korea flagship phones after Note 8.
- Wireless long-distance HD video increased the shipments to smart home, car backup, drone... with our proprietary transceiver.



# Trend in Revenue >20% growth



# Revenue by Product Portfolio

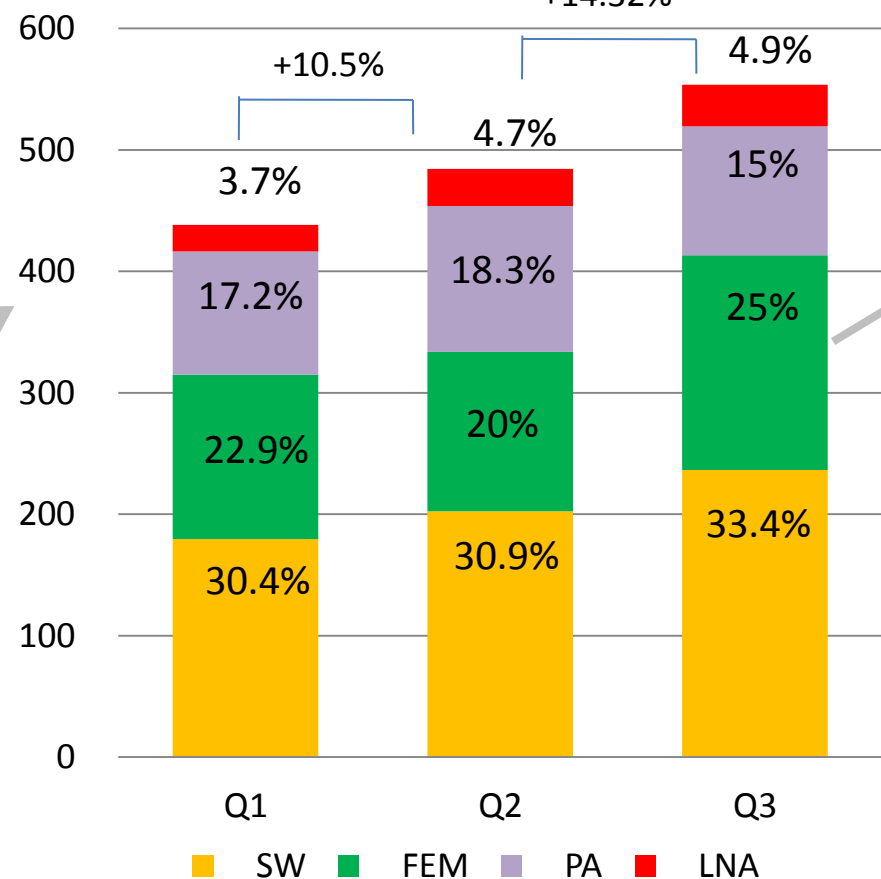
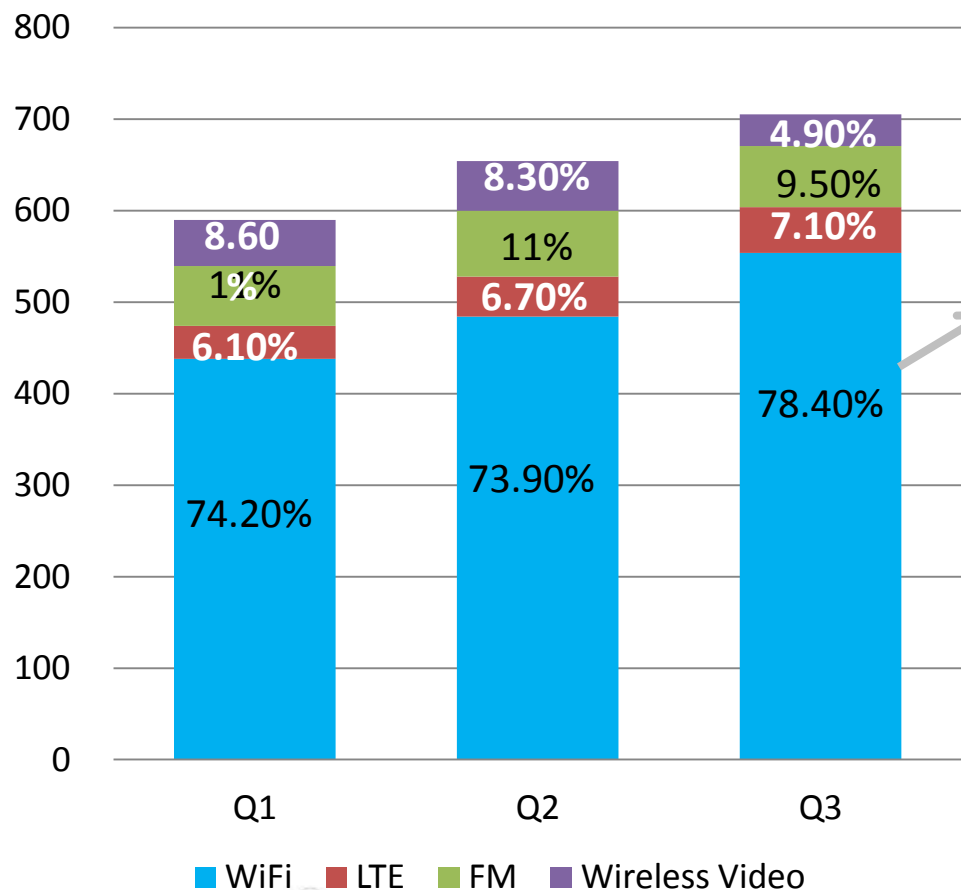
Unit: NT\$ Million

Product Portfolio

Unit: NT\$ Million

RFFE components Portfolio in Wi-Fi

+14.32%



Product Portfolio Migration toward High-GM PA and FEM