RichWave Technology Corp.

Q3 Investor Conference

Nov. 2017

COMPANY OVERVIEW

SUWON

SHANGHAI

TAIPEI

SHENZHEN

CHUPEI

LOS ANGELES

Founded	Listed in TSE	Customers	Products
Jan. 2004	**Nov. 2015**	**350**	**270**

Continue Innovation and Brand Recognition
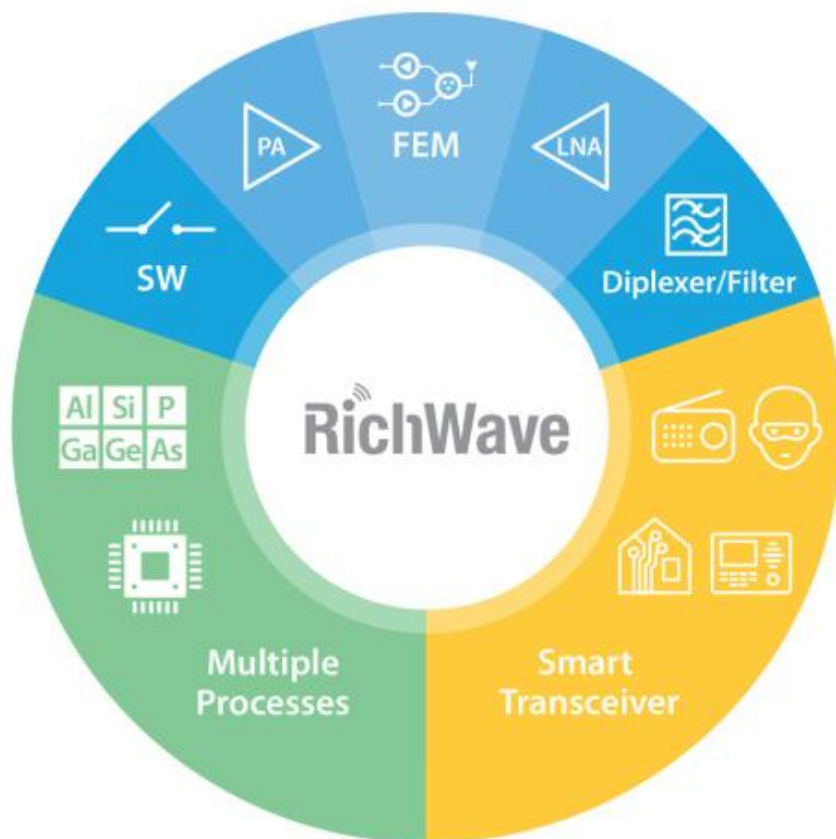
Embedded-WiFi Connects IoT

Point to Multi-Point – Enterprise Outdoor/Indoor Applications

Source: SIPSS-GLOBAL

Product Range

| CB | AP | MESH | PoE Injector | Module |

11a/b/g/n . Mesh . High Power . Single/Dual-band . Concurrent

| CB | AP | Router | PoE Injector |

11a/b/g/n . High Power . Single/Dual-band . Concurrent

| CB | AP | Router | Repeater | USB Adapter | Switch |

X-TRA Range . Stream Engine . Multi-media . VPN Lite

OUTDOOR
°WISP
°Enterprise

INDOOR
°Enterprise
°SMB

INHOUSE
°SOHO
°Home

Source: SIPSS-GLOBAL

Segments Embedding WiFi & Players

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

Total Addressable Market for RichWave

RichWave

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

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

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

Source
Berg Insight
© Statista 2017

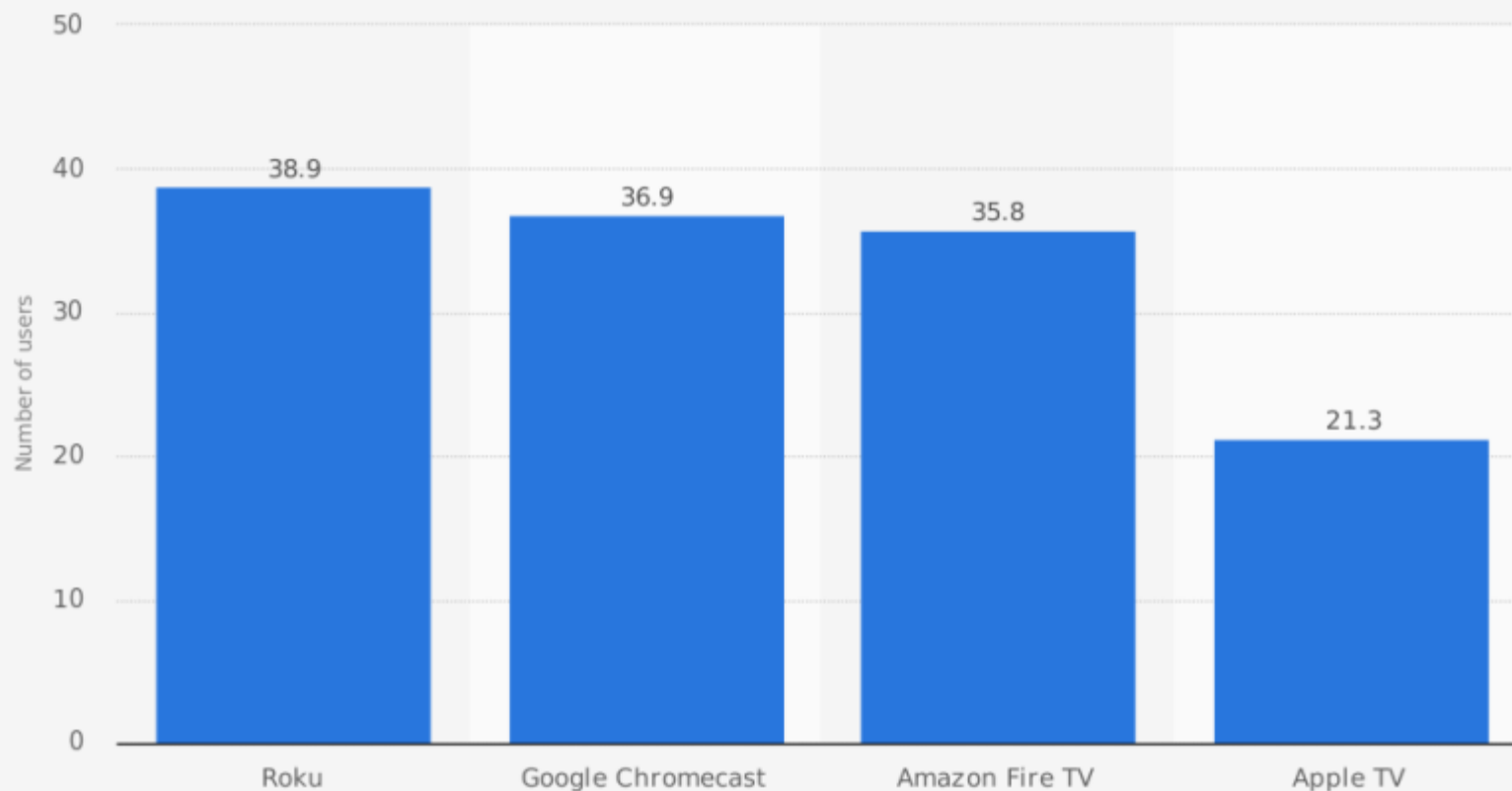Additional Information:
Worldwide; Berg Insight; 2015 to 2016

Cable & STB Drives WiFi Adoption
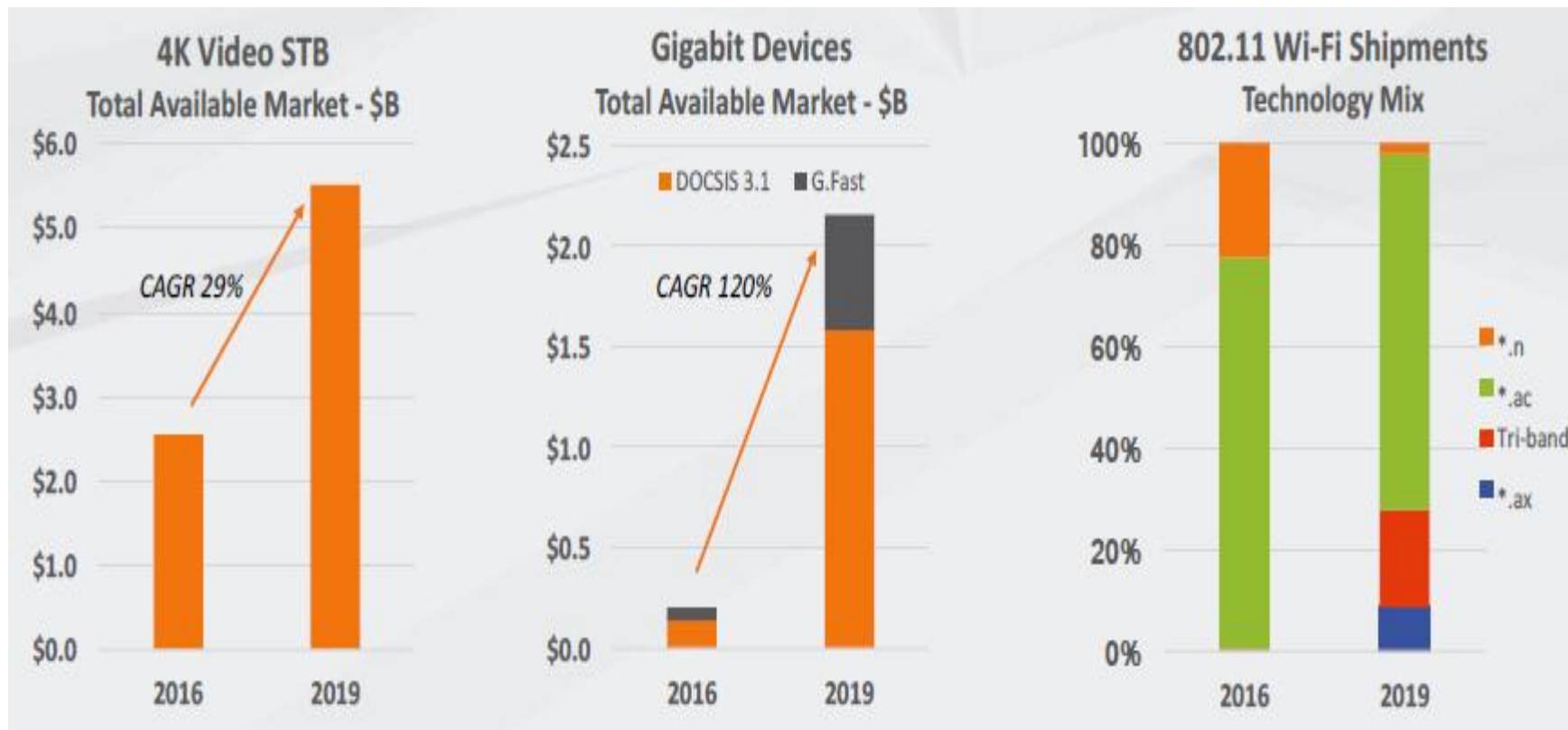
Source: ARRIS Investor Day 2017

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

Over-the-top (OTT) TV and video revenue worldwide from 2010 to 2021, by region (in billion U.S. dollars)
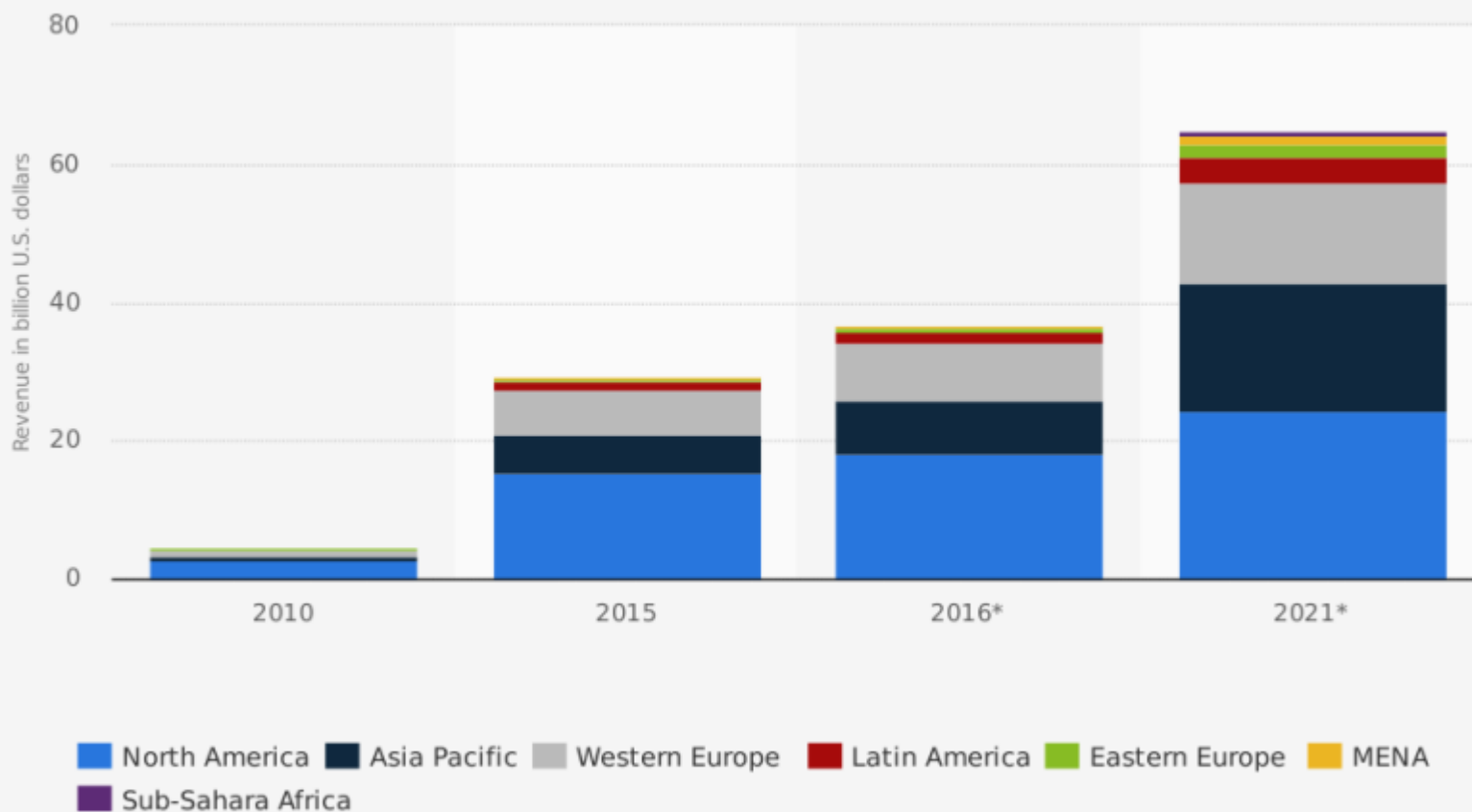
Source
Digital TV Research
© Statista 2017

Additional Information:
2010 and 2015

statista

Living-Room WiFi-Connectivity Fast Increase

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

- '16 (A): 180 | 65 — 73% of connectable devices get connected
- '17 (F): 200 | 65
- '18 (F): 222 | 64
- '19 (F): 242 | 63
- '20 (F): 260 | 61 — 81%

■ Total # of Connected Devices   ■ Total # Capable But Not Connected
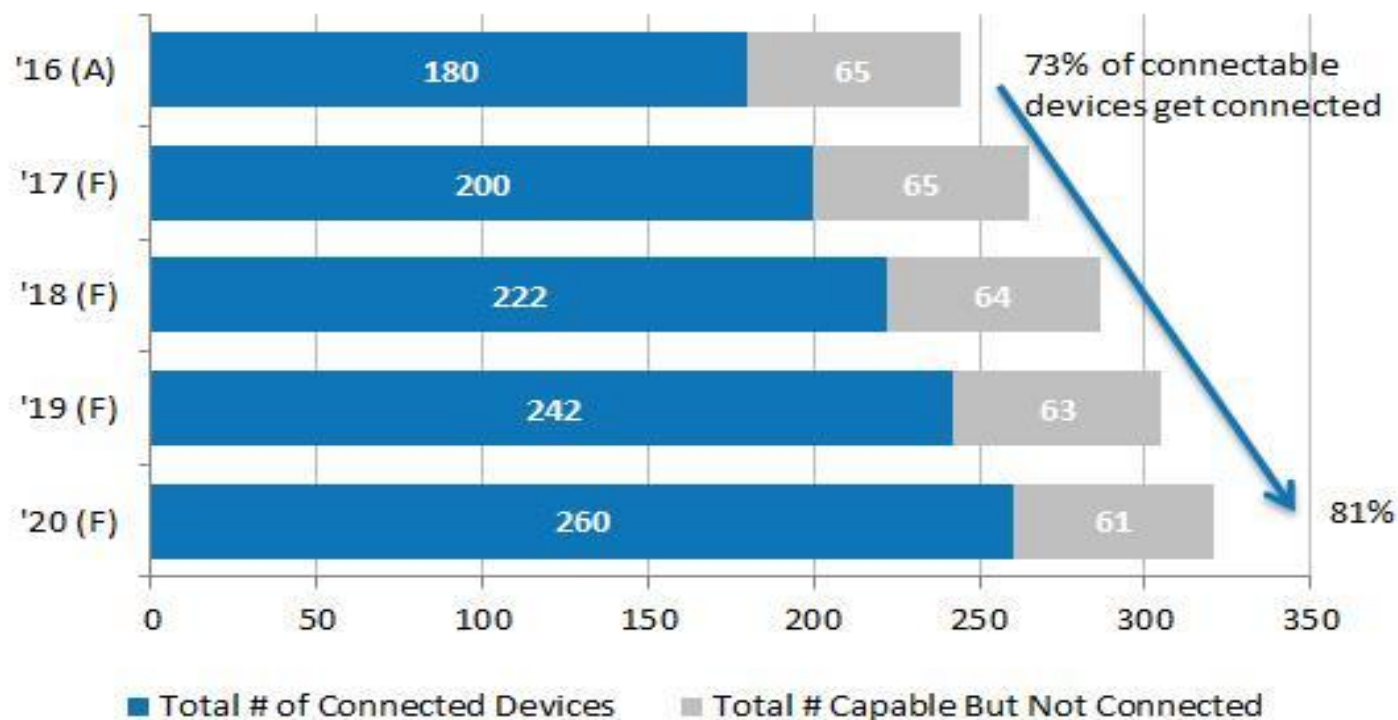
Base: U.S. Internet households
Source: The NPD Group/Connected Intelligence, TV-Connected Device Forecast
Includes a small percent of game consoles that are non-connectable

WiFi-in-Smart Speaker Grows Rapidly

US Voice-Enabled Speaker User Share by Player, 2017

Other
5.6%

Google Home
23.8%

Amazon Echo
70.6%

Source: eMarketer, April 2017
Image: Voicebot.ai

US Household Smart Speaker Ownership 2016-2020

94.2 million devices

Year		
2020	75%	125.65
2019		
2018		
2017		
2016	7%	118.48

Forecasted Growth

Total US Households (millions)

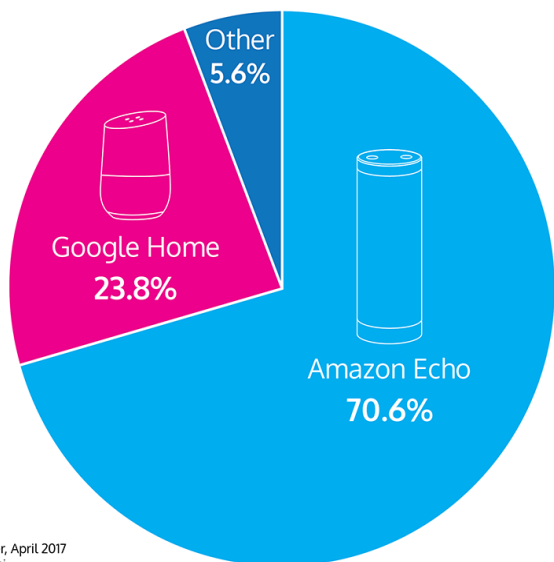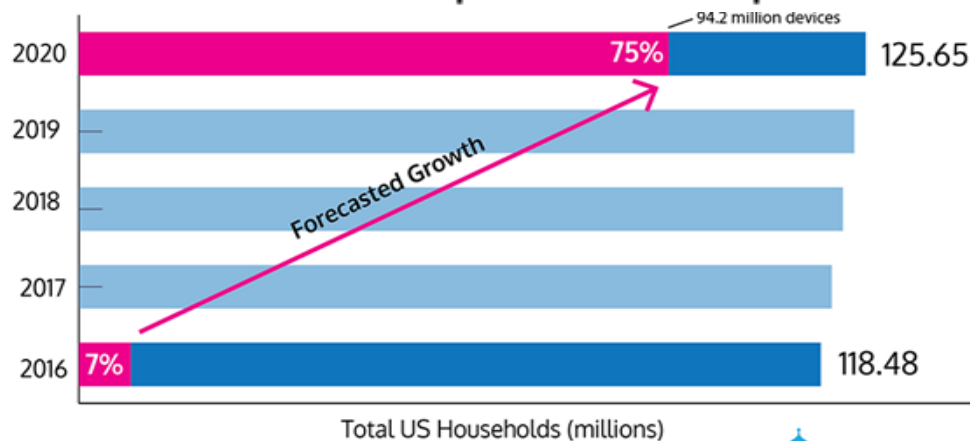Source: US Census, Gartner, Edison Research, Voicebot.ai

voicebot.ai
ALL THINGS VOICE WEB

US Smart Speaker Installed Base - 2016 to 2020

Year	Total Number of Smart Speakers (millions)
2020	138.25
2019	88.95
2018	50.25
2017	23.55
2014 - 16	7.85

Total Number of Smart Speakers (millions)
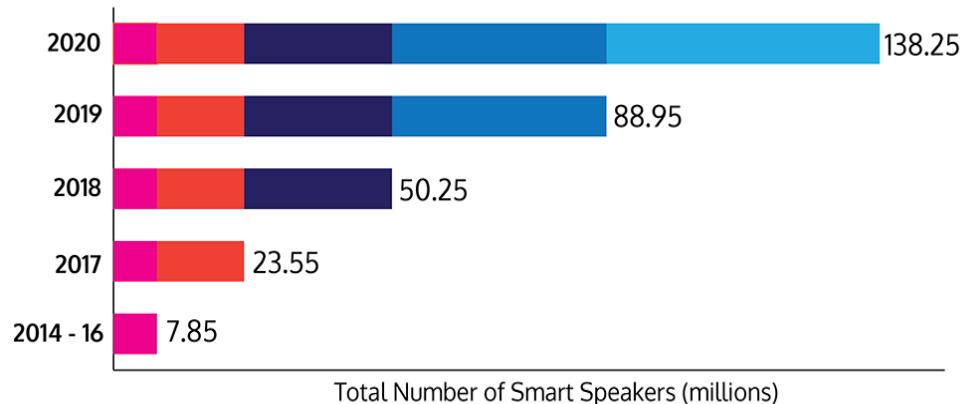
Source: CIRP, VoiceLabs, Statista, Edison Research, Voicebot.ai

voicebot.ai
ALL THINGS VOICE WEB

RichWave

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

Application Class / Type	No. of Connections 2025	Requirement
CCTV, mHealth, Electronic billboards, automotive infotainment	**2 Bn** Wired, WiFi, Cellular	>10Mb/s Not cost sensitive, fixed power
Telematics, smart home, M2M backhaul	**8 Bn** Wired, WiFi, Cellular, Satellite	<1Mb/s Low cost (<$15 UE), fixed power or regularly rechargeable battery
Sensors, meters, wearables, 'thing' tracking, assisted living, logistics	**20 Bn** WiFi, Zigbee, Bluetooth, PLC, sub-GHz License-Exempt (e.g. M-Bus, etc.)	<10Kb/s Very low-cost (<$5 UE), Ultra Low power (>10yrs battery life)

SPARK SUMMIT EAST 2017

HUAWEI

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RichWave

Wireless RF and Various Systems

Coming Wireless: WiFi, 4G, 5G & IOT Complement Each Other

RichWave

Range (m)

WAN (>1000) City and Nation	LORA, 3G, Cellular 4G (LTE-A relesse 10, Cat 4: 150Mbps, Cat 6: 300Mbps, LTE-Advance Pro (release 13), Cat 10:450Mbps), 5G Network
WLAN (100) Local Area	Proprietary Sub-GHz, 2.4GHz, WiFi: 802.11n 4x4 MIMO (~600Mbps), 802.11ac 4x4 MIMO (~6.9Gbps), 802.11ax 8x8 MIMO (~9.6Gbps)
WPAN (10)	RF4CE, BLE, 5G mmWave (~10Gbps), FCC: licensed Spectrum 28 to 40 GHz Phase Array
WBAN (1)	NFC, ZigBee, Bluetooth

Data Rate (Mbps): 0.01, 1, 10, 100, 1000, 10,000

Next Generation: 802.11ax Giving Faster Data Rate

802.11ax promises:

- Up to 4X capacity increase

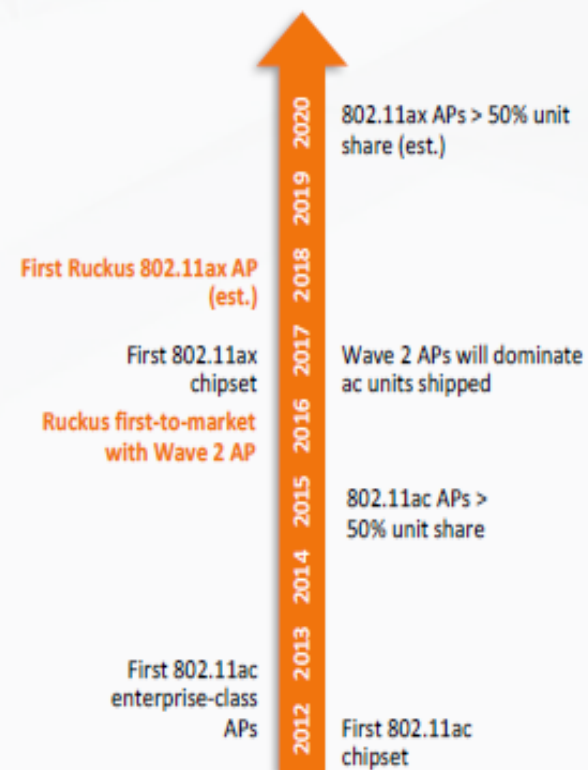- Higher efficiency

- Improved coverage and performance

vs. 802.11ac Wave 2

11ax: simultaneously serves lots of devices per AP...

...and delivers optimal performance in dense environments with many APs

Enterprise AP Timeline

Year	Event
2020	802.11ax APs > 50% unit share (est.)
2019	
2018	First Ruckus 802.11ax AP (est.)
2017	First 802.11ax chipset / Wave 2 APs will dominate ac units shipped
2016	Ruckus first-to-market with Wave 2 AP
2015	802.11ac APs > 50% unit share
2014	
2013	First 802.11ac enterprise-class APs
2012	First 802.11ac chipset

Source: ARRIS Investor Day 2017

WiFi Generation Migration:
Increasing Bandwidth, Modulation & MIMO
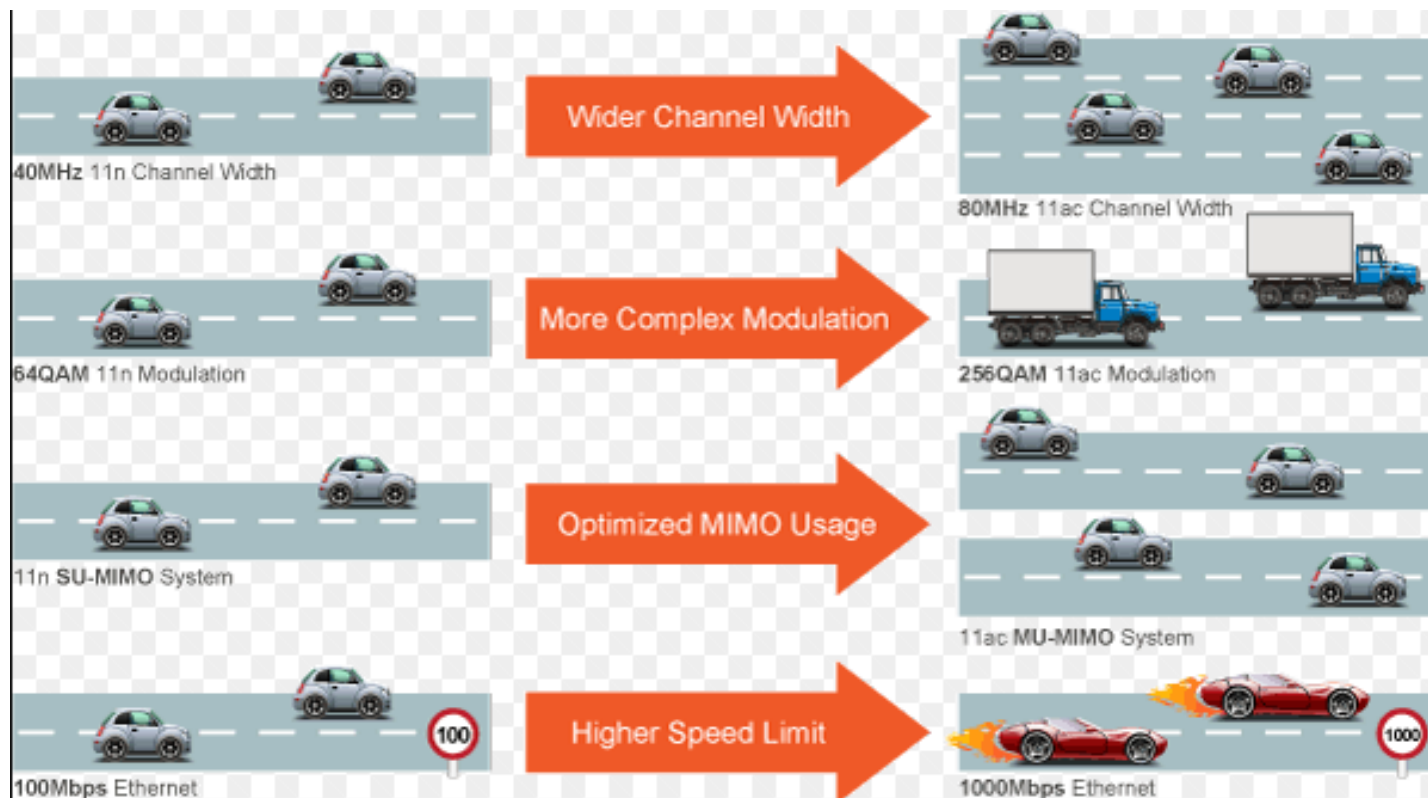
RichWave has Complete WiFi RFFE Solutions

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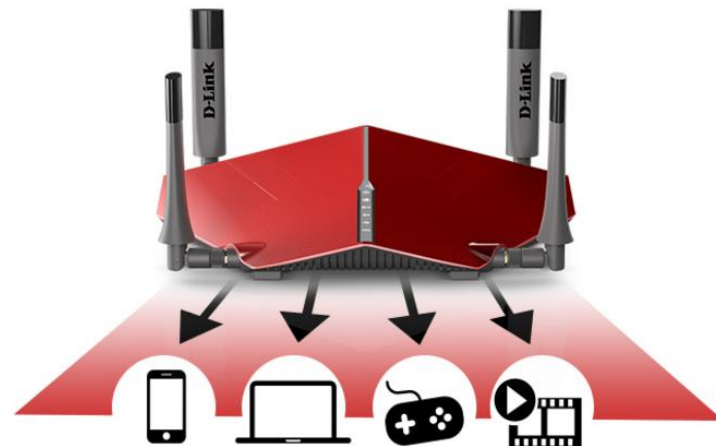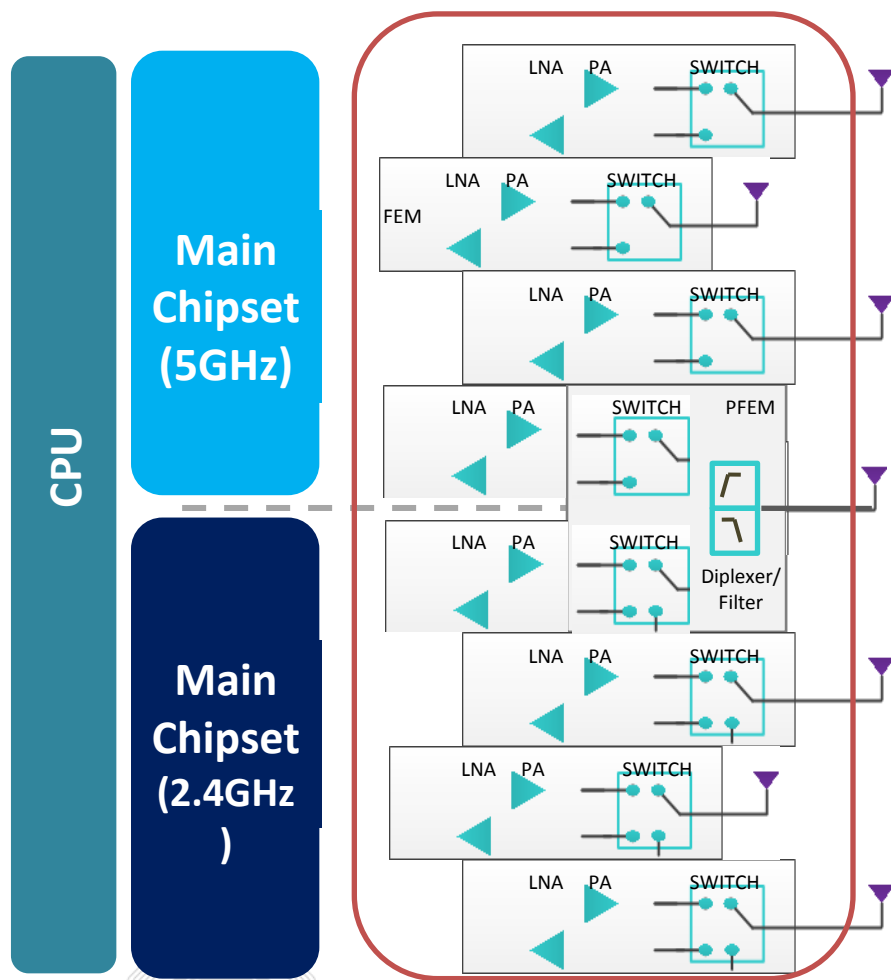
Source: D-Link

Antenna output	5GHz 11ac	5GHz 11n	2GHz 11ac	2GHz 11n
PA/LNA/SW	V	V	V	V
FEM (PA+LNA+SW)	V	V	V	V
FEM(LNA+SW)	V	V	V	V
Enterprise FEM (PA+LNA+SW)	V	V	V	V
Mobility FEM (PA+LNA+SW)	V	V	V	V

WiFi Range Coverage in 11ac & Beyond
- Need High Power FEM/PA & LNA

802.11ac Coverage

- 11ac (3x3)
- 11n (1x1)
- 11n (3x3)

High power PA/FEM for Go Far

LNA for Sensitivity

Data Rate in Mb/s

1 Room | 2 Rooms | 3 Rooms | 4+ Rooms
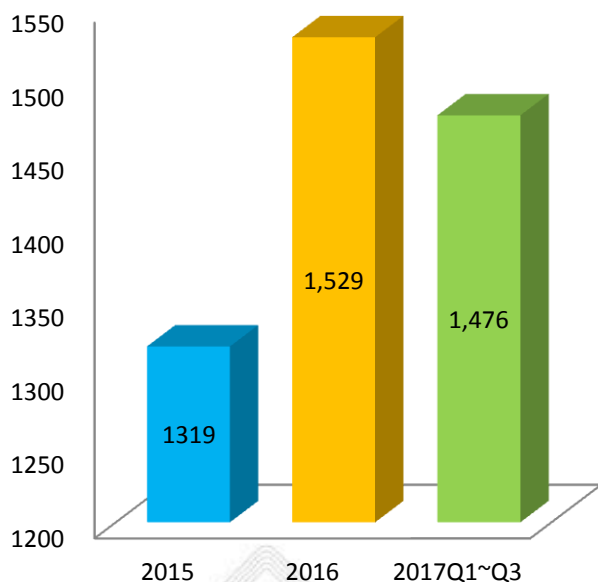
Distance in Meters
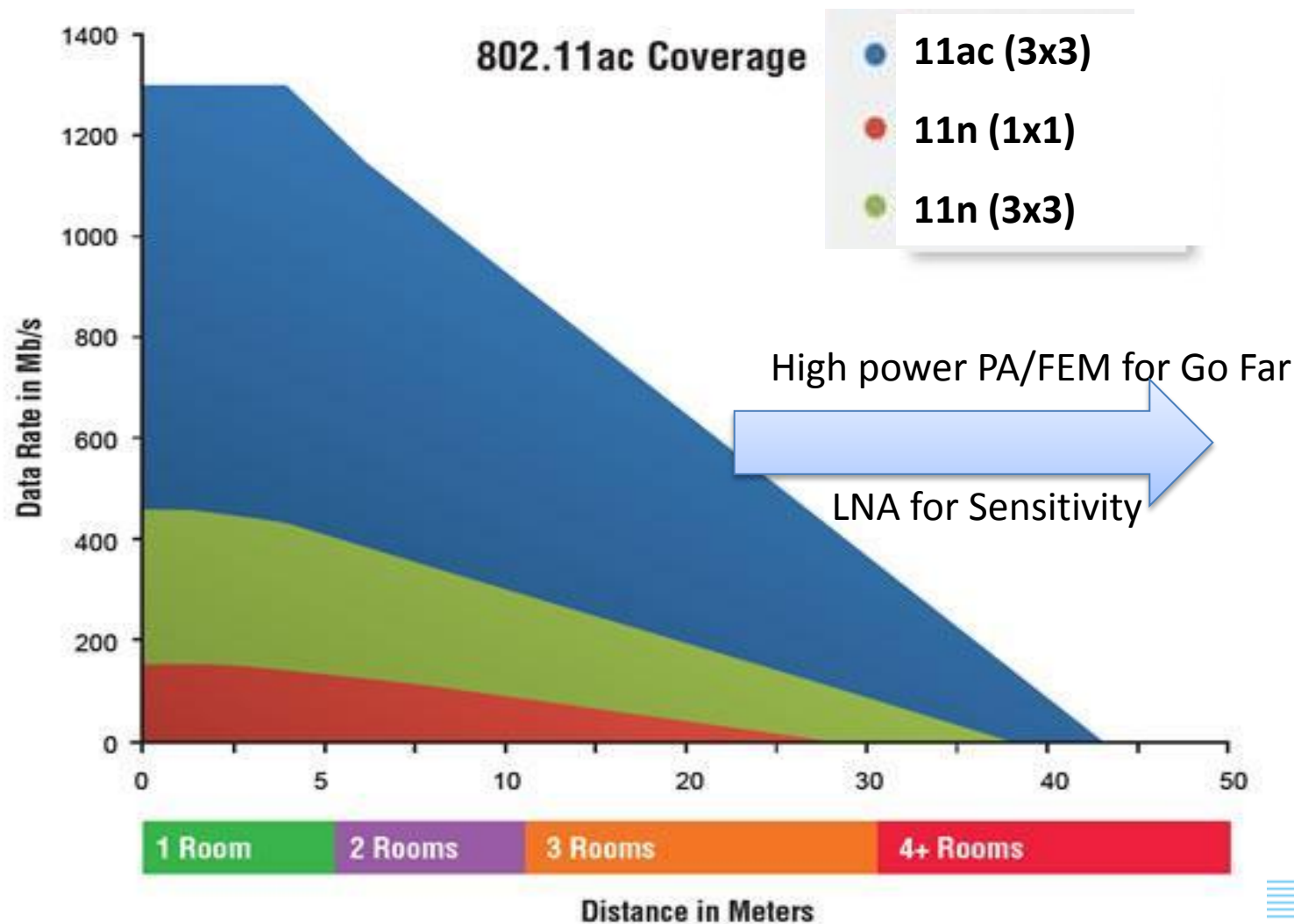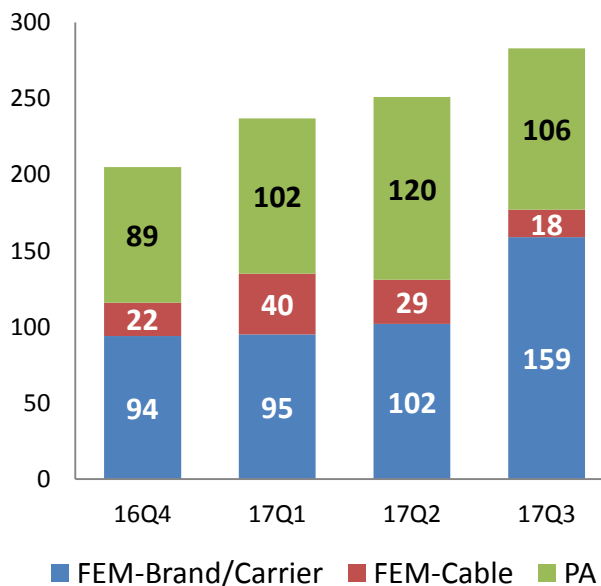
Growth Strategy & Advantages

Annually Solid Growth over 30% in WiFi

- 2017Q3 FEM in Brand/carrier QoQ growth over 55% with 802.11ac Brand/Carriers.

- 2017Q3 WiFi Overall QoQ growth 14%, YoY growth over 30% .

- Driven by 11ac worldwide share, MIMO 2x2 and 3x3, and increasing Range-coverage.

Unit: NT$ Million

Year	Value
2015	1319
2016	1,529
2017Q1~Q3	1,476

Unit: NT$ Million

	16Q4	17Q1	17Q2	17Q3
PA	89	102	120	106
FEM-Cable	22	40	29	18
FEM-Brand/Carrier	94	95	102	159

■ FEM-Brand/Carrier ■ FEM-Cable ■ PA

中国移动通信 CHINA MOBILE

中国电信 CHINA TELECOM

Deutsche Telekom

LIBERTY GLOBAL

FEM in Router & STB/OTT On Big Brands worldwide

+64%

M Units/ NT$ Million

Chart showing Quantity and Sales by quarter:

Quarter	Quantity	Sales
2016Q3	3.23	30.1
2016Q4	6.09	63.5
2017Q1	7.54	70.5
2017Q2	8.1	80.78
2017Q3	13.3	133

■ Quantity ■ Sales

Brand logos: TP-LINK The Reliable Choice, ROKU, SAGEMCOM, CHINA MOBILE 中国移动通信, CHINA TELECOM 中国电信, Deutsche Telekom, ZTE, Technicolor
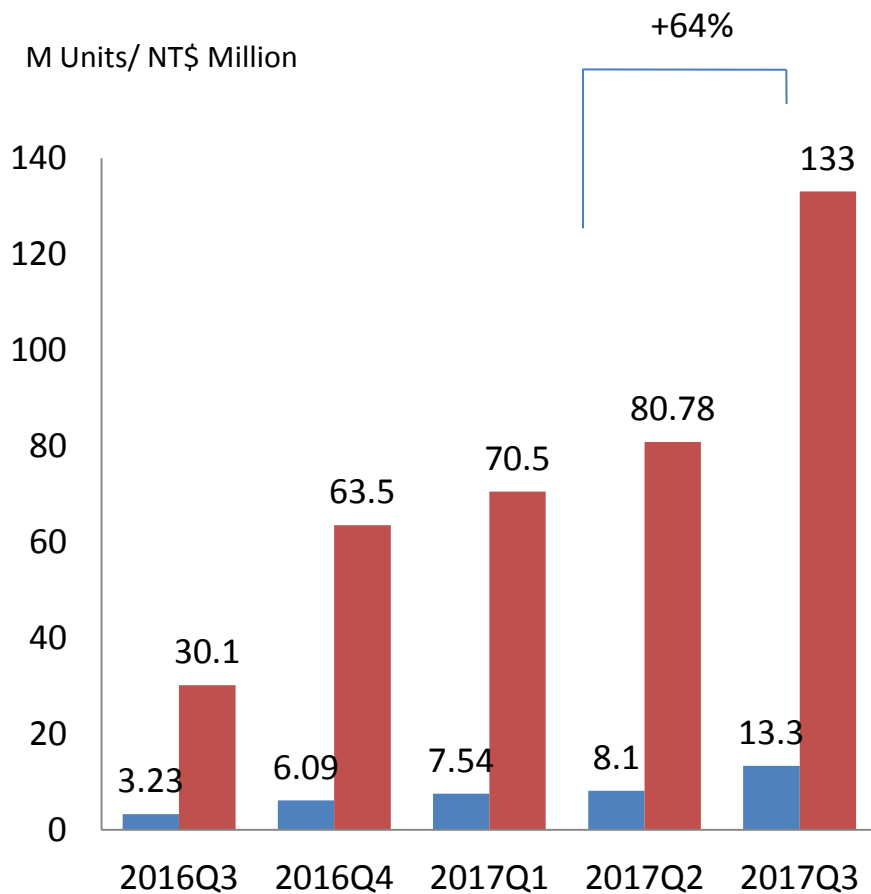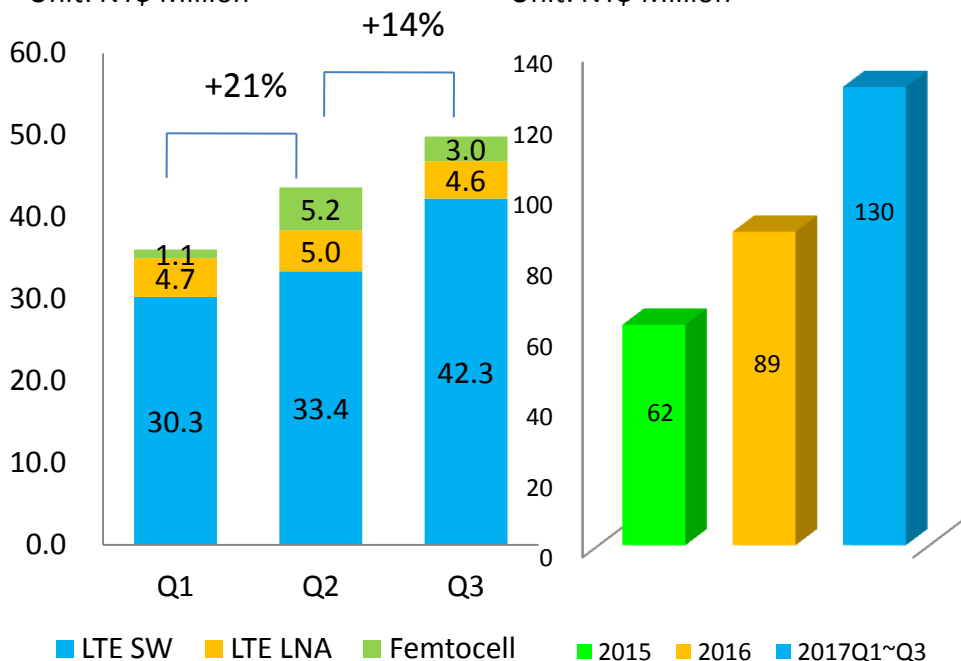
Win 27% Growth on Brand Players in LTE

- 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

+21%
+14%

Q1	Q2	Q3
1.1	5.2	3.0
4.7	5.0	4.6
30.3	33.4	42.3

■ LTE SW   ■ LTE LNA   ■ Femtocell

2015	2016	2017Q1~Q3
62	89	130

■ 2015   ■ 2016   ■ 2017Q1~Q3

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

Keep expanding in Branding FM

- FM continue win in Korea flagship phones in Note 8.
- Wireless long-distance HD video ship to smart home, car backup, drone… with our proprietary transceiver.

Unit: NT$ Million
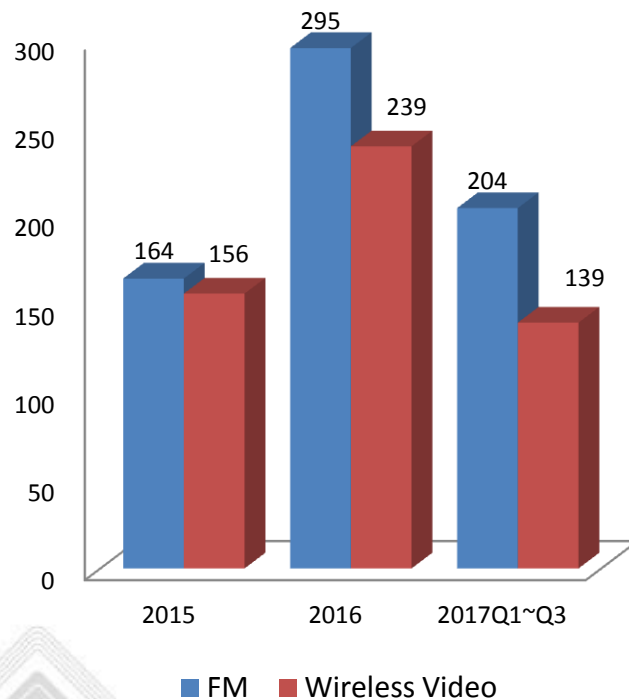
Our Coming Years Advantages

	Industry Trend	Our advantage
WiFi	11AC => 11AX+ 1AC MIMO 2x2~4x4 In Router/Cable/STB/PON	Good EVM Tech. Good Noise Tech. Complete FEM/PA+Passive-integration Integrated-Simple Process Tech.
LTE	WiFi-Mob => 11AC CA complexity & PAMid blended	Small-form/LP WiFi-Mob FEM technology With complete active-elements & Integration
Smarthome	Smart Speaker and Video	Good EVM Tech. Flexible Application Specific FEM

22.5dBm RichWave part
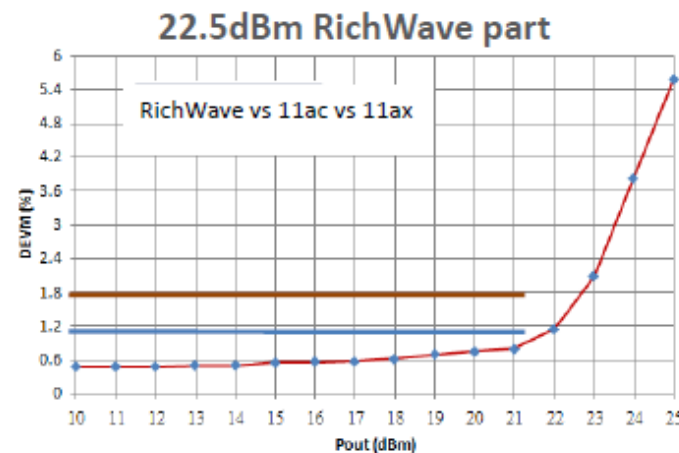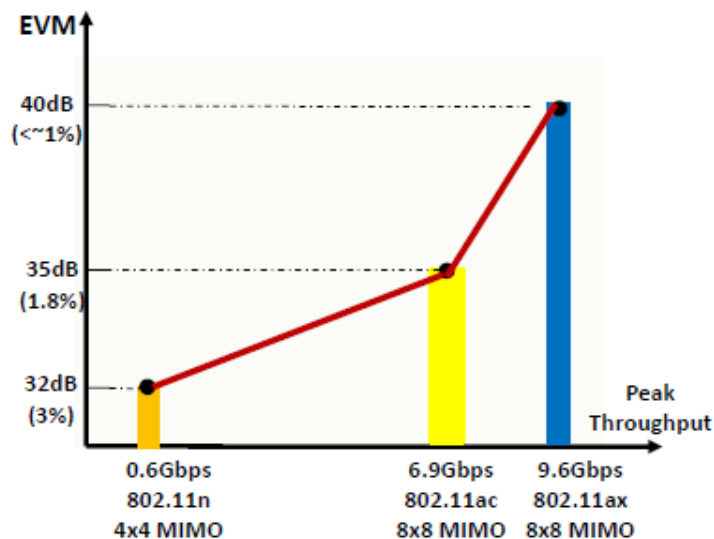
EVM floor and EVM win

Our WiFi 802.11ac Win by Performance

Output Power
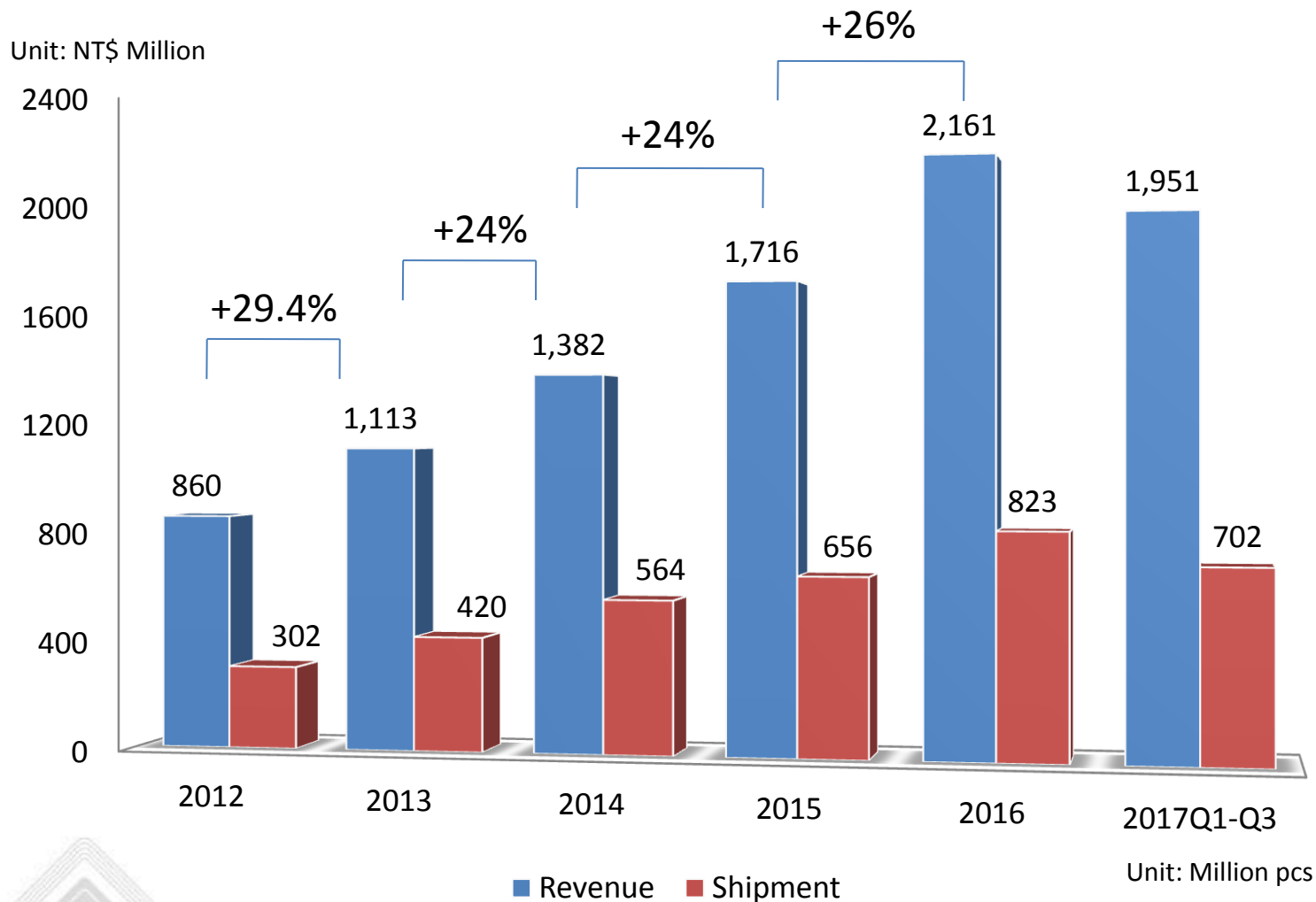

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Video Stream **Data Connected**

Set-top box **Data Connected**

IOT

L

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

Trend in Net Sales & Units

Unit: NT$ Million

+29.4%   +24%   +24%   +26%

Year	Revenue	Shipment
2012	860	302
2013	1,113	420
2014	1,382	564
2015	1,716	656
2016	2,161	823
2017Q1-Q3	1,951	702

■ Revenue   ■ Shipment

Unit: Million pcs

Revenue by Product Portfolio

Product Portfolio

Unit: NT$ Million

RFFE components Portfolio in Wi-Fi

Unit: NT$ Million

Legend (left): WiFi, LTE, FM, Wireless Video

Q1: WiFi 74.20%, LTE 6.10%, FM 1%, Wireless Video 8.60
Q2: WiFi 73.90%, LTE 6.70%, FM 11%, Wireless Video 8.30%
Q3: WiFi 78.40%, LTE 7.10%, FM 9.50%, Wireless Video 4.90%

Legend (right): SW, FEM, PA, LNA

Q1: SW 30.4%, FEM 22.9%, PA 17.2%, LNA 3.7%
Q2: SW 30.9%, FEM 20%, PA 18.3%, LNA 4.7%
Q3: SW 33.4%, FEM 25%, PA 15%, LNA 4.9%

+10.5%   +14.32%
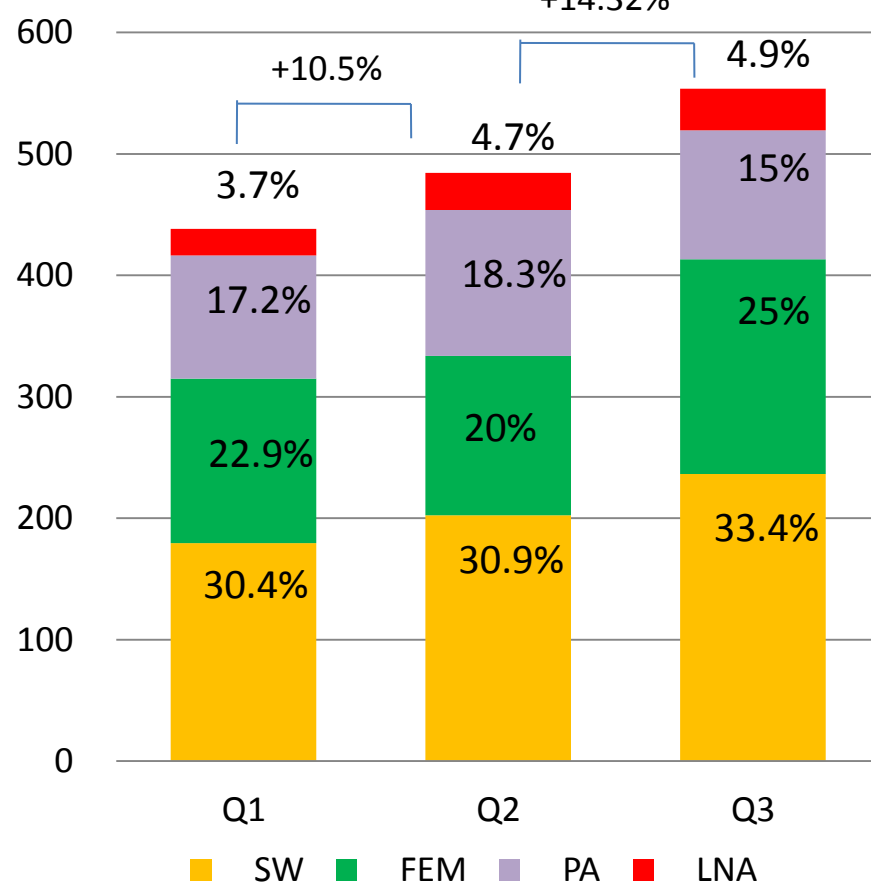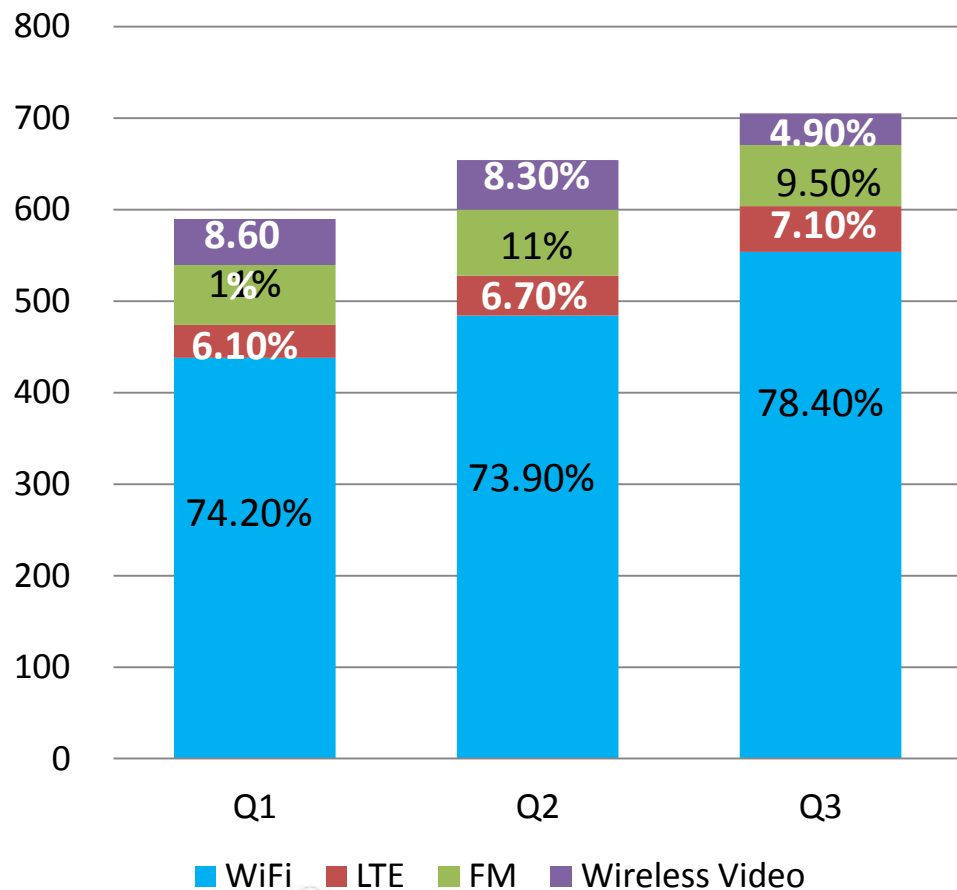
Product Portfolio Migration toward High-GM PA and FEM

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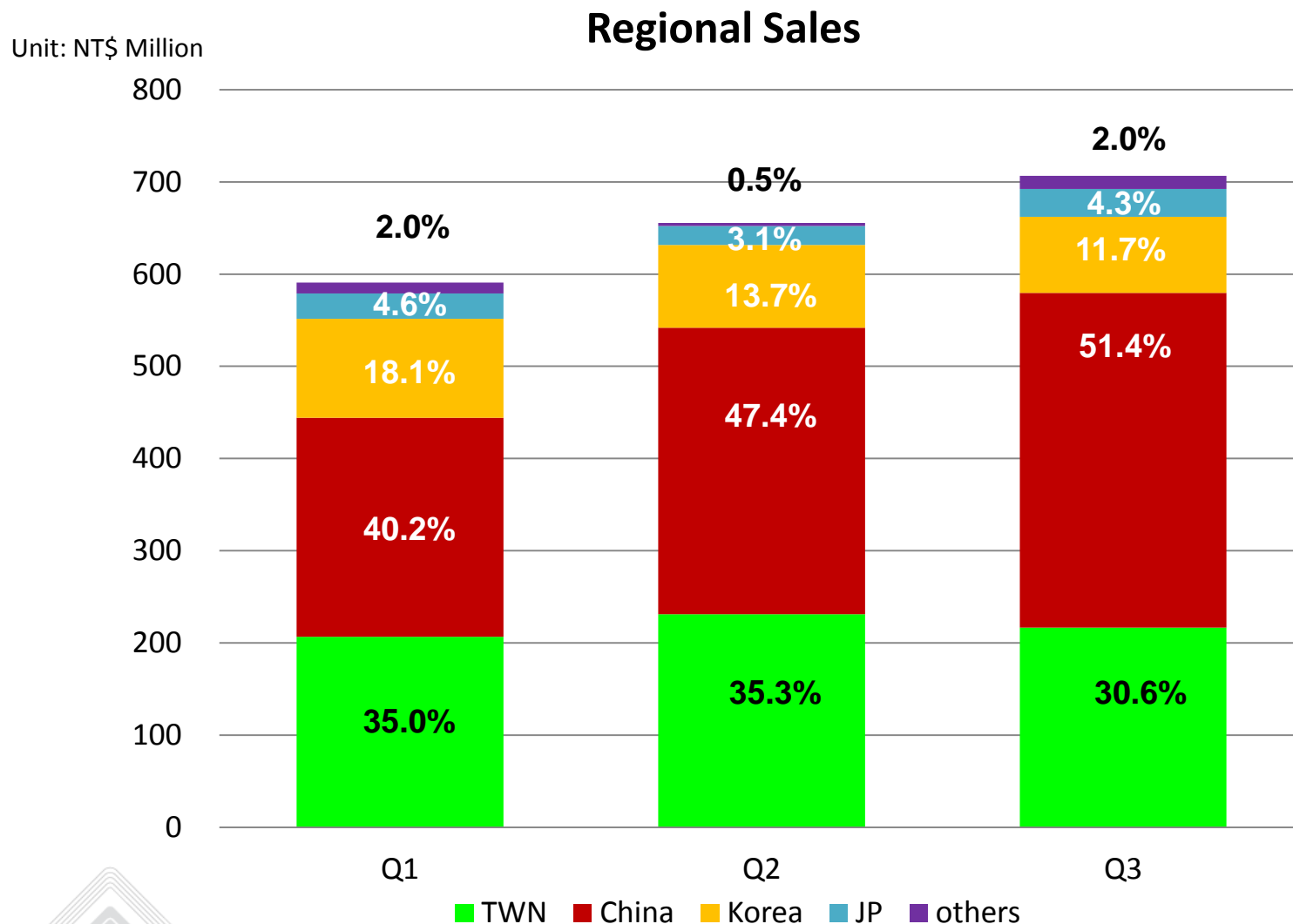
2017 Q3 Operation Results

Amount:NT$ MN	2017 Q3 Amount	%	2017 Q2 Amount	%	QoQ %	2016 Q3 Amount	%	YoY %
Net Sales	707	100.0%	655	100.0%	7.8%	557	100.0%	**26.8%**
Gross Margin	223	31.5%	238	36.3%	-6.3%	193	34.6%	**15.6%**
Operating Expense	157	22.3%	152	23.2%	3.3%	140	25.1%	**12.4%**
Operating Profit	66	9.3%	86	13.1%	-23.5%	53	9.5%	**24.3%**
Net Income before Tax	65	9.2%	89	13.6%	-26.6%	34	6.1%	**92.5%**
Net Income aftere Tax	59	8.3%	74	11.3%	-21.0%	30	5.4%	**95.5%**
EPS	**1.07**		**1.36**			0.55		

Operation performance keeps going up with market share growth