



RichWave Technology Corp.

5G Application Forum - WiFi, Mobile, Sensing

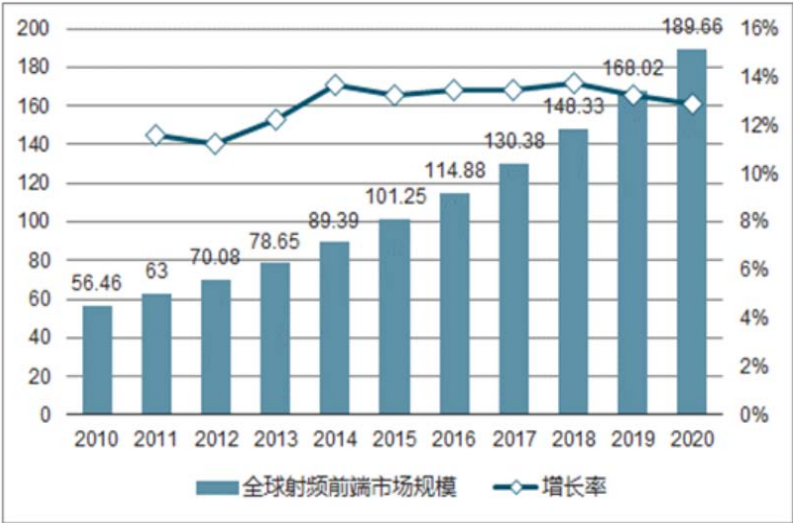
Nov. 2019

5G Supported by Multiple Segments



WiFi Trend

全球射频前端市场规模（含预测）



Source: 中國產業信息網

802.11ax Growing Exponentially with End-Devices



Source: WiFi Alliance

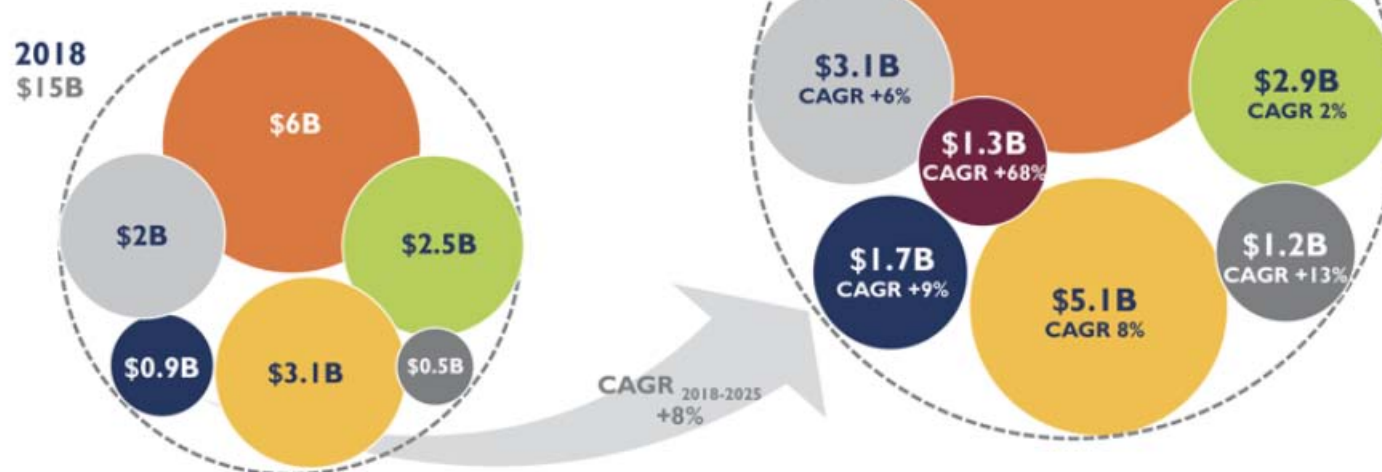
WiFi in Mobile Market

RF front-end and connectivity market forecast – By component

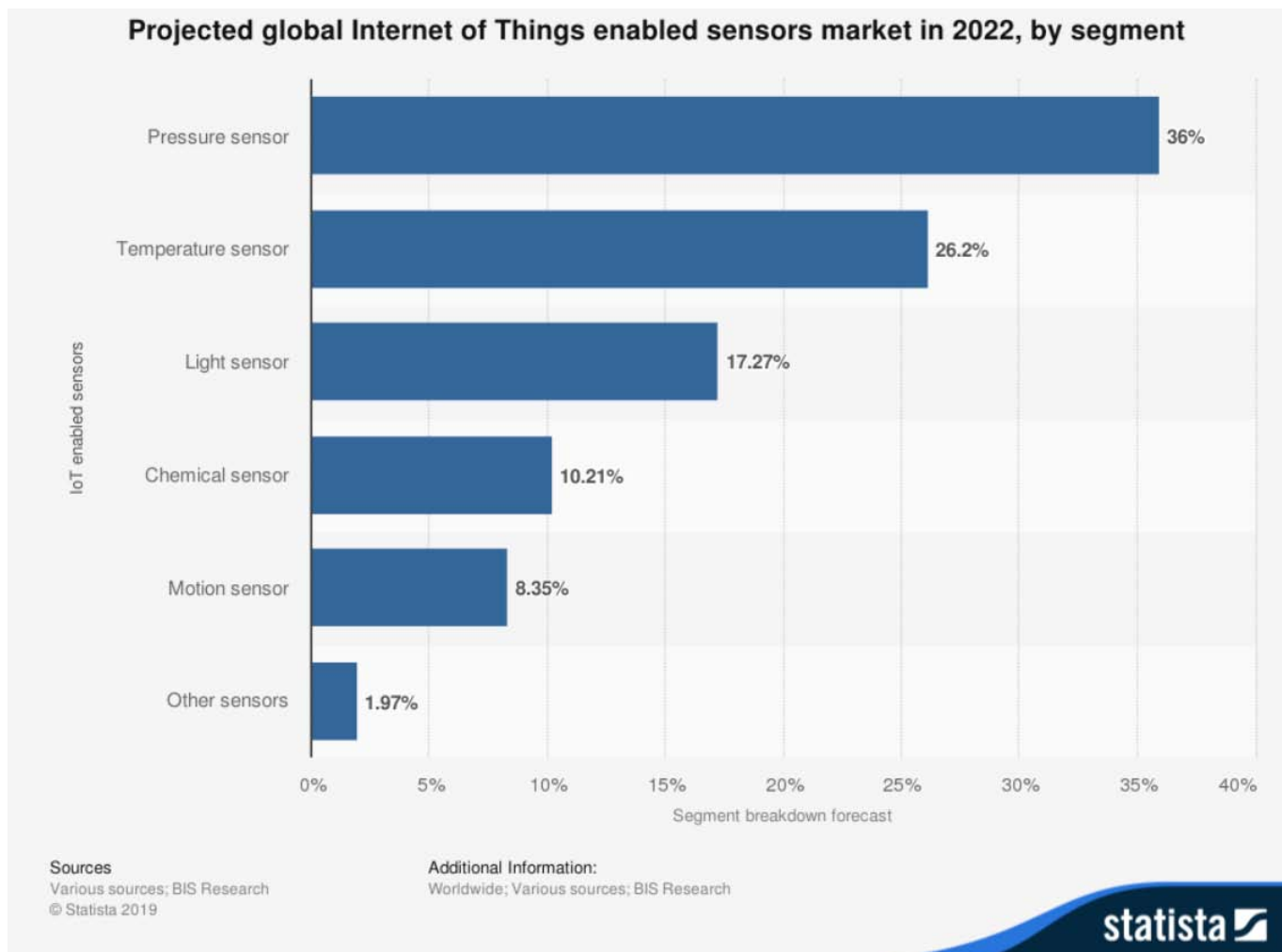
(Source: 5G's Impact on RF Front-End Module and Connectivity for Cell phones 2019, Yole Développement, August 2019)

-- TAM modules & RF components for front-end and connectivity

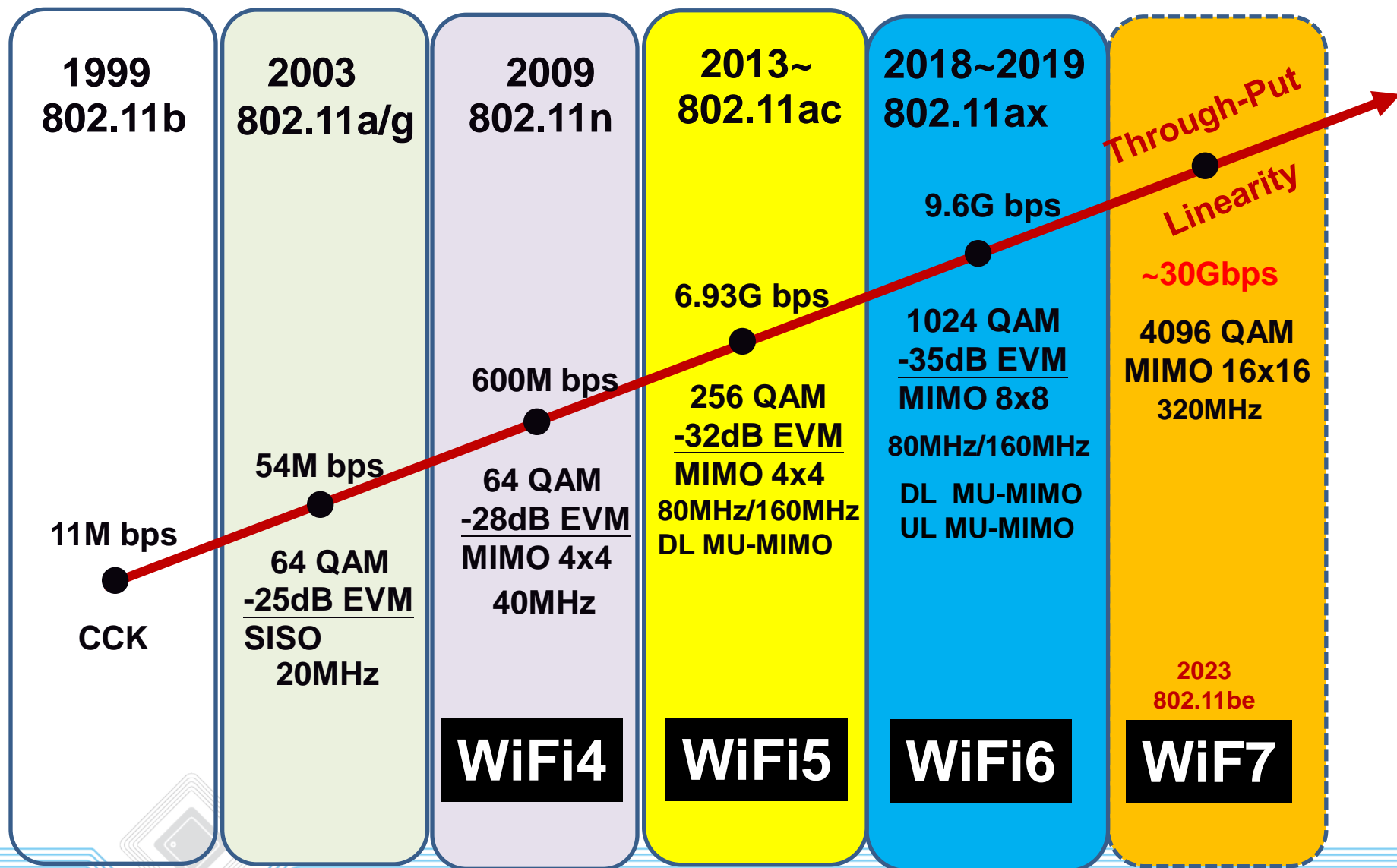
- PA module
- Receive module
- Wi-Fi & connectivity module
- AiP module
- Discrete filter, duplexer,...
- Discrete switch & LNA
- Tuner



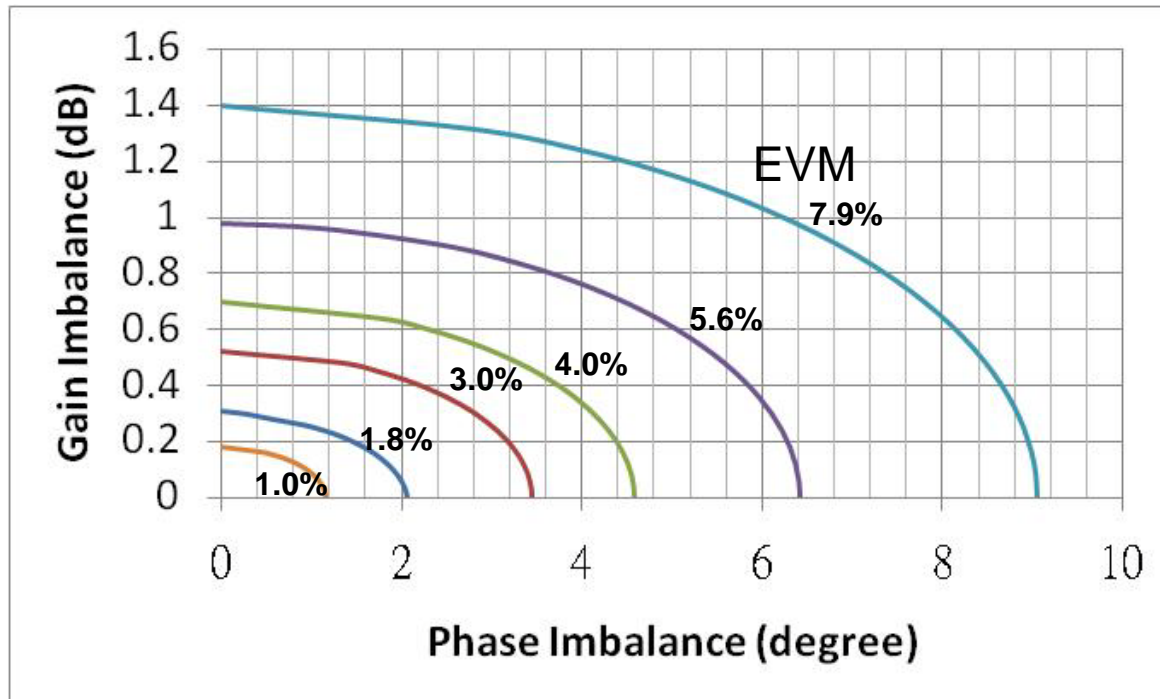
Sensor Market Trend



WiFi Evolution – WiFi6/802.11ax



EVM vs. Gain Imbalance and Phase Imbalance



- Gain drift within packet
- PA nonlinearity
 - Back-off
 - Memory effect
 - Gain Error
 - Phase Error

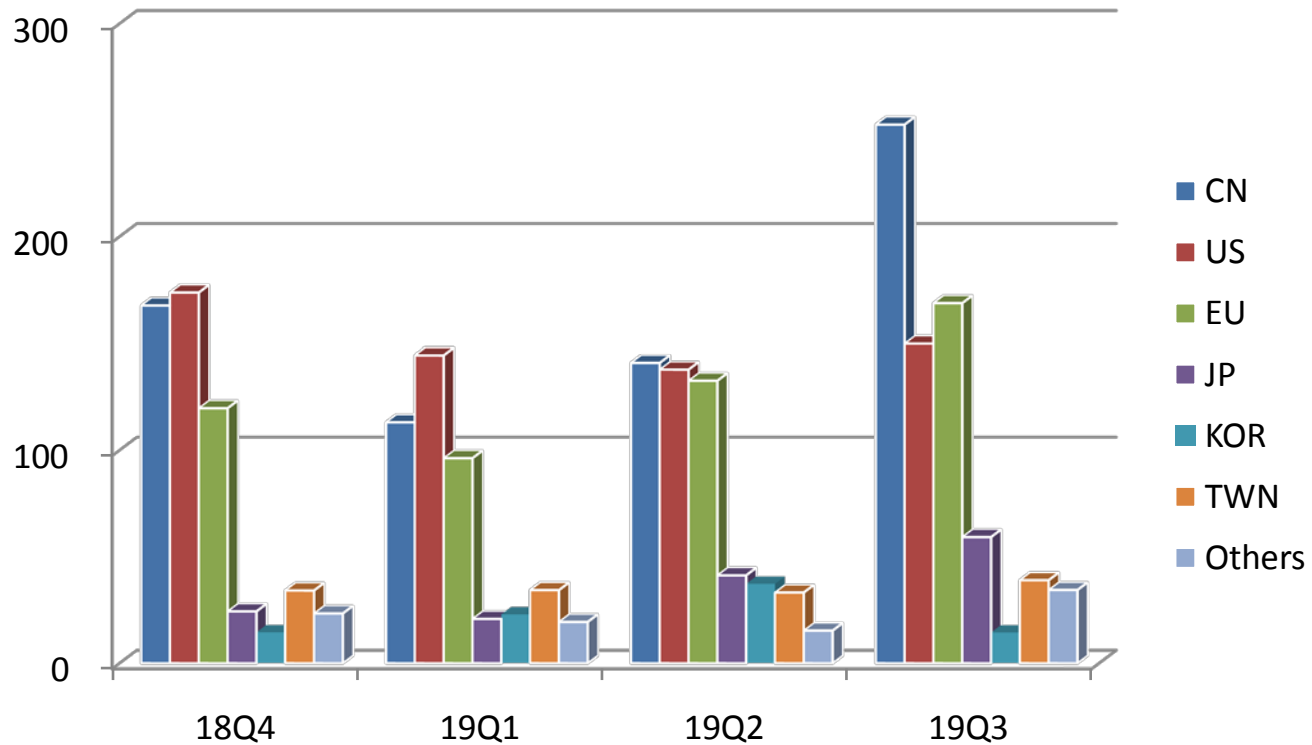
- For WiFi6/802.11ax application with 1.0% (40dB) EVM requirement, it is observed that the nonlinearity of PA need to meet the imbalance impairment
 - Gain error < 0.08 dB
 - Phase error < 1.0 degree



High Linearity PA

WiFi Revenue by Areas

Unit: NT\$ million



Business Highlights – WiFi

- Design win and shipping of 11ax FEM for China Telecom AP router.
- Design win of 11ax FEM for US retailer AP router.
- Design win of 11ax FEM for Technicolor VDSL gateway.
- Design win of 11ax FEM for Turkey telecom DSL gateway.
- Design win of 11ac FEM for Sagemcom gateway and STB.
- Design win of 11ac FEM for France telecom Freebox WiFi repeater and home gateway.
- Design win and shipping of 11ac FEM and PA for India telecom Reliance home gateway and mesh router
- Design win of 11ac FEM for Spain telecom Telefonica WiFi repeater and GPon gateway.
- Design win of switches for Google IP camera.



SAGEMCOM

freebox



Business Highlights – WiFi

- Design win of 11ax FEM for H3C AP router.
- Design win of 11ax FEM for China Mobile GPon gateway.
- Design win of 11ac FEM for ZTE AP routers and gateways.
- Design win of 11ac FEM for Nokia Bell AP routers and gateways.
- Design win of 11ac FEM for Ruijie AP routers.
- Design win of 11ac FEM for Thailand telecom VDSL router.
- Design win and shipping of 11ac FEM and PA for TP Link AP routers.
- Design win and shipping of 11ac FEM and PA for Huawei AP routers.
- Design win and shipping of 11ac FEM for Quectel WiFi modules.



5G Mobile Product Line

WiFi 6

Modem

QCOM

***Sub 6G
SW***

***Antenna
Swapping***

BCOM

LNA Module

Antenna SW

MTK

***Drectional
coupler***

5G-Related Products



Motion Sensor Application

Smart Lighting



Indoor light



Outdoor light



Street light

Smart Home & Health



Home Device

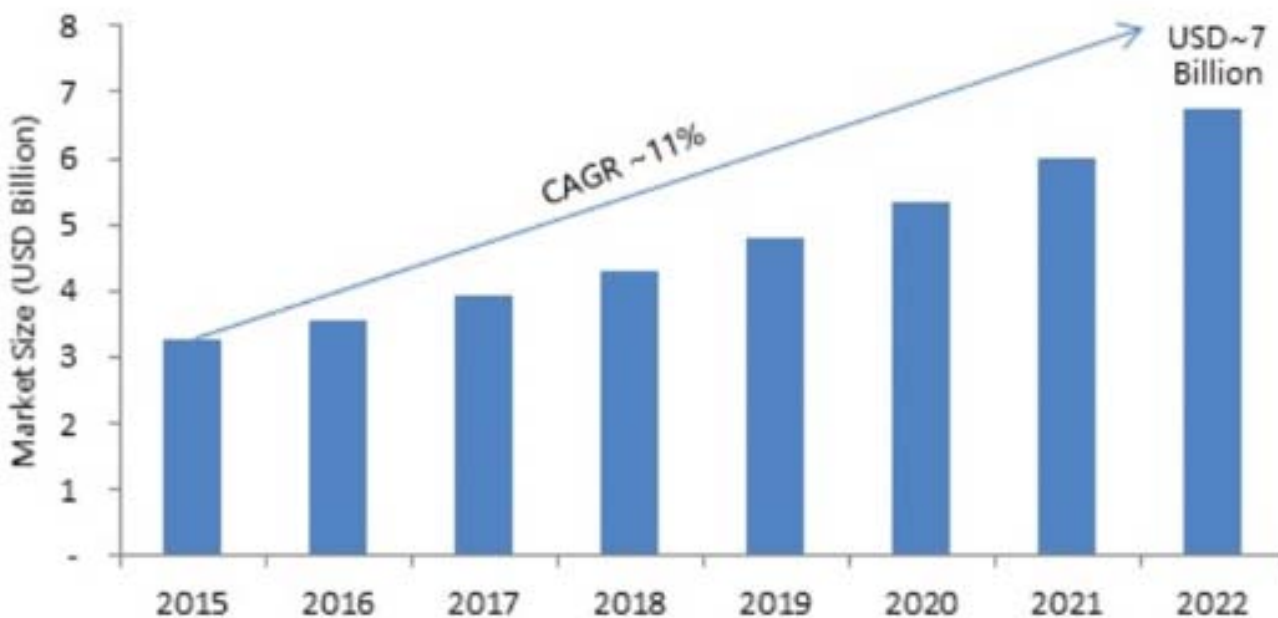


IP Camera



Vital Sign

Motion Sensor Market



Data source : Market Research Future



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