

FM Receivers in Smartphones

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NAB

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- U.S. Smartphone Sales Data
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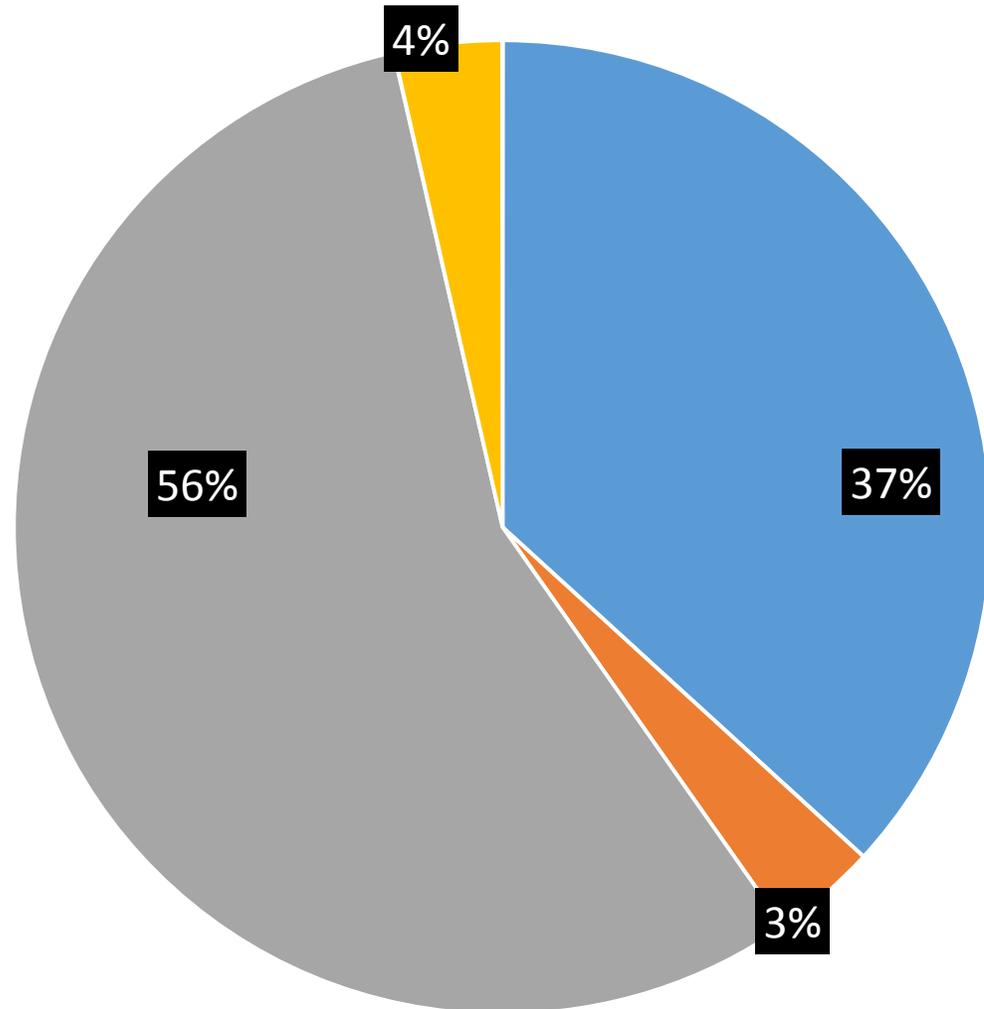
Advantages of FM in Smartphones

- Benefits to users, carriers and broadcasters
- Low cost to implement
- Instantly available and relatively consistent service
- Battery life extension
- No data plan impact
- Network offloading
- Local content
- The power of convergence: Hybrid Radio

FM Receivers in Smartphones:

U.S. Smartphone Sales Data

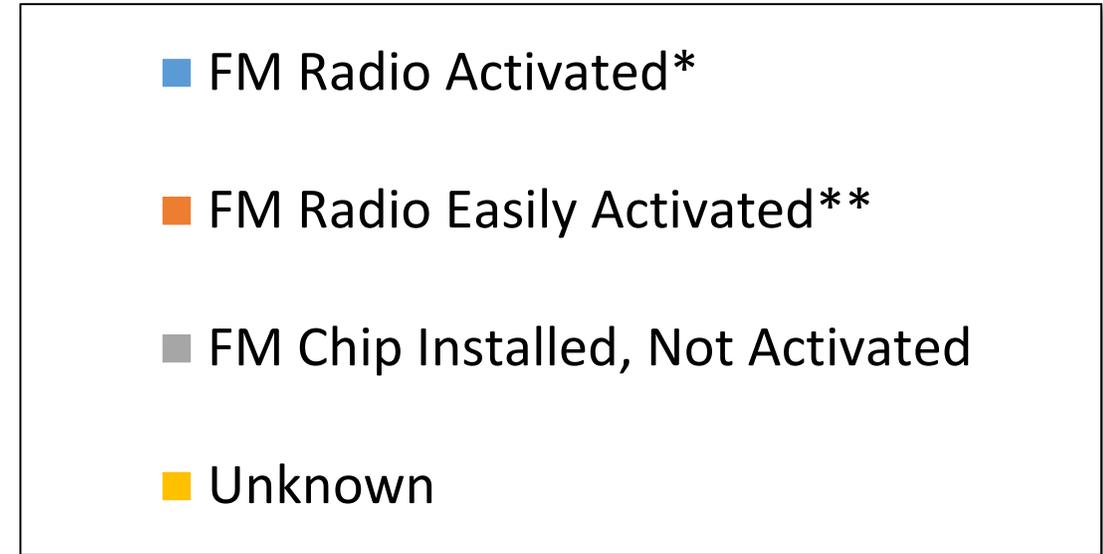
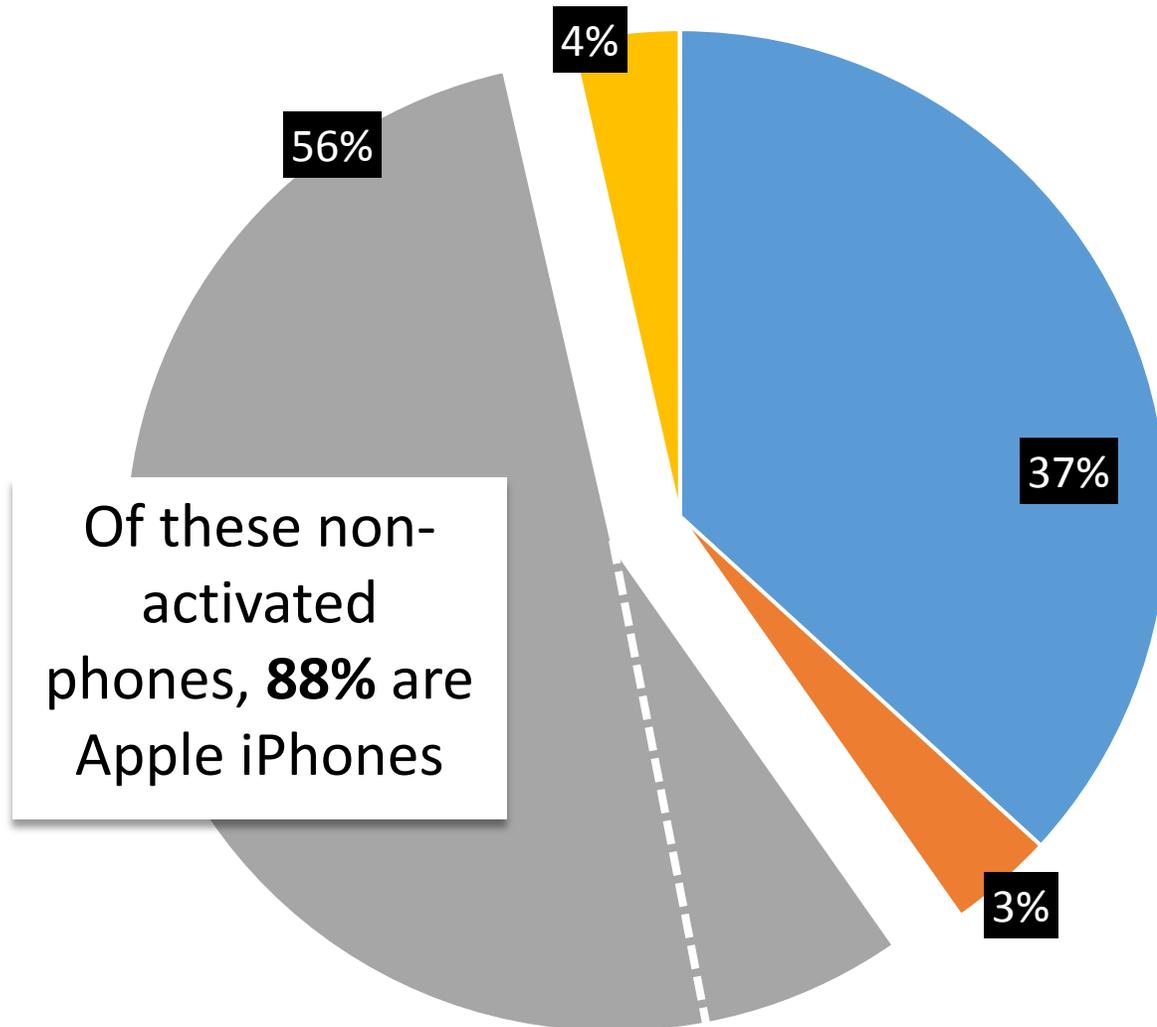
FM Radio Capability in Top-selling U.S. Smartphones (% of total sold), 2Q 2015



- FM Radio Activated*
- FM Radio Easily Activated**
- FM Chip Installed, Not Activated
- Unknown

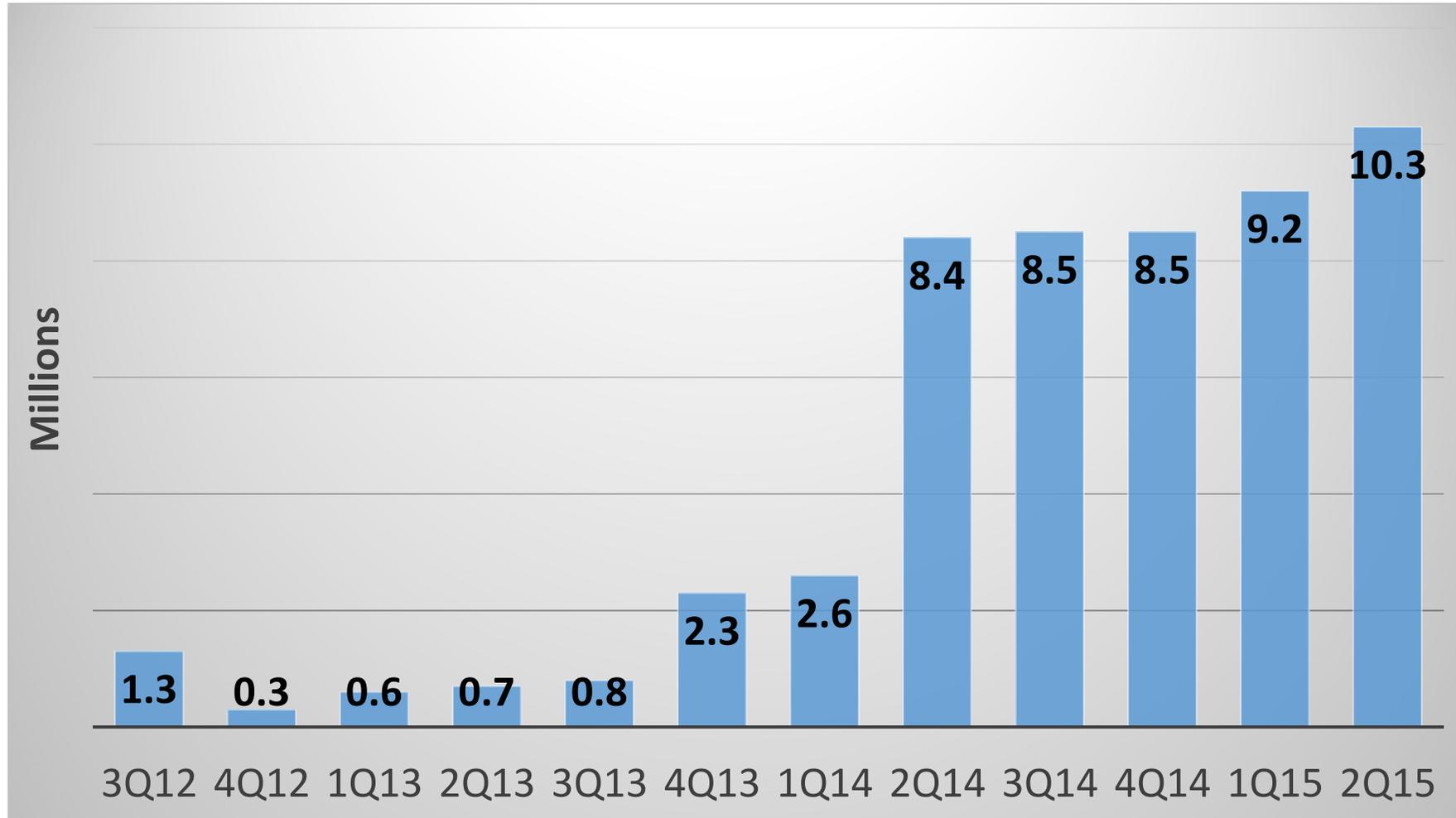
*FM radio activated by at least one major U.S. carrier using these phones.
**Some international versions of these phones have activated FM radios. Activating FM in U.S. versions would likely not involve changes to hardware.

FM Radio Capability in Top-selling U.S. Smartphones (% of total sold), 2Q 2015



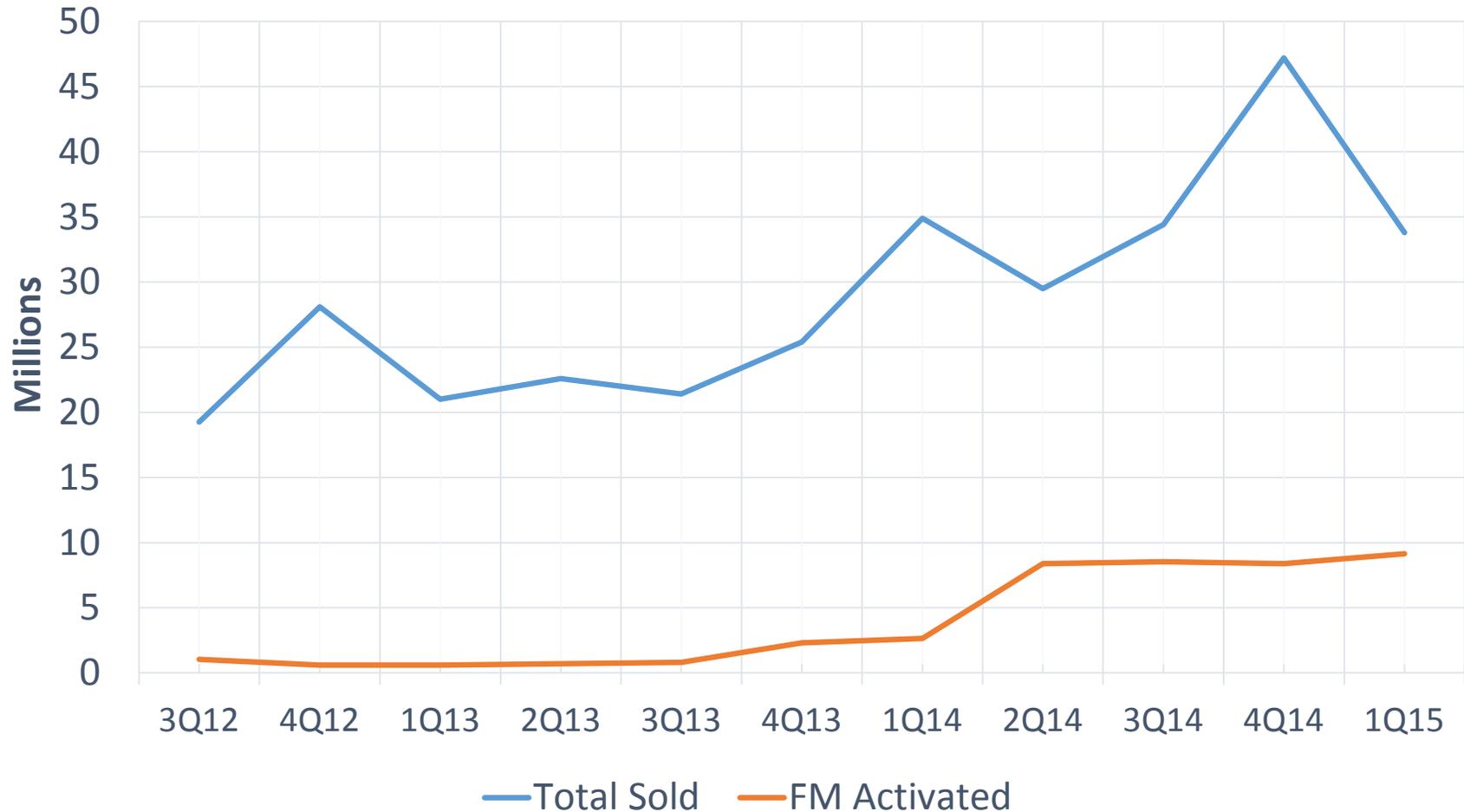
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Smartphones Sold in U.S. with FM Radio Activated (millions)*



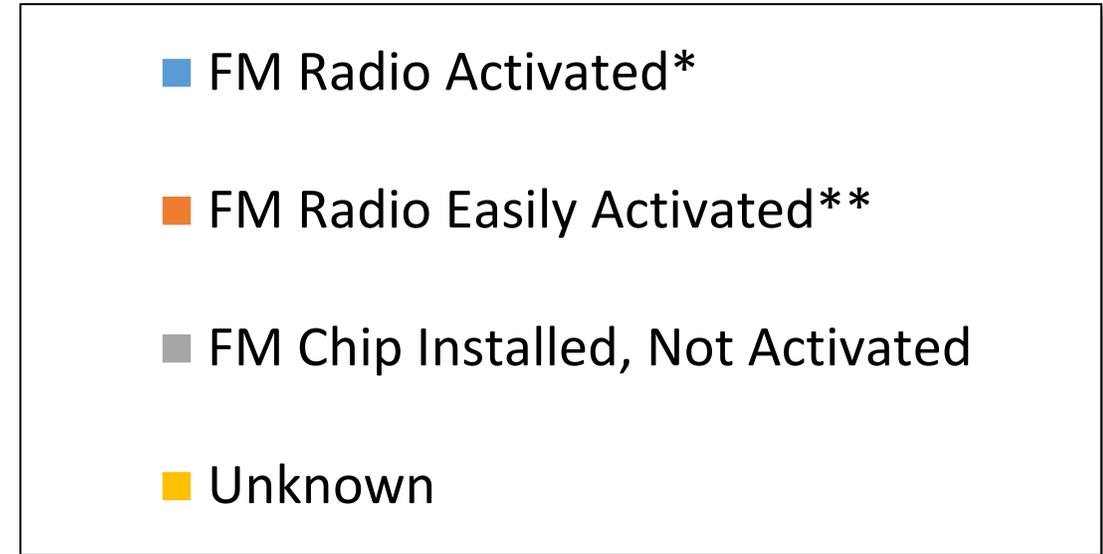
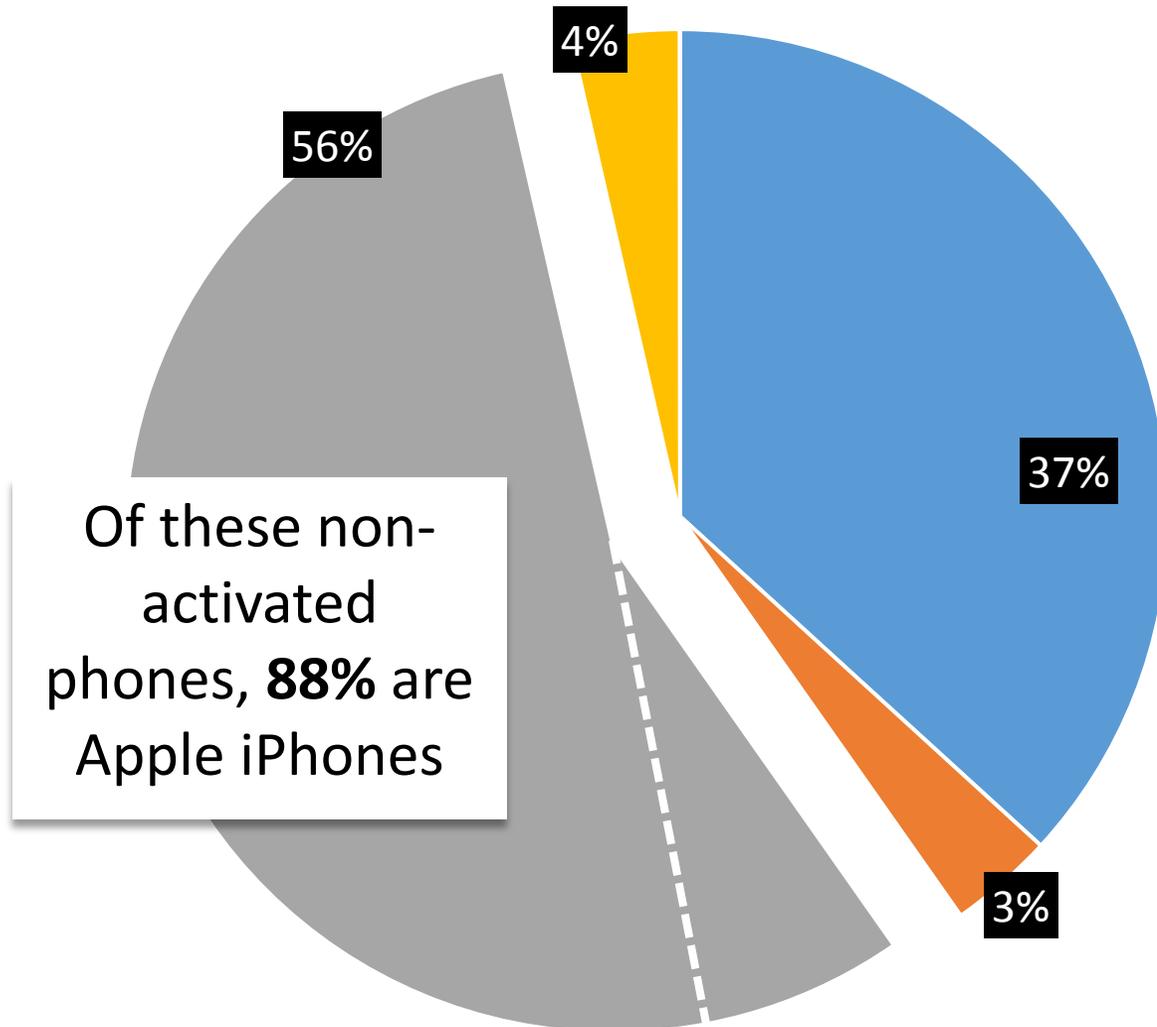
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Smartphones Sold per Quarter (millions): Total Units vs. FM Activated Units*



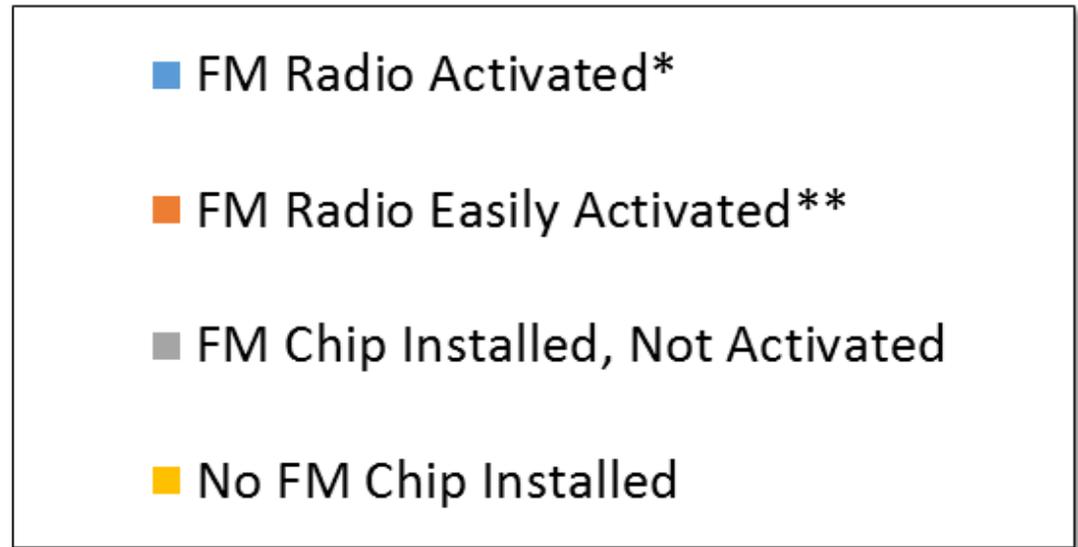
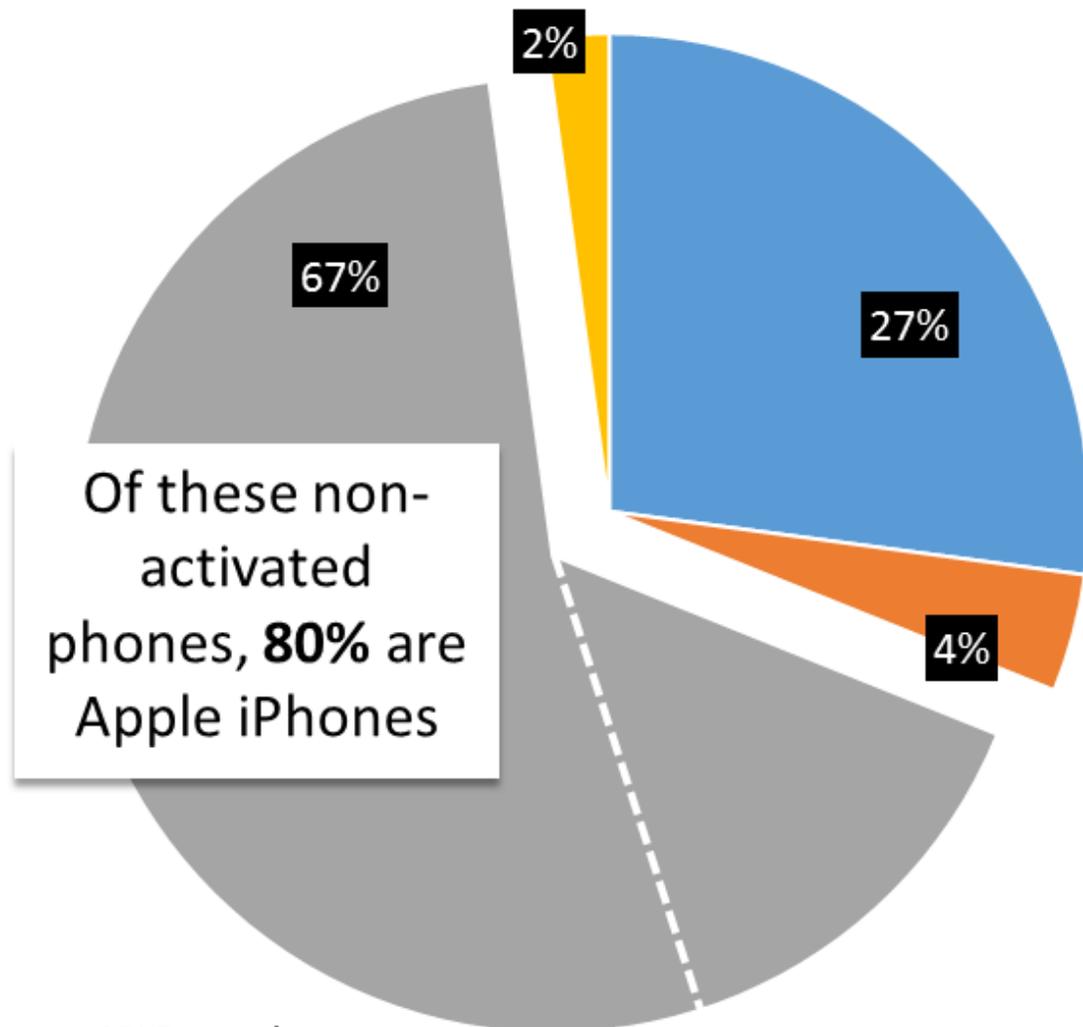
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FM Radio Capability in Top-selling U.S. Smartphones (% of total sold), 2Q 2015



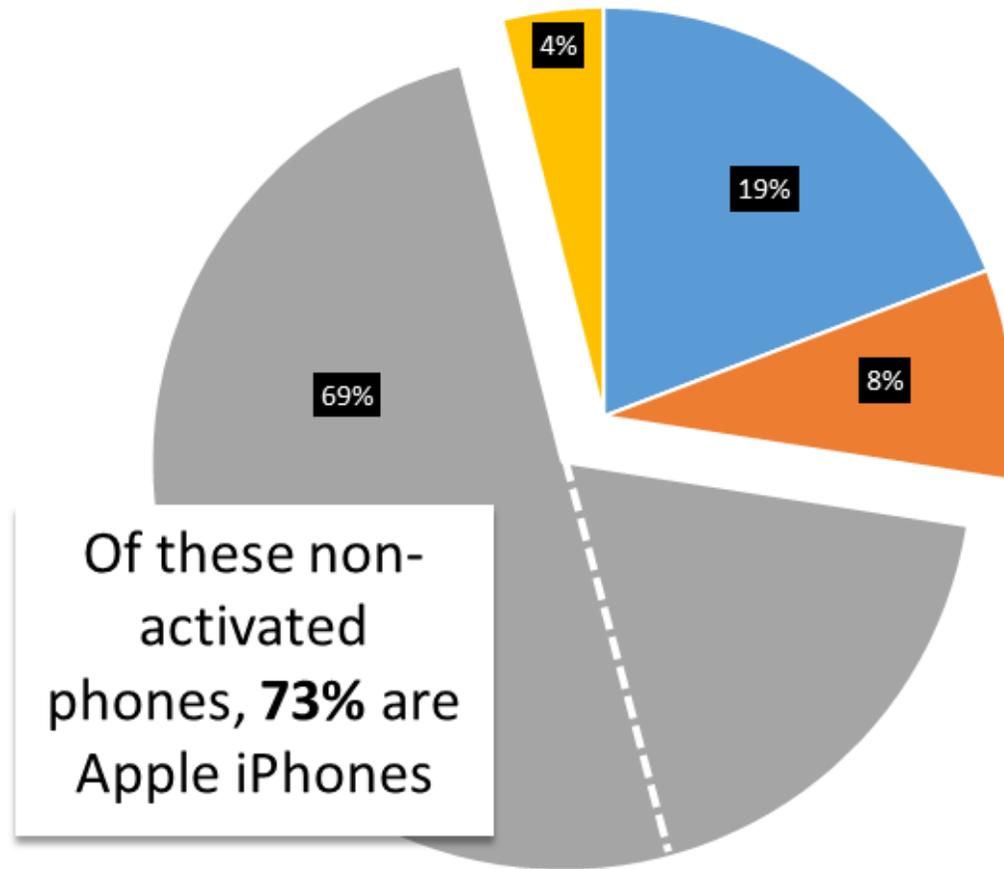
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FM Radio Capability in Top-selling U.S. Smartphones (% of total sold), 1Q 2015



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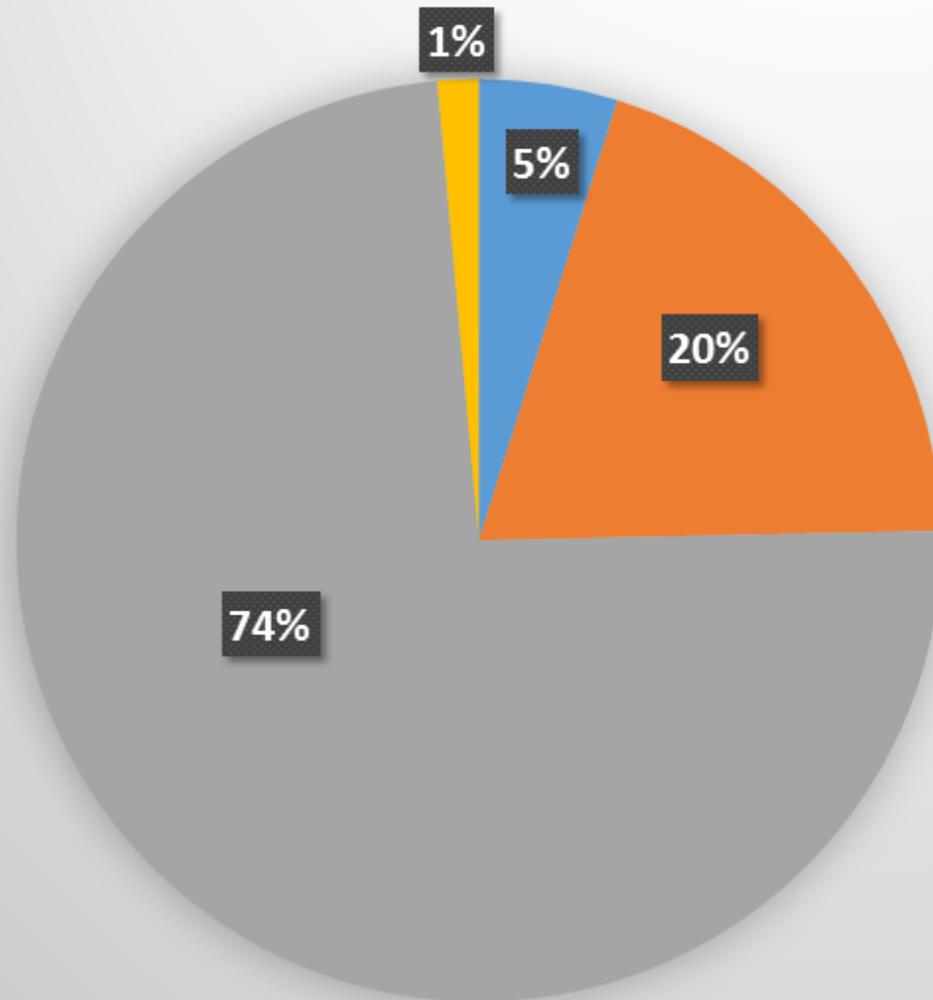
FM Radio Capability in Top-selling U.S. Smartphones (% of total sold), CY 2014



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FM Radio Capability of U.S. Top-Selling Smartphones (in % of total sold), CY 2013

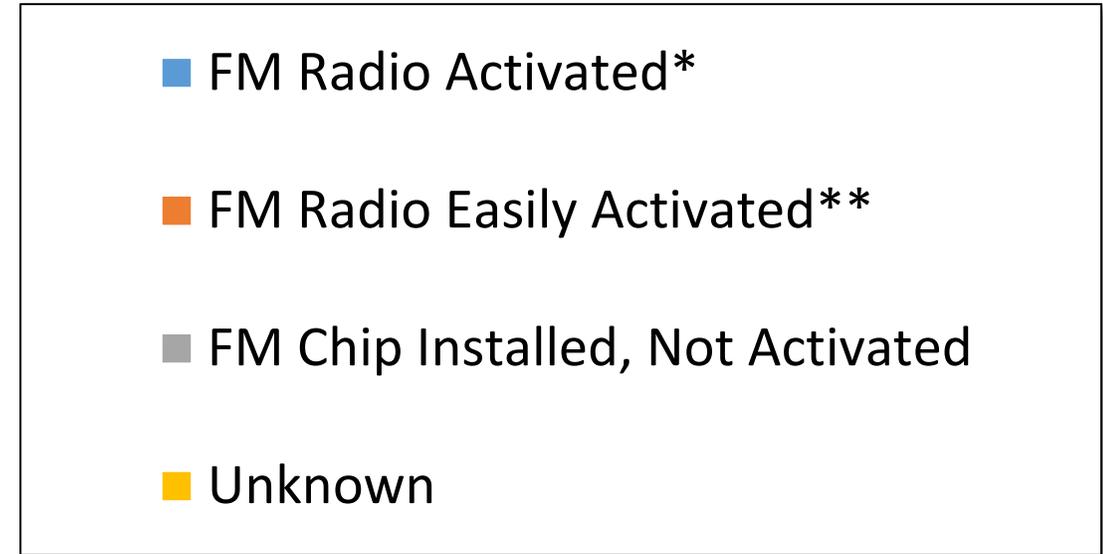
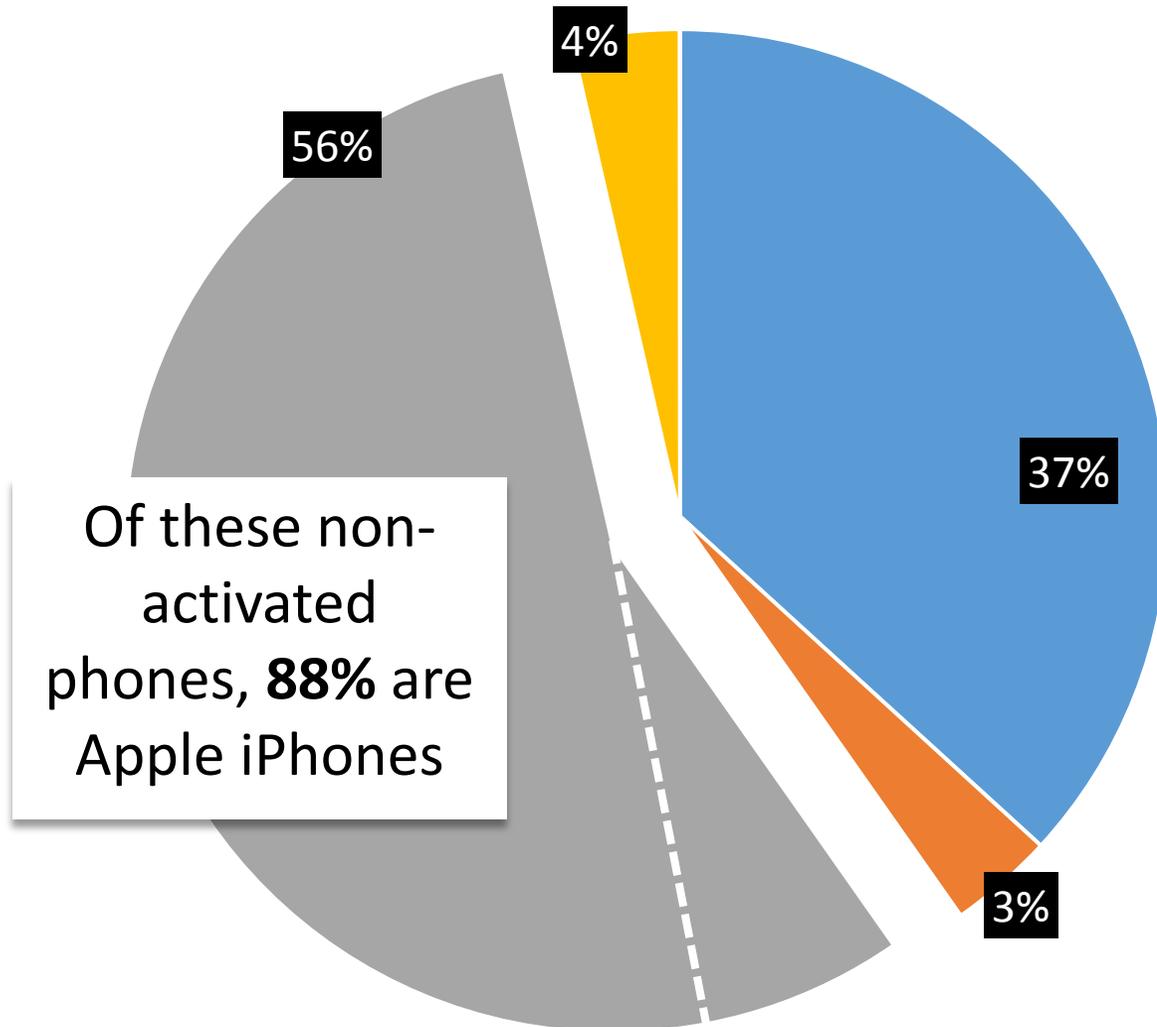


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FM Radio Capability in Top-selling U.S. Smartphones (% of total sold), 2Q 2015



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FM Receivers in Smartphones:

Smartphone “FM Readiness”

A Hierarchy of Implementations

- Class 1: FM receiver hardware on board
 - “Connectivity chip” includes WiFi, Bluetooth, FM
- Class 2: FM receiver on board and connected
 - RF in, audio (+ data) out
- Class 3: UI exposed (FM app preloaded)
- Class 4: Hybrid radio enabled

A Hierarchy of Implementations

CLASS	DESCRIPTION	EXAMPLES
1	FM Chip Onboard, “unconnected”	Samsung Galaxy S4 Apple iPhone 5S
2	FM Chip Connected, no UI	HTC One M8 (Verizon)
3	FM Fully Enabled	Motorola Moto G Samsung Galaxy S3 (Non-U.S.) HTC One M8 (AT&T)
4	Hybrid FM Enabled	Samsung Galaxy S5 (Sprint) HTC One M8 (Sprint)

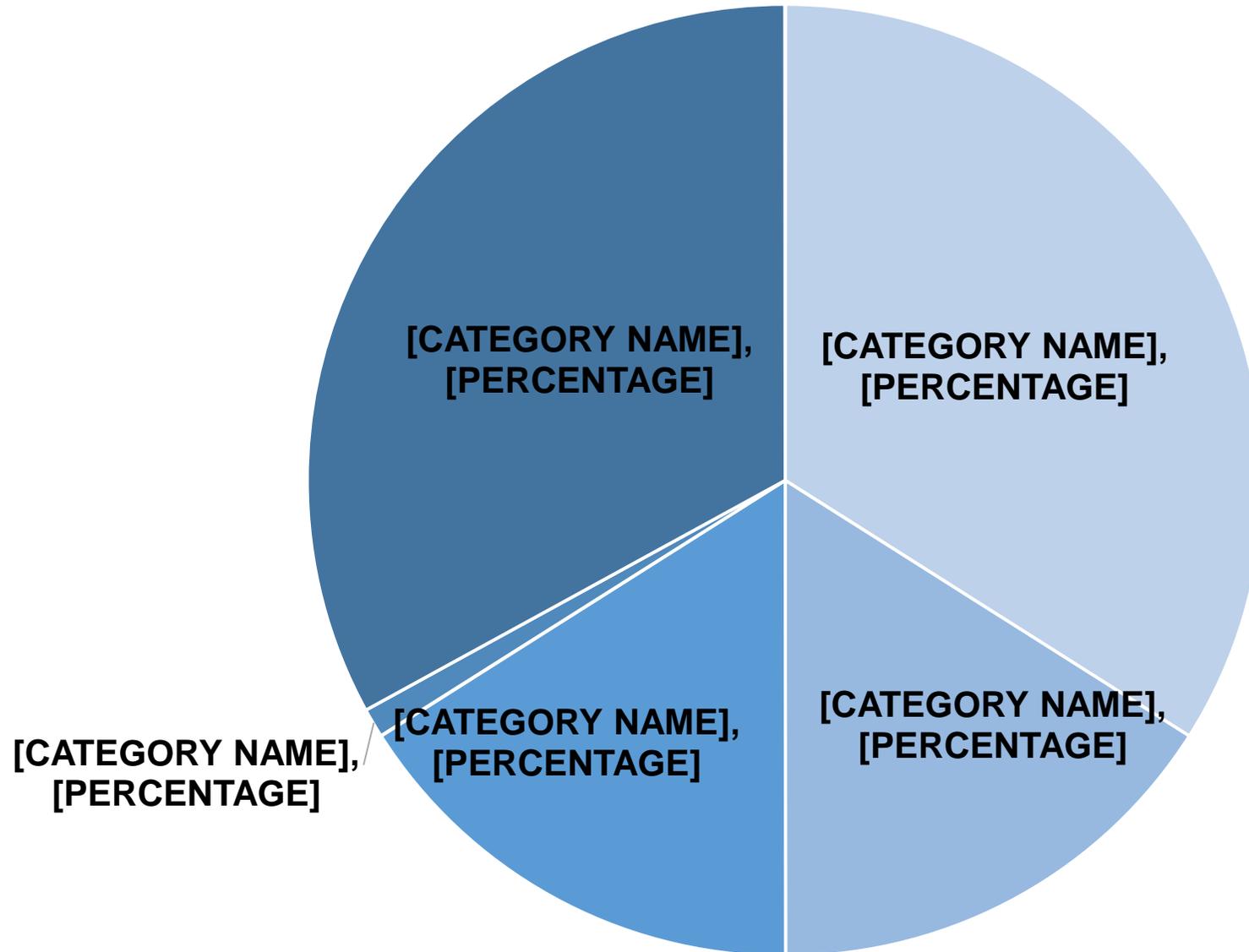
Differential Deployment

- U.S. vs. International Versions
- Differences between U.S. carriers
- The “Sprint Effect”
- The special case of Apple iPhones

FM Receivers in Smartphones:

Analysis by U.S. Carriers

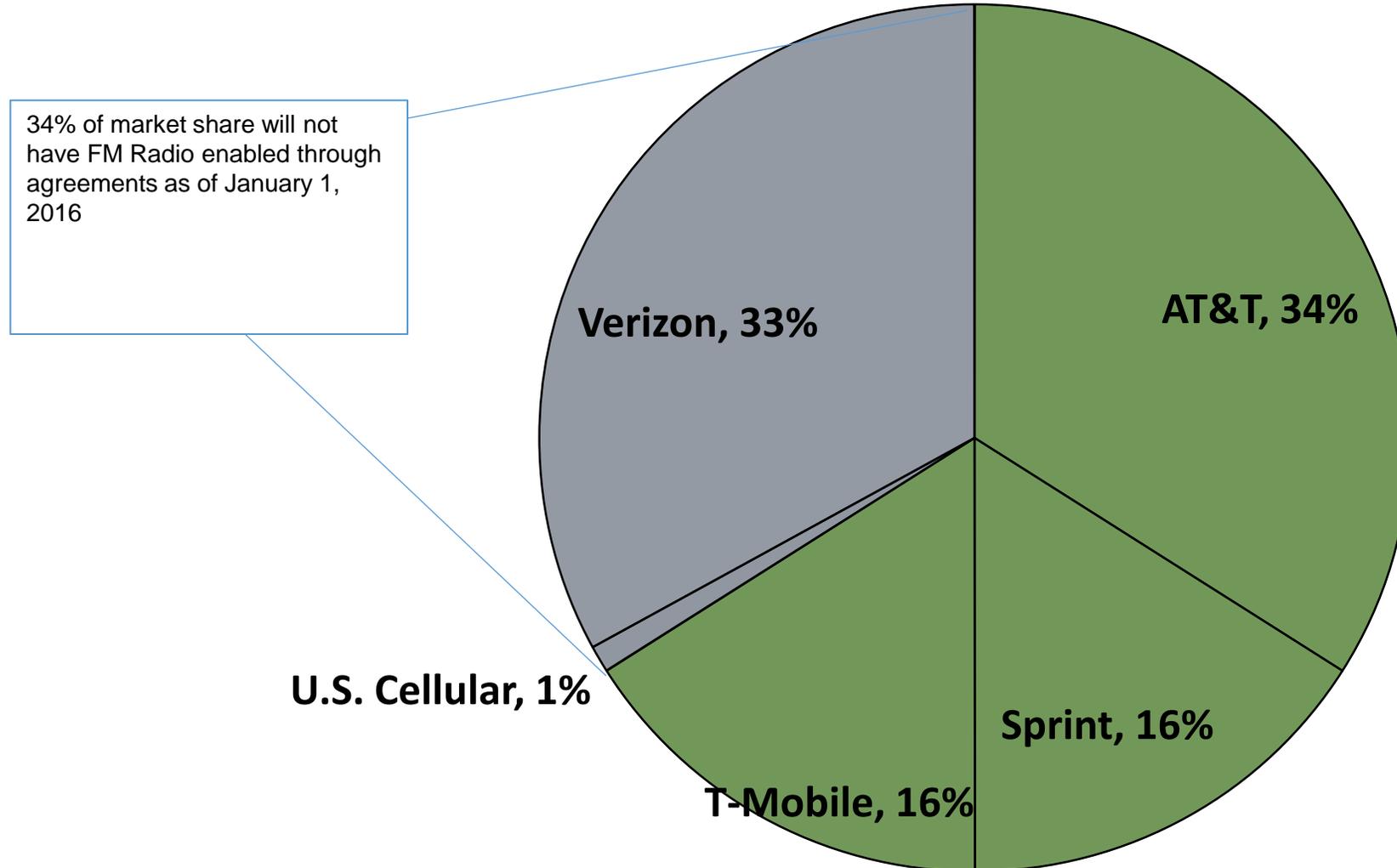
Major U.S. Carriers' Market Share



Source: Chetan Sharma
Technology & Strategy Consulting

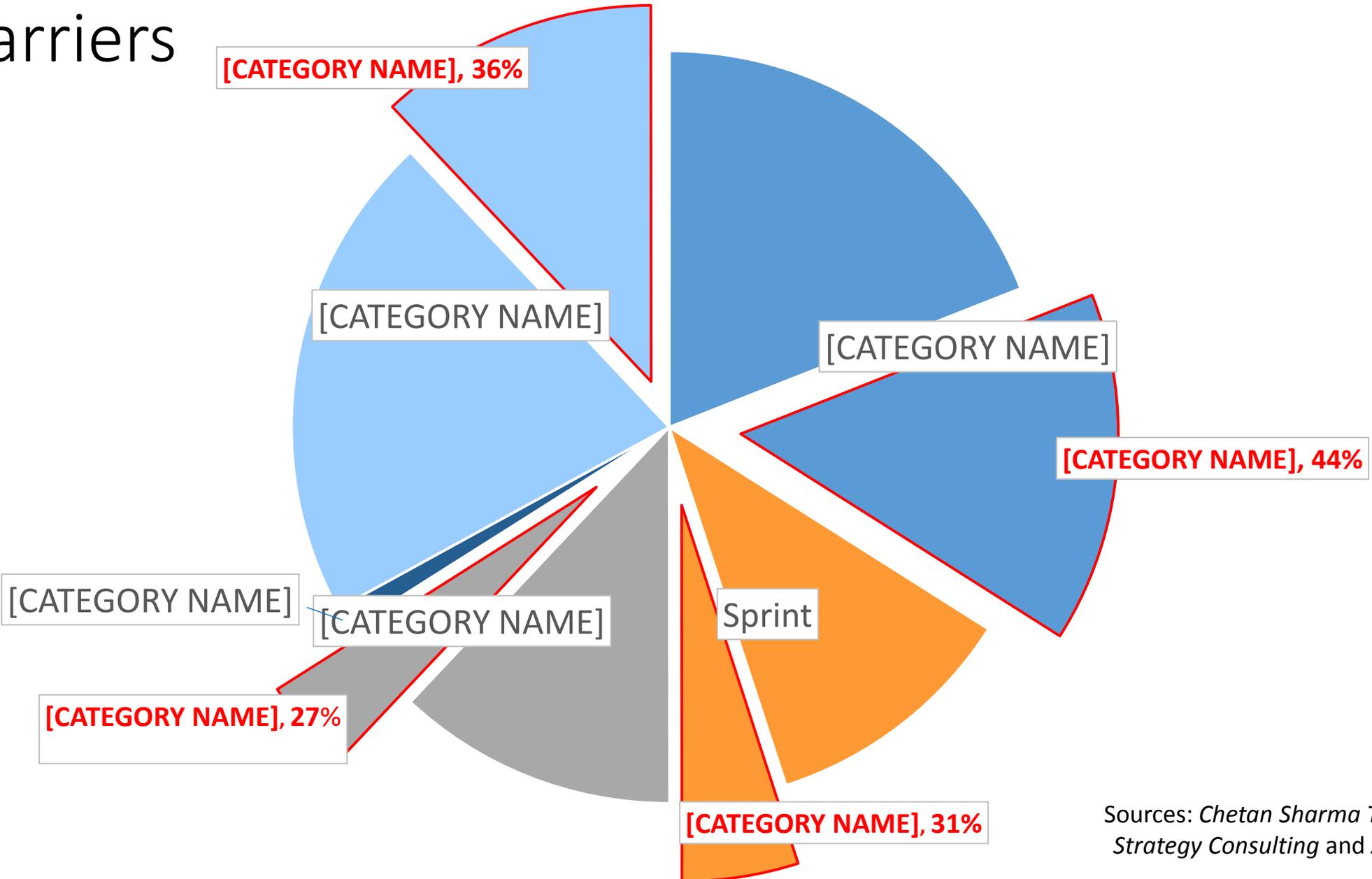
U.S. Carriers Enabling FM Chip

(as of January 1, 2016)



Three major carriers (with 66% of U.S. market) will encourage FM chip activation for their Android phones sold after Jan. 1, 2016.

iPhones Sold by Major U.S. Carriers



Sources: Chetan Sharma Technology & Strategy Consulting and ABI Research

FM Receivers in Smartphones:

Teardown Analysis

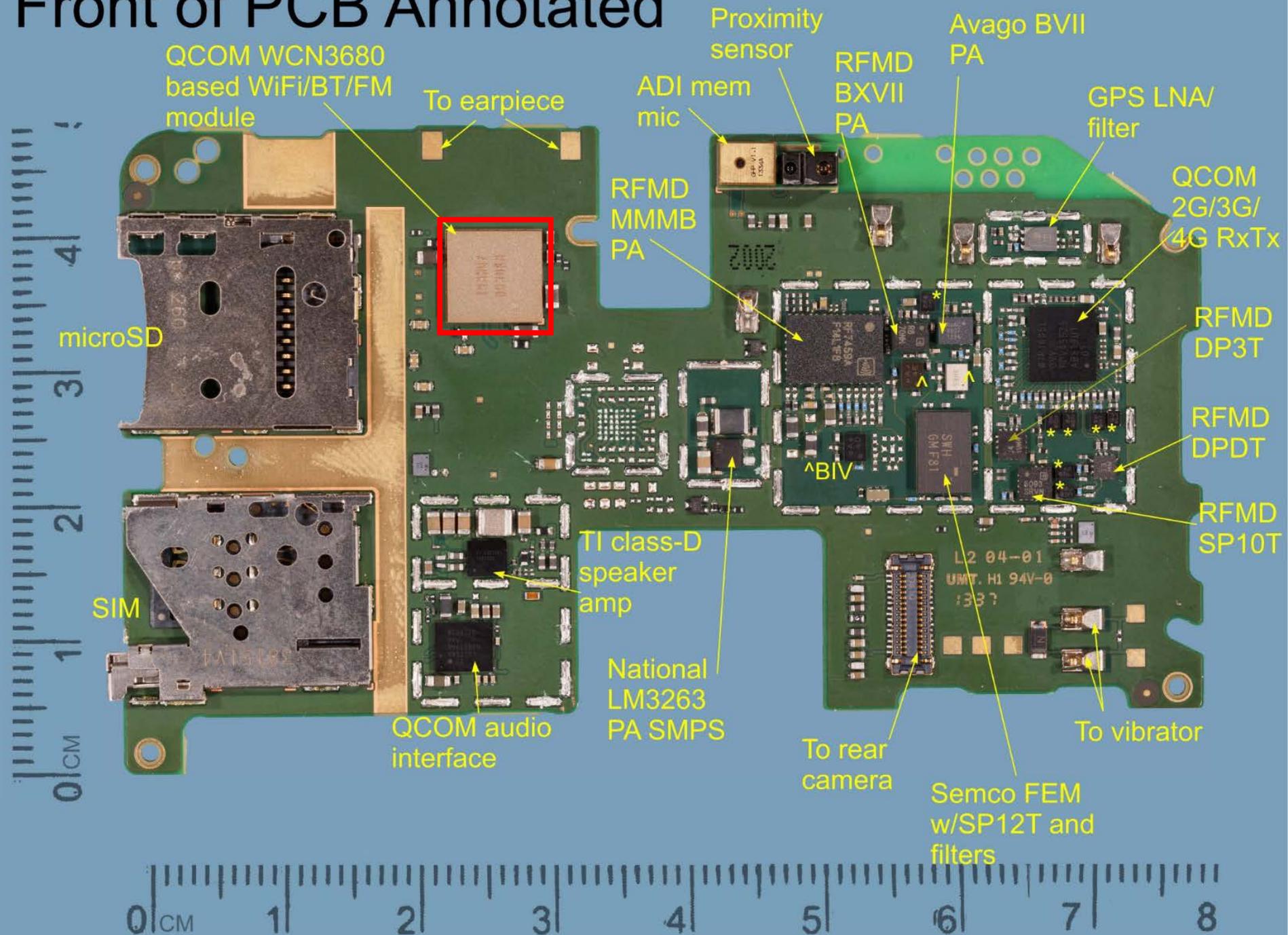
Sony Xperia Z3



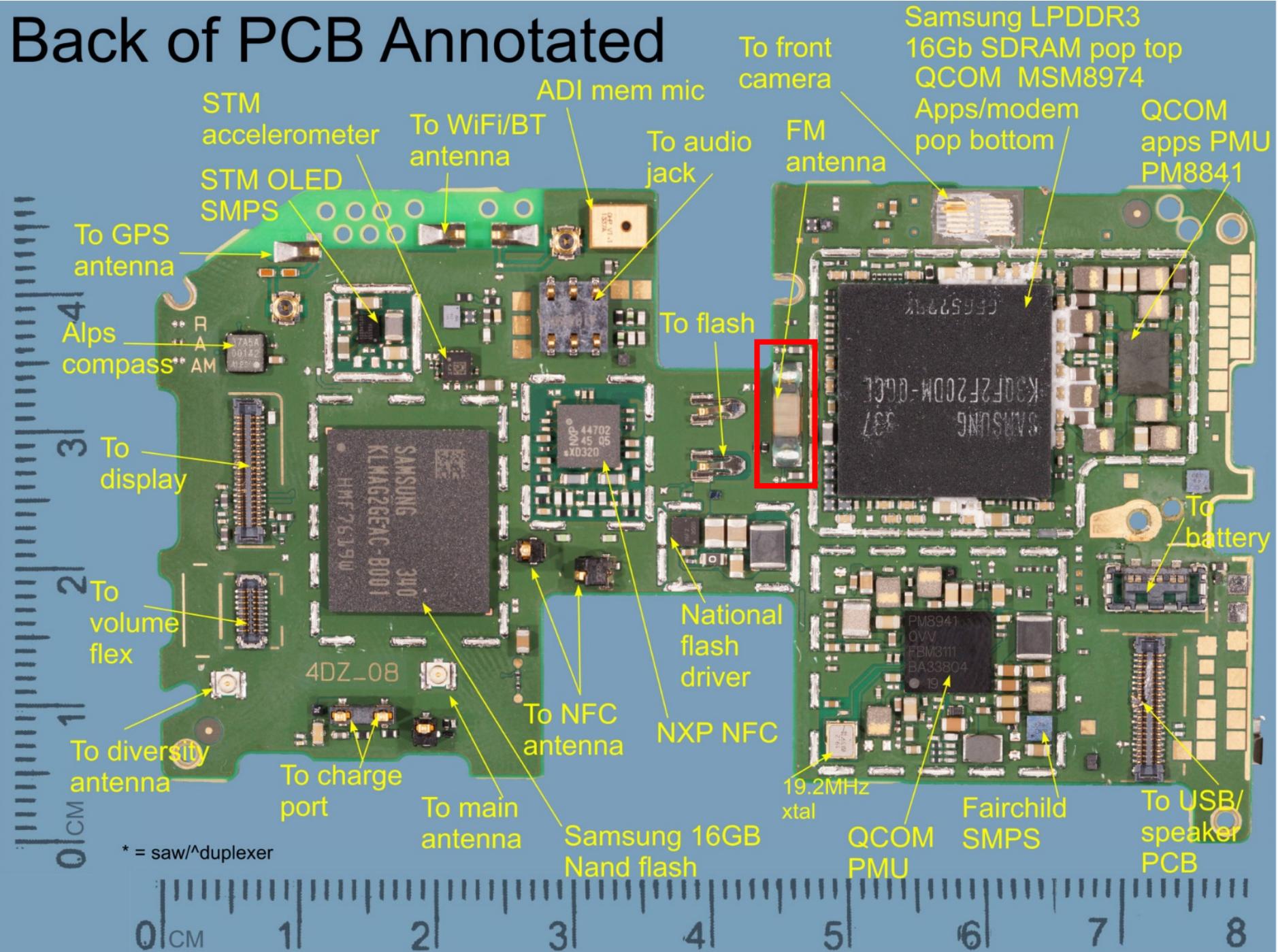
Nokia *Lumia* 1520



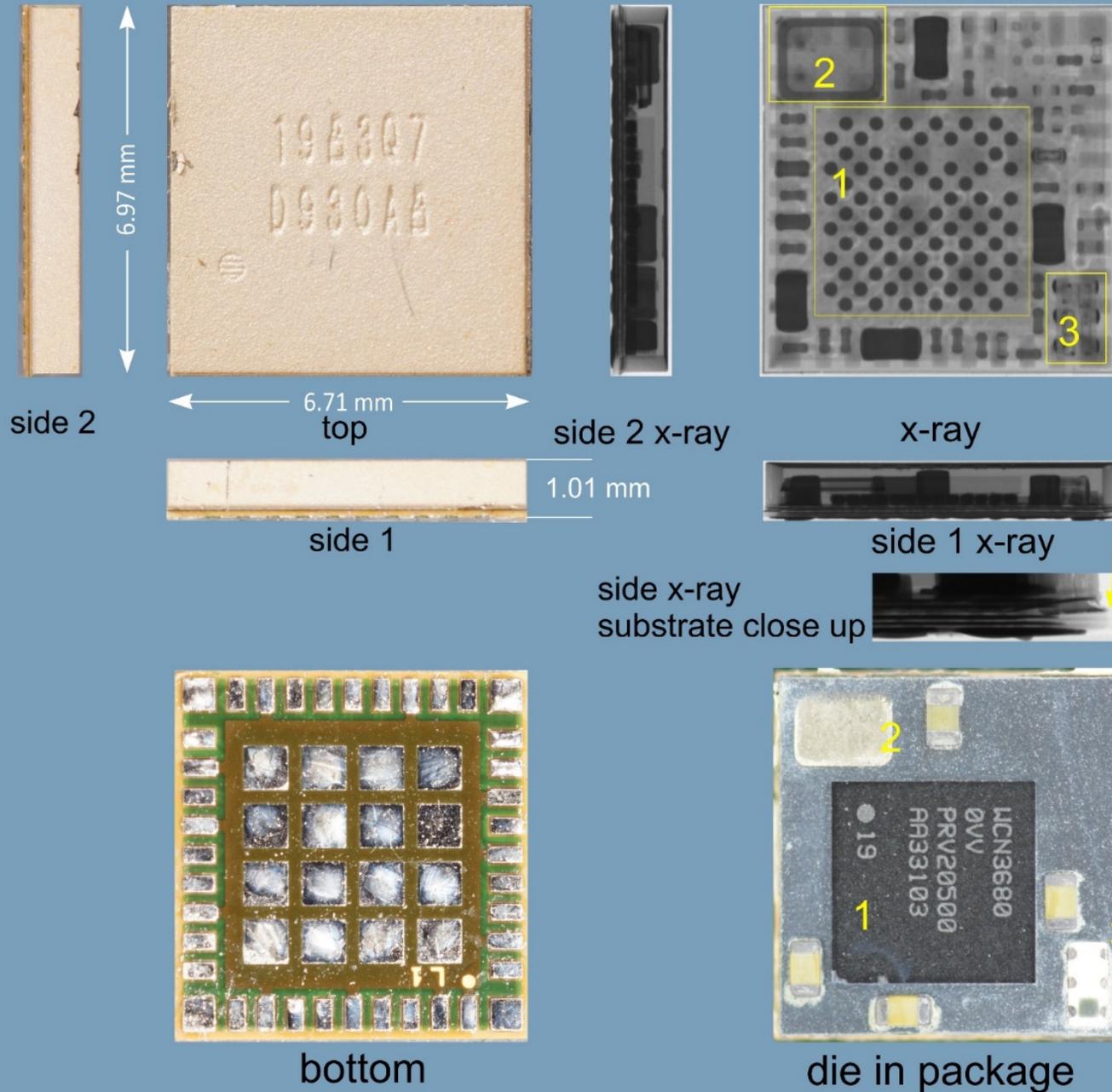
Front of PCB Annotated

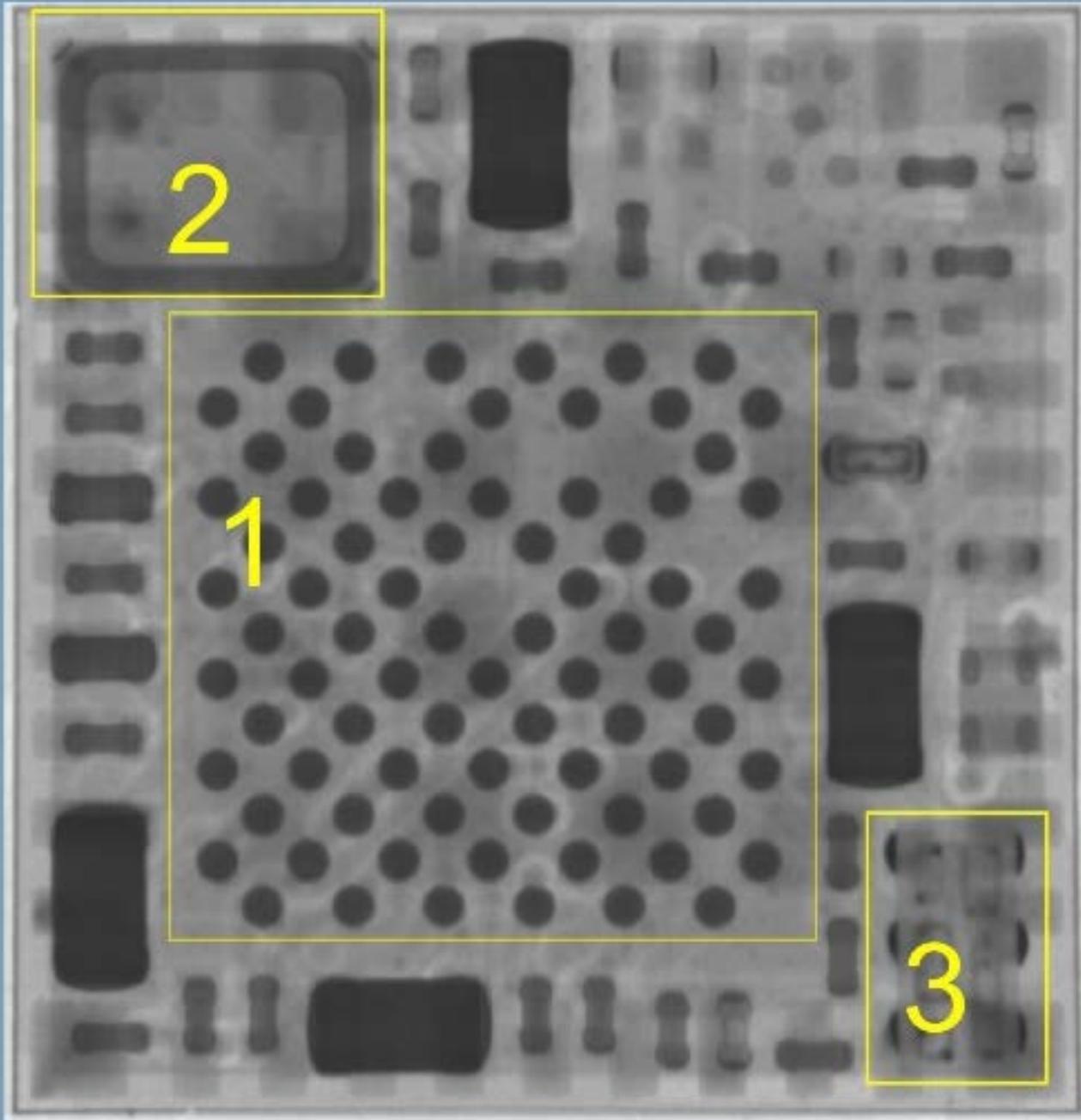


Back of PCB Annotated



Package Photos and X-Rays





1: Connectivity chip

2: Crystal

3: Multi-Layer Ceramic
Filter/Diplexer (2.4 GHz/5 GHz)

FM Receivers in Smartphones:

Power Consumption Comparison

Power Consumption Comparison

USAGE	AVG. POWER CONSUMPTION	EXPECTED BATTERY LIFE
FM Radio	0.21 Watts	36.16 hrs
Spotify IP Streaming	1.32 Watts	6.04 hrs
Pandora IP Streaming	1.01 Watts	7.90 hrs
TuneIn Radio IP Streaming	1.27 Watts	6.26 hrs

Source: Sprint/NextRadio study, July 2013

Thank You!

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