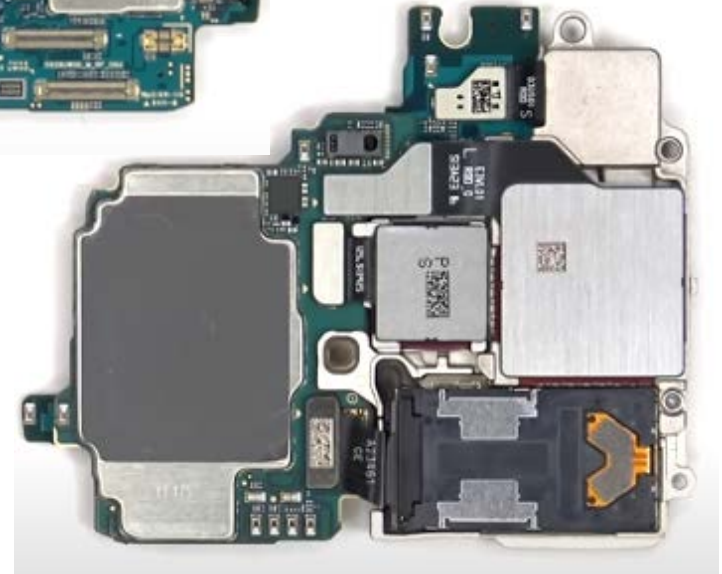
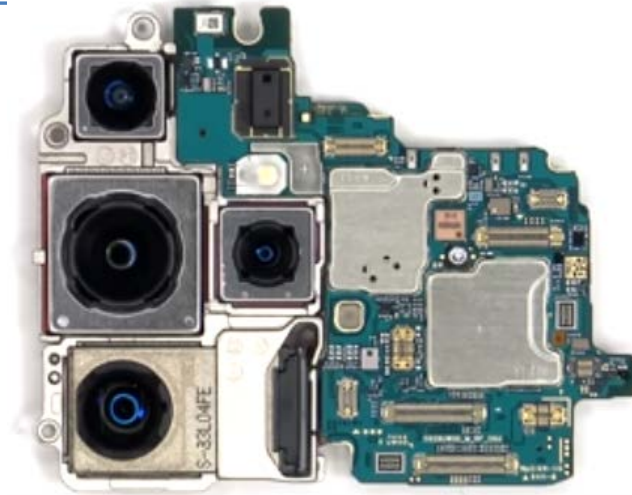


Lecture 00 Introduction to RF Systems

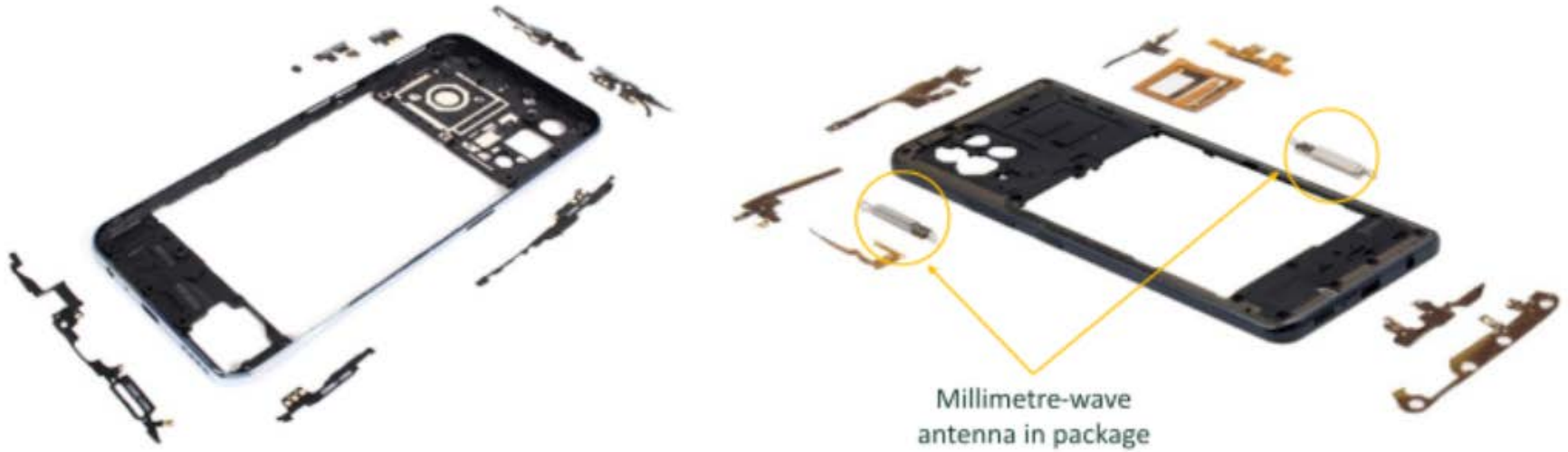
1. Smartphone
2. Smartphone Block Diagram
3. Semiconductors in Smartphones

1. Smartphone

- Samsung Galaxy S24 Ultra

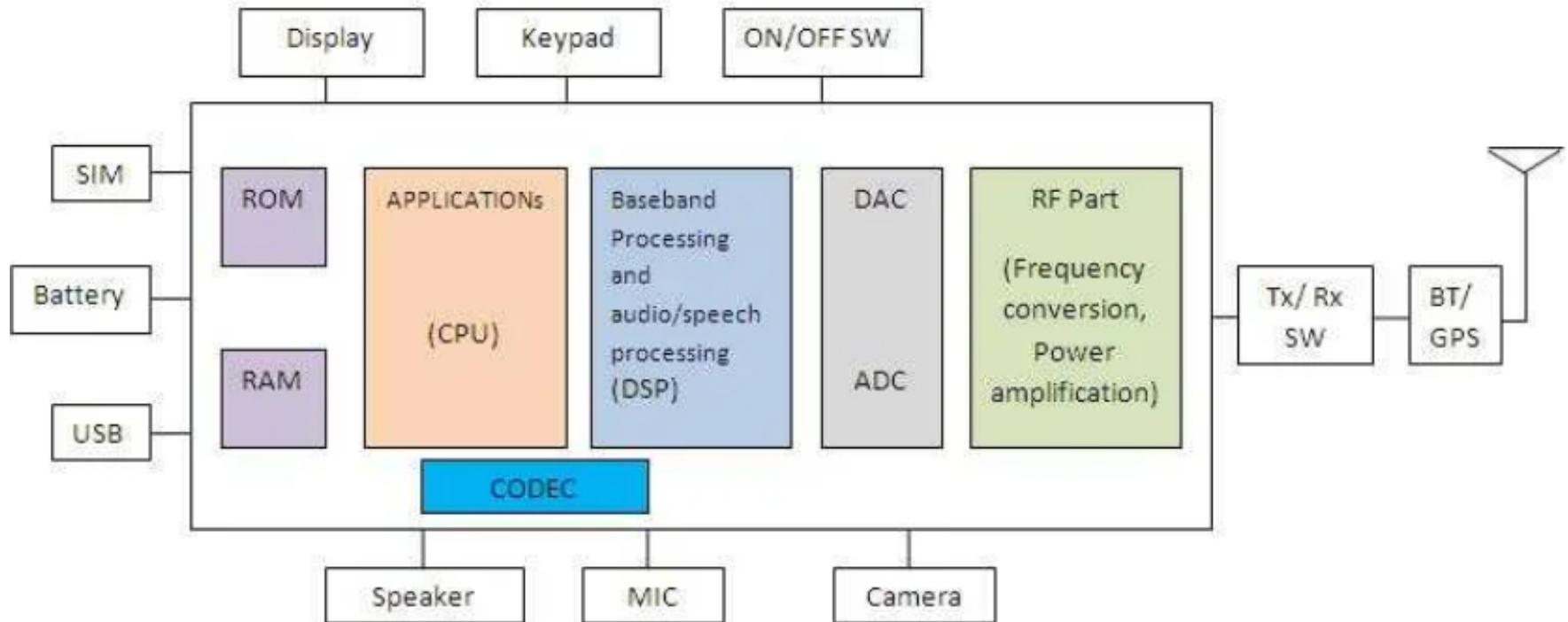


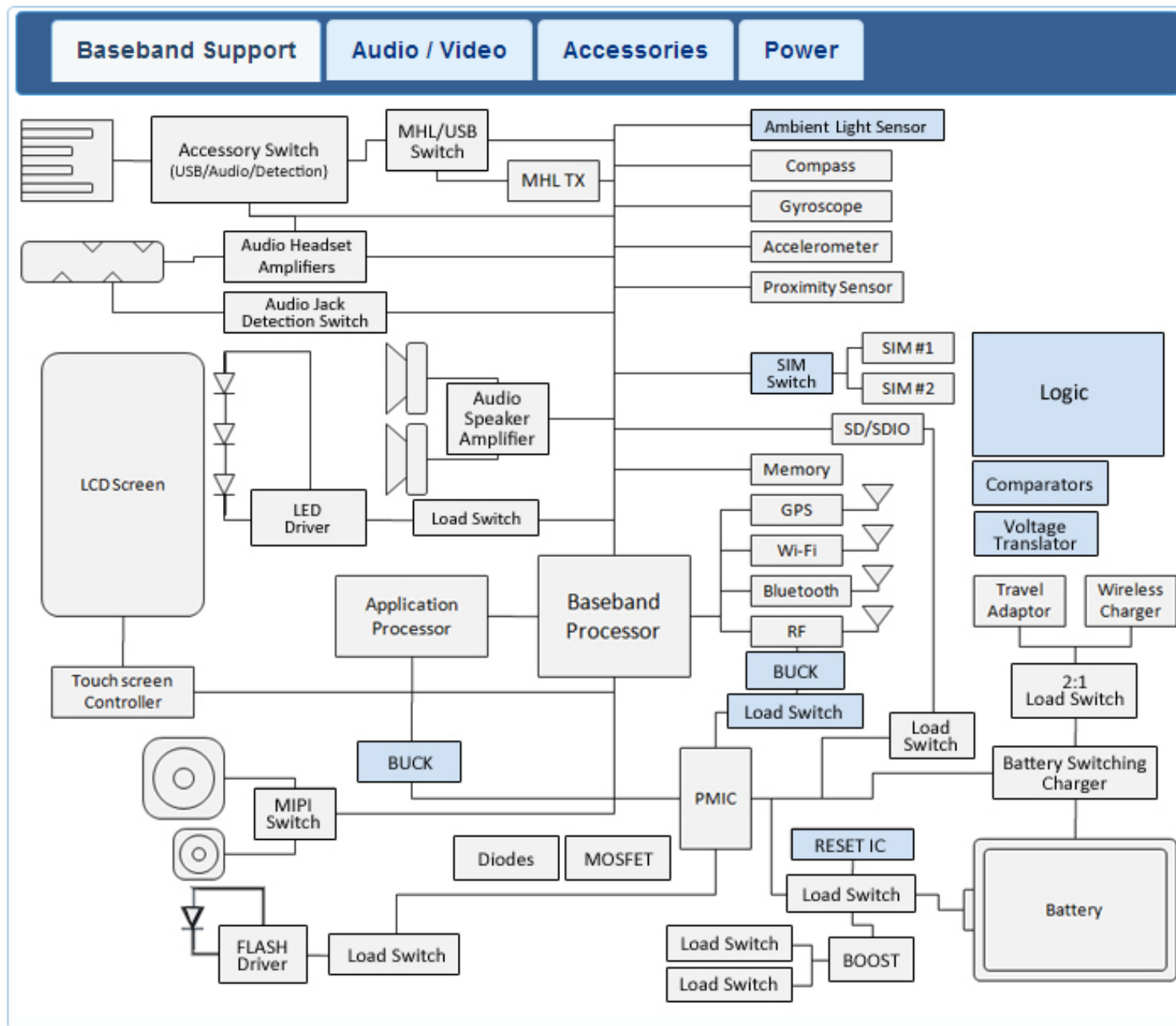
- Samsung Galaxy A42 Antennas



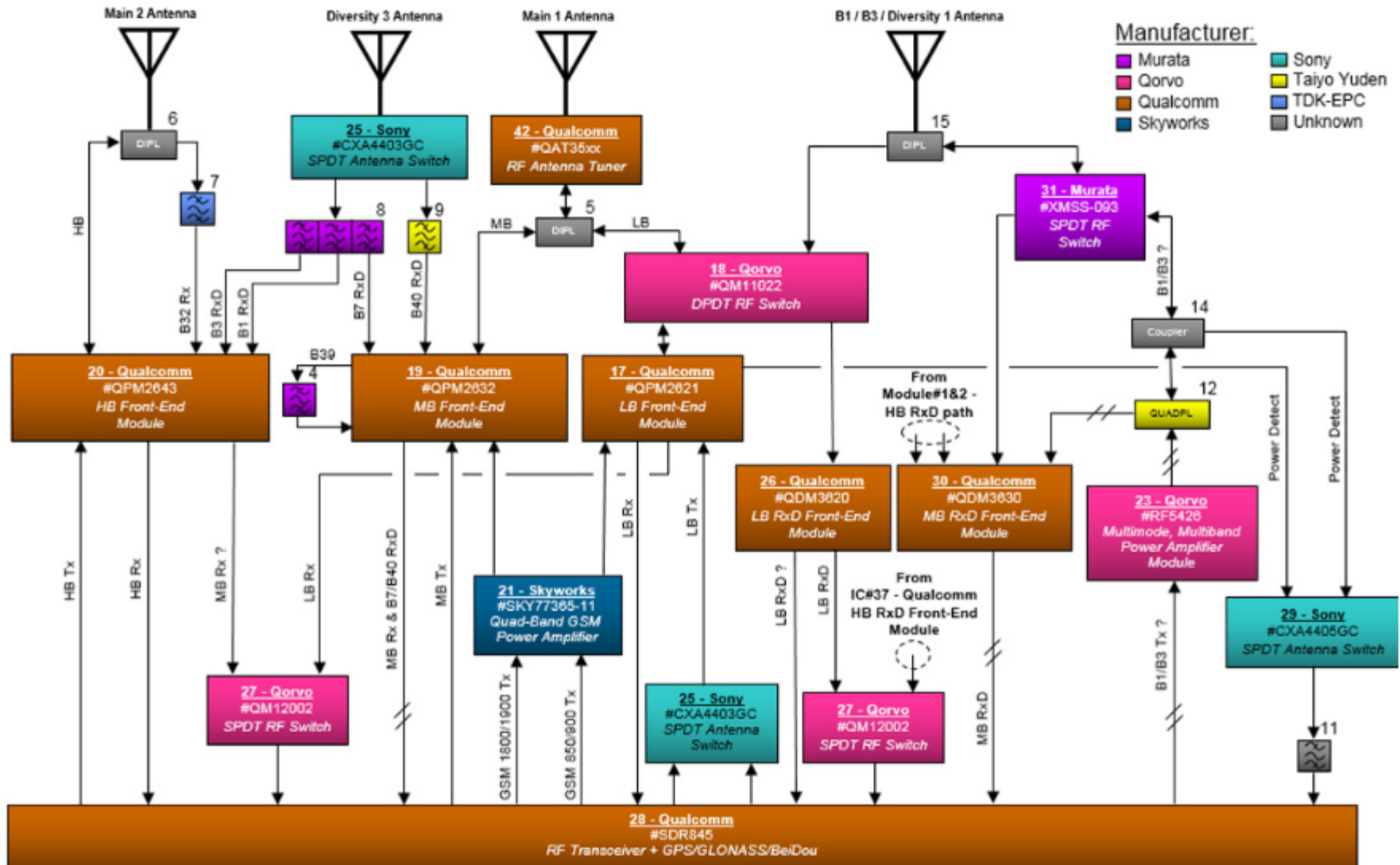
Left: a set of sub-6 GHz antennas on flexible substrate corresponding to their placement on the mid-frame of the Realme GT. Right: array of antennas found in the Samsung Galaxy A42 including two millimetre-wave antennas in package

2. Smartphone Block Diagram



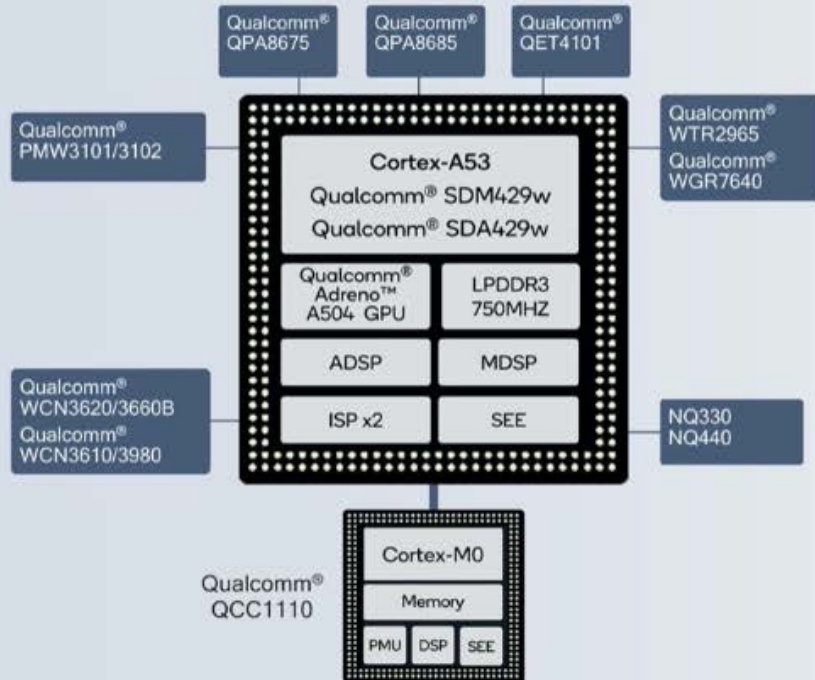


Block Diagram – Radio Design



3. Semiconductors in Smartphones

Qualcomm® Snapdragon Wear™ 4100+ Platform



Qualcomm QPA8675, Qualcomm QPA8685, Qualcomm QET4101, Qualcomm PMW3101, Qualcomm PMW3102, Qualcomm WTR2965, Qualcomm WGR7640, Qualcomm SDM429w, Qualcomm SDA429w, Qualcomm Adreno, Qualcomm QCN3620, Qualcomm WCN3660B, Qualcomm WCN3610, Qualcomm WCN3980, Qualcomm QCC1110, Qualcomm Hexagon, Qualcomm Snapdragon Wear and Qualcomm Trusted Execution Environment are products of Qualcomm Technologies, Inc. and/or its subsidiaries.

Key Specifications

SDA429w / SDM429w

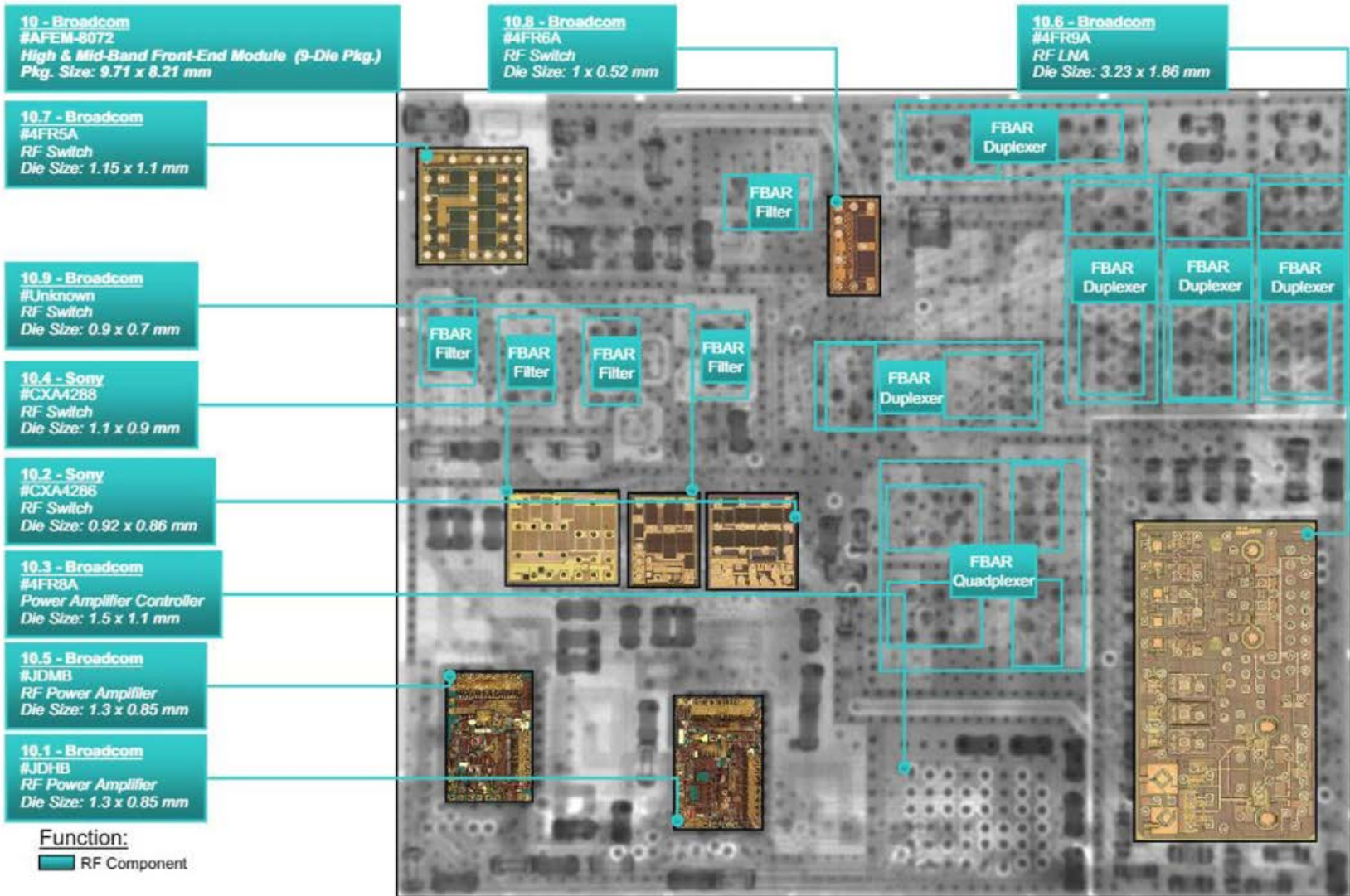
Process Node	12nm FF
Size	10x10 ePoP
CPU	4xA53, Up to 1.7Ghz
GPU	A504 @320MHz
Memory	LPDDR3 Up to 750MHz
DSP	MDSP (Modem, GPS) ADSP (Audio, Sensors) Qualcomm® Hexagon™ v56 DSP, 256KB, 691MHz

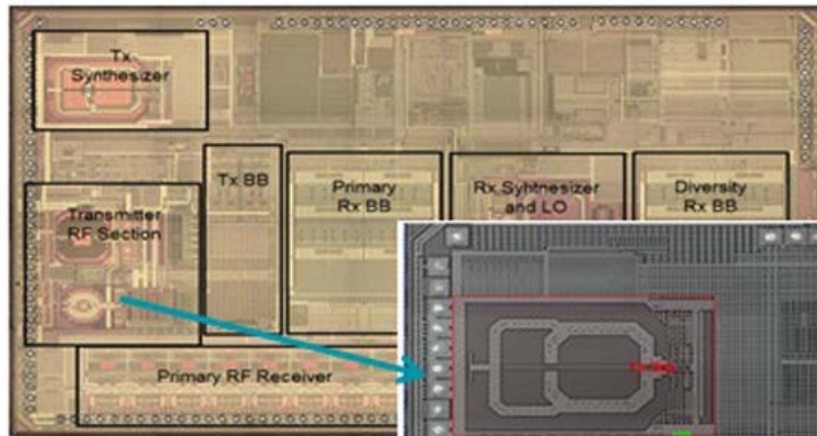
QCC1110

AON Co-Processor	Ultra low power M0 based processor Runs event-driven RTOS 5.2mm x 4mm
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Companion Chips

Connectivity	Wi-Fi 802.11 a/b/g/n Bluetooth 5.0, 4.2
Cellular	LTE CAT 1/3/4
Location	Gen 8C GPS, Glonass, Beidou, Galileo
PMIC	Low power wearables PMIC Integrates charger, fuel gauge, haptics
Security Features	Qualcomm® Trusted Execution Environment 4.0.5
RF	WTR2965: RF for Cellular / GPS WGR7640: RF for WiFi / BT
NFC	NQ330 / 440 from NXP
RFEE	QPA8675 + QPA8685 + QET4101





RF transceiver

