

M1 EECS (Electrical Engineering and Control Systems)

High frequency electronics : introduction

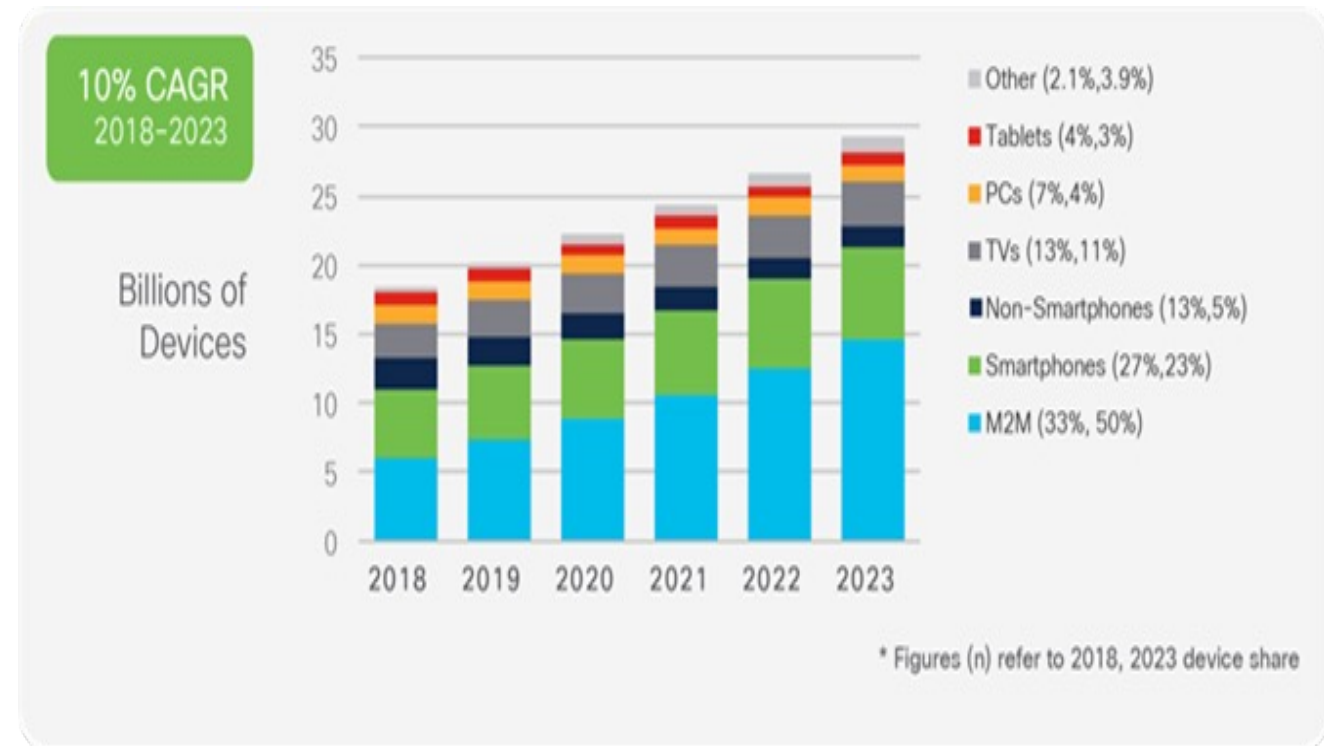
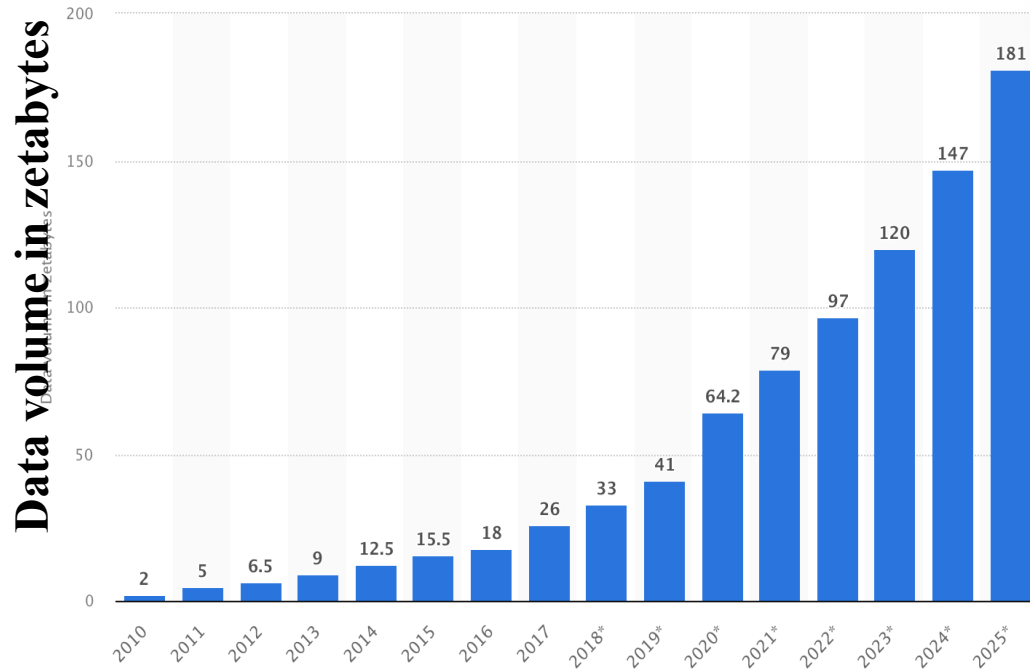
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Context : Why a RF passive component course ?

- World digital data exchange 2023 reaches 120 zetabytes (10^{21} bytes) (a byte is a letter) still growing up (double in 3 years)
- Main part of exchange are Wireless communication
 - IoT with 5G
 - Smartphone



The figure is a log-log plot showing the frequency range [GHz] on the y-axis (0.1 to 50) versus time on the x-axis (20 to 2010). The plot illustrates the evolution of various wireless communication technologies over time. A red line traces the path of 'New Microwave Applications' from the VHF Band (around 1940) through the UHF Band (around 1960), C-Band (around 1980), Ku-Band (around 1990), and into the 28-30 GHz range (around 2000). Other technologies shown include AM-radio, FM-radio, TV, SAT, SAT-LNB, 1G-Mobile, 2G-Mobile, 1G WLAN, 2G WLAN, 3G-Mobile, 3G WLAN, Car Radar, and 4G-Mobile. A yellow oval highlights the 'New Microwave Applications' area, and a red arrow points to the 4G-Mobile technology.

Technology	Frequency Range [GHz]	Approximate Year
AM-radio	0.1 - 0.5	1920 - 1940
FM-radio	0.1 - 0.5	1940 - 1960
TV (VHF Band)	0.1 - 0.5	1940 - 1960
TV (UHF Band)	0.5 - 1	1960 - 1980
SAT (Front End)	1 - 2	1980 - 1990
1G-Mobile (GSM, AMPS)	0.5 - 1	1980 - 1990
SAT-LNB (C-Band)	2 - 4	1980 - 1990
2G-Mobile (GPRS)	1 - 2	1990 - 2000
1G WLAN	2.5	1990 - 2000
2G WLAN	5	1990 - 2000
3G-Mobile (UMTS)	2 - 3	2000 - 2010
Sat-radio	2.3	2000 - 2010
SAT-LNB (Ku-Band)	10 - 12	2000 - 2010
LMDS	28-30	2000 - 2010
3G WLAN	17, 25	2000 - 2010
Car Radar	17.24	2000 - 2010
SAT (Return Path)	28-30	2000 - 2010
4G-Mobile	40	2010 - 2020



Course organisation

- Part1 : Introduction to microwave components
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- Part2 : S parameter & transmission line