

Introduction

Edgar P Fernandes - Distinguished Member of the Technical Staff (Motorola Solutions)

Edgar has over 30 years experience in RF design, product development, systems engineering and regulatory approval (RF, EMC, PSTN and product safety) in the telecommunications industry.

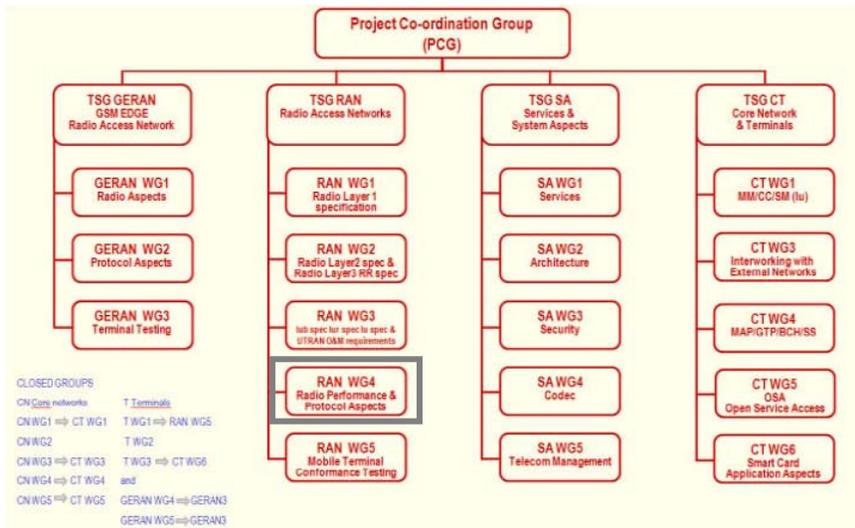
He has actively participated in both ETSI and the 3GPP Standards Groups since 1990. He has been the 3GPP RAN4 Vice-Chair since 2007 and is the rapporteur of many work items in 3GPP including the UTRA (WCDMA) and (EUTRA) LTE device specifications. In this role he has contributed significantly to setting the RF performance requirements for the Global Cellular Industry.

Edgar, who is based in the United Kingdom, holds a Bachelor of Science (Hons) in Electronic Engineering (specialisation in Communications) from The University of Southampton

3GPP Standardization Process



- ❖ 3GPP develops technical specifications on Mobile Broadband Systems
- ❖ The membership in 3GPP includes:
 - 372+ Individual Member companies,
 - Market Representation Partners,
 - Observer entities.
 - the 6 Global Organizational Partner or Standard Development Organizations below;



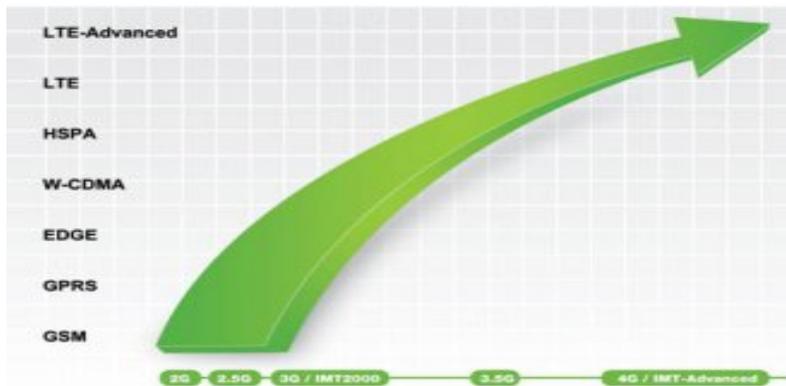
RAN4 Radio performance and protocol aspects

- ❖ RAN WG4 (RAN4) works on the RF aspects of UTRAN / E-UTRAN.
- ❖ RAN4 performs simulations of diverse RF system scenarios and derives the minimum requirements for transmission and reception parameters, and for channel demodulation.
- ❖ Once these requirements are set, the group defines the test procedures that will be used to verify them (only for BS).
- ❖ Requirements for other radio elements, like Repeaters, are specified in the RAN4 as well

* New bands, co-existence, regional regulatory requirement

3GPP Operating bands

- **3GPP specified operating bands**
 - 34 Bands specified in 3GPP; America, Asia and Europe
 - 12 US Bands; 2, 4, 5, 12, 13, 14, 17, 23, 24, 25, 26 and 41
Channel bandwidth of 1.4, 3, 5, 10, 15 and 20MHz
- **For local and international roaming**
 - GSM bands
 - WCDMA bands
 - LTE Band
 - + CDMA, WIMAX, iDEN, WLAN, Bluetooth and GPS
- **For LTE**
 - All devices must support 1 UL Tx path and 2 DL Rx path.
3 RF front end components; TX/RX + RX for each band



E-UTRA operating bands					
Band	Uplink (UL) band		Downlink (DL) band		Duplex Mode
	BS receive /UE transmit		BS transmit /UE receive		
	FUL_low	FUL_high	FDL_low	FDL_high	
1	1920 MHz	1980 MHz	2110 MHz	2170 MHz	FDD
2	1850 MHz	1910 MHz	1930 MHz	1990 MHz	FDD
3	1710 MHz	1785 MHz	1805 MHz	1880 MHz	FDD
4	1710 MHz	1755 MHz	2110 MHz	2155 MHz	FDD
5	824 MHz	849 MHz	869 MHz	894MHz	FDD
6 ¹	830 MHz	840 MHz	875 MHz	885 MHz	FDD
7	2500 MHz	2570 MHz	2620 MHz	2690 MHz	FDD
8	880 MHz	915 MHz	925 MHz	960 MHz	FDD
9	1749.9 MHz	1784.9 MHz	1844.9 MHz	1879.9 MHz	FDD
10	1710 MHz	1770 MHz	2110 MHz	2170 MHz	FDD
11	1427.9 MHz	1447.9 MHz	1475.9 MHz	1495.9 MHz	FDD
12	698 MHz	716 MHz	728 MHz	746 MHz	FDD
13	777 MHz	787 MHz	746 MHz	756 MHz	FDD
14	788 MHz	798 MHz	758 MHz	768 MHz	FDD
15	Reserved		Reserved		FDD
16	Reserved		Reserved		FDD
17	704 MHz	716 MHz	734 MHz	746 MHz	FDD
18	815 MHz	830 MHz	860 MHz	875 MHz	FDD
19	830 MHz	845 MHz	875 MHz	890 MHz	FDD
20	832 MHz	862 MHz	791 MHz	821 MHz	FDD
21	1447.9 MHz	1462.9 MHz	1495.9 MHz	1510.9 MHz	FDD
22					
23	2000 MHz	2020 MHz	2180 MHz	2200 MHz	FDD
24	1626.5 MHz	1660.5 MHz	1525 MHz	1559 MHz	FDD
25	1850 MHz	1915 MHz	1925 MHz	1990 MHz	FDD
26	814 MHz	849 MHz	859 MHz	894MHz	FDD
...					
33	1900 MHz	1920 MHz	1900 MHz	1920 MHz	TDD
34	2010 MHz	2025 MHz	2010 MHz	2025 MHz	TDD
35	1850 MHz	1910 MHz	1850 MHz	1910 MHz	TDD
36	1930 MHz	1990 MHz	1930 MHz	1990 MHz	TDD
37	1910 MHz	1930 MHz	1910 MHz	1930 MHz	TDD
38	2570 MHz	2620 MHz	2570 MHz	2620 MHz	TDD
39	1880 MHz	1920 MHz	1880 MHz	1920 MHz	TDD
40	2300 MHz	2400 MHz	2300 MHz	2400 MHz	TDD
41	2496 MHz	2690 MHz	2496 MHz	2690 MHz	TDD
42	3400 MHz	3600 MHz	3400 MHz	3600 MHz	TDD
43	3600 MHz	3800 MHz	3600 MHz	3800 MHz	TDD