



Broadband RF Spectrum Audit

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Executive Summary: Broadband Spectrum Audit

- Follow SADC Frequency Allocation Plan
- The **European rulings**, such as the European table of frequency allocations and applications in the frequency range 8.3 kHz to 3000 GHz ([ECA TABLE](#)), are first-rate guidelines
- Due to the natural growth of wireless communications (specifically cellular traffic), Zambian cellular operators **need more RF** in order to maintain same quality of service and quality of end user experience

- ATDI proposes to **redeploy TV channels and military**, and to use the RF bands 800 and 700 MHz for broadband cellular
- LTE at 700/800 MHz bands will stimulate **innovation** for emergency communication, health, elderly care, preserve nature and rural coverage
- ZICTA may rearrange the GSM 1800, 75 MHz x 2, and assign to AIRTEL, MTN and Zamtel **25 MHz x 2 to each Operator**

Executive Summary: Broadband Spectrum Audit (3)

- The 12 month licence period provides ZICTA much **flexibility**, so when renewing the licence, ZICTA may add RF and additional **obligations**
- ZICTA may oblige the MNOs to area and population; initially: **cover Roads Trunk (T) 99%, Main (M) 85% and District (D) 70%**
- As operators use the same cellular technologies and IHS serves all three Operators, ZICTA may enforce **passive and active infrastructure sharing** not only to improve return on investment, but also to improve cellular coverage and capacity, to optimize the RF usage, reduce human hazards and save land

- The Report **quantifies** the relation between operator's RF bandwidth to capacity and to the number of bases stations
- ATDI provides **threshold levels**, to guarantee QoS coverage and capacity. The coverage of every operator can be published

Thresholds power & field-strength for cellular & BWA

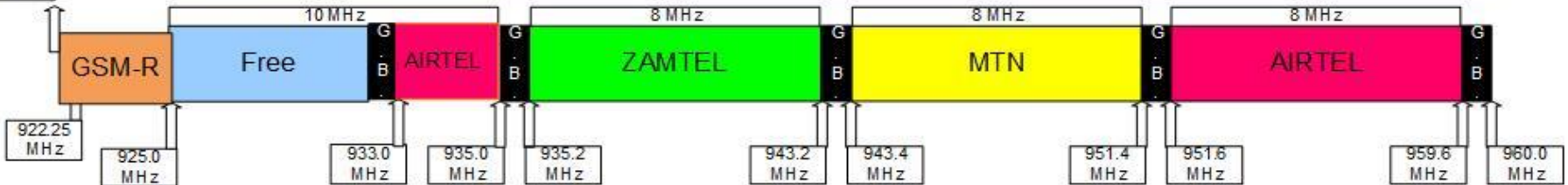
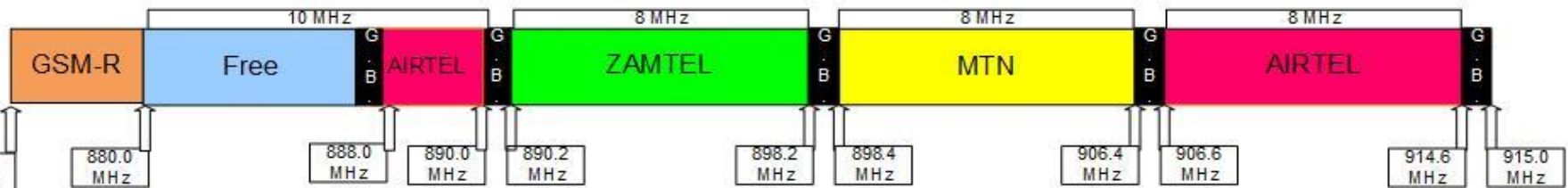
Technology (MHz)	CS (kHz)	SENS (dBm)	FS (dBμV/m)
GSM 900	200	-104	30
GSM 1,800	200	-104	36
UMTS 2,100	5,000	-80	61
LTE 700/800	5,000	-80	53
LTE 1,800–2,000	5,000	-80	61
	10,000	-77	64
	20,000	-74	67
LTE-TDD 2,300/2,600	5,000	-80	63
	10,000	-77	66
	20,000	-74	69
WiMAX 2,300/2,600	5,000	-80	63
	10,000	-77	66
	20,000	-74	69
WiMAX 3,500	5,000	-80	66
	10,000	-77	69
	20,000	-74	72
WiMAX5400	5,000	-80	70
	10,000	-77	73
	20,000	-74	76
WiMAX10500	5,000	-80	76
	10,000	-77	79
	20,000	-74	82

The GSM Band - General



ZICTA

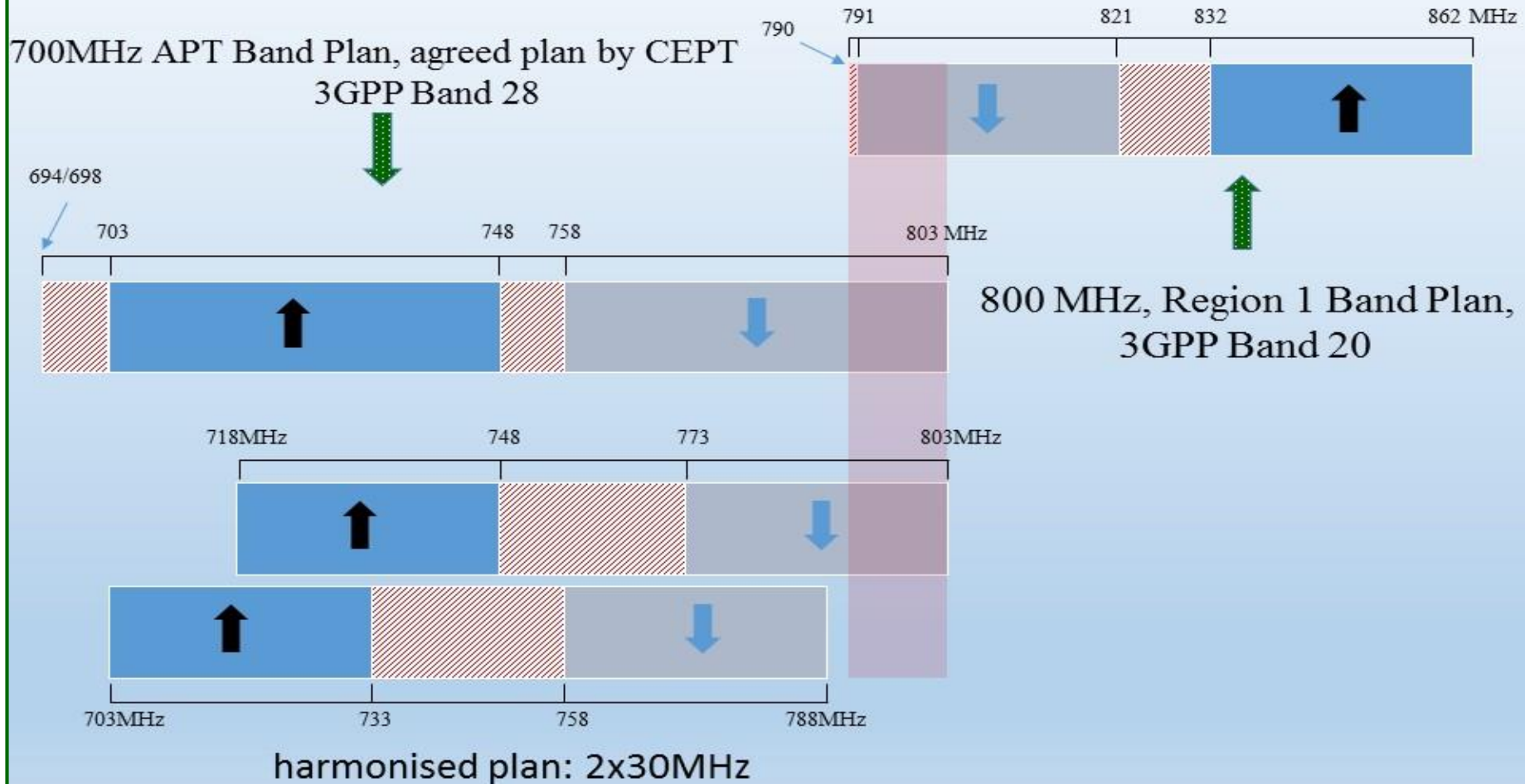
The GSM Band - Allocation



G.B. MEANS GUARD BAND

Digital Dividends: 700/800MHz band plan

Digital Dividends: 700/800MHz band plan (source GSMA)



BW required for FDD network

13kbit/s for GSM900 & GSM1800; 40Mbits/s for UMTS & WiMAX; 200 Mbits/s for LTE
GSM 1.4MHz x 2 at 900 MHz; UMTS 30MHzx2, at 2000MHz; LTE 20MHzx2 at 1,800 MHz

BW required, FDD UMTS national network

$$BW (MHz) = 30 \times \frac{dr (Mbits / s)}{40} \times \frac{subs}{1,000} \times \frac{freq (MHz)}{2,000} \times 2$$

BW required, FDD LTE national network

$$BW (MHz) = 20 \times \frac{dr (Mbits / s)}{200} \times \frac{subs}{1,000} \times \frac{freq (MHz)}{1,800} \times 2$$

BW vs min BW for FDD cellular; MHz

Operator	RF band	Technology	Total RF	Minimal RF	Missing/ Excess
MNO: AIRTEL	2,100	UMTS	20	30	30-20 =10
	1,800	GSM-1800	20	(1800/900) x1.4 = 2.8	2.8-20 =-17.2
	800/900	GSM- 900	8+ 2=10	1.4	1.4-10 =-8.6
MNO: MTN	2,100	UMTS	20	30	30-20 =10
	1,800	LTE	5	20	20-5 =15
	1,800	GSM-1800	20	(18/9) x1.4 =2.8	2.8-20 =-17.2
	900	GSM- 900	8	1.4	1.4-8 =-6.6
MNO: ZAMTEL	1,900	UMTS	15	30	30-15 =-15
	800	GSM- 900	8	1.4	1.4-8 =-6.6

BW vs min BW for TDD ISPs; units MHz

Operator	RF band	Technology	Total RF	Minimal RF	Missing/ Excess
	2,300	LTE-TDD	30	30	30-30
ISP: AFRICONNECT	2,600	WiMAX	40	$(2600/2300) \times 40 = 45$	45-40=
	5,400		40	$(5400/2300) \times 40 = 94$	94-40=
ISP: CEC- Liquid	2,300	LTE-TDD and WiMAX	20	WiMAX 40 MHz needed LTE-TDD 30 MHz needed	WiMAX 40-20= LTE-TDD 30-20=
ISP: HAI	3,500	WiMAX	21	$(3500/2300) \times 40 = 61$	61-21=
	5,400		20	$(5400/2300) \times 40 = 94$	94-21=
ISP: VODAFONE	2,300	LTE TDD	30	30	30-30
	3,500		21	$(3500/2300) \times 30 = 46$	46-21=
ISP: PARATUS TELECOM	3,500	WiMAX	42	$(3500/2300) \times 40 = 61$	61-42=
	5,400		20	$(5400/2300) \times 40 = 94$	94-20=
ISP: ISAT AFRICA	3,500		21	$(3500/2300) \times 40 = 61$	61-21=
ISP: ZAMREN	10.5GHz		7	$(10500/2300) \times 40 = 183$	183-7=1
ISP: MICROLINK	2,600	WiMAX and LTE	60	WiMAX $(26/23) \times 40$ MHz =45MHz needed LTE-TDD $(26/23) \times 30$ 34MHz needed	WiMAX 45-60= LTE-TDD 34-60=
ISP: ZAMNET	2,600	WiMAX	30	$(2600/2300) \times 40 = 45$	45-30=



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This presentation appears at http://mazar.atwebpages.com/Downloads/ZambiaZICTA_RF_Audit19Apr2017Mazar.pdf

See also

1. http://mazar.atwebpages.com/Downloads/EMF_Human%20Hazards_ZICTA_9Jan17_Mazar.pdf
2. http://mazar.atwebpages.com/Downloads/ZambiaZICTA_PricingModel19April2017Mazar.pdf