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PNG Radiocommunications & Telecommunications Technical Authority

THE 900 MHz BAND PLAN

THE 900 MHZ BAND PLAN

This band plan relates to the spectrum between **820 and 960 MHz** which for convenience will be referred to as the **900 MHz Band**.

In accordance with the ITU Radio Regulations for Region 3, the Papua New Guinea Table of Frequency Allocations makes provision for the following services in the 900 MHz Band:

_ Fixed
_ Mobile
_ Broadcasting
_ Radiolocation

This band was predominantly used for fixed services including audio/video Studio to Transmitter Links, Civil Aviation Links and Multi-channel PSTN Links.

Technological developments for land mobile services in this band world-wide have displaced the fixed services to other parts of the spectrum. This band is now largely considered a land mobile band.

B. OBJECTIVE

The objective of the band plan is to take account of developments in radiocommunications in the 900 MHz Band and to accommodate user demand for new services in this band in PNG.

The spectrum arrangements may be regarded as basic planning guide-lines, in which maximum flexibility will be applied whenever possible to satisfy user demand.

C. RADIOCOMMUNICATION SYSTEMS ACCOMMODATED BY THE BAND PLAN

This document allocates spectrum to various radiocommunication services/systems such as:

_ Global System for Mobile Communications (GSM)
_ Trunked Land Mobile Radio Service (TLMRS)
_ Conventional Land Mobile Service
_ Spread Spectrum Systems
_ Cordless Telephones (CT)
_ Single Frequency Single Channel Links
_ Two Frequency Single Channel Links
_ Low Capacity Fixed Links
_ Telemetry and Telecommand Systems
_ Data Communication Systems
_ Sound Broadcasting Studio to Transmitter Links (STLs)
_ Sound Outside Broadcast (SOB) Service/Links (SOBLs)
_ Industrial, Scientific and Medical (ISM) Applications
_ Radiolocation
_ Local Area Wireless Network (LAWN)
_ Wireless Modems
_ Wireless Microphones
_ Multi-channel PSTN Links

D. STRUCTURE OF THE BAND PLAN

The band layout is shown at Annex B - "SPECTRUM ALLOCATIONS IN THE 900 MHz BAND". The channel arrangements are given at Annex C.

The band plan is predominantly the digital GSM 900 Cellular Mobile Telephone Service (CMTS) adopted by PNG.

Other parts of the spectrum accommodate new services for which expressions of interest by prospective providers have been registered by the Papua New Guinea Telecommunication Authority (PANGTEL) as the major factor in determining the configuration of these parts.

E. SERVICE SUBDIVISIONS

1. CELLULAR MOBILE TELEPHONE SERVICE (CMTS)

The purpose of the re-plan of this Band is primarily to facilitate the introduction of public mobile telecommunication competition in Papua New Guinea, in particular to provide spectrum allocations for the digital cellular mobile telephone services using GSM technology. The channel arrangements are given at Annex D.

The Band Plan aims to provide for the orderly continuation of existing services affected by the above allocations for public mobile telecommunication services; wherever possible providing alternative allocations for displaced services to allow transitional arrangements within the 820 – 960 MHz band.

While spectrum allocations in this band will affect most existing services to some extent, all practicable steps will be taken to protect the 880 – 915 MHz and 925 – 960 MHz sub-bands for the current GSM services in Papua New Guinea. No new assignments will be made within this band

The exact amount of spectrum to be allocated for CMTS will depend on the acceptance of this service in PNG and the number of permitted service providers.

a) AMPS

AMPS was the initial CMTS technology adopted and deployed. The spectrum allocated were:

Base Receive	Base Transmit
825 – 845 MHz	870 – 890 MHz

Its deployment was short lived and replaced by GSM 900. The upper half of the AMPS spectrum is relinquished and allocated to GSM. Other spectrum is reserved for future use wireless access applications).

b) GSM (PGSM and EGSM)

GSM 900 spectrum encompasses both the Extended (EGSM) and Standard GSM (PGSM) 900 spectrum. The GSM system will use the frequency arrangement shown below:

Segment	Base Station/Up-Link	Base Station/ Down-Link
M/M1	880 - 915 MHz	925 - 960 MHz

A total of 35 MHz up link and down link pair has been divided equally between the three CMTS operators.

The current GSM allocation is on a permanent basis and with these changes certain services will need to be accommodated in other bands. The guard band is from 915 MHz to 925 MHz and is reserved for Spread

Spectrum Systems (see Spread Spectrum Systems)... All such services will be employed on non-interference basis.

2. CONVENTIONAL AND TRUNKED LAND MOBILE RADIO SERVICE (TLMRS)

These services will share the frequency segments as shown below:

Segment	Base Receive	Base Transmit
E/E1	820 - 825 MHz	865 - 870 MHz

These segments are allocated to trunking and conventional land mobile services even though these services are well provided for in lower frequency bands. The 900 MHz allocation arises from the availability of
spectrum created by this exercise and is intended to give users more options when developing radiocommunication systems. This band will be free from congestion and interference for a long period of time. User experience with mobile applications in the 900 MHz band which is very limited at present will also be enhanced.

3. SPREAD SPECTRUM SYSTEMS

The 915 - 925 MHz spectrum (Segment N) is allocated for spread spectrum and ISM systems. This allocation may support various data applications like wireless modems, wireless PBXs, telemetry and telecommand systems etc. Coordination is however required.

4. CORDLESS TELEPOINT SERVICE (CTS)

The 861 - 865 MHz spectrum (Segment L) may be used for the UK developed cordless telephone technology, CT2, widely adopted throughout this region with large scale implementation in some countries.

Combined with paging this service may be expected to compete for customers with the CMTS. With lower infrastructure and personal equipment costs this service may be affordable by a greater number of people. In fact majority locations in PNG are not posed for CMTS as there is little road infrastructure to permit great travel distances and speeds. The tourist industry however may be well posed for CTS.
This allocation may also support wireless PBX and wireless modems.

5. SINGLE CHANNEL LINKS

Single channel links refer to fixed links with the capacity to carry one voice channel or a digital signal with occupied bandwidth no greater than that of a voice channel. These links may operate in a single frequency mode of operation. These links may operate in a single frequency or two frequency mode of operation for either point-to-point or point-to-multi-point systems. The Two frequency (TFSC) Tx segment (928 – 929.5 MHz) is waived as it falls within the current extended GSM band.

a) Point to Point Links

The fixed point-to-point links may operate within the arrangements shown below:

Single Frequency (SFSC)	Two Frequency (TFSC)	
Segment	J (i)	H (i)
Frequency	857 - 858 MHz	852 - 853.5 MHz
Channels	40	60
Spacing	25 kHz	25 kHz
Tx/Rx Separation		76 MHz

The single frequency links may be used for remote control of paging transmitters, repeaters etc.

The two frequency links may be used for linking of repeaters and RTSS equipment. Strict rules regarding the relationship between transmit and receive frequencies will be observed when more than one link from the same frequency segment is used at the same site.

b) Point to Multi-Point Links

The fixed point-to-point links may operate within the arrangements shown below:

Single Frequency (SFSC)	Two Frequency (TFSC)	
Segment	J (ii)	H (ii)
Frequency	858 - 859 MHz	853.5 -854
Channels	40	20
Spacing	25 kHz	25 kHz
Tx/Rx Separation	76 MHz	

These segments will be used primarily for data communications, telemetry and telecommand systems; however voice communication will be permitted on the same channel.

6. LOW CAPACITY FIXED LINKS (TFLC)

The 854-857 MHz spectrum (Segment I) may be used for low capacity fixed links for more than one voice channel and for data communications. There are 15 channels with 200 kHz spacing. The maximum number of voice channels per link and the data communication speed will be determined by the modulation method employed subject to occupied bandwidth permitting adjacent channel operation.

These links operate in a two frequency mode and may therefore be used for Sound Broadcasting Links (SBLs) for the purpose of multihopping.

7. INDUSTRIAL, SCIENTIFIC AND MEDICAL (ISM) APPLICATIONS

With regard to radio frequency spectrum, ISM devices may be classified as devices which generate and use radio frequency for purposes other than radiocommunications, for example microwave ovens. The energy is confined to limited enclosures appropriate to the particular application and very little energy is allowed to be radiated as undesired leakage.

Subject to no interference and no protection ISM equipment is permitted to operate in the 918 - 925 MHz band i.e. Segment N.

8. SOUND BROADCASTING LINKS (SBLs)

The 850-852 MHz spectrum (Segment G) is allocated to Sound Broadcasting Links. There are 16 channels with nominal channel bandwidth of 125 kHz for mono programmes while for stereo programmes three contiguous channels may be used. A greater number of SBLs may be needed when the FM broadcasting service is more developed. This allocation may than be extended towards the 845-850 MHz spectrum which is reserved by this band plan.

a) Studio to Transmitter Links (STLs)

The first 12 SBL channels, 850 - 851.5 MHz segment, may be used for STLs.

b) Sound Outside Broadcast Links (SOBLs)

The last 4 SBL channels, 851.5-852 MHz segment, may be used for SOBLs.

9. RADIOLOCATION

The 915-925 MHz spectrum (Segment N) may be used for radiolocation by Defence as a secondary service or relevant/appropriate coordination.

10. WIRELESS MICROPHONES

Wireless microphones are permitted to operate in the 900 MHz band subject to TR 619 "CONDITIONS FOR OPERATION AND LICENSING OF LOW POWER DEVICES".

Some of the frequencies specified in TR 619 which are permitted for wireless microphones fall in the GSM Down Link segment (M). This band is now predominantly allocated for the current GSM services and therefore will not be permitted.

11. WIDE-BAND LINKS

For the purpose of this band plan the term wide-band link refers to links which occupy bandwidth greater than 200 kHz but less than 2 MHz.

The 890-960 MHz sub-band which has previously been allocated for Multi-channel PSTN links is now been greatly affected as this band segment falls within the current GSM primary service. The existing services in this band will strictly need to be accommodated in other bands.

However to provide for other services appropriate to the 900 MHz band and mainly required in urban areas the use of fixed wide-band links will be restricted to rural areas. Furthermore, the PSTN may only use the first two and the last two channels for wide band fixed links on a secondary basis in all areas.

Arrangements for this spectrum will be reviewed when required and will depend on CMTS developments and the requirements for other services in PNG. The GSM technology has been adopted and as a result future use of this segment for wide-band links will only be possible in those areas where CMTS will not be expected to operate.

F. RESERVED SPECTRUM (R)

All of the CMTS international allocations will be temporarily reserved until this service is fully established and may not be used for other purposes on a permanent basis.

The 845-850 MHz and 859-861 MHz segments will also be reserved for future planning as there is no evident demand for this band at this time. In some cases existing services affected by current GSM systems may shift allocations to facilitate in this segment.

Until allocated properly the reserved spectrum if required may be used on a temporary basis. Users should be made aware that they may have to be reassigned to another band if necessary when this band is allocated.

G. SERVICES AFFECTED BY THE PROPOSED BAND PLAN

The TV UHF bands are now re-planned. The main aim of the re-planning is to reduce the UHF TV bandwidth from the current 8 MHz to 7 MHz. Current TV technology has resulted in TV equipment (receivers etc,) that can perform reasonably well in the UHF bands. This results in saving of 41 MHz. (see Board Meeting No: 15, Agenda Item no 9, January 2000).

In the re-plan, the total number of UHF TV channels is unchanged. The "alignment" of the channel numbers with the channel limit will however change. The upper limit of TV UHF band V is now 813 MHz.

The existing TV Broadcasting Planning Policy permits that for economical reasons the 814-854 MHz spectrum i.e. channels 64 to 68 may temporarily be used for in-band Studio to Transmitter Television Links (STLs).

The upper half of the band i.e. 890-960 MHz previously being used for fixed wide-band links by Telikom is now predominantly allocated to extended GSM services on primary basis.

THE 900 MHz BAND PLAN

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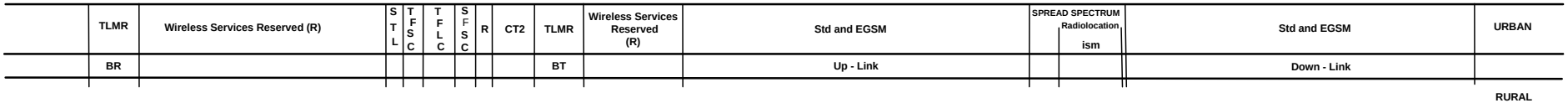
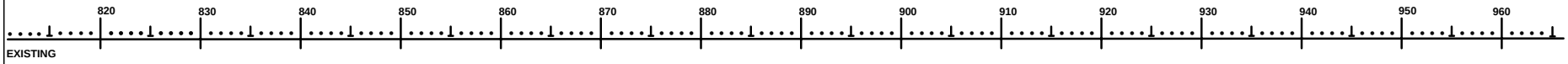
ANNEX A

REGIONAL BAND PLANS AND EXISTING 900 MHz BAND PLANS FOR PAPUA NEW GUINEA

PROPOSED — **PAPUA NEW GUINEA**

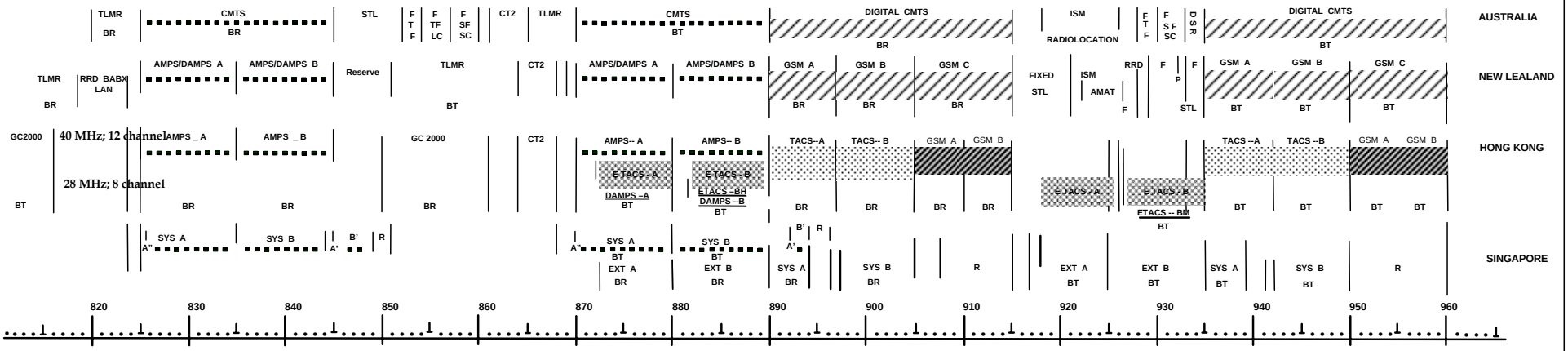




Legend:

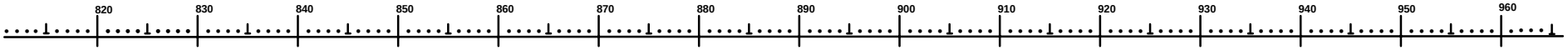
EGSM	Extended GSM 900	TLMR	Trunked land Mobile Radio	R	Reserved	BR	Base Receive
Std GSM	Standard GSM 900	TFLC	Two Frequency Low Capacity	TFSC	Two Frequency Single Channel	BT	Base Transmit
CMTS	Cellular Mobile telephone service	SFSC	Single Channel Single Frequency	CT2	Cordless Telephone		
GSM	Global System for Mobile Communications			STL	Studio to Transmitter Link	ISM	Industrial Scientific and Medical

REGIONAL



ANNEX B

SPECTRUM ALLOCATIONS IN THE 900 MHz BAND



>> URBAN

BR												BT			Up - Link		Down - Link	SITE SENSE
E 1	A 1		C 1	D 1	B	F	G	H	I	J	K	L	E	C	A	M	N	M 1	SEGMENT
TLMR	Wireless Services Reserved (R)						STL	TFSC	TFLC	SFSC	R	CT2	TLMR	Wireless Services Reserve (R)		Std and EGSM	SPREAD SPECTRUM Radiolocation ism	Std and EGSM	SERVICE SYSTEMS
200							16	80	15	80			200						CHANNELS

Legend:

EGSM	Extended GSM 900
Std GSM	Standard GSM 900
CMTS	Cellular Mobile telephone service
GSM	Global System for Mobile Communications
TLMR	Trunked land Mobile Radio
TFLC	Two Frequency Low Capacity
SFSC	Single Channel Single Frequency
R	Reserved
TFSC	Two Frequency Single Channel
CT2	Cordless Telephone
STL	Studio to Transmitter Link
BR	Base Receive
ISM	Industrial Scientific and Medical
1	Base Receive Segment
A _ O	Segment

CHANNEL ARRANGEMENTS IN THE 900 MHz BAND

SEGMENT E/E1: Two Frequency Trunked and Conventional Land Mobile Tx: 865.0 – 870.0 MHz Base Rx 820.0 – 825.0 MHz Tx/Rx = 45 MHz 200 channels at 25 kHz

Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx
1	820.0125	865.0125	30	820.7375	865.7375	59	821.4625	866.4625	88	822.1875	867.1875	117	822.9125	867.9125	146	823.6375	868.6375	175	824.3625	869.3625
2	820.0375	865.0375	31	820.7625	865.7625	60	821.4875	866.4875	89	822.2125	867.2125	118	822.9375	867.9375	147	823.6625	868.6625	176	824.3875	869.3875
3	820.0625	865.0625	32	820.7875	865.7875	61	821.5125	866.5125	90	822.2375	867.2375	119	822.9625	867.9625	148	823.6875	868.6875	176	824.4125	869.4125
4	820.0875	865.0875	33	820.8125	865.8125	62	821.5375	866.5375	91	822.2625	867.2625	120	822.9875	867.9875	149	823.7125	868.7125	178	824.4375	869.4375
5	820.1125	865.1125	34	820.8375	865.8375	63	821.5625	866.5625	92	822.2875	867.2875	121	823.0125	868.0125	150	823.7375	868.7375	179	824.4625	869.4625
6	820.1375	865.1375	35	820.8625	865.8625	64	821.5875	866.5875	93	822.3125	867.3125	122	823.0375	868.0375	151	823.7625	868.7625	180	824.4875	869.4875
7	820.1625	865.1625	36	820.8875	865.8875	65	821.6125	866.6125	94	822.3375	867.3375	123	823.0625	868.0625	152	823.7875	868.7875	181	824.5125	869.5125
8	820.1875	865.1875	37	820.9125	865.9125	66	821.6375	866.6375	95	822.3625	867.3625	124	823.0875	868.0875	153	823.8125	868.8125	182	824.5375	869.5375
9	820.2125	865.2125	38	820.9375	865.9375	67	821.6625	866.6625	96	822.3875	867.3875	125	823.1125	868.1125	154	823.8375	868.8375	183	824.5625	869.5625
10	820.2375	865.2375	39	820.9625	865.9625	68	821.6875	866.6875	97	822.4125	867.4125	126	823.1375	868.1375	155	823.8625	868.8625	184	824.5875	869.5875
11	820.2625	865.2625	40	820.9875	865.9875	69	821.7125	866.7125	98	822.4375	867.4375	127	823.1625	868.1625	156	823.8875	868.8875	185	824.6125	869.6125
12	820.2875	865.2875	41	821.0125	866.0125	70	821.7375	866.7375	99	822.4625	867.4625	128	823.1875	868.1875	157	823.9125	868.9125	186	824.6375	869.6375
13	820.3125	865.3125	42	821.0375	866.0375	71	821.7625	866.7625	100	822.4875	867.4875	129	823.2125	868.2125	158	823.9375	868.9375	187	824.6625	869.6625
14	820.3375	865.3375	43	821.0625	866.0625	72	821.7875	866.7875	101	822.5125	867.5125	130	823.2375	868.2375	159	823.9625	868.9625	188	824.6875	869.6875
15	820.3625	865.3625	44	821.0875	866.0875	73	821.8125	866.8125	102	822.5375	867.5375	131	823.2625	868.2625	160	823.9875	868.9875	189	824.7125	869.7125
16	820.3875	865.3875	45	821.1125	866.1125	74	821.8375	866.8375	103	822.5625	867.5625	132	823.2875	868.2875	161	824.0125	869.0125	190	824.7375	869.7375
17	820.4125	865.4125	46	821.1375	866.1375	75	821.8625	866.8625	104	822.5875	867.5875	133	823.3125	868.3125	162	824.0375	869.0375	191	824.7625	869.7625
18	820.4375	865.4375	47	821.1625	866.1625	76	821.8875	866.8875	105	822.6125	867.6125	134	823.3375	868.3375	163	824.0625	869.0625	192	824.7875	869.7875
19	820.4625	865.4625	48	821.1875	866.1875	77	821.9125	866.9125	106	822.6375	867.6375	135	823.3625	868.3625	164	824.0875	869.0875	193	824.8125	869.8125
20	820.4875	865.4875	49	821.2125	866.2125	78	821.9375	866.9375	107	822.6625	867.6625	136	823.3875	868.3875	165	824.1125	869.1125	194	824.8375	869.8375
21	820.5125	865.5125	50	821.2375	866.2375	79	821.9625	866.9625	108	822.6875	867.6875	137	823.4125	868.4125	166	824.1375	869.1375	195	824.8625	869.8625
22	820.5375	865.5375	51	821.2625	866.2625	80	821.9875	866.9875	109	822.7125	867.7125	138	823.4375	868.4375	167	824.1625	869.1625	196	824.8875	869.8875
23	820.5625	865.5625	52	821.2875	866.2875	81	822.0125	867.0125	110	822.7375	867.7375	139	823.4625	868.4625	168	824.1875	869.1875	197	824.9125	869.9125
24	820.5875	865.5875	53	821.3125	866.3125	82	822.0375	867.0375	111	822.7625	867.7625	140	823.4875	868.4875	169	824.2125	869.2125	198	824.9375	869.9375
25	820.6125	865.6125	54	821.3375	866.3375	83	822.0625	867.0625	112	822.7875	867.7875	141	823.5125	868.5125	170	824.2375	869.2375	199	824.9625	869.9625
26	820.6375	865.6375	55	821.3625	866.3625	84	822.0875	867.0875	113	822.8125	867.8125	142	823.5375	868.5375	171	824.2625	869.2625	200	824.9875	869.9875
27	820.6625	865.6625	56	821.3875	866.3875	85	822.1125	867.1125	114	822.8375	867.8375	143	823.5625	868.5625	172	824.2875	869.2875			
28	820.6875	865.6875	57	821.4125	866.4125	86	822.1375	867.1375	115	822.8625	867.8625	144	823.5875	868.5875	173	824.3125	869.3125			
29	820.7125	865.7125	58	821.4375	866.4375	87	822.1625	867.1625	116	822.8875	867.8875	145	823.6125	868.6125	174	824.3375	869.3375			

Refer to Policy Document “Trunked Land Mobile Radiocommunication Service (TLMRS)” for Licensing and Frequency Assignment Guidelines.

ANNEX C

All Segments in lower edge of the band between 825 – 850 MHz and higher edge of 870 – 880 MHz previously allocated for AMPS have been relinquished and are made available for Wireless Services Reserved (R).

SEGMENT G: Single Frequency Sound Broadcast STLs (SOBLs) Base Tx/Rx: 850.0 – 852.0 MHz 16 channels at 125 kHz.

Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx
1	850.0625	4	850.4375	7	850.8125	10	851.1875	13	851.5625	16	851.9375
2	850.1875	5	850.5625	8	850.9375	11	851.3125	14	851.6875		
3	850.3125	6	850.6875	9	851.0625	12	851.4375	15	851.8125		

Apart from mono programmes, three adjacent channels may be used for stereo programmes. Channels 1 – 12 may be used for STLs. Channels 13 – 16 may be used for SOBLs.

SEGMENT H: (i): Two Frequency Single Channel Point to Point links Tx: 928 – 929.5 MHz Base Rx 852 – 853.5 MHz Tx/Rx sep: 76 MHz channels at 25 kHz.

Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx
1	852.0125	928.0125	10	852.2375	928.2375	19	852.4625	928.4625	28	852.6875	928.6875	37	852.9125	928.9125	46	853.1375	929.1375	55	853.3625	929.3625
2	852.0375	928.0375	11	852.2625	928.2625	20	852.4875	928.4875	29	852.7125	928.7125	38	852.9375	928.9375	47	853.1625	929.1625	56	853.3875	929.3875
3	852.0625	928.0625	12	852.2875	928.2875	21	852.5125	928.5125	30	852.7375	928.7375	39	852.9625	928.9625	48	853.1875	929.1875	57	853.4125	929.4125
4	852.0875	928.0875	13	852.3125	928.3125	22	852.5375	928.5375	31	852.7625	928.7625	40	853.9875	928.9875	49	853.2125	929.2125	58	853.4375	929.4375
5	852.1125	928.1125	14	852.3375	928.3375	23	852.5625	928.5625	32	852.7875	928.7875	41	853.0125	929.0125	50	853.2375	929.2375	59	853.4625	929.4625
6	852.1375	928.1375	15	852.3625	928.3625	24	852.5875	928.5875	33	852.8125	928.8125	42	853.0375	929.0375	51	853.2625	929.2625	60	853.4875	929.4875
7	852.1625	928.1625	16	852.3875	928.3875	25	852.6125	928.6125	34	852.8375	928.8375	43	853.0625	929.0625	52	853.2875	929.2875			
8	852.1875	928.1875	17	852.4125	928.4125	26	852.6375	928.6375	35	852.8625	928.8625	44	853.0875	929.0875	53	853.3125	929.3125			
9	852.2125	928.2125	18	852.4375	928.4375	27	852.6625	928.6625	36	852.8875	928.8875	45	853.1125	929.1125	54	853.3375	929.3375			

These channels may be used for linking of repeaters and RTSS equipment. Channel assignments will be determined by strict engineering evaluations for sites with more than one link from the same segment.

Note: The Two Frequency (TFSC) Tx segment (928 – 929.5 MHz) is waived as it falls within the current extended Dowin-Link GSM band. No such allocation is longer permitted except for SFSC systems.

SEGMENT H (ii): Two Frequency Single Channel Point to Multi-Point Links Base Tx; 929.5 – 930.0 MHz Base Rx: 853.5 – 854.0 MHz Tx/Rx sep: 76 MHz 20 channels at 25 kHz. Note: The Two Frequency (TFSC) Tx segment (929.5 – 930.0 MHz) is waived as it falls within the current extended Dowin-Link GSM band. No such allocation is longer permitted in this segment except SFSC.

Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx
1	853.5125	929.5125	4	853.5875	929.5875	7	853.6625	929.6625	10	853.7375	929.7375	13	853.8125	929.8125	16	853.8875	929.8875	19	853.9625	929.9625
2	853.5375	929.5375	5	853.6125	929.6125	8	853.6875	929.6875	11	853.7625	929.7625	14	853.8375	929.8375	17	853.9125	929.9125	20	853.9875	929.9875
3	853.5625	929.5625	6	853.6375	929.6375	9	853.7125	929.7125	12	853.7875	929.7875	15	853.8625	929.8625	18	853.9375	929.9375			

The channels will be used for data communications, telemetry and telecommand systems. Voice communication will also be permitted on the same channels.

SEGMENT 1: Two Frequency Low Capacity Links Base Tx: 930.0 – 933.0 MHz Base Rx: 854.0 – 857.0 MHz Tx/Rx sep: 76 MHz 15 channels at 200 kHz.

Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx	Ch	Rx	Tx
1	854.100	930.100	4	854.700	930.700	7	855.300	931.300	10	855.900	931.900	13	855.500	932.500
2	854.300	930.300	5	854.900	930.900	8	855.500	931.500	11	856.100	932.100	14	856.700	932.700
3	854.500	930.500	6	855.100	931.100	9	855.700	931.700	12	856.300	932.300	15	856.900	932.900

This segment may be used as STLs (sound) multihop links.

Note: The Two Frequency (TFSC) Tx segment (930.0 – 933.0 MHz) is also waived as it falls within the current extended Dowin-Link GSM band. No such allocation is longer permitted in this segment except SFSC.

SEGMENT J (i): Single Frequency Single Channel Point to Point links Base Tx/Rx 857.0 – 858.0 MHz 40 channels at 25 kHz.

Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx
1	857.0125	5	857.1125	9	857.2125	13	857.3125	17	857.4125	21	857.5125	25	857.6125	29	857.7125	33	857.8125	37	857.9125
2	857.0375	6	857.1375	10	857.2375	14	857.3375	18	857.4375	22	857.5375	26	857.6375	30	857.7375	34	857.8375	38	857.9375
3	857.0625	7	857.1625	11	857.2625	15	857.3625	19	857.4625	23	857.5625	27	857.6625	31	857.7625	35	857.8625	39	857.9625
4	857.0875	8	857.1875	12	857.2875	16	857.3875	20	857.4875	24	857.5875	28	857.6875	32	857.7875	36	857.8875	40	857.9875

These channels may be used for remote control of paging transmitters, repeaters etc.

SEGMENT J (ii): Single Frequency Single Channel Point to Multi-Point Links Base Tx/Rx: 858.0 – 859.0 MHz 40 channels at 25 kHz.

Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx	Ch	Rx = Tx
1	858.0125	5	858.1125	9	858.2125	13	858.3125	17	858.4125	21	858.5125	25	858.6125	29	858.7125	33	858.8125	37	858.9125
2	858.0375	6	858.1375	10	858.2375	14	858.3375	18	858.4375	22	858.5375	26	858.6375	30	858.7375	34	858.8375	38	858.9375
3	858.0625	7	858.1625	11	858.2625	15	858.3625	19	858.4625	23	858.5625	27	858.6625	31	858.7625	35	858.8625	39	858.9625
4	858.0875	8	858.1875	12	858.2875	16	858.3875	20	858.4875	24	858.5875	28	858.6875	32	858.7875	36	858.8875	40	858.9875

These channels will be used for data communications, telemetry and telecommand systems. Voice communication will be also permitted on the same channels.

SEGMENT L: Cordless telephone Services (CTS) 861 – 865 MHz.

This segment may be used for UK developed cordless telephone technology - CT2, combined with paging. It may also support wireless PBX and wireless moderms.

SEGMENT M/M1: GSM System Up-link: 880 – 915 MHz Down-Link: 925 – 960 MHz.

Spectrum in this segment is assigned to the current GSM services on a primary basis.

SEGMENT N: Spread Spectrum Systems 915 – 925 MHz.

Segment N supports low power data applications like wireless moderms, wireless PBXs, telemetry and telecommand systems etc. It also incorporates ISM applications (918 – 925 MHz) and radiolocation for Defence (915 – 925 MHz).

SEGMENT R: Reserved (R) 825 – 850 MHz and 870 – 880 MHz is reserved for wireless services.

Spectrum may be used on a temporary basis.

TV channels/STLs: 814 – 854 MHz channels 64 to 68

This spectrum which was used for TV STLs is now cleared to cater for Wireless Services Reserved (R).

The UHF TV bands are now re-planned to reduce the bandwidth from current 8 MHz to 7 MHz which results in saving of 41 MHz.

In the re-plan the total number of UHF TV channels is unchanged. The “alignment” of the channel numbers with the channel limit will however change. The upper limit of UHF TV band V is now 813 MHz (refer: Re-planning of the UHF TV Bands IV and V channel arrangements, January 2000).

ANNEX D

SPECTRUM ARRANGEMENTS IN THE PNG GSM 900 MHz BAND

SEGMENT M/M1: Two Frequency CMTS (Digital) GSM 900 U-Link : 880 – 915 MHz D-Link: 925 – 960 MHz, U-Link/D-link separation = 45 MHz 175 channels at 200 kHz.

Operator 1

Ch	No	U/link	D/link	Ch	No	U/link	D/link
0	975	880.00	925.00	30	1005	886.00	931.00
1	976	880.20	925.20	31	1006	886.20	931.20
2	977	880.40	925.40	32	1007	886.40	931.40
3	978	880.60	925.60	33	1008	886.60	931.60
4	979	880.80	925.80	34	1009	886.80	931.80
5	980	881.00	926.00	35	1010	887.00	932.00
6	981	881.20	926.20	36	1011	887.20	932.20
7	982	881.40	926.40	37	1012	887.40	932.40
8	983	881.60	926.60	38	1013	887.60	932.60
9	984	881.80	926.80	39	1014	887.80	932.80
10	985	882.00	927.00	40	1015	888.00	933.00
11	986	882.20	927.20	41	1016	888.20	933.20
12	987	882.40	927.40	42	1017	888.40	933.40
13	988	882.60	927.60	43	1018	888.60	933.60
14	989	882.80	927.80	44	1019	888.80	933.80
15	900	883.00	928.00	45	1020	889.00	934.00
16	991	883.20	928.20	46	1021	889.20	934.20
17	992	883.40	928.40	47	1022	889.40	934.40
18	993	883.60	928.60	48	1023	889.60	934.60
19	994	883.80	928.80	49	1024	889.80	934.80
20	995	884.00	929.00	50	0	890.00	935.00
21	996	884.20	929.20	51	1	890.20	935.20
22	997	884.40	929.40	52	2	890.40	935.40
23	998	884.60	929.60	53	3	890.60	935.60
24	999	884.80	929.80	54	4	890.80	935.80
25	1000	885.00	930.00	55	5	891.00	936.00
26	1001	885.20	930.20	56	6	891.20	936.20
27	1002	885.40	930.40	57	7	891.40	936.40
28	1003	885.60	930.60	58	8	891.60	936.60
29	1004	885.80	930.80				

Operator 2

Ch	No	U/link	D/link	Ch	No	U/link	D/link
59	9	891.80	936.80	88	38	897.60	942.60
60	10	892.00	937.00	89	39	897.80	942.80
61	11	892.20	937.20	90	40	898.00	943.00
62	12	892.40	937.40	91	41	898.20	943.20
63	13	892.60	937.60	92	42	898.40	943.40
64	14	892.80	937.80	93	43	898.60	943.60
65	15	893.00	938.00	94	44	898.80	943.80
66	16	893.20	938.20	95	45	899.00	944.00
67	17	893.40	938.40	96	46	899.20	944.20
68	18	893.60	938.60	97	47	899.40	944.40
69	19	893.80	938.80	98	48	899.60	944.60
70	20	894.00	939.00	99	49	899.80	944.80
71	21	894.20	939.20	100	50	900.00	945.00
72	22	894.40	939.40	101	51	900.20	945.20
73	23	894.60	939.60	102	52	900.40	945.40
74	24	894.80	939.80	103	53	900.60	945.60
75	25	895.00	940.00	104	54	900.80	945.80
76	26	895.20	940.20	105	55	901.00	946.00
77	27	895.40	940.40	106	56	901.20	946.20
78	28	895.60	940.60	107	57	901.40	946.40
79	29	895.80	940.80	108	58	901.60	946.60
80	30	896.00	941.00	109	59	901.80	946.80
81	31	896.20	941.20	110	60	902.00	947.00
82	32	896.40	941.40	111	61	902.20	947.20
83	33	896.60	941.60	112	62	902.40	947.40
84	34	896.80	941.80	113	63	902.60	947.60
85	35	897.00	942.00	114	64	902.80	947.80
86	36	897.20	942.20	115	65	903.00	948.00
87	37	897.40	942.40	116	66	903.20	948.20

Operator 3

Ch	No	U/link	D/link	Ch	No	U/link	D/link
117	67	903.40	948.40	146	96	909.20	954.20
118	68	903.60	948.60	147	97	909.40	954.40
119	69	903.80	948.80	148	98	909.60	954.60
120	70	904.00	949.00	149	99	909.80	954.80
121	71	904.20	949.20	150	100	910.00	955.00
122	72	904.40	949.40	151	101	910.20	955.20
123	73	904.60	949.60	152	102	910.40	955.40
124	74	904.80	949.80	153	103	910.60	955.60
125	75	905.00	950.00	154	104	910.80	955.80
126	76	905.20	950.20	155	105	911.00	956.00
127	77	905.40	950.40	156	106	911.20	956.20
128	78	905.60	950.60	157	107	911.40	956.40
129	79	905.80	950.80	158	108	911.60	956.60
130	80	906.00	951.00	159	109	911.80	956.80
131	81	906.20	951.20	160	110	912.00	957.00
132	82	906.40	951.40	161	111	912.20	957.20
133	83	906.60	951.60	162	112	912.40	957.40
134	84	906.80	951.80	163	113	912.60	957.60
135	85	907.00	952.00	164	114	912.80	957.80
136	86	907.20	952.20	165	115	913.00	958.00
137	87	907.40	952.40	166	116	913.20	958.20
138	88	907.60	952.60	167	117	913.40	958.40
139	89	907.80	952.80	168	118	913.60	958.60
140	90	908.00	953.00	169	119	913.80	958.80
141	91	908.20	953.20	170	120	914.00	959.00
142	91	908.40	953.40	171	121	914.20	959.20
143	93	908.60	953.60	172	122	914.40	959.40
144	94	908.80	953.80	173	123	914.60	959.60
145	95	909.00	954.00	174	124	914.80	959.80
				175	125	915.00	960.00

Standard GSM 900 and EGSM : 880 – 915 MHz Up-Link and 925 – 960 MHz Down-link total BW: 35 MHz 175 channels at 200 kHz spacing, tolerance +/- 100 kHz, Tx/Rx separation 45 MHz. The BW per operator: 11.6 MHz.

ARFCN 975 and 125 are not allocated (to be used upon coordination with non-GSM operators in adjacent frequency bands and clearance from PANGTEL). Guard band of 400 kHz min between adjacent operators (operator co-ordination required for Guard Band usage).

ARCFN – Absolute Radio Frequency Carrier Number.

Channel: FnUp = 880 +0.2 (n-1) MHz
Channel: Fn Down = 925 + 0.2 (n-1) MHz