4.1 CHANNEL DESIGNATION SYSTEM FOR VHF/UHF FM CHANNELS

Although the FM channels can be referenced by their centre frequency, a numbering/naming system for FM channels in the 50 MHz, 145 MHz and 435 MHz is recommended (Tel Aviv 1996)

note : For the microwave bands the "old" numbering system as indicated in the bandplan still is recommended.

The system is based upon the following principles :

1) For each band, there should be a "designator letter":

   51 MHz : **F**

   145 MHz : **V**

   435 MHz : **U**

2) Each designator letter should be followed by two (for 50 and 145 MHz) or three (for 435 MHz) digits which indicate the channel.

3) If a channel is used as a repeater *output*, its designator should be preceded by the letter "**R**".

4) In the 50 MHz band the channel numbers start at A00A for 51.000 MHz and increment by one for each 10 kHz.

5) In the 145 Mhz band the channel numbers start at A00A for 145.000 MHz and increment by one for each 12.5 kHz.

6) In the 435 MHz band the channel numbers start at A000A for 430 MHz and increment by one for each 12.5 kHz.

Examples

F51 Simplex frequency 51.510 MHz
RF79 Repeater with output frequency 51.790 MHz
V40 Simplex frequency 145.500 MHz (the old S20)
RV48 Repeater with output frequency 145.600 MHz (the old R0)
U280 Simplex frequency 433.500 MHz (the old SU20)
RU002 Repeater with output frequency 430.025 MHz (the old FRU1)
RU242 Repeater with output frequency 433.025 MHz (the old RB1)
RU368 Repeater with output frequency 434.600 MHz (the old RU0)
RU692 Repeater with output frequency 438.650 MHz (the old R70)

note : In the 50 Mhz band no FM channels are defined below 51 MHz. (See also footnote e to the 50 MHz bandplan.
In the 145 MHz band FM channels only exist for the segment with the channel frequencies 145.000 -- 145.800 Mhz (the latter channel may be used for a downlink by manned space stations)
In the 435 MHz band no FM channels are defined in the segment 432.000 MHz -- 433.000 MHz

4.4 144 - 146 MHz BANDPLAN

Frequency (MHz)	Maximum Bandwidth (-6dB)	MODE	USAGE
144.000 **144.110**	**500Hz**	**Telegraphy(a)** **EME**	144.050 Telegraphy calling 144.100 Random MS(**m**)
144.110 **144.150**	**500Hz**	**Telegraphy** **MGM**	144.110–144.160 EME MGM 144.138 PSK31 center of activity
144.150 **144.180**	**2700Hz**	**Telegraphy, SSB, MGM**	144.160.144.180 alternative MGM allocation 144.170 alternative MGM calling frequency
144.180 **144.360**	**2700Hz**	**Telegraphy & SSB**	144.195-144.205 Random MS SSB (**m**) 144.300 SSB calling
144.360 **144.399**	**2700Hz**	**Telegraphy, SSB, MGM**	144.370 FSK441 Random calling(**m**)
144.400 **144.491**	**500Hz**	**Telegraphy** **MGM**	Beacons exclusive(**b**) 144.4905 +/-500Hz WSPR Beacons
144.500 **144.794**	**20kHz**	**All mode (f)**	144.500 SSTV calling 144.525 ATV SSB talk back 144.600 RTTY calling(**n**) 144.630-144.660 Linear Transponder OUT 144.660-144.690 Linear Transponder IN 144.700 FAX calling 144.750 ATV talk back
144.794 **144.990**	**12kHz**	**MGM (h)**	144.800 APRS

144.994 **145.194**	**12kHz**	**FM / Digital voice**	Repeater Input exclusive (**c**)
145194 **145.206**	**12kHz**	**FM / Digital voice (i)**	Space communication (**p**)
145.206 **145.5935**	**12kHz**	**FM / Digital voice (i)**	145.2375 FM Internet Voice Gateway 145.2875 FM Internet Voice Gateways 145.300 RTTY local 145.3375 FM Internet Voice Gateway 145.375 digital voice calling 145.500 (mobile) calling
145.594 **145.7935**	**12kHz**	**FM / Digital voice**	Repeater Output exclusive (**c,d**)
145.794 **145.806**	**12kHz**	**FM / Digital voice (i)**	Space communication (**p**)
145.806 **146.000**	**12kHz**	**ALL MODE (e)**	Satellite exclusive

NOTES ON THE 144 - 146 MHz BANDPLAN

1. IARU REGION 1 BANDPLAN

The following notes are part of the officially adopted IARU Region 1 bandplan, and all member societies should strongly promote adherence to the recommendations made in these notes.

1.1. General

i. In Europe no input or output channels of telephony repeaters shall be allowed to operate between 144.000 and 144.794 MHz.

ii. Except in the part of the band allocated to the Amateur Satellite Service and the linear transponders it is not allowed to use input- or output frequencies in the 145 MHz band for repeaters with in- or output in other amateur bands (Miskolc-Tapolca 1978, San Marino 2002).

iii. No packet-radio networks will be set up in the 145 MHz band (revised Lillehammer 1999)
It is recognised that in some parts of Region 1 the introduction of packet-radio may require the use of access frequencies in the 144 - 146 MHz band for a limited time (Düsseldorf 1989).

Note. The parts of Region 1 meant are those parts with low amateur population and/or those at the periphery of the Region, where exceptions can be tolerated as these do not harm the orderly use of the band in the parts of Region 1 where there is a greater pressure on the available spectrum space. In the latter part of the Region the second paragraph of the footnote should never be used to justify ignoring the first part for a considerable time.

1.2. Footnotes

a. Telegraphy is permitted over the whole band, but preferably not in the beacon band; Telegraphy exclusive between 144.000 - 144.110 MHz.

b. Refer to Beacons Chapter for coordination of beacons in the beacon sub-band Section **Fehler! Verweisquelle konnte nicht gefunden werden.**.

c. For technical standards on FM and repeaters see section 8

If there is a real need for more repeater channels (see section10), it is recommended that Societies or Repeater Groups consider setting up a repeater system on the higher frequency band(s).

Further to this subject the following recommendation was adopted in De Haan, 1993:

For FM repeater and simplex operation in the 144 to 146 MHz band IARU Region 1 will change to a genuine 12.5 kHz channel spacing system.
Furthermore in Tel Aviv, 1996 it was decided that societies shall promote the use of the 12.5 kHz channel spacing standard for FM channels in order to effectively implement the 12.5 kHz system .

For the numbering of FM telephony channels, see annex 2 to this section.

d. Established simplex frequencies on repeater output channels may be retained.

e. In view of the important public relations aspect of amateur satellite activities, it was decided at the IARU Region 1 Conference in Miskolc-Tapolca (1978) that:

i) AMSAT will be allowed to use the band 145.8 - 146.0 MHz for amateur satellite activity.

This decision was re-confirmed at the IARU Region 1 Conference in Brighton (1981).

iii) see also footnote p

f. No unmanned stations shall use the all-mode segment, except for linear transponders and ARDF beacons. (Tel Aviv 1996, San Marino 2002)

g. Attention is drawn to section 1.1. point iii of these Bandplan notes!

h. Network stations shall only operate in the part of the 145 MHz band allocated to Digital Communications and will be permitted only for a limited time. Such network stations should also have access ports on other VHF/UHF or Microwave bands and should not use the 145 MHz band to forward traffic to other network stations. In view of the time limitation the set-up of new network stations is not encouraged (De Haan, 1993).

Unmanned packet radio stations are only allowed in the segment 144.800 - 144.990 MHz. Outside of this segment the signal level produced by those stations shall be not larger than 60 dB below the carrier level (measured in a 12 kHz bandwidth). Any other unmanned packet radio and digital access points must cease operation not later than 31 December 1997.(Tel Aviv 1996).

i. This segment is for simplex use only with no Digital Voice gateways. Embedded data traffic is allowed along with digital voice. Digital Voice users should check that the channel is not in use by FM

2. USAGE

The following notes are referring to the Usage column in the bandplan. As already set out in the introduction to section IIc, in the right amateur spirit operators should take notice of these agreements which are made for operating convenience, but no right to reserved frequencies can be derived from a mention in the Usage column or from the following notes.

EME activity using MGM is commonly practised between 144.110-144.160MHz

2.1. Footnotes

m. See procedures set out in section 7.4

n. Publicity should be given to the usage of frequencies around 144.600 MHz by RTTY stations, in order to keep these frequencies clear from other traffic and to avoid interference with those RTTY stations.

p. For FM voice communications with special stations like manned spacecraft it is recommended to use 145.200 MHz for simplex operation or 145.200/145.800 MHz for split-channel operation (Vienna 1995/Tel Aviv 1996).

q It is recognised that in the IARU Region 1 rules for the Championships in Amateur Radio Direction Finding (ARDF) competitions, the frequencies for the unmanned beacons are in the segment 144.500 – 144.900 MHz. These beacons run low power and are on the air only during ARDF events. (Davos 2005)

4.5 430 - 440 MHz BANDPLAN

Frequency MHz	Maximum Bandwidth	MODE	USAGE	
430.000 SUB-REGIONAL (national bandplanning) (**d**) **431.975**	20kHz	ALL MODES	430.025 - 430.375 430.400 - 430.575 430.600 - 430.925 430.925 - 431.025 431.050 - 431.825 431.625 - 431.975	FM repeater output-channel freqs (F/PA/ON),12,5 kHz spacing, 1.6 MHz shift (f) Digital communication link channels (g) (j) Digital communications repeater channels (g) (j) (l) Multi mode channels (j) (k) (l) Repeater input channel freqs (HB/DL/OE), 25 kHz spacing, 7.6 MHz shift (f) Repeater input channel freqs (F/PA/ON), 12.5 kHz spacing, 1.6 MHz shift
432.000 **432.025**	500Hz	Telegraphy (**a)**		EME
432.025 **432.100**	500Hz	Telegraphy (**a)** MGM	432.050 432.088	Telegraphy centre of activity PSK31 centre of activity
432.100 **432.400**	2700Hz	Telegraphy SSB MGM	432.200 432.350 432.370	SSB centre of activity Microwave talkback centre of activity FSK441 random calling
432.400 **432.490**	500Hz	Telegraphy, MGM		Beacons exclusive (**b**)

Frequency MHz	Maximum Bandwidth	MODE	USAGE	
432.500 **432.975**	12kHz	ALL MODES	432.500 432.500-432.600 432.600 432.700 432.600-432.800	NEW APRS FREQUENCY LINEAR TRANSPONDER IN(**e**) RTTY (ASK/PSK) FAX (ASK) LINEAR TRANSPONDER OUT (**e**) REPEATER INPUT REGION 1 STANDARD, 25 kHz spacing, 2 MHz shift (Channel freq 432.600 - 432.975MHz) In the UK repeater OUTPUT channels.
433.000 **433.375**	12 kHz	FM **Digital voice** Repeater (p)		REPEATER INPUT REGION 1 STANDARD, 25 kHz spacing, 1.6 MHz shift (Channel freq 433.000--433.375 MHz) I
433.400 **433.575**	12 kHz	**FM** **Digital voice** **(f) (o)**	433.400 433.450 433.500	SSTV(FM/AFSK) digital voice calling (Mobile) FM calling SIMPLEX CHANNELS, 25 kHz spacing, (Channel freq 433.400 -- 433.575 MHz)
433.600 **434.000**	20kHz	ALL MODES	433.600 433.625 - 433.775 433.700 434.000	RTTY (AFSK/FM) Digital communications channels (**g**) (**h**) (**i**) FAX channel (FM/AFSK) Centre frequency of digital experiments as defined on note **(m)**
434.400 434.594	12kHz (c)	ALL MODES ATV (c)	434.450 - 434.575	Digital communications channels (by exception !!) (**i**)

Frequency MHz	**Maximum Bandwidth**	**MODE**	**USAGE**	
434.594 ATV (**c**) & FM **434.981**	12kHz (c)	ALL MODES		REPEATER OUTPUT (region 1 system), 25 kHz spacing, 1.6 MHz shift, (Channel freq 434.600 -- 434.975 MHz) In the UK repeater INPUT channels
435.000 **438.000**	20kHz (c)	Satellite service & ATV (**c**)		
438.000 ATV (**c**) & SUB-REGIONAL (national bandplanning) (**d**) **440.000**	20kHz (c)	ALL MODES	438.025 - 438.175 438.200 - 438.525 438.550 - 438.625 438.650 - 439.425 439.800 -- 439.975 439,9875	Digital communications channel frequency (**g**) Digital communications repeater channels (**g**) (**j**) (**l**) Multi-mode (**j**) (**k**) (**l**) Repeater output channels (HB/DL/OE), 25 kHz spacing, 7.6 MHz shift, (**f**) **(p)** Digital communications link channels (**g**) (**j**) POCSAG centre

NOTES ON THE 430 - 440 MHz BANDPLAN

1.IARU REGION 1 430-440MHz BANDPLAN

The following notes are part of the officially adopted IARU Region 1 bandplan, and all member societies should strongly promote adherence to the recommendations made in these notes.

1.1. General

i. In Europe no input or output channels of telephony repeaters shall be allowed to operate between 432 and 433 MHz.(From 1-1-2004 those frequencies are between 432.000 and 432.600 MHz)

iii. FM telephony channels and Repeaters are specified in chapter 8.8.6

1.2. Footnotes

a. Telegraphy is permitted over the whole narrow-band DX part of the band; Telegraphy exclusive between 432.000 - 432.100 MH. PSK31, however, can be used as well in this segment

b. Refer to Beacons Chapter for coordination of beacons in the beacon sub-band
See Section **Fehler! Verweisquelle konnte nicht gefunden werden.**

c. i. ATV operators should be encouraged to use the microwave allocations where available, but may continue to use the 430 MHz band where permitted by the licensing authority. In case of interference between ATV and the Amateur Satellite Service ,the Satellite Service should have priority.

ii. ATV transmissions in the 435 MHz band should take place in the segment 434.000 - 440.000 MHz. The video carrier should be below
434.500 MHz or above 438.500 MHz. National societies should provide guidance to their members on the exact frequencies to be used, with due consideration of the interests of other users. (Noordwijkerhout 1987)

d) The words "Sub-regional (national) bandplanning" appearing in IARU Region 1 VHF/UHF/Microwave bandplans mean the following:

In bands and sub-bands not available throughout Region 1, band-planning should be coordinated on a sub-regional basis between the countries where those bands and sub-bands are allocated to the Amateur Service. The words "national bandplanning" refer to bands/segments which are available only in a single country (such as the 70 MHz band allocation), or only in a few widely separated countries.(Torremolinos 1990)

e) At the IARU Region 1 Conference in Torremolinos (1990) the output band for linear transponders was extended from 432.700 to 432.800 MHz under the following condition:

The established use of 432.600 MHz for RTTY (ASK/PSK) and 432.700 MHz for FAX should be respected when installing linear transponders which use this allocation.

f). This segment is for simplex use only with no Digital Voice gateways. Embedded data traffic is allowed along with digital voice. Digital Voice users should check that the channel is not in use by other modes

2. USAGE

The following notes are referring to the Usage column in the bandplan. As already set out in the introduction to section IIc, in the right amateur spirit operators should take notice of these agreements which are made for operating convenience, but no right to reserved frequencies can be derived from a mention in the Usage column or from the following notes (except where Aexclusive@is mentioned@).

2.1. Footnotes

f. The HB/DL/OE wide-shift repeater system, already in use for a long time, is valuable with a view to a better utilisation of the whole band. Hence IARU Region 1 endorses the system.
This also applies for the French repeater channel system, also adopted by the Netherlands and Belgium, which IARU Region 1 supports as a useful measure to fill a hitherto unused part of the band.
For the numbering of FM telephony channels see 4.1

g. In the Usage section of the 435 MHz bandplan the following frequency segments have been designated for digital communications:

i) 430.544 - 430.931 MHz Extension of the 7.6 MHz repeater system input for digital comm.
438.194 - 438.531 MHz Output channels for the above

ii) 433.619 - 433.781 MHz
438.019 - 438.181 MHz

iii) 430.394 - 430.581 MHz For digital communication links
439.794 - 439.981 MHz For digital communication links

With due regard to the band allocated to the Amateur Service by the national Administration, the interests of other users, possible interference from e.g. ISM, the specific digital technique or system to be accommodated etc., a sub-regional, or national choice may be made within the above segments.

h. In those countries where 433.619 - 433.781 MHz is the only segment of the 435 MHz band available for digital communications, modulation techniques requiring a channel separation exceeding 25 kHz should not be used. If different or incompatible use of this part of the frequency spectrum in contemplated in neighbouring countries, this use should be coordinated between the countries concerned with the aim of avoiding harmful interference.

i. On a temporary basis, in those countries where 433.619 - 433.781 MHz is the only segment of the 435 MHz band available for Digital Communications:

1. Channels with centre frequencies 432.500, 432.525, 432.550, 432.575, 434.450, 434.475, 434.500, 434.525, 434.550 and 434.575 may be used for digital communications.

2. Use of these channels must nor interfere with linear transponders.

3. Modulation techniques requiring a channel separation exceeding 25 kHz must not be used on these channels. (De Haan, 1993)

j. At the IARU Region 1 Conference in Torremolinos (1990) the following recommendation was adopted regarding the segments for repeaters and links, shown in footnote g:

For a repeater/link to be installed within 150 km of a national border, the member society should co-ordinate the frequency allocation and the technical (system) data with the member societies in neighbouring countries. Special attention should be paid to the common good practice of using directional antennas and the minimum power necessary.

As a matter of course this agreement is also valid for any link experiments carried out on the multi-mode channels in the segment 438.544--438.631 MHz. (De Haan, 1993).

k. These multi-mode channels are to be used for experimenting with new transmission technologies (De Haan, 1993)

l. In the United Kingdom the use of low-power speech repeaters on repeater channels in the segment 438.419--438.581 is allowed. Where necessary, frequencies will be coordinated with neighbouring countries (De Haan, 1993).

m. Experiments using wide band digital modes may take place in the 435 MHz band in those countries that have the full 10 MHz allocation. These experiments should be in the all modes section around a frequency of 434 MHz, use horizontal polarisation and the minimum power required.(Tel Aviv 1996)

n. Common frequencies for Simplex (FM) Internet voice gateways are:
433.950, 433.9625, 433.975, 433.9875, 434.0125, 434.434.025, 434.0375, 434.050 MHz
(Cavtat 2008)

o. All Voice repeater channels may use FM or Digital Voice modes. (Cavtat 2008)