IARU Region 1 Technical Recommendation B.1.

DÜSSELDORF 1989, Tel Aviv 1996

GUIDELINES FOR THE CONSTRUCTION OF BEACONS ON THE VHF/UHF/MICROWAVE AMATEUR BANDS						
	Band---->	**50 MHz**	**145 MHz**	**435 MHz**	**1.3 GHz**	**higher bands**
Aerial		general purpose : omnidirectional special purpose : directional				
Transmitting period		24 hours per day				
Keying	Mode	F1A/A1A (A1 preferred)	F1A / A1A			
	Carrier	nominal frequency un-shifted				
	Carrier transm.period	40 seconds				
	Keying direction (F1A)	From shift position to nominal frequency[1]				
	Carriershift (F1A)	Fnom minus 250 Hz	Nominal frequency minus 400 Hz			
	Keying text	Call, Locator, etc.				
	Transm.period text	Maximum 20 seconds				
	Cyclus period = carrier period + text period	30 seconds				
	Repetition frequency text	1 time/cycle				
	Data transmission	not yet considered				
Frequency tolerance		± 250 Hz	± 250 Hz	± 500 Hz	± 2.5 kHz	

[1] When using F1A the identification procedure is the following : Before the start of the identification transmission the carrier shall jump to a frequency 250 or 400 Hz below the nominal frequency and shall be morse-keyed to the nominal frequency. After the identification transmission, hence after at least 7 dot lengths, the frequency shall jump back to the nominal frequency.

IARU Region 1 Technical Recommendation D.1.1

WARSAW 1975,CEFALU 1984

GENERAL RTTY STANDARD

The RTTY signalling speed to be 45.45 bit/s. The use of a higher speed than 50 bit/s is not considered appriate at this time,

The RTTY transmission mode to be FSK on all bands with a preferred shift of 170 MHz on the bands below 30 MHz an 170 or 850 Hz above 30 MHz. The mark signal shall be the higher radiated frequency,

Reception of RTTY by means of a two-tone system is encouraged for optimum communications effectiveness,

In the interests of bandwidth efficiency and communications effectiveness AFSK operation on AM transmitters is not encourgaded. Were AFSK operation is used on VHF-UHF for local and autstart communications the use of NBFM transmitters is strongly encouraged. In the interests of bandwidth efficiency the use of a standard AFSK shift of 170 Hz is recommended. In this case the standard AFSK tones should be 1275 Hz "space" and 1445 HZ "mark". If 850 Hz shift is used the "mark" frequency should be 2125 Hz.

AMTOR/RTTY STANDARD

All IARU member societies shall adopt CCIR 476-1 in both modes "A" and "B" and Region 1 shall be asked to liaise with Regions 2 and 3 so that AMTOR may become a truly international standard

A speed of 45.45 bit/s is currently recommended , however speeds op 50, 75 and 100 bit/s should be encouraged

Each society - only where such requirements still exist- should press their respective licensing authorities to remove the requirement for "dual indentification " when using the international standard CCITT number 2 code

The minimum specification for the signalling format should be 1 start bit, 7 data bits, 1 parity bit, 1 stop bit. The parity should be as follows :

if generated	even parity
if not generated	parity bit set to space.

IARU Region 1 Technical Recommendation D.1.2

NOORDWIJKERHOUT 1987

STANDARDS FOR DIGITAL COMMUNICATIONS

1. Modulation methods

- FM/AFSK (where allowed in the bandplans)
- FSK : at speeds below 300 bit/s FSK is preferred
- PSK : at speeds above 300 bit/s PSK is preferred

General Applications :

Shifts for FSK and FM/AFSK :

at 1200 bits per second	-1 kHz
below 1200 bits per second	-850 Hz, 170 Hz (preferred)

Mark is always the higher frequency.

Note. For FM/AFSK the audio frequencies are :
- space 1275 Hz
- mark 1445 Hz or 2125 Hz, depending on shift

Packet-Radio Applications: [1])

for 300 bit/s transmissions using FSK a shift of 200 Hz should be used;

for 1200 bit/s transmissions using FM/AFSK audio frequencies of 1200 and 2200 Hz should be used (as in the Bell 202 standard).

On the bands below 30 MHz the signalling speed shall not be more than 300 bit/s.

2. Coding/bit- rates [2])

- Baudot : 45.45, 50, 100 bits per second (50 bit/s preferred)

- ASCII : 1 start bit, 7 data bits, 1 parity bit, 1 stop bit.
  Parity: if generated - even parity
  if not generated - parity bit set to space

  110 bits per second preferred.

3. Protocols

- Packet Radio : AX-25 as published by ARRL

- AMTOR : CCIR 476-1, modes A and/or B.

[2] Packet-Radio : It is recognised that in the future higher data rates will be achievable through the use of different modulation methods. It is recommended, however, that in all cases for the frequencies used for communication between the user and a network access point the bandwidth should not exceed 12 kHz. For links between packet-radio nodes higher data rates and larger bandwidths may be used. For such high speed links (greater than 1200 bit/s) FM/AFSK is not preferred

IARU Region 1 Technical Recommendation D.2

CEFALU 1984

PROVISIONAL STANDARD FOR DELTA-MODULATION

For experiments with digital speech transmission CSVD (Continuously Variable Slope Delta) modulation based on the IC's commercially available for this purpose should be used with the following parameters :

- 3 bit adaptive algorithm as used in the IC's FX309, HC55516, MC3417
- bit rate : 16 kbit/second ± 50 ppm
- primary integrator time constant : 1 millisecond
- syllabic integrator time constant : 4 milliseconds
- modulation : F1E with $\Delta f = \pm 10$ kHz

IARU Region 1 Technical Recommendation FM.1

BRUSSELS 1969, SCHEVENINGEN 1972

A. TECHNICAL STANDARD FOR NARROW BAND FM

For NBFM within Region 1 a Maximum Modulation Index of 1 and an audio band restricted to 3 kHz shall be used

B. TECHNICAL STANDARDS FOR FIXED CHANNEL NBFM STATIONS

1. Traffic mode

   Simplex on one channel.

2. Maximum Deviation

   ± 3 kHz, 12K0F3E.

3. AF response

   300 - 3000 Hz, outside this band down with 12 dB/octave.

4. Pre-emphasis

   +6 dB/octave in the transmitter.

5. De-emphasis

   -6 dB/octave in the receiver.

IARU Region 1 Technical Recommemdation FM.2

SCHEVENINGEN 1972, TEL AVIV 1996

TECHNICAL STANDARDS FOR NBFM REPEATERS IN THE 145 MHz and 435 MHz BANDS

1. Polarisation: Antennas in the repeater service shall have vertical polarisation.

2. Operation: Without a new selective call the operating time for a repeater shall be between 3 - 10 minutes. The frequency of the selective call shall be 1750 ± 50 Hz. As an alternative the CTCSS and/or DTMF as described in below can be used. When the signal to be relayed has disappeared or the operating time has come to an end the repeater station shall send its own call, and 15 seconds thereafter the transmission shall be interrupted. It should not be possible to interrupt the automatic identification transmission by a selective call. For the station identification F2A modulation shall be used.
When working through a repeater station the lowest usable power consistent with good communication is recommended.

3. Power : The effective radiated power of the repeater transmitter shall not exceed 15 Watts.

4. Traffic mode: Simplex using demodulation/remodulation on a single channel / frequency pair.

5. Deviation: The maximum deviation of the repeater transmitter shall be ± 3 kHz (12K0F3E).

6. A.F. response: Audio frequency response shall be 300 - 3000 Hz. Outside this band the response shall go down with 12 dB/octave.

7. Pre-emphasis: The transmitter pre-emphasis shall be +6 dB/octave.

8. De-emphasis: The receiver de-emphasis shall be -6 dB/octave.

9. Responsibility: The repeater shall be under the control of the national IARU member society or their agent. The member society shall be responsible for the allocation of the adopted channel frequencies.

10. CTCSS: The use of CTCSS as an alternative or an addition to 1750Hz tone access shall be encouraged for VHF and UHF repeaters in Region 1 with the aim of reducing inadvertent interference by users to repeaters sharing the same input channel.
For CTCSS the frequencies listed in table FM2.1 shall be adopted as a standard so that compatibility between repeater systems in different countries can be maintained, aiding the traveller who moves between countries.(The frequencies shall be accurate ± 1%)
The CTCSS frequencies shall be allocated by member societies to their country's repeaters.
The reference letters shown in the table may be used to identify CTCSS frequencies in a compact way.

11. DTMF: The DTMF system as specified below can be used as an alternative to the control of repeaters, voice mail boxes etc.
The hardware part of the DTMF system consists of a keyboard with 12 push-buttons using the symbols #,*,A,B,C,D and figures from 0 to 9. When pressed each push-button will activate 2 tones simultaneously, one above, the other below 1000 Hz, according to the following scheme in table FM.2.2.
For example, if No. 5 is pressed, the tone combination 770 Hz/1336 Hz will be the result. The tone frequencies have to be accurate within ± 1.5 % .
Each tone burst should be betwen 65 and 105 msec long. The pause between tones should be at least 200 msec.

12. User functions: To control the basic functions of repeaters and voice-mailboxes, the following codes should be used :
Basic commands :
* Repeater opens, (like the 1750 Hz)
* + 0 Repeater opens and transmits callsign, location and - if necessary- the CTCSS tone.
* + 1..9 Additional functions (squelch control, power level and others)
These basic commands can be extended and it is possible to control special functions of the repeaters or voice-mailboxes

CTCSS FREQUENCIES IN Hz TO BE USED FOR REPEATER ACCESS			
71.9 - B	100.0 - L	141.3 - V	203.5 - AF
74.4 - C	103.5 - M	146.2 - W	210.7 - AG
77.0 - D	107.2 - M	151.4 - X	218.1 - AH
79.7 - E	110.9 - O	156.7 - Y	225.7 - AI
82.5 - F	114.8 - P	162.2 - Z	233.6 - AJ
85.4 - G	118.8 - Q	167.9 - AA	241.8 - AK
88.5 - H	123.0 - R	173.8 - AB	250.3 - AL
91.5 - I	127.3 - S	179.9 - AC	
94.8 - J	131.8 - T	186.2 - AD	

Table FM.2.1.

DTMF FREQUENCY PAIRS				
Hz	1209	1336	1477	1633
697	**1**	**2**	**3**	**4**
770	**4**	**5**	**6**	**B**
852	**7**	**8**	**9**	**C**
941	*****	**0**	#	**D**

Table FM.2.2.

IARU region 1 Technical Recommendation P.1

LAUSANNE1953,CEFALU 1984,TEL AVIV 1996

STANDARDS FOR SIGNAL POLARISATION

1. Helical aerials

   Looking into the direction of transmission, helical beam aerials shall have a right-hand thread.

2. Moonbounce aerials

   The polarisation of microwave signals used for communication via moonbounce shall be right-hand circular, i.e. the wave travelling away from the observer should rotate in a clockwise direction for operation below 3 GHz.

   For operation above 3 GHz linear polarisation shall be used. European stations should use vertical polarisation. All stations shall include provision for adjustable polarisation and be prepared to agree the offset beforehand. Exact polarisation offsets shall be checked at the commencement of activity.

   Should technical developments occur to make circular polarisation practical for general adoption this will be considered at a future conference.

3. NBFM Repeater aerials

   Vertical (see recommendation FM.2.)

STANDARDISATION OF S-METER READINGS

1. One S-unit corresponds to a signal level difference of 6 dB,
2. On the bands below 30 MHz a meter deviation of S-9 corresponds to an available power of -73 dBm from a continuous wave signal generator connected to the receiver input terminals,
3. On the bands above 144 MHz this available power shall be -93 dBm,
4. The metering system shall be based on quasi-peak detection with an attack time of 10 msec ± 2 msec and a decay time constant of at least 500 msec.

IARU Region 1 Technical Recommendation R.2

ALTERNATIVE "TONE" REPORTS

In order to make the indication of special propagation modes possible the Tonality (T) component of the RST reporting system (the 1-9 scale) will be extended with the following:

"a" For signals distorted by auroral propagation
"s" For signals distorted by "rain-scatter" propagation
"m" for signals distorted by multipath propagation.

(other letters can be added once the need arises)

and

the IARU contest rules shall be amended in such a way that for telegraphy contacts a letter may be given in stead of the numbers 1-9 for the tonality report

IARU REGION 1 TECHNICAL RECOMMENDATION V.1.1

BRUSSEL 1969, WARSAW 1975,NOORDWIJKERHOUT 1987

BASIC FAST SCAN AMATEUR TV STANDARD

The standard transmission system for Amateur Television shall be the CCIR-2 system following the Gerber standard.

The use of vestigial sideband techniques should be encouraged for use in the 435 MHz band.

ATV in the 435 MHz band should use the 434-440 MHz segment with the carrier frequency either below 434.5 MHz or above 438.5 MHz.

SATV - A SECOND TECHNICAL STANDARD FOR ATV

The technical parameters of SATV (small-bandwidth ATV) are as follows:

1. Picture frequency and line frequency as for the CCIR-2 system.

2. Maximum video bandwidth between 500 kHz and 1 MHz.

3. No audio carrier; the audio information is NBFM modulated on the video carrier, maximum deviation ±5 kHz.

Note : SATV transmitters are very easy to construct : no audio transmission is required and the tuning of the PA stages is simple.

At the receiving end there are two possible concepts:

a. The bandwidth of the TV receiver is made smaller and an I.F. limiter plus an FM detector are added.

b. A normal FM receiver is used for the audio part of the signal. From between the mixer and the I.F. filter of this receiver the broadband signal is coupled to a separate I.F. amplifier and detector, and the video signal obtained is sent to a video monitor.

Modern TV receivers can be easily modified for SATV.

Note: Advantages: Better use of the bands - e.g. several simultaneous QSO's possible in the bandwidth available in the 435 MHz band - and better signal range.

IARU Region 1 Technical Recommendation V.2

LILLEHAMMER1999,TORREMOLINOS 1991

STANDARDS FOR MICROWAVE FM ATV

	> 1 Ghz < 24 GHz	> 24 GHz
Mode of emission:	F5/F3	F5/F3
Video bandwidth (3 dB):	5 MHz	5 MHz
Pre-emphasis:	CCIR rec 405.1	CCIR Rec 405.1
Colour sub-carrier frequency:	4.433618 MHz	4.433618 MHz
Maximum instant. mod. index:	-	.05
Peak dev.(with pre-emphasis):	3.5 MHz	3.5 MHz
Channel bandwidth:	12 MHz at -40 dB 18 MHz at -50 dB	12 MHz at -40 dB
Sound sub-carrier frequency:	5.5 MHz	5.5 or 6 MHz
Sound sub-carrier amplitude (with respect to peak video):	-	-14 dB
Sound sub-carrier modulation index:	0.07	0.2

Notes

1. A video filter having a -3 dB bandwidth of 5 MHz should be included in the modulating amplifier.
2. A video peak clipper should be included after the the pre-emphasis but before the video filter.
3. DC clamping of the video signal should be included to prevent the nominal carrier frequency from changing with different television scenes.
4. An RF output filter should be included to prevent out of band energy from whatever source from reaching the aerial system.
5. When it is necessary to reduce the transmitted bandwidthon frequencies >24.0 Ghz below that shown above the sound carrier should be reduced in level or be removed altogether.

FACSIMILE STANDARDS

For facsimile transmissions in the Amateur Service the following characteristic values are preferred:

1. The video (picture) modulated signal is generated at the audio frequency level, similar to the technique used for SSTV. The edge frequencies for "black" and "white" are 1500 Hz and 2300 Hz respectively ; the frequencies corresponding to the half-tones are between these two frequencies. The audio frequency bandwidth is maximally 3000 Hz.

2. The rotation speed of the picture drum is switchable between 60, 90, 120, 150, 180 and 240 rpm, with 60, 120, 180 and 240 rpm being the preferred values.

3. The index of co-operation shall provisionally be 288, in accordance with CCIR recommendation. Minor deviations from this value are permissable.

4. Phasing-in signals and end-of-picture signals will be chosen at a later stage, taking into account practical considerations based on the state-of-the-art.

5. All Amateur Service allocations should be open for this mode of transmission. Operation via repeaters and amateur satellites should also be allowed.

6. For the transmissions F1C should be used. (e.g. frequency shift keying of an audio frequency sub-carrier, which modulates the main carrier in SSB, or direct FSK (shift-keying) of the main carrier by the modulating signal.) Additionally, on frequencies above 144.5 MHz mode F2C, i.e. FM/AFSK modulation of the RF carrier by a frequency-modulated sub-carrier, is permitted.