

International Telecommunication Union

**ITU-R**  
Radiocommunication Sector of ITU

**Recommendation ITU-R V.431-8**  
(08/2015)

**Nomenclature of the frequency and  
wavelength bands used in  
telecommunications**

**V Series**  
**Vocabulary and related subjects**

**150**   
1865-2015

 **ITU**  
International  
Telecommunication  
Union

## Foreword

The role of the Radiocommunication Sector is to ensure the rational, equitable, efficient and economical use of the radio-frequency spectrum by all radiocommunication services, including satellite services, and carry out studies without limit of frequency range on the basis of which Recommendations are adopted.

The regulatory and policy functions of the Radiocommunication Sector are performed by World and Regional Radiocommunication Conferences and Radiocommunication Assemblies supported by Study Groups.

## Policy on Intellectual Property Right (IPR)

ITU-R policy on IPR is described in the Common Patent Policy for ITU-T/ITU-R/ISO/IEC referenced in Annex 1 of Resolution ITU-R 1. Forms to be used for the submission of patent statements and licensing declarations by patent holders are available from <http://www.itu.int/ITU-R/go/patents/en> where the Guidelines for Implementation of the Common Patent Policy for ITU-T/ITU-R/ISO/IEC and the ITU-R patent information database can also be found.

### Series of ITU-R Recommendations

(Also available online at <http://www.itu.int/publ/R-REC/en>)

Series	Title
<b>BO</b>	Satellite delivery
<b>BR</b>	Recording for production, archival and play-out; film for television
<b>BS</b>	Broadcasting service (sound)
<b>BT</b>	Broadcasting service (television)
<b>F</b>	Fixed service
<b>M</b>	Mobile, radiodetermination, amateur and related satellite services
<b>P</b>	Radiowave propagation
<b>RA</b>	Radio astronomy
<b>RS</b>	Remote sensing systems
<b>S</b>	Fixed-satellite service
<b>SA</b>	Space applications and meteorology
<b>SF</b>	Frequency sharing and coordination between fixed-satellite and fixed service systems
<b>SM</b>	Spectrum management
<b>SNG</b>	Satellite news gathering
<b>TF</b>	Time signals and frequency standards emissions
<b>V</b>	<b>Vocabulary and related subjects</b>

*Note: This ITU-R Recommendation was approved in English under the procedure detailed in Resolution ITU-R 1.*

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## RECOMMENDATION ITU-R V.431-8

**Nomenclature of the frequency and wavelength bands  
used in telecommunications**

(1953-1956-1959-1963-1966-1974-1978-1982-1986-1993-2000-2015)

**Scope**

This text recommends the use of the hertz (Hz) as the unit of frequency, and the nomenclature to be used for the description of frequency and wavelength bands. It also provides extended information on nomenclature used in some applications.

**Keywords**

Hertz, frequency bands, wavelength bands

**Related ITU Recommendations**

Recommendation ITU-R V.430-4	Use of the international system of units (SI)
Recommendation ITU-R V.573-6	Radiocommunication vocabulary
Recommendation ITU-R V.574-5	Use of the decibel and the neper in telecommunications
Recommendation ITU-R V.665-3	Traffic intensity unit

The ITU Radiocommunication Assembly,

*considering*

- a)* that the merits of Heinrich Hertz (1857-1897) as a research worker on the basic phenomena of radio waves, are universally recognized, as was confirmed at the centenary of his birth; and that as early as 1937 the International Electrotechnical Commission (IEC) adopted the hertz (symbol: Hz) as a name for the unit of frequency (see *inter alia*, International Standard IEC 60027);
- b)* that the nomenclature in this Recommendation should be as synoptic as possible and that the designation of frequency bands should be as concise as possible,

*recommends*

- 1** that the hertz (Hz) be accepted for use in publications of the ITU, as the name for the unit of frequency in accordance with Recommendation ITU-R V.430 on the use of the international system of units (SI);
- 2** that administrations should always use the nomenclature of the frequency and wavelength bands given in Table 1 and Notes 1 and 2, which take account of No. **2.1** of the Radio Regulations (RR).

TABLE 1

Band number	Symbols	Frequency range (lower limit exclusive, upper limit inclusive)	Corresponding metric subdivision	Metric abbreviations for the bands
3	ULF	300-3 000 Hz	Hectokilometric waves	B.hkm
4	VLF	3-30 kHz	Myriametric waves	B.Mam
5	LF	30-300 kHz	Kilometric waves	B.km
6	MF	300-3 000 kHz	Hectometric waves	B.hm
7	HF	3-30 MHz	Decametric waves	B.dam
8	VHF	30-300 MHz	Metric waves	B.m
9	UHF	300-3 000 MHz	Decimetric waves	B.dm
10	SHF	3-30 GHz	Centimetric waves	B.cm
11	EHF	30-300 GHz	Millimetric waves	B.mm
12		300-3 000 GHz	Decimillimetric waves	B.dmm
13		3-30 THz	Centimillimetric waves	B.cmm
14		30-300 THz	Micrometric waves	B.µm
15		300-3 000 THz	Decimicrometric waves	B.dµm

NOTE 1 – “Band number N” extends from  $0.3 \times 10^N$  to  $3 \times 10^N$  Hz.

NOTE 2 – Symbols: Hz: hertz

k: kilo ( $10^3$ ), M: mega ( $10^6$ ), G: giga ( $10^9$ ), T: tera ( $10^{12}$ )

µ: micro ( $10^{-6}$ ), m: milli ( $10^{-3}$ ), c: centi ( $10^{-2}$ ), d: deci ( $10^{-1}$ )

da: deca (10), h: hecto ( $10^2$ ), Ma: myria ( $10^4$ ).

NOTE 3 – This nomenclature, used for designating frequencies in the field of telecommunications, may be extended to cover the ranges shown below, as is proposed by the International Union of Radio Science (URSI) (see Table 2).

TABLE 2

Band number	Symbols	Frequency range (lower limit exclusive, upper limit inclusive)	Corresponding metric subdivision	Metric abbreviations for the bands
-1		0.03-0.3 Hz	Gigametric waves	B.Gm
0	ELF	0.3-3 Hz	Hectomegametric waves	B.hMm
1		3-30 Hz	Decamegametric	B.daMm
2		30-300 Hz	Megametric	B.Mm

NOTE 4 – In most countries the frequency ranges used for FM sound broadcasting and television are designated by the Roman numerals I to V. The frequency ranges are indicated in Table 3. It should be noted that these ranges are, in some cases, not exclusive to the broadcasting services.

TABLE 3

Designation	Frequency range (MHz)		
	Region 1	Region 2	Region 3
I	47-68	54-68	47-68
II	87.5-108	88-108	87-108
III	174-230	174-216	174-230
IV	470-582	470-582	470-582
V	582-960	582-890	582-960

NOTE 5 – Certain frequency bands are sometimes designated by letter other than the symbols and abbreviations recommended in Tables 1 and 2. The symbols in question consist of capital letters which may be accompanied by an index (usually a small letter). There is at present no standard correspondence between the letters and the frequency bands concerned, and the same letter may be used to designate a number of different bands. It is not advisable to use these symbols in ITU publications. If, however, a letter symbol is used, reference should be made to the corresponding frequency band limits or at least to a frequency in the band, if that information is sufficient in itself, the first time the symbol appears in the text. For information, letter designations used by some authors, mainly in the field of radar and space communications, are indicated in Table 4.

TABLE 4

Letter symbols	Radar (GHz)		Space radiocommunications	
	Spectrum regions	Examples	Nominal designations	Examples (GHz)
L	1-2	1.215-1.4	1.5 GHz band	1.525-1.710
S	2-4	2.3-2.5 2.7-3.4	2.5 GHz band	2.5-2.690
C	4-8	5.25-5.85	4/6 GHz band	3.4-4.2 4.5-4.8 5.85-7.075
X	8-12	8.5-10.5	–	–
Ku	12-18	13.4-14.0 15.3-17.3	11/14 GHz band 12/14 GHz band	10.7-13.25 14.0-14.5
K <sup>(1)</sup>	18-27	24.05-24.25	20 GHz band	17.7-20.2
Ka <sup>(1)</sup>	27-40	33.4-36.0	30 GHz band	27.5-30.0
V	–	–	40 GHz band	37.5-42.5 47.2-50.2

<sup>(1)</sup> For space radiocommunications K and Ka bands are often designated by the single symbol Ka.