

Project: IEEE P802.15 Working Group for Wireless Personal Area Networks (WPANs)

Submission Title: [Definitions and updates to TVWS Regulatory Requirements]

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Abstract: []

Purpose: []

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Definitions

- Television band device (TVBD)
 - Intentional radiators that operate on an unlicensed basis on available channels in the broadcast television frequency bands. For example in U.S. at 54-60 MHz (TV channel 2), 76-88 MHz (TV channels 5 and 6), 174-216 MHz (TV channels 7-13), 470-608 MHz (TV channels 14-36) and 614-698 MHz (TV channels 38-51).

- Available Channel:
 - A TV channel, which is not being used by an authorized service at or near the same geographic location as the TVBD and is acceptable for use by an unlicensed device, for example 6 MHz in U.S.

- Fixed device:
 - A TVBD that transmits and/or receives radio-communication signals at a specified fixed location. A fixed TVBD may select channels for operation itself from a list of available channels provided by a TV bands database, initiate and operate a network by sending enabling signals to one or more fixed TVBDs and/or personal/portable TVBDs.

Definitions (contd)

- **Geo-location capability:**
 - The capability of a TVBD to determine its geographic coordinates within the level of accuracy. This capability is used with a TV bands database approved by the regulation (e.g. FCC) to determine the availability of TV channels at a TVBD's location.

- **TV bands database:**
 - A database system that maintains records of all authorized services in the TV frequency bands, is capable of determining the available channels as a specific geographic location and provides lists of available channels to TVBDs.

- **Personal/portable device:**
 - A TVBD that transmits and/or receives radio-communication signals at unspecified locations that may change. In U.S. personal/portable devices may only transmit on available channels in the frequency bands 512-608 MHz (TV channels 21-36) and 614-698 MHz (TV channels 38- 51).

Definitions (contd)

- Mode I personal/portable device:
 - A personal/portable TVBD that does not use an internal geo-location capability and access to a TV bands database to obtain a list of available channels. A Mode I device must obtain a list of available channels on which it may operate from either a fixed TVBD or Mode II personal/portable TVBD.

- Mode II personal/portable device:
 - A personal/portable TVBD that uses an internal geo-location capability and access to a TV bands database, either through a direct connection to the Internet or through an indirect connection to the Internet by way of fixed TVBD or another Mode II TVBD, to obtain a list of available channels.

- Sensing (also known as detection):
 - Devices that monitor frequencies for any radio transmissions. If the devices do not detect any radio transmission, assume that the channel is free and can be used.

Permissible channels of operation (U.S.)

- All TVBDs are permitted to operate available channels in the frequency bands 512-608 MHz (TV channels 21-36) and 614-698 MHz (TV channels 38-51).
 - Except the operation of TVBDs is prohibited on the first channel above and the first channel below TV channel 37 (608-614 MHz) that are available, i.e., not occupied by an authorized service. If a channel is not available both above and below channel 37, operation is prohibited on the first two channels nearest to channel 37.
- Operation on available channels in the bands 54-60 MHz (TV channel 2), 76-88 MHz (TV channels 5 and 6), 174-216 MHz (TV channels 7-13) and 470-512 MHz (TV channels 14-20), subject to the interference protection requirements is permitted only for fixed TVBDs that communicate only with other fixed TVBDs.
- Fixed and Mode II TVBDs shall operate only on available channels as described above and as determined by a TV bands database
- Mode I TVBDs shall operate only on available channels as described above and provided from a fixed or Mode II TVBD

General technical requirements (U.S.)

- Power limits for TVBDs
 - For fixed TVBDs, the maximum power delivered to the transmitting antenna shall not exceed one watt
 - For personal/portable TVBDs, the maximum EIRP shall not exceed 100 milliwatts (20 dBm)
 - TVBDs shall incorporate transmit power control to limit their operating power to the minimum necessary for successful communication

- Emission limits for TVBDs
 - In the television channels immediately adjacent to the channel in which a TVBD is operating, emissions from the TVBD shall be at least 72.8 dB below the highest average power in the TV channel in which the device is operating.

Canada TVWS Regulations

- Transmitter specifications:
 - Minimum bandwidth= 500 kHz
 - Maximum bandwidth= 6 MHz (and exceptionally 12 MHz)
 - Carrier frequency stability= +/-10 ppm
 - Subscriber equipment:
 - Maximum transmit power = 1 W conducted, 4 Watts radiated
 - Maximum transmit power spectral density= -7 dBW/100 kHz
 - Base equipment:
 - Maximum transmit power = 125 W
 - Maximum transmit power spectral density= 14 dBW/100 kHz

UK OFCOM TVWS Regulations

Channel Frequency (MHz)	21	22	23	24	25	26	27	28	29	30	31	32
	470-478	478-486	486-494	494-502	502-510	510-518	518-526	526-534	534-542	542-550	550-558	558-566
	33	34	35	36	37	38	39	40	41	42	43	44
	566-574	574-582	582-590	590-598	598-606	606-614	614-622	622-630	630-638	638-646	646-654	654-662
	45	46	47	48	49	50	51	52	53	54	55	56
	662-670	670-678	678-686	686-694	694-702	702-710	710-718	718-726	726-734	734-742	742-750	750-758
	57	58	59	60	61	62	63	64	65	66	67	68
	758-766	766-774	774-782	782-790	790-798	798-806	806-814	814-822	822-830	830-838	838-846	846-854
	69											
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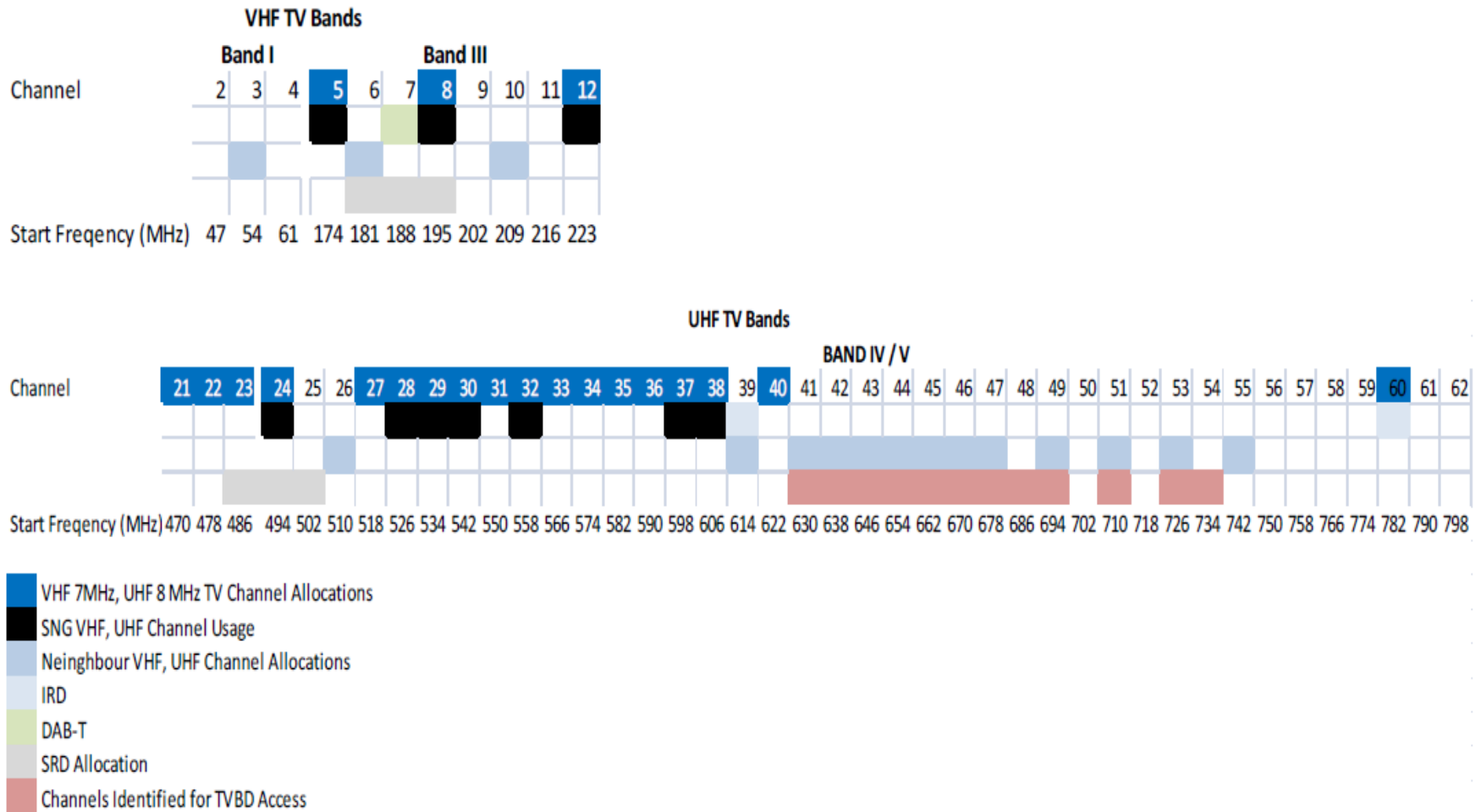
-  112 MHz of cleared spectrum (14 × 8 MHz)
-  Channel 38 (currently used for airport radar, but plans published for clearing radar use)
-  Channel 69 (used for PMSE but to be allocated as part of Upper cleared award to aligning with CEPT band plan)
-  256 MHz of spectrum retained for DTT (32 × 8 MHz but interleaved capacity available within this)
-  Channel 38 (currently used for radioastronomy but now to be dedicated channel for PMSE)
-  Channels 39, 40, (new DTT allocations as part of proposals for alignment with CEPT band plan)
-  Channels 61, 62, (to be allocated as part of Upper cleared award to align with the CEPT band plan)

Transmitted Power Requirements (Singapore)

Parameter for Detection	Value
Transmit Power	4dBm adjacent channel 17dBm
Transmit-power per channel	100 mW

Parameter for geo-location	Value
Transmit Power	Up to 100mW

Spectrum in Singapore



TVWS in Brazil

- The regulation for use of radio frequencies in range 450 MHz to 470 MHz to facilitate digital inclusion and coverage areas of low density population
- The operating systems in sub-bands of radio frequencies from 451 MHz to 458 MHz and of 461 MHz to 468 MHz should effectively limit the radiated power (e.r.p.) values presented below:

Station	Power (ERP)
Radio Base	48 dBm (63 W)
Mobile and Fixed Terminal	30 dBm (1W)

TVWS in Brazil (Contd)

- Systems operating in radio frequency sub-bands of 458 MHz to 460 MHz and of 468 MHz to 470 MHz must limit the power of the antenna at the entrance to the figures below:

Station	Power in Watts
Radio Base	250
Mobile and Fixed Terminal	25

TVWS Regulations in India

- Latest India Remarks as issued by the Wireless Planning and Co-ordination, Ministry of Telecommunications in India
- Requirement of rural communications may be considered for coordination in the frequency band 368-380 MHz on case-by-case basis.
- Requirements of fixed and mobile services will be considered in the frequency band 470-520 MHz and 520-585 MHz on case-by-case basis.