ITU-D Regional Development Forums 2010 for the Africa region on
"Modern spectrum Management and Transition from Analogue to Digital Broadcasting – Trends and Technologies"
Banjul (Gambia), 14 - 16 July 2010

Session 6: Frequency issues of the transition

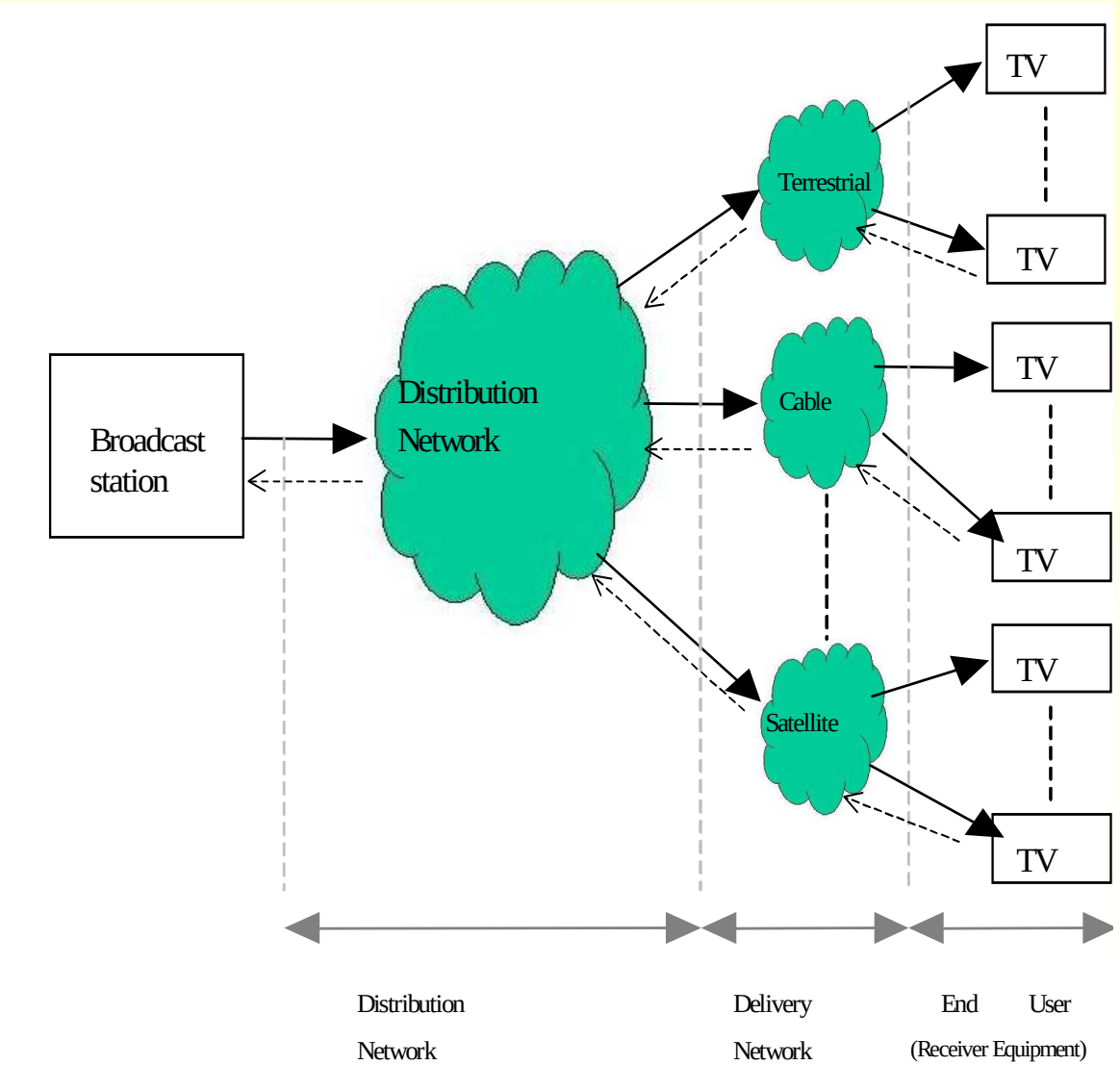
Optimised Way to Transmit the Video Signals

Dr. Haim Mazar (Madjar), Israeli Ministry of Communications, RF Division; ITU-D expert

16 July 2010

Broadcasting Network Henten A., Samarajiva R., Melody WH. 2003

Cable and Satellite communications are also good alternatives



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Technical Parameters of the TV systems

The three Analogue (or Analog) TV standards

	Lines per frame (visible lines)	Fields per second	Line Frequency (Hz)	Video Bandwidth (MHz)	Colour subcarrier (MHz)	Subcarrier Modulation	Year implemented
NTSC	525 (480)	59.94	15,734.264	4.2	3.58	Quadrature Amplitude (QAM)	1954
PAL	625 (576)	50	15,625. Only for PAL-M 15,734.264	5; 5.5; 6	4.43; PAL-M 3.58, PAL-N 3.58	Frequency (FM)	1967
SECAM							

The Three Digital TV Standards (Aware Channel Separation)

	Reception speed	Scanning Lines	Image size Pixels	Modulation
ATSC	Portable	1125	1920x1080	Single 8-VSB carrier codes
DVB-T	< 90 km/h, for 8k carriers; <180 km/h, 2k	Flexible		OFDM
ISDB-T				

See author's PhD thesis at http://eprints.mdx.ac.uk/133/2/MazarAug08.pdf p. 20

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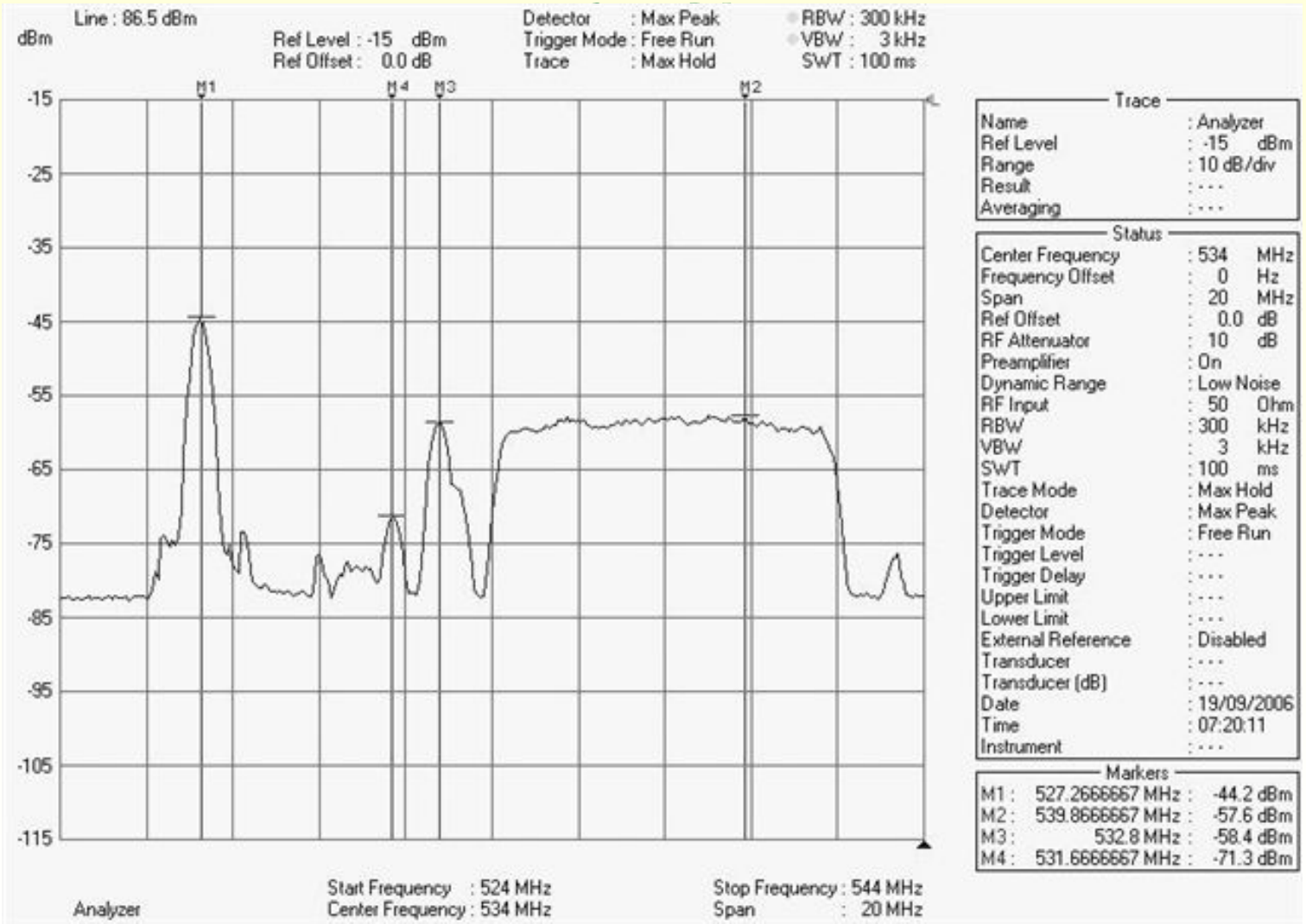
TV Analog ch. 28 (526-534 MHz) adjacent to Digital ch. 29 (534-542 MHz)

19/09/06; measured by author; M1-an.Video,M4-an.synch,M3-an.sound, M2- dig.



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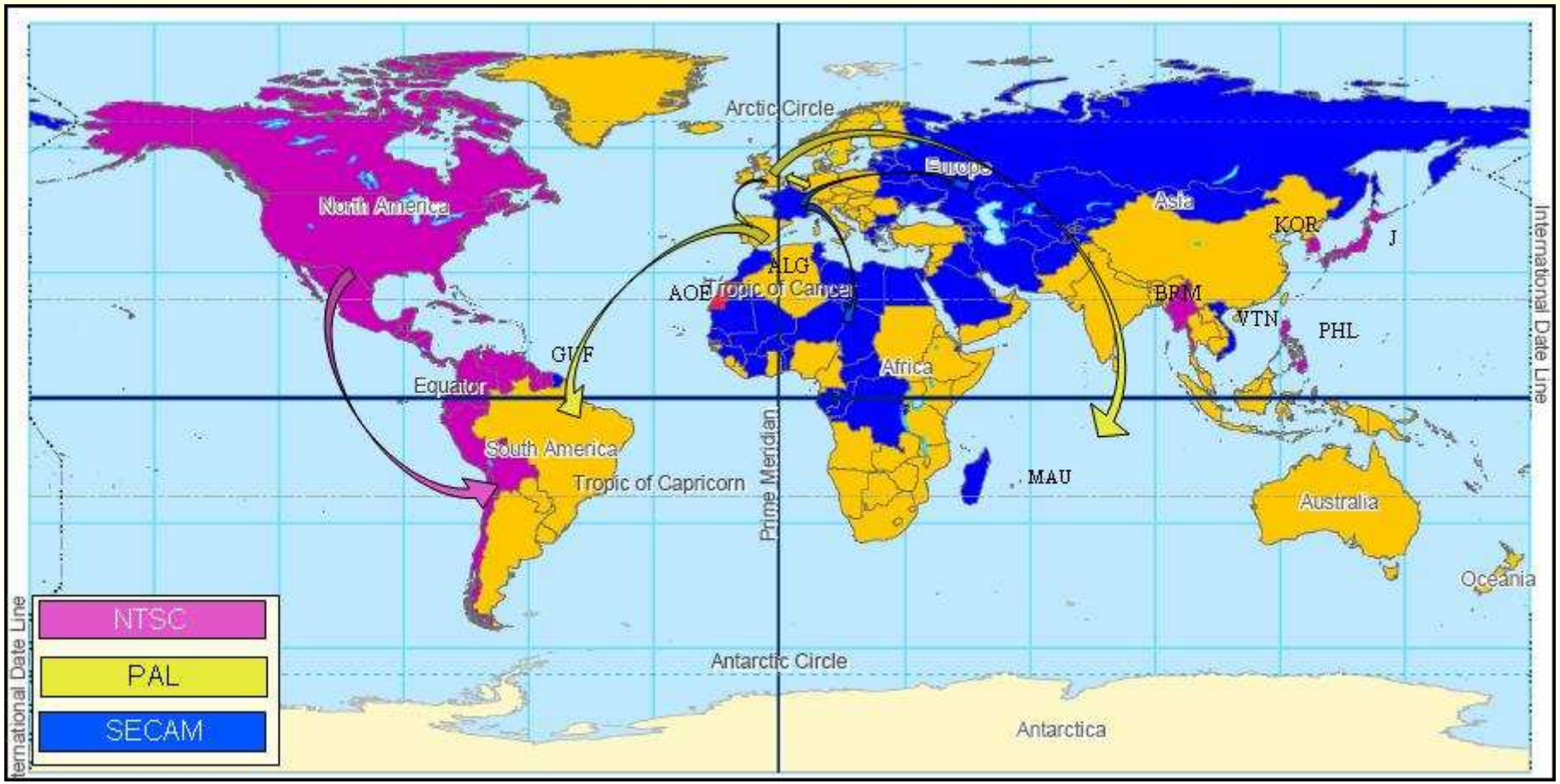
TV colours; analogue TV around the world

Influence of language (English or French) and colonialism



See http://eprints.mdx.ac.uk/133/2/MazarAug08.pdf p. 184

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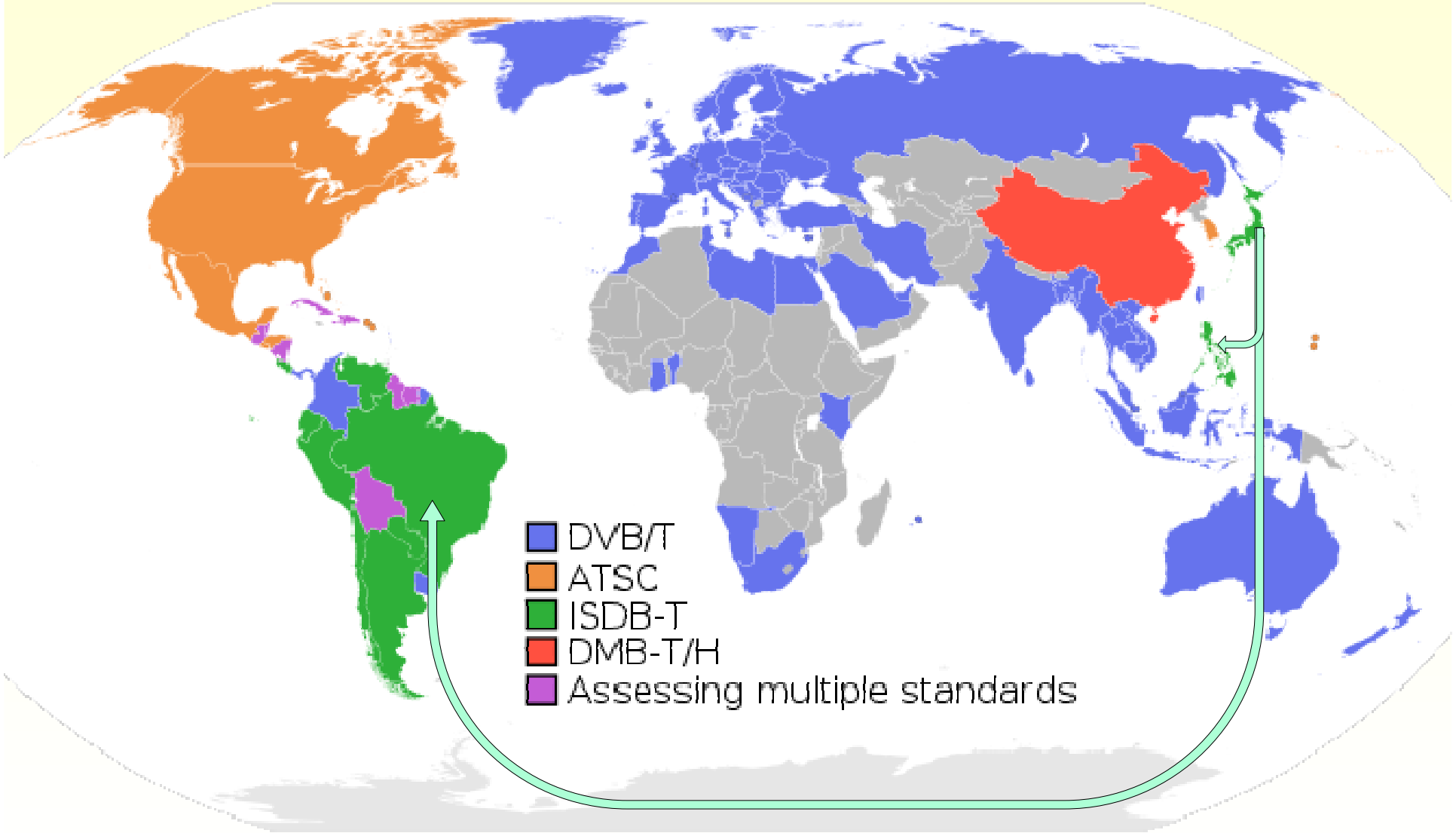
Digital Terrestrial Television (DTT) broadcasting systems by country



See http://en.wikipedia.org/wiki/File:Digital_broadcast_standards.svg 2 July 2010

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RF Digital Dividend in Israel

- 17 digital Transmitters, with two 8 UHF MHz channels cover all Israel with 5 programs (1, 2, 10, 33, 99)

Thus instead of

- 45 analog UHF and additional VHF Transmitters covering only one program - ch.1; and 15 analog Transmitters at UHF covering only one program- ch. 2.

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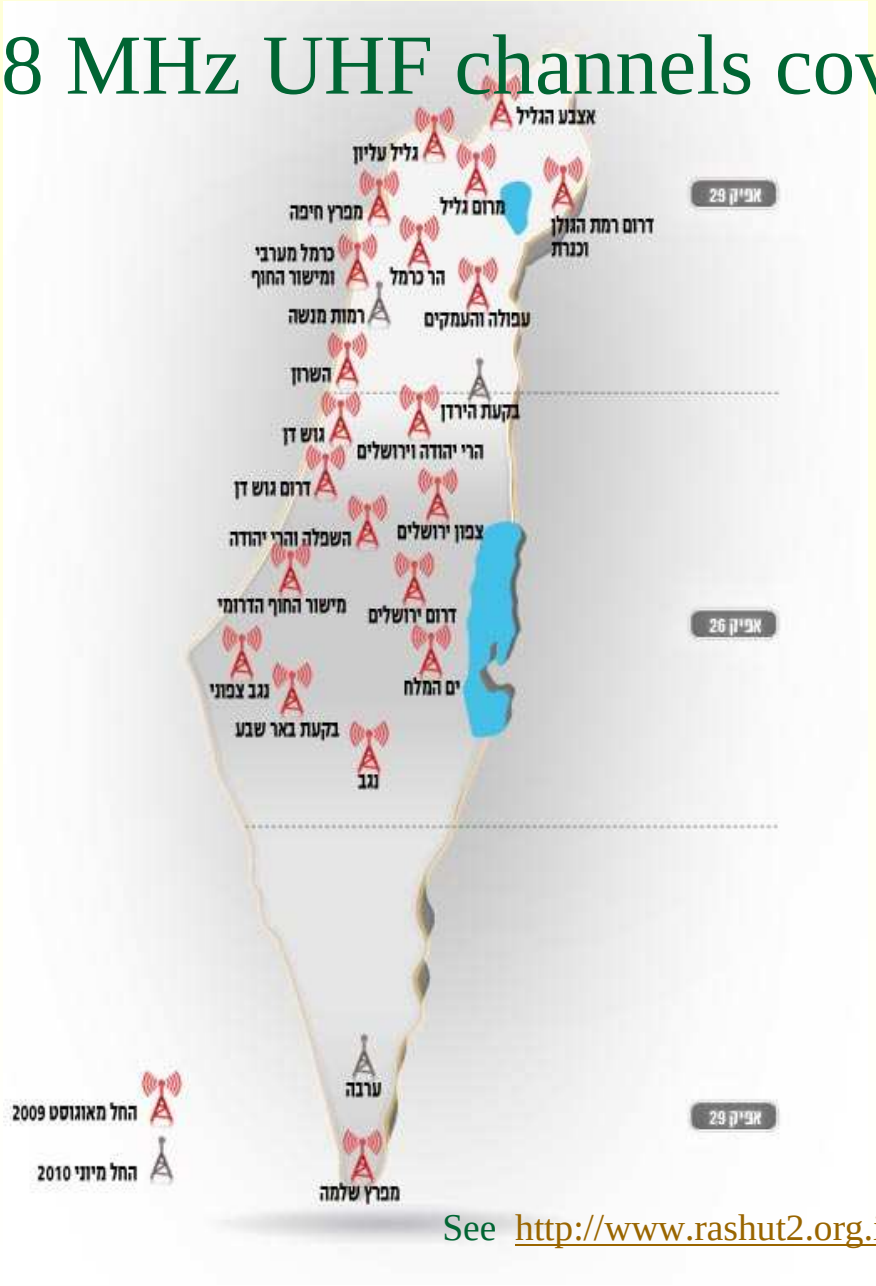
2 digital 8 MHz UHF channels cover all Israel



Channel 29

Channel 26

Channel 29

See http://www.rashut2.org.il/idan_map.asp 6 July 10

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Digital Switchover and Dividend

1. Digital switchover saves RF spectrum
2. Digital TV multiplexes don't need all the VHF and UHF bands allocated today to the analog TV, for the same transmissions
3. Switchover requires homes to upgrade their aerials and their direction
4. The free RF spectrum is very useful for the land-mobile service
5. International http://www.itu.int/dms_pub/itu-d/opb/hdb/D-HDB-GUIDELINES.01-2010-R1-PDF-E.pdf and Regional activities

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Questions to be Asked

1. Except competition to satellites and cable, do we really need over-the-air terrestrial TV?
2. Which Standard: DVB-T, ISDB-T? ATSC? DMB-T? (check Channel Separation)
3. Free view or paid? Will HD be free also? HD or Ultra HD, 3D?
4. How many programs to transmit? Subsidise set-top box?
5. Business model of DVB-H? Cellular Operators or Broadcasters transmit the DVB-H? Which Regulator?

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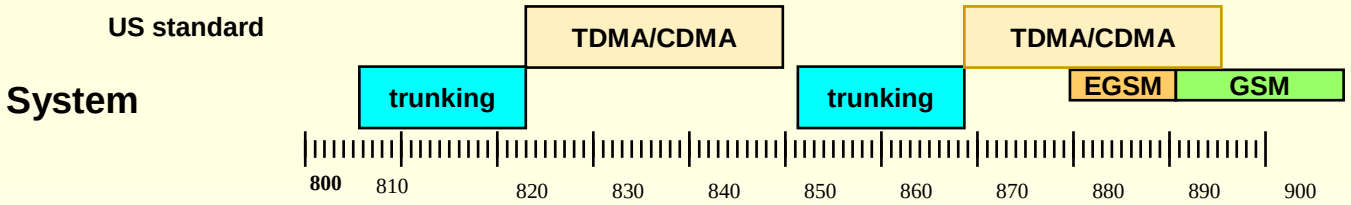
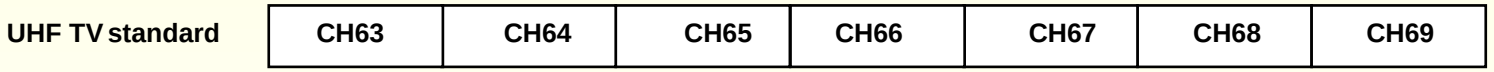
Digital Dividend 790-862 MHz: Present 800/900 MHz Cellular, Trunking & TV allocations

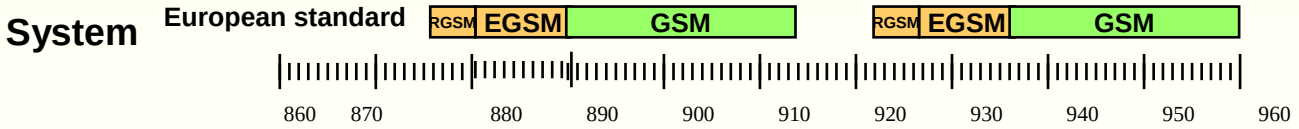
04 July 2010

European and American allocations



EUROPEEN





European Radio Telephones RDT 201

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Protection of land mobile systems from terrestrial digital video broadcasting systems in the VHF and UHF ITU-R M.1767

Land Mobile System (LMS) Power Sensitivity $P_s = KTB_{lms}\, F\, S/N$ (1)

- For **full overlap** B_{video} *(e.g.* 8 MHz) into B_{lms} *(e.g.* 5 MHz), the interference **video power threshold** level at the LMS station receiver input, P_r, is determined from the following equation:

$$P_r = KTB_{lms}\, F\, I/N\, B_v/B_{lms} = KTF\, I/N\, B_v \quad (2)$$

F: noise figure of the LMS base station or mobile station receivers

I/*N*: criterion of interference to LMS receiver system noise ratio

B_{video}:digital broadcast bandwidth (MHz)

B_{lms}: Land Mobile bandwidth (MHz)

- In the typical case of full inclusion of the LMS receiver bandwidth B_v in the interferer bandwidth B_i, the threshold interfering power is **independent of the LMS receiver bandwidth**

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Recommends 2 at ITU-R Rec. ITU-R M.1767

Field strength (dB(μV/m)) = −37 + *F* + *I*/*N* − *G* + *L* + 10 × log (*B*$_i$) + *P*$_o$ + 20 × log *f* − *K* (2)

G: LMS antenna gain (dBi) for the base station and the mobile station

L: cable feeder loss of the LMS receiver (dB)

B$_i$: digital broadcast bandwidth (MHz)

P$_o$: noise increase due to man-made noise and other interference power level (not from DAB and DVB systems) (dB)

f: centre frequency of the interfering broadcasting signal (MHz)

K: overlap correction factor from the Tables in Annex 4, if applicable.

- Using the relationship (numbers, not in dB) between field strength, *E*, and power, *P*$_r$, in free space is given by:

$$P_r = \frac{E^2 G\lambda^2}{Z_0 4\pi} = \frac{E^2 G c^2}{480\pi^2 f^2}$$

- See also ITU-R Recommendation F.1670-1 (02/06) Protection of fixed wireless systems from terrestrial digital video and sound broadcasting systems in shared VHF and UHF bands

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Any additional Qs?

Many Thanks for your kind attention

You are welcome to visit at my website

http://people.itu.int/~mazar/

Dr. Haim Mazar (Madjar)