

EBU **TECHNICAL**



EBU Workshop on Frequency and Network Planning Aspects of DVB-T2

Part 3: Implementing DVB-T2

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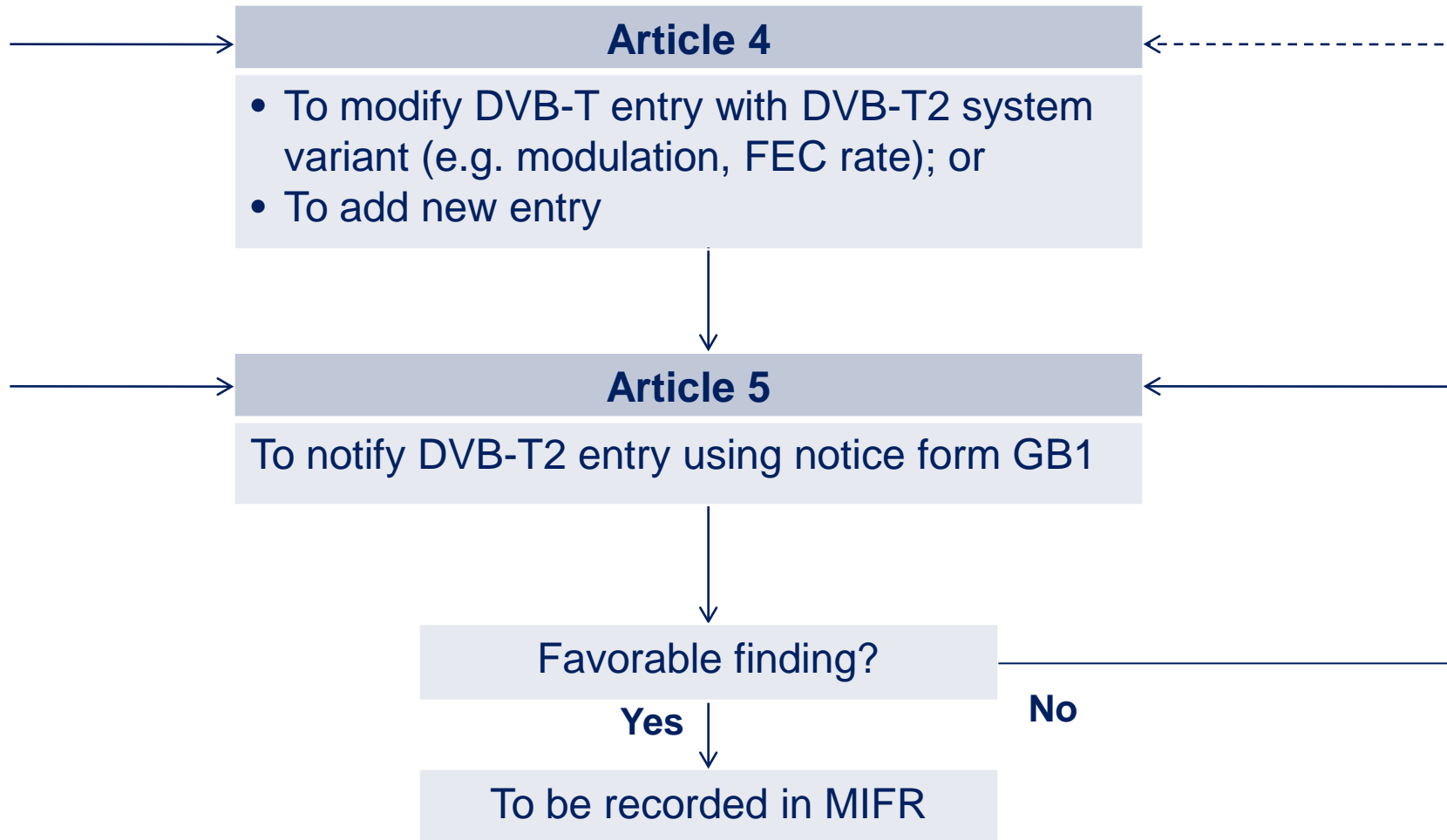


DTT regulation in Region 1

GE06 Agreement and Plan		
	174-230 MHz	470-862 MHz
GE06 Plan	<ul style="list-style-type: none">• DVB-T and T-DAB systems• 7 and 8 MHz channel raster	<ul style="list-style-type: none">• DVB-T system• 8 MHz channel raster
	<ul style="list-style-type: none">• T-DAB and DVB-T <u>spectrum masks</u>: out-of band power measured in 4 kHz bandwidth (dB)	
GE06 Agreement	<p>Articles and procedures, including:</p> <ul style="list-style-type: none">• Article 4: Procedure for modification to the plans• Article 5: Notification of frequency assignments<ul style="list-style-type: none">§5.1.3 'Envelop concept': possibility to use a Plan assignment with different characteristics if :<ul style="list-style-type: none">➤ power peak density in any 4kHz is respected and➤ it does not create more interference and does not request more protection	



Submission of DVB-T2 assignments



DVB-T and DVB-T2 entries compatible?

Conditions	DVB-T2 compatibility
Peak power density over 4kHz	Yes if: <ul style="list-style-type: none">• Same bandwidth• Same or higher number of OFDM carriers (FFT size)• Same radiated power
Protection and interference	Yes <ul style="list-style-type: none">• For equivalent variants similar or better PR and comparable median field strengths• Same linear polarisation• Same service areas using same or lower powers

- List of DVB-T2 variants directly compatible with 7, 8 and 1.7 MHz channel arrangements is given in EBU Tech 3348, Tables 6.1, 6.2 and 6.3, respectively



Remaining DVB-T2 variants

- There are DVB-T2 variants **not directly compatible** with DVB-T variants in GE06; e.g.:
 - Extended carrier mode for certain FFT sizes and certain bandwidths
 - 1k FFT for 7 and 8 MHz bandwidths
 - Certain FFT sizes for 1.7 MHz bandwidth

They may have the same interference potential but the GE06 DVB-T mask would not be respected

- **Can they be made compatible?**
 - Yes, if suitable filtering is applied in the processing chain before emission to ensure that the spectrum of the transmitted signal fulfils the mask
 - This may change the technical characteristics of the DVB-T2 signal (e.g. C/N values, Protection ratios etc) which may add difficulties for the Plan entry to be recorded in the MIFR
- Additional bandwidths: 5 and 6 MHz would also require suitable filtering



Status of DVB-T2 implementation

Deployed (8)

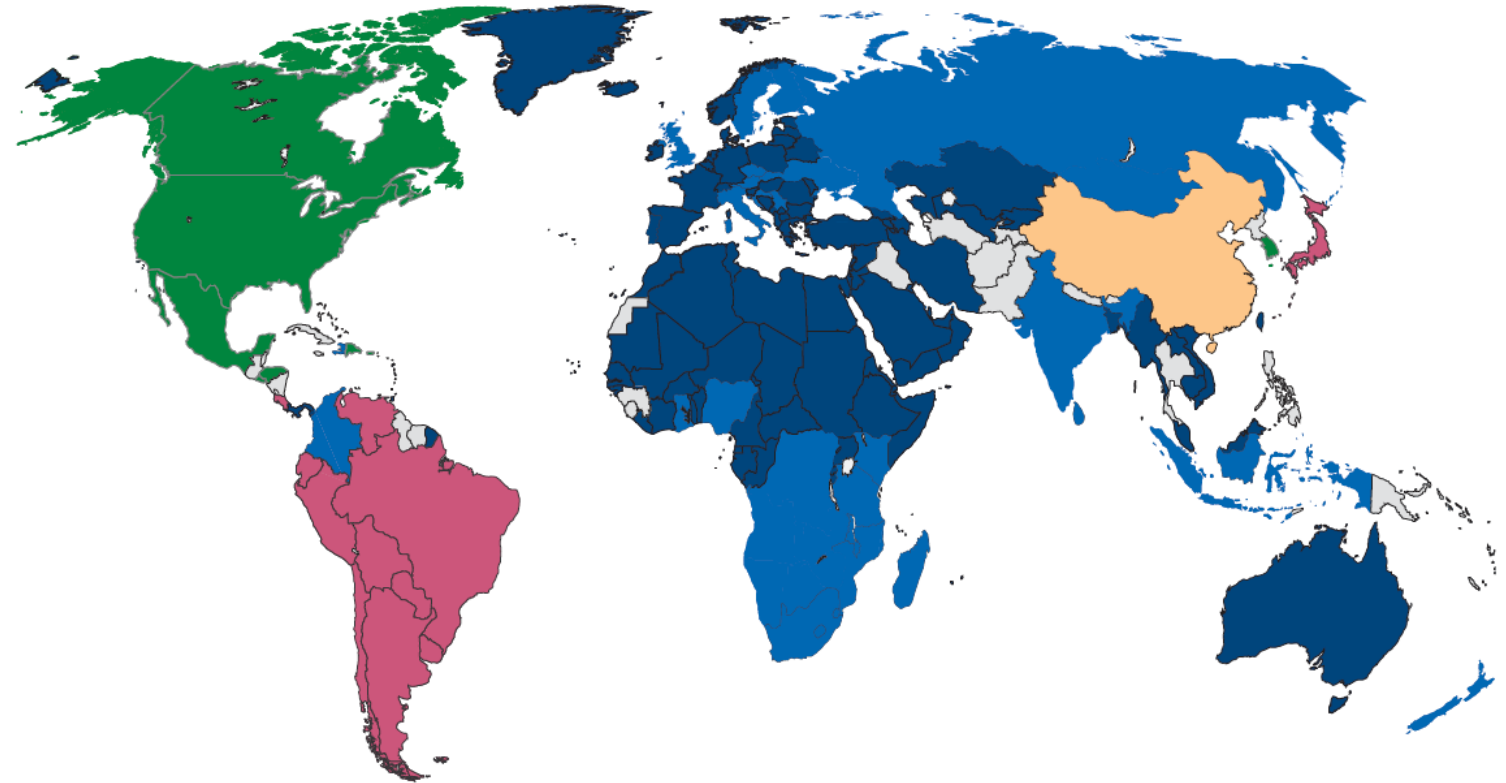
UK
Italy
Sweden
Finland
Zambia
Nigeria
Kenya
Uganda

Trials (10)

Belarus
France
Germany
Kazakhstan
Malaysia
Myanmar
Slovenia
Spain
Switzerland
Thailand

Adopted (29)

Colombia
Croatia
Czech Republic
Denmark
DR Congo
Ghana
India
Indonesia
Lesotho
Madagascar
Malawi
Mauritius
Mongolia
Mozambique
Namibia
Russia
Serbia
Seychelles
Singapore
Slovakia
South Africa
Sri Lanka
Swaziland
Tanzania
Ukraine
Zimbabwe



DVB-T

DVB-T2

ATSC

ISDB-T

DTMB



DVB-T2 transition scenarios

- **DVB-T to DVB-T2**

- E.g. in Europe: UK, Sweden, Finland, Italy
- DVB-T2 equipment not backwards compatible with DVB-T equipment:
 - Rx side: DVB-T receivers can not use DVB-T2 signals
 - Tx side: existing infrastructure related to antennas, masts, amplifiers etc. can be reused but modulators, gateways (SFNs), contribution networks, filters, monitoring equipment need to be upgraded.

➤ **Abrupt migration from DVB-T to DVB-T2 is not possible**

- **Analogue TV to DVB-T2**

- E.g. in Africa: Zambia, Nigeria, Kenya, Uganda
- DVB-T2 equipment available already and very soon on a mass market with prices approaching those of DVB-T equipment
- A similar transition period is required as the one from analogue TV to DVB-T including a simulcast period. This will be longer if the penetration of the terrestrial platform is higher
 - It requires additional funding
 - It requires additional spectrum

➤ **This is eased with DVB-T2 as is more spectrum efficient than DVB-T**



A successful transition to DVB-T2 requires...

Legislative framework in place	<ul style="list-style-type: none"> - Define switchover and switch off strategies, DTT coverage conditions - Issue the licenses - Ensure financial structure including help to low income households
Quality of the digital offer	<ul style="list-style-type: none"> - Attractive service offer in number of programmes and including new services (plus simulcast) - High technical quality: data capacity per programme, coverage, etc.
Information campaign	<ul style="list-style-type: none"> - WHO: Viewers, professionals, press must be prepared - HOW: simple, short, precise, attractive - WHERE: everywhere (web, TV, radio, press, shops...)
Well planned ASO and/or DVB-T switch off	<ul style="list-style-type: none"> - Strategy to be defined : overnight, per area, short, long... - Good timing - Good area to start: good coverage and DTT penetration - Do pilot tests
Cooperation of all actors	<ul style="list-style-type: none"> - Regulators, PSB, commercial broadcasters, manufacturers, installers - Create a Forum if it does not happen naturally



digitaluk

impulsa tdt

www.impulsatdt.es



➤ **Viewers should be attracted by the DTT, not disappointed !**

DVB-T2 in the UK

- Need to add HDTV services but spectrum shortage!
- DVB-T2 was then implemented to increase the capacity of the multiplexes

	DVB-T/MFN	DVB-T2/MFN
Bandwidth	8 MHz	8 MHz
Modulation	64 QAM	256 QAM
FFT	2k	32k
Guard interval	1/32	1/128
FEC	2/3	2/3
Scattered pilot	N/A	PP7
Carrier mode	Standard	Extended
C/N	20.1 dB	20.0 dB
Capacity	24 Mbit/s	40 Mbit/s

DVB-T2 :

- offers 65% more capacity than DVB-T:
 - 4 to 5 HDTV programmes in 1 multiplex
- Can be implemented under the GE06 Plan



DVB-T2 roll-out process in the UK

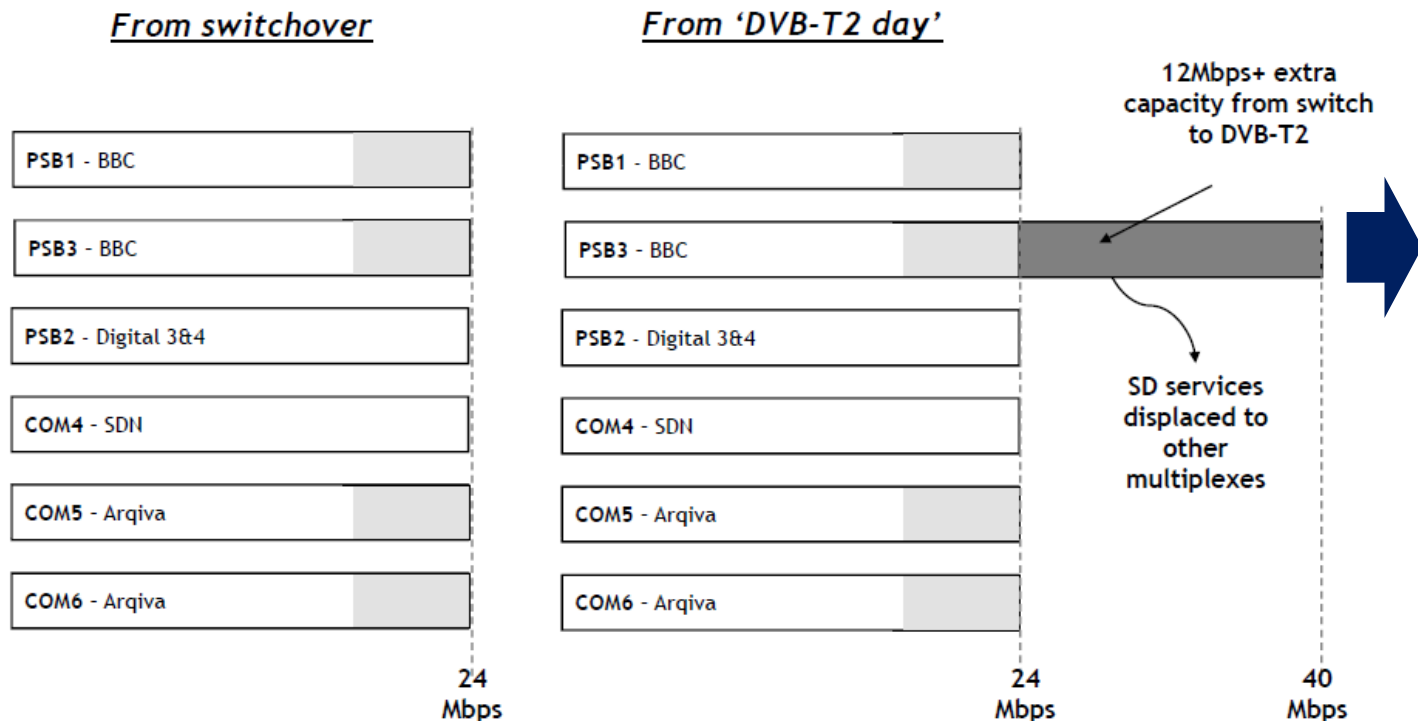
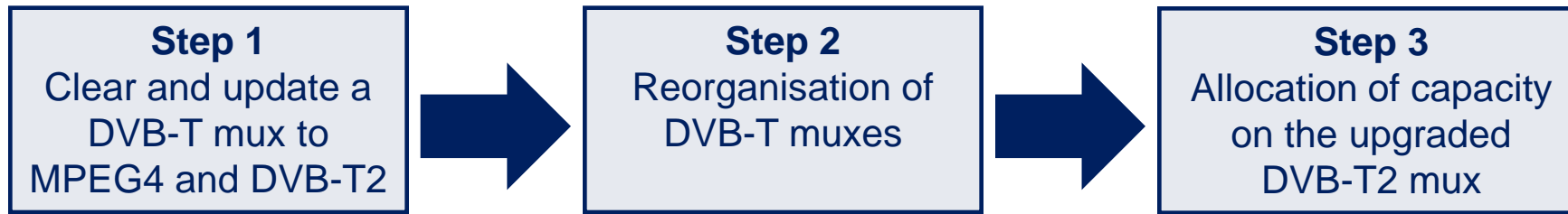
- Aggressive time table
- Two years from standardisation to consumer



- Sales figures end of 2011 confirm over 3 million DVB-T2/MPEG4 compatible HD TVs and set-top-boxes sold in UK. 1.75 million viewers watch DTT HD services

DVB-T2 implementation in the UK

- Three steps service implementation in Bands IV/V



DVB-T2 implementation in Sweden

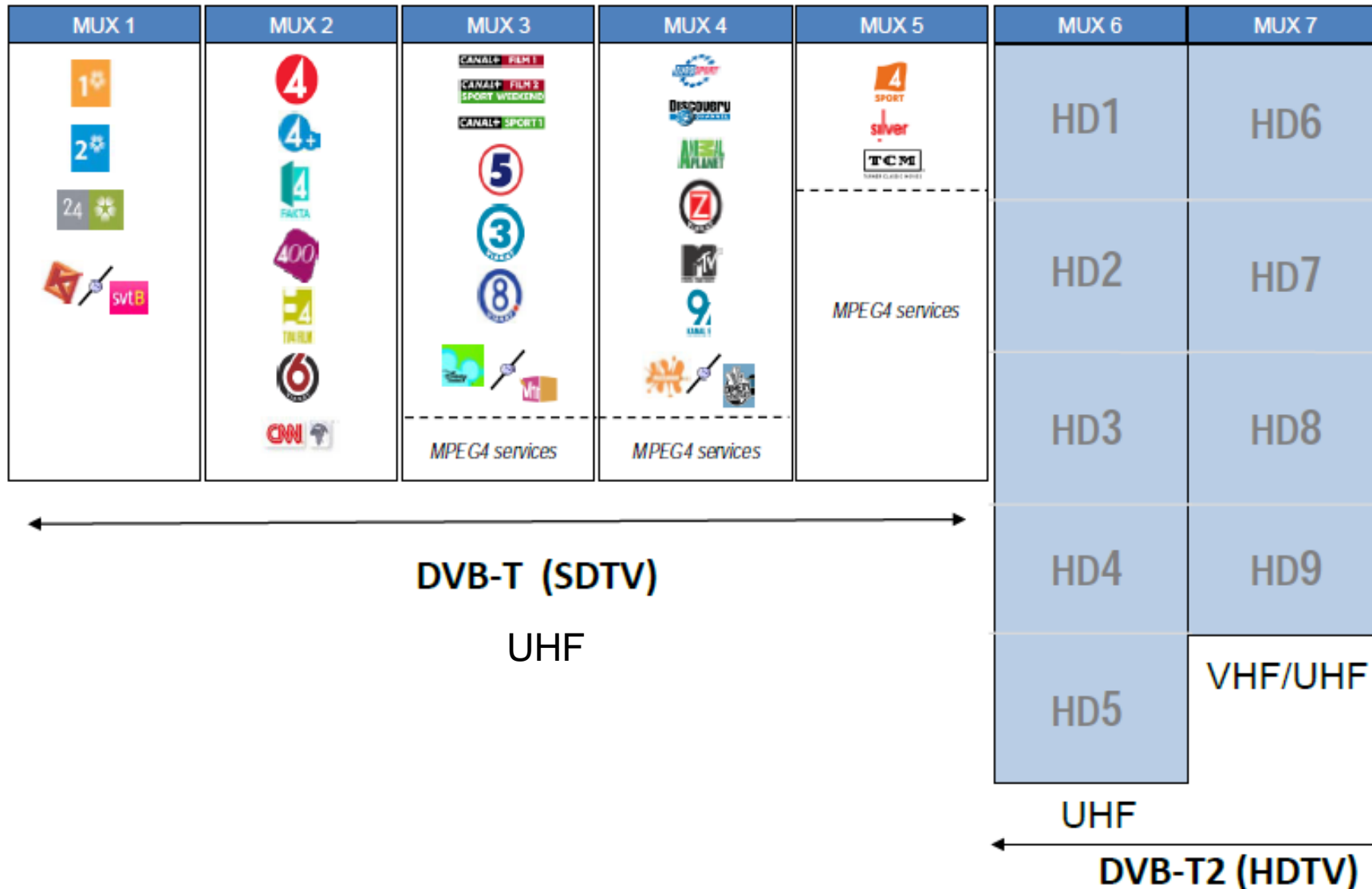
- DVB-T2 introduction directly linked to HDTV
- 9 services received HDTV license in June 2010 with the conditions:
 - DVB-T2
 - MPEG-4
 - Start no later than 1/1 2011

Mode	DVB-T2					DVB-T			Mbps
	Long	Normal	Long	Normal	N-UHF	Long	Normal	Short	
Freq band	UHF	UHF	VHF	VHF	UHF	UHF	UHF	UHF	
Bandwidth	8 MHz	8 MHz	7 MHz	7 MHz	8 MHz	8 MHz	8 MHz	8 MHz	
Mod	256 QAM	256 QAM	256 QAM	256 QAM	256 QAM	64 QAM	64 QAM	64 QAM	
FFT	32k-E	32k-E	32k	32k	32k-E	8k	8k	8k	
CodeRate	3/4	2/3	3/4	2/3	3/5	3/4	2/3	2/3	
Guard	1/8	1/16	1/8	19/256	19/256	1/4	1/8	1/32	
Pilots	PP4	PP2	PP2	PP4	PP4	-	-	-	
Capacity	37.1	36.6	31.1	30.9	32.5	22.39	22.12	24.13	
	Mux 6		Mux 7			Mux 1-5			
	+65%		+40%						

Source: **TERACOM GROUP**



DVB-T2 implementation in Sweden



Conclusions

- DVB-T2 assignments can be put in operation under the DVB-T entries in GE06 Plan
- In terms of their interference potential, all DVB-T2 variants would be compatible with DVB-T entries in GE06 Plan but a few variants would require additional filtering to ensure that the transmitted signal fulfills the GE06 spectrum mask requirements (peak-power-density over 4kHz)
- Countries having launched DVB-T will require a new transition period for the switchover to DVB-T2. It will require additional time and spectrum; an abrupt transition is not possible
- Countries not having launched DVB-T yet will have to make the choice of the DTT standard to be implemented. DVB-T2 offers the best technical performance and equipment is becoming affordable at prices comparable to DVB-T equipment



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**Thank you
for your attention!**

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