

EBU

OPERATING EUROVISION AND EURORADIO

DVB-S extension

higher spectral efficiency

WBU-ISOG FORUM LOS ANGELES MAY 2013

EUROVISION satellite network experience

The DVB-S2 standard used today can still be further extended in order to reach higher spectral efficiency.

There are three major extensions required:

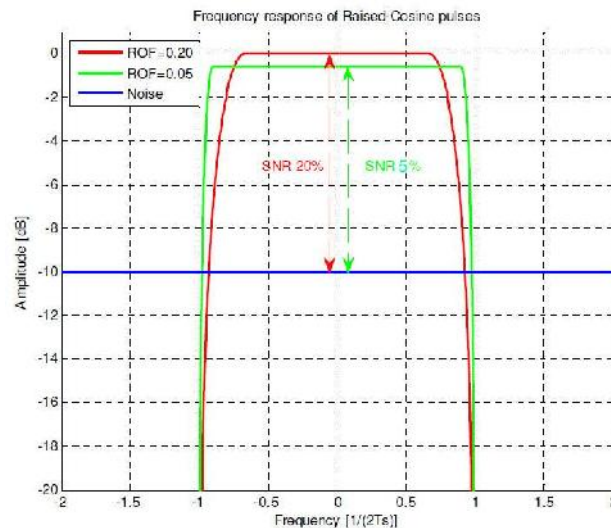
- roll-off lower than 20% (up to 5% as minimum)
- FEC (LDPC) higher granularity
- Wideband implementation (up to 72MHz)

EUROVISION satellite network experience

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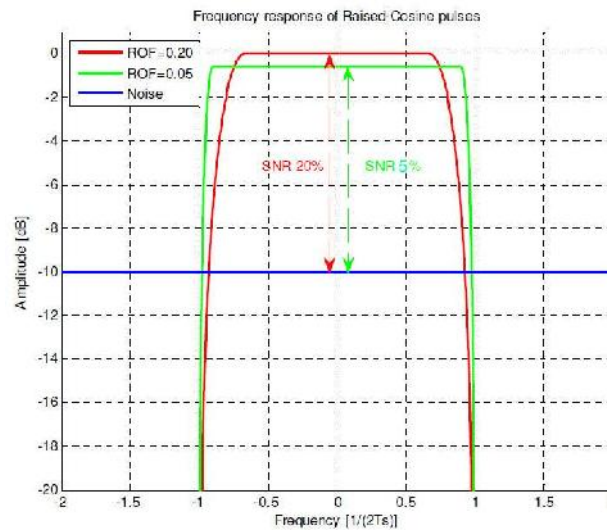


EUROVISION satellite network experience

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Signal 20% roll-off SNR 0 dB

Signal 5% roll-off SNR -0.58 dB

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FEC granularity available for 8PSK DVB-S2

$3/5$, $2/3$, $3/4$, $5/6$, $8/9$ and $9/10$

Higher granularity allows a fine selection of the MODCOD.

EUROVISION satellite network experience

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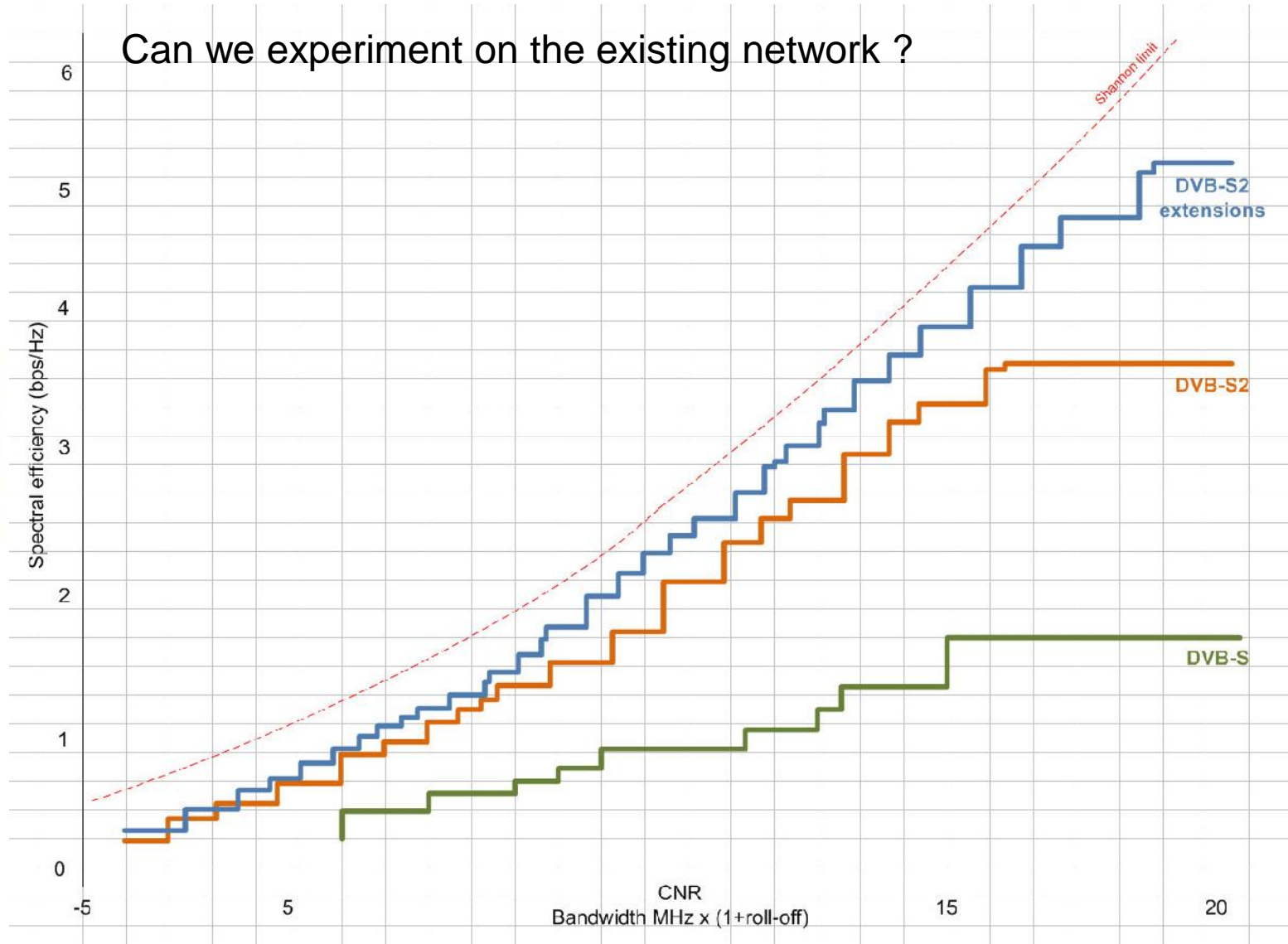
Symbol rate for 72MHz wide transponder calculated for one single carrier with roll-off 5%

$$72 \times (1/1+0.05) = 68.571429 \text{ Ms/s}$$

Wide MCPC carriers in 72MHz transponders become available.

EUROVISION satellite network experience

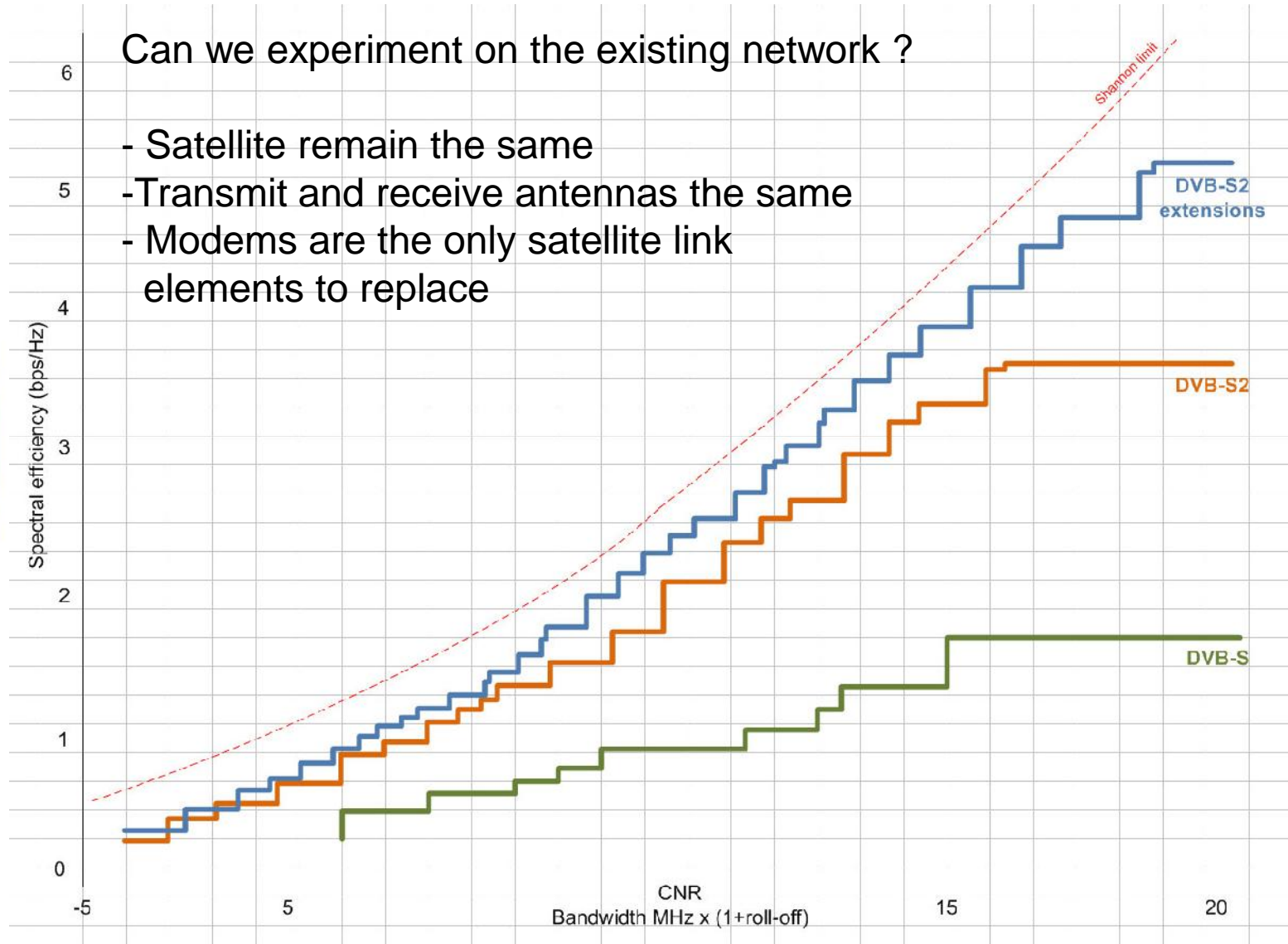
Can we experiment on the existing network ?



EUROVISION satellite network experience

Can we experiment on the existing network ?

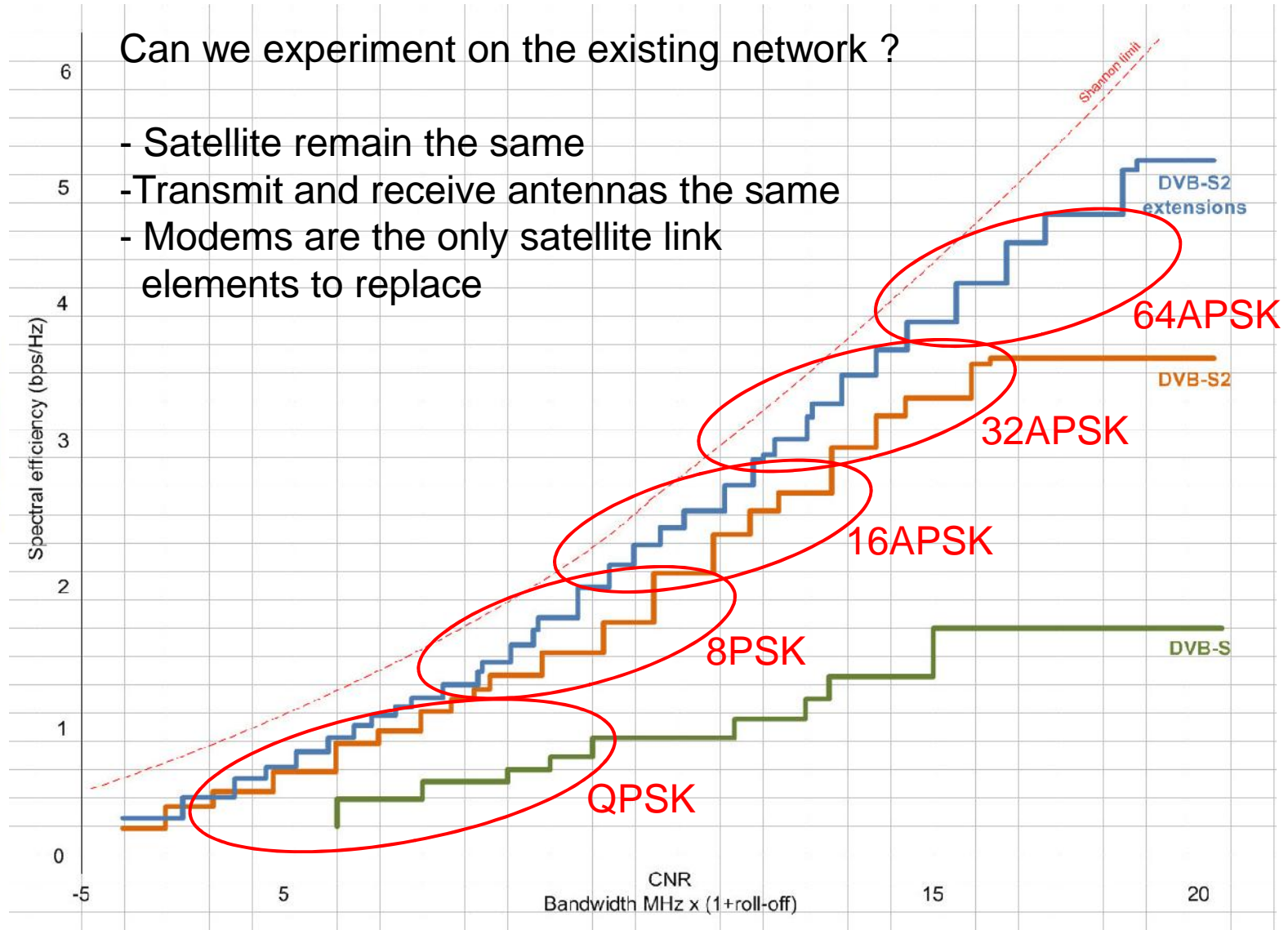
- Satellite remain the same
- Transmit and receive antennas the same
- Modems are the only satellite link elements to replace



EUROVISION satellite network experience

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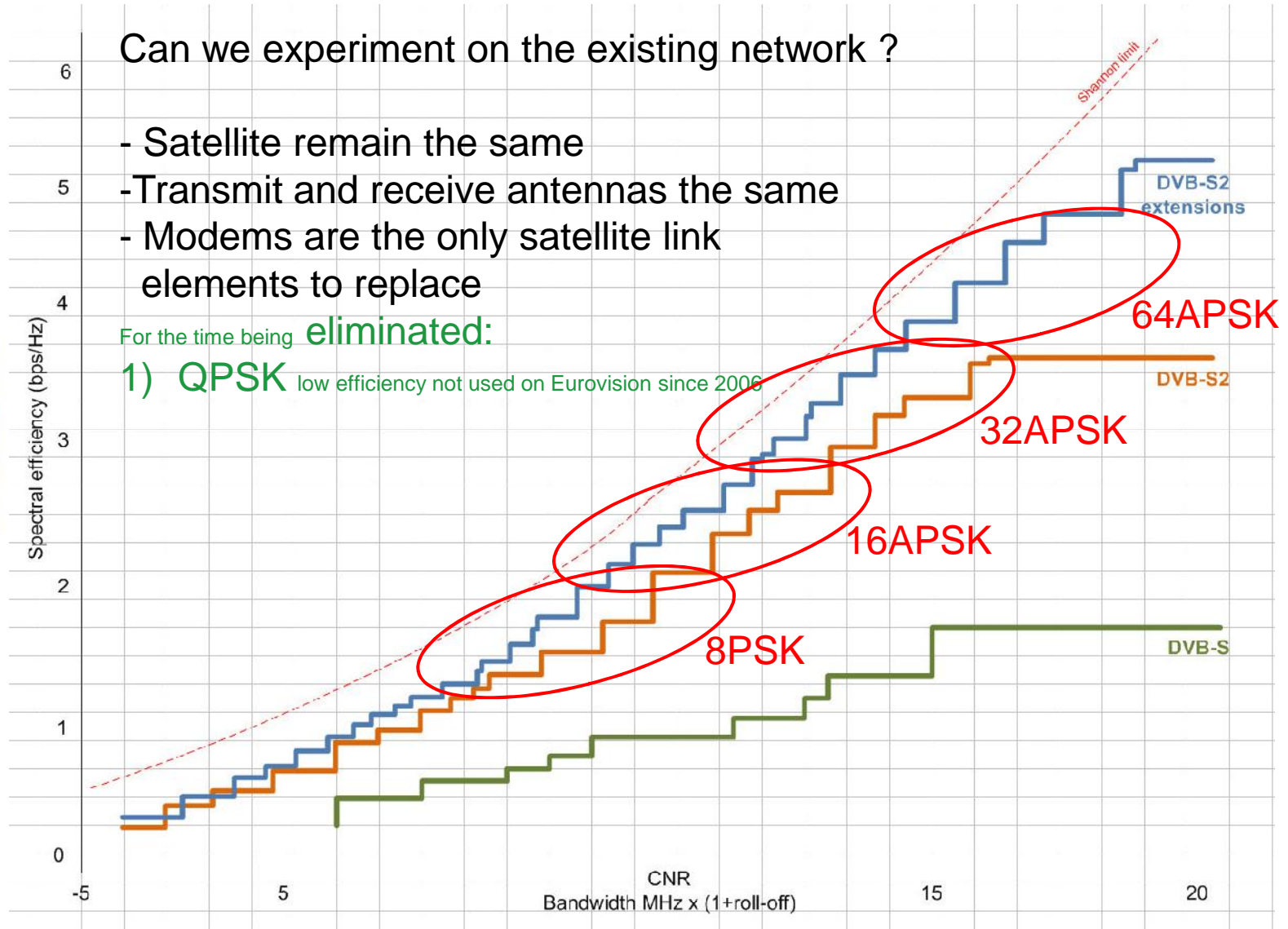
EUROVISION satellite network experience

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For the time being **eliminated:**

1) **QPSK** low efficiency not used on Eurovision since 2006



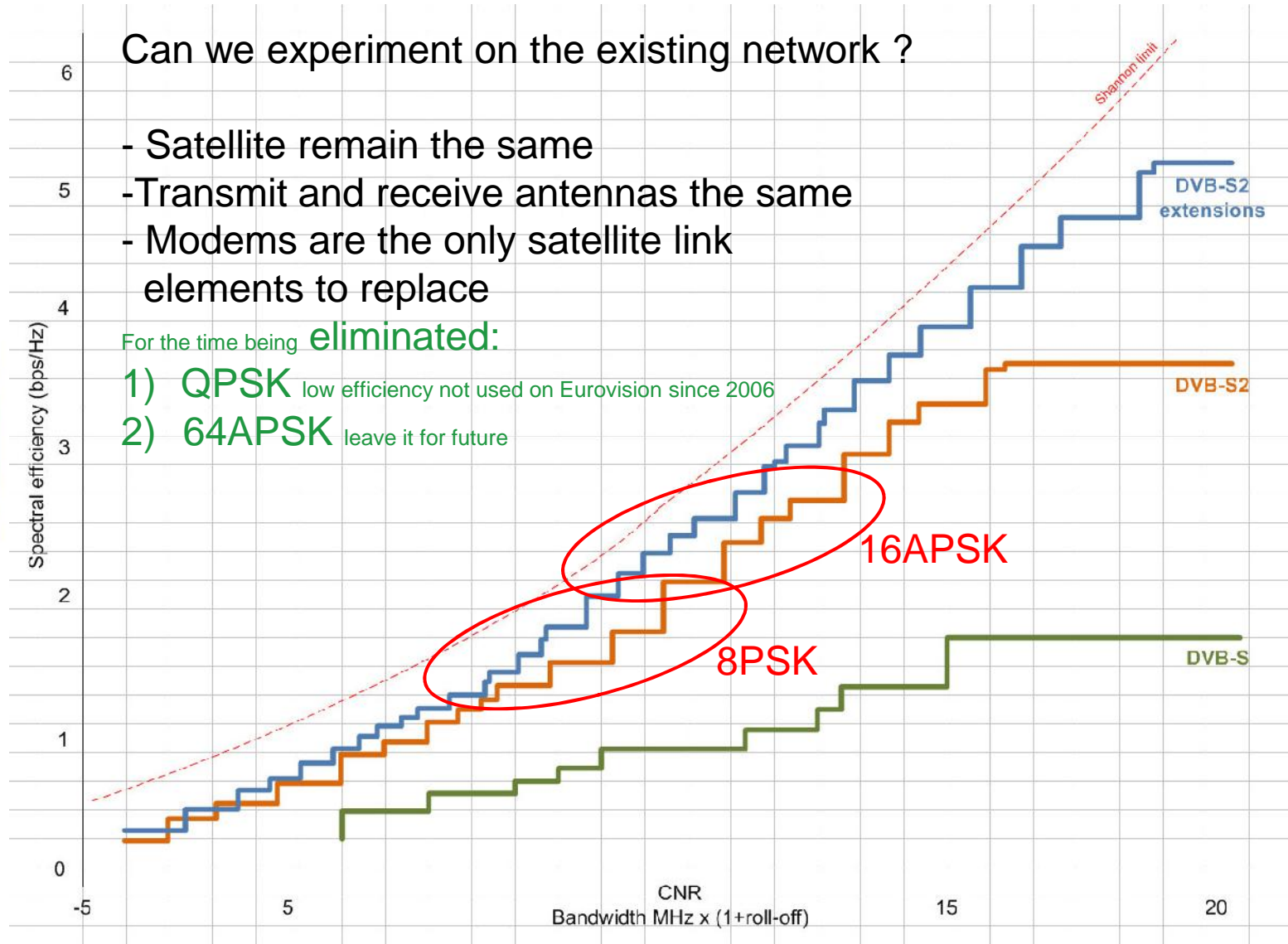
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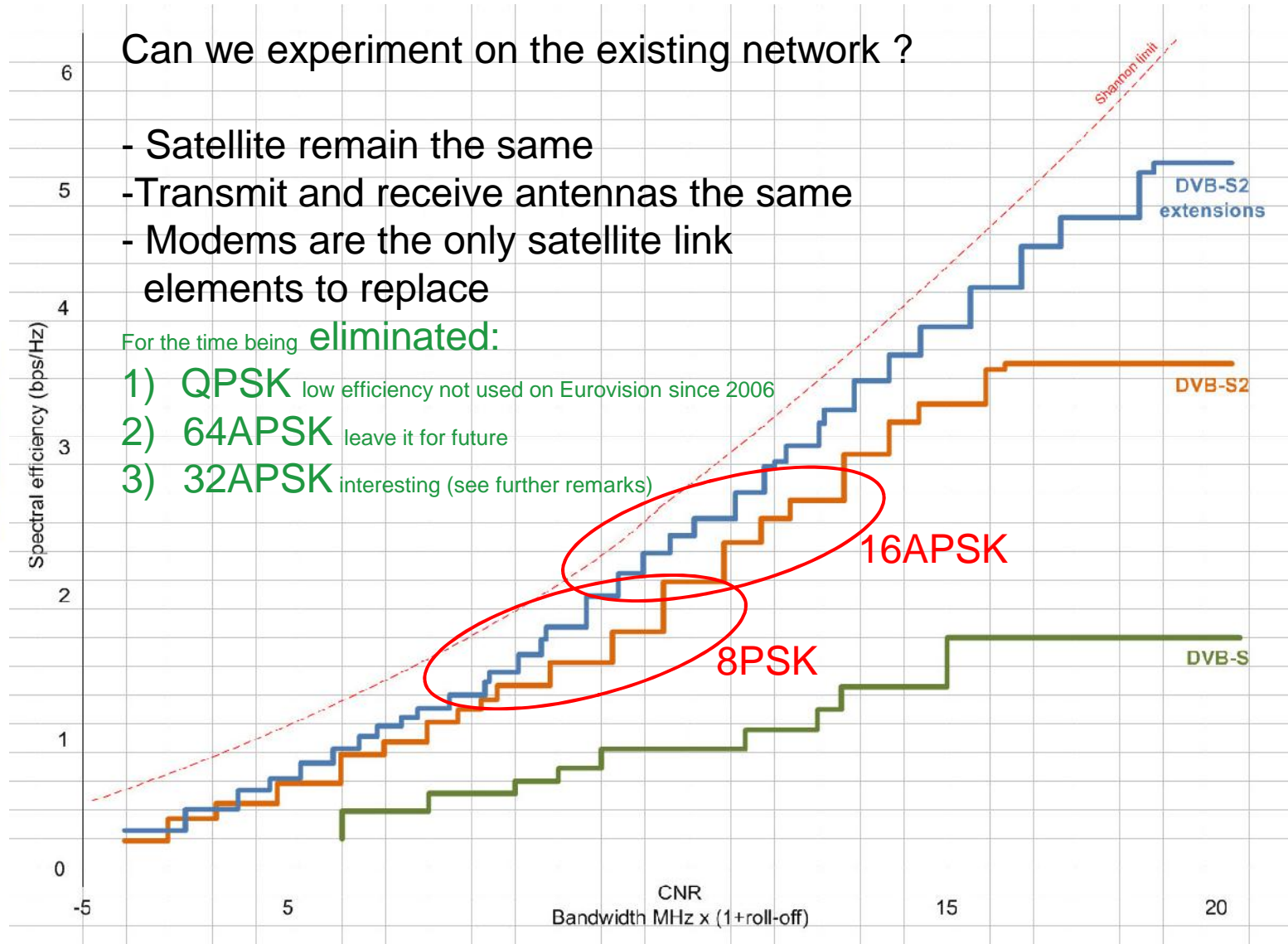
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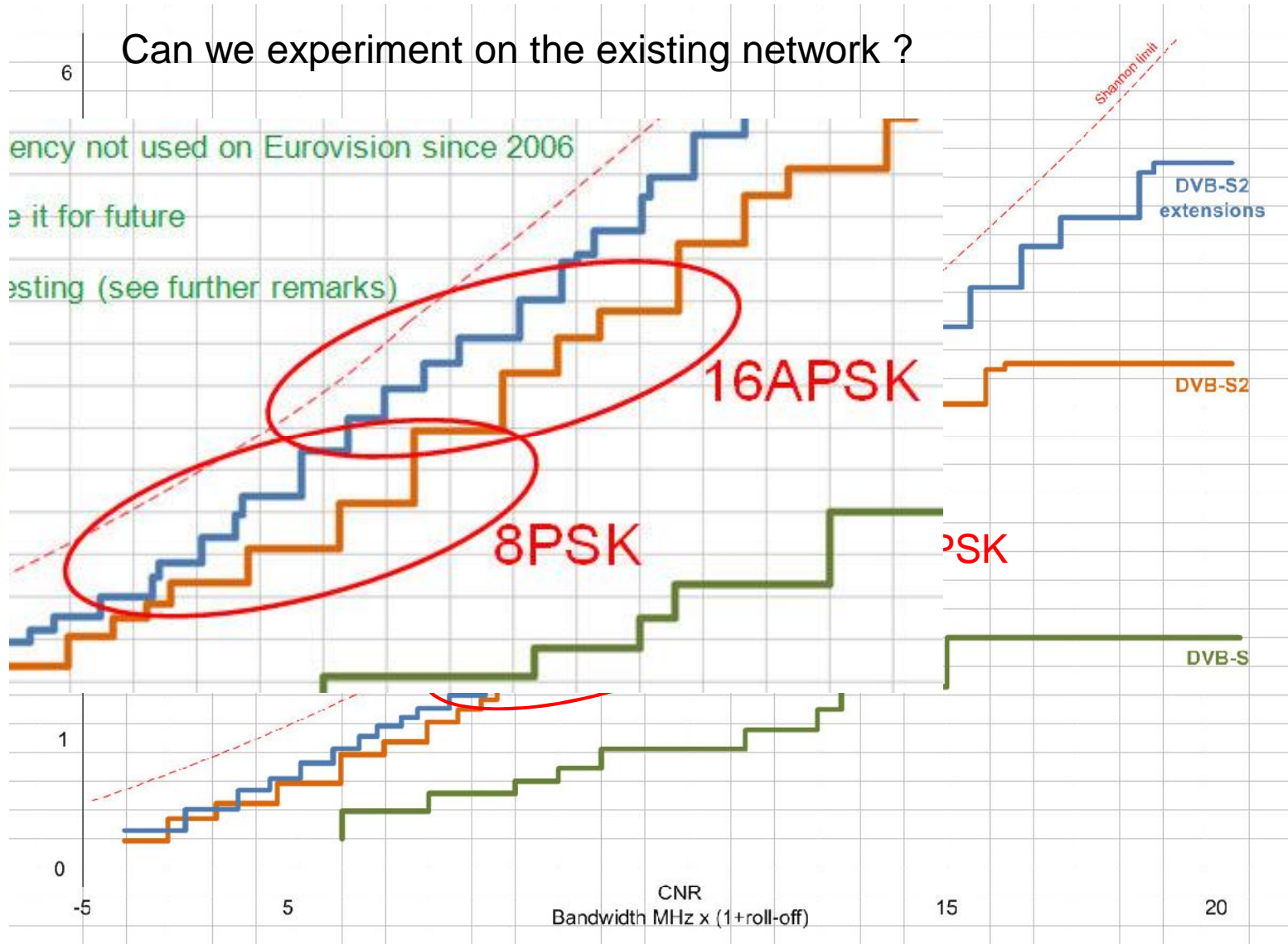
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- 3) **32APSK** interesting (see further remarks)



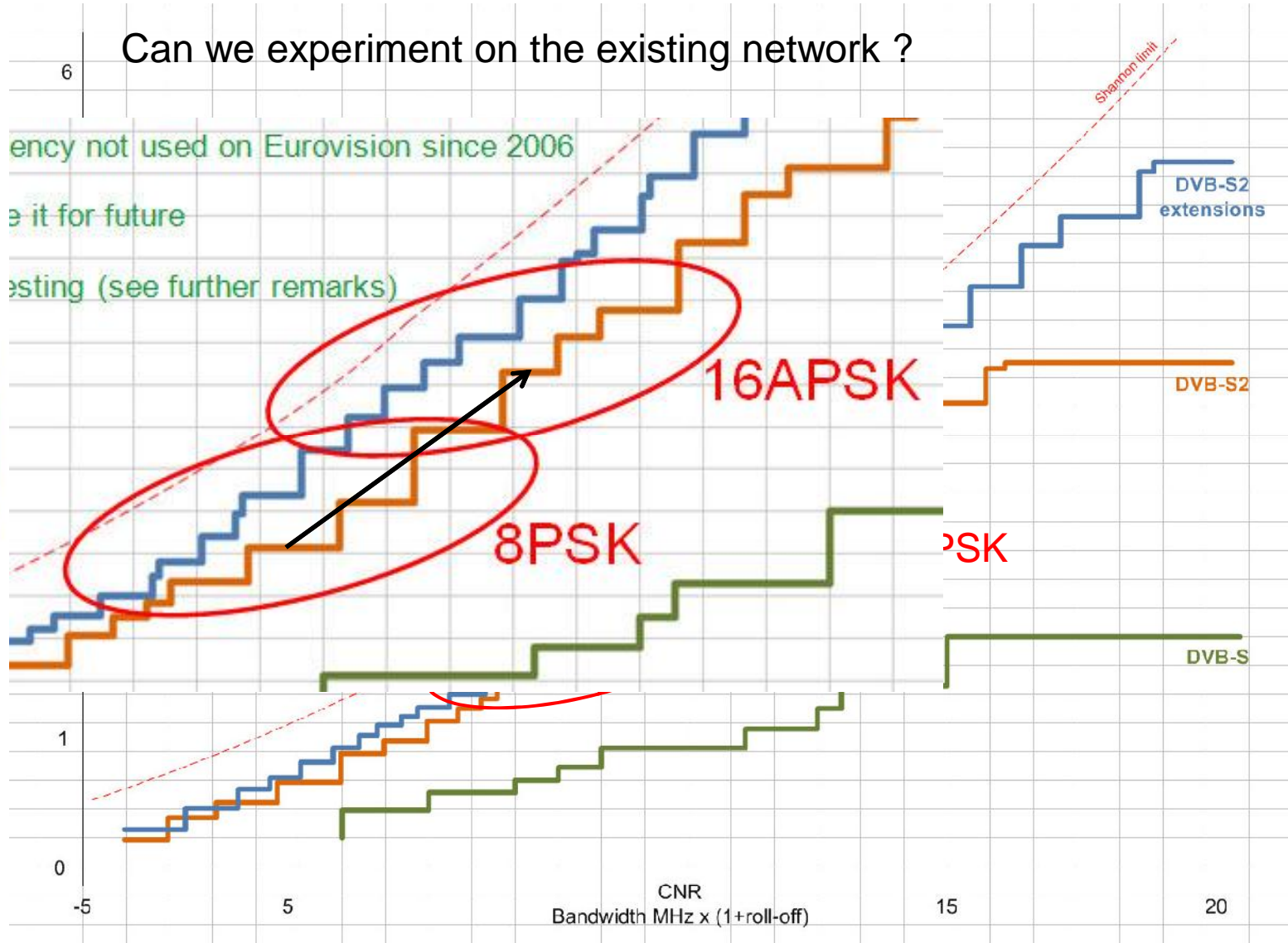
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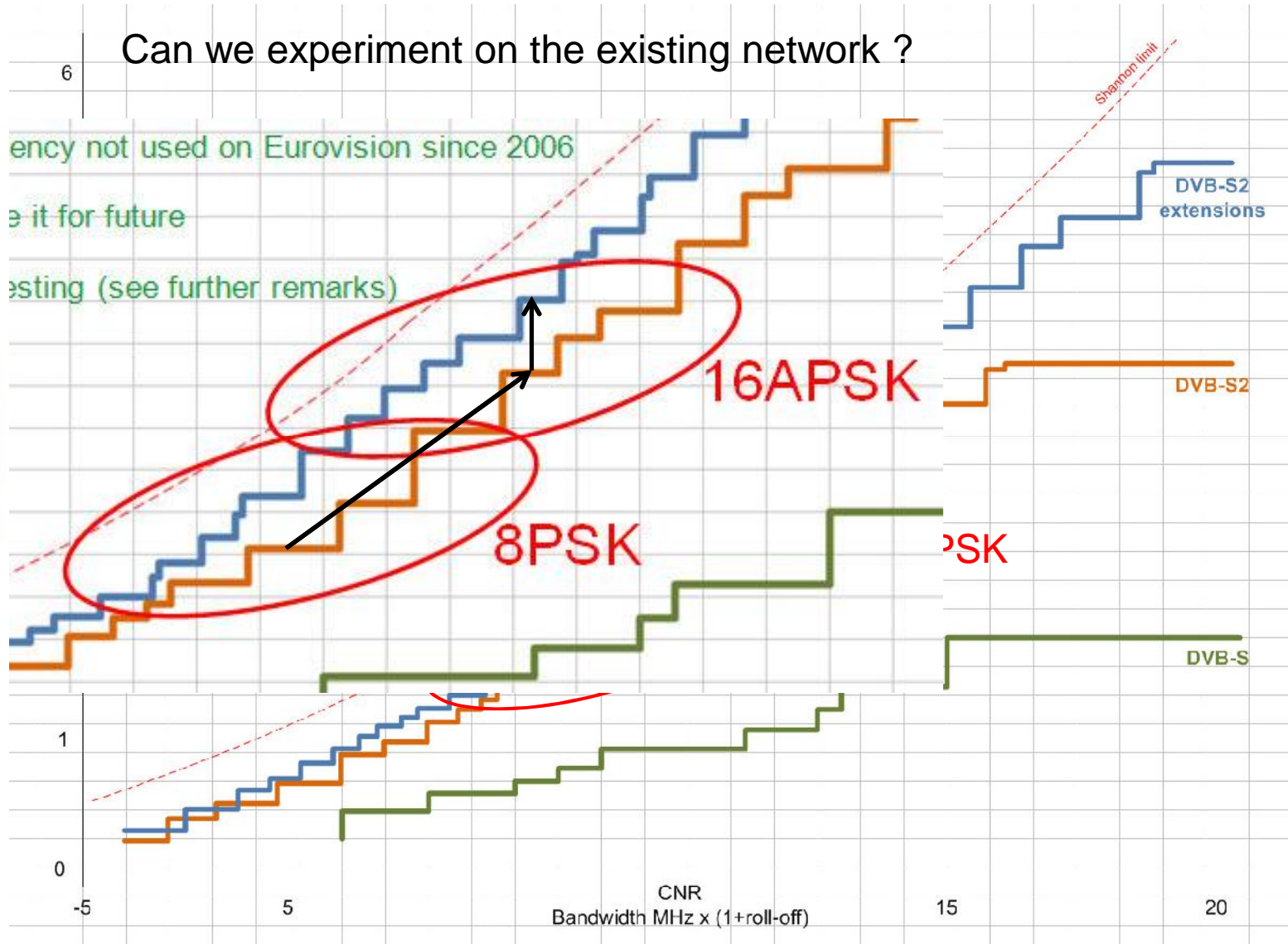
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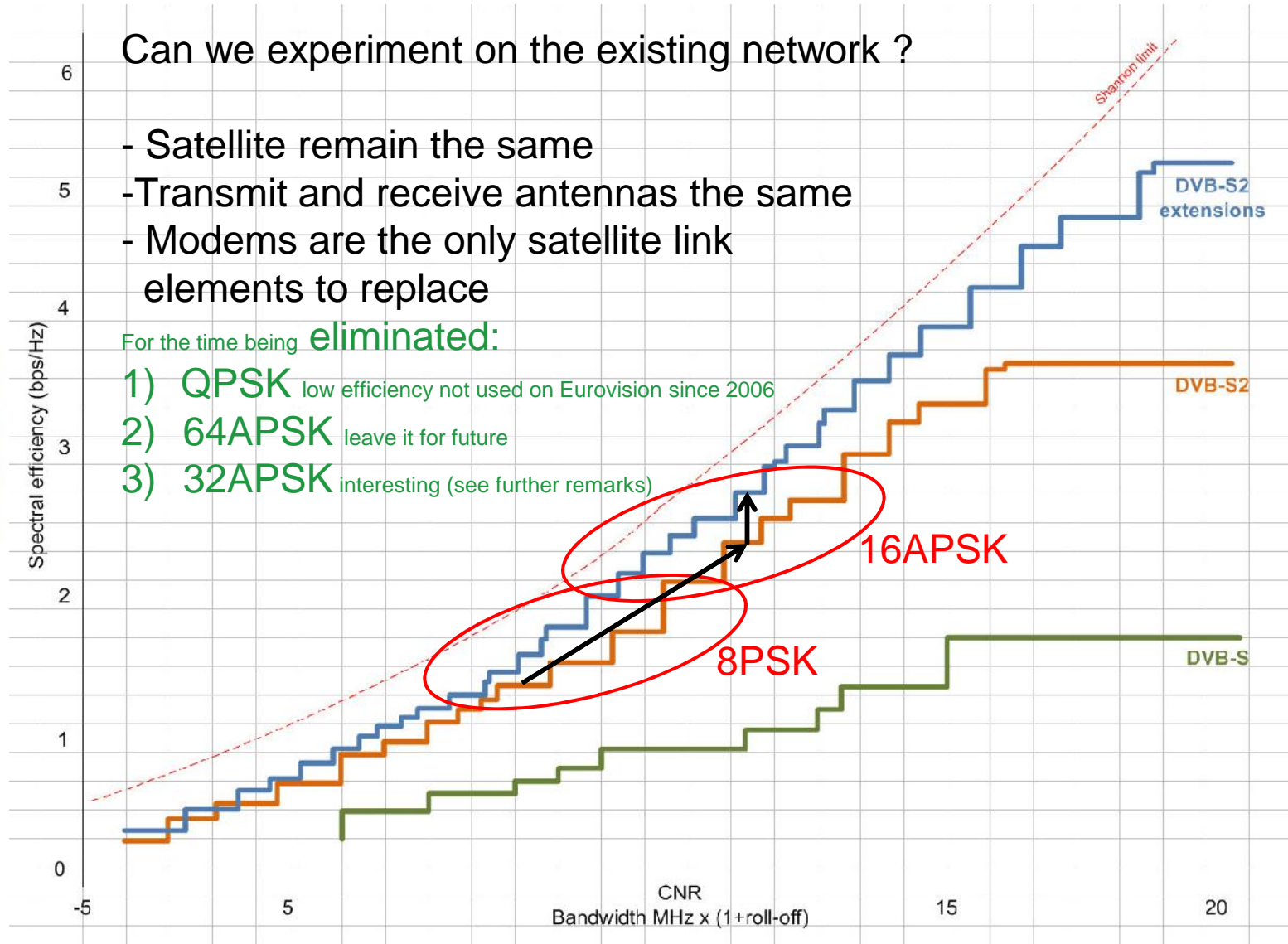
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EUROVISION satellite network experience

	DVB-S2 existing	DVB-S extensions
BW	36 MHz	36 MHz
Roll-off	20%	
Symbol rate	30.0 Ms/s	
Modulation	8PSK	
FEC (LDPC)	3/4	
Bit rate	65.326 Mbps	

EUROVISION satellite network experience

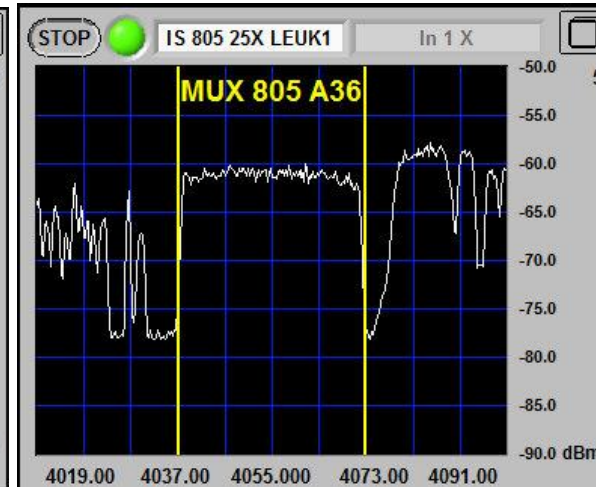
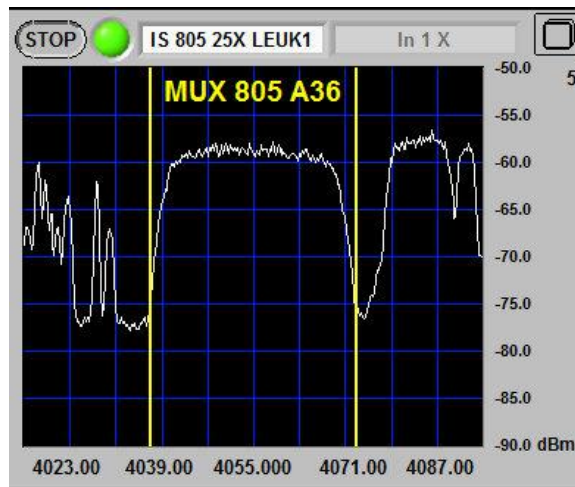
	DVB-S2 existing	DVB-S extensions
BW	36 MHz	36 MHz
Roll-off	20%	5%
Symbol rate	30.0 Ms/s	34.285 Ms/s
Modulation	8PSK	16APSK
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Bit rate	65.326 Mbps	94.124 Mbps

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+30% It could be more

The 32APSK was tested sucesfully and can be used only if high end receiving LNB installed.

The 64APSK is certainly is the most attractive part of the new standard but the RF elements of both transmit and receive chains need to be adapted.

EUROVISION satellite network experience

The 72MHz transponder on Asiasat 5 100.5 deg E

The screenshot displays the AVCOM Stancard BETA GUI v2.9.9c interface, divided into several sections:

- Line settings:** A list of parameters for the transponder, including TX State (Enable), Line Mode (NS3), RF Freq (1465.000700 MHz), Sinc Wave (OFF), Dual Channel Mode (Single channel), Symbol Rate (68.571429 MSPS), Bit Rate (149.783737 Mbps), Power (-12.00 dBm), Roll Off (0.05), Golden Seq (0), Spectrum Invert (ON), Output Level Mode (Constant Power), Power-Up TX State (Disable), and ACM Mode (Disable).
- NS2000 Menu:** A vertical menu with options: monitor, system, system config, and demodulator config.
- General:** A table of overall system parameters:

Mode	NS3	Symbol Rate	68.57 MSPS
State	Sync	Symbol Rate Offset	0.01 PPM
Pilot SNR	13.37 dB	Roll Off	0.05
Composite Power	-36.10 dBm	RF Frequency	1070.00 MHz
Signal Power	-43.24 dBm	Frequency Offset	-13.21 KHz
- Channel 1:** A table of channel-specific parameters:

Data Rate	149.78 Mbit/Sec
Link Margin	6.47 dB
Status	Locked
SNR	12.47 dB
Modulation	16APSK
FEC-Rate	17/30
Pilot	YES
Frame-Size	Normal
Frames	5.196e+06
Error Frames	0
ILR	0.00e+00
- MODE CODE Table (limited to 60):** A table showing modulation and FEC details:

Modulation	FEC rate	Pilot	Frame
16APSK	17/30	YES	Normal
- Waveforms:** Two signal waveforms are shown. The top one is labeled 'AS5 C11Y IAIPO1' and shows a signal with vertical markers labeled A through K. The bottom one is labeled 'AS5 10Y TAIPO2' and shows markers for 'AS Perm' and 'AS MUX'.

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- MODE CODE Table (limited to 60):** A table showing modulation and FEC details:

Modulation	FEC rate	Pilot	Frame
16APSK	17/30	YES	Normal
- Spectrum Plot:** A graph showing the signal spectrum with a peak at approximately 4060 MHz. The plot is labeled with 'AS5 C11Y IAIPO1' and 'AS5 10Y TAIPO2'. The x-axis ranges from 4040.00 to 4112.00 MHz, and the y-axis ranges from -50.0 to -90.0 dBm. Vertical lines are labeled A through K.

EUROVISION satellite network experience

The 72MHz transponder on Asiasat 5 100.5 deg E

The screenshot displays a satellite configuration interface with several key sections:

- Line settings:**
 - TX State: Enable
 - Line Mode: NS3
 - RF Freq: 1465.000700 MHz
 - Sine Wave: OFF
 - Dual Channel Mode: Single channel
 - Symbol Rate: 68.571429 MSPS
 - Bit Rate: 149.783737 Mbps
 - Power: -12.00 dBm
 - Roll Off: 0.05
 - Golden Seq: 0
 - Spectrum Invert: CN
 - Output Level Mode: Constant Power
 - Power-Up TX State: Disable
 - ACM Mode: Disable
- NS2000 Menu:**
 - monitor
 - system
 - system config
 - demodulator config
- General:**
 - Mode: NS3
 - State: Sync
 - Pilot SNR: 13.37 dB
 - Composite Power: -36.10 dBm
 - Signal Power: -43.24 dBm
 - Symbol Rate: 68.57 MSPS
 - Symbol Rate Offset: 0.01 PPM
 - Roll Off: 0.05
 - RF Frequency: 1070.00 MHz
 - Frequency Offset: -13.21 KHz
- Channel 1:**
 - Data Rate: 149.78 Mbit/Sec
 - Link Margin: 6.17 dB
 - Status: Locked
 - SNR: 12.47 dB
 - Modulation: 16APSK
 - FEC Rate: 17/30
 - Pilot: YES
 - Frame Size: Normal
 - Frames: 5.196e+06
 - Error Frames: 0
 - ILR: 0.00e+00
- MODE CODE Table (limited to 60):**

Modulation	FEC rate	Pilot	Frame
16APSK	17/30	YES	Normal
- Waveform Analysis:**
 - Top plot: AS5 C11Y IAIPO1. Shows a signal spectrum with vertical markers labeled A through K. The signal is centered around 4060 MHz.
 - Bottom plot: AS5 10Y TAIPO2. Shows a signal spectrum with vertical markers labeled AS Perm and AS MUX.

EUROVISION satellite network experience

The 72MHz transponder on Asiasat 5 100.5 deg E

The screenshot displays three main sections of the configuration software:

- Line settings (left):** Shows parameters for the transponder. Key values include:
 - Line Mode: NS3
 - RF Freq: 1465.000700 MHz
 - Symbol Rate: 68.571429 MSPS (circled in red)
 - Bit Rate: 149.783737 Mbps
 - Power: -12.00 dBm
 - Roll Off: 0.05 (circled in red)
- Demodulator (middle):** Shows parameters for the NS2000 demodulator. Key values include:
 - Data Rate: 149.78 Mbit/Sec (circled in red)
 - Link Margin: 5.47 dB (circled in red)
 - Status: Locked
 - SNR: 12.47 dB
 - Modulation: 16APSK
 - FEC-Rate: 17/30 (circled in red)
 - Pilot: YES
 - Frame-Size: Normal
 - Frames: 5.196e+06
 - Error Frames: 0 (circled in red)
 - ILR: 0.00e+00
- Uplink station (right):** Shows the status of the uplink station. Key values include:
 - Station: AS5 C11Y IAIPO1
 - Frequency: 4040.00 to 4112.00 MHz
 - Modulation: AS Perm
 - FEC rate: AS MUX

Modulator
Novelsat NS1000

Demodulator
Novelsat NS2000

Uplink station
Asiasat Hong Kong

The EBU logo consists of the letters 'EBU' in a bold, blue, sans-serif font.

OPERATING EUROVISION AND EURORADIO

The DVB logo features the letters 'DVB' in a large, bold, dark blue, sans-serif font. A registered trademark symbol (®) is located at the top right of the 'B'.

Digital Video
Broadcasting

Digital Video Broadcasting project group focused on all aspects related to the DVB-S extension and works under following schedule:

February – June 2013 gathering information from DVB group contributors

June – September 2013 new standard proposal preparation

End of 2013 – the new standard expected to be ready

<http://dvb.org/technology/standards/>

EBU

THANK YOU

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