• ABU

ASIA-PACIFIC BROADCASTING UNION
- Kuala Lumpur, Malaysia

• ASBU

ARAB STATES BROADCASTING UNION
- Tunis, Tunisia

• AUB

AFRICAN UNION OF BROADCASTING
- Dakar, Senegal

• CBU

CARIBBEAN BROADCASTING UNION
- St. Michael, Barbados

• EBU

EUROPEAN BROADCASTING UNION
- Geneva, Switzerland

• IAB

INTERNATIONAL ASSOCIATION OF BROADCASTING
- Montevideo, Uruguay

• NABA

NORTH AMERICAN BROADCASTERS ASSOCIATION
- Toronto, Canada

• OTI

ORGANIZACION DE TELECOMUNICACIONES IBEROAMERICANAS
- Mexico City, Mexico

28 March 2008

Dr. Riyadh Najm
Chair, WBU-TC
Saudi Arabia Ministry of Culture and Information
P.O. Box 10152
Riyadh 11433
Saudi Arabia

Dear Riyadh,

At the last WBU-ISOG Conference Call meeting of March 12th, 2008 the chair requested the undersigned, acting as the WBU-TC/ISOG Liaison, to raise questions related to the use of HD 1080i and 720P formats for international programming exchange.

The use of both HD formats by broadcasters has created the necessity to perform new processes namely HD cross-conversion and HD Frame Rate Conversion during international programming exchange. Moreover, the increasing interest in adopting MPEG-4 compression technology for contribution and international programming exchange applications, which concatenated with the various cross-conversions and frame rate conversions is creating a new group of issues that broadcasters must deal with rather sooner than later. Therefore, the questions to ask to the WBU-TC are the followings:

1. What would be the impact on the HD programme picture quality after formats' cross conversion between 1080i and 720P, and concatenated with MPEG-4 compression and decompression on international programme exchange?

2. What would be the impact on the HD programme picture quality after formats' cross conversion plus concatenated with MPEG-4 compression and decompression, and after undergoing through a frame rate converter on international programme exchange?

3. Where is the ideal place (in terms of image quality, bit-rate advantages) for converting from one image format to the other – before or after the contribution encoding process. This is to be evaluated also for MPEG-2 based contribution links.

These possible scenarios are expected in HD programming exchange and would require an investigation. The findings of this investigation would be used to develop a set of operational recommended practices, which would be of great benefit to the international broadcast community.

I thank you for WBU-TC consideration and welcome your feedback. As a suggestion, this issue could be included in the agenda of the upcoming WBU-TC meeting of May 13th, 2008 hosted by ZDF in Mainz, Germany.

Best Regard

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February 13, 2009

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Dear Anthony,

At the request of WBU-ISOG for WBU-TC to consider investigation into the use of HD 1080i and 720P formats for international programming exchange, where the use of both HD formats by broadcasters has created the necessity to perform new processes namely HD cross-conversion and HD Frame Rate Conversion during international programming exchange. Moreover, the increasing interest in adopting MPEG-4 compression technology for contribution and international programming exchange applications, which concatenated with the various cross-conversions and frame rate conversions is creating a new group of issues that broadcasters must deal with rather sooner than later.

The WBU-TC responds in the following manner;

There are two principle elements which will affect the answers to these questions. There is no single 'right' and 'wrong' answer to the question of where the standards converter should be located. There may be over-riding considerations such as cost, convenience, and practicality. The answers below are about 'how to optimize quality that the viewer sees, all other things being equal'.

A. Any process such as standards conversion can introduce unwanted 'entropy' into the scene, and this makes the job of the subsequent digital compression more difficult. Digital compression works best with 'clean' pictures. If there is noise or artifacts of any kind in the picture, the compressor will not know they are unwanted, and will just compress them as if they were wanted, using up bits, and along with the real 'wanted' signals. We will deliver the highest quality to the viewer if we systematically strive for the least noise and artifacts in the picture that is submitted for final compression.

B. Experience suggests that if interlace format is included in the chain from camera to viewer, it forms a 'weak link' or system bottleneck, after which headroom lost can never be regained. Both motion compensated standards conversion and digital compression algorithms use motion compensation as a first element, and this can be done more accurately if all the vertical-temporal information available with a progressively scanned signal, but not with an interlaced signal, is present.

Answers to questions:

Q1. What would be the impact on the HD programme picture quality after formats' cross conversion between 1080i and 720P, and concatenated with MPEG-4 compression and decompression on international programme exchange?

A1. If a 1080i/25 signal is converted to a 720p/50 signal, the 720p signal will only be a 'pseudo' 720p signal, because there will have been no vertical temporal information to pass to the 720p signal. It will be as difficult to compress as a 1080i signal, and will probably need about the same compressed bit rate. There may be some benefit from the professional interlace-to-progressive converter used in the standards conversion process, rather than using the one in the final receiver which will be much simpler.

Q2. What would be the impact on the HD programme picture quality after formats' cross conversion plus concatenated with MPEG-4 compression and decompression, and after undergoing through a frame rate converter on international programme exchange?

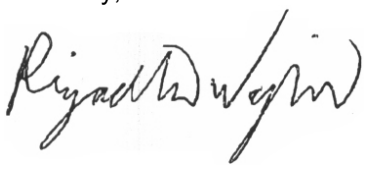
A2. If a 1080i/30 signal is converted to a 720p/50 signal, the result will be worse than above because of the additional artifacts introduced by the field rate standards conversion will make the signal more difficult to compress. If a 720p/50 signal is converted to a 1080i/30 signal, the broadcast result should be slightly better, but the v/t information needed for most effective compression will still not be there, and the compressed bit rates will be still about 20% higher than with native 720p/50 compression.

Q3. Where is the ideal place (in terms of image quality, bit-rate advantages) for converting from one image format to the other – before or after the contribution encoding process? This is to be evaluated also for MPEG-2 based contribution links.

A3. For the highest ultimate viewer quality, HDTV field rate standards conversion should be left as late in the chain as possible, whatever compression is used, and if possible should only be done just before broadcast delivery, though this may not be practical because of the need to integrate with local signals. Progressive scanning should be used in production as much as possible. MPEG4 AVC compression is likely to offer less bit rate gains over MPEG2 for the high bit rates that are needed for contribution networks compared to gains for broadcasting.

I hope this information is useful to you and look forward to our continued collaboration.

Sincerely,



Riyadh Najm
WBU-TC Chair