MISB MOTION IMAGERY STANDARDS BOARD	MISB ST 1205.1
STANDARD **Motion Imagery Test Sequences**	**27 February 2014**

1 Scope

This ST provides a file and metadata nomenclature for injected motion imagery test sequences.

2 References

2.1 Normative References

[1] ITU-R BT.601-7 Studio encoding parameters of digital television for standard 4:3 and wide screen 16:9 aspect ratios, 03/11

[2] ITU-R BT.709-5 Parameter values for the HDTV standards for production and international programme exchange, 04/02

2.2 Informative References

[3] Recommendation ITU-R BT.709-5, "Parameter Values for the HDTV standards for production and international program exchange"

3 Revision History

Revision	Date	Summary of Changes
ST 1205.1	02/27/2014	• Promoted to Standard; updated references

4 Acronyms

FPA	Focal Plane Array
FPS	Frame Per Second
MPEG	Motion Picture Experts Group
PSNR	Peak Signal to Noise
SSIM	Structural Similarity Index

5 Introduction

The overall scope of motion imagery test and measurement is much larger than what is addressed in this document.

The topic of motion imagery system calibration, test, and measurement spans the end-to-end system from glass-to-glass. It also spans the development cycle from research stage through specification, acceptance testing, operational deployment and maintenance as shown in Figure 1. Each part of the system at each phase of its lifecycle has metrics. Measurement techniques can vary. For example, in-service measurement during operational missions has very unique requirements.

The commercial broadcast industry has many standards and methods that can be leveraged. Future guidance is expected to take advantage of these resources to address the complete scope depicted in the figure. This Standard only addresses a narrow aspect of the overall topic. Future work will enlarge guidance to address more aspects.

Nothing in this document precludes the use of commercial motion imagerytest sequences provided each frame is labeled. This is needed to align the compressed output to the reference input without ambiguity.

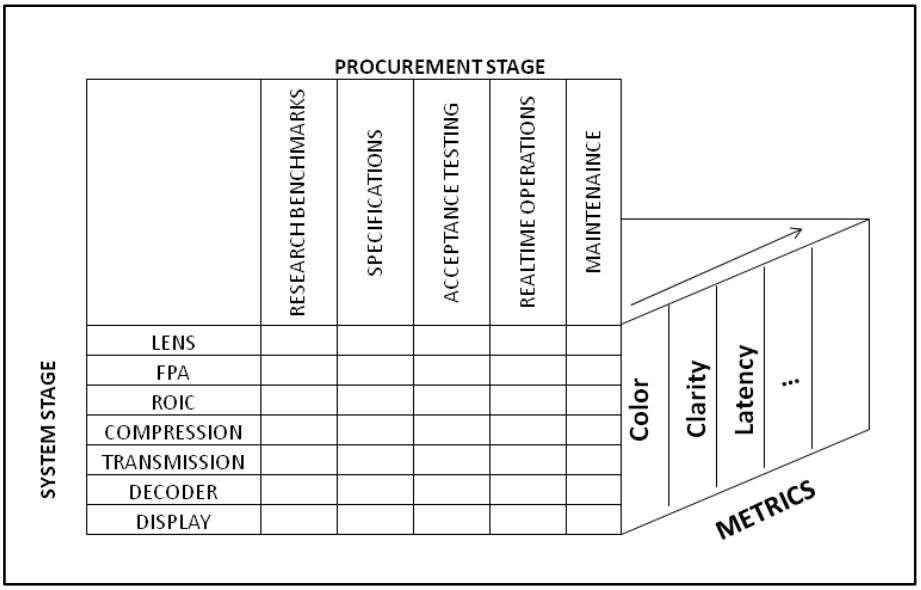

Figure 5. Overall Scope of MI Test and Measurement

Test sequences are injected prior to compression and data transmission.

It is envisioned that the test sequences will be designed to:

1. Test basic picture decoding performance
2. Quantify Mosquito Noise
3. Properly adjust signal amplitude range (e.g. 16-235 in an 8-bit digital system)
4. Measure noise artifact corruption (PSNR and SSIM)
5. Detect color bleeding from motion estimation (hue differences around moving sprites)
6. Measure MPEG compression effects (blockiness metric)
7. Measure judder and missing frames (frame label)

8. Test a system's frequency response (frequency ratio)
9. Evaluate vertical to horizontal resolution equality (H and V bars)
10. Test color space (ITU-R BT.601[1] versus ITU-R BT.709[2])

6 Test Sequence Nomenclature

The test sequence nomeclature is indicated four ways:

1. The test sequence ID forms the first part of the file name, followed by color sampling format, followed by spatial dimensions and temporal frame rate.

   Example: cal422_1920_1080_60_001.yuv is the file name for a 4:2:2 chroma subsampled, 1920x1080 , 60 FPS test sequence with identification number 001. A change in format or frame rate does not alter the identification number.

2. The test sequence ID is burned into each calibration frame as a text string.
3. The test sequence ID is burned into each calibration frame as a QR-code (optional).
4. Each frame is uniquely labeled.
5. The test sequence ID is included in the metadata.

Each frame is labeled (burned in) with the frame number as a text and QR-code representation.

7 Calibration Metadata Keys

Table 1: Calibration Pack

NAME	KEY				
CALIBRATION Pack	**06.0E.2B.34.02.05.01.01.0E.01.03.03.06.00.00.00 (CRC 39697)**				
	Constituent Keys				
Name	**Tag**	**Key**	**Units/Range**	**Format**	**Length (Bytes)**
Time Stamp of Last Frame in Sequence	1	06.0E.2B.34.01.01.01.01.0E.01.02.03.54.00.00.00 (CRC 4666)	micro-secs	UINT64	8
Sequence Duration (in Frames)	2	06.0E.2B.34.01.01.01.01.0E.01.02.03.55.00.00.00 (CRC 25742)	0- 65536 frames	UINT16	2
Time Stamp of Calibration Pack Creation	3	06.0E.2B.34.01.01.01.01.0E.01.02.03.56.00.00.00 (CRC 65362)	micro-secs	UINT64	8
Calibration Sequence Identifier	4	06.0E.2B.34.01.01.01.01.0E.01.02.03.57.00.00.00 (CRC 35302)	0-255	UINT8	1

7.1 Time Stamp of Last Frame in Sequence

The POSIX microsecond time stamp of the last frame in the calibration sequence.

7.2 Sequence Duration

The number of motion imagery frames in a calibration test sequence duration. The maximum value is 65535.

7.3 Time Stamp of Calibration Pack Creation

The Calibration Pack Creation time is the current time (POSIX microsecond time) when the calibration key value(s) are inserted into the stream. The reason for this key is to indicate the delay between the metadata calibration indication and the calibration data. Note the delay can be negative when the metadata is inserted before the calibration event happens. That is, if the Calibration Pack Creation Time (Tag 3) is less than the Time Stamp of the Last Frame in Sequence (Tag 1), then the metadata message is a prediction of when the calibration sequence will end. This alternative is provided to enable receiving equipment to prepare for receipt of motion imagerytest sequences in realtime. The predicted start time of the test sequence can be calculated by taking into account the "Sequence Duration" metadata value.

7.4 Calibration Sequence Identifier

The Calibration Sequence Identifier is the last three digits in the filename of the sequence. It is anticipated that various test sequences will span the range of test requirements.