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MPEG VIDEO CODING

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Source	PUT, Tencent, Philips, ETRI, Intel
Status	Input document
Title	MIV anchors
Author	Adrian Dziembowski, Joel Jung, Bart Kroon, Gwangsoon Lee, Dawid Mieloch, Basel Salahieh

Abstract

This document provides the generated ISO/IEC 23090-12 MPEG Immersive Video (MIV) anchors based on the Common Test Conditions for MPEG Immersive Video and with use of the Test Model 7 for MPEG Immersive Video (TMIV) reference software 7.0. The crosscheck was successful.

1 Introduction

The *Common Test Conditions for MPEG Immersive Video* (CTC) document [N0006] specifies three anchors:

- MIV anchor (A), tested in:
  - A97: full frame configuration with 97 coded frames,
  - A17: reduced frame configuration with 17 coded frames,
- MIV view anchor (V), tested in:
  - V17: reduced frame configuration,
- MIV decoder-side depth-estimating anchor (G), tested in:
  - G17: reduced frame configuration.

All anchors are based on *Test Model 7 for MPEG Immersive Video* (TMIV) reference software 7.0 [N0005] and *HEVC Test Model* (HM) 16.16.

G17 anchor required a fix in TMIV 7.0. Such a fix was provided in 7.0.1. The fix does not affect other anchors.

2 Anchor generation and crosschecking

This document is a collaborative effort of 5 organizations: Poznań University of Technology, Tencent, Philips Research Eindhoven, Electronics and Telecommunications Research Institute and Intel.

Anchors A17, A97 and V97 were generated by all 5 organizations, using following compilers: GCC 9.3 (PUT), GCC 8.1 (Tencent), GCC 10.2 (Philips), VC 15 (ETRI) and VC 16 (Intel). G17 anchor was generated by: PUT (GCC 9.3), Intel (VC 16) and Tencent (GCC 8.1).

The participants performed full crosscheck. The crosscheck was successful, with an exception for G17 anchor: SN, SQ and SR sequences, where the differences between participants for some views were larger than in other sequences. The probable cause is that due to the issue of the IVDE being compiler-dependent. The description of issue can be found at MPEG GitLab server.

3 Results

A selection of pose trace videos is available on the MPEG content server at /MPEG-I/Part12-ImmersiveVideo/Anchor_TMIV7.

The CTC reporting templates are attached to this document:

- anchor_A17.xlsm
- anchor_A97.xlsm
- anchor_V17.xlsm
- anchor_G17.xlsm

The results obtained by different participants match, however they are not exactly the same due to different behavior of TMIV 7.0 under different compilers (occurring for floating point based operations like pruning).

In Tables 1 – 3 and Figs. 1 – 3 three comparisons are presented:

- A17 vs. V17,
- G17 vs. V17,
- TMIV 7.0 vs. TMIV 6.0.1 (A97).

Table 1. Objective results: A17 vs. V17 (green: A17 is better).

Mandatory content - Proposal vs. Low/High-bitrate Anchors

Sequence		High-BR BD rate Y-PSNR	Low-BR BD rate Y-PSNR	Max delta Y-PSNR	High-BR BD rate VMAF	Low-BR BD rate VMAF	High-BR BD rate IV-PSNR	Low-BR BD rate IV-PSNR
ClassroomVideo	SA	-39.1%	-18.0%	1.39	---	-21.3%	-30.8%	-13.7%
Museum	SB	-61.1%	-46.0%	16.13	-24.4%	-15.5%	-72.4%	-53.9%
Fan	SO	34.5%	46.7%	8.02	60.0%	65.1%	32.7%	44.6%
Kitchen	SJ	-58.0%	-32.4%	16.09	-14.6%	-6.2%	-79.1%	-50.9%
Painter	SD	33.4%	32.4%	7.66	16.9%	25.4%	9.4%	19.6%
Frog	SE	32.1%	37.1%	6.29	41.7%	43.8%	14.1%	28.2%
Carpark	SP	-15.6%	-5.6%	7.17	48.1%	23.5%	-26.2%	-13.9%
Chess	SN	---	---	14.30	---	-35.8%	---	---
Group	SR	63.2%	59.6%	11.81	19.2%	35.6%	15.1%	27.5%
MIV		---	---	**9.87**	---	**12.7%**	---	---

Optional content - Proposal vs. Low/High-bitrate Anchors

Fencing	SL	27.7%	32.8%	10.50	6.5%	19.4%	-21.5%	-0.7%
Street	SU	39.9%	19.2%	8.83	30.6%	15.7%	0.3%	0.9%
Hall	ST	---	---	9.39	-36.9%	-13.5%	---	-61.7%
ChessPieces	SQ	---	---	14.65	---	-41.7%	---	---
Hijack	SC	---	-33.4%	9.30	-24.0%	21.3%	---	-38.0%
MIV		---	---	**10.53**	---	**0.2%**	---	---

Table 2. Objective results: G17 vs. V17 (green: G17 is better).

Mandatory content - Proposal vs. Low/High-bitrate Anchors

Sequence		High-BR BD rate Y-PSNR	Low-BR BD rate Y-PSNR	Max delta Y-PSNR	High-BR BD rate VMAF	Low-BR BD rate VMAF	High-BR BD rate IV-PSNR	Low-BR BD rate IV-PSNR
ClassroomVideo	SA	---	---	5.53	---	---	---	227.8%
Museum	SB	---	---	15.49	---	400.4%	478.8%	193.4%
Fan	SO	---	-83.0%	10.22	-72.4%	-72.1%	-62.4%	-68.0%
Kitchen	SJ	-22.8%	-4.6%	13.47	-29.2%	-8.1%	-9.8%	12.0%
Painter	SD	3.5%	-17.7%	9.66	-16.5%	-28.6%	26.4%	-5.8%
Frog	SE	-34.2%	-34.3%	6.81	-39.1%	-39.6%	-30.3%	-32.7%
Carpark	SP	0.5%	-22.4%	9.49	-12.4%	-29.5%	-46.5%	-45.9%
Chess	SN	---	---	32.07	---	---	---	---
Group	SR	---	---	22.58	16.3%	5.7%	---	---
MIV		---	---	**13.92**	---	---	---	---

Optional content - Proposal vs. Low/High-bitrate Anchors

Fencing	SL	96.1%	-7.2%	12.75	-7.9%	-35.0%	-13.8%	-31.3%
Hall	ST	---	---	17.94	---	---	---	---
Street	SU	-2.5%	-24.0%	7.94	-41.1%	-42.7%	-39.2%	-41.4%
ChessPieces	SQ	---	---	34.58	---	---	---	---
Hijack	SC	---	---	22.48	---	---	---	---
MIV		---	---	**19.14**	---	---	---	---

Table 3. Objective results: TMIV7 vs. TMIV6, anchor A97 (green: TMIV7 is better).

Mandatory content - Proposal vs. Low/High-bitrate Anchors

Sequence		High-BR BD rate Y-PSNR	Low-BR BD rate Y-PSNR	Max delta Y-PSNR	High-BR BD rate VMAF	Low-BR BD rate VMAF	High-BR BD rate IV-PSNR	Low-BR BD rate IV-PSNR
ClassroomVideo	SA	-26.1%	-14.4%	1.71	-14.1%	-7.4%	0.7%	-2.0%
Museum	SB	3.6%	2.9%	16.78	4.1%	3.1%	0.6%	0.8%
Fan	SO	-4.1%	6.6%	6.79	21.4%	25.1%	10.6%	20.3%
Kitchen	SJ	-26.6%	-14.1%	16.33	-30.4%	-12.9%	-20.8%	-10.8%
Painter	SD	2.5%	-3.2%	7.95	3.3%	-3.4%	1.5%	-3.8%
Frog	SE	-0.9%	1.6%	5.13	3.5%	3.8%	5.2%	4.5%
Carpark	SP	-28.9%	-24.0%	6.98	-37.2%	-29.2%	-17.3%	-18.7%
Chess	SN	-59.4%	-36.8%	15.79	-42.8%	-24.6%	-30.3%	-21.2%
Group	SR	-18.1%	-11.6%	11.77	-16.8%	-9.7%	-7.1%	-6.1%
MIV		**-17.6%**	**-10.3%**	**9.91**	**-12.1%**	**-6.1%**	**-6.3%**	**-4.1%**

Optional content - Proposal vs. Low/High-bitrate Anchors

Fencing	SL	-78.8%	-51.5%	10.09	-52.4%	-43.6%	-48.0%	-40.5%
Street	SU	-74.2%	-41.0%	8.37	-70.5%	-39.9%	-26.5%	-17.8%
Hall	ST	-38.9%	-30.1%	10.73	-11.6%	-16.2%	-18.6%	-19.4%
ChessPieces	SQ	---	-55.9%	15.79	-77.9%	-31.4%	-57.1%	-35.6%
Hijack	SC	0.4%	-5.4%	9.37	2.3%	-5.2%	19.3%	3.2%
MIV		---	**-36.8%**	**10.87**	**-42.0%**	**-27.3%**	**-26.2%**	**-22.0%**

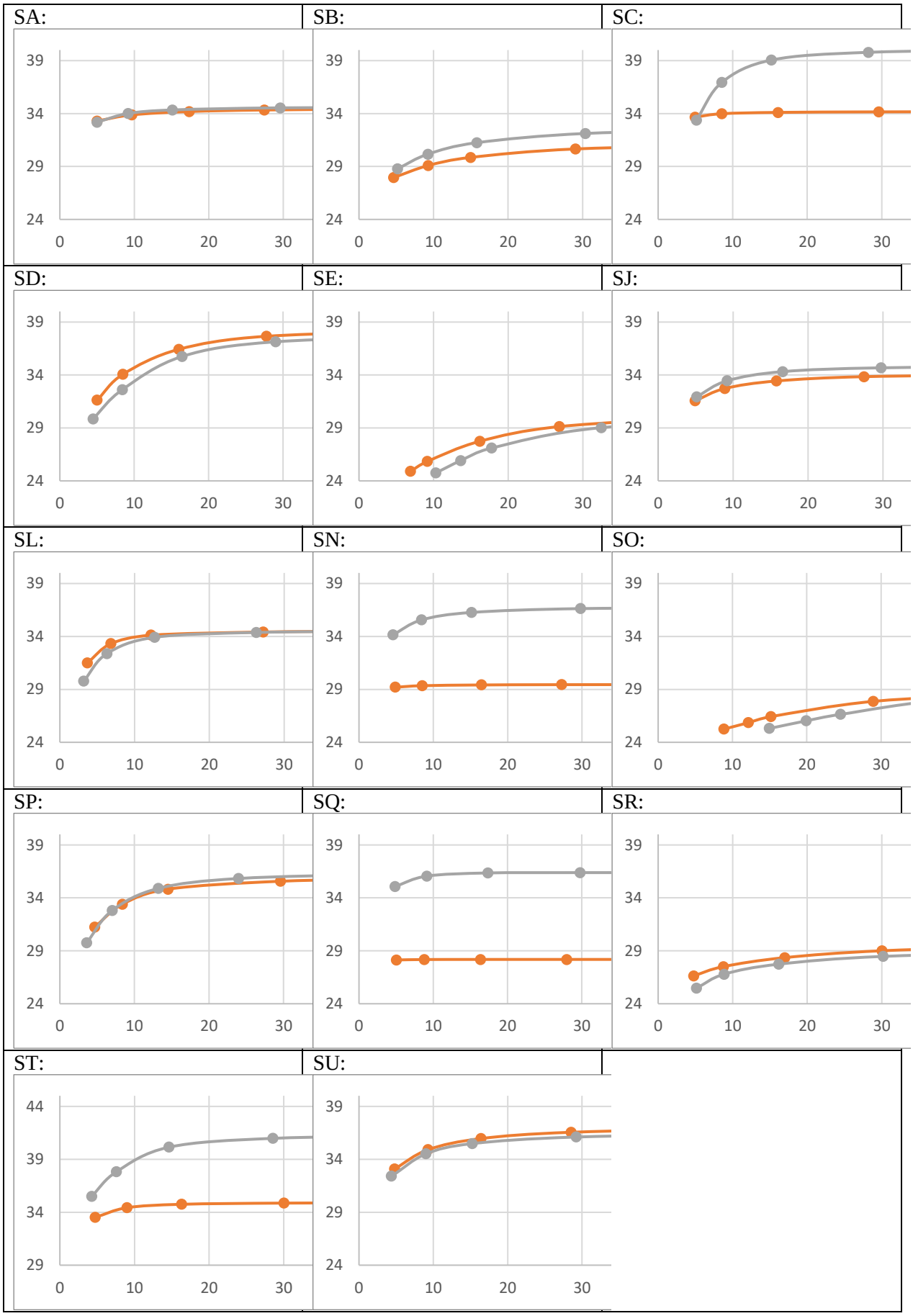

Fig. 1. WS-PSNR RD-curves: A17 (gray) vs. V17 (orange).

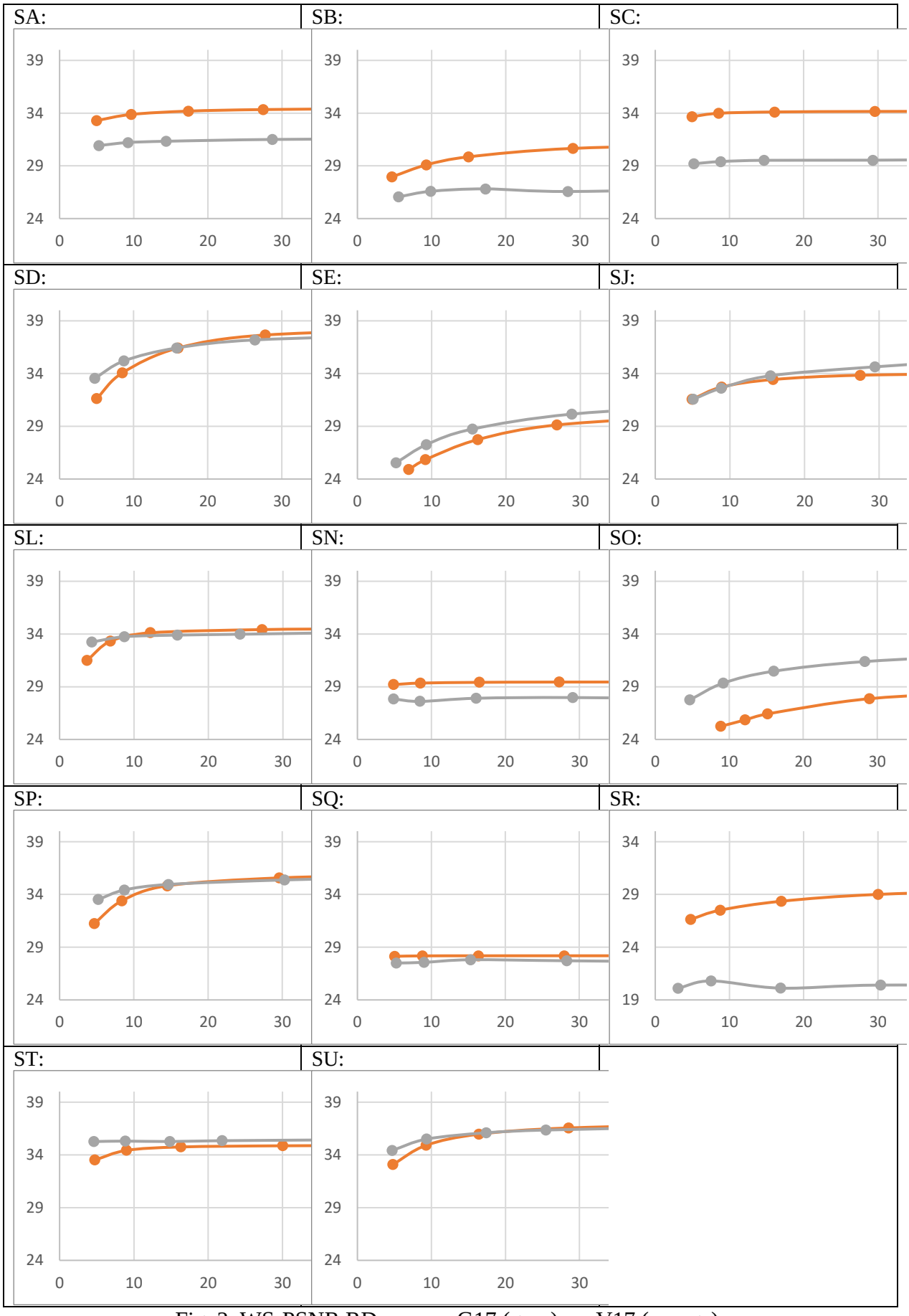

Fig. 2. WS-PSNR RD-curves: G17 (gray) vs. V17 (orange).

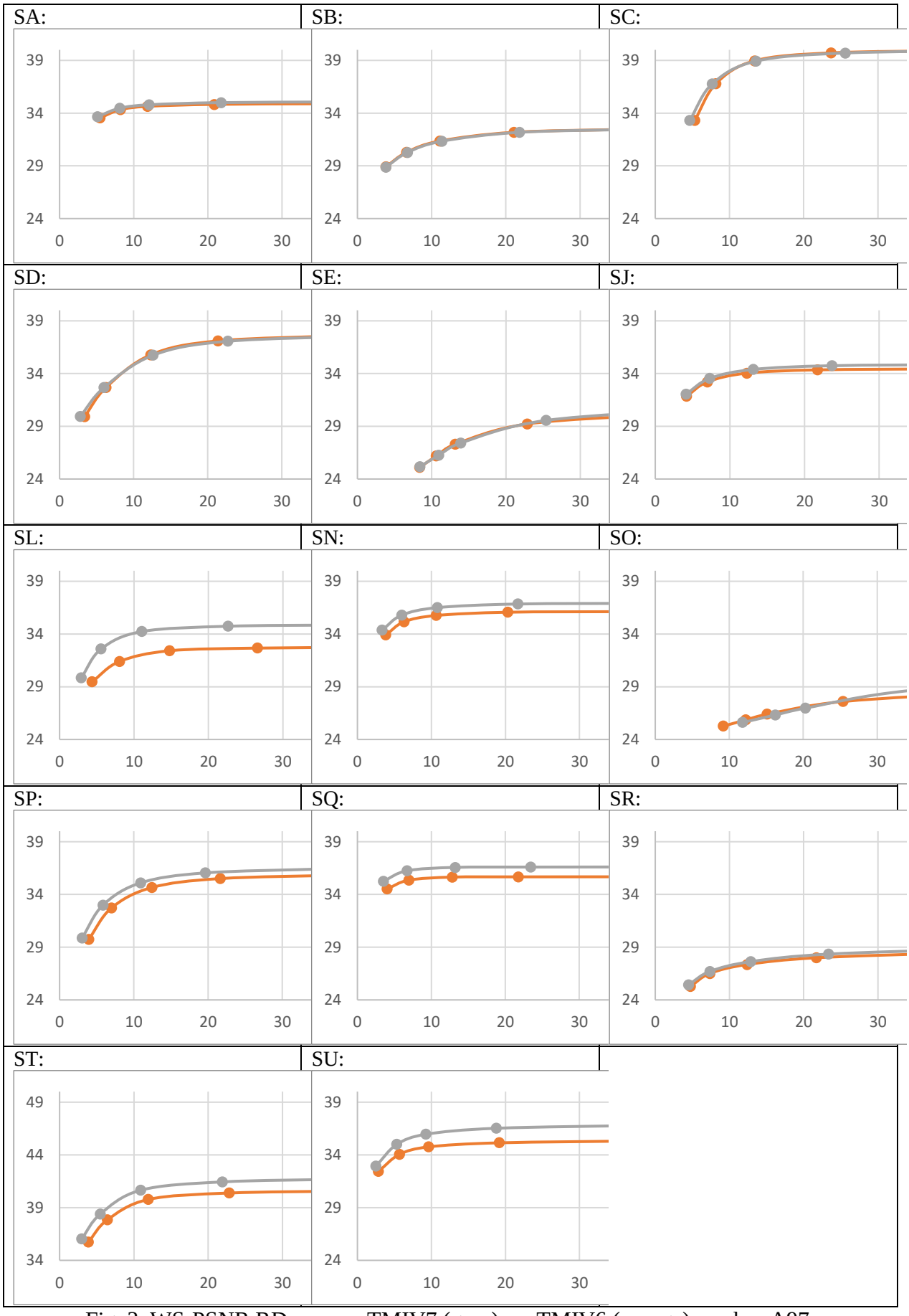

Fig. 3. WS-PSNR RD-curves: TMIV7 (gray) vs. TMIV6 (orange), anchor A97.

4 Recommendations

We recommend using attached reporting templates for all proposals.