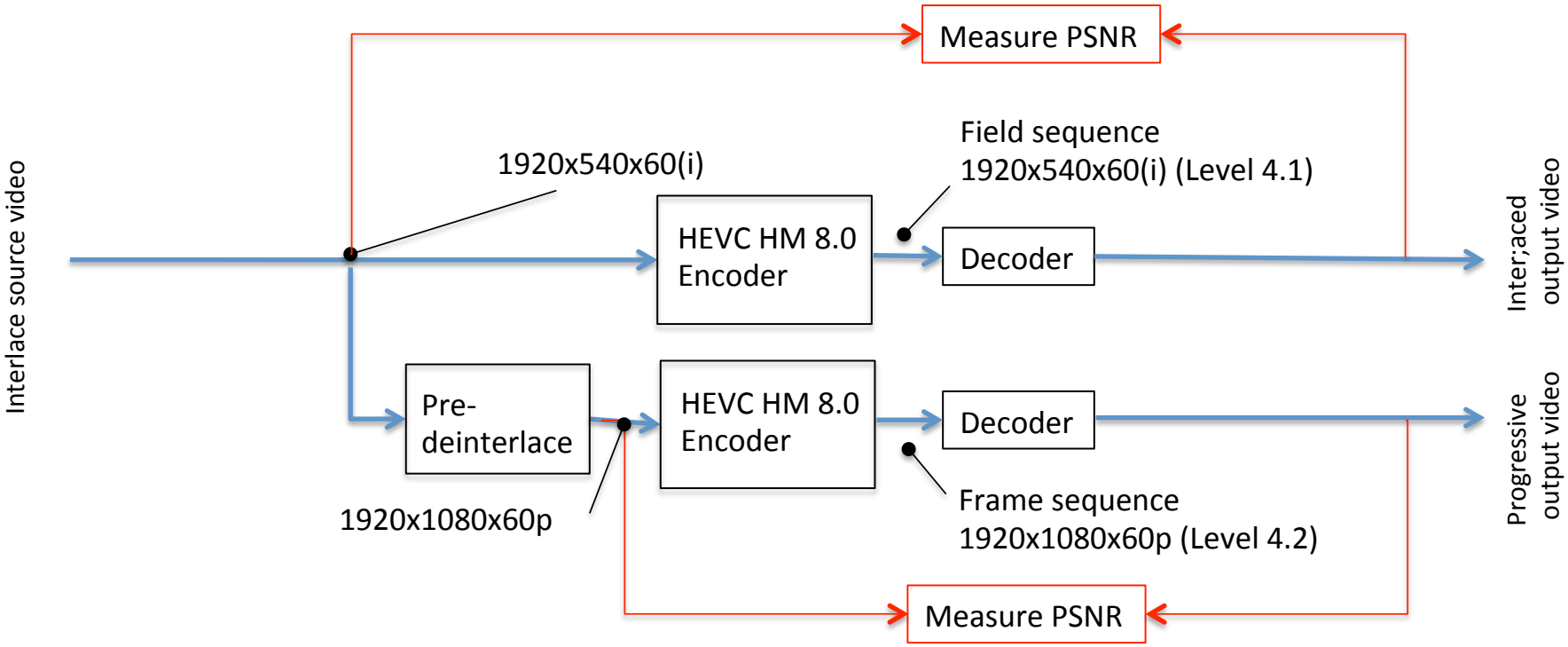
Results of HEVC coding on deinterlaced frame sequences (for information and discussion)

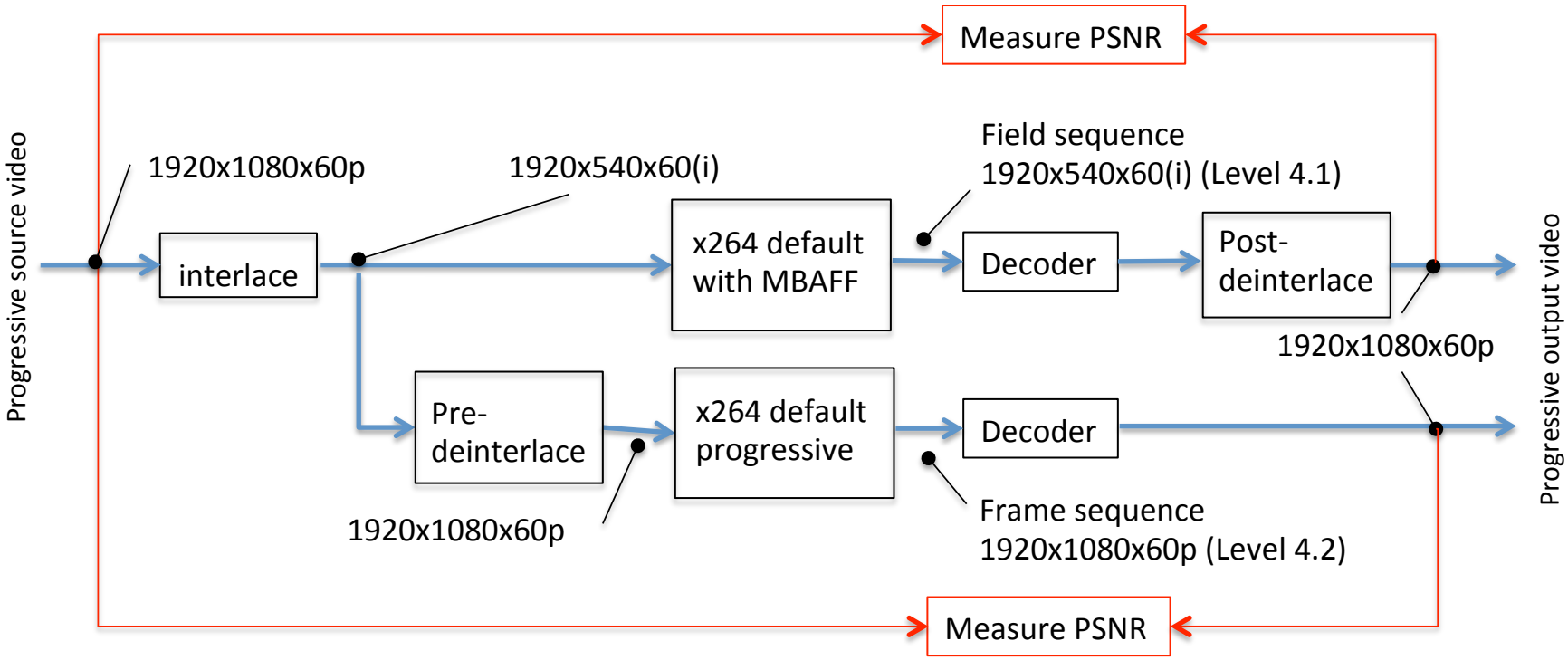
K0158

isovideo

Test 1: interlaced field vs. deinterlaced frame sequence (HEVC)



Test 2: pre- vs. post- deinterlace (AVC)



Results so far..

On the diverse but challenging test sequence set chosen..

- deinterlaced HEVC coded frame sequences average -15% (lower bit-) rates than HEVC coded field sequences (fixed QP=22,27,32,37, HM 8.0). Range is -39% to +32%

- Pre-encoding deinterlaced AVC coded sequences average lower rate than AVC MBAFF coded frame sequences (-18%). Range [-40%,+22%]

- Bdrate() suggests deinterlacing prior to encoding is better than deinterlacing after decoding.

Deinterlaced frame sequence rate reductions over interlaced fields (HEVC)

Sequence	Y BD Rate
BBC_sequence3	-8.21%
ants	-35.74%
basketball	9.79%
cactus_and_comb	-38.91%
canoe	12.88%
flower_garden (480i)	-28.42%
flower_garden (576i)	-37.10%
harpist_ref	-8.70%
mobile_and_calendar	-20.02%
pageant	-21.87%
rugby	14.83%
schumacher	31.74%
susie (480i)	-41.64%
susie (576i)	-31.32%
table_tennis (480i)	-33.20%
table_tennis (576i)	-30.70%
Average	-16.66%

deinterlacing pre-encoding vs. post-decoding (AVC)

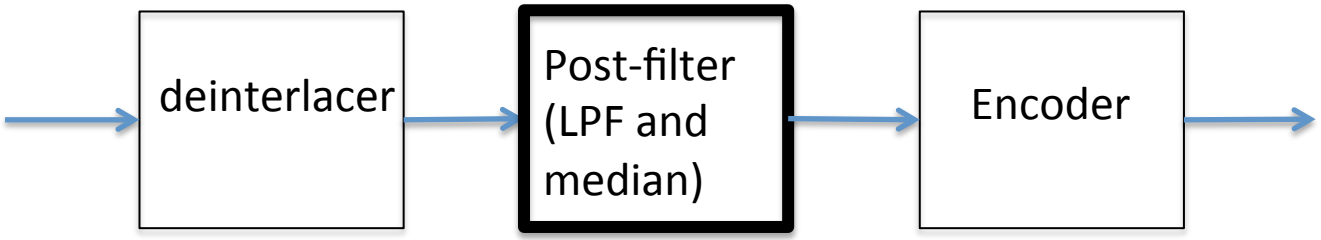
Sequence	Y BDRATE
Portland_Front_St	-20.75%
Portland_Max	-10.43%
basketball0	-27.47%
beach_waterfall	-29.71%
bike_jumping2	-26.10%
cat	-27.69%
cheerleaders	0.75%
controlled_burn	22.47%
crowd_run	-16.43%
ducks_take_off	12.79%
ice_skating	-2.95%
mobcal_ter	-35.01%
octopus_tree	-40.21%
old_town_cross	-35.36%
park_joy	-11.91%
riverplace	-29.45%
train_pan_zoom	-26.44%
Average	-17.70%

Issues

- Fixed QP rate control and PSNR not totally meaningful
  - Interpolated fields have artificially high detail, occasional wrong guesses.
  - bitstreams should be evaluated by subjective observation.
- Objective measures on decoded-then-deinterlaced content problematic due to quantization noise which does not provide as many clues to the deinterlacer as it would on raw video prior to encoding.
- There's no deterministic way to deinterlace – similar to encoding, model must be chosen.
- how to compare interlace / field sequences against deinterlaced on the same display monitor?

Future

- Low-pass filter deinterlaced video prior to encoding in order to better approximate rendering capacity of interlace source?



- New sequence structures (K0153, K0250) may improve field sequence results (4% ?)

Recommendation

- Make available raw YUV deinterlaced files for testing (MPEG AHG)
- Modify HM to support proposed sequence structures.

Preliminary conclusions

- Results are heavily dependent upon content and desired detail of deinterlaced output. (this experiment attempts to maximize sharpness of interpolated unknown fields; does not modify observed/ known fields)
- One reason to deinterlace prior to encoding is due to quantization noise that hampers deinterlacing post-decode
- Objective measures not fully meaningful. Adaptive QP better, but usual issues with PSNR. Subjective viewing more appropriate.
- High motion sequences do better as fields, while moderate to low do better as deinterlaced frames.

Raw deinterlaced YUV (.y4m) sequences applied in the study and produced bitstreams are available at:

http://www.isovideo.com/deinterlacing_before_compression.php