



4:4:4 Screen Content Coding using Mixed Chroma Sampling-Rate Techniques

JCTVC-I0272

27 April – 7 May 2012

Tao Lin, Peijun Zhang, Shuhui Wang, Kailun Zhou



Fast Growing Interest in SCC

➤ Driven by two major applications:

✓ The new generation cloud-mobile computing

❖ Separating Users from Computing Units at Screen

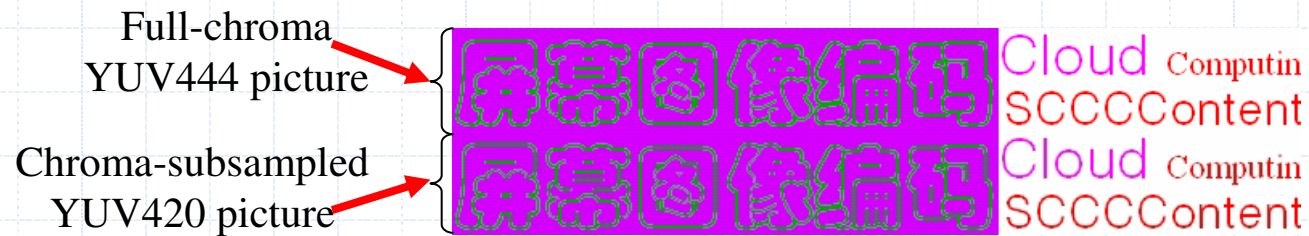
❖ Examples: Virtualized Screen, Cloudlet-screen Computing, Remote Desktop, Virtual Desktop Infrastructure, Zero Client, PCoIP, etc.

✓ Wireless external, second, or mirror display for mobile devices at office or home

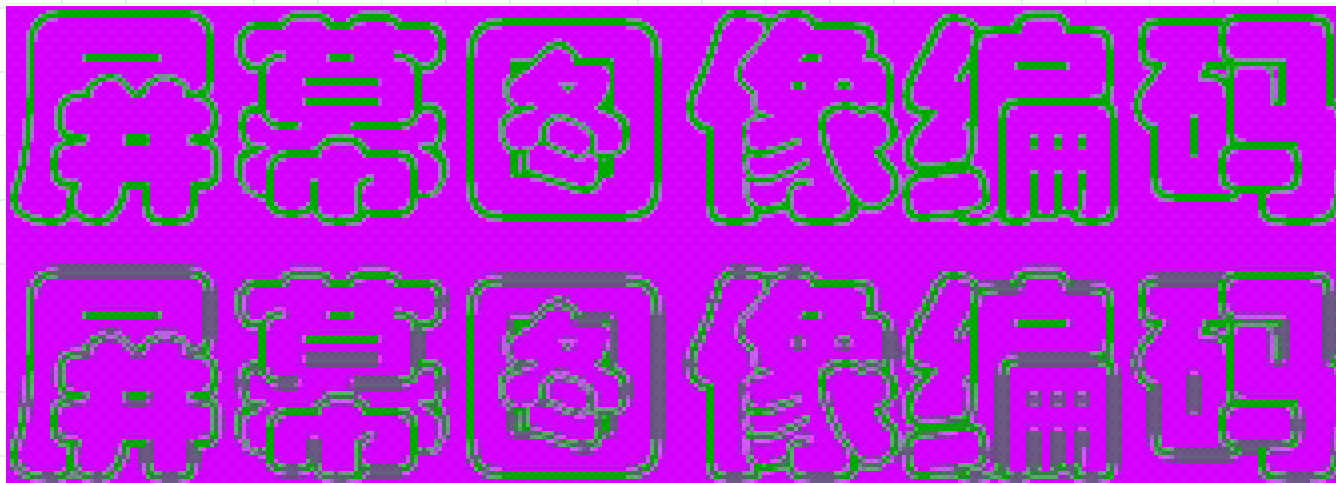


One Major Problem

- Most products still use 420 format due to past huge investment
- 420 chroma-subsampling degrades picture quality



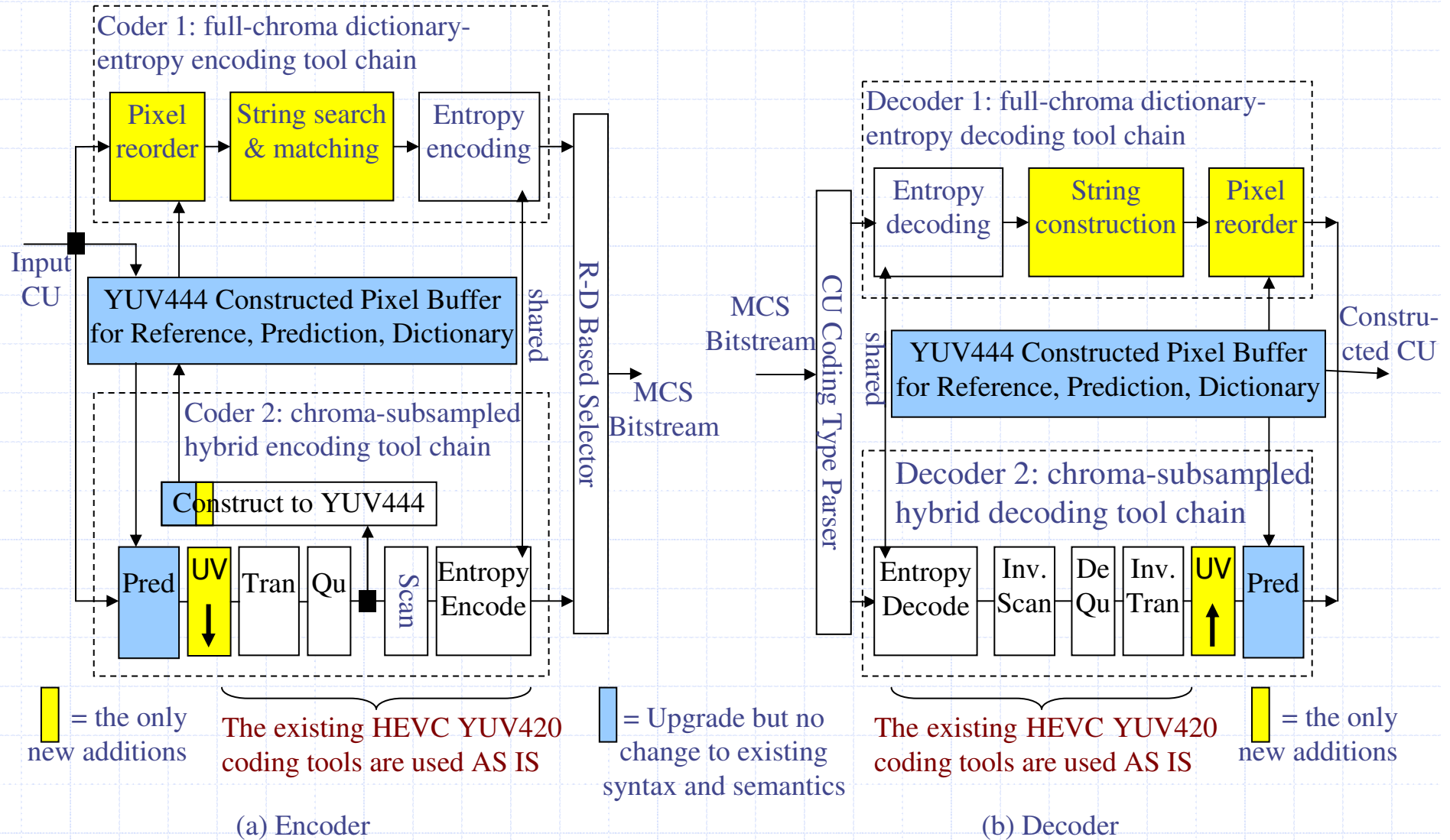
Chroma-subsampling causes severe color artifact such as black pixels in the YUV420 picture.



Artifact is more obvious after scaling-up (200% in the example) of the screen content .



- ◆ One picture has two types of content
 - ◆ Continuous-tone content
 - ◆ Discontinuous-tone content
- ◆ Really need two different types of tools and chroma-sampling-rate
 - ◆ 4:2:0 coding alone results in bad quality
 - ◆ 4:4:4 coding alone is overkill and too expensive
- ◆ High-efficiency Mixed Chroma Sampling-rate Coding
 - ◆ The state of the art HEVC 420 hybrid coding is always used AS IS
 - ◆ Add 444 Dictionary coding (four new syntax elements)





coding_unit() {	Descriptor
if(chroma_format_idc!=MCS) //or if(profile_idc!=MCS)	
{the current YUV420 HEVC hybrid coder syntax is used AS IS}	
else {	
coder_type_flag	ae(v)
if(coder_type_flag == 0) //HYBRID_CODER	
{the current YUV420 HEVC hybrid coder syntax is used AS IS}	
else //DICTIONARY_ENTROPY_CODER	
dictionary_entropy_coder()	
}	
}	

chroma_format_idc or profile_idc is defined in SPS

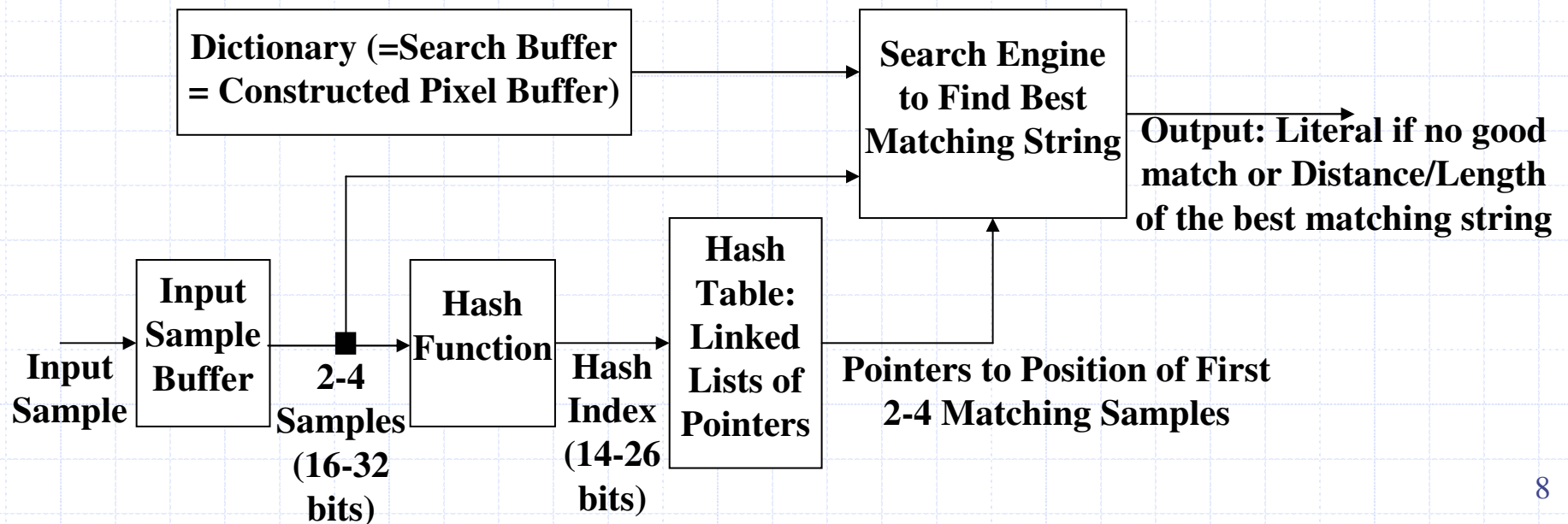


dictionary_entropy_coder {	Descriptor
decoded_sample_count = 0	
while(decoded_sample_count < NumSamplesInCU) {	
matching_string_flag	ae(v)
if(matching_string_flag == 1) {	
distance	ae(v)
length	ae(v)
decoded_sample_count += length	
}	
else {	
literal	ae(v)
decoded_sample_count += 1	
}	
}	

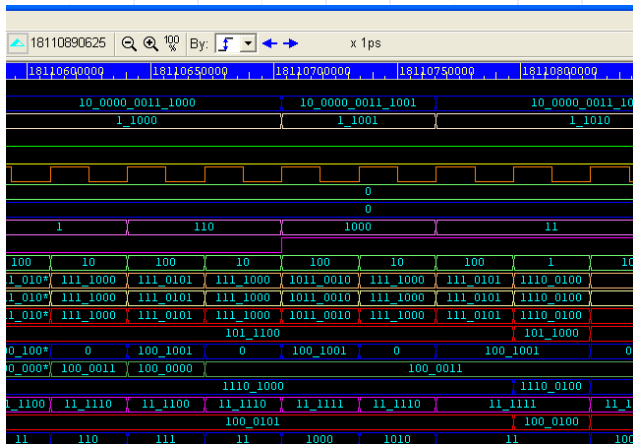


Why Dictionary Coding

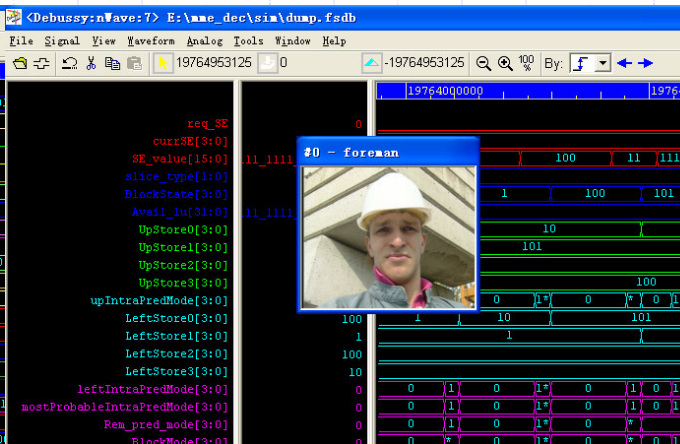
- ◆ Very effective for discontinuous-tone contents
 - ◆ An extension of intra prediction with a super-predictor-set
 - ◆ Exact matching and hash-table to accelerate prediction
- ◆ Decoder has negligible complexity and cost increment
- ◆ Very flexible encoder implementation



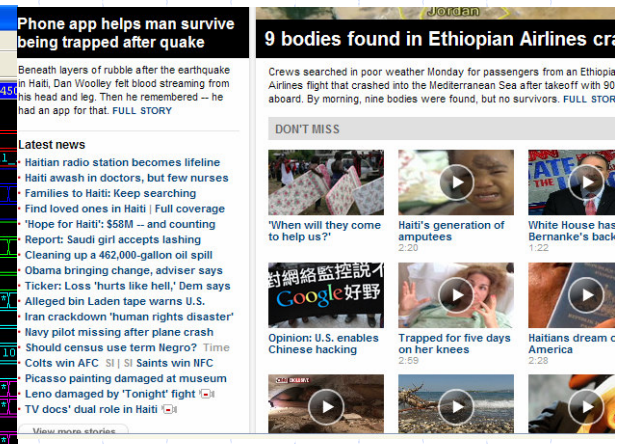
◆ MCS Intra coding



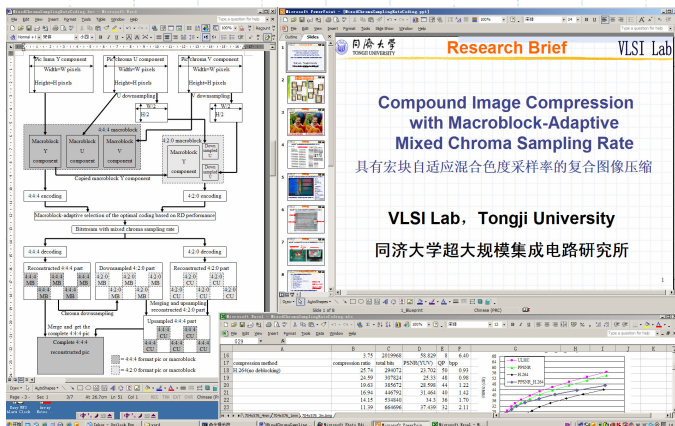
(a) Integrated-circuit design debug waveform.



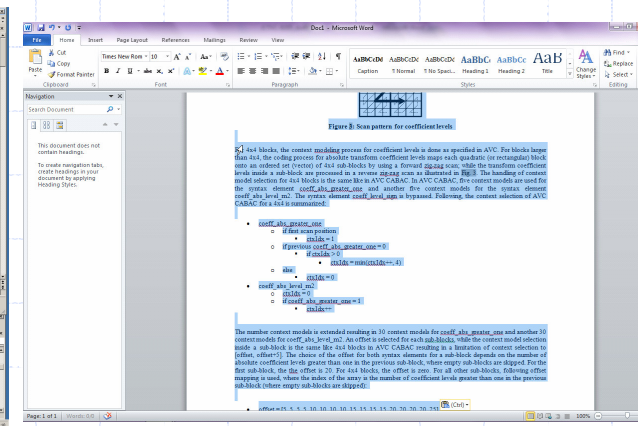
(b) IC design debug waveform plus nature picture.



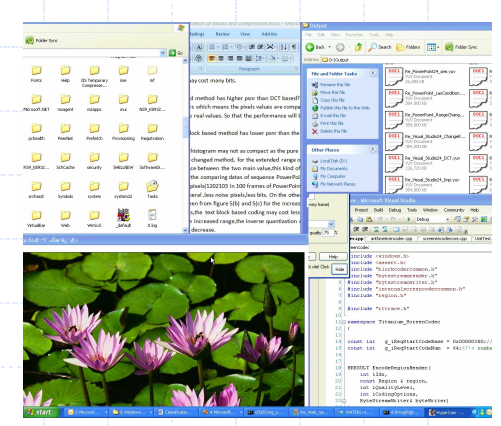
(c) Web page.



(d) PowerPoint, Word, and Excel file windows.



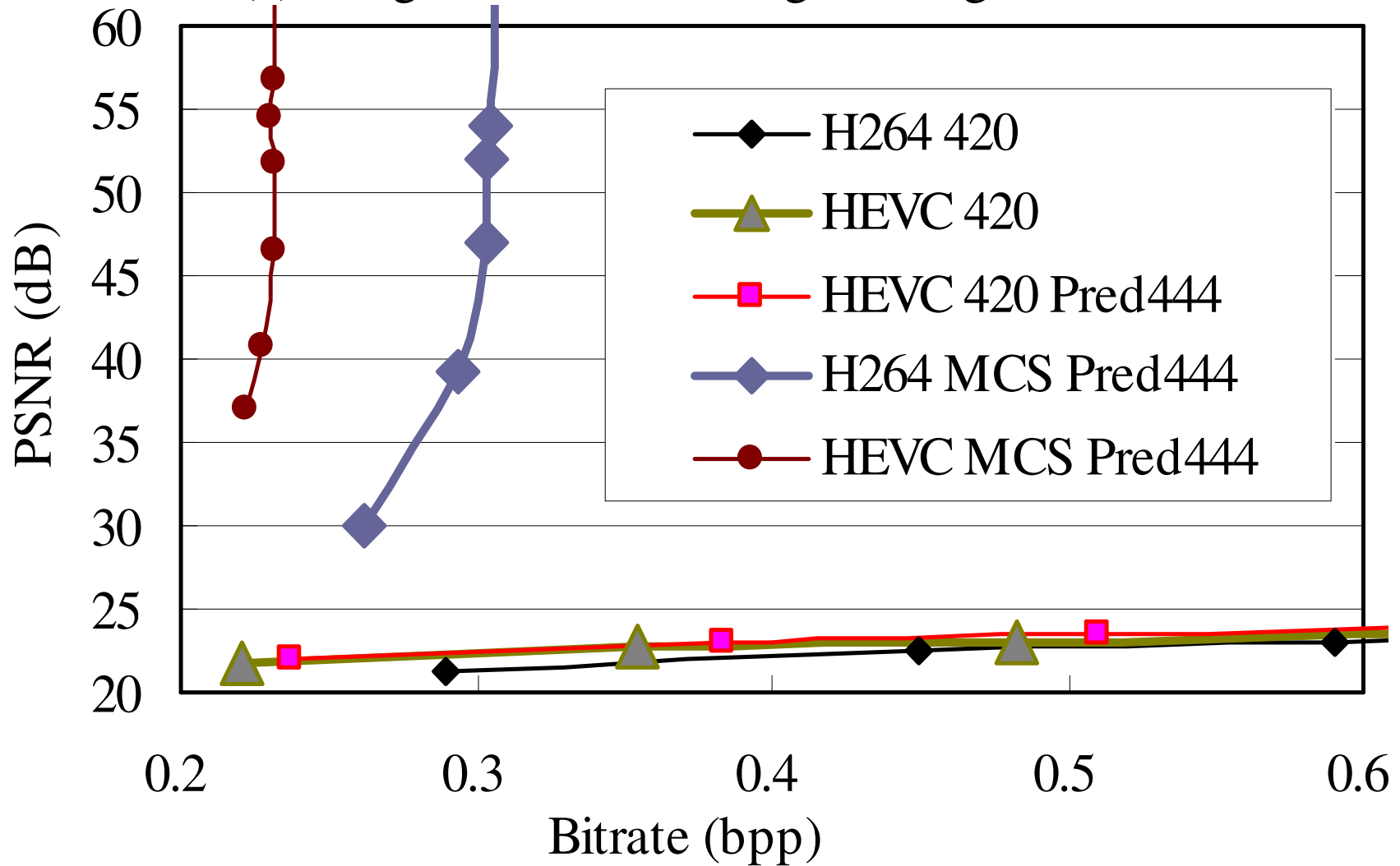
(e) Document editing.



(f) Various windows mix.

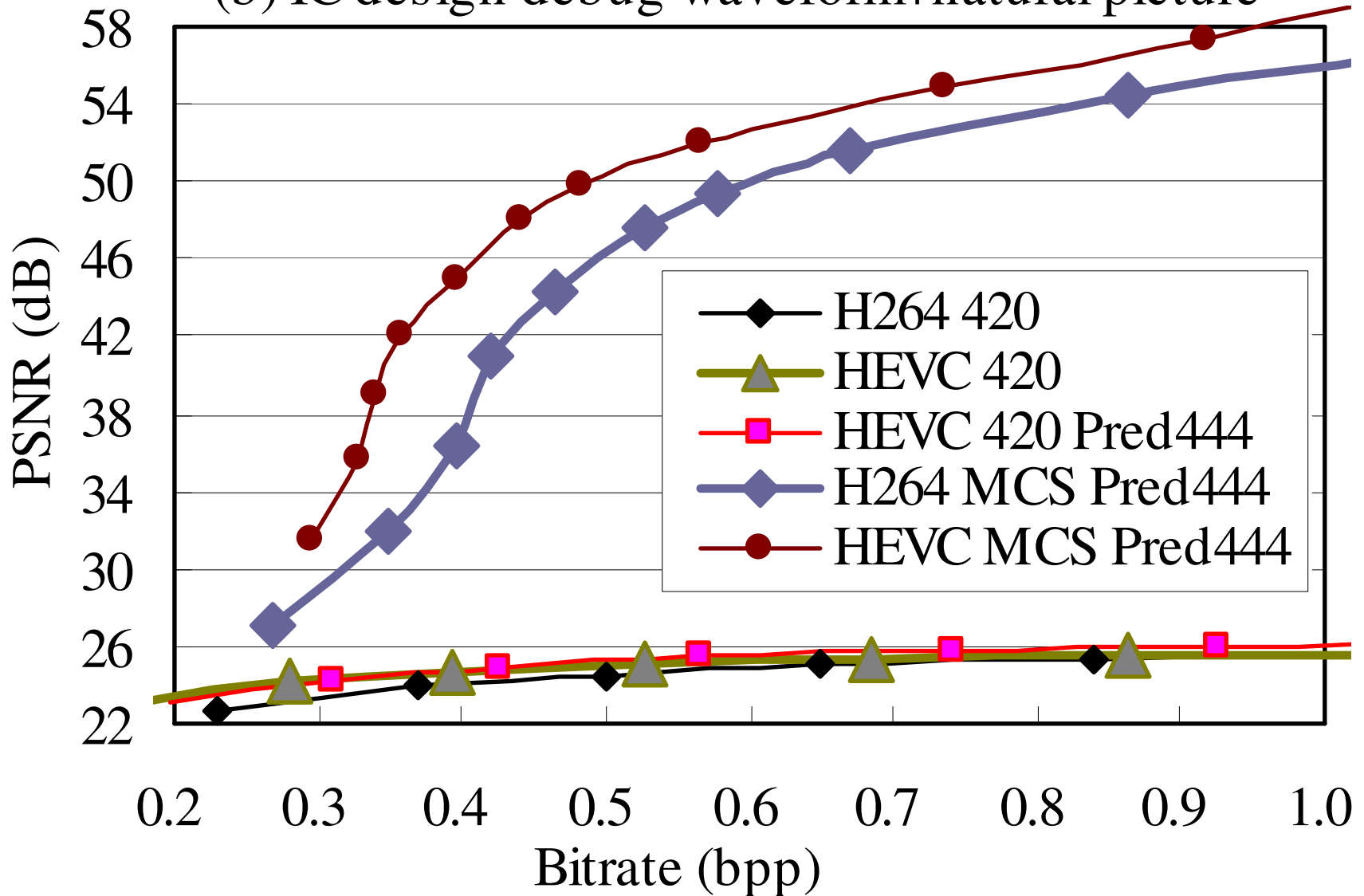


(a) Integrated-circuit design debug waveform



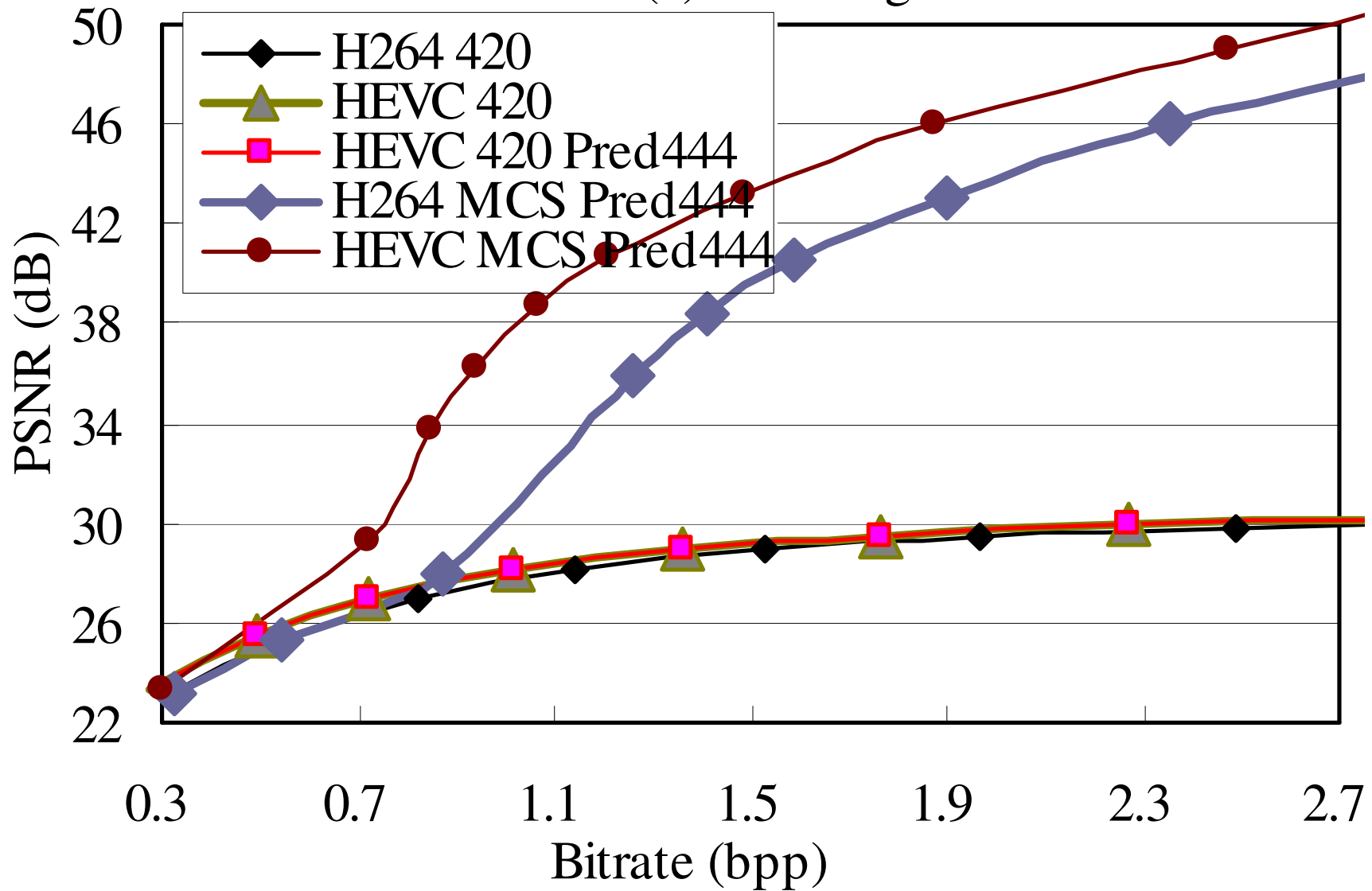


(b) IC design debug waveform+natural picture



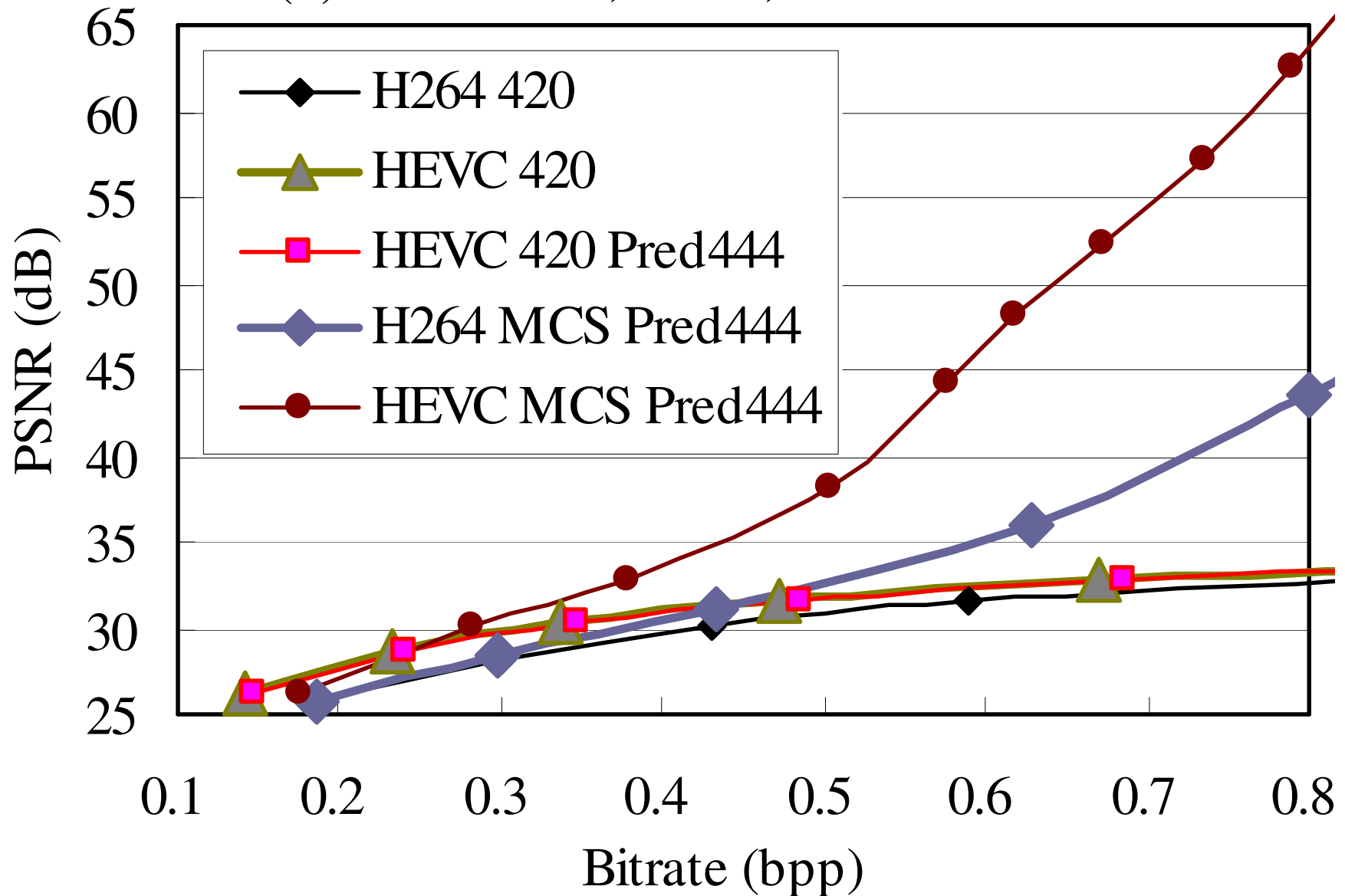


(c) Web Page



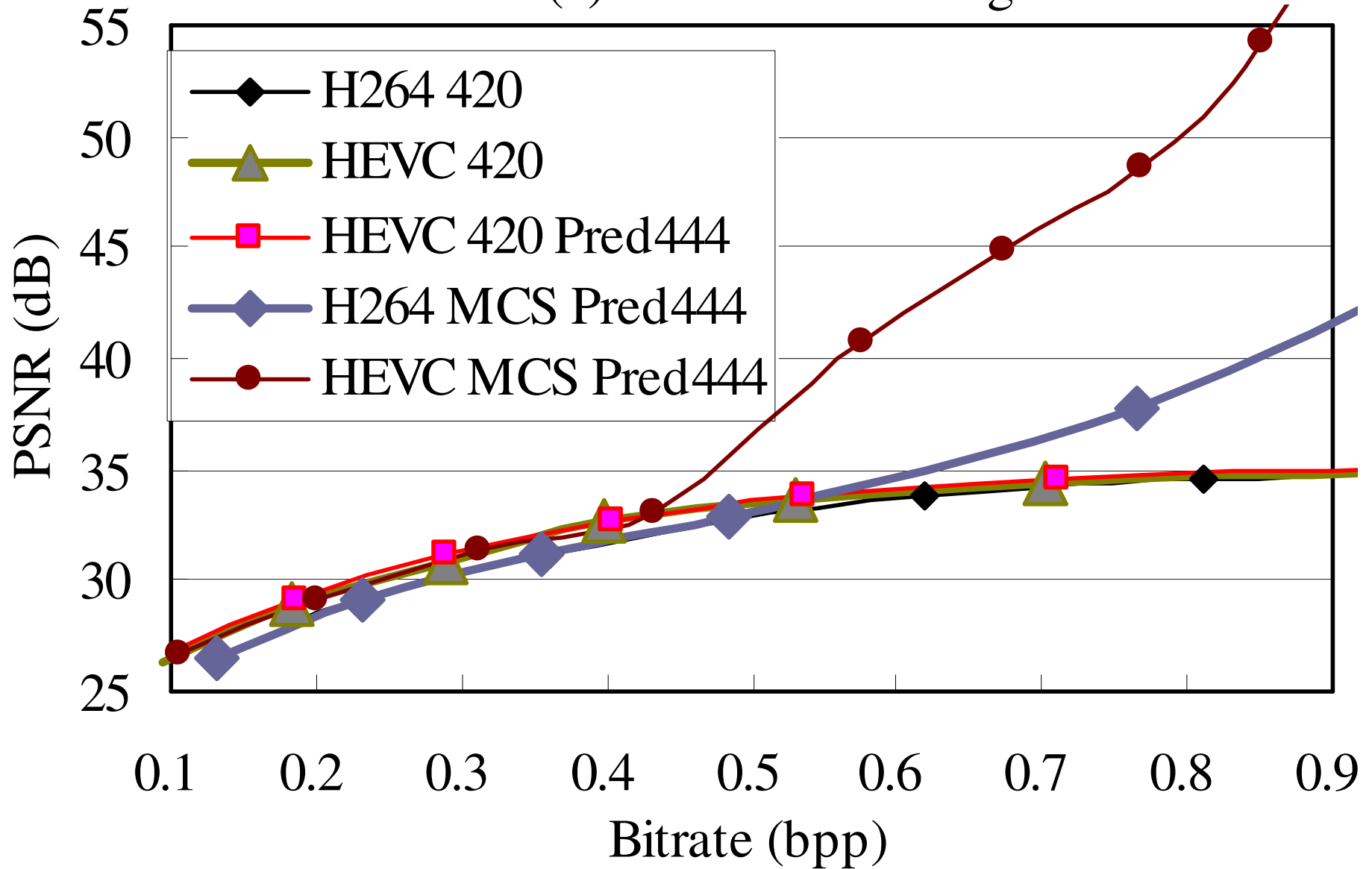


(d) PowerPoint, Word, Excel file windows



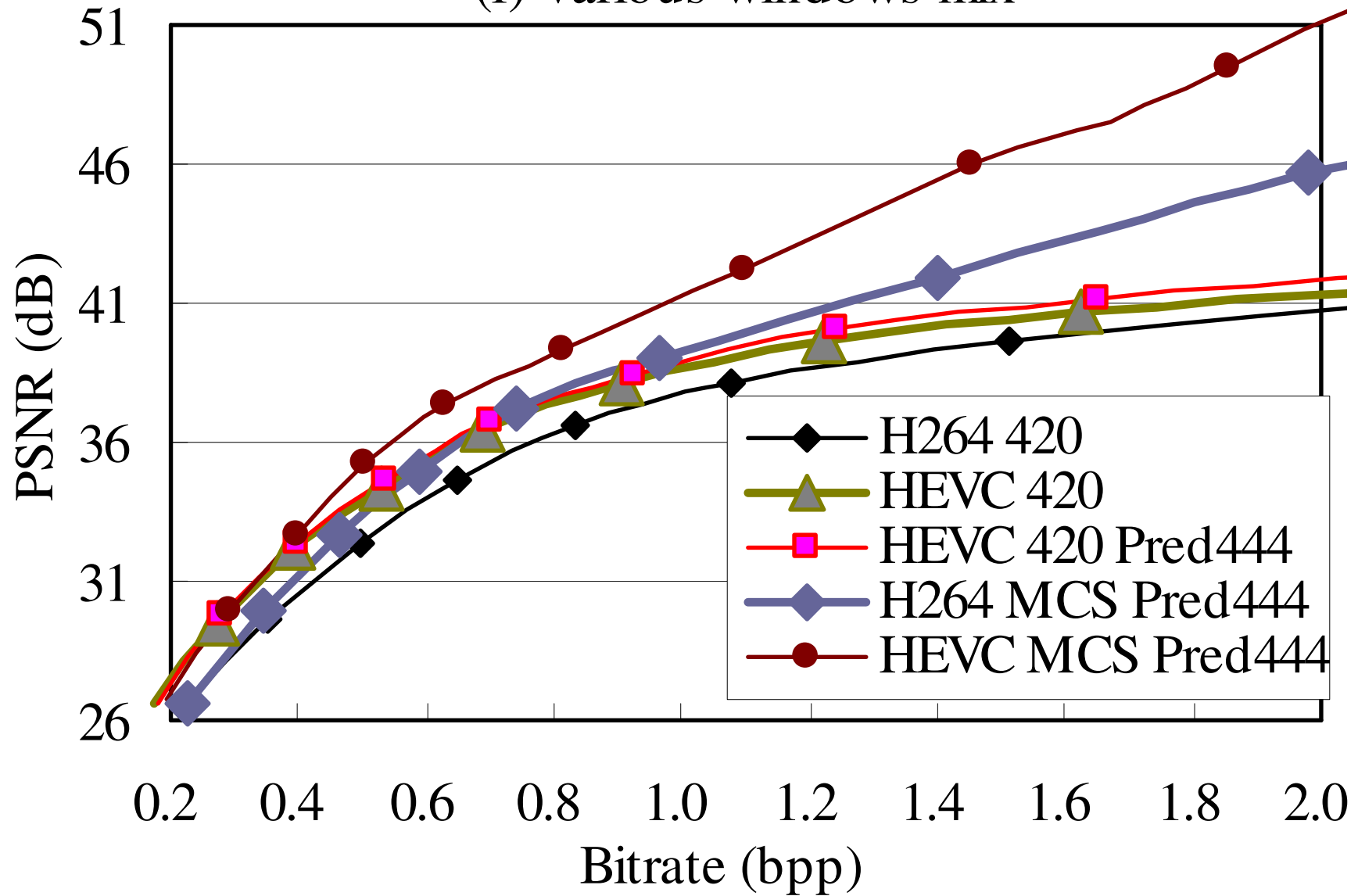


(e) Document Editing





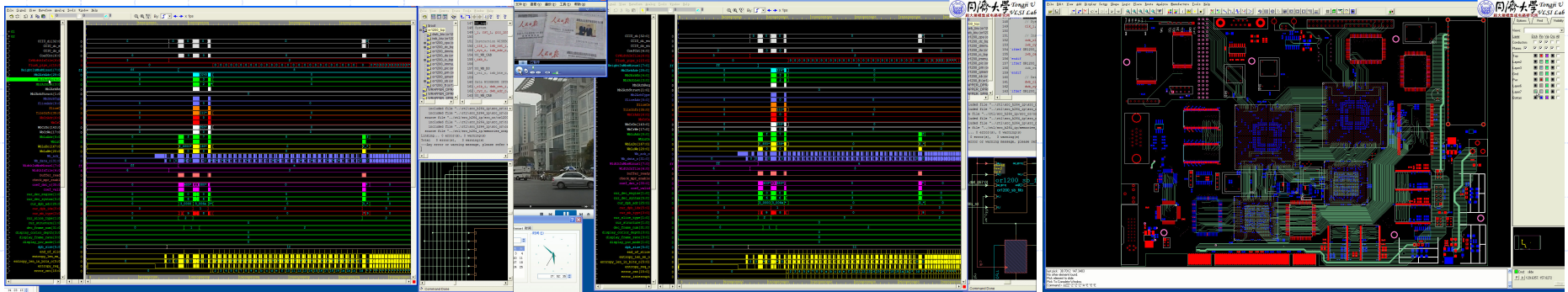
(f) Various windows mix





◆ MCS Inter coding

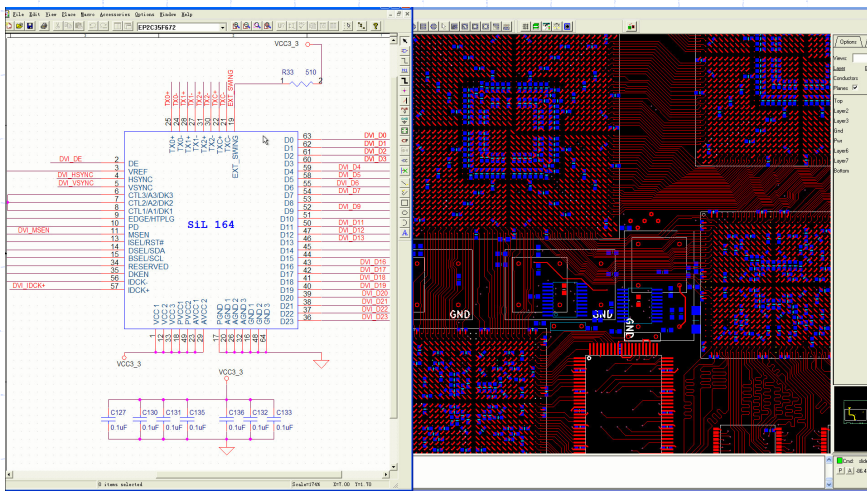
◆ See JCTVC-H0294 for details of the test sequences



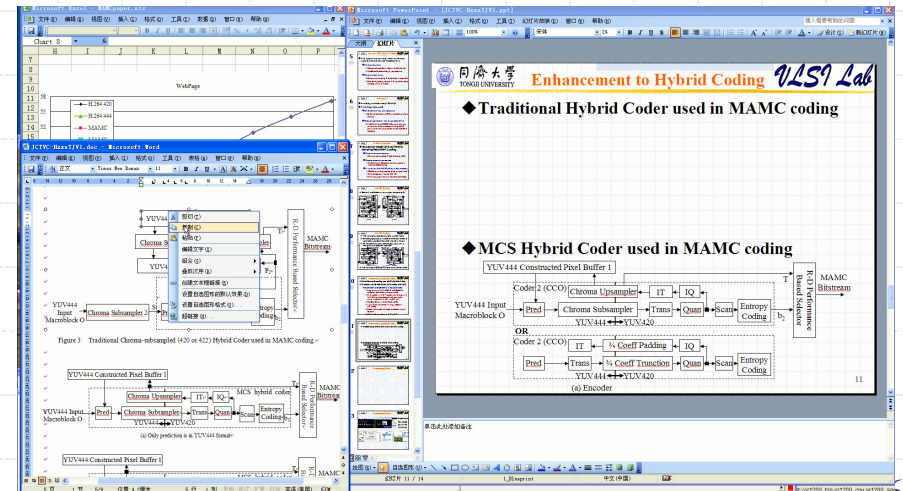
TJU_CAD_waveform.yuv

TJU_CAD_waveform_Street_Campus.yuv

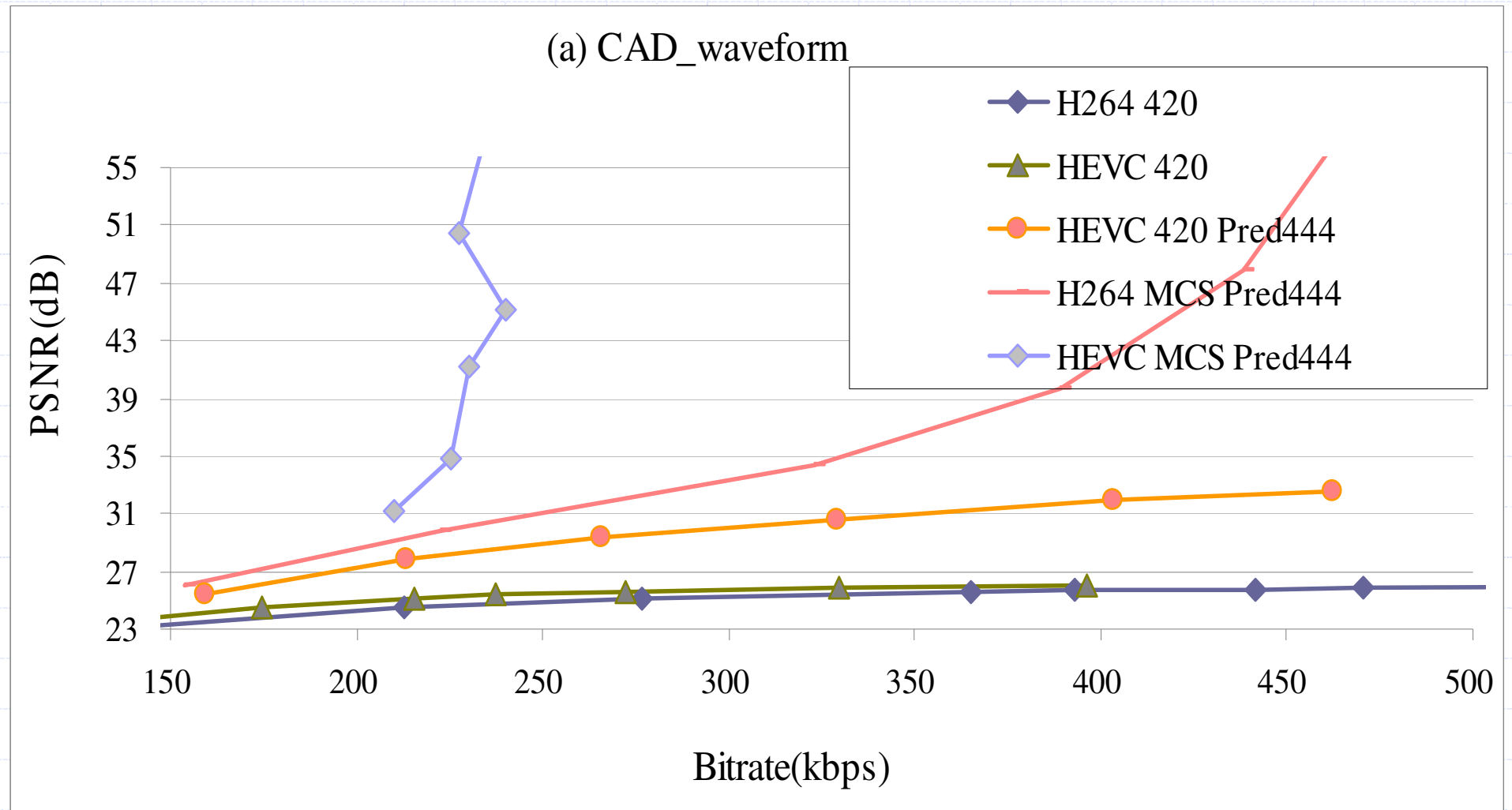
TJU_PCB_layout.yuv



TJU_PCB_schematic.yuv

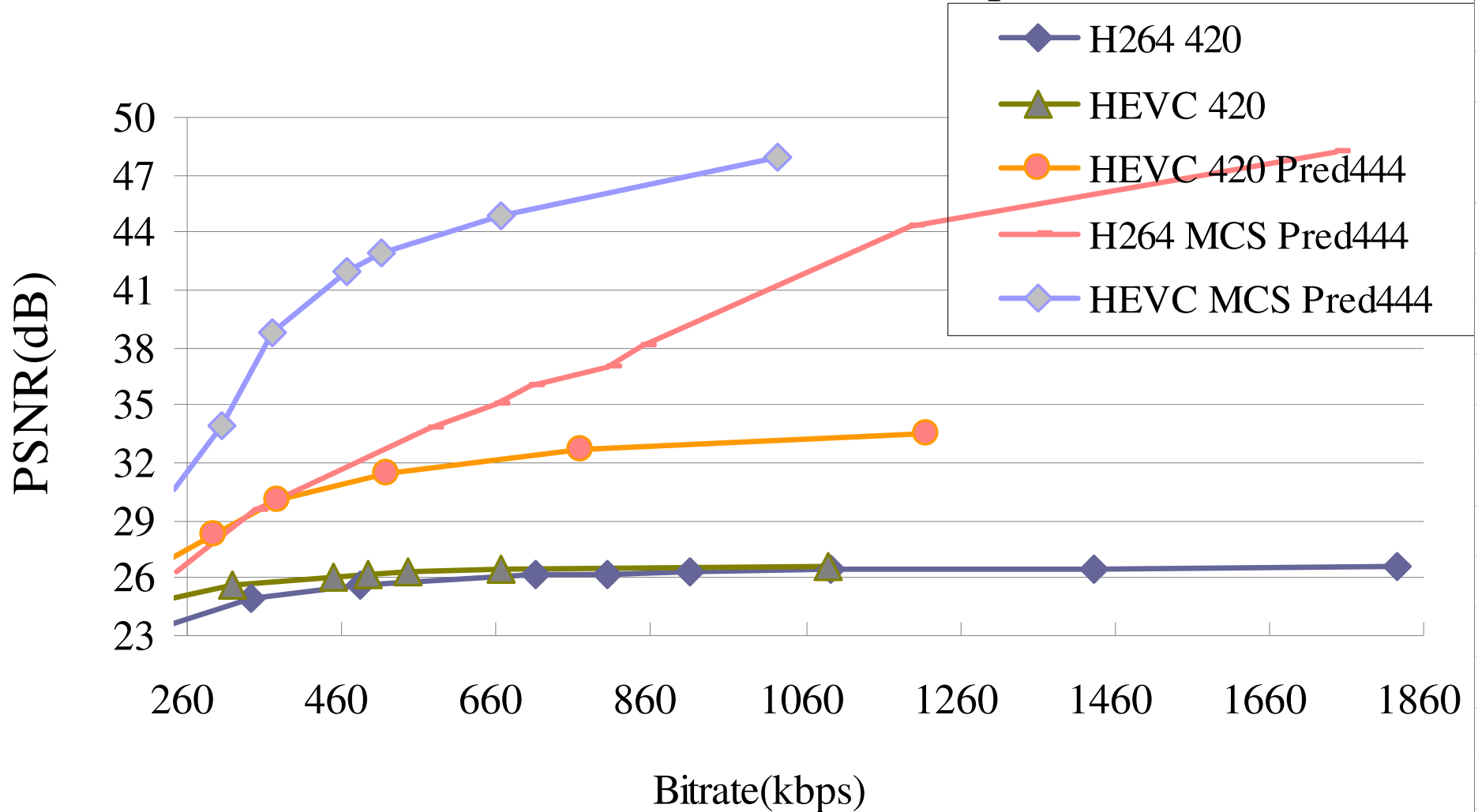


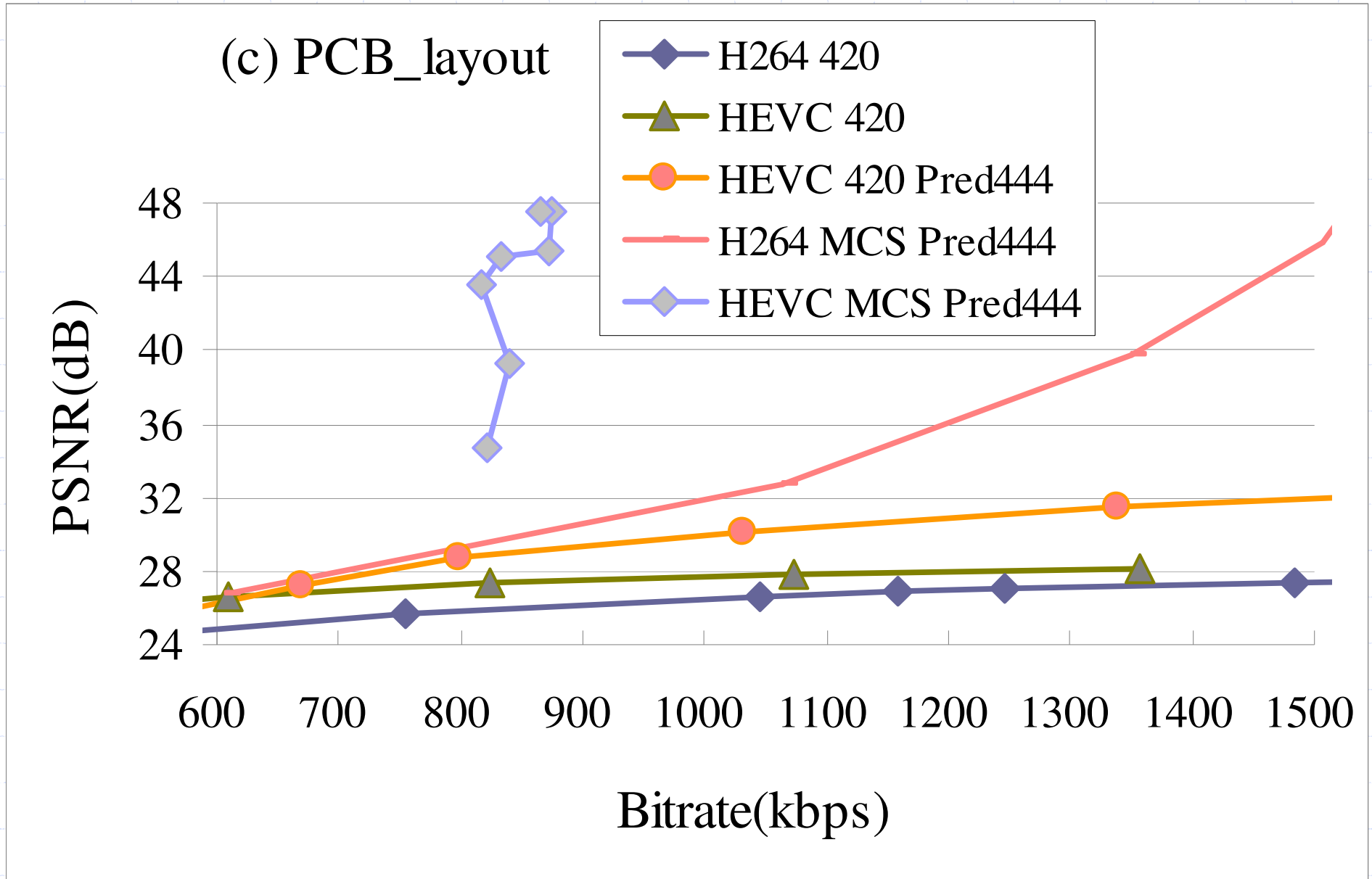
TJU_ppt_doc_xls.yuv

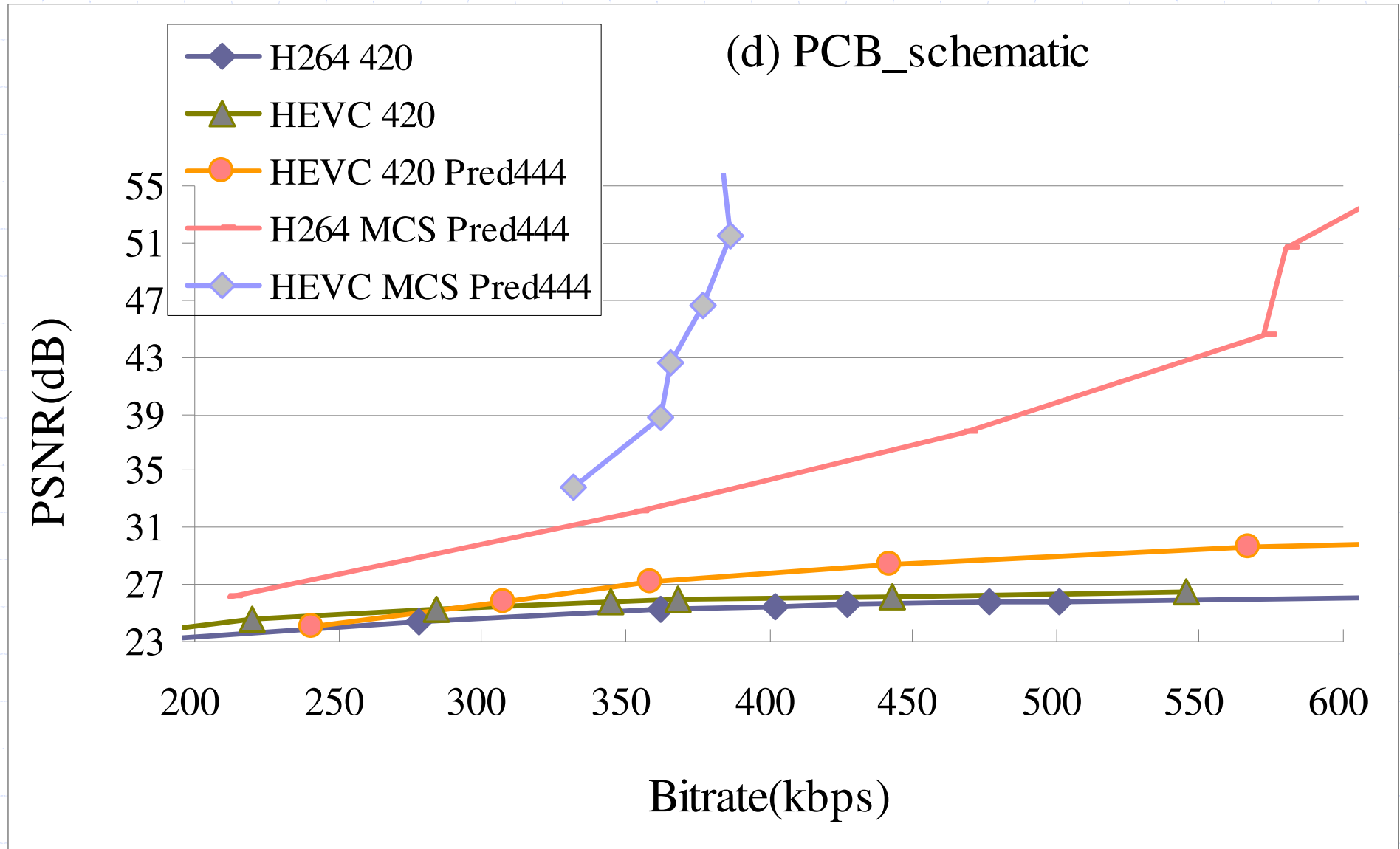


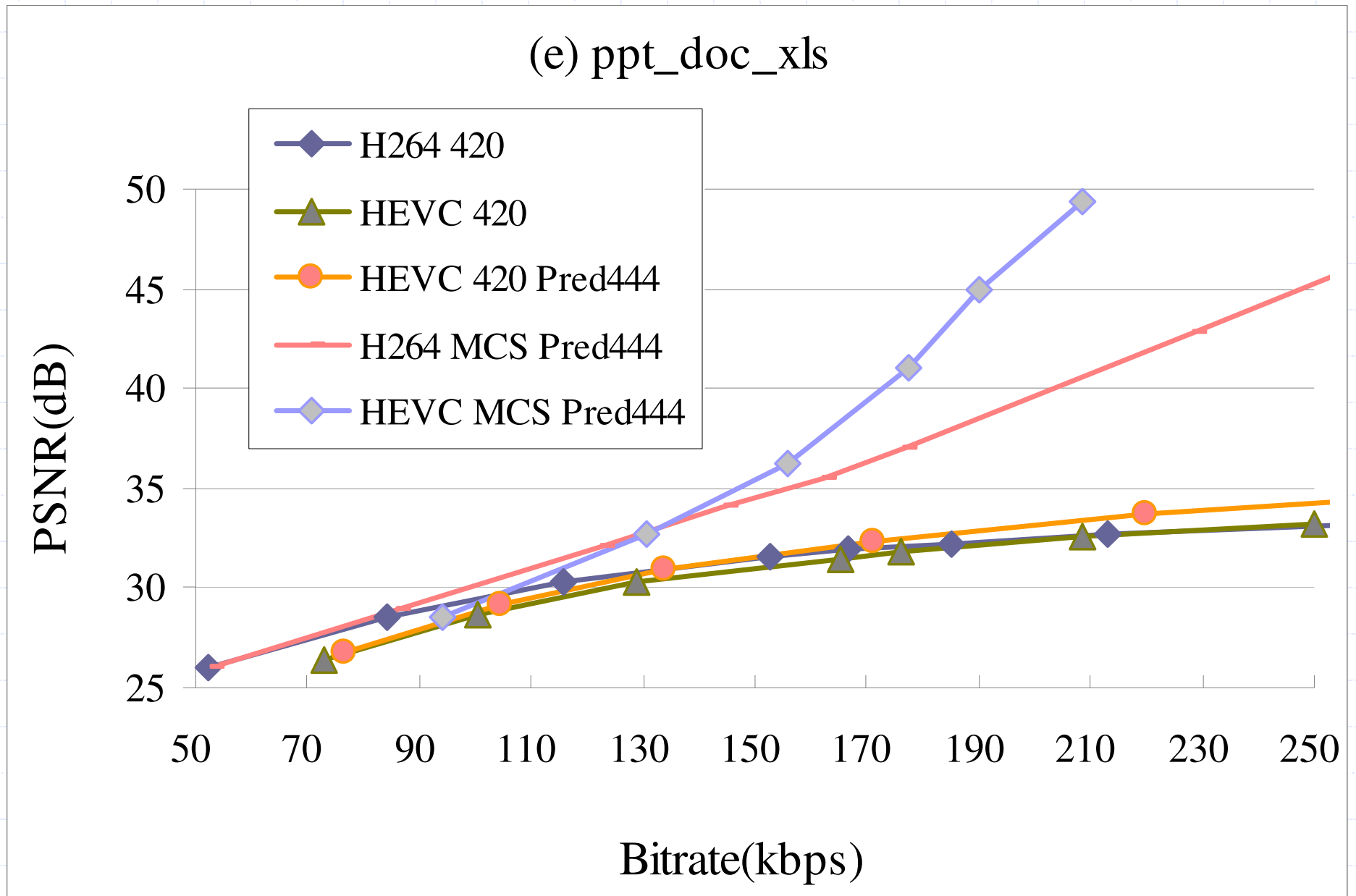


(b) CAD_waveform_Street_Campus











THANK YOU