International Telecommunication Union

AVS – a project towards to an open and cost-efficient Chinese national standard

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outline

- IP issues in international standard
- Status of AVS
- Summary

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IP issues in international standard

How to deal with IP in standard

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- Request from standard organization to IP contributor
  - Non-commitment
    - most exist standards in China
  - Rand
    - ITU-T VCEG
    - ISO/IEC/JTC1/SC29/WG11 (MPEG)
  - RandRF
    - ISO/IEC/JTC1/SC29/WG1 (JPEG)
  - Patent Pool
    - AVS
    - MPEG by MPEG LA, not by ISO-MPEG, much later than standard fixed

Advantage and disadvantage

- Non-commitment from IP holder
  - High risk
- RAND
  - Too ideal, definition not clear, hard to handle
- RAND-RF
  - Everyone happy in the start
  - but somehow with risk, like the happening at JPEG case
- Patent Pool
  - Later patent pool approach, like MPEG LA, maybe not accepted by market, if the pool want to charge too high
  - Patent pool approach, like AVS, need to find a way to get all key patent holders join-in
  - But not adopt by international standard organization yet

Reason of AVS requested by China

- What we learn from DVD IP trial in 2002
  - Problem in the case of design, manufacture, and sale in different region
    - There is no transfer mechanism from sale region to manufacture region
  - Problem in over charge of IP
    - In most major DVD manufacture in China, a DVD device cost about 30$ in China, but IP charge is about $20
      - IP cost = 20$/(30+20)$ = 40%
    - Some data show,
      - In US, 3-5% of total price for IP charge is acceptable
      - In Japan, under 10% of total price for tax and so on is acceptable
  - But DVD charge is legal! How we can solve the problem?

AVS try to solve the problem

- Create a organization, in which all member agree to put their contributions into a pool, to engage members make money by product, not by patent
- Simple to license the package of all central patents in low price
- Who will join?
  - Use patent to promote new technology, =>partnership
    - Big companies who make product
    - Universities and research institutes who grant by government
    - Basis of AVS working group
  - Use patent to protect itself, =>friendship
    - work with
  - Use patent to make money, =>other society
    - Pay attention to no infringe their patents

AVS Objectives

- Create an national audio-video standard for China broadcasting
  - Extend technology worldwide after China deployment
- Engage technology through wide participation
  - From within China Academia and Industry
  - From existing worldwide expertise
- Create favorable IP licensing terms
  - Affordable for current National Industries
  - One stop shop for entire suite of standards

AVS IPR Experts Group formation

- Late 2003 the President of AVS asked that a group of experts be assembled to create a recommendation for an IPR policy for AVS
- Create policies that:
  - reflect and respect China law and culture
  - reflect WTO requirements
  - reflect successful global practices
  - balance the rights of the inventor and needs of the implementers
  - innovative and forward looking
  - evolves with practice and law in China

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Assumption

- Worldwide licensing
- Patent pool membership optional
- Globally acceptable Intellectual Property policy
- Separate pricing possible for China and Rest-of-World
- Single domestic license (video, audio.. etc), separate licenses for all other geographies

AVS IPR Experts Group

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- Experienced members:经验丰富的成员
  - Patent Attorneys专利律师
  - Technical Experts技术专家
  - Contract Attorneys处理合同的律师
  - Previous experience in setting up patent pools具有建立专利池相关经验的成员
- Members are from:成员来自
  - Asia 亚洲
  - Europe 欧洲
  - North America 北美
- Members represent: 成员代表了
  - Consumer Electronics 消费电子产品界
  - Information Technology 信息技术界
  - Microelectronics微电子产业界

AVS IPR Experts group

- Members
  - BroadCom
  - IBM
  - Intel
  - Matsushita/Panasonic
  - Microsoft
  - Nokia
  - Sony
  - Sun Microsystems

Experts Achievements

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- Dual language (Chinese/English) suite of documents to govern standardization and IPR policy.
- Recommendation to the AVS Membership
  - Constitution 章程
  - Member Agreement including 包括下列文件的会员协议
    - IPR Policy 知识产权管理办法
    - Legacy Agreement 更新协议
  - Bylaws 章程细则
- Recommendations accepted by AVS membership Sept 2004

Leading edge elements

- Election of licensing options upon joining standardization effort.
- Different IPR options for patents inside PRC than patents outside PRC
- Disclosure of existence of unpublished patents with contributions

Member IPR Obligations

成员知识产权义务

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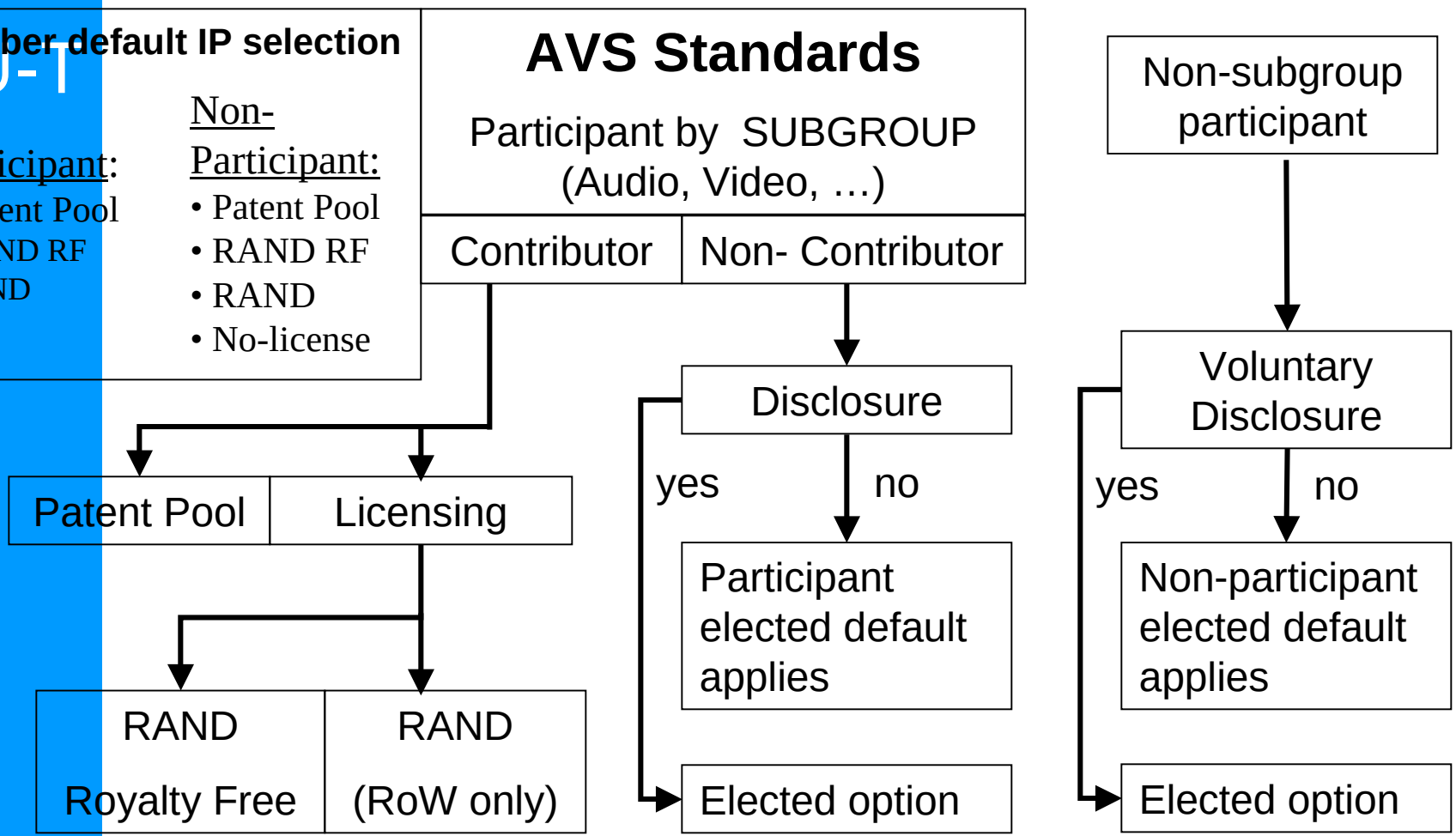
Member default IP selection

Participant:
- Patent Pool
- RAND RF
- RAND

Non-Participant:
- Patent Pool
- RAND RF
- RAND
- No-license



Licensing Obligations

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Join AVS
- Sign Member Agreement
- Declare default option

Non-Participant:
- RAND RF
- POOL
- RAND
- No License

Participant:
- RAND RF
- POOL
- RAND

Participate in Subgroup
- Commit to license
- License options

- RAND RF
- POOL
- RAND

Submit Contribution
- Disclose patents
- Declare license option

China Patent:
- RAND RF
- POOL

Worldwide Patent:
- RAND RF
- POOL
- RAND

Disclosure Obligations

- When making a contribution
  - Unpublished, published and granted patents
- Ongoing
  - When a patent is discovered
  - When a Patent Application is published
- During Final Draft Standard Review
  - 90 days to declare licensing option, OR:
  - Default applies

AVS has a procedure to remove some tools

- If some tools was found own by non-AVS member, if that patent holder is not willing to cooperate, then we will remove that tool out from AVS standard

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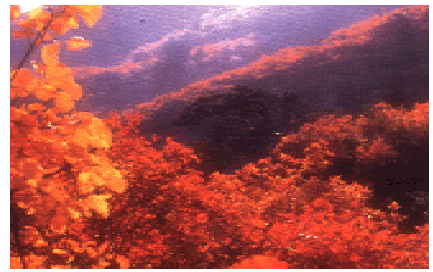
Status of AVS

Milestone of AVS



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- Mar18-21. 2002
  - 178th Xiangshan Science Conference, Beijing, “Broad-band Network and Security Stream Media Technology”
- June 21, 2002
  - “Audio Video Coding Standard Working Group” was set up in Beijing.
- Aug 23-24, 2002
  - first meeting of AVS, AVS united with MPEG-China. Website of AVS opened to the members formally.
- Dec 9, 2002
  - MII formally approve AVS working group to process AV coding related standard in China national standard
- Dec 19, 2003
  - In the 7th AVS meeting, FCD of AVS-video (1.0) and AVS-system (1.0) was finalized.
- Dec 12, 2004
  - In the 11st AVS meeting, FCD of AVS-M was finalized.

AVS members

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- Total 133 members (by May 31, 2005)
  - CE, 11%;
  - Com, 12%;
  - Comp and Soft, 44%;
  - IC, 14%;
- Local research entities, 24%
- Worldwide research entities, 30%

Local Members

Multinational members

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Standard Structure of AVS-Video

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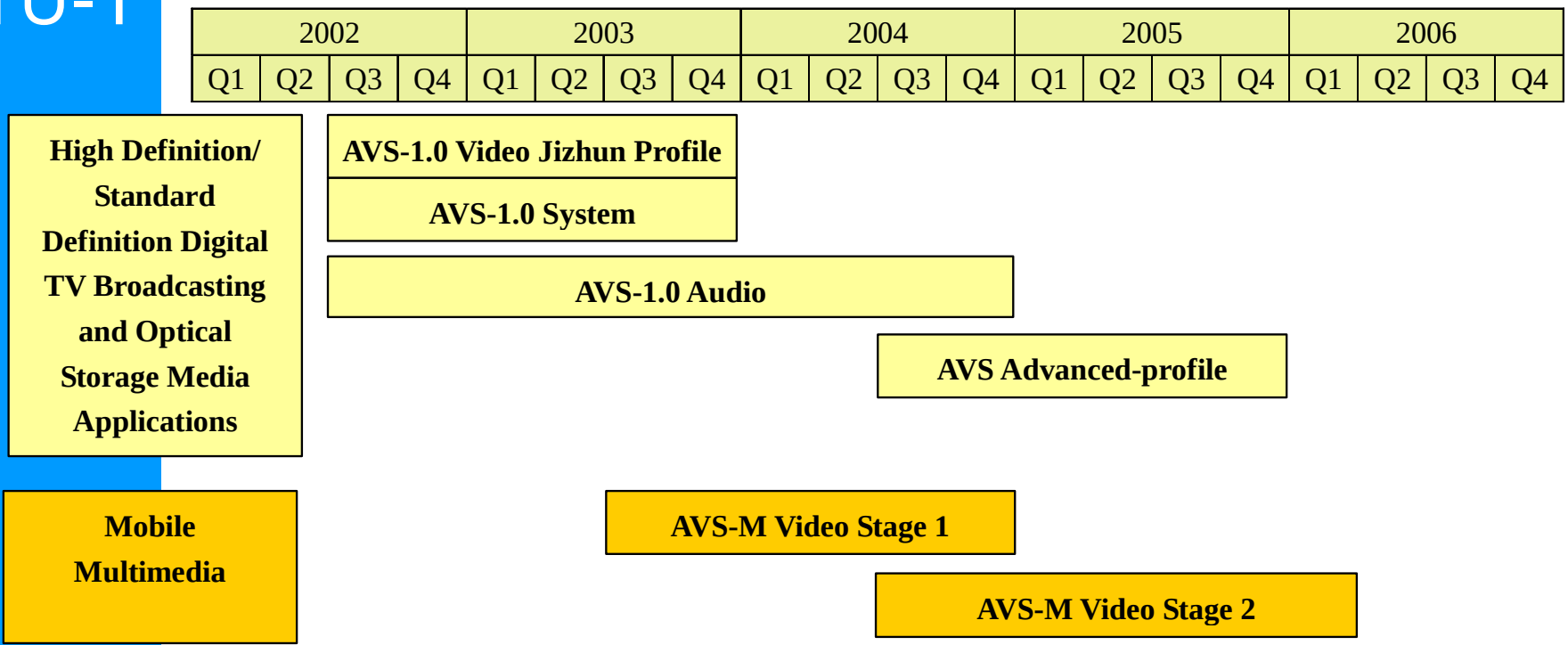

AVS Schedule

部分 (Part)	草案 (CD)	最终草案 (FCD)	标准送审稿 (FNSD)	国家标准 (FNS)
AVS1-P1（System for broadcast）	2003.12	2004.4	2004.8	
AVS1-P2（Video for HD, JZ profile）	2003.12	2004.4	2004.8	
AVS1-P2（Video for HD, ZQ profile）	2005.3	2005.9	2005.12	
AVS1-P3（Audio, 2 channels）	2004.12	2005.3	2005.6	
AVS1-P3（Audio, 5.1 channels）	2005.3	2005.6	2005.9	
AVS1-P6（DRM）	2005.3	2005.6	2005.9	
AVS1-P7（System for IP）	2005.6	2005.9	2005.12	
AVS1-P8（Video for mobile, stage 1）	2004.11	2004.12	2005.3	
AVS1-P8（Video for mobile, stage 2）	2005.9	2005.12	2006.3	
AVS1-P9（File format）	2005.3	2005.3	2005.6	

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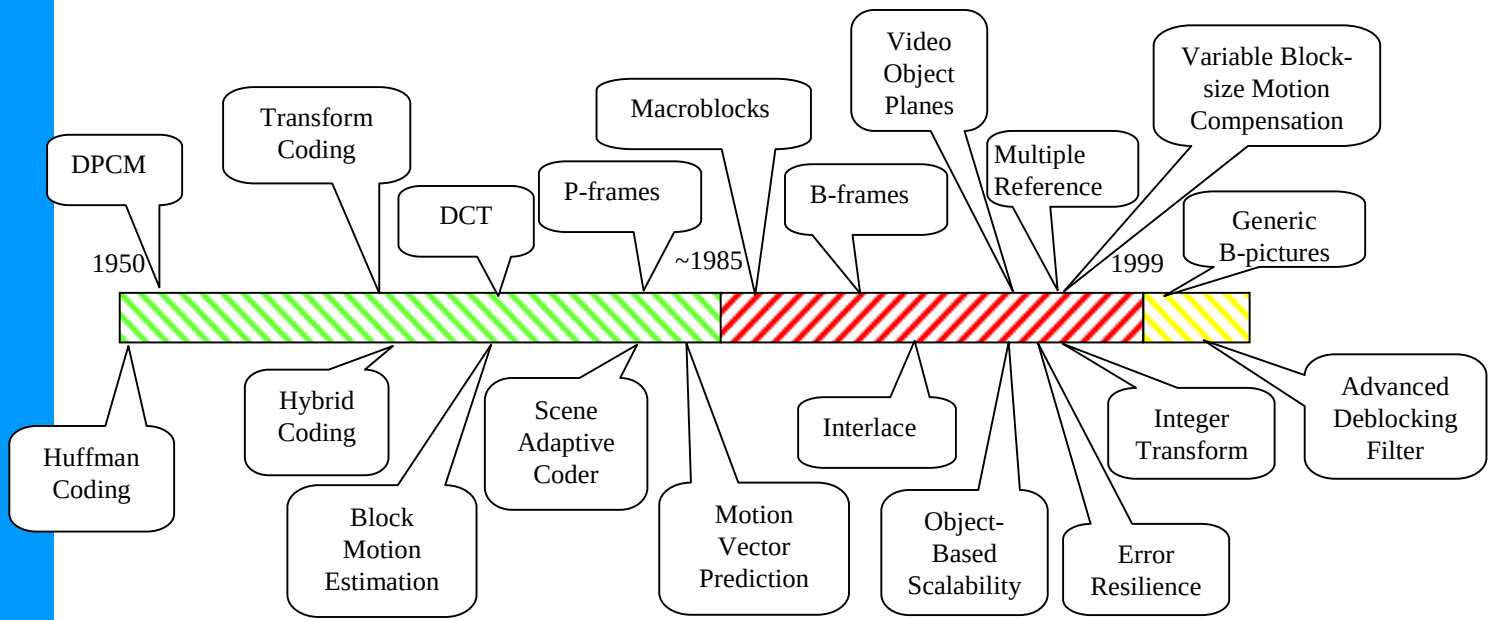
dates

Periods of key video coding tools contributed



C Reader, 2002

Resource: Cliff Reader 2002

Overview of video coding tools contributed

- Early period – 1970s-1980s
  - Most basic coding tools invented
  - Few patents filed
  - Some key patents expired
- Middle period – Late 1980s-Mid 1990s
  - Many patents filed on Interlace and B-frames
  - Some techniques reinvented and patented
  - Many patents on small improvements/syntax
- Recent period – Late 1990s-Now
  - Many new big improvements and patents
  - No patents on some of these, especially Telenor

AVS contribution is open to all members

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- 2003.3 (4th)decision:
  - 8x8-transform-only for HD
  - Common condition
- 2003.7.4 (video group meeting) accept:
  - avs-m1075, 8x8 integer transform and relative quantization [10 9 6 2], from ZJU, because of better performance (at lease 0.05dB averagely)
- 2003.7.31 (5th) accept:
  - avs-m1103, 8x8 integer transform and relative quantization [5 4 3 1] , from ICT, because of lower computational complexity
  - 1-D trans: 18 shift & 40 add vs forward trans. 6 shift & 32 add and inverse trans. 6 shift 28 add
- 2003.8.31 (video group meeting) accept:
  - avs-m1115, 8×8 integer transform and relative quantization [10 9 6 2], from ZJU, because of better performance (0.1dB averagely), especially for I frame (0.3dB gain)
- 2003.10 (6th)
  - Ad hoc group of transform
  - 16-bit implementation of transform
- 2003.11.6&10 (video group meeting) :
  - avs-m1178, 16-bit 8×8 integer transform and relative quantization, from digipro
  - avs-m1182, 8×8 integer transform and relative quantization, from ZJU & CUHK
  - Over-nights cross-check
  - 2003.11.15 final decision

dates

Cost efficiency

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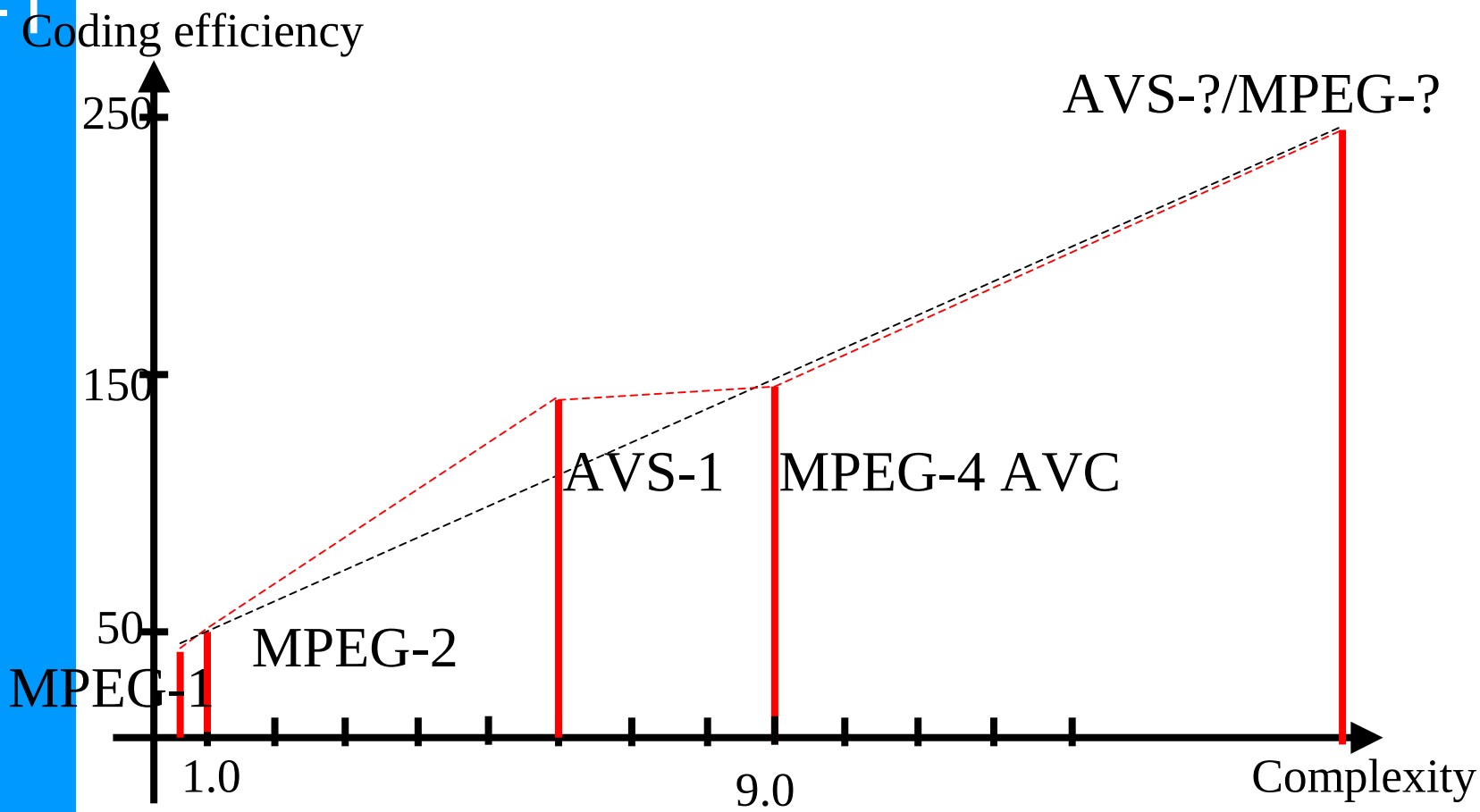

Cost efficiency analysis

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Tools	Estimated cost increase	
	AVS	H.264
Multiple reference	1	2
Variable block-size MC	1	2
Quarter pixel	3	3
Entropy coding	0.5	1
Deblock filter	0.5	1
Total	6	9

Cost efficiency for industry

- 1 RMB licensing for China market
  - System, video, audio, DRM
- Manageable by industry
  - One stop shop

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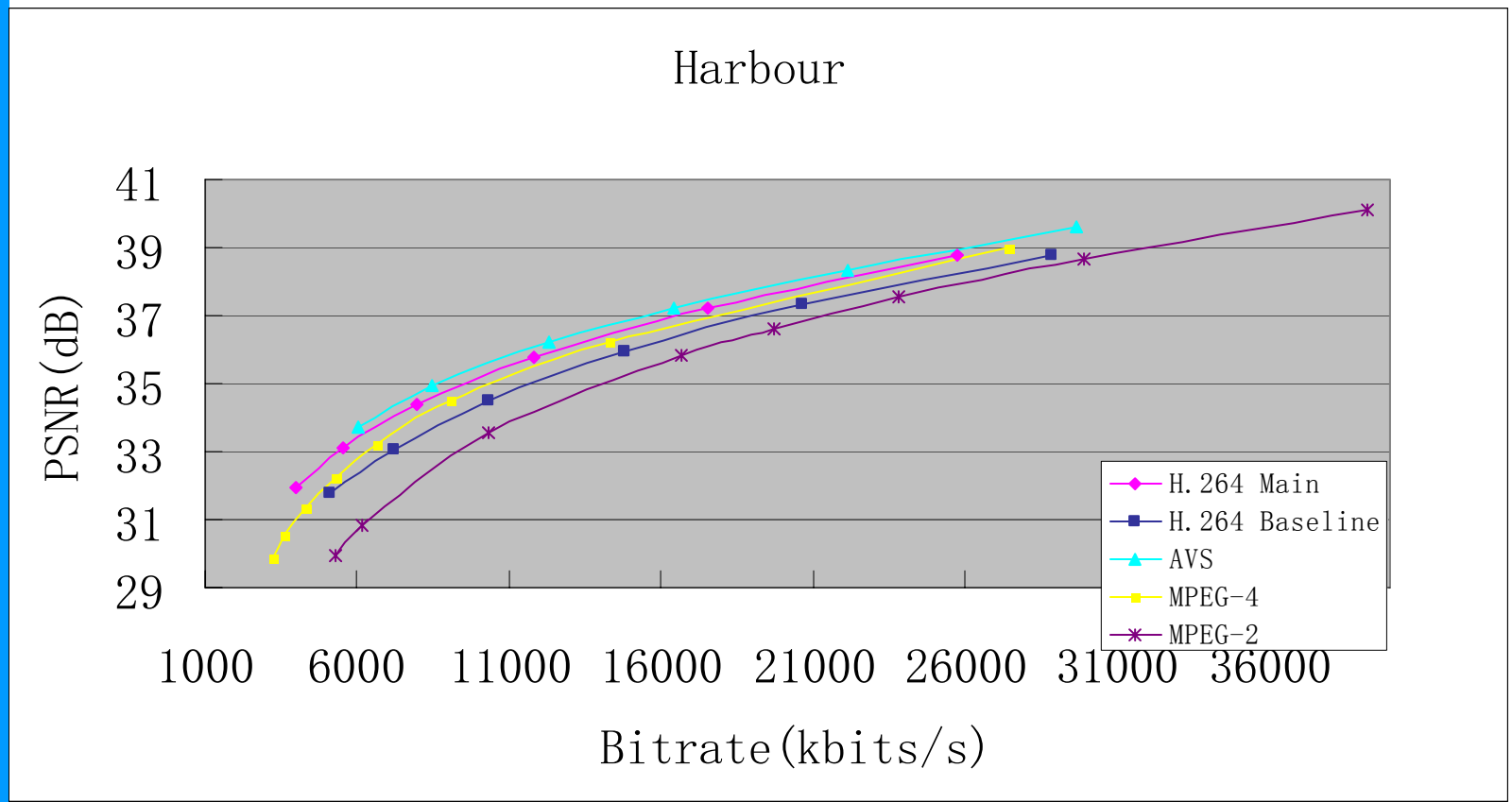
Performance

AVS video family

- AVS 1.0 video(AVS1-P2)
- AVS-M(AVS1-P7)

Performance- HD (1280 x720)



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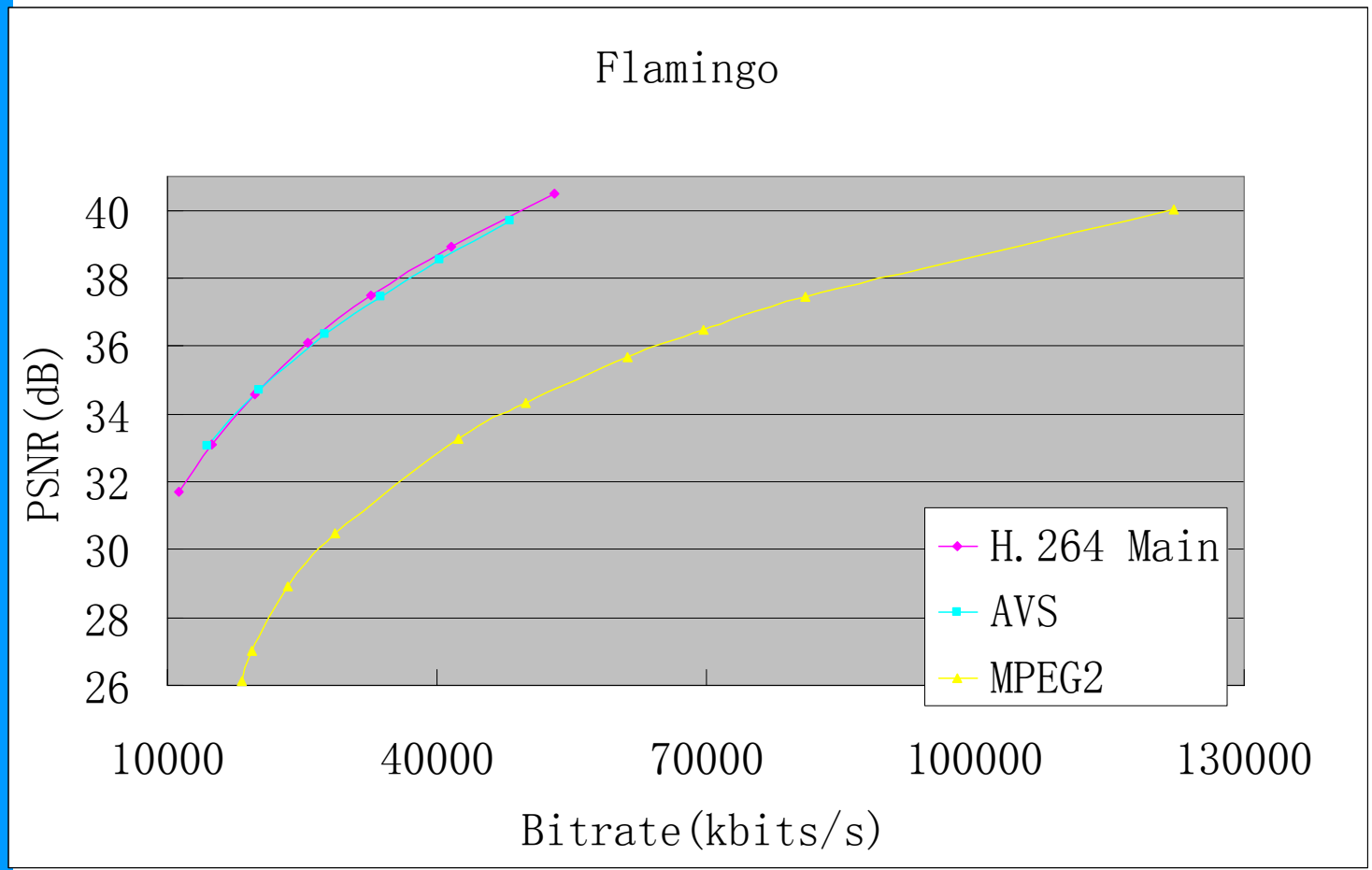
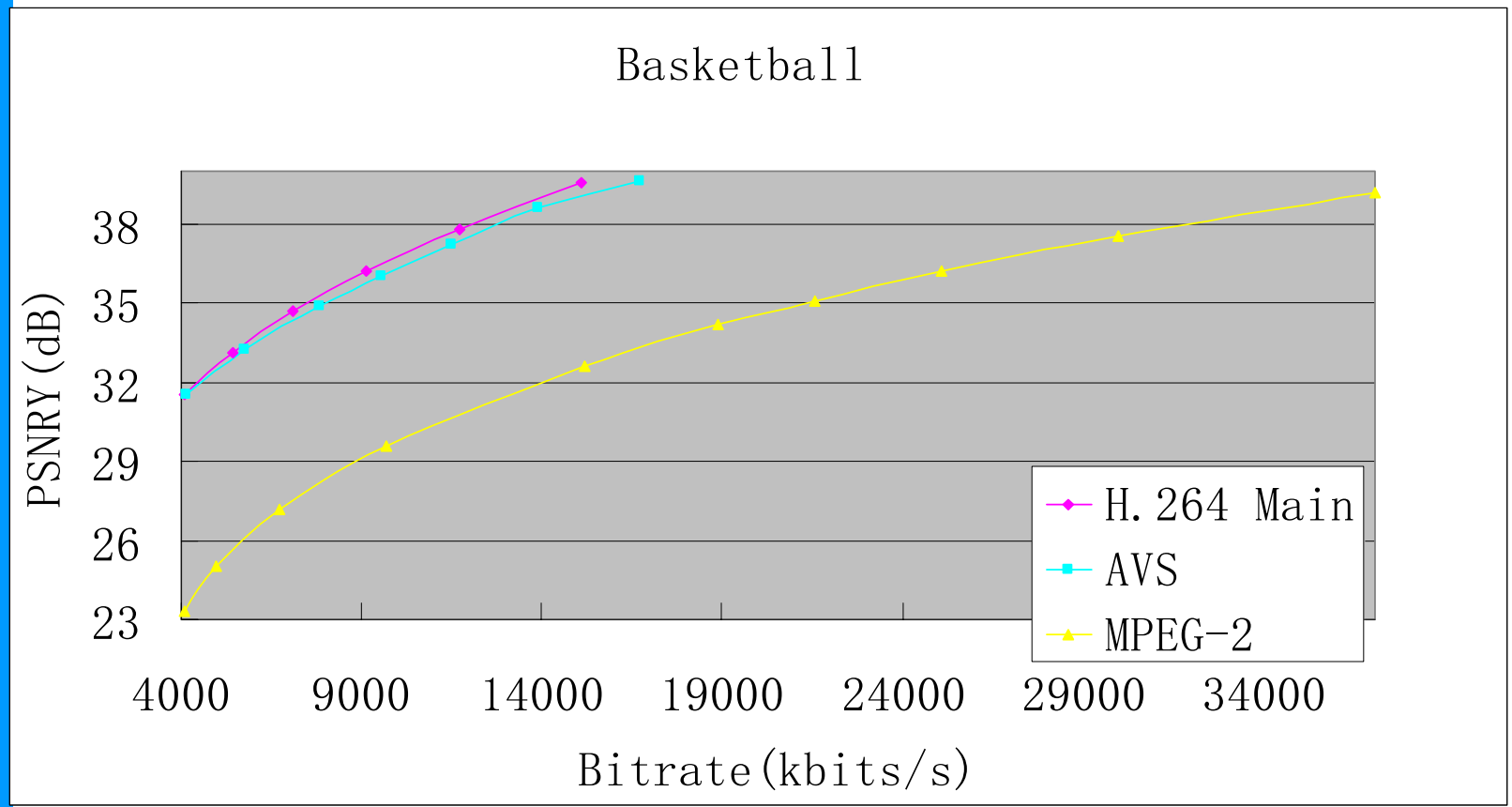
Performance- HD (1280 x720)



Performance – SD (720x576)



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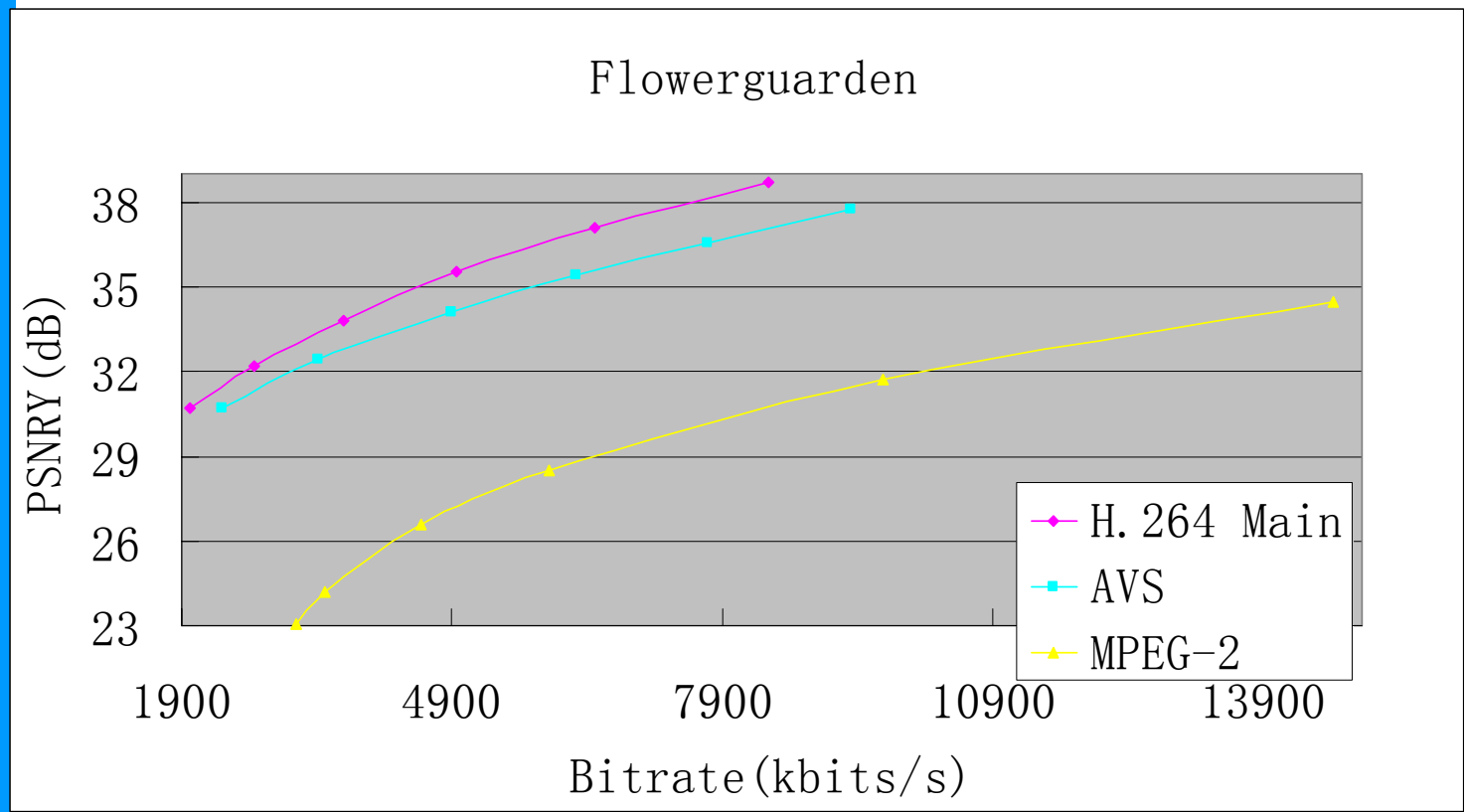
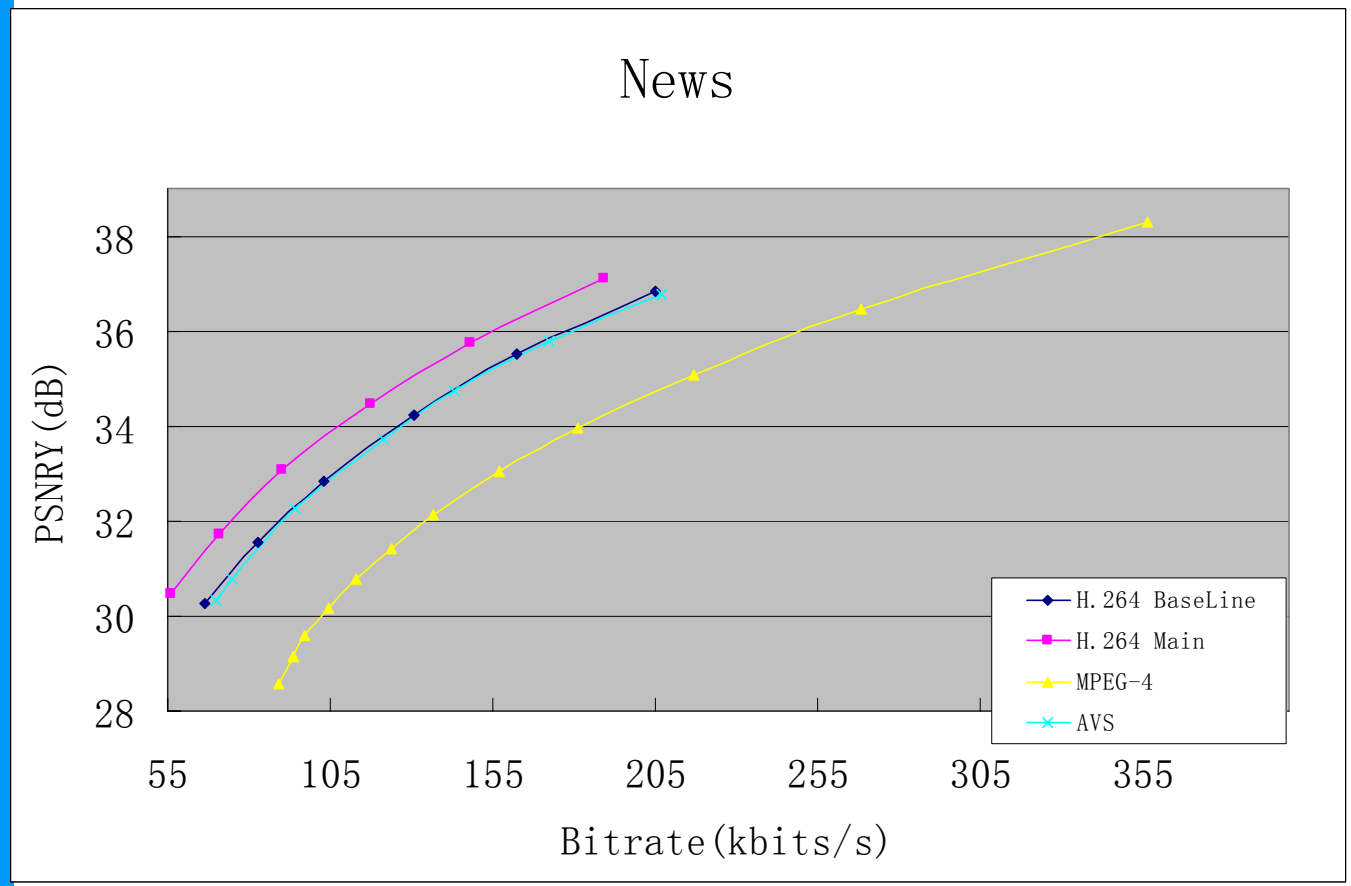
Performance – SD (720x576)



Performance – CIF (352x288)



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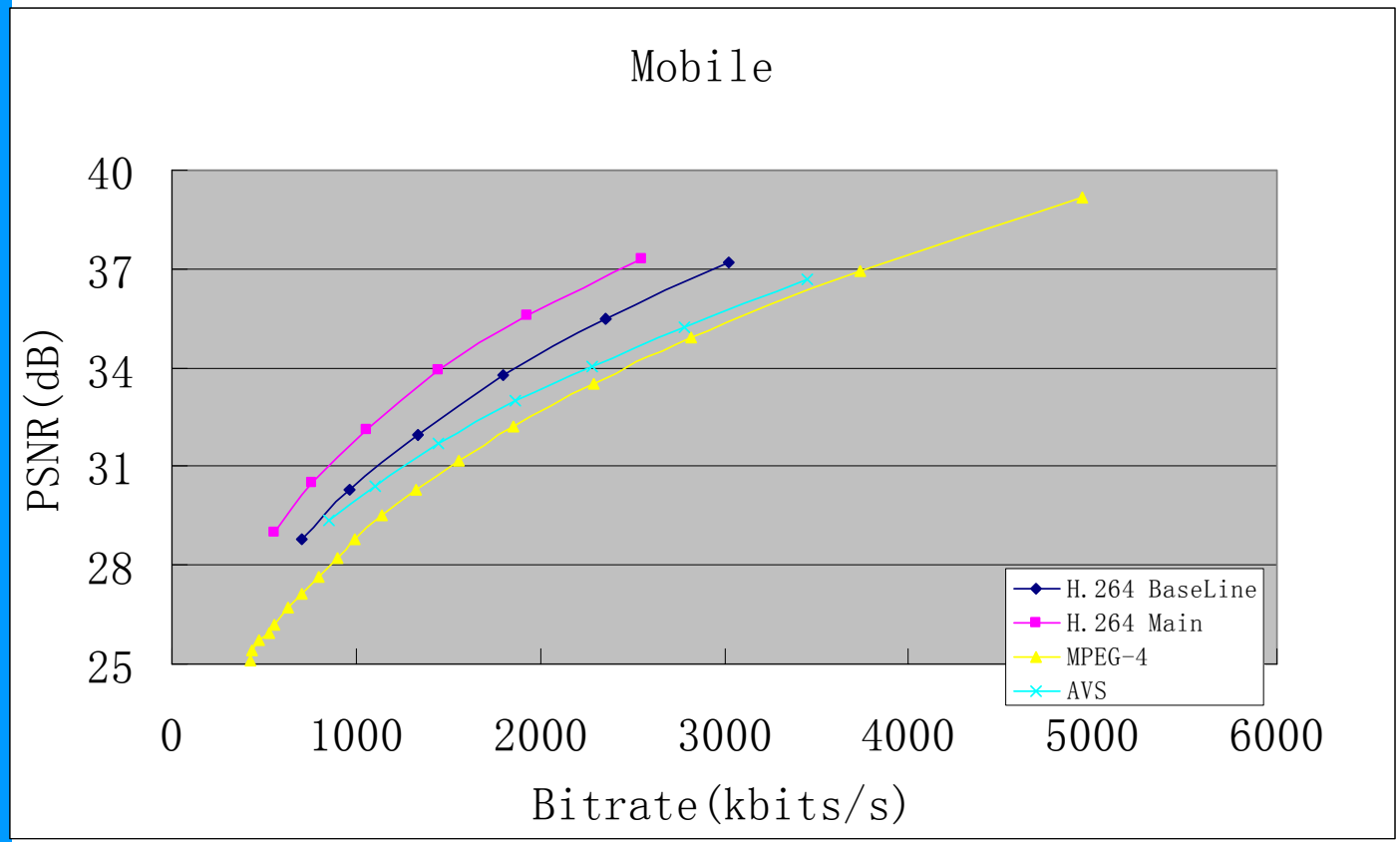

Differences between AVS, 264, MPEG-2

tools	AVS	H.264	MPEG-2
Intra-interpolation	8x8, 5 modes for Y prediction, 4 modes for UV prediction	4x4, 9 modes for Y prediction, 4 modes for UV prediction	Prediction only to DC coefficient
Reference frame	<=2	<=16	1
Block-size for MC	16x16, 16x8, 8x16 8x8	16x16, 16x8, 8x16 8x8,8x4,4x8,4x4	16x16, 16x8(interlace)
B frame micro-block bi-direction prediction	Coding front motion vector, and computing back motion vector	Coding two motion vectors	Coding two motion vectors

dates

Differences between AVS, 264, MPEG-2

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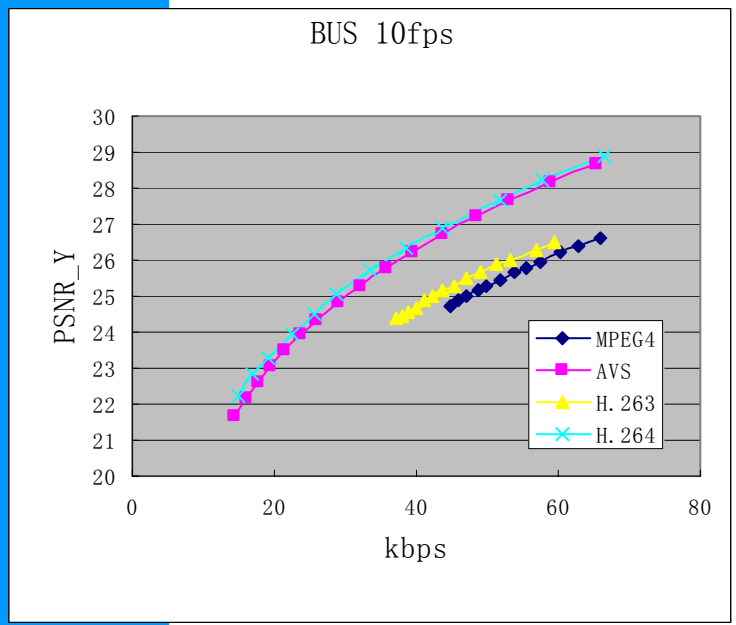
tools	AVS	H.264	MPEG-2
¼ pixel MC	½ pixels 4-tap ¼ pixels 4-tap	½ pixels 6-tap ¼ pixels 2-tap	½ pixels 2-tap
Transform and quantization	8x8 integer transform, encoding site normalization only	4x4 integer transform, both encoding and decoding sites need to normalize	8x8 float DCT
Entropy coding	Adaptive 2D VLC	CAVLC CABAC	VLC
Loop filter	8x8 based Less boundaries Less BS-levels (0..2), Less pixels filtered (p0, p1,q0, q1)	4x4 based More boundaries More BS-levels (0..4), More pixels filtered (p0..p3,q0..q3)	N/A

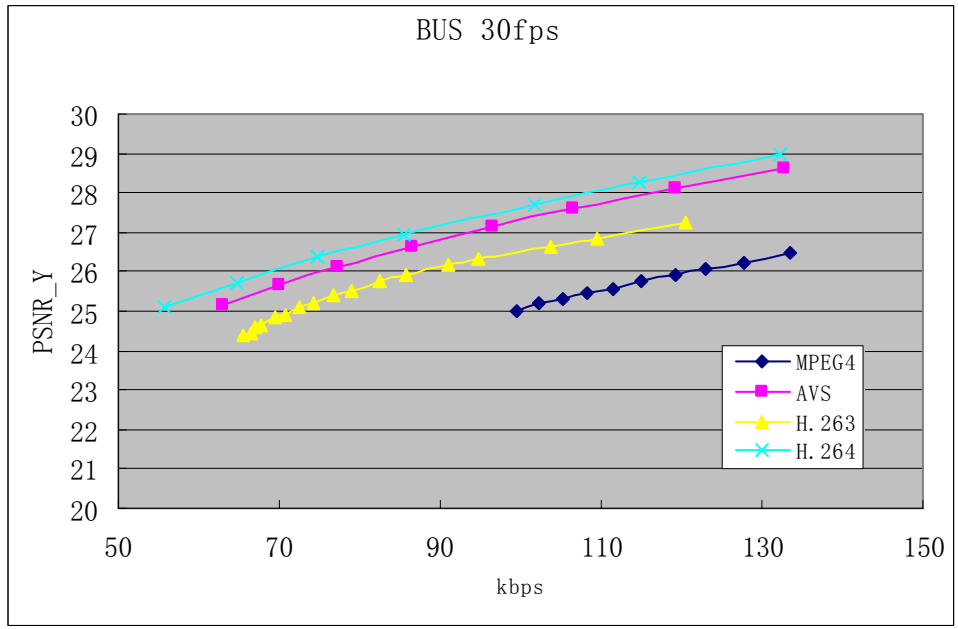
dates

AVS video family

- AVS 1.0 video(AVS1-P2)
- AVS-M(AVS1-P7)

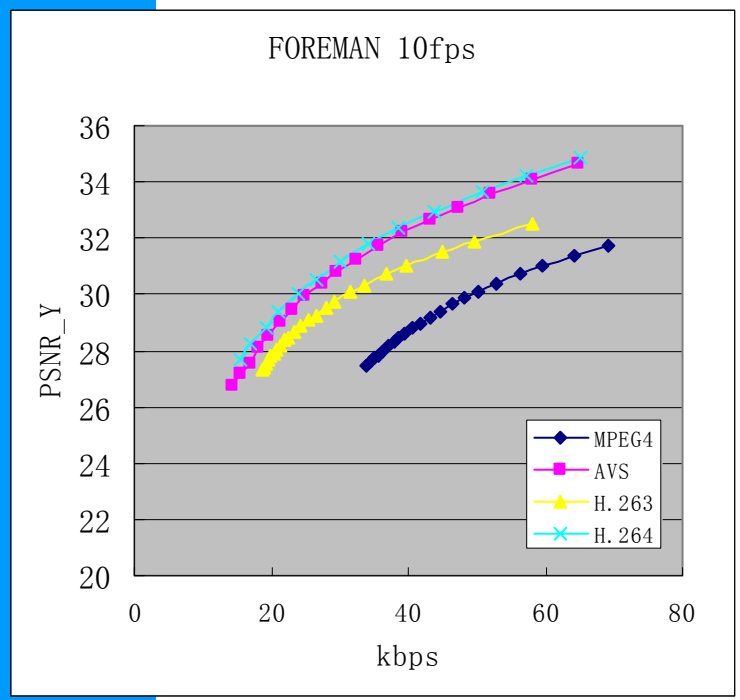
Testing on stream of BUS

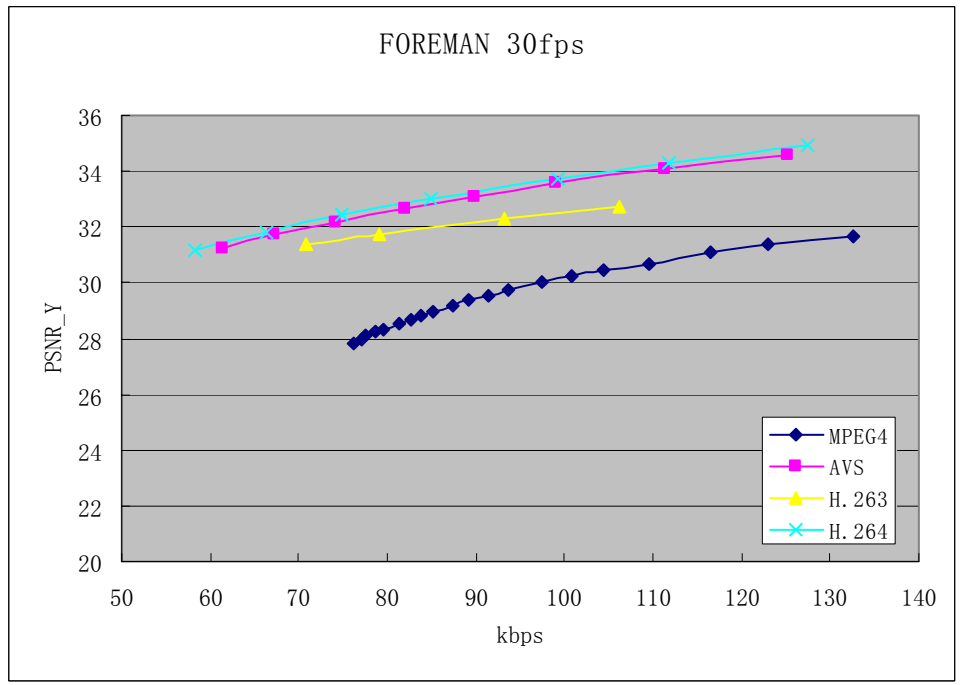




Testing by China Mobile

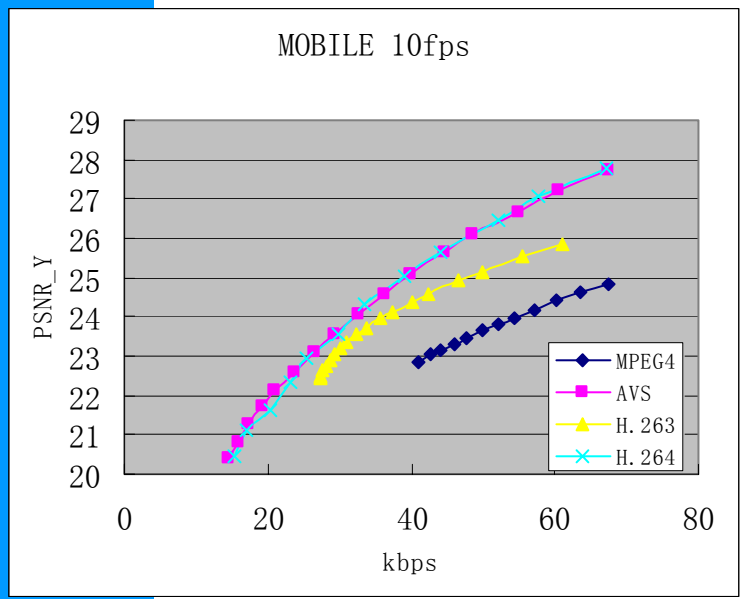
Testing on stream of FOREMAN

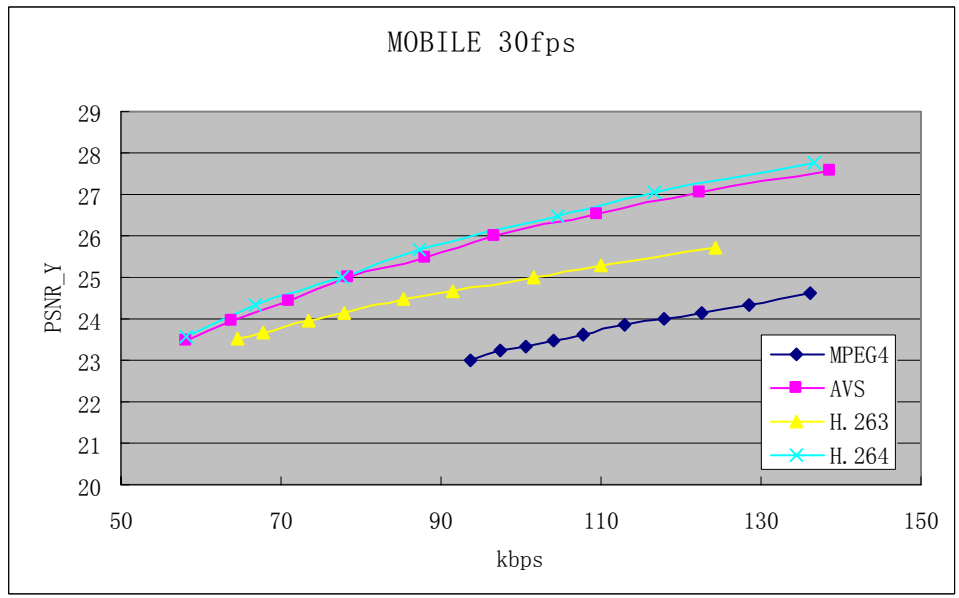




Testing by China Mobile

Testing on stream of MOBILE





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Testing on stream of TEMPETE

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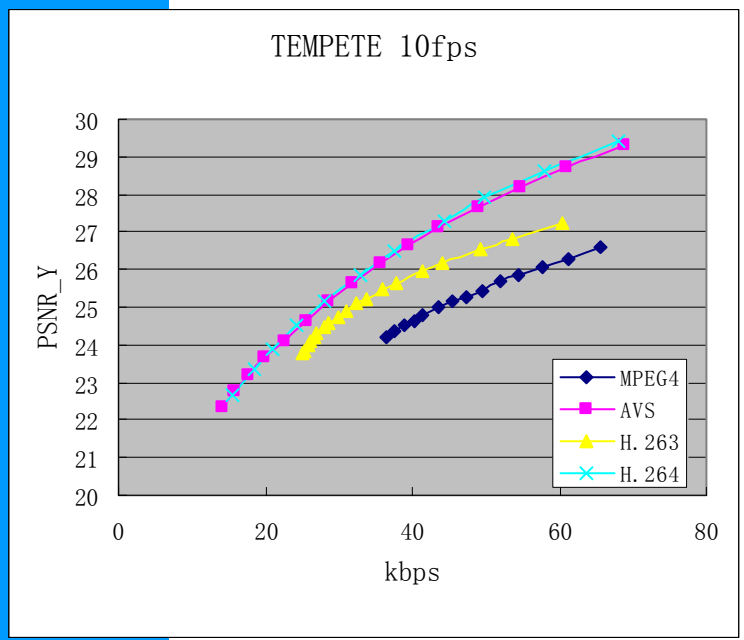

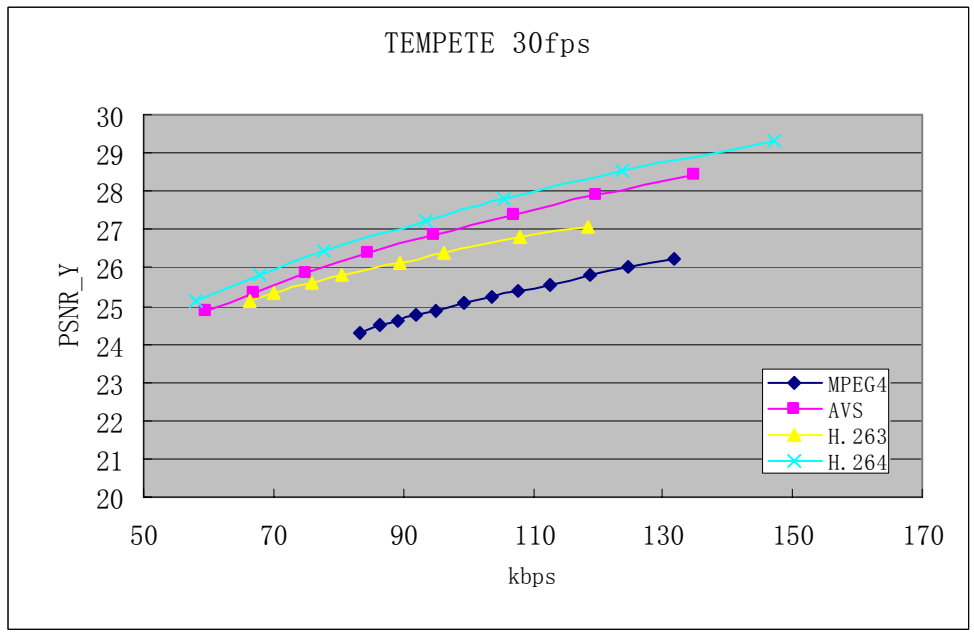

Testing by China Mobile

Summary

- AVS is a co-design between technology and IPR policy
- Patent pool approach should be recommended for major standard
- AVS working group of China wants to work with ITU-T and any others to share our experiences with you

Thanks