

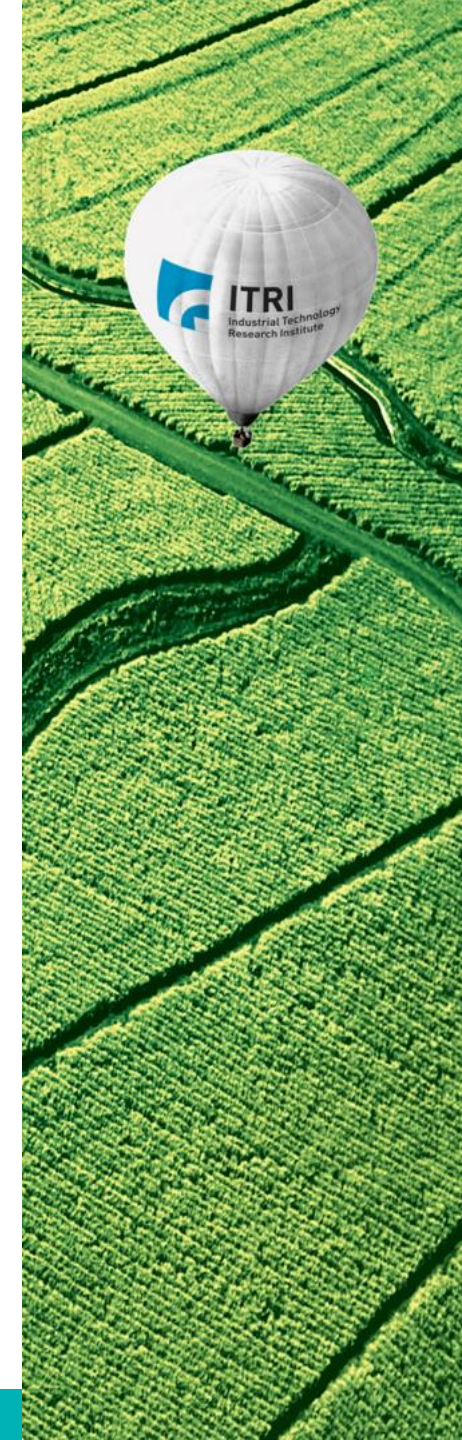
# ITRI

Industrial Technology  
Research Institute

## 國際視訊標準資訊分享

王聖博 (ITRI)

21<sup>st</sup> January 2022



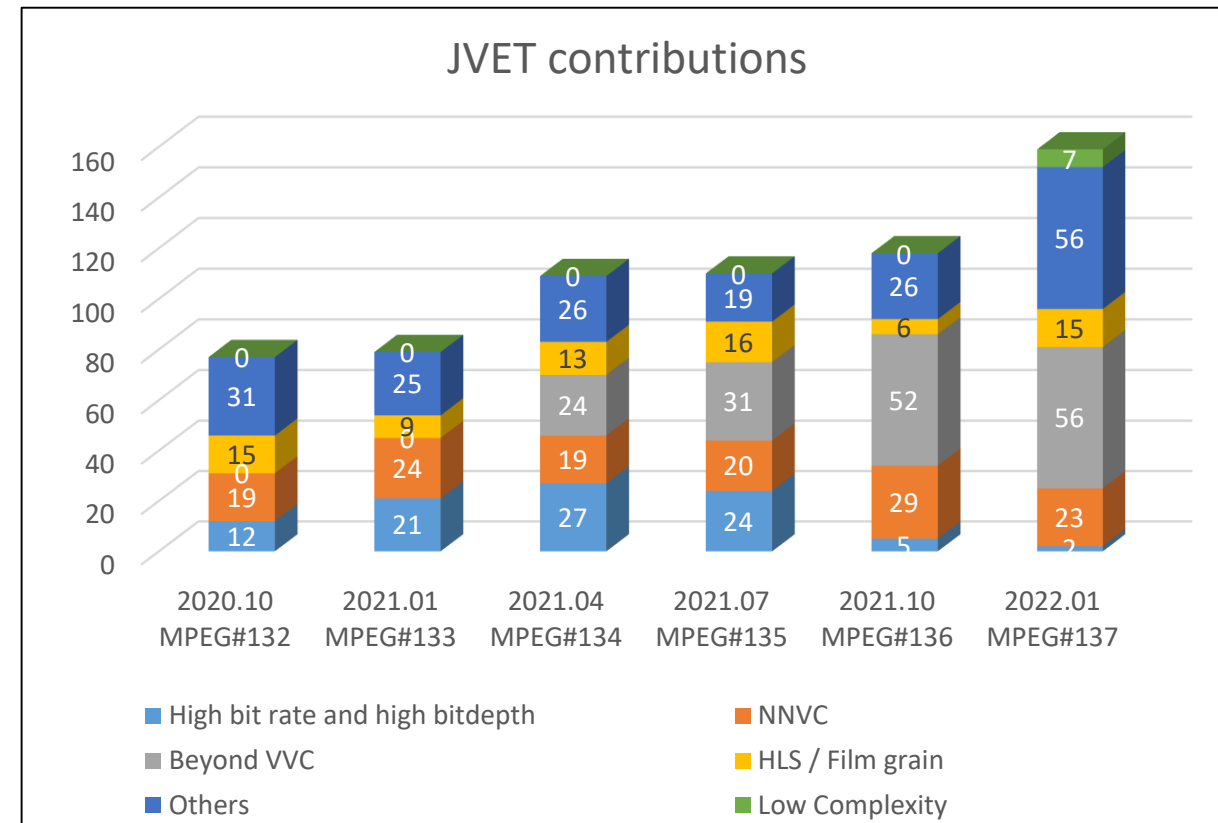
# Outline

- Status update for H.266
- Status update for 3DGC
- AI strategy for MPEG&JPEG

# Status update for H.266

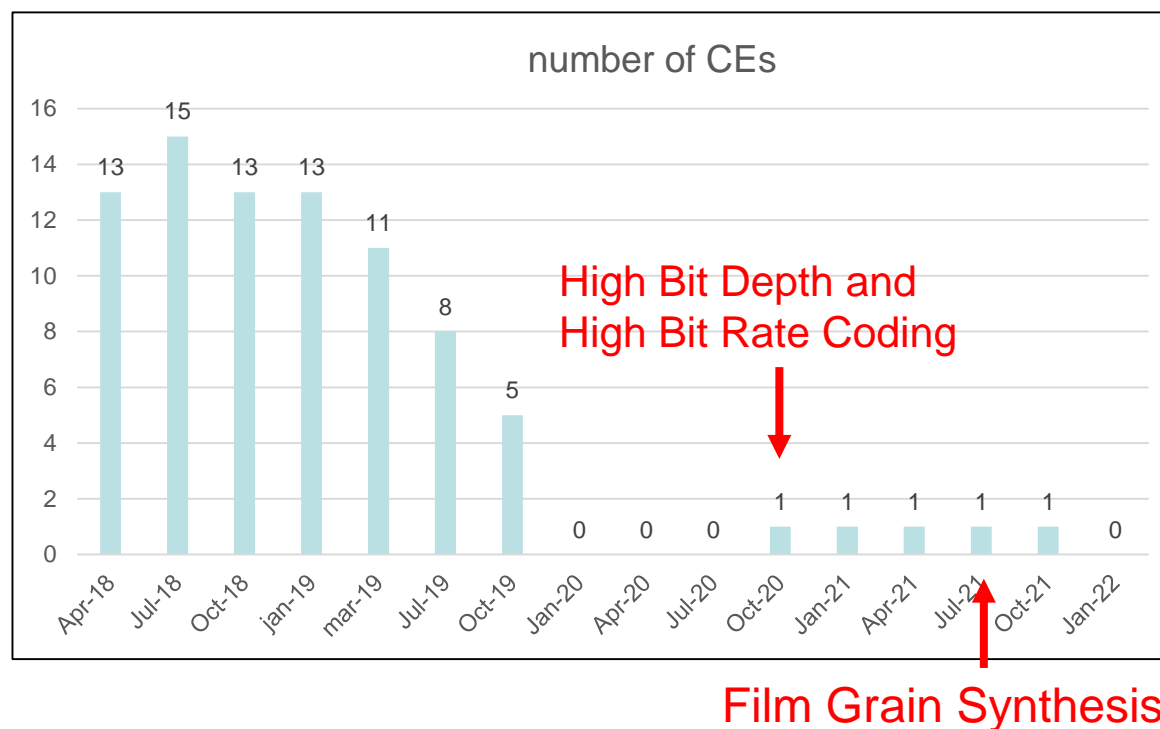
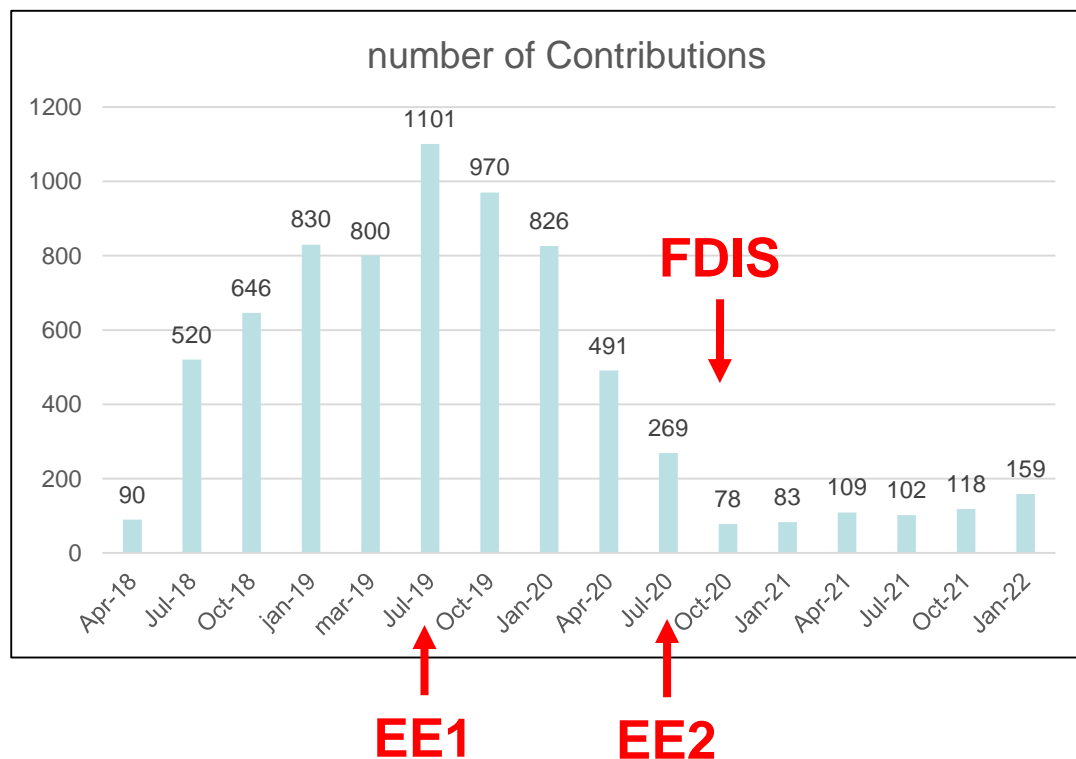
# Joint Video Expert Team (JVET)

- 26<sup>rd</sup> Meeting of JVET (8<sup>th</sup> Virtual meeting)
  - Date: 12–21 January 2022
  - Approximately 250 participants
  - Roughly 160 contributions
    - 2 high bit rate and high bit depth
    - 23 Neural network based video coding
    - 56 Enhanced compression beyond VVC capability
    - 15 High level syntax / Film grain
    - 7 Low Latency & Constraint Complexity
    - 56 CTC / SEI / Profile / Deployment / others / encoder optimization



# Number of JVET contributions and CEs

- Number of proposals remains about 100+ after FDIS, most of these proposals are regarding exploration experiments
- Core experiment (Film Grain Synthesis) was closed after MPEG#136

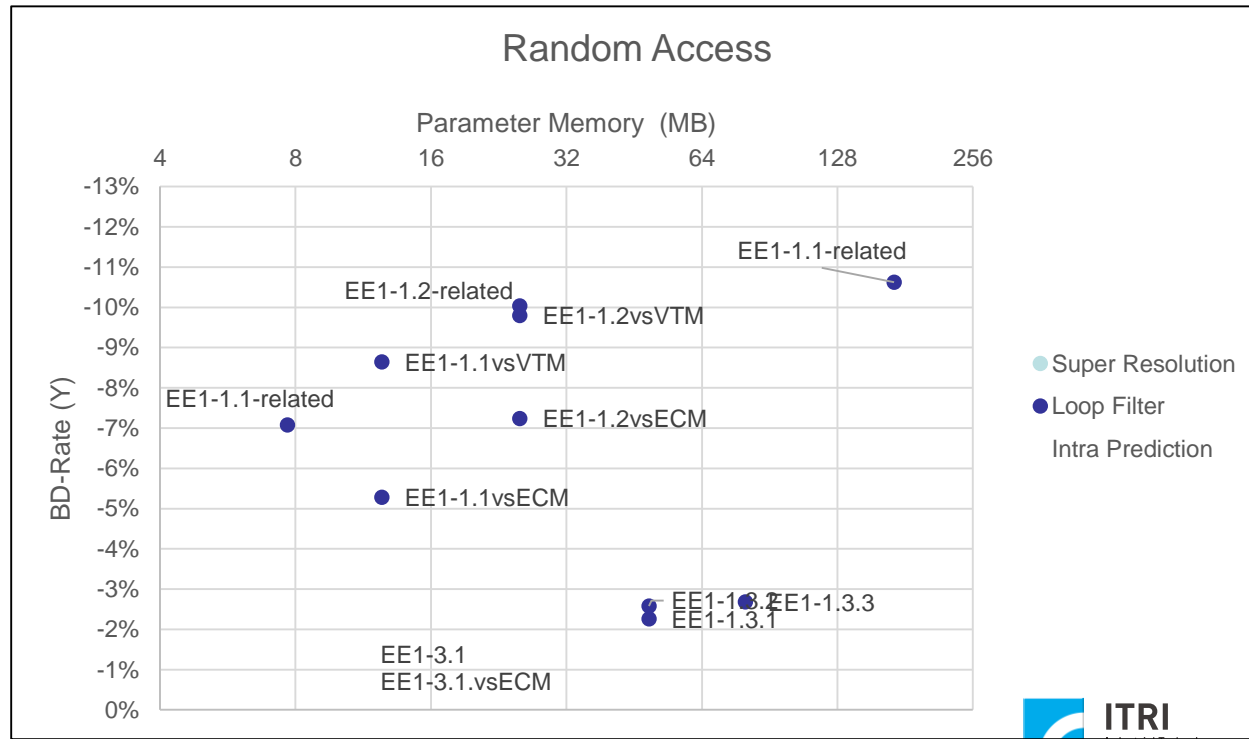
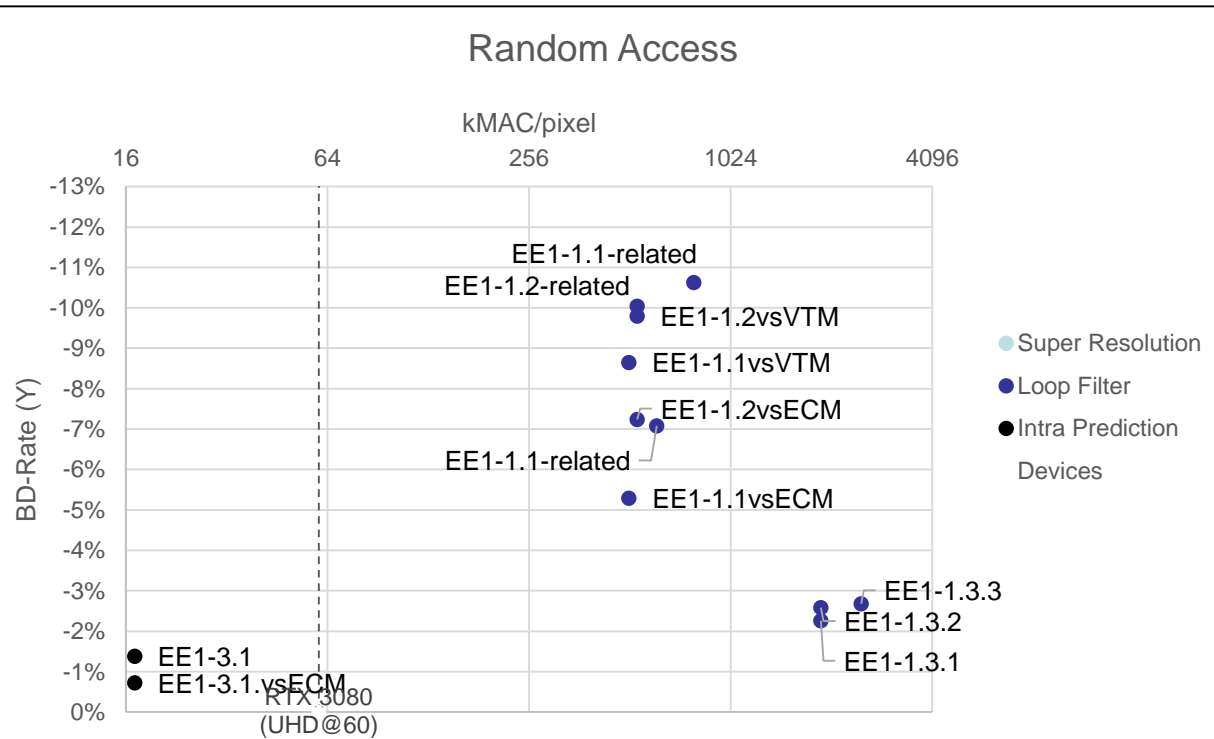


EE1: Exploration Experiments on Neural Network-based Video Coding

EE2: Exploration Experiment on Enhanced Compression beyond VVC capability

# EE1: Neural Network-based Video Coding

- Main topics: enhancement filters, super resolution, intra prediction
- Conducted viewing session for two best performing NN-based filter, VVC RPR and typical representative of NN-based super-resolution technology



# EE2: Enhanced Compression beyond VVC capability

- Currently investigated in EE:
  - Partitioning: ABT, UQT, ABT+UQT
  - Intra prediction: MRL extension
  - Inter prediction: Combinations GPM inter/intra, modified merge list construction, improvements of affine, TM improvements, MV sign prediction,
  - Transforms/coefficient coding: Sign prediction improvements, adaptive MTS
  - Loop filter: Edge-based CCSAO, adaptive filter shapes for ALF

	All Intra Main 10						Random Access Main 10						Low delay B Main 10				
	ECM3 over VTM-11.0 + V0056						ECM3 over VTM-11.0 + V0056						ECM3 over VTM-11.0 + V0056				
	Y	U	V	EncT	DecT		Y	U	V	EncT	DecT		Y	U	V	EncT	DecT
Class A1	-6.98%	-12.44%	-16.63%	311%	241%	Class A1	-14.95%	-16.42%	-21.85%	367%	466%	Class A1					
Class A2	-6.44%	-13.13%	-11.99%	298%	232%	Class A2	-15.84%	-20.38%	-20.42%	364%	511%	Class A2					
Class B	-6.05%	-13.75%	-14.21%	338%	257%	Class B	-13.57%	-19.94%	-19.32%	384%	493%	Class B	-12.28%	-24.89%	-24.11%	302%	331%
Class C	-7.06%	-10.21%	-10.67%	322%	252%	Class C	-15.35%	-17.27%	-16.98%	387%	427%	Class C	-12.51%	-18.81%	-18.94%	315%	294%
Class E	-7.58%	-11.55%	-12.41%	322%	294%	Class E						Class E	-12.11%	-17.24%	-19.15%	298%	296%
<b>Overall</b>	<b>-6.75%</b>	<b>-12.28%</b>	<b>-13.16%</b>	<b>320%</b>	<b>255%</b>	<b>Overall</b>	<b>-14.77%</b>	<b>-18.61%</b>	<b>-19.42%</b>	<b>377%</b>	<b>473%</b>	<b>Overall</b>	<b>-12.31%</b>	<b>-20.95%</b>	<b>-21.14%</b>	<b>305%</b>	<b>310%</b>
Class D	-5.86%	-8.45%	-8.23%	316%	265%	Class D	-16.10%	-17.65%	-16.99%	378%	459%	Class D	-14.09%	-20.17%	-19.36%	303%	296%
Class F	-10.80%	-15.69%	-15.66%	244%	298%	Class F	-13.54%	-18.02%	-17.76%	345%	407%	Class F	-12.15%	-18.99%	-18.67%	295%	324%
Class TGM	-15.62%	-18.73%	-18.25%	232%	293%	Class TGM	-14.65%	-18.96%	-19.20%	348%	304%	Class TGM	-14.02%	-21.79%	-22.13%	269%	255%

# Current Status & Progress

- CTC updates
  - Neural network-based video coding technology (EE1)
  - Enhanced compression tool testing (EE2)
    - Include HDR/WCG in CTC document for ECM/EE2 as optional class
  - Intend to unify common test conditions among different standards
- New edition of HEVC
  - New level 6.3, higher luma sample number, bit rate and buffer sizes
  - To support higher max bit rate for Main 4:2:2 and 4:4:4 Intra profiles for both HEVC and VVC.
  - DIS planned for January 2022, and FDIS July 2022



# AHGs for 24<sup>th</sup> JVET Meeting

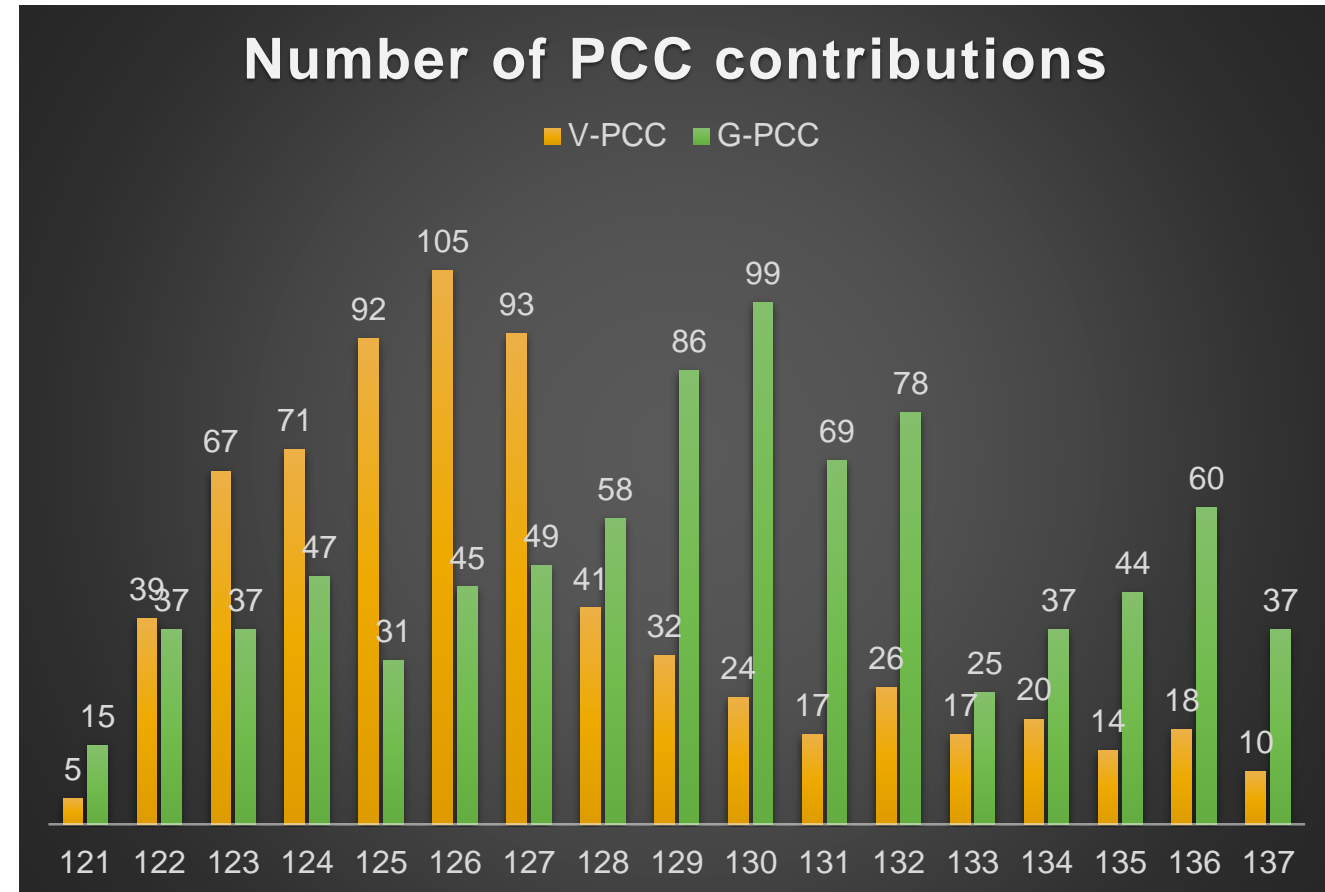
- Project Management (AHG1) \*
- Draft text and test model algorithm description editing (AHG2) \*
- Test model software development (AHG3) \*
- Test material and visual assessment (AHG4) \*
- Conformance testing (AHG5)
- ECM software development (AHG6)
- Low latency and constrained complexity (AHG7)
- High bit-depth, high bit rate and high frame rate coding (AHG8)
- SEI message studies (AHG9) \*
- Encoding algorithm optimizations (AHG10)
- Neural-network-based video coding (AHG11)
- Enhanced compression beyond VVC capability (AHG12)
- Film grain technologies (AHG13)

\* merge JVET and JCT-VC

# Status update for 3D graphics coding

# PCC meeting

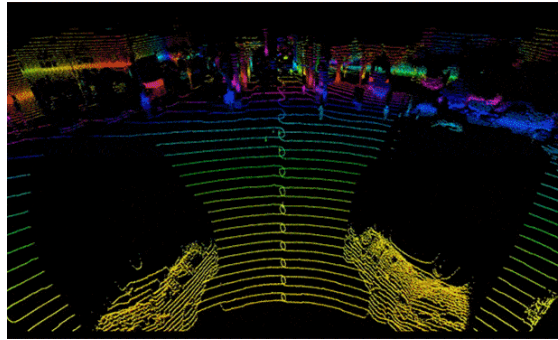
- Point Cloud Compression
  - ISO/IEC 23090-5 and -9
  - ISO/IEC 23090-19, -20, -21, -22
- Approximately 60+ participants



# PCC Activities



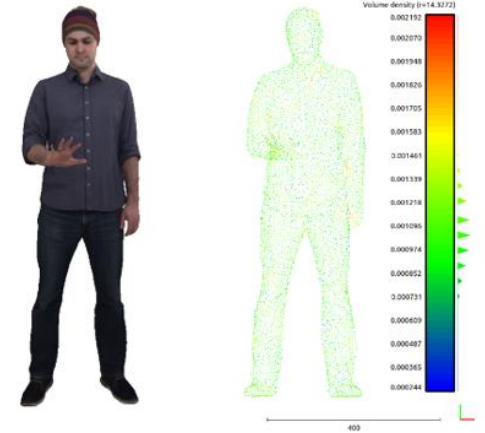
V-PCC



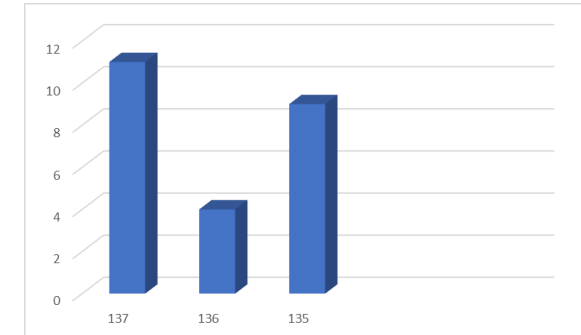
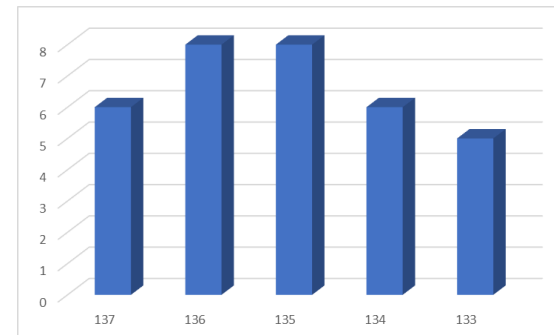
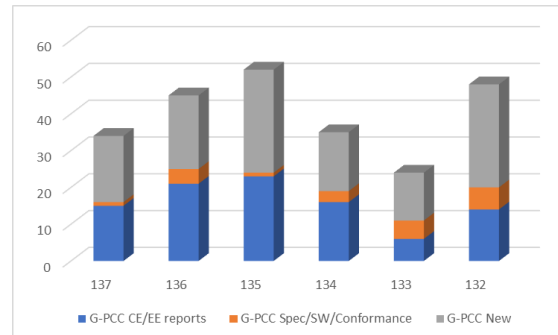
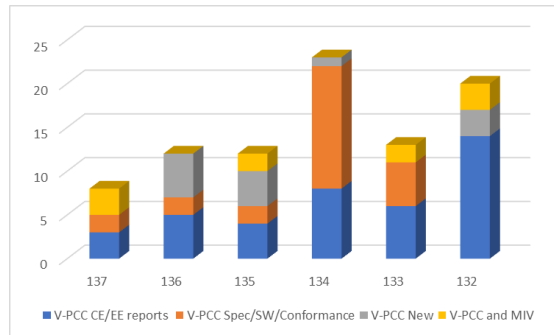
G-PCC



V-Mesh



AI-GC

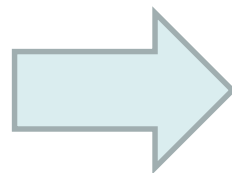
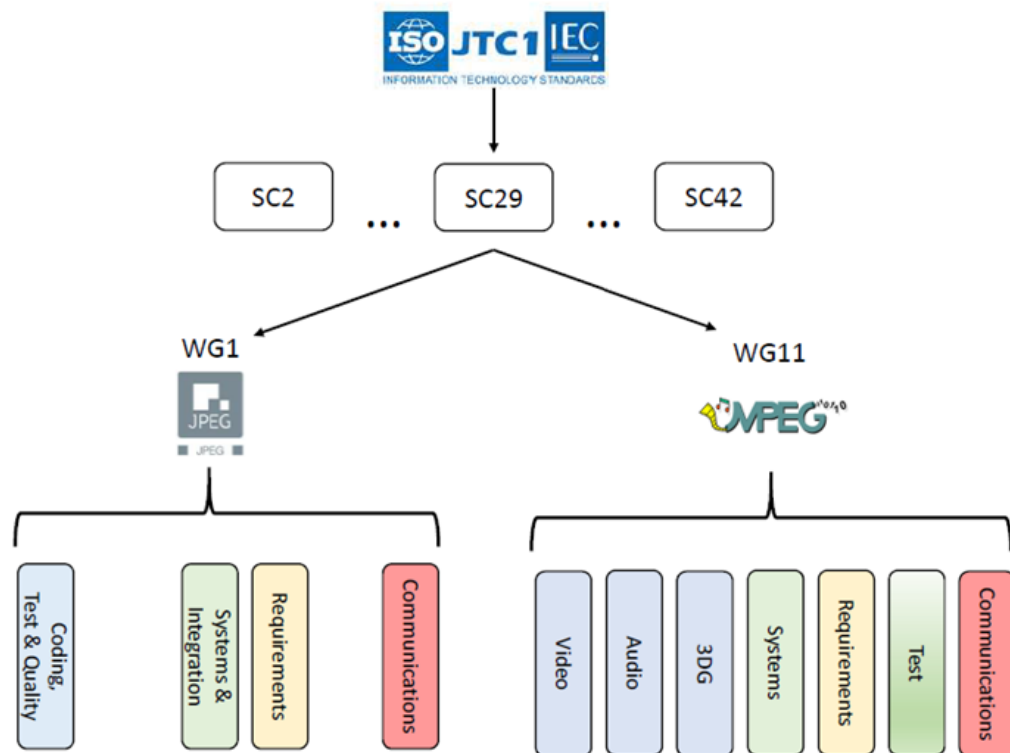


# AI STRATEGY FOR MPEG&JPEG

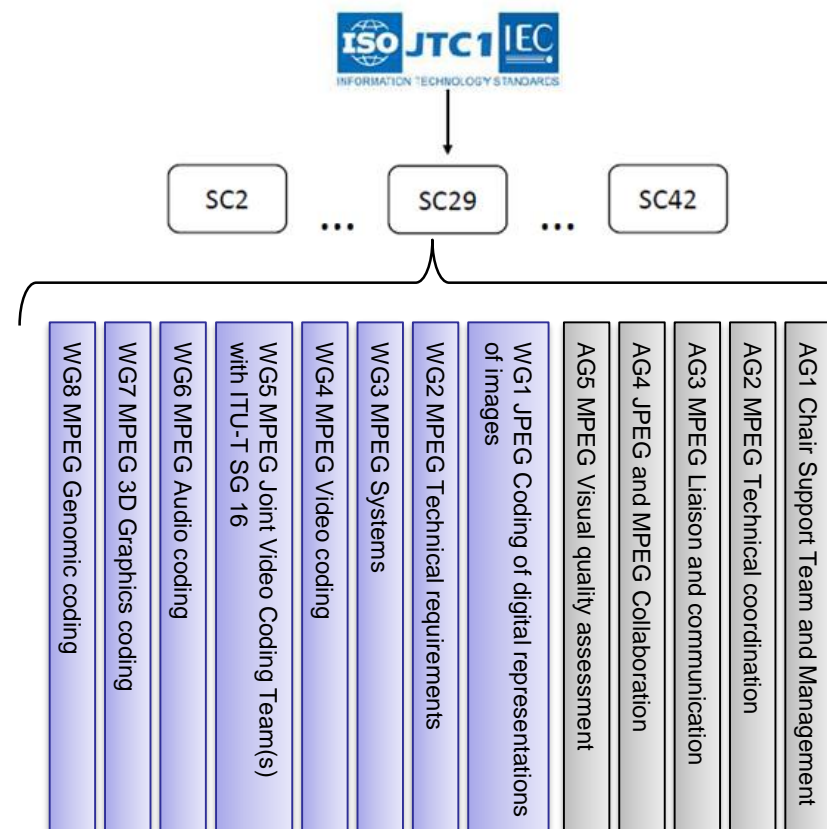
# ISO/IEC SC29 組織變革

- SC29重整WG1與WG11轄下的sub-groups與AHGs，建立5個Advisory group與8個working group

舊的組織架構



新的組織架構



# ISO/IEC SC29 標準組織架構



SC29  
(Multimedia)

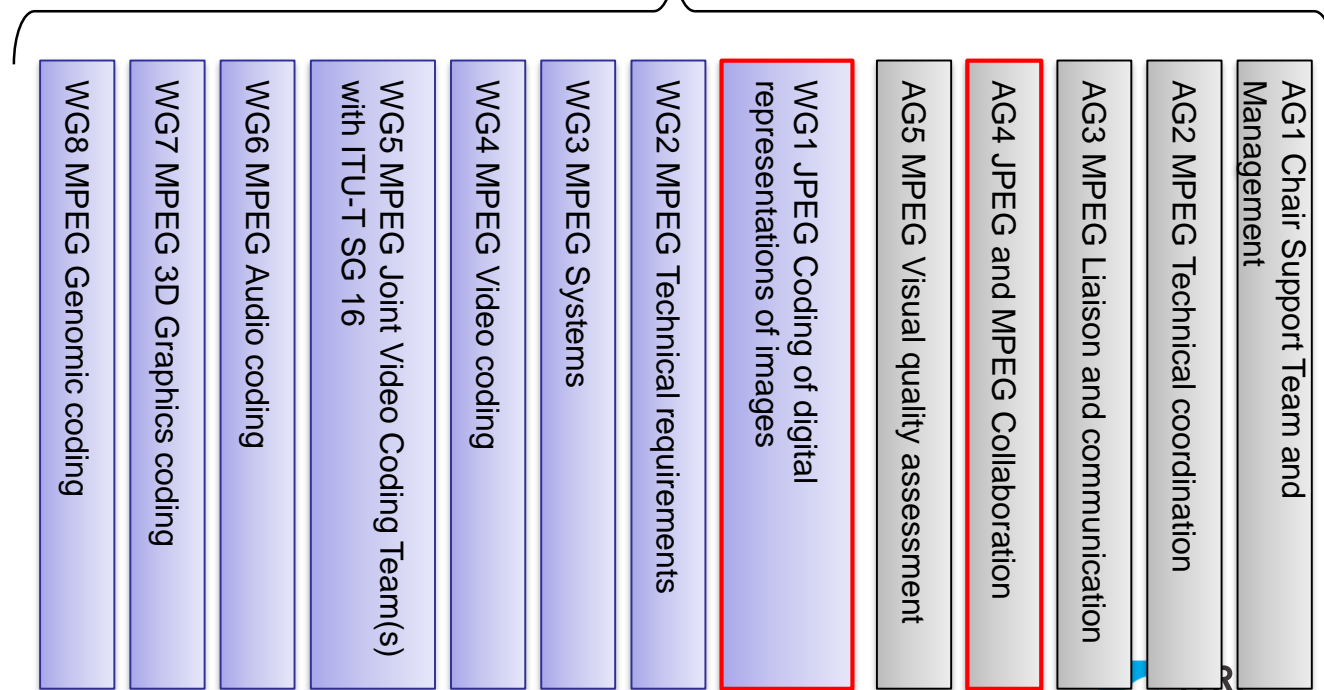
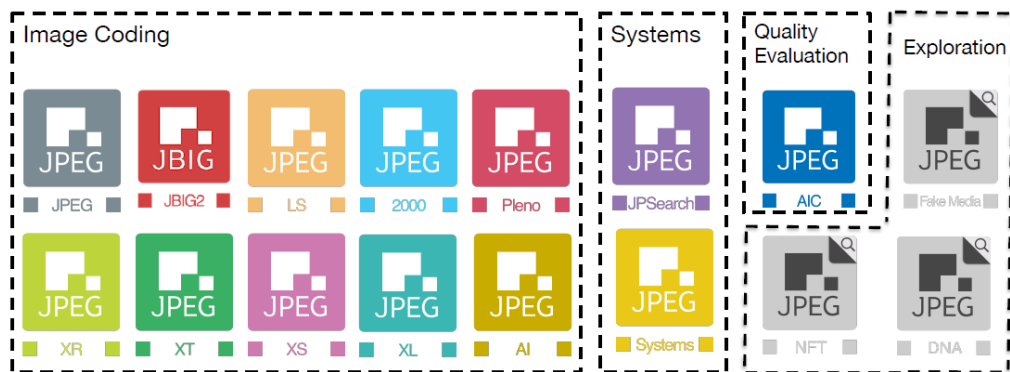


- MPEG(Moving Picture Experts Group)

- 5個Advisory group與8個working group
- 每年開會四次，最近八次會議皆採遠端會議形式，預計2022/07開始採用遠端/實體的複合形式舉行會議

- JPEG(Joint Photography Expert Group)

- Established at 1986
- JPEG Family of standards:



# Neural network based video coding-2

## - AI-based coding tools

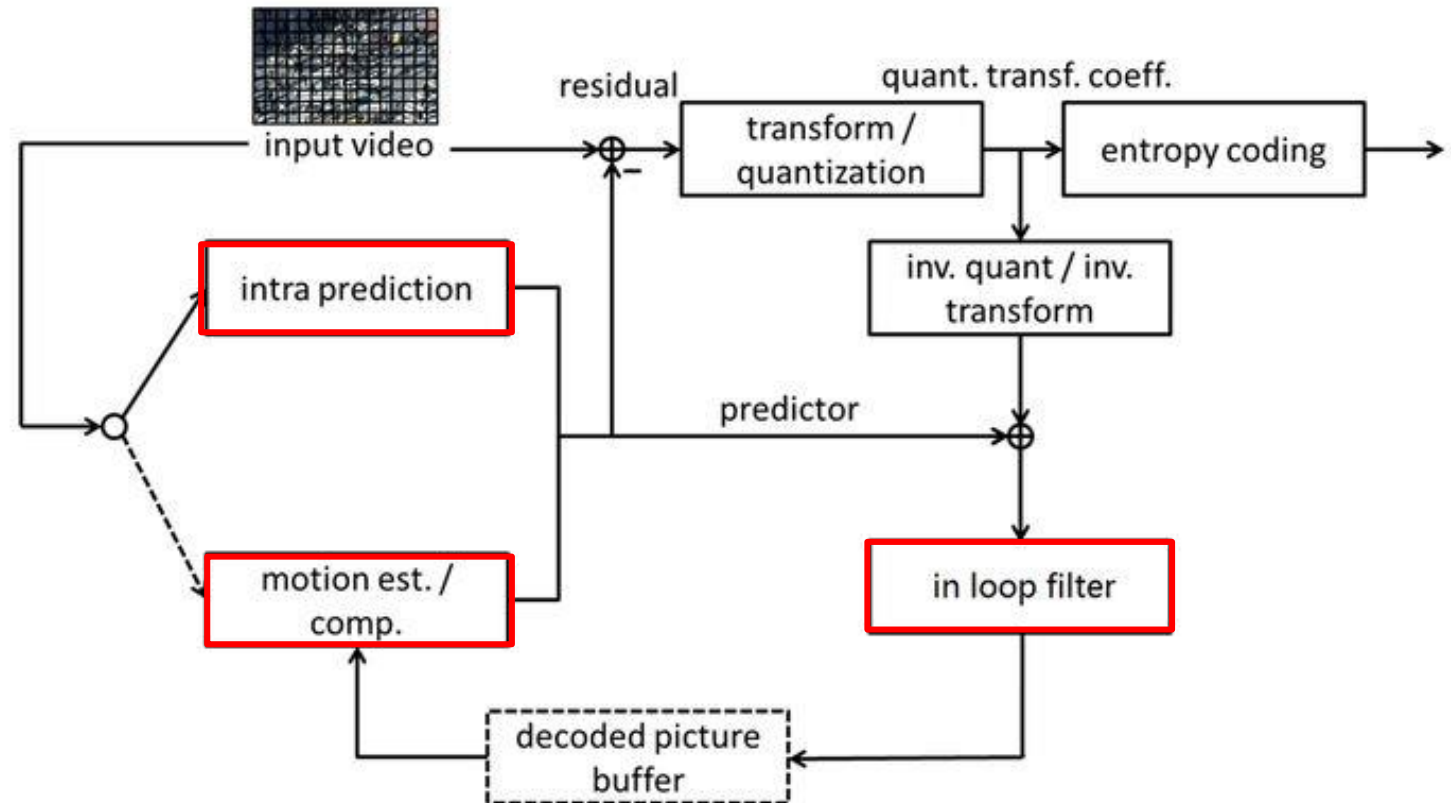
- Three major areas of work in JVET:
  - Replacing existing VVC coding tools (or enhancing them)
  - Introducing post-filtering operations
  - End-to-end solutions that do not rely on VVC



# Neural network based video coding-2

## - AI-based coding tools

- Tool replacement or enhancement :
  - In-loop filtering
  - Intra-Prediction
  - Inter-Prediction



# Neural network based video coding-3

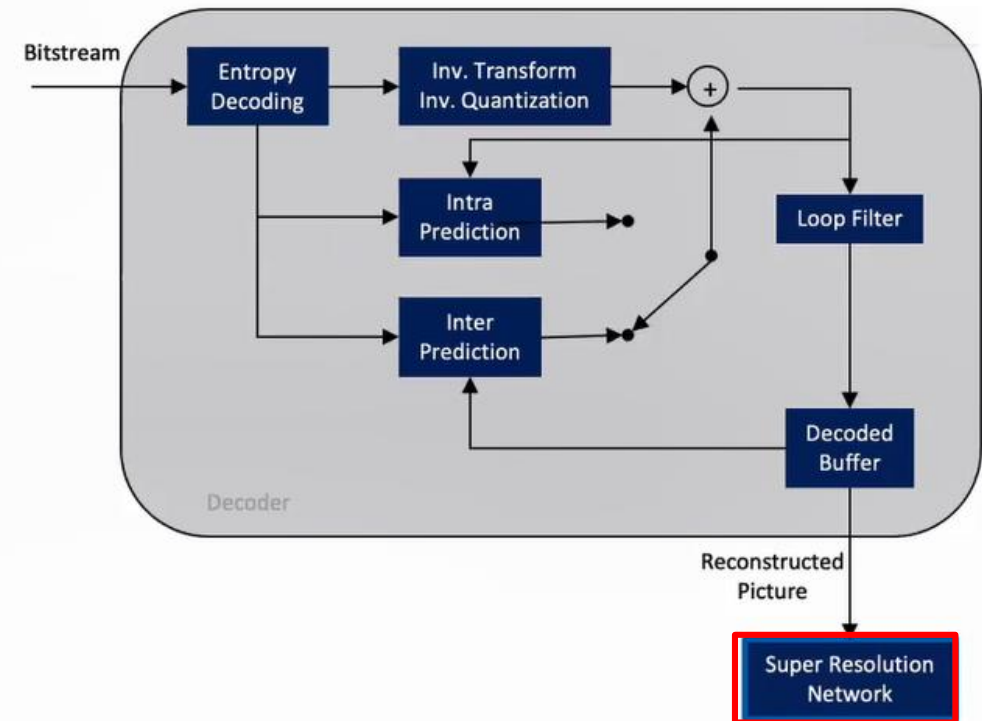
## - Super resolution

### Encoder



- super-resolution networks are located as a post-filter
  - Input sequence is down-sampled and compressed using VVC
  - Reconstructed sequence is upsampled using super-resolution network

### Decoder



# JPEG strategy on AI

- Three possible alternatives
  - AI assisted codec optimization
  - Component replacement by ML tools (e.g. NN)
  - End-to-end autoencoders

# Thank You



**INNOVATING A BETTER FUTURE!**