

American Society of Cinematographers Motion Imaging Technology Council Progress Report 2020

Camera Committee

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As the year progressed, almost all the cinema camera manufacturers were embracing the concept of “full frame” sensor cameras, having a sensor approximately the same size as a typical 35mm still film camera: 24 x 36mm. Arri introduced a “Mini” version of their LF camera, Canon came out with the C700 FF, Panasonic with the LUMIX S1H Full Frame Mirrorless (notable because it is the first mirrorless still/video camera to be granted NetFlix approval for their productions). Sony continued production of their Venice camera, while Red Digital continued production of their Monstro VV sensor camera, and introduced their first “all-in-one” camera, the Ranger. That sensor is shared with Panavision’s DXL2 camera, also an “all-in-one” design. To handle the amount of data being generated by these larger image sensors, manufacturers are implementing some form of compression of the recorded image data, while several also offer either uncompressed or compressed Raw data options as well.

While all professional digital cinema cameras have had the necessary exposure latitude, dynamic range, and wide color gamut to enable High Dynamic Range (HDR) post-production and deliverables, most now accept and can apply HDR Look Up Tables (LUTs) to enable on-set HDR viewing, using suitable HDR-capable monitors.

Also becoming more prevalent is the ability of the cameras to generate internally, and accept from external sources such as lenses, extensive metadata that is imbedded with the image and audio data in the master recording. In cooperation with the MITC Metadata and Lens Committees, the Camera Committee is requesting that post-production software designers retain that metadata throughout the processing chain; as currently many tools either strip it off, or otherwise ignore it, and do not pass it through.

This report lists the Digital Cinema Cameras, currently available from the world’s major equipment manufacturers, for either sale or rent to the motion picture industry. All cameras listed have CMOS sensors.

ARRI

ALEXA 65 - Maximum 60 fps, 6560 x 3100px, Sensor size: 54.12 x 25.58 mm, LPL Lens Mount, Recording Format: 12 bit log, Uncompressed & Unencrypted

ARRIRAW, Media: Codex SXR Capture Drive 2Tb. Weight 10.5 kg Note: the ALEXA 65 has the largest image sensor dimensions of any current digital cinema camera.

ALEXA LF - Maximum 150 fps, 4448 x 3096px, Sensor Size: 36.7 x 25.5mm, LPL Lens Mount with an available PL Mount Adapter, Recording Format: 12 bit log, Uncompressed & Unencrypted ARRIRAW or ProRes, Media: SXR Capture Drive or SxS PRO+ Card. Weight: 7.8kg Note: Built in Wireless Video transmitter

ALEXA MINI LF - Maximum 60 fps, 4448 x 3096px, Sensor Size: 36.7 x 25.5mm, LPL Lens Mount with an available PL Mount Adapter, Motorized Internal ND Filters: 2, 4, 6 stops, Recording Format: 12 bit log, Uncompressed & Unencrypted ARRIRAW or ProRes, Media: Codex Compact Drive, 1Tb. Weight: 2.6kg

ALEXA SXT W- Maximum 120 fps, 3424 x 2202px, Sensor Size: 28.3 x 18.2mm, PL Lens Mount, Recording format: 12 bit log, Uncompressed & Unencrypted ARRIRAW or ProRes, Media: SXR Capture Drive, XR Capture Drive, SxS PRO+ Card, CFast 2.0 Card. Weight: 6.5kg, Note: Built in Wireless Video transmitter

ALEXA MINI - Maximum 200 fps, 3424 x 2202px, Sensor Size: 28.3 x 18.2mm, PL Lens Mount, Motorized Internal ND Filters: 2, 4, 7 stops, Recording format: 12 bit log, Uncompressed & Unencrypted ARRIRAW or ProRes, Media: CFast 2.0 Card. Weight: 2.3kg

Amira - Maximum 200 fps, 3200 x 1800px, Sensor Size: 28.25 x 18.17mm, PL Lens Mount, Motorized Internal ND Filters: 2, 4, 7 stops. Recording format: 12 bit log, Uncompressed & Unencrypted ARRIRAW or ProRes, Media, CFast 2.0 Card. Weight: 4.1kg Note: Designed to be a “Single Person Crew” camera, with Mic or Line Level Audio inputs. Can also be configured for Multi-Cam Live Broadcast with a DTS FCA Fiber Optic Adaptor back.

For all ARRI cameras: in partnership with Codex, HDE (High Density Encoding) reduces ARRIRAW file sizes by up to 40%. This is an operation done during the initial downloading of the data from the camera’s capture drive, to the on-set storage and backup hard drives.

Blackmagic Design

Blackmagic URSA Mini Pro 4.6K G2 - Maximum 300 fps in 2K, 120 fps in 4.6k, 4608 x 2592px, Sensor Size: 25.3 x 14.2mm. PL, EF, F, or B4 Lens Mount, Recording Format: 12 bit (non-linear) Compressed RAW, or ProRes. Internal ND Filters: 2, 4, 6 stops, Media: CFast 2.0, UHS-II SD cards, 2.5” SSD, or External SSD drive. Weight: 2.3Kg

Canon

EOS C700 FF - Maximum 60fps 5.9k, 72fps 4K, 168 fps 2K. 5952 x 3140px, Sensor Size: 38.1 x 20.1mm. EF locking, or PL Lens Mount (not interchangeable). Recording Formats: Uncompressed "Cinema RAW" with Codex CDX-36150 Modular Recorder attached, 10 or 12 bit ProRes, 10 or 12 bit XF-AVC. Motorized ND Filters: 2, 4, 6 stops. Media: Codex Capture Drive and/or Cfast 2.0, SD card (proxy) Weight 3.5Kg Notes: "Super-35" sensor size, 4.5k versions of this camera are available in both Rolling Shutter and Global Shutter versions.

EOS C500 MkII - Maximum 60 fps in 4K, 120 fps in 2k, 6062 x 3432px, Sensor Size: 38.1 x 20.1mm. EF, EF-S, EF-C Locking, B4, and PL Lens Mounts. Recording Formats: 12/10 bit Compressed "CinemaRaw Light, 10 bit XF-AVC/ MPEG-4 AVC/H.264 YCC422, and 8 bit YCC420 (proxy), Media: CFexpress Card, SD Card (proxy) Weight: 1.77Kg Notes: Autofocus available with compatible lenses. Electronic Image Stabilization.

EOS C300 MkII - Maximum 30fps 4K, 120fps HD. 4096 x 2160px. Sensor Size: 26.4 x 13.8mm. EF or PL Lens mount (not interchangeable) Recording Formats: YCC422 10bit, [RG8444 (12bit/10bit) in HD] MPEG-4 AVC/H.264. Motorized ND Filters: 2, 4, 6 stops. Media: Cfast Card, SD Card (proxy) Weight: 2.9Kg

EOS C300 MkIII - Maximum 120fps 4K, 180fps 2K. 4096 x 2160px. Sensor Size: 26.4 x 13.8mm. EF, EF Locking, or PL Lens mount Recording Formats: 12/10 bit Compressed "CinemaRaw Light, 10 bit XF-AVC/ MPEG-4 AVC/H.264 YCC422. Media: CFexpress Card, SD Card (proxy). Weight: 1.75Kg Note: Dual ISO Sensitivity, Autofocus available with compatible lenses. Anamorphic desqueeze, 2x and 1.3x. Electronic Image Stabilization. Built on the frame of the C500 Mk II

Panasonic

AU-EVA1 5.7K Super 35 - Maximum 30fps 5.7K, 60fps 4K, 120fps 2k. 5720 x 3016px. Sensor Size: 24.6 x 13.0mm. EF Mount. Recording Formats: MOV: 4:2:2 10bit/4:2:0 8bit, AVCHD: 4:2:0 8bit, MPEG-4 AVC/H.264, HEVC H.265. Motorized ND Filters: 2, 4, 6 stops. (IR Cut, In/Out Selectable) Media: SHDC, SDXC, UHS-I/UHS-II Speed Class3, V90. Weight: 1.2Kg Note: Dual ISO Sensitivity, Electronic Image Stabilization, Auto Focus with Compatible Lenses

VariCam LT 4K HDR - Maximum 60fps 4K, 240fps 2k. 4096 x 2160px. Sensor Size: 24.6 x 12.9mm. EF or PL Lens Mount (Interchangeable). Recording Formats: AVC-Intra 12 or 10 bit, MPEG-4 AVC/H.264, ProRes. Motorized ND Filters: 2, 4, 6 stops. (IR Cut, In/Out Selectable) Media: express P2 Card, P2 Card. Weight: 2.7Kg Note: Dual ISO Sensitivity

VariCam 35 4K HDR - Maximum 120fps 4K. 4096 x 2160px. Sensor Size: 24.6 x 12.9mm. PL Lens Mount. Recording Formats: AVC-Intra 12 or 10 bit, ProRes. Motorized ND Filters: 2, 4, 6 stops. (IR Cut, In/Out Selectable) Media: express P2 Card, P2 Card, MicroP2 Card (Proxy). Weight: 5.0Kg Note: Dual ISO Sensitivity

VariCam PURE 4K HDR - Maximum 120fps 4K. 4096 x 2160px. Sensor Size: 24.6 x 12.9mm. PL Lens Mount. Recording Format: 12 bit Uncompressed Codex Raw. Motorized ND Filters: 2, 4, 6 stops. (IR Cut, In/Out Selectable) Media: Codex Capture Drive. Weight: 4.9Kg Note: Dual ISO Sensitivity

LUMIX S1H Full Frame Mirrorless - Maximum 23.98fps 6K, 29.97fps 4K, 59.94fps HD. 5952 x 3968px. Sensor Size: 35.6 x 23.8mm. L-Mount Lens Mount. Recording Format: MOV or MP4: H.264/MPEG-4 AVC, H.265/HVEC. Media: SD, SDHC, SDXC Memory Card. Weight: 1.5Kg Note: Dual ISO Sensitivity, Continuous Autofocus with compatible lenses, Image Sensor Stabilization, As of this writing, the only "Mirrorless" still camera approved by Netflix.

Panavision

DXL2 - Maximum 60 fps 8K, 8192 x 4320px. Sensor Size: 40.96 x 21.60mm. Panavision Lens Mount. Recording Formats: 16 bit Linear Compressed RedCode RAW, w/ simultaneous 4k ProRes or DNxHR. Media: SSD. Weight: 4.5Kg Notes: A modular camera that accepts wireless focus modules for the Preston system, SDI Connection Module, Power Module, Dual Menu displays on both sides. 600nit HDR capable viewfinder.

Red Digital Cinema

Red has consolidated their product line into two camera body styles, called "Brains" **DSMC2**, a modular system that requires additional components added to create a complete camera system, and **Ranger**, an "All-in-one" camera with built-in I/O, power, and control connectors. Then, in each of those body styles, they offer a range of sensor physical sizes and resolutions.

DSMC2 Brains:

Monstro 8K VV - Maximum 60fps full frame 8K, 8192 x 4320px. Sensor Size: 40.96 x 21.60mm. PL, Canon EF, Nikon F, Leica M Lens Mounts. User Interchangeable OLPF. Recording Formats: 16 bit Linear Compressed RedCode RAW, ProRes, DNxHR. Media: Red Mini-Mag. Weight: 1.5Kg

Helium 8K S35 - Maximum 60 fps 8K, 8192 x 4320px. Sensor Size: 29.90 x 15.77mm. PL, Canon EF, Nikon F, Leica M Lens Mounts. User Interchangeable

OLPF. Recording Formats: 16 bit Linear Compressed RedCode RAW, ProRes, DNxHR. Media: Red Mini-Mag. Weight: 1.5Kg

Gemini 5K S35 - Maximum 96 fps 5K, 5120 × 3000px. Sensor Size: 30.72 × 18mm. PL, Canon EF, Nikon F, Leica M Lens Mounts. User Interchangeable OLPF. Recording Formats: 16 bit Linear Compressed RedCode RAW, ProRes, DNxHR. Media: Red Mini-Mag. Weight: 1.5Kg
Note: Dual ISO Sensitivity

Dragon-X 6K S35 - Maximum 75 fps 6K, 6144 x 3160px. Sensor Size: 30.7 x 15.8 mm. PL, Canon EF, Nikon F, Leica M Lens Mounts. User Interchangeable OLPF. Recording Formats: 16 bit Linear Compressed RedCode RAW, ProRes, DNxHR. Media: Red Mini-Mag. Weight: 1.5Kg

Ranger Brains: Offer the same specifications as the above sensors, and include integrated signal I/O's connectors, wider input voltage (11.5-32V), Line/Mic 5-pin XLR input, Genlock, Timecode connectors, a built in control panel display, and a larger fan. Sensor sizes available:

Monstro 8K VV, Helium 8K S35, Gemini 5K S35 Weight: 3.4Kg

Sony

Venice - Maximum 60fps 6K, 75fps, 4K. 6048 x 4032px. Sensor Size: 36.2 x 24.1mm. PL, E Lens Mount. Recording Format: 16 bit linear XOCN ST. Motorized ND Filters: 1, 2, 3, 4, 5, 6, 7, 8 stops. Media: AXS SSD. Weight: 3.9Kg Note: Dual ISO Sensitivity, "Rialto" Remote Sensor Extension: separates sensor / filter wheel block from camera electronics

PMW-F55 - Maximum 60-fps 4K, 180fps 2K. 4096 x 2160px. Sensor Size: 24.0 x 12.70mm . PL , FZ Lens Mount. Recording Format: XAVC AVC/H.264 High 4:2:2 Intra (ProRes & DNxHD with optional Codec Board CBK-55PD). Global Shutter. Motorized ND Filters: 3, 6 stops. Media: SxS Pro+ Card. Weight: 2.2Kg Note: Can record 240 fps RAW with optional AXS-R5 RAW recorder

PXW-FX9 - Maximum 30fps 6K, 60-fps 4K, 120fps 2K. 3840 x 2160px. Sensor Size: 35.7 x 18.8mm. E Lens Mount. Recording Format: XAVC-I/L. Electronic Variable ND Filter. Media: XQD Card. Weight: 2.0Kg Note: Dual ISO Sensitivity, Auto Focus with compatible lenses

Vision Research - High Speed Cameras

Phantom v2640 ONYX - Maximum 6,600 fps, 2048 x 1952px, Sensor Size: 27.6 x 26.3mm, Global Shutter, Lens Mounts: Nikon, EF, PL, C. Notes: 3.9 second recording time @ 6,600 fps, 12 bit with 144Gb RAM memory. Weight: 8.1Kg

Phantom Flex4K - Maximum 1,000 fps @ 4096 x 2160px, 1,900 fps @ 2048 x 1152, Sensor Size: 27.6 x 15.5mm, Lens Mounts: Nikon, EF, PL. Notes: 5 seconds of record time at 1,000 fps @ 4K resolution 12bit with 64Gb of RAM memory. There is a Global Shutter option in the **Flex4K GS**. Weight: 6.3Kg

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