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	Navcam	Hazcam	Cachecam	LCAM	PUC	RUC	RDC	DDC	Skycam	SCAM RMI	Mastcam-Z	WATSON	ACI	PIXL MCC	Heli Nav	Heli RTE	
Quantity	2	6	1	1	3	1	1	1	1	1	2	1	1	1	1	1	
Location	Rover (mast)	Rover (body)	Rover (internal)	Rover (body)	Parachute structure	Rover (body)	Rover (body)	Descent Stage	Rover (body)	Rover (mast)	Rover (mast)	Rover (arm)	Rover (arm)	Rover (arm)	Heli	Heli	
Horizontal FOV	96°	136°	49mm at plane of focus	90°	35° ± 3°			48° ± 3°	127.7° ± 0.1°	1.08° useful 1.18° full	6.18° - 25.6°	32.8° - 31.2° (close to inf focus)	10.6°	37.6°	133°	101°	
Vertical FOV	73°	102°	65 mm	90°	30° ± 3°			37° ± 3°	127.7° ± 0.1°	1.08° useful 1.18° full	4.63° - 19.1°	24.6° - 23.4° (close to inf focus)	7.9°	28.4°	100°	82°	
Diagonal FOV	120°	172°	81 mm	118°								41.0° - 39.0° (close to inf focus)					
Focal ratio	f/12	f/12	f/8	f/2.7	f/7			f/5.6	f/15	f/5	f/6.7 - f/9.5	f/9.8 - f/8.5	f/3.8	f/12.0			
Focal length	19.1 mm	13.8 mm	32 mm 0.51 magnification (measured)	5.8 mm	9.5 mm			8 mm	5.58 mm	563 mm	26mm to 110mm	18.4 to 21.4 (close to inf focus)	87.5 mm	9.54 mm effective			
Best focus	3.5 meters	0.9 meters	-140 mm below illuminator mirror and -130 mm below exit aperture window Depth of field ±5 mm	2 meters to infinity	44 m	8 m	inf	8 m	0.5 m	1.05 meter to infinity	0.5 meter to infinity	1.78 cm to infinity	best: 48mm range: 39.7 to 56.4 mm	28-29 mm from the tip of the X-ray optics			
iFOV	0.33 mrad/pixel	0.46 mrad/pixel	12.5 microns/pixel at plane of focus	1.67 mrad (2 × 2 summed pixels)	~0.5 mrad/pixel			-0.4 mrad/pixel	2.1 mrad/pixel	10 μrad/pixel	283 to 67.4 μrad/pixel	0.3 - 0.34 mrad/pixel	115 μrad/pixel	0.91 × 0.87 mrad/pixel	~3.6 mrad/pixel	~0.53 mrad/pixel	
MTF											>0.35 at Nyquist	0.75 at best focus	0.7				
Effective Resolution									0.31° ± 0.01° (center) 0.38° ± 0.01° (edge)	better than 80 urad w/20% contrast		~105 μm/pix at 27cm distance ~15.9 μm/pix at 25 mm distance	10.1um @ 48mm distance				
Mass (per camera)	411 grams	498 grams	397 grams (camera) 398 grams (vision station)	880 grams	80 grams			140 grams		6.1 kg (Mast-Unit) 72 grams (camera cube)	1.38 kg each	6.83 kg (Turret Assembly)	67 grams				
Volume	74 mm × 88 mm × 125 mm	74 mm × 88 mm × 140 mm	74 mm × 88 mm × 143 mm	82 mm × 102 mm × 154 mm						35 mm × 35 mm × 25 mm (camera cube)	11 × 12 × 26 cm						
Stereo baseline	42.4 cm	Front: 24.8 cm Rear: 93.4 cm	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	24.4 cm	N/A	N/A	N/A	N/A	N/A	
Angle between left/right boresights	<0.4° (parallel)	Front: 20° Rear: <1° (parallel)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1.15 (per camera)	N/A	N/A	N/A	N/A	N/A	
Boresight mounting orientation	Mounted to pan/tilt RSM, left/right camera boresights are parallel	Front: 28° below nominal horizon, left/right cameras are canted outward by 10° each Rear: 45° below the nominal horizon, left/right camera boresights are parallel	Pointed downward inside of the ACA. Samples are brought up to the vision station by the SHA (Sample Handling Assembly)	pointed straight down	pointed at parachute	pointed straight up	pointed straight down		pointed straight up	Parallel with RSM boresight	Mounted to pan/tilt RSM	turret	turret	turret	pointed straight down	45 deg below horizontal	
Height above nominal surface	~1.98 meters when viewing horizon	0.73 meters	0.73 meters	~0.7 meters	NA	~1.3 meters*	~0.7 meters*	NA	~1.28	~2.1 meters when viewing horizon	~2 meters when viewing horizon	NA	NA	NA	0.12835 m	0.1815 m	
Detector characteristics																	
Detector Type	CMOSIS CMV-2000			On Semiconductor Python 5000	On Semi P1300 (RGB color)			Sony IMX265 (RGB color)	Teledyne DALSA	CMOSIS CMV 4000	ON Semi KAI-2020CM		ON Semi KAI-2020M	Omnivision OV7251			Sony IMX 214
Pixel format	5120 × 3840			1024 × 1024 pixels (2 × 2 summed mode), windowed from a total format of 2592 × 2048 pixels	1280 × 1024			2048 × 1536	1024 × 1024	2048 × 2048	1648 × 1200 1600 × 1200 photactive pixels		752 × 580	640 × 480	4224 × 3120 total 4280 × 3120 active		
Pixel pitch	6.4 μm			9.6 μm (2 × 2 summing of 4.8 μm pixels)	4.8 μm			3.45 μm	12 μm	5.5 μm	7.4 μm		7.4 μm	8.6 × 8.3 μm	3 μm	1.12 μm	

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Optical format	Full frame (32.77 mm×24.58 mm)			9.83 mm×9.83 mm	1/2" (6.14×4.9mm)			1/1.8" (7.07×5.3 mm)		1"	11.84×8.88 mm		11.84×8.88 mm		1/7.5"	1/3.06 (6.1×4.524mm)
Pixel type	Global shutter with correlated double sampling			global shutter with CDS	CMOS Global Shutter					Global Shutter					Global Shutter	
Color Filters	RGB Bayer color filter array (CFA)			Monochrome	RGB Bayer color filter array (CFA)			RGB Bayer color filter array (CFA)	Monochrome	RGB Bayer color filter array (CFA)	8 per camera and RGB Bayer color filter array (CFA)	1 + RGB Bayer color filter array (CFA)	Monochrome	Monochrome	Monochrome	RGB Bayer color filter array (CFA)
Spectral Bandpass	400 - 675 nm			480 - 720 nm					600 - 800 nm	375 - 655 nm						
Spectral Wavelength											See Table 2-8	590 ± 88 nm (Broadband) 640 ± 44 nm (Bayer filter Red) 554 ± 38 nm (Bayer filter Green) 495 ± 37 nm (Bayer filter Blue)	550 ± 50 nm			
Shutter type	Pipelined global shutter				Global Shutter			Global Shutter		Pipelined Global Shutter						
Bit depth	12			8	8			8	12	10 (default) 12 - 13 (HDR)	11	11	11	8	8	8
Full well	15,000 e-			33,925 e- (effective with 2 × 2 summing, gain 1)	6060 e-*			10,080 e-*	160000 e-*	13500 e-*	21826/21818e- (left/right)	24507 e-				
Pixel dark noise	8 e- RMS			32.6 e-	8.9 e-*			2.22 e-*	30 e-*	13e- (RMS)*	22/21 e- (left/right)	18.7 e-				
Conversion gain	0.24 DN/e-			139.4 e-/DN (2 × 2 summing)	0.096 LSB10/e- 140 μV/e-				55e-/DN*	0.075LSB/e-*	15.6 e-/DN	15.87 e-/DN				
Readout time	237 milliseconds								5s*							
Exposure time (commandable)	410.96 microseconds to 3.277161 seconds, in 50 microsecond steps using autoexposure algorithm from Maki et al.									1 msec to 65.535 sec						
Responsivity	0.29 A/W @ 55 nm with microlenses				7.7 V/lux.s					0.27 A/W*						
Maximum SNR	41.8 dB			45 dB	40 dB				>200:1*	41.3dB*						
Dynamic Range	66 dB			60 dB	56dB*			71.38dB*		60dB*						
QE	64.5% @ 55 nm with microlenses			55% peak	56% @ 550nm					~5% @ 550nm (with telescope)						
Camera interface																
Command and Protocol	LVDS			LVDS/ChannelLink						LVDS16x*	Synchronous					
Power Input	+4.3 Volts to +5.9 Volts			4.25 V to 5.5 V												
Data Rate	500,000 pixels/second			480 Mbps video												
Power	3 Watts (single camera, imaging mode) 1 Watt (single camera, idle)			3.7 Watts							11.8 W (single) 7.5 W (single)	14.3 W	14.3 W	0.31 W		
Memory	1 Gbit SDRAM			32 Gbytes flash							128 MB SDRAM					
FPGA	MicroSemi Rad-Tolerant ProASIC3			MicroSemi Rad-tolerant (RTAX-SL)												
Radiation Tolerance	20 kRad TID, RDF = 2			TID RDF >10												
Temperature Range	-55 °C to +50 °C (operational) -135 °C to +70 °C (survival)			-25 °C to +50 °C (operational) -40 °C to +70 °C						-35 °C to +35 °C (operational) -40 °C to +40 °C		-40 °C to +40 °C (operational)				
Camera type	NA			NA	CM3-U3-13Y3C-CS	CM3-U3-13Y3C-CS	CM3-U3-13Y3C-CS	CM3-U3-3154C-CS	NA	NA	NA	NA	NA	NA	NA	NA

* info from manufacturer specifications