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CORRECTION

Correction to: PIXL: Planetary Instrument for X-Ray Lithochemistry

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After the article was published a number of instances appeared to be incorrect. Please find in this document the corrected versions that should be regarded as final by the reader.

The original article can be found online at https://doi.org/10.1007/s11214-020-00767-7

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In section:

3 X-Ray Source

3.1 X-Ray Source Overview

The following text should not be present:

"The X-ray source combines components from multiple organizations. The high-voltage power supply (HVPS), which includes the LVCM, HVMM, and connecting cables, was designed and built by Battel Engineering and the University of Michigan Space Physics Research Laboratory (SPRL). The X-ray tube was designed and built by Moxtek Inc., and the X-ray optic was designed and built by XOS Inc. XOS aligned and integrated the X-ray tube and optic, while SPRL integrated this tube/optic assembly into the XRSA."

Please also find the corrected:

Appendix A: Parameters

This is a complete list of parameters that are in place when a scan is initiated that are returned in data products. All of these can be changed by uplink

Bytes	Content	Global variable
0 – 3	Version The version number is hard-coded to 0x01000000 If more parameters are added to the list of tunable parameters, the version number will change, and provide the ground tools with a definitive mechanism for decoding the PIXL data product	Version

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[4] Battel Engineering, Scottsdale, AZ, USA

[5] Moxtek Inc., Orem, UT, USA

[6] Measurement & Instrumentation Systems, National Space Institute, Technical University of Denmark, 2800 Kongens Lyngby, Denmark

[7] XOS, East Greenbush, NY, USA

[8] Space Physics Research Laboratory, University of Michigan, Ann Arbor, MI, USA

[9] Space Science Institute, Boulder, CO, USA

[10] Queensland University of Technology, Brisbane, Australia

[11] California Institute of Technology, Pasadena, CA, USA

[12] XIA LLC, Hayward, CA, USA

[13] Hertzberg Engineering, Mountain View, CA, USA

[14] Texas A&M University, College Station, TX, USA

[15] Lunar and Planetary Institute, Houston, TX, USA

Bytes	Content	Global variable
4 – 7	Selected column represents the pixel of the “interesting point” in the source image (integer)	Selected_Col
8 – 11	Selected row represents the pixel of the “interesting point” in the source image (integer)	Selected_Row
12 – 15	Source file ID (integer)	FileID
16 – 19	Columns in the rectangular scan (count)	Cols
20 – 23	Rows in the rectangular scan (count)	Rows
24 – 27	Distance between columns (m)	col_spacing
28 – 31	Distance between rows (m)	row_spacing
32 – 35	Boolean 0 = Columns first then rows 1 = Rows first then columns	direction_flag
36 – 39	Clock angle between the “row orientation” and the X-axis in the base frame (radians)	radian_angle
40 – 43	X-coordinate in the base frame of the center of the scan (m). The Cartesian location (X, Y, and Z) of the target, and the normal vector (X, Y, and Z) at that point are placement parameters, but will be over-written by the output from the landmark detection algorithm	Center_X
44 – 47	Y-coordinate in the base frame of the center of the scan (m). The Cartesian location (X, Y, and Z) of the target, and the normal vector (X, Y, and Z) at that point are placement parameters, but will be over-written by the output from the landmark detection algorithm	Center_Y
48 – 51	Z-coordinate in the base frame of the center of the scan (m). The Cartesian location (X, Y, and Z) of the target, and the normal vector (X, Y, and Z) at that point are placement parameters, but will be over-written by the output from the landmark detection algorithm	Center_Z
52 – 55	X-Unit vector of the normal to the plan to be generated (unitless). The Cartesian location (X, Y, and Z) of the target, and the normal vector (X, Y, and Z) at that point are placement parameters, but will be over-written by the output from the landmark detection algorithm	Normal_X
56 – 59	Y-Unit vector of the normal to the plan to be generated (unitless). The Cartesian location (X, Y, and Z) of the target, and the normal vector (X, Y, and Z) at that point are placement parameters, but will be over-written by the output from the landmark detection algorithm	Normal_Y
60 – 63	Z-Unit vector of the normal to the plan to be generated (unitless). The Cartesian location (X, Y, and Z) of the target, and the normal vector (X, Y, and Z) at that point are placement parameters, but will be over-written by the output from the landmark detection algorithm	Normal_Z
64 – 67	Specification of which detectors to use. Legitimate values are: 0xA1B1 = Use both *A* and *B* detectors 0xA1B0 = Use detector *A* only 0xA0B1 = Use detector *B* only 0xAFBF = Feed “fake data” in for both *A* and *B* 0xA1BF = *A* detector on, feed fake data for *B* 0xAFB1 = feed fake data for *A*, *B* detector on 0xAFB0 = feed fake data for *A* only, *B* off 0xA0BF = feed fake data for *B* only, *A* off 0xA0B0 = Both detectors off. Not used	DSPC_Usage

Bytes	Content	Global variable
68 – 71	Thermal set point for LVCM when powered (DN Counts)	LVCM_Temp_SetPoint
72 – 75	Thermal set point for TEC_A when powered. (DN Counts)	TEC_A
76 – 79	Thermal set point for TEC_B when powered. (DN Counts)	TEC_B
80 – 83	HVPS voltage set point (DN counts)	HV_Voltage
84 – 87	HV bias voltage for detector in use (DN counts)	HV_Bias_In_Use
88 – 91	HV bias voltage for detectors not in use (DN counts)	HV_Bias_Fallow
92 – 95	HC DAC current (DN counts)	DAC_Current
96 – 99	Minimum number of centroids that must match valid SLI's for an OFS measurement to be deemed valid (count)	min_sli_matches
100 – 103	Current value for SLI's (mA/3) in DN	sli_current
104 – 107	Offset from the top corner of the scan for acquisition of first spectrum (spots)	Histogram_offset
108 – 111	Offset from the top corner of the scan for acquisition of first OFS correction (spots)	OFS_offset
112 – 113	Offset from the top corner of the scan for acquisition of first TRN correction (spots)	TRN_offset
116 – 119	Offset from the top corner of the scan for acquisition of first pause for metrology (spots)	Metrology_offset
120 – 123	Offset from the top corner of the scan for acquisition of first JPEG context image (spots)	JPG_Context_offset
124 – 127	Offset from the top corner of the scan for acquisition of first periodic image (spots)	Periodic_Img_offset
128 – 131	Offset from the top corner of the scan for acquisition of first ROI image (spots)	ROI_Image_offset
132 – 135	Offset from the top corner of the scan for acquisition of first SLI A image (spots)	SLI_A_Image_offset
136 – 139	Offset from the top corner of the scan for acquisition of first SLI B image (spots)	SLI_B_Image_offset
140 – 143	Offset from the top corner of the scan for acquisition of first struct (spots)	SLI_A_Struct_offset
144 – 147	Offset from the top corner of the scan for acquisition of first struct (spots)	SLI_B_Struct_offset
148 – 151	Period for spectral collection (spots)	Histogram_period
152 – 155	Period for OFS correction (spots)	OFS_period
156 – 159	Period for TRN correction (spots)	TRN_period
160 – 163	Period for pause for metrology (spots)	Metrology_period
164 – 167	Period for JPG context image collection (spots)	JPG_Context_period
168 – 171	Period for periodic image collection (spots)	JPG_Periodic_period
172 – 175	Period for ROI image collection (spots)	ROI_Image_period
176 – 179	Period for image of SLI A collection (spots)	SLI_A_Image_period
180 – 183	Period for image of SLI B collection (spots)	SLI_B_Image_period
184 – 187	Period for SLI A struct collection (spots)	SLI_A_Struct_period
188 – 191	Period for SLI B struct collection (spots)	SLI_B_Struct_period
192 – 195	Specification of which SLI to use. Legitimate values are: 0x0B0A = B for approach, A for scan 0x0A0A = A for approach and scan 0x0B0B = B for approach and scan	SLI_Select

Bytes	Content	Global variable
196 – 199	Number of OFS retries before declaring failure	ofs_retry_limit
200 – 203	Number of TRN retries before declaring failure	trn_retry_limit
204 – 207	Duration of normal spectral integration (s)	Integration_Normal
208 – 211	Duration of dwell spectral integration (seconds)	Integration_Dwell
212 – 215	Threshold beneath which a TRN lateral correction will be deemed unnecessary (m)	xy_correct_threshold
216 – 219	Threshold beneath which a Z-correction (for OFS correction or TRN correction) will be deemed unnecessary (m)	z_correct_threshold
220 – 223	Limit for proximity of the closest point on the target. If any point on the target has a lower Z-value than this, then it is not safe to approach the target. (m)	min_safe_Z
224 – 227	Maximum dynamic range of the target. If any point on the target is more than this value from the mean, then the target is not safe to approach. (m)	Delta_Z_Limit
228 – 231	Sine value of the limit of the angle between the normal vector of the observed target plane, and the base frame Z-vector. If the sine of the angle is less than this, the target is not safe to approach. The tunable parameter is sin(x); where "x" is the angle between the base frame Z-vector and the Z-component of the approximated plane as derived from the SLI spots. For example: for a limit of 15° of tilt; (90°-15°) = 65°; sin(65°) = 0.906. This is the default value	Target_Tilt_Sine_Limit
232 – 235	Duration for pause for metrology (s)	Pause_Duration
236 – 239	DN Value for the HV set point when the EM electronics is being driven to 20 kV (DN Count)	HV_Voltage_EM_at_20
240 – 243	DN Value for the DAC current when the EM electronics is being driven to 20 kVolt (DN Count)	DAC_Current_EM_at_20
244 – 247	DN Value for the HV set point when the EM electronics is being driven to 28 kV (DN Count)	HV_Voltage_EM_at_28
248 – 251	DN Value for the DAC current when the EM electronics is being driven to 28 kV (DN Count)	DAC_Current_EM_at_28
252 – 255	Distance from the X-ray source to the focus point in front of the sensor head (m)	rfocus
256 – 259	X-coordinate in the base frame of the pivot point for the steering algorithm (m)	Pivot_X
260 – 263	Y-coordinate in the base frame of the pivot point for the steering algorithm (m)	Pivot_Y
264 – 267	Z-coordinate in the base frame of the pivot point for the steering algorithm (m)	Pivot_Z
268 – 271	Boolean flag to enable boresight science if landmark detection fails to provide a solution	boresight_sci_enabled
272 – 275	Boolean flag to indicate whether to continue with an observation in the face of a failure of OFS correction to converge	continue_on_OFS_Failure
276 – 279	Offset from the top corner of the scan for performing the first min safe Z check (spots)	safe_Z_check_offset
280 – 283	Period for performing min safe Z check (spots)	safe_Z_check_period
284 – 287	Boolean flag to indicate that images of SLI spots should be stored as RAW form (Default is 0 = store as JPG)	SLI_Image_Raw
288 – 291	Boolean flag to indicate that periodic images during a scan should be stored as RAW form (Default is 0 = store as JPG)	Periodic_Image_Raw

Bytes	Content	Global variable
292 – 295	Maximum number of DWELL duration spectra to acquire during a Scan (Default is zero)	AdSamp_Budget
296 – 299	Fallow parameter	unused_1
300 – 303	Bit-mapped integer specifying which varieties of intermediate data should be dumped by ReportGV. Legitimate values are: 0x0001 = No MCC valid spot data 0x0002 = MCC data in sensor frame 0x0004 = MCC data in base frame 0x0008 = Plane fit data 0x0010 = Scan target Info 0x0020 = NTE limits 0x0040 = TRN debug data 0x0080 = OFS correction results 0x0100 = Daisy chain content 0x0200 = Raw OLM solution (TRN data from MCC)	Dump_Mask

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