From: Lachlan Casey
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Subject: FW: Thin Section Scanning
Date: Saturday, 27 August 2022 8:54:00 PM
Attachments: test2.GeoPIXE

Format description:

There is a huge JSON header with a bunch of parameters that we may or may not care about. The bulk of the file is pixel records in hex:

Pixel Record

Note: not name/value pairs for file size reasons. The pixel record header is the only record type name/value pair, for easier processing. We are keeping separate records for separate detectors, since the deadtime information will also be per detector per pixel.

1. Record type pair "DP", Length of pixel data record in bytes (4 byte int)
2. X Horizontal pixel index (2 byte int)
3. Y Vertical pixel index (2 byte int)
4. Detector Data in this record is for this detector (2 byte int)
5. Deadtime Deadtime for this pixel (4 byte float)
6. Data (for each channel with data up to maximum channel index)
    a. Channel Channel index (0- Max Chan) (2 byte int)
    b. Count Event counts in channel (2 byte int)

The header is:

Data ".Geopixe" file format draft 2:

The first name/value entry in a record will the the type of the record as the name and the length of the record as the value.

For the headers, the "name" field will be a 2 byte int with the length of the string followed by a wide-char string. The "value" field will the the data. For example, the File header

"Record type" field has the name "GP", so the binary data will be like 0x00 04 00 47 00 50 00 00 00 e0 or {0x00 04, L"GP", 224}.

File Header Record

Data	Name field	Value field
Record Type	GP	Length of header in bytes (4 byte int)
Timestamp	Timestamp	Acquisition timestamp (SYSTEMTIME struct - 16 bytes)
Duration	Duration	Acquisition duration (SYSTEMTIME struct - 16 bytes)
Dwell time	Dwell	Dwell time for each pixel in mS (4 byte float)
Atmosphere	ATM	kPa under atmosphere (2 byte int)
X resolution	Xres	Horizontal resolution (2 byte unsigned integer)
Y resolution	Yres	Vertical resolution (2 byte unsigned integer)
Width	Width	Horizontal size, mm (4 byte float)
Height	Height	Vertical size, mm (4 byte float)
Detector Count	Dets	Number of detectors (2 byte int)
Maximum Channel index	Chan	Maximum index of data channels in a pixel record, 4096 for iXRF (4 byte int)
Gain Per Channel	Gain	eV per channel, will always be 10.0 for iXRF, (4 byte float)
Deadtime	Deadtime	Average deadtime of detectors at first pixel (4 byte float)

Detector Record

Data	Name field	Value field
Record Type	DT	Length of record in bytes (4 byte int)

Detector Index	Idx	0-detector max (2 byte int)
Detector Type	Type	1: Si(Li), 2: Si-pin, 3: Ge, 4: PC, 5: SDD (2 byte int)
Detector Element	Elt	Z index of contact element, like Si = 14 (2 byte int)
Active Area	Area	In mm² (4 byte float)
Collimator diameter	Coll	In mm (4 byte float)
Thickness	Thick	In mm (4 byte float)
Dead layer thickness	DLThick	In µm (4 byte float)
Contact Material	Contact	Z index of contact element, like Au = 79 (2 byte int)
Contact thickness	CThick	In nm (4 byte float)
Ice thickness	Ice	In nm (4 byte float)
Window Type	Win	1=Be, 2=Quantum, 3=Moxtek AP1.x, 4=Windowless, 5=Quantek, 6=Parylene, 7=Diamond, 8=Aluminum, 9=Moxtek BH, 10=Mica, 11=Mylar (2 byte int)
Window thickness	WThick	In µm (4 byte float)
Window coating material	WCoat	Z index of window coating element, like Al= 13 (2 byte int)
Window coating thickness	WCThick	In nm (4 byte float)
Support grid thickness	GThick	In µm (4 byte float)
Grid area fraction	GArea	0 - 1.0 (4 byte float)
Grid 2 element	G2Elt	Z index of Grid 2 element, like W= 74 (2 byte int)
Grid 2 thickness	G2Thick	In µm (4 byte float)
Grid 2 area fraction	G2Area	0 - 1.0 (4 byte float)
Axis Angle	Axis	In Degrees (4 byte float)
Azimuth Angle	Azim	In Degrees (4 byte float)

X-ray Source Record

Data	Name field	Value field
Record Type	XR	Length of record in bytes (4 byte int)
Voltage	KV	Beam power in kV (4 byte float)
Amerage	UA	Beam current in µA (4 byte float)
Source Element	Elt	Z index of target element, like Rh= 45 (2 byte int)
Anode Thickness	Anode	In µm (4 byte float)
Window Type	WType	1: Be, 2: Allow, 3: Windowless (2 byte int)
Window Thickness	WThick	In µm (4 byte float)
Tube Type	TType	1: Side, 2: End, 3: Transmission target (2 byte int)
Tube Model	TModel	1: Model #1 (Pella), 2: Model #2 (Ebel) (2 byte int)
Optic Type	OType	1: None, 2: Capillary, 3: Mirror, 4: Multilayer (2 byte int)
Spot Size	Spot	In µm (4 byte float)
Incidence Angle	Incid	In Degrees (4 byte float)
Take-off Angle	Take	In Degrees (4 byte float)
Scatter Angle	Scat	In Degrees (4 byte float)
Tube to Sample	TTS	In mm (4 byte float)
Tube to Optic	TTO	In mm (4 byte float)
Optic Length	OLen	In mm (4 byte float)
Optic to Sample	OTS	In mm (4 byte float)
Sample to Detector	STD	In mm (4 byte float)