

Methods Used to Calibrate the Planetary Instrument for X-Ray Lithochemistry Prototype



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Abstract

PIXL (Planetary Instrument for X-Ray Lithochemistry) is an instrument that will be aboard the MARS 2020 rover. This X-Ray Fluorescence (XRF) Spectrometer will have the ability to identify the chemical elements of a soil or rock sample by using a software program called PIQUANT which is used for quantitative analysis of the elemental distribution of the rocks and soils. Glass standards (BIR1, BCR2, BHVO2, NIST_610, XRF_U27, XRF_U34, BR_U38) are used in the to create a master element calibration factor (ECF). This master ECF will help us calibrate the PIXL prototype to enable quantification of elements in geological materials. Quantification capability was assessed using XRF measurements of pressed powder standards.

Prepping Samples



Fig 2. Pressed pellet sample



Fig 3. Glass samples

PIXL Prototype System



Fig 4. PIXL Prototype. Micro XRF Equipped with 2 detectors [Ketek], 1 X-Ray tube [Moxtek] with focusing optic [XOS]

Master ECF

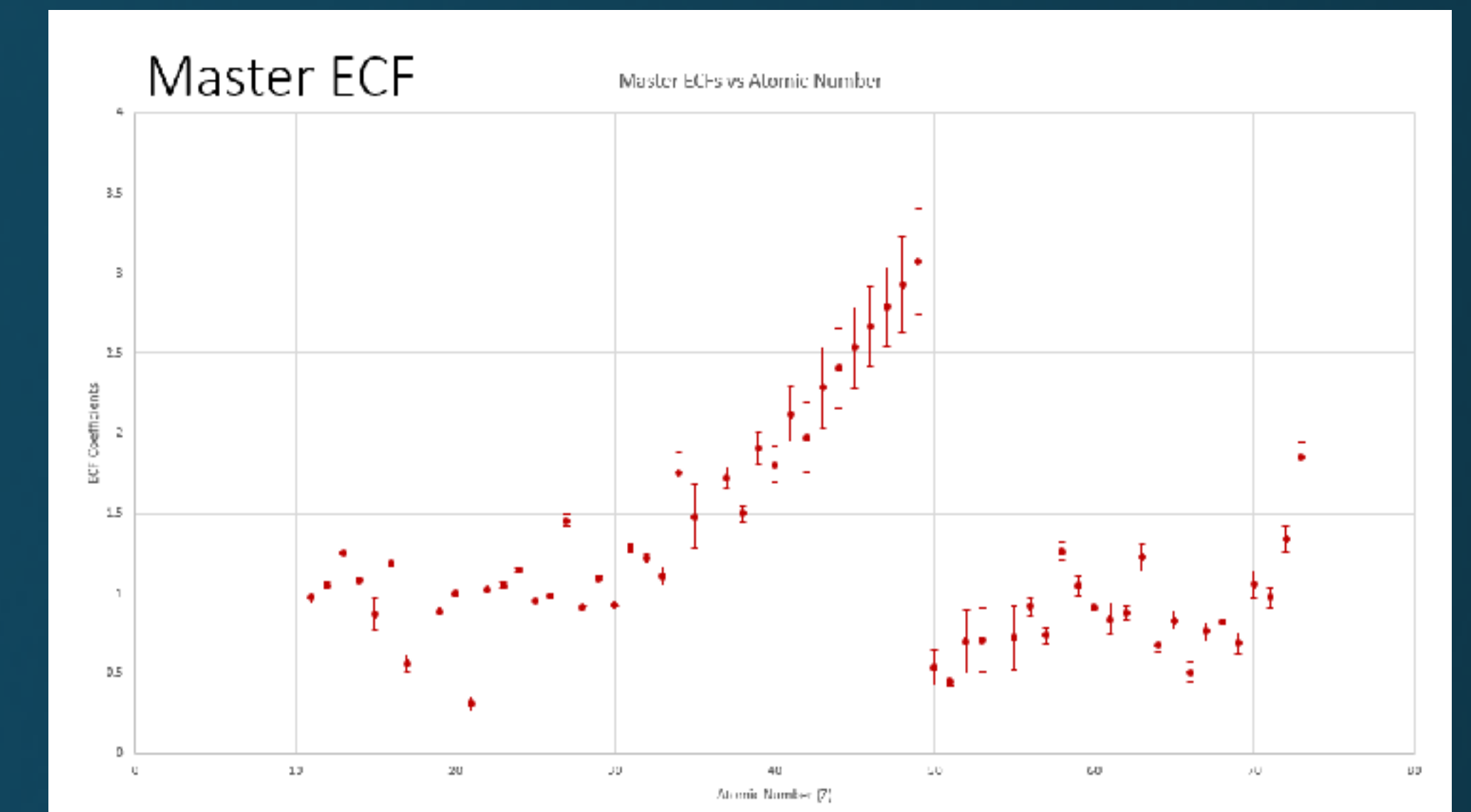


Fig 6. Glass standards are used to obtain the master ECF.

Materials and Methods

- X-Ray Fluorescence Spectrometer, Pellet Presser, Glass/ Powder samples

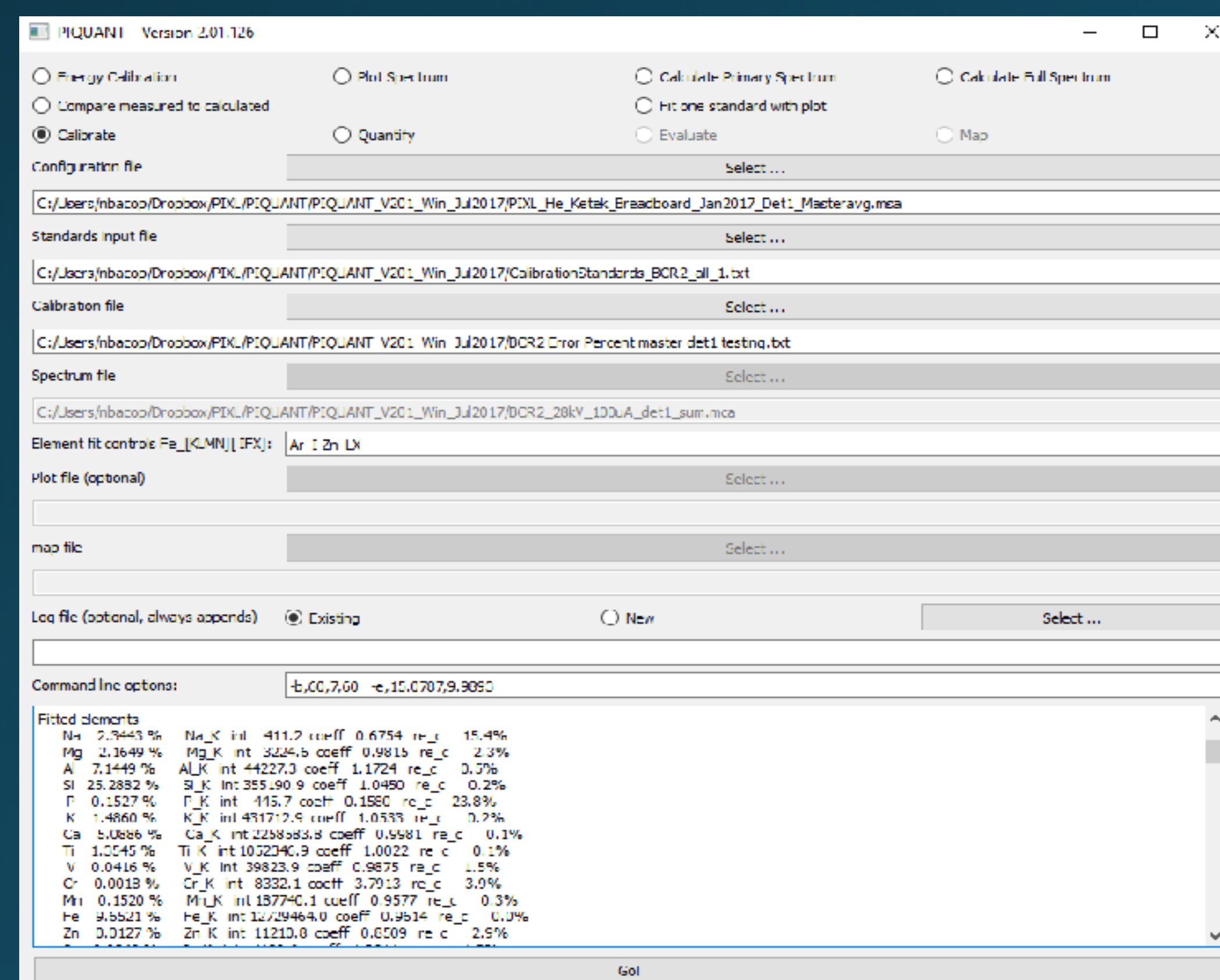


Fig 1. PIQUANT GUI software helps analyze XRF data

PIQUANT

- Reads spectrum files
- Analytical software – elemental concentration from XRF
- Fundamental Parameter – predicts the concentrations of elements
- Processes spectra from glass/ powder samples
- Files: MCA, Sum, Configuration, Standard Calibration

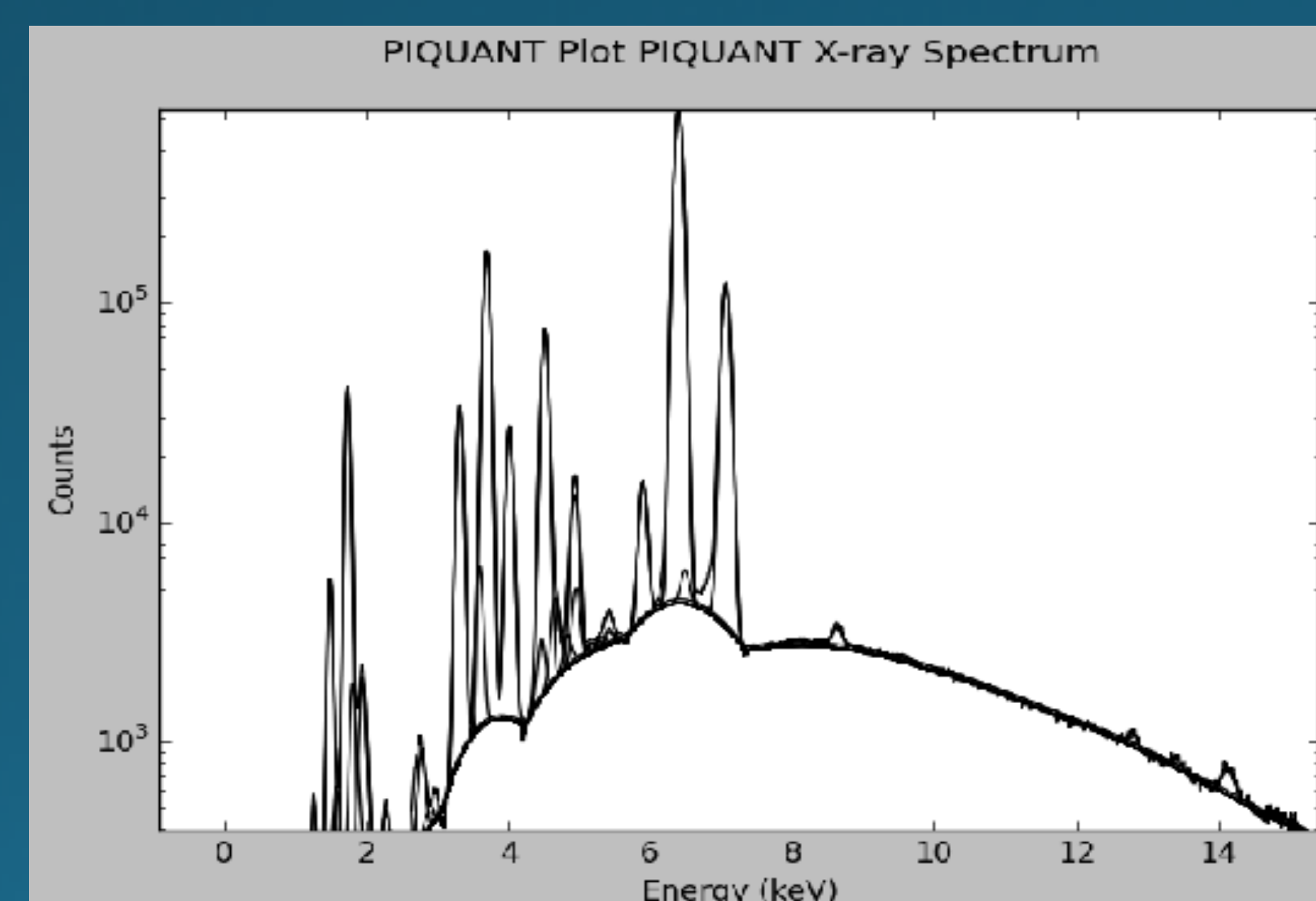


Fig 5. BCR2 Det. I. Element energy level. Peaks show us concentration of each element inside sample.

Conclusion

Through micro-XRF measurements of glass and pressed-powder standards, we were able to begin calibration of the PIXL prototype system. Glass standards were used to derive ECF's specific to the system. From there measurements of pressed powders were used to assess accuracy of quantifying elemental constituents. for the PIXL prototype.

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