A Collaborative Framework:

Ensuring Availability for Certified Reference Materials for PGM Refineries

by Hannelie de Beer

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Presentation Flow

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THE PROBLEM

THE PROBLEM

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The Challenge of Metrological Traceability

The Challenge of Metrological Traceability

Traceability links results to SI units, ensuring accuracy and reproducibility. CRMs are vital benchmarks for labs, supporting quality assurance in industries like precious metal refining, where precision is critical.

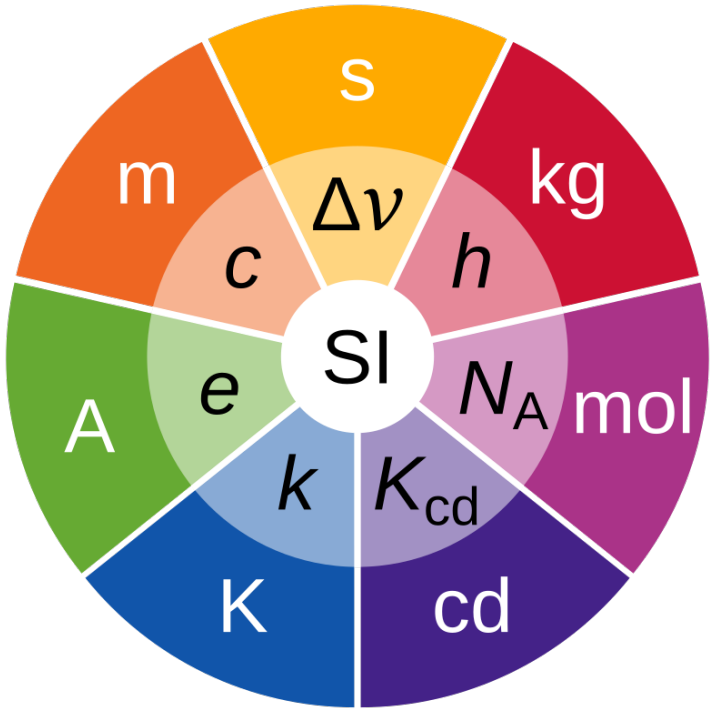
Standard Requirements

- ISO 17025:2017 requires analytical results traceable to the SI system.

Uses of CRMs

Certified Reference Materials (CRMs) are essential for:

- Method validation
- Instrument calibration
- Ensuring result reliability and accuracy



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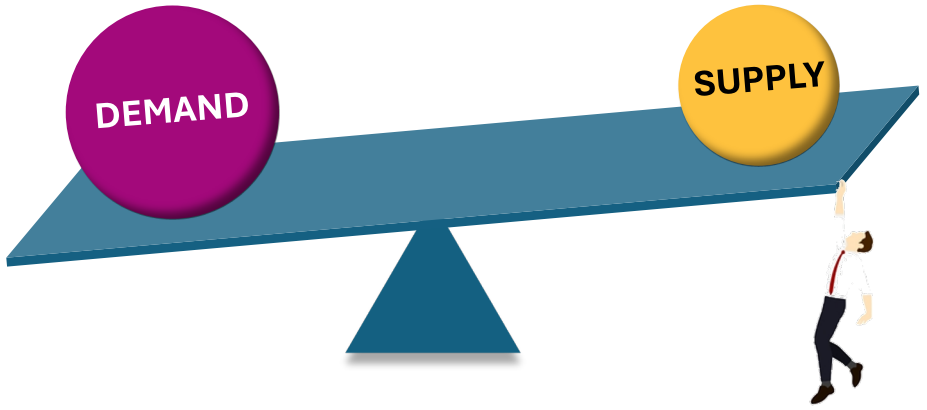
Limited Availability of Refinery-Grade CRMs

Limited Availability of Refinery-Grade CRMs

There are CRMs available for bullion and high-purity PGM sponges, however they are scarce. Reasons for scarcity for refinery feed grades and intermediates is due to:

1. Non-conformity in refining processes
2. High monetary value of precious metals
3. Proprietary nature of feed materials and technology

These issues limit access to CRM causing challenges to demonstrate traceability and analytical quality control. This gap drives the need for innovative solutions.



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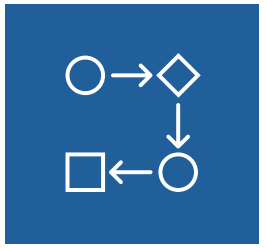
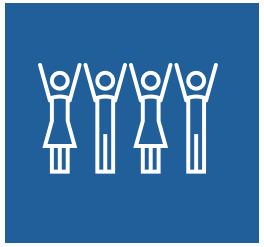
A Solution Emerges

A Solution Emerges

8 years ago: Rand Refinery sought help for a loaded carbon CRM.



As an ISO 17043 accredited facility, we applied PT methodologies.



Outcome: Successful in-house

Now: Qotho is ISO 17034 accredited, expanding CRM production.

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Expanding the Scope

Expanding the Scope

In late 2024, Rand Refinery sought collaboration to produce higher-grade in-feed material CRMs, aiming to optimise refining efficiency and analytical compliance.

Goal

Prepare and certify materials to meet industry needs.

Motivation

Addressing a critical gap in this mineral sector.

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THE CASE STUDY

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Case Study Materials and Sample Preparation Process

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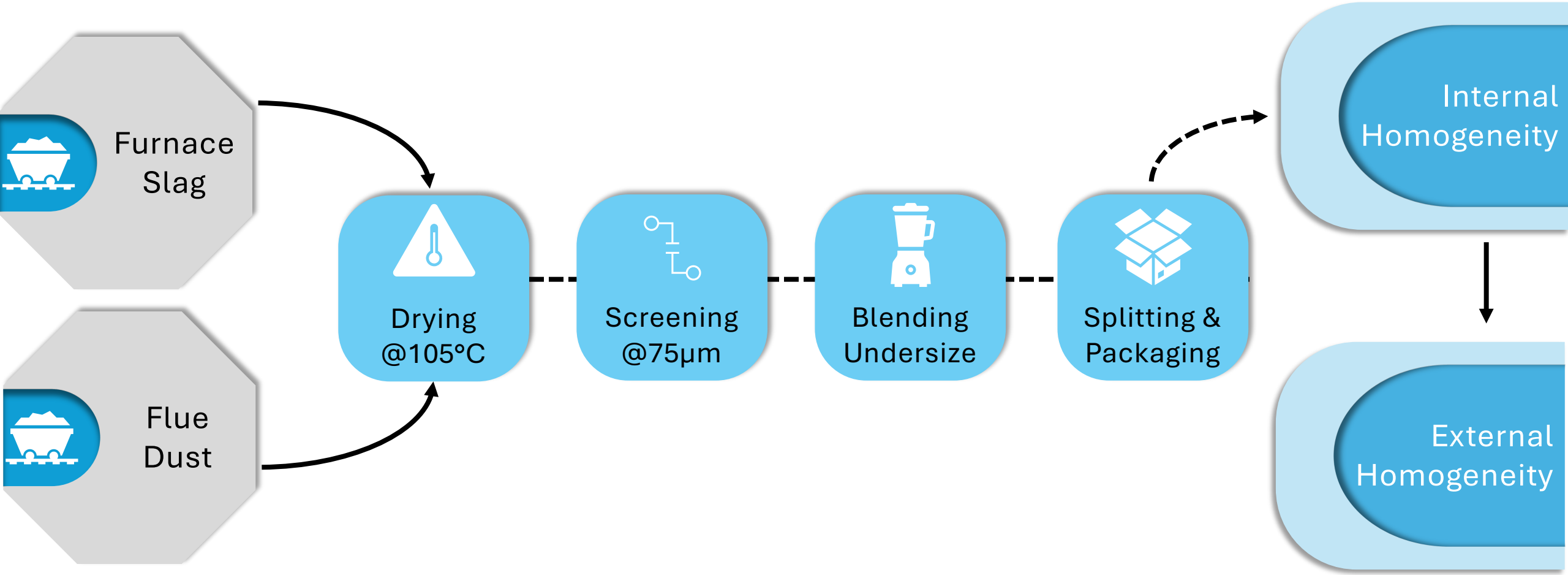

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Homogeneity Results

Homogeneity Results

- Non-precious metals confirmed homogeneous via XRF.
- External homogeneity tests carried out on Au and Ag:
  - Ag: Homogeneous in both samples
  - Au: Failed homogeneity in both samples
- Client feedback: Data distribution better than typical, approved certification phase.

Sample	Analyte	Unit	s (analytical)	s (sample)	**SDPA**	F-test
6-050-MGR	Ag	g/t	3.332	1.882	3.925	Ok
6-050-MGR	Au	g/t	0.833	0.820	0.351	Not OK
6-051-HGR	Ag	g/t	92.119	58.095	111.672	Ok
6-051-HGR	Au	g/t	146.717	173.734	228.179	Not OK

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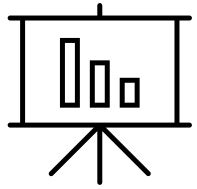
Certification Approach

Certification Approach

3 samples per batch sent to 4 LBMA referee labs:

1. AHK UK
2. Alex Stewart
3. ALS Inspection UK
4. Bureau Veritas UK

- Duplicate analysis was carried out
- Dry-basis reporting.
- Homogeneity data consolidated into 3 datasets



- 15 datasets subjected to Robust statistics (ISO 13528:2017) applied via Q/Hampel method.
- Quodata (ProLab Plus)

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THE RESULTS

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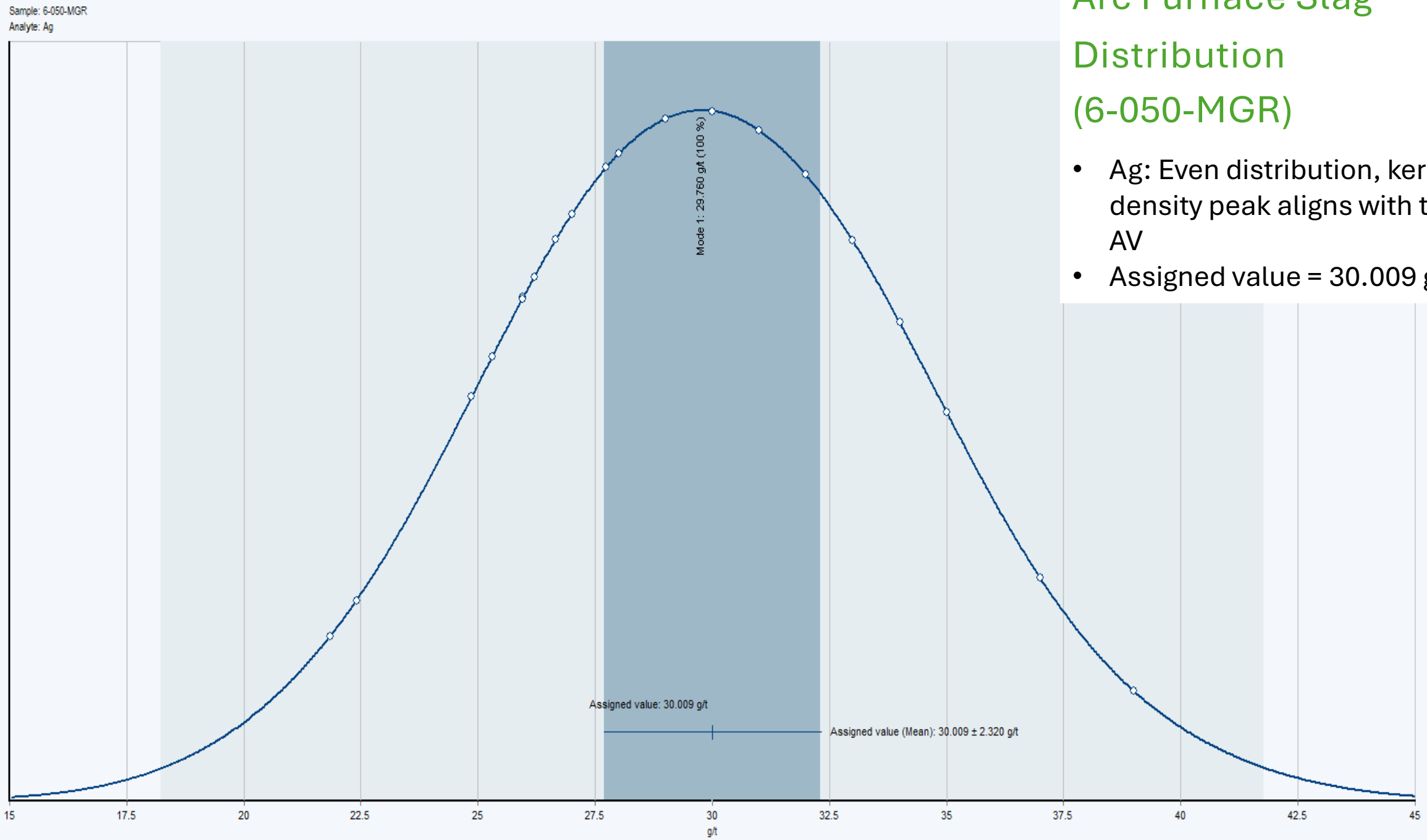
Arc Furnace Slag Distribution (6-050-MGR)

Arc Furnace Slag Distribution (6-050-MGR)

- Ag: Even distribution, kernel density peak aligns with the AV
- Assigned value = 30.009 g/t



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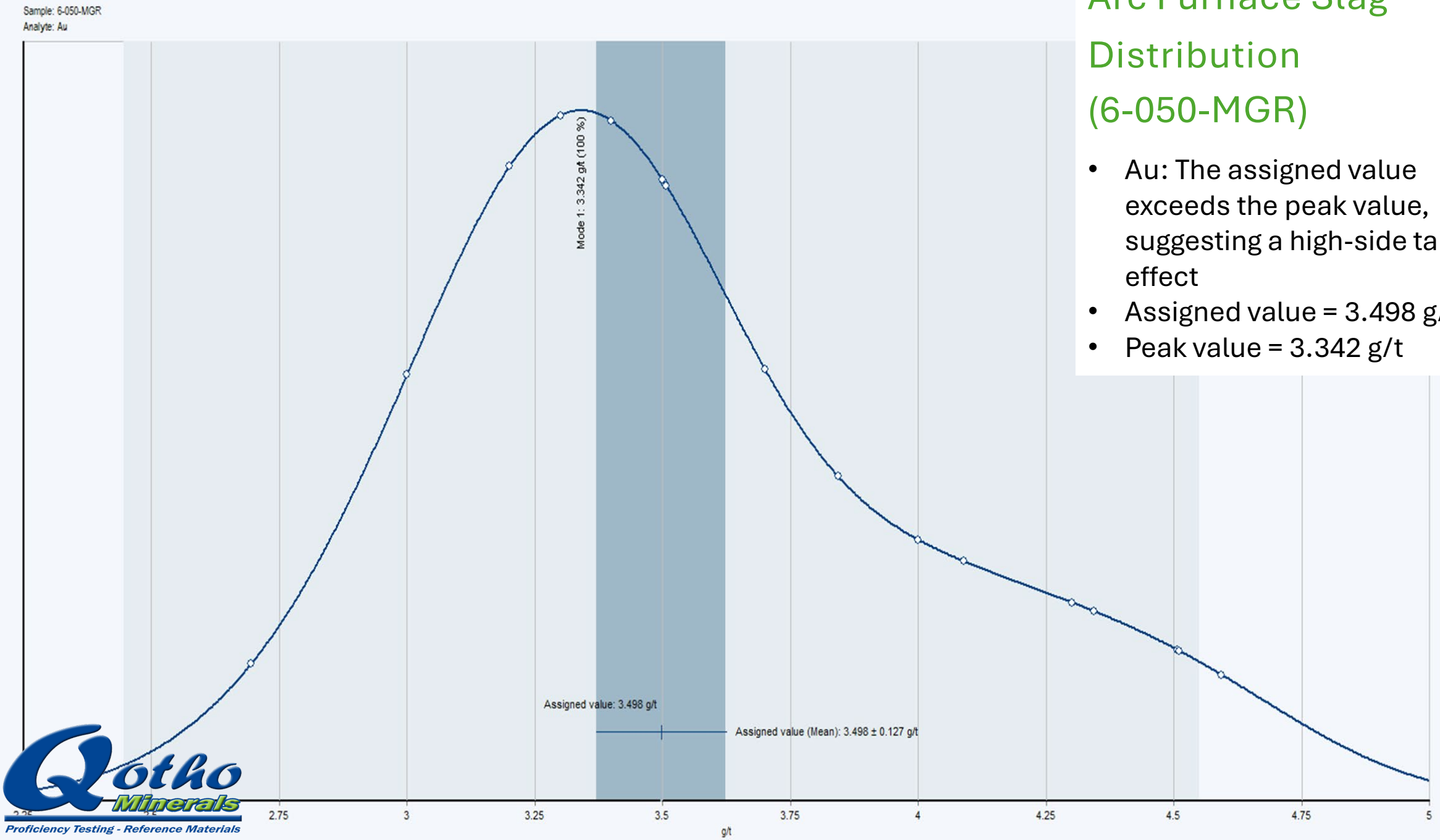

- Au: The assigned value exceeds the peak value, suggesting a high-side tailing effect
- Assigned value = 3.498 g/t
- Peak value = 3.342 g/t

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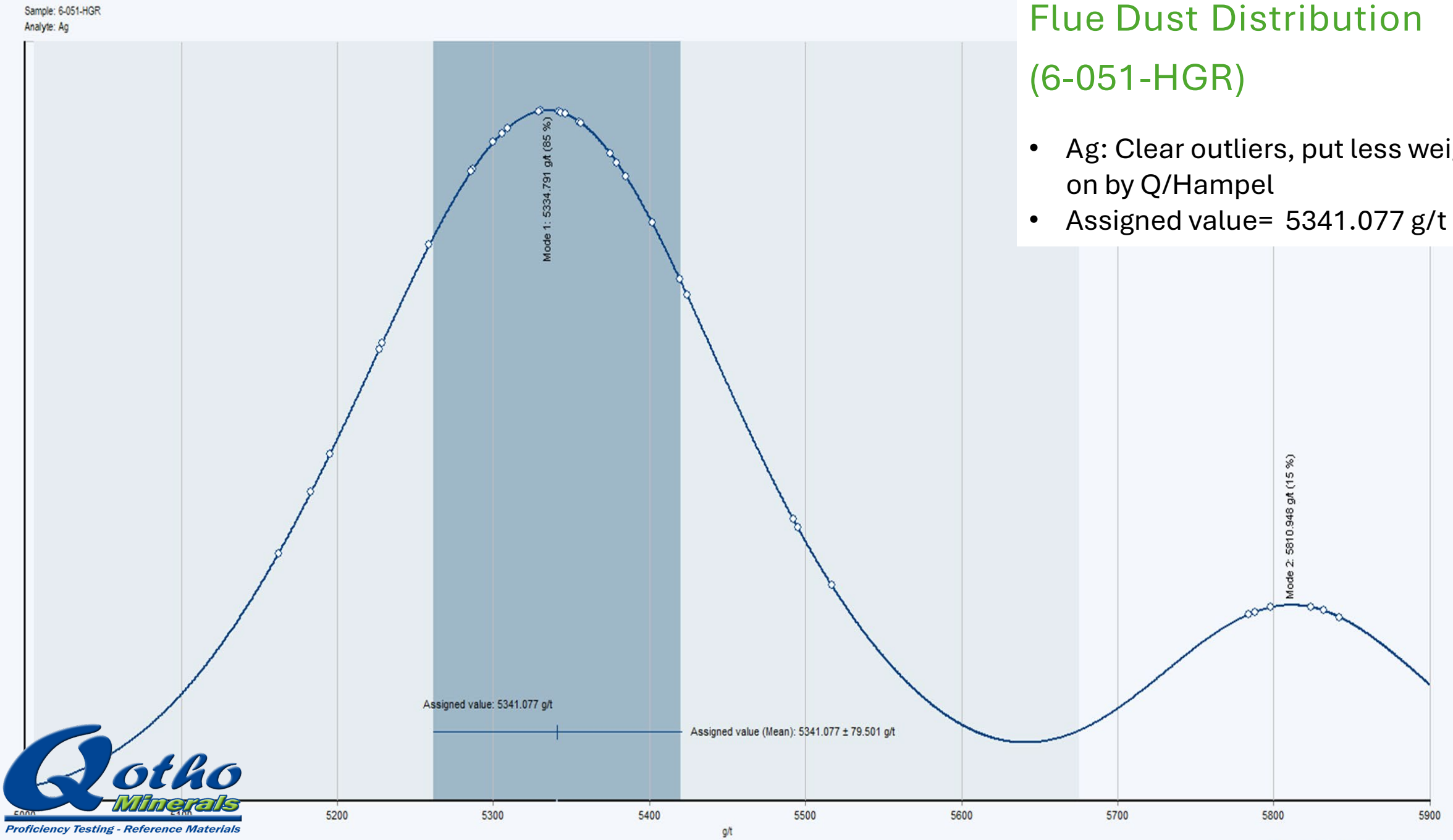
Flue Dust Distribution (6-051-HGR)

Flue Dust Distribution (6-051-HGR)

- Ag: Clear outliers, put less weight on by Q/Hampel
- Assigned value= 5341.077 g/t



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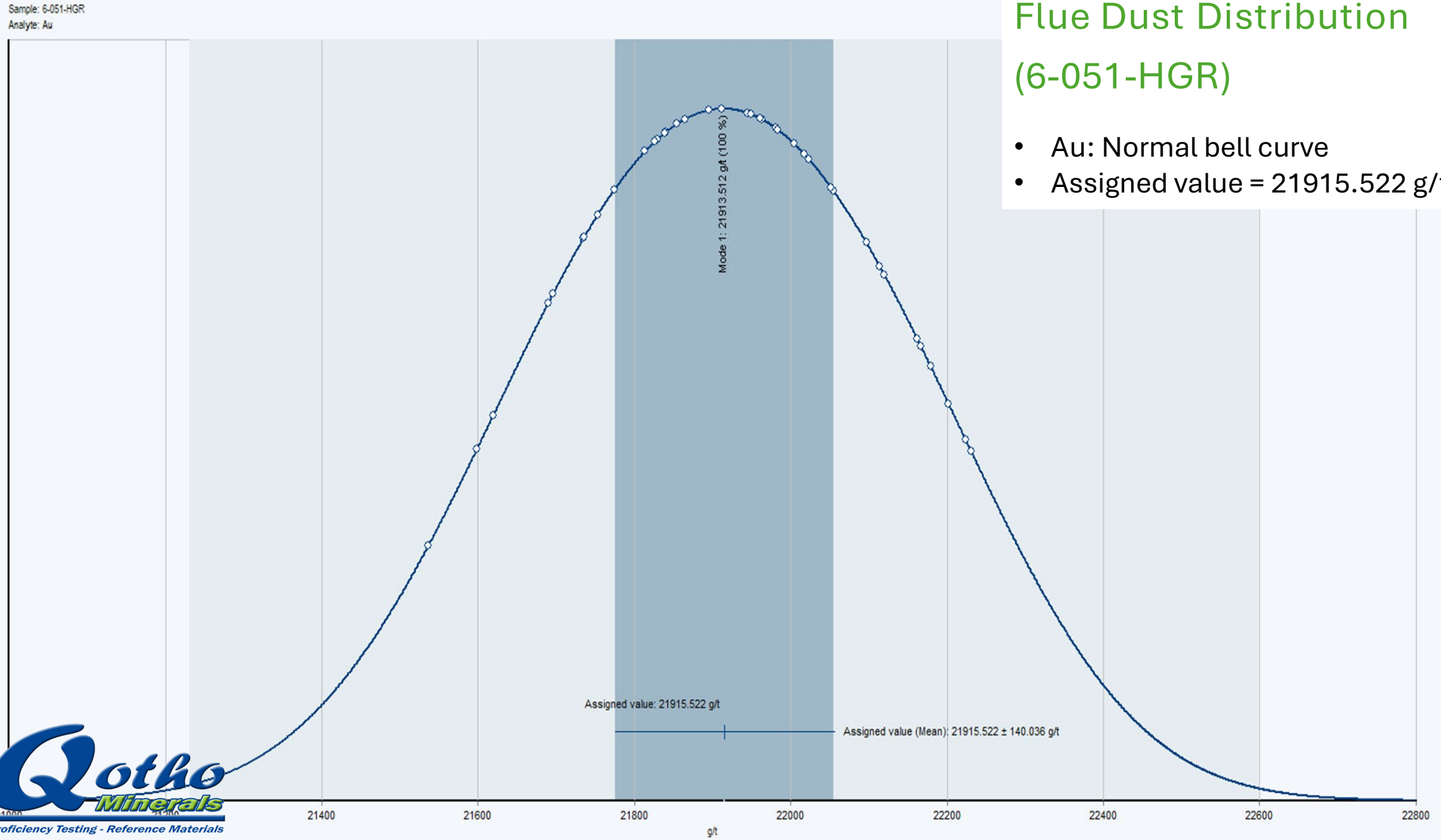
Flue Dust Distribution (6-051-HGR)

- Au: Normal bell curve
- Assigned value = 21915.522 g/t



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Assigned Values and Measurement Uncertainties

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- Certified Values

Sample	Analyte	Units	Assigned Value	s (Standard Deviation)	± 2s (Limit of Tolerance)	± 3s (Control Limit)	Expanded Uncertainty
6-050-MGR	Ag	g/t	30.01	3.93	7.86	11.79	2.49
6-051-HGR	Ag	g/t	5341.08	111.67	223.34	335.01	85.26

- Uncertified Values (For information only)

Sample	Analyte	Units	Assigned Value	s (Standard Deviation)	± 2s (Limit of Tolerance)	± 3s (Control Limit)	Expanded Uncertainty
6-050-MGR	Au	g/t	3.50	0.35	0.70	1.05	0.14
6-051-HGR	Au	g/t	21917.17	221.04	442.08	663.12	146.13

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Data Distribution Highlights (6-050-MGR)

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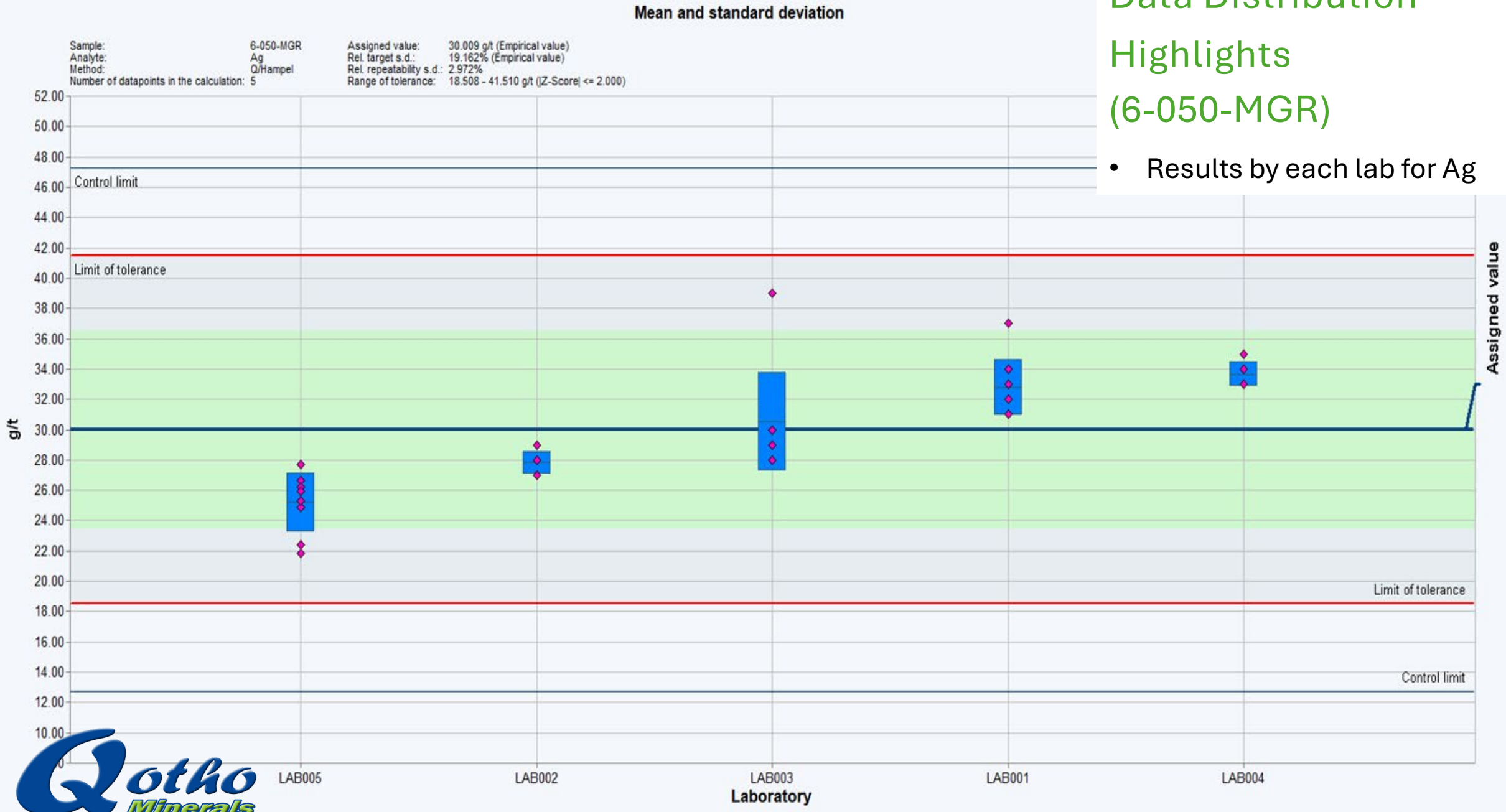
- Results by each lab for Ag



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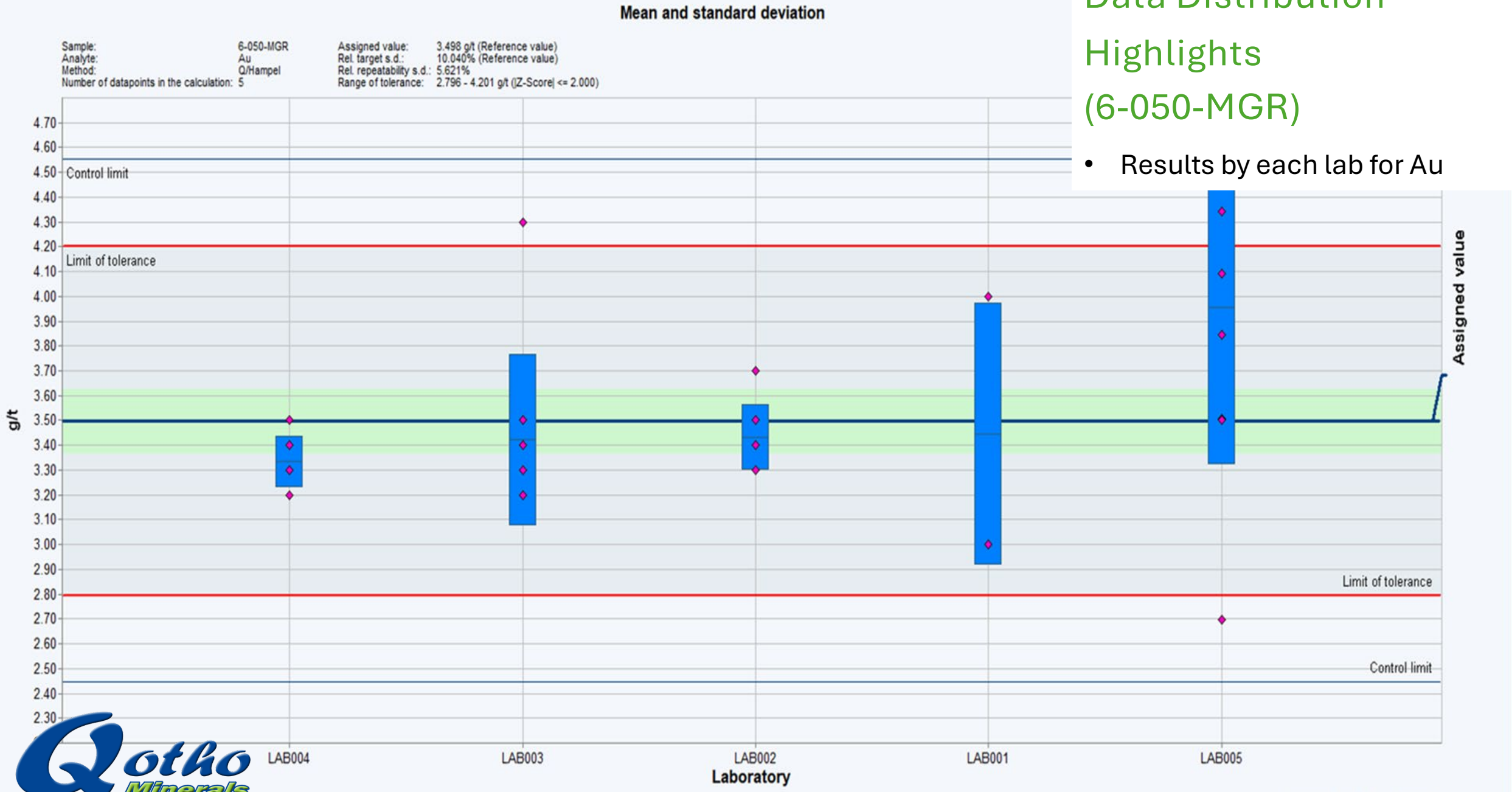
Data Distribution Highlights (6-050-MGR)

- Results by each lab for Au



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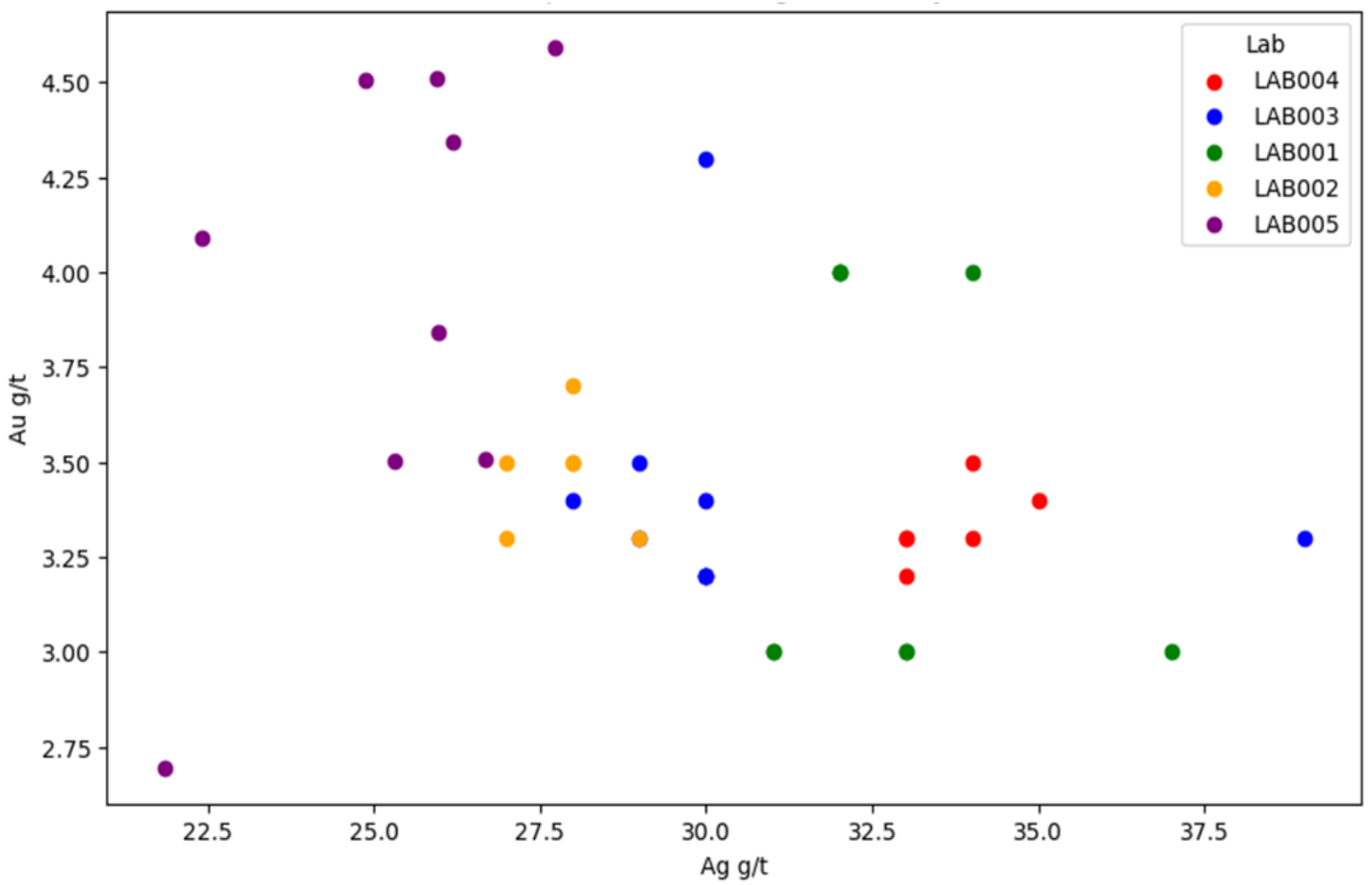
Data Distribution Highlights (6-050-MGR)

Scatter Plot of Au vs. Ag Results for the Furnace Slag Sample



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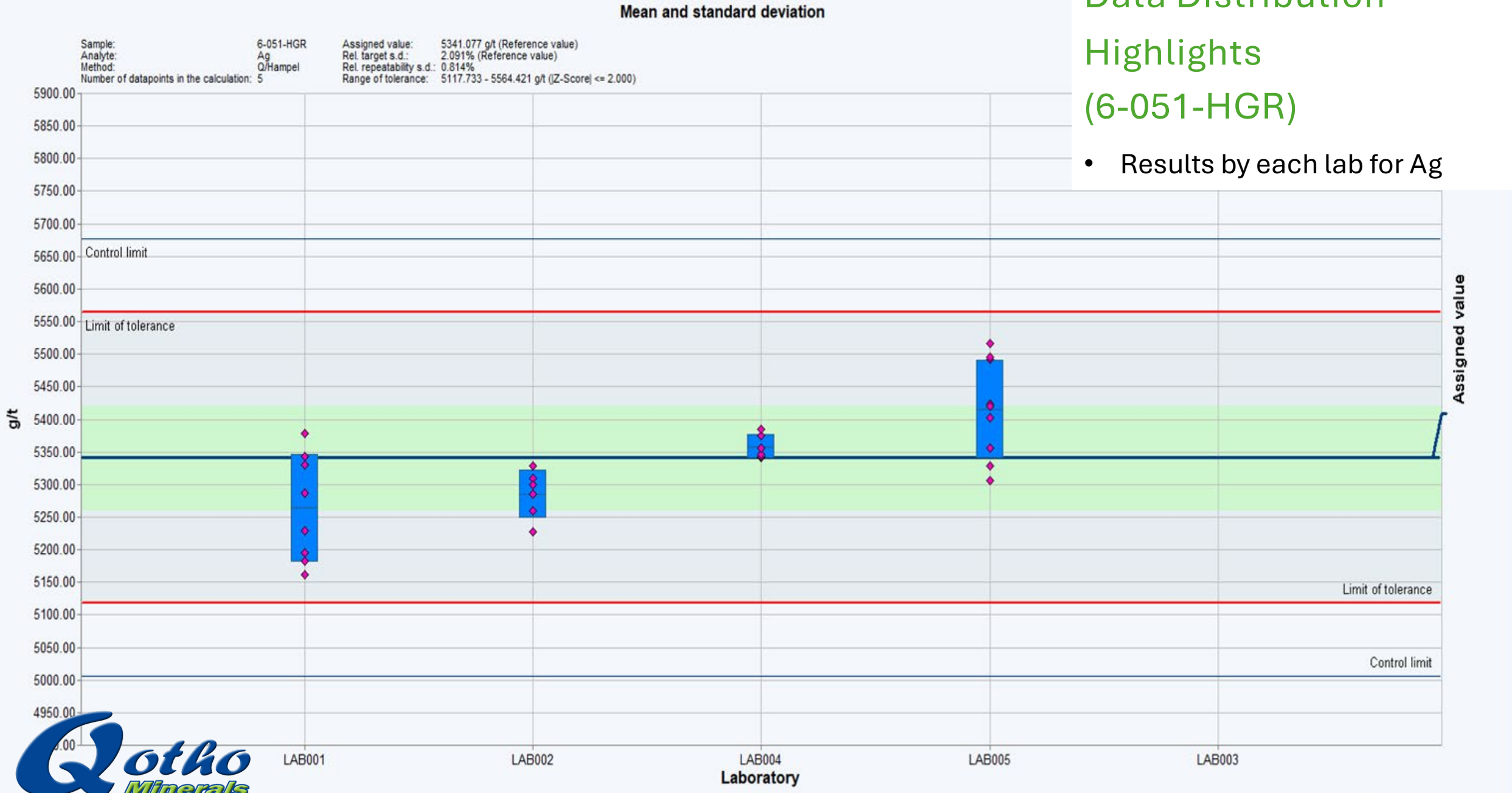

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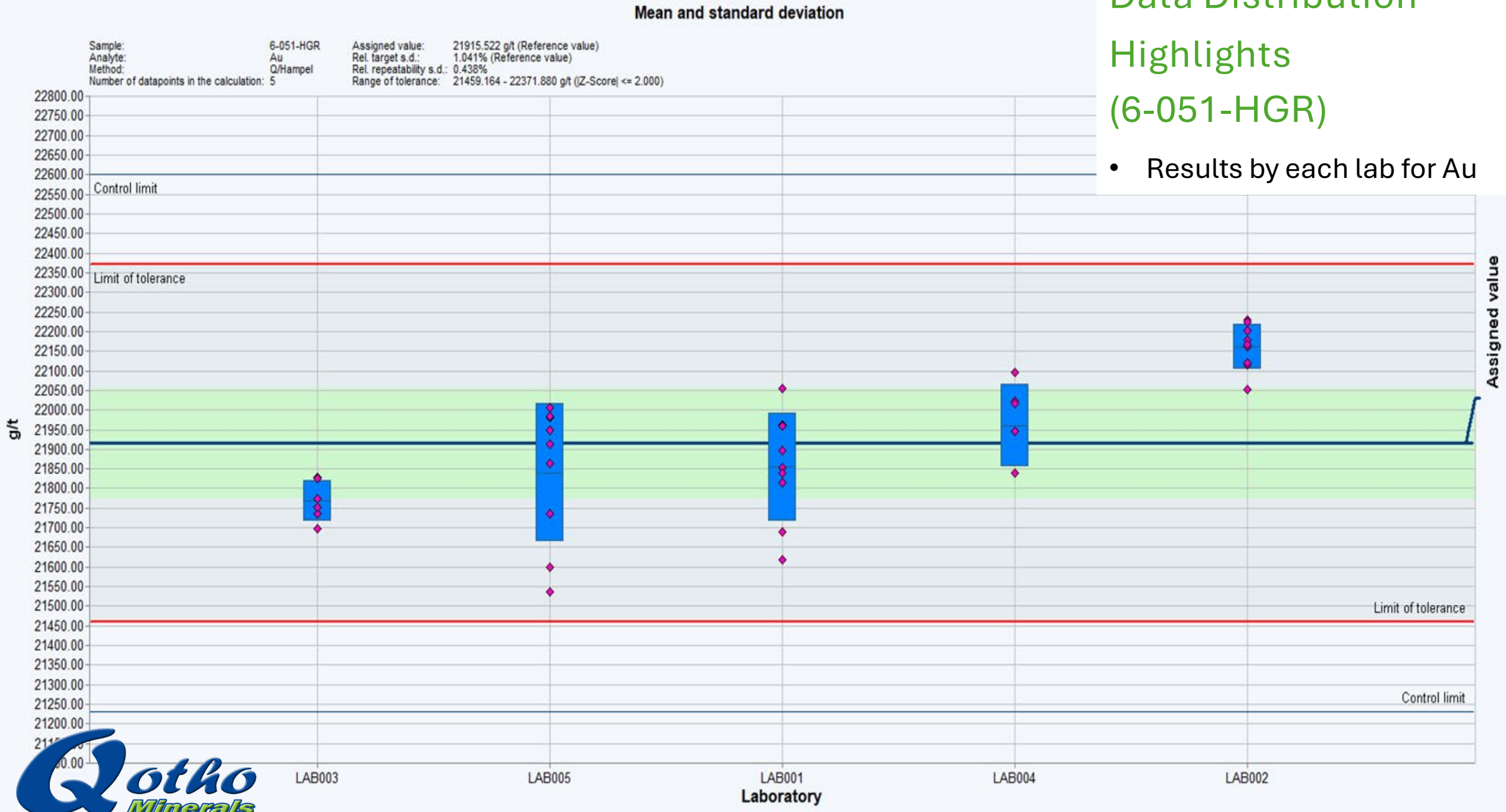
Data Distribution Highlights (6-051-HGR)

- Results by each lab for Au



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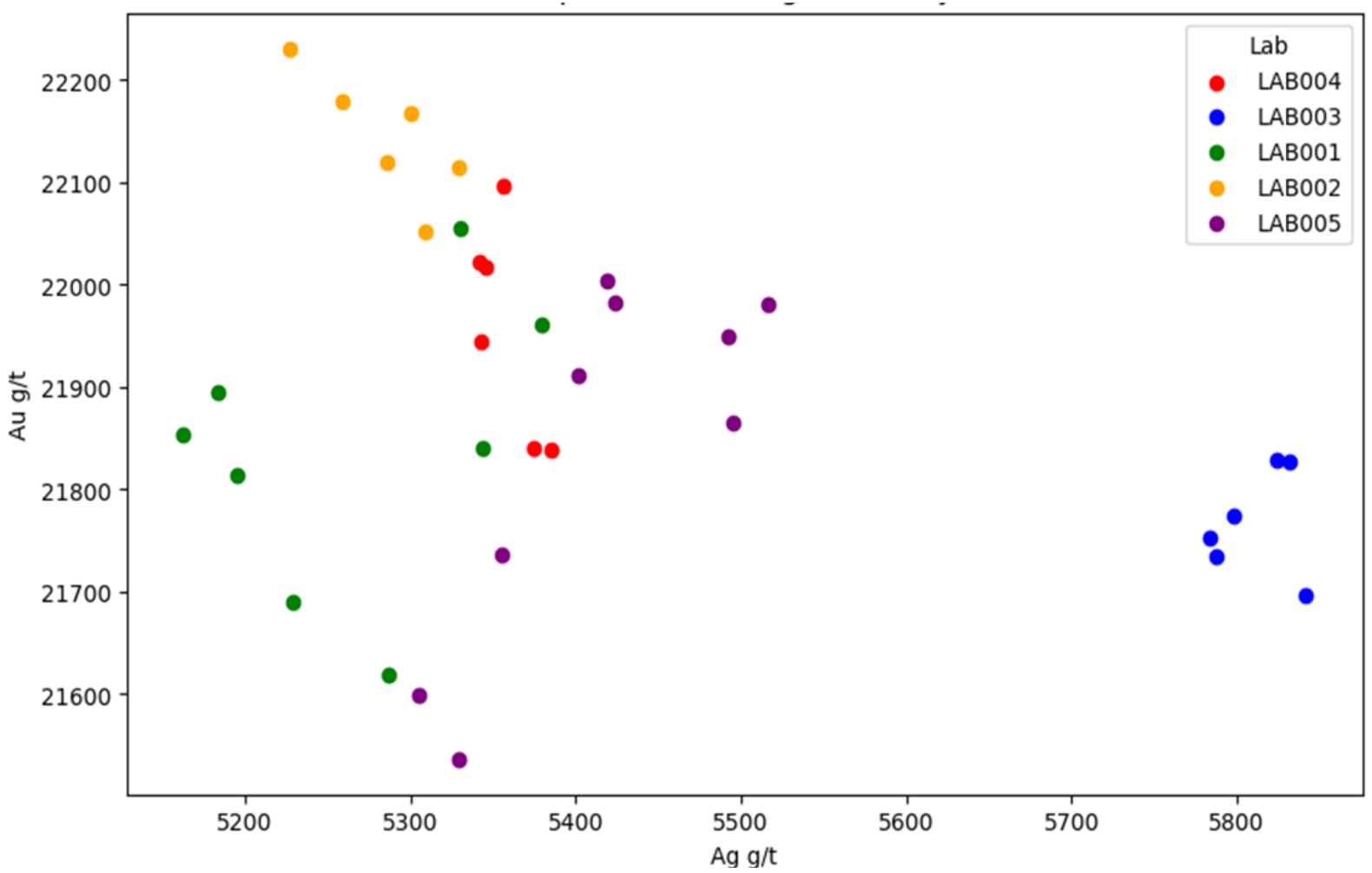
Data Distribution Highlights (6-051-HGR)

Scatter Plot of Au vs. Ag Results for the Flue Dust Sample



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THE TAKE-AWAY

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Reflections and Future Directions

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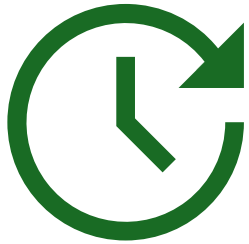
Reflections

- CRMs can be produced without losing high-value materials.
- Potential for an industry-wide CRM library via LBMA lab collaboration.
- Option for individual labs to certify specific materials internally.



Future Directions

- Collaborative preparation
- Share performance reports
- Certify materials where possible
- Framework for CRM trading among LBMA members

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Elevating Quality Standards

Elevating Quality Standards

Internal Approach

- Material prep and inter-lab programs run in-house.
- Outcome: Reference Material – a step up from in-house QAQC samples.

VS.

External Approach

- Prep, programs, and certification by ISO-accredited facilities.
- Outcome: Certified Reference Materials – boosts industry confidence and result reliability.

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Next Steps

Next Steps

Continue working with Rand Refinery

Loaded carbon CRM and many more expected in 2025

Industry Goal:

Enhance industry standards and ISO 17025 compliance

How to achieve the Goal

Working together – Together Everyone Achieves More

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Join the Quest For Quality