QUARTZ LIMS WHITE PAPER

The Specimen Outlives the Job

Managing Physical Specimen Inventory Beyond the Life of Any Single Job

For laboratory managers and operations leaders in failure analysis and materials characterization labs

Executive Summary

Most laboratory systems organize work around the job sample, the record created when work is requested and retired when the job closes. But in many laboratories the physical object on the bench has a life far longer than any single job. A wafer is received once and examined across many jobs over months. A coupon is cut from it, a smaller piece is cleaved from the coupon, and each of these physical objects may be referenced by analysis after analysis. The job sample is transient; the physical specimen persists.

This paper makes the case for managing physical specimens as first-class inventory records, distinct from the transient job samples that reference them. It explains why conflating the two loses critical history, how a parent-and-child inventory model preserves lineage as specimens are subdivided, and why registering a specimen once and referencing it many times is the foundation on which a lab's physical-world capabilities rest. It closes with how Quartz LIMS implements this.

Two Different Things That Look Alike

A job sample and a physical specimen are easy to confuse because, for a single analysis, they appear to be the same object. The distinction becomes clear the moment a specimen is used more than once. The physical wafer that arrived in the lab is one thing, with one identity, received on one date. The several job samples that have referenced it over time are something else: each is a record of one analysis, tied to one job, with its own status and outcome.

When a system tracks only job samples, the physical object has no durable identity of its own. Its history is scattered across the jobs that happened to use it, there is no single place to ask what has been done to this wafer, and when the wafer is subdivided the relationship between the pieces is lost. A specimen-management capability exists precisely to give the physical object the persistent identity and lineage that the transient job record cannot.

Registering the Specimen Once

The foundational move is to register each physical specimen as an inventory record when it is received, independent of any job. From that point the specimen has a stable identifier, a status that reflects its own lifecycle rather than any analysis, and a record that accumulates over its entire time in the lab. Jobs then reference the specimen rather than recreating it, so the same physical object can be examined repeatedly without losing the thread that connects those examinations.

This register-once, reference-many pattern is the heart of mature sample management. A specimen is registered in a central inventory, its identity and metadata stay consistent across every team and job that touches it, and its status moves through its own lifecycle, for example from active to disposed or returned, on its own terms.

Preserving Lineage as Specimens Are Subdivided

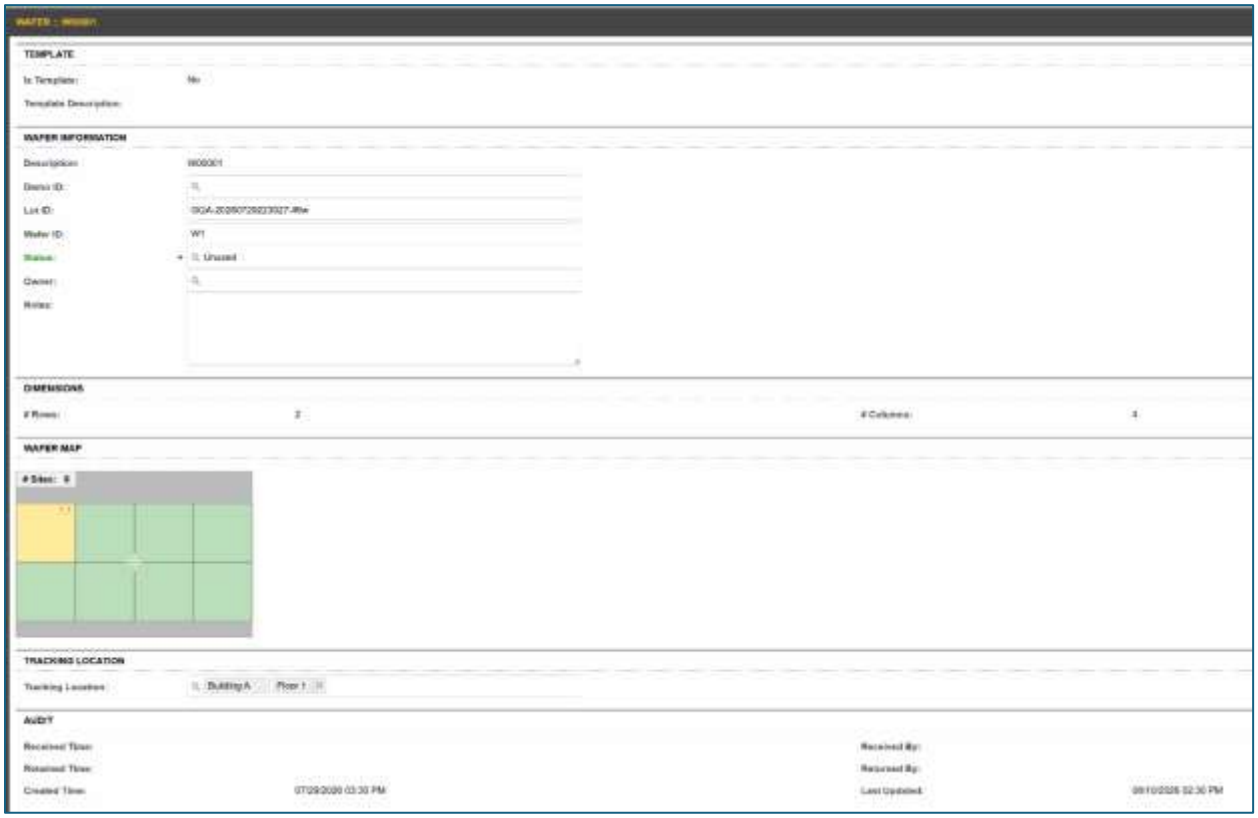
Physical specimens in a materials or semiconductor lab are rarely static. A wafer is divided into coupons, and a coupon may be cleaved or thinned into smaller pieces, sometimes several levels deep. Each subdivision creates a new physical object that is meaningfully related to its parent, and that relationship is itself valuable data. Which coupon came from which wafer, and which piece from which coupon, is often essential to interpreting a result.

A specimen inventory model captures this as explicit parent-and-child lineage. The wafer is the parent, its coupons are children identified by their position on the wafer, and pieces derived from a coupon are its children in turn. Preserving this lineage across every split and derivation is what allows a result on a small piece to be traced back to the precise location on the original wafer. Sample-management platforms treat this parent-to-child traceability as a core requirement, because without it, scientific defensibility breaks down at exactly the point where specimens are most heavily processed.

Concept	Role in the lab
Wafer	The top-level specimen received and registered once; referenced by many jobs over its lifetime.
Coupon	A section of a wafer, identified by its position; a child of the wafer that becomes a sample when used in a job.
Sub-coupon	A piece derived from a coupon, nestable to multiple levels; preserves lineage back to its parent.
Job sample	The transient record of one analysis, referencing a specimen at submission and retired with the job.

Templates and Reuse

Because specimens of a given kind share a common geometry, a specimen inventory benefits from reusable templates. Rather than describing the layout of every wafer from scratch, the lab defines the geometry once and applies it to each new wafer of that type. This is a small efficiency in isolation, but at volume it is the difference between a register that is maintained accurately and one that staff cut corners on. Reuse is what keeps the discipline sustainable.



Why Specimen Identity Comes First

Persistent specimen inventory is the base layer on which a lab's physical-tracking capabilities rest. A specimen can only be located if it has a durable identity to attach a location to. It can only be barcoded meaningfully if the barcode refers to something that persists rather than a record that disappears when a job closes. It can only be sent to an outside vendor and received back as the same object if the lab tracks that object across the round trip. Each of these capabilities assumes that the physical specimen is something the system knows about in its own right.

This is why specimen identity is worth establishing deliberately and early. A granular, trustworthy digital record of the work is what makes the data reliable, and persistent specimen inventory is what gives the physical world a place in that record. Location tracking, barcoding, outsourcing, and a lab's other physical-tracking capabilities all build directly on the specimen identity established here.

The Record and the Shelf

A specimen inventory is only as useful as it is disciplined. If specimens are registered inconsistently, or if subdivisions are created on the bench without being recorded, the inventory drifts from physical reality and becomes a liability, because people will trust it precisely when it is wrong. The value depends on registration and subdivision being captured as they happen, which is why the later barcode and location capabilities matter so much: they make accurate capture the path of least resistance.

It is also worth resisting the urge to model every physical distinction. Not every lab needs sub-coupons nested many levels deep, and a hierarchy more elaborate than the work requires adds effort without insight. The right depth is the depth at which the lineage actually informs a result. Model that, and stop.

How Quartz LIMS Implements This

Quartz LIMS provides inventory management for physical specimens as records distinct from job samples. Each specimen is registered once, carries its own identifier and lifecycle status, and may be referenced by many jobs over its lifetime. The wafer, coupon, and sub-coupon hierarchy preserves parent-and-child lineage through every subdivision, reusable templates capture common geometries, and the inventory integrates with search, data export, and the location and barcode capabilities described in the papers that follow.

Because Quartz LIMS is built to treat all laboratory data as first-class records and is configured to each lab's own structure and terminology, the specimen model reflects how a given lab actually receives, subdivides, and reuses its physical samples. The result is a durable, traceable identity for every physical object, the foundation on which a lab's physical-tracking capabilities depend.

To see how specimen inventory would map to your lab, learn more at quartzlims.com or request a walkthrough with the Quartz team.

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