APVERION
BRINGING ENGINEERING KNOWLEDGE INTO FOCUS

FIELD NOTE 01 / FIB-SEM

Localize before you remove.

Preserve before you proceed.

A practical workflow for moving from a broad failure hypothesis to a site-specific cross-section without losing the coordinates, conditions, observations, or reasoning that make the result reproducible.



01	02	03	04	05	06
FRAME	NAVIGATE	PROTECT	MILL	ANALYZE	RETURN

01 Frame

Define the failure question, candidate mechanisms, sample history, region of interest, and the evidence required to distinguish competing explanations.

EVIDENCE TO PRESERVE

- Failure mode and device history
- Competing hypotheses and confidence
- Acceptance criteria for localization

DECISION GATE

Is the question specific enough to guide destructive work?

02 Navigate

Correlate optical, electrical, X-ray, layout, and SEM evidence to establish the target coordinate and orientation.

EVIDENCE TO PRESERVE

- Reference images and fiducials
- Coordinate transforms and orientation
- Target uncertainty and keep-out zones

DECISION GATE

Can another operator find the same target?

03 Protect

Select deposition, grounding, cleaning, and geometry controls that protect the feature while minimizing preparation artifacts.

EVIDENCE TO PRESERVE

- Protective-layer material and dimensions
- Beam conditions and grounding strategy
- Known artifact risks

DECISION GATE

Will preparation preserve the feature being tested?

04 Mill

Progress from coarse removal to controlled polishing while monitoring endpoint, redeposition, curtaining, charging, and drift.

EVIDENCE TO PRESERVE

- Beam energy, current, angle, and dwell
- Intermediate images and endpoint decisions
- Operator adjustments with reasons

DECISION GATE

Has the target been exposed without over-milling?

05 Analyze

Acquire morphology, dimensional, compositional, and contextual evidence at conditions appropriate to the question.

EVIDENCE TO PRESERVE

- SEM conditions and detector choice
- EDS maps, spectra, measurements, annotations
- Artifact assessment and uncertainty

DECISION GATE

Does the evidence discriminate among the hypotheses?

06 Return

Connect the cross-section, preparation history, observations, interpretation, and outcome to the governed case record.

EVIDENCE TO PRESERVE

- Traceable finding and confidence
- Unresolved alternatives
- Recommended next action

DECISION GATE

Can the next investigation reuse what was learned?

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THE DURABLE ENGINEERING RECORD

What should survive *after the work is complete.*

01	Original sample and case context
02	Traceable target coordinates and orientation
03	Complete beam and preparation history
04	Raw and annotated images with acquisition metadata
05	Interpretation tied to supporting evidence
06	Artifacts, uncertainty, and unresolved alternatives

01 **FRAME** — *02* **NAVIGATE** — *03* **PROTECT** — *04* **MILL** — *05* **ANALYZE** — *06* **RETURN**

COMMON KNOWLEDGE FAILURES

The instrument can succeed *while the record fails.*

01 Capturing only the final cross-section and losing the navigation path.

02 Treating curtaining, redeposition, charging, or beam damage as sample truth.

03 Changing beam conditions without recording why the endpoint decision changed.

04 Reporting a visually compelling feature without connecting it to the failure hypothesis.

OPERATING PRINCIPLE

The cross-section is not the investigation. It is one irreversible step inside a larger evidence chain.

What must be known - and recorded - before the ion beam changes the sample?