TFCompanion Release Notes - March 31, 2026

Semiconsoft, Inc. - TFCompanion release notes

TFCompanion Release Notes

Overview

This document summarizes the major features and workflow improvements added in the recent update cycle.

1. Tikhonov Regularization in Marquardt Fit

The Marquardt solver now supports diagonal Tikhonov-style regularization on selected parameters.

What it does:

- Adds a penalty term that keeps a parameter near its nominal or reference value unless the data strongly supports moving away from it.
- Improves numerical stability for poorly conditioned fits.
- Helps prevent unrealistic movement of weakly observable parameters such as void fraction, roughness-like terms, or selected oscillator parameters.

Solver behavior:

- Step construction, step acceptance, and convergence are now based on the same penalized objective.
- Confidence intervals and correlation use the regularized Hessian when regularization is active.
- Reported chi and chi-square remain data-fit metrics, so they stay comparable to earlier versions.

Recommended use:

- Use regularization when a parameter is weakly observable, highly correlated, or should stay near a trusted nominal value.
- Start with a small to moderate weight and increase only if needed.
- Use stronger regularization for nuisance parameters than for core metrology parameters.
- Use regularization during calibration or training when a shared model needs to remain physically stable across many samples.

Interpretation:

- Unregularized uncertainty means what the data alone supports.
- Regularized uncertainty means what the data supports under the chosen prior or penalty.
- Regularized confidence intervals are usually smaller than unregularized ones.

2. Regularization Weight in the UI

Regularization weight, shown as R.W., is now available in multiple editing tables.

Added locations:

- Thickness table in the filmstack editor.
- Isotropic material parameter tables.
- Batch parameter table.
- R/T Conditions tab for filmstack correction parameters.

Filmstack condition parameters now supported:

- Roughness coefficient.
- Scale coefficient.
- Offset.
- Dull factor.

3. Optional Final Hessian Recalculation for CI

A Marquardt control option was added to recompute the final Hessian before extracting confidence intervals and correlation.

- Improves CI and correlation accuracy for diagnostics and desktop analysis.
- Keeps the fast path available for server use where CI is not needed.

4. XML and Text Serialization Cleanup

Material, parameter, and filmstack import and export paths were normalized and corrected.

- More reliable XML round-trip for filmstack, material, and parameter data.
- Better text export and import consistency for parameterized materials.
- Full material type names are normalized for XML while keeping backward compatibility for older content.
- Additional regression coverage was added for the updated round-trip paths.

5. Strategy Search and Automation for Stage-2 Calibration

A strategy-search workflow was added to support automated evaluation of different fit strategies against known target values.

Core capabilities:

- Strategy template file support.
- Parent-child strategy branching.
- Automatic regularization sweeps.
- Brute-force exploration of material parameters in a selected layer.
- Summary metrics focused on measurement-versus-target performance.
- Export of strategy results.

Summary metrics:

- Average of Measurement minus SE target.
- Standard deviation of Measurement minus SE target.
- Correlation of Measurement versus SE target.
- Range of target values and measured values.
- Mean chi-square.

6. EMA Interface Layer Insertion in TFCompanion

You can now create and insert an EMA interface layer directly from neighboring filmstack materials without saving a separate material to the database first.

- Insert Layer or Add Layer now offers Create EMA Interface.
- Supports Bruggeman EMA and Maxwell-Garnett EMA.
- Uses neighboring layer materials automatically.
- Inserts the new layer directly into the current filmstack.

7. MultiExperiment Linked Materials Improvements

The linked-material workflow now supports faster linking and EMA constituent handling.

- Link Material in All Filmstacks can link a selected material slot across all filmstacks.
- EMA materials can be expanded to expose constituent materials in the tree.
- Constituents can be linked across filmstacks just like regular materials.
- Linking now respects the material slot and layer instead of matching by name globally.

8. Practical Regularization Guidance

Use regularization when the data does not strongly determine a parameter but physics or prior knowledge suggests a reasonable nominal value.

Good candidates include:

- Void fraction and EMA fraction.

- Roughness-like corrections.
- Weak oscillator parameters around known transitions.
- Calibration-only parameters that should stay near a trained nominal state.

Avoid using very strong regularization blindly on the main metrology parameter in production unless that prior is physically justified.