

## Finger Tightened Fittings Can Produce Band Broadening in HPLC - HPLC Primer

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### How Finger-Tight Fittings Can Cause Band Broadening in HPLC

Unexpected band broadening, ghost peaks, or elevated baseline noise can originate from a simple but critical issue: an imperfect tubing–port connection.

When finger-tight fittings and ferrules do not seat the tubing tip flush against the receiving port, a small unswept dead volume forms. This mixing pocket disperses analyte zones and compromises sensitivity and resolution.

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### The Root Cause: Unswept Dead Volume

Even a slight gap or misalignment between the tubing end and the port inlet creates a stagnant space where eluent eddies and mixes before entering the flow path.

- Effect on peaks: Broader, tailing, or “shouldered” peaks due to pre-column dispersion.
- Effect on noise/sensitivity: Dilution and mixing can raise baseline noise and decrease signal-to-noise, appearing as lost sensitivity or “ghost” signatures.
- Why it happens: Inadequate tightening, deformed ferrules, or poor tubing cuts prevent the tubing tip from seating perfectly against the internal sealing surface.

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### Connection Quality: Tubing Geometry and Seating

Proper connection geometry is essential to eliminate the unswept pocket.

- Square, burr-free tubing ends: A clean, perpendicular cut lets the tubing face mate flatly to the port; angled or burred cuts leave a gap.
- Correct ferrule compression: The ferrule must hold the tube coaxially; skewed compression tilts the tip and leaves a crescent-shaped void.
- Appropriate tightening force: Finger-tight systems still require firm, even torque—under-tightening leaves gaps; over-tightening can deform ferrules and ports.

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### Practical Steps to Prevent Band Broadening at Fittings

Adopt these best practices whenever assembling or servicing flow paths:

- Cut the tubing properly: Use a sharp cutter; inspect the end under magnification for a flat, clean face and remove burrs.

- Align before tightening: Insert the tubing fully until the tip naturally meets the port's seat; maintain alignment as you tighten.
- Verify seating: After tightening, gently pull back—there should be no axial play; re-seat if movement is detected.
- Standardize parts: Use fittings, ferrules, and tubing matched to the port geometry to minimize tolerance stack-up and misalignment.

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## Diagnostic Clues Pointing to Connection Issues

If chromatography suddenly degrades after maintenance or column changes, consider the fittings first.

- New dead volume signs: Peaks broaden across the chromatogram, not only for early or late eluters.
- Baselines worsen: Noise or “ghost” features increase despite unchanged mobile phases and detector settings.
- Reversibility: Re-making the connection with a properly cut tube and firm, aligned tightening typically restores performance immediately.

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## Conclusion

Finger-tight connections are convenient, but connection quality directly governs extra-column dispersion.

Ensuring a square tubing cut, coaxial alignment, and full seating of the tubing tip against the port eliminates unswept dead volume—restoring sharp peaks, stable baselines, and reliable sensitivity.

Click [HERE](#) for HPLC fittings ordering information and pictures.

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