

NMR Tubes - Up Close

Part 1: Outside Diameter and Inside Diameter

Have you ever gone to purchase an NMR tube and seen such words as 'OD and ID', 'Camber' or 'Concentricity' in the specifications? You might have thought to yourself "What are those things and why do they matter? I just want a tube that gives me great resolution." Keep reading to understand why these properties and others, are important to obtaining the best resolution for your experiment.

"All ID and OD of Wilmad Labglass tubes are held within a tolerance of +/- 0.001 inches"

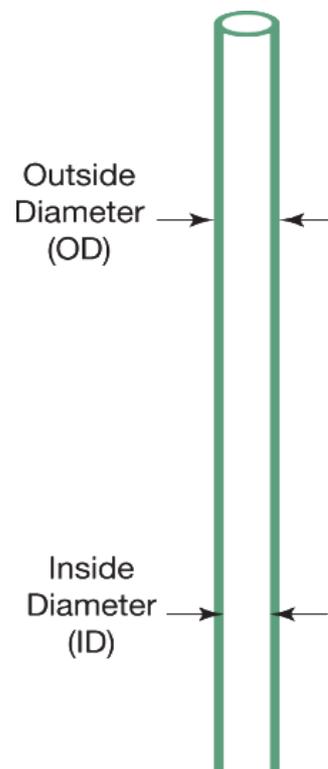
Outside Diameter (OD): A measure of the distance across the center of the tube from the outermost surfaces.

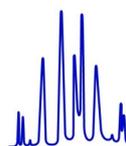
Inside Diameter (ID): A measure of the distance across the center of the tube from the innermost surfaces.

Failure to adhere to strict diameter tolerances can produce undesirable characteristics in NMR Spectroscopy like the ones described below.

- If the ID is too small, finned vortex plugs might burst the tube causing catastrophic damage to the probe
- If the ID is too large, vortex plugs and coaxial inserts can move during an experiment
- If the OD is too small, the tube can slip and a spinning wobble may occur causing modulation sidebands in the spectra. Even more disturbing the tube may slip through the probe.
- If the OD is too large, the tube could make contact with the probe insert, damaging the probe - a costly repair!

At Wilmad-LabGlass, We Measure, Measure Again, and then Measures Again! Wilmad-LabGlass measures both ID & OD over a large number of points along the entire length of the tube ensuring all tubes are held within a tolerance of ± 0.001 ". These tight tolerances and strict inspection processes are what make Wilmad-LabGlass NMR tubes the only choice when you need promised performance.





NMR Tubes - Up Close

Part 2: Concentricity

'Concentricity', 'Camber', O.D., I.D. Those are just some of the standard specifications for NMR tubes and each one of them can affect the quality of your spectra. Here we discuss concentricity and how a tube with poor concentricity can cause issues with your NMR experiment.

Concentricity: A measurement of variation in the radial centers, measured at the inner and outer walls.

Concentricity can be thought of as the degree to which the cylinders defined by the inner and outer surfaces of the tube are parallel. If the inner surface deviates and becomes closer to the outer surface that will cause one portion of the tube to have a smaller wall thickness than the other. This could cause issues with your spectral reading like the ones described below.

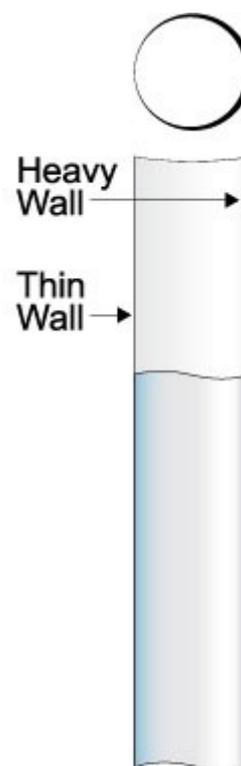
1. When spinning your NMR experiment a concentricity outside of the range of 0.006" - 0.0005" may cause modulation sidebands
2. Poor tube concentricity can expose portions of your sample to a magnetic field that is not homogenous with the portions outside of a perfect inner cylinder resulting in decreased spectral quality

How do our tubes measure up?

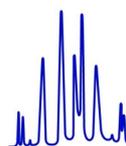
Wilmad-LabGlass measures concentricity throughout the entire length of the NMR tube, not all NMR tube manufacturers can say the same. And, our state of the art measuring equipment ensures that Wilmad-LabGlass tubes meet their stated specifications.

With concentricity tolerances as tight as 2.5 microns or better you can rely on Wilmad-LabGlass for your NMR experiment.

“With concentricity tolerances as tight as 2.5 microns or better you can rely on Wilmad Labglass”



Example of a NMR tube with poor concentricity



NMR Tubes - Up Close

Part 3: Camber

Camber : The lack of straightness of an NMR tube.

The camber of an NMR tube is measured by holding the tube on both ends and rotating it. During rotation, gauges measure the deflection in the middle of the tube giving a (+/-) deviation reading. Tubes with deviations less than 53.34 μm can be expected to spin reliably. All Wilmad-LabGlass Precision & Economy Thin-Walled tubes are guaranteed to fall within this specification .

If your NMR tube is not within this range you could experience issues like the ones described below.

- Modulation sidebands in spectra
- Probe damage (a costly repair)
- NMR tube breakage due to contact with the probe
- Instrument downtime, costly decontamination or in severe cases instrument decommission

Help Ensure the Long Life of your Spectrometer

It's easy! Use NMR tubes with a tight camber tolerance. With only $\sim 300 \mu\text{m}$ separating the NMR tube from the probe, meeting a strict camber tolerance is one of the most important criteria in maintaining your spectrometer health.

WilmaD-LabGlass measures and reports camber for all of our Economy and Precision NMR tubes so you can keep your spectrometer in good working order.

“WilmaD Labglass precision and economy thin walled tubes have camber deviations less than 53.34 μm ”

