

Why Triple Quadrupole Mass Spectrometry is a Better Choice than Single Quadrupole

Summary:

Multiple Reaction Monitoring (MRM) using a triple quadrupole mass spectrometer provides several advantages over Selected Ion Monitoring (SIM) using a single quadrupole mass spectrometer. By incorporating double mass filtering and MS/MS detection, triple quadrupole MS/MS offers higher selectivity and less interference from co-eluting compounds and matrix components, reducing the need for extensive method development and enabling faster analysis times. This technology also enables quantitation with lower limits of quantitation (LOQ) due to improved signal-to-noise ratios.

Moreover, triple quadrupole GCMS TQ 8900 requires fewer ions per compound for confirmatory analysis, with the EU Commission Decision mandating detection of 2 MRM transitions and 4 SIM transitions, respectively. This technology offers greater sensitivity than SIM, allowing for identification of lower-level analytes, with a difference of at least two orders of magnitude. Lastly, triple quadrupole MS/MS delivers a wider linear range, improved accuracy, and reproducibility in comparison to single quadrupole SIM.



GCMS SQ 8700

VS



GCMS TQ 8900

GCMS TQ 8900 has several advantages over GCMS SQ 8700 for this application:

✚ Increased selectivity:

GCMS TQ 8900 offers increased selectivity over GCMS SQ 8700 because it uses two quadrupoles in series to isolate target mass ions. This significantly reduces background noise and increases selectivity, allowing for better identification and quantification. Detection by triple quadrupole tandem mass spectrometry (MS/MS) allows for superior selectivity through double mass filtering. In MRM mode, a single signal per analyte is generally detected, while in SIM mode, multiple signals per compound can be detected. The reason is the generation of identical fragmentation ions in the sample source of the same class of compounds.

✚ Improved sensitivity:

GCMS TQ 8900 is also more sensitive than GCMS SQ 8700. With double mass selection, it can detect trace levels in samples at much lower concentrations. The detected signal-to-noise ratio (S/N) is higher, resulting in lower limits of quantification (LOQ). The typical difference in sensitivity observed is at least one order of magnitude. Ability to perform analyses in Multiple Reaction Monitoring (MRM) mode: GCMS TQ 8900 can perform analyses in MRM mode, which allows for quantification of a specific compound in a complex mixture. This technique significantly improves the precision and sensitivity of the measurement.

✚ Linearity and reproducibility:

Generally, a wider linear range can be used for quantification if a triple quadrupole MS/MS is used due to the increased selectivity allowing for detection at lower LOQs. The upper limit of quantification of SIM and MRM is usually comparable due to ion source or detector saturation. Versatility: GCMS TQ 8900 is more versatile than GCMS SQ 8700, as it can also be used for the analysis of non-volatile compounds, such as drugs, hormones, and metabolites.