

The Extrel® MAX300™ series of quadrupole mass spectrometers exceeds the EPA requirements for the detection of benzene in ambient air.

The hazards to human health and the various government regulations pertaining to the environmental release of, and human exposure to, benzene, toluene and xylenes are well documented. Among these aromatic hydrocarbons, collectively referred to as BTX, benzene has the lowest permissible Time Weighted Average (TWA); as low as 1 part per million (ppm) in certain industries.

Component	EPA Requirements (TWA)	Extrel MAX300 Detection Limit
Benzene	1 ppm /10 ppm*	0.010 ppm
Toluene	200 ppm	0.011 ppm
o-Xylene	100 ppm	0.021 ppm

*TWA of Benzene depends on Industry

Table 1: Comparison of EPA Requirements and MAX300 Detection Limits

The Extrel MAX300 series of quadrupole mass spectrometers is ideally suited for the low ppm level analysis of BTX in air. In particular:

- The MAX300 has a **benzene detection limit of 10 parts per billion (ppb)**; 100 times better than the EPA's time weighted average requirement of 1 part per million.
- The analysis method of the MAX300 accurately subtracts interferences from toluene and xylene eliminating false benzene readings.
- The fast response of the Extrel MAX300 enables analysis of a single stream in less than 10 seconds; 80 streams in less than 15 minutes.

Typical Analysis Information

The typical analysis method used in measuring BTX is shown in Figure 1 at right. The analysis typically includes the air components: nitrogen, oxygen and argon in addition to the BTX components benzene, toluene and xylene. The components will be analyzed at masses (m/z) 28, 32, 40, 78, 92 and 106 amu respectively.

The faraday detector is used for the analysis of the standard air components. Since the BTX components are present at ppm levels, the multiplier detector is used to analyze those components.

Fragment Matrix		Relative Abundance						
Add Chemicals		Sensitivity	m/z 28	m/z 32	m/z 40	m/z 78	m/z 92	m/z 106
<input checked="" type="checkbox"/>	N2	1.000	100					
<input checked="" type="checkbox"/>	O2	.980		100				
<input checked="" type="checkbox"/>	Ar	1.500			100			
<input checked="" type="checkbox"/>	Benzene	1.793				100		
<input checked="" type="checkbox"/>	Toluene	1.107					70	
<input checked="" type="checkbox"/>	Xylenes	.759				7.2	6.8	43
Background intensity:			.000000	.000000	.000000	.000000	.000000	.000000
Detector:			Farad	Farad	Farad	Mult	Mult	Mult
Ion Repeat:			1	1	1	1	1	1

Figure 1: Analysis Fragmentation Matrix



Application Background

The Extrel MAX300 series quadrupole mass spectrometers satisfy the environmental monitoring requirements for various volatile organics in air. In particular, the MAX300 is ideally suited for the low ppm level analysis of BTX in air. The MAX300's on-line analysis is fast (about 400 milliseconds per component), highly precise and capable of detection limits on the order of 10 ppb when using a multiplier to complement the standard faraday detector. It has been proven that the MAX300 series offers superior performance, particularly in analyzing Benzene; exceeding the required detection limits.

In addition to a variety of standard rotary valve inlet configurations used in process chemical applications, Extrel offers its 80-port FASTValve. The FASTValve is specifically designed for those applications such as environmental, which typically analyze a large number of streams.

Key Application Facts

- The Extrel FASTValve is an 80-port high flow, rotary valve specifically designed for ambient air monitoring.
- The typical analysis cycle is < 10 seconds/stream and the MAX300 is capable of monitoring 80 sample points in less than 15 minutes.
- The Dual Faraday and Electron Multiplier Detector and its autoranging capabilities enable the MAX300 to achieve a continuous dynamic range of 100% down to 10 ppb.
- Extrel's Questor 5 web-based user interface has the capabilities to meet 21 CFR Part 11 requirements.
- The Extrel MAX300 supports a variety of industry standard communications including ethernet, Bi-directional MODBUS, MODBUS RTU or TCP/IP, OPC and analog communication protocols.



Figure 2:
Extrel FASTValve

Due to its speed of response, component selectivity, unmatched accuracy and precision, the Extrel MAX300 series of quadrupole mass spectrometers is the worldwide analyzer of choice for ambient air monitoring applications. Extrel has more than 70 ambient air monitoring installations worldwide with many analyzers in operation for over 15 years.



Extrel maintains sales and service offices around the world. Please contact us for the office nearest you or visit our web site at www.extrel.com BTX 122011

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