IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE

APPLERA CORPORATION, MDS INC., and APPLIED BIOSYSTEMS/MDS SCIEX, Plaintiffs, v. MICROMASS UK LTD. and MICROMASS, INC., Defendants.	)	Civil Action No. 00-105-RRM

MEMORANDUM OPINION

Jack B. Blumenfeld, Esquire and Julia Heaney, Esquire, Morris, Nichols, Arsht & Tunnell, Wilmington, Delaware; Walter E. Hanley, Jr., Esquire, James Galbraith, Esquire, Lewis V. Popovski, Esquire, Jeffrey S. Ginsberg, Esquire, and Huiya Wu, Esquire, Kenyon & Kenyon, New York, New York; counsel for plaintiffs.

Robert W. Whetzel, Esquire and Chad Shandler, Esquire, Richards, Layton & Finger, Wilmington Delaware; James G. Hunter, Jr., Esquire, Kenneth G. Schuler, Esquire, and Kevin C. May, Esquire, Latham & Watkins, Chicago, Illinois; counsel for defendants.

February 5, 2002

Revised: February 6, 2002

Wilmington, Delaware

McKELVIE, District Judge

This is a patent infringement case. Plaintiff Applera Corporation, formerly known as PE Corporation, is a Delaware corporation with its principal place of business in Norwalk, Connecticut. Plaintiff MDS Inc. is a Canadian corporation with its principal place of business in Toronto, Canada. Plaintiff Applied Biosystems/MDS Sciex, formerly known as Perkin-Elmer Sciex Instruments, is a Canadian partnership formed under the laws of Ontario and having a place of business there. Applera and MDS are general partners of Applied Biosystems/MDS Sciex. MDS is the owner of U.S. Patent No. 4,963,736 (the '736 patent), entitled "Mass Spectrometer and Method and Improved Ion Transmission." Applied Biosystems/MDS Sciex is the exclusive licensee of the '736 patent. The plaintiffs will be collectively referred to as AB/Sciex, although MDS, as owner of the patent, will be referred to individually when appropriate.

Defendant Micromass UK Ltd. is a British corporation with its principal place of business in Manchester, United Kingdom. Micromass UK manufactures mass spectrometers sold under the name Quattro Ultima. Defendant Micromass, Inc. is a Massachusetts corporation with its principal place of business in Beverly, Massachusetts. Micromass, Inc. distributes and sells the Quattro Ultima in the United States. When necessary, the defendants will be referred to collectively as Micromass.

On February 18, 2000, AB/Sciex filed its complaint in this action alleging that the defendants infringe one or more claims of the '736 patent. On July 10, 2000, Micromass

Inc. filed its answer, affirmative defenses, and counterclaims and Micromass UK moved to dismiss the case for lack of personal jurisdiction. Micromass UK later withdrew the motion to dismiss and filed its answer, affirmative defenses, and counterclaims. On November 15, 2000, both defendants filed their amended answer, affirmative defenses, and counterclaims. The defendants' counterclaims seek a declaratory judgment that '736 patent is invalid and unenforceable, and allege that AB/Sciex has filed this suit in an improper effort to maintain monopoly power in violation of section 2 of the Sherman Act, 15 U.S.C. § 2, or attempted or conspired to do so.

On December 13, 2001, the court held a hearing in accordance with Markman v. Westview Instruments, Inc., 517 U.S. 370 (1996), to construe the disputed claims of the '736 patent. The parties sought construction of almost every limitation in the patent's two independent claims. Among the many limitations considered, the principal disputes between the parties relate to the claim terms "first" and "second," "end to end" and "aligned," and the structure accompanying certain means-plus-function limitations. This is the court's construction of the disputed claims.

I. FACTUAL AND PROCEDURAL BACKGROUND

The court draws the following facts from the complaint, the '736 patent, its prosecution and reexamination history, and the submissions of the parties.

A. Background of the Technology

Mass spectrometers analyze trace substances in a sample gas or liquid and provide information about the molecular weight or chemical structures of compounds in the trace substance. They are commonly employed in analytical chemistry for a variety of uses, including testing for the presence of drugs in bodily fluids or testing food and drink for minimum quality standards. Mass spectrometers operate by applying an electrical charge to the molecules of the substance being analyzed, resulting in charged molecules known as ions. The substance being analyzed can then be separated into its constituent parts by applying an electrical charge to the ions that separates them based on the ratio of their molecular weight to the charge.

Figure 1 from the '736 patent can be used to illustrate the basic workings of the type of mass spectrometer, typically called a quadrupole mass spectrometer, that AB/Sciex argues is at issue in this case.

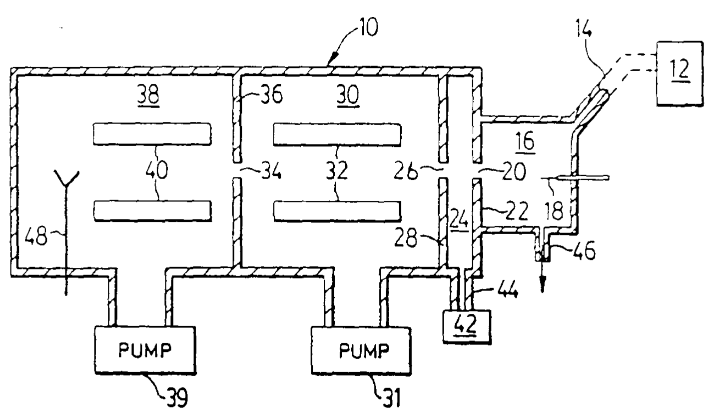


FIG.1

In a quadrupole mass spectrometer, ions are generated by introducing a trace substance into a duct (14). The trace substance is then ionized in the ionization chamber (16) by applying an electric charge with an electric discharge needle (18). The desired ions are then separated from the ambient gas (introduced through duct 44) and the undesired ions by two rod sets (32 and 40). A rod set is a group of electrodes (four in a quadrupole, six in a hexapole, etc.) shaped as rods, spaced equally apart to define an elongated central space through which the ions travel. The two quadrupole rod sets are each two-dimensionally represented in Figure 1 (32 and 40).

A typical quadrupole mass spectrometer uses two types of rod sets (32 and 40), each set in a separate vacuum chamber (30 and 38). One set of rods (32), known as an ion guide, uses an alternating current (AC) to channel the ions entering the device into the central space between the rods. By alternating the positive and negative charges in adjacent rods, the ion guide forces the ions to oscillate between the rods while traveling down their length. This is known as "strong focusing." The ambient gas, meanwhile, is pumped out of the vacuum chamber (31).

By directing ions into a vacuum chamber containing an ion guide, the ions are separated from the background gas in the chamber and channeled by the ion guide into a central stream. The central stream proceeds through a small orifice (34) and into another vacuum chamber (38), which contains another rod set (40) and vacuum pump (39). This second set of rods, known as a mass filter, applies both an AC voltage and a direct current (DC) voltage to select ions of a particular mass-charge ratio. The mass filter is arranged so that the ion stream can proceed from the ion guide rod set in the first vacuum chamber, though an orifice, and into the mass filter rod set in the second vacuum chamber. The mass filter then uses a particular voltage to separate the desired ions from the undesired, and the desired ions continue to a detector (48) that records their presence.

According to the ’736 patent, it was believed “[i]n the past” that the ion transmission through the device “increases with lowered gas pressure” in the vacuum chambers, also called cells. “For example the classical equation for a scattering cell shows that the ion signal intensity (ion current) transmitted through the cell decreases with increasing gas pressure in the cell.” ’736 Patent, Col. 1, ln. 33-37.

> Unfortunately the resultant need for low pressures in the region of the ion optic elements has in the case of gassy ion sources required the use of large and expensive vacuum pumps. This greatly increases the cost of the instrument and reduces its portability.

Id. at Col. 1, ln. 37-41. The inventors of the ’736 patent sought to solve this problem. As more fully described below, the inventors discovered that the “classical equation” was flawed and that increasing the pressure in the ion guide, within certain parameters, could improve ion signal intensity.

B. The ’736 Patent

On October 16, 1990, the U.S. Patent and Trademark Office (PTO) issued the ’736 patent, entitled “Mass Spectrometer and Method and Improved Ion Transmission.” Donald J. Douglas and John B. French are its inventors and MDS Health Group Limited is the assignee. The ’736 patent describes a mass spectrometer employing both an ion guide and mass filter located in separate vacuum chambers, as shown in Figure 1. What was novel about the invention, according to its specification, was the particular parameters of pressure, rod length, and voltage used to maximize transmission of ions from the ionization chamber (16) to the detector (48), thereby improving its sensitivity. Because, in accordance with the suggested parameters, the pressure in the ion guide chamber (30) was higher than previously used, “smaller, cheaper pumps” could be used to make the device more easily transportable.

According to the ’736 patent’s abstract, the vacuum chamber (38) containing the mass filter (40) is kept at a low pressure, such as 0.02 millitorr or less. In contrast, the vacuum chamber (30) containing the AC-only rods (32) that act as an ion guide is kept at a comparatively higher pressure, defined in terms of the product of the pressure and the length (“P x L”) of the rods. The patent claims state that the product of the length of the rods and the pressure should be equal to or above 2.25×10^{-2} torr cm, and the specification further explains that the P x L parameter should preferably be between 6×10^{-2} and 15×10^{-2} torr cm. In addition, a DC voltage employed between the inlet (26) and the AC-only rods (32) in the ion guide is kept low, “e.g. below 1 and 30 volts, preferably between 1 and 10 volts.” As a result of utilizing these parameters, the inventors found “a large enhancement in ion signal, with less focussing aberration and better sensitivity at high masses.”

The inventors reported that "the reasons for this [improvement in ion signal intensity] are not fully understood," '736 Patent, Col. 1, ln. 49-50, but hypothesized why they thought it occurred. They described that the use of the above parameters produces "a kind of collisional focussing [sic] or damping effect," id., Col. 6, ln. 66-67, that forced ions toward the center line of the ion guide. By adjusting the pressure in the first vacuum chamber (30) to a level comparatively higher than previously thought and varying it depending on length of the rods (32), and by manipulating the DC voltage between the inlet orifice (26) and the ion guide rod set (32) to a lower level than normal, the user of the invention could achieve improved ion transmission.

The '736 patent contains 24 claims, two of which are independent and 22 are dependant. The two independent claims are 1 and 14. Claim 1, an apparatus claim, recites:

> 1. A mass spectrometer system comprising:
>
> (a) first and second vacuum chambers separated by a wall, said first vacuum chamber having an inlet orifice therein,
>
> (b) means for generating ions of a trace substance to be analyzed and for directing said ions through said inlet orifice into said first vacuum chamber,
>
> (c) a first rod set in said first vacuum chamber extending along at least a substantial portion of the length of said first vacuum chamber, and a second rod set in said second vacuum chamber, each rod set comprising a plurality of elongated parallel rod means spaced laterally apart a short distance from each other to define an elongated space therebetween extending longitudinally through such rod set, said elongated spaces of said first and second rod sets being first and second spaces respectively, said first rod set being located end to end with said second rod set so that said first and

second spaces are aligned,

(d) an interchamber orifice located in said wall and aligned with said first and second spaces so that ions may travel through said inlet orifice, through said first space, through said interchamber orifice, and through said second space,

(e) means for applying essentially an AC-only voltage between the rod means of said first rod set so that said first rod set may guide ions through said first space,

(f) means for applying both AC and DC voltages between the rod means of said second rod set so that said second rod set may act as a mass filter for said ions,

(g) means for flowing gas through said inlet orifice into said first space,

(h) means for pumping said gas from each of said chambers,

(i) the pressure in said second chamber being a very low pressure for operation of said second rod set as a mass filter,

(j) the product of the pressure in said first chamber times the length of said first rod set being equal to or greater than 2.25 x 10^{-2} torr cm but the pressure in said first chamber being below that pressure at which an electrical breakdown will occur between the rod means of said first rod set,

(k) and means for maintaining the kinetic energies of ions moving from said inlet orifice to said first rod set at a relatively low level, whereby to provide improved transmission of ions through said interchamber orifice.

’736 Patent, Col. 14, ln. 24 - Col. 15, ln. 7.

Claim 14, a method claim, recites:

14. A method of mass analysis utilizing a first rod set and a second rod set located in first and second vacuum chambers respectively, said first and second rod sets each comprising a plurality of rod means and defining longitudinally extending first and second spaces respectively located end-to-end with each other and separated by an interchamber orifice so that an

ion may travel through said first space, said interchamber orifice and said second space, said method comprising:

(a) producing outside said first chamber ions of a trace substance to be analyzed,

(b) directing said ions through an inlet orifice in an inlet wall into said first space, first through said first space, said interchamber orifice and then through said second space, and then detecting the ions which have passed through said second space, to analyze said substance,

(c) placing an essentially AC-only RF voltage between the rod means of said first set so that said first rod set acts to guide ions therethrough, through,

(d) placing AC and DC voltages between the rod means of said second rod set so that said second rod set acts as a mass filter,

(e) admitting a gas into said first chamber with said ions,

(f) pumping said gas from said first chamber to maintain the product of the pressure in said first chamber times the length of said first rod set at or greater than 2.25×10^{-2} torr cm but maintaining the pressure in said first chamber below that pressure at which an electrical breakdown would occur between the rods of said first set,

(g) pumping gas from said second chamber to maintain the pressure in said second chamber at a substantially lower pressure than that of said first chamber, for effective mass filter operation of said second rod set,

(h) and controlling the kinetic energy of ions entering said first rod set to maintain such kinetic energy at a relatively low value,

whereby to provide improved transmission of said ions through said interchamber orifice.

’736 Patent, Col. 15, ln. 51 - Col. 16, ln. 29. The patent’s specification contained two preferred embodiments. The first, Figure 1, was the basic quadrupole mass spectrometer structure discussed above. The second, Figure 12, was basically a reproduction of the first, with a few slight modifications and additions, including an empty vacuum chamber (70) between the curtain gas chamber (24) and the ion guide's vacuum chamber (30').

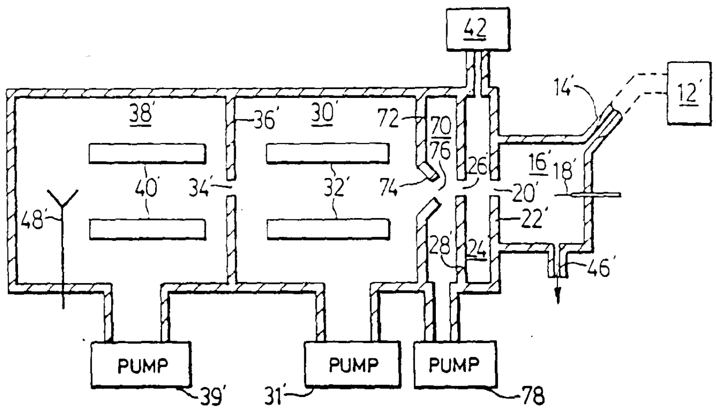


FIG. 12

C. The Prosecution History

MDS filed the application for the '736 patent on November 15, 1989. The application describes the basic structure of a quadrupole mass spectrometer and notes that much of the structure and method of operation recited within is also detailed in U.S. Patent No. 4,328,420, an earlier patent filed by one of the same inventors, John B. French. The '736 patent application cites two articles by Dr. Richard Smith, et al., entitled "On-Line Mass Spectrometric Detection for Capillary Zone Electrophoresis," 59 Anal. Chem. 1230 (Apr. 15, 1987) (the "1987 Smith article"), and "Capillary Zone Electrophoresis – Mass Spectrometer Using an Electrospray Ionization Interface," 60 Anal. Chem. 436 (March 1, 1988) (the "1988 Smith article").

According to the ’736 patent, the two Smith articles demonstrate the “classic theory” that the ion signal is improved by keeping the pressure in the ion guide’s vacuum chamber relatively low. The 1987 Smith article shows operation of an AC-only rod set in a vacuum chamber at 8×10^{-4} torr and the 1988 Smith article shows an AC-only rod set in a vacuum chamber at 1×10^{-6} torr.

On May 8, 1990, the patent examiner issued a final office action allowing all 24 claims of the ’736 patent, stating that “prior art does not teach to operate an AC only quadrupole, used to guide ions to a mass analyzing quadrupole in a high vacuum chamber, at a pressure such that the product of the length of the AC only quadrupole times the pressure in its chamber is greater than or equal to 2.25×10^{-2} torr cm.” The ’736 patent issued on October 16, 1990.

D. The Reexamination History

On January 10, 1997, attorneys representing MDS sent a letter to Micromass UK, asserting that an employee of Micromass UK had recently published an article describing a hexapole rod set in a vacuum pressure similar to that disclosed in MDS’s ’736 patent. The letter commented that “this device, if sold, will infringe the claims of the” ’736 patent and its Canadian counterpart. Micromass UK responded by letter dated April 16, 1997, stating that it did not believe its product infringes and citing several references published prior to the application for ’736 patent, including: (1) French, European Patent Application, Publication No. 0 023 826, February 11, 1981 (the “French application”);

(2) Boitnott et al., Optimization of Instrument Parameters for Collision Activated Decomposition (CAD) Experiments for a Finnigan Triple Stage Quadrupole GC/MS/MS/DS, 1981 Pittsburgh Conference On Analytical Chemistry and Applied Spectroscopy, Abstract No. 782 (the "Finnigan abstract"); (3) Boitnott et al., Optimization of Instrument Parameters for Collision Activated Decomposition (CAD) Experiments for a Triple Stage Quadrupole (TSQ™ GC/MS/MS/DS, Finnigan Topic 8160 (the Finnigan paper"); (4) Caldecourt et al., An Atmospheric-Pressure Ionization Mass Spectrometer/Mass Spectometer, International Journal of Mass Spectrometery and Ion Physics, Vol. 49, p. 233-251 (1983) (the "Caldecourt article").

On September 30, 1997, MDS filed a request for reexamination with the PTO, citing the four references mentioned in Micromass UK's letter and four additional references, including another European patent application and three articles.

1. Ion Trap References

In its request for reexamination, MDS described the four new references not disclosed by Micromass as "ion trap" references and distinguished them from the '736 patent on the basis that the claimed invention did not trap ions in the system for analysis. This distinction is relevant to the court's claim construction because Micromass now argues that MDS disclaimed that the '736 patent "traps" ions for a significant period of time, as the ion trap references of prior art would suggest. For example, one of the ion trap references was Schaaf et al., Trapped Ion Density Distribution in the Presence of He-

Buffer Gas, Applied Physics, Vol. 25, pp. 249-251 (1981) (the Schaaf article). MDS explained that "Schaaf's ion trap operates on a fundamentally different principle than the claimed mass spectrometer. With an ion trap, ions of a selected range of mass to charge ratios are trapped or stored for a period of time (which can be quite lengthy) due to electric fields generated with electrodes." Request for Reexamination at 6. In contrast, MDS argued that in the claimed invention, "[t]he first rod set receives essentially only an AC voltage so that ions are guided through the first vacuum chamber without being trapped there." Id. at 7.

2. Tandem References

MDS also distinguished the four references provided by Micromass, describing the structure they reveal as a "tandem mass spectrometer." Micromass refers to them instead as "triple stage mass spectrometers," and states that the Quattro Ultima is a "triple stage" or "tandem" mass spectrometer.

According to MDS, in a tandem mass spectrometer ions proceed through a quadrupole AC-DC mass filter (10, in the figure below), then a collision cell containing an AC-only rod set (14), and then another quadrupole AC-DC mass filter (12). The collision cell accepts ions not filtered out by the first mass filter, then collides those ions into a gas at high energy, causing them to fragment. The fragments are called "daughter ions" and then proceed into the second mass filter for further filtering for the desired fragments. The basic structure of a tandem mass spectrometer is shown here.

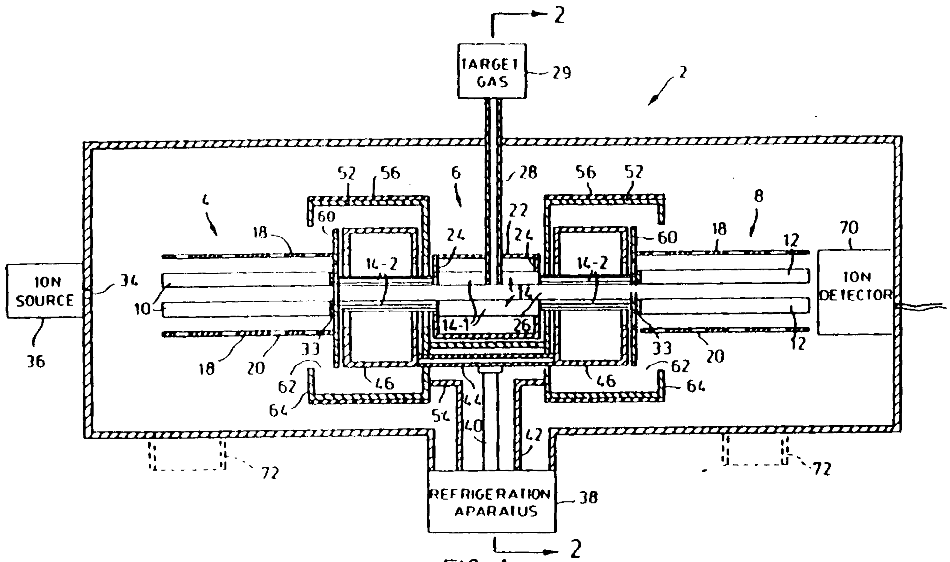


FIG. 1

Micromass argues that MDS's distinction between a tandem mass spectrometer and the claimed invention is significant to the construction of the claim terms "first" and "second." For example, MDS explained that the "first rod set" (ion guide) in the claimed invention is comprised of AC-only rods, while the "second rod set" (mass filter) in the claimed invention are AC-DC rods. It also explained that the "first vacuum chamber" in the claimed invention has a product of the pressure and length of the rods of 2.25 x 10^{-2} torr cm, while the "second vacuum chamber" has a lower pressure. Given these characteristics of the claimed invention, MDS distinguished the tandem references as follows:

> The French application also differs from the system of the invention in other ways. For instance, whereas the first rod set in the invention receives essentially an AC-only voltage, the first section in the French application receives both AC and DC voltages. Whereas the first vacuum chamber of the invention has a product of its pressure with the length of the first rod set

> equal or greater than 2.25 x 10^{-2} torr cm, whereby the pressure is at least 1.5 millitorr for a 15 cm rod set, the first section in the French application states that the pressure must be maintained low, typically at 10^{-5} torr. Further, whereas the second rod set in the invention receives both AC and DC voltages to act as a mass filter, the second section in the French application receives an AC only voltage and is for inducing dissociation of ions. The second chamber of the invention is at very low pressure while the French application states that the pressure in the second section may be varied from 0.1 millitorr to 10 millitorr.

Id. at 13-14; see also id. at 16 (Finnegan abstract), 19 (Finnigan paper), and 21 (Caldecourt article).

MDS did not, however, distinguish the tandem mass spectrometers based solely on the placement of the various rod sets and vacuum chambers. It also described operational differences. For example, MDS distinguished the French application by stating:

> The French application differs from the system of the invention in that it relates to a three-stage mass spectometer having two end sections for acting as mass filters and a center quadrupole section for producing collision induced dissociation of parent ions into fragment or daughter ions. A collision cell, such as the one described in the French application, dissociates a parent ion into fragment ions by creating conditions whereby a high energy parent ion collides with a high pressure gas. The use of a high pressure gas is therefore well known with mass spectrometers that have collision cells. A mass spectrometer according to the invention, on the other hand, is intended to improve the transmission of ions through a cell. The mass spectrometer according to the invention uses an increased pressure to improve ion transmission and maintains 'the kinetic energies of ions moving from said inlet orifice to said first rod set at a relatively low level' (claim 1). The French application would therefore teach away from the invention since it collides ions at high kinetic energies into a high pressure region to dissociate the ions into daughter ions, which is in contrast to the invention which uses low kinetic energy ions and an

> increased pressure to produce an improved transmission of ions entering the device.

Request for Reexamination at 13. MDS identified similar distinctions for the Finnigan abstract, see id. at 15-16, the Finnigan paper, see id. at 18, and the Caldecourt article, see id. at 21-22.

3. PTO Proceedings

The PTO examiner granted MDS's reexamination request, stating that there "is a substantial likelihood that a reasonable examiner would consider these teachings important in deciding whether or not the claims are patentable." The PTO examiner discussed with particularity the relevance of the French application, the Finnigan abstract, and the Finnigan paper to the patentability of the claims of the '736 patent.

In an Office Action on February 3, 1998, the PTO examiner rejected all the claims of the '736 patent as obvious under paragraph 2 of 35 U.S.C. § 103(a). The examiner considered the structure disclosed in the French application and the voltage parameters disclosed in the Finnigan abstract and paper and concluded, "[i]t would have been obvious to a person having ordinary skill in the art to control the energies of the ions entering the French apparatus in accordance with the teachings of [the Finnigan abstract and paper] by providing DC voltage between the rods of the first quadrupole and the inlet wall."

On March 11, 1998, the PTO examiner met with Donald Douglas, inventor of the technology in the ’736 patent, to discuss the patentability of its claims. In his interview summary, the examiner indicated that he and Douglas reached agreement on all claims. He described that agreement as follows.

> Applicant could remove French et al. as a reference by establishing that the product of the pressure and length of the AC only quadrupole described in the reference when that quadrupole was used as a collision cell between two mass analyzing quadrupoles to fragment ions was not intended to be used when that quadrupole was used only as an ion guide and not to fragment the ions.

Thus, the examiner acknowledged the distinction between an ion guide and collision cell.

On April 30, 1998, MDS filed an Amendment to the ’736 patent to add new dependant claims 25-30, which will be discussed separately. The Amendment was accompanied by a declaration from Dr. French, the second inventor indicated on the ’736 patent and the inventor of the ’420 patent and the French European patent application. In that declaration, French recited the distinction drawn during the interview with Douglas. “The French application does not suggest that the recited pressure range and rod length may be used in a quadrupole section which acts as an ion guide and which is not intended to fragment the ions.”

On June 2, 1998, the PTO issued a final Office Action in which it stated that claims 1-24 of the ’736 patent were patentable, but rejected the new claims 25-30 as indefinite under paragraph 2 of 35 U.S.C. § 112. With respect to claims 1-24, the examiner stated that the “declaration of Dr. French filed on June 3, 1998 establishes that the apparatus disclosed in the French application does not operate with a product of pressure and rod length greater than or equal to 2.25 x 10^{-2} torr cm in a chamber containing a rod set operated with only AC voltages applied."

On August 12, 1998, MDS filed a Response After Final Office Action in which it submitted that claims 25-30 are patentable. The Response also listed further reasons, not cited by the examiner, why MDS believed claims 1-24 were not suggested by the French application. MDS listed the following four reasons why the French application did not suggest the claimed invention: "(1) the French application teaches away from the invention by suggesting that pressure be reduced in the first chamber, (2) the French application does not suggest the product of pressure and rod length in the first chamber, (3) the French application does not suggest collisional focusing, (4) the French application does not suggest improving the transmission of ions entering the first chamber."

Following further correspondence between the PTO and MDS, the PTO issued a Reexamination Certificate dated May 25, 1999 which confirmed the patentability of claims 1-24 and allowed claims 25-30.

E. The New Claims

As noted, the PTO examiner initially rejected all of MDS's new claims as indefinite under 35 U.S.C. § 112. Of the six new claims, claims 25 and 26 are dependant on claim 1 and the remainder are dependant on claim 14. Although neither party seeks construction of the terms in the new claims, Micromass argues that statements made during the prosecution of claims 25 and 26 are relevant to the construction of the terms "end to end" and "aligned" in claim 1. Claims 25 and 26 state:

> 25. The mass spectrometer system as set forth in claim 1, wherein a first longitudinal axis of the first rod set intersects a second longitudinal axis of the second rod set.
>
> 26. The mass spectrometer system as set forth in claim 1, wherein the first rod set is parallel to the second rod set.

The examiner stated that claim 25 was rejected because its new limitation, the intersection of the longitudinal axes of the rod sets, "contradicts the limitation set forth in parent claim 1 that the rods in each rod set 'define an elongated space . . . extending longitudinally though such rod set' and the two rod sets are located end to end with each other 'so that said first and second spaces are aligned.'" To make his point, he then posed the question, "[h]ow can the two longitudinal axes of the rod sets intersect if they are aligned?"

In the Response After Final Office Action filed by MDS on August 12, 1998, MDS sought to answer the examiner's question. It argued that the term "aligned" did not require alignment on one parallel axis:

> The use of the term "aligned" in claim 1, however, does not necessarily mean that the first and second rod sets are *parallel* to each other. Webster's Ninth New Collegiate Dictionary, for instance, defines "align" as "to bring into alignment" and also as "to be in or come into *precise adjustment or correct relative position*" (emphasis added). The term

> "alignment," moreover, is defined as "the act of aligning or state of being aligned, esp: the *proper positioning* or state of *adjustment of parts . . . in relation to each other."*

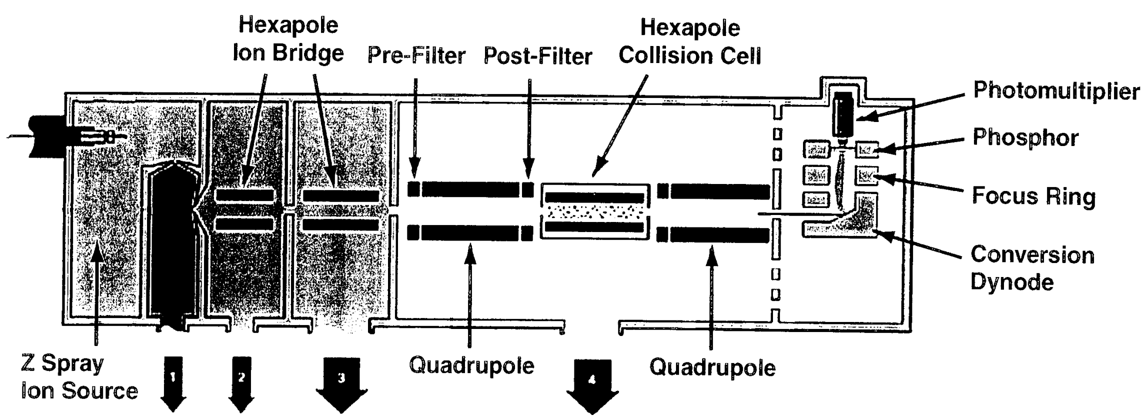
Response After Final Office Action, at 2 (emphasis added). After noting that the term "aligned" did not require the rod sets to be parallel, MDS argued that therefore the longitudinal axes of the rod sets "could be at an angle relative to each other while at the same time the first and second spaces are aligned to each other." Id. at 3. Alternatively, MDS argued that even if the longitudinal axes were parallel, the two axes would nonetheless "intersect" because "'intersect' can mean that the axes cross over each other or are parallel to each other." Id.

With respect to claim 26 and its requirement that the rod sets be parallel, MDS argued that it had established, in its discussion of claim 25, that the requirement that the first and second spaces be aligned did not require that the rod sets that define the spaces be parallel to one another. "Instead, the first space could be at an angle relative to the second space and the two spaces could be aligned by having the ends precisely located relative to each other so that their ends abut." Id. at 4. Therefore, MDS submitted that claim 26's limitation of parallel rod sets was not already part of claim 1 and could be patented.

On May 25, 2000, the PTO issued the Reexamination Certificate for the '736 patent allowing the new claims.

F. The Accused Product: The Quattro Ultima

AB/Sciex argues that Micromass's Quattro Ultima satisfies all of the claim limitations of at least claims 1 and 14 of the '736 patent. As noted, the Quattro Ultima is a tandem mass spectrometer that contains, among other structures, a quadrupole mass filter, then a collision cell (in this case, a hexapole collision cell), and another quadrupole mass filter. Those structures are shown in vacuum chamber 4 in the schematic below, which was furnished by Micromass as a simplified example of the Quattro Ultima's structure.



Ions enter the Quattro Ultima from a source and then enter an initial vacuum chamber (vacuum chamber 1). That vacuum chamber has an orifice in it, permitting ions and gas to flow into vacuum chamber 2, which contains what Micromass refers to a "hexapole ion bridge." AB/Sciex contends that the hexapole ion bridge is a set of AC-only rods and therefore is an ion guide satisfying the relevant claim limitations of the

’736 patent. It also claims that there is a DC voltage applied between the orifice of vacuum chamber 2 and the hexapole ion bridge. Next, ions pass through an orifice into vacuum chamber 3, which contains another hexapole ion bridge. Ions then pass through another orifice into vacuum chamber 4, which contains the aforementioned tandem mass spectrometer, including an AC-DC quadrupole mass filter, an AC-only hexapole collision cell, and another AC-DC quadrupole mass filter. After proceeding through the tandem mass spectrometer section of the Quattro Ultimata, the ions reach a detector.

In July 2001, Micromass replaced the hexapole ion bridges in vacuum chambers 2 and 3 with “ion tunnels.” An ion tunnel is a series of ring-shaped electrodes arranged so that ions travel through their empty center. AB/Sciex continues to contend that the post-July 2001 Quattro Ultima infringes the claims of the ’736 patent.

II. DISCUSSION

A. Basic Principles of Claim Construction

The construction of the claims in a patent is a matter left to the province of the court. Markman v. Westview Instruments, Inc., 517 U.S. 370, 391 (1996). In construing a patent’s claims, the court must begin with intrinsic evidence, such as the patent itself, the patent specification, and the prosecution history. “It is well-settled that, in interpreting an asserted claim, the court should look first to the intrinsic evidence of record, i.e., the patent itself, including the claims, the specification and, if in evidence, the prosecution history. Such intrinsic evidence is the most significant source of the legally operative meaning of disputed claim language." Vitronics Corp. v. Conceptronic, Inc., 90 F.3d 1576, 1582 (Fed. Cir. 1996). Among these types of intrinsic evidence, the court "look[s] first to the claim language itself to define the scope of the patented invention." Bell-Atlantic Network Servs., Inc. v. Covad Communications Group, Inc., 262 F.3d 1258, 1267 (Fed. Cir. 2001). The court must "give[] claim terms their ordinary and accustomed meaning as understood by one of ordinary skill in the art." Hockerson-Halberstadt, Inc. v. Avia Group Int'l, Inc., 222 F.3d 951, 955 (Fed. Cir. 2000). This requirement extends to technical terms, which must be furnished "the meaning that [they] would be given by persons experienced in the field of the invention, unless it is apparent from the patent and the prosecution history that the inventor used the term with a different meaning." Hoechst Celanese Corp. v. BP Chems. Ltd., 78 F.3d 1575, 1578 (Fed. Cir. 1996).

After looking to the patent claims themselves, the court considers the remaining intrinsic evidence presented, including the patent's specification and its prosecution history. Interactive Gift Express, Inc. v. CompuServe Inc., 256 F.3d 1323, 1331 (Fed. Cir. 2001). "If the claim language is clear on its face, then [the court's] consideration of the rest of the intrinsic evidence is restricted to determining if a deviation from the clear language of the claims is specified." Id. There are typically two such potential deviations. First, a patentee may choose to be his own lexicographer and use a claim term in the specification in a manner other than its plain and ordinary meaning. See Vitronics Corp., 90 F.3d at 1582. Second, the patentee may forfeit a particular construction if he or she "relinquished [a] potential claim construction in an amendment to the claim or in an argument to overcome or distinguish a reference." Elkay Mfg. Co. v. Ebco Mfg. Co., 192 F.3d 973, 979 (Fed. Cir. 1999).

After consideration of the plain and ordinary meaning of the claim limitations, the court considers the patent specification and prosecution history. Interactive Gift Express, Inc., 256 F.3d at 1332. The patent specification is helpful in construing claims because it is the patentee's written description of the invention. There are two general guidelines for the use of the patent specification: "(a) one may not read a limitation into a claim from the written description, but (b) one may look to the written description to define a term already in a claim limitation, for a claim must be read in view of the specification of which it is a part." Renishaw PLC v. Marposs Societa' per Azioni, 158 F.3d 1243, 1248 (Fed. Cir. 1998). The court may also consider the patent's prosecution history. "The prosecution history limits the interpretation of claim terms so as to exclude any interpretation that was disclaimed during prosecution." Southwall Techs. Inc. v. Cardinal IG Co., 54 F.3d 1570, 1576 (Fed. Cir. 1995). If, after consideration of the prosecution history and patent specification, "the meaning of the claim limitations is apparent from the totality of the intrinsic evidence, then the claim has been construed."

Interactive Gift Express, Inc., 256 F.3d at 1332.

"Only when the claim language remains genuinely ambiguous after consideration of the intrinsic evidence," may the court consider extrinsic evidence presented by the parties. Bell & Howell Document Mgmt. Prods. Co. v. Altek Sys., 132 F.3d 701, 706 (Fed. Cir. 1997). All evidence other than the claims themselves, the patent specification, and prosecution history is extrinsic evidence. There are few limits on the court's use of extrinsic evidence, but it is well-established that "extrinsic evidence may never be used 'for the purpose of varying or contradicting the terms in the claims.'" Interactive Gift Express, Inc., 256 F.3d at 1332 (citing Markman, 52 F.3d at 981).

B. "comprising"

AB/Sciex and Micromass dispute the construction of terms in the '736 patent's two independent claims, 1 and 14, for purposes of this Markman proceeding. Claims 1 and 14 both use the term "comprising" in their prefatory statements, before the claims go on to enumerate further claim limitations. AB/Sciex suggests that the court should define "comprising" as "including, but not limited to." Micromass does not disagree with AB/Sciex's proposed construction and admits that the term "comprising" permits the inclusion of additional elements beyond those recited, but argues that the court's construction of the term should not be used by AB/Sciex to evade the primary requirement of the term "comprising" – that the invention must include all enumerated claim limitations.

It is well-established that "'comprising' is a term of art used in claim language which means that the named elements are essential, but other elements may be added and still form a construct within the scope of the claim." Genentech, Inc. v. Chiron Corp., 112 F.3d 495, 501 (Fed. Cir. 1997); see also Phillips Petroleum Co. v. Huntsman Polymers Corp., 157 F.3d 866, 874 (Fed. Cir. 1998) ("The use of "comprising" and "which comprises" in the composition and process claims generally would mean that the claims require the presence of [the listed element], but that additional elements or process steps may be present."); Regents of Univ. of California v. Eli Lilly & Co., 119 F.3d 1559, 1572 (Fed. Cir. 1997) ("The word 'comprising,' as UC argues and as is well-established, permits inclusion of other moieties."); Moleculon Research Corp. v. CBS, Inc., 793 F.2d 1261, 1271 (Fed. Cir. 1986) ("In every case, the court has held that the open term 'comprising' does not exclude additional unrecited elements, or steps . . ."). Thus, "comprising" can neither narrow nor broaden the meaning of the claim limitations subsequently recited. It simply requires the presence of the enumerated claim limitations enumerated without prohibiting other unrecited elements, structures, or steps from being present in the invention. Because the court finds that AB/Sciex's construction of "including, but not limited to" is consistent with this well-understood construction of the term, the court hereby adopts that construction.

C. "first" and "second"

Claims 1 and 14 of the '736 patent use "first" or "second" to modify various claim elements, such as “vacuum chamber,” “rod set,” and “space.” The construction of “first” and “second” is important because the tandem mass spectrometer asserted as prior art is alleged to have elements similar to those in the ’736 patent, but in a different order of ion travel. The construction is also important because Micromass’s Quattro Ultima has an empty vacuum chamber before the hexapole ion bridge chamber alleged by AB/Sciex to be the “first vacuum chamber” in the ’736 patent. Thus, the construction of “first” and “second” could dictate which element must come first in the claimed invention and the order in which subsequent elements must follow.

Micromass proposes that the plain meaning of “first” is “preceding all others in time, order, or importance,” and the plain meaning of “second” is “next to the first in place or time.” Webster’s Ninth New Collegiate Dictionary 466, 1060 (1991). In the context of the ’736 patent therefore, “first” and “second” sets where each element is located in the path an ion travels in the device. For example, the “first vacuum chamber” must be “the very first vacuum chamber encountered by the ions” and “second vacuum chamber” must be “the very next vacuum chamber encountered by the ions.” In this way, Micromass contends “first” and “second” dictate the absolute position of each particular element in the device.

AB/Sciex proposes that “first” and “second” only identify separate, but distinct, elements. That is, the ’736 patent discloses two vacuum chambers and the terms “first” and “second” should be understood as separately identifying “a vacuum chamber” and "another distinct vacuum chamber," respectively, without specifying a particular order.

AB/Sciex's position that "first" and "second" do not establish positions in the claimed invention and are mere identifiers is premised on the following three arguments. First, AB/Sciex argues that it is well-established practice among the patentees to use "first" and "second" as identifiers of similar, but distinct, elements. It notes that numerous cases and treatises demonstrate that patent drafters use the terms "first" and "second" to identify separate elements. See, e.g., Envirco Corp. v. Clestra Cleanroom, Inc., 209 F.3d 1360, 1365-66 (Fed. Cir. 2000) (distinguishing "the 'second' from the 'first baffle means'"); Canon Computer Sys., Inc. v. Nu-Kote Int'l, Inc., 134 F.3d 1085, 1089-90 (Fed. Cir. 1998); Neomagic Corp. v. Trident Microsystems, Inc., 98 F. Supp. 2d 538, 544 (D. Del. 2000); Robert C. Faber, ed., Landis on Mechanics of Patent Claim Drafting, § 19, at III-16 (4th ed. 1999); 2 Irving Kayton et al., Patent Practice § 10.22 (f) (6th ed. 1998). None of the cases or treatises cited, however, state that "first" and "second" are *only* identifiers and that they do not also explain the position of elements. Indeed, most of the cases and treatises have no discussion of the meaning of "first" or "second," or the terms thereby modified, at all. Thus, it is not clear that patent drafters using "first" and "second" do not also intend to impart positional significance to those terms.

Second, AB/Sciex notes the claims state, for example, either "first and second vacuum chamber" or "*a* first rod set" and "*a* second rod set." The claims do not state "*the* first rod set" or "*the* second rod set." AB/Sciex argues that the because the claims do not use the definite article "the," the claims cannot be interpreted to mean "*the very* first rod set" or "*the very* next rod set." This argument is unpersuasive, however, because AB/Sciex does not explain how the use of either no article, the indefinite article "a," or the definite article "the" explains how "first" and "second" should be properly construed.

Looking only at these arguments, Micromass's reliance on the plain meaning of "first" and "second" might be persuasive. Were "first" and "second" merely identifiers, as AB/Sciex suggests, the drafters of the '736 patent could just as easily have said, for example, "a vacuum chamber" and "another vacuum chamber," or "vacuum chamber A" and "vacuum chamber B." Either would have identified separate vacuum chambers without also suggesting a positional hierarchy.

But relying on the plain meaning of "first" as "preceding all others in time, order, or importance" and the plain meaning of "second" as "next to the first in place or time" does not necessarily provide a correct construction of the use of those terms in the patent. Nowhere in the claims themselves is it stated that "first" must mean "preceding all other in the path of ion travel," as opposed to, for example, "preceding all others in importance." While the use of "first" and "second" in the patent is consistent with "first" and "second" in the path of a traveling ion, this construction is not required by the claims themselves. Therefore, Micromass's plain meaning argument does not necessarily support its contention that "first" and "second" establish the absolute position of the elements.

Importantly, Micromass's proposed construction of "first" and "second" as setting the absolute position of elements is inconsistent with one of the preferred embodiments in the specification. Were the court to adopt Micromass's position that "first" and "second" must mean "the very first" and "the very second," Figure 12 would be excluded from coverage under the claims. While Figure 1 of the '736 patent shows the more basic embodiment of the invention with only two vacuum chambers (30 and 38), Figure 12 presents a slight variation in which an empty vacuum chamber (70) is added, after the ionization chamber (16') but before the ion guide chamber (30'). If the term "first vacuum chamber" is construed to mean the very first vacuum chamber in the path of ions, the preferred embodiment in Figure 12 would be excluded from coverage by the claims because claim 1 requires "a first rod set in said first vacuum chamber." AB/Sciex correctly notes that a claim construction that excludes a preferred embodiment "is rarely, if ever, correct and would require highly persuasive evidentiary support." Vitronics Corp., 90 F.3d at 1583.

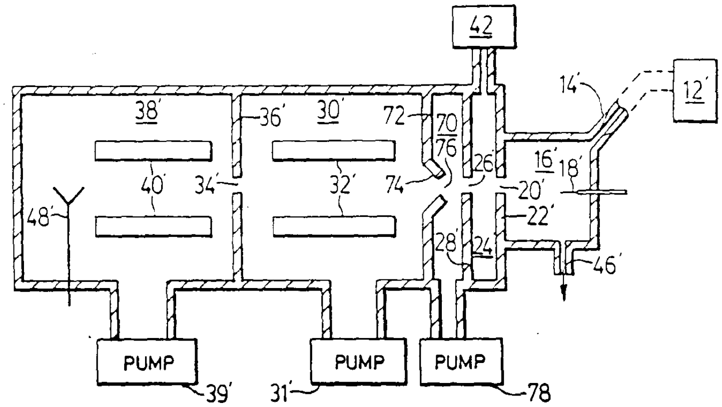


FIG. 12

Micromass argues that regardless of whether Figure 12 is covered by the claims, its construction is compelled by the prosecution history. See Elekta Instrument S.A. v. O.U.R. Scientific Int'l, Inc., 214 F.3d 1302, 1308 (Fed. Cir. 2000) (preferred embodiment may be excluded from patent's claims when patentee disclaimed the construction that would cover the embodiment). Micromass contends that when MDS distinguished the tandem mass spectrometer references during reexamination, it adopted a construction of "first" and "second" inconsistent with the position it now takes. As noted previously, ions traveling in a tandem mass spectrometer first encounter an AC-DC rod set in a low pressure vacuum chamber, then an AC-only rod set in a high pressure collision cell, and finally another AC-DC rod set in a low pressure vacuum chamber. In distinguishing this structure, MDS stated:

> The French application also differs from the system of the invention in other ways. For instance, whereas the *first* rod set in the invention receives essentially an AC-only voltage, the *first* section in the French application receives both AC and DC voltages. Whereas the *first* vacuum chamber of

> the invention has a product of its pressure with the length of the first rod set equal or greater than 2.25 x 10^{-2} torr cm, whereby the pressure is at least 1.5 millitorr for a 15 cm rod set, the *first* section in the French application states that the pressure must be maintained low, typically at 10^{-5} torr. Further, whereas the *second* rod set in the invention receives both AC and DC voltages to act as a mass filter, the *second* section in the French application receives an AC only voltage and is for inducing dissociation of ions. The *second* chamber of the invention is at very low pressure while the French application states that the pressure in the *second* section may be varied from 0.1 millitorr to 10 millitorr.

Request for Reexamination at 13-14 (emphasis added); see also id. at 16 (Finnegan abstract), 19 (Finnigan paper), and 21 (Caldecourt article). Because MDS distinguished the tandem references based on which elements were "first" and "second," Micromass argues that the correct meaning for those terms must be "preceding all other elements in the path of ion travel" and "next to the first element in the path of ion travel."

It is apparent from the manner in which MDS uses "first" and "second" in the above passage that it intended to refer to "first" and "second" in the path of ion travel relative to each other. If MDS were only using "first" and "second" as identifiers of separate elements, and not the order of those elements, MDS's distinction would fail because the mere presence of the elements, in any order, would satisfy the claim limitations. Indeed, MDS made clear that it was using "first" and "second" as positions in the order of ion travel in distinguishing the Finnigan abstract, another tandem mass spectrometer reference.

> The Finnigan abstract does not disclose or suggest that ions having a relatively low kinetic energy travel through an inlet orifice into a *first*

> vacuum chamber having a *first* rod set for receiving essentially only an AC voltage. The Finnigan abstract further does not disclose or suggest that ions then travel through an interchamber orifice to a *second* chamber having a *second* rod set receiving both AC and DC voltages.

Id. at 16 (emphasis added). From these statements, it is clear that MDS is relying on positional differences to distinguish the tandem references, and therefore disclaimed a more broad construction that the terms are mere identifiers of separate elements. In such cases, the Federal Circuit "has endorsed narrowing the interpretation of the claim to be consistent with a narrow claim scope urged by the applicant during the prosecution of the patent." Pall Corp. v. PTI Techs., Inc., 259 F.3d 1383, 1392-93 (Fed. Cir. 2001).

Although MDS disclaimed its proposed construction of "first" and "second" as mere identifiers, this "disclaimer" does not compel the court's adoption of Micromass's "absolute position" construction. AB/Sciex, in explaining its comments from the reexamination, set forth an alternative construction – that "first" and "second" only define where in the invention the element is located relative to the other listed element. That is, regardless of how many vacuum chambers and rod sets there might be in the structure and where they are, the invention only requires that "first" come before "second." Or, put simply, the ion guide elements must precede the mass filter elements. MDS did not disclaim this construction of "first" and "second" on reexamination and, in fact, its comments were consistent with this construction.

This "relative positioning" construction of "first" and "second" is persuasive because it would cover Figure 12. The existence of an empty vacuum chamber prior to the vacuum chamber containing the ion guide is immaterial to whether the "first vacuum chamber" claimed in the invention precedes the "second vacuum chamber" claimed in the invention. Thus, the court will construe "first" to mean "an element" and "second" to mean "an element coming after, in the path of ion travel, the first such element." This construction sets a relative relationship between the "first vacuum chamber" and "second vacuum chamber" consistent with the plain meaning of those terms and the reexamination history. The court does not believe that this construction reads the word "first" out of the claims. Rather, the court's constructions of "first" and "second" together establish the relative positions of those elements listed in the claims without regard to the existence or placement of similar elements not mentioned in the claims.

Therefore, the court finds that the construction of the terms "first" and "second" that best comports with the plain meaning of those terms, the patent's specification, and the reexamination history, is that they define the position, in the path of ion travel, of the elements in the invention relative to the similar elements also mentioned in the claims. Thus, "first" is construed to mean "an element." "Second" is construed to mean "an element coming after, in the path of ion travel, the first such element."

1. <u>"first vacuum chamber" and "second vacuum chamber"</u>

Consistent with the court's conclusion, it will further define the specific applications of "first" and "second" in the various elements. The court construes "first vacuum chamber" as "a vacuum chamber." The court construes "second vacuum chamber" as "a vacuum chamber coming after, in the path of ion travel, the first vacuum chamber." The parties agree that the term "vacuum chamber" means a chamber held at a pressure lower than atmospheric pressure.

2. "first rod set" and "second rod set"

The court construes "first rod set" as "a rod set." Similarly, the court construes "second rod set" as "a rod set coming after, in the path of ion travel, the first rod set."

Other than the adjective "first," Micromass raises two additional limitations that it argues are in the term "rod set." First, Micromass argues that "rod set" must be comprised of just that – rods – and that other shapes of electrodes, such as the rings of the latest Quattro Ultima design, cannot infringe the claims. It maintains that MDS, in distinguishing the ion trap references that use AC-only voltage during reexamination, disclaimed that the term "rod set" permits anything other than "rods." AB/Sciex agrees, but believes such a construction by the court to be unnecessary because "a rod is a rod." The court agrees and believes the proper construction of rod to be self-evident.

Micromass also contends that the "rod set" must be arranged as a quadrupole. It notes that the patent specification repeatedly refers to the arrangement of rods as a quadrupole in the preferred embodiment. See '736 Patent, Col. 4, ln. 21-23. Nowhere, however, do the claims of the '736 patent use the word quadrupole. Instead, claim 1 only requires "a plurality of elongated parallel rod means spaced laterally apart a short distance from each other." Claim 14 has a similar requirement. It is well-established that limitations not existing in the claims cannot be imported from specification. See Dayco Prods., Inc. v. Total Containment, Inc., 258 F.3d 1317, 1326 (Fed. Cir. 2001) ("although we construe claims in light of the teaching of the specification, we do not treat characteristics of a preferred embodiment as claim limitations"). Thus, the court finds that the term "rod set" in the claims of the '736 patent require only a plurality, meaning two or more, of rods in each rod set and do not require a quadrupole.

3. "first space" and "second space"

Claim 1(c) of the '736 patent discusses a space within each vacuum chamber and rod set such that "each rod set comprising a plurality of elongated parallel rod means spaced laterally apart a short distance from each other to define an elongated space therebetween extending longitudinally through such rod set." The preamble of claim 14 is similar. The court construes "first space" in both claims as "a space." Similarly, the court construes "second space" in both claims as "a space coming after, in the path of ion travel, the first space."

D. "inlet orifice"

Claim 1(a) of the '736 patent requires "first and second vacuum chambers separated by a wall, said first vacuum chamber having an inlet orifice therein." Claim 14(b) requires the "directing said ions through an inlet orifice in an inlet wall into said first space." Micromass contends that because the claims require that the inlet orifice must be in the first vacuum chamber, the inlet orifice must be the beginning of that part of the mass spectrometer held below atmospheric pressure. Put differently, Micromass is relying on its interpretation of “first vacuum chamber” as “the vacuum chamber proceeding all other vacuum chambers,” and arguing that because the inlet orifice must be the inlet to the first vacuum chamber and because the first vacuum chamber must be the first chamber held below atmospheric pressure, the inlet orifice must be the inlet to the first chamber held below atmospheric pressure.

AB/Sciex contends that the term “inlet orifice” refers to “an orifice that provides an inlet into the claimed first vacuum chamber for the passage of ions and neutral gas molecules.”

Micromass’s proposed construction is unconvincing because it is premised upon its construction of “first vacuum chamber,” which has been rejected by the court. Essentially, Micromass seeks a definition of “inlet orifice” such that if an empty vacuum chamber were to precede the ion guide (as in the Quattro Ultima), the “first vacuum chamber” could not possess both an inlet orifice and a rod set, as required by the claims of the patent. But the court has construed “first vacuum chamber” to mean “a vacuum chamber.” Therefore, the ion guide vacuum chamber can be the “first vacuum chamber” and any preceding vacuum chamber does not alter this result. Thus, the “inlet orifice” to the “first vacuum chamber” need not be the entrance to the first chamber held at less than atmospheric pressure. Instead, the court will adopt AB/Sciex’s proposed construction, which is consistent with the court's earlier construction of "first" and "second."

E. "separated by a wall" and "interchamber orifice"

Claim 1(a) describes "first and second vacuum chambers separated by a wall." Claim 1(d) then requires "an interchamber orifice located in said wall and aligned with said first and second spaces so that ions may travel through." Similarly, the preamble in claim 14 describes "first and second spaces . . . separated by an interchamber orifice so that an ion may travel through said first space, said interchamber orifice and said second space . . ." Thus, while claim 14 does not identify the wall discussed in claim 1, it does identify the interchamber orifice separating the first and second spaces.

Micromass's proposes a construction of "separated by a wall" and "interchamber orifice" that would require the wall and interchamber orifice to join or link the two vacuum chambers and spaces. In support of this construction, Micromass points to Figures 1 and 12 and notes that in both there is only a solitary wall and interchamber orifice dividing the two vacuum chambers and spaces. Micromass also notes that the description of Figure 1, which states, in part, "[t]he vacuum chamber 30 is connected by an interchamber orifice 34 in a separator plate 36 to a second vacuum chamber 38 pumped by a vacuum pump 39." Noting the specification's use of the term "connected" to describe the interchamber orifice, Micromass maintains that wall and interchamber orifice must "join or link together" the two structures.

AB/Sciex contends that "separated by a wall" should be construed to mean only that “there is at least a wall between the first and second vacuum chambers” and that “interchamber orifice” should be construed to mean “an orifice in a wall that is between the first and second vacuum chambers.” It criticizes Micromass’s proposed construction because by requiring that the wall and interchamber orifice to join or link the two vacuum chambers or spaces, Micromass would be creating a requirement that no other structure, such as the multiple walls between vacuum chambers in the Quattro Ultima, be between the “first vacuum chamber” and the “second vacuum chamber.”

AB/Sciex’s proposed construction is well-founded. Claim 1 requires only that the first and second vacuum chambers be separated by a wall with an interchamber orifice. Because the claim uses the term “comprising,” other structures may be present between the two vacuum chambers at well. See Genentech, Inc. v. Chiron Corp., 112 F.3d 495, 501 (Fed. Cir. 1997) (“‘Comprising’ is a term of art used in claim language which means that the named elements are essential, but other elements may be added and still form a construct within the scope of the claim.”). Similarly, claim 14 requires only that an interchamber orifice separate the first and second spaces and it does not preclude other structures separating those spaces. Micromass’s proposed construction ignores this ordinary reading of the claims and relies on the embodiments shown in the specification. The court will not import limitations existing only in the patent specification into the claims themselves. See Comark Communications, Inc. v. Harris Corp., 156 F.3d 1182, 1186 (Fed. Cir. 1998) (“limitations from the specification are not to be read into the claims"). Thus, the court will adopt AB/Sciex's proposed construction of "interchamber orifice" and "separated by a wall."

F. "so that ions may travel through said inlet orifice, through said first space, through said interchamber orifice, and through said second space" and "so that an ion may travel through said first space, said interchamber orifice and said second space"

Claim 1(d) contains the phrase "so that ions may travel through said inlet orifice, through said first space, through said interchamber orifice, and through said second space." Claim 14 similarly traces the path of the ions in its preamble. It states "so that an ion may travel through said first space, said interchamber orifice and said second space." Claim 14(b) similarly recites "directing said ions through an inlet orifice in an inlet wall into said first space, first through said first space, said interchamber orifice and then through said second space . . . ."

AB/Sciex seeks a construction of these phrases that would not exclude the addition of other unlisted structures through which the ions travel. It notes that the preambles of both claim 1 and 14 include the term "comprising," thereby indicating the necessity of the listed elements but not the exclusion of others. See Genentech, Inc., 112 F.3d at 501. Micromass contends otherwise, but relies on the meaning of "aligned" of "end-to-end" in the phrases immediately prior to those recited above in support of its argument. Thus, the court finds that plain meaning of the phrases recited above is that the ions must pass through each of the recited elements, but may also pass through additional structures.

G. “located end to end” and “aligned”

Claim 1(c) requires that “said first rod set being located end to end with said second rod set so that said first and second spaces are aligned.” Claim 1(d) also uses the term “aligned” and requires “an interchamber orifice . . . aligned with said first and second spaces.” Claim 14’s preamble similarly requires “first and second rod sets each comprising a plurality of rod means and defining longitudinally extending first and second spaces respectively located end-to-end with each other . . . .” The parties agree that because the first and second spaces are defined by area of the first and second rod sets, respectively, the terms “located end to end” and “aligned,” as used in claim 1, are related. The court will therefore address them concurrently.

Micromass’s proposed construction of “located end to end”[1] is “characterized by having the end of one object placed against the end of another.” This construction of “located end to end” is described by Micromass as consistent with the plain meaning of “end to end.” Its proposed construction of “aligned” is similar. Micromass argues that “aligned” must mean that the end of the first rod set or space is placed at or near the end of the second rod set or space so that the two abut. According to Micromass, this construction of “aligned” is required by the prosecution history of amended claims 25

[1]Neither party attaches significance to the fact that “end-to-end” in claim 14 is hyphenated and “end to end” in claim 1 is not.

and 26. Given these constructions, it is Micromass's argument that claim 1(c) and 14 would not be infringed if another structure separated the rod sets or spaces because the additional structure would prevent the rod sets or spaces from being "end to end" or "aligned."

AB/Sciex contends that "located end to end" and "aligned" do not prohibit the use of other intervening structures. The proper construction of "located end to end," according to AB/Sciex, is defined in functional terms by the claim itself as "so that first and second spaces are aligned." This is consistent, AB/Sciex explains, with the claim's recitation of the path of ions "through said inlet orifice, through said first space, through said interchamber orifice and through said second space." '736 Patent, Claim 1(d). AB/Sciex goes on to define "aligned" as requiring only that ions travel on the specified path.

AB/Sciex argues that Micromass's plain meaning arguments have no support in the patent itself. It contends that nowhere does the patent specification require that the two spaces or rod sets be adjoining or near one another, only that they be near enough to accomplish the patent's function of permitting an ion stream to proceed from the first rod set and space to the second rod set and space. Furthermore, AB/Sciex notes that the patent claims themselves require a wall and interchamber orifice between the rod sets and spaces, thereby proving that they need not abut.

As Micromass asserts, "end to end" is defined as "characterized by having the end of one object placed against the end of another." Webster's Third New International Dictionary, Unabridged 750 (1986). AB/Sciex does not propose an alternative construction, but rather argues that "end to end" only means "that the first and second spaces are aligned." Were the court merely evaluating which of these two constructions is most likely to be the plain meaning of "end to end," it would choose Micromass's proposed construction. But "end to end" is used in the context of the overall structure of claim 1. Thus, AB/Sciex responds to this "plain meaning" argument by noting that claim 1 requires a wall (36) that divides the two vacuum chambers (30 and 38), thereby preventing the rod sets (32 and 40) from being strictly "end to end," as Micromass suggests. This argument is a convincing rejoinder to Micromass's proposed construction. If the rod sets are separated by a wall, as required by claim 1(a), the end of the first rod set cannot be placed against the end of the second rod set. Similarly, in claim 14, the spaces described as "end to end" terminate at the end of each rod and are then separated from each other by an interchamber orifice. Thus, the two spaces cannot abut ends.

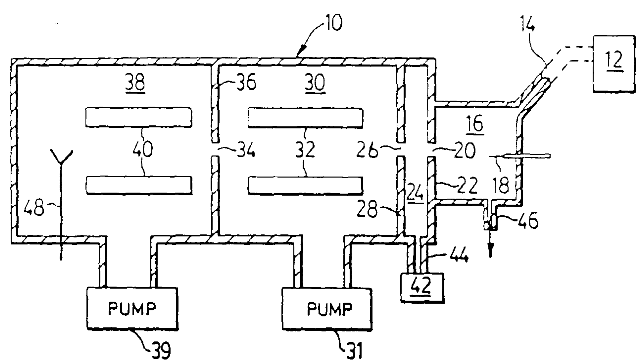


FIG.1

In further support of its argument that "end to end" means only that the first and second spaces are aligned and not adjacent, AB/Sciex points to Figures 1 and 12 in the patent specification, which not only show a wall (36) with interchamber orifice between the two rod sets (32 and 40), but also an undefined amount of space. Moreover, the initial description of the structure of the invention states that there must be "a first rod set in said first vacuum chamber extending along at least a substantial portion of the length of said first vacuum chamber," thereby explaining that the inventors did not believe the first rod set (32) was required to extend to the end of the first vacuum chamber (30). '736 Patent, Col. 1, lnn 63-65. AB/Sciex argues that the specification therefore contradicts Micromass's construction that the rod sets in claim 1 must be end to end.

Turning for a moment to the meaning of "aligned," it is readily apparent that construing the meaning of this term is not as difficult as "end to end." "Align" is defined as "to bring into line or alignment," or "to be in or come into precise adjustment or correct relative position." Webster's Ninth New Collegiate Dictionary 70 (1991). Nothing in the claims of the patent or the specification indicates that the claims use "aligned" any differently than its traditional definition.

Micromass's position is thus a tenuous one. While it argues that "end to end" must mean that the ends of the elements are abutting, that construction of the term would seem to conflict with both the other terms of the claim and the patent specification. And while it asserts that "aligned" must mean that the end of the first rod set or space are placed at or near the end of the second rod set or space, the plain and ordinary meaning of "aligned" would appear only to require the elements be in precise adjustment or correct relative position.

Lacking other support, Micromass argues that the prosecution history of claims 25 and 26 support its proposed construction of "end to end" and "aligned." In rejecting claim 25, which added to claim 1 a limitation that the longitudinal axes created by the rod sets intersect, the PTO examiner took the position that "if the two rod sets are aligned, they are by definition parallel." The PTO examiner used the same reasoning to reject claim 26, which added a limitation that the longitudinal axes created by the rod sets be parallel. In distinguishing the limitations of claim 25 and 26 from the requirements of claim 1, MDS argued that "aligned" meant only that the elements "be in or come into *precise adjustment* or *correct relative position*." (citing Webster's Ninth New Collegiate Dictionary). Response After Final Office Action, 2. Therefore, AB/Sciex argued, the longitudinal axes of the rod sets (32 and 40) and the spaces they define could be aligned and at the same time either be non-parallel and intersect (claim 25) or be parallel (26). Micromass focuses on a statement made by MDS while making this argument. MDS stated, "[t]he first and second spaces, for instance, may be 'aligned' when an end of the first space terminates *near* an end of the second space whereby ions can travel through the first rod set and into the second rod set." Id. at 3 (emphasis added). MDS also stated, "the first space could be at an angle relative to the second space and the two spaces could be aligned by having the ends precisely located relative to each other *so that their ends abut*." Id. at 4 (emphasis added).

Micromass argues that because MDS made these statements in arguing the definition of "aligned," and because "aligned" and "end to end" are related terms, both claims should be construed to require that the rods or spaces be near or abut. This argument is unpersuasive. First, in explaining the meaning of "aligned," AB/Sciex was not commenting on the meaning of "end to end," and thus it cannot be said that the prosecution history supports Micromass's proposed construction of that term. Second and more important, MDS did not disclaim any particular construction of "aligned" by making these statements. Indeed, it introduced each of the sentences that Micromass relies upon with language such as "for instance, may be . . ." and "could be." MDS was not describing the meaning of "aligned," but instead was describing how its invention might be structured if it were to use non-parallel rod sets. MDS never asserted that "abutting" rod sets and spaces was how the claims had to be construed. The court therefore does not find MDS disclaimed any particular construction of "end to end" or "aligned" in its prosecution history.

The court will therefore adopt AB/Sciex's proposed construction of "aligned." Micromass's proposed construction of the term lacks support in the claims themselves, the specification, or the prosecution history. In contrast, AB/Sciex's proposed construction, also explained during the prosecution of dependent claims 25 and 26, is consistent with the plain meaning of that term – "being in or coming into precise adjustment or correct relative position."

The proper construction of "end to end" presents a more difficult question because its dictionary definition is contrary to the other claim limitations and the specification, which both show structures between the elements described as "end to end." But the correct construction of "end to end" is revealed by the claims, which require only that ions move "through" the elongated spaces formed by the rods. Indeed, the claims describe the transmission of ions from the inlet orifice, through the first space created by the first rod set, through the inlet orifice, and through the second space created by the second rod set. Thus, the claims adopt a functional description of the path of the ions that takes the ions longitudinally from one elongated space and through the next. Claims 1 and 14 do not require that the axes of the rod sets be parallel or on the same axis, only that the ions travel in this manner successfully. The prosecution history of dependant claim 25 even suggests that the longitudinal axes of the two rod sets in claim 1 might be both non-parallel and intersecting and still accomplish this function. Because functionality, and not any particular angle or distance is required by the claims, the court will therefore adopt AB/Sciex's proposed construction of "end to end" – that the rod set (Claim 1) or space (claim 14) must be arranged in a manner that ions may be successfully transmitted from the end of the first rod set or space to the end of the second rod set or space.

H. "ions of a trace substance to be analyzed"

Claim 1(b) requires a "means for generating ions of a trace substance to be analyzed." Claim 14(a) requires "producing . . . ions of trace substance to be analyzed." The parties disagree on the proper construction of "ions of a trace substance to be analyzed." Micromass proposes that the phrase be construed so that "to be analyzed" modifies "ions." This construction would require that the claimed invention generate or produce the same ions it will analyze.

AB/Sciex argues that the proper construction of the phrase is that "to be analyzed" modifies its direct predecessor – "trace substance." That is, the claimed invention need only analyze the trace substance by generating or producing ions of it. It contends that Micromass's proposed construction is motivated by an attempt to use the Quattro Ultima's collision cell to avoid infringement. Because the collision cell dissociates ions into daughter ions, it is suggested by AB/Sciex that the Quattro Ultima does not analyze the same ions it generated or produced.

The court agrees with AB/Sciex that the phrase "to be analyzed" modifies the term "trace substance" and not "ions." This is the most plain and ordinary meaning of the phrase because "to be analyzed" directly follows "trace substance," and not "ions." Moreover, were the court to look to other intrinsic evidence, AB/Sciex's construction is consistent with the patent specification. The first two sentences in the section entitled "Background of the Invention" state: "Mass spectrometry is commonly used to *analyze* *trace substances.* In such analysis, firstly ions are produced from the *trace substance to be analyzed*." '736 Patent at Col. 1, ln. 15-17 (emphasis added). While the analysis of ions is a necessary component of analyzing the trace substance, the claims of the '736 patent do not require that the ions generated or produced by the invention be what is finally analyzed. Rather, claims 1(b) and 14(a) do require that the trace substance be analyzed.

I. Does claim 1(d) or claim 14(a) require that the invention not dissociate ions?

Along the same lines, Micromass argues that claims 1(d) and 14(a), taken as a whole, require that: (1) "the device or method practicing the invention not contain a collision cell," (2) "the device or method practicing the invention not intentionally generate any daughter ions in the first space," and (3) "the device or method practicing the invention operate such that ions generated in the source travel intact (*i.e.*, without dissociation) to the detector." Again, this claim construction issue is relevant to whether the Quattro Ultima, with its collision cell, can infringe.

With respect to claim 1(d), Micromass notes that it describes how "ions travel through said inlet orifice, through said first space, through said interchamber orifice, and through said second space." Those ions, Micromass asserts, must be the same as those discussed in claim 1(b), which discusses the "means for generating ions of a trace substance . . . and for directing said ions through said inlet orifice into said first vacuum chamber." Thus, Micromass concludes that claim 1(d) describes a particular passageway of ion travel and because no fragmentation of ions is taught and no collision cell is described as part of that path, any device that fragments ions or contains a collision cell cannot infringe. It finds support for this construction in the prosecution history; particularly, the extensive comments made by MDS to distinguish the tandem mass spectrometer's use of a collision cell to fragment ions.

The court disagrees with Micromass's proposed construction. As noted previously, claim 1(d)'s discussion of the pathway of ions does not preclude the presence of other structures because claim 1 uses the term "comprising" to introduce elements. See supra at 27. Moreover, nothing in claim 1(d) mentions a collision cell or ion dissociation. Thus, there is no basis for incorporating the limitations Micromass suggests into that claim. Furthermore, the prosecution history is unhelpful to Micromass on this point. Micromass has not shown that AB/Sciex is proposing a construction that was disclaimed by MDS during the reexamination. See Southwall Techs., Inc., 54 F.3d at 1576 ("The prosecution history limits the interpretation of claim terms so as to exclude any interpretation that was disclaimed during prosecution."). During reexamination, MDS distinguished the proposed invention from a collision cell. It did not state that the claims require that *no* collision cell exist in a mass spectrometer that uses the claimed invention. Again, the claim's use of the term "comprising" indicates that other structures might exist in addition to that which was claimed.

The claim limitation in 14(b), however, presents a different situation. It uses a phrase in describing the pathway of ions that claim 1 lacks. After remarking in claim 14(a) that the ions are produced outside the first chamber, claim 14(b) states "directing said ions through an inlet orifice . . . and then through said second space, and then *detecting the ions which have passed through said second space to analyze said substance*." (emphasis added). This last phrase requires that the ions produced outside the first chamber later be detected for analyzing the substance. This claim language appears to support only the last of Micromass's three proposed constructions, that "the device or method practicing the invention operate such that ions generated in the source travel intact (*i.e.*, without dissociation) to the detector." But to say that the claim requires that ions travel without any dissociation, however, is to construe claim 14(b) too broadly. Claim 14(b) requires only that ions produced outside the first chamber and travel through the first and second spaces also be detected in order to analyze the trace substance. The claim says nothing about dissociation, only that the ions travel the specific path.

In summary, the court does not construe claim 1(d)'s recitation of the path of ions "through said inlet orifice, through said first space, through said interchamber orifice, and through said second space" to include any of the three limitations suggested by Micromass. With respect to claim 14(b),however, the clause "directing said ions through an inlet orifice . . . and then through said second space and then detecting the ions which have passed through said second space to analyze said substance" requires that ions produced outside the first chamber and that travel through the first and second spaces also be detected in order to analyze the substance.

J. “means . . . for directing said ions through said inlet orifice into said first vacuum chamber”

Claim 1(b) states: “means . . . for directing said ions through said inlet orifice into said first vacuum chamber.” This is a means-plus-function limitation governed by paragraph 6 of 35 U.S.C. § 112. Section 112 requires that when, “[a]n element in a claim for a combination [is] expressed as a means or step for performing a specified function without the recital of structure, material, or acts in support thereof,” the court shall construe that claim “to cover the corresponding structure, material, or acts described in the specification and equivalents thereof.” Id. Accordingly, means-plus-function limitations are to be construed in two steps. The court must first identify the function claimed and then identify the corresponding structure, material, or acts described in the patent specification. See Lockheed Martin Corp. v. Space Systems/Loral Inc., 249 F.3d 1314, 1324 (Fed. Cir. 2001). Neither party in this case disputes that the function claimed in claim 1(b) is “directing said ions through said inlet orifice into said first vacuum chamber.” Nor do the parties disagree that one of the structures identified in the specification to accomplish this function is the DC potential voltage applied between the inlet orifice (26) and the first rod set (32) in the first vacuum chamber (30). The ’736 patent specification recites, in referring to Figure 1, that “[i]ons produced in the ionization chamber 16 are drifted by appropriate DC potentials on plates 22, 28 and on the AC-only rod set 32 through opening 20 and orifice 26," into the first vacuum chamber. '736 Patent, Col 4, ln. 38-41.

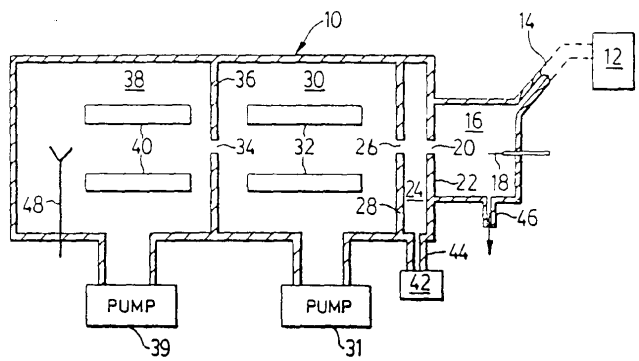


FIG.1

The parties disagree, however, whether the patent specification also identifies, with sufficient particularity, the differential in pressure on either side of the inlet orifice as another structure for accomplishing the function recited in claim 1(b). To evaluate this claim, the court must read the specification "as a whole to determine the structure capable of performing the claimed function." Budde v. Harley-Davidson, Inc., 250 F.3d 1369, 1379 (Fed. Cir. 2001). Read as a whole, the specification contains many references to the pressure differential on opposite sides of the inlet orifice. It notes that the ionization chamber (16) "is maintained at approximately atmospheric pressure." '736 Patent, Col. 4, ln. 13-14. Next to the ionization chamber is the curtain gas chamber (24), into which an inert gas, such as nitrogen, argon, or carbon dioxide is supplied, which has the effect of "preventing air and contaminants in the ionization chamber from entering the vacuum system." Id. at ln. 29-36. Furthermore, the specification describes how "[t]he curtain gas flows through orifice 26 [the inlet orifice] into the first vacuum chamber 20." Id. at ln. 32-33. The comparatively lower pressure achieved by the vacuum pump (31) in the first vacuum chamber (30) is discussed ubiquitously in the patent and is recited at various levels significantly less than atmospheric pressure, including 2.4, 5.6, and 8.6 millitorr. See, e.g., id. at Col 8, ln. 45. Thus, it is clear from the patent specification that a pressure differential exists between curtain gas chamber (24) and the first vacuum chamber (30) and that this pressure differential causes the curtain gas to flow through the orifice (26). The question presented is whether this description of the structure satisfies the requirements of § 112.

Micromass argues that while the specification does disclose the structure, the patent nowhere relates this structure to the function recited in claim 1(b). It contends that the definiteness standard of § 112 requires that the specification expressly link a structure to the function recited in the claim. "This duty to link or associate structure to function is the *quid pro quo* for the convenience of employing § 112." B. Braun Med., Inc. v. Abbott Labs., 124 F.3d 1419, 1424 (Fed. Cir. 1997) (emphasis in original). Micromass concludes that the pressure differential cannot be a corresponding structure for the means-plus-function limitation in claim 1(b) because the pressure differential, while noted in the specification, is not clearly linked or associated with the function of ion transmittal through the inlet orifice. See Budde, 205 F.3d at 1377 (noting the "duty to clearly link or associate structure to the claimed function").

Thus, Micromass does not present a position on claim construction per se, but seeks to argue claim 1(b) reveals no clearly linked structure and is therefore indefinite and cannot be construed. Because the structure is evident from the specification and Micromass's only argument is that it is not clearly linked to the function, the court will assume, for purposes of claim construction, that the claims satisfy § 112.

AB/Sciex responds that while there is no express statement in the specification by which the pressure differential is identified as accomplishing the movement of ions into the first vacuum chamber, no such express statement is required. Instead, the court must determine whether one skilled in the art would have understood that the pressure differential disclosed was a "structure capable of performing the function recited in the claim limitation." Id. at 1382. "Whether or not the specification adequately sets forth structure corresponding to the claimed function necessitates consideration of that disclosure from the viewpoint of one skilled in the art." Id. at 1376. AB/Sciex notes that its expert, Dr. Christie G. Enke, has declared that it is his "opinion that the '736 patent shows that pressure differentials created by pumps are used to direct the flow of ions and neutral molecules from an area of relatively high pressure to an area of low pressure." Expert Report of Dr. Christie G. Enke, at 16.

Micromass has not presented evidence that Dr. Enke's opinion on this matter is incorrect and that, in truth, one skilled in the art would not have known that differences in pressure would transmit ions. Rather, Micromass makes two arguments. First, it takes the position that "[b]ecause the specification does not link differential pumping with the function of directing ions through the inlet orifice – let alone link them 'clearly' as required by Federal Circuit precedent – it is not 'means' within the scope of Claim Element 1(b) regardless of whether it is well-known to one skilled in the art." Defendant's Answering Br. at 28. That is, Micromass argues that if there is no express link between the structure of the invention and the function identified, regardless of whether this link would have been evident from the specification to one skilled in the art, the structure does not satisfy § 112. None of the precedent cited by Micromass supports this position. See Lockwood v. American Airlines, Inc., 107 F.3d 1565, 1571-72 (Fed. Cir. 1997); In re Donaldson Co., 16 F.3d 1189, 1195 (Fed. Cir. 1994). Instead, the requirement that the court view the specification from the perspective of one skilled in the art is clearly established. See Budde, 205 F.3d at 1376.

Second, Micromass asserts that it is inappropriate to resort to Dr. Enke's report because it is extrinsic evidence and no party has indicated that claim 1(b) suffers from an ambiguity. This is incorrect. Because the court must furnish technical terms in the patent the meaning given by those skilled in the art, see Hoechst Celanese Corp., 78 F.3d at 1578, it cannot ignore assertions of what would be known to one skilled in the field of the invention.

Thus, the court finds that one of the functions disclosed in the means-plus-function limitation in claim 1(b) is “directing said ions through said inlet orifice into said first vacuum chamber” and that the specification contains two structures that accomplish the described function: (1) the DC potential voltage between the inlet orifice and the AC-only rods; and (2) the pressure differential between the chamber preceding the first vacuum chamber and the first vacuum chamber.

K. “guide ions through”

Claim 1(e), which describes the working of the invention’s ion guide, states: “means for applying essentially an AC-only voltage between the rod means of said first rod set so that said first rod set may guide ions through said first space.” Claim 14(c) similarly states: “placing an essentially AC-only RF voltage between the rod means of said first set so that said first rod set acts to guide ions therethrough.” RF stands for “radio frequency and is another way of describing an alternating current. The parties dispute the proper construction of “guide ions through.”[2]

Micromass contends that the ordinary meaning of “through” is “a function word that indicate[s] movement into at one side or point and out at another and especially the opposite side of” or “to indicate passage from one end or boundary to another.” Thus, it concludes that “guide ions through” requires that the first rod set (1) guide ions all the

[2]The parties treat “guide ions through” and “guide ions therethrough,” for purposes of this construction, interchangeably.

way from the beginning to the end of the first space, (2) without ever trapping or storing them for a period of time. Micromass argues that this construction is supported by an argument MDS made to distinguish its claimed invention from one of the ion trap references it presented on reexamination.

AB/Sciex contends that "guide ions through" means only what it says – ions must be guided through the first space by the ion guide. It argues that Micromass's construction creates two claim limitations unsupported by the claims themselves. Those two limitations are (1) the requirement that *all* ions enter and exit the ion guide, and (2) that the ions must be guided without ever trapping or storing them for any period of time. AB/Sciex argues that the first of these requirements is rebutted by the specification, which notes that the maximum percentage of ions transmitted through the ion guide using various orifice sizes and pressures was 90%. See '736 Patent at Col. 7, ln. 10-66. The second of these requirements, AB/Sciex argues, has no basis in the plain meaning of the claims and is not required by statements MDS made during the prosecution history.

Reading the claims alone, it is apparent that the term "guide ions through" does not require the successful transmission of all ions or limit the amount of time permitted to do so. It is uncontested that "through" is defined as "indicate[s] movement into at one side or point and out at another and esp[ecially] the opposite side of." Webster's Ninth New Collegiate Dictionary 1230 (1991). No part of this definition, however, requires the transmission of all ions or sets any restriction on how long the movement of ions can take. Indeed, the only limitation on the number of ions guided through the ion guide is the fact that "ions" is plural and therefore there must be two or more.

Lacking textual support for its two limitations in the claims themselves, Micromass points to statements made by MDS in distinguishing the ion trap references during reexamination. While discussing the Schaaf article, MDS described the working of an ion trap by stating, "[w]ith an ion trap, ions of a selected range of mass to charge ratios are trapped or stored for a period of time (which can be quite lengthy) due to electric fields generated with electrodes." Request for Reexamination at 6. In contrast, MDS argued that the claimed invention had an entirely different structure than an ion trap and stated that the "first rod set receives essentially only an AC voltage so that ions are guided through the first vacuum chamber without being trapped there." Id. at 7. Micromass argues that this statement is an admission that the ion guide does not trap ions for any length of time and that this admission must narrow the court's construction of "guide ions through." Understood in context, the distinction drawn by MDS was not that ion guides do not trap ions for any length of time and ion traps do. Rather, MDS argued that ion traps are designed to trap the ions of interest for further analysis, while the ion guide is designed to transmit the ions of interest for further analysis. Moreover, MDS did not state that *all* ions are guided through the first vacuum chamber without being trapped there, it only said that ions are guided without being trapped in the first vacuum chamber. Thus, it is inappropriate to find in this statement an admission that the claim's limitation that the invention "guide[s] ions through" requires that *all* ions be guided through. The court finds that MDS did not disclaim a broad interpretation of "guide ions through" by distinguishing the ion trap reference in the Schaaf article.

The court will therefore adopt AB/Sciex's proposed construction that the term "guide ions through" means simply that ions must be guided through the first space by the AC-only voltage between the rod means. The court will not adopt a more narrow construction of the phrase to require either that all ions be transmitted through the ion guide or that the ion guide not trap or hold any ions for any length of time.

L. <u>"means for flowing gas" and "admitting a gas into said first chamber with said ions"</u>

Claim 1(g) requires "means for flowing gas through said inlet orifice into said first space." This claim is means-plus-function limitation governed by paragraph 6 of 35 U.S.C. § 112. Claim 14(e) requires "admitting a gas into said first chamber with said ions."

The function disclosed in claim 1(g) is apparent and agreed by both parties. Claim 1(g)'s function is to "flow[] gas through said inlet orifice into said first space." Where the parties depart is in construing the corresponding structure. Micromass describes the corresponding structure as the curtain gas source (42) that introduces an inert curtain gas into a chamber (24), and which then flows into both the first vacuum chamber (30) and into the ionization chamber (16). <u>See</u> '736 Patent, Col. 4, ln. 29-36. Therefore, Micromass argues that the "means for flowing gas" is properly construed to mean the introduction by a separate duct of an inert gas that flows both into the ionization chamber and the first vacuum chamber.

AB/Sciex disagrees. It focuses on the function – to flow gas through said inlet orifice and into said first space – and argues that structure of the invention that accomplishes this function is not the curtain gas source itself, but the difference in pressure between the chamber (24) in which the gas is introduced and the first vacuum chamber (30). This conclusion is supported by the specification, AB/Sciex argues. The specification details that the "curtain gas chamber 24 is connected by an orifice 26 in orifice plate 28 to a first vacuum chamber 30 pumped by a vacuum pump 31." Id. at Col. 4, ln. 19-21. It goes on to state that the "curtain gas flows through orifice 26 into the first vacuum chamber 30." Id. at Col. 4, ln. 32-33. Therefore, AB/Sciex argues that the corresponding structure is not the curtain gas source and chamber, but the differential pressure.

The court concludes that AB/Sciex's position is correct. Claim 1(g)'s function – "flowing gas through said inlet orifice into said first space" – is performed in the specification by the existence of gas in a chamber, separated from the first vacuum chamber by the inlet orifice, at a higher pressure than that in the first vacuum chamber. The court will therefore construe the structure of claim 1(g) in this manner.

Claim 14(e) is not a means-plus-function limitation and therefore does not require construction of both a function and corresponding structure detailed in the specification. Its meaning is clear from the face of the text. Claim 14(e) requires "admitting a gas into said first chamber with said ions."

M. "the pressure in said second chamber being a very low pressure" and "the pressure in said second chamber at a substantially lower pressure than that of the said first chamber"

Claim 1(i) requires that "the pressure in said second chamber being a very low pressure for operation of said second rod set as a mass filter." Claim 14(g) describes "pumping gas from said second chamber to maintain the pressure in said second chamber at a substantially lower pressure than that of said first chamber, for effective mass filter operation of said second rod set."

Micromass seeks a construction of "a very low pressure" and "substantially lower pressure than that of said first chamber" that is consistent with the specification. The patent specification states that "it is advantageous that the pressure in vacuum chamber 38 containing the mass spectrometer rods 40 be very low, e.g. between 2×10^{-5} and 1×10^{-6} torr or less." '736 Patent, Col. 4, ln. 53-56. Therefore, Micromass posits that the pressure in the second vacuum chamber must be 2×10^{-5} torr or lower.

Micromass's position is unwarranted by the claims. Claim 1(i) and claim 14(g) do not require any particular maximum pressure, but only that the pressure be "a very low pressure" (Claim 1(i)) or "substantially lower than that of said first chamber" (Claim

14(g)). No more or less is required. See Specialty Composites v. Cabot Corp., 845 F.2d 981, 987 (Fed. Cir. 1988) ("particular embodiments appearing in the specification will not generally be read into the claims"). Thus, the court believes the claims require no further construction.

N. "equal to or greater than 2.25×10^{-2} torr cm but the pressure . . . being below that pressure at which electrical breakdown would occur between the rod means of said first rod set" and "at or greater than 2.25×10^{-2} torr cm but maintaining the pressure in said first chamber below that pressure at which electrical breakdown would occur between the rods of said first rod set"

Claim 1(j) requires that the product of the pressure and the length of the rods in the first vacuum chamber be "equal to or greater than 2.25×10^{-2} torr cm but the pressure . . . being below that pressure at which an electrical breakdown will occur between the rod means of said first set." Claim 14(f) requires that the vacuum pump (31) of the first chamber "maintain the product of the pressure in said first chamber times the length of said first rod set at or great than 2.25×10^{-2} torr cm but maintaining the pressure . . . below that pressure at which an electrical breakdown would occur between the rods of the first set."

AB/Sciex's proposed construction of these limitations is that "the pressure in the first vacuum chamber is at level such that the product of the pressure and the rod length ("P x L") is equal to or greater than $2.2.5 \times 10^{-2}$ torr cm, but the pressure is not so high that electrical breakdown will occur between the rods." It argues that this construction is dictated by the terms of the claim and no other parameter, such as a quantified upper limit of pressure, is contained within the limitation.

Micromass's proposes a construction of the claims that would impart several additional limitations on the claim. These will be addressed in turn.

1. location of pressure measurement

Micromass argues the construction should require that the pressure measurement, for purposes of the P x L calculation, must be taken between the rods of the first rod set, rather than anywhere else in the first vacuum chamber. It notes that the specification states, "[i]t is also noted that the number of collisions which an ion has while travelling through the AC-only rods 32 is determined by the length of the rods multiplied by the pressure *between the rods*." '736 Patent, Col. 13, ln. 3-6 (emphasis added). Similarly, in response to an interrogatory, AB/Sciex stated "that the pressure in the 'first chamber' is most appropriately measured within the 'elongated space' defined by the 'first rod set.'" Plaintiff's Response to Micromass, Inc's First Set of Interrogatories, at 12.

In response, AB/Sciex contends that Micromass is seeking to import claim limitations from the specification and extrinsic evidence, such as the interrogatory response, into the claims. The court agrees. Micromass does not cite any support for its interpretation of the claim anywhere in the language of the claims themselves, and instead cites only the unequivocally true statement in the specification that it is the pressure between the rods that determines whether collisional focusing will improve ion transmission. It is well-established that the specification should not be used to incorporate into the patent claims a limitation existing only in the patent's specification. See Intervet Am., Inc. v. Kee-Vet Labs., Inc., 887 F.2d 1050, 1053 (Fed. Cir. 1989). Thus, the court finds that neither claim 1(j) or 14(f) contains a limitation on the location where the pressure in the first vacuum chamber should be measured.

2. "length of said first rod set"

Micromass argues that the "length of first rod set," as that term is used in claims 1(j) and 14(f) must mean "the length of the quadrupole rods." As noted earlier, supra at 36, the court has found that the claims do not require that the first rod set be a set of quadrupole rods. Thus, the court will not impart this limitation on the claims.

3. "equal to or greater than 2.25 x 10^{-2} torr cm"

Micromass argues that claims 1(j) and 14(f) require that the lower limit of P x L in the first vacuum chamber be 2.25 x 10^{-2} torr cm. Micromass's position anticipates that AB/Scies will argue that the lower limit of P x L could actually be lower than this specific quantity. In AB/Sciex's response to Micromass's interrogatories, AB/Sciex discussed where in the first vacuum chamber pressure should be measured. It stated, "one skilled in the art would also conclude that if, based on pressure measurement at or near the [vacuum] pump aperture, the pressure times rod length in the 'first chamber' was slightly less than 2.25 x 10^{-2} torr cm, the pressure within the 'elongated space' times the rod length might nevertheless be equal to or greater than 2.25 x 10^{-2} torr cm."

Concerned that AB/Sciex might use this statement to further lower the pressure required in any particular section of the first vacuum chamber, Micromass seeks to hold AB/Sciex to the 2.25 x 10^{-2} torr cm limit.

While AB/Sciex does not stipulate in its response that the lower limit permitted by the claim is 2.25 x 10^{-2} torr cm, it does argue that the meaning of the claim is clear and therefore does not require construction. The court therefore concludes that the plain meaning of the claim is clear – the P x L product in the first vacuum chamber must be equal to or greater than 2.25 x 10^{-2} torr cm.

4. <u>"below that pressure at which an electrical breakdown will occur between the rod means"</u>

Micromass makes two arguments concerning the upper limit of pressure in the first vacuum chamber. First, apart from however the term "electrical breakdown" is construed, it argues that the pressure should not exceed 30 millitorr. This argument is based on a comment in the patent's specification that "enhancement of the ion signal through orifice 34' occurred up to between 25 and 30 millitorr. Above these pressures, the signal was reduced as compared with that at 2.4 millitorr." <u>Id.</u>, Col. 13, ln. 51-54. Because the objective of the invention is to increase ion transmission, and because this did not occur above 30 millitorr, Micromass contends that the upper limit of pressure in the first vacuum chamber must be 30 millitorr. The weakness in Micromass's argument is apparent. Micromass furnishes no support from the claims themselves that support a

30 millitorr upper limit. Indeed, the claim's recitation of "electrical breakdown" as the upper limit of pressure directly contradicts using a fixed standard like 30 millitorr. The court will not import limitations from the specification into the claims themselves. See Intervet Am. Inc., 887 F.2d at 1053.

Accepting the "electrical breakdown" standard on its face, Micromass's second argument is that this claim should be construed as "a discharge of electricity between the rod means of the first rod set." It finds support for this interpretation in the reports of its experts. AB/Sciex counters that "electrical breakdown" occurs where the instrument ceases to function, although "[c]ertainly in such case there will be a discharge of electricity between the rods." Plaintiff's Rebuttal Claim Contruction Br. at 58. AB/Sciex also contends that because this claim term is not relevant to any question of infringement, it is irrelevant and need not be construed.

While the court is not in a position to discern whether the upper pressure limit for the first vacuum chamber will become relevant to the question of infringement, it will nonetheless refuse to construe "electrical breakdown" at this time on the basis that the briefing on the term is limited. Should the parties require a construction at some later date, they may request a supplemental opinion.

Thus, the court will construes claims 1(j) and 14(f) to require that "the pressure in the first vacuum chamber is at level such that the product of the pressure and the rod length ("P x L") is equal to or greater than 2.2.5 x 10^{-2} torr cm, but the pressure is not so high that electrical breakdown will occur between the rods."

O. "means for maintaining the kinetic energies of ions moving from said inlet orifice to said rod set at a relatively low level" and "controlling the kinetic energies of ions entering said first rod set to maintain such kinetic energy at a relatively low value"

Claim 1(k) requires a "means for maintaining the kinetic energies of ions moving from said inlet orifice to said first rod set at a relatively low level, whereby to provide improved transmission of ions through said interchamber orifice." This claim is a means-plus-function limitation subject to paragraph 6 of 35 U.S.C. § 112. AB/Sciex posits that the function described in claim 1(k) is "to maintain the kinetic energies of ions moving from the inlet orifice of the first vacuum chamber to the rod set at a level below that at which significant fragmentation of ions will occur." It cites two structures revealed in the specification to accomplish this function: (1) the DC potential between the inlet orifice and the rod set; and (2) the pressure in the first vacuum chamber.

Claim 14(h) requires "controlling the kinetic energy of ions entering said first rod set to maintain such kinetic energy at a relatively low value," and, when combined with the phrase at the end of claim 14, "whereby to provide improved transmission of ions through said interchamber orifice." AB/Sciex suggests that the phrase, which is not a means-plus-function claim limitation, means "adjusting the DC potential between the inlet orifice and the rod set and the pressure in the first vacuum chamber to maintain the kinetic energy of ions entering the first rod set at a level below that at which significant fragmentation of the ions will occur." This construction is substantially the same as that AB/Sciex has suggested for claim 1(k).

Rather than address claim 1(k) and 14(h) as a whole, Micromass has divided the claims into their component terms and phrases for construction. Thus, the court will discuss these terms and phrases in turn.

1. <u>"maintaining" and "maintain"</u>

Micromass asserts that the plain meaning of "maintaining" or "maintain" is "to carry on," "to continue," and "to keep unimpaired." Thus, it asserts that the proper construction of "means for maintaining the kinetic energies of ions . . . at a relatively low level" in claim 1(k) and "maintain such kinetic energy at a relatively low value" in claim 14(h) is one that requires "the kinetic energies be kept unimpaired at a relatively low level through the relevant region."

AB/Sciex contends that "maintaining" and "maintain" are common words used in their everyday manner and therefore require no further construction. It notes, however, that Micromass's proposed construction of those terms – that "the kinetic energies be kept unimpaired" – contains two implications not required by the claim language. First, AB/Sciex is concerned that Micromass intends to imply that the kinetic energy of ions can never vary through the region between the inlet orifice and the first rod set. It argues that this construction is not supported by the claim language. The court agrees. Read in whole, the claim limitations require that the kinetic energies of the ions be maintained at a relatively low level throughout the relevant region. The claims do not require that the kinetic energy of ions never fluctuate. Indeed, the kinetic energies of ions may fluctuate greatly, as long as the kinetic energy of those ions does not surpass the relatively low value or level required by the claim.

Second, AB/Sciex is concerned that Micromass's construction implies that the kinetic energies of *all* the transmitted ions be maintained at a relatively low level. Again, such a construction would be at odds with the claim language. Claim 1(k) requires only "maintaining the kinetic energies of ions . . . ." It does not say "all ions," but instead indicates the number of ions needed to meet the limitation only be expressing "ions" in the plural. Thus, the court concludes that only a plurality of ions need to be maintained a relatively low level to satisfy this limitation.

Thus, "maintaining" and "maintain" are used in their ordinary sense and require no further construction except to note that the use of these terms in claims 1(k) and 14(h) requires neither that (1) the kinetic energies of the ions never vary, nor (2) all ions satisfy this claim limitation.

2. <u>"kinetic energy of ions"</u>

Micromass posits that the "kinetic energy of ions" should be construed to mean "the energy associated with motion," as opposed to the ions' potential energy or internal energy.

AB/Sciex does not disagree, but argues that to the extent that Micromass attempts to add a further limitation to the claim language, it should be rejected. It does not explain, however, what further limitation might be added by Micromass's proposed construction.

"Kinetic" is defined as "of or relating to the motion of material bodies and the forces and energy associated therewith." Webster's Ninth New Collegiate Dictionary 662 (1991). This definition is consonant with that provided by Micromass and the court will therefore adopt Micromass's proposed construction of "kinetic energy of ions" as "energy associated with the motion of ions."

3. <u>"relatively low level" or "relatively low value"</u>

As noted above, AB/Sciex contends that the "relatively low" level or value of kinetic energy at which the ions must be maintained is such that the ions will avoid significant fragmentation caused by collision induced dissociation.

Micromass argues that the term "relatively low," as used in the claims, is indefinite and therefore all of the claims of the '736 patent should be held invalid as indefinite under paragraph 2 of 35 U.S.C. § 112. It also argues that AB/Sciex's proposed construction of "relatively low" is similarly indefinite, because it would require understanding how much fragmentation is "significant." Micromass does not, however, offer an alternative construction of "relatively low." Rather, it simply criticizes AB/Sciex's proposed construction by arguing it has no basis in the words of the claims.

The claims themselves provide no support for AB/Sciex's proposed construction of "relatively low." Nor is it apparent, from the face of the claims themselves, what meaning should be ascribed to that term.

The only discussion of "relatively low" is in the claim specification's discussion of the relationship between kinetic energy and the dissociation of ions.

> [I]t appears that a large number of *relatively low* energy collisions are effective in damping both the radial and axial velocities of the ions and in forcing the ions by collisional damping closer to the centre line of the AC-only rod set 32. It appears that more energetic collisions, which occur when the offset voltage is higher, do not have a similar effect and in fact for some reason reduce the ion signal. Further, a high ion energy can lead to collision induced dissociation, resulting in further ion loss."

'736 Patent, Col. 12, ln. 39-49 (emphasis added). Furthermore, in the patent reexamination proceedings, MDS made several comments in distinguishing tandem mass spectrometers on the basis that they use a high pressure to fragment ions. MDS stated, "[t]he use of high pressure gas and high kinetic energy parent ions to cause fragmentation is in contrast to the invention which maintains the kinetic energy of ions at a relatively low level and uses an increased pressure to improve ion transmission." Request for Reexamination, at 18.

On the basis of the statements made in the specification and reexamination, the court concludes that the relationship of high kinetic energies and collision induced dissociation is clear from the patent's intrinsic evidence. It is therefore appropriate to construe "relatively low" by resort to what the patent specification and prosecution history state will occur when the kinetic energy is not relatively low – fragmentation caused by collision induced dissociation. Whether the fragmentation needs to be "significant," however, is not supported by the specification or prosecution history. The specification only indicates "relatively low energy collisions" improve the operation of the mass spectometer, that "energetic collisions" reduce the ion signal and that "high ion energy" results in further ion loss. Thus, the specification supports construing "relatively low" to mean that further increases would "reduce the ion signal."

Thus, the court will construe "relatively low level" and "relatively low value" to mean "the level or value of kinetic energy below the level at which the ion signal is reduced by further increases of the kinetic energy." This construction is consistent with the whereby clause in claims 1(k) and 14(h) discussed next.

4. "whereby to provide improved transmission of ions through said interchamber orifice"

Micromass argues at length that the two "whereby clauses" at the end of claims 1(k) and 14, are claim limitations because they describe the "necessary result" or "critical property" of the claimed invention. See KX Indus., L.P. v. Culligan Water Techs., Inc., 90 F. Supp. 2d 461, 487-88 (D. Del. 1999) (holding that a whereby clause that was substantially amended to overcome prior art was sufficiently definite to constitute a claim limitation and did not simply announce the invention's result). This is in contrast to the general rule that "a whereby clause that merely states the result of the limitations in the claim adds nothing to the patentability or substance of the claim" and is therefore not a claim limitation. Texas Instruments, Inc. v. United States Int'l Trade Comm'n, 988 F.2d 1165, 1172 (Fed. Cir. 1993). Thus, Micromass proposes construing the whereby clause to mean that one practicing the invention must realize improved ion transmission through the interchamber orifice relative to the number of ions that would be transmitted without practicing the invention.

AB/Sciex agrees that the whereby clause is a claim limitation, but argues that Micromass's proposed construction is too broad because it defines "improved" as "relative to the number of ions that would be transmitted without practicing the invention." According to AB/Sciex, Micromass's proposed construction would foster a comparison between the ion transmission rates of any other method of ion transmittal and the claimed invention. It is difficult to understand AB/Sciex's concern. Assuming the whereby clause is a claim limitation, it is only meaningful to the extent that a potential infringer might practice all of the other claims and somehow not realize improved ion transmission through the interchamber orifice. Thus, AB/Sciex's concern that Micromass might try to avoid infringement by comparing any other method of ion transmission to the claimed invention is unfounded.

Nonetheless, the court agrees with AB/Sciex that the "whereby" clause requires no further construction. The proper construction of the whereby clause is self-evident from the face of the claims, which state "to provide improved transmission of ions through said interchamber orifice." The court will therefore decline to provide further construction of the claim.

5. "means for maintaining the kinetic energy of ions"

Claim 1(k) is a means-plus-function limitation. Therefore the court must identify both the claimed function and the structure in the patent specification corresponding to that function. See Lockheed Martin Corp., 249 F.3d at 1324-25. The function listed in claim 1(k) is "maintaining the kinetic energies of ions moving from said inlet orifice to said first rod set at a relatively low level." The crux of the parties' dispute over this element, however, is if there is any corresponding structure revealed in the specification and, if so, what that structure is and how it should be construed.

AB/Sciex contends that the structure revealed in the patent's specification is the application of two variables: (1) a DC potential voltage between the inlet orifice (26) and the first rod set (32), and (2) the pressure in the first vacuum chamber (30). Because the function of the claim limitation is maintaining a low kinetic energy, and because throughout the specification it discusses how the kinetic energy of the ions is a function of these two variables, the structure must involve *both* the voltage and the pressure. See '736 Patent, Col. 6, ln. 3-10 (discussing an improved ion transmission caused by using a high pressure vacuum chamber and a low DC difference voltage); Col. 12, ln. 3-5 ("higher gas pressures and relatively low DC difference voltages . . . have been found to produce the following advantages.”). Indeed, the specification repeatedly explains the relationship between kinetic energy and either voltage or pressure. In Column 8, for example, the patent specification discusses at length the effect of using 10 volts, but increasing the pressure in the chamber. See id., Col. 8, ln. 6-40. The patent recites that the kinetic energy of the ions, measured in electron volts (eV) decreased as the pressure in the first vacuum chamber was increased, because “the collisional effects were removing both axial and radial velocities from the ions.” Id., Col. 8, ln. 29-40, 50-52. That is, holding the voltage constant, the kinetic energy of ions decreased as the pressure increased. The specification also explains that, holding the pressure constant, increasing the voltage will increase the kinetic energy ions. See id., Col. 12, ln. 44-45 (“It appears that more energetic collisions, which occur when the offset voltage is higher . . . reduce the ion signal.”).

Micromass argues that the specification contains no structure that corresponds to the function recited in claim 1(k) and is therefore indefinite in scope and invalid.[3] But because the court has not yet addressed Micromass’s invalidity motion, it argues that if it is forced to assume that a structure exists in the specification, that structure is only the

---

[3]Indeed, much of Micromass’s briefing is directed to the alleged indefiniteness of the means-plus-function limitation in claim 1(k). While the court will go on to evaluate the specification to construe the structure, it does not mean to foreclose Micromass’s numerous other arguments, including that the voltage and pressure parameters are not a “structure” for purposes of a means-plus-function limitation and that the specification does not “clearly link” a structure to the function.

offset voltage applied between the inlet orifice and the first rod set, as discussed in dependant claims 8 through 11.

A/B Sciex contends that, in light of the patent specification's extensive discussion of the effects of pressure and voltage on kinetic energy, Micromass's default position that the structure for accomplishing the function is only voltage cannot be correct. After careful consideration of the specification, the court agrees with AB/Sciex. As noted above, the patent specification repeatedly recites the effect of the pressure in the first vacuum chamber on the kinetic energy of ions entering it. Thus, the structure for accomplishing that function must be both voltage and pressure.

Having adopted AB/Sciex's position on the structure corresponding to the function of claim 1(k), the court will turn to three limitations Micromass seeks to add that it believes are revealed in the specification.

First, Micromass argues that the only offset voltage parameter disclosed by the specification is 1-30 volts and that the structure should thus be so limited. The specification explains that "[t]he experiments which have been conducted show that a preferred range for the difference voltage between the AC-only rods 32, 32', the wall 28 or skimmer 74 is between about 1 and 30 volts DC." '736 Patent, Col. 12, ln. 57-60. AB/Sciex responds that while the 1-30 volts yielded the best results, the specification does not require such a voltage range. Indeed, to do so would be inconsistent with the specification's repeated instruction that kinetic energy is a function of both voltage and pressure. Moreover, the specification itself states that a "high difference voltage (e.g. of between 40 and 100 volts DC) . . . may still produce signal enhancement effects." Id. Col. 12, ln. 53-56. Thus, the court does not believe the specification requires limiting the voltage parameters to 1 to 30 volts.

Second, Micromass argues that the specification provides a maximum voltage of 40 volts can be used at "high" pressures, such as 2.5 millitorr or higher. It notes that the specification states, "[a] difference voltage of between 40 and 100 volts between the AC-only rods 32 or 32', and the wall 28 or skimmer 74 tended to shut off the ion signal at pressures of 2.5 millitorr and higher in chamber 30, 30'." See id., Col. 12, ln. 49-52. Again, this upper limit of 40 volts, like the restriction of 1 - 30 volts, is not required by the specification, which discusses the importance of *both* voltage and pressure and explains that, given appropriate circumstance, signal enhancement might be experienced at voltages of up to 40 to 100 volts.

Third, it argues that to maintain a constant low kinetic energy, there must be an inverse relationship between the pressure in the first chamber and the offset voltage applied. See id. at Col. 12, ln. 30-35 ("the DC difference voltage . . . should normally be low at the high pressures used."); Col. 11, ln. 7-12 ("when the AC-only rod set 32' is operated at a high pressure (e.g. 5 millitorr) with a relatively low CD difference voltage . . . then . . . higher ion signals [are] received."); Col. 6, ln. 3-10 ("when the same high pressure experiments were conducted . . with the DC difference voltage . . . between 1 and 10 volts . . . . [t]he ion signal increased significantly."); Col. 9, ln. 35-40 ("the ion to gas ratio entering the AC-only rods 32' increased . . . when appropriate pressures (typically 5 to 8 millitorr) were used in chamber 30' and when an appropriate DC difference voltage (preferably about 1 to 15 volts) existed."). In addition to these statements, Micromass points to the table in Column 11 of the patent and notes that where the pressure in the ion guide chamber was relatively low (0.5 millitorr in Figures 17 and 18), the inventors used a high difference voltage of 85 and 90 volts. See id., Col. 11, ln. 23-33. But when the pressure in the ion guide was relatively high (5.6 millitorr in Figures 15 and 16), the inventors used a low difference voltage of 5 and 15 volts. See id.

AB/Sciex argues that Micromass is wrong that the two must have an inverse relationship and that its conclusion is based on an erroneous reading of the table in column 11. The table in column 11 cannot be relied upon for this conclusion, AB/Sciex explains, because at 0.5 millitorr, the P x L product in the example is not at or above 2.25 x 10^{-2} torr cm. It also argues that in some of the experiments, increasing voltage and increasing pressure both produced better ion transmission. While this conclusion is interesting, it is also irrelevant. At any given voltage and pressure, increasing both or decreasing both might result in an improved ion flow. But the point made by Micromass is that if the kinetic energy of the ions is held constant, then the voltage and pressure must bear an inverse relationship. This conclusion is a natural corollary of AB/Sciex's own position that increasing pressure will decrease kinetic energy and increasing voltage will increase kinetic energy. Because Micromass's proposed limitation is a corollary of the two relationships AB/Sciex already requests as the structure, however, it is unnecessary to require Micromass's limitation because it is self-evident.

Therefore, the court finds that the structure corresponding to the function in claim 1(k) – "maintaining the kinetic energies of ions . . . at a relatively low level" – is the use of two operating parameters: (1) the DC potential voltage between the inlet orifice and the rod set; and (2) the pressure in the first vacuum chamber.

6. "controlling"

Claim 14(h) states "controlling the kinetic energy of ions entering said first rod set to maintain such kinetic energy at a relatively low value." Micromass asserts that the proper construction of "controlling" is "to exercise restraining or directing influence over," "regulate," or "to have power over." It then argues that the claim specification nowhere discloses how one might practice the method of "restraining or directing influence over" the kinetic energy of ions, other than perhaps the use of an offset voltage between 1 and 30 volts, and possibly up to 40 volts, between the inlet orifice and the first rod set. Although it does not say so, it appears that Micromass is proposing to the court a definition of "controlling" that would require the practitioner of the invention to use these voltage parameters.

AB/Sciex disagrees. It argues that the meaning of "controlling" is clear and does not require construction by the court. Moreover, Micromass's proposed construction seeks to import from the specification limitations not listed in the claim.

The court agrees. As Micromass notes, the meaning of "controlling" is well understood as "exercising restraining or directing influence over." This meaning is unambiguous and clear from the claim. The fact that the specification may recite particular voltage levels by which the control can be administered neither contradicts this construction nor introduces further clarity. Instead, Micromass is seeking to import parameters existing only in the specification to the claim limitations themselves. It may not do so. See Intervet Am., Inc., 887 F.2d at 1053.

III. CONCLUSION

For the foregoing reasons, the disputed claims of the '736 patent are construed as follows.

"comprising"	Including, but not limited to
"vacuum chamber"	A chamber maintained at less than atmospheric pressure
"first vacuum chamber"	A vacuum chamber
"second vacuum chamber"	A vacuum chamber coming after, in the path of ion travel, the first vacuum chamber
"first rod set"	A rod set
"second rod set"	A rod set coming after, in the path of ion travel, the first rod set
"first space"	A space

"second space"	A space coming after, in the path of ion travel, the first space
"inlet orifice"	An orifice that provides an inlet into the first vacuum chamber for the passage of ions and neutral gas molecules
"separated by a wall"	At least a wall between the first and second vacuum chambers
"interchamber orifice"	An orifice in a wall between the first and second vacuum chambers
"so that ions may travel through said inlet orifice, through said first space, through said interchamber orifice, and through said second space" and "so that an ion may travel through said first space, said interchamber orifice and said second space	Ions must travel through at least the recited structures
"located end to end"	The rod sets and spaces must be arranged in a manner that ions may be successfully transmitted from the end of the first rod set or the first space to the end of the second rod set or second space
"aligned"	Being in or coming into precise adjustment or correct relative position
"ions of a trace substance to be analyzed"	The trace substance is to be analyzed

"directing said ions through an inlet orifice in an inlet wall into said first space, first through said first space, said interchamber orifice and then through said second space, and then detecting the ions which have passed through said second space to analyze said substance,"	Ions traveling on the recited path through an inlet wall, the first space, interchamber orifice, and second space must be detected to analyze the substance
"means . . . for directing said ions through said inlet orifice into said vacuum chamber"	The function of this element is "directing said ions through said inlet orifice into said vacuum chamber." The corresponding structure, material, or acts described in the specification is either, or both, of two independent operating parameters: (1) the application of appropriate DC potential between the inlet orifice and the rod set in the first vacuum chamber; and/or (2) a difference in the pressures on either side of the inlet orifice.
"guide ions through" and "guide ions therethrough"	Ions are guided through the first space (claim 1(3)) or between the rod means of said first set (claim 14(c)).
"means for flowing gas"	The function of this element is "to flow gas through said inlet orifice and into said first space." The corresponding structure, material, or acts described in the specification is the existence of gas in a chamber, separated from the first vacuum chamber by the inlet orifice, at a higher pressure than that in the first vacuum chamber.
"equal to or greater than 2.25×10^{-2} torr cm	The product of the pressure in the first vacuum chamber and the length of the rods in the first rod set must be equal to or greater than 2.25×10^{-2} torr cm
"kinetic energy of ions"	Energy associated with the motion of ions
"relatively low level" or "relatively low value"	The level or value of kinetic energy below the level at which the ion signal is reduced by further increases of the kinetic energy

"means for maintaining the kinetic energy of ions"	The function of this element is "maintaining the kinetic energy of ions moving from said inlet orifice to said first rod set at a relatively low level." The corresponding structure, material, or acts described in the specification is the application of two variables: (1) a DC potential voltage between the inlet orifice and the first rod set, and (2) the pressure in the first vacuum chamber.