## I. GENERAL INFORMATION

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|---|---|
| **Device Generic Name:** | Excimer Laser |
| **Device Trade Name:** | MEL 80™ Excimer Laser System |
| **Applicant's Name and Address:** | Carl Zeiss Meditec Inc.<br>5160 Hacienda Drive<br>Dublin, California 94568 USA<br>(925) 557-4100 |
| **Date(s) of Panel Recommendation:** | None |
| **PMA Number:** | P060004 |
| **Date of Notice of Approval to Applicant:** | August 11, 2006 |

## II. INDICATIONS FOR USE

The MEL 80 Excimer Laser is indicated for use in primary Laser Assisted *in situ* Keratomileusis (LASIK) treatments for the reduction or elimination of myopia of less than or equal to -7.0 D with or without refractive astigmatism of less than or equal to -3.0 D, with a maximum MRSE of -7.00 D, in patients who are 21 years of age or older with documentation of stable manifest refraction over the past year as demonstrated by change in sphere and cylinder of ≤ 0.5 D.

## III. CONTRAINDICATIONS, WARNINGS AND PRECAUTIONS

### A. Contraindications

LASIK surgery is contraindicated in:

- Patients with diagnosed collagen vascular, autoimmune, or immunodeficiency diseases;
- Pregnant or nursing women;
- Patients with signs of keratoconus;
- Patients who are taking one or both of the following medications: isotretinoin (Accutane[1]), or amiodarone hydrochloride (Cordarone[2]).

### B. Warning and Precautions

Please refer to the Professional Use information and the Patient Information booklet for a complete list of warnings and precautions.

1 Accutane is the registered trademark of Hoffman La Roche Inc.

2 Cordarone is the registered trademark of Sanofi-Synthlabo

## IV. DEVICE DESCRIPTION

The Carl Zeiss Meditec MEL 80 Excimer Laser System is designed for refractive surgery based on the ablation of corneal tissue achieved with a short pulse excimer laser having a wavelength of 193 nanometers. The laser head emits 4 to 6 nanosecond pulses with a repetition rate of 250 Hz. The MEL 80 Excimer Laser is a spot-scanning laser that utilizes a Gaussian beam with a 0.7 mm spot diameter.

The MEL 80 Excimer Laser System also contains an ablation debris removal system called the Cone for Controlled Atmosphere (CCA+). The CCA+ is a patented airflow system that ensures constant ablation debris removal from the beam path.

The MEL 80 Excimer Laser System includes a 250 Hz eyetracker. The system determines the pupil center from an infrared (IR) image of the patient's eye, refreshed and processed at 250 Hz.

A green LED (532 nm) light located inside the surgical microscope and centered on its optical axis serves as a fixation target for the patient. For ease of fixation, the LED is employed in a blinking mode at a frequency of 2Hz. The fixation light blinks during the entire surgery.

User control of the MEL 80 Excimer Laser is implemented by a software application called the Operation Assistant (OPASS), which runs on a familiar Windows PC (operating system Windows XP®) computer interface in order to provide the surgeon direct control over the preoperative data and an integrated application manual. The OPASS program allows the surgeon to input clinical data and monitor the progress of the operation on a visual control panel. The Windows PC transfers data to the central control unit of the excimer laser, which is fully independent and controls the operation of the excimer laser (note: the surgeon has no access to this central control unit).

The MEL 80 Excimer Laser System consists of the following major components:

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| **Laser Arm** | The Laser Arm contains the operating microscope, the debris removal system (called CCA+), the galvanometric scanners, the eye tracking camera, a portion of the optical system, the control panel and the laser arm interface. |
| **Laser Unit** | The excimer laser unit consists of the laser head with thyratron and HV power supply, the trigger unit and the laser interface. The communication with the central control unit PC104 is done fiber-optically via the laser interface, which also optically controls the trigger unit. The laser head is provided with premix gas by the gas handling system. |
| **Optics** | The optics form the excimer raw beam and guide it to the treatment plane by means of a beam shaper, two lenses, and different mirrors, so that a well-defined beam of Gaussian shape emerges. A vacuum pump is used to evacuate air present in the beam path; this function is initiated automatically when the laser is started. |
| **PC104** | The central control unit PC104 with laser control software (called POLO) provides the control of the whole laser system. It performs the following tasks: execution of the treatment (i.e. triggering of the laser head), monitoring and setting of the scanner position, control of the blower and the flue gas suction (debris removal), communication with user interface software (called OPASS), execution of the gas management system functions, and energy control via high voltage setting and energy measuring. |
| **Control Panel** | The control panel provides control of the distance lasers (which are used for correct height adjustment of the patient's eye), the white light illumination, and the eyetracker parameters. The control panel displays messages in the event of a lost connection between OPASS and POLO via a mini display. |
| **Eyetracker** | A fast eyetracker unit ensures alignment of the laser beam to the eye of the patient. It is comprised of a 250 Hz infrared CCD camera, an infrared LED illumination system (810 nm) and a separate control computer (EyePAC). |
| **Operating Microscope** | An operating stereomicroscope (OPMI) allows the surgeon to observe the patient's eye during the treatment. |
| **Illumination System** | An LED ring light consisting of 72 single visible light LEDs arranged in an annular pattern is mounted at the laser exit aperture for illumination of the operating area (maximum irradiance in treatment plane is 3.76 $mW/cm^2$). In addition, there is a satellite illumination system (two visible light LEDs) mounted on the CCA+ unit to allow grazing-angle illumination of the patient's eye (maximum irradiance in treatment plane is 0.55 $mW/cm^2$). |
| **Gas Handling System** | The gas handling system consists of a flushing gas (helium) and a laser gas (premix) bottle, pipes, valves, pressure sensors, vacuum pump, filters (halogen), and pressure reducers. The central control unit performs an automatic gas change on user request. The bottles are placed inside the device. |
| **CCA+ Debris Removal** | A blower and flue gas suction unit called CCA+ debris removal provides a controlled environment at the patient's eye by removing the debris. It is mounted on a swivel arm (the entire component is referred to as the CCA+ unit), and also carries the infrared illumination. The CCA+ unit can be moved away when not in use. |
| **Patient Bed** | A motor-driven patient bed is movable in all 3 dimensions (X-, Y- and Z-directions). In addition, the patient headrest can be moved in the Z-direction and can be tilted in a dorsal and ventral direction. The bed can be swung out manually for easy exit of the patient. |

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| **Slit Lamp (optional)** | The slit lamp produces an evenly illuminated field approximately 8 cm in front of a reflecting prism, the geometry and color of which can be varied by the use of apertures and filters. The slit lamp has a 6V (10W) halogen bulb, a slit width of 0.15 mm to 0.75 mm, and a slit height and illumination field size of 2 mm to 12 mm (continuous). |

## A. MEL 80 Laser Specifications

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| Laser Type | Argon Fluoride |
| Laser Wavelength | 193 nm |
| Laser Spot Size (FWHM diameter) | 0.7 mm ± 0.1 mm |
| Laser Pulse Duration | 4 to 6 nanoseconds |
| Laser Head Repetition Rate | 250 Hz |
| Fluence (at the treatment area) | > 150 mJ/cm$^2$ (peak) |
| Range of Ablation Diameter | Up to 9 mm (optic zone of 6.0 to 7.0 mm, with a transition zone of 1.7 to 1.9 mm). The laser has the capability for an optic zone range of 5.0 to 8.0 mm, and an ablation diameter of up to 10 mm. |
| Eyetracker | |
| - Tracking frequency | 250 Hz |
| Installation Requirements | Please refer to the Operator's Manual for restrictions, tolerances or other requirements established regarding room air circulation, clearance between the laser room walls, and distance between the laser and other electronic or radiation-producing medical equipment. |

The software versions in the laser system are as follows:

a. OPASS Software version 3.1.0
b. OPASS PC Operating System: Windows XP
c. POLO Software version 02.02.002
d. Eyetracker Firmware version 6.15

This laser is locked out for treatments exceeding -7.0 D sphere, -3.0 D cylinder, and -8.0 D MRSE. Optical zones below 6.0 mm and above 7.0 mm are also locked out.

## B. Microkeratome

The LASIK procedure requires the use of a commercially available mechanical or laser microkeratome that has been cleared for marketing via premarket notification. The microkeratome is used to make a thin flap of tissue of pre-selected thickness and diameter on the cornea. This flap is then folded out of the

way, and the excimer laser is used to reshape the front surface of the cornea below the flap. Three different keratomes were used in this study. Two devices were traditional microkeratomes that utilize a stainless steel blade to make the flap. The cornea is held in position by a suction ring, with a geared drive mechanism on the suction ring used as a track for the motorized microkeratome. The third device was a femtosecond ophthalmic surgical laser that creates a LASIK flap through precise individual microphotodisruptions of tissue, created by tightly focused ultrashort pulses which are delivered through a disposable applanation lens while fixating the eye under very low vacuum.

## V. ALTERNATIVE PRACTICES OR PROCEDURES

Alternative methods of correcting nearsightedness (myopia) with and without astigmatism include: glasses, contact lenses, and photorefractive keratectomy (PRK).

## VI. MARKETING HISTORY

The Carl Zeiss Meditec MEL 80 Excimer Laser System has been marketed in the following countries: Australia, Austria, Belgium, Canada, Czech Republic, China, Croatia, Denmark, Egypt, Estonia, Finland, France, Germany, India, Iran, Italy, Japan, Kazakhstan, Kuwait, Latvia, Libya, Lithuania, Malaysia, Morocco, Mexico, Netherlands, Oman, Palestine, Portugal, Russia, South Africa, Slovenia, Spain, Switzerland, Thailand, Turkey, United Arab Emirates, and the United Kingdom.

The Carl Zeiss Meditec MEL 80 Excimer Laser System has not been withdrawn from marketing for any reason relating to the safety and effectiveness of the device.

## VII. POTENTIAL ADVERSE EFFECTS OF THE DEVICE ON HEALTH

Potential adverse reactions associated with LASIK include: loss of best spectacle corrected visual acuity, overcorrection, increase in refractive cylinder, worsening of patient complaints such as double vision and glare, sensitivity to bright lights, increased difficulty with night vision, fluctuations in vision, increase in intraocular pressure, corneal haze, corneal infection/infiltrate/ulcer, corneal epithelial defect, corneal decompensation/edema, problems associated with the flap including a lost, misplaced or misaligned flap, retinal detachment, and retinal vascular accidents. The occurrence of many of these events may involve the necessity of secondary (additional) surgical intervention.

Please refer to the complete list of adverse events and complications observed during the clinical study, which are presented in the clinical study section.

## VIII. SUMMARY OF PRECLINICAL STUDIES

### A. Objectives

The following preclinical tests were conducted to establish the safety and performance of the MEL 80 Excimer Laser System:

1. Ablation Profiles

To verify ablation profiles, a representative set of lenses was shot onto polymethylmethacrylate (PMMA) plates. The attempted refractive powers of the lenses were -0.5 to -12.0 D for myopia (spherical) and -0.25 to -6.0 D for myopic cylinder. Optical zones from 5 to 8 mm were used. Before creating each of the lenses, a fluence test was performed and a calibration lens was shot on a separate piece of PMMA to ensure correct energy setting of the laser. Each of the ablation profiles were then ablated on a PMMA plate. The PMMA plates were then measured for ablation depth, and the measurement data were exported as an ASCII file and loaded into an Excel spread sheet for analysis. Profilometry curves were generated that included the actual measurement data as well as tolerance curves that represented lower and upper limits of acceptable depth values. The tolerance curves were derived from the desired curve by variation of the sphere and cylinder value by ± 10% for >3.5 D of absolute sphere and cylinder, and ± 0.35 D for <3.5 D. The results of the testing demonstrated that the profilometry met these specified requirements.

2. Beam Homogeneity Measurements

Beam homogeneity (profile) measurements for the MEL 80 Laser System were performed by measuring the beam profile in the working plane and its variation along the optical axis, and by measuring the fluence, beam profile, and energy for production units. The results of the testing confirmed that the beam profile meets the specified requirements of a FWHM (full width at half maximum) beam diameter in the working plane between 0.6 mm and 0.8 mm.

3. Pulse Width and Stability

The MEL 80 specification for pulse width (duration) is 5 ns ± 1 ns, and was verified by measurement testing.

The MEL 80 was also subjected to intensive use (i.e., reliability testing) in which treatment regimes of 10,000 pulses within 3 minutes were tested. Two separate tests were performed: Test 1 was for a laser connected to a 230V/50Hz electricity network, and Test 2 was for a laser connected to a 120V/60Hz U.S. similar electricity network. Both the energy in the treatment plane and the refractive power of a test PMMA lens were determined for each treatment. The measurements were performed for 102 and 60 treatments over a time period of 3 days and 2 days for Test 1 and

Test 2, respectively. All treatments were performed at a fixed energy setting; i.e., a fluence calibration was not performed between the treatments. The results of the tests demonstrated that the standard deviation of the energy amounted to 1.6% maximum, whereas the standard deviation of the refractive power of the PMMA test lenses amounted to 3.5% maximum. The results demonstrated that both the energy and the refractive power of test lenses are very stable during the time period of up to 3 days, which correspond to the passive gas life time, i.e., the time during which the laser is able to operate with a single gas filling.

4. Tests of Fluence Control & Fail-safe Systems

The fluence of the excimer beam in the treatment plane is kept constant by controlling the energy during operation. The energy is changed by the control in readjusting the discharge high voltage value, and the spot diameter is fixed by design. The results of testing confirmed that perturbations of the energy by 10% are compensated by the energy control within 1-2 seconds.

Several fail-safe systems are implemented in the MEL 80, including those for energy, the laser scanners, the shutter, the gas system, the eyetracker, the cone for controlled atmosphere (CCA+) debris removal system, and the laser head. The fail-safe systems were tested as part of product verification testing using MEL 80 lasers that were prepared for product release.

5. Eye Tracking System

To check the overall performance of the eyetracker, verification tests were performed. Test lenses were ablated from PMMA plates that were attached to a tracking target. The PMMA plate and the tracking target were moved by means of a translation stage. The moving coordinates were obtained from actual LASIK treatments that were recorded with a special high-speed recorder (250 Hz) during the procedure. The refractive powers of the PMMA lenses attached to the tracking target were compared with the refractive powers of PMMA lenses that were ablated under static conditions. The results of the testing demonstrated that the refractive powers of both the dynamic and static PMMA lenses lie within the same tolerance range.

6. Electrical Safety and Electromagnetic Compatibility Testing

The MEL 80 Excimer Laser System was tested in accordance with IEC 60601-1[3], IEC 60601-1-2[4], and IEC 601-2-22[5], and was found to meet the requirements of the standards.

[3] Medical Electrical Equipment - Part 1: General Requirements For Basic Safety And Essential Performance
[4] Medical Electrical Equipment - Part 1-2: General Requirements For Safety - Collateral Standard: Electromagnetic Compatibility - Requirements And Tests
[5] Medical Electrical Equipment - Part 2: Particular Requirements For The Safety Of Diagnostic And Therapeutic Laser Equipment

7. Software Validation Testing

Carl Zeiss Meditec procedures require the establishment and review of specifications, development of risk analysis, and adequate verifications and validation of software and hardware prior to release. Testing was performed in accordance with EN 60601-1-4[6] to verify and validate module and system level functions. The results of the overall validation testing demonstrate that the MEL 80 Excimer Laser System meets the system specifications for performance and accuracy.

8. Ambient Temperature During Transport and Use

The MEL 80 Excimer Laser System was tested in a climate controlled test chamber at temperatures of 15 °C and 30 °C (the range of operating specifications for temperature), with humidity between 30 and 55%. A functional test was performed at each temperature, which consisted of manual verification that the OPASS software started properly, and that the laser lighting, aiming laser, distance laser, eye tracker, and patient bed performed as intended. In addition, -5.0 D and +5.0 D lenses were ablated in PMMA plates to confirm that a tolerance of ±0.25 D was met for each lens. Requirements for functional and ablation profilometry testing were met at both temperatures.

Additionally, the MEL 80 Excimer Laser System was subjected to a transport temperature test in a climatic test chamber at a temperature range of -15 °C to +45 °C (which covers the range of transportation specifications for temperature). The same functional and ablation profilometry testing described above was performed before and after the laser was subjected to the temperature range of -15 °C to +45 °C. Requirements for functional and ablation profilometry testing were met before and after exposure to the transportation temperature range.

9. Optical Radiation Safety Analysis

The illumination system of the MEL 80 underwent evaluation and testing in accordance with IEC 60825-1[7], and was found to meet the requirements of this standard. The optional slit-lamp was tested in accordance with the FDA Slit Lamp Guidance document (July 8, 1998).

## B. Results

The results of the preclinical testing provided evidence to support the conclusion that the device did not present an unreasonable risk to subjects and could proceed to clinical trials in the U.S. under an approved investigational device exemption (IDE).

[6] Medical Electrical Equipment: Part 1-4: General Requirements for Collateral Standard: Programmable Electrical Medical Systems

[7] Safety Of Laser Products - Part 1: Equipment Classification, Requirements And User's Guide

# IX. SUMMARY OF CLINICAL STUDIES

## A. Objectives

The objective of this study was to evaluate the safety and effectiveness of the Carl Zeiss Meditec MEL 80 Excimer Laser System for the reduction or elimination of myopia of less than or equal to -10.00 D, and astigmatism less than or equal to -3.50 D at the spectacle plane (myopia with or without astigmatism), when used as part of the LASIK surgical procedure. An optic zone of 6.0 to 7.0 mm with a transition zone of 1.7 to 1.9 mm was used during the study.

## B. Study Design

This was a prospective multicenter clinical trial in which a total of 360 eyes of consecutive patients at four (4) clinical sites were enrolled, treated with the MEL 80 Excimer Laser, and followed for a 6-month period. The pre-treatment condition of the eye was considered the control state for most comparisons.

Patients were screened for eligibility, and informed consent was obtained from those who met screening criteria and were interested in participating in the study. Eligible patients were examined preoperatively to obtain a medical history and to establish a baseline for ocular condition. Baseline and postoperative measurements included manifest refraction, cycloplegic refraction, distance visual acuity (best corrected and uncorrected), slit-lamp examination, fundus examination, and intraocular pressure (IOP).

Myopic eyes without astigmatism were treated with a spherical treatment only, and myopic eyes with astigmatism were treated with a combination of a single cylinder and spherical treatment.

Subjects were permitted to have second eyes (fellow eyes) treated simultaneously with the first eye surgery or sequentially. Monovision treatments and retreatments were not allowed during the study.

A total of 360 eyes were enrolled in this study. In this report, effectiveness results are provided for 354 eyes with at least 6 months of follow-up data. Safety data are provided for all 360 eyes enrolled in the study.

## C. Inclusion and Exclusion Criteria

In order to be enrolled in the study, patients needed to meet these conditions: have myopia less than or equal to -10.00 D, and astigmatism less than or equal to -3.50 D at the spectacle plane; have a stable refraction for the past year, as demonstrated by a change of less than or equal to 0.50 D; discontinue use of contact lenses at least 2 weeks for hard contacts and 1 week for soft lenses prior to the preoperative examination; hard contact wearers must have two central keratometry readings and two manifest refractions taken at least one week apart

that did not differ by more than 0.50 D; have visual acuity correctable to at least 20/40 in both eyes; the operative eye must be targeted for emmetropia; be at least 21 years of age; be willing and able to return for scheduled follow-up examinations; and provide written informed consent.

Patients not meeting the above inclusion criteria were excluded from the study. In addition, subjects who exhibited any of the following conditions were excluded: history of anterior segment pathology, including cataracts (in the operative eye); severe dry eye syndrome unresolved by treatment; residual, recurrent, active ocular or uncontrolled eyelid disease, corneal scars within the ablation zone or other corneal abnormality such as recurrent corneal erosion or severe basement membrane disease; ophthalmoscopic signs of progressive or unstable myopia or keratoconus (or keratoconus suspect); required ablation was deeper than 250 microns from the corneal endothelium; irregular or unstable (distorted/not clear) corneal mires on central keratometry readings; blind in the fellow eye; previous intraocular or corneal surgery; history of ocular herpes zoster or herpes simplex keratitis; history of steroid-responsive rise in intraocular pressure, glaucoma, or preoperative IOP > 21 mm Hg; diabetes, diagnosed autoimmune disease, connective tissue disease or clinically significant atopic syndrome; immunocompromised patients, or use of chronic systemic corticosteroid or other immunosuppresive therapy; pregnant, lactating, or child-bearing potential and not practicing a medically approved method of birth control; sensitivity to planned study medications; simultaneous participation in other ophthalmic drug or device clinical trial.

## D. Study Plan, Patient Assessments and Efficacy Criteria

All subjects were expected to return for follow-up examinations at 1 day, 1 week, 1 month, 3 months and 6 months postoperatively. Retreatment would not be performed as a part of the protocol.

Preoperatively, the subjects' medical and ocular histories were recorded. The objective parameters measured during the study included: uncorrected visual acuity (UCVA), best spectacle corrected visual acuity (BSCVA), manifest refraction, cycloplegic refraction, intraocular pressure, corneal pachymetry, slit lamp examination of the anterior segment, fundus examination, computerized corneal topography, central keratometry, and subjective self-evaluation questionnaire.

The primary efficacy variables for this study were improvement of UCVA, predictability of the planned correction, and stability of the manifest refraction.

## E. Study Period, Investigational Sites, and Demographics Data

### 1. Study Period and Investigational Sites

Subjects were treated between August 2004 and January 2005. The database for this PMA reflected data collected through September 24, 2005. A total of 360 eyes were treated at four sites.

### 2. Demographics

The demographics of this study are typical for a contemporary refractive surgery trial performed in the U.S (see Table 1). The cohort consists primarily of Caucasians.

**TABLE 1**
**DEMOGRAPHICS**
**ALL TREATED EYES**

| Demographics | Treated for Spherical Myopia Only | | Treated for Astigmatic Myopia | | All Treated Eyes/Subjects* | |
|---|---|---|---|---|---|---|
| | Number | Percentage | Number | Percentage | Number | Percentage |
| NUMBER OF EYES & SUBJECTS | 88 Eyes of 61 Enrolled Subjects | | 272 Eyes of 155 Enrolled Subjects | | 360 Eyes of 182 Enrolled Subjects | |
| | % | n | % | n | % | n |
| **GENDER** | | | | | | |
| Male | 47.5% | 29 | 58.1% | 90 | 55.5% | 101 |
| Female | 52.5% | 32 | 41.9% | 65 | 44.5% | 81 |
| **RACE** | | | | | | |
| White | 85.2% | 52 | 78.1% | 121 | 79.7% | 145 |
| Black | 4.9% | 3 | 3.2% | 5 | 3.3% | 6 |
| Asian | 3.3% | 2 | 5.8% | 9 | 4.9% | 9 |
| Other | 6.6% | 4 | 12.9% | 20 | 12.1% | 22 |
| **SURGICAL EYE** | | | | | | |
| Right | 51.1% | 45 | 49.6% | 135 | 50.0% | 180 |
| Left | 48.9% | 43 | 50.4% | 137 | 50.0% | 180 |
| **AGE (in years)** | | | | | | |
| Mean (SD) | 33.0 (8.2) | | 33.6 (8.9) | | 33.5 (8.8) | |
| Minimum, Maximum | 21.0, 51.0 | | 21.0, 60.0 | | 21.0, 60.0 | |

* Gender, Race, and Age were based on subjects, but Surgical Eye is based on eyes

## F. Data Analysis and Results

### 1. Preoperative characteristics

Presented in Tables 2A and 2B are the preoperative refraction parameters eyes treated for spherical myopia and astigmatic myopia. Preoperative refraction parameters for all eyes are presented in Tables 2C and 2D.

**TABLE 2A**
**PREOPERATIVE REFRACTION PARAMETERS**
**EYES TREATED FOR SPHERICAL MYOPIA ONLY**

| Manifest Refraction | Primary Eyes % | Primary Eyes n | Fellow Eyes % | Fellow Eyes n | Total Eyes % | Total Eyes n |
|---|---|---|---|---|---|---|
| **Sphere** | | | | | | |
| -0.25 to -1.00 D | 0.0 | 0 | 2.3 | 1 | 1.1 | 1 |
| -1.01 to -2.00 D | 11.1 | 5 | 7.0 | 3 | 9.1 | 8 |
| -2.01 to -3.00 D | 26.7 | 12 | 20.9 | 9 | 23.9 | 21 |
| -3.01 to -4.00 D | 26.7 | 12 | 32.6 | 14 | 29.5 | 26 |
| -4.01 to -5.00 D | 15.6 | 7 | 18.6 | 8 | 17.0 | 15 |
| -5.01 to -6.00 D | 11.1 | 5 | 4.7 | 2 | 8.0 | 7 |
| -6.01 to -7.00 D | 4.4 | 2 | 7.0 | 3 | 5.7 | 5 |
| -7.01 to -8.00 D | 2.2 | 1 | 4.7 | 2 | 3.4 | 3 |
| -8.01 to -9.00 D | 0.0 | 0 | 2.3 | 1 | 1.1 | 1 |
| -9.01 to -10.00 D | 2.2 | 1 | 0.0 | 0 | 1.1 | 1 |
| *Mean (SD)* | *-3.800 (1.617)* | | *-4.035 (1.731)* | | *-3.915 (1.668)* | |
| *Range* | *-9.25 to -1.75* | | *-9.00 to -1.00* | | *-9.25 to -1.00* | |
| Total | 100.0 | 45 | 100.0 | 43 | 100.0 | 88 |

**TABLE 2B**
**PREOPERATIVE REFRACTION PARAMETERS**
**STRATIFIED BY SPHERE AND CYLINDER COMPONENTS**
**EYES TREATED FOR ASTIGMATIC MYOPIA**
**(ATTEMPTED SPHERICAL AND CYLINDRICAL CORRECTIONS)**

| Manifest Sphere Mean: -3.370 SD: 1.716 Range: -10.00 to 0.00 | Manifest Cylinder Mean: -0.975, SD: 0.684, Range: -3.50 to -0.25 | | | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -0.25 to -0.50 D | | -0.51 to -1.00 D | | -1.01 to -2.00 D | | -2.01 to -3.00 D | | -3.01 to -3.50 D | | | |
| | % | n/N | % | n/N | % | n/N | % | n/N | % | n/N | % | n/N |
| -0.00 to -1.00 D | 2.2 | 6/272 | 1.5 | 4/272 | 1.1 | 3/272 | 0.4 | 1/272 | 0.0 | 0/272 | 5.1 | 14/272 |
| -1.01 to -2.00 D | 8.8 | 24/272 | 6.3 | 17/272 | 4.8 | 13/272 | 1.1 | 3/272 | 0.0 | 0/272 | 21.0 | 57/272 |
| -2.01 to -3.00 D | 11.8 | 32/272 | 7.4 | 20/272 | 3.7 | 10/272 | 0.7 | 2/272 | 0.0 | 0/272 | 23.5 | 64/272 |
| -3.01 to -4.00 D | 9.9 | 27/272 | 5.9 | 16/272 | 4.0 | 11/272 | 1.8 | 5/272 | 0.0 | 0/272 | 21.7 | 59/272 |
| -4.01 to -5.00 D | 3.3 | 9/272 | 2.2 | 6/272 | 5.1 | 14/272 | 1.5 | 4/272 | 0.7 | 2/272 | 12.9 | 35/272 |
| -5.01 to -6.00 D | 3.3 | 9/272 | 0.7 | 2/272 | 3.7 | 10/272 | 1.1 | 3/272 | 0.0 | 0/272 | 8.8 | 24/272 |
| -6.01 to -7.00 D | 1.1 | 3/272 | 1.1 | 3/272 | 1.8 | 5/272 | 0.7 | 2/272 | 0.0 | 0/272 | 4.8 | 13/272 |
| -7.01 to -8.00 D | 0.4 | 1/272 | 0.4 | 1/272 | 0.4 | 1/272 | 0.0 | 0/272 | 0.0 | 0/272 | 1.1 | 3/272 |
| -8.01 to -9.00 D | 0.4 | 1/272 | 0.4 | 1/272 | 0.0 | 0/272 | 0.0 | 0/272 | 0.0 | 0/272 | 0.7 | 2/272 |
| -9.01 to -10.00 D | 0.4 | 1/272 | 0.0 | 0/272 | 0.0 | 0/272 | 0.0 | 0/272 | 0.0 | 0/272 | 0.4 | 1/272 |
| Total | 41.5 | 113/272 | 25.7 | 70/272 | 24.6 | 67/272 | 7.4 | 20/272 | 0.7 | 2/272 | 100.0 | 272/272 |

N = Total number of eyes treated for astigmatic myopia.

## TABLE 2C
## PREOPERATIVE REFRACTION PARAMETERS
## STRATIFIED BY MRSE AND CYLINDER COMPONENTS
## ALL EYES TREATED

| MRSE Mean: -3.872 SD: 1.769 Range: -10.250 to -0.625 | Manifest Cylinder Mean: -0.737, SD: 0.727, Range: -3.500 to 0.000 | | | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -0.00 to -0.50 D | | -0.51 to -1.00 D | | -1.01 to -2.00 D | | -2.01 to -3.00 D | | -3.01 to -3.50 D | | | |
| | % | n/N | % | n/N | % | n/N | % | n/N | % | n/N | % | n/N |
| -0.00 to -1.00 D | 0.6% | (2/360) | 0.6% | (2/360) | 0.8% | (3/360) | 0.0% | (0/360) | 0.0% | (0/360) | 1.9% | (7/360) |
| -1.01 to -2.00 D | 8.3% | (30/360) | 2.5% | (9/360) | 0.6% | (2/360) | 0.0% | (0/360) | 0.0% | (0/360) | 11.4% | (41/360) |
| -2.01 to -3.00 D | 13.9% | (50/360) | 6.4% | (23/360) | 3.6% | (13/360) | 0.8% | (3/360) | 0.0% | (0/360) | 24.7% | (89/360) |
| -3.01 to -4.00 D | 16.1% | (58/360) | 5.3% | (19/360) | 2.8% | (10/360) | 0.8% | (3/360) | 0.0% | (0/360) | 25.0% | (90/360) |
| -4.01 to -5.00 D | 7.2% | (26/360) | 1.7% | (6/360) | 3.3% | (12/360) | 0.8% | (3/360) | 0.0% | (0/360) | 13.1% | (47/360) |
| -5.01 to -6.00 D | 4.4% | (16/360) | 1.4% | (5/360) | 3.3% | (12/360) | 1.4% | (5/360) | 0.0% | (0/360) | 10.6% | (38/360) |
| -6.01 to -7.00 D | 3.1% | (11/360) | 0.8% | (3/360) | 2.8% | (10/360) | 0.6% | (2/360) | 0.6% | (2/360) | 7.8% | (28/360) |
| -7.01 to -8.00 D | 1.1% | (4/360) | 0.3% | (1/360) | 1.4% | (5/360) | 0.8% | (3/360) | 0.0% | (0/360) | 3.6% | (13/360) |
| -8.01 to -9.00 D | 0.6% | (2/360) | 0.6% | (2/360) | 0.0% | (0/360) | 0.3% | (1/360) | 0.0% | (0/360) | 1.4% | (5/360) |
| -9.01 to -10.00 D | 0.3% | (1/360) | 0.0% | (0/360) | 0.0% | (0/360) | 0.0% | (0/360) | 0.0% | (0/360) | 0.3% | (1/360) |
| -10.01 to -11.00 D | 0.3% | (1/360) | 0.0% | (0/360) | 0.0% | (0/360) | 0.0% | (0/360) | 0.0% | (0/360) | 0.3% | (1/360) |
| Total | 55.8% | (201/360) | 19.4% | (70/360) | 18.6% | (67/360) | 5.6% | (20/360) | 0.6% | (2/360) | 100.0% | (360/360) |

## TABLE 2D
## PREOPERATIVE REFRACTION PARAMETERS
## STRATIFIED BY SPHERE AND CYLINDER COMPONENTS
## ALL EYES TREATED

| Manifest Sphere Mean: -3.503 SD: 1.718 Range: -10.00 to 0.00 | Manifest Cylinder Mean: -0.737, SD: 0.727, Range: -3.50 to 0.00 | | | | | | | | | | Total | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -0.00 to -0.50 D | | -0.51 to -1.00 D | | -1.01 to -2.00 D | | -2.01 to -3.00 D | | -3.01 to -3.50 D | | | |
| | % | n/N | % | n/N | % | n/N | % | n/N | % | n/N | % | n/N |
| -0.00 to -1.00 D | 1.9% | (7/360) | 1.1% | (4/360) | 0.8% | (3/360) | 0.3% | (1/360) | 0.0% | (0/360) | 4.2% | (15/360) |
| -1.01 to -2.00 D | 8.9% | (32/360) | 4.7% | (17/360) | 3.6% | (13/360) | 0.8% | (3/360) | 0.0% | (0/360) | 18.1% | (65/360) |
| -2.01 to -3.00 D | 14.7% | (53/360) | 5.6% | (20/360) | 2.8% | (10/360) | 0.6% | (2/360) | 0.0% | (0/360) | 23.6% | (85/360) |
| -3.01 to -4.00 D | 14.7% | (53/360) | 4.4% | (16/360) | 3.1% | (11/360) | 1.4% | (5/360) | 0.0% | (0/360) | 23.6% | (85/360) |
| -4.01 to -5.00 D | 6.7% | (24/360) | 1.7% | (6/360) | 3.9% | (14/360) | 1.1% | (4/360) | 0.6% | (2/360) | 13.9% | (50/360) |
| -5.01 to -6.00 D | 4.4% | (16/360) | 0.6% | (2/360) | 2.8% | (10/360) | 0.8% | (3/360) | 0.0% | (0/360) | 8.6% | (31/360) |
| -6.01 to -7.00 D | 2.2% | (8/360) | 0.8% | (3/360) | 1.4% | (5/360) | 0.6% | (2/360) | 0.0% | (0/360) | 5.0% | (18/360) |
| -7.01 to -8.00 D | 1.1% | (4/360) | 0.3% | (1/360) | 0.3% | (1/360) | 0.0% | (0/360) | 0.0% | (0/360) | 1.7% | (6/360) |
| -8.01 to -9.00 D | 0.6% | (2/360) | 0.3% | (1/360) | 0.0% | (0/360) | 0.0% | (0/360) | 0.0% | (0/360) | 0.8% | (3/360) |
| -9.01 to -10.00 D | 0.6% | (2/360) | 0.0% | (0/360) | 0.0% | (0/360) | 0.0% | (0/360) | 0.0% | (0/360) | 0.6% | (2/360) |
| Total | 55.8% | (201/360) | 19.4% | (70/360) | 18.6% | (67/360) | 5.6% | (20/360) | 0.6% | (2/360) | 100.0% | (360/360) |

## 2. Postoperative Characteristics and Results

### a. Accountability

Accountability was very high with only 6 eyes lost to follow-up. There were no missed visits and no patients were discontinued from this study. Accountability for all treated eyes across the study visit schedule is presented in Table 3.

**TABLE 3**
**ACCOUNTABILITY**
**ALL TREATED EYES**

| Total Eyes (N) = 360 | | 1 Day | 1 Week | 1 Month | 3 Months | 6 Months |
|---|---|---|---|---|---|---|
| Available for Analysis | % (n/N) | 100.0% (360/360) | 100.0% (360/360) | 98.9% (356/360) | 99.4% (358/360) | 98.3% (354/360) |
| Discontinued* | % (n/N) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) |
| Deceased | % (n/N) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) |
| Retreatment | % (n/N) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) |
| Aborted | % (n/N) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) |
| Active (Not yet eligible for the interval) | | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) |
| Lost to Follow-up† | % (n/N) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) | 0.0% (0/360) | 1.7% (6/360) |
| Missed Visit‡ | % (n/N) | 0.0% (0/360) | 0.0% (0/360) | 1.1% (4/360) | 0.6% (2/360) | 0.0% (0/360) |
| % Accountability = Available for Analysis ÷ (Enrolled - Discontinued - Not yet eligible) | | 100.0% (360/360) | 100.0% (360/360) | 98.9% (356/360) | 99.4% (358/360) | 98.3% (354/360) |

N = Total number of eyes enrolled.

* Discontinued = Exited due to retreatment (n = 0), aborted procedure (n = 0), or death (n = 0).

† Lost to follow-up: Eyes were not examined at the 6-month visit, and were not considered active or discontinued.

‡ Missed visit: Eyes were not examined at the scheduled visit, however, were examined at a subsequent visit.

### b. Stability of refractive outcome

As shown in Table 4A, for the consistent cohort of study eyes, the mean change in MRSE between 1 and 3 months was -0.05 D with a standard deviation of 0.32 D, and the mean change in MRSE between 3 and 6 months was similar, i.e., 0.06 D, S.D. 0.38 D. Thus, there was essentially no change in mean MRSE across these study visits. Between 3 and 6 months, the mean change in MRSE per month was 0.02 D, well below the target value of 0.04 D. In addition, ≥ 98% of eyes were reported with a change of MRSE by ≤ 1.00 D at both intervals. The upper limit of the monthly 95% confidence interval (CI) was > -0.01 D for 1-3 months and the lower limit was < +0.01 D for 3-6 months. Thus, stability was demonstrated at 3-months postoperatively.

**TABLE 4A**
**STABILITY OF MANIFEST REFRACTION SPHERICAL EQUIVALENT (MRSE)**
**ALL TREATED EYES**

| Change in MRSE | Between 1 and 3 Months | Between 3 and 6 Months |
|---|---|---|
| **Pairwise Sequential Visits*** | | |
| Change of MRSE by ≤ 1.00 D | | |
| % (n/N) | 99.4% (354/356) | 98.0% (345/352) |
| 95% CI for %† | (98.0%, 99.9%) | (95.9%, 99.2%) |
| Change of MRSE (Paired-Differences) in Diopter | | |
| Mean | -0.050 | 0.058 |
| SD | 0.317 | 0.380 |
| 95% CI for Mean | (-0.083, -0.016) | (0.018, 0.097) |
| Mean/month | -0.025 | 0.019 |
| SD/month | 0.159 | 0.127 |
| 95% CI for Mean/month | (-0.041, -0.008) | (0.006, 0.032) |
| **Consistent Cohort*** | | |
| Change of MRSE by ≤ 1.00 D | | |
| % (n/N) | 99.4% (348/350) | 98.0% (343/350) |
| 95% CI for %† | (98.0%, 99.9%) | (95.9%, 99.2%) |
| Change of MRSE (Paired-Differences) in Diopter | | |
| Mean | -0.046 | 0.059 |
| SD | 0.316 | 0.380 |
| 95% CI for Mean | (-0.079, -0.013) | (0.019, 0.099) |
| Mean/month | -0.023 | 0.020 |
| SD/month | 0.158 | 0.127 |
| 95% CI for Mean/month | (-0.040, -0.006) | (0.006, 0.033) |

* Pairwise Sequential Visits = Eyes that had two consecutive exams, but not necessarily every follow-up exam. Consistent Cohort = All eyes examined at 1, 3, and 6 months.

† It was calculated based on Clopper-Pearson exact method.
Note: 70 eyes at one study site underwent manifest refraction at month 6 which "pushed plus" to a greater extent than the protocol MR done at earlier visits at that site.

As shown in Table 4B, for the consistent cohort of study eyes, the mean change in manifest refraction cylinder (MRCYL) between 1 and 3 months was -0.004 D with a standard deviation of 0.31 D, and the mean change in MRCYL between 3 and 6 months was similar, i.e., 0.014 D, S.D. 0.28 D. Thus, there was essentially no change in mean MRCYL across these study visits. Between 3 and 6 months, the mean change in MRCYL per month was 0.005 D, well below the target value of 0.04 D. In addition, ≥ 99% of eyes were reported with a change of MRSE by ≤ 1.00 D at both intervals. Thus, stability was demonstrated at 3-months postoperatively.

**TABLE 4B**
**STABILITY OF MANIFEST REFRACTION CYLINDER (MRCYL)**
**EYES TREATED FOR ASTIGMATIC MYOPIA**

| Change in MRCYL | Between 1 and 3 Months | Between 3 and 6 Months |
|---|---|---|
| **Pairwise Sequential Visits*** | | |
| Change of **MRCYL** by ≤ 1.00 D | | |
| % (n/N) | 99.6% (268/269) | 100.0% (264/264) |
| 95% CI for %† | (97.9%, 100.0%) | (98.6%, 100.0%) |
| Change of **MRCYL** (Paired-Differences) in Diopter | | |
| Mean | -0.004 | 0.014 |
| SD | 0.306 | 0.276 |
| 95% CI for Mean | (-0.040, 0.033) | (-0.019, 0.048) |
| Mean/month | -0.002 | 0.005 |
| SD/month | 0.153 | 0.092 |
| 95% CI for Mean/month | (-0.020, 0.017) | (-0.006, 0.016) |
| **Consistent Cohort*** | | |
| Change of **MRCYL** by ≤ 1.00 D | | |
| % (n/N) | 99.6% (262/263) | 100.0% (263/263) |
| 95% CI for %† | (97.9%, 100.0%) | (98.6%, 100.0%) |
| Change of **MRCYL** (Paired-Differences) in Diopter | | |
| Mean | -0.002 | 0.014 |
| SD | 0.308 | 0.276 |
| 95% CI for Mean | (-0.039, 0.036) | (-0.019, 0.048) |
| Mean/month | -0.001 | 0.005 |
| SD/month | 0.154 | 0.092 |
| 95% CI for Mean/month | (-0.020, 0.018) | (-0.006, 0.016) |

* Pairwise Sequential Visits = Eyes that had two consecutive exams, but not necessarily every follow-up exam. Consistent Cohort = All eyes examined at 1, 3, and 6 months.

† It was calculated based on Clopper-Pearson exact method.

### c. Effectiveness Outcomes

Table 5 presents the key effectiveness variable outcomes for all treated eyes. Key effectiveness outcomes at 3 months stratified by each diopter of preoperative MRSE are presented in Tables 6A, 6B, and 6C for all eyes, spherical myopia eyes, and astigmatic myopia eyes, respectively. Stratification of key efficacy parameters by optical zone is presented in Table 6D for all eyes.

As shown in Table 5, the three primary outcomes for percent of eyes with 20/40 or better uncorrected visual acuity and percent of eyes within ± 0.50 D and ± 1.00 D of attempted correction are all above the suggested minimum FDA Guidance document[8] values for myopia. At 3 months, 92.5% of eyes had UCVA 20/20 or better, and 99.7% of eyes had UCVA 20/40 or better. At 6 months, 92.7% of eyes had UCVA 20/20 or better, and 99.4% of eyes had UCVA 20/40 or better.

Efficacy data for the overall cohort stratified in one diopter increments of preoperative MRSE meet the outcomes recommended in the FDA guidance, with the exception of eyes with a preoperative MRSE of -9.01 to -10.00 D (Table 6A). This group had 0% of eyes (versus the recommended 50%) achieve MRSE within ± 0.50 D of the intended outcome; however, there was only 1 eye in this group. Similarly, efficacy data for eyes treated for spherical myopia and astigmatic myopia stratified in one diopter increments of preoperative MRSE meet the outcomes recommended in the FDA guidance, with the exception of eyes with a preoperative MRSE of -9.01 to -10.00 D (Table 6B) and 0.00 to -1.00 D (Table 6C), respectively.

The effect of the optical zone on the efficacy parameters of uncorrected visual acuity and accuracy of the postoperative refraction is shown in Table 6D. The analyses revealed that the optical zone size selected did not play a significant role in efficacy outcomes with regard to the proportion of eyes with UCVA of 20/40 or better and deviation from the intended correction within ± 0.50 D and within ± 1.00 D at 3 months postoperatively.

[8] Checklist of Information Usually Submitted in an Investigational Device Exemptions (IDE) Application for Refractive Surgery Lasers (October 10, 1996)

## TABLE 5
## SUMMARY OF KEY EFFECTIVENESS VARIABLES (ALL TREATED EYES)

| Key Effectiveness Variables | 1 Week<br>% (n/N)<br>95% CI* | 1 Month<br>% (n/N)<br>95% CI* | 3 Months<br>% (n/N)<br>95% CI* | 6 Months<br>% (n/N)<br>95% CI* |
|---|---|---|---|---|
| UCVA 20/20 or better | 85.8% (309/360)<br>81.8%, 89.3% | 91.6% (326/356)<br>88.2%, 94.2% | 92.5% (331/358)<br>89.2%, 95.0% | 92.7% (328/354)<br>89.4%, 95.1% |
| UCVA 20/40 or better | 99.4% (358/360)<br>98.0%, 99.9% | 99.7% (355/356)<br>98.4%, 100.0% | 99.7% (357/358)<br>98.5%, 100.0% | 99.4% (352/354)<br>98.0%, 99.9% |
| MRSE†, Attempted vs. Achieved, ± 0.50 D | 75.3% (271/360)<br>70.5%, 79.6% | 80.6% (287/356)<br>76.1%, 84.6% | 84.9% (304/358)<br>80.8%, 88.5% | 76.8% (272/354)<br>72.1%, 81.1% |
| MRSE†, Attempted vs. Achieved, ± 1.00 D | 92.5% (333/360)<br>89.3%, 95.0% | 96.3% (343/356)<br>93.8%, 98.0% | 95.8% (343/358)<br>93.2%, 97.6% | 95.5% (338/354)<br>92.8%, 97.4% |
| MRSE†, Attempted vs. Achieved, ± 2.00 D | 100.0% (360/360)<br>99.0%, 100.0% | 100.0% (356/356)<br>99.0%, 100.0% | 99.7% (357/358)<br>98.5%, 100.0% | 100.0% (354/354)<br>99.0%, 100.0% |

N = Number of CRFs received with non-missing values at each visit.

†MRSE = Manifest Spherical Equivalent = Manifest Sphere + 0.5 × Manifest Cylinder.

* The confidence interval was 95% and calculated based on Clopper-Pearson exact method.

25

## TABLE 6A
## SUMMARY OF KEY EFFECTIVENESS VARIABLES AT 3 MONTHS (POINT OF STABILITY) STRATIFIED BY PREOPERATIVE MRSE
## ALL TREATED EYES

| Key Effectiveness Variables | Preoperative MRSE | | | | | | | | | | | Total | P-value† |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -0.00 to -1.00 D % (n/N) | -1.01 to -2.00 D % (n/N) | -2.01 to -3.00 D % (n/N) | -3.01 to -4.00 D % (n/N) | -4.01 to -5.00 D % (n/N) | -5.01 to -6.00 D % (n/N) | -6.01 to -7.00 D % (n/N) | -7.01 to -8.00 D % (n/N) | -8.01 to -9.00 D % (n/N) | -9.01 to -10.00 D % (n/N) | -10.01 to -11.00 D % (n/N) | % (n/N) | |
| UCVA 20/20 or better | 71.4% (5/7) | 100.0% (41/41) | 94.3% (82/87) | 94.4% (85/90) | 95.7% (45/47) | 81.6% (31/38) | 92.9% (26/28) | 84.6% (11/13) | 60.0% (3/5) | 100.0% (1/1) | 100.0% (1/1) | 92.5% (331/358) | 0.0381 |
| UCVA 20/40 or better | 85.7% (6/7) | 100.0% (41/41) | 100.0% (87/87) | 100.0% (90/90) | 100.0% (47/47) | 100.0% (38/38) | 100.0% (28/28) | 100.0% (13/13) | 100.0% (5/5) | 100.0% (1/1) | 100.0% (1/1) | 99.7% (357/358) | 0.3720 |
| MRSE*, Attempted vs. Achieved, ± 0.50 D | 71.4% (5/7) | 92.7% (38/41) | 92.0% (80/87) | 82.2% (74/90) | 83.0% (39/47) | 71.1% (27/38) | 92.9% (26/28) | 76.9% (10/13) | 80.0% (4/5) | 0.0% (0/1) | 100.0% (1/1) | 84.9% (304/358) | 0.0365 |
| MRSE*, Attempted vs. Achieved, ± 1.00 D | 71.4% (5/7) | 100.0% (41/41) | 97.7% (85/87) | 93.3% (84/90) | 97.9% (46/47) | 94.7% (36/38) | 100.0% (28/28) | 92.3% (12/13) | 80.0% (4/5) | 100.0% (1/1) | 100.0% (1/1) | 95.8% (343/358) | 0.4619 |
| MRSE*, Attempted vs. Achieved, ± 2.00 D | 100.0% (7/7) | 100.0% (41/41) | 100.0% (87/87) | 100.0% (90/90) | 97.9% (46/47) | 100.0% (38/38) | 100.0% (28/28) | 100.0% (13/13) | 100.0% (5/5) | 100.0% (1/1) | 100.0% (1/1) | 99.7% (357/358) | 0.3559 |

N = Number of CRFs received with non-missing values for each subgroup.

* MRSE = Manifest Spherical Equivalent = Manifest Sphere + 0.5 × Manifest Cylinder.

† $\chi^2$ test. Due to small sample sizes, baseline groups of MRSE -7.01 D or higher were combined and -2.00 D or lower were combined.

## TABLE 6B
## SUMMARY OF KEY EFFECTIVENESS VARIABLES AT 3 MONTHS (POINT OF STABILITY) STRATIFIED BY PREOPERATIVE MRSE
## EYES TREATED FOR SPHERICAL MYOPIA ONLY

| Key Effectiveness Variables | Preoperative MRSE | | | | | | | | | | Total | P-value† |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -0.00 to -1.00 D % (n/N) | -1.01 to -2.00 D % (n/N) | -2.01 to -3.00 D % (n/N) | -3.01 to -4.00 D % (n/N) | -4.01 to -5.00 D % (n/N) | -5.01 to -6.00 D % (n/N) | -6.01 to -7.00 D % (n/N) | -7.01 to -8.00 D % (n/N) | -8.01 to -9.00 D % (n/N) | -9.01 to -10.00 D % (n/N) | % (n/N) | |
| UCVA 20/20 or better | 100.0% (1/1) | 100.0% (8/8) | 100.0% (21/21) | 96.2% (25/26) | 93.3% (14/15) | 100.0% (7/7) | 100.0% (5/5) | 66.7% (2/3) | 0.0% (0/1) | 100.0% (1/1) | 95.5% (84/88) | 0.0106 |
| UCVA 20/40 or better | 100.0% (1/1) | 100.0% (8/8) | 100.0% (21/21) | 100.0% (26/26) | 100.0% (15/15) | 100.0% (7/7) | 100.0% (5/5) | 100.0% (3/3) | 100.0% (1/1) | 100.0% (1/1) | 100.0% (88/88) | NA |
| MRSE*, Attempted vs. Achieved, ± 0.50 D | 100.0% (1/1) | 100.0% (8/8) | 100.0% (21/21) | 96.2% (25/26) | 100.0% (15/15) | 85.7% (6/7) | 80.0% (4/5) | 66.7% (2/3) | 100.0% (1/1) | 0.0% (0/1) | 94.3% (83/88) | 0.0103 |
| MRSE*, Attempted vs. Achieved, ± 1.00 D | 100.0% (1/1) | 100.0% (8/8) | 100.0% (21/21) | 100.0% (26/26) | 100.0% (15/15) | 100.0% (7/7) | 100.0% (5/5) | 66.7% (2/3) | 100.0% (1/1) | 100.0% (1/1) | 98.9% (87/88) | 0.0101 |
| MRSE*, Attempted vs. Achieved, ± 2.00 D | 100.0% (1/1) | 100.0% (8/8) | 100.0% (21/21) | 100.0% (26/26) | 100.0% (15/15) | 100.0% (7/7) | 100.0% (5/5) | 100.0% (3/3) | 100.0% (1/1) | 100.0% (1/1) | 100.0% (88/88) | NA |

N = Number of CRFs received with non-missing values for each subgroup.

* MRSE = Manifest Spherical Equivalent = Manifest Sphere + 0.5 × Manifest Cylinder.

† $\chi^2$ test. Due to small sample sizes, baseline groups of MRSE -7.01 D or higher were combined and -2.00 D or lower were combined.

27

## TABLE 6C
## SUMMARY OF KEY EFFECTIVENESS VARIABLES AT 3 MONTHS (POINT OF STABILITY) STRATIFIED BY PREOPERATIVE MRSE
## EYES TREATED FOR ASTIGMATIC MYOPIA

| Key Effectiveness Variables | Preoperative MRSE | | | | | | | | | | | Total | P-value† |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | -0.00 to -1.00 D % (n/N) | -1.01 to -2.00 D % (n/N) | -2.01 to -3.00 D % (n/N) | -3.01 to -4.00 D % (n/N) | -4.01 to -5.00 D % (n/N) | -5.01 to -6.00 D % (n/N) | -6.01 to -7.00 D % (n/N) | -7.01 to -8.00 D % (n/N) | -8.01 to -9.00 D % (n/N) | -9.01 to -10.00 D % (n/N) | -10.01 to -11.00 D % (n/N) | % (n/N) | |
| UCVA 20/20 or better | 66.7% (4/6) | 100.0% (33/33) | 92.4% (61/66) | 93.8% (60/64) | 96.9% (31/32) | 77.4% (24/31) | 91.3% (21/23) | 90.0% (9/10) | 75.0% (3/4) | NA NA | 100.0% (1/1) | 91.5% (247/270) | 0.1022 |
| UCVA 20/40 or better | 83.3% (5/6) | 100.0% (33/33) | 100.0% (66/66) | 100.0% (64/64) | 100.0% (32/32) | 100.0% (31/31) | 100.0% (23/23) | 100.0% (10/10) | 100.0% (4/4) | NA NA | 100.0% (1/1) | 99.6% (269/270) | 0.4294 |
| MRSE*, Attempted vs. Achieved, ± 0.50 D | 66.7% (4/6) | 90.9% (30/33) | 89.4% (59/66) | 76.6% (49/64) | 75.0% (24/32) | 67.7% (21/31) | 95.7% (22/23) | 80.0% (8/10) | 75.0% (3/4) | NA NA | 100.0% (1/1) | 81.9% (221/270) | 0.0493 |
| MRSE*, Attempted vs. Achieved, ± 1.00 D | 66.7% (4/6) | 100.0% (33/33) | 97.0% (64/66) | 90.6% (58/64) | 96.9% (31/32) | 93.5% (29/31) | 100.0% (23/23) | 100.0% (10/10) | 75.0% (3/4) | NA NA | 100.0% (1/1) | 94.8% (256/270) | 0.5946 |
| MRSE*, Attempted vs. Achieved, ± 2.00 D | 100.0% (6/6) | 100.0% (33/33) | 100.0% (66/66) | 100.0% (64/64) | 96.9% (31/32) | 100.0% (31/31) | 100.0% (23/23) | 100.0% (10/10) | 100.0% (4/4) | NA NA | 100.0% (1/1) | 99.6% (269/270) | 0.2800 |

N = Number of CRFs received with non-missing values for each subgroup.

* MRSE = Manifest Spherical Equivalent = Manifest Sphere + 0.5 × Manifest Cylinder.

† $\chi^2$ test. Due to small sample sizes, baseline groups of MRSE -7.01 D or higher were combined and -2.00 D or lower were combined.

## TABLE 6D
## SUMMARY OF KEY EFFECTIVENESS VARIABLES AT 3 MONTHS
## STRATIFIED BY OPTICAL ZONE
## ALL TREATED EYES

| Key Effectiveness Variables | Optical Zone | | | Total | P-value† |
|---|---|---|---|---|---|
| | < 6.5 mm % (n/N) | 6.5 mm % (n/N) | 7.0 mm % (n/N) | % (n/N) | |
| UCVA 20/20 or better | 70.6% (12/17) | 93.4% (310/332) | 100.0% (9/9) | 92.5% (331/358) | 0.0127 |
| UCVA 20/40 or better | 100.0% (17/17) | 99.7% (331/332) | 100.0% (9/9) | 99.7% (357/358) | 1.0000 |
| MRSE*, Attempted vs. Achieved, ± 0.50 D | 88.2% (15/17) | 84.6% (281/332) | 88.9% (8/9) | 84.9% (304/358) | 1.0000 |
| MRSE*, Attempted vs. Achieved, ± 1.00 D | 100.0% (17/17) | 95.5% (317/332) | 100.0% (9/9) | 95.8% (343/358) | 1.0000 |
| MRSE*, Attempted vs. Achieved, ± 2.00 D | 100.0% (17/17) | 99.7% (331/332) | 100.0% (9/9) | 99.7% (357/358) | 1.0000 |

N = Number of CRFs received with non-missing values for each subgroup.

* MRSE = Manifest Spherical Equivalent = Manifest Sphere + 0.5 × Manifest Cylinder.

† Fisher's exact test.

### d. Correction of Cylindrical Component

Table 7A presents the vector magnitude analysis of the cylinder correction at 1, 3, and 6 months. The vector magnitude ratio (SIRC/IRC) was 1.37 (S.D. 0.66) at 3 months, suggesting overcorrection of the baseline cylinder. A vector analysis summary is presented in Table 7B for astigmatic myopia eyes. At 3 months, a high Correction Ratio (CR) was observed in eyes with baseline cylinder of -0.25 to -0.50 D (CR = 1.78), and in eyes with baseline cylinder of -0.51 to -1.00 D (CR 1.26). Because nearly half of the study population had cylinder of -1.00 D or less, and even though the CR was close to 1.00 for the eyes with baseline cylinder of -1.01 to -3.50 D, this is not reflected in the overall mean CR of 1.42.

These data confirm that the overcorrections occurred primarily in the baseline cylinder groups of -0.25 to -0.50 D and -0.51 to -1.00 D, which had significantly higher CR values as compared to all other baseline cylinder groups at 3 months postoperatively. At 3 months, all other baseline cylinder groups had a CR value that was closer to the desired target value of 1.0. This was confirmed by the high levels of UCVA in the overall study population and in the eyes with low levels of preoperative cylinder.

**TABLE 7A**
**VECTOR MAGNITUDE ANALYSIS SUMMARY**
**EYES TREATED FOR ASTIGMATIC MYOPIA &**
**WITH COMPLETE PREOPERATIVE AND POSTOPERATIVE REFRACTION**

| Statistics | Preoperative | Postoperative | IRC | SIRC | SIRC/IRC |
|---|---|---|---|---|---|
| **1 Month** | | | | | |
| N | 269 | 269 | 269 | 269 | 269 |
| Mean | -0.982 | -0.373 | 0.982 | 1.199 | 1.40 |
| Standard Deviation | 0.684 | 0.344 | 0.684 | 0.743 | 0.70 |
| Minimum | -3.500 | -1.500 | 0.250 | 0.051 | 0.18 |
| Maximum | -0.250 | 0.000 | 3.500 | 3.999 | 4.94 |
| **3 Months** | | | | | |
| N | 270 | 270 | 270 | 270 | 270 |
| Mean | -0.980 | -0.377 | 0.980 | 1.185 | 1.37 |
| Standard Deviation | 0.684 | 0.356 | 0.684 | 0.747 | 0.66 |
| Minimum | -3.500 | -1.500 | 0.250 | 0.035 | 0.07 |
| Maximum | -0.250 | 0.000 | 3.500 | 4.237 | 4.00 |
| **6 Months** | | | | | |
| N | 266 | 266 | 266 | 266 | 266 |
| Mean | -0.986 | -0.355 | 0.986 | 1.190 | 1.36 |
| Standard Deviation | 0.686 | 0.354 | 0.686 | 0.764 | 0.65 |
| Minimum | -3.500 | -2.000 | 0.250 | 0.169 | 0.24 |
| Maximum | -0.250 | 0.000 | 3.500 | 4.740 | 5.80 |

N = Number of available CRFs received with non-missing values at each visit.

**TABLE 7B**
**VECTOR ANALYSIS SUMMARY AT POINT OF STABILITY**
**EYES TREATED FOR ASTIGMATIC MYOPIA**

| Preoperative Cylinder | \|IRC\| | | \|SIRC\| | | CR[1] | | ER[2] | |
|---|---|---|---|---|---|---|---|---|
| | N | Mean ± SD | N | Mean ± SD | N | Mean ± SD | N | Mean ± SD |
| **3 Months** | | | | | | | | |
| All | 270 | 0.884 ± 0.600 | 270 | 1.095 ± 0.673 | 270 | 1.420 ± 0.722 | 270 | 0.606 ± 0.730 |
| -0.25 to -0.50 D | 111 | 0.385 ± 0.108 | 111 | 0.664 ± 0.354 | 111 | 1.784 ± 0.923 | 111 | 0.961 ± 0.951 |
| -0.51 to -1.00 D | 70 | 0.778 ± 0.112 | 70 | 0.978 ± 0.334 | 70 | 1.259 ± 0.405 | 70 | 0.412 ± 0.442 |
| -1.01 to -2.00 D | 67 | 1.343 ± 0.242 | 67 | 1.466 ± 0.503 | 67 | 1.095 ± 0.335 | 67 | 0.331 ± 0.281 |
| -2.01 to -3.00 D | 20 | 2.282 ± 0.239 | 20 | 2.513 ± 0.626 | 20 | 1.109 ± 0.288 | 20 | 0.270 ± 0.225 |
| -3.01 to -3.50 D | 2 | 2.892 ± 0.146 | 2 | 2.586 ± 0.783 | 2 | 0.888 ± 0.226 | 2 | 0.219 ± 0.074 |

Refraction was converted from the spectacle to the corneal plane and cylinder axis of left eye was flipped around the vertical axis. Then IRC, SIRC, CR and ER were calculated.

[1] CR = |SIRC|/|IRC|.

[2] ER = |EV|/|IRC|. EV = Error Vector = Vector difference between IRC and SIRC = IRC - SIRC.

### e. Ablation Algorithm Adjustment Based on Effectiveness Outcomes

Based on regression analyses of the clinical trial data, the ablation algorithm was modified as follows:

- adjustment (reduction) to the sphere component of -0.25 D for both sphere and spherocylindrical eyes
- adjustment (reduction) to the cylinder component of -0.25 D for spherocylindrical eyes only

### f. Safety Outcomes

The key safety variables for all treated eyes are presented in Table 8. Change in BSCVA stratified by each diopter of preoperative MRSE for all treated eyes at 3 months is presented in Table 9. All the adverse events reported are summarized in Table 10. The cumulative adverse event rate for all reported events was quite low, with no category of event exceeding 0.6% on a cumulative basis. Overall, the device was deemed to be reasonably safe.

**TABLE 8**
**SUMMARY OF KEY SAFETY VARIABLES (ALL TREATED EYES)**

| Key Safety Variables | 1 Week<br>% (n/N)<br>95% CI* | 1 Month<br>% (n/N)<br>95% CI* | 3 Months<br>% (n/N)<br>95% CI* | 6 Months<br>% (n/N)<br>95% CI* |
|---|---|---|---|---|
| Loss of ≥ 2 lines BSCVA | 2.2% (8/360)<br>1.0%, 4.3% | 0.8% (3/356)<br>0.2%, 2.4% | 0.6% (2/358)<br>0.1%, 2.0% | 0.3% (1/354)<br>0.0%, 1.6% |
| Loss of > 2 lines BSCVA | 0.6% (2/360)<br>0.1%, 2.0% | 0.0% (0/356)<br>0.0%, 1.0% | 0.0% (0/358)<br>0.0%, 1.0% | 0.0% (0/354)<br>0.0%, 1.0% |
| BSCVA worse than 20/40 | 0.0% (0/360)<br>0.0%, 1.0% | 0.0% (0/356)<br>0.0%, 1.0% | 0.0% (0/358)<br>0.0%, 1.0% | 0.0% (0/354)<br>0.0%, 1.0% |
| BSCVA worse than 20/25 if 20/20 or better preoperatively | 0.0% (0/360)<br>0.0%, 1.0% | 0.0% (0/356)<br>0.0%, 1.0% | 0.0% (0/358)<br>0.0%, 1.0% | 0.0% (0/354)<br>0.0%, 1.0% |
| Haze ≥ trace with loss of BSCVA > 2 lines | 0.0% (0/360)<br>0.0%, 1.0% | 0.0% (0/356)<br>0.0%, 1.0% | 0.0% (0/358)<br>0.0%, 1.0% | 0.0% (0/354)<br>0.0%, 1.0% |
| Increased manifest refractive astigmatism > 2.0 D‡ | 0.0% (0/ 88)<br>0.0%, 4.1% | 0.0% (0/ 87)<br>0.0%, 4.2% | 0.0% (0/ 88)<br>0.0%, 4.1% | 0.0% (0/ 88)<br>0.0%, 4.1% |

N = Number of CRFs received with non-missing values at each visit.
†MRSE = Manifest Spherical Equivalent = Manifest Sphere + 0.5 × Manifest Cylinder.
* The confidence interval was 95% and calculated based on Clopper-Pearson exact method.
‡ For eyes treated for spherical myopia only.

## TABLE 9
## CHANGE IN BEST SPECTACLE-CORRECTED VISUAL ACUITY (BSCVA) AT 3 MONTHS STRATIFIED BY PREOPERATIVE MRSE
## ALL TREATED EYES

| Change in BSCVA from Preop | -0.00 to -1.00 D % (n/N) | -1.01 to -2.00 D % (n/N) | -2.01 to -3.00 D % (n/N) | -3.01 to -4.00 D % (n/N) | -4.01 to -5.00 D % (n/N) | -5.01 to -6.00 D % (n/N) | -6.01 to -7.00 D % (n/N) | -7.01 to -8.00 D % (n/N) | -8.01 to -9.00 D % (n/N) | -9.01 to -10.00 D % (n/N) | -10.01 to -11.00 D % (n/N) | Total % (n/N) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Decrease > 2 lines (Decrease > 10 letters) | 0.0% (0/7) | 0.0% (0/41) | 0.0% (0/87) | 0.0% (0/90) | 0.0% (0/47) | 0.0% (0/38) | 0.0% (0/28) | 0.0% (0/13) | 0.0% (0/5) | 0.0% (0/1) | 0.0% (0/1) | 0.0% (0/358) |
| Decrease 2 lines (Decrease 8 to 10 letters) | 0.0% (0/7) | 0.0% (0/41) | 0.0% (0/87) | 1.1% (1/90) | 0.0% (0/47) | 0.0% (0/38) | 0.0% (0/28) | 7.7% (1/13) | 0.0% (0/5) | 0.0% (0/1) | 0.0% (0/1) | 0.6% (2/358) |
| Decrease 1 line (Decrease 3 to 7 letters) | 28.6% (2/7) | 9.8% (4/41) | 8.0% (7/87) | 4.4% (4/90) | 10.6% (5/47) | 7.9% (3/38) | 7.1% (2/28) | 7.7% (1/13) | 0.0% (0/5) | 0.0% (0/1) | 0.0% (0/1) | 7.8% (28/358) |
| No change (Change within 2 letters) | 42.9% (3/7) | 36.6% (15/41) | 51.7% (45/87) | 48.9% (44/90) | 48.9% (23/47) | 50.0% (19/38) | 35.7% (10/28) | 38.5% (5/13) | 40.0% (2/5) | 0.0% (0/1) | 100.0% (1/1) | 46.6% (167/358) |
| Increase 1 line (Increase 3 to 7 letters) | 28.6% (2/7) | 39.0% (16/41) | 36.8% (32/87) | 43.3% (39/90) | 31.9% (15/47) | 36.8% (14/38) | 46.4% (13/28) | 30.8% (4/13) | 40.0% (2/5) | 0.0% (0/1) | 0.0% (0/1) | 38.3% (137/358) |
| Increase 2 lines (Increase 8 to 10 letters) | 0.0% (0/7) | 14.6% (6/41) | 2.3% (2/87) | 2.2% (2/90) | 8.5% (4/47) | 5.3% (2/38) | 7.1% (2/28) | 15.4% (2/13) | 20.0% (1/5) | 100.0% (1/1) | 0.0% (0/1) | 6.1% (22/358) |
| Increase > 2 lines (Increase > 10 letters) | 0.0% (0/7) | 0.0% (0/41) | 1.1% (1/87) | 0.0% (0/90) | 0.0% (0/47) | 0.0% (0/38) | 3.6% (1/28) | 0.0% (0/13) | 0.0% (0/5) | 0.0% (0/1) | 0.0% (0/1) | 0.6% (2/358) |
| Not reported* | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Total† | 7 | 41 | 87 | 90 | 47 | 38 | 28 | 13 | 5 | 1 | 1 | 358 |

N = Number of non-missing BSCVA change at 3 months for the corresponding sub-group.
* Number of available CRFs received with missing BSCVA change at 3 months.
† Number of available CRFs received at 3 months.

33

## TABLE 10
## ADVERSE EVENTS SUMMARY
## ALL TREATED EYES

| Adverse Event | 1 Day N=360 | 1 Week N=360 | 1 Month N=356 | 3 Months N=358 | 6 Months N=354 | Unsch.* N=20 | Cum.* N=360 |
|---|---|---|---|---|---|---|---|
| | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) |
| Corneal infiltrate or ulcer | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 5.0% (1) | 0.3% (1) |
| Dry eye | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 5.0% (1) | 0.3% (1) |
| Epithelium in the interface | 0.0% (0) | 0.0% (0) | 0.3% (1) | 0.0% (0) | 0.0% (0) | 5.0% (1) | 0.3% (1) |
| Eye irritated | 0.0% (0) | 0.3% (1) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.3% (1) |
| Punctal plug inserted | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 5.0% (1) | 0.3% (1) |
| VA blurry | 0.0% (0) | 0.0% (0) | 0.6% (2) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.6% (2) |
| VA decrease due to head trauma | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.3% (1) | 0.0% (0) | 0.3% (1) |

N = number of eyes returned for the visits. n = number of eyes reported with the corresponding event. % = n ÷N ×100%.

* Unsch = Unscheduled visits. Cum (Cumulative) = any event during the course of the study.

### g. Complications and Patient Symptoms

Table 11 presents a summary of all complications reported for all treated eyes during the course of the study. The incidence rate for all reported categories was quite low, and at the 3-month visit the only complications reported were double/ghost images in the eye and epithelium in the interface. At the 6-month visit, the only complications reported were blepharitis, double/ghost images in the eye, and epithelium in the interface. On a cumulative basis, only epithelium in the interface (3.9%) and diffuse lamellar keratitis (5.3%) exceeded a 1% incidence rate.

**TABLE 11**
**POSTOPERATIVE COMPLICATIONS SUMMARY**
**ALL TREATED EYES**

| Complications | 1 Day N=360 | 1 Week N=360 | 1 Month N=356 | 3 Months N=358 | 6 Months N=354 | Unsch.* N=20 | Cum.* N=360 |
|---|---|---|---|---|---|---|---|
| | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) | % (n) |
| Blepharitis | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.6% (2) | 0.0% (0) | 0.6% (2) |
| Conjunctivitis | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 10.0% (2) | 0.6% (2) |
| Diffuse lamellar keratitis+ | 4.7% (17) | 0.8% (3) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 10.0% (2) | 5.3% (19) |
| Double/ghost images in the operative eye | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.6% (2) | 0.3% (1) | 0.0% (0) | 0.8% (3) |
| Epithelial defect | 0.3% (1) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.3% (1) |
| Epithelial slide with bandage contact lens placed | 0.6% (2) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.6% (2) |
| Epithelial spots | 0.0% (0) | 0.3% (1) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.3% (1) |
| Epithelium Stained and rough | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 5.0% (1) | 0.3% (1) |
| Epithelium in the interface | 0.0% (0) | 0.3% (1) | 2.2% (8) | 2.2% (8) | 1.4% (5) | 15.0% (3) | 3.9% (14) |
| Fibrosis at edge of epithelium | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 5.0% (1) | 0.3% (1) |
| Foreign body sensation | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 5.0% (1) | 0.3% (1) |
| Heaped epithelium | 0.6% (2) | 0.3% (1) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.8% (3) |
| Irregular astigmatism due to epithelial ingrowth | 0.0% (0) | 0.0% (0) | 0.3% (1) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.3% (1) |
| Loose epithelium | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 5.0% (1) | 0.3% (1) |
| SPK | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 5.0% (1) | 0.3% (1) |
| SPK with bandage contact lens placed | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 5.0% (1) | 0.3% (1) |
| Sub-epithelial infiltrate | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 5.0% (1) | 0.3% (1) |
| Subconjunctival hemorrhage | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 0.0% (0) | 5.0% (1) | 0.3% (1) |

N = number of eyes returned for the visits. n = number of eyes reported with the corresponding event. % = n ÷N ×100.

* Unsch = Unscheduled visits. Cum (Cumulative) = any event during the course of the study.

\+ 18 of the 19 reports of DLK were associated with use of the Intralase Laser Keratome, 1 report was associated with the ACS keratome, and no reports were associated with the Hansatome keratome.

Subjects filled out a subject questionnaire at the preoperative visit and at all follow-up visits. They graded their symptoms according to severity as either none, mild, moderate, marked, or severe (see Table 12). Table 13 presents the patient symptom change from baseline to 3 and 6 months postoperatively. Any symptom for which there is at least a one grade increase from baseline is considered "worse" and at least a one grade decrease is considered "better".

Table 12 provides all patient symptoms for all treated eyes both preoperatively and at 3 and 6 months. Symptoms are grouped by severity level into "absent", "mild", "moderate", "marked", and "severe". Symptoms in the mild category are not considered to be clinically significant. It can be seen that those symptoms reported at 3 and 6 months fall predominantly into the "mild" category. Clinically significant symptoms (those rated moderate to severe) with statistically significant change from baseline to month 3 are dryness (increased 6% to 12%), tearing (decreased 2% to 0%), blurred vision (increased 2% to 7%), and fluctuation of vision (increased 1% to 4%).

**TABLE 12**
**PATIENT SYMPTOMS**
**ALL TREATED EYES**
Page 1 of 4

| Symptom | Preop | | 3 Months | | 6 Months | |
|---|---|---|---|---|---|---|
| Evaluation | n | % | n | % | n | % |
| **Light sensitivity** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 244 | 67.8% | 240 | 67.4% | 256 | 72.7% |
| Mild | 79 | 21.9% | 92 | 25.8% | 79 | 22.4% |
| Moderate | 28 | 7.8% | 17 | 4.8% | 13 | 3.7% |
| Marked | 7 | 1.9% | 7 | 2.0% | 4 | 1.1% |
| Severe | 2 | 0.6% | 0 | 0.0% | 0 | 0.0% |
| **Headaches** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 314 | 87.2% | 319 | 89.6% | 312 | 88.6% |
| Mild | 33 | 9.2% | 24 | 6.7% | 32 | 9.1% |
| Moderate | 10 | 2.8% | 8 | 2.2% | 6 | 1.7% |
| Marked | 1 | 0.3% | 3 | 0.8% | 2 | 0.6% |
| Severe | 2 | 0.6% | 2 | 0.6% | 0 | 0.0% |
| **Pain/burning** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 332 | 92.2% | 326 | 91.6% | 330 | 93.8% |
| Mild | 20 | 5.6% | 23 | 6.5% | 19 | 5.4% |
| Moderate | 4 | 1.1% | 4 | 1.1% | 2 | 0.6% |
| Marked | 3 | 0.8% | 3 | 0.8% | 1 | 0.3% |
| Severe | 1 | 0.3% | 0 | 0.0% | 0 | 0.0% |
| **Dryness** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 276 | 76.7% | 163 | 45.8% | 213 | 60.5% |
| Mild | 64 | 17.8% | 150 | 42.1% | 104 | 29.5% |
| Moderate | 14 | 3.9% | 32 | 9.0% | 34 | 9.7% |
| Marked | 6 | 1.7% | 11 | 3.1% | 1 | 0.3% |
| Severe | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| **Excessive tearing** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 334 | 92.8% | 339 | 95.2% | 344 | 97.7% |
| Mild | 18 | 5.0% | 17 | 4.8% | 6 | 1.7% |
| Moderate | 4 | 1.1% | 0 | 0.0% | 2 | 0.6% |
| Marked | 4 | 1.1% | 0 | 0.0% | 0 | 0.0% |
| Severe | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |

N = Number of Self-evaluation Forms received with non-missing response for the corresponding symptom at each visit. % = n ÷ N × 100%.

**TABLE 12 *(CONTINUED)***
**PATIENT SYMPTOMS**
**ALL TREATED EYES**
Page 2 of 4

| Symptom Evaluation | Preop | | 3 Months | | 6 Months | |
|---|---|---|---|---|---|---|
| | n | % | n | % | n | % |
| **Gritty, scratchy** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 326 | 90.6% | 316 | 88.8% | 321 | 91.2% |
| Mild | 28 | 7.8% | 33 | 9.3% | 30 | 8.5% |
| Moderate | 6 | 1.7% | 7 | 2.0% | 1 | 0.3% |
| Marked | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| Severe | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| **Glare** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 281 | 78.1% | 251 | 70.5% | 261 | 74.1% |
| Mild | 52 | 14.4% | 85 | 23.9% | 76 | 21.6% |
| Moderate | 23 | 6.4% | 15 | 4.2% | 12 | 3.4% |
| Marked | 4 | 1.1% | 5 | 1.4% | 1 | 0.3% |
| Severe | 0 | 0.0% | 0 | 0.0% | 2 | 0.6% |
| **Halos** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 303 | 84.2% | 241 | 67.7% | 271 | 77.0% |
| Mild | 32 | 8.9% | 94 | 26.4% | 54 | 15.3% |
| Moderate | 21 | 5.8% | 6 | 1.7% | 17 | 4.8% |
| Marked | 4 | 1.1% | 13 | 3.7% | 8 | 2.3% |
| Severe | 0 | 0.0% | 2 | 0.6% | 2 | 0.6% |
| **Blurred vision** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 321 | 89.2% | 286 | 80.3% | 298 | 84.7% |
| Mild | 32 | 8.9% | 46 | 12.9% | 29 | 8.2% |
| Moderate | 5 | 1.4% | 19 | 5.3% | 23 | 6.5% |
| Marked | 2 | 0.6% | 5 | 1.4% | 2 | 0.6% |
| Severe | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| **Double vision** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 354 | 98.3% | 322 | 90.4% | 334 | 94.9% |
| Mild | 0 | 0.0% | 24 | 6.7% | 6 | 1.7% |
| Moderate | 4 | 1.1% | 6 | 1.7% | 9 | 2.6% |
| Marked | 2 | 0.6% | 4 | 1.1% | 3 | 0.9% |
| Severe | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |

N = Number of Self-evaluation Forms received with non-missing response for the corresponding symptom at each visit. % = n ÷ N × 100%.

**TABLE 12 *(CONTINUED)***
**PATIENT SYMPTOMS**
**ALL TREATED EYES**
Page 3 of 4

| Symptom Evaluation | Preop | | 3 Months | | 6 Months | |
|---|---|---|---|---|---|---|
| | n | % | n | % | n | % |
| **Fluctuation of vision** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 342 | 95.0% | 273 | 76.7% | 287 | 81.5% |
| Mild | 16 | 4.4% | 69 | 19.4% | 52 | 14.8% |
| Moderate | 2 | 0.6% | 10 | 2.8% | 11 | 3.1% |
| Marked | 0 | 0.0% | 4 | 1.1% | 2 | 0.6% |
| Severe | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| **Variation - bright light** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 323 | 89.7% | 315 | 88.5% | 304 | 86.4% |
| Mild | 29 | 8.1% | 36 | 10.1% | 42 | 11.9% |
| Moderate | 5 | 1.4% | 3 | 0.8% | 5 | 1.4% |
| Marked | 3 | 0.8% | 2 | 0.6% | 1 | 0.3% |
| Severe | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| **Variation - normal light** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 354 | 98.3% | 328 | 92.1% | 324 | 92.0% |
| Mild | 4 | 1.1% | 22 | 6.2% | 22 | 6.3% |
| Moderate | 2 | 0.6% | 4 | 1.1% | 5 | 1.4% |
| Marked | 0 | 0.0% | 2 | 0.6% | 1 | 0.3% |
| Severe | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| **Variation - dim light** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 305 | 84.7% | 273 | 76.7% | 277 | 78.7% |
| Mild | 41 | 11.4% | 62 | 17.4% | 61 | 17.3% |
| Moderate | 10 | 2.8% | 12 | 3.4% | 8 | 2.3% |
| Marked | 4 | 1.1% | 9 | 2.5% | 4 | 1.1% |
| Severe | 0 | 0.0% | 0 | 0.0% | 2 | 0.6% |
| **Night driving vision** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 253 | 70.3% | 239 | 67.1% | 257 | 73.0% |
| Mild | 68 | 18.9% | 81 | 22.8% | 62 | 17.6% |
| Moderate | 30 | 8.3% | 23 | 6.5% | 24 | 6.8% |
| Marked | 9 | 2.5% | 11 | 3.1% | 7 | 2.0% |
| Severe | 0 | 0.0% | 2 | 0.6% | 2 | 0.6% |

N = Number of Self-evaluation Forms received with non-missing response for the corresponding symptom at each visit. % = n ÷ N × 100%.

**TABLE 12 *(CONTINUED)***
**PATIENT SYMPTOMS**
**ALL TREATED EYES**
Page 4 of 4

| Symptom Evaluation | Preop | | 3 Months | | 6 Months | |
|---|---|---|---|---|---|---|
| | n | % | n | % | n | % |
| **Other*** | N = 360 | | N = 356 | | N = 352 | |
| Absent | 358 | 99.4% | 354 | 99.4% | 345 | 98.0% |
| Mild | 2 | 0.6% | 0 | 0.0% | 3 | 0.9% |
| Moderate | 0 | 0.0% | 2 | 0.6% | 4 | 1.1% |
| Marked | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |
| Severe | 0 | 0.0% | 0 | 0.0% | 0 | 0.0% |

N = Number of Self-evaluation Forms received with non-missing response for the corresponding symptom at each visit. % = n ÷ N × 100%.
*Other symptoms were pressure in eyes when tired or headaches (preop); trouble focusing on close objects (6 months); eyes jump when reading (6 months); floaters (6 months); itchiness (3 and 6 months).

Table 13 presents the changes in patient symptoms from baseline to 3 and 6 months for all treated eyes. At 3 months, a greater percentage of patients experienced worsening of their symptoms than at 6 months. While most symptoms did not change or were better, as seen in Table 13, some of the symptoms that worsened at 3 months include the following: dryness, halos, blurred vision, and fluctuation of vision.

**TABLE 13**
**PATIENT SYMPTOMS CHANGE FROM BASELINE**
**ALL TREATED EYES**

| Patient Symptom | 3 Months % (n/N) | | | 6 Months % (n/N) | | |
|---|---|---|---|---|---|---|
| | Better | No Change | Worse | Better | No Change | Worse |
| Light sensitivity | 18.5 (66/356) | 64.9 (231/356) | 16.6 (59/356) | 22.7 (80/352) | 63.4 (223/352) | 13.9 (49/352) |
| Headaches | 9.8 (35/356) | 84.0 (299/356) | 6.2 (22/356) | 8.8 (31/352) | 85.8 (302/352) | 5.4 (19/352) |
| Pain/burning | 5.9 (21/356) | 88.8 (316/356) | 5.3 (19/356) | 7.4 (26/352) | 88.4 (311/352) | 4.3 (15/352) |
| Dryness | 10.1 (36/356) | 49.2 (175/356) | 40.7 (145/356) | 12.8 (45/352) | 59.7 (210/352) | 27.6 (97/352) |
| Excessive tearing | 5.3 (19/356) | 92.4 (329/356) | 2.2 (8/356) | 7.4 (26/352) | 90.9 (320/352) | 1.7 (6/352) |
| Gritty, scratchy | 9.6 (34/356) | 79.8 (284/356) | 10.7 (38/356) | 9.4 (33/352) | 83.2 (293/352) | 7.4 (26/352) |
| Glare | 15.4 (55/356) | 63.5 (226/356) | 21.1 (75/356) | 17.6 (62/352) | 65.6 (231/352) | 16.8 (59/352) |
| Halos | 8.1 (29/356) | 67.4 (240/356) | 24.4 (87/356) | 11.4 (40/352) | 71.9 (253/352) | 16.8 (59/352) |
| Blurred vision | 7.6 (27/356) | 75.0 (267/356) | 17.4 (62/356) | 8.8 (31/352) | 77.3 (272/352) | 13.9 (49/352) |
| Double vision | 1.1 (4/356) | 89.9 (320/356) | 9.0 (32/356) | 1.1 (4/352) | 94.3 (332/352) | 4.5 (16/352) |
| Fluctuation of vision | 1.4 (5/356) | 78.7 (280/356) | 19.9 (71/356) | 2.8 (10/352) | 81.0 (285/352) | 16.2 (57/352) |
| Variation - bright light | 7.9 (28/356) | 83.4 (297/356) | 8.7 (31/356) | 7.7 (27/352) | 81.8 (288/352) | 10.5 (37/352) |
| Variation - normal light | 1.1 (4/356) | 91.6 (326/356) | 7.3 (26/356) | 1.7 (6/352) | 90.9 (320/352) | 7.4 (26/352) |
| Variation - dim light | 9.8 (35/356) | 73.0 (260/356) | 17.1 (61/356) | 11.1 (39/352) | 73.6 (259/352) | 15.3 (54/352) |
| Night driving vision | 23.0 (82/356) | 55.9 (199/356) | 21.1 (75/356) | 20.7 (73/352) | 64.2 (226/352) | 15.1 (53/352) |
| Other | 0.6 (2/356) | 98.9 (352/356) | 0.6 (2/356) | 0.6 (2/352) | 97.4 (343/352) | 2.0 (7/352) |

**h. Retreatment**

No retreatments were performed as a part of the protocol.

**i. Factors Associated with Outcomes**

Gender, preoperative refraction, age, baseline MRSE, primary vs. Fellow eye, and study site were evaluated as statistically significant predictors of the UCVA and refractive outcome for the LASIK procedure. These analyses identified a site effect and an effect of age and baseline MRSE.

Statistical analysis of the study data by site revealed that the percentage of eyes reported with a MRSE within ± 0.50 D of the attempted correction was significantly different among the four investigational sites at 3 and 6 months. At 3 months, 77% of eyes were within 0.50 D of intended MRSE at site #2, compared with 83%, 87%, and 92% at the other three study sites. At 6 months, 67% of eyes were within 0.50 D of intended MRSE at site #1, compared with 76%, 80%, and 86% at the other three study sites. This difference at 6 months, attributable to a change in manifest refraction technique during the study at one site, was statistically significant with respect to deviation from intended correction within ± 0.50 D for all eyes treated, with a significantly lower proportion of eyes achieving MRSE within ± 0.50 D at 6 months postoperatively ($p=0.0263$) at Site 1. There were no statistically significant differences observed between the study sites with respect to attempted versus achieved MRSE within ± 1.00 D of the intended correction at 3 or 6 months.

With regard to effect of age, the requirements for deviation from emmetropia within ± 0.50 D and within ± 1.00 D were met for each age group in all cohorts of eyes, i.e., all treated eyes, spherical myopia eyes and astigmatic myopia eyes, at 3 months postoperatively. At 6 months, the only age subgroup that did not meet the minimum requirements of 50% of eyes within ± 0.50 D of emmetropia was the age group ≥ 50 years. All subgroups met the minimum target value of 75% of eyes within ± 1.00 D of emmetropia at 3 and 6 months.

With respect to the effect of baseline MRSE on refractive predictability, eyes with a baseline MRSE of higher than -7.00 D were reported with a lower proportion of eyes achieving refractive predictability within ± 0.50 D of the intended outcome at 6 months (note: this difference was not observed at 3 months). That is, at 6 months, eyes with baseline MRSE up to -7.00 D had statistically higher MRSE accuracy outcome (79% were within 0.50 D of intended MRSE), than eyes with baseline MRSE greater than -7.00 D (45% within 0.50 D of intended MRSE). Baseline MRSE did not have a significant statistical association with UCVA outcomes of 20/40 or better at 3 or 6 months. However, eyes with baseline MRSE -7.00 D or lower

demonstrated a greater proportion of eyes achieving UCVA better than 20/40 (i.e., 20/12.5 to 20/16 at 3 months, and 20/16 to 20/32 at 6 months) than eyes with baseline MRSE higher than -7.00 D. In addition, subjects 50 years of age and older were reported with a lower proportion of eyes achieving 20/40 or better UCVA at 6 months as compared to subjects less than 50 years old (this difference was not observed at 3 months).

### j. Patient Satisfaction

Responses provided by the study subjects at 3 and 6 months to three questions regarding their experiences with the laser surgery are provided in Table 14. These three questions related to: 1) the perceived overall quality of vision following surgery; 2) the subject's willingness to have the surgery again if he/she could make the choice over; and 3) the subject's overall satisfaction with the results of the surgical procedure.

At 3 months, the overall quality of vision was rated highly, with 99.4% of patients indicating that there was an improvement, while only 0.6% indicated that there was no improvement; 94.4% would elect to have the surgery again; 98.3% reported being satisfied, while 0.6% were neutral and 1.1% were dissatisfied.

**TABLE 14**
**PATIENT EVALUATION OF SATISFACTION AND VISION QUALITY IMPROVEMENT ALL TREATED SUBJECTS (SUBJECT BASIS)**

| Self-evaluation | Response | 3 Months % (n/N) | 6 Months % (n/N) |
|---|---|---|---|
| Overall Vision Quality | No Improvement | 0.6% (1/180) | 0.6% (1/178) |
| | Slight Improvement | 1.1% (2/180) | 0.0% (0/178) |
| | Moderate Improvement | 1.1% (2/180) | 1.7% (3/178) |
| | Marked Improvement | 14.4% (26/180) | 16.3% (29/178) |
| | Extreme Improvement | 82.8% (149/180) | 81.5% (145/178) |
| | Not reported* | 0 | 0 |
| | Total† | 180 | 178 |
| Select Refractive Surgery Again | No | 1.1% (2/180) | 2.2% (4/178) |
| | Yes | 94.4% (170/180) | 94.4% (168/178) |
| | Unsure | 4.4% (8/180) | 3.4% (6/178) |
| | Not reported* | 0 | 0 |
| | Total† | 180 | 178 |
| Satisfaction | Very Satisfied | 90.6% (163/180) | 88.8% (158/178) |
| | Moderately Satisfied | 7.8% (14/180) | 8.4% (15/178) |
| | Neutral | 0.6% (1/180) | 1.7% (3/178) |
| | Dissatisfied | 1.1% (2/180) | 0.6% (1/178) |
| | Very Dissatisfied | 0.0% (0/180) | 0.6% (1/178) |
| | Not reported* | 0 | 0 |
| | Total† | 180 | 178 |

Summaries were per subject basis. The worse response of the two eyes of a subject was used as the response of the subject. N = Number of available subjects with non-missing values at each visit. % = n ÷ N × 100%.

* Number of available subjects with missing values at the visit.

† Number of available eyes at the visit.

### k. Device Failures and Replacements

There was one device failure/malfunction and there were no device replacements during the course of the study. During this failure, surgery was interrupted briefly due to a computer malfunction. The procedure was quickly completed and did not impact the subject's surgical outcome.

## X. CONCLUSIONS DRAWN FROM THE STUDIES

The data in this application provides reasonable assurance that the device is safe and effective when used in accordance with the directions for use. Note that the approved refractive range in the indications for use is narrower than the range studied in the clinical trial due to an insufficient number of eyes with high values of sphere (greater than -7.00 D) and cylinder (greater than -3.00 D).

## XI. PANEL RECOMMENDATION

In accordance with the provisions of section 515(c)(2) of the act as amended by the Safe Medical Devices Act of 1990, this PMA was not referred to the Ophthalmic Device Panel, an FDA advisory committee, for review and recommendation because the information in the PMA substantially duplicates information previously reviewed by this panel.

## XII. CDRH DECISION

CDRH issued an approval order on August 11, 2006.

The applicant's manufacturing facility was inspected and was found to be in compliance with the Quality System Regulation (21 CRF 820).

## XIII. APPROVAL SPECIFICATIONS

Directions for Use: See Device Labeling.

Hazards to health from use of the device: See Indications, Contraindications, Warnings, Precautions and Adverse Events in the labeling.

Post-approval requirements and restrictions: See Approval Order.