SUMMARY OF SAFETY AND EFFECTIVENESS DATA

I. GENERAL INFORMATION

Device Generic Name:	Ophthalmic Excimer Laser System
Device Trade Name:	Nidek EC-5000 Excimer Laser System
Applicant's Name and Address:	Nidek Co. LTD 34-14 Maehama Hiroishi-cho Gamagori, Aichi Japan **U.S. Office**: Nidek, Inc. 47651 Westinghouse Drive Fremont, California 94539
Date of Panel Recommendation:	None
Premarket Approval (PMA) Application Number:	P970053/S9
Date of Notice of Approval to Applicant:	October 11, 2006

The Nidek EC-5000 Excimer Laser System was originally approved on December 17, 1998 under PMA P970053 for the limited indication for myopic photorefractive keratectomy (PRK) uncomplicated by astigmatism (≤ -0.75 D) in patients 21 years of age or older with -0.75 to -13.0 D of myopia whose refractive change for one year prior to treatment is within ±0.5 D for low myopia (≤ -7.0 D MRSE) or within ± 1.0 D for high myopia (> -7.0 D MRSE).

The clinical indication was expanded in Supplement 1 (approved September 29, 1999) to include PRK treatment of myopic astigmatism (-1.00 to -8.00 D MRSE with -0.5 to -4.00 D cylinder). Supplement 6 (approved September 4, 2001) further expanded the clinical indication to include laser assisted in-situ keratomilicusis (LASIK) for the treatment of myopic astigmatism (-1.00 to -14.00 D MRSE with up to -4.00 D astigmatism) using an optical zone between 5.0 and 6.5 mm in patients 21 years of age or older. Supplements 7 and 8 added the use of active eye trackers operating at 60 Hz and 200 Hz, respectively, for the approved myopic and myopic astigmatism indications.

The sponsor submitted this supplement to further expand the clinical indications. The updated clinical data to support the expanded indication is provided in this summary. The hazard analysis, software testing, preclinical test results, and profilometry validation of

ablation patterns for spherical hyperopia and hyperopic astigmatism supporting this indication were submitted in this supplement. Refer to the SSED of the original PMA (P970053) for information on non-clinical studies that were previously performed for the EC-5000 Excimer Laser System that did not need to be repeated for the hyperopia indication. Written requests for copies of the SSED can be obtained from the Dockets Management Branch (HFA-305), Food and Drug Administration, 5630 Fishers Lane, Rm. 1061, Rockville, MD 20857 under Docket # 00M-1640 (P970053), Docket # 00M-1664 (S1), and Docket 01M-0014 (S2) or you may download the files from the internet site: http://www.fda.gov/cdrh/pdf/p970053.html

II. INDICATIONS FOR USE

The Nidek EC-5000 Excimer Laser System is indicated for Laser-Assisted In-Situ Keratomileusis (LASIK) treatment:

- for the reduction or elimination of hyperopia refractive errors from +0.5 to +5.0 D of sphere with or without astigmatic refractive errors from +0.5 to +2.0 D at the spectacle plane with manifest refraction spherical equivalent (MRSE) of +5.0 D or less;
- in patients 21 years of age or older; and,
- in patients with documented stability of manifest refraction over the prior year, demonstrated by a change in manifest refraction spherical equivalent (MRSE) not greater than ±0.5 D.

III. CONTRAINDICATIONS

LASIK surgery is contraindicated in:

- Patients with collagen vascular, autoimmune or immunodeficiency diseases;
- Pregnant or nursing women;
- Patients with signs of keratoconus, keratoconus suspect, or unstable central keratometry readings with irregular mires;
- Patients who are taking one or both of the following medications: isotretinoin (Accutane®) or amiodarone hydrochloride (Cordaron®); or,
- Eyes that have a calculated residual stromal bed thickness that is less than 250 microns.

To avoid corneal ectasia, residual corneal bed thickness remaining after laser ablation must be calculated preoperatively to be 250 microns or greater.

IV. WARNINGS AND PRECAUTIONS

The warnings and precautions can be found in the device labeling.

V. DEVICE DESCRIPTION

A. Microkeratome

The LASIK procedure required the use of a commercially available microkeratome that has been cleared for marketing via premarket notification. Three different microkeratomes and one femtosecond laser were used in this study. Each microkeratome consisted of a sterilization/storage tray, which includes the shaper head, a left/right eye adapter, suction ring, suction handle, blade handling pin, and corneal reference marker. The instrument motor, tonometer, cleaning brush, disposable blades, power/suction supply unit with vacuum and motor footswitches, and power cords are provided as separate components in an accessory stand and equipment suitcase which complete the system. Microkeratomes used in the clinical study included: MK-2000 (Nidek Co., LTD; Gamagori, Japan), Moria M2 (Moria USA; Doylestown, PA), and Hansatome (Bausch & Lomb; Rochester, NY). The femtosecond laser used in the clinical study was an IntraLase FS (IntraLase Corporation; Irvine, CA).

B. Nidek EC-5000 Excimer Laser System

The Nidek EC-5000 Excimer Laser System is an ophthalmic laser system for refractive surgery of the cornea designed to correct the vision of subjects with a variety of refractive errors (myopia, myopic astigmatism, hyperopia, and hyperopic astigmatism).

The Nidek EC-5000 device consists of an argon fluoride (ArF) excimer laser and beam delivery system, a diode aiming laser; the laser optical viewing system including the microscope, fixation light, and illumination lamps; the mechanical systems used for positioning, focusing, and gas handling; and microprocessor controllers.

The Nidek EC-5000 Excimer Laser System uses a 193 nm ArF laser beam to recontour the cornea by ablation of corneal tissue. The laser system features a scanning beam delivery system in which the laser beam is dynamically rotated about the optical axis and paired with an iris diaphragm in a series of predetermined beam offset positions to produce a series of circular scan patterns for hyperopic corrections, eliminating the need for the slit aperture that is used for myopic ablations. The hyperopic treatment is a time-based treatment in which the degree of refractive treatment applied is mathematically calculated to determine the amount of time the scanning beam must spend in each beam offset position to produce the desired hyperopic treatment shape. The treatment algorithm and laser

treatment parameters were empirically optimized based on international clinical results.

For hyperopia spherical corrections, the optical axis of the system is first aligned with the optical axis of the cornea. Then, the linear scanning mirror is set at a fixed position relative to the optical axis of the cornea, thereby establishing an offset for the laser beam. This offset is later increased in steps throughout the treatment, beginning with step 1 and ending with step 7. Pulses are delivered such that they are positioned 159 degrees apart and overlap by 21 degrees. After the first step is completed, the linear scanning mirror is moved to the second step. The iris diaphragm continues to open at a specified rate and the laser beam continues to rotate about the corneal axis and fire at the same constant rate as in Step 1. This sequence of events is completed for each of the seven steps. For cylindrical corrections, the laser scanning method is the same as spherical corrections, except that the angular separation of each pulse is 180 degrees rather than 159 degree angular separation used for spherical corrections.

The laser parameters used in the clinical study were as follows:

Model	EC-5000 (Model EC2B)
Pulse Repetition Rate	34 Hz
Fluence (nominal)	300 mJ/cm^2/scan (mean at the cornea)
Slit Beam	2 mm by 10 mm (FWHM)
Iris Diaphragm Diameter	10 mm (Max)
Optical Zone	6.0 mm
Ablation Zone	9.0 mm
Ablation Rate in Cornea	0.6 μm/scan
Ablation Rate in PMMA	0.315 μm/scan
PMMA/Cornea Ratio	0.89
Cyl/Sph Ratio	0.32

The software versions in the laser system used during the clinical trial were:

Laser Operating System	Windows 2000 v.5.26(a)
200 Hz Eye tracker	ETC v.4.10
Dragon Eye Software	v.3.15

The software versions in the laser system at approval are:

Laser Operating System	Windows 2000 v.5.27
200 Hz Eye tracker	ETC v.4.10
Dragon Eye Software	v.3.20

The Nidek EC-5000 Excimer Laser System for hyperopia plus astigmatism ablations is locked out for spherical treatments greater than +5.00 D, cylindrical treatments greater than +2.00 D cylinder, for treatments with an MRSE greater than +5.0 D, and for optical zones (OZ) different from the approved OZ of 6.0 mm or treatment zones (TZ) different from the approved TZ of 9.0 mm.

The systems of the EC-5000 Excimer Laser used in the hyperopia clinical study include:

1. Optical Transmission System

   The optical delivery system aims to deliver the laser beam oscillated from the laser head and coaxial aiming beam to the cornea. The optical delivery system consists of mirrors, attenuator controller, laser shutter, linear scanning and image control, astigmatic control unit, variable circular iris diaphragm that controls the size, shape, and position of the laser beam, aiming shutter and projection lens. The linear scanning mechanism is driven by a stepping motor and a cylinder cam feed followed by an image rotator mechanism which is also driven by a stepping motor. Both mechanisms are equipped with sensors and encoders for positional feedback.

2. Energy Monitoring and Control

   The beam fluence is monitored directly by monitoring the energy of the laser beam. An energy detector, placed in the laser head, is used to monitor the energy and will shut off the laser beam if the fluence is too high or too low. It is recommended that the surgeon perform a calibration before each surgery.

3. Gas Handling System

   The EC-5000 Excimer Laser System incorporates two gas supply devices. The premix ArF gas is used for laser light formation and the nitrogen gas is used to rinse the beam path and optics during treatment.

4. Eye Tracking System

   The Eye Tracking System is used to measure eye movements from a digital high speed video camera at a sampling rate of 200 Hz, with a sampling interval of 5.0 ms. The eye position data are used to control the scanner position of the laser and validity flags are used to control the actual firing of the laser. The active video eye tracker can be decentered by the operator.

5. Operating Microscope

The observation system consists of an operational microscope. Observation and alignment of the cornea are performed through the operation microscope. Observation of the cornea is always possible even before, after, and during laser emission.

6. Fixation Target

The fixation lamp is positioned on the same path as the path of the excimer laser beam to make the patient's visual line coaxial with the optical path of the laser.

7. Alignment and Illumination System

The alignment and illumination system consists of alignment illumination (inner illumination which is also used for alignment), external illumination, an arm control system that varies exposure and focusing position, and the fixation lamp.

The correct eye exposure position is identified by the use of the aiming beam, which is coaxial to the excimer laser as viewed through the operational microscope. The focusing position occurs when the reflection of the optical alignment illumination lights, which shine on the cornea in two different directions, are superimposed on each other.

The initial exposure position is aligned to the center of the pupil and the focusing position is aligned to the surface of the cornea by the motorized control stick and the focusing knob. When the eye tracker is activated, it automatically tracks the center of the patient pupil; it is not necessary to perform subsequent alignment with the control stick.

8. Patient Bed

The patient lays on his/her back on the movable and height adjustable bed, which enables the operator to position and center the patient under the laser beam.

9. Laser System Software Control

The Windows 2000 based laser control software contains a hyperopic module that controls the hyperopic and hyperopic astigmatism ablation patterns. The hyperopic treatment module is security key controlled.

VI. ALTERNATIVE PRACTICES AND PROCEDURES

Alternative methods of correcting farsightedness (hyperopia) with and without astigmatism include: glasses, contact lenses, photorefractive keratectomy (PRK), LASIK, conductive keratoplasty (CK), and Laser Thermal Keratoplasty (LTK).

VII. MARKETING HISTORY

The EC-5000 Excimer Laser System has been distributed worldwide in more than 50 countries including Algeria, Argentina, Australia, Bahrain, Belgium, Bolivia, Brazil, Canada, Chile, China, Costa Rica, Croatia, Czech Republic, Dominican Republic, Ecuador, Egypt, Finland, France, Germany, Greece, India, Indonesia, Iran, Ireland, Israel, Italy, Korea, Kuwait, Japan, Jordan, Lebanon, Malaysia, Mexico, New Zealand, Oman, Norway, Pakistan, Paraguay, Peru, Poland, Puerto Rico, Romania, Russia, Saudi Arabia, Singapore, Slovakia, South Africa, Spain, Sweden, Switzerland, Syria, Taiwan, Thailand, Tunisia, Turkey, UAE, UK, Ukraine, United States, Uruguay, and Venezuela. The Nidek EC-5000 Excimer Laser System has not been withdrawn from any country or market for reasons of safety or effectiveness.

VIII. POTENTIAL ADVERSE EFFECTS OF THE DEVICE ON HEALTH

Potential adverse effects associated with LASIK include: loss of best spectacle-corrected visual acuity (BSCVA), double vision, sensitivity to bright lights, difficulty with night vision, fluctuations in vision, increased intraocular pressure, corneal haze, secondary surgical intervention, corneal infiltrate or ulcer, corneal epithelial defect, corneal edema, problems associated with the flap including a lost, misplaced, or misaligned flap, and retinal vascular accidents.

Please refer to complete listing of adverse events and complications observed during the clinical study, which are presented in tables 28 and 29 of the Summary of Clinical Studies, Section X .

IX. SUMMARY OF PRECLINICAL STUDIES

A. Nidek EC-5000 Excimer Laser System

1. Hazard Analysis and Software Validation

Hazard analysis and software validation testing were conducted for the Nidek EC-5000 Excimer Laser System hyperopic treatment module and the Windows-based sytem operating software. The hazard analysis includes risk assessment of hazards to the patient, operator, service personnel, bystanders, manufacturing personnel, and the environment. The software validation procedures covered all aspects of new software specifications and design, development, testing, functionality and performance. The hazard analysis and software validation testing indicated no new hazards affecting safety or effectiveness. Refer to the EC-5000 Excimer Laser System Operator's Manual and the Hyperopia Operator's Manual for safety precautions for the use of the excimer laser system.

2. Profilometry of Ablation

As a part of this PMA, Nidek validated the accuracy of the hyperopic astigmatic corrections by performing a variety of test ablations on flat and curved plastic surfaces. The degree of decreased ablation efficiency associated with the change in peripheral corneal curvature was evaluated using flat plastic surfaces tilted at angles to correspond to corneal curvature. All ablations were scanned with a surface profilometer and showed good agreement to theoretical targets.

X. SUMMARY OF CLINICAL STUDIES

A clinical study of LASIK treatment with the Nidek EC-5000 Excimer Laser System for the correction of hyperopia with and without astigmatism was conducted under IDE G030204. Specifically, safety and effectiveness outcomes at 6 months postoperatively were assessed, as refractive stability is reached by that time. The IDE study is described in detail as follows:

A. Study Objective

The objective of this clinical study was to demonstrate that LASIK treatment with the Nidek EC-5000 is safe and effective for the correction of hyperopia with and without astigmatism.

B. Study Design

This was a prospective, non-randomized, open-label, multi-center study in which the control was the preoperative state of the treated eye (i.e., comparison of pretreatment and post-treatment visual parameters in the same eye).

C. Inclusion and Exclusion Criteria

Enrollment in the study on the effect of LASIK treatment with the Nidek EC-5000 Excimer Laser System was limited to those subjects who met the following inclusion and exclusion criteria:

- 21 years of age or older;
- Had an uncorrected refractive error that could be surgically treated by LASIK consisting of spherical hyperopia (+0.5 D to +6.0 D and untreated cylinder less than +0.50 D) or hyperopic astigmatism with a spherical component of +0.5 D to +6.0 D, and an astigmatic component of +0.50 D to +3.0 D), based on the manifest refraction in the operative study eye;

- Target postoperative refraction of 0.00 D sphere and 0.00 D cylinder (eyes treated for hyperopic astigmatism) or 0.00 D MRSE (eyes treated for spherical hyperopia) in the operative study eye;
- BSCVA distance of 20/25 or better in each eye;
- Less than 0.75 D SE difference between the screening cycloplegic and screening manifest refractions;
- A stable correction (± 0.5 D) in the operative study eye, as determined by MRSE for a minimum of 12 months prior to surgery;
- For contact lens wearers, demonstration of a stable refraction (± 0.5 D MRSE) of the manifest refraction and topography on two consecutive exam dates at least 7 days apart after discontinuation of contact lens wear;
- Normal topography;
- Signed written informed consent; and,
- Willingness and ability to comply with schedule for follow-up visits.

Subjects were not permitted to enroll in the study if they met any of the following exclusion criteria:

- An acute or chronic disease or illness that would increase the operative risk or confound the outcome(s) of the study (e.g., severe dry eyes, immunocompromised, connective tissue disease with ocular involvement, clinically significant atopic disease, diabetes with ocular involvement, etc.);
- Use of systemic medications that may confound the outcome of the study or increase the risk to the subject, including, but not limited to steroids, antimetabolites, etc.;
- Previous ocular condition (other than refractive error) that may predispose the eye for future complications, for example: history of corneal disease (e.g., herpes simplex, herpes zoster keratitis, recurrent erosion syndrome or corneal dystrophy, etc.);
- Evidence of retinal vascular disease;
- Keratoconus or unstable central keratometry readings with irregular mires;
- Glaucoma or glaucoma suspect by exam findings;
- Previous intraocular or corneal surgery, except strabismus surgery;
- Pregnancy or lactation during the course of the study;
- A known sensitivity to study medications;
- Mixed astigmatism in the operative study eye, based on the screening manifest refraction;

- Surgical treatment plan in the study eye(s) for monovision or intentional undercorrection or overcorrection;
- Residual corneal bed thickness remaining after laser ablation is calculated preoperatively to be less than 250 microns in the operative study eye;
- Preoperative central corneal thickness of less than 475 microns in the operative study eye;
- Concurrent participation in other ophthalmic clinical trials;
- Contact lens intolerance in subjects who are not undergoing bilateral treatment; or,
- Mesopic pupil size $\geq$ 8mm.

D. Study Plan, Patient Assessments, and Outcome Evaluations

- Subjects completed follow-up examinations at 1 day, 1 week, and 1, 3, 6, 9, and 12 months post-LASIK.
- Subjects were permitted to have second eyes (fellow eyes) treated at the discretion of the investigator at the same time as the first eyes (primary eyes) or after the primary eye treatment.
- Subjects were ineligible for retreatment unless specific permission was obtained from the sponsor, FDA, and the IRB.
- All study treatments were conducted using a 6 mm diameter optical zone and 9 mm diameter ablation zone with intention of full correction to emmetropia.
- Parameters measured during the study were: slit lamp examination of the eye, corneal topography, cycloplegic refraction, manifest refraction, UCVA distance and near, BSCVA distance and near, pupil size measurements, dilated fundus examination, keratometry, pachymetry, and intraocular pressure measurements.

Safety monitoring throughout the study included observations at appropriate times for complications, adverse events, and clinically significant findings on ophthalmic examination. Subjective complaints were evaluated by means of a patient questionnaire.

The primary efficacy variables for this study were improvement of UCVA, predictability of manifest refraction spherical equivalent (MRSE), and refractive stability.

No retreatments were performed in the study.

E. Study Period, Investigational Sites, and Demographic Data

1. Study Period

A total of 293 eyes in 148 subjects were treated between December 10, 2003 and December 2, 2004. The database for this PMA supplement reflected data collected through March 1, 2006 and included 293 eyes: 144 spherical hyperopia eyes and 149 hyperopic astigmatism eyes. There were 6 investigational sites in the U.S. and 1 investigational site in Mexico that provided eligible data for analysis.

2. Demographics

Of the 148 subjects enrolled in the study, 32% (48/148) were male and 68% (100/148) were female. Racial distribution consisted of 70% Caucasian (103/148); 28% Hispanic (42/148); 1% Black (2/148); and, 1% Asian (1/148). The cohort had a mean age of 49.5 years with a range of 23 to 69 years. Table 1 presents demographic information for the cohort of subjects enrolled in the study.

TABLE 1
Subject Population Demographic Characteristics

GENDER	N	% (N=148)
Male	48	32
Female	100	68
RACE		
Caucasian	103	70
Black	2	1
Asian	1	1
Hispanic	42	28
AGE (YR)	N	148
	Mean	49.54
	Std	8.88
	Min	23
	Max	69

F. Data Analysis and Results

1. Baseline Characteristics

The preoperative refractive errors for the entire cohort of treated eyes are summarized in Table 2 (stratified by baseline sphere and cylinder) and Table 3 (stratified by baseline MRSE) below.

TABLE 2
Preoperative Refractive Errors
Stratified by Baseline Sphere and Cylinder

Sphere	Cylinder				Total Hyperopic Astigmatism	TOTAL EYES ENROLLED
	0 - 0.49	0.50 - 1.00	1.01 - 2.00	2.01 - 3.00		
0.5 - 1.00	3	13	4	3	20	23
1.01 - 2.00	58	34	12	0	46	104
2.01 - 3.00	44	33	9	2	44	88
3.01 - 4.00	29	12	8	3	23	52
4.01 - 5.00	8	5	4	1	10	18
5.01 - 6.00	2	4	1	1	6	8
Total Treated	144	101	38	10	149	293
	Spherical Hyperopia Eyes	Hyperopic Astigmatism Eyes				TOTAL

TABLE 3
Preoperative Refractive Errors
Stratified by Baseline Manifest Refraction Spherical Equivalent (MRSE)

MRSE	Cylinder				Total Hyperopic Astigmatism	TOTAL EYES ENROLLED
	0 - 0.49	0.50 - 1.00	1.01 - 2.00	2.01 - 3.00		
0.5 - 1.00	3	7	0	0	7	10
1.01 - 2.00	57	30	9	1	40	97
2.01 - 3.00	45	35	11	2	48	93
3.01 - 4.00	29	19	10	0	29	58
4.01 - 5.00	8	3	4	5	12	20
5.01 - 6.00	2	6	3	1	10	12
> 6.00	0	1	1	1	3	3
Total Treated	144	101	38	10	149	293
	Spherical Hyperopia Eyes	Hyperopic Astigmatism Eyes				TOTAL

2. Postoperative Characteristics and Results

a. Accountability

Accountability by eye for the 293-eye cohort is summarized in Table 4 below for the entire cohort of treated eyes. Accountability was calculated using the following formula:

$$\% \; Accountability = \frac{Available \; for \; Analysis}{Enrolled - Discontinued - Not \; Yet \; Eligible} \times 100$$

Overall accountability was greater than 99% at all visits through 6 months, with more than 99% of the cohort available for inclusion in the data analysis for determination of refractive stability at 6 months and 98% of the eyes available for confirmation of refractive stability at the 9-month examination.

TABLE 4
Accountability

Status	1 Day		1 WK		1 MO		3 MO		6 MO		9 MO		12 MO	
Enrolled (N)	293		293		293		293		293		293		293	
	n/N	%	n/N	%	n/N	%	n/N	%	n/N	%	n/N	%	n/N	%
Available for Analysis	293	100.0	293	100.0	291	99.3	291	99.3	291	99.3	287	98.0	279	95.2
Discontinued (Retreated)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Active (Not Eligible for Interval)	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Lost to Follow-up	0	0.0	0	0.0	0	0.0	2	0.7	2	0.7	2	0.7	2	0.7
Missed Visit (Accounted for)	0	0.0	0	0.0	2	0.7	0	0.0	0	0.0	4	1.4	12	4.1
Excluded from Efficacy Analysis	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
% Accountability		100.0%		100.0%		99.3%		99.3%		99.3%		98.0%		95.2%

b. Stability of Outcome

Refractive stability was evaluated in the eyes that completed one or more pairs of successive postoperative visits. The mean changes (paired differences) in MRSE (± Standard Deviation (S.D). and 95% confidence interval (C.I.)) between pairs of successive refractions for eyes with all consecutive visits from Month 1 through Month 9 are reported in Tables 5 and 6, respectively, for eyes treated for spherical hyperopia and for those treated for hyperopic astigmatism.

TABLE 5 Refractive Stability for All Spherical Hyperopia Eyes that Underwent the 1 Week and 1, 3, 6, and 9 Month Visits					
		WEEK 1 TO MONTH 1	MONTH 1 TO MONTH 3	MONTH 3 TO MONTH 6	MONTH 6 TO MONTH 9
Change of MRSE ≤ 1D	n/N	135/140	138/140	140/140	140/140
	(%)	(96.43%)	(98.57%)	(100.0%)	(100.0%)
	(CI)	(93.4, 99.5)	(96.6,100.0)	(97.4,100.0)	(97.4,100.0)
Change of MRSE in diopters	Mean	0.066	0.065	0.014	0.102
	Std	0.49	0.37	0.28	0.32
	(CI)	(-0.05, 0.18)	(-0.04, 0.17)	(-0.07, 0.10)	(0.01, 0.20)
Rate of Change (diopters/month)		0.066	0.033	0.005	0.034

TABLE 6 Refractive Stability for All Hyperopic Astigmatism Eyes that Underwent the 1 Week and 1, 3, 6, and 9 Month Visits					
		WEEK 1 TO MONTH 1	MONTH 1 TO MONTH 3	MONTH 3 TO MONTH 6	MONTH 6 TO MONTH 9
Change of MRSE ≤ 1D	n/N	142/143	139/143	138/143	140/143
	(%)	(99.30%)	(97.20%)	(96.50%)	(97.90%)
	(CI)	(97.9,100.0)	(94.5, 99.9)	(93.5, 99.5)	(95.6,100.0)
Change of MRSE in diopters	Mean	0.056	0.163	0.028	0.026
	Std	0.32	0.40	0.43	0.39
	(CI)	(-0.04, 0.15)	(0.06, 0.27)	(-0.08, 0.14)	(-0.08, 0.13)
Rate of Change		0.056	0.082	0.009	0.009

Refractive stability was achieved at 6 months and confirmed at 9 months postoperatively for all the cohorts. The time point to refractive stability was 3 months for the spherical hyperopia eyes and 6 months for the hyperopic astigmatism eyes and the entire cohort of treated eyes. At the time point of refractive stability, the mean rate of change was 0.033 D/month for the spherical hyperopia cohort (at 3 months) and 0.009 D/month for the eyes treated for hyperopic astigmatism (at 6 months).

c. Effectiveness Outcomes

The effectiveness analyses were based on 291 eyes that were available for analysis at 6 months postoperatively. A summary of key effectiveness variables is provided below in Table 7 for all eyes treated in the cohort. It is expected that at least 50% of the eyes will achieve a postoperative uncorrected visual acuity (UCVA) of 20/20 or better. The cohort of eyes in this study performed well in this

category, with 59.8% (174/291) of all eyes treated having an UCVA of 20/20 or better at 6 months postoperatively, which is the time point of refractive stability.

Results from the clinical study demonstrate that eyes treated for spherical hyperopia only and those treated for hyperopic astigmatism met or exceeded the target criteria established for the study. However, eyes treated for spherical hyperopia had a greater proportion that achieved 20/20 or better UCVA (69.4% for spherical cohort, 50.3% for astigmatic cohort), with the proportion achieving 20/40 or better UCVA being the same in both groups (98.6% for spherical and astigmatic cohorts). Similarly, eyes treated for spherical hyperopia had a greater proportion that were within ±0.5 D of attempted MRSE (77.1% for spherical cohort, 60.5% for astigmatic cohort) with the proportion within ±1.0 D of attempted MRSE being similar for both groups (95.1% for spherical cohort, 91.8% for astigmatic cohort).

TABLE 7
Key Effectiveness Outcomes for All Eyes Treated

		WEEK 1	MONTH 1	MONTH 3	MONTH 6	MONTH 9	MONTH 12
EFFICACY VARIABLES							
MRSE ± 0.50 D	n/N	227/293	227/291	210/291	200/291	197/287	176/279
	(%)	(77.47%)	(78.01%)	(72.16%)	(68.73%)	(68.64%)	(63.08%)
	(CI)	(72.6, 82.4)	(73.2, 82.9)	(66.9, 77.4)	(63.3, 74.2)	(63.2, 74.1)	(57.3, 68.9)
MRSE ± 1.00 D	n/N	281/293	278/291	272/291	272/291	268/287	252/279
	(%)	(95.90%)	(95.53%)	(93.47%)	(93.47%)	(93.38%)	(90.32%)
	(CI)	(93.6, 98.2)	(93.1, 98.0)	(90.6, 96.4)	(90.6, 96.4)	(90.4, 96.3)	(86.8, 93.9)
MRSE ± 2.00 D	n/N	292/293	289/291	290/291	290/291	286/287	279/279
	(%)	(99.66%)	(99.31%)	(99.66%)	(99.66%)	(99.65%)	(100.0%)
	(CI)	(99.0,100.3)	(98.3,100.3)	(99.0,100.3)	(99.0,100.3)	(99.0,100.3)	(100.0,100.0)
UCVA 20/20 or better	n/N	154/293	174/291	163/291	174/291	174/287	170/279
	(%)	(52.56%)	(59.79%)	(56.01%)	(59.79%)	(60.63%)	(60.93%)
	(CI)	(46.7, 58.4)	(54.0, 65.5)	(50.2, 61.8)	(54.0, 65.5)	(54.9, 66.4)	(55.1, 66.8)
UCVA 20/40 or better	n/N	283/293	287/291	286/291	287/291	284/287	277/279
	(%)	(96.59%)	(98.63%)	(98.28%)	(98.63%)	(98.95%)	(99.28%)
	(CI)	(94.5, 98.7)	(97.3,100.0)	(96.8, 99.8)	(97.3,100.0)	(97.8,100.2)	(98.3,100.3)

Efficacy outcomes for the eyes that are within the approved range (≤ +5.00 D sphere, ≤ +2.00 D cylinder, with ≤ +5.00 D MRSE) are summarized in Table 8 below. As would be expected at 6 months, the approved range cohort shows superior efficacy outcomes, with 72.0% of the eyes achieving a MRSE within ±0.50 D of the attempted parameters compared to 68.7% of the entire cohort.

Similarly, 62.7% of the eyes in the approved range cohort had an UCVA of 20/20 or better at 6 months compared to 59.8% of the entire cohort.

TABLE 8 Key Effectiveness Outcomes Eyes Within the Approved Range							
		WEEK 1	MONTH 1	MONTH 3	MONTH 6	MONTH 9	MONTH 12
EFFICACY VARIABLES							
MRSE ± 0.50 D	n/N	212/270	214/268	198/268	193/268	189/265	166/256
	(%)	(78.52%)	(79.85%)	(73.88%)	(72.01%)	(71.32%)	(64.84%)
MRSE ± 1.00 D	n/N	259/270	259/268	254/268	254/268	250/265	234/256
	(%)	(95.93%)	(96.64%)	(94.78%)	(94.78%)	(94.34%)	(91.41%)
MRSE ± 2.00 D	n/N	269/270	266/268	267/268	267/268	264/265	256/256
	(%)	(99.63%)	(99.25%)	(99.63%)	(99.63%)	(99.62%)	(100.0%)
UCVA 20/20 or better	n/N	149/270	169/268	156/268	168/268	167/265	166/256
	(%)	(55.19%)	(63.06%)	(58.21%)	(62.69%)	(63.02%)	(64.84%)
UCVA 20/40 or better	n/N	262/270	266/268	264/268	266/268	262/265	254/256
	(%)	(97.04%)	(99.25%)	(98.51%)	(99.25%)	(98.87%)	(99.22%)

Summaries of key effectiveness parameters at Month 6 are stratified below by preoperative manifest refraction spherical equivalent (MRSE), preoperative manifest sphere, and preoperative manifest cylinder in Tables 9, 10, and 11, respectively.

TABLE 9 Key Effectiveness Outcomes at Month 6 Stratified by Baseline MRSE								
MRSE (Diopters)		0.00 TO 1.00D	1.01 TO 2.00D	2.01 TO 3.00D	3.01 TO 4.00D	4.01 TO 5.00D	>5.00D	CUM TOTAL
EFFICACY VARIABLES								
MRSE ± 0.50 D	n/N	5/10	72/97	70/93	42/58	9/19	2/14	200/291
	(%)	(50.00%)	(74.23%)	(75.27%)	(72.41%)	(47.37%)	(14.29%)	(68.73%)
MRSE ± 1.00 D	n/N	10/10	96/97	86/93	54/58	16/19	10/14	272/291
	(%)	(100.0%)	(98.97%)	(92.47%)	(93.10%)	(84.21%)	(71.43%)	(93.47%)
MRSE ± 2.00 D	n/N	10/10	97/97	93/93	57/58	19/19	14/14	290/291
	(%)	(100.0%)	(100.0%)	(100.0%)	(98.28%)	(100.0%)	(100.0%)	(99.66%)
UCVA 20/20 or better	n/N	4/10	67/97	64/93	28/58	7/19	4/14	174/291
	(%)	(40.00%)	(69.07%)	(68.82%)	(48.28%)	(36.84%)	(28.57%)	(59.79%)
UCVA 20/40 or better	n/N	10/10	97/97	91/93	57/58	19/19	13/14	287/291
	(%)	(100.0%)	(100.0%)	(97.85%)	(98.28%)	(100.0%)	(92.86%)	(98.63%)

TABLE 10 Key Effectiveness Outcomes at Month 6 Stratified by Baseline Sphere								
		0.00 TO 1.00D	1.01 TO 2.00D	2.01 TO 3.00D	3.01 TO 4.00D	4.01 TO 5.00D	5.01 TO 6.00D	CUM TOTAL
EFFICACY VARIABLES								
MRSE ± 0.50 D	n/N	13/23	77/103	66/ 87	35/ 52	8/18	1/8	200/291
	(%)	(56.52%)	(74.76%)	(75.86%)	(67.31%)	(44.44%)	(12.50%)	(68.73%)
MRSE ± 1.00 D	n/N	23/23	101/103	79/87	48/52	15/18	6/8	272/291
	(%)	(100.0%)	(98.06%)	(90.80%)	(92.31%)	(83.33%)	(75.00%)	(93.47%)
MRSE ± 2.00 D	n/N	23/23	103/103	87/87	51/52	18/18	8/8	290/291
	(%)	(100.0%)	(100.0%)	(100.0%)	(98.08%)	(100.0%)	(100.0%)	(99.66%)
UCVA 20/20 or better	n/N	12/23	70/103	59/87	23/52	10/18	0/8	174/291
	(%)	(52.17%)	(67.96%)	(67.82%)	(44.23%)	(55.56%)	(0.00%)	(59.79%)
UCVA 20/40 or better	n/N	22/23	103/103	86/87	51/52	18/18	7/8	287/291
	(%)	(95.65%)	(100.0%)	(98.85%)	(98.08%)	(100.0%)	(87.50%)	(98.63%)

TABLE 11 Key Effectiveness Outcomes at Month 6 Stratified by Baseline Cylinder						
		0.00 TO 0.49D	0.50 TO 1.00D	1.01 TO 2.00D	2.01 TO 3.00D	CUM TOTAL
EFFICACY VARIABLES						
MRSE ± 0.50 D	n/N	111/144	65/ 99	20/ 38	4/ 10	200/291
	(%)	(77.08%)	(65.66%)	(52.63%)	(40.00%)	(68.73%)
MRSE ± 1.00 D	n/N	137/144	92/ 99	36/ 38	7/ 10	272/291
	(%)	(95.14%)	(92.93%)	(94.74%)	(70.00%)	(93.47%)
MRSE ± 2.00 D	n/N	143/144	99/ 99	38/ 38	10/ 10	290/291
	(%)	(99.31%)	(100.0%)	(100.0%)	(100.0%)	(99.66%)
UCVA 20/20 or better	n/N	100/144	54/ 99	19/ 38	1/ 10	174/291
	(%)	(69.44%)	(54.55%)	(50.00%)	(10.00%)	(59.79%)
UCVA 20/40 or better	n/N	142/144	98/ 99	38/ 38	9/ 10	287/291
	(%)	(98.61%)	(98.99%)	(100.0%)	(90.00%)	(98.63%)

Eyes treated for spherical hyperopia or hyperopic astigmatism that have a baseline spherical component of manifest refraction of +5.00 D or less, a baseline spherical component of manifest refraction of +2.00 D or less, with an MRSE of +5.00 D or less show good efficacy and support the indicated range of approval. Eyes treated in the study also showed good improvement in functional vision. As shown in Table 12 below, 76% of the eyes achieved an uncorrected visual acuity (UCVA) postoperatively that was no worse than 1 line (5 letters) below the baseline best spectacle-corrected visual acuity (BSCVA) at Month 6.

TABLE 12 UCVA compared to Baseline BSCVA							
		WEEK 1	MONTH 1	MONTH 3	MONTH 6	MONTH 9	MONTH 12
UCVA ≥ 2 lines (≥10 letters) better than Baseline BSCVA	n/N	5/293	9/291	3/291	3/291	4/287	3/279
	(%)	(1.71%)	(3.09%)	(1.03%)	(1.03%)	(1.39%)	(1.08%)
	(CI)	(0.2, 3.2)	(1.1, 5.1)	(-0.2, 2.2)	(-0.2, 2.2)	(0.0, 2.8)	(-0.2, 2.3)
UCVA within 1 line (5 letters) of Baseline BSCVA	n/N	205/293	224/291	227/291	219/291	214/287	220/279
	(%)	(69.97%)	(76.98%)	(78.01%)	(75.26%)	(74.56%)	(78.85%)
	(CI)	(64.6, 75.3)	(72.0, 81.9)	(73.2, 82.9)	(70.2, 80.3)	(69.4, 79.7)	(74.0, 83.7)
UCVA ≥ 2 lines (≥10 letters) worse than Baseline BSCVA	n/N	83/293	58/291	61/291	69/291	69/287	56/279
	(%)	(28.33%)	(19.93%)	(20.96%)	(23.71%)	(24.04%)	(20.07%)
	(CI)	(23.1, 33.6)	(15.2, 24.6)	(16.2, 25.7)	(18.7, 28.7)	(19.0, 29.1)	(15.3, 24.9)

d. Vector Analysis

Vector analysis was performed on the cohort of eyes treated for hyperopic astigmatism. All vector analysis is based on the vector components vertex-corrected to the corneal plane.

Cylinder stability calculated as the magnitude of cylinder vector differences is summarized in Table 13 below for each postoperative visit interval between Month 1 through Month 9.

TABLE 13
Magnitude of Cylinder Vector Differences

		MONTH 1 TO MONTH 3	MONTH 3 TO MONTH 6	MONTH 6 TO MONTH 9	MONTH 9 TO MONTH 12
Magnitude of Cylinder Vector Difference ≤ 0.5 D	n/N	102/147	95/147	109/144	111/141
	(%)	(69.39%)	(64.63%)	(75.69%)	(78.72%)
	(CI)	(61.9, 76.8)	(56.9, 72.4)	(68.7, 82.7)	(72.0, 85.5)
Magnitude of Cylinder Vector Difference ≤ 1D	n/N	140/147	141/147	141/144	140/141
	(%)	(95.24%)	(95.92%)	(97.92%)	(99.29%)
	(CI)	(91.8, 98.7)	(92.7, 99.1)	(95.6,100.0)	(97.9,100.0)
Magnitude of Cylinder Vector Difference (diopters)	Mean	0.343	0.361	0.273	0.244
	Std	0.35	0.30	0.25	0.25
	(CI)	(0.25, 0.44)	(0.27, 0.45)	(0.19, 0.36)	(0.16, 0.33)

The magnitude of the cylinder vector difference plateaus and remains constant over time, with no more than a 0.088 D/month difference between intervals for any of the intervals after the 1 month postoperative visit.

The stability of absolute (non-vector) cylinder is summarized in Table 14 below. The magnitude of the absolute vector difference was no more than 0.5 D for over 92% of subjects at all time intervals. Similarly, the absolute cylinder also remains constant over time, with no more than a 0.02D difference occurring between any of the intervals evaluated.

TABLE 14 Stability of Absolute (Non-Vector) Cylinder					
		MONTH 1 TO MONTH 3	MONTH 3 TO MONTH 6	MONTH 6 TO MONTH 9	MONTH 9 TO MONTH 12
Cylinder Magnitude Difference ≤ 0.5 D	n/N	136/147	136/147	138/144	136/141
	(%)	(92.52%)	(92.52%)	(95.83%)	(96.45%)
	(CI)	(88.3, 96.8)	(88.3, 96.8)	(92.6, 99.1)	(93.4, 99.5)
Cylinder Magnitude Difference ≤ 1D	n/N	145/147	146/147	144/144	141/141
	(%)	(98.64%)	(99.32%)	(100.0%)	(100.0%)
	(CI)	(96.8,100.0)	(98.0,100.0)	(97.4,100.0)	(97.4,100.0)
Cylinder Magnitude Difference (diopters)	Mean	0.024	0.002	0.012	0.032
	Std	0.37	0.37	0.29	0.27
	(CI)	(-0.07, 0.12)	(-0.10, 0.10)	(-0.08, 0.10)	(-0.05, 0.12)

The descriptive statistics for the predictability (accuracy) of the attempted versus achieved manifest sphere and magnitude of vector cylinder are summarized in Table 15 below for the entire cohort and in Table 16 for those eyes within the approved range (≤ +5.00 D sphere, ≤ +2.00 D cylinder, with ≤ +5.00 D MRSE).

TABLE 15 Treatment Accuracy for Sphere and Cylinder Magnitude						
	BASELINE	MONTH 1	MONTH 3	MONTH 6	MONTH 9	MONTH 12
SPHERE	N=293	N=291	N=291	N=291	N=287	N=279
Mean (SD)	2.48 (1.22)	-0.07 (0.58)	0.05 (0.56)	0.07 (0.56)	0.12 (0.54)	0.17 (0.56)
Attempted (SD)	2.48 (1.22)	2.48 (1.23)	2.47 (1.22)	2.47 (1.22)	2.47 (1.23)	2.47 (1.23)
Achieved (SD)		2.51 (1.46)	2.39 (1.43)	2.37 (1.43)	2.29 (1.39)	2.26 (1.43)
% Achieved		97.64%	91.75%	91.05%	88.56%	85.73%
± 0.5D		68.73%	64.60%	61.17%	62.28%	60.57%
± 1.0D		93.13%	92.10%	93.13%	91.70%	88.89%
CYLINDER	N=149	N=149	N=147	N=147	N=144	N=142
Mean (SD)	1.04 (0.60)	0.38 (0.39)	0.41 (0.44)	0.42 (0.43)	0.42 (0.49)	0.45 (0.47)
Attempted (SD)	1.04 (0.60)	1.04 (0.60)	1.04 (0.60)	1.04 (0.60)	1.05 (0.60)	1.04 (0.60)
Achieved (SD)		0.65 (0.55)	0.63 (0.60)	0.62 (0.56)	0.62 (0.62)	0.59 (0.59)
% Achieved		59.45%	55.26%	57.35%	56.36%	52.74%
± 0.5D		62.42%	58.50%	53.06%	57.93%	53.52%
± 1.0D		90.60%	87.76%	89.12%	86.90%	85.21%

Hyperopic astigmatic treatments performed with the EC-5000 excimer laser using the H70 treatment algorithm yielded excellent treatment results for vector cylinder. At the timepoint of refractive stability (6 months), the eyes in the entire hyperopic astigmatic cohort (see Table 15) achieved 92.4% of the attempted vector cylinder treatment and those that were in the approved range (see Table 16) achieved 93.6% of the attempted vector cylinder treatment. The results for the spherical component of the treatment were not as accurate, but were still good, with the entire cohort of hyperopic astigmatic eyes achieving 85.3% of the attempted spherical treatment and the eyes in the approved cohort achieving 83.3% of the attempted spherical treatment. The percentage of vector cylinder achieved remains constant after 3 months, as does the percentage of spherical treatment achieved.

TABLE 16 Treatment Accuracy for Sphere and Cylinder Magnitude For Eyes within the Approved Ranges						
	BASELINE	MONTH 1	MONTH 3	MONTH 6	MONTH 9	MONTH 12
SPHERE	N=270	N=268	N=268	N=268	N=265	N=256
Mean (SD)	2.31 (1.01)	-0.06 (0.56)	0.05 (0.55)	0.08 (0.54)	0.12 (0.54)	0.17 (0.56)
Attempted (SD)	2.31 (1.01)	2.31 (1.01)	2.31 (1.01)	2.31 (1.01)	2.30 (1.01)	2.29 (1.01)
Achieved (SD)		2.33 (1.27)	2.22 (1.24)	2.19 (1.24)	2.14 (1.22)	2.08 (1.23)
% Achieved		97.41%	91.73%	90.27%	88.66%	85.53%
± 0.5D		71.27%	66.42%	63.81%	64.29%	61.72%
± 1.0D		94.03%	92.91%	93.66%	92.11%	89.06%
CYLINDER	N=128	N=128	N=126	N=126	N=124	N=121
Mean (SD)	0.90 (0.40)	0.32 (0.33)	0.34 (0.35)	0.34 (0.36)	0.36 (0.43)	0.37 (0.40)
Attempted (SD)	0.90 (0.40)	0.90 (0.40)	0.90 (0.40)	0.90 (0.40)	0.90 (0.40)	0.90 (0.40)
Achieved (SD)		0.57 (0.45)	0.56 (0.53)	0.55 (0.49)	0.54 (0.53)	0.52 (0.52)
% Achieved		60.02%	55.69%	58.34%	56.88%	53.38%
± 0.5D		67.19%	63.49%	59.52%	62.90%	58.68%
± 1.0D		94.53%	92.06%	92.86%	89.52%	91.74%

A summary of the intended refractive correction (IRC), surgically induced refractive correction (SIRC), correction ratio (CR), and error ratio (ER) at 6 months postoperatively (timepoint of stability) is provided in Table 17 below.

TABLE 17 Refractive Correction Parameters Stratified by Preoperative Cylinder						
VISIT	CYLINDER GROUP*	N	IRC MEAN(SD)	SIRC MEAN(SD)	CR MEAN(SD)	ER MEAN(SD)
POSTOP MONTH 6	ALL	147	1.04 (0.60)	0.92 (0.54)	0.92 (0.30)	0.42 (0.43)
	0.5D-1.0D	87	0.66 (0.14)	0.64 (0.25)	0.97 (0.31)	0.47 (0.50)
	>1.0D-2.0D	50	1.37 (0.27)	1.18 (0.40)	0.86 (0.28)	0.36 (0.32)
	>2.0D-3.0D	8	2.56 (0.19)	1.92 (0.73)	0.76 (0.30)	0.39 (0.25)
	>3.0D-4.0D	2	3.27 (0.14)	2.60 (1.15)	0.80 (0.39)	0.42 (0.15)

(*Cylinder group based on cylinder correction at the corneal plane)

At 6 months postoperatively, the SIRC of 0.92 for the hyperopic astigmatism cohort closely approximates the intended refractive correction for all eyes treated. This is confirmed by the correction ratio (CR) of 0.92 for all treated eyes in the cohort. Outcomes in higher cylindrical ranges are consistent with those observed in other contemporary LASIK clinical trials.

The number of eyes that are within ±0.5 D, ±1.0 D, and ±2.0 D of attempted versus achieved manifest refraction spherical equivalent (MRSE) and the proportion of eyes that were overcorrected or undercorrected at each of the postoperative examinations are summarized in Table 18 below for eyes treated for hyperopic astigmatism and in Table 19 for eyes treated for spherical hyperopia.

TABLE 18
Accuracy of Attempted vs. Achieved MRSE Refractive Correction
Eyes Treated for Hyperopic Astigmatism

Achieved MRSE		PREOP	MONTH 1	MONTH 3	MONTH 6	MONTH 9	MONTH 12
± 0.5 D	n/N	0/149	111/149	95/147	89/147	89/144	82/142
	(%)	(0.00%)	(74.50%)	(64.63%)	(60.54%)	(61.81%)	(57.75%)
± 1.0 D	n/N	6/149	141/149	134/147	135/147	129/144	122/142
	(%)	(4.03%)	(94.63%)	(91.16%)	(91.84%)	(89.58%)	(85.92%)
± 2.0 D	n/N	49/149	149/149	147/147	147/147	144/144	142/142
	(%)	(32.89%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)
Undercorrected > +1.0 D	n/N	143/149	8/149	13/147	12/147	15/144	20/142
	(%)	(95.97%)	(5.37%)	(8.84%)	(8.16%)	(10.42%)	(14.08%)
Undercorrected > +2.0 D	n/N	100/149	0/149	0/147	0/147	0/144	0/142
	(%)	(67.11%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
Overcorrected < -1.0 D	n/N	0/149	0/149	0/147	0/147	0/144	0/142
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
Overcorrected < -2.0 D	n/N	0/149	0/149	0/147	0/147	0/144	0/142
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)

Overall at 6 months postoperatively, 68.7% (200/291) of all the eyes treated were within ± 0.5 D of the attempted refraction and 93.5% (272/291) of the eyes were within ± 1.0 D of the attempted refraction. Similar results were observed in the individual cohorts, with 95.1% (135/144) of the eyes treated for spherical hyperopia (Table 19) and 91.8% (135/147) of the hyperopic astigmatic eyes (Table 18) within ±1.0 D of attempted MRSE. None of the eyes (0/291; 0.0%) in the study was undercorrected by more than 2.0 D MRSE and only one eye (1/291; 0.3%) was overcorrected by more than 2.0 D MRSE at 6 months postoperatively. The subject with the overcorrected spherical hyperopia eye developed bilateral posterior subcapsular cataracts, which became evident on the slit lamp examination at the 6 month examination. Obtaining a reliable and accurate manifest refraction was difficult in this subject because of the cataracts.

TABLE 19 Accuracy of Attempted vs. Achieved MRSE Refractive Correction Eyes Treated for Spherical Hyperopia								
Achieved MRSE		PREOP	MONTH 1	MONTH 3	MONTH 6	MONTH 9	MONTH 12	
± 0.5 D	n/N	1/144	116/142	115/144	111/144	108/143	94/137	
	(%)	(0.69%)	(81.69%)	(79.86%)	(77.08%)	(75.52%)	(68.61%)	
± 1.0 D	n/N	8/144	137/142	138/144	137/144	139/143	130/137	
	(%)	(5.56%)	(96.48%)	(95.83%)	(95.14%)	(97.20%)	(94.89%)	
±2.0 D	n/N	63/144	140/142	143/144	143/144	142/143	137/137	
	(%)	(43.75%)	(98.59%)	(99.31%)	(99.31%)	(99.30%)	(100.0%)	
Uncercorrected > +1.0 D	n/N	136/144	1/142	1/144	2/144	2/143	4/137	
	(%)	(94.44%)	(0.70%)	(0.69%)	(1.39%)	(1.40%)	(2.92%)	
Undercorrected > +2.0 D	n/N	81/144	0/142	0/144	0/144	0/143	0/137	
	(%)	(56.25%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	
Overcorrected < -1.0 D	n/N	0/144	4/142	5/144	5/144	2/143	3/137	
	(%)	(0.00%)	(2.82%)	(3.47%)	(3.47%)	(1.40%)	(2.19%)	
Overcorrected < -2.0 D	n/N	0/144	2/142	1/144	1/144	1/143	0/137	
	(%)	(0.00%)	(1.41%)	(0.69%)	(0.69%)	(0.70%)	(0.00%)	

The mean percent reduction in absolute (non-vector) cylinder is shown in Table 20 below.

TABLE 20 Percent Reduction in Absolute (Non-Vector) Cylinder		
Cylinder Group*	n	Mean (range) Percent Reduction
All hyperopic astigmatism eyes	145	57.6% (15.0% - 100.0%)
≥ 0.5 D to ≤ 1.0 D	87	53.2% (-134.5% to - 100.0%)
> 1.0 D to ≤ 2.0 D	50	64.7% (-21.2% to - 100.0%)
> 2.0 D to ≤ 3.0 D	8	60.5% (15.0% to - 100.0%)

(*Cylinder group based on cylinder correction at the corneal plane)

c. Safety Outcomes

The safety analyses were based on 291 eyes that were available for analysis at 6 months postoperatively. A summary of key safety variables is provided below in Tables 21, 22, and 23 for all eyes treated in the cohort and the individual cohorts and are stratified by baseline manifest refraction spherical equivalent in Table 24.

TABLE 21
Summary of Key Safety Variables for All Eyes Treated

		WEEK 1	MONTH 1	MONTH 3	MONTH 6	MONTH 9	MONTH 12
SAFETY VARIABLES							
Loss of 2 or more lines (≥10 letters) BSCVA	n/N	12/293	2/291	4/290	10/291	11/287	4/279
	(%)	(4.10%)	(0.69%)	(1.38%)	(3.44%)	(3.83%)	(1.43%)
BSCVA worse than 20/40	n/N	0/293	0/291	0/290	0/291	0/287	0/279
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
Increase > 2D cylinder	n/N	0/293	1/291	1/291	1/291	2/287	1/279
	(%)	(0.00%)	(0.34%)	(0.34%)	(0.34%)	(0.70%)	(0.36%)
BSCVA worse than 20/25 if 20/20 or better preop	n/N	3/270	0/268	1/267	1/268	3/265	3/257
	(%)	(1.11%)	(0.00%)	(0.37%)	(0.37%)	(1.13%)	(1.17%)

TABLE 22
Summary of Key Safety Variables for Eyes Treated for Spherical Hyperopia

		WEEK 1	MONTH 1	MONTH 3	MONTH 6	MONTH 9	MONTH 12
SAFETY VARIABLES							
Loss of 2 or more lines (≥10 letters) BSCVA	n/N	5/144	1/142	2/143	6/144	6/143	3/137
	(%)	(3.47%)	(0.70%)	(1.40%)	(4.17%)	(4.20%)	(2.19%)
BSCVA worse than 20/40	n/N	0/144	0/142	0/143	0/144	0/143	0/137
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
Increase > 2D cylinder	n/N	0/144	1/142	1/144	1/144	2/143	1/137
	(%)	(0.00%)	(0.70%)	(0.69%)	(0.69%)	(1.40%)	(0.73%)
BSCVA worse than 20/25 if 20/20 or better preop	n/N	1/141	0/139	1/140	1/141	2/140	2/134
	(%)	(0.71%)	(0.00%)	(0.71%)	(0.71%)	(1.43%)	(1.49%)

TABLE 23 Summary of Key Safety Variables for Eyes Treated for Hyperopic Astigmatism							
		WEEK 1	MONTH 1	MONTH 3	MONTH 6	MONTH 9	MONTH 12
SAFETY VARIABLES							
Loss of 2 or more lines (≥10 letters) BSCVA	n/N	7/149	1/149	2/147	4/147	5/144	1/142
	(%)	(4.70%)	(0.67%)	(1.36%)	(2.72%)	(3.47%)	(0.70%)
BSCVA worse than 20/40	n/N	0/149	0/149	0/147	0/147	0/144	0/142
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
Increase > 2D cylinder	n/N	0/149	0/149	0/147	0/147	0/144	0/142
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
BSCVA worse than 20/25 if 20/20 or better preop	n/N	2/129	0/129	0/127	0/127	1/125	1/123
	(%)	(1.55%)	(0.00%)	(0.00%)	(0.00%)	(0.80%)	(0.81%)

TABLE 24 Key Safety Outcomes at Month 6 Stratified by Baseline MRSE								
MRSE (Diopters)		0.00 TO 1.00D	1.01 TO 2.00D	2.01 TO 3.00D	3.01 TO 4.00D	4.01 TO 5.00D	>5.00D	CUM TOTAL
EFFICACY VARIABLES								
Loss of 2 or more lines (≥10 letters) BSCVA	n/N	0/3	1/57	1/46	4/28	0/8	0/2	6/144
	(%)	(0.00%)	(1.75%)	(2.17%)	(14.29%)	(0.00%)	(0.00%)	(4.17%)
BSCVA worse than 20/40	n/N	0/3	0/57	0/46	0/28	0/8	0/2	0/144
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
Increase > 2D cylinder	n/N	0/3	0/57	0/46	1/28	0/8	0/2	1/144
	(%)	(0.00%)	(0.00%)	(0.00%)	(3.57%)	(0.00%)	(0.00%)	(0.69%)
BSCVA worse than 20/25 if 20/20 or better preop	n/N	0/3	0/56	0/44	1/28	0/8	0/2	1/141
	(%)	(0.00%)	(0.00%)	(0.00%)	(3.57%)	(0.00%)	(0.00%)	(0.71%)

Very little loss of BSCVA occurred in the majority of eyes treated in the study, with 1% or less of the eyes at any postoperative exam reporting a BSCVA worse than 20/25 if the preoperative BSCVA was 20/20 or better. The incidence of new reports of loss of 2 or more lines (≥10 letters) of BSCVA was 1.4% at Month 3, 2.4% at Month 6, 2.1% at Month 9, and 0.7% at Month 12. The overall cumulative rate was 6.5% (19/293 eyes) for the cohort, of which 1.4% (4/293 eyes) had a persistent loss of at least 2 lines (10 letters) of BSCVA; last visit BSCVA was 20/20 for 1 eye, 20/32 for 2 eyes, and 20/40 for 1 eye that had a concomitant posterior subcapsular cataract that diminished the BSCVA. Changes in BSCVA from baseline to each postoperative visit are summarized in Tables 25, 26, and 27 for all eyes treated and the individual cohorts.

TABLE 25 Changes in BSCVA from Preop to Postop for All Eyes Treated							
		WEEK 1	MONTH 1	MONTH 3	MONTH 6	MONTH 9	MONTH 12
Decrease > 2 Lines	n/N	0/293	0/291	0/290	1/291	1/287	1/279
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.34%)	(0.35%)	(0.36%)
	(CI)	(0.0, 0.0)	(0.0, 0.0)	(0.0, 0.0)	(-0.3, 1.0)	(-0.3, 1.0)	(-0.4, 1.1)
Decrease 2 Lines	n/N	12/293	2/291	4/290	9/291	10/287	3/279
	(%)	(4.10%)	(0.69%)	(1.38%)	(3.09%)	(3.48%)	(1.08%)
	(CI)	(1.8, 6.4)	(-0.3, 1.7)	(0.0, 2.7)	(1.1, 5.1)	(1.3, 5.6)	(-0.2, 2.3)
Decrease 1 Line	n/N	68/293	47/291	47/290	53/291	48/287	43/279
	(%)	(23.21%)	(16.15%)	(16.21%)	(18.21%)	(16.72%)	(15.41%)
	(CI)	(18.3, 28.1)	(11.8, 20.5)	(11.9, 20.5)	(13.7, 22.7)	(12.3, 21.1)	(11.1, 19.7)
No Change	n/N	158/293	165/291	165/290	154/291	166/287	158/279
	(%)	(53.92%)	(56.70%)	(56.90%)	(52.92%)	(57.84%)	(56.63%)
	(CI)	(48.1, 59.7)	(50.9, 62.5)	(51.1, 62.7)	(47.1, 58.8)	(52.0, 63.7)	(50.7, 62.6)
Increase 1 Line	n/N	48/293	64/291	60/290	67/291	55/287	71/279
	(%)	(16.38%)	(21.99%)	(20.69%)	(23.02%)	(19.16%)	(25.45%)
	(CI)	(12.1, 20.7)	(17.1, 26.8)	(15.9, 25.4)	(18.1, 28.0)	(14.5, 23.8)	(20.2, 30.7)
Increase 2 Lines	n/N	3/293	9/291	12/290	7/291	7/287	3/279
	(%)	(1.02%)	(3.09%)	(4.14%)	(2.41%)	(2.44%)	(1.08%)
	(CI)	(-0.2, 2.2)	(1.1, 5.1)	(1.8, 6.5)	(0.6, 4.2)	(0.6, 4.3)	(-0.2, 2.3)
Increase > 2 Lines	n/N	4/293	4/291	2/290	0/291	0/287	0/279
	(%)	(1.37%)	(1.37%)	(0.69%)	(0.00%)	(0.00%)	(0.00%)
	(CI)	(0.0, 2.7)	(0.0, 2.7)	(-0.3, 1.7)	(0.0, 0.0)	(0.0, 0.0)	(0.0, 0.0)

TABLE 26 Changes in BSCVA from Preop to Postop for Spherical Hyperopia Eyes							
		WEEK 1	MONTH 1	MONTH 3	MONTH 6	MONTH 9	MONTH 12
Decrease > 2 Lines	n/N	0/144	0/142	0/143	1/144	1/143	1/137
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.69%)	(0.70%)	(0.73%)
	(CI)	(0.0, 0.0)	(0.0, 0.0)	(0.0, 0.0)	(-0.7, 2.1)	(-0.7, 2.1)	(-0.7, 2.2)
Decrease 2 Lines	n/N	5/144	1/142	2/143	5/144	5/143	2/137
	(%)	(3.47%)	(0.70%)	(1.40%)	(3.47%)	(3.50%)	(1.46%)
	(CI)	(0.4, 6.5)	(-0.7, 2.1)	(-0.6, 3.4)	(0.4, 6.5)	(0.4, 6.6)	(-0.6, 3.5)
Decrease 1 Line	n/N	32/144	22/142	18/143	23/144	18/143	15/137
	(%)	(22.22%)	(15.49%)	(12.59%)	(15.97%)	(12.59%)	(10.95%)
	(CI)	(15.3, 29.2)	(9.4, 21.6)	(7.0, 18.1)	(9.9, 22.1)	(7.0, 18.1)	(5.6, 16.3)
No Change	n/N	83/144	83/142	83/143	81/144	90/143	86/137
	(%)	(57.64%)	(58.45%)	(58.04%)	(56.25%)	(62.94%)	(62.77%)
	(CI)	(49.4, 65.9)	(50.2, 66.7)	(49.8, 66.3)	(48.0, 64.5)	(54.9, 71.0)	(54.5, 71.0)
Increase 1 Line	n/N	20/144	27/142	32/143	28/144	26/143	31/137
	(%)	(13.89%)	(19.01%)	(22.38%)	(19.44%)	(18.18%)	(22.63%)
	(CI)	(8.1, 19.7)	(12.4, 25.6)	(15.4, 29.3)	(12.8, 26.0)	(11.7, 24.6)	(15.5, 29.8)
Increase 2 Lines	n/N	1/144	7/142	7/143	6/144	3/143	2/137
	(%)	(0.69%)	(4.93%)	(4.90%)	(4.17%)	(2.10%)	(1.46%)
	(CI)	(-0.7, 2.1)	(1.3, 8.6)	(1.3, 8.5)	(0.8, 7.5)	(-0.3, 4.5)	(-0.6, 3.5)
Increase > 2 Lines	n/N	3/144	2/142	1/143	0/144	0/143	0/137
	(%)	(2.08%)	(1.41%)	(0.70%)	(0.00%)	(0.00%)	(0.00%)
	(CI)	(-0.3, 4.5)	(-0.6, 3.4)	(-0.7, 2.1)	(0.0, 0.0)	(0.0, 0.0)	(0.0, 0.0)

TABLE 27 Changes in BSCVA from Preop to Postop for Hyperopic Astigmatism Eyes							
		WEEK 1	MONTH 1	MONTH 3	MONTH 6	MONTH 9	MONTH 12
Decrease > 2 Lines	n/N	0/149	0/149	0/147	0/147	0/144	0/142
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
	(CI)	(0.0, 0.0)	(0.0, 0.0)	(0.0, 0.0)	(0.0, 0.0)	(0.0, 0.0)	(0.0, 0.0)
Decrease 2 Lines	n/N	7/149	1/149	2/147	4/147	5/144	1/142
	(%)	(4.70%)	(0.67%)	(1.36%)	(2.72%)	(3.47%)	(0.70%)
	(CI)	(1.2, 8.2)	(-0.7, 2.0)	(-0.6, 3.3)	(0.0, 5.4)	(0.4, 6.5)	(-0.7, 2.1)
Decrease 1 Line	n/N	36/149	25/149	29/147	30/147	30/144	28/142
	(%)	(24.16%)	(16.78%)	(19.73%)	(20.41%)	(20.83%)	(19.72%)
	(CI)	(17.1, 31.2)	(10.7, 22.9)	(13.2, 26.3)	(13.8, 27.1)	(14.1, 27.6)	(13.0, 26.4)
No Change	n/N	75/149	82/149	82/147	73/147	76/144	72/142
	(%)	(50.34%)	(55.03%)	(55.78%)	(49.66%)	(52.78%)	(50.70%)
	(CI)	(42.1, 58.5)	(46.9, 63.2)	(47.6, 64.0)	(41.4, 57.9)	(44.5, 61.1)	(42.3, 59.1)
Increase 1 Line	n/N	28/149	37/149	28/147	39/147	29/144	40/142
	(%)	(18.79%)	(24.83%)	(19.05%)	(26.53%)	(20.14%)	(28.17%)
	(CI)	(12.4, 25.2)	(17.8, 31.9)	(12.6, 25.5)	(19.2, 33.8)	(13.5, 26.8)	(20.6, 35.7)
Increase 2 Lines	n/N	2/149	2/149	5/147	1/147	4/144	1/142
	(%)	(1.34%)	(1.34%)	(3.40%)	(0.68%)	(2.78%)	(0.70%)
	(CI)	(-0.5, 3.2)	(-0.5, 3.2)	(0.4, 6.4)	(-0.7, 2.0)	(0.0, 5.5)	(-0.7, 2.1)
Increase > 2 Lines	n/N	1/149	2/149	1/147	0/147	0/144	0/142
	(%)	(0.67%)	(1.34%)	(0.68%)	(0.00%)	(0.00%)	(0.00%)
	(CI)	(-0.7, 2.0)	(-0.5, 3.2)	(-0.7, 2.0)	(0.0, 0.0)	(0.0, 0.0)	(0.0, 0.0)

The adverse events and complications that occurred during the clinical study are summarized in Tables 28 and 29, respectively, below.

TABLE 28 Adverse Events								
	Intraop	1 Day	1 Wk	1 Mo	3 Mo	6 Mo	9 Mo	12 Mo
ADVERSE EVENTS	% (n/N)	% (n/N)	% (n/N)	% (n/N)	% (n/N)	% (n/N)	% (n/N)	% (n/N)
Diffuse lamellar keratitis with progressive melt		0.0% (0/293)	0.0% (0/293)	0.0% (0/291)	0.0% (0/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
Corneal infiltrate or ulcer		0.0% (0/293)	0.0% (0/293)	0.0% (0/291)	0.0% (0/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
Any corneal epithelial defect involving keratectomy site at 1 month or later				0.0% (0/291)	0.0% (0/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
Corneal edema at 1 month or later				0.0% (0/291)	0.0% (0/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
Epithelium in interface with loss of 2 or more lines (≥10 letters) of BSCVA		0.0% (0/293)	0.0% (0/293)	0.0% (0/291)	0.0% (0/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
Miscreated flap (lost, incomplete, too thin)	0.0% (0/293)	0.0% (0/293)	0.0% (0/293)	0.0% (0/291)	0.0% (0/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
Melting of the flap		0.0% (0/293)	0.0% (0/293)	0.0% (0/291)	0.0% (0/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
IOP on 2 consecutive exams that is increase of > 10 mm Hg above baseline or > 30 mm Hg		0.0% (0/293)	0.0% (0/293)	0.0% (0/291)	0.0% (0/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
Haze beyond 6 mos. with loss of ≥2 lines (≥10 letters) BSCVA							0.0% (0/285)	0.0% (0/232)
Decrease of BSCVA of 2 or more lines (≥ 10 letters) not due to irregular astigmatism as shown by hard contact lens refraction at 3 months or later[1]					1.4% (4/291)	2.4% (7/291)	2.1% (6/285)	0.4% (1/232)
Retinal detachment	0.0% (0/293)	0.0% (0/293)	0.0% (0/293)	0.0% (0/291)	0.0% (0/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
Retinal vascular accidents	0.0% (0/293)	0.0% (0/293)	0.0% (0/293)	0.0% (0/291)	0.0% (0/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
Any other vision threatening event	0.0% (0/293)	0.0% (0/293)	0.0% (0/293)	0.0% (0/291)	0.0% (0/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
Ocular penetration	0.0% (0/293)	0.0% (0/293)	0.0% (0/293)	0.0% (0/291)	0.0% (0/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)

No adverse events occurred in the study except loss of 2 or more lines (≥10 letters) of BSCVA. Of the eyes that lost BSCVA at 6 months or later, all but 2 eyes had a preoperative BSCVA of 20/16 or better and these eyes did not have the ability to gain lines of BSCVA.

The incidence of postoperative complications is summarized in Table 29 below.

[1] The incidence of new reports of loss of 2 or more lines (≥10 letters) of BSCVA was 1.4% at Month 3, 2.4% at Month 6, 2.1% at Month 9, and 0.7% at Month 12. The overall cumulative rate was 6.5% (19/293 eyes) for the cohort, of which 1.4% (4/293 eyes) had a persistent loss of at least 2 lines (10 letters) of BSCVA; last visit BSCVA was 20/20 for 1 eye, 20/32 for 2 eyes, and 20/40 for 1 eye that had a concomitant posterior subcapsular cataract that diminished the BSCVA.

TABLE 29 Complications								
	Intraop	1 Day	1 Wk	1 Mo	3 Mo	6 Mo	9 Mo	12 Mo
COMPLICATIONS	% (n/N)	% (n/N)	% (n/N)	% (n/N)	% (n/N)	% (n/N)	% (n/N)	% (n/N)
Corneal edema between 1 week and 1 month after procedure			0.7% (2/293)	0.0% (0/291)				
Peripheral corneal epithelial defect at 1 month or later		0.0% (0/293)	0.0% (0/293)	0.0% (0/291)	0.3% (1/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
Epithelium in interface		0.7% (2/293)	0.0% (0/293)	0.0% (0/291)	0.3% (1/291)	0.0% (0/291)	0.0% (0/285)	0.4% (1/232)
Foreign body sensation at 1 month or later				1.0% (3/291)	0.0% (0/291)	0.0% (0/291)	0.4% (1/285)	0.0% (0/232)
Pain at 1 month or later				1.4% (4/291)	0.0% (0/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
Ghost/double images in the operative eye		0.0% (0/293)	0.0% (0/293)	0.7% (2/291)	0.0% (0/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
Flap is not of the size and shape as initially intended or microkeratome stopped mid-cut	0.3% (1/293)	0.0% (0/293)	0.0% (0/293)	0.0% (0/291)	0.0% (0/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
Diffuse lamellar keratitis		3.1% (9/293)	0.7% (2/293)	0.7% (2/291)	0.3% (1/291)	0.0% (0/291)	0.0% (0/285)	0.0% (0/232)
Dry eyes requiring punctal plugs or prescribed use of ocular lubricants at 1 month or later				2.7% (8/291)	0.3% (1/291)	1.4% (4/291)	0.0% (0/285)	0.0% (0/232)

The complications with an incidence of >1% at any visit were DLK, pain, foreign body sensation (FBS), and dry eye requiring prescribed ocular lubricants (the most common complication; Month 1, 2.7%; and Month 6, 1.4%).

Other postoperative observations that occurred during the study are summarized in Table 30 below.

Table 30 Postoperative Observations for All Eyes Treated								
	Intraop	1 Day	1 Wk	1 Mo	3 Mo	6 Mo	9 Mo	12 Mo
Observations	% (n/N)	% (n/N)	% (n/N)	% (n/N)	% (n/N)	% (n/N)	% (n/N)	% (n/N)
Blepharitis		0.0 % (0/293)	0.0% (0/293)	0.7% (2/291)	0.0% (0/291)	0.0% (0/291)	0.0 % (0/285)	0.0 % (0/232)
Chalazion		0.0 % (0/293)	0.0% (0/293)	0.7% (2/291)	0.0% (0/291)	0.0% (0/291)	0.0 % (0/285)	0.0 % (0/232)
Conjunctivitis, allergic		0.0 % (0/293)	0.0% (0/293)	0.0% (0/291	0.0% (0/291)	0.0% (0/291)	0.7 (2/285)	0.0 % (0/232)
Discomfort		0.0 % (0/293)	0.0% (0/293)	0.0% (0/291	0.0% (0/291)	0.7% (2/291)	0.0 % (0/285)	0.0 % (0/232)
Epithelial abrasion	0.3% (1/293)	0.0 % (0/293)	0.0% (0/293)	0.0% (0/291	0.0% (0/291)	0.0% (0/291)	0.0 % (0/285)	0.0 % (0/232)
Epithelial basement membrane degeneration		0.0 % (0/293)	0.3% (1/293)	0.3% (1/291)	0.0% (0/291)	0.0% (0/291)	0.0 % (0/285)	0.0 % (0/232)
Hordeolum		0.0 % (0/293)	0.0% (0/293)	0.3% (1/291)	0.0% (0/291)	0.0% (0/291)	0.0 % (0/285)	0.0 % (0/232)
Interface blood		0.3% (1/293)	0.0% (0/293)	0.0% (0/291	0.0% (0/291)	0.0% (0/291)	0.0 % (0/285)	0.0 % (0/232)
Laceration, lid	0.7% (2/293)	0.0 % (0/293)	0.0% (0/293)	0.0% (0/291	0.0% (0/291)	0.0% (0/291)	0.0 % (0/285)	0.0 % (0/232)
Lens opacity		0.0 % (0/293)	0.0% (0/293)	0.0% (0/291	0.0% (0/291)	1.0% (3/291)	0.0 % (0/285)	0.9% (2/232)
Misaligned flap		0.3% (1/293)	0.0% (0/293)	0.0% (0/291	0.0% (0/291)	0.0% (0/291)	0.0 % (0/285)	0.0 % (0/232)
PEK 3+		0.0 % (0/293)	0.7% (2/293)	0.0% (0/291	0.0% (0/291)	0.0% (0/291)	0.0 % (0/285)	0.0 % (0/232)
Photophobia		0.0 % (0/293)	0.0 % (0/293)	0.7% (2/291)	0.0% (0/291)	0.0% (0/291)	0.0 % (0/285)	0.0 % (0/232)
Sheen in interface		5.8% (17/293)	3.4% (10/293)	6.9% (20/291)	4.5% (13/291)	4.1% (12/291)	0.0 % (0/285)	0.0 % (0/232)
Striae		0.0 % (0/293)	0.3% (1/293)	0.7% (2/291)	0.3% (1/291)	0.0% (0/291)	0.0 % (0/285)	0.0 % (0/232)
Tearing, excessive		0.0 % (0/293)	0.0% (0/293)	0.0% (0/291)	0.0% (0/291)	0.3% (1/291)	0.4% (1/285)	0.0 % (0/232)

The most commonly occurring postoperative observation was that of sheen in interface that developed transiently (1 Day, 5.8%; 1 Week, 3.4%; 1 Month, 6.9%; 3 Months, 4.5%; 6 Months, 4.1%; and, 0% thereafter). Lamellar sheen is not unique to this study, having been observed by international Nidek users.

Lamellar sheen occurs after Nidek EC-5000 hyperopic LASIK in the lamellar bed and is randomly distributed in the central cornea. The sheen appears as a faint dusting in the interface that is spotty and grayish in color with feathered edges and an orange-peel texture. In some cases, reflective patches give the surface a slight shiny appearance, hence the term sheen. [NOTE: The lamellar sheen observed after hyperopic LASIK is different from subepithelial stromal haze that occurs after PRK (diffuse, gray, granular confluence) and is also different from DLK (diffuse lamellar keratitis with a granular 'Sands of Sahara' appearance, associated with ocular inflammation).

All cases of lamellar sheen in the study were transient, beginning 1 day to 6 months after surgery, lasting 1 week to 6 months, and resolving without treatment. No cases were observed after the 6 month examination. Lamellar sheen did not affect visual acuity in most cases, although it likely contributed to a transient loss of 2 lines (10 letters) of BSCVA in 7 eyes in the study (each of which returned to within 1 line (5 letters) of baseline BSCVA and a final BSCVA of 20/20 or better upon resolution of the sheen). At the 6 month examination, there was no statistically significant difference in BSCVA between eyes with and without sheen.

The results of the subjective questionnaire at baseline and at the 6- and 12-month examinations are summarized by symptom in Table 31 below. Subjective visual complaints were obtained from each subject using a 10-point questionnaire to record symptoms. Visual complaints were recorded for each eye, and severity was classified as being either: *"none," "mild," "moderate," "marked,"* or *"severe."* "Postoperative spectacle/contact lens use" and "patient satisfaction with LASIK outcome" were not included as specific questions on the visual complaint questionnaire and, therefore, were not evaluated in the PMA clinical trial. Visual symptoms after hyperopic LASIK were generally mild in severity. The reduction in post-operative complaints of difficulty reading and the increase in complaints about eye dryness were both clinically significant, defined as a change of ±10% or more in the proportion of eyes reporting symptoms that were moderate to severe postoperatively compared to baseline.

TABLE 31
SUBJECTIVE COMPLAINTS

QUESTION	VISIT	NONE	MILD	MODERATE	MARKED	SEVERE
LIGHT SENSITIVITY	SCREENING	207/293 (71%)	59/293 (20%)	17/293 (6%)	6/293 (2%)	4/293 (1%)
	POSTOP MONTH 6	211/291 (73%)	66/291 (23%)	10/291 (3%)	4/291 (1%)	0/291 (0%)
	POSTOP MONTH 12	218/276 (79%)	40/276 (14%)	14/276 (5%)	2/276 (1%)	2/276 (1%)
DIFFICULTY NIGHT DRIVING	SCREENING	199/293 (68%)	57/293 (19%)	27/293 (9%)	7/293 (2%)	3/293 (1%)
	POSTOP MONTH 6	243/291 (84%)	39/291 (13%)	8/291 (3%)	1/291 (0%)	0/291 (0%)
	POSTOP MONTH 12	221/276 (80%)	40/276 (14%)	13/276 (5%)	2/276 (1%)	0/276 (0%)
DIFFICULTY READING[2]	SCREENING	146/293 (50%)	54/293 (18%)	61/293 (21%)	22/293 (8%)	10/293 (3%)
	POSTOP MONTH 6	153/289 (53%)	86/289 (30%)	30/289 (10%)	16/289 (5%)	4/289 (1%)
	POSTOP MONTH 12	131/276 (47%)	88/276 (32%)	39/276 (14%)	16/276 (6%)	2/276 (1%)
DOUBLE VISION	SCREENING	285/293 (97%)	6/293 (2%)	1/293 (0%)	0/293 (0%)	1/293 (0%)
	POSTOP MONTH 6	278/291 (96%)	7/291 (2%)	6/291 (2%)	0/291 (0%)	0/291 (0%)
	POSTOP MONTH 12	263/287 (92%)	20/287 (7%)	4/287 (1%)	0/287 (0%)	0/287 (0%)
FLUCTUATION IN VISION	SCREENING	254/293 (87%)	32/293 (11%)	7/293 (2%)	0/293 (0%)	0/293 (0%)
	POSTOP MONTH 6	186/291 (64%)	85/291 (29%)	14/291 (5%)	6/291 (2%)	0/291 (0%)
	POSTOP MONTH 12	204/276 (74%)	58/276 (21%)	11/276 (4%)	1/276 (0%)	2/276 (1%)
GLARE	SCREENING	232/293 (79%)	35/293 (12%)	18/293 (6%)	6/293 (2%)	2/293 (1%)
	POSTOP MONTH 6	227/291 (78%)	59/291 (20%)	5/291 (2%)	0/291 (0%)	0/291 (0%)
	POSTOP MONTH 12	220/276 (80%)	37/276 (13%)	15/276 (5%)	4/276 (1%)	0/276 (0%)
HALOS	SCREENING	255/293 (88%)	24/293 (8%)	10/293 (3%)	2/293 (1%)	2/293 (1%)
	POSTOP MONTH 6	235/291 (81%)	42/291 (14%)	10/291 (3%)	4/291 (1%)	0/291 (0%)
	POSTOP MONTH 12	231/276 (84%)	31/276 (11%)	12/276 (4%)	2/276 (1%)	0/276 (0%)
STARBURSTS	SCREENING	271/293 (92%)	14/293 (5%)	6/293 (2%)	2/293 (1%)	0/293 (0%)
	POSTOP MONTH 6	243/291 (84%)	40/291 (14%)	7/291 (2%)	1/291 (0%)	0/291 (0%)
	POSTOP MONTH 12	243/276 (88%)	21/276 (8%)	11/276 (4%)	1/276 (0%)	0/276 (0%)
DRYNESS[3]	SCREENING	222/293 (76%)	57/293 (19%)	8/293 (3%)	4/293 (1%)	2/293 (1%)
	POSTOP MONTH 6	134/291 (46%)	111/291 (38%)	34/291 (12%)	10/291 (3%)	2/291 (1%)
	POSTOP MONTH 12	153/276 (55%)	92/276 (33%)	18/276 (7%)	9/276 (3%)	4/276 (1%)
PAIN	SCREENING	290/293 (99%)	2/293 (1%)	1/293 (0%)	0/293 (0%)	0/293 (0%)
	POSTOP MONTH 6	277/291 (95%)	14/291 (5%)	0/291 (0%)	0/291 (0%)	0/291 (0%)
	POSTOP MONTH 12	269/276 (97%)	4/276 (1%)	2/276 (1%)	0/276 (0%)	1/276 (0%)
FOREIGN BODY	SCREENING	278/293 (95%)	14/293 (5%)	1/293 (0%)	0/293 (0%)	0/293 (0%)
	POSTOP MONTH 6	238/291 (82%)	47/291 (16%)	6/291 (2%)	0/291 (0%)	0/291 (0%)
	POSTOP MONTH 12	233/276 (84%)	32/276 (12%)	7/276 (3%)	3/276 (1%)	1/276 (0%)

[2] Clinically significant decrease (≥ 10% change) in the proportion of eyes reporting moderate to severe difficulty reading at 6 Months (17%) and 12 Months (21%) compared to baseline (32%).
[3] Clinically significant increase (≥ 10% change) in the proportion of eyes reporting moderate to severe dry eye symptoms at 6 Months (16%) compared to baseline (5%).

Changes in patient symptoms reported via a self-administered questionnaire are summarized below in Table 32. A patient's rating of a symptom was considered to be worse if there was 2 or more grade worsening in the symptom after LASIK compared to before LASIK, better if the change from baseline was 2 or more grades better after LASIK, and unchanged if there was only a one grade change or no change in the symptom after LASIK compared to baseline. Clinically significant changes in a symptom were considered to have occurred when there was a 10% or greater proportion of the subjects that reported an improvement (2 or more grades better than baseline) or worsening (2 or more grades worse than baseline) of a symptom. Using this criterion, there was a clinically significant improvement in night driving (12.4%) and difficulty reading (25.1%), and clinically significant worsening in dryness after LASIK (13.7%), as well as worsening of reading difficulty (10.3%), although this is offset by the number of patients with an improvement in their ability to read (25.1%).

TABLE 32
Change in Subjective Complaints between Baseline and 6 Months

Symptom	Better than Baseline (2 or more grade change)	No Change from Baseline (0-1 grade change)	Worse than Baseline (2 or more grade change)
LIGHT SENSITIVITY	7.9% (23/291)	89.3% (260/291)	2.7% (8/291)
DIFFICULT NIGHT DRIVING	12.4% (36/291)	85.2% (248/291)	2.4% (7/291)
DIFFICULTY READING	25.1% (73/291)	63.0% (186/291)	10.3% (30/291)
DOUBLE VISION	0.7% (2/291)	97.3% (283/291)	2.1% (6/291)
FLUCTUATION IN VISION	1.4% (4/291)	92.1% (268/291)	6.5% (19/291)
GLARE	8.6% (25/291)	90.0% (262/291)	1.4% (4/291)
HALOS	3.4% (10/291)	93.1% (271/291)	3.4% (10/291)
STARBURSTS	2.1% (6/291)	95.9% (279/291)	2.1% (6/291)
DRYNESS	2.7% (8/291)	83.5% (243/291)	13.7% (40/291)
PAIN	0.3% (1/291)	99.7% (290/291)	0% (0/291)
FOREIGN BODY	0.3% (1/291)	97.6% (284/291)	2.1% (6/291)

f. Device Failure

There were no reports of device failure at any of the study sites during the treatment period for this study.

g. Retreatments

No retreatments were performed during the study; therefore, there is insufficient data to determine the safety or effectiveness of performing LASIK retreatments on eyes that were originally treated for spherical hyperopia or hyperopic astigmatism.

XI. CONCLUSIONS DRAWN FROM THE CLINICAL STUDY

The data in this application provides reasonable assurance that the device is safe and effective when used in accordance with the directions for use. Preclinical profilometry studies demonstrated good agreement to theoretical targets. The clinical trial conducted under IDE G030204 demonstrated that refractive stability was achieved at 6 months and that safety and effectiveness target outcomes were also met at the point of stability.

XII. 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, and FDA advisory committee, for review and recommendation because the information in the PMA substantially duplicates information previously reviewed by this panel.

XIII. CDRH DECISION

CDRH issued an approval order on October 11, 2006.

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

XIV. APPROVAL SPECIFICATIONS

Postapproval Requirements and Restriction:	See Approval Order
Hazards to Health from Use of the Device:	See Indications, Contraindications, Warnings, Precautions, and Adverse Events in the labeling.
Directions for Use:	See Labeling