SUMMARY OF SAFETY AND EFFECTIVENESS DATA (SSED)

I. GENERAL INFORMATION

Device Generic Name:	Ophthalmic Excimer Laser
Device Trade Name:	ALLEGRETTO WAVE® Eye-Q Excimer Laser System
Device Procode:	LZS
Applicant's Name and Address:	Alcon Research, Ltd. 6201 South Freeway Fort Worth, Texas 76134 USA Telephone: (817)-551-8651
Date of Panel Recommendation:	None
Premarket Approval Application (PMA) Number:	P020050/S12
Date of FDA Notice of Approval	September 27, 2013

The original PMA (P020050) was approved October 7, 2003, and the ALLEGRETTO WAVE® Eye-Q Excimer Laser System is indicated for performing Laser Assisted *in situ* Keratomileusis (LASIK) treatments in patients 18 years of age or older for the reduction or elimination of myopic refractive errors up to -12.0 diopters (D) of sphere with and without astigmatic refractive errors up to 6.0 D; and in patients with documented evidence of a stable manifest refraction defined as ≤ 0.50 D of preoperative spherical equivalent shift over one year prior to surgery. The Safety and Effectiveness Data (SSED) to support the indication is available on the CDRH website and is incorporated by reference here: http://www.accessdata.fda.gov/cdrh_docs/pdf2/P020050b.pdf.

A Panel-Track Supplement to the original PMA (P020050/S4) was approved July 26, 2006, and expanded the indications for use of the ALLEGRETTO WAVE® Eye-Q Excimer Laser System for performing wavefront-guided LASIK treatments for the reduction or elimination of up to -7.00 diopters (D) of spherical equivalent myopia or myopia with astigmatism, with up to -7.00 D of spherical component and up to 3.00 D of astigmatic component at the spectacle plane surgery in patients 18 years of age or older with documentation of a stable manifest refraction defined as ≤ 0.50 D of preoperative spherical equivalent shift over one year prior to surgery. The SSED to support the indication is available on the CDRH website and is incorporated by reference here: http://www.accessdata.fda.gov/cdrh_docs/pdf2/P020050S004a.pdf.

II. INDICATIONS FOR USE

The WaveLight ALLEGRETTO WAVE® Eye-Q Excimer Laser System used in conjunction with the WaveLight ALLEGRO Topolyzer (topographer) and T-CAT treatment planning software is indicated for performing topography-guided laser assisted in situ keratomileusis (T-CAT LASIK):

- for the reduction or elimination of up to -9.00 diopters (D) of spherical equivalent myopia or myopia with astigmatism, with up to -8.00 D of spherical component and up to -3.00 D of astigmatic component at the spectacle plane;

- in patients who are 18 years of age or older; and,

- in patients with documentation of a stable manifest refraction defined as 0.50 D or less of preoperative spherical equivalent shift over one year prior to surgery.

III. CONTRAINDICATIONS

T-CAT LASIK treatments are contraindicated in:

- Pregnant or nursing women
- Patients with a weakened immune system, including diagnosed collagen vascular, autoimmune or immunodeficiency disease
- Patients with degenerations of structure of the cornea, including diagnosed keratoconus or any clinical pictures suggestive to keratoconus
- Patients with severe dry eye
- Patients with eyes that have a calculated residual stromal bed thickness that is less than 250 microns
- Patients with a recurrent corneal erosion
- Patients with advanced glaucoma
- Patients with uncontrolled diabetes

IV. WARNINGS AND PRECAUTION

The warnings and precautions can be found in the ALLEGRETTO WAVE® Eye-Q Excimer Laser System labeling.

V. DEVICE DESCRIPTION

The ALLEGRETTO WAVE® Eye-Q Excimer Laser system is a scanning-spot excimer laser system used in refractive surgery for the treatment of refractive errors of the human eye. The system consists of a compact excimer laser with high pulse frequency, a galvanometer scanner for positioning the laser spot and a fast eye-tracker for determining

eye position and laser beam direction. The integrated eye-tracker offers automatic centration of the ablation and tracking of eye movements.

The three devices that are used to plan and perform the topography-guided LASIK treatments are the:

- ALLEGRETTO WAVE EYE-Q® Laser System
- ALLEGRO Topolyzer topography system
- T-CAT software for treatment planning

The T-CAT software constructs each treatment plan using the manifest refractive error, diagnostic data obtained from the ALLEGRO Topolyzer topography system, and manual user adjustments. Each T-CAT plan uses numerical algorithms to generate the ablation contour patterns to be used in T-CAT LASIK.

The planned treatment is transferred to the notebook computer of the ALLEGRETTO WAVE® Eye-Q Excimer Laser System via media, such as an USB-stick. The Excimer Laser System software checks the treatment file for integrity and request final approval by the user.

The T-CAT treatment planning software is a device option that requires specific software licensing. This involves requesting authorization from the device manufacturer for each specific ALLEGRO Topolyzer and the corresponding ALLEGRETTO WAVE EYE-Q® laser device. Devices that have not been authorized for use with each other cannot be used for topography-guided treatments.

VI. ALTERNATIVE PRACTICES AND PROCEDURES

Alternative methods of correcting nearsightedness (myopia) with and without astigmatism include: glasses, contact lenses, phakic intraocular lenses (PIOLs), LASIK with another laser system, and photorefractive keratectomy (PRK).

VII. MARKETING HISTORY

The ALLEGRETTO WAVE® Eye-Q Excimer Laser System, T-CAT software module, and the ALLEGRO Topolyzer have been marketed in the following countries: Austria, Australia, Bahrain, Belgium, Brazil, Canada, China, France, Germany, Great Britain, Greece, Hong Kong, India, Ireland, Israel, Italy, Japan, Korea, Lebanon, Mexico, Netherlands, Norway, Russia, Saudi Arabia, Singapore, Slovenia, Spain, Sri Lanka, Sweden, Switzerland, Egypt, Algeria, Argentina, Chile, Columbia, Curacao, Finland, Iran, Jordan, Kenya, La Reunion, Malaysia, New Zealand, Poland, Serbia, Slovakia, South Africa, Sweden, Taiwan, Thailand, Czech Republic, Dubai), and the United States. The ALLEGRETTO WAVE® Eye-Q Excimer Laser System, T-CAT software module, and the ALLEGRO Topolyzer have not been withdrawn from marketing for any reason relating to

the safety and effectiveness of the devices.

VIII. 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 secondary (additional) surgical intervention.

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

IX. SUMMARY OF PRECLINICAL STUDIES

A. Laboratory/Animal Studies

No preclinical in-vivo studies were conducted or required to demonstrate safety and effectiveness.

B. Additional Studies

1. Hazard Analysis and Software Validation. The system hazard analysis was updated to include hazards attributable to the ALLEGRO Topolyzer and to the T-CAT treatment planning software. All new hazards have been acceptably mitigated and the mitigations have been validated under the WaveLight quality system. Also, software validation and verification tests have been successfully completed for the ALLEGRETTO WAVE® Eye-Q Excimer Laser System, the T-CAT software module, and the ALLEGRO Topolyzer, and the current software versions have no unresolved anomalies.

2. Ablation Profilometry. Prior to the start of the clinical study, the T-CAT ablation algorithm was validated with profile measurements of representative plastic ablations spanning the entire dioptric range of spherical, cylindrical, and spherocylindrical treatments to be available for clinical use. For each test ablation, the results were depicted as profile plots of the measured and intended ablation and the percent difference. These results were consistently within ±10% of the intended ablation.

X. SUMMARY OF PRIMARY CLINICAL STUDY

The applicant performed a study (T-CAT-001) to establish reasonable assurance of the safety and effectiveness of T-CAT for performing topography-guided LASIK using the ALLEGRETTO WAVE® Eye-Q Excimer Laser System for the treatment of manifest and cornea-based myopic refractive errors under G090153.

A. Study Design

The T-CAT-001 study was a prospective, non-randomized, multicenter study conducted at nine (9) clinical sites. A total of 249 eyes of 212 enrolled subjects with myopia, with or without astigmatism, were treated with Topography-guided Custom Ablation Treatment (T-CAT) LASIK with the ALLEGRETTO WAVE® Eye-Q Excimer Laser System.

The sample size for this study was based on having a high probability that the confidence interval for the mean refractive error is wholly contained in the interval (-0.5D, 0.5D). A sample size of 249 evaluable eyes was deemed sufficient to estimate the mean refractive error to within ± 0.5 D.

Corneal topography, manifest refraction, and measurements of uncorrected (UCVA) and best spectacle-corrected visual acuity (BSCVA) were obtained at baseline and at appropriate times after the LASIK treatment to evaluate the effectiveness of the treatment. Safety monitoring throughout the study included observations at all scheduled and unscheduled visits for subjective complaints, complications, and adverse events; as well as clinically significant findings upon ophthalmic examination, dilated fundus examination, slit lamp examination, and contrast sensitivity testing. Subject reported outcome questionnaires were used to evaluate subjective visual complaints, quality of vision, and quality of life preoperatively and postoperatively.

Subjects who agreed to participate in the T-CAT-001 study provided informed consent and underwent the required screening procedures to determine study eligibility for T-CAT. Subjects in whom one or both eyes had a preoperative refractive error within the specified range for myopia (MRSE up to-9.0 D; sphere 0 to -9.0 D, cylinder 0 to 6.0 D) and met all study eligibility criteria were further evaluated as potential candidates for a topography-guided LASIK procedure. Measurements taken at baseline and postoperatively included manifest refraction, cycloplegic refraction, distance BSCVA and UCVA, slit lamp examination, corneal topography, pachymetry, intraocular pressure, and fundus examination.

Corneal topographies used to plan the T-CAT LASIK treatment were obtained prior to treatment using the ALLEGRO Topolyzer topography system. The T-CAT software used data from the ALLEGRO Topolyzer and clinical refraction to determine the treatment plan; then, the topography-guided LASIK procedure was

delivered to the study eye using the ALLEGRETTO WAVE® Eye-Q Excimer Laser System.

1. Clinical Inclusion and Exclusion Criteria

Inclusion Criteria

Subjects enrolled in the study were required to meet these conditions: be at least 18 years of age; a candidate for LASIK surgery with myopia at the spectacle plane $\leq$ -9.0 D manifest refraction spherical equivalent (MRSE), with sphere between 0.0 and -9.0 D and astigmatism between 0.0 and 6.0 D in the operative eye, and the operative eye targeted for emmetropia; have a reliable corneal topography that could be used to determine the T-CAT treatment plan, visual acuity correctable to 20/25 or better in each eye; if wearing contact lenses, discontinue use of soft lenses for at least 3 days, soft extended wear lenses for at least 1 week, soft toric lenses or rigid gas permeable lenses for at least 2 weeks; contact lens wearers must have had two manifest refractions taken at least one week apart that did not differ by more than 0.5 D; providing written informed consent; and, willing and able to comply with the follow-up visit schedule.

Exclusion Criteria

Subjects who met any of these conditions were excluded from the study: history of prior refractive treatment; mixed astigmatism refractive error; clinically significant lenticular astigmatism, abnormal topography that would place the eye at risk for developing post-refractive corneal ectasia, such as keratoconus, keratoconus suspect, forme fruste keratoconus, or pellucid marginal degeneration; treatment plan would predict a residual stromal bed thickness less than 250 microns; history of herpes simplex keratitis, herpes zoster keratitis, recurrent erosion syndrome, corneal melt, corneal dystrophy, or other corneal or anterior segment disease that might reasonably be expected to affect the outcome of treatment; evidence of retinal vascular disease; female patients who were pregnant or lactating or planned to become pregnant during the course of the study; known sensitivity to study medications; nystagmus or any other condition that would prevent a steady gaze during the LASIK treatment or other diagnostic tests; corneal dystrophy or corneal guttae; any pathology involving the iris, such as coloboma, tears, cuts, or significant pigment loss; other residual, recurrent or active ocular pathology or previous intraocular or corneal surgery that might confound the outcome or increase the risk of the study; any acute or chronic illness that might increase the risk or confound the outcome of the study, such as diagnosed autoimmune disease, systemic connective tissue disease, clinically significant atopic disease, uncontrolled diabetes mellitus; use of systemic corticosteroids or antimetabolites; intraocular pressure > 23 mm Hg, a history of glaucoma, or a glaucoma suspect; or, any other history, condition, or finding that would make the subject unsuitable as a candidate for LASIK or study participation or may confound the outcome of the study.

2. Follow-Up Schedule

All subjects were evaluated at the following visit intervals before and after the T-CAT LASIK treatment:

- Preoperative (-30 to -1 days)
- Operative (Day 0)
- Day 1 (1 to 3 days)
- Week 1 (5 to 9 days)
- Month 1 (3 to 5 weeks)
- Month 3 (10 to 14 weeks)
- Month 6 (21 to 26 weeks)
- Month 9 (35 to 43 weeks)
- Month 12 (11-14 months; Final Exam)

All subjects were expected to return for each follow-up examination during the visit windows shown above. All final exam procedures were completed at the Month 12 visit.

Preoperatively, the subjects' ocular, medical, and medication histories and demographic information were obtained. 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, corneal topography, central keratometry, aberrometry, low contrast acuity, and contrast sensitivity. Patient reported outcomes included a self-evaluation of visual symptoms, a quality of life questionnaire, and patient satisfaction with the T-CAT LASIK procedure.

3. Clinical Endpoints

Safety and Effectiveness Criteria

The primary safety target criteria for the study, evaluated at the time point of refractive stability are:

- Changes in Best Spectacle Corrected Visual Acuity: Less than 5.0% of the eyes should lose 2 or more lines of BSCVA; and less than 1.0% of eyes that have preoperative BSCVA of 20/20 or better should have postoperative BSCVA worse than 20/40.

- Incidence of Adverse Events: Less than 1% of eyes should have a specific adverse event (per type of event).

- Induced Manifest Refractive Astigmatism: Less than 1% of eyes treated

for spherical correction only should have an increase in manifest refractive astigmatism of more than 2.0 D of absolute cylinder magnitude as compared to the preoperative refraction.

These primary safety endpoints were measured postoperatively at 1, 3, 6, 9 and 12-months. Specifically, safety outcomes at 3-months postoperatively were assessed, as refractive stability is reached by that time.

Other safety endpoints included adverse events (AEs), complications, evaluation of corneal haze and intraocular pressure, symptoms/problems/complaints assessed in subject questionnaires and contrast sensitivity.

The primary effectiveness target criteria for the study, evaluated at the postoperative time point of refractive stability, are:

- Refractive Predictability: Decrease in MRSE to within ± 1.00 D and ± 0.50 D of the intended refractive outcome at the point at which stability is first reached. A minimum of 75% of eyes should have achieved a refraction within ± 1.00 D of the intended outcome, and at least 50% of eyes should be within ± 0.50 D of the intended outcome.

- Visual Acuity: A minimum of 85% of eyes should have UCVA of 20/40 or better for eyes with BSCVA of 20/20 or better preoperatively.

- Refractive Stability: A minimum of 95% of eyes should have a change of 1.00 D or less in MRSE between 2 refractions performed at two consecutive scheduled visit intervals performed at least 3 months apart, and the mean rate of MRSE change should be 0.04 D or less per month (NOTE: Refractive stability is generally accepted to have been achieved at the latter of two postoperative refractions performed at least 3 months apart or at 3 months after surgery when compared with the 1-month interval, if all of the refractive stability criteria have been met).

Other effectiveness endpoints include an analysis of Zernike data and, and a patient symptom questionnaire that assesses vision related quality of life factors.

These primary effectiveness endpoints were measured postoperatively at 1, 3, 6, 9, and 12-months. Specifically, effectiveness outcomes were assessed at 3-months postoperatively, as refractive stability is reached by that time.

No retreatments were performed in the study. Therefore, no safety or effectiveness data are available for the use of T-CAT LASIK in performing a retreatment procedure or for T-CAT LASIK treated eyes that have a retreatment performed using another technology.

B. Accountability of PMA Cohort

Accountability by eye is summarized below in Table 1 for all 249 eyes of 212 enrolled subjects treated with T-CAT LASIK in the study. Accountability at each visit ranging from 95.0% to 100.0%. The accountability at the 12-month final visit is 95.0%.

Table 1: Accountability by Eye for All Eyes Treated for Myopia

Status[1]	**1 Day**		**1 Week**		**1 Month**		**3 Months**		**6 Months**		**9 Months**		**12 Months**	
Enrolled (N)	249		249		249		249		249		249		249	
	n/N	%	n/N	%	n/N	%	n/N	%	n/N	%	n/N	%	n/N	%
Available for Analysis	248	99.6	249	100	248	99.6	247	99.2	244	98.0	237	95.2	230	92.4
Discontinued	0	0	0	0	1	0.4	1	0.4	1	0.4	2	0.8	7	2.8
Active (Not Eligible for Interval)	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	2	0.8	8	3.2	12	4.8
Missed Visit (Accounted for)	1	0.4	0	0	0	0	1	0.4	2	0.8	2	0.8	0	0
Percent (%) Accountability		99.6		100		100		99.6		98.4		96.0		95.0

N = Enrolled (total number of eyes that underwent a primary T-CAT LASIK treatment).
Discontinued = Total number of eyes no longer under observation.
Active = Total number of eyes that underwent a primary T-CAT LASIK treatment but had not reached the postoperative interval being reported.
Lost to Follow-up (LTF) = Total number of eyes that failed to complete the specified examination interval and all subsequent examination intervals; includes eyes of subjects who moved, those who refused to come back for additional exams, and subjects who were contacted by telephone but did not complete any subsequent exams.
Missed Visit = Total number of eyes that failed to undergo the specified examination interval but completed a subsequent visit.

$$\%\ Accountabi\ lity = \frac{Available\ \ for\ \ Analysis}{Enrolled\ - Discontinu\ ed - Not\ Yet\ Eligible}$$

A total of 19 eyes in 17 subjects (19/249 eyes of 212 enrolled subjects; 7.6%) were considered to be discontinued or LTF (defined directly above) at the conclusion of the 12-month study. Four (4) were discontinued for administrative reasons, one (1) was a voluntary withdrawal, and the remainder (14 eyes) were lost-to-follow-up. BSCVA at

last recorded visit was provided and was 20/20 or better in each of these 19 eyes of 17 subjects.

C. Study Population Demographics and Baseline (Preoperative) Parameters

Demographics

Demographic characteristics of the subjects enrolled in the study are summarized in Table 2 below. The demographics of the study are typical for a contemporary refractive surgery clinical trial performed in the United States.

Table 2: Summary of Demographic Information

Parameter		Myopia Cohort N=212 subjects (249 eyes)	
		n/N[1]	%
Gender	Male	93	43.87%
	Female	119	56.13%
Race	Caucasian	157	74.06%
	Asian	8	3.77%
	Black	4	1.89%
	Hispanic	37	17.45%
	Other	6	2.83%
Surgical Eye	Right	128	51.41%
	Left	121	48.59%
Age (in years)	Mean (std)	34.0 (9.3)	
	Min - Max	18 - 65	

[1] Gender, Race, and Age n/N's are based on the 212 subjects enrolled in the study that had eyes treated. Surgical Eye n/N is based on the total 249 eyes treated in the study.

Age of the subjects in the T-CAT LASIK study ranged from 18 to 65 years, with a mean age of 34.0 years, at the time the T-CAT LASIK treatment was performed. The subject population consisted of an approximately equal number of male (44%) and female (56%) subjects. The study was performed at nine sites in the United States; and study subjects treated at research sites located in the Midwest or Southeast were mostly Caucasian, while subjects in the Southwest or West were primarily Caucasian or Hispanic. The eyes treated in the T-CAT-001 myopic study cohort were approximately equally distributed, with 128 (51%) right eyes treated and 121 (49%) left eyes treated. The age, race, and gender of each study site cohort were characteristic of the typical LASIK patient population of the site.

Baseline Refractive Parameters

The preoperative bin distribution, based on the preoperative manifest refraction at the spectacle plane that was used in calculating the T-CAT LASIK treatment plan, is summarized below, with stratification based on sphere and cylinder in Table 3 and on MRSE and cylinder in Table 4. Shaded areas of Tables 3 and 4 indicate refractive

conditions that were studied. However, due to the limited number of subject studied for each bin that is shaded, treatment of these dioptric ranges (in both sphere and cylinder) are either flagged as warnings to the user or locked out in software to prevent use in treatment. All T-CAT treated eyes were targeted for emmetropia, with the measured pre-treatment clinical manifest refraction, as entered into the T-CAT software to calculate the treatment plan, used as the attempted refraction for the refractive predictability calculations.

Table 3: T-CAT-001 Bin Distribution Stratified by Attempted Sphere and Cylinder

	Attempted Cylinder								
Attempted Sphere	**0.00D**	**-0.01 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 -4.00 D[1]**	**-4.01 to -5.00 D[1]**	**-5.01 to -6.00 D[2]**	**Total**
0.00 to -1.00 D	4	7	6	11	4	2	4	1	39
-1.01 to -2.00 D	2	9	11	7	9	2	0	1	41
-2.01 to -3.00 D	3	12	3	2	2	2	3	0	27
-3.01 to -4.00 D	6	8	7	4	5	3	0	0	33
-4.01 to -5.00 D	2	6	6	6	0	1	0	0	21
-5.01 to -6.00 D	4	11	2	3	5	2	0	0	27
-6.01 to -7.00 D	6	5	2	5	3	0	0	0	21
-7.01 to -8.00 D	6	6	5	5	1	0	0	0	23
-8.01 to -9.00 D[2]	5	9	3	0	0	0	0	0	17
Total N	38	73	45	43	29	12	7	2	249

[1] Please note that treatment of these dioptric powers will present a flagged warning to the user so that the user understands that FDA believes correction of these powers has not been substantiated by an adequate set of data.

[2] Please note that treatment of these refractive powers is not allowed because the number of subjects studied cannot substantiate the effectiveness of treatment of this dioptric range.

Table 4: T-CAT-001 Bin Distribution Stratified by Attempted MRSE and Cylinder

	Attempted Cylinder								
Attempted MRSE	**0.00D**	**-0.01 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 -4.00 D**	**-4.01 to -5.00 D**	**-5.01 to -6.00 D**	**Total**
0.00 to -1.00 D	4	2	1	1	0	0	0	0	8
-1.01 to -2.00 D	2	11	9	11	4	0	0	0	37
-2.01 to -3.00 D	3	10	7	6	8	3	2	1	40
-3.01 to -4.00 D	6	12	6	2	3	2	2	0	33
-4.01 to -5.00 D	2	5	6	7	5	1	2	1	29
-5.01 to -6.00 D	4	9	4	5	0	3	1	0	26

Attempted Cylinder									
Attempted MRSE	**0.00D**	**-0.01 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 -4.00 D**	**-4.01 to -5.00 D**	**-5.01 to -6.00 D**	**Total**
-6.01 to -7.00 D	6	6	3	2	3	1	0	0	21
-7.01 to -8.00 D	6	7	5	5	4	2	0	0	29
-8.01 to -9.00 D	5	11	4	4	2	0	0	0	26
Total N	38	73	45	43	29	12	7	2	249

D. Safety and Effectiveness Results

Safety Results

The safety analyses were based on the total PMA cohort of 249 eyes of 212 enrolled subjects. A summary of key safety and effectiveness variables at each of the postoperative visits is provided below in Table 5 for the myopia cohort. The primary safety outcomes for this study and overall AEs are presented below in the following tables. It should be noted that the safety of the device was not based on the study sample alone, but rather on all the available data from the device to date. The safety data from this study were for confirmatory purposes.

Table 5: Summary of Key Safety Parameters after T-CAT LASIK

SAFETY VARIABLES		Month 1	Month 3	Month 6	Month 9	Month 12
Loss of 2 or more lines BCVA[1]	n/N	1/248	0/247	1/244	0/237	1/230
	(%)	(0.40%)	(0.00%)	(0.41%)	(0.00%)	(0.43%)
	(CI)	(0.0, 2.2)	(0.0, 1.5)	(0.0, 2.3)	(0.0, 1.5)	(0.0, 2.4)
BCVA worse than 20/40	n/N	0/248	0/247	1/244	0/237	0/230
	(%)	(0.00%)	(0.00%)	(0.41%)	(0.00%)	(0.00%)
	(CI)	(0.0, 1.5)	(0.0, 1.5)	(0.0, 2.3)	(0.0, 1.5)	(0.0, 1.6)
Increase > 2D cylinder (spherical only)	n/N	0/ 37	0/ 37	0/ 36	0/ 36	0/ 36
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
	(CI)	(0.0, 9.5)	(0.0, 9.5)	(0.0, 9.7)	(0.0, 9.7)	(0.0, 9.7)
BCVA worse than 20/40 if 20/20 or better preop	n/N	0/242	0/241	1/238	0/232	0/225
	(%)	(0.00%)	(0.00%)	(0.42%)	(0.00%)	(0.00%)

[1] Two additional eyes had single reports of transient loss of 2 or more lines of BSCVA at unscheduled visits. These eyes are reported as occurring at unscheduled visits in Table 8, "Adverse Events for All Myopic Eyes Treated with T-CAT LASIK".

Loss of BSCVA was minimal, with only 5 single reports of BSCVA loss of 2 lines or more at any of the 1 month or later, scheduled or unscheduled, postoperative visits in the study. All five of these instances of BSCVA loss were transient, unrelated to the T-CAT LASIK treatment and resolved by the next postoperative follow-up visit.

The key safety parameters at 3 months after T-CAT LASIK (the time point of refractive stability), stratified by each preoperative MRSE dioptric bin and by each

preoperative cylinder bin, are presented below in Tables 6 and 7, respectively. Similar safety results are observed in the stratified bins as are seen in the entire cohort. Thus, the clinical safety outcomes support the refractive range for the approved indications for use.

Table 6: Summary of Key Safety Parameters Stratified by Pre-Treatment MRSE - Results at 3 Months after T-CAT LASIK

SAFETY VARIABLES		-0.01 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	-6.01 TO -7.00D	-7.01 TO -8.00D	-8.01 TO -9.00D	CUM TOTAL
Loss of 2 or more lines BCVA	n/N	0/ 8	0/ 37	0/ 40	0/ 33	0/ 28	0/ 26	0/ 20	0/ 29	0/ 26	0/247
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
	(CI)	(0.0, 36.9)	(0.0, 9.5)	(0.0, 8.8)	(0.0, 10.6)	(0.0, 12.3)	(0.0, 13.2)	(0.0, 16.8)	(0.0, 11.9)	(0.0, 13.2)	(0.0, 1.5)
BCVA worse than 20/40	n/N	0/ 8	0/ 37	0/ 40	0/ 33	0/ 28	0/ 26	0/ 20	0/ 29	0/ 26	0/247
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
	(CI)	(0.0, 36.9)	(0.0, 9.5)	(0.0, 8.8)	(0.0, 10.6)	(0.0, 12.3)	(0.0, 13.2)	(0.0, 16.8)	(0.0, 11.9)	(0.0, 13.2)	(0.0, 1.5)
Increase > 2D cylinder	n/N	0/ 4	0/ 2	0/ 3	0/ 6	0/ 2	0/ 4	0/ 5	0/ 6	0/ 5	0/ 37
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
	(CI)	(0.0, 60.2)	(0.0, 84.2)	(0.0, 70.8)	(0.0, 45.9)	(0.0, 84.2)	(0.0, 60.2)	(0.0, 52.2)	(0.0, 45.9)	(0.0, 52.2)	(0.0, 9.5)
BCVA worse than 20/40 if 20/20 or better preop	n/N	0/ 8	0/ 37	0/ 40	0/ 32	0/ 28	0/ 25	0/ 19	0/ 26	0/ 26	0/241
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
	(CI)	(0.0, 36.9)	(0.0, 9.5)	(0.0, 8.8)	(0.0, 10.9)	(0.0, 12.3)	(0.0, 13.7)	(0.0, 17.6)	(0.0, 13.2)	(0.0, 13.2)	(0.0, 1.5)

Table 7: Summary of Key Safety Parameters Stratified by Pre-Treatment Cylinder - Results at 3 Months after T-CAT LASIK

SAFETY VARIABLES		0.00D	0.01 TO 0.50D	0.51 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
Loss of 2 or more lines BCVA	n/N	0/ 37	0/ 72	0/ 45	0/ 43	0/ 29	0/ 12	0/ 7	0/ 2
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
	(CI)	(0.0, 9.5)	(0.0, 5.0)	(0.0, 7.9)	(0.0, 8.2)	(0.0, 11.9)	(0.0, 26.5)	(0.0, 41.0)	(0.0, 84.2)
BCVA worse than 20/40	n/N	0/ 37	0/ 72	0/ 45	0/ 43	0/ 29	0/ 12	0/ 7	0/ 2
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
	(CI)	(0.0, 9.5)	(0.0, 5.0)	(0.0, 7.9)	(0.0, 8.2)	(0.0, 11.9)	(0.0, 26.5)	(0.0, 41.0)	(0.0, 84.2)
Increase > 2D cylinder	n/N	0/ 37	0/ 0	0/ 0	0/ 0	0/ 0	0/ 0	0/ 0	0/ 0
	(%)	(0.00%)							
	(CI)	(0.0, 9.5)							
BCVA worse than 20/40 if 20/20 or better preop	n/N	0/ 37	0/ 70	0/ 45	0/ 42	0/ 28	0/ 10	0/ 7	0/ 2
	(%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)	(0.00%)
	(CI)	(0.0, 9.5)	(0.0, 5.1)	(0.0, 7.9)	(0.0, 8.4)	(0.0, 12.3)	(0.0, 30.8)	(0.0, 41.0)	(0.0, 84.2)

Corneal Haze

Corneal haze was graded at each postoperative time point after observation on the slit lamp examination. Rare occurrences of haze were reported in the T-CAT) LASIK clinical trial.

Intraocular Pressure

Intraocular pressure was measured by Goldmann applanation tonometry at the slit lamp. There were no clinically significant changes (defined as >10 mm Hg increases) between intraocular pressure measurements obtained preoperatively and postoperatively.

Adverse events and complications that occurred during the study at all scheduled and unscheduled visits are presented in Table 8 below. The cumulative rate of safety events classified as adverse events that occurred at scheduled or unscheduled visits was 1.6% (4/249 eyes) for BSCVA loss of 2 or more lines, all of which were transient and unrelated to the T-CAT LASIK procedure. The cumulative rate of retinal detachments was 0.8% (2/244 eyes), occurring bilaterally in the same subject at approximately 6 months after the T-CAT LASIK surgery; both of which were unrelated to the T-CAT LASIK treatment.

Table 8: Adverse Events for All Myopic Eyes Treated with T-CAT LASIK[1]

ADVERSE EVENTS	Intraop (N=249)	Day 1 (N=248)	Week 1 (N=249)	Month 1 (N=248)	Month 3 (N=247)	Month 6 (N=244)	Month 9 (N=237)	Month 12 (N=230)	Unscheduled (n)
Diffuse lamellar keratitis with progressive melt		0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0
Corneal infiltrate or ulcer		0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0
Any corneal epithelial defect involving keratectomy site at 1 month or later				0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0
Corneal edema at 1 month or later				0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0
Epithelium in interface with loss of 2 or more lines of BSCVA		0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0
Miscreated flap (lost, incomplete, too thin)		0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0
Melting of the flap		0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0
IOP on 2 consecutive exams that is > 10 mm Hg above baseline or > 30 mm Hg		0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0
Haze beyond 6 mos. with loss of ≥2 lines (≥10 letters) BSCVA							0 (0.00%)	0 (0.00%)	0
Decrease of BSCVA of ≥ 10 letters					0 (0.00%)	1(0.41%)	0 (0.00%)	1(0.43%)	2
Retinal detachment	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	2(0.82%)	0 (0.00%)	0 (0.00%)	0
Retinal vascular accidents	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0
Any other vision threatening event	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0
Ocular penetration	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0

[1] BSCVA loss, n = 2 new reports occurring at unscheduled visits.

Complications

Complications that occurred during the study at all scheduled and unscheduled visits are presented in Table 9 below. The following complications were observed at 3 months after T-CAT LASIK surgery: foreign body sensation at 1 month or later, 5 eyes (2.0%); double images in the treated eye, 1 eye (0.4%); ghost images in the treated eye, 2 eyes (0.8%); dry eyes requiring prescribed use of ocular lubricants or punctal plugs,10 eyes (4.0%). At the final 12-month postoperative study visit, the safety observations of any type that occurred at a rate of 1% or greater included reports of: dry eye requiring no treatment or ocular lubricants as needed in 20 eyes (8.7%), blurred vision at distance or near in 6 eyes (2.6%), mild superficial punctuate keratitis in 4 eyes (1.7%), ocular irritation in 4 eyes (1.4%), dry eyes requiring punctal plugs or prescribed use of ocular lubricants in 3 eyes (1.3%), fluctuation in vision in 3 eyes (1.3%), and starbursts in 3 eyes (1.3%).

Table 9: Complications for All Myopic Eyes Treated with T-CAT LASIK

COMPLICATIONS	Intraop (N=249)	Day 1 (N=248)	Week 1 (N=249)	Month 1 (N=248)	Month 3 (N=247)	Month 6 (N=244)	Month 9 (N=237)	Month 12 (N=230)	Unscheduled[1] (n)
Corneal edema between 1 week and 1 month after procedure			1 (0.40%)	0 (0.00%)					0
Peripheral corneal epithelial defect at 1 month or later				0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0
Epithelium in interface, >2mm				0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0
Foreign body sensation at 1 month or later				6 (2.42%)	5 (2.02%)	3 (1.23%)	0 (0.00%)	0 (0.00%)	1
Pain at 1 month or later				2 (0.81%)	0 (0.00%)	0 (0.00%)	2 (0.84%)	0 (0.00%)	0
Double images in the operative eye		0 (0.00%)	0 (0.00%)	2 (0.81%)	1 (0.40%)	1 (0.41%)	2 (0.84%)	0 (0.00%)	1
Ghost images in the operative eye		0 (0.00%)	1 (0.40%)	2 (0.81%)	2 (0.81%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	2
Flap is not of the size and shape as initially intended or microkeratome stopped mid-cut or resultant flap is misaligned	0 (0.00%)	2 (0.80%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0
Diffuse lamellar keratitis		5 (2.01%)	2 (0.80%)	1 (0.40%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	0 (0.00%)	4
Dry eyes requiring punctal plugs or prescribed use of ocular lubricants at 3 months or later					10 (4.05%)	8 (3.28%)	6 (2.53%)	3 (1.30%)	6

[1] Double images, new report n=1; Ghost images, new report n = 2; Diffuse lamellar keratitis, new report n = 1, ongoing reports n = 3; Dry eyes with treatment, new reports n = 4, ongoing reports n = 2.

Patient Subjective Questionnaire

Table 10 below summarizes the severity of visual symptoms after T-CAT LASIK. Responses were obtained from each subject using a 12-item, self-administered, subjective symptom questionnaire (labeled "Patient Questionnaire" on patient forms in G090153). Visual symptoms after T-CAT LASIK were generally mild in severity.

Table 10: Visual Symptoms Recorded via Self-Administered Symptom Questionnaire[1]

Question	Visit	None	Mild	Moderate	Marked	Severe
Light Sensitivity	Screening	136/249 (55%)	71/249 (29%)	29/249 (12%)	13/249 (5%)	
	Postop Month 1	77/247 (31%)	110/247 (45%)	40/247 (16%)	17/247 (7%)	3/247 (1%)
	Postop Month 3	125/247 (51%)	83/247 (34%)	35/247 (14%)	1/247 (0%)	3/247 (1%)
	Postop Month 6	141/244 (58%)	85/244 (35%)	17/244 (7%)	1/244 (0%)	
	Postop Month 9	144/237 (61%)	81/237 (34%)	12/237 (5%)		
	Postop Month 12	160/230 (70%)	56/230 (24%)	14/230 (6%)		
Difficulty Driving at Night	Screening	112/249 (45%)	81/249 (33%)	35/249 (14%)	18/249 (7%)	3/249 (1%)
	Postop Month 1	130/246 (53%)	76/246 (31%)	25/246 (10%)	11/246 (4%)	4/246 (2%)
	Postop Month 3	148/247 (60%)	73/247 (30%)	16/247 (6%)	9/247 (4%)	1/247 (0%)
	Postop Month 6	179/244 (73%)	43/244 (18%)	17/244 (7%)	5/244 (2%)	
	Postop Month 9	166/236 (70%)	56/236 (24%)	12/236 (5%)	2/236 (1%)	
	Postop Month 12	164/230 (71%)	51/230 (22%)	14/230 (6%)	1/230 (0%)	
Reading Difficulty	Screening	172/249 (69%)	38/249 (15%)	14/249 (6%)	11/249 (4%)	14/249 (6%)
	Postop Month 1	190/247 (77%)	24/247 (10%)	19/247 (8%)	10/247 (4%)	4/247 (2%)
	Postop Month 3	208/247 (84%)	23/247 (9%)	7/247 (3%)	8/247 (3%)	1/247 (0%)
	Postop Month 6	205/244 (84%)	26/244 (11%)	7/244 (3%)	5/244 (2%)	1/244 (0%)
	Postop Month 9	201/237 (85%)	26/237 (11%)	3/237 (1%)	3/237 (1%)	4/237 (2%)
	Postop Month 12	194/230 (84%)	29/230 (13%)	4/230 (2%)	2/230 (1%)	1/230 (0%)
Double Vision	Screening	226/249 (91%)	14/249 (6%)	6/249 (2%)	3/249 (1%)	
	Postop Month 1	226/247 (91%)	14/247 (6%)	4/247 (2%)	3/247 (1%)	
	Postop Month 3	228/247 (92%)	13/247 (5%)	1/247 (0%)	5/247 (2%)	
	Postop Month 6	224/244 (92%)	15/244 (6%)	1/244 (0%)	4/244 (2%)	
	Postop Month 9	224/237 (95%)	8/237 (3%)	2/237 (1%)	3/237 (1%)	
	Postop Month 12	217/230 (94%)	12/230 (5%)	1/230 (0%)		
Fluctuation in Vision	Screening	197/249 (79%)	39/249 (16%)	9/249 (4%)	3/249 (1%)	1/249 (0%)
	Postop Month 1	130/247 (53%)	89/247 (36%)	21/247 (9%)	6/247 (2%)	1/247 (0%)
	Postop Month 3	168/246 (68%)	69/246 (28%)	8/246 (3%)	1/246 (0%)	
	Postop Month 6	172/244 (70%)	59/244 (24%)	12/244 (5%)	1/244 (0%)	
	Postop Month 9	167/237 (70%)	61/237 (26%)	8/237 (3%)	1/237 (0%)	
	Postop Month 12	169/230 (73%)	54/230 (23%)	7/230 (3%)		

Question	Visit	None	Mild	Moderate	Marked	Severe
Glare	Screening	156/249 (63%)	51/249 (20%)	30/249 (12%)	10/249 (4%)	2/249 (1%)
	Postop Month 1	107/247 (43%)	113/247 (46%)	21/247 (9%)	6/247 (2%)	
	Postop Month 3	142/247 (57%)	90/247 (36%)	13/247 (5%)	2/247 (1%)	
	Postop Month 6	148/244 (61%)	85/244 (35%)	11/244 (5%)		
	Postop Month 9	166/237 (70%)	65/237 (27%)	6/237 (3%)		
	Postop Month 12	153/230 (67%)	75/230 (33%)	2/230 (1%)		
Halos	Screening	184/249 (74%)	40/249 (16%)	17/249 (7%)	6/249 (2%)	2/249 (1%)
	Postop Month 1	100/247 (40%)	101/247 (41%)	32/247 (13%)	11/247 (4%)	3/247 (1%)
	Postop Month 3	147/247 (60%)	81/247 (33%)	17/247 (7%)	2/247 (1%)	
	Postop Month 6	158/244 (65%)	79/244 (32%)	7/244 (3%)		
	Postop Month 9	175/237 (74%)	55/237 (23%)	7/237 (3%)		
	Postop Month 12	173/230 (75%)	54/230 (23%)	3/230 (1%)		
Starbursts	Screening	189/249 (76%)	34/249 (14%)	18/249 (7%)	6/249 (2%)	2/249 (1%)
	Postop Month 1	144/245 (59%)	69/245 (28%)	27/245 (11%)	3/245 (1%)	2/245 (1%)
	Postop Month 3	179/247 (72%)	54/247 (22%)	11/247 (4%)	3/247 (1%)	
	Postop Month 6	183/244 (75%)	57/244 (23%)	3/244 (1%)	1/244 (0%)	
	Postop Month 9	193/237 (81%)	37/237 (16%)	6/237 (3%)	1/237 (0%)	
	Postop Month 12	186/229 (81%)	36/229 (16%)	6/229 (3%)	1/229 (0%)	
Dryness	Screening	120/249 (48%)	85/249 (34%)	32/249 (13%)	11/249 (4%)	1/249 (0%)
	Postop Month 1	41/247 (17%)	135/247 (55%)	49/247 (20%)	18/247 (7%)	4/247 (2%)
	Postop Month 3	57/247 (23%)	145/247 (59%)	37/247 (15%)	6/247 (2%)	2/247 (1%)
	Postop Month 6	90/244 (37%)	113/244 (46%)	35/244 (14%)	5/244 (2%)	1/244 (0%)
	Postop Month 9	91/237 (38%)	113/237 (48%)	27/237 (11%)	3/237 (1%)	3/237 (1%)
	Postop Month 12	114/230 (50%)	92/230 (40%)	18/230 (8%)	6/230 (3%)	
Pain	Screening	236/249 (95%)	9/249 (4%)	3/249 (1%)	1/249 (0%)	
	Postop Month 1	214/247 (87%)	26/247 (11%)	7/247 (3%)		
	Postop Month 3	229/247 (93%)	18/247 (7%)			
	Postop Month 6	232/243 (95%)	10/243 (4%)	1/243 (0%)		
	Postop Month 9	221/237 (93%)	15/237 (6%)	1/237 (0%)		
	Postop Month 12	218/230 (95%)	10/230 (4%)	1/230 (0%)	1/230 (0%)	
Foreign Body Sensation	Screening	211/249 (85%)	28/249 (11%)	9/249 (4%)	1/249 (0%)	
	Postop Month 1	174/246 (71%)	61/246 (25%)	7/246 (3%)	1/246 (0%)	3/246 (1%)
	Postop Month 3	195/247 (79%)	42/247 (17%)	8/247 (3%)	2/247 (1%)	
	Postop Month 6	205/244 (84%)	35/244 (14%)	4/244 (2%)		
	Postop Month 9	208/237 (88%)	27/237 (11%)	1/237 (0%)	1/237 (0%)	
	Postop Month 12	208/229 (91%)	16/229 (7%)	5/229 (2%)		
Other	Screening	5/ 10 (50%)	2/ 10 (20%)	1/ 10 (10%)		2/ 10 (20%)
	Postop Month 1		2/ 2 (100%)			

Question	Visit	None	Mild	Moderate	Marked	Severe
	Postop Month 3	2/ 3 (67%)	1/ 3 (33%)			
	Postop Month 6	7/ 10 (70%)	2/ 10 (20%)	1/ 10 (10%)		
	Postop Month 9	9/ 11 (82%)		2/ 11 (18%)		
	Postop Month 12	12/ 14 (86%)	2/ 14 (14%)			

[1]Any variation in the N for an observation at a specific time point is due to one or more subjects omitting the rating for that symptom at that time point.

Changes in the degree of severity of visual symptoms reported via the visual symptom questionnaire at 3 months compared to baseline are summarized below in Table 11. All categories of complaints showed a reduction in severity after the T-CAT LASIK procedure compared to baseline, except double vision and foreign body sensation, both of which had a minimal increase in severity postoperatively. The 3.6% decrease in severity of light sensitivity, 4.4% decrease in complaints of difficulty driving at night, 6.4% decrease in reading difficulty, and 2.4% reduction in glare complaints were all statistically significant improvements in the severity of these visual symptoms in the T-CAT LASIK treated eyes.

Table 11: Changes in Degree of Severity of Visual Symptoms in All Eyes Treated with T-CAT LASIK

Question	Percent Baseline None – Moderate	Percent Baseline Marked - Severe	Percent 3 Month None - Moderate	Percent 3 Month Marked - Severe	Difference in Marked - Severe
Light Sensitivity	94.78	5.22	98.38	1.62	-3.60
Difficulty Driving at Night	91.57	8.43	95.95	4.05	-4.39
Reading Difficulty	89.96	10.04	96.36	3.64	-6.40
Double Vision	98.80	1.20	97.98	2.02	0.82
Fluctuation in Vision	98.39	1.61	99.59	0.41	-1.20
Glare	95.18	4.82	99.19	0.81	-4.01
Halos	96.79	3.21	99.19	0.81	-2.40
Starbursts	96.79	3.21	98.79	1.21	-2.00
Dryness	95.18	4.82	96.76	3.24	-1.58
Pain	99.60	0.40	100.0	0.00	-0.40
Foreign Body Sensation	99.60	0.40	99.19	0.81	0.41
Other	80.00	20.00	100.0	0.00	-20.0

Table 12: Change in Refractive Status Vision Profile (RSVP) Score[1]

Visit	Subscale	N Diff	Mean Base	Mean Score	Mean Diff	Effect Size
Postop Month 1	Concern	211	45.69	18.50	-27.19	-1.3178
	Expectations	208	59.44	63.10	3.67	0.1450
	Physical/social functioning	177	17.55	5.11	-12.44	-0.6409
	Driving	177	23.26	13.82	-9.44	-0.4100
	Symptoms	176	14.40	12.42	-1.98	-0.1288
	Optical problems	174	7.54	5.63	-1.90	-0.1596
	Glare	176	14.80	16.67	1.87	0.1203
	Problem with corrective lenses	25	24.12	22.94	-1.18	-0.0685
	Total Score	211	19.98	4.03	-15.96	-1.3233
Postop Month 3	Concern	210	45.65	13.87	-31.78	-1.5374
	Expectations	205	59.33	65.24	5.91	0.2347
	Physical/social functioning	198	16.46	3.44	-13.02	-0.7505
	Driving	196	22.62	11.08	-11.54	-0.5140
	Symptoms	195	14.08	8.63	-5.45	-0.3780
	Optical problems	196	7.49	4.15	-3.34	-0.2761
	Glare	195	14.79	12.54	-2.24	-0.1425
	Problem with corrective lenses	26	26.67	12.02	-14.65	-0.9796
	Total Score	210	19.97	3.99	-15.97	-1.3218
Postop Month 6	Concern	207	45.57	12.26	-33.31	-1.6213
	Expectations	205	59.39	63.54	4.15	0.1638
	Physical/social functioning	200	16.18	3.18	-13.00	-0.7606
	Driving	200	22.38	10.38	-12.00	-0.5418
	Symptoms	199	13.97	7.34	-6.62	-0.4457
	Optical problems	198	7.66	3.61	-4.05	-0.3140
	Glare	198	14.73	10.04	-4.69	-0.2891
	Problem with corrective lenses	32	26.84	1.17	-25.67	-1.5522
	Total Score	207	19.93	3.87	-16.06	-1.3354
Postop Month 9	Concern	201	45.46	12.73	-32.73	-1.5937
	Expectations	197	59.64	64.21	4.57	0.1795
	Physical/social functioning	191	16.31	3.16	-13.15	-0.7585
	Driving	188	22.03	9.69	-12.34	-0.5628
	Symptoms	190	14.02	6.99	-7.03	-0.4675
	Optical problems	190	7.95	3.00	-4.95	-0.3742
	Glare	191	15.01	8.40	-6.61	-0.4034
	Problem with corrective lenses	38	28.60	2.96	-25.64	-1.3174
	Total Score	201	19.89	3.64	-16.25	-1.3439
Postop Month 12	Concern	195	44.89	11.18	-33.71	-1.6601
	Expectations	193	59.26	65.35	6.09	0.2403
	Physical/social functioning	189	16.41	2.27	-14.14	-0.7807
	Driving	188	22.03	8.29	-13.74	-0.6184
	Symptoms	188	13.64	5.87	-7.77	-0.5237
	Optical problems	188	7.22	2.65	-4.57	-0.3592
	Glare	190	14.71	7.26	-7.46	-0.4563
	Problem with corrective lenses	37	27.86	3.04	-24.82	-1.1559
	Total Score	195	19.54	3.15	-16.39	-1.3822

[1] The number of respondents (N) for each subscale varies based on whether the subscale question applies to that subject.

The RSVP (Table 12 above) shows an improvement in all subscales evaluated at each of the postoperative visits and in the total composite score that is computed for each visit. The only exception is glare at the 1 month visit, which shows a worsening that changes to improvement at 3 months and all subsequent visits. Published literature indicates that a difference of 6 points or more on the composite

score is a clinically significant change.[1] The difference in composite score from baseline to each postoperative visit showed a clinically significant improvement in the RSVP profile, with a mean improvement that is nearly three times the minimum threshold for clinically significant improvement at each postoperative visit, ranging from a change of -15.97 points at 3 months to a change of -16.39 points at 12 months. On the basis of these data, the T-CAT LASIK treatment leads to a clinically and statistically significant improvement in symptoms measured by the RSVP. Specifically, subjects who underwent T-CAT LASIK with the ALLEGRETTO WAVE® Eye-Q Excimer Laser in the clinical trial experienced an improvement in physical/social functioning, driving, visual symptoms, optical problems, and problems with corrective lenses that was evident at three months and continued to improve through 12 months postoperatively, compared to their habitual refractive correction method (glasses or contact lenses) preoperatively.

A question to evaluate the study subjects self-reported satisfaction with the T-CAT LASIK procedure was added during the course of the study. Of the 124 subjects who were polled, nearly all of the study subjects (122/124; 98.4%) were satisfied with their outcomes and would have the T-CAT LASIK treatment again.

Contrast Sensitivity

Contrast sensitivity was evaluated preoperatively and at 3 and 6 months after the T-CAT LASIK procedure under mesopic (3 cd/m^2) and photopic (85 cd/m^2) chart luminance, with and without glare (1 lux and 10 lux for mesopic and photopic, respectively). Testing was performed using sine-wave grating targets with five spatial frequencies (1.5, 3, 6, 9, and 18 cycles/degree) and nine contrast levels. Clinically significant changes in contrast sensitivity, at 3 and 6 months after T-CAT LASIK, are summarized in Table 13 below. A clinically significant increase or decrease in contrast sensitivity is defined as an increase or decrease of at least 0.3 log units at two or more spatial frequencies. In addition, any transition from seeing to not seeing, or, from not seeing to seeing a grating at the highest available contrast is considered equivalent to a ≥0.3 log unit change for the purpose of assessing clinical significance. As shown in Table 13, the number of T-CAT LASIK treated eyes with a clinically significant increase in contrast sensitivity was two to three folds higher than those eyes with clinically significant decreases, both with and without glare under mesopic and photopic testing conditions at 3 and 6 months postoperatively.

Table 13: Clinically Significant Changes in Log_{10} Mesopic and Photopic Contrast Sensitivity (Log_{10} [Threshold $Contrast^{-1}$]) With and Without Glare at 3 Months and 6 Months after T-CAT LASIK

Visit	Luminance	Glare	Clinically Significant Decrease (n/N %)	Clinically Significant Increase (n/N %)
Postop Month 3	Mesopic	Glare	25/ 210 (11.90)	50/ 210 (23.81)
		No Glare	15/ 210 (7.14)	43/ 210 (20.48)
	Photopic	Glare	18/ 210 (8.57)	58/ 210 (27.62)
		No Glare	19/ 210 (9.05)	55/ 210 (26.19)
Postop Month 6	Mesopic	Glare	31/ 207 (14.98)	68/ 207 (32.85)
		No Glare	16/ 207 (7.73)	52/ 207 (25.12)
	Photopic	Glare	20/ 207 (9.66)	65/ 207 (31.40)
		No Glare	17/ 207 (8.21)	66/ 207 (31.88)

As shown in Tables 14 and 15, at 3 and 6 months after T-CAT LASIK surgery, there was an improvement in contrast sensitivity at nearly all low, middle, and high spatial frequencies under mesopic and photopic conditions, with and without glare

Table 14: Changes in Log_{10} Mesopic and Photopic Contrast Sensitivity (Log_{10} [Threshold Contrast^{-1}]) Without Glare at 3 Months and 6 Months after T-CAT LASIK[1]

Visit	Type	Cycles per Degree	Total N	Preop n	PreOp N_0	Preop Mean[2]	Preop SD	Postop n	Visit N_0	Postop Mean[3]	Postop SD	Paired Difference n	Difference N_0	Paired Difference Mean[4]	Paired Difference SD
Postop Month 3	Mesopic	(1.5)	247	245	1	1.6019	0.2323	245	0	1.6609	0.2521	243	1	0.0613	0.1806
		(3)	247	245	1	1.6116	0.3450	245	0	1.6546	0.3778	243	1	0.0372	0.4946
		(6)	247	240	6	1.7107	0.2718	245	0	1.7850	0.2539	239	6	0.0828	0.2512
		(12)	247	213	33	1.3893	0.2947	228	17	1.4017	0.3005	204	41	0.0430	0.3096
		(18)	247	166	79	1.0022	0.2972	178	67	1.0205	0.2830	135	109	0.0371	0.3310
	Photopic	(1.5)	247	237	0	1.5969	0.2408	245	0	1.6379	0.2271	235	0	0.0435	0.1937
		(3)	247	236	1	1.6223	0.3755	245	0	1.6835	0.4092	234	1	0.0681	0.4870
		(6)	247	235	2	1.7995	0.2453	245	0	1.9140	0.2223	233	2	0.1132	0.2120
		(12)	247	230	7	1.4752	0.2840	242	3	1.6134	0.2581	226	10	0.1371	0.2876
		(18)	247	202	34	1.0924	0.2939	229	16	1.2167	0.3054	192	44	0.1424	0.3670
Postop Month 6	Mesopic	(1.5)	244	241	1	1.6016	0.2375	244	0	1.6725	0.2581	241	1	0.0712	0.1974
		(3)	244	241	1	1.6048	0.3484	244	0	1.6826	0.3950	241	1	0.0738	0.4925
		(6)	244	235	7	1.7003	0.2615	243	1	1.7962	0.2660	234	8	0.0990	0.2798
		(12)	244	206	36	1.3875	0.2911	226	18	1.4441	0.3051	198	44	0.0757	0.3306
		(18)	244	161	80	0.9893	0.2825	186	58	1.0592	0.3212	140	101	0.0871	0.3872
	Photopic	(1.5)	244	235	0	1.5921	0.2372	244	0	1.6602	0.2488	235	0	0.0703	0.2178
		(3)	244	234	1	1.6257	0.3708	244	0	1.7204	0.4115	234	1	0.1016	0.5311
		(6)	244	234	1	1.8015	0.2542	244	0	1.9227	0.2385	234	1	0.1217	0.2510
		(12)	244	230	5	1.4720	0.2903	240	4	1.6186	0.2659	228	7	0.1440	0.2849
		(18)	244	201	33	1.0992	0.3064	234	10	1.2298	0.2924	198	36	0.1516	0.3395

[1] *N_o patients are not included in the mean because they could not see any contrast level. Mean results with N_o>0 are, therefore, biased upward; and, the corresponding standard deviations are biased downward.

[2] Preop Mean: Calculated as the average of the log values of each individual preoperative contrast sensitivity measurement.

[3] Postop Mean: Calculated as the average of the log values of each individual postoperative contrast sensitivity measurement.

[4] Percent Change Mean: Calculated as the average of the individual paired differences (postop-preop) of the log values for each eye.

Table 15: Changes in Log_{10} Mesopic and Photopic Contrast Sensitivity (Log_{10} [Threshold Contrast^{-1}]) With Glare at 3 Months and 6 Months after T-CAT LASIK[1]

Visit	Type	Cycles per Degree	Total N	Preop n	PreOp N_0	Preop Mean[2]	Preop SD	Postop n	Visit N_0	Postop Mean[3]	Postop SD	Paired Difference n	Difference N_0	Paired Difference Mean[4]	Paired Difference SD
Postop Month 3	Mesopic	(1.5)	247	242	4	1.5055	0.2758	244	1	1.5650	0.2703	239	5	0.0646	0.2269
		(3)	247	241	5	1.6835	0.2735	243	2	1.7323	0.2636	239	5	0.0502	0.2316
		(6)	247	229	16	1.6355	0.2964	241	4	1.7072	0.2577	226	18	0.0897	0.3025
		(12)	247	191	54	1.3714	0.3061	210	35	1.3590	0.2899	176	68	0.0178	0.3166
		(18)	247	146	99	1.0063	0.3021	168	77	0.9726	0.3013	119	125	0.0100	0.3791
	Photopic	(1.5)	247	237	0	1.5689	0.2493	245	0	1.6574	0.2405	235	0	0.0935	0.2087
		(3)	247	235	2	1.7827	0.2229	245	0	1.8845	0.2151	233	2	0.1051	0.2022
		(6)	247	229	2	1.7926	0.2617	241	0	1.8936	0.2288	224	2	0.0999	0.2377
		(12)	247	223	14	1.4741	0.2853	242	3	1.5966	0.2663	220	16	0.1312	0.2911
		(18)	247	203	33	1.0776	0.2928	234	11	1.2248	0.2866	196	40	0.1619	0.3551
Postop Month 6	Mesopic	(1.5)	244	238	4	1.5004	0.2770	244	0	1.5809	0.2711	238	4	0.0838	0.2548
		(3)	244	237	5	1.6710	0.2642	242	2	1.7480	0.2847	236	6	0.0785	0.2789
		(6)	244	225	16	1.6228	0.2966	237	7	1.7281	0.2603	222	19	0.1053	0.3086
		(12)	244	185	56	1.3632	0.3001	219	25	1.3918	0.2989	177	64	0.0669	0.3138
		(18)	244	140	101	0.9968	0.2806	167	76	1.0124	0.2797	112	130	0.0374	0.3536
	Photopic	(1.5)	244	235	0	1.5684	0.2502	244	0	1.6803	0.2562	235	0	0.1162	0.2405
		(3)	244	233	2	1.7905	0.2283	244	0	1.8821	0.2345	233	2	0.0918	0.2132
		(6)	244	227	2	1.7990	0.2572	243	1	1.9260	0.2428	226	3	0.1269	0.2646
		(12)	244	223	12	1.4746	0.2942	240	4	1.6296	0.2749	222	13	0.1610	0.3185
		(18)	244	203	31	1.0827	0.3105	231	13	1.2439	0.3152	195	39	0.1726	0.3688

[1] *N_o patients are not included in the mean because they could not see any contrast level. Mean results with N_o>0 are, therefore, biased upward; and, the corresponding standard deviations are biased downward.

[2] Preop Mean: Calculated as the average of the log values of each individual preoperative contrast sensitivity measurement.

[3] Postop Mean: Calculated as the average of the log values of each individual postoperative contrast sensitivity measurement.

[4] Percent Change Mean: Calculated as the average of the individual paired differences (postop-preop) of the log values for each eye.

Effectiveness Results

A summary of key effectiveness variables at each of the postoperative visits is provided below in Table 16 for the myopia cohort treated with T-CAT LASIK.

Table 16: Summary of Key Effectiveness Parameters after T-CAT LASIK

EFFECTIVENESS VARIABLES		**Month 1**	**Month 3**	**Month 6**	**Month 9**	**Month 12**
MRSE +/- 0.50 D	n/N	220/248	227/247	227/244	221/237	218/230
	(%)	(88.71%)	(91.90%)	(93.03%)	(93.25%)	(94.78%)
	(CI)	(84.1, 92.4)	(87.8, 95.0)	(89.1, 95.9)	(89.3, 96.1)	(91.1, 97.3)
MRSE +/- 1.00 D	n/N	244/248	244/247	241/244	235/237	229/230
	(%)	(98.39%)	(98.79%)	(98.77%)	(99.16%)	(99.57%)
	(CI)	(95.9, 99.6)	(96.5, 99.7)	(96.4, 99.7)	(97.0, 99.9)	(97.6,100.0)
MRSE +/- 2.00 D	n/N	248/248	247/247	243/244	237/237	230/230
	(%)	(100.0%)	(100.0%)	(99.59%)	(100.0%)	(100.0%)
	(CI)	(98.5,100.0)	(98.5,100.0)	(97.7,100.0)	(98.5,100.0)	(98.4,100.0)
UCVA 20/20 or better	n/N	217/248	229/247	217/244	212/237	213/230
	(%)	(87.50%)	(92.71%)	(88.93%)	(89.45%)	(92.61%)
	(CI)	(82.7, 91.3)	(88.7, 95.6)	(84.3, 92.6)	(84.8, 93.1)	(88.4, 95.6)
UCVA 20/40 or better if BCVA 20/20 or better preop	n/N	239/242	239/241	235/238	231/232	224/225
	(%)	(98.76%)	(99.17%)	(98.74%)	(99.57%)	(99.56%)
	(CI)	(96.4, 99.7)	(97.0, 99.9)	(96.4, 99.7)	(97.6,100.0)	(97.5,100.0)

At all postoperative visits from 3 to 12 months, 89% or more of the eyes saw 20/20 or better without correction; and 92% or more of the eyes were within ±0.5 D of attempted MRSE.

The key effectiveness parameters at 3 months after T-CAT LASIK, stratified by preoperative MRSE and by each preoperative cylinder, are presented below in Tables 17 and 18, respectively. Refractive stability is attained at 3 months postoperatively and confirmed at 6 months; thus, the 3-month time point of refractive stability visit was selected for presentation of these results. Similar clinical results are observed in the stratified bins at 3 months postoperatively as are seen in the entire cohort. Thus, the clinical effectiveness outcomes support the refractive range for the proposed indication for use.

Table 17: Summary of Key Effectiveness Parameters Stratified by Pre-Treatment MRSE – Results at 3 Months after T-CAT LASIK

EFFECTIVENESS VARIABLES		**-0.01 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**	**-6.01 TO -7.00D**	**-7.01 TO -8.00D**	**-8.01 TO -9.00D**	**CUM TOTAL**
MRSE +/- 0.50 D	n/N	8/ 8	36/ 37	37/ 40	32/ 33	24/ 28	25/ 26	18/ 20	26/ 29	21/ 26	227/247
	(%)	(100.0%)	(97.30%)	(92.50%)	(96.97%)	(85.71%)	(96.15%)	(90.00%)	(89.66%)	(80.77%)	(91.90%)
	(CI)	(63.1,100.0)	(85.8, 99.9)	(79.6, 98.4)	(84.2, 99.9)	(67.3, 96.0)	(80.4, 99.9)	(68.3, 98.8)	(72.6, 97.8)	(60.6, 93.4)	(87.8, 95.0)
MRSE +/- 1.00 D	n/N	8/ 8	37/ 37	40/ 40	33/ 33	27/ 28	26/ 26	19/ 20	29/ 29	25/ 26	244/247
	(%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(96.43%)	(100.0%)	(95.00%)	(100.0%)	(96.15%)	(98.79%)
	(CI)	(63.1,100.0)	(90.5,100.0)	(91.2,100.0)	(89.4,100.0)	(81.7, 99.9)	(86.8,100.0)	(75.1, 99.9)	(88.1,100.0)	(80.4, 99.9)	(96.5, 99.7)
MRSE +/- 2.00 D	n/N	8/ 8	37/ 37	40/ 40	33/ 33	28/ 28	26/ 26	20/ 20	29/ 29	26/ 26	247/247
	(%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)
	(CI)	(63.1,100.0)	(90.5,100.0)	(91.2,100.0)	(89.4,100.0)	(87.7,100.0)	(86.8,100.0)	(83.2,100.0)	(88.1,100.0)	(86.8,100.0)	(98.5,100.0)
UCVA 20/20 or better	n/N	8/ 8	36/ 37	36/ 40	32/ 33	26/ 28	24/ 26	16/ 20	27/ 29	24/ 26	229/247
	(%)	(100.0%)	(97.30%)	(90.00%)	(96.97%)	(92.86%)	(92.31%)	(80.00%)	(93.10%)	(92.31%)	(92.71%)
	(CI)	(63.1,100.0)	(85.8, 99.9)	(76.3, 97.2)	(84.2, 99.9)	(76.5, 99.1)	(74.9, 99.1)	(56.3, 94.3)	(77.2, 99.2)	(74.9, 99.1)	(88.7, 95.6)
UCVA 20/40 or better if BCVA 20/20 or better preop	n/N	8/ 8	37/ 37	40/ 40	32/ 32	27/ 28	24/ 25	19/ 19	26/ 26	26/ 26	239/241
	(%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(96.43%)	(96.00%)	(100.0%)	(100.0%)	(100.0%)	(99.17%)
	(CI)	(63.1,100.0)	(90.5,100.0)	(91.2,100.0)	(89.1,100.0)	(81.7, 99.9)	(79.6, 99.9)	(82.4,100.0)	(86.8,100.0)	(86.8,100.0)	(97.0, 99.9)

Table 18: Summary of Key Effectiveness Parameters Stratified by Pre-Treatment Cylinder – Results at 3 Months after T-CAT LASIK

EFFECTIVENESS VARIABLES		0.00D	0.01 TO 0.50D	0.51 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
MRSE +/- 0.50 D	n/N	33/ 37	66/ 72	43/ 45	40/ 43	27/ 29	11/ 12	5/ 7	2/ 2	227/247
	(%)	(89.19%)	(91.67%)	(95.56%)	(93.02%)	(93.10%)	(91.67%)	(71.43%)	(100.0%)	(91.90%)
	(CI)	(74.6, 97.0)	(82.7, 96.9)	(84.9, 99.5)	(80.9, 98.5)	(77.2, 99.2)	(61.5, 99.8)	(29.0, 96.3)	(15.8,100.0)	(87.8, 95.0)
MRSE +/- 1.00 D	n/N	36/ 37	71/ 72	44/ 45	43/ 43	29/ 29	12/ 12	7/ 7	2/ 2	244/247
	(%)	(97.30%)	(98.61%)	(97.78%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(98.79%)
	(CI)	(85.8, 99.9)	(92.5,100.0)	(88.2, 99.9)	(91.8,100.0)	(88.1,100.0)	(73.5,100.0)	(59.0,100.0)	(15.8,100.0)	(96.5, 99.7)
MRSE +/- 2.00 D	n/N	37/ 37	72/ 72	45/ 45	43/ 43	29/ 29	12/ 12	7/ 7	2/ 2	247/247
	(%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)
	(CI)	(90.5,100.0)	(95.0,100.0)	(92.1,100.0)	(91.8,100.0)	(88.1,100.0)	(73.5,100.0)	(59.0,100.0)	(15.8,100.0)	(98.5,100.0)
UCVA 20/20 or better	n/N	36/ 37	67/ 72	44/ 45	42/ 43	25/ 29	9/ 12	4/ 7	2/ 2	229/247
	(%)	(97.30%)	(93.06%)	(97.78%)	(97.67%)	(86.21%)	(75.00%)	(57.14%)	(100.0%)	(92.71%)
	(CI)	(85.8, 99.9)	(84.5, 97.7)	(88.2, 99.9)	(87.7, 99.9)	(68.3, 96.1)	(42.8, 94.5)	(18.4, 90.1)	(15.8,100.0)	(88.7, 95.6)
UCVA 20/40 or better if BCVA 20/20 or better preop	n/N	37/ 37	69/ 70	45/ 45	42/ 42	28/ 28	10/ 10	6/ 7	2/ 2	239/241
	(%)	(100.0%)	(98.57%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(85.71%)	(100.0%)	(99.17%)
	(CI)	(90.5,100.0)	(92.3,100.0)	(92.1,100.0)	(91.6,100.0)	(87.7,100.0)	(69.2,100.0)	(42.1, 99.6)	(15.8,100.0)	(97.0, 99.9)

In the stratified MRSE and stratified cylinder analyses, at least 90.0% of the eyes in each dioptric group (except the highest MRSE -8.01 to -9.00 D, MRSE -4.00 to -5.00, and 4.01 to 5.00 D cylinder groups) achieved a postoperative refraction that was within ±0.5 D of the attempted refraction. This closely approximates the results for the entire cohort, in which 91.9% of all T-CAT LASIK treated eyes were within ±0.5 D of the attempted achieved manifest refraction.

Stability of Refractive Outcome

Refractive stability was calculated as the mean change (paired differences) in MRSE (±S.D. and 95% C.I.) between pairs of successive refractions. Refractive stability for eyes that completed one or more pairs of successive postoperative visits is presented below in Table 19 for a consistent cohort of 227 eyes that completed every postoperative visit at 1, 3, 6, 9, and 12 months. As shown in Table 19 the mean annual change in MRSE from 1 to 3 months and from 3 to 6 months was -0.050 D/year and -0.176 D/year, respectively, for the consistent cohort of eyes. The mean change is well below the target value of 0.5 D/year change in MRSE. Additionally, 99.6% of the eyes in the consistent cohort had a change in MRSE from 1 to 3 months that was ≤1.0 D; and 100% of the eyes achieved this same degree of refractive stability for the 3 to 6 month postoperative interval. Based on these analyses, refractive stability is achieved at 3 months and confirmed at 6 months postoperatively for this cohort of eyes treated with T-CAT LASIK.

Table 19: Refractive Stability for Eyes that Have Paired Differences at All of the Specified Visit Intervals (Completed All Visits) – All Eyes Treated

Stability Criterion		Week 1 to Month 1	Month 1 to Month 3	Month 3 to Month 6	Month 6 to Month 9	Month 9 to Month 12
Change of MRSE <= 1.0 D	n/N	227/227	226/227	227/227	227/227	226/227
	(%)	(100.0%)	(99.56%)	(100.0%)	(100.0%)	(99.56%)
	(CI)	(98.4,100.0)	(97.6,100.0)	(98.4,100.0)	(98.4,100.0)	(97.6,100.0)
Change of MRSE <= 0.5 D	n/N	212/227	217/227	219/227	216/227	218/227
	(%)	(93.39%)	(95.59%)	(96.48%)	(95.15%)	(96.04%)
	(CI)	(89.3, 96.3)	(92.0, 97.9)	(93.2, 98.5)	(91.5, 97.6)	(92.6, 98.2)
Change of MRSE in diopters	Mean	0.058	-0.008	-0.044	-0.017	0.014
	Std	0.09	0.07	0.06	0.06	0.06
	(CI)	(0.02, 0.10)	(-0.04, 0.03)	(-0.08,-0.01)	(-0.05, 0.01)	(-0.02, 0.05)
Mean Change of MRSE per Year	Mean	0.694	-0.050	-0.176	-0.068	0.057
	Std	13.40	2.66	1.04	0.89	1.00
	(CI)	(0.22, 1.17)	(-0.26, 0.16)	(-0.31,-0.04)	(-0.19, 0.06)	(-0.07, 0.19)

Manifest Sphere and Manifest Cylinder Descriptive Statistics

Descriptive statistics for manifest sphere and manifest cylinder for each study visit are summarized below in Tables 20 and 21, respectively. Descriptive statistics for MRSE at screening through 12 months after T-CAT LASIK are summarized in Table 22. As shown in the tables below, the T-CAT LASIK procedure achieves good accuracy for all three parameters. At 3 months postoperatively, the mean

sphere, cylinder, and MRSE are 0.15 D (±0.37), -0.19 D (±0.32), and 0.06 D (±0.33), respectively. The standard deviations of approximately 0.33 D for each parameter are well within the accepted standards for variability of these manifest refraction measurements. The mean sphere, cylinder, and MRSE change very little over time from 3 months to 12 months, with the mean sphere and MRSE decreasing slightly to 0.09 D and 0.00 D, respectively, and the mean cylinder remaining unchanged at -0.19 D.

Table 20: Descriptive Statistics for Manifest Refraction Sphere

Visit	n	Mean Sphere	Standard Deviation	Lower 95% Confidence Limit	Upper 95% Confidence Limit
Screening	249	-4.01	2.57	-4.33	-3.69
Postop Month 1	248	0.18	0.39	0.13	0.22
Postop Month 3	247	0.15	0.37	0.11	0.20
Postop Month 6	244	0.11	0.37	0.06	0.16
Postop Month 9	237	0.09	0.34	0.04	0.13
Postop Month 12	230	0.09	0.33	0.05	0.14

Table 21: Descriptive Statistics for Manifest Refraction Cylinder

Visit	n	Mean Cylinder	Standard Deviation	Lower 95% Confidence Limit	Upper 95% Confidence Limit
Screening	249	-1.19	1.23	-1.34	-1.04
Postop Month 1	248	-0.22	0.33	-0.26	-0.18
Postop Month 3	247	-0.19	0.32	-0.23	-0.15
Postop Month 6	244	-0.19	0.30	-0.23	-0.15
Postop Month 9	237	-0.19	0.30	-0.22	-0.15
Postop Month 12	230	-0.19	0.30	-0.23	-0.15

Table 22: Descriptive Statistics for Manifest Refraction Sphere Equivalent (MRSE)

Visit	n	Mean MRSE	Standard Deviation	Lower 95% Confidence Limit	Upper 95% Confidence Limit
Screening	249	-4.61	2.43	-4.91	-4.30
Postop Month 1	248	0.06	0.36	0.02	0.11
Postop Month 3	247	0.06	0.33	0.01	0.10
Postop Month 6	244	0.01	0.35	-0.03	0.06
Postop Month 9	237	-0.01	0.30	-0.04	0.03
Postop Month 12	230	-0.00	0.27	-0.04	0.04

Uncorrected Visual Acuity

Table 23 below shows that nearly one-third of the eyes treated for myopia with T-CAT LASIK (78/247, 31.6%) achieved a distance UCVA of 20/12.5 or better, and over two-thirds of the eyes (170/247; 68.9%) were seeing 20/16 or better without correction at 3 months postoperatively. Furthermore, a total of 93% of the T-CAT LASIK eyes had a UCVA of 20/20 or better at 3 and 12 months postoperatively, with slight shifts toward continuing improvement in the proportion of these eyes that attained UCVA of 20/16, 20/12.5, and 20/10 through 12 months after T-CAT LASIK.

Table 23: Summary of Changes in Uncorrected Visual Acuity

UCVA Criterion		Preop	Month 1	Month 3	Month 6	Month 9	Month 12
20/10 or better	n/N	0/249	11/248	19/247	25/244	30/237	36/230
	(%)	(0.00%)	(4.44%)	(7.69%)	(10.25%)	(12.66%)	(15.65%)
20/12.5 or better	n/N	0/249	59/248	78/247	69/244	72/237	79/230
	(%)	(0.00%)	(23.79%)	(31.58%)	(28.28%)	(30.38%)	(34.35%)
20/16 or better	n/N	0/249	146/248	170/247	172/244	152/237	149/230
	(%)	(0.00%)	(58.87%)	(68.83%)	(70.49%)	(64.14%)	(64.78%)
20/20 or better	n/N	0/249	217/248	229/247	217/244	212/237	213/230
	(%)	(0.00%)	(87.50%)	(92.71%)	(88.93%)	(89.45%)	(92.61%)
20/25 or better	n/N	4/249	240/248	240/247	235/244	231/237	222/230
	(%)	(1.61%)	(96.77%)	(97.17%)	(96.31%)	(97.47%)	(96.52%)
20/32 or better	n/N	7/249	244/248	244/247	241/244	234/237	227/230
	(%)	(2.81%)	(98.39%)	(98.79%)	(98.77%)	(98.73%)	(98.70%)
20/40 or better	n/N	11/249	245/248	245/247	241/244	236/237	229/230
	(%)	(4.42%)	(98.79%)	(99.19%)	(98.77%)	(99.58%)	(99.57%)
20/50 or better	n/N	19/249	246/248	247/247	242/244	236/237	229/230
	(%)	(7.63%)	(99.19%)	(100.0%)	(99.18%)	(99.58%)	(99.57%)
20/63 or better	n/N	34/249	247/248	247/247	243/244	236/237	230/230
	(%)	(13.65%)	(99.60%)	(100.0%)	(99.59%)	(99.58%)	(100.0%)
20/80 or better	n/N	42/249	247/248	247/247	244/244	237/237	230/230
	(%)	(16.87%)	(99.60%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)
20/100 or better	n/N	54/249	247/248	247/247	244/244	237/237	230/230
	(%)	(21.69%)	(99.60%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)
20/125 or better	n/N	64/249	247/248	247/247	244/244	237/237	230/230
	(%)	(25.70%)	(99.60%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)
20/160 or better	n/N	79/249	248/248	247/247	244/244	237/237	230/230
	(%)	(31.73%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)
20/200 or better	n/N	104/249	248/248	247/247	244/244	237/237	230/230
	(%)	(41.77%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)
20/400 or better	n/N	249/249	248/248	247/247	244/244	237/237	230/230
	(%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)	(100.0%)

Table 24 below compares the postoperative visual acuity without correction to the preoperative visual acuity with correction in the eyes that were treated with T-CAT LASIK for myopia with or without astigmatism. Eyes treated with T-CAT LASIK achieved improvement in postoperative UCVA compared to preoperative BSCVA, with nearly one-third of the eyes (73/247; 29.6%) gaining 1, 2, or more than 2 lines

of vision without correction at 3 months after T-CAT LASIK compared to their BSCVA before treatment. Additionally, 60.3% (149/247) of the eyes reporting a UCVA after T-CAT LASIK that was equal to their BSCVA before the refractive correction. In total, 89.9% of the eyes (222/247) treated with T-CAT LASIK saw as well or better without glasses after surgery as with glasses before surgery.

Table 24: UCVA after T-CAT LASIK Compared to BSCVA before T-CAT LASIK

UCVA vs. BSCVA		Month 1	Month 3	Month 6	Month 9	Month 12
UCVA > 2 Lines Better than Baseline BSCVA	n/N	1/248	1/247	2/244	3/237	7/230
	(%)	(0.40%)	(0.40%)	(0.82%)	(1.27%)	(3.04%)
UCVA 2 Lines Better than Baseline BSCVA	n/N	10/248	18/247	13/244	18/237	19/230
	(%)	(4.03%)	(7.29%)	(5.33%)	(7.59%)	(8.26%)
UCVA 1 Line Better than Baseline BSCVA	n/N	41/248	54/247	48/244	45/237	45/230
	(%)	(16.53%)	(21.86%)	(19.67%)	(18.99%)	(19.57%)
UCVA equal to Baseline BSCVA	n/N	160/248	149/247	153/244	138/237	134/230
	(%)	(64.52%)	(60.32%)	(62.70%)	(58.23%)	(58.26%)
UCVA 1 Line Worse then Baseline BSCVA	n/N	27/248	20/247	18/244	26/237	18/230
	(%)	(10.89%)	(8.10%)	(7.38%)	(10.97%)	(7.83%)
UCVA 2 Lines Worse than Baseline BSCVA	n/N	5/248	2/247	6/244	4/237	3/230
	(%)	(2.02%)	(0.81%)	(2.46%)	(1.69%)	(1.30%)
UCVA > 2 Lines Worse than Baseline BSCVA	n/N	4/248	3/247	4/244	3/237	4/230
	(%)	(1.61%)	(1.21%)	(1.64%)	(1.27%)	(1.74%)

Change in Best Spectacle Corrected Visual Acuity

The changes in lines of BSCVA from screening to each postoperative visit are summarized in Table 25 below for the myopic cohort.

Table 25: Changes in Lines of Best Spectacle-Corrected Visual Acuity (BSCVA)

		Month 1	Month 3	Month 6	Month 9	Month 12
Increase > 2 Lines	n/N	2/248	4/247	3/244	5/237	7/230
	(%)	(0.81%)	(1.62%)	(1.23%)	(2.11%)	(3.04%)
Increase 2 Lines	n/N	12/248	21/247	23/244	21/237	24/230
	(%)	(4.84%)	(8.50%)	(9.43%)	(8.86%)	(10.43%)
Increase 1 Line	n/N	55/248	72/247	62/244	61/237	62/230
	(%)	(22.18%)	(29.15%)	(25.41%)	(25.74%)	(26.96%)
No Change	n/N	169/248	146/247	149/244	142/237	131/230
	(%)	(68.15%)	(59.11%)	(61.07%)	(59.92%)	(56.96%)
Decrease 1 Line	n/N	9/248	4/247	6/244	8/237	5/230
	(%)	(3.63%)	(1.62%)	(2.46%)	(3.38%)	(2.17%)
Decrease 2 Lines	n/N	1/248	0/247	0/244	0/237	1/230
	(%)	(0.40%)	(0.00%)	(0.00%)	(0.00%)	(0.43%)
Decrease > 2 Lines	n/N	0/248	0/247	1/244	0/237	0/230
	(%)	(0.00%)	(0.00%)	(0.41%)	(0.00%)	(0.00%)

Correction of Cylindrical Component

T-CAT LASIK incorporates a cylinder treatment into the calculated treatment plan if any cylinder magnitude value is entered into the treatment refraction in the T-CAT software. A total of 210 eyes (210/249 eyes of 212 enrolled subjects; 84.3%) treated in the T-CAT-001 study had an attempted cylinder correction. All 210 eyes treated for cylinder are included in the vector analysis that is presented below. All vector analyses were performed using the methods described by Eydelman et al.[1]

Cylinder stability was calculated as the mean change (paired differences) in absolute manifest refraction cylinder magnitude (±S.D. and 95% C.I.) between pairs of successive refractions. Refractive stability for a consistent cohort of 191 eyes that had a cylinder component treated with T-CAT LASIK, and completed every postoperative visit at 1, 3, 6, 9, and 12 months, is summarized in Table 26 below. The mean annual change in absolute cylinder magnitude from 1 to 3 months and from 3 to 6 months was 0.220 D/year and 0.047 D/year, respectively, for the consistent cohort of eyes. The mean change is well below the target value of 0.5 D/year change in absolute cylinder magnitude. In addition, 100% of the eyes in the consistent cohort achieved a change of MRSE that was ≤1.0 D during the 1 to 3 months and 3 to 6 months intervals. Consistent with the evaluation of MRSE stability, cylinder stability is achieved at 3 months and confirmed at 6 months postoperatively for this cohort of eyes that had cylinder treatments performed with T-CAT LASIK.

Table 26: Stability of Absolute (Non-Vector) Cylinder in a Consistent Cohort of Eyes that Completed All Visits

Stability Criterion		Week 1 to Month 1	Month 1 to Month 3	Month 3 to Month 6	Month 6 to Month 9	Month 9 to Month 12
Change of Absolute Cylinder <= 1.0 D	n/N	189/191	191/191	191/191	189/191	191/191
	(%)	(98.95%)	(100.0%)	(100.0%)	(98.95%)	(100.0%)
Change of Absolute Cylinder <= 0.5 D	n/N	182/191	179/191	187/191	187/191	189/191
	(%)	(95.29%)	(93.72%)	(97.91%)	(97.91%)	(98.95%)
Change of Absolute Cylinder in diopters	Mean	0.020	0.037	0.012	-0.013	-0.005
	Std	0.11	0.08	0.06	0.06	0.04
Mean Change of Absolute Cylinder per Year	Mean	0.236	0.220	0.047	-0.052	-0.021
	Std	15.53	3.05	0.91	0.94	0.72

The residual cylinder magnitudes and absolute axis shifts at 3 months after T-CAT LASIK surgery, the time point of refractive stability, are presented in Table 27

below. Further stratification by preoperative cylinder shows that the majority of eyes with absolute axis shifts >30 degrees were low cylinder treatments (> 0.0 to -1.0 D cylinder) with residual cylinder of ≤0.5 D.

Table 27: Absolute Axis Shifts Stratified by Residual Cylinder

Residual Cylinder Magnitude		Absolute Shift in Axis						
		0 deg	≤5 deg	>5 to ≤10 deg	>10 to ≤ 15 deg	>15 to ≤30 deg	>30 deg	Total
0D	n (%)	77 (36.67)	0	0	0	0	0	77
	(CI)	(30.14, 43.57)						
>0D to <0.5D	n (%)	0	9 (4.29)	6 (2.86)	4 (1.90)	8 (3.81)	65 (30.95)	92
	(CI)	(1.98, 7.98)	(1.06, 6.11)	(0.52, 4.80)	(1.66, 7.37)	(24.77, 37.68)	(CI)	
≥0.5D to <1.0D	n (%)	0	2 (0.95)	4 (1.90)	2 (0.95)	4 (1.90)	20 (9.52)	32
	(CI)	(0.12, 3.40)	(0.52, 4.80)	(0.12, 3.40)	(0.52, 4.80)	(5.91, 14.33)	(CI)	
≥1.0D to <2.0D	n (%)	0	1 (0.48)	0	2 (0.95)	3 (1.43)	3 (1.43)	9
	(CI)	(0.01, 2.62)	(0.12, 3.40)	(0.30, 4.12)	(0.30, 4.12)	(CI)	(0.01, 2.62)	
Total	Total	77	12	10	8	15	88	210

A summary of the intended refractive correction (IRC), surgically induced refractive correction (SIRC), correction ratio (CR), and error ratio (ER) at 3 months postoperatively (time point of stability) is provided in Table 28 below.

Table 28: Refractive Correction Parameters Stratified by Preoperative Cylinder

Visit	Cylinder Group	N	IRC[1] MEAN(SD)	SIRC[2] MEAN(SD)	CR[3] MEAN(SD)	ER[4] MEAN(SD)
Postop Month 3	ALL	210	1.27 (1.09)	1.23 (1.06)	1.03 (0.40)	0.26 (0.54)
	>0.0-0.5D	72	0.35 (0.12)	0.40 (0.21)	1.17 (0.61)	0.45 (0.79)
	>0.5D-1.0D	45	0.73 (0.10)	0.74 (0.18)	1.02 (0.25)	0.21 (0.42)
	>1.0D-2.0D	43	1.45 (0.30)	1.35 (0.38)	0.93 (0.18)	0.14 (0.20)
	>2.0D-3.0D	29	2.30 (0.27)	2.15 (0.43)	0.93 (0.15)	0.17 (0.21)
	>3.0D-4.0D	12	3.27 (0.25)	3.13 (0.58)	0.96 (0.15)	0.10 (0.14)
	>4.0D-5.0D	7	4.21 (0.26)	4.10 (0.44)	0.97 (0.09)	0.12 (0.14)
	>5.0D-6.0D	2	4.94 (0.02)	4.94 (0.02)	1.00 (0.00)	0.00 (0.00)

[1] IRC = Intended Refractive Correction (difference between intended and preoperative vectors)

[2] SIRC = Surgically Induced Refractive Correction (difference between postoperative and preoperative vectors)

[3] CR = Correction Ratio = SIRC/IRC (ratio of achieved vector magnitude to intended correction); 1 is ideal, <1 implies undercorrection, >1 implies overcorrection

[4] ER = Error Ratio = (IRC-SIRC)/IRC = Error Vector/Intended Vector Magnitude (proportion of intended correction not successfully treated)

At 3 months postoperatively, the SIRC of 1.23 D for the myopic astigmatism cohort closely approximates the intended refractive correction of 1.27 D for all eyes

treated for myopic astigmatism. This is confirmed by the correction ratio (CR) of 1.03 for all treated eyes in the myopic astigmatism cohort. Similar trends in the data are observed for each of the individual cylinder groups, with a CR of 0.93 implying a slight undercorrection in the 1.0 to 3.0 D groups that approaches an ideal CR of 1.00 in the >3.0 D and higher corrections. As would be expected, the greatest variability in the correction ratio is observed in the smallest cylinder magnitude group, where eyes with a preoperative cylinder between 0.0 and 0.5 D had a slightly higher correction ratio of 1.17.

Zernike Analysis of Aberrometry Measurements

Aberrometry measurements were obtained at screening and at 3 and 6 months postoperatively using the WaveLight Analyzer aberrometer. A Zernike analysis was performed to evaluate the effect of the T-CAT LASIK treatment on whole eye aberrations.

140 eyes had valid paired aberrometry measurements at screening and 3 months postoperatively, and 113 eyes had valid paired aberrometry data obtained at screening and 6 months postoperatively. A paired analysis of preoperative and postoperative root-mean-squared (RMS) aberrations magnitudes was performed for each eye to determine the RMS change from baseline at each postoperative visit.

The exclusion of measurements that failed to meet the specified quality parameters was expected, since the inability to obtain a wavefront measurement suitable for planning a wavefront guided treatment defines a population for which topography-guided treatment may be appropriate.

As expected, the T-CAT LASIK procedure resulted in a decrease in defocus and astigmatism RMS magnitudes at 3 and 6 months ($p<0.05$). Coma increased, but trefoil, spherical aberrations, and tetrafoil were relatively unchanged at 3 and 6 months, with postoperative magnitudes approximating the corresponding preoperative values. Percentage changes should be interpreted cautiously for Zernike coefficients such as tetrafoil, that have very small values for which small incremental changes in value will result in a seemingly large percentage change.

Zernike Analysis of Corneal Topography Measurements

T-CAT LASIK is based in part on corneal topography measurements in an attempt to reduce, or at least minimize, corneal irregularities that cannot be corrected by spherical or cylindrical ablations. To assess the effectiveness of these treatments, a Zernike analysis was performed to compare preoperative and 3-month postoperative corneal irregularities directly. All topography images were obtained using the ALLEGRO Topolyzer topographer. Corneal Zernike coefficient data were extracted from the raw data file for each selected topography image. Specifically, the median values from the preoperative images used in the T-CAT treatment plan were compared to a single image obtained 3 months after treatment.

Data for the paired preoperative and postoperative Topolyzer raw data files were extracted at a diameter that was 0.5 mm smaller than the optical zone (OZ) diameter used for treatment. OZ diameters of 6.0, 6.5, and 7.0 mm were included in the study, but the majority of eyes were in the 6.5 mm group. Although the analysis was conducted for all terms through the 8th order, terms above the 5th order did not contribute appreciably to the total RMS value. Also, the 2nd order terms were not used in planning the T-CAT treatments. Therefore, the 3rd – 5th order terms are sufficient for evaluation of the T-Cat treatment effects on corneal irregularities. All terms in this range show small increases but the changes are all less than a nanometer, too small to have an appreciable refractive effect. Overall RMS results for these terms are summarized in Table 29 below:

Table 29: 6.5 mm OZ Group; Preoperative and Postoperative Overall RMS magnitudes and changes for Zernike orders 3-5, n = 204 Eyes.

Aberration	Statistic	Preop (micron)	Visit (micron)	Difference (micron)	Mean of Percent Differences (%)
> 2nd Order	mean	0.000537	0.000579	0.000043	8.8
	Std.	0.000088	0.000150	0.000135	26.3
	median	0.000534	0.000560	0.000012	2.5
	(Q1,Q3)	(0.000480 , 0.000596)	(0.000469 , 0.000674)	(-0.000051 , 0.000118)	(-9.5 , 23.7)

E. Factors Associated with Outcomes

Gender, age, race, postoperative medications, keratectomy device used to create the LASIK flap, and optical zone diameter used for the T-CAT LASIK treatment were evaluated to determine the homogeneity of the study data across the clinical sites. Statistical analysis indicated that there were no differences in the proportion of males and females across the nine clinical sites (p=0.4643), nor were there any differences in the age distribution across sites (p=0.4408). There was a significant difference in the distribution of minority races across the nine sites (p=<0.0001), primarily due to the number of Hispanics and other minority races enrolled at the four sites in the southwest and west coast areas. Hispanic subjects were the second most commonly enrolled race after Caucasians. Although there are statistically significant differences in ethnic distribution amongst the nine sites, the safety and effectiveness outcomes are similar across the nine investigative sites. Furthermore, the ethnic diversity is desirable as it provides results from a cross-section of ethnic groups and mirrors the U.S. population.

T-CAT LASIK eyes at eight of the nine investigative sites were treated with topical Vigamox® (moxifloxacin) and prednisolone acetate after T-CAT LASIK to prevent infection and inflammation in the treated eye. One site prescribed Zymar® (gatifloxacin) and Flarex® (fluorometholone acetate) postoperatively instead of Vigamox® and prednisolone acetate. Zymar® and Vigamox® are both fourth generation fluoroquinolone antibiotics that are therapeutically interchangeable with nearly identical spectrums of antimicrobial activity. Flarex® and prednisolone

acetate are both corticosteroid ophthalmic suspensions that are frequently prescribed after laser refractive surgery. The homogeneity of the key safety and effectiveness parameters were evaluated; and there was no significant difference between the outcomes reported for the site that used Zymar® and Flarex® and the sites that used Vigamox® and prednisolone acetate. Thus, the use of a therapeutically equivalent antibiotic (Zymar®) and anti-inflammatory (Flarex®) did not affect the outcomes in the study cohort.

A femtosecond laser was used to create the LASIK keratectomy flap in the majority of eyes treated. The femtosecond laser was used exclusively at six of the nine investigative sites. A mechanical microkeratome was used on a proportion of the T-CAT LASIK eyes at two sites, and exclusively at one of the participating investigative sites. The effect of keratectomy device on the homogeneity of the key safety and effectiveness parameters and the MRSE accuracy was evaluated. Statistical analysis demonstrated that the choice of keratectomy device used in the LASIK procedure has no significant effect ($p<0.05$) on any of the key safety and effectiveness parameters or the MRSE accuracy.

Optical zone diameters of 6.0 mm, 6.5 mm and 7.0 mm were used during treatment in the T-CAT 001 study. Statistical analysis indicated the distribution of eyes was significantly different across sites and optical zones ($p<0.0001$). This significant difference was caused by a single site; and when the site was dropped from the analysis, the results indicated there was no significant difference in the distribution of eyes across sites and optical zones ($p=0.0792$) The difference in distribution in this site did not affect the homogeneity of outcomes across sites and there was no site effect on the key safety and effectiveness parameters and there was no site effect on the baseline MRSE.

F. Device Failures and Replacements

There were no failures, malfunctions, or replacements of the ALLEGRETTO WAVE® Eye-Q Excimer Laser or T-CAT Software during the course of the study. There was one malfunction of the battery back-up of the ALLEGRO Topolyzer during the postoperative follow-up period of the study, which had no effect on the T-CAT LASIK treatments or the safety and effectiveness outcomes.

G. Financial Disclosure

The Financial Disclosure by Clinical Investigators regulation (21 CFR 54) requires applicants who submit a marketing application to include certain information concerning the compensation to, and financial interests and arrangement of, any clinical investigator conducting clinical studies covered by the regulation. The pivotal clinical study included 10 investigators of which 10 investigators were full-time or part-time employees of the sponsor and 5 investigators had disclosable financial interests/arrangements as defined in 21 CFR 54.2(a), (b), (c) and (f) and described below:

- Compensation to the investigator for conducting the study where the value could be influenced by the outcome of the study: 0 investigators
- Significant payment of other sorts: 10 investigators
- Proprietary interest in the product tested held by the investigator: 0 investigators
- Significant equity interest held by investigator in sponsor of covered study: 0 investigators

The applicant has adequately disclosed the financial interest/arrangements with clinical investigators. Statistical analyses were conducted by FDA to determine whether the financial interests/arrangements had any impact on the clinical study outcome. The information provided does not raise any questions about the reliability of the data.

XI. PANEL MEETING RECOMMENDATION AND FDA'S POST-PANEL ACTION

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

XII. CONCLUSIONS DRAWN FROM PRE-CLINICAL AND CLINICAL STUDIES

A. Safety Conclusions

The adverse effects of the device are based on data collected in a clinical study conducted to support PMA approval as described above. Analysis of safety was based on the total PMA cohort of 249 eyes of 212 enrolled subjects. The primary safety variables for the study included preservation of best spectacle corrected visual acuity (BSCVA), induced manifest refractive astigmatism, and incidence of adverse events. All endpoint target values were met. At 3 months, the time point of refractive stability, none of the eyes had a 2 or more line loss of BSCVA; and at 12 months, one eye lost 2 or more lines of BSCVA that resolved at a visit 1 month later. None of the eyes had an increase of more than 2 diopters of refractive astigmatism at any postoperative visit. The cumulative rate of any adverse event was 0.0% at 3 months, the time point of refractive stability. The cumulative rate of any adverse event was 0.8% or less at the scheduled postoperative visits, consisting of retinal detachments (2/249 eyes; 0.81%), and 2 or more line loss of BSCVA in 2 eyes at scheduled visits and 2 eyes at unscheduled visits, for a total cumulative incidence of 1.6% (4/249 eyes) at 1 month or later. Postoperative uncorrected visual acuity (UCVA) was compared to preoperative BSCVA at 3 months, for which 89.9% of the eyes (222/247) treated with T-CAT LASIK saw as well *without* glasses as *with* glasses before surgery. At 3 months, all categories of complaints showed a reduction in the proportion of eyes with clinically significant complaints (those rated as marked or severe) after the T-CAT LASIK procedure compared to

baseline, except double vision and foreign body sensation, both of which had minimal postoperative increases in severity of 0.8% and 0.4%, respectively. Symptoms that are traditionally associated with LASIK (glare, halos, difficulty driving at night, light sensitivity, and eye dryness)[2] improved after T-CAT LASIK with the ALLEGRETTO WAVE® Eye-Q Excimer Laser. The 3.6% decrease in light sensitivity, 4.4% decrease in complaints of difficulty driving at night, 6.4% decrease in reading difficulty, and 2.4% reduction in glare complaints were all statistically significant improvements in the severity of these visual symptoms in the T-CAT LASIK treated eyes.

B. Effectiveness Conclusions

The effectiveness of T-CAT LASIK performed with the ALLEGRETTO WAVE® Eye-Q Excimer Laser is based on the data collected in the clinical study conducted to support PMA approval as described above. Determination of effectiveness for marketing approval was based on all 249 eyes of 212 enrolled subjects treated in the study for myopia with or without astigmatism and consistent with the approved refractive indications for use. The primary effectiveness variables for the study included predictability of manifest refraction spherical equivalent (MRSE) to the intended refractive outcome, improvement in uncorrected visual acuity (UCVA), stability of manifest refraction, and predictability of manifest refraction astigmatism to the attempted astigmatism correction. All endpoint target values were met for the effectiveness cohort. In the clinical study, stability was demonstrated at 3 months, and confirmed at 6 months, after T-CAT LASIK surgery. At 3 months, 31.6% of the eyes treated for nearsightedness with T-CAT LASIK achieved a UCVA of 20/12.5 or better; 68.9% of the eyes had a UCVA of 20/16 or better; and, a total of 92.7% of the T-CAT LASIK eyes had a UCVA of 20/20 or better. At 3 months, 91.9% of eyes had an MRSE within 0.5 diopters of the intended treatment, and 98.8% had an MRSE within 1.0 diopters of the intended treatment. Subject satisfaction measured by a subjective questionnaire indicated that 98.4% of the subjects polled were satisfied with their outcomes and would have the T-CAT LASIK procedure again. Quality of vision, measured by a validated questionnaire instrument, demonstrated a significant improvement in the subjects' perception of the quality of their vision after T-CAT LASIK.

C. Overall Conclusions

The data provided in this application provide reasonable assurance of the safety and effectiveness of T-CAT LASIK performed with the ALLEGRETTO WAVE® Eye-Q Excimer Laser System when used in accordance with the indications and directions for use. Safety and effectiveness endpoint outcomes met or exceeded target criteria when compared to the anticipated clinical benefit as demonstrated in the clinical study. The refractive range in the approved Indications for Use is more limited than the range studied in the clinical study, and excludes higher refractive cylinder range where an insufficient number of eyes were enrolled in the study than were necessary to support reasonable assurance of safety and effectiveness.

XIII. CDRH DECISION

CDRH issued an approval order on September 27, 2013.

The applicant's manufacturing facility have been inspected and found to be in compliance with the device Quality System (QS) regulation (21 CFR 820).

XIV. 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 device labeling.

Post-Approval Requirements and Restrictions: See approval order.

XV. REFERENCES

1. Eydelman MB, Drum B, Holladay J, Hilmantel G, Kezirian G, Durrie D, Stulting RD, Sanders D, Wong B. Standardized analyses of correction of astigmatism by laser systems that reshape the cornea. *J Refract Surg.* 22.1(2006):81-95. Print.

2. "LASIK, What are the risks and how can I find the right doctor for me?" Food and Drug Administration. 09, Dec. 2011. Web. 04 Oct. 2013.