SUMMARY OF SAFETY AND EFFECTIVENESS DATA (SSED)

I. GENERAL INFORMATION

Device Generic Name:	Ablation Catheter, Generator, and Accessories
Device Trade Name:	Globe® Pulsed Field System
Device Procode:	QZI
Applicant's Name and Address:	Kardium Inc. 8518 Glenlyon Parkway, Unit 155 Burnaby, British Columbia, Canada V5J 0B6
Date(s) of Panel Recommendation:	None
Premarket Approval Application (PMA) Number:	P240044
Date of FDA Notice of Approval:	August 27, 2025

II. INDICATIONS FOR USE

Globe® Catheter, Globe® Catheter Cable
The Globe Catheter is indicated for anatomical and electrophysiological mapping and stimulation of cardiac tissue, and for the delivery of ablation energy for the treatment of drug refractory, recurrent, symptomatic paroxysmal atrial fibrillation, when used in conjunction with the Globe Pulsed Field System.

Globe® Pulsed Field (PF) Generator, Globe® Controller, Globe® Workstation
The Globe® PF System is indicated for catheter-based cardiac anatomical and electrophysiological mapping and stimulation of cardiac tissue.

When used for pulsed field ablation, refer to the Instructions for Use of the compatible cardiac ablation catheter for the specific indications for use.

III. CONTRAINDICATIONS

1. Pediatric patients.
2. Patients with material in or around the atrium that could become dislodged during the procedure, such as intracardiac thrombus, myxoma, or tumor.
3. Patients suffering from active systemic infection (sepsis).
4. Patient with intolerance to anticoagulation medications.

IV. WARNINGS AND PRECAUTIONS

The warnings and precautions can be found in the Globe® PF System labeling.

V. DEVICE DESCRIPTION

The Globe® PF System includes the following components:

- Globe® Catheter
- Globe® Catheter Cable
- Globe® Controller
- Globe® Workstation
- Globe® Pulsed Field Generator

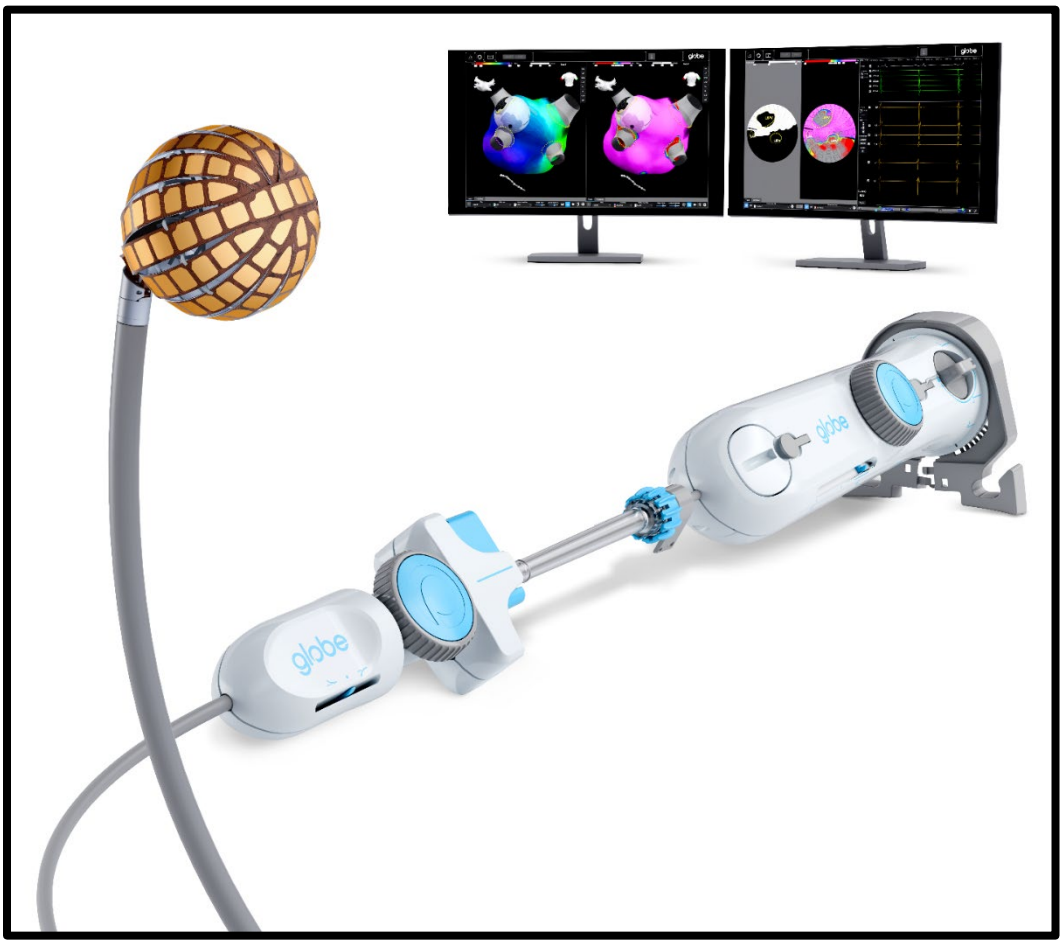

Figure 1: Globe® PF System, depicting Globe® Catheter and Globe® Workstation

The marketed Globe® Controller and Globe® Workstation include device functions uniquely classified under class II and class III. Device functions related to anatomical and electrophysiological mapping and stimulation are classified under class II (Product Code: DQK, 21 CFR 870.1425). Device functions related to delivery of ablation energy for the treatment of drug refractory, recurrent, symptomatic paroxysmal atrial fibrillation (PAF)

are classified under class III (Product Code: QZI), including but not limited to the selection of ablation electrodes on the Globe® Workstation and the control of ablation energy through the Globe® Controller. This Premarket Approval (PMA) application only applies to device functions classified under class III.

The Globe® PF System must be used with the compatible class II Globe® Controller, Globe® Workstation, Globe® Positioning System Electrodes, and Globe® Positioning System Cable. At the time of PMA approval, these compatible devices received 510(k) clearance under K250747. The Globe® PF System can be used with the compatible class II Globe® Introducer. At the time of PMA approval, this compatible device received 510(k) clearance under K250529.

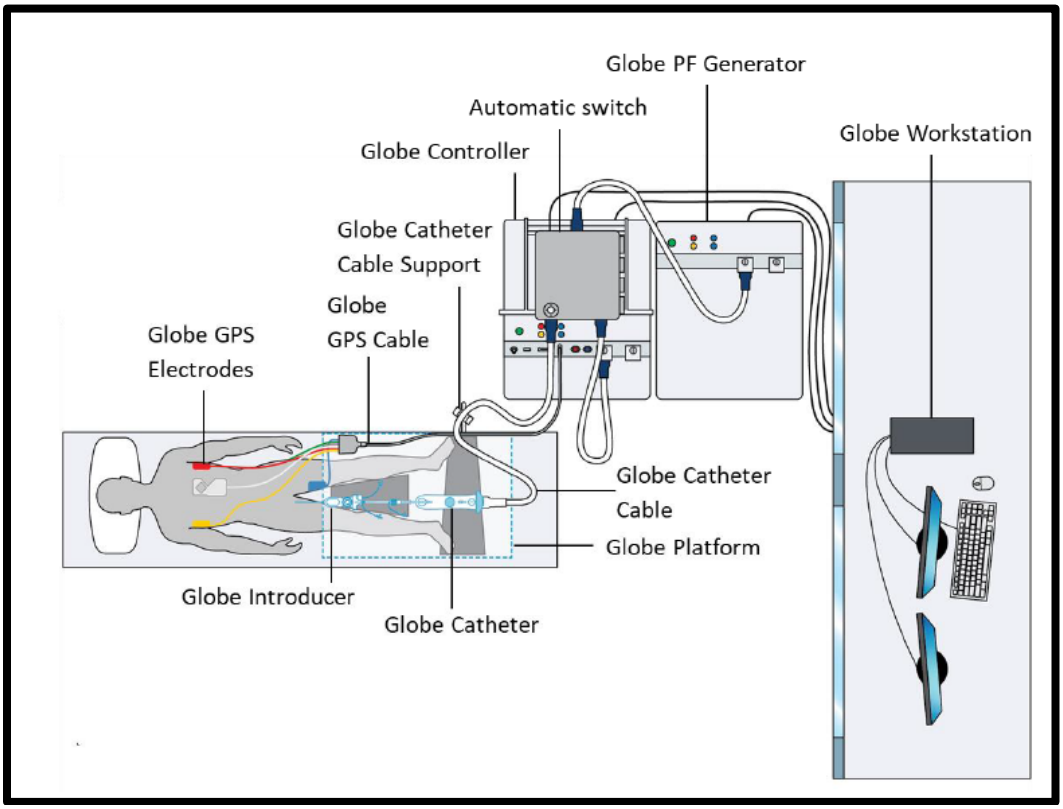

Figure 2: Globe® PF System installation. The Globe® Catheter and Globe® Catheter Cable, and Globe® PF Generator are class III devices. The Globe® Controller and Globe® Workstation include both class II and class III device functions. The Globe® Introducer, Globe® GPS Electrodes, and Globe® GPS Cable are class II devices.

Globe® Catheter and Globe® Catheter Cable

The Globe® Catheter is the main component of the Globe® PF System. It consists of a percutaneous, single-use, 16 F (5.3 mm), ethylene oxide (EO)-sterilized catheter with a multi-electrode array at the distal end that is used for anatomical and electrophysiological mapping, pulsed field energy delivery, and pacing stimulation. The multi-electrode array is 30 mm in diameter and consists of 122 gold-plated, heparin conjugate-coated

electrodes. Each electrode can measure temperature, electrical impedance, degree of tissue contact, and intracardiac electrograms; deliver PF energy for ablation; and apply stimulation pulses. The electrodes are located along thin strips of flexible polyimide circuits that are laminated onto thin, pre-shaped, rounded-edge stainless-steel ribs. The eight ribs of the array are interconnected with polyethylene lines to form a semi-compliant sphere when the array is fully deployed.

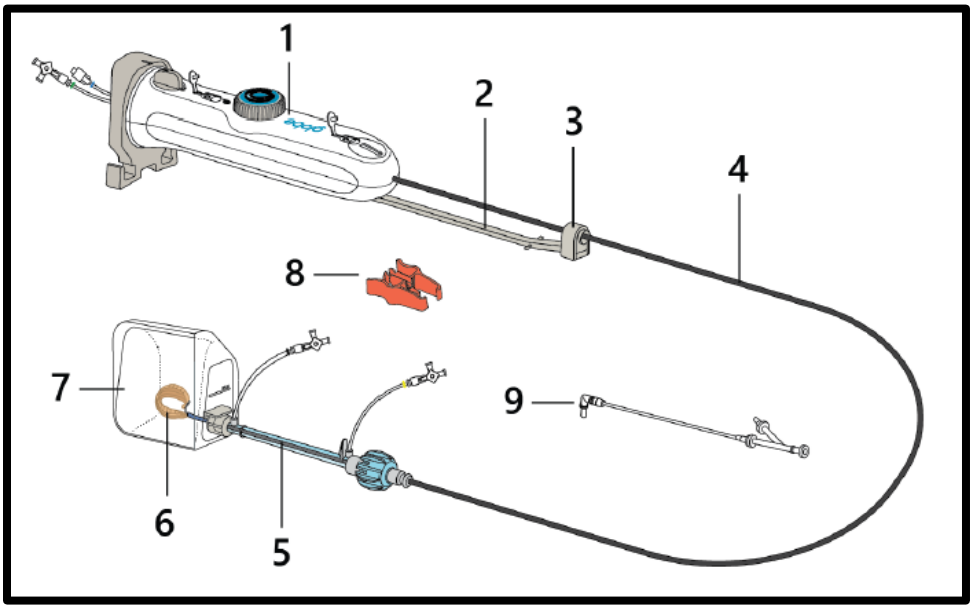

Figure 3: Complete Globe® Catheter [(1) Handle; (2) Insertion guide; (3) Loader dock; (4) Shaft; (5) Catheter loader; (6) Array; (7) Flushing chamber; (8) Insertion guide tool (orange); (9) Vacuum Pump]

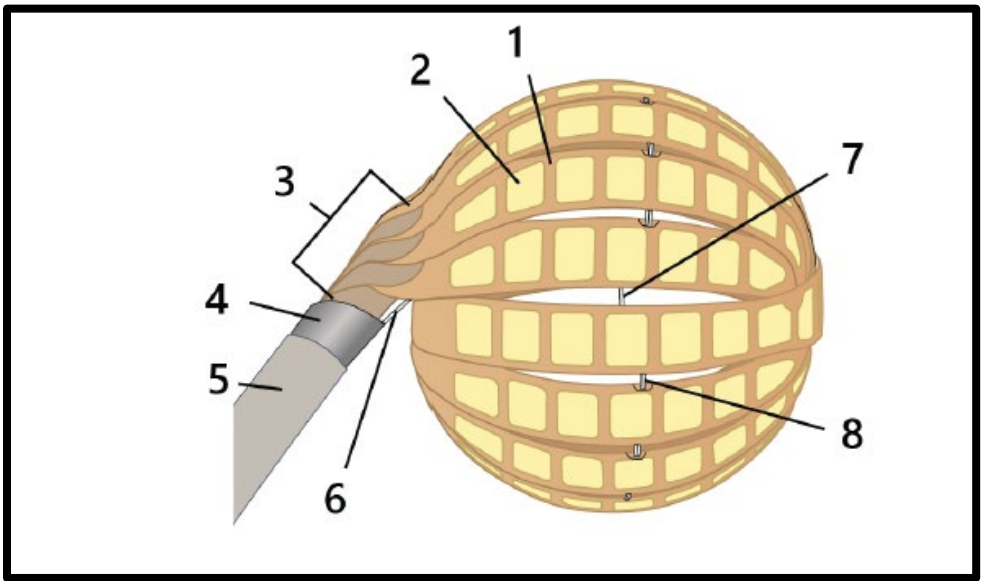

Figure 4: Catheter array (deployed) [(1) Rib; (2) Electrode; (3) Array base; (4) Catheter shaft; (5) Introducer sheath; (6) Rib tip deployment line; (7) Fanning deployment line; (8) Tie line]

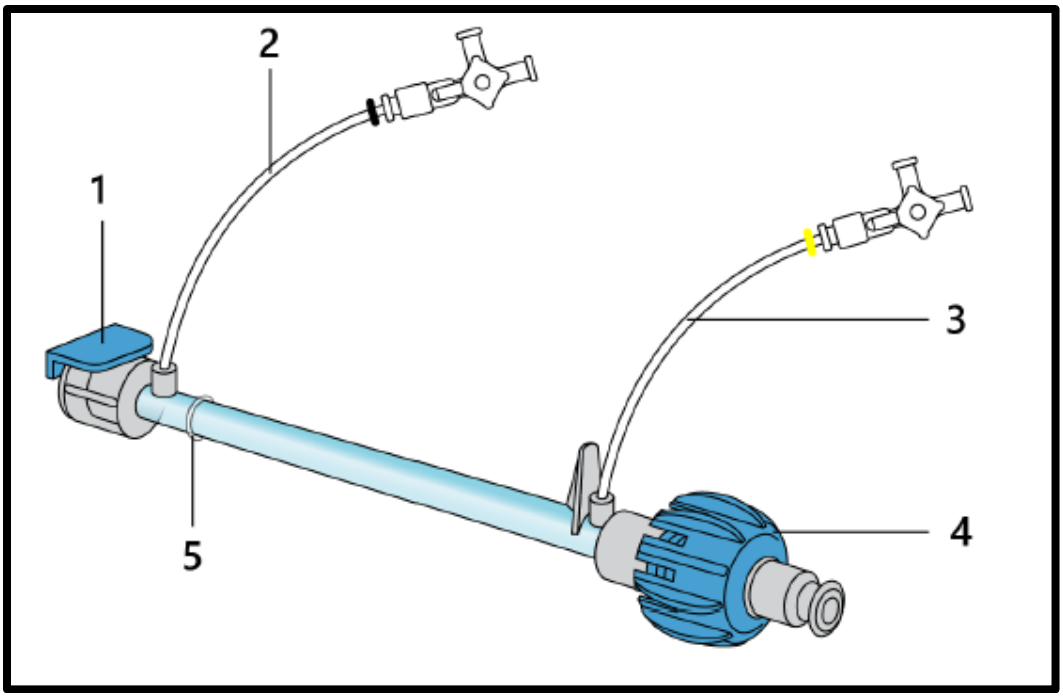

Figure 5: Catheter loader [(1) Catheter loader latch (blue); (2) Distal loader line (black); (3) Proximal loader line (yellow); (4) Hemostatic seal; (5) Loader band]

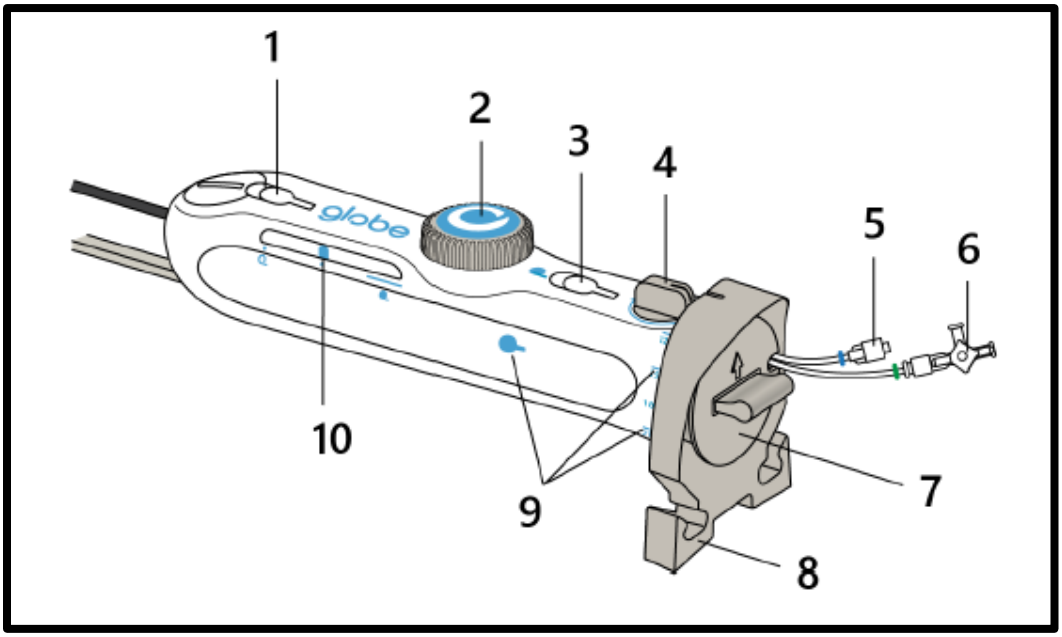

Figure 6: Catheter handle [(1) Distal vent; (2) Deployment knob; (3) Proximal vent; (4) Cable lock; (5) Short flush line (blue); (6) Long flush line (green); (7) Splash guard; (8) Handle stand; (9) Orientation indicators; (10) Deployment indicator]

After preparation of the Globe® Catheter, including air removal with heparinized saline, the array is delivered to the left atrium (LA) via transseptal access from the right femoral

vein using a guidewire and a compatible introducer (e.g., the Globe® Introducer). The Globe® Catheter array travels inside the introducer sheath in a straight, stacked configuration and automatically coils as it enters the left atrium. Using the deployment knob on the catheter handle, the user deploys the array and unfolds it into a globe.

The Globe® Catheter creates lesions in the cardiac tissue by use of pulsed field (PF) energy through a process known as irreversible electroporation. In this process, the application of a rapidly-alternating, high-voltage electric field to the target tissue results in increased cell membrane permeability and eventual cell death. To specify where to deliver PF energy, the clinician selects electrodes on a 2D or 3D representation of the array using the ablation panel presented on the Globe® Workstation. PF energy can be delivered to a minimum of two electrodes and a maximum of 64 electrodes simultaneously. The device labeling recommends no more than two applications of PF energy when the number of pulses is set to 100%.

Globe® Controller

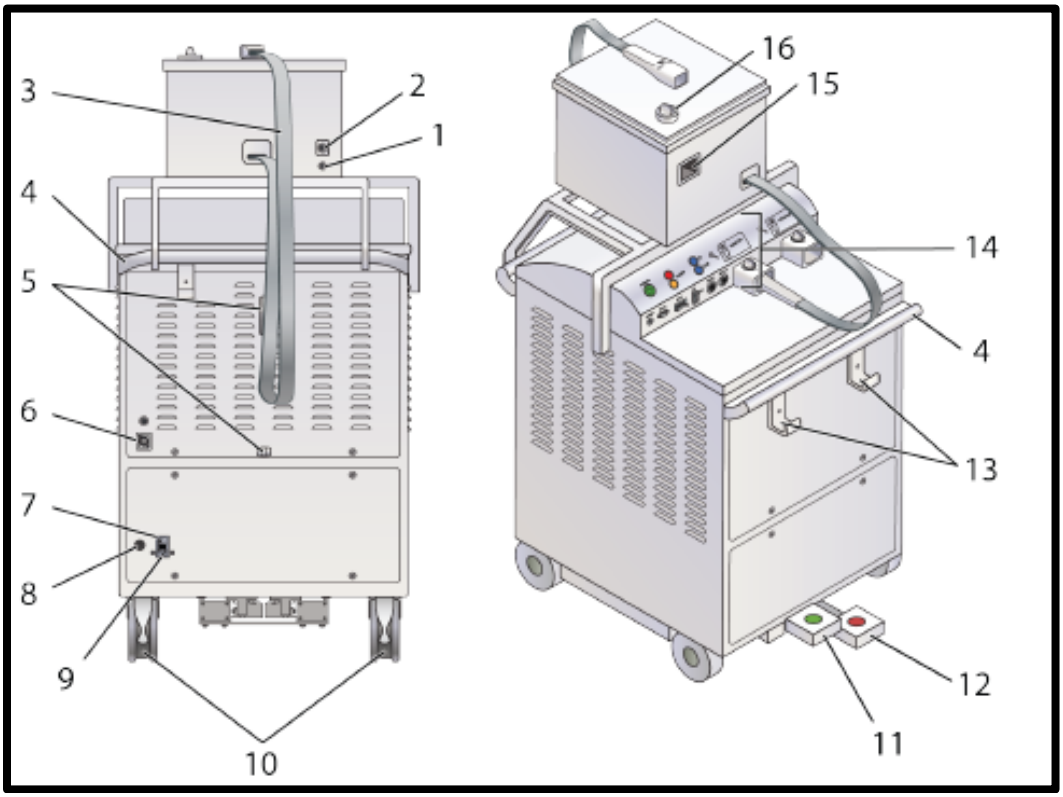

Figure 7: Globe Controller [(1) Power cable port; (2) USB port; (3) Long connection cable; (4) Handle; (5) Hooks for the Globe Platform; (6) USB port; (7) Mains power switch; (8) Potential equalization conductor terminal; (9) Power cable port; (10) Casters; (11) Caster unlock (green pedal); (12) Caster lock (red pedal); (13) Cable hooks; (14) Interface panel; (15) Globe Catheter port; (16) Lock

Globe® PF Generator

The Globe® Pulsed Field Generator (Globe® PF Generator) is used for the generation of PF energy for cardiac tissue ablation. The PF energy is delivered as a series of rapidly varying, high-voltage, bipolar electrical pulses delivered through pairs of electrodes on the catheter array to ablate cardiac tissue.

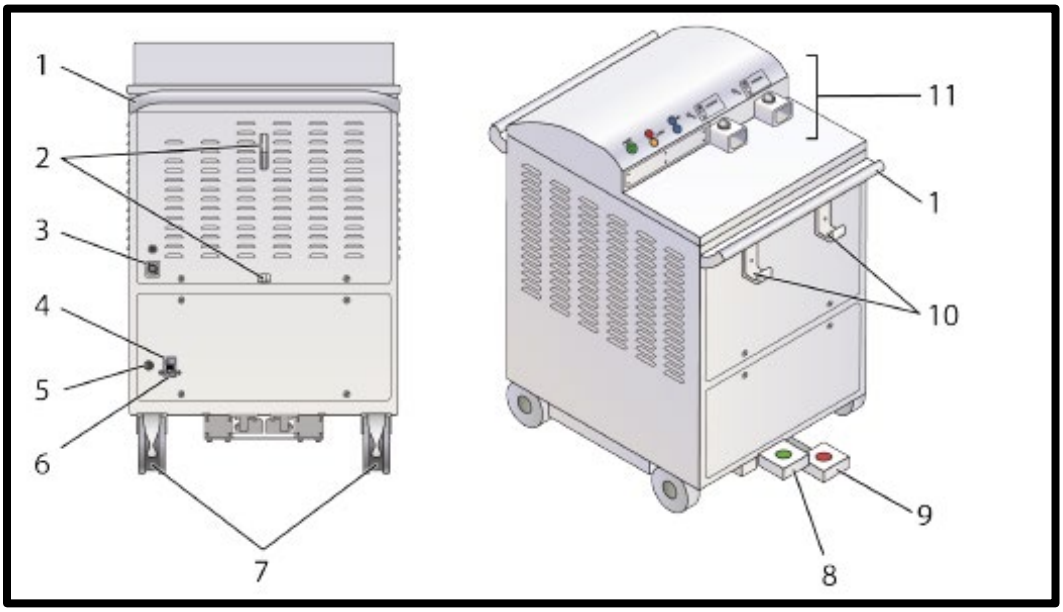

Figure 8: Globe PF Generator [(1) Handle; (2) USB and power cable hooks; (3) USB port; (4) Mains power switch; (5) Potential equalization conductor terminal; (6) Power cable port; (7) Casters; (8) Caster unlock (green pedal); (9) Caster lock (red pedal); (10) Cable hooks; (11) Interface panel

The complete system allows the user to navigate the Globe Catheter inside the heart, record intracardiac electrograms, deliver stimulation pulses, generate electro-anatomical maps, infer contact with cardiac tissue, and deliver ablation energy from selected electrodes.

VI. ALTERNATIVE PRACTICES AND PROCEDURES

There are several other alternatives for the correction of drug refractory, recurrent, symptomatic PAF. These alternatives include:

- Treatment with medicines that help control the rate and/or rhythm of the heart and other medicines that reduce the likelihood of clots forming (known as medical or pharmacologic therapy).
- Cardioversion to restore the heart's normal rhythm (with electrical shock or medicine).
- Implantable devices that control the rate of the heart.

- Implantable devices that reduce the likelihood of clots forming.

- Catheter ablation with other devices approved in the United States.

Each alternative has its own advantages and disadvantages. A patient should fully discuss these alternatives with his/her physician to select the method that best meets expectations and lifestyle.

VII. MARKETING HISTORY

The Globe® Pulsed Field System has not been marketed in the United States or any foreign country.

VIII. POTENTIAL ADVERSE EFFECTS OF THE DEVICE ON HEALTH

Below is a list of the potential adverse effects (e.g., complications) associated with the use of the device.

- Access site complications
- Dyspnea
- Paralysis
- Acute kidney injury
- Allergic reaction
- Anemia
- Arrhythmias
- Arterio-venous fistula
- Atrioesophageal fistula
- Cardiac tamponade
- Cardiac and/or pulmonary arrest
- Cardiovascular perforation
- Chest pain/discomfort
- Congestive heart failure
- Coronary artery occlusion
- Cough/hemoptysis
- Death
- Deep vein thrombosis
- Device entrapment necessitating conversion to surgery
- Dislodgement of or damage to ICD or pacemaker
- Electric shock
- Embolism
- Endocardial fibrosis
- Esophageal lesions/ulcerations
- Fever

- Fluid retention causing swelling, or edema in legs, pleural cavity, peritoneal cavity, lungs
- Gastrointestinal event (diverticulosis, reflux, nausea, etc.)
- Headache
- Heart block
- Heart inflammation
- Hemorrhage
- Hemothorax/hemoperitoneum
- Hypo/hypertension
- Iatrogenic atrial septal defect
- Infection
- Myocardial infarction (MI)
- Nerve injury or spasms
- Pericardial effusion
- Pneumonia
- Pneumothorax
- Pulmonary vein stenosis
- Seizure
- Sinus node dysfunction
- Skin burn
- Stroke
- Syncope
- Thrombocytopenia
- Transient ischemic attack (TIA)
- Valvular damage
- Vasospasms (e.g., coronary artery spasm)
- Vasovagal reaction
- Vessel wall injury including dissection
- Visual blurring

For the specific adverse events that occurred in the clinical study, please see Section X below.

IX. SUMMARY OF NON-CLINICAL STUDIES

Non-clinical testing was conducted to ensure an acceptable level of confidence in the safety and performance of the Globe® Catheter and the Globe® PF System for clinical use. Nonclinical testing included design verification (device level, system level, and software), design validation testing, biocompatibility of patient-contacting materials, sterilization, packaging, and shelf-life testing.

A. Laboratory Studies

Design Verification

Globe® Catheter and Globe® Catheter Cable

Globe® Catheter Bench Top Design Verification
Design verification testing for the Globe® Catheter included the following:

- System simulated use testing
- Mechanical performance: Deployment and retraction tests, joint strength, tensile strength, torque testing, radiopacity, and buckling
- Electrical performance
- Dimensional inspection

Testing confirmed acceptable results to all performance requirements.

Basic Safety and EMC Design Verification
The Globe® Catheter and the Globe® PF System were tested in accordance with the following standards for basic safety and electromagnetic compatibility (EMC):

- IEC 60601-1
- IEC 60601-1-2
- IEC 60601-2-2

Software Verification and Validation
The Globe® PF System utilizes the Globe® Software for PF energy delivery. Software verification and validation was performed that included unit, integration, and system testing. Cybersecurity verification and validation was also performed on the Globe® PF System. Testing confirmed that all software and cybersecurity requirements were met.

Biocompatibility
Biocompatibility testing was conducted on the Globe® Catheter to ensure the biological safety of the patient-contacting materials following the applicable principles of 10993-1 and included the following: Cytotoxicity; Sensitization; Irritation; Systemic Toxicity; Pyrogenicity; Hemocompatibility (Hemolysis, Coagulation, Thrombosis, Complement Activation, and Platelet activation and Hematology). The Globe® Catheter was deemed safe for clinical use.

Sterilization
The Globe® Catheter is single-use and provided sterile. The Globe® Catheter is sterilized using ethylene oxide (EO) at qualified sterilization facilities using a validated sterilization cycle. Validation of the sterilization cycle was conducted to provide a sterility assurance level (SAL) of at least 10^{-6}. The EO residual levels were found to be within the allowable limits per ISO 10993-7 for limited exposure devices.

Packaging Validation
Packaging validation testing was conducted on the sterile barrier system of the Globe® Catheter and included the testing evaluated package integrity following sterilization, simulated handling and distribution, and real-time aging, and included conditioning, performance testing, sterile barrier system integrity and seal strength. The Globe® Catheter passed packaging validation to the labeled shelf-life.

Human Factors
Human factors testing of the Globe® PF System was conducted to confirm that the system is appropriate for the intended users, uses, and use environments. Summative studies were conducted for the intended user groups: Electrophysiology Lab Staff and Physicians. All summative evaluation acceptance criteria were met for the Globe® PF System and the system was found to be safe for use by health care practitioners qualified to complete ablation procedures.

Globe® PF Generator, Globe® Controller, Globe® Workstation

Voluntary Consensus Standards
The sponsor conducted testing to demonstrate that the Globe® PF System conforms with applicable clauses of the following FDA-recognized and non-FDA-recognized voluntary consensus standards.

- IEC 60601-1:2020
- IEC 60601-1-2:2020
- IEC 60601-1-6:2020
- IEC 60601-1-8:2020
- IEC 60601-2-2:2017
- IEC 60601-2-27:2011
- TS 60601-4-2:2024
- IEC 62304:2015
- IEC 81001-5-1:2021
- TIR80002-1:2009
- AAMI TIR57:2016
- ANSI/AAMI SW96:2023
- IEC 62366-1:2020
- ISO 10555-1:2013
- ISO 10993-1:2018
- ISO 10993-4:2017
- ISO 10993-5:2009
- ISO 10993-7:2008
- ISO 10993-10: 2021
- ISO 10993-11:2017
- ISO 10993-17:2023
- ISO 10993-18:2020
- ISO 10993-23:2021

- ISO 11135:2014
- ISO 11607-1:2019
- ISO 11607-2:2019
- ISO 14971:2019
- ISO 15223-1:2021
- ISO 20417:2021
- ISO 80369-7:2021
- ASTM F1980-16
- ASTM D4169-22
- ISTA 3A 2018
- ISO 22442-1:2020
- ISO 22442-2:2020
- ISO 22442-3:2007
- ISO 14644-1:2015
- ISO 14644-2:2015
- ISO 14644-3:2020
- ISO 14644-5:2004
- ISO 14698-1:2003
- ISO 14698-2:2003

B. Animal Studies

Four formal animal studies were conducted to assess the thrombogenicity potential and the safety and efficacy of the system in vivo for the Globe® Catheter and Globe® PF System. The studies were conducted in compliance with the Good Laboratory Practice (GLP) Regulations (21 CFR Part 58).

Efficacy was demonstrated as pulmonary vein isolation was achieved for all treated pulmonary veins assessed via acute entrance block following a 20-minute wait, and chronically at 30 days post-ablation, where applicable. Safety was demonstrated by the lack of clinically significant adverse events or abnormal findings in assessments of gross pathology, histopathology, thromboembolism, and overall animal health assessments. All tests were performed in the canine model.

Table 1 – Animal Studies Conducted

Study	Study Objective	Results
Acute GLP thrombogenicity evaluation of the Globe® PF System in a canine model.	This study evaluated the thrombogenicity of the Globe® Catheter while deployed in the left atrium of healthy canines (n=3) under clinically relevant, worst-case conditions.	All acceptance criteria were met
Acute and chronic GLP safety and efficacy study using the Globe® PF System for pulsed field and radiofrequency ablation in a canine model	The purpose of this GLP study was to evaluate the safety and efficacy of the Globe® PF System for delivery of either PF ablation alone, or PF ablation followed by RF ablation in an acute (short-term, 3 ± 1 days) subgroup of canine mongrels (n=6) and chronic (long-term, 30 ± 3 days) subgroup of canine mongrels (n=6).	All acceptance criteria were met
Short-term chronic GLP safety and efficacy study using the Globe® PF System for pulsed field ablation in a canine model	The purpose of this GLP study was to evaluate the safety and efficacy of an optimized PF dose with the Globe® PF System, in a healthy canine model (n=6) acutely (short term of 3 ± 1 days).	All acceptance criteria were met
Chronic GLP safety and efficacy study using the Globe® PF System for pulsed field in a canine model	The purpose of this GLP study was to evaluate the safety and efficacy of an optimized PF dose with the Globe® PF System, in a healthy canine model (n=6), longer term (30 ± 3 days)	All acceptance criteria were met

C. Additional Studies

N/A

X. SUMMARY OF PRIMARY CLINICAL STUDY(IES)

The applicant performed a clinical study titled, "A Prospective, Multicenter Clinical Study to Evaluate the Safety and Effectiveness of the Globe® Pulsed Field System for Treating Patients with Symptomatic Paroxysmal or Persistent Atrial Fibrillation," (PULSAR, ClinicalTrials.gov Registration: NCT05462145), to establish a reasonable assurance of safety and effectiveness of percutaneous catheter ablation with the Globe® PF System for the treatment of drug refractory, recurrent, symptomatic paroxysmal in the US, Canada, Germany, and Czech Republic under IDE #G220208. Data from this clinical study were the basis for the PMA approval decision. A summary of the clinical study is presented below.

A. Study Design

The PULSAR study was a prospective, multi-center, non-randomized, open-label, uncontrolled, single-arm clinical study. Patients were treated between March 10, 2023, and March 21, 2024. The database for this PMA reflected data collected through November 1, 2024, and included 183 patients (19 lead-in, 164 open enrollment). There were 12 investigational sites.

The study received institutional review board (IRB) or equivalent approval or positive opinion at all sites. Each subject provided informed consent prior to the investigational procedure. A Data Safety Monitoring Board (DSMB) was established to perform independent review of the safety data with respect to the study termination criteria. A Clinical Events Committee (CEC) was established to perform adjudication of Primary Safety Events.

The single-arm study did not include a control arm. Results were evaluated against a pre-defined performance goal.

The PULSAR study continues to enroll subjects with persistent AF. This document only discusses the results for the paroxysmal AF cohort.

1. Clinical Inclusion and Exclusion Criteria

Enrollment in the PULSAR study was limited to patients who met the following inclusion criteria:

1. Age 18-80
2. A diagnosis of recurrent symptomatic PAF defined as atrial fibrillation (AF) that terminates spontaneously or with intervention within seven days of onset, documented by either of the following:
    - At least one documented PAF episode within twelve months prior to enrollment and a physician's note indicating at least two symptomatic PAF episodes occurring within six months prior to enrollment
      or
    - At least two documented PAF episodes within six months prior to enrollment, and a documented physician's note indicating symptoms consistent with PAF

   Documentation of an AF episode must include a recording such as electrocardiogram (ECG), transtelephonic monitoring (TTM), Holter monitor, telemetry strip, or recording from a personal wearable device approved by the relevant regulatory authority.
3. Failure or intolerance of at least one antiarrhythmic drug (AAD) Class I or III, including inability to take AAD therapy due to the strong potential for adverse consequences (e.g., a patient with resting significant bradycardia)
4. Signed Patient Informed Consent Form (ICF)

5. Able and willing to comply with all pre-, post-, and follow-up testing and requirements.

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

1. AF secondary to a reversible cause or of non-cardiac origin, including but not limited to uncontrolled hyperthyroidism, untreated obstructive sleep apnea, acute alcohol toxicity
2. Active fever or systemic infection, including but not limited to sepsis
3. Any condition contraindicating acute or chronic anticoagulation
4. Known allergies or hypersensitivities to anesthesia or contrast media that cannot be controlled with pre-treatment
5. Severe mitral valve regurgitation (i.e., +3 or +4) or stenosis
6. Uncontrolled heart failure or New York Heart Association (NYHA) function class III or IV
7. Unstable angina
8. History of pre-existing hemidiaphragmatic paralysis
9. Severe bleeding disorder history
10. Presence of any pre-existing pulmonary vein stenosis
11. Rheumatic heart disease
12. Untreated severe obstructive sleep apnea with apnea hypopnea index (AHI) >30
13. MI/percutaneous coronary intervention (PCI) within the last three months
14. History of thromboembolic events including cerebral ischemic events (stroke or TIAs) within the past six months
15. Evidence of intracardiac thrombus at the time of the procedure
16. Prior left atrial ablation or surgical procedure (including left atrial appendage (LAA) closures)
17. Planned left atrial surgical procedure (including LAA closure) for any time during the follow-up period
18. Any cardiac surgery within the previous six months
19. Body mass index (BMI) > 40 kg/m2
20. Presence of any pulmonary vein stents
21. Mitral valve prosthesis
22. Hypertrophic cardiomyopathy
23. Primary pulmonary hypertension (right ventricular systolic pressure (RVSP) on echo >50 mmHg)
24. Chronic kidney disease (class III or IV)
25. Chronic liver disease or Child Pugh class B or C liver disease
26. Presence of an implanted cardiac device, including implantable cardioverter defibrillator or pacemaker, implantable loop recorder, insertable cardiac monitor.
27. Planned LAA closure or implant of a cardiac device, including implantable cardioverter defibrillator or pacemaker, implantable loop

recorder, insertable cardiac monitor, for any time during the follow-up period.

28. Known implants, conditions or anatomical abnormality that may interfere with the device delivery or positioning (e.g., myxoma, tumor, calcification, venous access path narrowing or tortuosity, atrial septal defect closure device)
29. Left ventricular ejection fraction (LVEF) <35%
30. Anterior-posterior LA diameter >55mm
31. Person of childbearing potential who is pregnant (as evidenced by pregnancy test if pre-menopausal)
32. Known active drug or alcohol dependency
33. Life expectancy < 12 months
34. Current enrollment in any investigational study of a medical device, biologic, or drug not pre-approved by Kardium.

2. Follow-up Schedule

All patients were scheduled to return for follow-up examinations via remote visits on Day 8, 1 month and 2 months, and via in person visits on Months 3, 6 and 12.

No sub-group analyses were performed for sex, age, race, ethnicity, or any other relevant characteristic specific subgroups.

The table below outlines the evaluations performed preoperatively and postoperatively. Adverse events and complications were recorded at all visits.

Table 2 – Schedule of Study Events

Procedure	Screening / Baseline (Day -30 to 0)	Treatment (Day 1)	Discharge	Week 1 (Day 8 ± 3 days)	Month 1 (Day 31 ± 14 days)	Month 2 (Day 60 ± 14 days)	Month 3 (Day 91 ± 21 days)	Month 6 (Day 181 ± 28 days)	Month 12 (Day 366 ± 45 days)	Repeat ablation[10]	Unscheduled visit[10]
Visit Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		
	in person	in person	in person	remote	remote	remote	in person	in person[12]	in person[12]	in person	
Informed consent	**X**										
Demographics	**X**										
Medical history	**X**										
Inclusion / Exclusion	**X**										
Physical exam	**X**		**X**								
Pregnancy test[1]	**X**										
12-lead ECG	**X**		**X**				**X**	**X**	**X**		**X**
Concomitant cardiac medications[2]	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
TTE	**X**[3]		**X**[4]								
Chest CT or MRI	**X**[3]										
TEE or ICE[5]	**X**									**X**	
Ablation Procedure[6]		**X**								**X**	
AFEQT	**X**							**X**	**X**		
NIHSS	**X**		**X**[11]							**X**	
TTM							Weekly and symptomatic[7]				
24-hour Holter monitoring[8]								**X**	**X**		
Review/History of Repeat Ablations, DC Cardioversion / Hospitalization				**X**	**X**		**X**	**X**	**X**	**X**	**X**

Procedure	Screening / Baseline (Day -30 to 0)	Treatment (Day 1)	Discharge	Week 1 (Day 8 ± 3 days)	Month 1 (Day 31 ± 14 days)	Month 2 (Day 60 ± 14 days)	Month 3 (Day 91 ± 21 days)	Month 6 (Day 181 ± 28 days)	Month 12 (Day 366 ± 45 days)	Repeat ablation[10]	Unscheduled visit[10]
Visit Number	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**		
Review of Arrhythmia Recurrence (AF/AFL/AT)				X	X		X	X	X	X	X
Adverse events[9]		X	X	X	X	X	X	X	X	X	X
Device deficiencies		X								X	

Notes:

1. Pregnancy test performed on pre-menopausal persons of childbearing potential only, within 48 hours prior to the procedure.
2. Concomitant AAD and other relevant cardiovascular medications.
3. Pre-procedure TTE imaging to determine atrial size, and CT/MRI to assess adequacy of anatomy, are required only if not performed within the last 6 months before the Screening visit. Additional imaging required for participants enrolled in the PV Stenosis Substudy if chest CT or MRI not performed within 30 days pre-procedure.
4. Post-procedure for pericardial effusion Screening if required, at the Investigator's discretion.
5. For atrial thrombus screening.
6. Index ablation procedure performed within 30 days of consent.
7. TTM supplied to participant, with transmissions weekly and symptomatic sent to Core lab.
8. Participants instructed to perform Holter monitoring during the time window allotted for the visit.
9. AEs collected from Visit 2 (Day 1) treatment.
10. If the participant has undergone any unscheduled visit or re-ablation procedure visit within the time window for a planned follow-up visit, the assessments planned for that follow-up visit were performed at the unscheduled/re-ablation visit.
11. Neurology consult performed as needed.
12. 6- and 12-month visits may be conducted remotely. 6-month visit conducted in person if participated in PV Stenosis Substudy.

The key timepoints are shown below in the tables summarizing safety and effectiveness.

3. Clinical Endpoints

With regards to safety, the clinical endpoint is the rate of participants presenting with one or more primary safety events up to and including 7 days (or otherwise indicated) after the index ablation procedure. Primary safety events comprise:

- Death
- Cardiac tamponade/perforation
- Heart block
- Major vascular access complication
- Major bleeding
- MI
- Pericarditis requiring intervention
- Pulmonary edema
- Stroke/cerebrovascular accident (CVA)
- Thromboembolism
- TIA
- Vagal nerve injury resulting in gastroparesis
- Atrio-esophageal fistula (within 2 months of ablation procedure)
- Diaphragmatic paralysis/phrenic nerve injury (unresolved at 6 months)
- Severe PV stenosis (within 6 months of ablation procedure)
- Any Globe PF System-related or PF procedure-related cardiovascular and/or pulmonary adverse event within 7 days that prolongs or requires hospitalization for more than 48 hours (excluding recurrent AF/AFL/AT)

With regards to effectiveness, the primary effectiveness endpoint is the rate of 12-month treatment success. Treatment success is defined as freedom from treatment failure. Treatment failure will include:

- Documented recurrence of AF, atrial flutter (excluding documented cavotricuspid isthmus (CTI)-dependent atrial flutter), atrial tachycardia (AF/AFL/AT) as evidenced by episodes ≥ 30 secs on TTM, Holter monitoring, or continuously recorded on the standard 12-lead ECG during the effectiveness evaluation period (i.e., after the 90-day blanking period through to 12 months)
- Acute procedural failure, defined as:
    - Inability to isolate all accessible targeted pulmonary veins (PV) (minimally assessed for entrance block and/or exit block) during the index procedure
    - Ablation using a non-study device in the left atrium (LA)
- Direct Current (DC) cardioversion for AF/AFL/AT during the effectiveness evaluation period
- Redo ablation failure, defined as:

- Any LA repeat ablation procedure for recurrent AF/AFL/AT at any time after the index procedure

- AAD failure, defined as:
  - Administering during the effectiveness evaluation period a previously failed Type I or III AAD at a dose greater than the highest ineffective historical dose
  - Starting a new Type I or III AAD for AF during the effectiveness evaluation period
  - Use of amiodarone after the ablation procedure
- Surgical treatment for AF/AFL/AT after the index procedure

With regard to success/failure criteria, study success is met when both the primary effectiveness and safety null hypotheses are rejected.

B. Accountability of PMA Cohort

At the time of database lock, of the 183 patients enrolled in the PMA study, 164 patients were included in the primary safety analysis and 78 patients were included in the primary effectiveness analysis at the completion of the study, the 12 months post-operative visit.

The protocol allowed for two interim analyses of the primary effectiveness endpoint after completion of the 12 month follow up for 50% and 75% of the open enrollment participants. A study database freeze for the 50% interim analysis was performed for the 78 participants who had completed the 12 month follow up. The cohort will continue to be followed until all participants have completed the 12-month follow up or have exited the study.

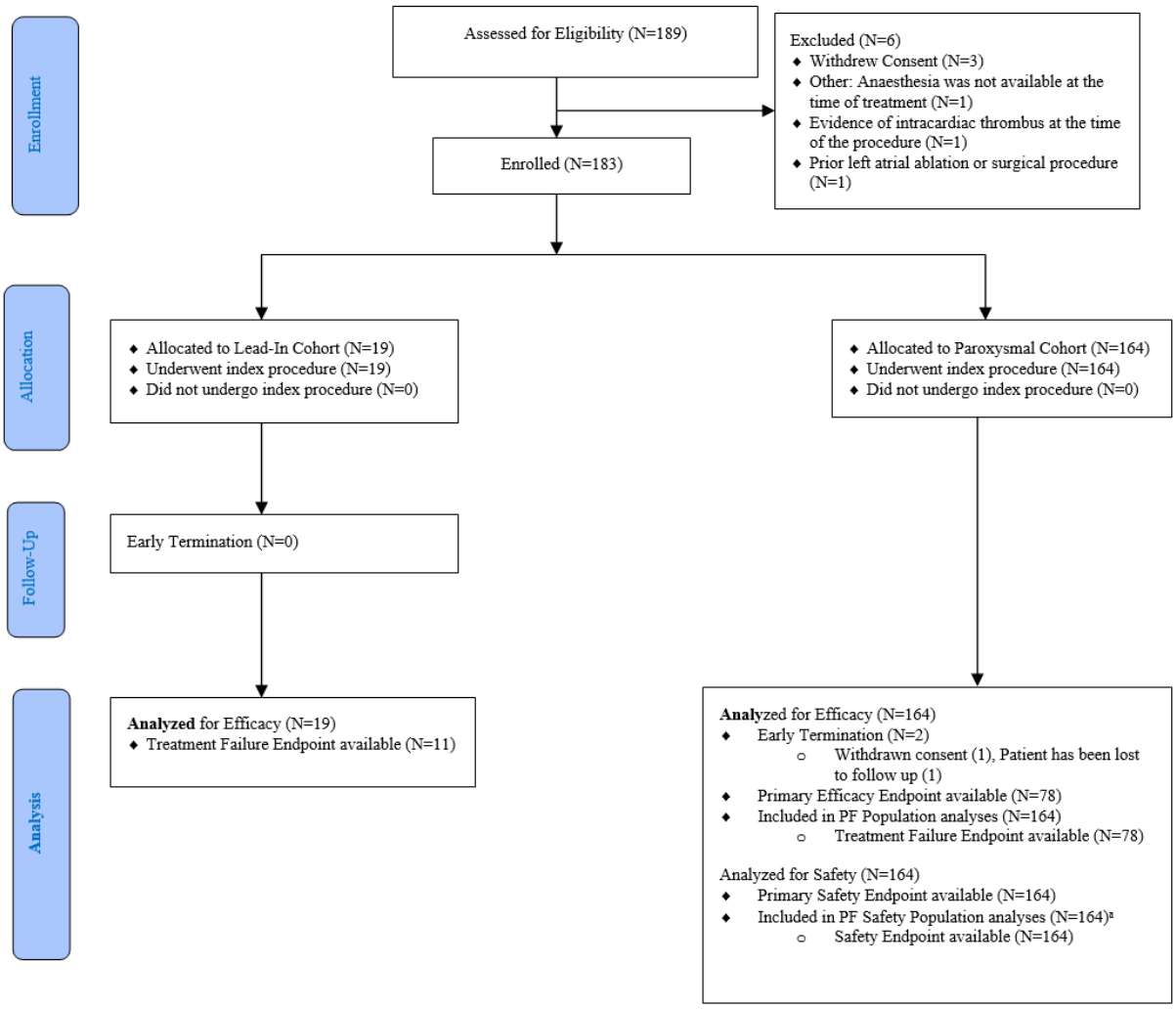

Figure 9 – Participant Accountability

[a] Participants who terminated the study between Day 91 and Day 181 visits are included in the Safety population for the primary safety endpoint. If patients in this situation had a safety event at one of the previously completed visits, this is counted as an event for the patient. If they did not, they are assumed to be event-free in the 6-month window despite no 6-month visit since most of these events happen early, particularly before 90 days.

C. Study Population Demographics and Baseline Parameters

The demographics of the study population are typical for a paroxysmal atrial fibrillation study performed in the US.

All-Enrolled populations: 50% of All-Enrolled participants were in the US (this ratio was 65% in the Interim Population). The overall mean age was 65.4 ± 8.9 and 40% were female at birth. All female participants of childbearing potential had a completed pregnancy test. There were no participants with NYHA Class III/IV heart failure. More details about subjects' demographic information are provided in the tables below.

Table 3 – Summary of Baseline and Demographic Characteristics by Population

		Lead-In Population (N=19)		Interim Population (N=78)		Open Population (N=164)		All Enrolled Population (N=183)	
Demographic Category	**Characteristic**	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Sex at Birth	Male	11	58	53	68	98	60	109	60
	Female	8	42	25	32	66	40	74	40
Ethnicity	Not Hispanic or Latin	19	100	78	100	161	98	180	98
	Hispanic	0	0	0	0	3	2	3	2
	Not Reported	0	0	0	0	0	0	0	0
	Unknown	0	0	0	0	0	0	0	0
Race	Black	0	0	4	5	4	2	4	2
	East Asian	0	0	2	3	4	2	4	2
	Indigenous (First Nations, Inuk/Inuit, Metis, American Indian or Alaska Native)	0	0	0	0	2	1	2	1
	Latin American	0	0	0	0	1	1	1	1
	Middle Eastern	0	0	0	0	1	1	1	1
	Native Hawaiian or Pacific Islander	0	0	0	0	0	0	0	0
	South Asian	0	0	0	0	0	0	0	0
	Southeast Asian	0	0	0	0	0	0	0	0
	White	18	95	71	91	146	89	164	90
	Other	0	0	0	0	1	1	1	1
	Multi-Racial[a]	1	5	0	0	2	1	3	2
	Unknown	0	0	1	1	3	2	3	2
NYHA Class	I	3	16	4	5	14	9	17	9
	II	0	0	3	4	19	12	19	10
	III	0	0	0	0	0	0	0	0
	IV	0	0	0	0	0	0	0	0
	None (participant does not have HF)	16	84	71	91	131	80	147	80

N = Number of participants in the indicated population.
[a] Participants may select more than one race but those participants are only represented in Multi-Racial category.

Table 4 – Baseline Medical History by Population

	Lead-in Population (N=19)		Interim Population (N=78)		Open Population (N=164)		All Enrolled Population (N=183)	
Medical History Term	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Any medical history	19	100	78	100	164	100	183	100
Atrial Fibrillation	19	100	78	100	164	100	183	100
Hypertension	10	53	49	63	98	60	108	59
Type II Diabetes	2	11	11	14	21	13	23	13
Vascular Disease History	4	21	10	13	20	12	24	13
Previous Myocardial Infarction	3	16	5	6	8	5	11	6
Congestive Heart Failure	1	5	1	1	8	5	9	5
Stroke/TIA/Thrombo-embolism	1	5	3	4	7	4	8	4
Chronic Kidney Disease	1	5	2	3	3	2	4	2

The cohort was majority white with mean BMI of 28.3 and a normal EF. HTN was noted in 59%, 13% had vascular disease and 13% had DM. AADs were used in 22% (majority flecainide).

D. Safety and Effectiveness Results

The pivotal study has two co-primary endpoints. The primary effectiveness endpoint was the 12-month ablation treatment success based on an evaluation period extending from the end of a 90-day blanking period following the index procedure until the 12-month visit. The primary safety endpoint was the rate of Safety Population participants presenting with one or more primary safety events up to 6 months after the index ablation procedure. The analyses for the safety and effectiveness endpoints were performed using the Safety Population (N=164) and Interim Population (N=78), respectively. The treatment failure-free rate in the interim population (N=78) was 80.8% with a lower confidence bound of 70.3%. Therefore, the primary effectiveness performance goal of 50% was met. The lower one-sided 99.7% confidence bound (based on the interim analysis critical p-value) was 65.6%. The primary safety endpoint was the rate of Safety Population participants presenting with one or more primary safety events up to and including 7 days (or as indicated) after the index ablation procedure. The rate of primary safety events in the Safety Population (N=164) was 0.6% (1/164) with an upper confidence bound of 3.4%. Therefore, the primary safety performance goal of 14% was met. The null hypothesis, that the primary safety event rate was equal to or greater than the performance goal of 14%, was rejected ($p<0.001$, against a critical p-value of 0.05).

1. Safety Results

The analysis of safety was based on the Safety Population cohort of 164 patients/procedures, etc. available for the 6-month evaluation. The primary safety endpoint was the rate of Safety Population participants presenting with one or more primary safety events up to and including 7 days (or as indicated) after the index ablation procedure.

The primary estimate for the safety evaluation is the rate of Safety Population participants presenting with one or more primary safety events. Primary safety event status at 6 months is a derived variable based on participants experiencing one or more of the primary safety events by their 6-month follow-up.

The rate of primary safety events in the Safety Population (N=164) was 0.6% (1/164) with an upper confidence bound of 3.4%. This demonstrates that the primary safety performance goal was met. The null hypothesis, that the primary safety event rate was equal to or greater than the performance goal of 14%, was rejected ($p<0.001$, against a critical p-value of 0.05).

The key safety outcomes for this study are presented below (Table 5).

Table 5 – Primary Safety Event Rate at 6-Months – Safety Population

Statistic	Safety Population (N = 164)
Number of participants with one or more Primary Safety Event	1
Percent of participants with one or more Primary Safety Event (95% CI)	0.6 (0.0, 3.4)
p-value[a]	<0.001
N = Number of participants in the Safety Population who have completed their Month 6 visit [a] Based on a one-sided exact binomial test compared to the performance goal of 14%	

Adverse effects are reported in the section below (Table 6).

Adverse effects that occurred in the PMA clinical study:

There was a total of 73 adverse events in the All-Enrolled Population (40%), with the majority of those events (74%) reported as mild. There was a total of 16 adverse device effects in the All-Enrolled Population (9%), the majority of those events reported as mild (12/16 = 75%).

A total of 4 participants in the Safety Population had peri-procedural SAEs that were device or procedure related (GERWK-009, GERWK-012, USAMS- 025, and USASB-006). One participant (CANMG-009) had a late onset SAE (158 days

following ablation) due to AF recurrence. The participant was admitted to the hospital, where chemical cardioversion was performed, and the participant was observed for 13 days before discharge. The event was adjudicated as possibly procedure related, resulting in a late-onset SAE rate of 0.5%. No deaths were reported in the study as of the database freeze date for this interim report.

For serious adverse effects (SAEs), a total of 20 participants (11%) in the All Enrolled Population had serious adverse events as assessed by the investigator and the medical monitor (8 severe and 14 moderate). A summary of those events is provided in the table below.

Table 6 – Summary of Serious Adverse Events

Participant	Event	Severity	Procedure Date (mm/dd/yy)	Event Date (mm/dd/yy)	Days Since Ablation	Device Related	Procedure Related
CANMG-008	NSTEMI	Severe	11/15/23	8/11/24	270	No	No
CANMG-009	Atrial Fibrillation	Moderate	12/12/23	5/19/24	159	No	Possible
CZENH-004	Transmural myocardial scarring	Moderate	3/11/23	2/27/24	353	No	No
CZENH-005	Centroblastic variant of diffuse large B-cell Lymphoma	Severe	3/28/23	7/13/23	107	No	No
GERHD-014	Transient Ischemic Attack	Severe	1/30/24	4/13/24	74	No	No
GERWK-002	Left humeral head fracture	Moderate	8/29/23	3/27/24	211	No	No
GERWK-009	Aspiration in the bronchial system	Moderate	9/1/23	9/1/23	0	No	Yes
GERWK-012	Dressler's syndrome	Moderate	9/5/23	9/24/23	19	Possible	Probable
GERWK-015	Cholelithiasis	Moderate	9/7/23	11/28/23	82	No	No
GERWK-027	Iatrogenic hyperthyroidism	Moderate	12/14/23	7/2/24	201	No	No
USABD-001	Cardiac Arrest	Severe	8/1/23	5/21/24	294	No	No
	MRSA[a]	Severe		5/23/24	296	No	No
USABD-014	Ischemic chest pain	Moderate	10/2/23	7/25/24	297	No	No

Participant	Event	Severity	Procedure Date (mm/dd/yy)	Event Date (mm/dd/yy)	Days Since Ablation	Device Related	Procedure Related
USACC-001	Pulmonary Embolism	Moderate	12/8/23	6/18/24	193	No	No
	Subcapsular renal hematoma	Moderate		6/30/24	205	No	No
	Splenic Laceration[b]	Severe		7/2/24	207	No	No
USAHC-001	Chest Pain – Palpitations	Moderate	3/7/24	9/3/24	180	No	No
USAMS-005	Syncope	Moderate	6/5/23	11/2/23	150	No	No
USAMS-025	Urinary Retention[c]	Moderate	7/11/23	7/12/23	1	No	Yes
USASB-005	Acute hypoxic respiratory failure	Severe	1/8/24	7/13/24	187	No	No
USASB-006	Hemorrhagic stroke	Severe	2/8/24	2/8/24	0	No	Yes
	Pulmonary Embolism	Moderate		2/15/24	7	No	Yes
USASB-008	Pneumonia	Moderate	1/25/24	5/27/24	123	No	No
USASV-007	Papillary renal cell Carcinoma	Severe	10/4/23	8/8/24	309	No	No

[a] Participant was admitted on 5/21/24 for recanalization of acutely occluded left main and left anterior descending artery. Two days later and during hospitalization, the participant developed a bacterial infection (MRSA), as confirmed by a culture completed on 5/26/24. The onset date of this safety event was set as 5/23/24.

[b]The date of onset for the splenic laceration is 6/30/2024 per the SAE narrative. This will be updated in this table for the final report.

[c]The date of onset for the urinary retention is 7/11/2024 per the SAE narrative. This will be updated in this table for the final report.

2. Effectiveness Results

The analysis of effectiveness was based on the 78 evaluable patients at the 12-month time point. The primary effectiveness endpoint was the 12-month ablation treatment success in the Interim Population participants based on an evaluation period extending from the end of a 90-day blanking period following the index procedure until the 12-month visit.

The treatment failure-free rate in the interim population (N=78) was 80.8% (63/78, 95% CI = 70.3%, 88.8%) with a lower confidence bound of 70.3%. This

demonstrates that the primary effectiveness performance goal was met. The null hypothesis, that the primary effectiveness rate was less than or equal to the performance goal of 50%, was rejected ($p<0.001$, against a critical p-value of 0.002674 for the interim analysis). Consequently, the success criterion for this endpoint was met.

Key effectiveness outcomes are presented in Table 7.

Table 7 – Summary of Treatment Failure-free Rate at 12-Months – Interim Population

Statistic	Interim Population (N = 78)
Number of treatment-failure-free participants	63
Percent of treatment-failure-free participants (95% CI)	80.8 (70.3, 88.8)
p-value[a]	<0.001
N = Number of participants who have completed their Month 12 visit. [a] Based on a one-sided exact binomial test compared to the performance goal of 50%. The significance boundary at the time of this interim analysis corresponds to a nominal p-value of 0.002674.	

3. Subgroup Analyses

No formal subgroup analyses were performed for sex, age, race, ethnicity, or any other relevant characteristic specific subgroups, but a sensitivity analysis for the interim population support the results of the primary analysis. A tipping point analysis showed the performance goal was exceeded in the worst-case scenario (number of treatment failures among missing participants at 12 months of 2).

Table 8 – Tipping Point Analysis of Treatment Failure-free Rate at 12 Months – Interim Population

Interim Population (N=78, Effectiveness tipping Point Analysis Population[a] N=80)		
Number of Treatment Failures Among Missing Participants at 12 Months	**Number of Treatment Failure-free Participants (%)**	**p-value[b]**
0 (Best case)	65 (81.2%)	<0.001
1	64 (80.0%)	<0.001
2 (Worst case)	63 (78.7%)	<0.001
N = Number of participants in the Interim Population [a] The Tipping Point analysis includes the Interim Population plus participants who terminated the study early (prior to the 12-month follow-up) [b] Based on a one-sided exact binomial test compared to the performance goal of 50%		

4. Pediatric Extrapolation

In this premarket application, existing clinical data was not leveraged to support approval of a pediatric patient population.

XI. 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 34 investigators of which 0 were full-time or part-time employees of the sponsor and 4 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
- Significant payment of other sorts: 0
- Proprietary interest in the product tested held by the investigator: 0
- Significant equity interest held by investigator in sponsor of covered study: 4

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.

XII. SUMMARY OF SUPPLEMENTAL CLINICAL INFORMATION

N/A

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

In accordance with the provisions of section 515(c)(3) of the act as amended by the Safe Medical Devices Act of 1990, this PMA was not referred to the Circulatory System Devices Panel, an FDA advisory committee, for review and recommendation because the information in the PMA substantially duplicates information previously reviewed by this panel.

XIV. CONCLUSIONS DRAWN FROM PRECLINICAL AND CLINICAL STUDIES

A. Effectiveness Conclusions

The primary effectiveness endpoint was treatment failure-free rate at 12 months with a performance goal of 50%.

The protocol allowed for 2 interim analyses of the primary effectiveness endpoint after completion of the 12 month follow up for 50% and 75% of the open enrollment participants. A study database freeze for the 50% interim analysis was performed for the 78 participants who had completed the 12 month follow up. The cohort will continue to be followed until all participants have completed the 12-month follow up or have exited the study.

The study met its success criteria.

For effectiveness, the study population consisted of 78 participants with 12 months of follow up. The failure free treatment rate was 81% with a LB of the 95% CI of 70% with a performance goal of 50%.

The pulmonary vein substudy showed a small decrease in PV diameter in 33 participants. Although this was smaller than what is shown in RF ablation studies, the finding appears to have been more evident than in prior studies of PFA.

B. Safety Conclusions

The risks of the device are based on nonclinical laboratory and animal studies as well as data collected in a clinical study conducted to support PMA approval as described above.

The primary safety endpoint was the rate of participants with one or more safety events up to and including 6-months after the ablation procedure. The study population consisted of 164 participants. The rate of primary safety events was 0.6% (1/164) with an upper confidence bound of 3.4% with a performance goal of 14%.

The safety results were excellent; of 164 subjects, there were 2 primary SAEs in one participant (hemorrhagic stroke and pulmonary emboli). No novel or unexpected complications occurred.

C. Benefit-Risk Determination

The probable benefits of the device are also based on data collected in a clinical study conducted to support PMA approval as described above. The probable risks of the device are also based on data collected in a clinical study conducted to support PMA approval as described above. Probable risks appear to be the same or less than previously approved ablation catheters. This trial was not designed to demonstrate superiority in either safety or effectiveness over other devices approved for the treatment of drug-refractory, recurrent, symptomatic PAF. The sources of uncertainty are the small sample size and limited follow up to 1 year.

Additional factors to be considered in determining probable risks and benefits for the Globe® Pulsed Field System included the uncertainty due to a small study small sample size and single arm study design.

1. Patient Perspective

   Patient perspectives considered during the review included:
   Assessment of the change in score from AF Effect on QualiTy-of-life (AFEQT) questionnaire from baseline. The AFEQT questionnaire is a participant-reported outcome which assesses 4 domains of interest: symptoms, daily activities, treatment concerns, and treatment satisfaction. AFEQT scores range from 0 (worst) to 100 (best) and were reported at baseline, 6-month visit, and 12-month visit. There was a positive trend in the mean and median AFEQT scores between baseline and both 6-month and 12-month visits across all categories of the questionnaire. This trend was observed in all study populations.

In conclusion, given the available information above, the data support that for anatomical and electrophysiological mapping and stimulation of cardiac tissue, and for the delivery of ablation energy for the treatment of drug refractory, recurrent, symptomatic paroxysmal atrial fibrillation, when used in conjunction with the Globe® Pulsed Field System, the probable benefits outweigh the probable risks.

D. Overall Conclusions

The data in this application support the reasonable assurance of safety and effectiveness of this device when used in accordance with the indications for use.

XV. CDRH DECISION

CDRH issued an approval order on August 27, 2025. The final clinical conditions of approval cited in the approval order are described below.

The PULSAR Post-Approval Study (PAS) is a prospective, multi-center, non-randomized, single arm study to evaluate the long-term effectiveness and safety of the Globe Pulsed Field System for the treatment of drug-refractory, recurrent, symptomatic, paroxysmal atrial fibrillation (PAF). Adult patients who intend to undergo their de novo catheter ablation procedure to treat symptomatic paroxysmal atrial fibrillation refractory or intolerant to at least one Class I or III antiarrhythmic medication will be enrolled and ablated using the Globe Pulsed Field System. The study will enroll approximately 250 patients at up to 15 clinical sites in the United States, Canada, and Europe, with at least 50% of subjects from the United States. Following consent, all study subjects will complete an enrollment/baseline visit, ablation procedure, and be followed through 36 months post-ablation. Follow-up visits will be conducted at 1, 3, 6, 12, 24, and 36 months following the index ablation procedure. A 24-hour Holter or equivalent rhythm monitoring will be performed at 6- and 12-months post ablation for asymptomatic recurrence and at times needed for symptomatic recurrences, and for the extended follow-up, annually at 24- and 36-months post-ablation.

The primary objectives of the PAS will be the following:

- Estimating the primary safety adverse event rate for ablation using the Globe Pulsed Field System.
- Estimating the rate of 12-month treatment success following ablation procedure using the Globe Pulsed Field System.

Secondary/Additional objectives will include but are not limited to:

- Estimating the rate of treatment success, evaluated at 24 months and 36 months following ablation procedure using the Globe Pulsed Field System.
- Estimating the rate of device- or procedure-related serious adverse events through 12 months post-ablation using the Globe Pulsed Field System.

From the date of study protocol approval, you must meet the following timelines for the PULSAR PAS:

- First subject enrolled within 6 months
- 20% of subjects enrolled within 12 months
- 50% of subjects enrolled within 18 months
- 100% of subjects enrolled within 24 months

In addition, you must submit separate periodic reports on the progress of the PULSAR PAS as follows:

- PAS Progress Reports every six (6) months until subject enrollment has been completed, and annually thereafter, from the date of the PMA approval letter, unless otherwise specified by FDA.
- If any enrollment milestones are not met, you must begin submitting quarterly enrollment status reports every 3 months in addition to your periodic (6-month) PAS Progress Reports, until FDA notifies you otherwise.
- Submit the Final PAS Report three (3) months from study completion (i.e., last subject's last follow-up date).

Each PAS report should be submitted to the address below identified as a "PMA Post-Approval Study Report" in accordance with how the study is identified above and bearing the applicable PMA reference number.

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

XVI. 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.