SUMMARY OF SAFETY AND EFFECTIVENESS DATA (SSED)

I. GENERAL INFORMATION

Device Generic Name: Implanted electrical urinary continence device

Device Trade Name: Neuspera Sacral Neuromodulation (SNM) System

Device Procode: EZW

Applicant's Name and Address: Neuspera Medical, Inc.
51 Daggett Drive
San Jose, CA 95134

Date(s) of Panel Recommendation: None

Premarket Approval Application (PMA) Number: P240031

Date of FDA Notice of Approval: June 17, 2025

II. INDICATIONS FOR USE

The Neuspera Sacral Neuromodulation System ("Neuspera SNM System") is indicated for the treatment of the symptoms of urinary urge incontinence (UUI) in patients who have failed, could not tolerate, or were not a candidate for more conservative treatments.

III. CONTRAINDICATIONS

- Patients with sacral depth measured from skin to the S3 foramen greater than 10 cm as confirmed by imaging.
- Patients who have not demonstrated an appropriate response to test stimulation.
- Patients who are unable to operate the neurostimulator.
- Men who have Benign Prostatic Hyperplasia (BPH) or patients with other lower urinary tract obstructions that leads to significant obstructive symptoms or pathology.

After implantation of the Neurostimulator, the following contradictions apply:

- Electrical treatments where the conducted current is induced into the body from an external source in the area of the Neurostimulator (this may permanently damage the Neurostimulator).
- Medical treatments or procedures utilizing effects caused by electric fields (such as diathermy) unless the treatment or procedure is identified within as acceptable (such as MRI).

IV. WARNINGS AND PRECAUTIONS

The warnings and precautions can be found in the Neuspera SNM System labeling.

V. DEVICE DESCRIPTION

The Neuspera Sacral Neuromodulation System ("Neuspera SNM System") consists of the following components (names in parentheses are trade names). See **Figure 1**:

- Neuspera Sacral Nerve Stimulator Implant Kit, including the Implantable Neurostimulator ("Implant Kit")
- External Components
- Wireless Transmitter and Accessories (Charging Pad and Magnet)
- Clinician Programmer
- Patient Controller
- Undergarment
- Trial System
- Trial System Kit ("Trial Lead Kit")
- Trial Lead Kit ("Extra Trial Lead")
- Procedural Accessories Kit
- External Procedural Kit ("External Nerve Stimulator Kit")

The Implantable Neurostimulator is an implantable neurostimulator with four programmable electrodes. The programmable electrodes deliver stimulation to the sacral nerve.

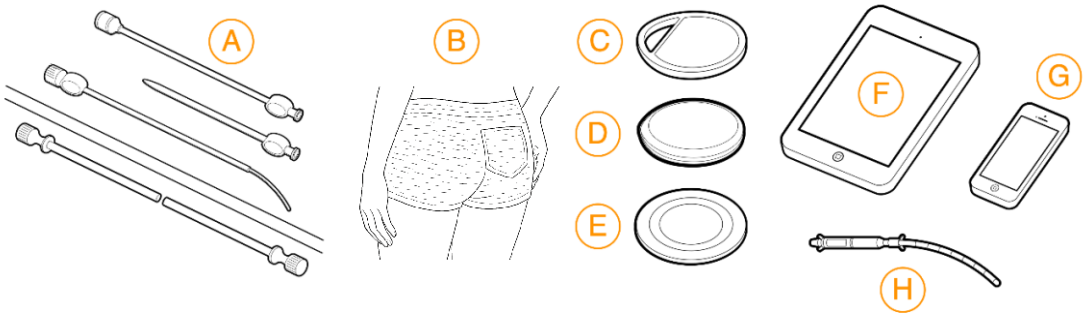


Figure 1. Neuspera SNM System
A. Implantable Sacral Nerve Stimulator Kit, B. Undergarment, C. Magnet, D. Wireless Transmitter, E. Charging Pad, F. Clinician Programmer, G. Patient Controller, and H. Implantable Neurostimulator

1. Implantable Neurostimulator

The neurostimulator (see Figure 2) delivers pulses of energy to the sacral nerve that helps control the bladder. The distal portion is pre-formed with a curvature and contains four electrodes for stimulation. The proximal end has an encapsulated antenna to

receive the signal from the Wireless Transmitter. Circuitry within the neurostimulator takes the signal from the Wireless Transmitter and sends programmable electrical pulses to the stimulation electrodes. The radial tines are designed to maintain the position of the implant after implantation. Specifications of the neurostimulator are provided in **Table 1** and **Table 2**.

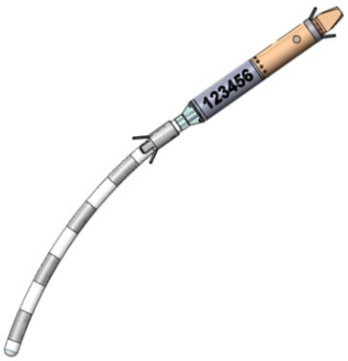


Figure 1. Neuspera Implantable Neurostimulator

Table 1. Neurostimulator Dimensions and Materials

Feature	Neurostimulator Material
Dimensions	
Electrode size	3 mm
Electrode spacing	3 mm
Neurostimulator length (excluding tether)	44 mm
Neurostimulator diameter	2.3 mm
Materials	
Electrodes, Feedthrough Flanges, Proximal Circuitry Housing	Platinum/Iridium 90/10
Distal Nose, Distal Electrode Array Body, and Tines	Thermoplastic polyurethane
Adhesive connecting device segments	Epoxy
Push Rod Keying feature	Polyetheretherketone (PEEK)
Tethered Suture	Expanded Polytetrafluoroethylene

Table 2. Neurostimulator Specifications

Stimulation Parameter	Neurostimulator Specification
Amplitude	0.2-4.8 V
Pulse width duration	105-945 µs
Pulse frequency	5-100 Hz
Mode	Continuous or Cycling

2. External Components

a) Wireless Transmitter (WT) and Accessories (Charging Pad and Magnet)

The Wireless Transmitter (WT) is an externally worn device used to power and communicate to the neurostimulator and is programmed and controlled using the

Clinician Programmer and Patient Controller. It contains a rechargeable battery that is recharged on the charging pad. Patients are instructed to complete two hours of therapy daily, and the WT needs to be worn for the duration of the daily therapy session. Specifications of the Wireless Transmitter are provided in **Table 3**. Stimulation of the neurostimulator only occurs while the WT is placed over the implant site.

The Charging Pad is used to recharge the Wireless Transmitter, and the Magnet is used to reset the Wireless Transmitter and to turn the Wireless Transmitter off to conserve battery power.

Table 3. Wireless Transmitter Specifications

Feature	Wireless Transmitter Specification
Battery capacity	≥2000 mAh
Battery capacity (therapy time)	~2 hours (will vary with RF power control settings)
Time for full recharge	≤5 hours
Frequency range (powering)	902-928 (ISM compliant band)
Frequency range (Bluetooth)	2.4-2.5GHz

b) Clinician Programmer (CP)

The Clinician Programmer is used by the clinician to manage the Wireless Transmitter associated with the patient's neurostimulator and program a patient's stimulation therapy.

c) Patient Controller (PC)

The Patient Controller is used by the patient to turn the Wireless Transmitter on/off, adjust stimulation amplitude, and select pre-configured stimulation programs.

d) Undergarment

The Neuspera Undergarment is used to place and hold the Wireless Transmitter in the correct position for therapy. The specifically designed pocket will also pad and insulate the Wireless Transmitter against the body. The Undergarment is intended to be worn under general clothing (i.e. pants, shirts, and jackets). It is also compatible with pads and diapers. The Undergarment is available in six sizes, from Extra-Small to XXX-Large in Men's Briefs or Women's Low-Rise Hipster designs.

3. Implantable Sacral Nerve Stimulation (SNS) Tool Kit

The Implantable SNS Tool Kit contains the following tools needed to introduce and implant the neurostimulator:

- The foramen needle is used to locate the foramen, test stimulate the implantation location using the Intraoperative Cable and Ground Pad, and External Stimulator, and introduce the guidewire.
- The pre-dilator provides initial dilation of the neurostimulator introduction pathway.
- The dilator/sheath assembly introduces the sheath to the correct location in the foramen and the sheath introduces the neurostimulator.
- The guidewire is used to place the pre-dilator and dilator/introducer sheath assembly.
- The push rod is a tool used to place the neurostimulator correctly in the foramen through the sheath. The neurostimulator is pre-loaded on the push rod.

4. Trial System

The Trial System is used for trial stimulation to determine efficacy before recommendation for a permanent implant and to test the implant location prior to deployment of the Implantable Neurostimulator. See Figure 3 for Trial System components.

The Trial System consists of the following kits:

- Trial Lead Kit
- Extra Trial Lead
- Procedural Accessories Kit
- External Nerve Stimulator Kit

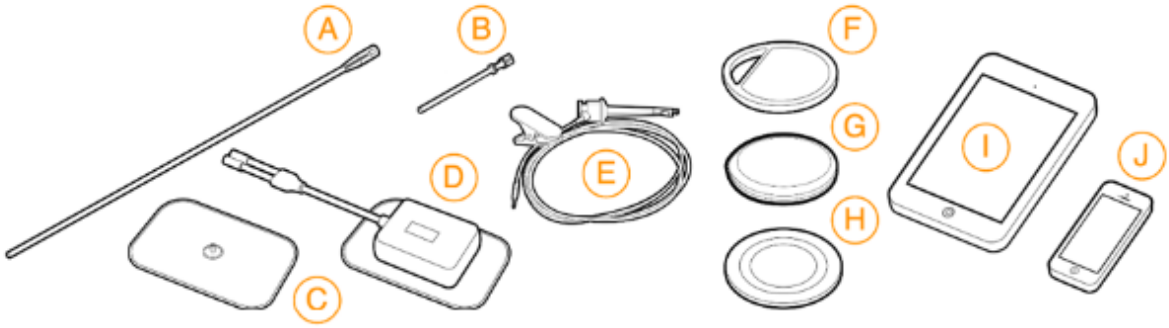


Figure 2. Neuspera Trial System Components
A. Trial Lead with Stylet; B. 3.5" Foramen Needle (protective cap not shown); C. Intraoperative Ground Pad; D. External Stimulator with Ground Pad; E. Intraoperative Cable; F. Wireless Transmitter Magnet; G. Wireless Transmitter; H. Charging Pad; I. Clinician Programmer; J. Patient Controller. Procedural Accessories not shown.

a) Trial Lead with Stylet

The Trial Lead is a temporary lead with a single electrode that allows the electrical pulses from the External Stimulator to be delivered to the sacral nerve. The Trial Lead is placed using a percutaneous procedure. The Trial Lead is introduced through the sacral foramina to allow the electrode at its tip to stimulate the sacral nerve root; the remainder of the Trial Lead exits the skin to be connected to the External Stimulator.

b) External Stimulator with Trial Ground Pad

The External Stimulator is a single-use, non-rechargeable, external device, that provides electrical pulses to stimulate the sacral nerve root by the Trial Lead for up to 7 days. The External Stimulator is placed on an adhesive ground pad on the patient's back for the trialing period (up to 7 days). The Trial System is intended to be used continuously during the stimulation trial. The stimulation parameter ranges for the External Stimulator are listed in **Table 4**. The stimulation parameters, ranges, and waveform from the External Stimulator are identical to the output of the Neuspera implantable neurostimulator.

Table 4. External Stimulator Specifications

Stimulation Parameter	External Stimulator Specification
Amplitude	0.2 – 4.8 V
Pulse width duration	105-945 µs
Pulse frequency	5-100 Hz
Mode	Continuous or Cycling

VI. ALTERNATIVE PRACTICES AND PROCEDURES

There are several other alternatives for the treatment of urinary urge incontinence (UUI). 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.

Non-invasive treatment options should be discussed with all patients, including incontinence management strategies, bladder training, behavioral therapies, pelvic floor exercises, maintaining a healthy weight, and fluid consumption management.

Medications for treatment of UUI may also be considered and include antimuscarinic medications or beta-3 agonists. These medications are taken daily and may have short- or long-term side effects that may affect a patient's ability to take or tolerate them.

For patients that fail to have improvement, cannot tolerate or are not candidates for these treatment options, they may consider minimally invasive therapies. These include sacral neuromodulation, percutaneous tibial nerve stimulation, implantable tibial nerve

stimulation and/or intradetrusor botulinum toxin injection. Percutaneous tibial nerve stimulation provides stimulation of the posterior tibial nerve to send signals to the bladder to reduce UUI episodes. It is an in-office procedure using a percutaneous needle; this technique requires multiple, on-going office visits. Implantable tibial nerve stimulation requires an in-office or hospital surgical procedure to place a stimulator along the posterior tibial nerve to stimulate the nerve. Patients may also receive injections of Botox into the bladder wall. This treatment lasts typically 6-9 months. In some cases, it may lead to urinary retention requiring self-catheterization until the treatment begins to wear off.

VII. MARKETING HISTORY

The Neuspera Sacral Neuromodulation 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, which are risks beyond those normally associated with surgery, some of which may necessitate surgical intervention.

- Adverse change in voiding function (bowel and/or bladder)
- Allergic or immune system response to the implanted materials that could result in device rejections
- Change in sensation or magnitude of stimulation which has been described as uncomfortable (jolting or shocking) by some patients
- Implant erosion
- Implant fracture/failure
- Implant migration
- Electrical shock
- Heating or burn at implant site or site of Wireless Transmitter placement
- Infection
- Lack of effectiveness
- Pain or irritation at implant site
- Reoperation/Revision
- Seroma, hemorrhage, and/or hematoma
- Nerve injury (including numbness)
- Technical device malfunction leading to an adverse event
- Transient electric shock or tingling
- Vulvovaginal pain or pelvic pain
- Unintended nerve activation

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

IX. SUMMARY OF NON-CLINICAL STUDIES

A. Laboratory Studies

Bench testing described in this section were conducted to evaluate the safety and performance of the Neuspera SNM system.

1. Implantable Neurostimulator and Implantable Sacral Nerve Stimulation (SNS) Tool Kit

   Key testing for the Implantable Neurostimulator and Implantable Sacral Nerve Stimulation (SNS) Tool Kit is summarized in the tables below. For every requirement, the acceptance criteria were met (i.e., device passed testing).

   The test results summarized below demonstrate that all applicable Implantable Neurostimulator and Implantable Sacral Nerve Stimulation (SNS) Tool Kit requirements have been verified and that the design outputs meet the design input requirements.

Table 5. Bench Testing Summary – Implantable Neurostimulator – Electrical and Mechanical Requirements

Test	Test Purpose	Acceptance Criteria	Results
Implant – Stimulation Voltage Amplitude Programmability	The characteristics of the output pulses shall be within specified tolerances.	Acceptance criteria will be met if the implant is able to deliver stimulation with a leading-edge pulse amplitude between 0.2 V and 1.0V in steps of 0.1 V with a tolerance of 0.1 V for each programmable value and between 1.0 V and 4.8 V in steps of 0.2 V with a tolerance of 10% for each programmable value into a nominal 1 kΩ load.	Pass
Implant – Stimulation Pulse Duration Programmability	The characteristics of the output pulses shall be within specified tolerances.	Acceptance criteria will be met if the implant stimulation pulse duration is programmable between 105-945 μs in steps of 15us with a tolerance of 10% for each programmable value.	Pass
Implant – Stimulation Pulse Frequency Programmability	The characteristics of the output pulses shall be within specified tolerances.	Acceptance criteria will be met if the implant stimulation pulse frequency is programmable between 5 and 100 Hz in steps of 1Hz with a tolerance of 10% for each programmable value.	Pass
Implant – Polarity Configuration	To verify the implant is capable of specified output configurations.	Acceptance criteria will be met if all 4 electrodes are configurable to +, -, and off.	Pass

Implant – Data Integrity Check	To verify the Implant does not respond to corrupted communication signals.	Acceptance criteria will be met if during reception from the WT, the implant utilizes the data integrity code transmitted by the WT to disregard data that does not pass a data integrity check.	Pass
Implant - Electrodes	To verify the Implant electrodes meet dimensional requirements.	Acceptance criteria will be met if the implant electrodes are measured to have a diameter between 1.25 – 1.45 mm and a length between 2.7 – 3.3 mm.	Pass
Implant – Electrode Spacing	To verify the Implant electrode spacing meet dimensional requirements.	Acceptance criteria will be met if the spacing between each implant electrode is measured to be between 2.7 – 3.3 mm.	Pass
Implant – Maximum Allowable Charge Imbalance	To verify the leakage current is in an acceptable range.	Acceptance criteria will be met if the net DC current stimulation density is $\leq 0.75\ \mu A/mm^2$.	Pass
Implant – Maximum Allowable Stimulation	To verify the stimulation charge density is in an acceptable range.	Acceptance criteria will be met if the implant does not allow $> 30\ \mu C/cm^2$ to or from the implant can regardless of the stimulation setting.	Pass
Implant – X-Ray	To demonstrate implant functionality after X-ray and compatibility with fluoroscopic procedures.	Acceptance criteria will be met if all test articles pass subsequent verification tests for requirements after exposure to 100 mSv or greater of radiation.	Pass
Implant – Insulation Durability	To demonstrate that the electrode array meets mechanical flexure requirements for the specified service life	Acceptance criteria will be met if the electrode array insulation materials are intact after running through a specified number of cycles equivalent to the service life.	Pass
Implant – Hermeticity	To demonstrate that the implant hermetic package leak rate is below limit to maintain functionality for the specified service life	Acceptance criteria will be met if the circuit housing of the implant is hermetic with an acceptable leak rate.	Pass
Implant – Damage Resistance to Maximum WT Power	To demonstrate that the implant shall not be damaged and remains functional after exposure to maximum WT power	Acceptance criteria will be met if the implant meets the acceptance criteria after exposure to 11.55 dBm or greater.	Pass

Implant – Resistance to Chronic Migration	To demonstrate that the implant shall prevent acute or chronic migration	Acceptance criteria will be met if the implant resists posterior and anterior migration with the specified force requirements	Pass
Implant – Chronic Retrieval Force	To demonstrate that the Implant (not including tether) shall withstand typical chronic (>90 days) retrieval forces. Tensile forces up to 30 N applied to the proximal end.	Acceptance criteria will be met if the implant withstands tensile forces applied to the proximal end greater than 30 N.	Pass
Implant – Mechanical Integrity for Implant Deployment and Retrieval	To demonstrate that the implant shall withstand typical use mechanical forces for acutely deploying and retrieving.	Acceptance criteria will be met if the implant maintains electrical continuity after exposure to 5 cycles of specified forces.	Pass
Implant – Electrode Array Flex Durability	The electrode array shall withstand forces from flexing over the specified service life per ISO 14708-3 §23.4 and §23.5.	Acceptance criteria will be met if the electrode array withstands flexing without insulation or conductor compromise over a specified number of cycles equivalent to the service life.	Pass

Where noted, the bench testing in **Table 6** was conducted per ISO 14708-3:2017, Implants for surgery — Active implantable medical devices, Part 3: Implantable Neurostimulators.

Table 6. Bench Testing Summary – Implant & Implant Kit ISO 14708 Requirements

Test	Test Purpose	Acceptance Criteria	Results
Implant – Electrode Insulation Dielectric Strength	To test that the implant has effective functional electrical insulation between conductors	Acceptance criteria will be met if the voltage between each of the four electrodes (E0, E1, E2, E3) and the circuit housing shall be ≤ X mV, where X is calculated based on the following formula: X = Measured Resistor Value X 0.001 mA	Pass
Implant – No Sharp Features	To demonstrate implant has no sharp features per 14708-3 §15.2.	Acceptance criteria will be met if the implant does not have any surface features which contain sharp corners or edges.	Pass

Implant – Maximum Temperature	To verify the implant outer surface temperature shall comply with ISO 14708-3 §17.1.	Implant surface temperature shall be ≤ 39°C.	Pass
Implant – Resistance to Pressure	To demonstrate that the implant is resistant to pressure changes per ISO 14708-3 §25.1.	Implant meets the essential performance requirements following completion of the pressure changes.	Pass
Implant – Resistance to Temperature	To demonstrate that the implant is resistant to temperature per ISO 14708-3 §26.2.	Implant meets the essential performance requirements following completion of the temperature changes:	Pass
Implant – Resistance to Mechanical Forces	To demonstrate that the implant is resistant to mechanical forces per ISO 14708-3 §23.2.	Implant meets essential performance requirements following completion of the mechanical forces.	Pass
Implant – Resistance to Mechanical Shock	To demonstrate that the implant is resistant to mechanical shock per ISO 14708-3 §23.7.	Implant meets essential performance requirements following mechanical shock.	Pass
Implant – Compatibility with Defibrillators	To demonstrate implant is compatible with external defibrillators.	Implant meets essential performance requirements following exposure to defibrillation waveform.	Pass (Note: As described in the device labeling, external defibrillation can cause induced currents in the lead or other system components that can injure the patient.)
Implant – Ultrasound Compatibility	To demonstrate implant is compatible with diagnostic ultrasound	Implant shall remain functional after exposure to diagnostic ultrasound.	Pass

Implant – EM Disturbance	To demonstrate the implant complies with applicable 14708-3 Section 27 (27.104; 27.105; 27.105.1; 27.106; 27.107) requirements.	Implant shall be functional through demonstration of stimulation through all electrodes, implant stimulation, if active, must not increase beyond maximum output (4.8 V), and implant output, if active, maintains charge recovery phase of stimulation equal to positive phase for charge.	Pass (Note: As described in the labeling, electromagnetic interference (EMI) from various sources may damage the device, interfere with device operation, or cause harm to the patient.)
Implant – MRI Compatibility	To demonstrate implant can be safely scanned with MRI under labeled conditions.	The implant shall be MRI Conditional for 1.5 T and 3.0 T normal mode scans up to 1 hour per ISO 14708-3 §22.2.	Pass (Please see paragraph below for additional MRI compatibility testing conducted on the implant.)
Implant – Particulates	To verify there is no unacceptable release of particulate matter when the device is used as intended.	1) Particle counts of size 10 mm or greater are less than or equal 6000 particles in all extracts performed. 2) Particle counts of size 25 mm or greater are less than or equal 600 particles in all extracts performed.	Pass

MR compatibility testing was conducted to demonstrate that the Implant can be safely used in MRI environments (1.5 T and 3.0 T normal mode scans up to 1 hour) and to support MR Conditional labeling, with regards to the potential hazards for a patient undergoing an MRI while implanted with the device. Where appropriate, test methods were derived from the ISO Technical Specification 10974:2018: Assessment of the safety of magnetic resonance imaging for patients with active implantable medical devices (AIMDs) and FDA-2019-D-2837 and Testing and Labeling Medical Devices for Safety in the Magnetic Resonance (MR) Environment. MRI RF heating evaluation was also conducted according to ISO/TS 10974 guidelines using the Tier 2 approach for electrically short device.

The results of this testing demonstrate that patients with the Implant can undergo an MRI at 1.5 T and 3 T for up to 1 hour and support an MR Conditional label for the Implant.

Table 7. Implant Kit Tools – General Requirements

Test	Test Purpose	Acceptance Criteria	Results
Foramen Needle – Insulation Stability	To demonstrate the needle has effective electrical insulation between the distal electrode and proximal contact.	Following completion of ≥ 24 hours of immersion in 9.0g/L of saline at 37°C ± 2, the 3.5" needle shall withstand ≥ 500 VDC for 60 seconds with < 2.5 mA of leakage current.	Pass
Foramen Needle – Typical Forces	To demonstrate the foramen needle can withstand multiple insertion cycles.	The foramen needle shall be undamaged and mechanically functional after undergoing 3 cycles of at least a 5N compressive load.	Pass
Foramen Needle – Lateral Stiffness	To demonstrate that the needle has sufficient lateral stiffness	With the stylet installed to the needle cannula, the lateral stiffness of the 3.5" needle shall be ≥ 8.7 N/m.	Pass
Guidewire – Typical Forces	To demonstrate the guidewire can withstand multiple insertion cycles.	Acceptance criteria will be met if the guidewire withstands at least a 5N insertion force for 3 consecutive cycles without visible or permanent damage.	Pass
Pre-Dilator – Typical Forces	To demonstrate the pre-dilator can withstand multiple insertion cycles.	Acceptance criteria will be met if the pre-dilator withstands at least a 22N insertion force for 3 consecutive cycles without visible or permanent damage.	Pass
Implant Tools – Tine Deployment	The pushrod and implant, when assembled, shall deploy the tines when the implant is placed through the sheath.	Acceptance criteria will be met if the tines deploy after passing through the sheath.	Pass
Foramen Needle – Stimulation Parameters	The foramen needle shall be able to deliver the full range of stimulation parameters.	The foramen needle shall deliver at least a 5 mA stimulation pulse with a 945 µs pulse width, 100 Hz pulse frequency, and voltage drop less than 100mV.	Pass

Foramen Needle – Insertion Force	To demonstrate the needle insertion force does not exceed acceptable limits	Needle insertion force shall be less than 4 N when inserted into a tissue surrogate polyurethane film	Pass
Foramen Needle – Charge Density	To demonstrate that the uninsulated distal needle electrode has sufficient surface area to not allow unacceptable density charge	With at least a 5 mA stimulation amplitude, the charge density of the distal electrode of the needle shall be <= 30 C/cm^2.	Pass

2. Wireless Transmitter (WT)

Key testing for the Wireless Transmitter (WT) and accessories is summarized in the tables below. For every requirement, the acceptance criteria were met (i.e., device passed testing).

The test results summarized below demonstrate that all applicable Wireless Transmitter (WT) and accessories requirements have been verified and that the design outputs meet the design input requirements.

Where noted, the bench testing in **Table 8** was conducted per the following:

- Federal Communications Commission requirements,
- IEC 60601-1:2005, Medical Electrical Equipment -- Part 1: General Requirements Basic Safety and Essential Performance, 3rd edition,
- IEC 60601-1-2:2014, Medical electrical equipment - Part 1-2: General requirements for basic safety and essential performance - Collateral Standard: Electromagnetic disturbances - Requirements and tests,
- IEC 60601-1-11:2015: General requirements for basic safety and essential performance — Collateral standard: Requirements for medical electrical equipment and medical electrical systems used in the home healthcare environment

Table 8. FCC, IEC 60601-1, IEC 60601-1-2, And IEC 60601-1-11 Compliance Testing

Test	Test Purpose	Acceptance Criteria	Results
WT-Enclosure Electrical Safety	To demonstrate the WT complies with applicable IEC 60601-1 electrical enclosure requirements.	The WT enclosure shall comply with the following IEC 60601-1 material integrity requirements: i. be at least 0.4 mm thick between interior and exterior per IEC 60601-1 8.8.2 ii. Withstand 3000 V AC Hipot, Dielectric testing per IEC 60601-1 8.8.3	Pass

		iii. Include 3.4 mm creepage distance and 1.6 mm air clearance at seams	
WT - Enclosure Heat and Environmental Stress Resistance	To demonstrate the WT complies with applicable IEC 60601-1 Enclosure Heat and Environmental Stress requirements.	The WT enclosure shall be resistant to heat per 60601-1 8.8.4.1 and environmental stresses per 60601-1 8.8.4.2.	Pass
WT- Enclosure Mechanical Safety	To demonstrate the WT complies with applicable IEC 60601-1 mechanical requirements.	The WT shall withstand: i. Push, per IEC 60601-1 §15.3.2 ii. Impact, per IEC 60601-1 §15.3.3 iii. Drop, per ISO 14708-3 §23.1, IEC 60601-1 §15.3.4.1, IEC 60601-1 §15.3.4.2 iv. Mold stress relief per IEC 60601-1 §15.3.6 v. Shock and vibration per IEC 60601-1-11 §10.1.2	Pass
WT - Applied Part	To demonstrate the WT complies with applicable body worn floating device requirements.	The WT shall be subjected to the requirements for applied parts (Class BF).	Pass
WT- Transportable and Storage Conditions per IEC 60601-1-11	To demonstrate the WT complies with applicable IEC 60601-1 requirements.	The WT shall remain functional following transportation and storage conditioning for up to 1 month in the following environmental conditions after the WT has been removed from its protective packaging and subsequently between uses per IEC 60601-1-11 §4.2.2. • -10 °C to +5°C • +5 °C to + 35°C at relative humidty (RH) up to 90%, non-condensing • >35 °C to 55 °C at a water vapor pressure up to 50 hPa	Pass
WT- Environmental Operating Conditions	To demonstrate the WT complies with applicable IEC 60601-1 requirements.	The WT shall comply with its specifications under the following environmental conditions per IEC 60601-1-11 §4.2.3.1 • +5 °C to +40 °C; • a RH range of 15% to 90%, noncondensing and not requiring a vapor partial pressure greater than 50 hPa; and • an atmospheric pressure range of 700 hPa to 1060 hP	Pass

WT-Flammability Rating	To demonstrate the WT complies with applicable IEC 60601-1 enclosure flammability requirements.	The WT enclosure and PCB shall have a flammability rating FV-2 or better per IEC 60601-1 §11.3.	Pass
WT-Enclosure Material Insulation	To demonstrate the WT complies with applicable IEC 60601-1 enclosure material insulation requirements.	The WT enclosure material shall be typical insulating electronic enclosure material such as ABS or polycarbonate with no exposed electrical conductors [to limit leakage currents] per IEC 60601-1 §8.7.4.	Pass
WT - Battery Protection	To demonstrate the WT battery complies with applicable IEC 60601-1 requirements.	The WT battery shall be equipped with protection circuitry preventing excessive discharge to be compliant with IEC 60601-1 ed3 §15.4.3	Pass
WT-Electrostatic Discharge (ESD)	To demonstrate the WT complies with applicable IEC 60601-1-2 requirements	The WT shall meet essential performance requirements following exposure to ESD per 60601-1-2 test, ESD 61000-4-2 class 4.	Pass
WT – Electromagnetic Compatibility (EMC) IEC 60601-1-2 Compliance	To demonstrate the WT complies with applicable IEC 60601-1-2 requirements	The WT shall be EMC compliant per IEC 60601-1-2, class B.	Pass
WT- EMC IEC 60601-4-2 compliance	To demonstrate the WT complies with applicable requirements of IEC/TR 60601-4-2 Ed. 1.0 en:2016 Medical electrical equipment - Part 4-2: Guidance and interpretation - Electromagnetic immunity: performance of medical electrical equipment and medical electrical systems	The WT shall be EMC compliant per IEC 60601-4-2	Pass
WT - Maximum Touch Temperature during Therapy	To demonstrate that the WT maximum enclosure surface during therapy with the garment does not become too hot	The WT maximum enclosure surface touch temperature during therapy with the garment shall not exceed 60 °C at any time per IEC 60601-1.	Pass

WT - Maximum Wearable w/ WT Skin Temperature during Therapy	To demonstrate that the Wearable with WT during therapy does not become too hot.	The WT maximum Wearable with WT skin surface temperature during therapy shall not exceed 43 °C per IEC 60601-1.	Pass

Table 9. Wireless Transmitter Bench Testing

Test	Test Purpose	Acceptance Criteria	Results
WT - Charge Battery Temperature Controls	To verify WT temperature limits operation within the battery's specifications.	The WT shall limit battery temperature in accordance with the battery manufacturer's specifications.	Pass
WT - Temperature Control Loop	To verify the WT shuts down stimulation if the temperature control loop malfunctions to ensure thermal safety	The WT shall detect and not allow stimulation if temperature control loop is not functional.	Pass
WT - Discharge Temperature Controls	To demonstrate the WT has adequate temperature controls to cease stimulation if the WT becomes too hot	The WT shall cease therapy delivery until the battery temperature has dropped below the overheat threshold of 60°C and shall automatically resume therapy delivery when the temperature drops to below <=58°C.	Pass
WT - Battery Operation Duration	To demonstrate the WT's battery operation duration is acceptable for the duration of treatment	The WT's battery shall be sufficient for at least 2 hours of operation under typical use conditions.	Pass
WT - Service Life Durability	To demonstrate the WT performs as intended during its service life	The WT shall have a minimum operational service life of 1 year based on 1 battery full discharge and full recharge cycle per day.	Pass

Table 10. WT Charger and Battery Verification

Test	Test Purpose	Acceptance Criteria	Results
WT Charger- WT Battery Charge Time	To demonstrate the WT charges within the specified time	Acceptance criteria will be met if the charger is able to charge the WT to a state of charge level of 95% or greater in 5 hours.	Pass

WT- Lithium Ion Battery IEC 62133-2 Compliance	To demonstrate WT battery complies with requirements of IEC 62133-2 Ed. 1.1 b:2021 Secondary cells and batteries containing alkaline or other non-acid electrolytes - Safety requirements for portable sealed secondary lithium cells, and for batteries made from them, for use in portable applications - Part 2: Lithium systems.	The WT batteries shall comply with requirements of IEC 62133-2.	Pass

3. System, Clinician Programmer, and Patient Controller

Key system testing, including the Clinician Programmer and Patient Controller, is summarized in the tables below. System testing included testing of all components together. For every requirement, the acceptance criteria were met (i.e., device passed testing).

The test results summarized below demonstrate that all applicable system testing, including the Clinician Programmer and Patient Controller requirements have been verified and that the design outputs meet the design input requirements.

Table 11. Bench Testing Summary - System

Test	Test Purpose	Acceptance Criteria	Results
System - IEC 60601-1, 60601-1-2, and 60601-1-11 Compliance	To demonstrate basic safety and essential performance of medical electrical equipment	The system shall be compliant with IEC 60601-1, 60601-1-2, 60601-1-11.	Pass
System - ISO 14708-1 and 14708-3 Compliance	To demonstrate the system requirements for active implantable medical devices are acceptable per ISO 14708-1 and 14708-3.	The system shall be compliant with ISO 14708-1 and 14708-3.	Pass

System - WT Offset Distance	The system shall provide therapy stimulation with an WT offset distance of 3cm at nominal settings.	The system shall provide nominal stimulation settings under the following use conditions for at least 5 cm depth in phantom (including 5mm shell and >45mm fluid phantom fluid): • 30 degree radial angle • WT-implant displacement conditions: +30mm X-displacement, -30mm X displacement, +30mm Y-displacement, 30mm Y-displacement • +60 and -60 degree axial angle • at nominal stimulation settings (1V Amplitude, 14Hz Freq, 210us Pulse Width)	Pass
System - Continuous Stimulation During Therapy	The system shall be able to provide continuous stimulation for the treatment duration	The system shall be able to provide daily 4 hours of continuous stimulation (with the exception of the WT replacement after 2 hours of therapy).	Pass
System - RF Power Setting	To demonstrate the system can set the average WT RF output power needed to power the implant.	The system shall be capable of setting the average WT RF output power used for powering the implant.	Pass
System - Clinician Programmer Stimulation Settings	The clinician programmer and WT placed adjacent to the trial stimulator, stimulation settings parameters can change settings parameters	Using the clinician programmer and WT placed adjacent to the trial stimulator, stimulation settings parameters shall be changed including: • Change from left to right lead stimulation output • Start and Stop stimulation • Adjust stimulation frequency, amplitude, pulse width	Pass

System - Patient Controller Stimulation Settings	To demonstrate the patient programmer and WT placed when adjacent to the trial stimulator, stimulation settings parameters can change settings parameters	Using the patient programmer and WT placed adjacent to the trial stimulator, stimulation settings parameters shall be changed including: • Change from left to right lead stimulation output • Start and Stop stimulation •Adjust stimulation amplitude	Pass

4. Trial System

Key system testing for the Trial System, including the Trial System Kit, Trial Lead Kit, Procedural Accessories Kit, and External Procedure Kit is summarized in the tables below. For every requirement, the acceptance criteria were met (i.e., device passed testing).

The test results summarized above demonstrate that all applicable system testing, including the Clinician Programmer and Patient Controller requirements have been verified and that the design outputs meet the design input requirements.

Table 12. Bench Testing Summary - Trial System Kit

Test	Test Purpose	Acceptance Criteria	Results
Trial Foramen Needle - Lateral Stiffness	To demonstrate that the needle has sufficient lateral stiffness	The foramen needle lateral stiffness range shall be greater than 8.7 N/m with stylet installed.	Pass
Trial Foramen Needle - Insulation Stability	To demonstrate the needle has effective electrical insulation between the distal electrode and proximal contact.	After immersion in 9.0 g/L saline for a minimum of 24 hours at 37 °C, the insulated region shall withstand 500 volts DC for 60 seconds minimum without dielectric breakdown.	Pass
Trial Foramen Needle - Typical Forces	To demonstrate the foramen needle is compatible with the lead and can withstand multiple insertion and removal cycles.	The foramen needle shall withstand typical insertion forces (5N) up to three times	Pass
Trial Foramen Needle – Stimulation Parameters	The foramen needle shall be able to deliver the stimulation parameters.	The foramen needle shall be able to deliver up to 5 mA stimulation pulse amplitude, 945 µs pulse width, and 100 Hz pulse frequency.	Pass
Trial Foramen Needle – Typical Forces	The foramen needle shall withstand typical insertion forces	The foramen needle shall withstand typical insertion forces (5N) up to three times.	Pass

Trial Foramen Needle – Charge Density	The uninsulated distal needle electrode has sufficient surface area to not allow unacceptable charge density	The uninsulated distal needle electrode shall be sufficient in surface area to not allow > 30 uC/cm^2 to or from the needle at 5mA stimulation amplitude	Pass
Trial Lead - Insertion Force in Needle	To demonstrate that the lead and needle meet specified interface requirements for insertion force	Trialing lead shall fit through the 3.5" foramen needle with less than 1.5 N of force.	Pass
Trial Lead - Foramen Needle Compatibility – Insertion and Removal	To demonstrate the trial lead is compatible with the foramen needles and can withstand multiple insertion and removal cycles.	Trial Lead shall be able to withstand three cycles of insertion and removal from the foramen needle	Pass
Trial Lead - Markers for Electrode Exit from Needle	To verify that the trial lead meets user interface requirements for lead placement.	The Trial lead shall have visual markers to denote that when the distal portion of the trial lead marker is at the needle hub, the distal tip of the trial lead electrode and distal needle tip match.	Pass
Trial Lead - Stylet from Lead Retention Force	To demonstrate that the lead and stylet meet specified interface requirements for insertion force	The force to remove the stylet from the trialing lead shall be < 1 N.	Pass
Trial Lead – Stylet Lateral Stiffness	To demonstrate that the stylet lateral stiffness is acceptable	The stylet lateral stiffness shall be greater than 3.8 N/m with the applied force applied at a stylet length of 1 cm and a displacement of 1 cm.	Pass
Trial Lead - DC Resistance	To demonstrate the DC resistance of the lead is within specification.	The DC resistance from proximal tip to the distal electrode shall be ≤ 250 ohms.	Pass
Trial Lead - Proximal Pin Insertion Cycles	To demonstrate the number of connection cycles with the External Stimulator	The trial lead connector shall be capable of insertion and removal from the trial stimulator for a minimum of 3 cycles.	Pass
Trial Lead - Stimulation Output	To demonstrate the trial lead is capable of delivering maximum stimulation parameters	The trialing lead shall be able to deliver up to 5 mA stimulation pulse amplitude, 945 µs pulse width, and 100 Hz pulse frequency.	Pass

Trial Lead - Distal Cyclic Flexure Strength	To demonstrate the distal lead body can withstand repeated flexure.	The trial lead shall withstand flexure cycling (90 degrees) at a rate of 2 Hz for > 1,000 cycles without mechanical or electrical damage.	Pass
Trial Lead - Maximum Tensile Force, elongation	To demonstrate the lead remains electrically and mechanically intact after sustained elongation and the lead has adequate tensile strength	The Trial Lead shall withstand 20% elongation for ≥ 1 minute. DC resistance shall be ≤ 250 ohms after the testing. The proximal electrode tip shall be secured to the coiled lead body with a tensile force of ≥ 5 N	Pass
Trial Lead - Proximal Cyclic Flexure Strength	To demonstrate the proximal lead body can withstand repeated flexure.	The proximal region at the proximal contact junction shall withstand flexure cycling (+ 45 degrees) at a rate of 2 Hz for a minimum of 2,000 cycles without mechanical or electrical damage.	Pass
Trial Lead - Leakage Current	To test that the lead has effective functional electrical insulation between conductors	The insulation of the trial lead shall withstand immersion in saline for a minimum of 10 days at 37°C, such that the leakage current between the conductor and a reference electrode shall be < 9 uA when tested to a minimum of 10 volts DC per ISO 14708-1 clause 16.3	Pass
Trial Lead - Crush Resistance	To demonstrate the lead remains mechanically intact and capable of normal operation following exposure to a crush force.	The trial lead shall remain mechanically intact and maintain electrical conductivity without insulation damage following a 200 lb load.	Pass
Trial Lead - Abrasion Resistance	To demonstrate the lead remains mechanically intact and capable of normal operation following exposure to abrasion.	The trial lead shall remain mechanically intact and maintain electrical conductivity without insulation damage following typical 7-day abrasion forces.	Pass

Table 13. Bench Testing Summary – External Procedure Kit

Test	Test Performed	Acceptance Criteria	Results
External Stimulator - Crush Resistance	To demonstrate the External Stimulator remains mechanically intact and capable of normal operation following exposure to a crush load.	The external stimulator remains mechanically intact and capable of normal operation after application of 200lb load on top surface.	Pass
External Stimulator - Case Deflection Resistance	To demonstrate the External Stimulator remains mechanically intact and capable of normal operation following exposure to an enclosure deflection load.	The external stimulator remains mechanically intact and capable of normal operation after application of 200lb deflection load at center of top surface applied with circular, flat deflection source <30mm diameter.	Pass
External Stimulator - Abrasion Resistance	To demonstrate the External Stimulator remains mechanically intact and capable of normal operation following exposure to an enclosure abrasion.	The external stimulator remains mechanically intact and capable of normal operation after application typical 7-day abrasion mechanical forces.	Pass
External Stimulator - Size and Weight	To demonstrate External Stimulator meets volume and weight requirements.	External Stimulator excluding cable shall be less than 33 cc in volume and less than 53.9g in weight	Pass
External Stimulator - Change Balance	To verify the leakage current is in an acceptable range.	The external stimulator shall not allow net DC current stimulation current density in excess of 0.75 uA / mm2	Pass
External Stimulator - Current Density	To verify the stimulation charge density is in an acceptable range.	The external stimulator shall not allow > 30 uC/cm2 to or from the lead regardless of stimulation setting.	Pass
External Stimulator - Configurations	To verify the External Stimulator is capable of specified configurations.	The external stimulator shall be configurable for the following: Left lead anode, right lead cathode Left lead cathode, right lead anode Left lead cathode, ground pad anode Right lead cathode, ground pad anode	Pass

External Stimulator - Stimulation Voltage Amplitude Programmability	The characteristics of the output pulses shall be within specified tolerances.	The external stimulator shall deliver stimulation with a leading-edge pulse amplitude between 0.2 V and 1.0V in steps of 0.1 V with a tolerance of 0.1 V for each programmable value and between 1.0 V and 4.8 V in steps of 0.2 V with a tolerance of 10% for each programmable value into a nominal 1 kΩ load.	Pass
External Stimulator - Stimulation Pulse Duration Programmability	The characteristics of the output pulses shall be within specified tolerances.	The external stimulator pulse duration shall be programmable between 105-945 μs in steps of 15us with a tolerance of 10% for each programmable value.	Pass
External Stimulator - Stimulation Pulse Frequency Programmability	The characteristics of the output pulses shall be within specified tolerances.	The external stimulator pulse frequency shall be programmable between 5 and 100 Hz in steps of 1Hz with a tolerance of 10% for each programmable value.	Pass
External Stimulator - E-Stop	To verify the External Stimulator is capable of being turned off through an alternative means.	The External Stimulator shall include an additional mechanism to stop stimulation without WT and Patient Controller	Pass
External Stimulator - Continuous Operation	To verify the External Stimulator meets specifications for up to 7-day service life.	The external stimulator shall be capable of continuous stimulation for at least 7 days (24 hours/day) of operation under 4.8V, 210us pulse with, 14 Hz, 1k ohm impedance stimulation.	Pass
External Stimulator – Data Integrity Check	To verify the External Stimulator does not respond to corrupted communication signals.	During reception from the WT, the External Stimulator will use the data integrity code transmitted by the WT to disregard data that does not pass a data integrity check.	Pass
External Stimulator - No sharp edges	To demonstrate the External Stimulator complies with applicable IEC 60601-1 requirements.	The External Stimulator shall have no rough surfaces or sharp edges/corners per ISO 60601-1 §9.3.	Pass

External Stimulator - Enclosure Electrical Safety	To demonstrate the External Stimulator complies with applicable IEC 60601-1 requirements.	The External Stimulator enclosure shall comply with the following IEC 60601-1 material integrity requirements: i. be at least 0.4 mm thick between interior and exterior IEC 60601-1 8.8.2 ii. Withstand 3000 V AC Hipot, Dielectric testing per IEC 60601-1 §8.8.3 iii. Include 3.4 mm creepage distance and 1.6 mm air clearance at seams	Pass
External Stimulator - Enclosure Material Insulation	To demonstrate the External Stimulator complies with applicable IEC 60601-1 requirements.	The External Stimulator enclosure material shall be typical insulating electronic enclosure material such as ABS or polycarbonate with no exposed electrical conductors per IEC 60601-1 §8.7.4.	Pass
External Stimulator - Enclosure Mechanical Safety	To demonstrate the External Stimulator complies with applicable IEC 60601-1 mechanical requirements.	The External Stimulator shall withstand: i. Push, per IEC 60601-1 §15.3.2 ii. Impact, per IEC 60601-1 §15.3.3 iii. Drop, per ISO 14708-3 §23.1, IEC 60601-1 §15.3.4.1, IEC 60601-1 §15.3.4.2 iv. Mold stress relief per IEC 60601-1 §15.3.6 v. Shock and vibration per IEC 60601-1-11 §10.1.2	Pass
External Stimulator - Environmental Operating Conditions	To demonstrate the External Stimulator complies with applicable IEC 60601-1-11 requirements.	The External Stimulator shall comply with its specifications under the following environmental conditions per IEC 60601-1-11 §4.2.3.1: +5 °C to +40 °C; a RH range of 15% to 90%, non-condensing and not requiring a vapor partial pressure greater than 50 hPa; and an atmospheric pressure range of 700 hPa to 1060 hP	Pass
External Stimulator - No removable small parts per IEC 60601-1-11	To demonstrate the External Stimulator complies with applicable IEC 60601-1-11 requirements.	The External Stimulator shall have no removable small parts per 60601-1-11 Section 9.	Pass

External Stimulator - Applied Part BF	To demonstrate the External Stimulator complies with applicable requirements for body worn floating devices.	The External Stimulator shall be subjected to the requirements for applied parts (Class BF).	Pass
External Stimulator - Maximum Temperature during Therapy	To demonstrate the External Stimulator complies with applicable IEC 60601-1 requirements.	The External Stimulator maximum temperature during therapy shall not exceed 43 °C at any time per IEC 60601-1	Pass
External Stimulator - Transportable and Storage Conditions per IEC	To demonstrate the External Stimulator complies with applicable IEC 60601-1-11 requirements.	The External Stimulator shall remain functional following transportation and storage conditioning for up to 1 month in the following environmental conditions after the External Stimulator has been removed from its protective packaging and subsequently between uses per IEC 60601-1-11 §4.2.2. • -10 °C to +5 °C • +5 °C to + 35 °C at RH up to 90%, non-condensing • >35 °C to 55 °C at a water vapor pressure up to 50 hPa	Pass
External Stimulator - ESD	To demonstrate the External Stimulator complies with applicable IEC 60601-1-2 requirements.	The External Stimulator shall meet essential performance requirements following exposure to ESD per 60601-1-2 test, ESD 61000-4-2 class 4.	Pass
Trial Test Stimulation Cable - Resistance	To demonstrate the DC resistance of the cable is within specification.	The test stimulation cable shall have a resistance of <150 ohms.	Pass

5. Sterility

Several of the Neuspera components are provided in sterile packaging:

- Implantable Sacral Nerve Stimulator Kit ("Implant Kit")
- Foramen Needle
- Trial Lead/Stylet
- Intraoperative Cable

All components are sterilized by ethylene oxide (EO). The Implant Kit is provided in a Tyvek breather bag with a Tyvek tray lid. The remaining components are provided in a double barrier Tyvek pouch system.

The Neuspera components that are provided sterile are terminally sterilized using a 100% ethylene oxide (EO) sterilization cycle. Validation of the sterilization process demonstrates a Sterility Assurance Level (SAL) of 10^{-6} and complies with ANSI/AAMI/ISO 11135-1:2007 *Sterilization of health care products - Ethylene oxide - Part 1: Requirements for development, validation, and routine control of a sterilization process for medical devices*. Sterilant residuals conform to the maximum allowable limits of EO and Ethylene Chlorohydrin (ECH) residuals specified in ISO 109937: 2008 *Biological Evaluation of Medical Devices - Part 7: Ethylene Oxide Sterilization Residuals.* The bacterial endotoxin limits are based on FDA's Guidance for Industry - *Pyrogen and Endotoxins Testing: Questions and Answers* (June 2012) and were verified using Limulus Amebocyte Lysate (LAL) testing.

6. Reprocessing

   All other Neuspera manufactured system components, that are not sterile, are provided non-sterile and do not need to be sterilized prior to use. Reprocessing instructions in the labeling are in accordance with 2015 FDA guidance document, "*Reprocessing Medical Devices in Health Care Settings: Validation Methods and Labeling*," and 2001 FDA guidance document, "*Guidance on Medical Device Patient Labeling."*

7. Biocompatibility

   Biocompatibility testing was performed for all the patient-contacting materials of the Neuspera SNM System in accordance with the FDA Guidance Document, *Use of International Standard ISO 10993-1,"Biological evaluation of medical devices - Part 1: Evaluation and testing within a risk management process*". All biocompatibility studies were conducted in compliance with Good Laboratory Practices (GLP), 21 CFR Part 58.

   The following biocompatibility endpoints were assessed:

   - The Implantable Sacral Nerve Stimulator (Implant) is an implant device, contacting tissue/bone for long-term duration (>30 days)
     - Cytotoxicity
     - Sensitization
     - Intracutaneous Irritation
     - Material Mediated Pyrogenicity
     - Implantation
     - Genotoxicity
     - Chronic systemic toxicity
     - Chemical characterization followed by Toxicological Risk Assessment of compounds extracted from the device to evaluate acute and subacute/subchronic systemic toxicity, and carcinogenicity

- All Implant Tools are external communicating devices, contacting tissue/bone for limited duration (<24 hours)
    - Cytotoxicity
    - Intracutaneous Irritation
    - Material Mediated Pyrogenicity
    - Sensitization
    - Acute Systemic Toxicity

- Trial Lead and Stylet are considered external communicating devices, contacting tissue/bone for prolonged duration (>24 hours, up to 7 days)
    - Cytotoxicity
    - Intracutaneous Irritation
    - Sensitization
    - Material Mediated Pyrogenicity
    - Implantation
    - Chemical characterization followed by Toxicological Risk Assessment of compounds extracted from the device to evaluate acute and subacute/subchronic systemic toxicity, and genotoxicity

- Wireless Transmitter is a surface device contacting intact skin for long-term duration (>30 days)
    - Cytotoxicity
    - Intracutaneous Irritation
    - Sensitization

- Trial ground pad is a surface device contacting intact skin for prolonged contact (>24 hours, up to 7 days)
    - Cytotoxicity
    - Intracutaneous Irritation
    - Sensitization

- Intraoperative ground pad is a surface device contacting intact skin for limited contact (< 1 hour)
    - Cytotoxicity
    - Intracutaneous Irritation
    - Sensitization

- Undergarment is a surface device contacting intact skin for long-term contact (>30 days)
    - Cytotoxicity
    - Intracutaneous Irritation
    - Sensitization

The results of testing demonstrate that all components of the Neuspera SNM System are biocompatible.

8. Packaging and Shelf Life

   The shelf life of Neuspera SNM System kits containing sterile components are provided in **Table 14** below. Packaging was conducted per ISO 11607-1: 2019, *Packaging for Terminally Sterilized Medical Devices.* The results demonstrate that the packaging maintains the sterility of the device components. Shelf life testing demonstrated that the device adequately maintains its performance and the packaging maintains its sterility over the claimed shelf life (**Table 14**).

   All other components of the Neuspera SNM System do not have a designated shelf life.

Table 14. Shelf Life of Neuspera SNM System Kits with Sterile Components

Component	Shelf Life
Implant Kit	1 year
Trial System Kit	4 months
Trial Lead Kit	4 months
Procedural Accessories Kit	4 months
External Procedure Kit	4 months

9. Software Verification and Validation

   Software development was based on IEC 62304:2006, *Medical device software -- Software life cycle processes* and is controlled in a lifecycle consistent with this standard. The software documentation were provided in accordance with the FDA Guidance Document entitled, "*Content of Premarket Submissions for Device Software Functions*," issued on June 14, 2023.

   Software and firmware were tested to ensure that the functional requirements as defined in the product software, and firmware requirements were met.

10. Cybersecurity

    Cybersecurity assessment and evaluation of the Neuspera SNM System was conducted in accordance with the FDA Guidance Document entitled, "*Cybersecurity in Medical Devices: Quality System Considerations and Content of Premarket Submissions,*" issued on September 27, 2023, and AAMI TIR 57:2016, *Principles for medical device security – Risk management*.

11. Wireless

    Wireless testing of the Neuspera SNM System was conducted in accordance with the FDA Guidance Document entitled, "*Radio Frequency Wireless Technology in Medical Devices*" issued on August 14, 2013.

B. Animal Studies

Animal studies were conducted to determine the safety and performance of the proposed device design prior to clinical use. Testing demonstrated that the device met the study endpoints. Key information from the animal studies is summarized in **Table 15** below.

Table 15. Summary of Pre-Clinical Animal Studies

Study	Objective	Results & Conclusions
A GLP, 90 Days Chronic Study in Ovine to Evaluate the Final Device Design	Evaluate the safety and performance of the final device design in a GLP study.	Overall implant and removal of the non-functional devices at 2-weeks and 90-days was completed without sequelae. The results from the chemistry, hematology and histopathology reports were all within normal limits. The histopathology data and lack of adverse events observed in this study supported the subject device safety for clinical use.
A non-GLP, Chronic, Awake, Urodynamic Baseline Study in Ovine	Assess the in vivo functional performance (i.e., ambulatory stimulation) of the sacral nerve neurostimulator for the study duration (110 days). A secondary objective was to monitor for any potential chronic safety issues (>2 month) related to the implant(s).	Two neurostimulators were implanted following the Implant Kit IFU developed for the pivotal study. Both implants could be successfully powered with the mid-field powering technology through at least one week post-operatively. The implant in the right S3 foramen remained functional through at least the first 14 days post-operatively and could be powered using a prototype Wireless Transmitter (same hardware, same core firmware) for up to at least 8 hours. The devices were still functional at 110 days post-implant.
A GLP Study in Ovine to Evaluate a Novel Wireless Implantable Device for Sacral Nerve Stimulation	Assess the Neuspera wireless implantable device system and evaluate the ability to implant and remove the device, as well as to ensure that the device works as intended after implantation.	After implantation, once the sheep was standing, testing was performed using the wireless transmitter (WT) and clinician programmer. The device could be adequately implanted and activated, demonstrating acceptable thresholds using the two controllers. The device could be adequately removed without significant tissue trauma, signs of hemorrhage or other overt pathological findings. This was an acute study (recovered from anesthesia, assessed, then euthanized).

C. Additional Studies

1. Human Factors and Usability

Two usability studies for the intraoperative workflow steps related to the Trial System were conducted with patient and clinical users. The first trial system usability study included 17 clinicians who currently implant sacral neuromodulation systems to test the clinician use flows. The second trial system usability study included 15 lay people to test the patient use flows. The validation testing showed that the manuals, training, and system use steps for the trial system allowed the users to complete the critical tasks with no use errors or problems that could result in serious harm.

Additionally, a Usability study for the permanent system was conducted with patient users. This study included 20 lay people to test patient use flows. This validation included a knowledge assessment of warnings and cautions, some of which were defined as critical tasks. The validation testing shows that the manuals, training, and system use steps were adequate to demonstrate that the device can be used by the intended users without serious use errors or problems, for the intended uses and under the expected use conditions. Users were able to complete the critical tasks with no use errors or problems that could result in serious harm.

A separate Usability study for the permanent system was conducted as a knowledge assessment for clinicians. For this study, 16 clinicians were recruited who watched a training video focused on the permanent system and associated critical tasks. These steps included the identification of correct and incorrect placement of the implant. The clinicians then were asked to complete a knowledge assessment. This validation testing showed that the video was sufficient to train clinicians on the correct placement of the device and the identification of critical tasks for the permanent system. To address some use-related errors, clinicians are required to be trained on the use of the device. Additionally, trained Field Clinical Engineers (FCEs) must be present at each trial procedure and permanent implant to ensure that clinicians understand both the device and the procedure. FCE training consists of one-on-one didactic training with the FCE manager, shadowing at least two procedures with an experienced FCE, and then being proctored by an experienced FCE prior to attending procedures alone. FCE clinical checklists will be required to be completed for each procedure.

X. SUMMARY OF PRIMARY CLINICAL STUDY

The applicant performed a clinical study to establish a reasonable assurance of safety and effectiveness of sacral electrical stimulation with the Neuspera SNM System for treatment of the symptoms of urinary urge incontinence (UUI) in patients who have failed, could not tolerate, or were not a candidate for more conservative treatments in the US and EU under IDE # G190064. Data from this clinical study were the basis for the PMA approval decision. A summary of the pivotal clinical study, Clinical Study of

Neuspera's Implantable Sacral Nerve Stimulation (SNS) System in Patients with Symptoms of Urinary Urgency Incontinence (UUI) (the SANS-UUI study), is presented below.

A. Study Design

Subjects were enrolled in the pivotal study beginning on June 8, 2022, and treated between September 28, 2022, and December 5, 2023. The database for this PMA reflected data collected through January 16, 2025, at the 12-month data lock, and included 242 subjects with 130 of those subjects undergoing attempted implant placement. There were 34 investigational sites activated, 31 investigational sites that enrolled and 25 investigational sites that implanted subjects.

The study was a prospective, multi-center, single-arm clinical study designed to evaluate the safety and effectiveness of the Neuspera SNM System. The study included patients with UUI who have failed, could not tolerate, or were not a candidate for more conservative treatments.

1. Clinical Inclusion and Exclusion Criteria

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

1. Is willing and able to understand and has voluntarily signed and dated the current approved informed consent.
2. Is male or female 22 years of age or older.
3. Has a Body Mass Index (BMI) greater than or equal to 18 and less than or equal to 40 kg/m2.
4. Is a good surgical candidate and is capable of participating in all testing and follow-up clinic visits associated with this clinical study and is capable of independently using the system components as described in the Patient Manual.
5. Is ambulatory and able to use toilet without assistance.
6. Has a diagnosis of UUI for greater than or equal to 6 months prior to the screening baseline visit date.
7. Has typical residual bladder volume <150 cc tested within 6 months prior to the screening baseline visit date or is willing to have a test at screening baseline visit.
8. Has urodynamic testing (uroflowmetry, cystometry, and pressure flow) completed within 6-months prior to the screening baseline visit date or is willing to have testing at the screening baseline visit.
9. Has cystoscopy testing completed within 6 months prior to the screening baseline visit date or is willing to have a test at the screening baseline visit.
10. Has failed or was not a candidate for more conservative treatment (e.g., pelvic floor exercise, biofeedback, behavioral modification)
11. Has failed, could not tolerate (stopped taking medication due to lack of efficacy or intolerable side effects), or not a good candidate for (as determined

by treating physician) at least one (1) antimuscarinic or β3 adrenoceptor agonist medication.

12. Is willing and able to washout (at least five half-lives) from OAB medications for a period determined appropriate based on type of OAB medication prior to the baseline bladder diary and remain off OAB medications through the 12-month follow-up visit.
13. Has appropriate sacral anatomy as determined by sponsor's and investigator's analysis of radiographic imaging. (The distance from the surface of the skin in the prone and seated position to the bone edge of the S3 foramen must be within the capabilities of the system).

Baseline Bladder Diary Inclusion Criteria:

14. Has a diagnosis of UUI with at least 4 UUI episodes on a 72 - hour diary, and minimum of one (1) UUI episode per 24-hour period.

Subjects were <u>not</u> permitted to enroll in the SANS-UUI study if they met any of the following exclusion criteria:

1. Has a hemoglobin A1c of >8%, or has diabetes mellitus with glucosuria.
2. Has diabetic neuropathy.
3. Has interstitial cystitis or bladder pain syndrome as defined by either American Urological Association (AUA) or European Association of Urology (EAU) guidelines, chronic pelvic pain, or recurrent symptomatic urinary tract infections.
4. Has skin, orthopedic, neurological, or hematological (bleeding disorder) or anatomical limitations that could prevent successful placement of the neurostimulator.
5. Has broken, blistered skin or compromised circulation in the area of the neurostimulator implant.
6. Has neurogenic bladder dysfunction such as traumatic or atraumatic myelopathy, multiple sclerosis, Parkinsonism, or history of cerebrovascular accident.
7. Has documented urinary retention within 6 months prior to the screening baseline visit date.
8. Has clinically significant bladder outlet obstruction.
9. Is currently undergoing or has previously undergone pelvic irradiation.
10. Is a subject with a mechanical obstruction such as benign prostatic hypertrophy, urethral stricture, or cancer.
11. Has current grade 3 or 4 pelvic organ prolapse including cystocele, rectocele, enterocele, procidentia, or vaginal vault prolapse.
12. Has symptomatic urinary tract infection (UTI); the subject may be considered for study enrollment if the subject is symptom-free after a full course of treatment prior to beginning the baseline bladder diary. If an asymptomatic bacteriuria is detected during the urinalysis performed at screening, a subject may be enrolled without a waiting period relative to UTI treatment.
13. Has primary stress incontinence or mixed incontinence where the stress component predominates or has been treated surgically for stress urinary incontinence within 6 months prior to the screening baseline visit date.

14. Has received tibial nerve stimulation (TNS) in the past 3 months for the treatment of overactive bladder or unwilling to stay off TNS therapy for 12-month period following implant.
15. Has received treatment of urinary symptoms with any botulinum neurotoxin type-A (BoNTA) agent in the past 12 months; (e.g. obotulinumtoxinA, Botox®, abobotulinumtoxinA, Dysport®, IncobotulinumtoxinA, Xeomin®).
16. Is a woman who is pregnant or planning to become pregnant during this clinical study or is a woman of child-bearing potential who is not using a medically acceptable method of birth control. Women of child-bearing potential must undergo a pregnancy test, with clear negative result.
17. Has active substance abuse, including alcohol.
18. Has a known hypersensitivity or contraindication to procedural or post-procedural medications which cannot be adequately managed medically.
19. Has a known hypersensitivity to Neuspera's SNS System device components.
20. Has previously failed SNS therapy.
21. Has active implantable medical devices such as neurostimulators, drug pumps, pacemakers, or internal defibrillators since compatibility has not been assessed.
22. Has known needs for diathermy (shortwave, microwave, or therapeutic ultrasound), and radiofrequency ablation in the vicinity of the neurostimulator since these procedures have not been evaluated.
23. Has a known need for therapeutic ultrasound in the area of the sacral nerve neurostimulator as the device can inadvertently concentrate the ultrasound field and cause harm.
24. Has a known need for therapeutic ionizing radiation as can damage the electrical components of the sacral nerve stimulator and any damage may not be immediately detectable.
25. Has plans to enroll or is currently enrolled in another investigational device or drug trial during his/her participation in this study.
26. The investigator is unable to elicit an appropriate motor response in the subject during the intra-operative testing of the implant procedure.

2. Follow-up Schedule

All subjects were scheduled to return for follow-up examinations at 7, 14, 21, and 28-days after implantation. Subjects then returned for clinic evaluation at 2, 3, 4, 5, 6, 9 and 12 months post implant, then every six months thereafter, estimated to be up to 36 months. Subjects were scheduled for a telephone visit at 5.5 months post implant procedure.

Preoperatively, subjects underwent cytoscopy, urodynamics, and sacral anatomy assessment. Postoperatively, a neurostimulator position confirmation image was performed at Day 28 or 42 along with a response rate assessment. The objective parameters measured during the study included a 72 hour bladder diary that was collected at baseline and 6 and 12 months after implantation. Subjects also completed daily stimulation diaries for the first 12 months and a weekly

stimulation diary after 12 months. Additionally, the International Consultation on Incontinence Questionnaire Overactive Bladder Quality of Life (ICIQ-OABqol) and Patient Global Impression of Improvement (PGI-I) questionnaires were performed at Month 3, 6 and 12 months after implantation. Adverse events and complications were recorded at all visits.

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

3. Clinical Endpoints

With regards to safety, the primary safety endpoint was defined as the incidence of device-related severe adverse events (SAEs) through the 6-month post-implant visit. Safety was evaluated by review of all adverse events that occurred during the study.

With regards to effectiveness, the primary effectiveness endpoint was defined as the percentage of all subjects with an attempted implant who experience ≥50% reduction in the number of UUI episodes at 6 months post-implant, relative to the number of UUI episodes at baseline (therapy responder). This endpoint was also evaluated at 12-months post-implant.

The following secondary effectiveness endpoints were evaluated at 6 and 12 months:

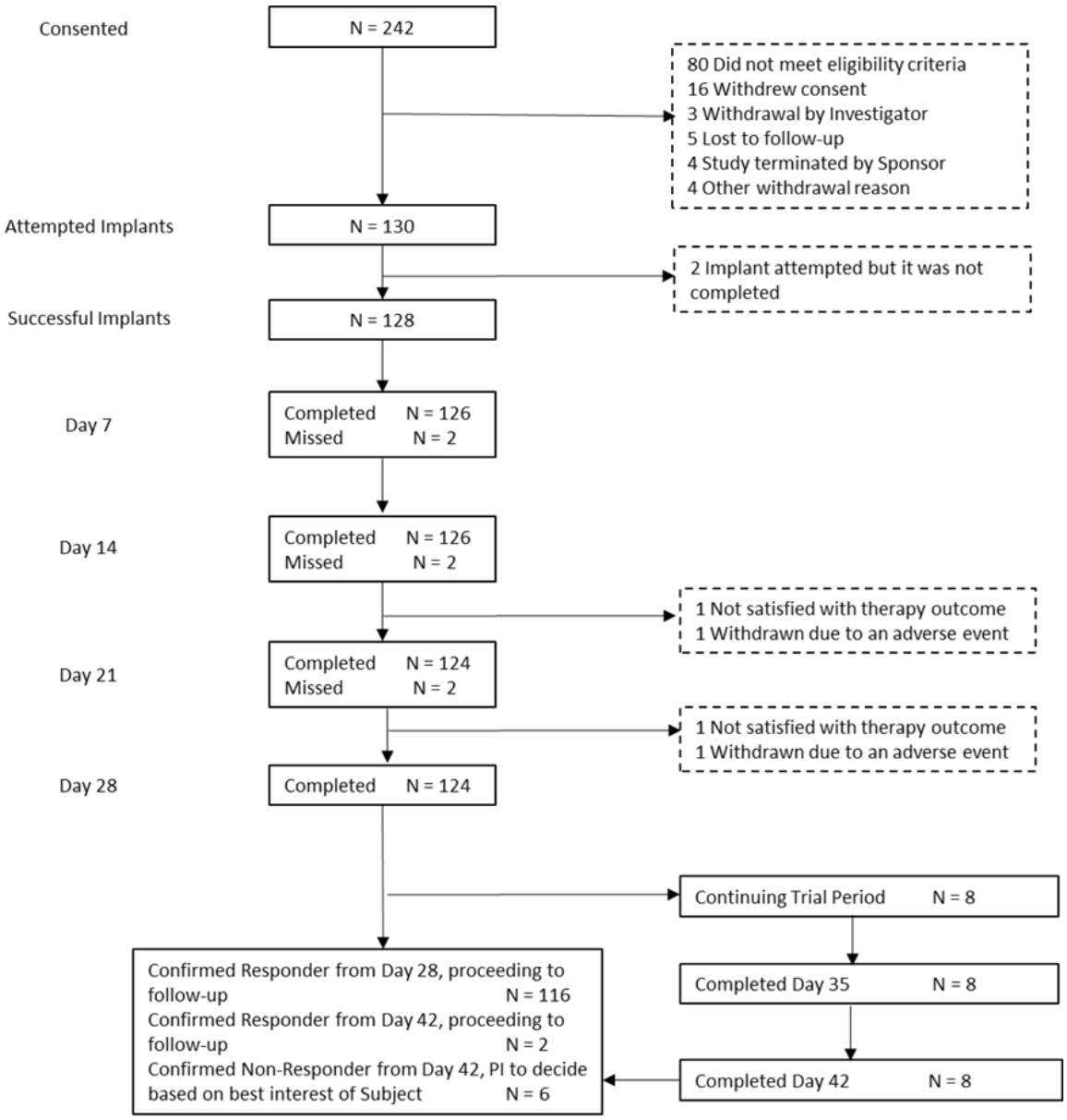
- Change from baseline in mean number of UUI episodes
- Change from baseline in ICIQ-OABqol score
- The percentage of subjects who experience an improvement in ICIQ-OABqol of at least 10 points
- Change in urgent episodes per day from baseline. Calculated across all diary episodes with at least mild urgency
- Change in average number of daily voids from subjects with at least 8 voids at baseline

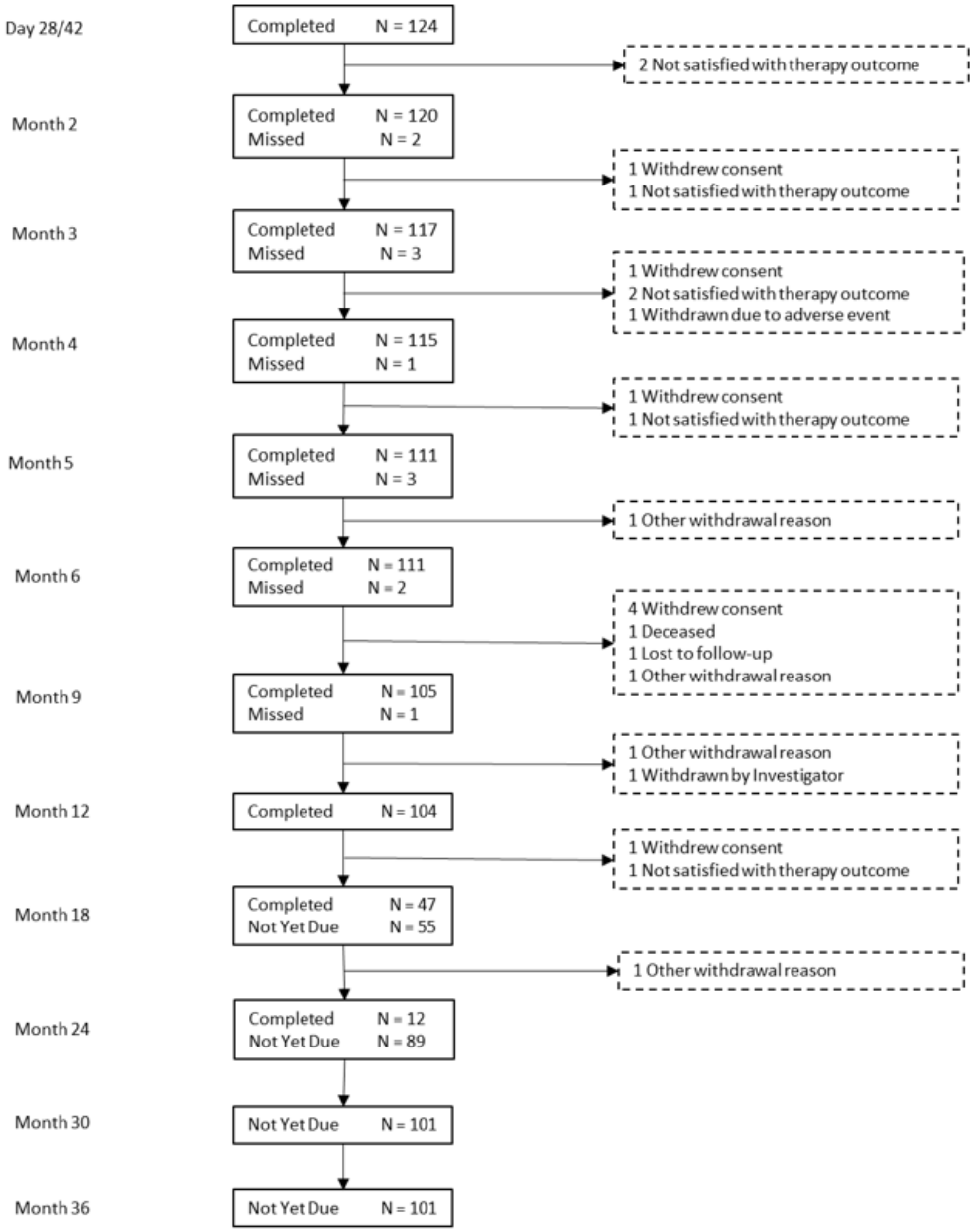
With regard to success/failure criteria, greater than 50% of subjects with an attempted implant should have achieved greater than 50% reduction in UUI episodes at 6 and 12 months compared to baseline for the study to be considered a success with respect to effectiveness.

B. Accountability of PMA Cohort

At the time of database lock, of 242 subjects enrolled in the PMA study, 130 subjects had implants attempted and 128 subjects were successfully implanted. 104 subjects were available for analysis at the completion of the study, the 12-month post-operative visit.

Figure 4: Subject Accountability – Post Implant Period





The analysis sets were pre-specified in the protocol as follows:

- Intent-to-Treat (ITT) Analysis Set: The ITT analysis set is defined as all subjects who have signed informed consent.
- Modified Intent-to-Treat (mITT) Analysis Set: The mITT analysis set is defined as all subjects for whom an initial implant is attempted.
- Implanted Analysis Set: The Implanted analysis set is defined as all subjects who are implanted with the Neuspera SNS system.
- Responder Analysis Set: The Responder analysis set is defined as subjects who are implanted with the system and are defined as responders at the Day 28 or Day 42 clinic visit post-implant.

- Per Protocol (PP) Analysis Set: The Per Protocol analysis set is defined as implanted subjects who have no protocol deviations that may significantly affect the primary endpoints. The determination of subjects excluded from the Per Protocol analysis set was made prior to analysis.
- Worst Case Analysis Set: The Worst Case analysis set assumes that all subjects with missing data were failures.

C. Study Population Demographics and Baseline Parameters

The demographics of the study population are typical for a pivotal study performed in the US.

There were 242 consented subjects in 29 US clinical sites and 2 sites in Europe. At 25 sites, 130 subjects had implants attempted, and 128 subjects were successfully implanted. **Table 16** shows the baseline demographics of the mITT subjects.

Table 166. Baseline Demographics

Baseline Characteristics	mITT Analysis Set (n = 130)
Age (years)	
N	130
Mean ± SD	60.4 ± 10.2
Median	61.0
Min, Max	21.0, 83.0
BMI	
N	130
Mean ± SD	29.5 ± 5.1
Median	29.0
Min, Max	18.0, 39.0
Sex (n/N (%))	
Female	128/130 (98.5)
Male	2/130 (1.5)
Race (not mutually exclusive, n/N (%))	
American Indian or Alaska Native	0/130 (0.0)
Asian	0/130 (0.0)
Black or African American	5/130 (3.8)
Native Hawaiian or Other Pacific Islander	0/130 (0.0)
White	124/130 (95.4)
Other	2/130 (1.5)
Ethnicity (n/N (%))	
Hispanic or Latino	10/130 (7.7)
Not Hispanic or Latino	120/130 (92.3)

Table 17 below presents the subjects' incontinence history as reported at baseline visit.

Table 17. Incontinence History

Incontinence History (Not mutually exclusive) n/N (%)	mITT Analysis Set (n = 130)
Overactive bladder (OAB)	122/130 (93.8)
Stress urinary incontinence (SUI)	52/130 (40.0)
Urinary urge incontinence (UUI)*	116/130 (89.2)
Mixed incontinence	50/130 (38.5)
UUI predominates	50/130 (38.5)
SUI predominates	0/130 (0.0)
Other urinary incontinence	1/130 (0.8)
Fecal incontinence	13/130 (10.0)
Urinary Frequency	66/130 (50.8)
Nocturia	58/130 (44.6)

**Note: Multiple options are allowed to be selected for the same patient. In this table, 116 mITT subjects out of 130 had a diagnosis of UUI for their incontinence history. An additional eight (8) subjects had mixed incontinence with UUI predominating, indicating that they also had UUI. The remaining six (6) subjects that did not have UUI or mixed incontinence did have an OAB diagnosis; given that the subjects also had to have four UUI episodes in 72 hours, they would need to have OAB with associated UUI. Consequently, all subjects in the mITT analysis had a history of UUI.*

Table 18 below presents mITT subjects categorized by severity of their UUI symptoms at baseline. Subjects in the mITT analysis set had a baseline of 4.5 (± 2.5 SD) UUI episodes per day.

Table 18. Baseline UUI episodes per day

Baseline UUI episodes per day	mITT Analysis Set (n = 130)
Mild (<3 UUI episodes per day)	41/130 (31.5%)
Moderate (3-5 UUI episodes per day)	42/130 (32.3%)
Severe (>5 UUI episodes per day)	47/130 (36.2%)

Table 19 presents subjects' UUI treatment history as reported at baseline.

Table 19. UUI Treatment History at Baseline

UUI Treatment History (n/N (%))	mITT Analysis Set (n = 130)
Current or previous use of any medication to treat UUI	118/130 (90.8)
Use of antimuscarinics to treat UUI	93/130 (71.5)
Previously Used But Discontinued	70/130 (53.8)

UUI Treatment History (n/N (%))	mITT Analysis Set (n = 130)
Currently Using	23/130 (17.7)
No Response Given	0/130 (0.0)
Use of β3 agonist to treat UUI	57/130 (43.8)
Previously Used But Discontinued	41/130 (31.5)
Currently Using	14/130 (10.8)
No Response Given	2/130 (1.5)
Sacral Nerve Stimulation	1/130 (0.8)
Tibial Nerve Stimulation	11/130 (8.5)
Botulinum neurotoxin type-A (BoNT-A)	14/130 (10.8)

D. Safety and Effectiveness Results

1. Safety Results

The analysis of safety was based on the mITT cohort of 130 subjects. The key safety outcomes for this study are presented below in **Tables 20** to **24**. Adverse events are reported in **Tables 21** and **22**.

There were no device-related SAEs through 12-months post-implant. There were a total of 338 adverse events in 108/130 (83.1%) subjects, and 27 severe adverse events in 21/130 (16.2%) subjects in subjects who had an attempted implant. One SAE, respiratory failure, was determined related to the implant procedure. There were a total of 27 device-related events in 21 of 130 (16.2%) subjects, and 21 procedure-related events in 19 of 130 subjects (14.6%). Thirteen (13) events were definitely related to the device and one event definitely related to implant procedure.

There were 2 device fractures, 5 device migrations in 4 subjects, 4 revisions, and 15 device explants at 6-months. At 12-months, there were a total of 5 device revisions and 21 explants. At 12 months, the number of device fractures and migrations did not change from 6 months. The majority of the migrations occurred within the first month of implant, and the fractures occurred on Day 26 and Day 63. However, one additional device fracture was seen after the 12-month data lock and was attributed to chiropractic manipulation. **Table 20** shows the fractures, migrations, and revisions that occurred through the 12-month datalock.

Table 20. Fractures, Migrations, Revisions, and Explants through 12-Months

Events	Number of events	Number of subjects	Notes
Device Migration	5	4	**Action Taken:** 3 – Revision 2 – Explant
Device Fracture	2	2	**Action Taken:** 1 – Revision 1 – Explant
Revisions	5	5	**Reason for Revision:** 2 – Device Migration 1 – Device Fracture and Migration 2 – Loss of Stimulation
Explants	21	21	**Reason for Explant*:** 11 – Patient Request 7 – Other Reason 2 – Loss of Stimulation 1 – Device Migration

**Note: Study exit required a device explant per the study protocol.*

Table 21 shows the device-related adverse events through 12-months post-implant, and **Table 22** shows the procedure-related adverse events through 12-months post-implant.

Table 2117. Device-Related Adverse Events through 12-months – mITT Analysis Set

	Events n	Subjects n/N (%)[2]
Total Device-Related Adverse Events[1]	27	21/130 (16.2%)
Device dislocation	5	4/130 (3.1%)
Device stimulation issue	3	3/130 (2.3%)
Device breakage	2	2/130 (1.5%)
Implant site pain	2	2/130 (1.5%)
Medical device pain	2	2/130 (1.5%)
Medical device site burn	2	2/130 (1.5%)
Anxiety	1	1/130 (0.8%)
Back pain	1	1/130 (0.8%)
Defecation urgency	1	1/130 (0.8%)
Frequent bowel movements	1	1/130 (0.8%)
Implant site rash	1	1/130 (0.8%)

	Events n	Subjects n/N (%)[2]
Micturition urgency	1	1/130 (0.8%)
Pain in extremity	1	1/130 (0.8%)
Procedural pain	1	1/130 (0.8%)
Radicular pain	1	1/130 (0.8%)
Urinary tract infection	1	1/130 (0.8%)
Vulvovaginal pain	1	1/130 (0.8%)

[1]*As coded by the CEC chairperson.*
[2] *Exact 95% confidence Interval.*

Table18 22. Procedure-Related Adverse Events through 12 months – mITT Analysis Set

	Events n	Subjects n/N (%)[2]
Total Procedure-Related Adverse Events[1]	21	19/130 (14.6%)
Device dislocation	3	2/130 (1.5%)
Implant site rash	2	2/130 (1.5%)
Anxiety	1	1/130 (0.8%)
Device breakage	1	1/130 (0.8%)
Device stimulation issue	1	1/130 (0.8%)
Dysphagia	1	1/130 (0.8%)
Erythema	1	1/130 (0.8%)
Frequent bowel movements	1	1/130 (0.8%)
Hematemesis	1	1/130 (0.8%)
Implant site discharge	1	1/130 (0.8%)
Implant site pain	1	1/130 (0.8%)
Mouth ulceration	1	1/130 (0.8%)
Pain in extremity	1	1/130 (0.8%)
Procedural headache	1	1/130 (0.8%)
Radicular pain	1	1/130 (0.8%)
Respiratory failure	1	1/130 (0.8%)
Vomiting	1	1/130 (0.8%)
Vulvovaginal pain	1	1/130 (0.8%)

[1]*As coded by the CEC chairperson.*
[2] *Exact 95% confidence Interval.*

Tables 23 and **24** shows device- and procedure-related AEs as a function of time through 12-months post-implant, respectively. The procedure-related AE that occurred after 366 days was related to an explant procedure.

Table 23. Device-Related AEs Over Time through 12-months (from Implant Date) – mITT Analysis Set (N = 130)

Device-Related AEs	Day 0	Day 1-7	Day 8-30	Day 31-90	Day 91-180	Day 181-365	Grand Total
Grand Total	**4**	**4**	**8**	**7**	**3**	**1**	**27**
Device dislocation			5				**5**
Device stimulation issue		1		1	1		3
Device breakage			1	1			2
Implant site pain	1			1			2
Medical device pain	1			1			2
Medical device site burn				1	1		2
Anxiety		1					1
Back pain			1				1
Defecation urgency				1			1
Frequent bowel movements	1						1
Implant site rash					1		1
Micturition urgency	1						1
Pain in extremity		1					1
Procedural pain				1			1
Radicular pain			1				1
Urinary tract infection						1	1
Vulvovaginal pain		1					1

Table 24. Procedure-Related AEs Over Time through 12 months (from Implant Date) – mITT Analysis Set (N = 130)

Procedure-Related AEs	Day 0	Day 1-7	Day 8-30	Day 31-90	Day 91-180	Day 181-365	Day 366+	Grand Total
Grand Total	**6**	**7**	**6**	**0**	**0**	**1**	**1**	**21**
Device dislocation			3					**3**
Implant site rash		1				1		**2**
Anxiety		1						**1**
Device breakage			1					**1**
Device stimulation issue		1						**1**
Dysphagia	1							**1**
Erythema							1	**1**
Frequent bowel movements	1							**1**
Hematemesis	1							**1**
Implant site discharge			1					**1**

Procedure-Related AEs	Day 0	Day 1-7	Day 8-30	Day 31-90	Day 91-180	Day 181-365	Day 366+	Grand Total
Implant site pain	1							**1**
Mouth ulceration	1							**1**
Pain in extremity		1						**1**
Procedural headache		1						**1**
Radicular pain			1					**1**
Respiratory failure		1						**1**
Vomiting	1							**1**
Vulvovaginal pain		1						**1**

2. Effectiveness Results

The analysis of primary effectiveness was based on the mITT cohort of 130 subjects at the 6-month time point. Key effectiveness outcomes are presented in **Tables 25** and **28**.

For the modified Intent to Treat (mITT) analysis set, which consisted of all subjects with an attempted implant, 82.9% of subjects at Month 6 were responders (≥ 50% reduction from baseline in UUIs per day). The study met the 50% performance goal at 6 months as summarized in **Table 25** below.

Table 25. Responder Rate in UUI at Month 6 – mITT Analysis Set – Imputed

	Estimate (%)	Lower 95% CI	Upper 95% CI	P-value (2-sided)
Subjects with ≥ 50% reduction from baseline in UUIs per day	82.9%	76.4%	89.4%	<0.0001

The imputation model includes baseline age, investigational site, baseline UUI episodes, and all available follow-up visit UUI episodes through 6 months. It uses full conditional specification and 100 imputed data sets.

The primary endpoint was also analyzed for additional analysis sets at 6 months (**Table 26**).

Table 26. Primary Endpoint for Various Analysis Sets at Month 6 - Imputed

Subjects with ≥ 50% reduction from baseline in UUIs per day	Estimate (%)	Lower 95% CI	Upper 95% CI	P-value (2-sided)
Implanted (N=128)	84.2%	77.8%	90.5%	<0.0001
Responder (N=118)	90.5%	85.1%	95.8%	<0.0001
Per Protocol (N=117)	86.2%	80.0%	92.5%	<0.0001
Worst Case (mITT)[1] (N=130)	80.8%	74.0%	87.5%	<0.0001

The imputation model includes baseline age, investigational site, baseline UUI episodes, and all available follow-up visit UUI episodes through 6 months. It uses full conditional specification and 100 imputed data sets.
[1]The worst case assumes all missing responses are failures. The estimates are based on data summaries without multiple imputation modelling. Z-test statistic is displayed instead of t.

Table 27 shows the secondary effectiveness endpoints related to urinary symptoms at 6 months.

Table 27. Secondary Effectiveness Endpoint Results at Month 6 – mITT Analysis Set – Imputed

Effectiveness Measure (n=130)	Month 6	p-value
Reduction from baseline in the mean number of UUI episodes per day	3.28 ± 2.53	< 0.0001
Improvement from baseline in ICIQ-OABqol score	35.24 ± 9.11	<0.0001
Percentage of subjects who experienced an improvement in ICIQ-OABqol of at least 10 points (compared to a 50% performance goal)	91.9%	< 0.0001
Reduction from baseline in Urgent Episodes	1.21 ± 2.77	<0.0001
Reduction in average number of daily voids in subjects with at least 8 voids at baseline	1.65 ± 5.23	=0.0006

The imputation model includes baseline age, investigational site, baseline data, and all available follow-up measures through 6 months. It uses full conditional specification and 100 imputed data sets.

For the secondary effectiveness endpoints in **Table 27**, the first three endpoints (i.e., reduction from baseline in the mean number of UUI episodes per day, improvement from baseline in ICIQ-OABqol score, and the percentage of subjects who experienced an improvement in ICIQ-OABqol of at least 10 points) supported the findings from the primary endpoint in improvement in UUI symptoms. The reported changes of 1.21 ± 2.77 in urgency episodes and 1.65 ± 5.23 in voids per day do not represent clinically meaningful outcomes. The secondary endpoints related to urgency and frequency episodes are not related to the UUI claim and do not support safety and effectiveness of the device in treatment of urinary urgency and frequency.

The effectiveness results at 12-months showed improvements in UUI symptoms from baseline, as well. For mITT subjects (N=130), 77.7% of subjects at Month 12 were responders (≥ 50% reduction from baseline in UUIs per day), as summarized in **Table 28** below.

Table 28. Responder Rate in UUI at Month 12 – mITT Analysis Set (n=130) - Imputed

	Estimate (%)	Lower 95% CI	Upper 95% CI
Subjects with ≥ 50% reduction from baseline in UUIs per day	77.7%	70.4%	85.0%

The imputation model includes baseline age, investigational site, baseline UUI episodes, and all available follow-up visit UUI episodes through 6 months. It uses full conditional specification and 100 imputed data sets.

This endpoint was also analyzed for additional study groups, as summarized in **Table 29** below.

Table 29. Responder Rate for Various Analysis Sets at Month 12 - Imputed

Subjects with ≥ 50% reduction from baseline in UUIs per day	Estimate (%)	Lower 95% CI	Upper 95% CI
Implanted (N=128)	79.0%	71.7%	86.2%
Responder (N=118)	84.8%	78.1%	91.5%
Per Protocol (N=117)	82.1%	75.0%	89.2%
Worst Case (mITT) (N=130)[1]	73.8%	66.3%	81.4%

The imputation model includes baseline age, investigational site, baseline UUI episodes, and all available follow-up visit UUI episodes through 6 months. It uses full conditional specification and 100 imputed data sets.
[1]The worst case assumes all missing responses are failures. The estimates are based on data summaries without multiple imputation modelling. Z-test statistic is displayed instead of t.

Table 30 shows the secondary effectiveness endpoints related to urinary symptoms at 12 months.

Table 30. Secondary Effectiveness Results at Month 12– mITT Analysis Set (N=130) - Imputed

Effectiveness Measure (n=130)	Month 12
Reduction from baseline in the mean number of UUI episodes per day	2.96 ± 2.57
Improvement from baseline in ICIQ-OABqol score	31.76 ± 22.50
Percentage of subjects who experienced an improvement in ICIQ-OABqol of at least 10 points (compared to a 50% performance goal)	84.4%
Reduction from baseline in Urgent Episodes	1.14 ± 2.70
Reduction in average number of daily voids in subjects with at least 8 voids at baseline	1.67 ± 5.17

The imputation model includes baseline age, investigational site, baseline data, and all available follow-up measures through 12 months. It uses full conditional specification and 100 imputed data sets.

3. Subgroup Analyses
   The following baseline characteristics were evaluated for potential association with safety and effectiveness outcomes (**Table 31**):

Table 31: Primary Endpoint Subgroup Analysis at Month 6– mITT Analysis Set (N = 130) – Imputed

Subjects with ≥ 50% reduction from baseline in UUIs per day	Estimate (%)	Lower 95% CI	Upper 95% CI[3]
Female (N=128)	77.4%	70.0%	84.8%
Male[1] (N=2)	100.0%	100.0%	100.0%
Age <65 years (N=94)	82.1%	74.3%	90.0%
Age ≥65 years (N=36)	66.3%	50.4%	82.1%
White (N=123)	78.9%	71.5%	86.3%
All Other Races[1] (N=7)	57.1%	20.5%	93.8%
Baseline UUIs <8 (N=117)	79.5%	72.0%	87.0%
Baseline UUIs ≥8[2] (N=13)	61.5%	35.1%	88.0%
US (N=124)	77.5%	70.0%	85.0%
EU[1] (N=6)	83.3%	53.5%	100.0%

[1] The subgroup does not contain any missing response values following the imputation of failures. Therefore, the estimates are based on data summaries without multiple imputation modelling. Z-test statistic is displayed instead of t.
[2] The subgroup contains a single missing response value. The imputation model results in zero between-imputation variance. Therefore, the single missing value is imputed with the result of the multiple imputation value for that subject, and estimate is based on the data summary without multiple imputation modelling. Z-test statistic is displayed instead of t.
[3] If the imputation results in an upper 95% CI >100%, the value will be forced at 100%.
Note: The imputation model includes baseline age, investigational site, baseline UUI episodes, and all available follow-up visit UUI episodes through 12 months. It uses full conditional specification and 100 imputed data sets.

Table 32: Responder Rate Endpoint Subgroup Analysis at Month 12– mITT Analysis Set (N = 130) at Month 12 - Imputed

Subjects with ≥ 50% reduction from baseline in UUIs per day	Estimate (%)	Lower 95% CI	Upper 95% CI[3]
Female (N=128)	77.4%	70.0%	84.8%
Male[1] (N=2)	100.0%	100.0%	100.0%
Age <65 years (N=94)	82.1%	74.3%	90.0%
Age ≥65 years (N=36)	66.3%	50.4%	82.1%
White (N=123)	78.9%	71.5%	86.3%
All Other Races[1] (N=7)	57.1%	20.5%	93.8%
Baseline UUIs <8 (N=117)	79.5%	72.0%	87.0%
Baseline UUIs ≥8[2] (N=13)	61.5%	35.1%	88.0%
US (N=124)	77.5%	70.0%	85.0%
EU[1] (N=6)	83.3%	53.5%	100.0%

[1] The subgroup does not contain any missing response values following the imputation of failures. Therefore, the estimates are based on data summaries without multiple imputation modelling. Z-test statistic is displayed instead of t.
[2] The subgroup contains a single missing response value. The imputation model results in zero between-imputation

variance. Therefore, the single missing value is imputed with the result of the multiple imputation value for that subject, and estimate is based on the data summary without multiple imputation modelling. Z-test statistic is displayed instead of t.
[3] If the imputation results in an upper 95% CI >100%, the value will be forced at 100%.
Note: The imputation model includes baseline age, investigational site, baseline UUI episodes, and all available follow-up visit UUI episodes through 12 months. It uses full conditional specification and 100 imputed data sets.

The study was not specifically powered for sex-, age-, race-, baseline UUI, or US vs EU site subgroups.

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 100 investigators (including sub-investigators). None of the clinical investigators had disclosable financial interests/arrangements as defined in sections 54.2(a), (b), (c), and (f). The information provided does not raise any questions about the reliability of the data.

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

XIII. CONCLUSIONS DRAWN FROM PRECLINICAL AND CLINICAL STUDIES

A. Effectiveness Conclusions

The results from the SANS-UUI study show that the Neuspera SNM System provides a clinically meaningful improvement in UUI symptoms in patients who have failed, could not tolerate, or were not a candidate for more conservative treatments.

The Neuspera SNM System demonstrated ≥50% reduction in the number of UUI episodes at 6- and 12-months post-implantation, relative to the number of UUI episodes at baseline. For the mITT analysis set, 82.9% and 77.7% of subjects at 6 months and 12 months post-implant, respectively, were responders (≥ 50% reduction from baseline in UUIs per day). The secondary effectiveness endpoints in the clinical study as measured by improvements in urinary symptoms including reduction in UUI

episodes and ICIQ-OABqol scores also supported improvement in symptoms of UUI by the Neuspera SNM System.

B. Safety Conclusions

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

In the SANS-UUI study of the Neuspera SNM System, there were no serious device-related AEs, and one serious procedure-related AE reported, respiratory failure, through 12 months post-implant. At 12 months post implant, there were 21 procedure related adverse events in 19 of 130 subjects (14.6%) and 27 device-related adverse events in 21 of 130 (16.2%) subjects seen in the study. At the twelve-month endpoint, the most common device-related AEs in the study were implant migration (3.1% of subjects), device stimulation issue (2.3%), implant fracture (1.5%), implant site pain (1.5%), medical device pain (1.5%), and medical device site burn (1.5%). No other device-related AE occurred more than once (<0.8% of subjects).

At 12 months, there were 2 device fractures, 5 device migrations in 4 subjects, 5 revisions, and 15 device explants. The majority of the migrations occurred within the first month of implant, and the fractures occurred on Day 26 and Day 63. However, one additional device fracture was seen after the 12-month data lock and was attributed to chiropractic manipulation.

C. Benefit-Risk Determination

The probable benefits of the device are based on data collected in a clinical study conducted to support PMA approval as described above. The results from the clinical study show that the Neuspera SNM System provides a clinically meaningful improvement in UUI symptoms in patients who have failed, could not tolerate, or were not a candidate for more conservative treatments. For the mITT analysis set, 82.9% and 77.7% of subjects at 6 month and 12 months post-implant, respectively, were responders (≥ 50% reduction from baseline in UUIs per day). The secondary effectiveness endpoints in the clinical study as measured by improvements in urinary symptoms including reduction in UUI episodes and ICIQ-OABqol scores also supported improvement in symptoms of UUI by the Neuspera SNM System. There is uncertainty in the long-term, real-world effectiveness of the subject device in comparison to other legally marketed SNM devices for treatment of UUI. Other devices provide continues stimulation, which do not require daily active involvement from patients. The Neuspera SNM System, on the other hand, requires patients interact with the device for two hours daily stimulation, while refraining from certain activities during treatment sessions. This raises uncertainty on whether there may be non-compliance over time leading to decreased efficacy in real world use as compared to the clinical study. Given this uncertainty, a post-approval study is requested to obtain additional information about the long-term effectiveness and treatment durability considering patient compliance.

The probable risks of the device are also based on data collected in a clinical study conducted to support PMA approval as described above. In the clinical study, there were no serious device-related AEs, and one serious procedure-related AE reported respiratory failure, through 12 months post-implant. At 12 months post implant, there were 21 procedure related adverse events in 19 of 130 subjects (14.6%) and 27 device-related adverse events in 21 of 130 (16.2%) subjects seen in the study. At the twelve-month endpoint, the most common device-related AEs in the study were device dislocation (3.1% of subjects), device stimulation issue (2.3%), device breakage (1.5%), implant site pain (1.5%), medical device pain (1.5%), and medical device site burn (1.5%). No other device-related AE occurred more than once (<0.8% of subjects). At 12 months, there were 2 device fractures, 5 device migrations in 4 subjects, 5 revisions, and 21 device explants. The majority of the migrations occurred within the first month of implant, and the fractures occurred on Day 26 and Day 63. However, one additional device fracture was seen after the 12-month data lock and was attributed to chiropractic manipulation. There is uncertainty about the risk of long-term occurrences of device fracture and migration events due to the device's design and whether the current labeling is adequate to prevent these events. Given the uncertainty, a post-approval study is requested to obtain additional information about the long-term rates for fracture, migration, revision, and implantation.

1. Patient Perspective
   This submission either did not include specific information on patient perspectives or the information did not serve as part of the basis of the decision to approve or deny the PMA for this device.

In conclusion, given the available information above, the data support that for treatment of the symptoms of urinary urge incontinence (UUI) in patients who have failed, could not tolerate, or were not a candidate for more conservative treatments, 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.

The results from the non-clinical and clinical evaluations support that a significant portion of the patient population for whom the device is intended can be expected to achieve clinically significant results.

The safety and effectiveness of the Neuspera SNM System for treatment of urinary urge incontinence was based a pivotal study evaluating the Neuspera SNM System indicating that the benefit of the Neuspera SNM Therapy outweighs the associated risks. Based on the clinical study results, it is reasonable to conclude that the clinical benefits of the use of the Neuspera SNM System in the treatment of UUI symptoms, in terms of reduction in the number of UUI episodes outweigh the risks.

XIV. CDRH DECISION

CDRH issued an approval order on June 17, 2025. The final clinical conditions of approval cited in the approval order are described below.

1. Continued Follow-Up of the "Clinical Study of Neuspera's Implantable Sacral Nerve Stimulation (SNS) System in Patients with Symptoms of Urinary Urgency Incontinence (UUI)" –

   This study was initiated prior to device approval and is a single-arm, multi-center clinical study. It was conducted at 31 sites and enrolled 242 subjects. The 12-month outcomes from the study were used to support PMA approval. Continued follow up from this study through 72 months will be used to verify the continued safety and effectiveness of the Neuspera Sacral Neuromodulation System.

   You must re-enroll subjects in the PAS within 3 months of the PMA approval. At least 80% of the patient cohort must be followed out to 72 months post procedure. Follow-up visits must be conducted every six months, once subjects are re-enrolled for the PAS study.

   You must collect and report the following clinical outcomes:

   Effectiveness
   - Percentage of subjects who experience an improvement in UUI episodes (therapy responders) of at least 50% or more (primary)
   - Change from baseline in quality of life as measured and assessed by the total ICIQ-OABqol score
   - Change from baseline in mean number of UUI episodes
   - Percentage of subjects who experience an improvement in ICIQ-OABqol of at least 10 points
   - Change in urgent voids per day calculated across all diary episodes with at least mild urgency
   - Change in average number of daily voids from baseline in subjects with at least 8 voids at baseline
   - Change in quality of life measured from baseline as measured and assessed by the ICIQ-OABqol subscale scores
   - Change in Male/Female Lower Urinary Tract Symptoms questionnaire
   - Patient Global Impression of Improvement (PGI-I) measured after implant during follow-up

   Safety
   - Comprehensive summary of all adverse events (AEs) for the duration of study participation, including all device- or procedure-related adverse events, including but not limited to, burns, erosions, implant migrations and fractures, explantations, and revisions

- Percentage of subjects with device-related serious adverse events reported
- Device fracture and migration rates*
- Revision rates*
- Explantation rates*

*The device fractures and migration rates, revision rates, and explantation rates will be reported to FDA annually post commercial approval through the 72 month timepoint. The report will include a detailed report of fractures and migrations, including when it occurred, any cause of fracture/migration that was noted and how it was measured, and how the issue was resolved.

Device Use

- Device parameters including but not limited to voltage, pulse width, frequency, and stimulating electrode
- Patient compliance with therapy at every 6-month visit, as measured by the number of days that a patient completed therapy in the seven (7) days immediately prior to the bladder diary and by actual use data (including the stimulation daily use and duration of time) collected in the Wireless Transmitter log and Patient Controller application

All PAS safety and effectiveness endpoints and outcomes will be assessed at 2, 3, 4, 5, and 6 years post-implant and reported to FDA annually.

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

XV. 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.

XVI. REFERENCES

None