

# Navigating the PMTA Landscape from a Device Engineering Perspective for Next Generation Nicotine Delivery Products

Sky Carman, Electrical Engineer, MBA

June 29, 2023



Reynolds American Inc. and its affiliates are independent subsidiaries of the British American Tobacco Group

# Disclaimer

This material was prepared to facilitate discussion regarding government policy and tobacco harm reduction. Without limitation, the topics, proposals, concepts and other matters discussed or described herein are not final, are subject to change and/or cancellation and may be for illustrative or theoretical purposes only. No definitive plans or commitments should be inferred from these materials, and any proposed plans or commitments are subject in all respects to applicable internal reviews and governance requirements.

Reynolds does not make health claims regarding its brands, which are not cessation products. Nothing contained here should be misconstrued to the contrary. The views expressed in this presentation are those of the presenter and may not represent the views of Reynolds. To the extent that third-party sources are referenced, Reynolds is not responsible for the content of referenced sources and the views expressed may not represent the views of Reynolds. No tobacco product is safe, all tobacco products containing nicotine are addictive. Youth should never use tobacco. Smokers who are concerned about their health should quit.

Reynolds American Inc. and its affiliates are independent subsidiaries of the British American Tobacco Group.

© 2022 RAI Services Company

# Agenda

- 1** The PMTA Final Rule
- 2** Requirements for Components, Parts, and Materials
- 3** Dimensions, Construction, Design Parameters, Test Data, and Function
- 4** Principles of Operation
- 5** Product Testing and Analysis

# Premarket Tobacco Product Application (PMTA)



- U.S. Food and Drug Administration (FDA) requires a PMTA for certain **new tobacco products** seeking a marketing order
- Requests scientific data that demonstrates the marketing of a product is **appropriate for the protection of public health**
  - Risks and benefits to the population, including nonusers
  - How likely current tobacco product users are to use the new product
  - Whether nontobacco users are likely to use the new product
  - Methods, facilities and controls used to manufacture, process, and pack the new tobacco product
- Two outcomes
  - Marketing Granted Order (MGO)
  - Marketing Denial Order (MDO)
- Reynolds American has received several MGOs
  - Vuse Solo, Ciro & Vibe – various Original and Tobacco flavors

**DEPARTMENT OF HEALTH AND HUMAN SERVICES**

**Food and Drug Administration**

**21 CFR Parts 1100, 1107 and 1114**

[Docket No. FDA-2019-N-2854]

**RIN 0910-AH44**

**Premarket Tobacco Product Applications and Recordkeeping Requirements**

**AGENCY:** Food and Drug Administration, HHS.

**ACTION:** Final rule.

# Regulatory Guidance Timeframes

<p><b>“Pre-existing Tobacco Product”*</b> <i>Before 15 Feb 2007</i></p>	<p><b>“Pre-08 Aug 2016”</b> <i>16 Feb 2007 through 08 Aug 2016</i></p>	<p><b>“Post-08 Aug 2016”</b> <i>After 08 Aug 2016</i></p>	<p><b>PMTA Final Rule</b> <i>After 04 Nov 2021</i></p>
<ul style="list-style-type: none"> <li>• If a pre-existing tobacco product, and unchanged, may remain in market with no pre-market clearance required</li> <li>• No known pre-existing vapor products exist (eliminates substantial equivalence pathway)</li> </ul>	<ul style="list-style-type: none"> <li>• Products in market required pre-market clearance filing on or before 09 Sep 2020</li> <li>• Products may remain in market (subject to FDA enforcement discretion)</li> </ul>	<ul style="list-style-type: none"> <li>• Products require pre-market clearance from FDA</li> <li>• With no pre-existing tobacco product, cleared PMTA (or Supplemental PMTA) is the only pathway to market for vapor products</li> </ul>	<ul style="list-style-type: none"> <li>• PMTAs submitted after 04 Nov 2021 must contain data and other information that address the requirements set forth in the PMTA Final Rule</li> <li>• Does not apply retroactively to PMTAs submitted prior to 04 Nov 2021</li> </ul>

*Product standards may affect pre-existing or otherwise cleared products*

\*Prior to August 19, 2022, pre-existing tobacco products were referred to as “grandfathered” tobacco products.

# The PMTA Final Rule Device Requirements

Code of Federal Regulations Title 21 Chapter I Subchapter K Part 1114 Subpart B - (21 CFR 1114)

PART 1114 - Subpart B - Premarket Tobacco Product Applications

§ 1114.7 Required Content and Format

i. Product formulation

1. Components or parts, materials, ...

i. Components or parts

ii. Materials

2. Other properties

i. Product dimensions and construction

ii. Design Parameters and test data (Table 21 & 23)

iii. Function

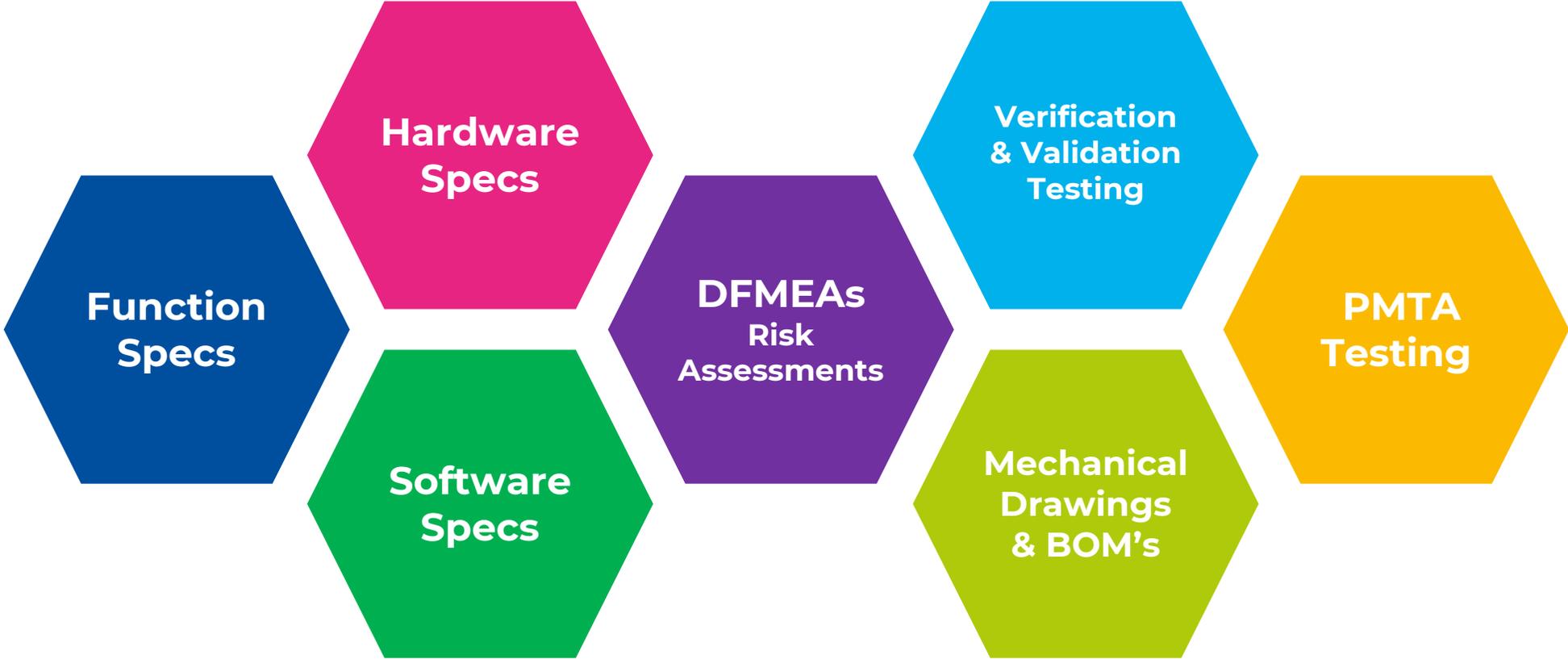
3. Principles of Operation

4. Product Testing and Analysis



Device Engineering sections of the PMTA Final Rule (ENDS & HTP)

# Design Documentation



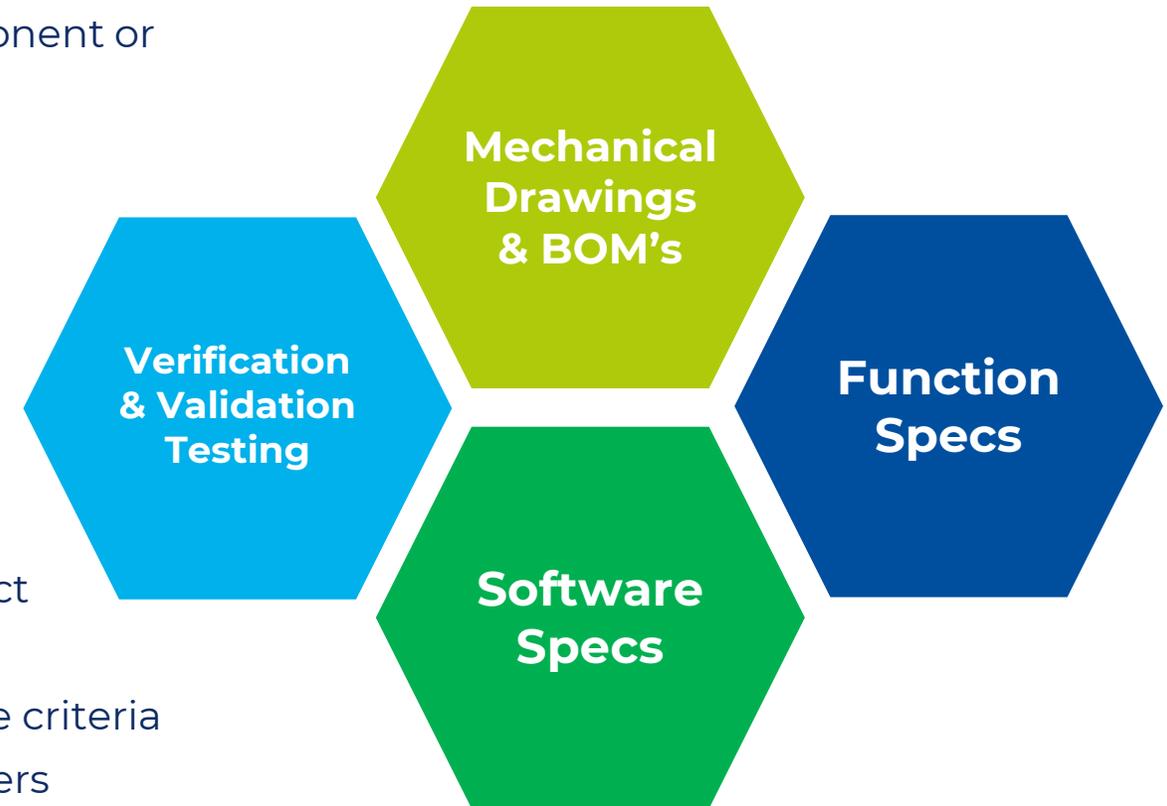
Appropriate engineering design documentation needed to support a PMTA

# Agenda

- 1 The PMTA Final Rule
- 2 Requirements for Components, Parts, and Materials
- 3 Dimensions, Construction, Design Parameters, Test Data, and Function
- 4 Principles of Operation
- 5 Product Testing and Analysis

# Components, Parts & Materials

- Components or parts (21 CFR 1114.7(i)(1)(i))
  - The quantity, function, and purpose of each component or part
    - Software:
      - Description of the software or technology
      - It's purpose
      - Device data collection
    - Materials (21 CFR 1114.7(i)(1)(ii))
      - The material name and description
      - Material location within the product
      - Subcomponent location within the product
      - Function of the material
      - The quantities, tolerances, and acceptance criteria
      - Material specifications, grades, and suppliers
      - Any other material properties



PMTA Narratives for this section supported by Specs, Drawings, BOMs, and Validation Testing

# Agenda

- 1 The PMTA Final Rule
- 2 Requirements for Components, Parts, and Materials
- 3 Dimensions, Construction, Design Parameters, Test Data, and Function
- 4 Principles of Operation
- 5 Product Testing and Analysis

# Product Dimensions and Construction

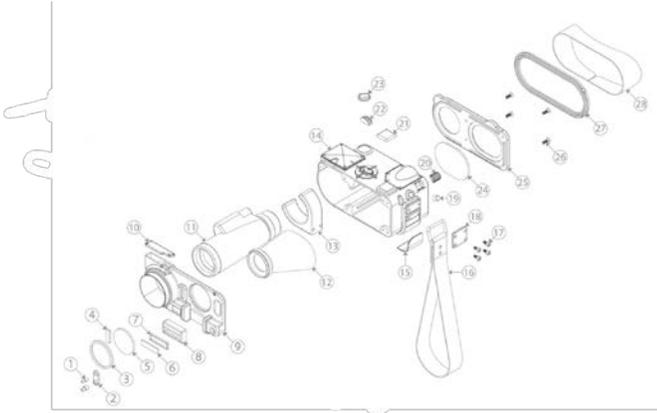
- Product dimensions and construction. (21 CFR 1114.7(i)(2)(i))
  - Product dimensions and construction using a diagram or schematic drawing
    - Finished tobacco product
    - Components with dimensions, operating parameters, and materials



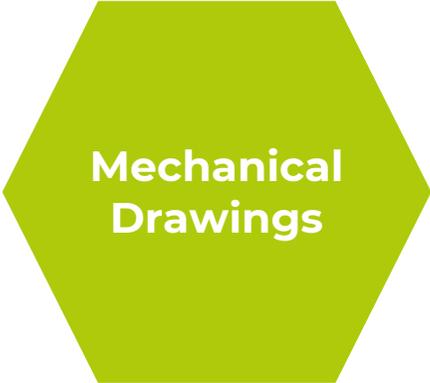
SCALE 1:1

Units	mm
Tolerances	± 0.1mm unless otherwise specified
Material	Steel (Special low carbon)
Treatment	Hardened to 740+/-80 HV10
Tumbling	No
Surface finish	Ground (no surface plating)

Drawings / Specifications



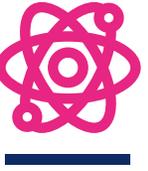
Location in the product



Product dimensions and construction narratives are supported by mechanical drawings

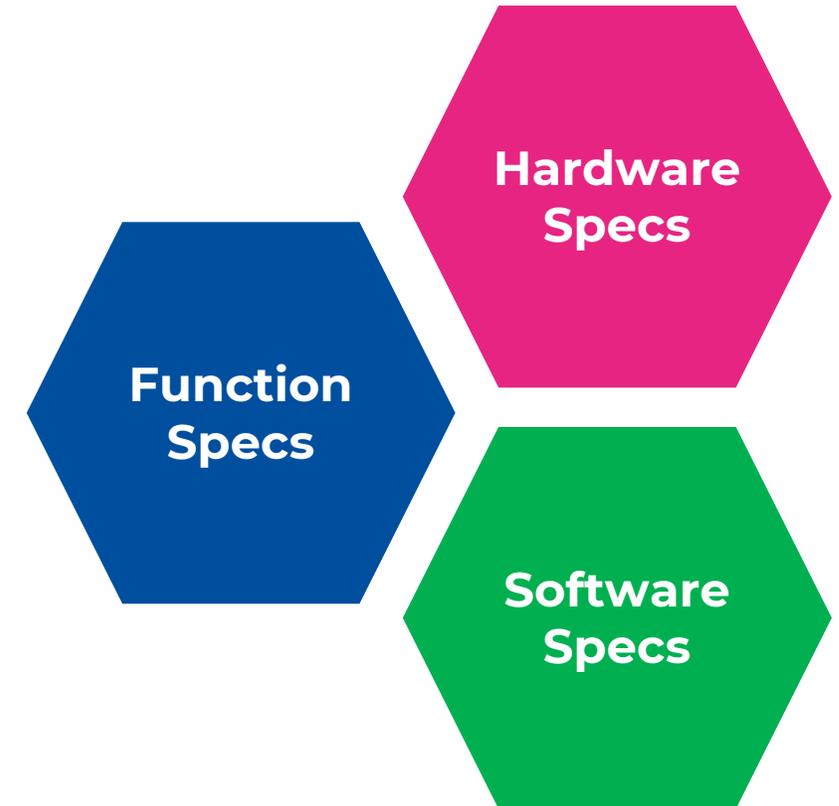
# Design Parameters and Test Data

- Design parameters and test data (21 CFR 1114.7(i)(2)(ii))
  - All final design parameters of the product including the parameters specified (Table 21 & 23)
  - Performance criteria, test protocols, line data, and a summary of the results (Table 21 & 23)
- **General Categories of PMTA Testing of Devices**
  - Devices / Power Delivery Unit (PDU)
    - Functionality
    - Battery Management & Battery Safety characteristics
    - Device Power Output (Wattage)
  - Airflow Testing
    - Draw resistance
    - Airflow Rate
  - Temperature Testing
    - Thermal profiling
    - Inhaled aerosol temperatures
  - Product Yield
    - Puff Count



# Function

- (iii) Function. (21 CFR 1114.7(i)(2)(iii))
  - How the product is intended to function
  - Function specifications provide product-level operation
  - Electronics hardware specifications describe circuit level operations
  - Software specifications provide software-level operations



Functional description narratives are supported by Hardware, Software & Functional Specs

# Agenda

**1** The PMTA Final Rule

**2** Requirements for Components, Parts, and Materials

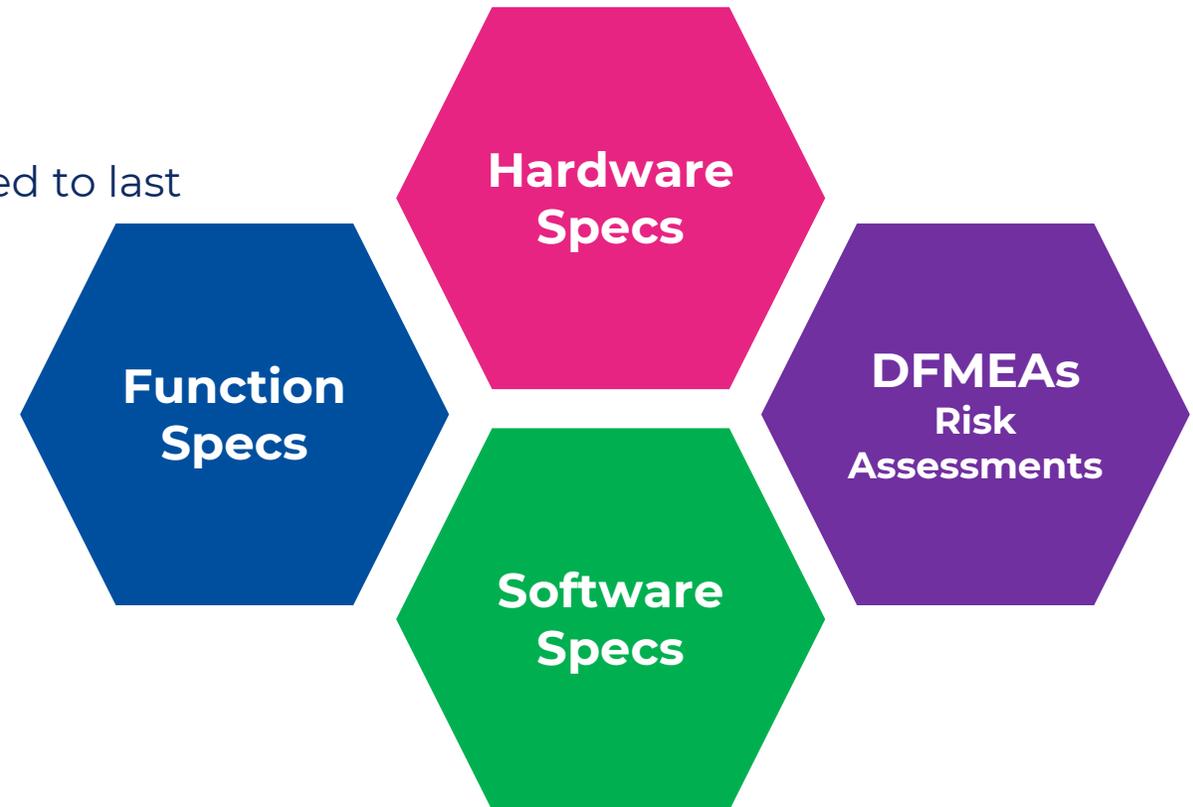
**3** Dimensions, Construction, Design Parameters, Test Data, and Function

**4** Principles of Operation

**5** Product Testing and Analysis

# Principles of Operation

- Principles of operation. (21 CFR 1114.7(i)(3))
  - FDA requires full narrative descriptions
    - How to operate the product
    - How long a single unit of product is expected to last
    - How, or if, the product can be modified
    - Description of a single unit of product
    - A description of the heating source



Principles of Operation Narratives are supported by Hardware, Software & Functional Specs

# Agenda

- 1** The PMTA Final Rule
- 2** Requirements for Components, Parts, and Materials
- 3** Dimensions, Construction, Design Parameters, Test Data, and Function
- 4** Principles of Operation
- 5** Product Testing and Analysis

# Product Testing and Analysis

- Product Testing and Analysis (21 CFR 1114.7(i)(4))
  - Performed on test samples that reflect the finished tobacco product design
  - Sufficient sample size
  - The name and location of laboratory
  - Time between manufacture and testing
  - The storage conditions of the product
  - The number of samples and measurement replicates
  - Method procedure, method validation information, rationale for each test method
  - Testing standards, protocols, acceptance criteria, line data, and a summary of the results
  - Reports of product formulation testing
  - Descriptions of non-standard aerosol-generating regimens used for analytical testing

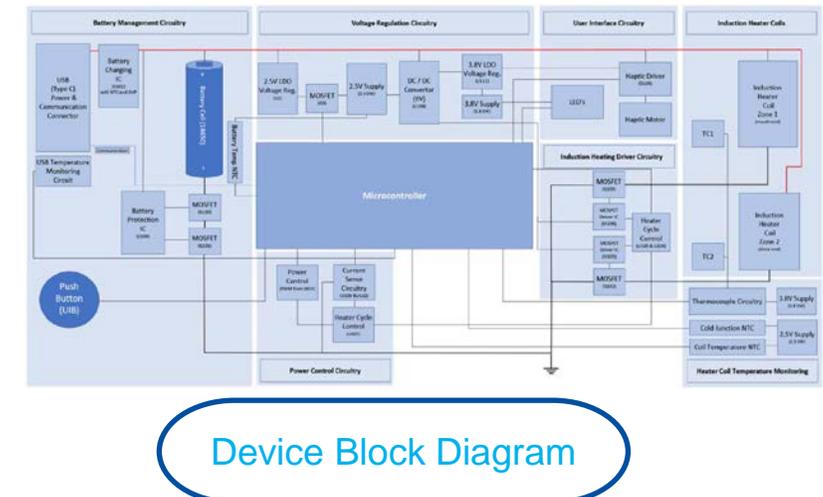
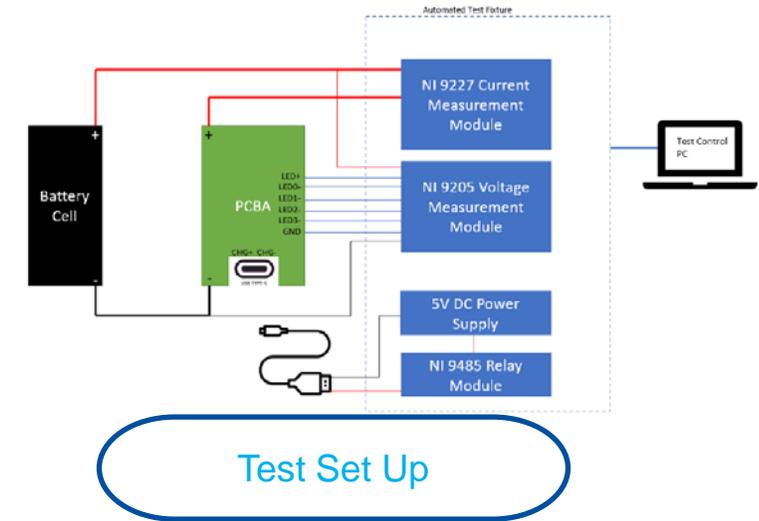


PMTA  
Testing

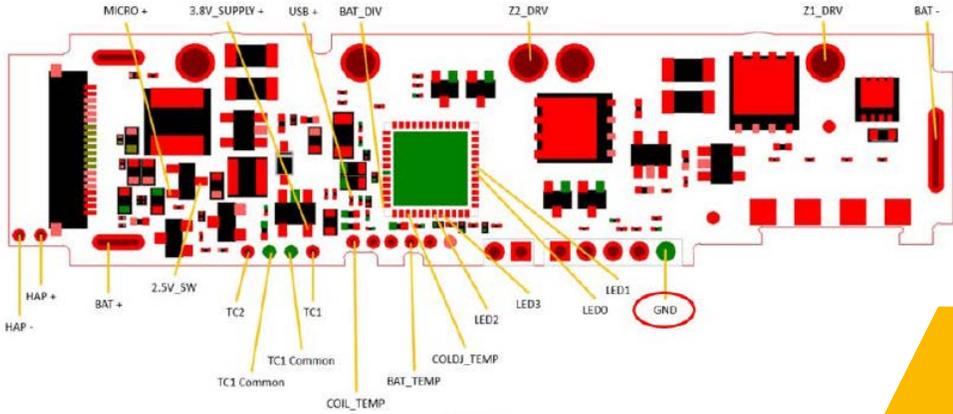
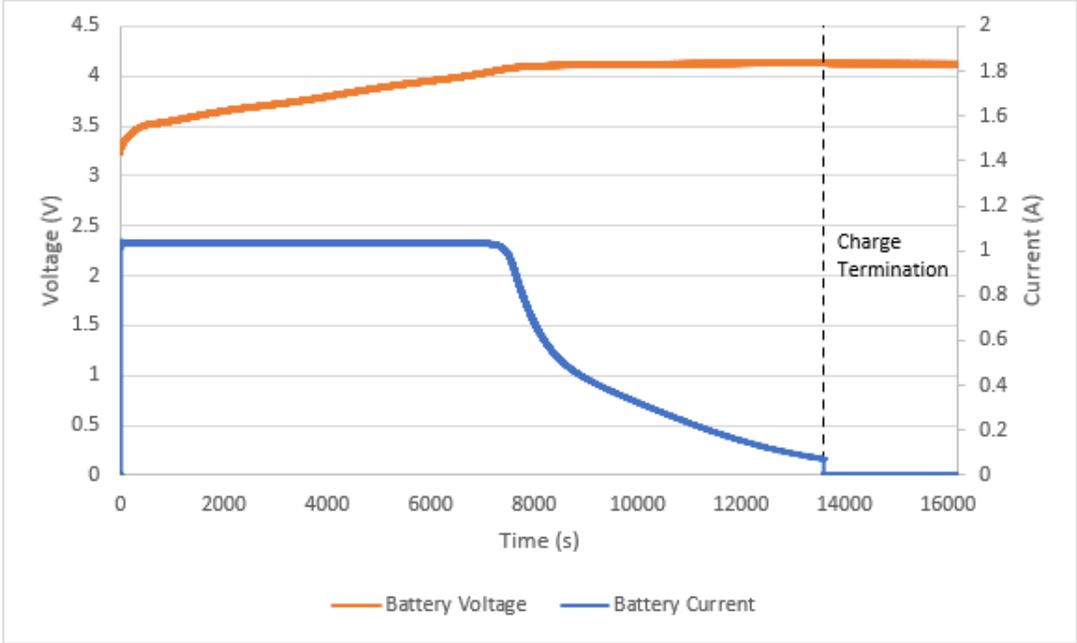
Product Testing and Analysis section provides the details for PMTA testing

# Testing Report Summary Considerations

- A description of the function being tested
- The purpose of the test
- Rationale (for the test and method)
- Success criteria
- Supporting technical documentation
- Test method, procedure, sample preparation, test process
- Test fixture Set up
- Test points, schematics, layouts, and illustrations
- Test data (summary line data)
- Results summary
- Equipment list
- Calibration records
- Individual samples data
- Use common data formats (graphs, tables)



# Device Testing Considerations - Examples



PMTA  
Testing

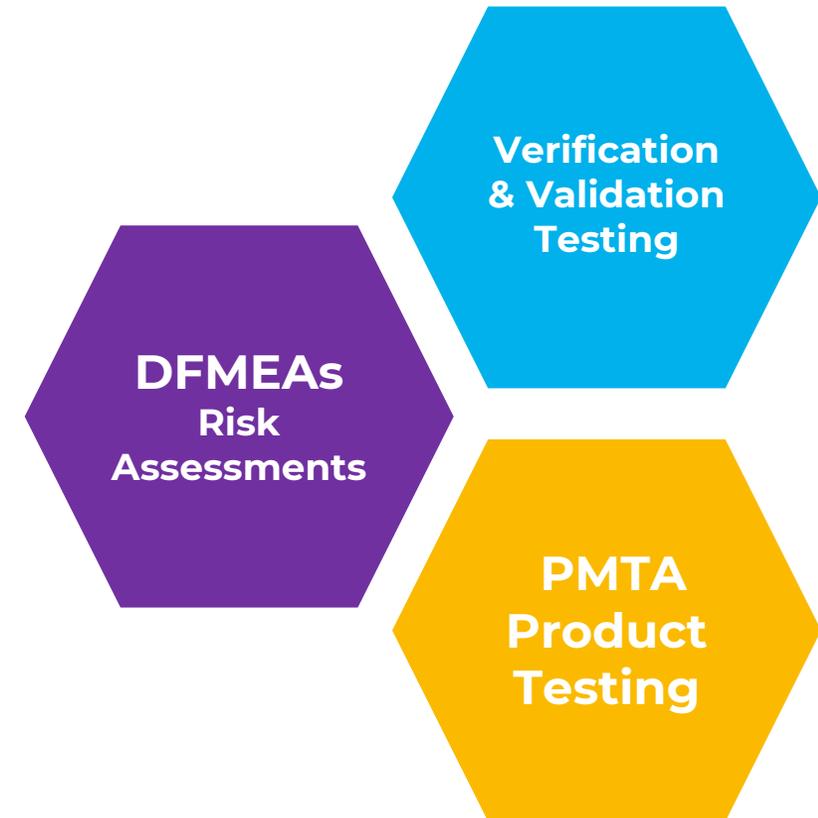
Data Representation

Circuit Test Points

Diagrams and illustrations provide clarity for the test method and data collected

# Other Sections

- Risk assessments for devices DFMEA (21 CFR 1114.7 (j))
  - DFMEA's show that the appropriate engineering design rigor has been applied prior to mass production
- Verification or Validation (21 CFR 1107.3(b)(1)(vi)(B) Recordkeeping
  - Not a replacement for "Required Design Parameters and Testing"
  - May be used to show design criteria has been met
  - Expected to have on file



Risk Assessment and Verification & Validation's role in a PMTA

# The Final Rule and Software

- Software as a component of the product and its function
  - Section (21 CFR 1114.7(i)(1)(i)) Components
    - Does not mention version and revision control
    - Asks for a description which is more in alignment with the Principles of Operation and Function sections
- During TPSAC in May, on TPMP's, the FDA expressed interest in clarification on use of the term software
  - Once software is programmed into a device it becomes firmware
    - The device firmware controls the operations of the hardware in the device
  - Differentiating terms for software and its applications include
    - Firmware, software applications, memory (Flash, EEPROM), backend applications
    - Software and or systems involved with connectivity and or data collection
    - web based api's (application programming interface), apps, widgets, connectivity, IoT

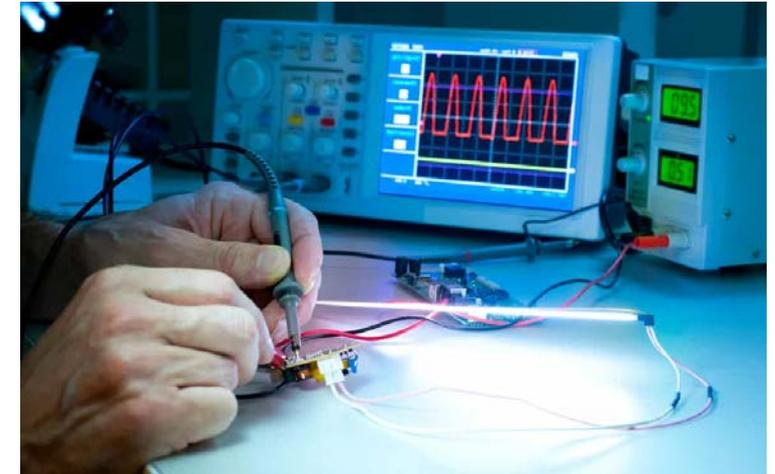
# Other Considerations

- Avoid the use of instrumentation equipment screen shots
  - Present data in graph form
  - Clearly identify and label and axes
  - Include flags or text in the graphs to describe measurements
- Use calibrated equipment
  - Describe what the equipment does and how it is used
  - Include calibration records
- Include results for all samples tested



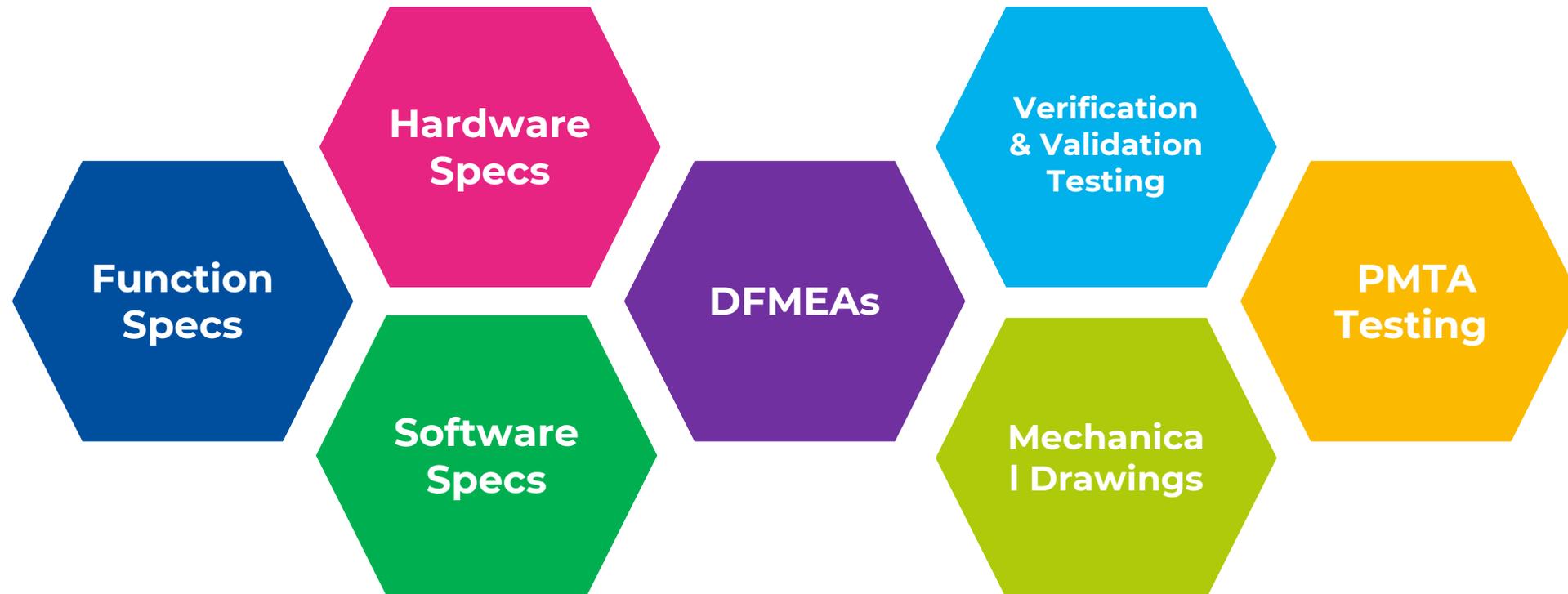
# Other Considerations

- Include descriptive statistics
  - Minimum, maximum, average, and standard deviation values
- Avoid including raw data files and nonstandard file types
  - Summarize data into line / summary data tables
- Clearly identify success criteria
  - Provide sources for success criteria (references)
- Measure and provide data for test events
  - Don't rely on visual indications as proof of measurement
- Scope of testing
  - Testing that is appropriate for the functionality of the device

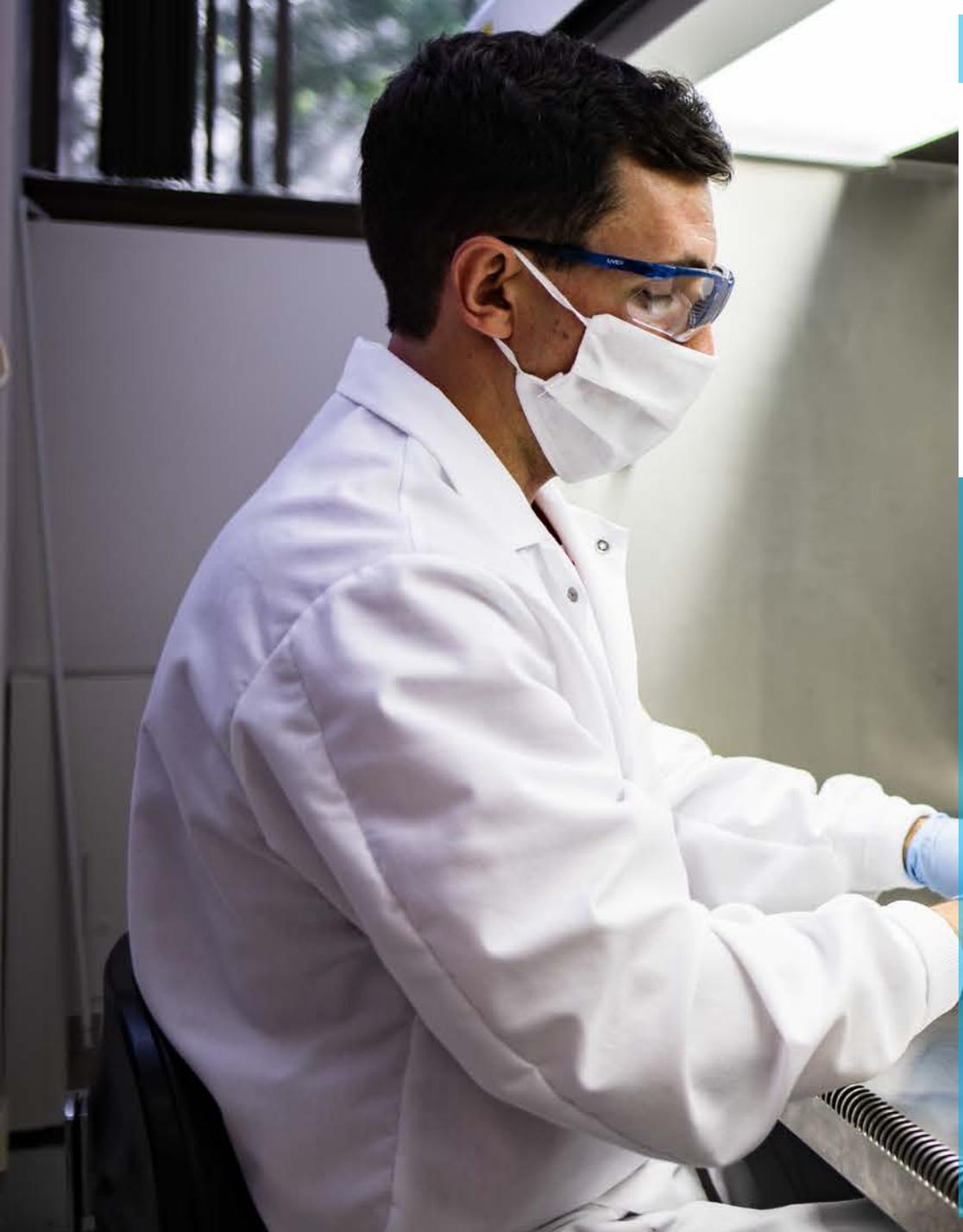


# Conclusion

The final rule covers required design parameters, product characteristics, testing, and reporting which emphasizes the importance of the supporting engineering design and documentation.



The appropriate design documentation, clarity in testing, and data is crucial to support a PMTA



# REYNOLDS

A BETTER TOMORROW

Visit us at  
[ReynoldsScience.com](https://ReynoldsScience.com)



# Appendix



# Table 21 Required Design Parameters for ENDS



Provide Target Specification With Upper and Lower Range Limits for:	Provide test data (include test protocols, quantitative acceptance criteria, data sets, and a summary of the results) for:
<ul style="list-style-type: none"> <li>• Draw resistance (mm H<sub>2</sub>O)</li> <li>• Puff count (for full tank/cartridge)</li> <li>• Atomizer tank/cartridge volume (mL)</li> <li>• Number of heating elements (e.g., coil)</li> <li>• Heating Element diameter (gauge)</li> <li>• Heating Element length (mm)</li> <li>• Heating Element resistance (Ohms)</li> <li>• Heating Element temperature range (°C)</li> <li>• Heating Element configuration (target only)</li> <li>• Battery voltage operating range (V)</li> <li>• Battery current operating range (mA)</li> <li>• Battery Capacity (mAh)</li> <li>• Battery Nominal Voltage (V)</li> <li>• Battery Current rating (mA)</li> <li>• Battery charging temperature limits (°C)</li> <li>• Battery discharge temperature limits (°C)</li> <li>• Battery end of discharge voltage (V)</li> <li>• Battery maximum charging current (mA)</li> <li>• Battery maximum discharging current (mA)</li> <li>• Battery upper limits charging voltage (V)</li> <li>• Power Delivery Unit (PDU) voltage operating range (V)</li> <li>• PDU current operating range (mA)</li> <li>• PDU wattage operating range (watts)</li> <li>• PDU temperature cut-off (°C) (if applicable)</li> <li>• Airflow rate (L/min) (if applicable)</li> <li>• PDU Current cut-off (mA) (if applicable)</li> <li>• PDU Temperature cut-off (°C) (if applicable)</li> <li>• Inhaled aerosol temperature (°C)</li> <li>• Ventilation (%)</li> </ul>	<ul style="list-style-type: none"> <li>• Draw resistance (mm H<sub>2</sub>O)</li> <li>• Puff count (for full tank/cartridge)</li> <li>• Atomizer tank/cartridge volume (mL)</li> <li>• Heating Element diameter (gauge)</li> <li>• Heating Element resistance (Ohms)</li> <li>• Heating Element temperature range (°C)</li> <li>• Battery voltage operating range (V)</li> <li>• Battery current operating range (mA)</li> <li>• PDU voltage operating range (V)</li> <li>• PDU current operating range (mA)</li> <li>• PDU wattage operating range (watts)</li> <li>• PDU Current cut-off (mA) (if applicable)</li> <li>• PDU temperature cut-off (°C) (if applicable)</li> <li>• Battery Capacity (mAh)</li> <li>• Battery Nominal Voltage (V)</li> <li>• Battery Current rating (mA)</li> <li>• Battery charging temperature limits (°C)</li> <li>• Battery discharge temperature limits (°C)</li> <li>• Battery maximum charging current (mA)</li> <li>• Battery maximum discharging current (mA)</li> <li>• Battery upper limits charging voltage (V)</li> <li>• Inhaled aerosol temperature (°C)</li> <li>• Airflow rate (L/min) (if applicable)</li> <li>• Ventilation (%)</li> </ul>

# Table 23 Required Design Parameters for HTP

Provide Target Specification With Upper and Lower Range Limits for:	Provide test data (include test protocols, quantitative acceptance criteria, data sets, and a summary of the results) for:	Provide Target Specification With Upper and Lower Range Limits for:	Provide test data (include test protocols, quantitative acceptance criteria, data sets, and a summary of the results) for:
<p><b>Overall Product</b></p> <ul style="list-style-type: none"> <li>○ Mass (mg)</li> <li>○ Length (mm)</li> <li>○ Width (mm)</li> <li>○ Height (mm)</li> <li>○ Diameter (mm)</li> <li>○ Draw resistance (mm H2O)</li> <li>○ Puff Count (for full tank/cartridge)</li> <li>○ Puff volume (mL)</li> <li>○ Product volume (mL)</li> <li>○ Airflow rate (L/min) (if applicable)</li> <li>○ Ventilation (%)</li> <li>○ Operational Temperature (°C)</li> <li>○ Temperature sensor (if applicable)</li> <li>○ Material wrapper length (mm) (if applicable)</li> <li>○ Material wrapper width (mm) (if applicable)</li> <li>○ Material wrapper basis weight (g/m2) (if applicable)</li> <li>○ Material porosity (permeability) (CU) (if applicable)</li> </ul> <p><b>Heating element</b></p> <ul style="list-style-type: none"> <li>○ Heating element source/ type/approach (electrical, carbon, aerosol, etc.)</li> <li>○ Heating element temperature range (°C)</li> <li>○ Heating element operational temperature (°C)</li> <li>○ Heating element maximum temperature (boost temperature) (°C)</li> <li>○ Heating element material</li> <li>○ Heating element Configuration (i.e., the shape and design of the heating element. If the heating element is a coil, it is the shape and arrangement of the coil. If the heating element is a novel design, provide the configuration and its design targets.)</li> <li>○ Heating element length (mm)</li> <li>○ Heating element mass (mg)</li> <li>○ Heating element location</li> <li>○ Number of heating elements (e.g., coil) (dimensionless)</li> <li>○ Heating Element diameter (gauge) (if applicable)</li> <li>○ Heating Element resistance (Ohms)</li> </ul>	<p><b>Overall Product</b></p> <ul style="list-style-type: none"> <li>○ Draw resistance (mm H2O)</li> <li>○ Puff count (for full tank/cartridge)</li> <li>○ Product volume (mL)</li> <li>○ Airflow rate (L/min) (if applicable)</li> <li>○ Ventilation (%)</li> <li>○ Operational Temperature (°C)</li> <li>○ Temperature sensor (if applicable)</li> <li>○ Material wrapper length (mm) (if applicable)</li> <li>○ Material wrapper width (mm) (if applicable)</li> <li>○ Material wrapper basis weight (g/m2) (if applicable)</li> <li>○ Material porosity (permeability) (CU) (if applicable)</li> </ul> <p><b>Heating element</b></p> <ul style="list-style-type: none"> <li>○ Heating Element diameter (gauge)</li> <li>○ Heating Element resistance (Ohms)</li> <li>○ Heating Element temperature range (°C)</li> </ul>	<p><b>Tobacco / E-liquid</b></p> <ul style="list-style-type: none"> <li>○ Tobacco mass (mg) (if applicable)</li> <li>○ Tobacco density (g/cm3) (if applicable)</li> <li>○ Tobacco moisture or oven volatiles (%) (if applicable)</li> <li>○ Tobacco cut size (CPI or mm) (if applicable)</li> <li>○ E-liquid volume (mL) (if applicable)</li> <li>○ E-liquid viscosity (at 20°C) (if applicable)</li> </ul> <p><b>Battery (if applicable)</b></p> <ul style="list-style-type: none"> <li>○ Battery capacity (mA)</li> <li>○ Battery Voltage Operating Range (V) or Wattage (W)</li> <li>○ Battery Current Charging range (amps)</li> <li>○ Battery Nominal Voltage (V)</li> <li>○ Battery Current rating (mA)</li> <li>○ Battery charging temperature limits (°C)</li> <li>○ Battery discharge temperature limits (°C)</li> <li>○ Battery end of discharge voltage (V)</li> <li>○ Battery maximum charging current (mA)</li> <li>○ Battery maximum discharging current (mA)</li> <li>○ Battery upper limits charging voltage (V)</li> <li>○ Power Delivery Unit (PDU) voltage operating range (V)</li> <li>○ PDU current operating range (mA)</li> <li>○ PDU wattage operating range (watts)</li> <li>○ PDU temperature cut-off (°C) (if applicable)</li> <li>○ PDU Current cut-off (mA) (if applicable)</li> </ul> <p><b>Aerosol</b></p> <ul style="list-style-type: none"> <li>○ Inhaled aerosol temperature (°C)</li> <li>○ Aerosol Particle number concentration (#/cm3)</li> <li>○ Count median diameter (nm)</li> <li>○ PM2.5 (µg/m3)</li> </ul> <p><b>Filter (if applicable)</b></p> <ul style="list-style-type: none"> <li>○ Filter efficiency (%) {If no filter efficiency data is available for the products, include information sufficient to show that the cigar filter is unchanged [e.g., denier per filament (DPF), total denier (g/9000m), and filter density(g/cm3)]}</li> <li>○ Filter pressure drop (mm H2O)</li> <li>○ Filter length (mm)</li> <li>○ Filter diameter (mm)</li> <li>○ Filter ventilation (%)</li> </ul>	<p><b>E-liquid</b></p> <ul style="list-style-type: none"> <li>○ E-liquid viscosity (at 20°C)</li> <li>○ E-liquid volume (ml)</li> </ul> <p><b>Tobacco (if applicable)</b></p> <ul style="list-style-type: none"> <li>○ Tobacco moisture (%)</li> <li>○ Tobacco cut size (CPI or mm)</li> <li>○ Tobacco density (g/cm3)</li> </ul> <p><b>Battery</b></p> <ul style="list-style-type: none"> <li>○ Battery voltage operating range</li> <li>○ Battery current operating range (mA)</li> <li>○ PDU voltage operating range (V)</li> <li>○ PDU current operating range (mA)</li> <li>○ PDU wattage operating range</li> <li>○ PDU Current cut-off (mA) (if applicable)</li> <li>○ PDU temperature cut-off (°C)</li> <li>○ Battery Capacity (mAh)</li> <li>○ Battery Nominal Voltage (V)</li> <li>○ Battery Current rating (mA)</li> <li>○ Battery charging temperature limits (°C)</li> <li>○ Battery discharge temperature limits (°C)</li> <li>○ Battery maximum charging current (mA)</li> <li>○ Battery maximum discharging current (mA)</li> <li>○ Battery upper limits charging voltage (V)</li> </ul> <p><b>Aerosol</b></p> <ul style="list-style-type: none"> <li>○ Inhaled aerosol temperature (°C)</li> <li>○ Aerosol Particle number concentration (#/cm3)</li> <li>○ Count median diameter (nm)</li> <li>○ PM2.5 (µg/m3)</li> </ul> <p><b>Filter (if applicable)</b></p> <ul style="list-style-type: none"> <li>○ Filter efficiency (%) {If no filter efficiency data is available for the products, include information sufficient to show that the cigar filter is unchanged [e.g., denier per filament (DPF), total denier (g/9000m), and filter density(g/cm3)]}</li> <li>○ Filter ventilation (%)</li> <li>○ Filter pressure drop (mm H2O)</li> </ul>

