

Microwave Ovens

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Which Microwave Ovens are Subject to the Performance Standard?

- Microwave ovens intended to heat, cook, or dry food
 - Home use
 - Commercial food services
- Does not apply to industrial microwave heating or cooking



Microwave Oven - Definition

- Title 21 CFR § 1030.10(b)
- (1) **Microwave oven** means a device designed to **heat, cook, or dry food** through the application of electromagnetic energy at frequencies assigned by the Federal Communications Commission in the normal ISM heating bands ranging from 890 megahertz to 6,000 megahertz.
- As defined in this standard, "microwave ovens" are limited to those manufactured **for use in homes, restaurants, food vending, or service establishments, on interstate carriers, and in similar facilities.**

[Emphasis added]



Performance Standard Summary for Microwave Ovens

- The federal radiation safety performance standard for microwave ovens (21 CFR § 1030.10) applies to microwave ovens manufactured after October 6, 1971.
- Requirements include:
 - Power density limit of 5 mW/cm² at 5 cm from external surface limits (after acquired by a purchaser)
 - Measurement and test conditions
 - Safety interlocks with a monitor circuit
 - Warnings, precaution labels, and manuals

Wire Insertion Hazard

- Insertion of a wire into a microwave oven's interior microwave-energy-containing spaces may result in serious injuries.
 - Inserted wire acts as an antenna
 - An antenna bypasses shielding
 - May result in substantially exceeding the power density limit

Wire Insertion Requirement

Title 21 CFR § 1030.10(2)(iv) *Safety interlocks.*

- Microwave radiation emission in excess of the limits specified in paragraph (c)(1)* of this section shall not be caused by insertion of an insulated wire through any opening in the external surfaces of a fully assembled oven into the cavity, waveguide, or other microwave-energy-containing spaces while the door is closed, provided the wire, when inserted, could consist of two straight segments forming an obtuse angle of not less than 170 degrees.

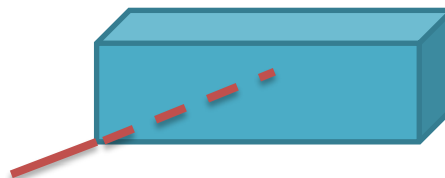
* Emission limits in (c) (1) = 1 mW/cm² or 5 mW/cm² (before or after purchase)

Wire Insertion Requirement History

- 1970—some ovens include uncovered mesh as microwave shielding.
 - No glass or plastic covering
 - Easy to insert objects through the uncovered mesh
- 1975—FDA published a revision to the performance standard.
 - Changed insertion into the oven cavity into insertion into any microwave energy containing spaces

Wire Insertion Test Failure

- **Example**: A straight wire can be inserted into the microwave oven cavity from the bottom left corner of the door.



- FDA laboratory test: Is wire insertion possible?
- No emission measurement is made.
 - Potential hazard
 - Enforcement issue

Wire Insertion Test Proposal

- Proposal: Series of tests of emissions with inserted wire.
- Either verify if insertion always causes significant excess power density, or
- Develop a test that is not unduly hazardous.

Door Open Operation Background

- Increased number of consumer complaints regarding microwave ovens.
 - Approximately 40 microwave oven consumer complaints in in 2015-2016.
 - Only 10 consumer complaints in 2014.
- Most complaints - microwave oven operates with an open door.

Door Open Operation Details

- Partial failures with some functions (lights, fan, turntable) continuing, possibly without generating microwaves.
- No guarantee microwaves cannot be generated.
- Microwave power density measurement of the faulty oven desirable.

Door Open Operation Details

- FDA access to the faulty ovens usually not possible because faulty oven is:
 - No longer partially functioning,
 - Disposed of by the consumer, or
 - Oven was replaced and faulty taken and disposed of by a service technician.

Door Safety Interlock and Monitoring Requirement

Title 21 CFR § 1030.10(2)(vi) *Safety interlocks.*

- A means of monitoring one or both of the required safety interlocks shall be provided which shall cause the oven to become inoperable and remain so until repaired if the required safety interlock(s) should fail to perform required functions as specified in this section. Interlock failures shall not disrupt the monitoring function.

Door Open Operation Hazards

- Possibility that failures could allow microwave generation to continue with the door open.
- Serious burns could result if microwave generation continues with the door open.
- Even if no microwave radiation occurs, it appears that the microwave oven continues to generate microwave radiation.
 - causes anxiety, fear, and stress

Door Open Operations Proposals

- FDA will continue to investigate complaints.
- FDA will make microwave power density measurements on faulty microwave ovens when possible.
- We are considering :
 - Revising the performance standard,
 - Writing and issuing guidance, or
 - Working to alter consensus standards to address door open operation.

Door Open Operations Proposals

- Possible content of changes:
 - Add a performance requirement to unambiguously display an indication when the oven can still generate microwaves.
 - Require all functions associated with microwave production to be shut off by the safety interlocks.

Questions for TEPRSSC

- What other actions, if any, should FDA pursue in order to address wire insertion test failure?
- What are your recommendations regarding to our intended actions?

Questions for TEPRSSC

- What changes, if any, do you recommend making to the microwave oven performance standard?
- What changes should we encourage in voluntary consensus standards (e.g., IEC standards) ?
- Would altering voluntary consensus standards be preferable to amending the microwave oven performance standard?
- Alternatively or additionally, what sort of guidance, if any, should FDA develop?

