

# Panashield, Inc.

*Facility Solutions For Global  
Electromagnetic Compatibility*

# Absorber Technologies and Its Impact on Anechoic / Semi Anechoic Chambers

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# Discussion Points

- Brief History of Absorber for EMC
- Current Technology of Absorber
  - ❖ Absorber Types
  - ❖ Impact on Chamber Design

- **Brief History of Absorber for EMC**

1940's – Carbon on plywood and Horse Hair

1950's – Introduction of Urethane Foam

1960's – Urethane Foam

1968 – First patent by for Styrene by TDK Japan

1969 – First patent for Ferrite by University Tokyo

1970's – Primarily use of Urethane foam absorber  
worldwide

- **Brief History of Absorber for EMC**

1980's – Mostly urethane in worldwide, start of ferrite in Japan

1986 – First USA chamber with ferrite by IBM

1990's – Urethane and Ferrite Tile, introduction of Hybrids for Ferrite Tile

1992 – Introduction of Ferrite Grid Panels by Panashield & Channel Partner IBEX Group (30 MHz to 5 GHz RE without use of hybrids)

- **Brief History of Absorber for EMC**

2003 – Introduction of New Fibrous Composite Fireproof Hybrid by Panashield & Japanese Channel Partner **HYB-NF**

2012 – Introduction of New Technology Styrene Hybrid by Panashield's channel Partner Dutch Microwave Absorber Solutions (DMAS) **EHPA-612-T45**

# • Current Technology of Absorber

## ▪ ABSORBER TYPES:

- Polyurethane foam absorbers – pyramidal and wedge
- Polystyrene foam absorbers – pyramidal and wedge
- Ferrite tile absorbers – tiles and tile panels
- Hybrid absorbers – urethane, fibrous composite, traditional styrene, new taper styrene

# • Current Technology of Absorber

## IMPACT ON CHAMBER DESIGN

### ABSORBER

### IMPACT

Urethane

Lower cost/MIL/DO160 compliant  
High frequency test applications  
Requires larger physical chamber sizes

Styrene

Higher cost/Longer chamber life  
Requires larger chamber size than ferrite

Ferrite

Reduced chamber size  
Expanded lower frequency range  
Provided longer chamber life  
3 times the cost of foam absorbers

Hybrids

Extends use of ferrite above 1 GHz to 60 GHz



# • **Current Technology of Absorber**

## MULTI PURPOSE TEST CHAMBER APPLICATIONS

**Increase in international EMC test standards require chamber designs to offer multi purpose testing capabilities.**

- Commercial EMC Emissions & Immunity
- Military 461 & DO 160
- Automotive CISPR 25
- Wireless ETSI, WiFi Alliance
- Aerospace, Free Space Simulation
- Medical EN Standards

- **Current Technology of Absorber**

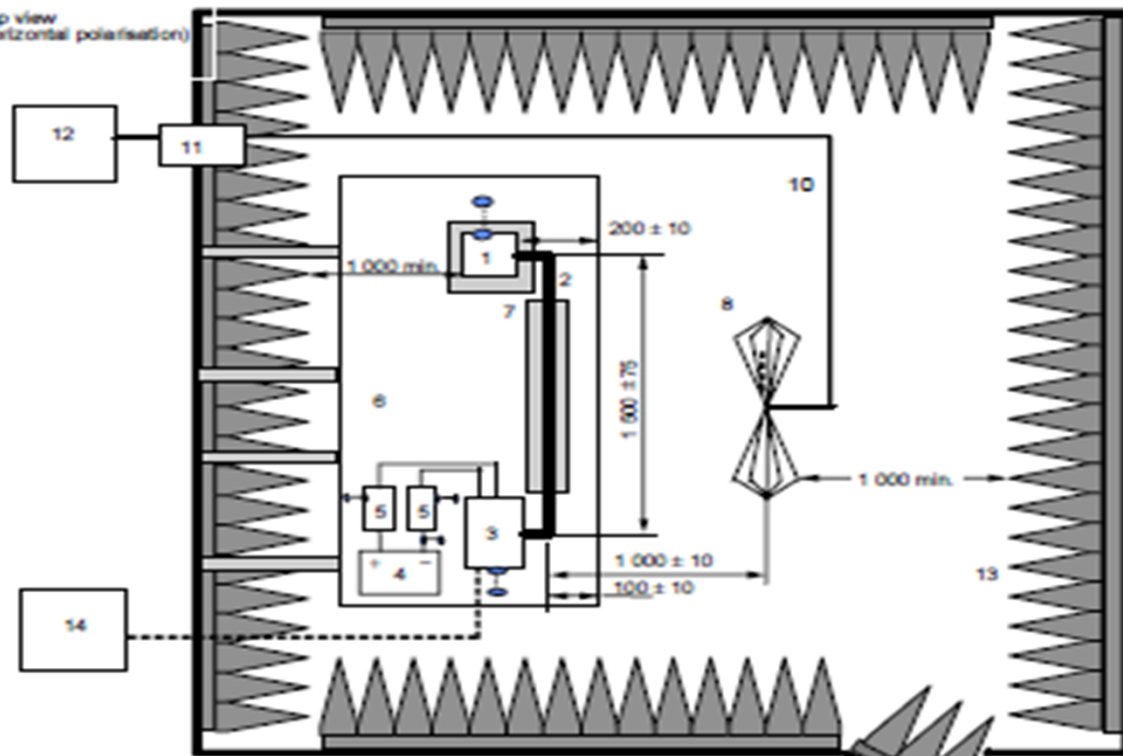
## **EXAMPLE OF ABSORBER CHOICE IN DESIGNING A CHAMBER**

# Example: Designing Automotive Test Chamber What Absorber Type to Specify?

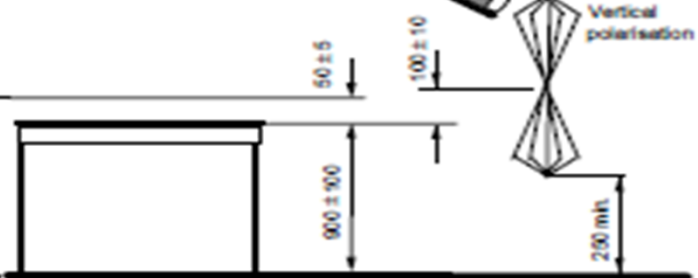
## PARAMETERS:

- ❑ CISPR 25 Separation Distances
  - For radiated emissions tests, the shielded enclosure shall be of sufficient size to ensure that neither the vehicle/EUT nor the test antenna shall be closer than 1 m from the walls or ceiling, or to the nearest surface of the absorber material used thereon.
  
- ❑ CISPR 25 Ground Plane (Bench) Minimum Size
  - The minimum width of the ground plane for radiated emissions shall be 1000 mm. The minimum length of the ground plane for radiated emissions shall be 2000 mm, or underneath the entire equipment plus 200mm, whichever is larger. The height of the ground plane (test bench) shall be  $(900 \pm 100)$  mm above the floor.

Top view  
(horizontal polarisation)



Front view



Side view

Vertical polarisation

IC 3/2008

❑ Sizing rule of thumb for CISPR 25  
Automotive Component Test Chambers:

- Width = 4m + depth of absorber x 2
- Length = 5m + depth of absorber x 2
- Height = 2.7m + depth of absorber x 1

## Absorber Lining Options

- **36"**(91.4cm)Urethane Foam (Panashield/Others)

Width= 583cm Length= 683cm Height= 362cm (19' x 23' x 12' )

- **24"**(60.9cm)Ferrite/Urethane Hybrid (Panashield/Others)

Width= 522cm Length= 622cm Height= 331cm (17' x 21' x 11' )

- **19"**(48cm)Ferrite/Styrene Hybrid (Panashield/Others)

Width= 496cm Length= 596cm Height= 318cm (16'-4" x 19'-7" x 10'-6" )

- **13"**(33cm)Ferrite/Fibrous Hybrid (Panashield Only HYB)

Width= 466cm Length= 566cm Height= 303cm (15'-4" x 18'-7" x 10' )

## Key Decision Points to Consider:

- ❑ Larger absorber requires larger size chamber.
- ❑ Urethane absorber less effective at frequencies below 400 MHz.
- ❑ Urethane standard or hybrid absorber fire retardant (not fireproof); contain toxic chemicals; susceptible to low & high humidity levels; shorter life span.
- ❑ Newer technology absorber such as taper styrene & HYB fibrous composite hybrids have many benefits in size, chemical make-up, performance, and life span.

- **Current Technology of Absorber**

**HYBRID CHOICE KEY IN CHAMBER DESIGN**

Urethane

Lower Performance, Short Life Span, larger depth

HYB Fibrous Composite

High Performance, Long Life, Fire Proof, Shortest Depth, Clean Room Compliant, Humidity Resistant, Bright White



- **Current Technology of Absorber**

Traditional Styrene

High Performance, Long Life,  
Fire Retardant, Longer Depth

New Taper Styrene

High Performance, Shortest  
Depth, Max Depth for 10M  
EMC Chamber only 19" versus  
40" to 60" by other vendors;  
Long Life, Lowest Carbon  
Footprint of all foams,  
Proprietary Taper Design