



# **Hexavalent Chrome Free Coatings for Electronics**

Electromagnetic Interference  
(EMI)

Shielding Effectiveness (SE)



## Objective

Determine the suitability of trivalent chromium conversion coatings that meet the requirements of MIL-DTL-5541, Type II, for use in applications where high-frequency electrical performance is important.

- Evaluate the ability of pretreated aluminum to form adequate EMI seals
- Assess the performance of trivalent chromium pretreatments against a known control hexavalent chrome pretreatment before and after they have been exposed to a set of environmental conditions
- Performance will be assessed by evaluating shielding effectiveness (SE) test data from a variety of test samples comprised of different aluminum types and/or conversion coatings



## Materials

### Alloys

- 5052-H32
- 6061-T6

### Pretreatments

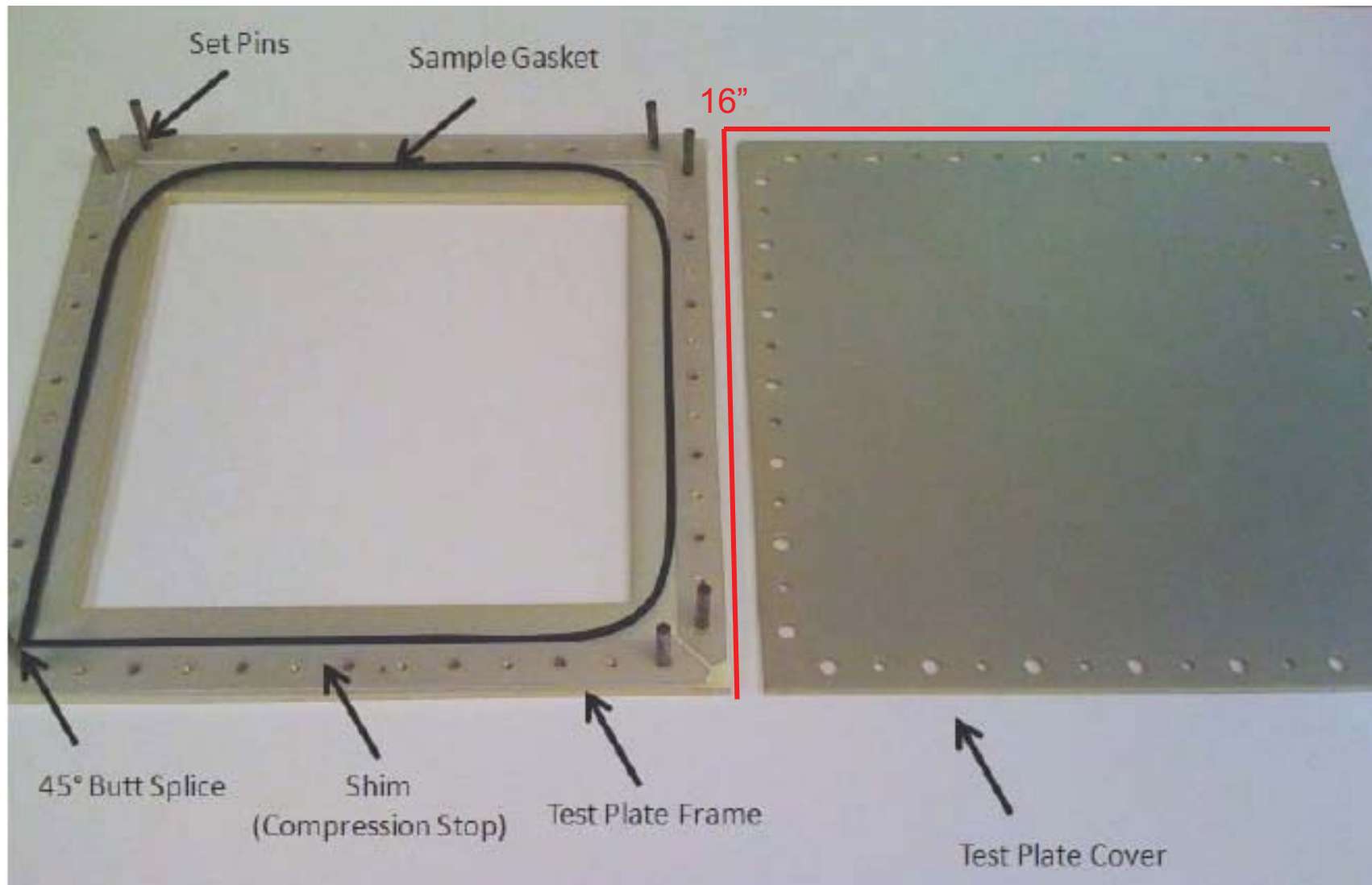
- MIL-DTL-5541, Type I, Class 3, Hexavalent {Control}
- MIL-DTL-5541, Type II, Class 3, SurTec 650
- MIL-DTL-5541, Type II, Class 3, Metalast TCP

### EMI Gasket

- XX



# Test Articles



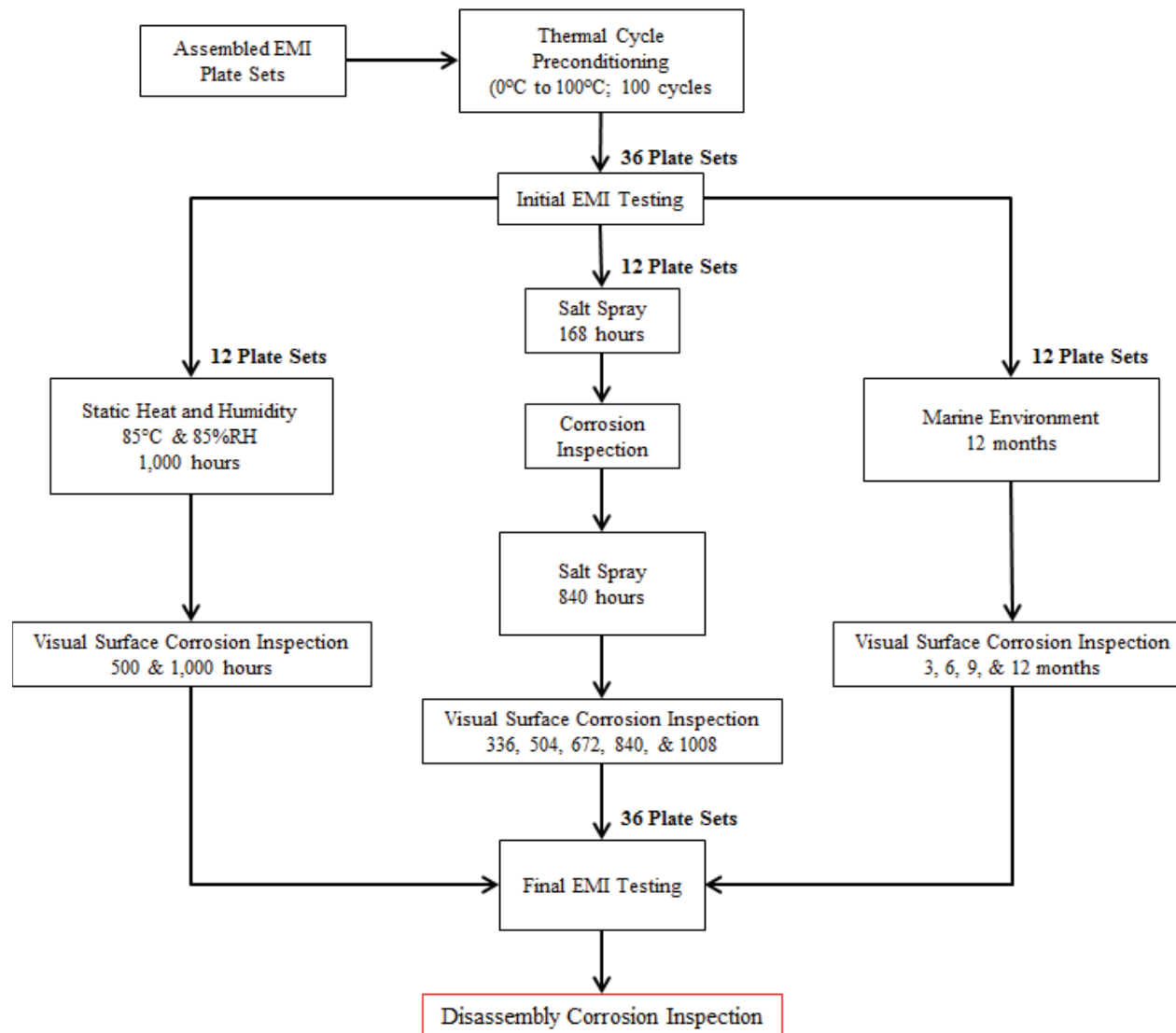


## Testing Overview

Test	Test Method	Duration	Evaluation Criteria	Location
Thermal Preconditioning	0°C to 100°C	100 Cycles	N/A	TBD
EMI Testing {Pre}	Chomerics CHO-TP09	50 MHz – 18 GHz with 3 freq's/decade	Chomerics	Chomerics
Salt Spray Resistance	ASTM B 117	168 Hours then 1,008 Hours	MIL-DTL-5541	KSC Corrosion Lab
Static Heat and Humidity	85°C +/- 1°C and 85% RH +/- 5% RH	1,000 Hours	MIL-DTL-5541	KSC Corrosion Lab
Marine Environment	ASTM D 1014	12 Months	MIL-DTL-5541	KSC Corrosion Lab
EMI Testing {Post}	Chomerics CHO-TP09	50 MHz – 18 GHz with 3 freq's/decade	Chomerics	Chomerics



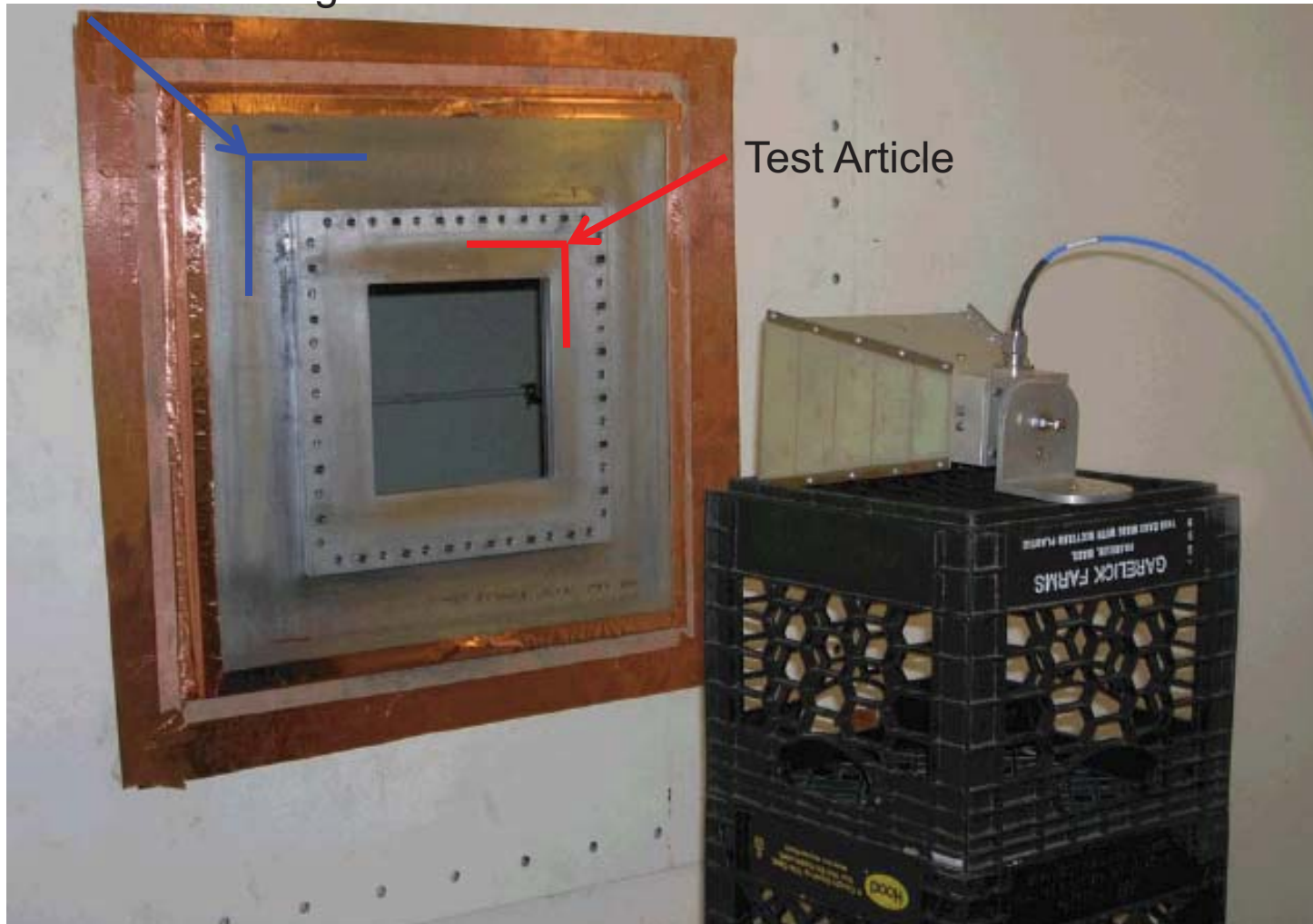
# Test Flow





# EMI Test Setup

Adapter Plate for Mounting



Basic Thru-Hole Open Reference Setup 1GHz to 18GHz



## Cost

### COST OUTLINE {Test Fixture}

• SE Test plan generation (DRAFT COMPLETE)	\$N/A
• Test panel cover fabrication costs T6061 (SP310-3, Qty 18)	\$1,282.50
• Test panel cover fabrication costs T5051 (SP310-3, Qty 18)	\$1,282.50
• Test panel frame fabrication costs T6051 (SP310-2, Qty 18)	\$2,080.80
• Test panel frame fabrication costs T5051 (SP310-2, Qty 18)	\$2,080.80
• Main Shielded Room Adapter Plate (Qty 1) (SP310-1)	\$ N/A At Chomerics
• Coating MIL-DTL-5541, Type I, Class 3, Hexavalent (Qty 12)	\$182.00
• Coating MIL-DTL-5541, Type II, Class 3, SurTec 650 (Qty 12)	\$146.00
• Coating MIL-DTL-5541, Type II, Class 3, Metalast TCP (Qty 12)	\$150.00 (est)
• Shims Ultem 1000 single piece construction	\$8,208.00
• Bolts/Fasteners (Qty 864)	\$500.00
• Gasket costs – 4 corner spliced	\$2,985.00
• Test fixture assembly labor (16 Hours) (Travel ?)	\$ _____
• Thermal Preconditioning Test 0-100 Degrees C (all 36 Panels)	\$ _____
• Salt Spray Test ASTM B117 (12 Panels)	\$6,000.00
• Static Heat and Humidity Test 85/85 (12 Panels)	\$6,000.00
• Marine Environment Test	\$4,000.00
• Shielding Effectiveness Testing (84 Tests) (5/shift @ 1,800/shift)	\$30,240
• Corrosion Analysis Costs (24 Hours) (Travel ?)	\$ _____
• Shipping Crate (Qty 3)	\$1,500.00
• Transportation/Shipping Charges (6 trips @ \$500.00 EA)	\$3,000.00
• Shielding Effectiveness Test Report	\$1,500.00
• Environmental Analysis Test Report	\$ _____
» TOTAL	<b>\$63,011.68</b>





## Cost

### **COST OUTLINE {Resistivity Testing}**

- Test panels T6061 (Qty 10) \$15.00 (est)
- Test panels T5051 (Qty 10) \$15.00 (est)
- Coating MIL-DTL-5541, Type I, Class 3, Hexavalent (Qty) \$150.00 (est)
- Coating MIL-DTL-5541, Type II, Class 3, SurTec 650 (Qty ) \$150.00 (est)
- Coating MIL-DTL-5541, Type II, Class 3, Metalast TCP (Qty ) \$150.00 (est)
- Contact Electrical Resistance – MIL-DTL-81706 \$\_\_\_\_\_
- Surface Resistance Test – ASTM D 257 \$\_\_\_\_\_
- » **TOTAL** **\$480**

**National Aeronautics and Space Administration (NASA)**



# Questions