Test Report for CR EMSG-1252

Jiangsu Crystal River Electronic Technology Co., Ltd

Content

1. Product description

1.1 Overview

CR EMSG-1252 is a kind of two-part Ni/C conductive glue product, which is cured at high temperature. It has low hardness, excellent electromagnetic sealing performance and good sealing performance in humid environment under low pressing force, and has good initial isolation degree. It still has excellent isolation degree under extreme aging conditions. In the case of dense 5G base station modules, FIP dispensing process can be used to form. With low viscosity, it can guarantee short production cycle on any type of dispenser. At 100°C, it can be fully cured in 50 minutes, with good cost performance.

1.2 Product features

CR EMSG-1252 is a new two-part Ni/C conductive glue product with high isolation and super low hardness.

- ✓ It has low compression force, suitable for high compression deformation occasions.
- ✓ Has high initial isolation and high isolation after ultimate aging.
- ✓ Low viscosity makes it possible to guarantee a very short production cycle on any type of glue dispenser.
- ✓ Good adhesion on various plastic and metal substrates.
- ✓ Meet the environmental protection requirements of EU Directive 2002/95/EC (RoHS).

1.3 Product applications

- ✓ Indoor and outdoor installation of communication equipment
- ✓ Base station
- ✓ Portable test and calibration equipment
- ✓ Satellite radio transceiver

1.4 Storage and use

CR EMSG-1252 is packaged in a 2000ml plastic bucket or a 310ml plastic cartridge for transportation. The shelf life at -20±2℃ is at least 3 months. Use dispenser to dispense the mixed conductive glue on the cleaned workpiece surface, and cured at 100°C for 50 minutes. During use, ensure that the surface of the material is clean. Avoid contact with sulfur, sulfur compounds, amines, urethane rubber, various oils, waxes and some release agents.

2. Product Test Project

2.1 Compression set test

2.1.1 Purpose

Provide technical certification basis for compression set performance of CR EMSG-1252 two-part high isolation ultra-soft conductive glue before and after aging.

2.1.2 Test product

CR EMSG-1252, a solid circular sample with a diameter of 13mm and a thickness of about 2.1mm, the quantity is 15 pieces.

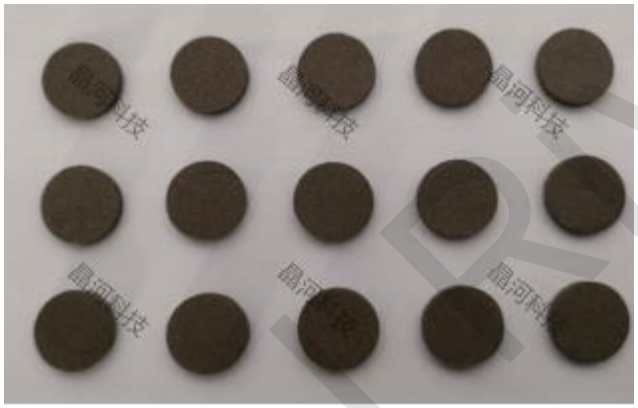

Fig. 2.1-1 Compression set test sample

2.1.3 Test standards

ASTM D395 Method B

2.1.4 Instruments or fixtures

Molding press, Compression fixture, Thickness gauge, Drying oven

Fig. 2.1-2 Molding press

Fig. 2.1-3 Compression fixture

Fig. 2.1-4 Thickness gauge

Fig. 2.1-5 Drying oven

2.1.5 Test method

1) Press the CR EMSG-1252 material with molding press and a mold (the size of the mold is 200mm×200mm×2.1mm), curing conditions: 185°C/300 seconds, and ensure that there are no pores inside the molded test sheet.
2) Use a knife die to cut the test sheet after step 1) into a circle with a diameter of 13mm, and total quantity is 15.
3) Stack every three pieces together, and use a thickness gauge to measure the initial total height t_0 of the five stacked test sheets, and record them to ensure that there is no gap in the middle.
4) The sample is compressed by about 25%, then the assembled fixture is put into the drying oven, heated to 100°C at a temperature change rate of 2°C/min, kept at 100°C for 168 hours, and taken out for testing device and remove the test sample for cooling.
5) Place the test samples on the surface of the material with poor thermal conductivity, such as a wooden block, and cool down for 2 hours.
6) Use a thickness gauge to measure the thickness t_i of the sample after step 5) and record it.
7) Calculate compression set according to the following formula.

   $CB_1=[(t_0-t_i)/ (t_0- t_n)] \times 100\%$

   Where:

   CB_1 - Compression set

   t_0 - Initial height of sample

   t_i - Final height of sample

   t_n - Height of limit block, 4.5mm

2.1.6 Test result

Fig.2.1-6 Compression set assembly

Fig. 2.1-7 Sample state after aging

Tab. 2.1-1 Compression set test result for CR EMSG-1252

No.	Sample height, mm			Compression ratio, %	Compression set, %		Result
	Original/t_0	Limit block/t_n	Final/t_i		Test value	CR standard	
1#	6.03	4.5	5.53	25.4	32.7	＜65	Ok
2#	6.05	4.5	5.48	25.6	36.8		
3#	6.04	4.5	5.51	25.5	34.4		
4#	6.04	4.5	5.56	25.5	31.2		
5#	6.05	4.5	5.54	25.6	32.9		

2.2 Compression rebound test

2.2.1 Purpose

Provide technical certification basis for the rebound force performance of CR EMSG-1252 two-part high isolation ultra-soft conductive glue product after compression.

2.2.2 Test product

CR EMSG-1252 strip

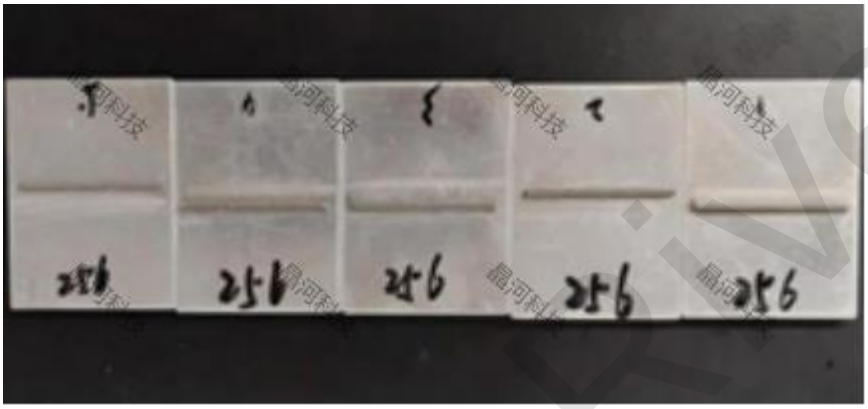

Fig.2.2-1 Test sample of rebound force

2.2.3 Test standards

JH-WI-38/Conductive glue Compression& Repulsion Test Work Instructions

2.2.4 Instruments or fixtures

Digital Calipers, Dispensing Machines, Rebound Force Compression Fixtures, Universal Material Testing Machines

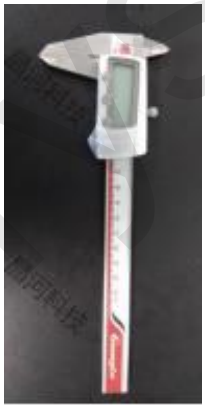

Fig.2.2-2 Digital Calipers

Fig.2.2-3 Dispensing Machines

Fig.2.2-4 Rebound Force Compression Fixtures

Fig.2.2-5 Universal Material Testing Machines

2.2.5 Test method

1) Mix the conductive glue evenly, and pour it into a 55CC syringe after vacuuming.
2) Extrude the conductive glue in the syringe through the dispenser, and dispense the strip with a length of more than 45mm on the stainless-steel plate.
3) Put the sample after step 2) into the oven to cure at 100℃ for 45min, take it out and cool it to room temperature for 1h and measure the size of the strip.
4) Put the sample in the slot of the lower compression plate, so that the strip is perpendicular to the direction of the upper indenter. Test conditions: the compression rate is 5mm/min, the initial force is 0.25N, the test indenter is 10mm wide, and the compression height is 0.62mm (the strip is compressed to 1mm).
5) Record the maximum rebound force and the steady-state force value when the compression state is maintained for 5 minutes, and use the steady-state force value as a measure of the sample's rebound force.

2.2.6 Test result

Tab.2.2-1 Compression rebound force test result for CR EMSG-1252

No.	Strip size, mm		Maximum compression ratio	Transient rebound force maximum		5min rebound force steady state value		Result
	Width	Height		Test value	CR standard	Test value	CR standard	
1#	1.30	1.63	38.0%	20.47N	≤30N	13.55N	15±5N	Ok
2#	1.31	1.64	37.8%	25.05N		16.82N		Ok
3#	1.29	1.61	38.5%	22.12N		14.48N		Ok
4#	1.31	1.62	38.3%	21.68N		14.31N		Ok
5#	1.30	1.61	38.5%	25.75N		17.18N		Ok

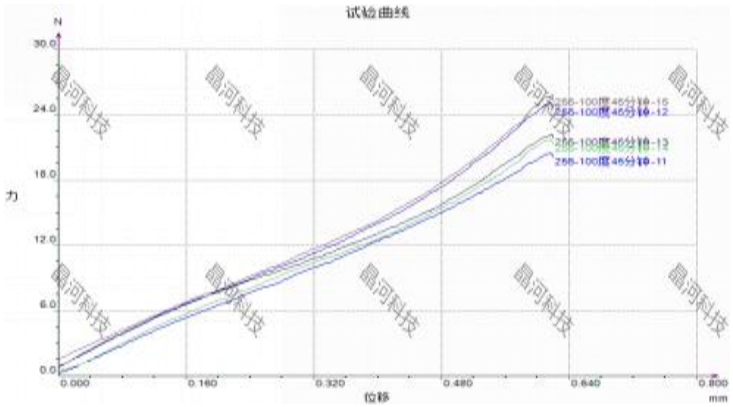

Fig.2.2-6 Compression rebound force test curve for CR EMSG-1252

2.3 Hardness/density test

2.3.1 Purpose

Provide technical certification basis for hardness and density cured performance of CR EMSG-1252 two-part high isolation ultra-soft conductive glue product.

2.3.2 Test product

■ Hardness sample:

CR EMSG-1252 two-part high isolation ultra-soft conductive glue square test piece (bake at 150℃ for 1 hour) with a size of 100mm×100mm, the quantity is 3 pieces.

■ Density sample

13mm diameter CR EMSG-1252 two-component high isolation ultra-soft conductive adhesive circular test piece (bake at 150℃ for 1 hour), the quantity is 5 pieces.

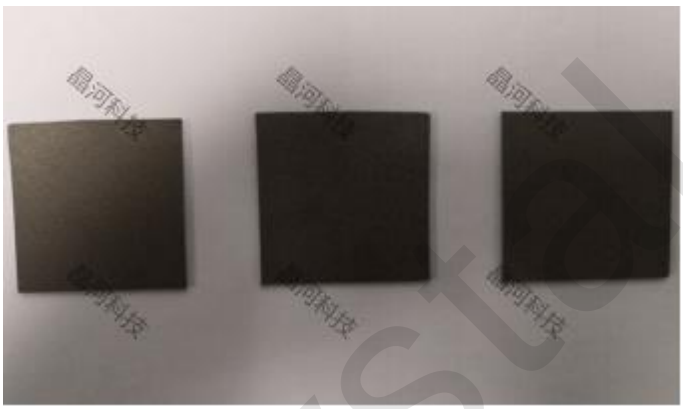

Fig. 2.3-1 Hardness test samples

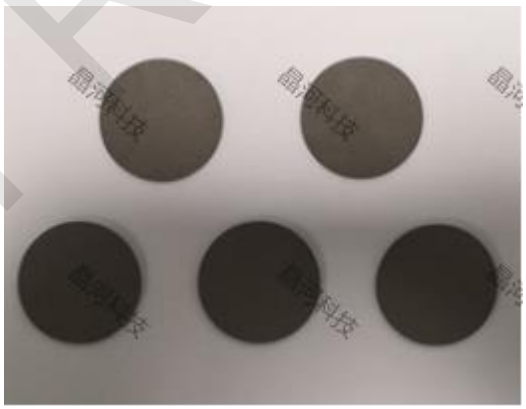

Fig. 2.3-2 Density test samples

2.3.3 Test standards

ASTM D2240 (Hardness), ASTM D792 (Density)

2.3.4 Instruments or fixtures

Molding Press, Thickness Gauge, Shore A Durometer, Solid Density Tester

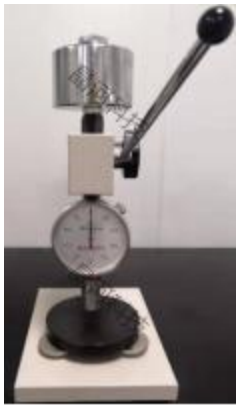

Fig. 2.3-3 Shore A Durometer

Fig. 2.3-4 Thickness Gauge

Fig. 2.3-5 Solid Density Tester

Fig. 2.3-6 Molding Press

2.3.5 Test method

1) Press the CR EMSG-1252 material using a molding machine and a mold (the size of the mold is 200mm×200mm×2.1mm), and the curing conditions are: 185℃/300 seconds, and ensure that there are no pores inside the molded test piece.
2) Use a cutter to cut the test piece of step 1) into 3 pieces of 100mm × 100mm test pieces and 5 round test pieces with a diameter of 13mm for use.

■ **Test method of hardness**

1) Test the thickness of the 100mm×100mm test piece, and then stack three pieces on a flat table.
2) Apply pressure to the sample through the durometer until the lower surface of the durometer is close to the surface of the sample, read and record.
3) Test 5 times on the four corners and different positions of the middle part on the square sample.
4) Take the median value.

■ **Test method of density cured**

1) Number the circular test density samples.
2) Put the sample in step 1) into the solid density meter for density test and record it.
3) Take the median value.

2.3.6 Test result

Fig. 2.3-7 Hardness Point 1

Fig. 2.3-8 Hardness Point 2

Fig. 2.3-9 Hardness Point 3

Fig. 2.3-10 Hardness Point 4

Fig. 2.3-11 Hardness Point 5

Tab. 2.3-1 CR EMSG-1252 Hardness& Density Test Results

Part number	Performance	Test value						CR standard	Result
		1	2	3	4	5	Median		
CR EMSG-1252	Hardness, Shore A	45	43	44	45	42	44	45±5	Ok
	Density cured, g/cm^3	2.12	2.15	2.14	2.08	2.09	2.12	2.10±0.20	Ok

2.4 Tensile strength/maximum elongation test

2.4.1 Purpose

Provide technical certification basis for tensile strength/maximum elongation performance of CR EMSG-1252 two-part high isolation ultra-soft conductive glue product.

2.4.2 Test product

CR EMSG-1252 Two-part high isolation super soft conductive glue material, dumbbell-shaped sample specified by ASTM D412.

Fig. 2.4-1 Tensile Strength/Maximum Elongation Test Samples

2.4.3 Test standards

ASTM D412

2.4.4 Instruments or fixtures

Molding press, Thickness gauge, Universal material testing machine, Blast drying oven

Fig. 2.4-2 Universal material testing machine

Fig. 2.4-3 Thickness gauge

Fig. 2.4-4 Blast drying oven

Fig. 2.4-5 Molding press

2.4.5 Test method

1) Press the CR EMSG-1252 material using a molding machine and a mold (the size of the mold is 200mm × 200mm × 2.1mm), and the curing conditions are: 185℃/300 seconds, and ensure that there are no pores inside the molded test piece.
2) Bake the test piece of step 1) at 150°C for 1 hour in a blast drying oven.
3) Use a knife die to cut the test piece after step 2) into a dumbbell-shaped test piece as shown in Figure 2.4-1, with a quantity of 3 pieces.
4) Use a thickness gauge to test its thickness.
5) Put the dumbbell-shaped test piece on the fixture of the universal material testing machine, select the tensile strength module, input the thickness of the test piece and test it, test three test pieces in parallel, and record the results.

2.4.6 Test result

Tab. 2.4-1 Tensile Strength/Maximum Elongation Test Results for CR EMSG-1252

Part number	Performance	Test value				CR Standard	Result
		Sample 1	Sample 2	Sample 3	Mean		
CR EMSG-1252	Tensile strength, MPa	0.82	0.86	0.84	0.84	⩾0.60	Ok
	Maximum Elongation, %	269	255	263	262	＞100	Ok

2.5 Tear strength test

2.5.1 Purpose

Provide technical certification basis for tear strength performance of CR EMSG-1252 two-part high isolation ultra-soft conductive glue product.

2.5.2 Test product

CR EMSG-1252 Two-part high isolation super soft conductive glue material, crescent-shaped type sample specified by ASTM D624

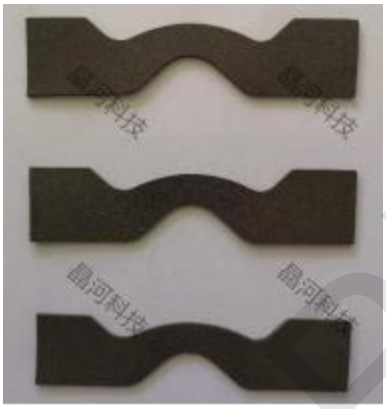

Fig. 2.5-1 Tear Strength Test Samples

2.5.3 Test standards

ASTM D624

2.5.4 Instruments or fixtures

Molding press, Thickness gauge, Universal material testing machine, Blast drying oven

Fig. 2.5-2 Universal material testing machine

Fig. 2.5-3 Thickness gauge

Fig. 2.5-4 Blast drying oven

Fig. 2.5-5 Molding press

2.5.5 Test method

1) Press the CR EMSG-1252 material using a molding machine and a mold (the size of the mold is 200mm × 200mm × 2.1mm), and the curing conditions: 185℃/300 seconds, and ensure that there are no pores inside the molded test piece.
2) Bake the test piece of step 1) at 150°C for 1 hour in a blast drying oven.
3) Use a knife die to cut the test piece after step 2) into a crescent-shaped test piece as shown in Figure 2.5-1, and the number is 3 pieces.
4) Use a thickness gauge to test its thickness.
5) Put the crescent-shaped test piece on the fixture of the universal material testing machine, select the tear strength module, input the thickness of the test piece to test, test three test pieces in parallel, and record the results.

2.5.6 Test result

Tab. 2.5-1 Tear Strength Test Results for CR EMSG-1252

Part Number	Tear strength, N/mm					Result
	CR Standard	Test value				
		Sample 1	Sample 2	Sample 3	Mean	
CR EMSG-1252	＞4.0	7.1	7.3	7.3	7.2	Ok

2.6 Flammability rating test

2.6.1 Purpose

Provide technical certification basis for flammability rating performance of CR EMSG-1252 two-part high isolation ultra-soft conductive glue product.

2.6.2 Test product

CR EMSG-1252 two-part high isolation super soft conductive glue material, the sample specified by UL94

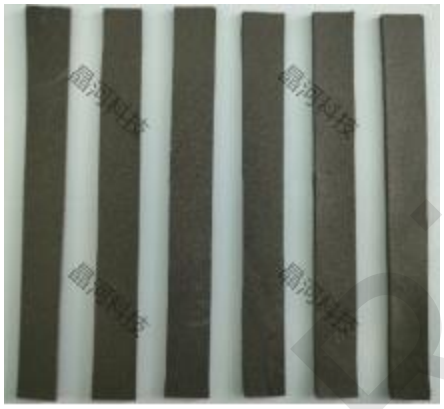

Fig. 2.6-1 Flame retardant grade test samples

2.6.3 Test standards

UL94

2.6.4 Instruments or fixtures

Molding press, Thickness gauge, Blast drying oven, Flame retardant tester

Fig. 2.6-2 Molding press

Fig. 2.6-3 Thickness gauge

Fig. 2.6-4 Blast drying oven

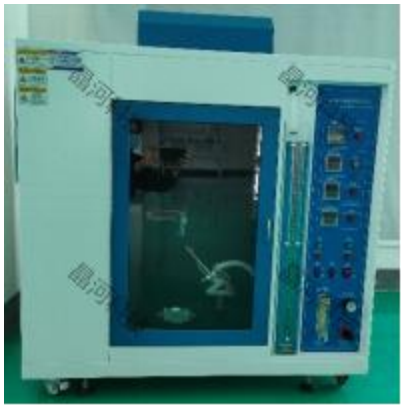

Fig. 2.6-5 Flame retardant tester

2.6.5 Test method (HB class fire test)

1) Press the CR EMSG-1252 material using a molding machine and a mold (the size of the mold is 200mm × 200mm × 2.1mm), and the curing conditions: 185℃/300 seconds, and ensure that there are no pores inside the molded test piece.
2) Bake the test piece of step 1) at 150°C for 1 hour in a blast drying oven.
3) Size: Use a knife die to cut the test piece after step 2) into a rectangular test piece as shown in Figure 2.6-1. Sample size: length × width: 125±5mm × 13.0±0.5mm, and the number is 6 pieces.
4) Scribing: Scribe the test piece after step 3) at 25mm and 100mm from the ignition end respectively.
5) Clamping: Clamp the end of the sample close to 100mm, keep the length direction horizontal, the width direction and the horizontal plane at 45°±2°, and fix the wire mesh at 10±1mm below the sample.
6) Burner: Adjust the methane gas supply of the burner to generate a gas flow rate of 105±5ml/min, and the back pressure is less than 10 mm water column, so as to ensure a nominal 50 W test flame.
7) Flame: The burner should be kept away from the sample and ignited, adjust the burner to produce a blue flame 20±1mm high. The flame is obtained by adjusting the air supply and air intake.
8) Combustion: apply the flame to the free end of the lower edge of the sample, tilt the flame furnace at 45°, put it into the flame at a depth of 6mm, and remove the flame furnace for 30±1 seconds or when it burns to 25mm.
9) Timing: Start timing when the flame burns to 25±1mm, and count the time t used to stop burning and the burned length L.

10) Calculation: V=60L/t.

Where:

V - Burning speed, mm/min

L - Burned length, mm

t - Burning time, s

2.6.6 Test result

Tab. 2.6-1 Flammability rating test results for CR EMSG-1252

No.	Thickness mm	Actual burn length, mm	Actual burning time, second	Whether to stop burning (Within 100mm gauge)	Burning rate, mm/min		Result
					Measured value	UL Standard	
1#	2.14	8	30	Yes	16	≤75	HB
2#	2.15	10	30	Yes	20		
3#	2.16	10	30	Yes	20		
4#	2.15	8	30	Yes	16		
5#	2.14	8	30	Yes	16		
6#	2.16	10	30	Yes	20		

2.7 Adhesion test

2.7.1 Purpose

Provide technical certification basis for adhesion performance of CR EMSG-1252 two-part high isolation ultra-soft conductive glue product.

2.7.2 Test product

Two-part high isolation super soft conductive glue CR EMSG-1252.

Fig. 2.7-1 Adhesion Test Samples

2.7.3 Test standards

JH-WI-16/Conductive glue Adhesion Test Work Instructions

2.7.4 Instruments or fixtures

Dispensing machine, Blast drying oven, Push-pull force meter, Digital caliper

Fig. 2.7-2 Dispensing machine

Fig. 2.7-3 Blast drying oven

Fig. 2.7-4 Digital caliper

Fig. 2.7-5 Push-pull force mete

2.7.5 Test method

1) Dispense CR EMSG-1252 onto the aluminum surface after nickel-tin plating treatment with dispensing machine.
2) Bake at 150°C for 30 minutes, then cool in air for 20 minutes.
3) Test the width and height of the strip at the position of the test point and record it.
4) Use the push-pull gauge to push the strip away, where the diameter of the test probe is 1cm, place the test block parallel to the substrate and perpendicular to the strip, and use the push-pull gauge to push the strip cured to test the adhesive force between the strip cured and the substrate, the maximum range of the push-pull gauge is 20, and the unit is N.

2.7.6 Test result

Fig. 2.7-6 Adhesion Test Point1

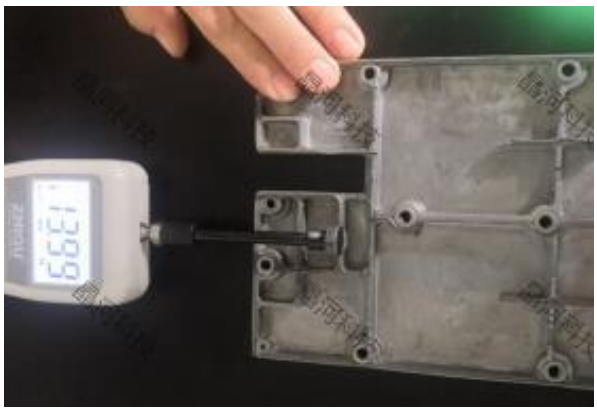

Fig. 2.7-7 Adhesion Test Point2

Fig. 2.7-8 Adhesion Test Point 3

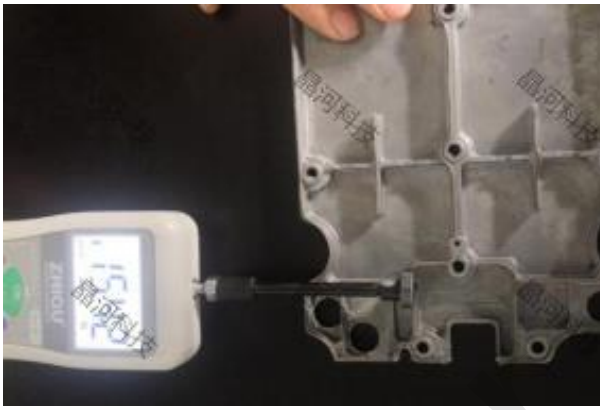

Fig. 2.7-9 Adhesion Test Point4

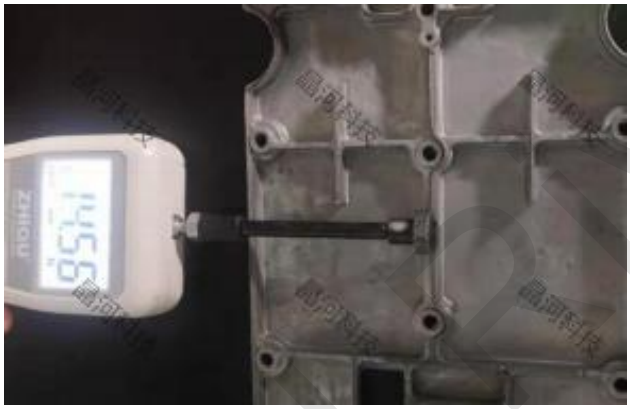

Fig 2.7-10 Adhesion Test Point5

Tab. 2.7-1 Adhesion Test Results for CR EMSG-1252

CR EMSG-1252	Strip wide mm	Strip height mm	Adhesion, N/cm		Result
			Test value	CR standard	
Test point 1	1.32	1.63	14	＞10	Ok
Test point 2	1.32	1.63	13		
Test point 3	1.32	1.63	13		
Test point 4	1.31	1.62	15		
Test point 5	1.32	1.63	14		

2.8 Volume resistivity test

2.8.1 Purpose

Provide technical certification basis for volume resistivity performance of CR EMSG-1252 two-part high isolation ultra-soft conductive glue product.

2.8.2 Test product

Two-part high isolation super soft conductive glue CR EMSG-1252 material.

Fig. 2.8-1 Volume resistivity test samples

2.8.3 Test standards

MIL-DTL-83528C

2.8.4 Instruments or fixtures

Molding press, Thickness gauge, DC low resistance tester, Blast drying oven, Push-pull force and test bench

Fig. 2.8-2 Push-pull force and test bench & DC low resistance tester

Fig. 2.8-3 Molding press

Fig. 2.8-4 Blast drying oven

Fig. 2.8-5 Thickness gauge

2.8.5 Test method

1) Press the CR EMSG-1252 material with a molding press and a mold (the size of the mold is 200mm×200mm×2.1mm), and the curing conditions: 185℃ /300 seconds, and ensure that there are no pores inside the test pieces.
2) Put the sample after step 1) into a blast drying oven, bake it at 150°C for 30 minutes, take it out and cool it at room temperature for 30 minutes.
3) Cut the sample into 14.3mm diameter discs, the quantity is 5 pieces, measure the diameter and thickness of the samples, and record.
4) Put the test sample in the middle of the electrode, apply a downward pressure of 111N, and keep it for 30 seconds, record the resistance value of the sample.
5) Calculate its volume resistivity according to the following formula.
   ρ= R*3.14*D^2/4T
   Where:
   ρ - Volume resistivity
   R - Resistance
   D - Diameter of test sample
   T - Sample thickness
6) Place the test sample after step 5) in a blast drying oven at 156°C, age for 48 hours, and then cool in air for 30 minutes;
7) Measure the diameter and thickness of the test sample after step 6), then repeat steps 4) and 5), and record.
   *Note: The standard requires sample thickness range: 1.397~3.048mm
   The standard requires a pressure of 100 ± 5 psi or 25 psi on the sample
   The standard requires that the maximum time to maintain constant pressure does not exceed 2 minutes

2.8.6 Test result

2.8.6.1 Volume resistance before aging

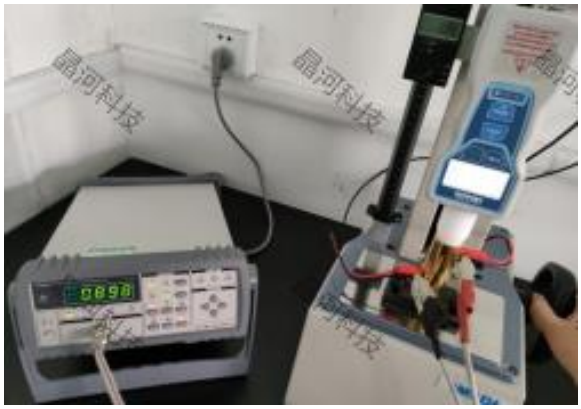

Fig. 2.8-6 Volume resistance for sample 1#

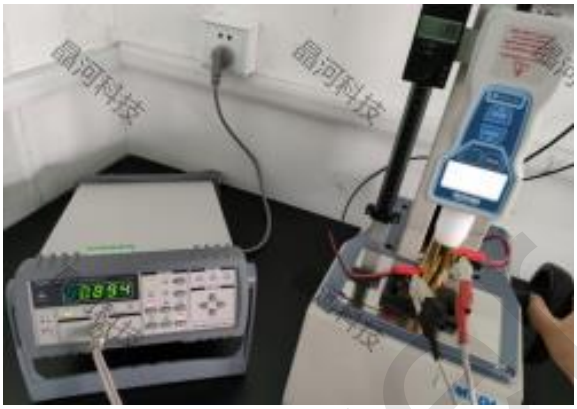

Fig. 2.8-7 Volume resistance for sample 2#

Fig. 2.8-8 Volume resistance for sample 3#

Fig. 2.8-9 Volume resistance for sample 4#

Fig. 2.8-10 Volume resistance for sample 5#

2.8.6.2 Volume resistance after aging

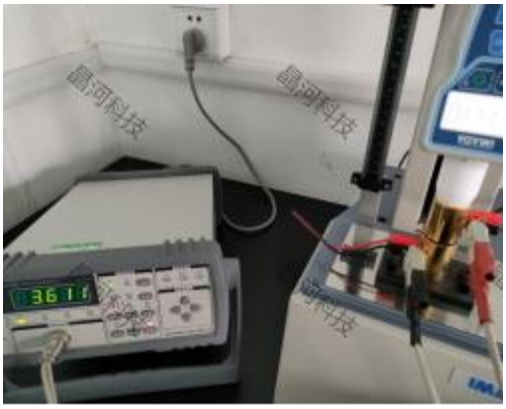

Fig. 2.8-11 Volume resistance for sample 1#

Fig. 2.8-12 Volume resistance for sample 2#

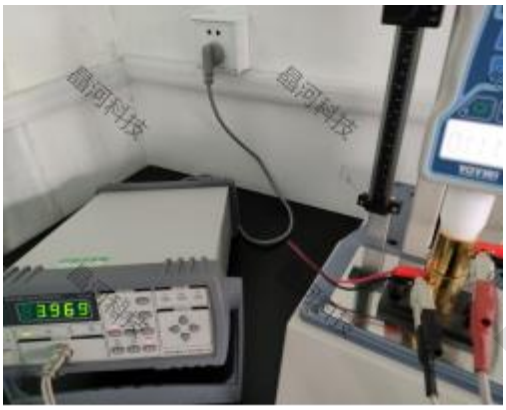

Fig. 2.8-13 Volume resistance for sample 3#

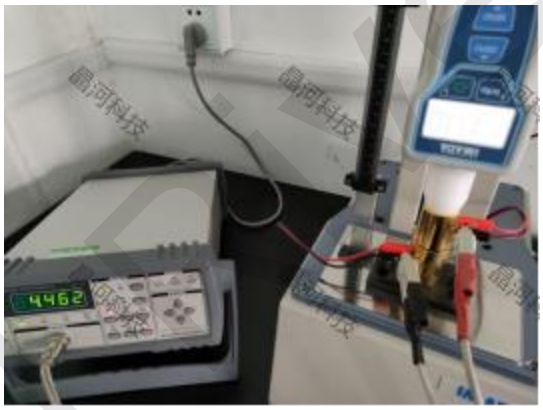

Fig. 2.8-14 Volume resistance for sample 4#

Fig. 2.8-15 Volume resistance for sample 5#

Tab. 2.8-1 Volume resistivity test results before and after aging CR EMSG-1252

No.	Before aging					
	Diameter D, cm	Thickness T, cm	Resistance R, Ohm	Volume resistivity, Ohm-cm		Result
				Test value	CR standard	
1#	1.412	0.215	0.000898	0.0065	≤0.0250	Ok
2#	1.412	0.211	0.000894	0.0066		
3#	1.412	0.214	0.000956	0.0070		
4#	1.412	0.218	0.000833	0.0060		
5#	1.412	0.214	0.000906	0.0066		
	After aging (156℃&48h)					
1#	1.402	0.219	0.003611	0.0254	＜0.0400	Ok
2#	1.412	0.216	0.003026	0.0219		
3#	1.406	0.216	0.003969	0.0285		
4#	1.412	0.208	0.004462	0.0336		
5#	1.412	0.216	0.004306	0.0312		

2.9 Resistance test

2.9.1 Purpose

Provide technical certification basis for resistance performance of CR EMSG-1252 two-part high isolation ultra-soft conductive glue product.

2.9.2 Test product

Two-part high isolation super soft conductive glue CR EMSG-1252 material.

Fig. 2.9-1 Resistance test samples

2.9.3 Test standards

JH-WI-18/Conductive glue resistance test work instructions

2.9.4 Instruments or fixtures

Dispensing machine, Blast drying oven, DC Low Resistance Tester& Resistance Tester

Fig. 2.9-2 Dispensing machine

Fig. 2.9-3 Blast drying oven

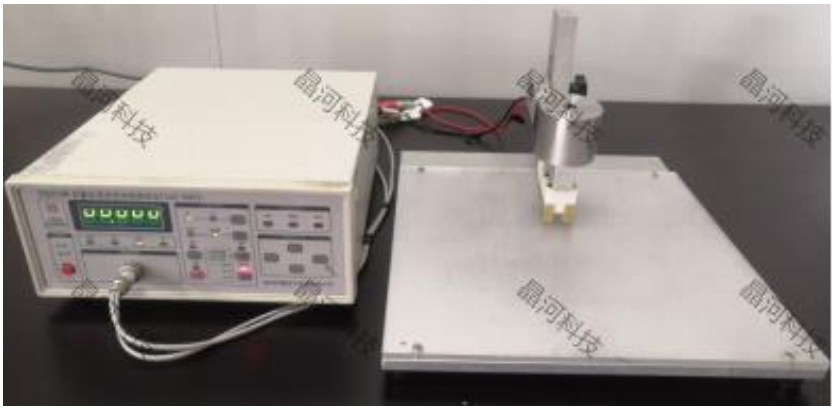

Fig. 2.9-4 Current Low Resistance Testers and Resistance Testers

2.9.5 Test method

1) Dispense CR EMSG-1252 conductive glue onto the aluminum surface treated with nickel-tin electroplating with dispensing machine.
2) Bake at 150°C for 30 minutes, then cool in air for 30 minutes.
3) Use a resistance test device to test the resistance. The test device contains two electrodes with a size of 10mm*10mm and a spacing of 10mm. During the test, use a pressure of 1 kg to press the electrodes onto the surface of strip and record.

■ Resistance test method:

1) Place the dispensing structure horizontally on the workbench.
2) Place the two electrodes of the test tool on the rubber strip and straighten it, and no longer apply additional pressure to the tool.
3) Read the stable resistance value after 10 seconds.
   Remarks: The weight of the test block is 1 kg. After pressing on the rubber strip, the compression rate of the rubber strip is about 30%.

2.9.6 Test result

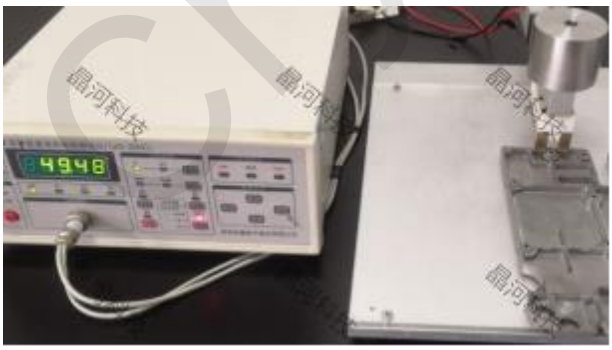

Fig. 2.9-5 Test point 1

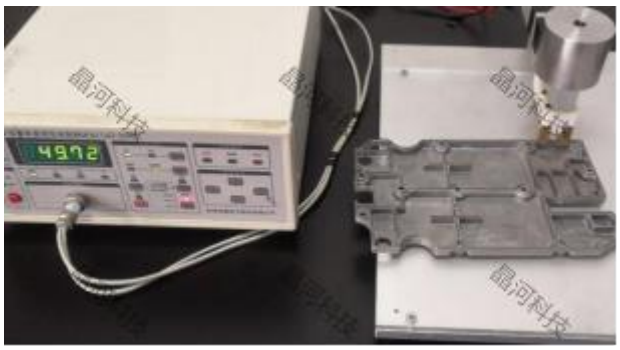

Fig. 2.9-6 Test point 2

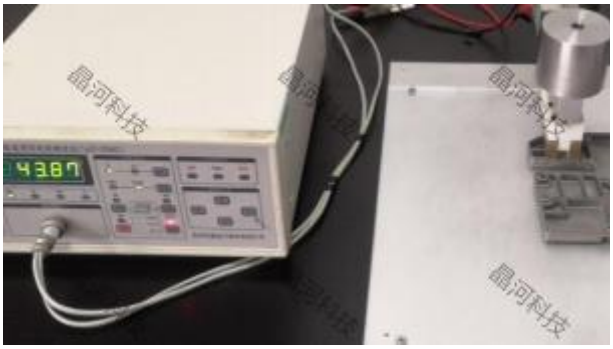

Fig. 2.9-7 Test point 3

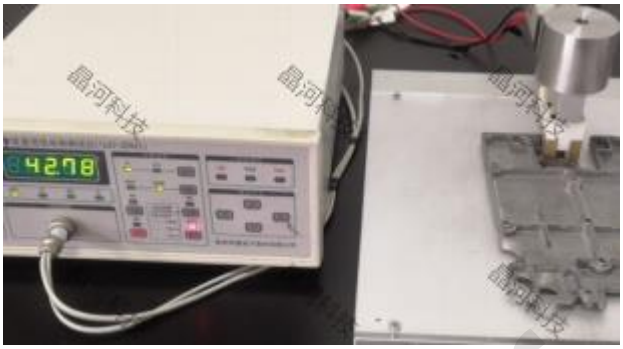

Fig. 2.9-8 Test point 4

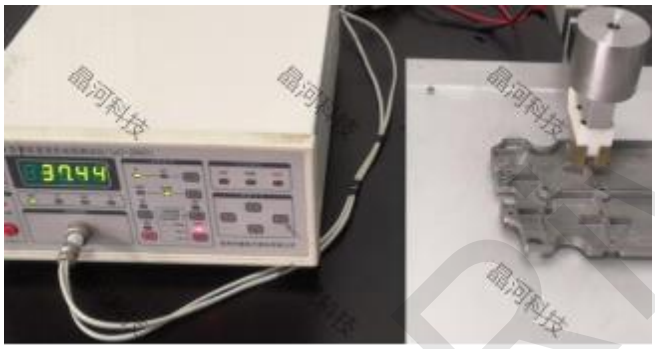

Fig. 2.9-9 Test point 5

Tab. 2.9-1 Room temperature resistance test results for CR EMSG-1252

Part Number	Room temperature resistance, Ohm						Result
	Test point 1	Test point 2	Test point 3	Test point 4	Test point 5	CR standard	
CR EMSG-1252	0.049	0.049	0.043	0.042	0.037	＜0.100	Ok

2.10 Isolation test after HAST aging(85℃&85RH)

2.10.1 Purpose

Provide technical certification basis for Isolation performance after damp heat aging of CR EMSG-1252 two-part high isolation ultra-soft conductive glue product.

2.10.2 Test product

Two-part high isolation super soft conductive glue CR EMSG-1252 material.

Fig. 2.10-1 Isolation Test Sample

2.10.3 Test standards

Huawei isolation dual-chamber test method

2.10.4 Instruments or fixtures

Digital calipers, Vector network analyzers, Dispensing machine, Blast drying ovens, HAST chamber

Fig. 2.10-2 Dispensing machine

Fig. 2.10-3 Vector network analyzers

Fig. 2.10-4 Digital calipers

Fig. 2.10-5 Blast drying ovens

Fig. 2.10-6 HAST chamber

Fig. 2.10-7 Isolation Dispensing Samples

Fig. 2.10-8 Isolation Jig Assembly

2.10.5 Test method

1) Mix the conductive glue evenly and pour it into a 50CC syringe.
2) Extrude the conductive glue in the syringe through the dispensing machine, and dispense glue on the isolation test fixture according to the normal production procedure (dispensing pressure 0.5MPa, 16# needle, speed 30).
3) Put the isolation test fixture after step 2) in the oven at 150℃ for 30min, then take it out and cool it to room temperature, measure the size of the rubber strip, and then install the bottom plate.
4) Perform the initial isolation test on the assembled sample after step 3), turn on the vector network analyzer, preheat for 15 minutes, set the frequency range to 300MHz~10GHz, test method S12 (S21), power 10dB, sweep points 3201, IFBW100Hz.
5) Use the calibration piece to connect the two connecting wires for calibration, and then try not to move the connecting wires. Install the probe on the test tool, connect the connecting wire, and observe and record the test curve after the test curve is stable.
6) Put the assembled sample after step 5) in HAST chamber, the conditions

are 85℃& 85% HR, age for 1000 hours, and then cool in the air for 30 minutes.

7) Perform isolation test on the assembled sample after step 6), turn on the vector network analyzer, preheat for 15 minutes, set the frequency range to 300MHz~10GHz, test method S12 (S21), power 10dB, scan points 3201, IFBW100Hz.
8) Use the calibration piece to connect the two connecting wires for calibration, and then try not to move the connecting wires. Install the probe on the test tool, connect the connecting wire, and observe and record the test curve after the test curve is stable.

2.10.6 Test result

Tab. 2.10-1 85℃&85RH aging 1000 hours isolation test results for CR EMSG-1252

No.	Width mm	Height mm	Limit height mm	Compression rate %	Minimum isolation (0.03-10GHz), dB					Result
					0h	300h	600h	1000h	CR standard	
1#	1.34	1.66	1.00	39.8	123	123	119	112		Ok
2#	1.37	1.64	1.00	39.0	123	122	117	115		Ok
3#	1.35	1.65	1.00	39.4	124	118	101	102	＞70	Ok
4#	1.34	1.66	1.00	39.8	123	122	118	114		Ok
5#	1.35	1.64	1.00	39.0	121	108	100	105		Ok

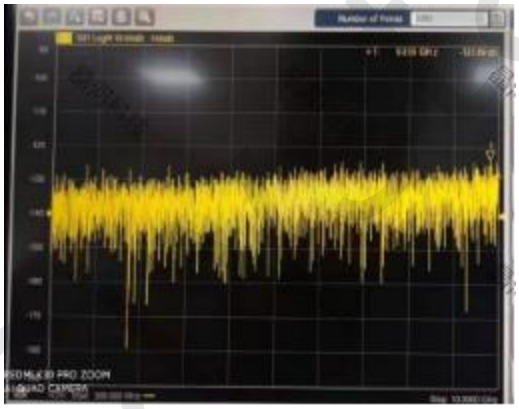

Fig. 2.10-9 Initial isolation for 1# sample

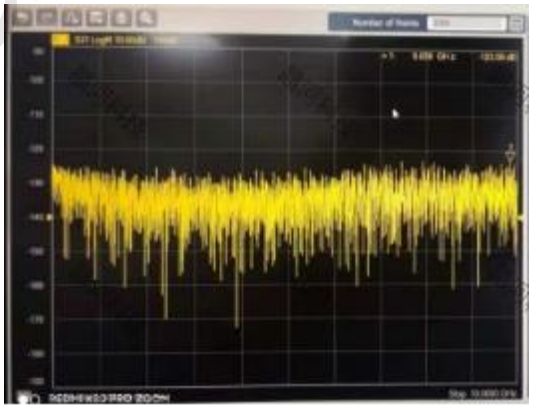

Fig. 2.10-10 1# sample aging for 300h isolation

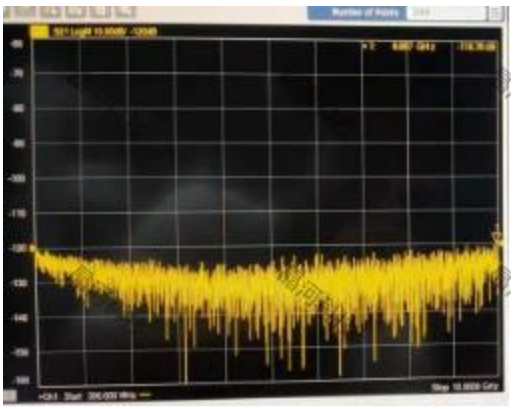

Fig. 2.10-11 1# sample aging for 600h isolation

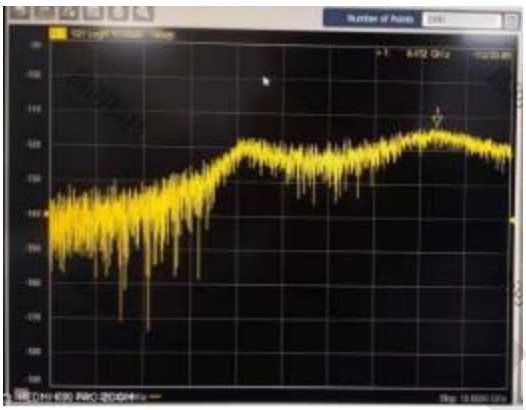

Fig. 2.10-12 1# sample aging for 1000h isolation

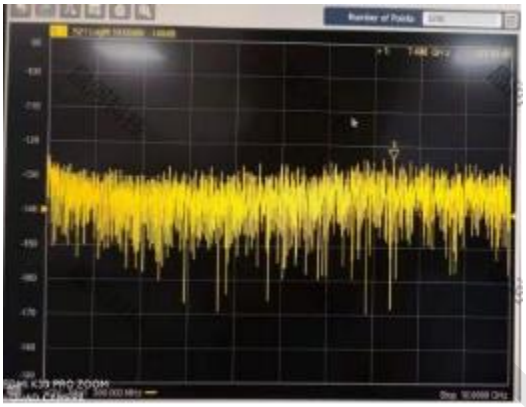

Fig. 2.10-13 Initial isolation for 2# sample

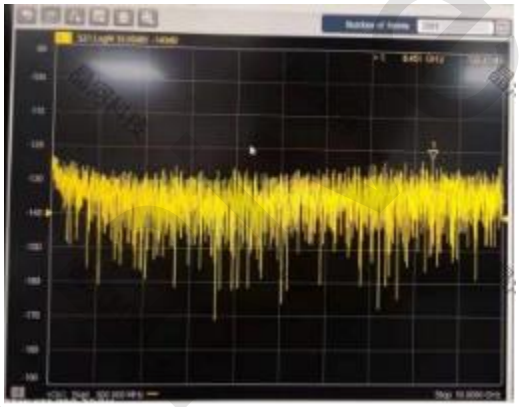

Fig. 2.10-14 2# sample aging for 300h isolation

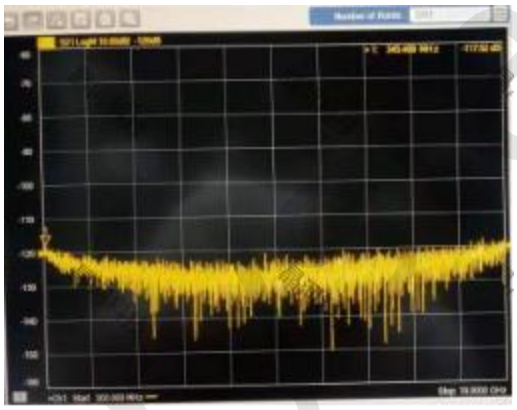

Fig. 2.10-15 2# sample aging for 600h isolation

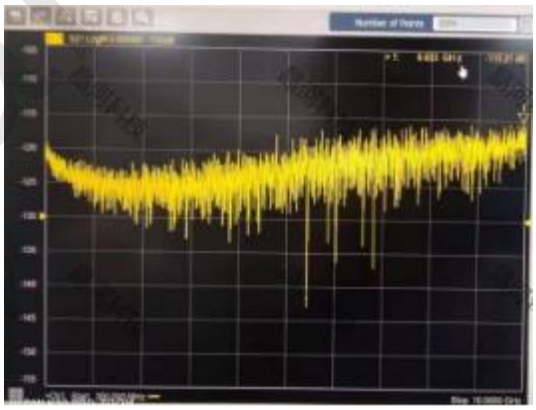

Fig. 2.10-16 2# sample aging for 1000h isolation

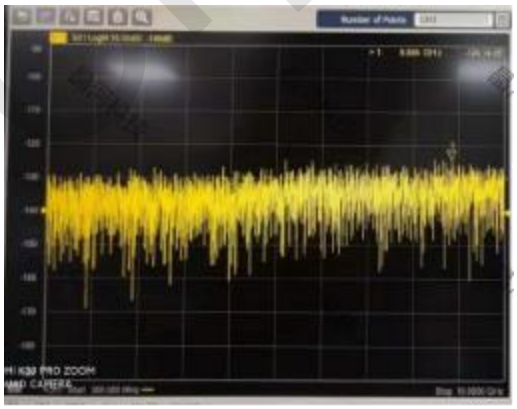

Fig. 2.10-17 Initial isolation for 3# sample

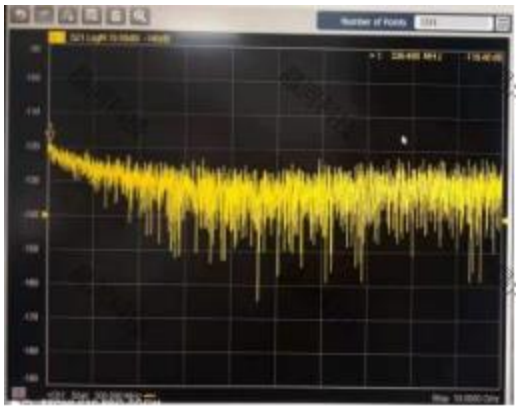

Fig. 2.10-18 3# sample aging for 300h isolation

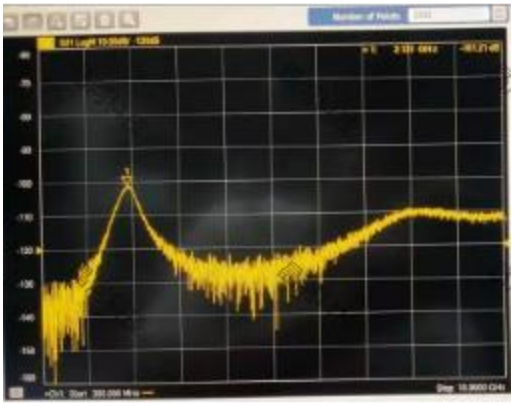

Fig. 2.10-19 3# sample aging for 600h isolation

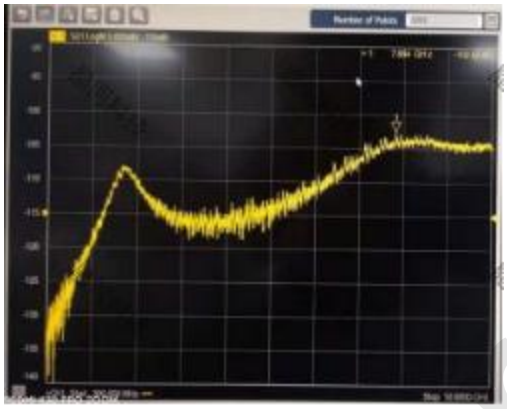

Fig. 2.10-20 3# sample aging for 1000h isolation

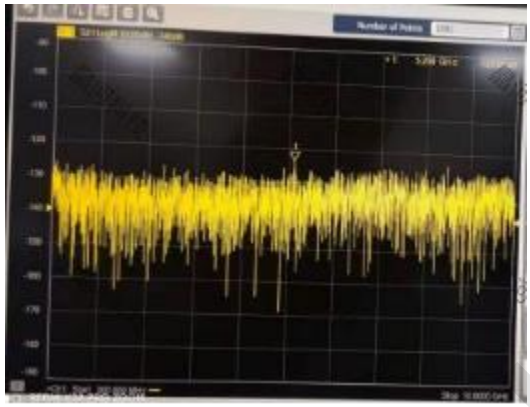

Fig. 2.10-21 Initial isolation for 4# sample

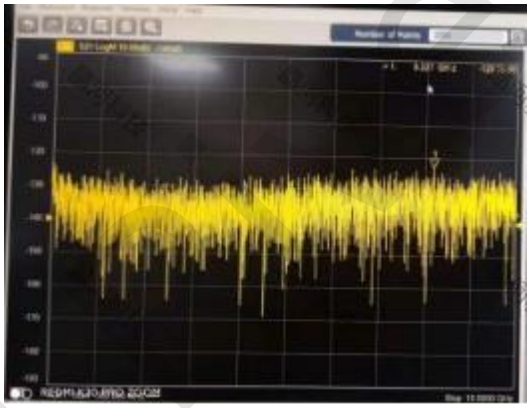

Fig. 2.10-22 4# sample aging for 300h isolation

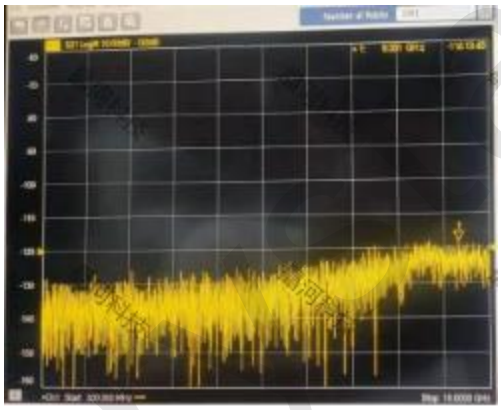

Fig. 2.10-23 4# sample aging for 600h isolation

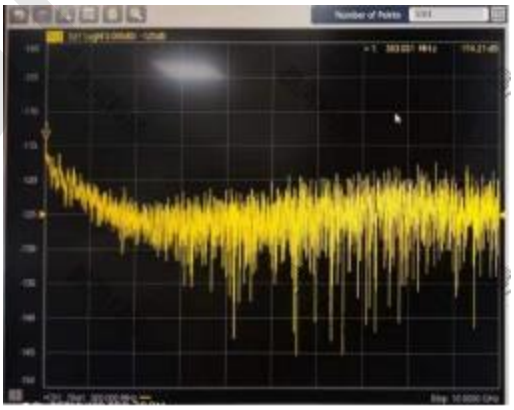

Fig. 2.10-24 4# sample aging for 1000h isolation

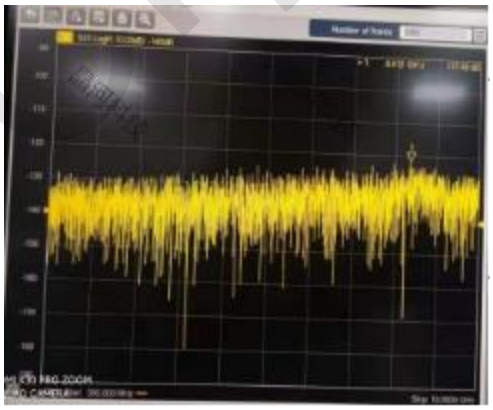

Fig. 2.10-25 Initial isolation for 5# sample

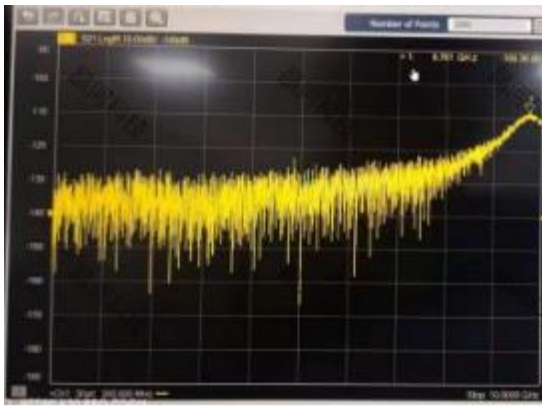

Fig. 2.10-26 5# sample aging for 300h isolation

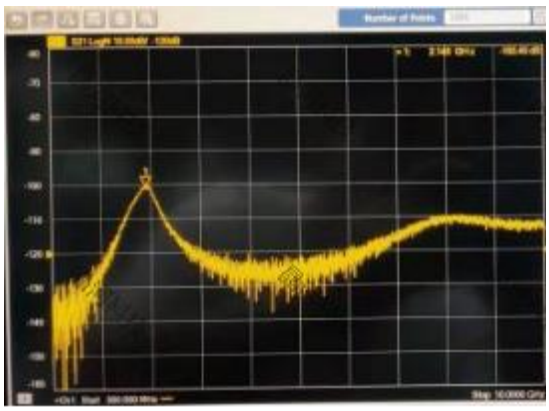

Fig. 2.10-27 5# sample aging for 600h isolation

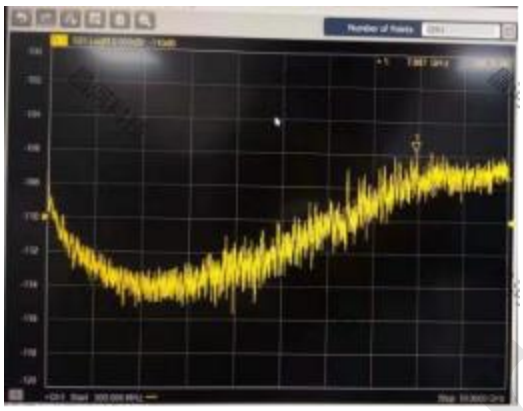

Fig. 2.10-28 5# sample aging for 1000h isolation

2.11 Isolation test after thermal shock aging

2.11.1 Purpose

Provide technical certification basis for isolation performance after thermal shock aging(-40℃~70℃) of CR EMSG-1252 two-part high isolation ultra-soft conductive glue product.

2.11.2 Test product

Two-part high isolation super soft conductive glue CR EMSG-1252 material.

Fig. 2.11-1 Shielding effectiveness test sample before aging

2.11.3 Test standards

Huawei isolation dual-chamber test method

2.11.4 Instruments or fixtures

Digital calipers, Vector network analyzers, Dispensing machine, blast drying ovens, Thermal shock box

Fig. 2.11-2 Dispensing machine

Fig. 2.11-3 Vector network analyzers

Fig. 2.11-4 Digital calipers

Fig. 2.11-5 Blast drying ovens

Fig. 2.11-6 HAST chamber

Fig. 2.11-7 Isolation Dispensing Samples

Fig. 2.11-8 Isolation Jig Assembly

2.11.5 Test method

1) Mix the CR EMSG-1252 conductive glue evenly, vacuumize them, and pour them into a 30CC hose to make them firm.
2) Wipe the isolation jig clean, and dispense glue on the four-axis dispensing machine according to the test requirements.
3) Put the test sample after step 2) into a blast drying oven at 100°C for 40 minutes, then take it out and cool it to room temperature for more than 1 hour.
4) Measure and record the width and height of the test sample strip, and tighten the screw with a torque of 20Kgf according to Figure 2.11-8.
5) Use the S21 method of the N5230A vector network analyzer to measure the initial isolation of the sample after step 4). Network analyzer parameter setting value requirements: frequency range 300MHz~10GHz, number of scanning points 3201, power 10dBm, IFBW: 100Hz.
6) Use the calibration piece to connect the two connecting wires for calibration, and then try not to move the connecting wires. Install the probe on the test tool, connect the connecting line, observe and save the test curve after the

test curve is stable, and record the minimum isolation degree.

7) Put the isolation sample after step 6) into the thermal shock box to carry out the thermal shock test.
8) The cycle conditions are as follows: -40℃~70℃, high and low temperature stand for 30 minutes, temperature rise and fall 11℃/min, 600 cycles. The total time of a single cycle is 80 minutes, and the number of cycles in 24 hours is about 18.
9) Regularly take out the samples that have passed step 8) for isolation test, observe and record the isolation test curve and minimum value. After the test, put the samples back into the thermal shock box to continue the aging test.

2.11.6 Test result

Tab. 2.11-1 -40℃~70℃ aging cycle 600 times isolation test results for CR EMSG-1252

No.	Width mm	Height mm	Limit height mm	Compression rate %	Minimum isolation (0.03-10GHz), dB				Result
					0 cycle	455 cycles	600 cycles	CR standard	
1#	1.47	1.80	1.00	44.4	108	102	97	＞70	Ok
2#	1.46	1.77	1.00	43.5	107	106	107		Ok
3#	1.47	1.80	1.00	44.4	107	107	107		Ok
4#	1.35	1.63	1.00	38.7	107	99	92		Ok
5#	1.36	1.61	1.00	37.9	107	97	93		Ok
6#	1.36	1.64	1.00	39.0	108	96	93		Ok
7#	1.27	1.47	1.00	32.0	107	105	103		Ok
8#	1.25	1.51	1.00	33.8	107	108	107		Ok
9#	1.28	1.46	1.00	31.5	107	108	106		Ok

Note:

- The actual average temperature rise and fall is 5.13 degrees per minute, the total time of a single cycle is 102.88 minutes, and the number of cycles in 24 hours is about 14 times.
- The used vector network analyzer has low precision, so the initial measured isolation is small.

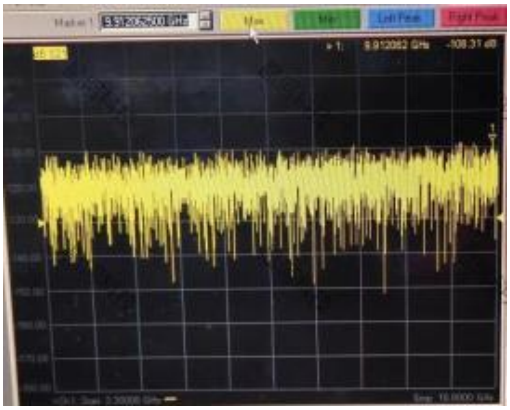

Fig. 2.11-9 Initial isolation for 1# sample

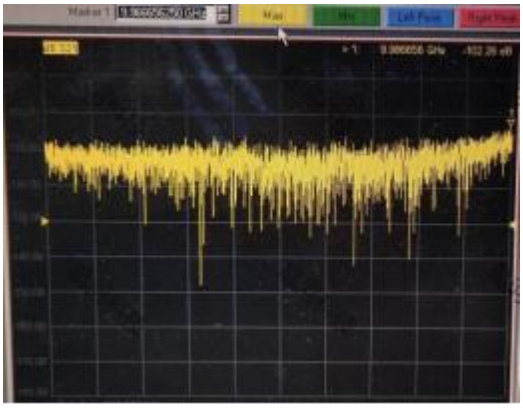

Fig. 2.11-10 1# sample aging for 455 cycles isolation

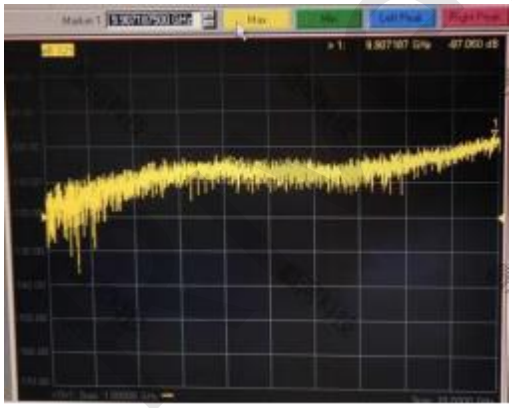

Fig. 2.11-11 1# sample aging for 614 cycles isolation

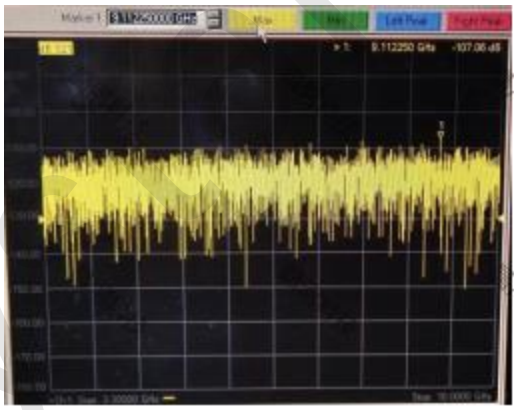

Fig. 2.11-12 Initial isolation for 2# sample

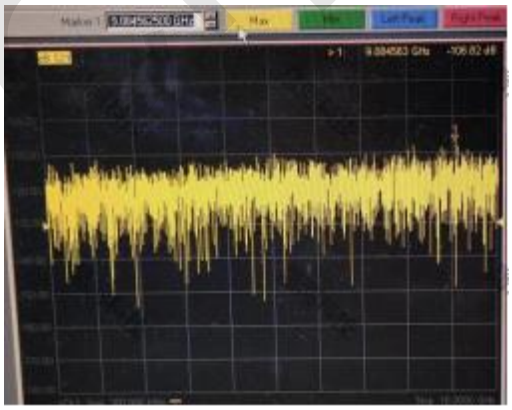

Fig. 2.11-13 2# sample aging for 455 cycles isolation

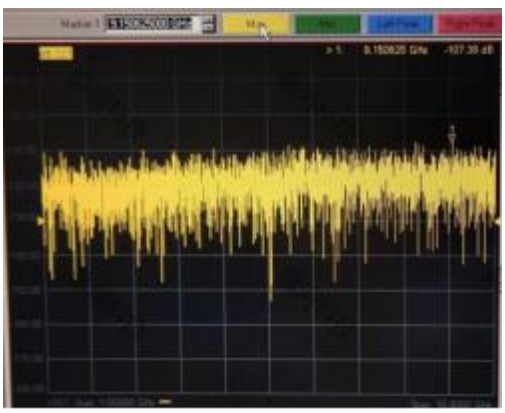

Fig. 2.11-14 2# sample aging for 614 cycles isolation

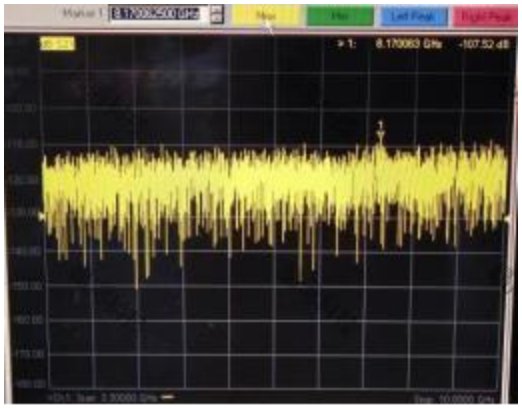

Fig. 2.11-15 Initial isolation for 3# sample

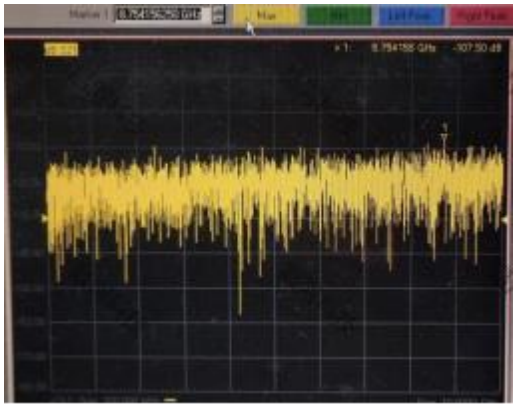

Fig. 2.11-16 3# sample aging for 455 cycles isolation

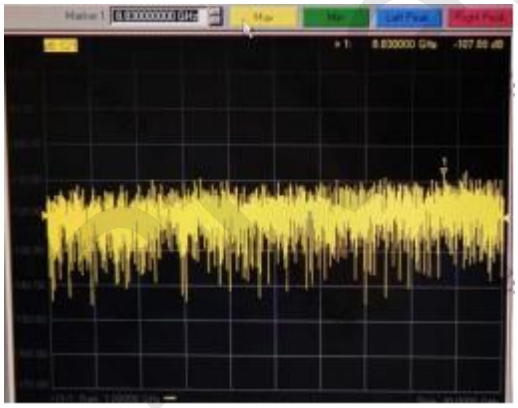

Fig. 2.11-17 3# sample aging for 614 cycles isolation

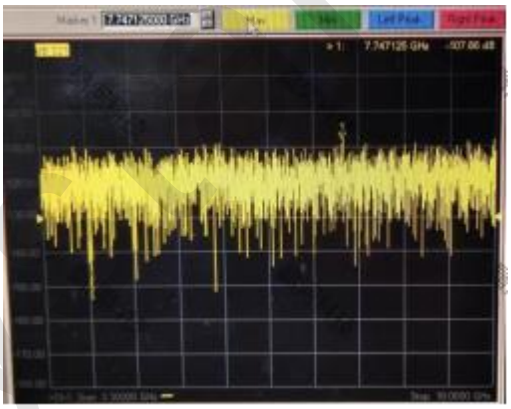

Fig. 2.11-18 Initial isolation for 4# sample

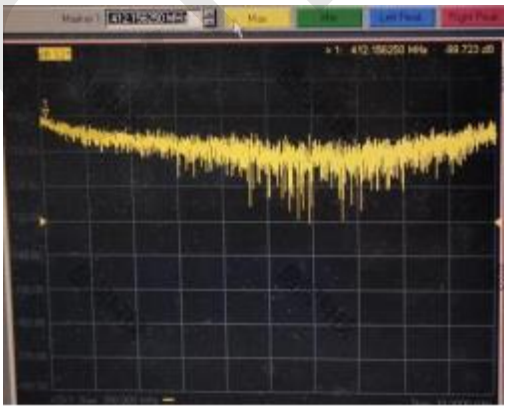

Fig. 2.11-19 4# sample aging for 455 cycles isolation

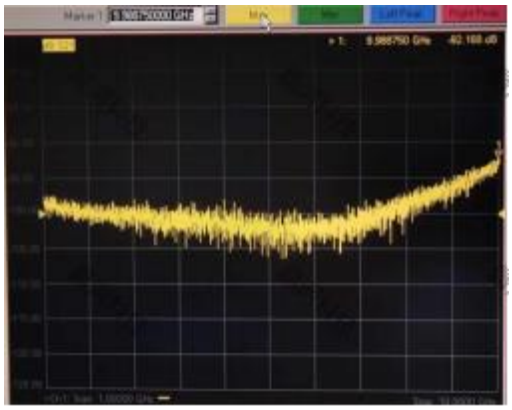

Fig. 2.11-20 4# sample aging for 614 cycles isolation

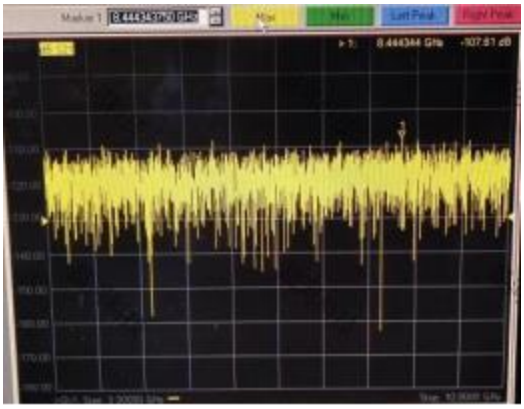

Fig. 2.11-21 Initial isolation for 5# sample

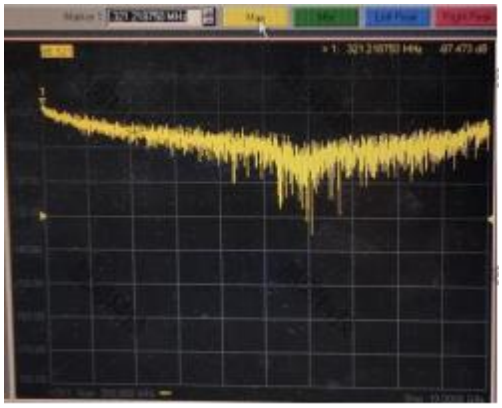

Fig. 2.11-22 5# sample aging for 455 cycles isolation

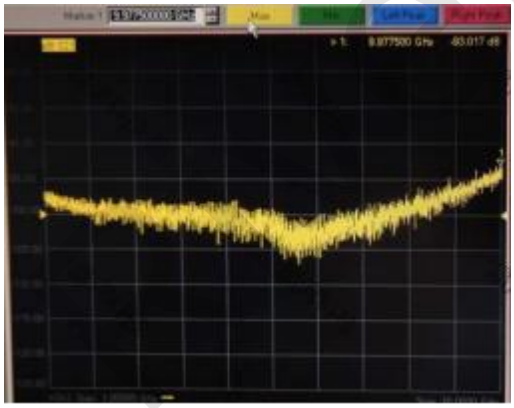

Fig. 2.11-23 5# sample aging for 614 cycles isolation

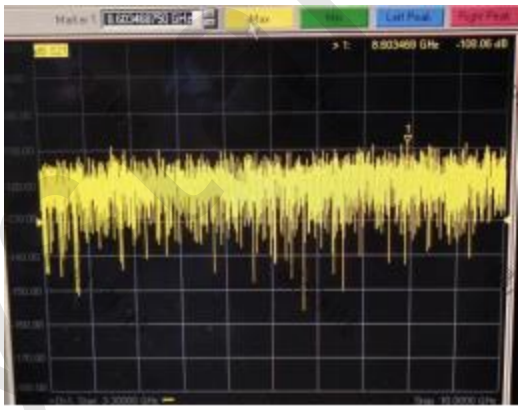

Fig. 2.11-24 Initial isolation for 6# sample

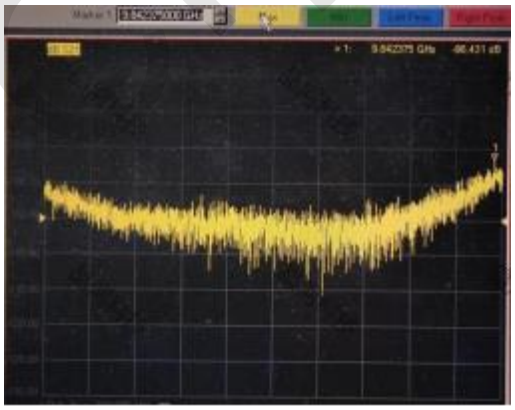

Fig. 2.11-25 6# sample aging for 455 cycles isolation

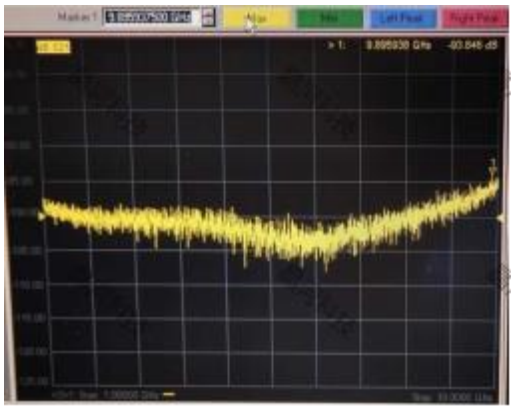

Fig. 2.11-26 6# sample aging for 614 cycles isolation

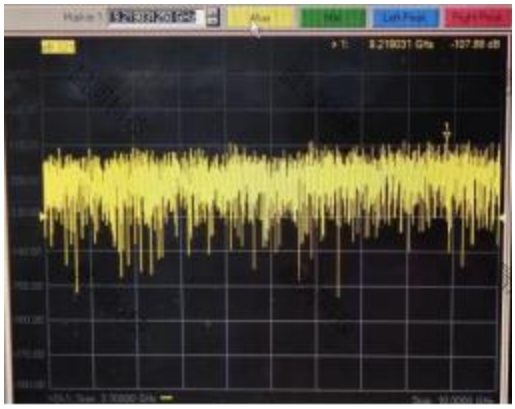

Fig. 2.11-27 Initial isolation for 7# sample

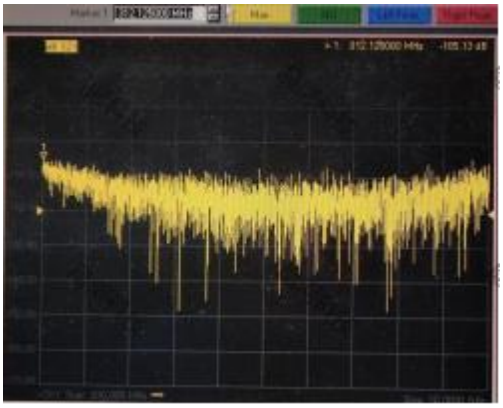

Fig. 2.11-28 7# sample aging for 455 cycles isolation

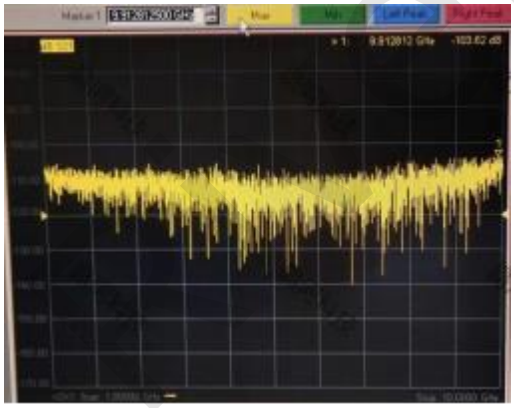

Fig. 2.11-29 7# sample aging for 614 cycles isolation

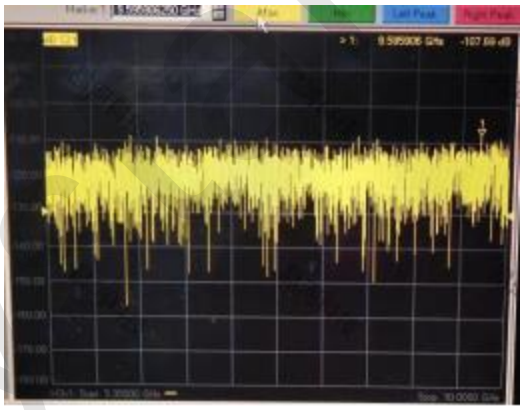

Fig. 2.11-30 Initial isolation for 8# sample

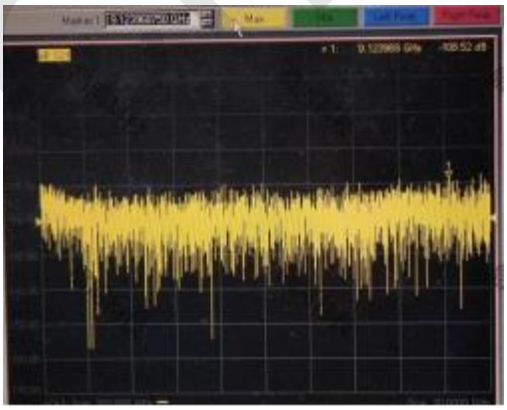

Fig. 2.11-31 8# sample aging for 455 cycles isolation

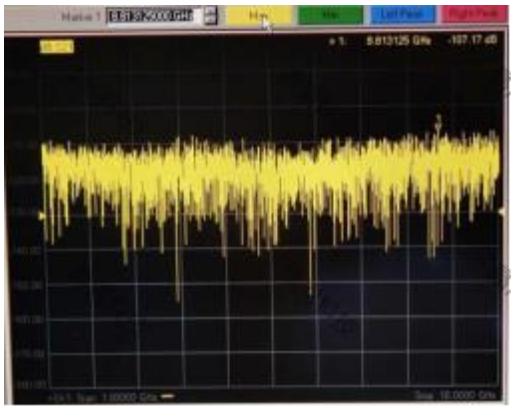

Fig. 2.11-32 8# sample aging for 614 cycles isolation

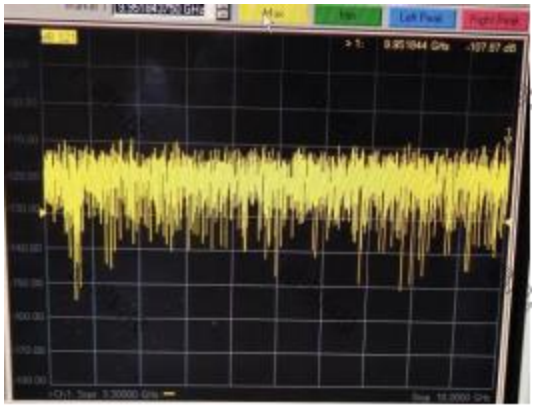

Fig. 2.11-33 Initial isolation for 9# sample

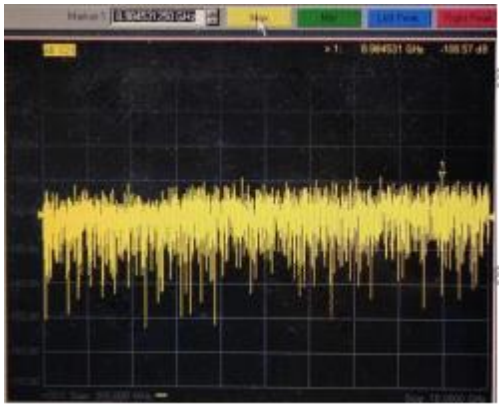

Fig. 2.11-34 9# sample aging for 455 cycles isolation

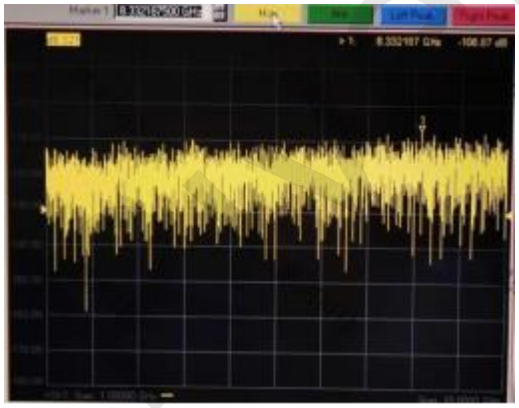

Fig. 2.11-35 9# sample aging for 614 cycles isolation

2.12 Isolation test after thermal shock aging

2.12.1 Purpose

Provide technical certification basis for isolation performance after thermal shock aging(-40℃~125℃)of CR EMSG-1252 two-part high isolation ultra-soft conductive glue product.

2.12.2 Test product

Two-part high isolation super soft conductive glue CR EMSG-1252 material.

Fig. 2.12-1 Shielding effectiveness test sample before aging

2.12.3 Test standards

Huawei isolation dual-chamber test method

2.12.4 Instruments or fixtures

Digital calipers, Vector network analyzers, Dispensing machine, blast drying ovens, Thermal shock box

Fig. 2.12-2 Dispensing machine

Fig. 2.12-3 Vector network analyzers

Fig. 2.12-4 Digital calipers

Fig. 2.12-5 Blast drying ovens

Fig. 2.12-6 HAST chamber

Fig. 2.12-7 Isolation Dispensing Samples

Fig. 2.12-8 Isolation Jig Assembly

2.12.5 Test method

1) Mix the CR EMSG-1252 conductive glue evenly, vacuumize them, and pour them into a 30CC hose to make them firm.
2) Wipe the isolation jig clean, and dispense glue on the four-axis dispensing machine according to the test requirements.
3) Put the test sample after step 2) into a blast drying oven at 100°C for 40 minutes, then take it out and cool it to room temperature for more than 1 hour.
4) Measure and record the width and height of the test sample strip, and tighten the screw with a torque of 20Kgf according to Figure 2.12-8.
5) Use the S21 method of the N5230A vector network analyzer to measure the initial isolation of the sample after step 4). Network analyzer parameter setting value requirements: frequency range 300MHz~10GHz, number of scanning points 3201, power 10dBm, IFBW: 100Hz.
6) Use the calibration piece to connect the two connecting wires for calibration, and then try not to move the connecting wires. Install the probe on the test tool, connect the connecting line, observe and save the test curve after the

test curve is stable, and record the minimum isolation degree.

7) Put the isolation sample after step 6) into the thermal shock box to carry out the thermal shock test.
8) The cycle conditions are as follows: -40℃~125℃, high and low temperature standing for 30 minutes, heating and cooling 10 degrees per minute, 600 cycles. The total time of a single cycle is 93 minutes, and the number of cycles in 24 hours is about 15.5 times.
9) Regularly take out the samples that have passed step 8) for isolation test, observe and record the isolation test curve and minimum value. After the test, put the samples back into the thermal shock box to continue the aging test.

2.12.6 Test result

Tab. 2.12-1 -40℃~125℃ aging cycle 600 times isolation test results for CR EMSG-1252

No.	Width mm	Height mm	Limit height mm	Compression rate %	Minimum isolation (0.03-10GHz), dB					
					0 cycle	215 cycles	400 cycles	500 cycles	600 cycles	CR standard
1#	1.52	1.65	1.00	39.4	124	90	82	71	64	
2#	1.54	1.79	1.00	44.1	122	108	94	86	73	
3#	1.46	1.65	1.00	39.4	123	101	90	77	74	＞70
4#	1.44	1.64	1.00	39.0	122	94	78	75	72	
5#	1.52	1.64	1.00	39.0	119	100	79	79	78	

Note:

- The actual average temperature rise and fall is 10 degrees per minute, the total time of a single cycle is 93 minutes, and the number of cycles in 24 hours is about 15.5 times.
- The precision of the vector network analyzer used is relatively high.
- In 600 cycles, the minimum isolation of 1 # sample is 64 dB, lower than 70 dB, which may be due to the relaxation of the compression nut caused by hot expansion and cold contraction at high and low temperatures.

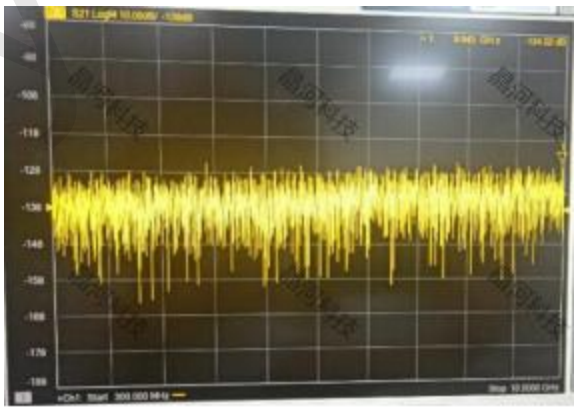

Fig. 2.12-9 Initial isolation for 1# sample

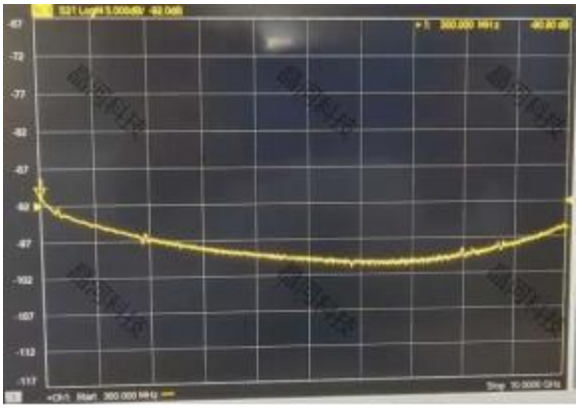

Fig. 2.12-10 1# sample aging for 215 cycles isolation

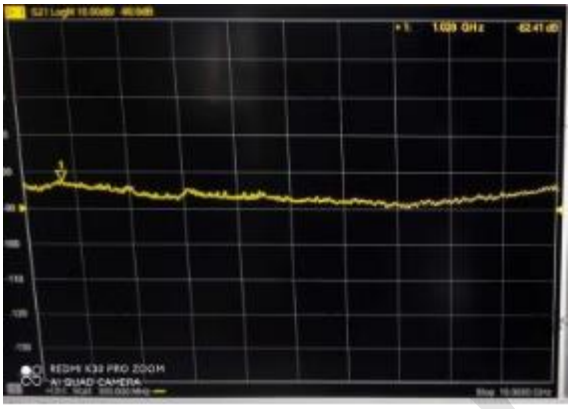

Fig. 2.12-11 1# sample aging for 400 cycles isolation

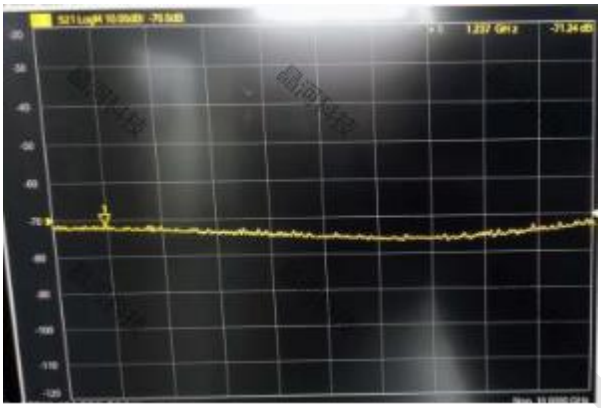

Fig. 2.12-12 1# sample aging for 500 cycles isolation

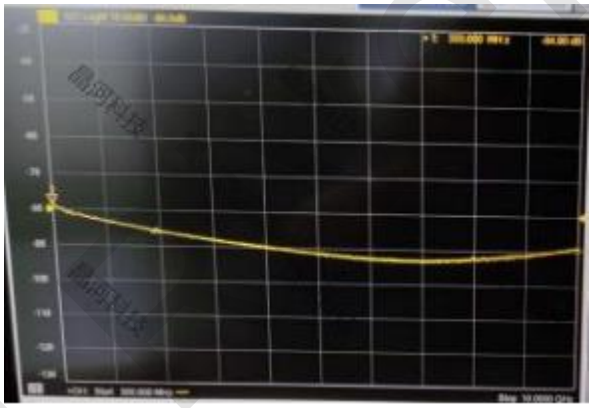

Fig. 2.12-13 1# sample aging for 600 cycles isolation

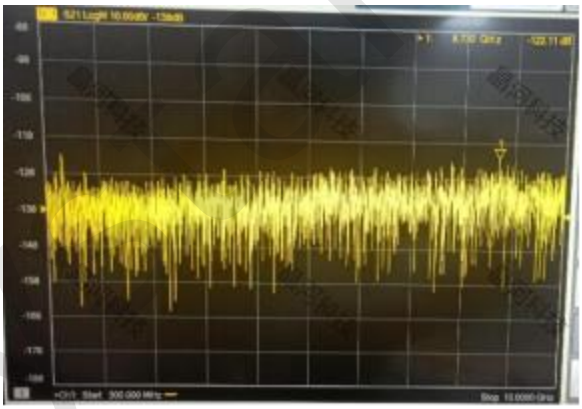

Fig. 2.12-14 Initial isolation for 2# sample

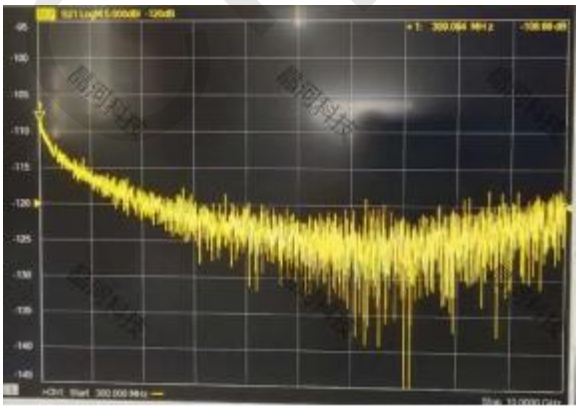

Fig. 2.12-15 2# sample aging for 215 cycles isolation

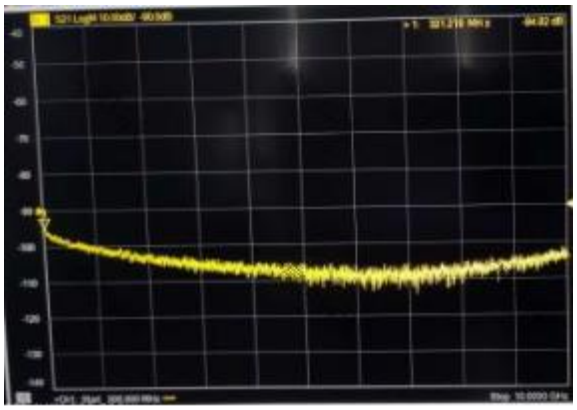

Fig. 2.12-16 2# sample aging for 400 cycles isolation

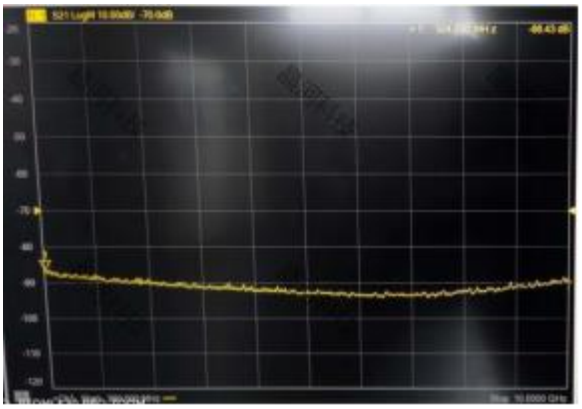

Fig. 2.12-17 2# sample aging for 500 cycles isolation

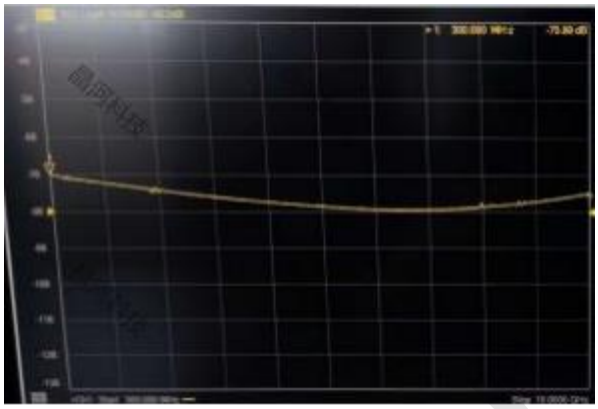

Fig. 2.12-18 2# sample aging for 600 cycles isolation

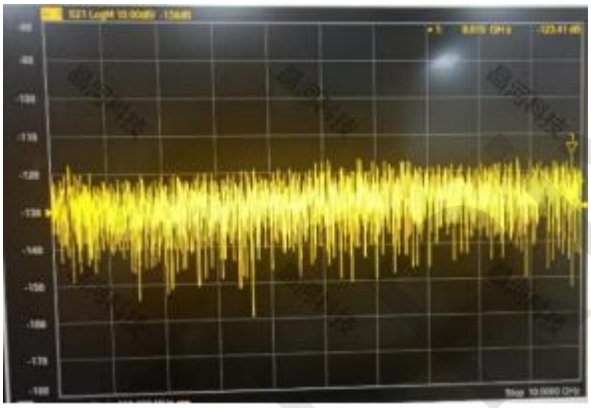

Fig. 2.12-19 Initial isolation for 3# sample

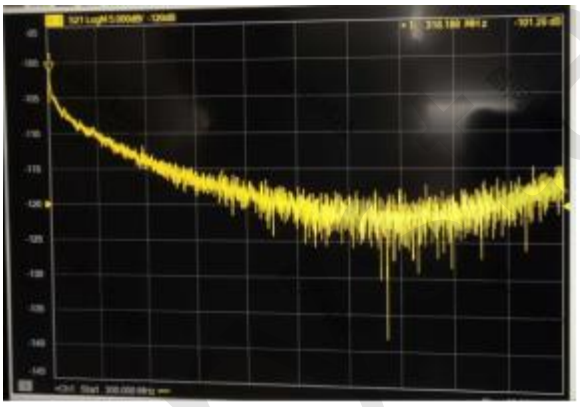

Fig. 2.12-20 3# sample aging for 215 cycles isolation

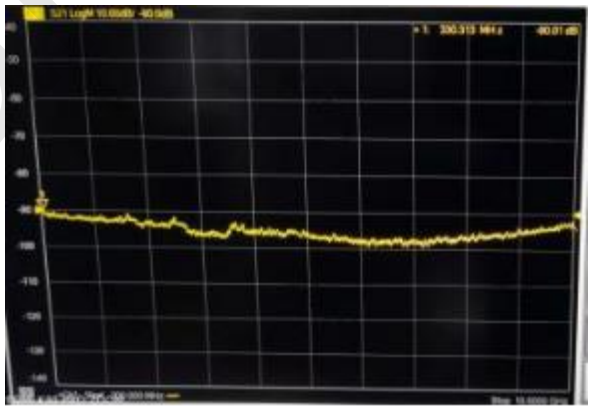

Fig. 2.12-21 3# sample aging for 400 cycles isolation

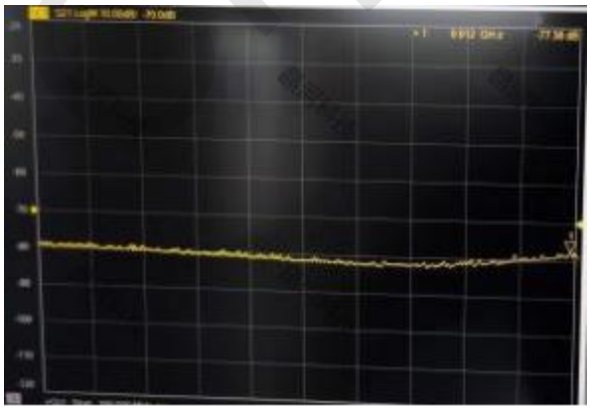

Fig. 2.12-22 3# sample aging for 500 cycles isolation

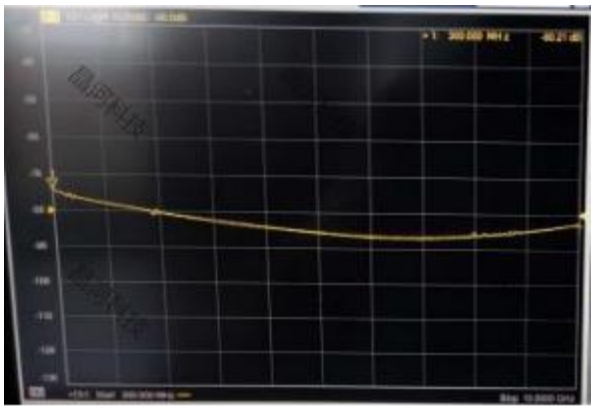

Fig. 2.12-23 3# sample aging for 600 cycles isolation

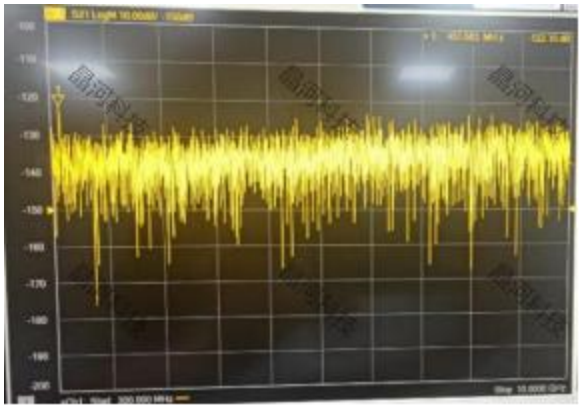

Fig. 2.12-24 Initial isolation for 4# sample

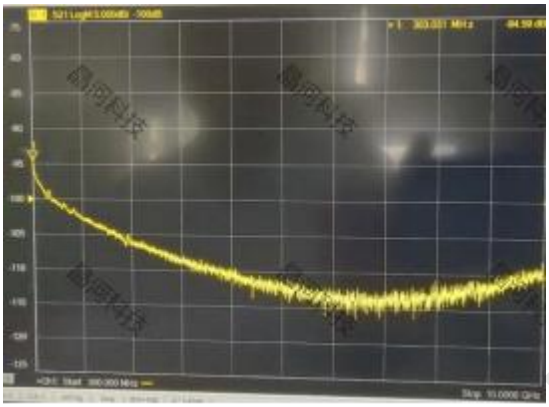

Fig. 2.12-25 4# sample aging for 215 cycles isolation

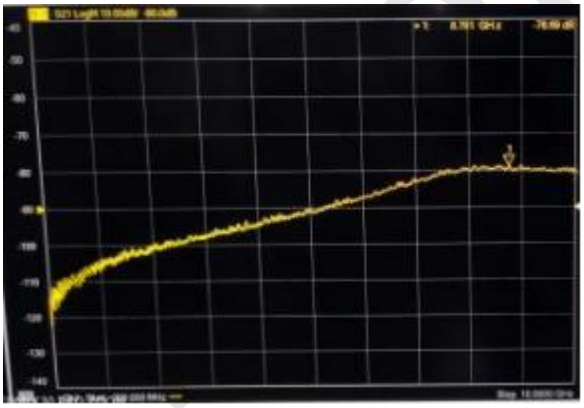

Fig. 2.12-26 4# sample aging for 400 cycles isolation

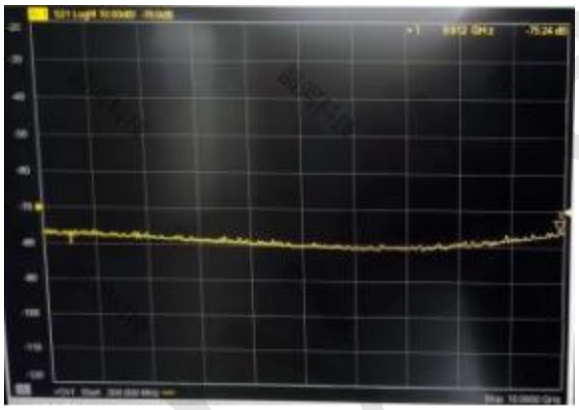

Fig. 2.12-27 4# sample aging for 500 cycles isolation

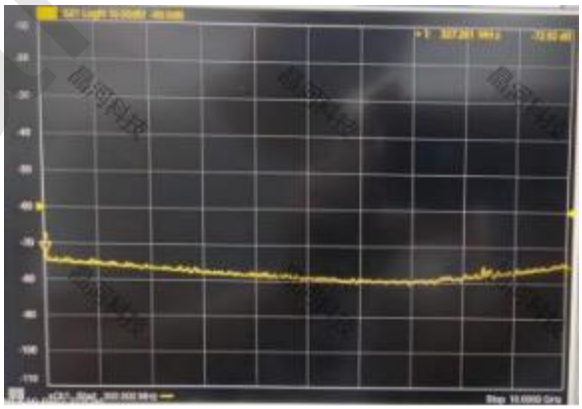

Fig. 2.12-28 4# sample aging for 600 cycles isolation

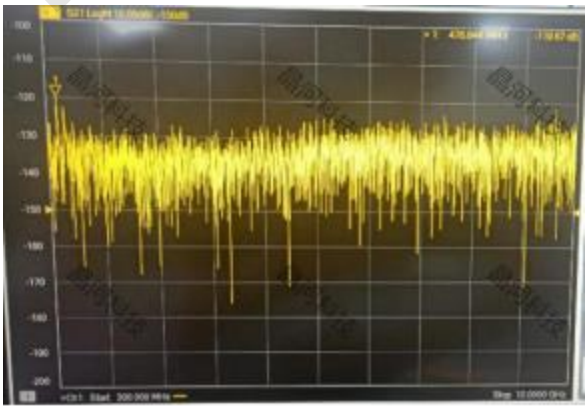

Fig. 2.12-29 Initial isolation for 5# sample

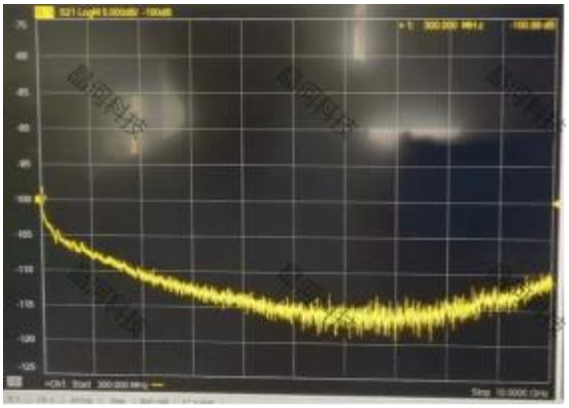

Fig. 2.12-30 5# sample aging for 215 cycles isolation

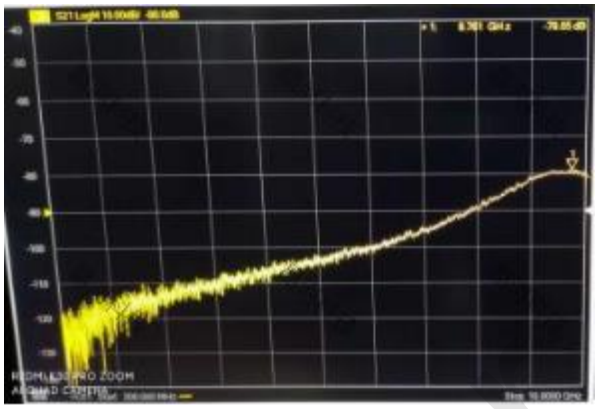

Fig. 2.12-31 5# sample aging for 400 cycles isolation

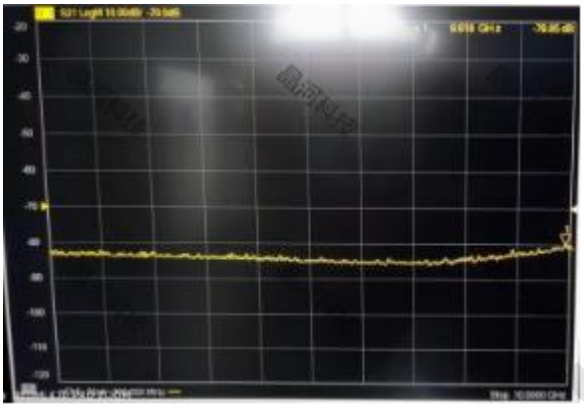

Fig. 2.12-32 5# sample aging for 500 cycles isolation

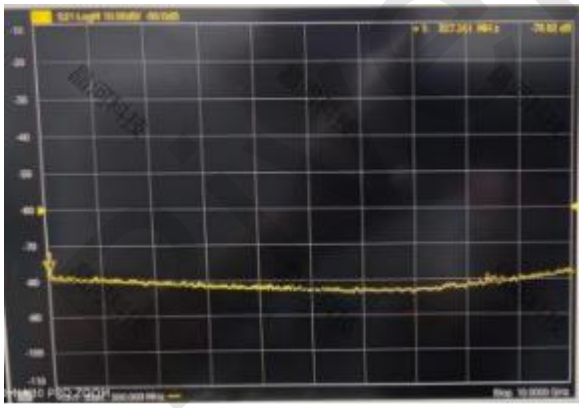

Fig. 2.12-33 5# sample aging for 600 cycles isolation

2.13 Oil seepage test

2.13.1 Purpose

Provide technical certification basis for oil seepage performance of CR EMSG-1252 two-part high isolation ultra-soft conductive glue product.

2.13.2 Test product

Two-part super soft conductive glue CR EMSG-1252 dispensing strip, about 40mm long, a total of 3 strips.

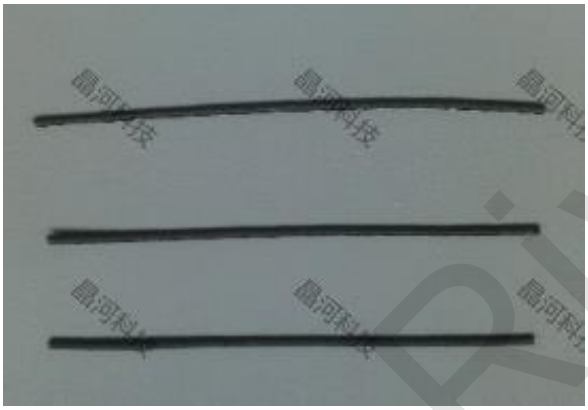

Fig. 2.13-1 Oil seepage samples

2.13.3 Test standards

JH-WI-37/ Oil seepage Test work Instructions for Conductive glue

2.13.4 Instruments or fixtures

Compression fixture, dispensing machine, hast box

Fig. 2.13-2 Compression fixture

Fig. 2.13-3 Dispensing machine

Fig. 2.13-4 Hast box

2.13.5 Test method

1) Prepare three 40mm long dispensing strips, compress the test sample at room temperature by 50%, put filter paper at the bottom of the strip, and put the installed compression fixture into the hast box. The temperature is also room temperature.
2) The temperature of the test box is raised to 100°C at 1°C/min, and the temperature is kept at 100°C for 168 hours.
3) Cool down to 25°C, 1°C/min, and place at room temperature for 1 hour.
4) The appearance of the test sample is inspected, and oil-absorbing paper is used to absorb the dispensing surface.

2.13.6 Test result

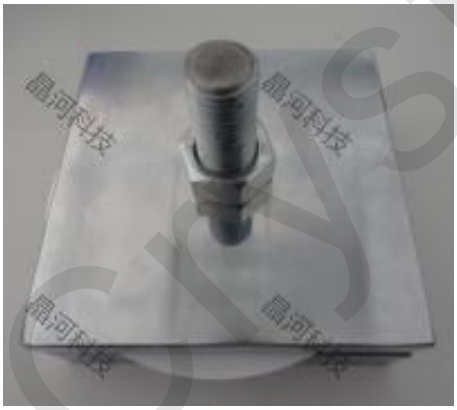

Fig. 2.13-5 Oil seepage test sample assembly

Fig. 2.13-6 Filter paper after oil leakage test

Tab. 2.13-1 Oil seepage test results for CR EMSG-1252

Performance	Unit	Sample 1	Sample 2	Sample 3
Rubber strip Height	mm	1.25	1.26	1.26
Compression height	mm	0.6	0.6	0.6
Compression ratio	%	52.00	52.38	52.38
Sample appearance after test	---	No adhesion phenomenon		
Oil stains after test	---	No oily substance oozing or volatilizing		