PABCO® Gypsum
a division of PABCO® building products, LLC

Important Notice

In August 1, 2013, PABCO® Gypsum, a division of PABCO® building products, LLC acquired the QuietRock® business and operations from Serious Energy, Inc. Serious Energy, Inc. corporate structure and legal name changed through the years from Quiet Solution, Inc. to Serious Materials, Inc to Serious Energy, Inc. The acquisition of the QuietRock® business by PABCO® Gypsum includes the products, technical data, test reports and other intellectual property. For the avoidance of confusion, references to "Quiet Solution", "Serious Materials", or "Serious Energy" used within test reports, in general, should be understood as references to PABCO® Gypsum as of August 1, 2013.

ENGINEERING EVALUATION TEST ON
QuietRock QR-530 RF Panel

Southwest Research Institute
6220 Culebra Road
San Antonio, TX 78228-0510

Southwest Research Institute Project 18.18051.13.107
Report Number EMCR 05/020

Prepared for:

QUIET SOLUTION
1250 Elko Drive
Sunnyvale, California 94089

August 2005

Prepared by:

David A. Smith

The results of this test report apply only to the specific samples tested. If the manufacturer extends the test results to apply to other samples of the same model, or from the same lot or batch, the manufacturer should ensure the additional samples are manufactured using identical electrical and mechanical components.

ACCREDITED
1110-01

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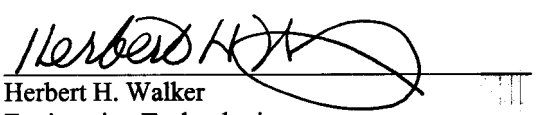
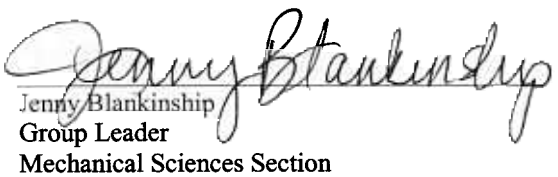
Reviewed by:



Herbert H. Walker
Engineering Technologist
Mechanical Sciences Section
Mechanical and Fluids Engineering Department

Approved by:



Jenny Blankinship
Group Leader
Mechanical Sciences Section
Mechanical and Fluids Engineering Department

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1.0 INTRODUCTION

1.1 Purpose

The Electromagnetic Compatibility Research Laboratory (EMCR) of Southwest Research Institute performed shielding effectiveness testing® on two samples of QuietRock QR-530 RF panels provided by Quiet Solution. Testing was performed August 08 - 10, 2005. The tests were performed according to the requirements outlined in IEEE 299-1997 as a reference for the shielding effectiveness testing.

1.2 Test Setup and Procedure

The QuietRock QR-530 RF panel samples were placed in a fixture installed in a common wall shared by two shielded enclosures. Refer to Figure 1.1. The test fixture has an opening that is 24 inches by 24 inches. Broadband receive and transmit antennas were placed 1-meter from each side of the shielded enclosure opening. The shielded enclosure dynamic range was determined by first measuring the signal levels with the shielded enclosure opening completely open (no panel), and then completely closed (metal panel installed). A test sample was then inserted into the test fixture and the signal level was measured to determine the shielding effectiveness of the test sample. The frequency range of 20 MHz – 10 GHz was measured at discrete frequencies using a Rohde & Schwarz ESI-40 Spectrum Analyzer and a Rohde & Schwarz SMR 40 Signal Generator. The frequency range of 20 MHz – 200 MHz was tested in 5 MHz increments. The 200 MHz to 1 GHz frequency range was tested in 50 MHz increments. The shielding effectiveness was measured at 500 MHz steps from 2 GHz to 10 GHz.

The QuietRock QR-530 samples were inserted between the shielded enclosure wall and were clamped in place using the adjustable clamps. Photographs of the test fixture are provided in Appendix B.

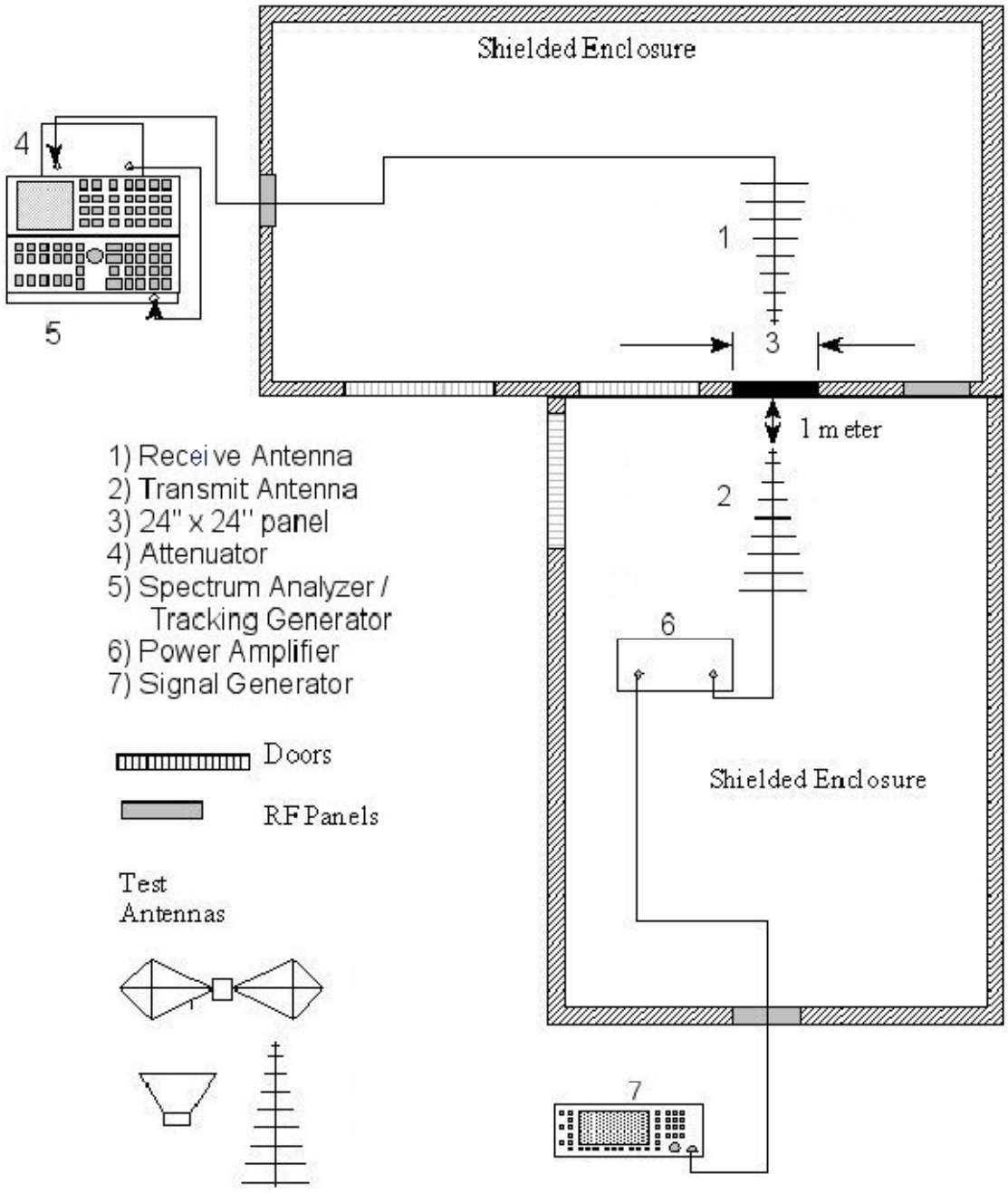


Figure 1.1 Basic Test Setup

2.0 TEST RESULTS

2.1 Test Configuration 1, Vertical Antenna Orientation

Test Configuration 1 consisted of a single layer of QuietRock QR-530 RF Panel (27 inches by 27 inches), with a vertical seam created by two panel edges along vertical center axis as-manufactured. The seam was taped with a single layer of 3M 1354 electrically conductive tape.

The measured shielding effectiveness of Configuration 1, with antennas vertically polarized, is shown in Figure 2.1.

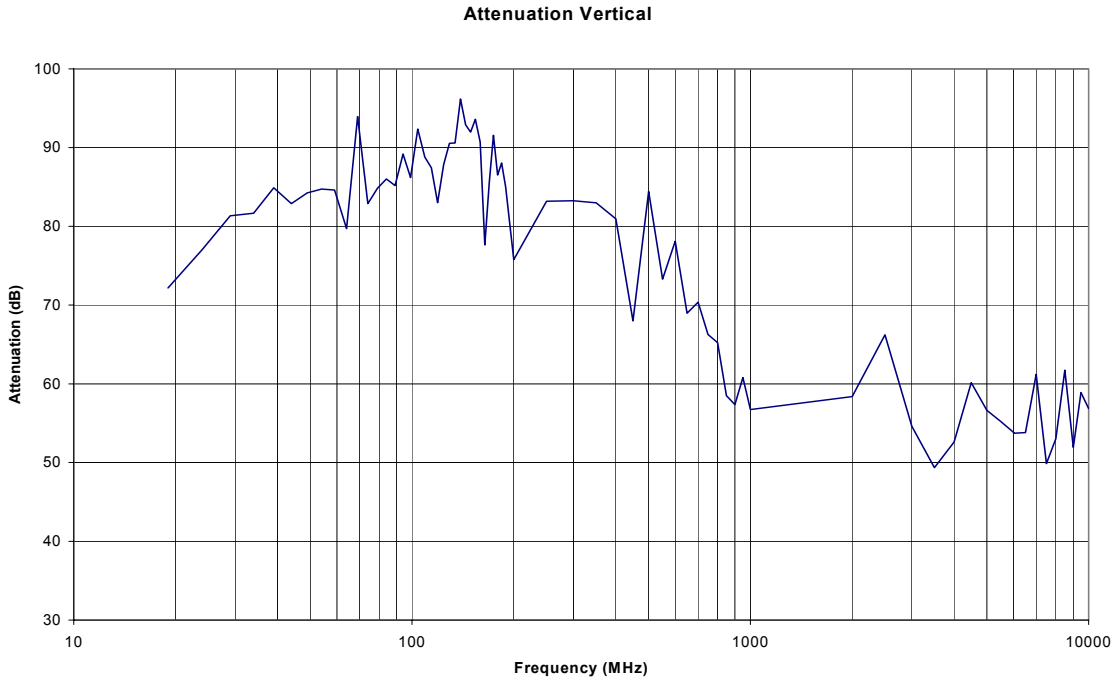


Figure 2.1 Configuration 1, Vertical Antenna Orientation

2.2 Test Configuration 1, Horizontal Antenna Orientation

Test Configuration 1 consisted of a single layer of QuietRock QR-530 RF Panel (27 inches by 27 inches), with a vertical seam created by two panel edges along vertical center axis as-manufactured. The seam was taped with a single layer of 3M 1354 electrically conductive tape.

The measured shielding effectiveness of Configuration 1, with antennas horizontally polarized, is shown in Figure 2.2.

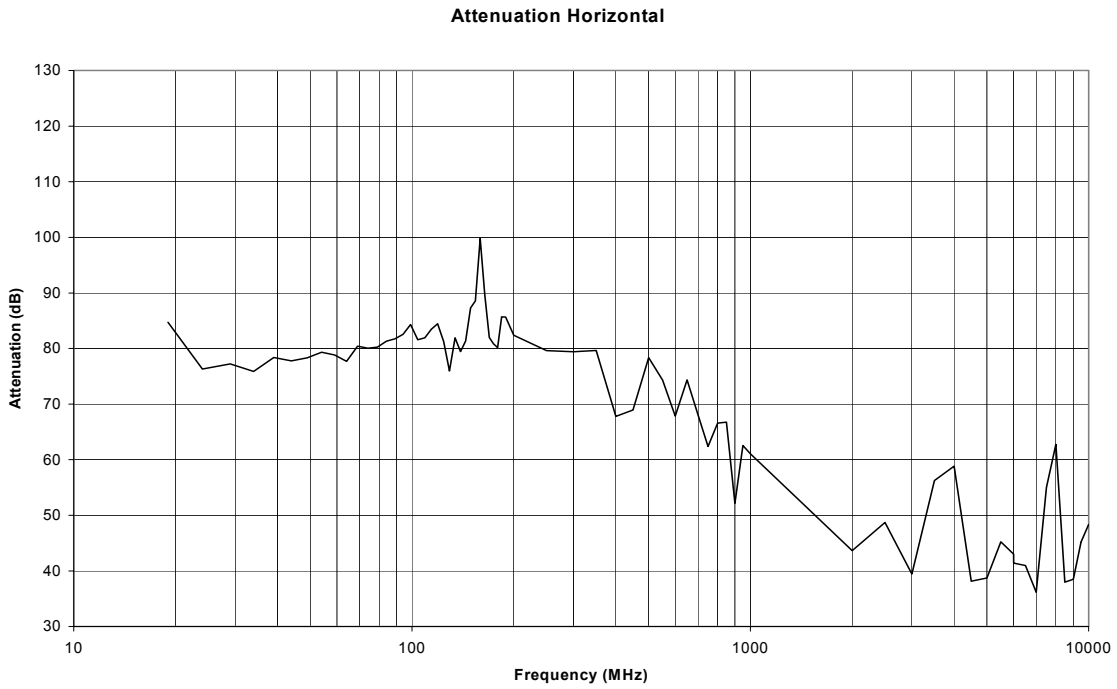


Figure 2.2 Configuration 1, Horizontal Antenna Orientation

2.3 Test Configuration 2, Vertical Antenna Orientation

Test Configuration 2 consisted of a single layer of QuietRock QR-530 RF panel (27 inches by 27 inches).

The measured shielding effectiveness of Configuration 2, with antennas vertically polarized, is shown in Figure 2.3.

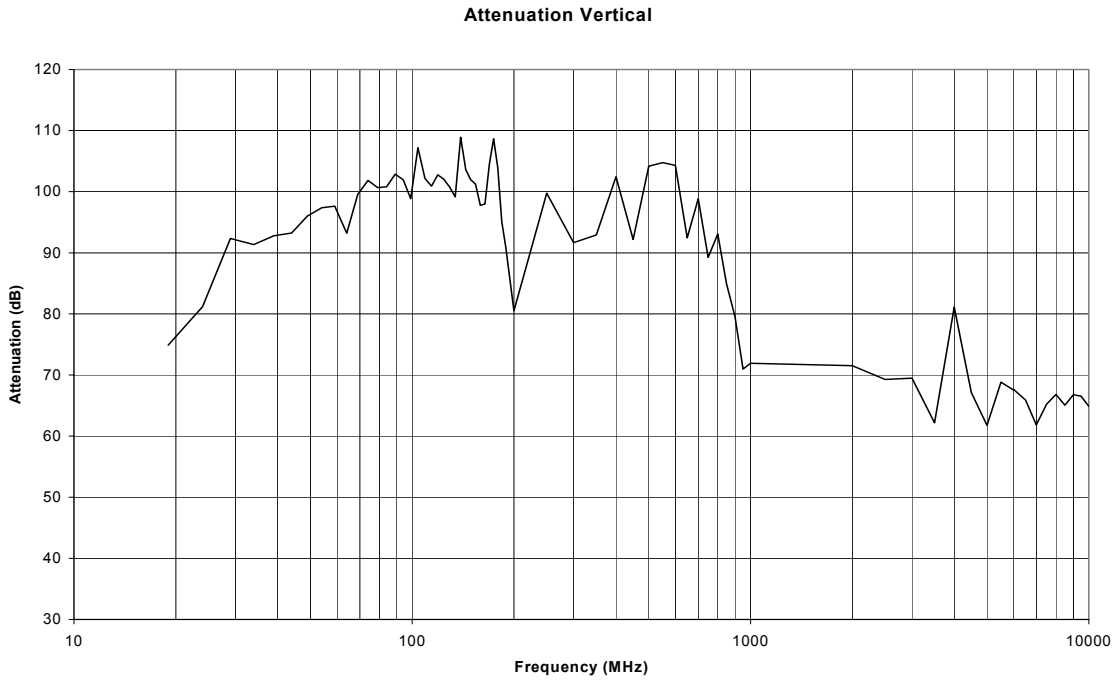


Figure 2.3 Configuration 2, Vertical Antenna Orientation

2.4 Test Configuration 2, Horizontal Antenna Orientation

Test Configuration 2 consisted of a single layer of QuietRock QR-530 RF panel (27 inches by 27 inches).

The measured shielding effectiveness of Configuration 2, with antennas horizontally polarized, is shown in Figure 2.4.

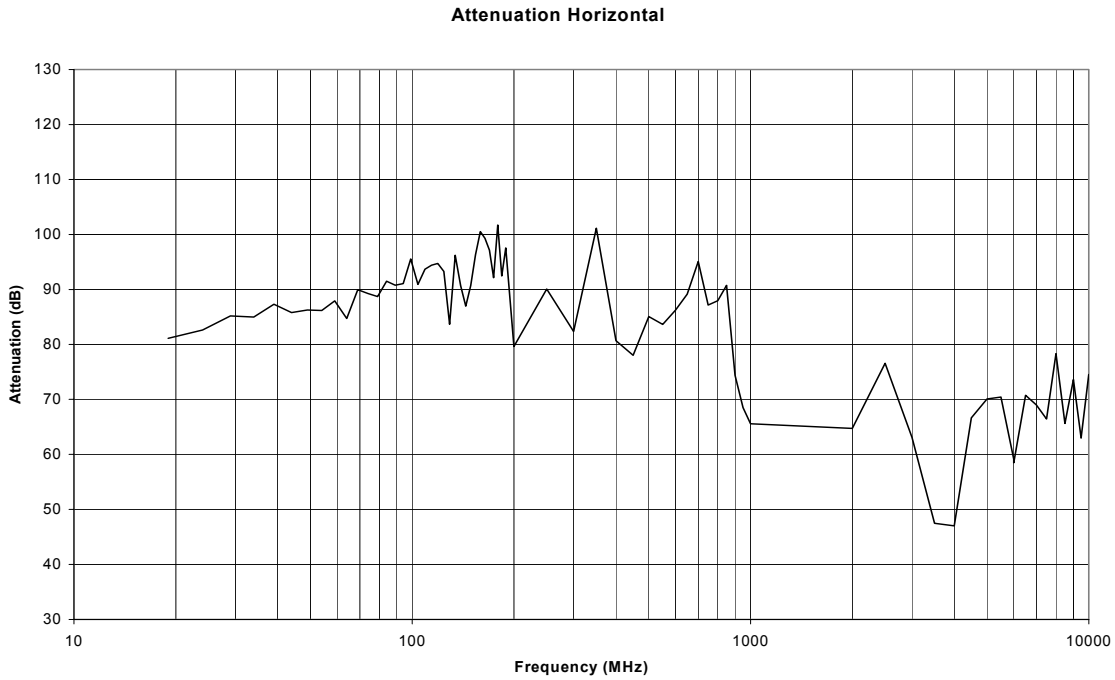


Figure 2.4 Configuration 2, Horizontal Antenna Orientation

2.5 Test Configuration 3, Vertical Antenna Orientation

Test Configuration 3 consisted of a single layer of QuietRock QR-530 RF Panel (27 inches by 27 inches), with a vertical seam created by two panel edges along vertical center axis as-manufactured. The seam was taped on the front side with a single layer of 3M 1354 electrically conductive tape. Screwed to the backside of the center seam was a 3.5 inch deep, 25 gage steel stud, typical of steel framed construction.

The measured shielding effectiveness of Test Configuration 3, with antennas vertically polarized, is shown in Figure 2.5.

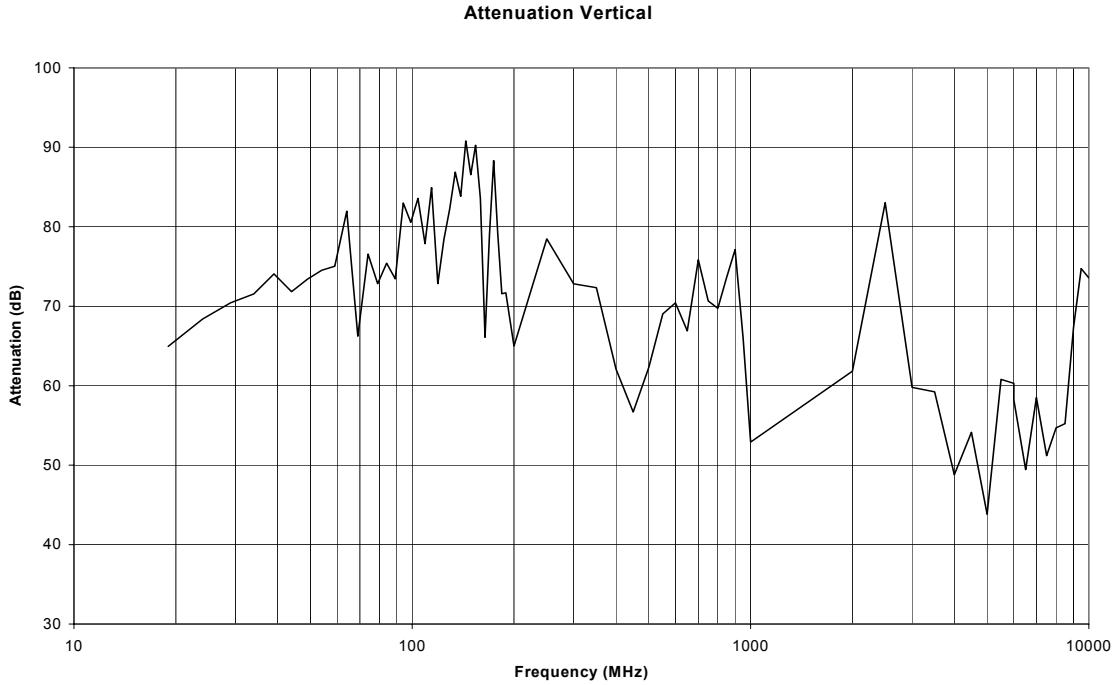


Figure 2.5 Configuration 3, Vertical Antenna Orientation

2.6 Test Configuration 3, Horizontal Antenna Orientation

Test Configuration 3 consisted of a single layer of QuietRock QR-530 RF Panel (27 inches by 27 inches), with a vertical seam created by two panel edges along vertical center axis as-manufactured. The seam was taped on the front side with a single layer of 3M 1354 electrically conductive tape. Screwed to the backside of the center seam was a 3.5 inch deep, 25 gage steel stud, typical of steel framed construction.

The measured shielding effectiveness of Configuration 3, with antennas horizontally polarized, is shown in Figure 2.6.

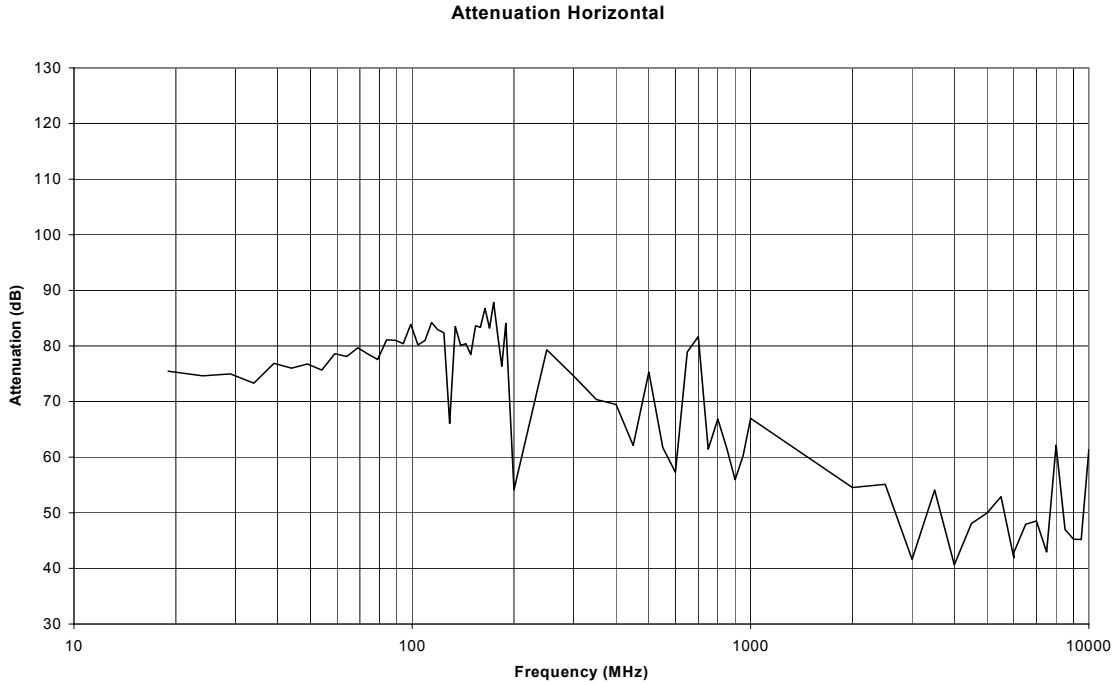


Figure 2.6 Configuration 3, Horizontal Antenna Orientation

2.7 Test Configuration 4, Vertical Antenna Orientation

Test Configuration 4 consisted of a single layer of QuietRock QR-530 RF Panel (27 inches by 27 inches), with a vertical seam created by two field-trimmed panel edges along vertical center axis where QuietSeal RF putty was used beneath 3M 1354 electrically conductive tape over each edge. The seam was taped with a single layer of 3M 1354 electrically conductive tape.

The measured shielding effectiveness of Configuration 4, with antennas vertically polarized, is shown in Figure 2.7.

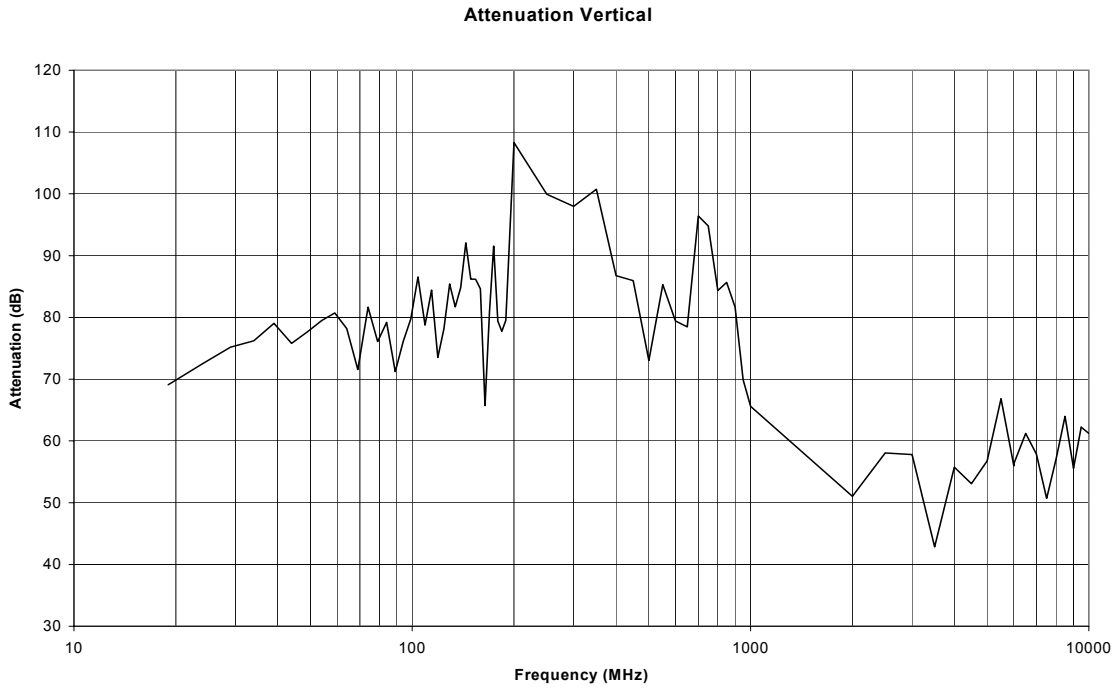


Figure 2.7 Configuration 4, Vertical Antenna Orientation

2.8 Test Configuration 4, Horizontal Antenna Orientation

Test Configuration 4 consisted of a single layer of QuietRock QR-530 RF Panel (27 inches by 27 inches), with a vertical seam created by two field-trimmed panel edges along vertical center axis where QuietSeal RF putty was used beneath 3M 1354 electrically conductive tape over each edge. The seam was taped with a single layer of 3M 1354 electrically conductive tape.

The measured shielding effectiveness of Configuration 4, with antennas horizontally polarized, is shown in Figure 2.8.

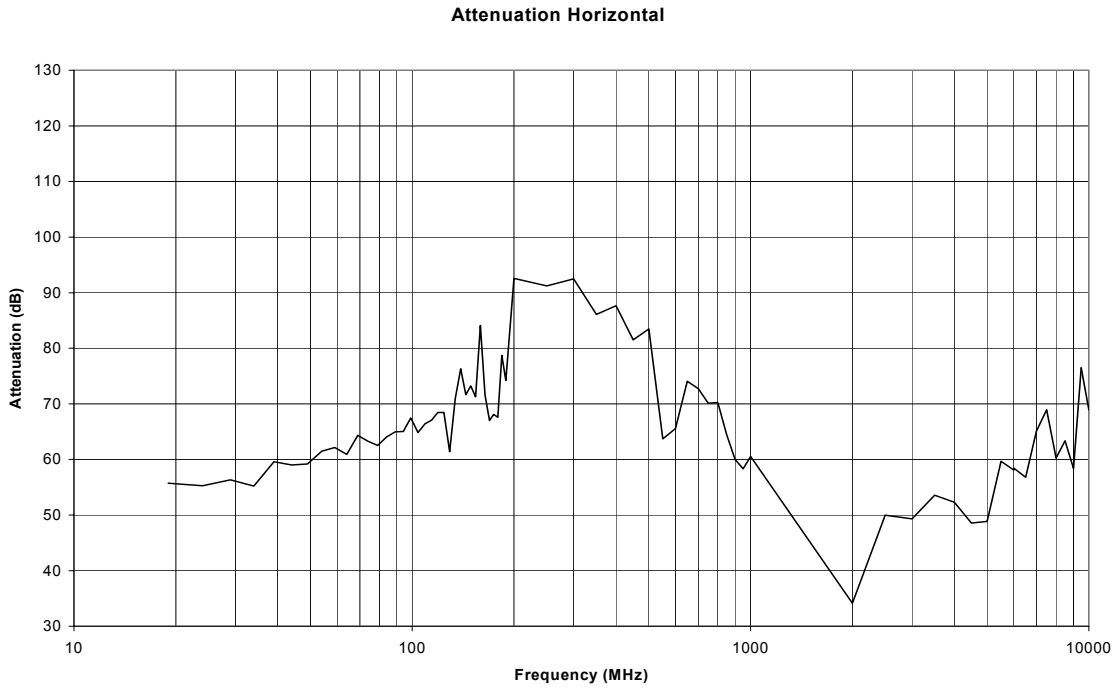


Figure 2.8 Configuration 4, Horizontal Antenna Orientation

2.9 Test Configuration 5, Vertical Antenna Orientation

Configuration 5 consisted of two layers of QuietRock QR-530 RF Panels with staggered seams. The base layer had a vertical seam created by two field-trimmed panel edges. The seam was taped with a single layer of 3M 1354 electrically conductive tape. The second layer did not have a seam. The two layers were connected together with sheetrock screws along the horizontal center edge and taped along the outer edges with 3M 1354 electrically conductive tape.

The measured shielding effectiveness of Configuration 5, with antennas vertically polarized, is shown in Figure 2.9.

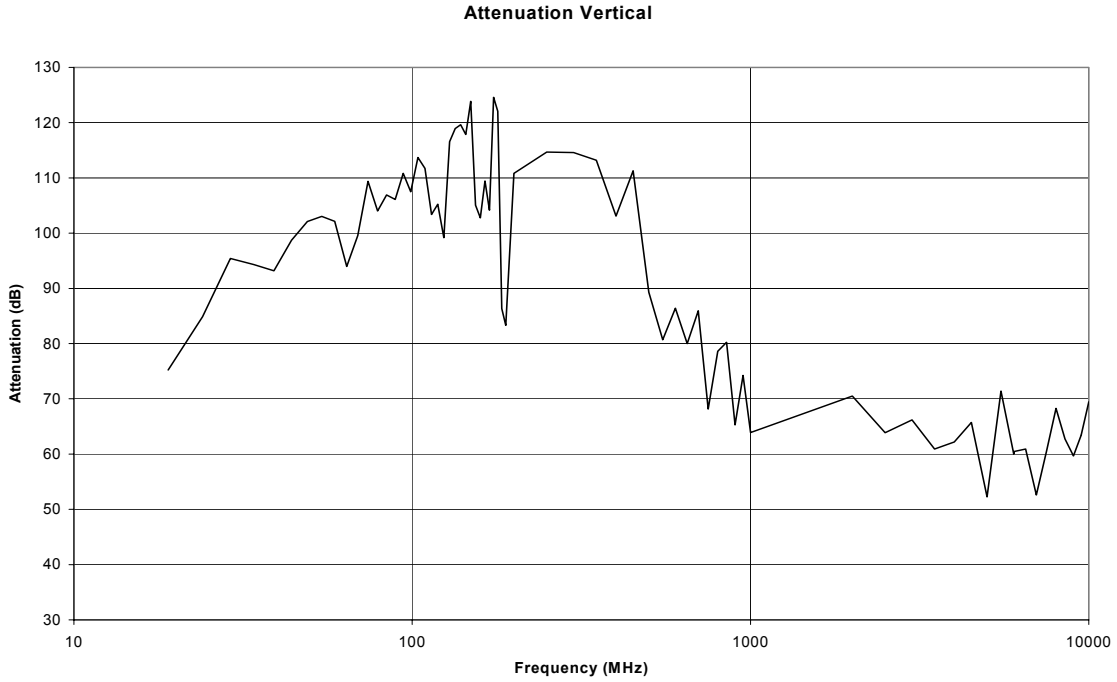


Figure 2.9 Configuration 5, Vertical Antenna Orientation

2.10 Test Configuration 5, Horizontal Antenna Orientation

Configuration 5 consisted of two layers of QuietRock QR-530 RF Panels with staggered seams. The base layer had a vertical seam created by two field-trimmed panel edges. The seam was taped with a single layer of 3M 1354 electrically conductive tape. The second layer did not have a seam. The two layers were connected together with sheetrock screws along the horizontal center edge and taped along the outer edges with 3M 1354 electrically conductive tape.

The measured shielding effectiveness of Configuration 5, with antennas horizontally polarized, is shown in Figure 2.10

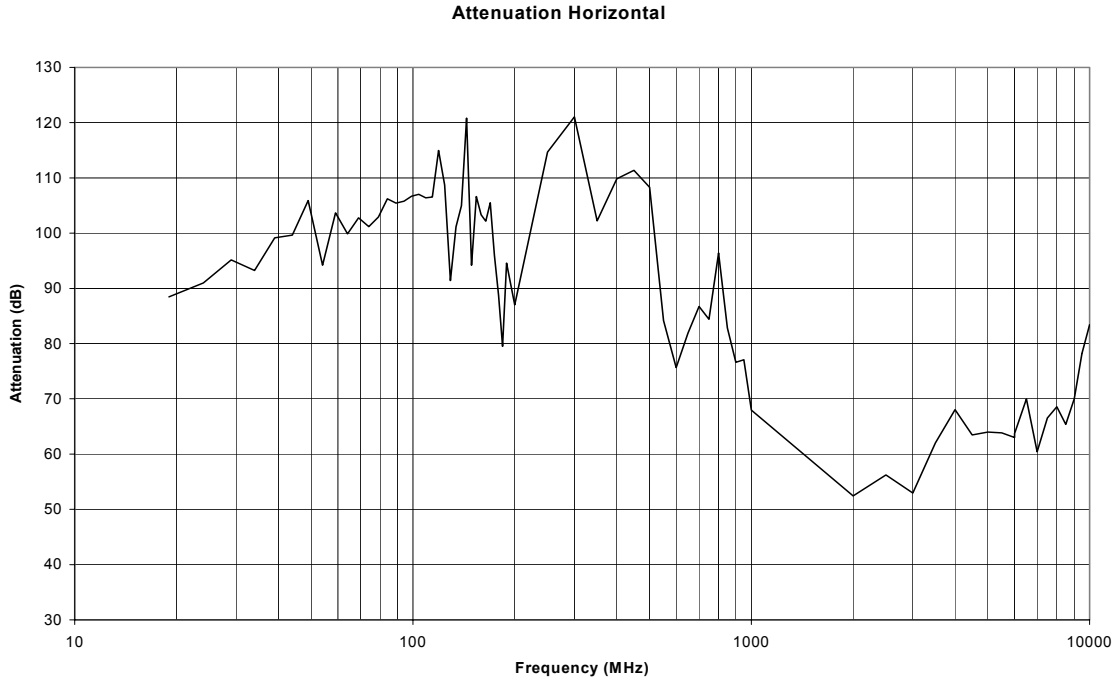


Figure 2.10 Configuration 5, Horizontal Antenna Orientation

APPENDIX A — EQUIPMENT LIST

EQUIPMENT USE REPORT

DATE: 08-10 August 2005

PROJECT: 18.18051.13.107 **TEST PERFORMED:** Shielding Effectiveness

LOCATION: SE 4 & SE 5 **TECHNICIAN(s):** D. Smith

EQUIPMENT				
Manufacturer	**Description**	**Model #**	**Serial #.**	**Cal Due**
Rohde & Schwarz	RF Signal Generator (20 MHz–18 GHz)	SMR 40	100112	01Oct07
Rohde & Schwarz	EMI Spectrum Analyzer	ESI40	837514/008	08Sep05
HP	Microwave Amplifier, 2-20 GHz	8349A	2441A00546	NCR
IFI	0.01-1000 MHz 20 Watt Amplifier	5520	0189-3528	NCR
IFI	200-1000 MHz 80 Watt Amplifier	M5480	0591-3989	NCR
EMCO	1-18 GHz Double Ridged Guide Horn	3115	501	05Jun06
EMCO	1-18 GHz Double Ridged Guide Horn	3115	2043	11Oct05
EMCO	20-200 MHz Power Bicon Antenna	3109	3243	13Jun06
EMCO	20-200 MHz Bicon Antenna	3104	2107	22Dec05
ARA	Log Periodic Antenna	LPD 2010	213	26Feb06
ARA	Log Periodic Antenna	LPD 2010	152	16Jan06
HP	HPIB Extender	37204	2547U09394	NCR
HP	HPIB Extender	37204	2547U09396	NCR

NCR- No Calibration Required

SOFTWARE			
Base Software Title	**Revision**	**Revised for test? (Y/N)**	**Test Setup Verification Date**
FreRes	3.81	N	Concurrent with testing

APPENDIX B — PHOTOGRAPHS OF TEST SETUP

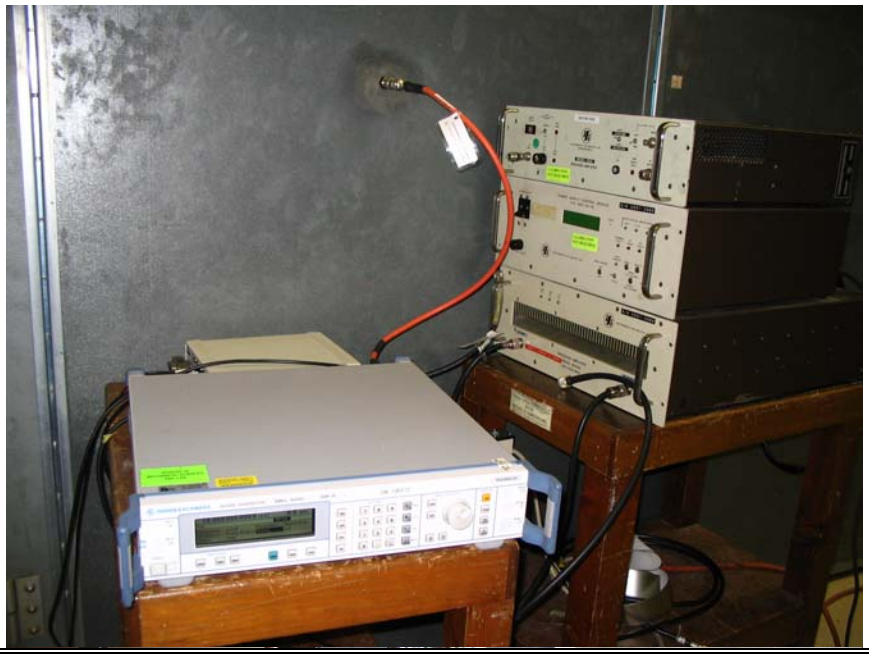
PHOTO DOCUMENTATION WORKSHEET	
Testing performed: Shielding Effectiveness	Tested By: D.Smith
Client: Quiet Solution	Project #: 18.18051.13.107

Receive Side Test Fixture

Transmit Side Test Fixture

PHOTO DOCUMENTATION WORKSHEET	
Testing performed: Shielding Effectiveness	Tested By: D.Smith
Client: Quiet Solution	Project #: 18.18051.13.107

Data Acquisition System



Test Instrumentation

PHOTO DOCUMENTATION WORKSHEET	
Testing performed: Shielding Effectiveness	Tested By: D.Smith
Client: Quiet Solution	Project #: 18.18051.13.107

Configuration 1 Factory Seam Taped

Configuration 2 Solid Sheet

PHOTO DOCUMENTATION WORKSHEET	
Testing performed: Shielding Effectiveness	Tested By: D.Smith
Client: Quiet Solution	Project #: 18.18051.13.107

Configuration 3 Stud

Configuration 4 Field Seam Taped

PHOTO DOCUMENTATION WORKSHEET	
Testing performed: Shielding Effectiveness	Tested By: D.Smith
Client: Quiet Solution	Project #: 18.18051.13.107

Configuration 5 Double Layer