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Document
Test Report

Date
September 3, 2002

Prepared
FBM, Henrik Olsson
EMC Test Engineer

Ref. No
E014-TR 020125

Supersedes

Page
1 (10)

Title
EMC Test, Shielded 500 MHz antenna

Equipment under test (EUT):

Description:	Active antenna for Ground Penetrating Radar System
Manufacturer:	Malå Geoscience
Model name:	Shielded 500 MHz

Summary:

The EUT complied with the requirement of radiated emissions given in FCC 15.209, measured in the frequency range 30 – 960 MHz

Approved:

Petter Gärdin
Ass. Laboratory Technical Manager

Contents

1 Introduction

The object of the test is to show compliance with the emission standard FCC Part 15.

Date of test: August 13, 2002

Location: Malå Geoscience, Malå Sweden

Test performed by: Henrik Olsson, AerotechTelub / FBM

Client: Malå Geoscience
Skolgatan 11
SE-93070 Malå
Sweden

Client's observers: Lars Lundmark, Malå Geoscience
Bernt Johansson, Malå Geoscience

2 Test methods and results

2.1 Results

The test results in this report apply only for the tested specimen.

EMISSION REQUIREMENTS ACCORDING TO FCC 15.209					
Environmental phenomena	**Test method**	**Requirement**	**Result**	**Comments**	**Test order**
Radiated emission	ANSI C63.4	FCC 15.209	Pass		1

3 Applicable documents

Measurements		
ANSI C63.4	1992-07-17	Radio noise emissions from low-voltage electrical and electronic equipment in the range of 9 kHz to 40 GHz.
FCC Part 15	2002-07-22	Radio Frequency Devices
FCC 02-42	2002-04-22	Revision of Part 15 of the Commission's Rules Regarding Ultra-Wideband Transmission Systems

4 Equipment under test (EUT)

4.1 Identification of equipment under test

Equipment under test (EUT):

Description:	Active antenna for Ground Penetrating Radar System
Manufacturer:	Malå Geoscience
Model name:	Shielded 500 MHz
Serial No:	006386
Build state:	Production sample

4.2 Test site

4.2.1 Description

The test site was located outside the Malå Geoscience's facilities in Malå at about 50 m distance from the nearest building. According to the measurement procedures 51 cm (20") of dry sand was placed in the ground, under the EUT. A ground plane, made by sheet metal, was formed around the EUT and protruding under the measurement antenna. The EUT was placed directly on the dry sand with no ground plane under it.

Picture 1: Test Site

The measurement distance antenna – EUT was 3 m. The measurement system and related equipment were placed in a van located 15 m behind the antenna.

4.2.2 Ambient signals

Mobile telephones:	460 – 470 MHz, 937 – 945 MHz
FM broadcasts:	89 – 102 MHz
Television:	174 – 181 MHz, 216 – 224 MHz, 494 – 501 MHz

In addition many signals of short-term duration were found. Each measurement signal close to or above the limit was examined if ambient or related to the EUT.

4.3 General configuration of EUT

The EUT was powered by its internal battery pack.

The EUT was connected to a Malå Geoscience Control Unit CU II via fibre optic cables. The CU II was placed beside the test site, not being a subject of the test.

No other cables were connected to the EUT or the Control Unit. No more connectors were provided on the EUT.

4.4 Operation of EUT during tests

The Control Unit was gathering data from the EUT like in normal operation.

5 Emission

5.1 Measurement of radiated emission, ANSI C63.4

5.1.1 Requirements according to FCC 15.209

Radiated emission from the EUT in the frequency range 30 to 960 MHz shall not exceed the limit as specified below.

Frequency range	Limit
30 - 88 MHz	40 dBµV/m
88 – 216 MHz	43.5 dBµV/m
216 – 960 MHz	46 dBµV/m

5.1.2 Procedures

The radiated emission was measured on an Open Area Test Site (OATS) with 3 meters measuring distance. A tent, made entirety of non-metallic material, protected the site.

Picture 2

The EUT was configured and the test was performed in accordance with ANSI C63.4.

The test was initiated with a pre-scan in the frequency range 30 - 960 MHz, where the emission level was measured in 16 different combinations of 8 EUT angle positions and vertical/horizontal polarisation. For each position the EUT was turned manually and the ground plane was adjusted to follow the EUT outlines.

A composite trace of the peak measurements was drawn.

Subsequently, frequencies with the highest emission were selected. EUT position, antenna height and polarisation were adjusted in order to find the position with the highest emission level. Quasi peak values were measured in the maximised positions.

The diagrams are shown with the quasi peak limit according to FCC 15.209.

5.1.3 Deviations from the standard

The ground plane was arranged according to FCC 02-42.

5.1.4 Climatic conditions

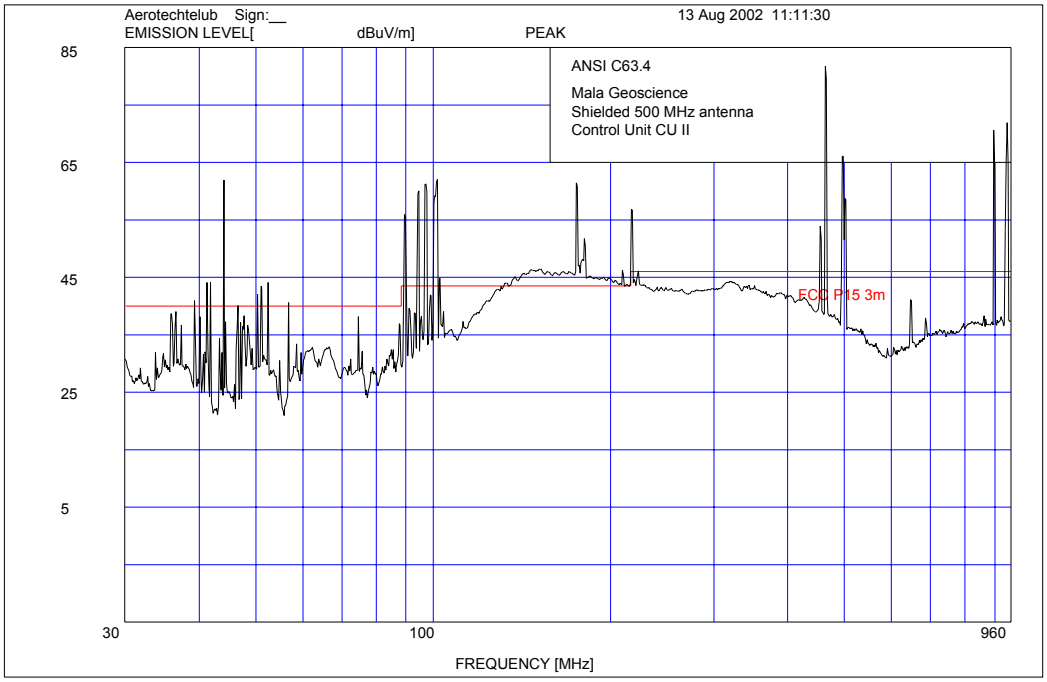
	Requirement according to standard	**Climatic conditions during the test**
Temperature	-	20 – 25 °C
Relative humidity	-	Not measured

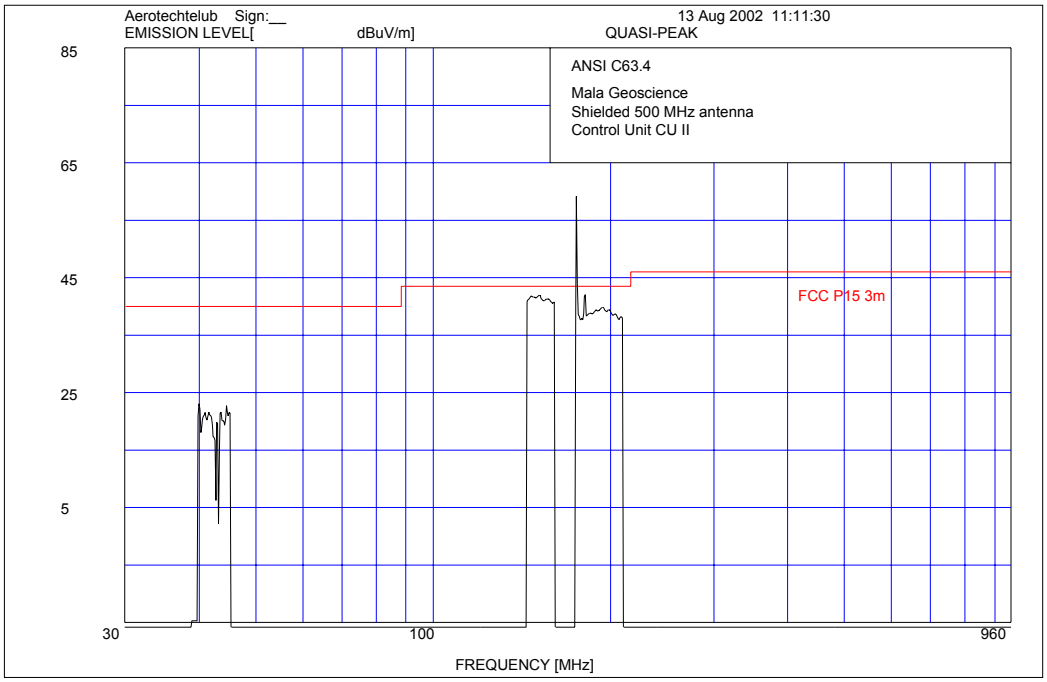
5.1.5 Results

Given measured values are valid for the described arrangement and operation of the EUT.

The EUT complied with the requirement of radiated emission specified in FCC 15.209 in the frequency range 30 – 960 MHz. No signals above the limit line were related to the EUT.

Quasi-peak measurements were not made in the entire frequency range. In order to preserve time measurements were taken in certain ranges only. The characteristics of the signal were the same in the entire range.


Aerotechtelub Sign:__
13 Aug 2002 11:11:30
EMISSION LEVEL[dBuV/m] PEAK
ANSI C63.4
Mala Geoscience
Shielded 500 MHz antenna
Control Unit CU II
FCC P15 3m
85
65
45
25
5
30
100
960
FREQUENCY [MHz]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EMISSION LEVEL[dBuV/m] QUASI-PEAK
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Shielded 500 MHz antenna
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FCC P15 3m
85
65
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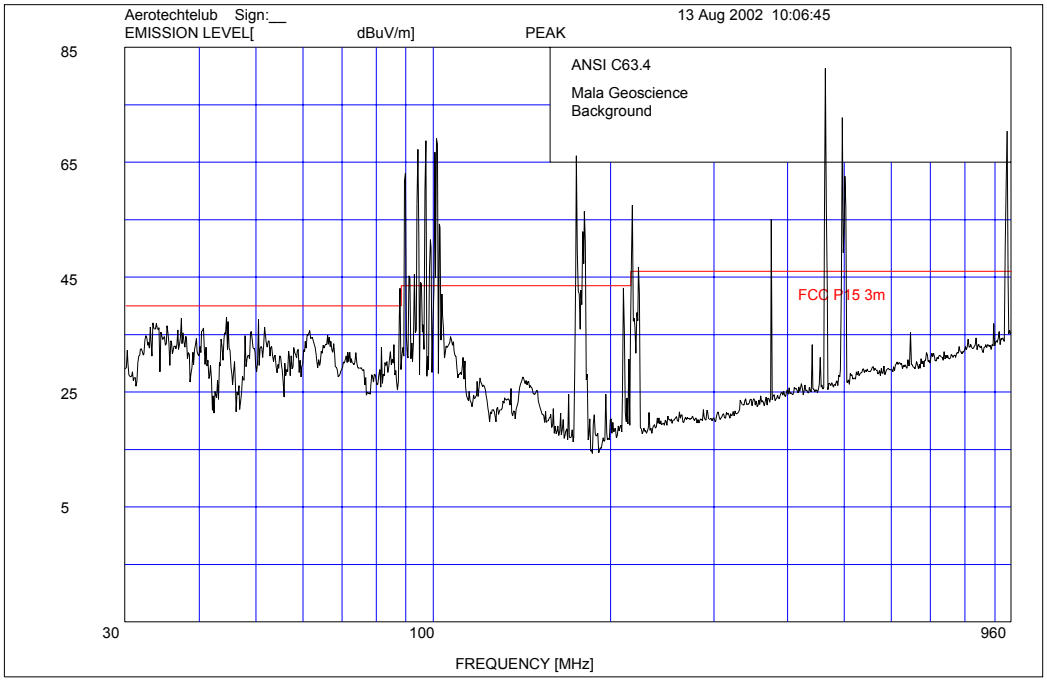
100
960
FREQUENCY [MHz]

Background



5.1.6 Signal List

Frequency (MHz)	Amplitude quasi-peak (dBµV/m)	Antenna polarisation	Noise level peak (dBµV/m)	Delta to limit (dB) (1
40,1	23,0	Vertical		-17,0
44,7	22,7	Vertical		-17,3
151,6	41,9	Vertical		-1,6
300		Vert/Hor	22	
400		Vert/Hor	25	
800		Vert/Hor	32	

(1 Negative value means below limit.

5.1.7 Measurement uncertainty

For the test site used no calculations exists.

5.1.8 Instrumentation

Hewlett Packard Spectrum analyser	8568B	100 Hz - 1.5 GHz	2648A13535 / 2634A02996
Hewlett Packard RF Preselector	85685A	20 Hz - 2 GHz	2510A00145
Hewlett Packard Quasi-Peak Adapter	85650A		2430A00465
Chase Bilog antenna	CBL6111A	30 - 1000 MHz	1164