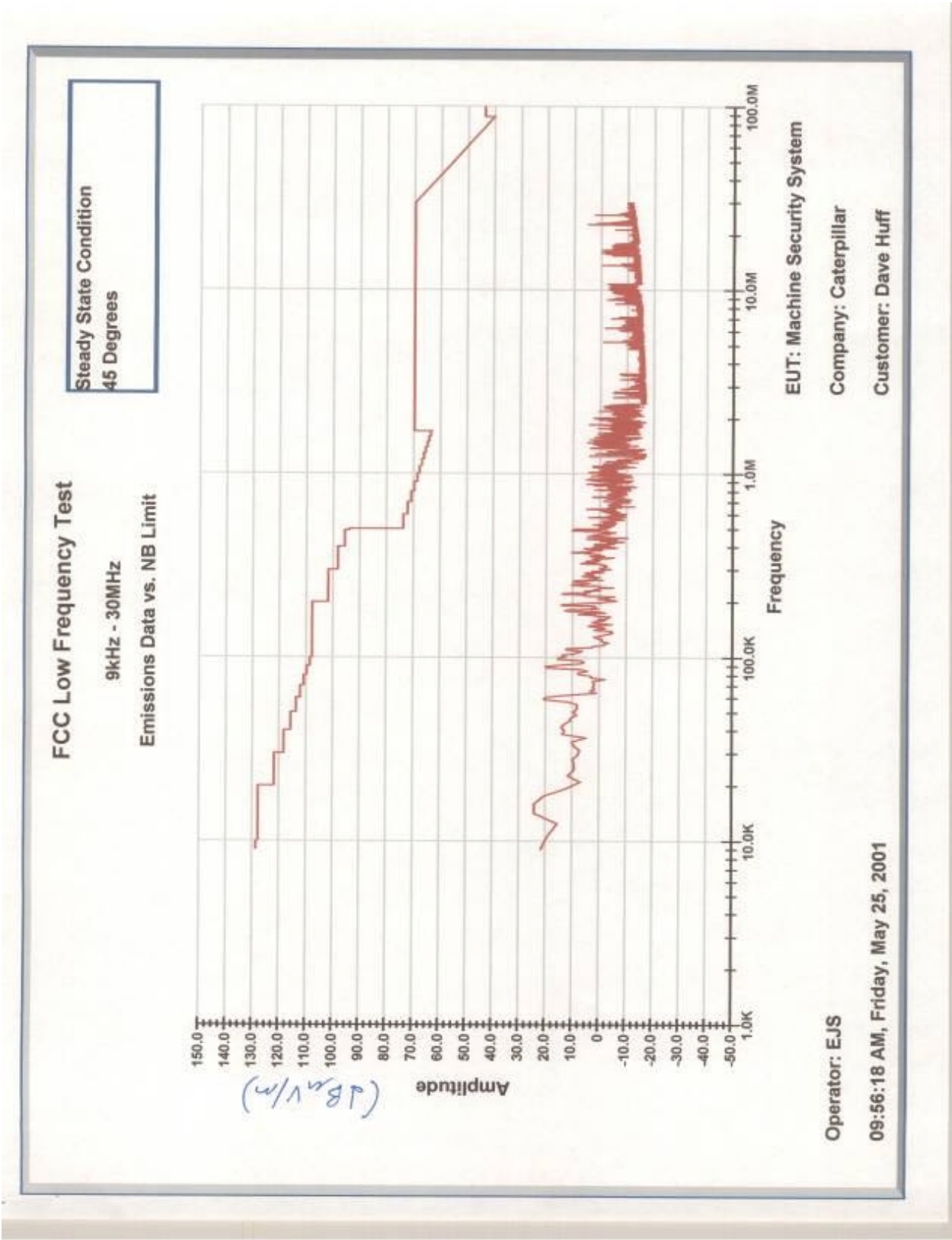
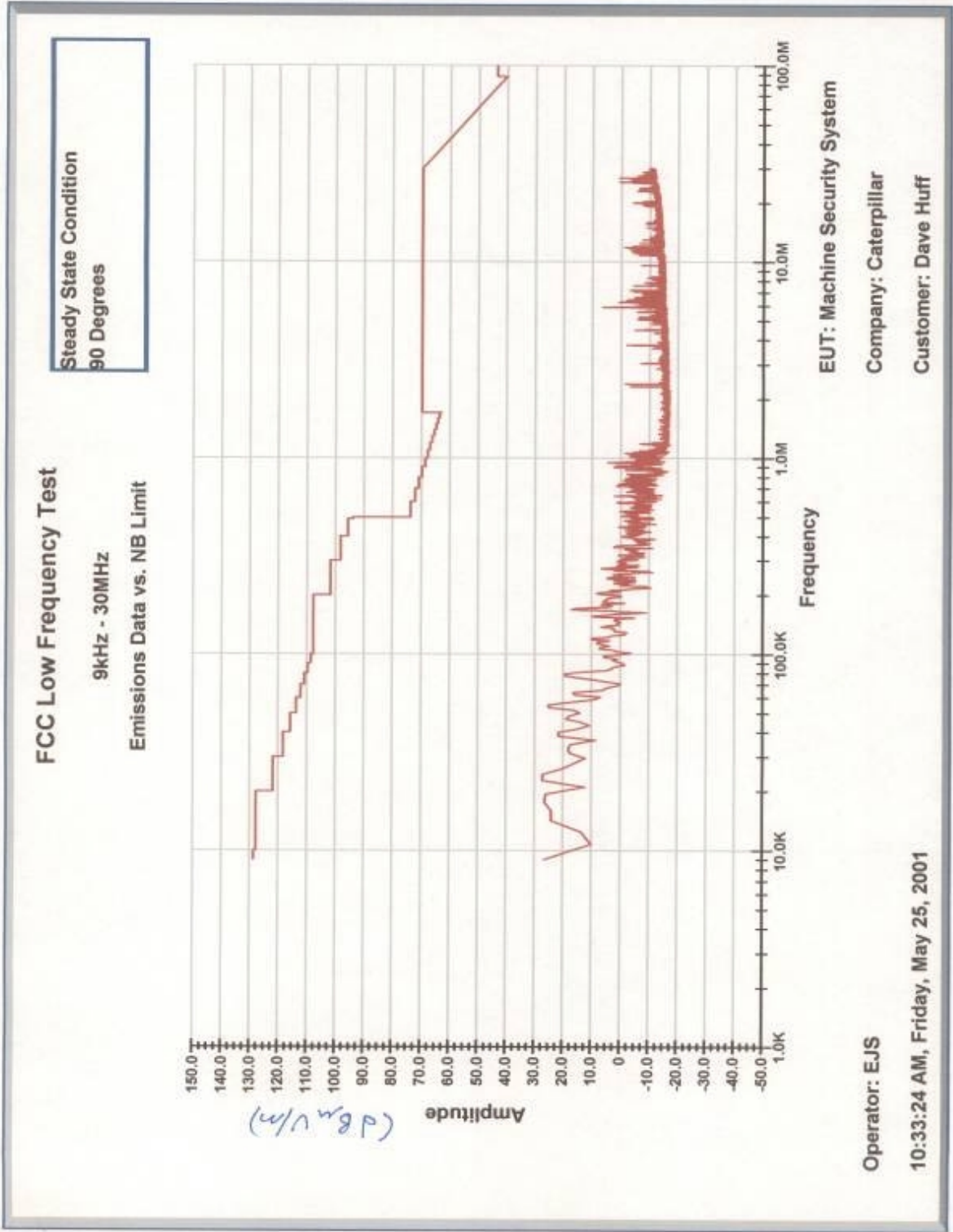
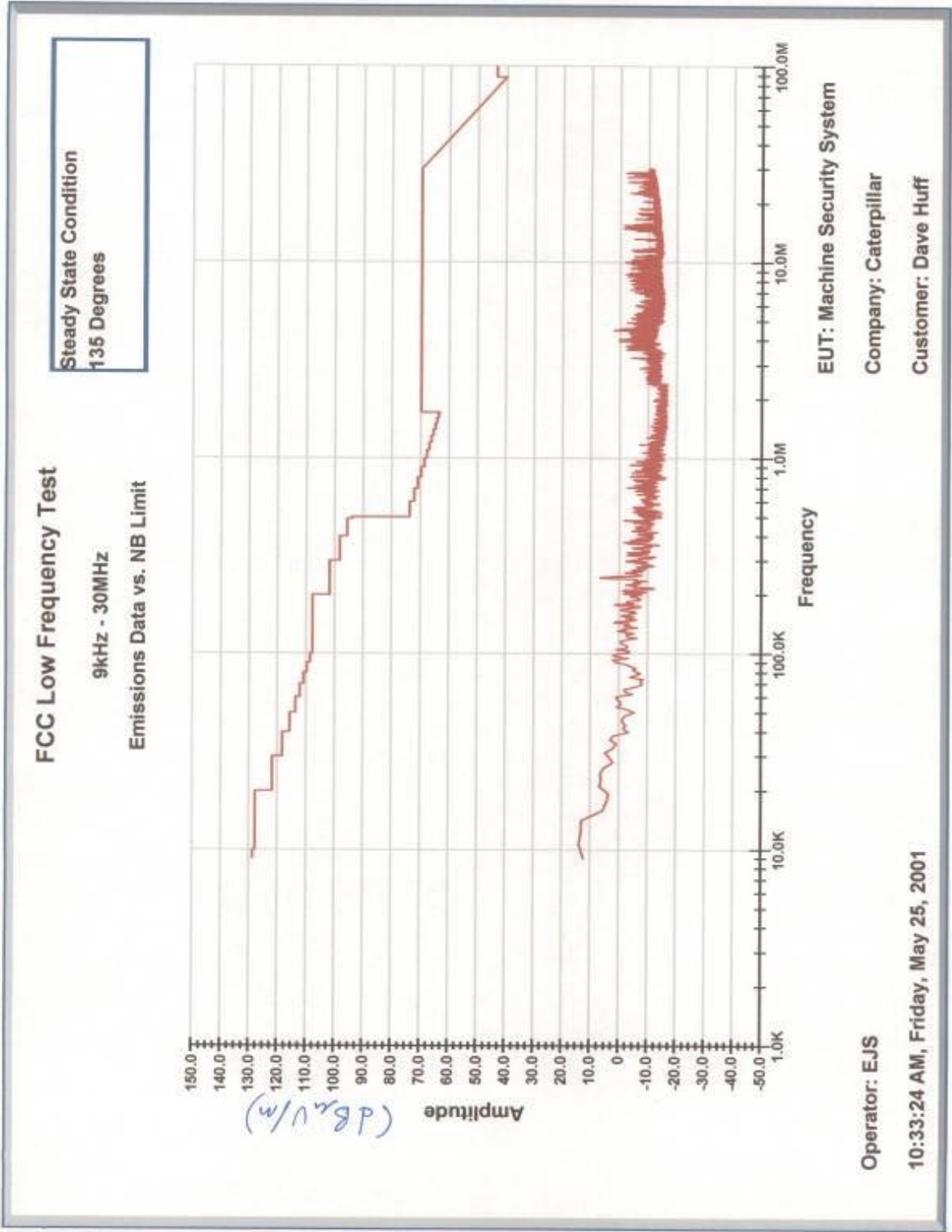
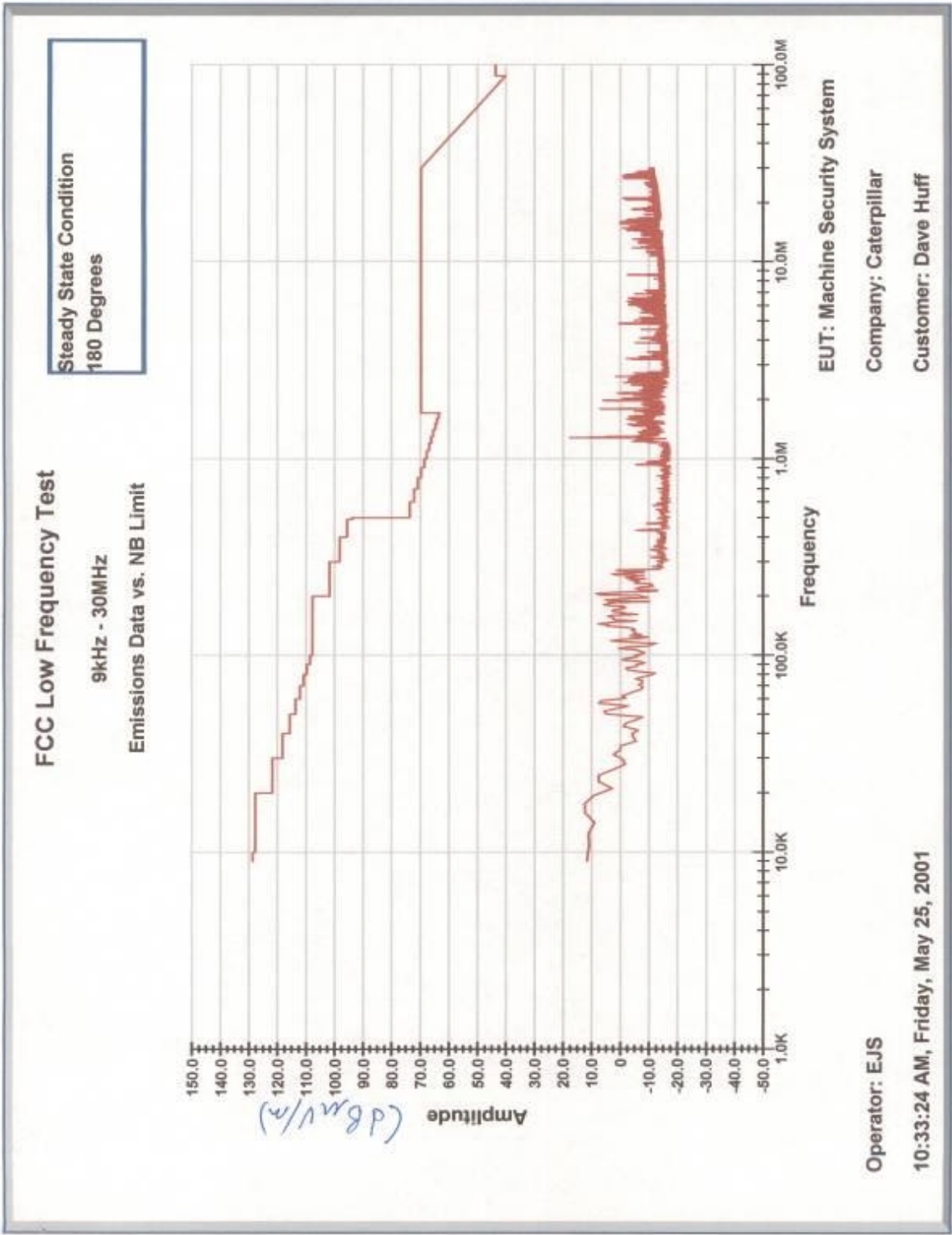
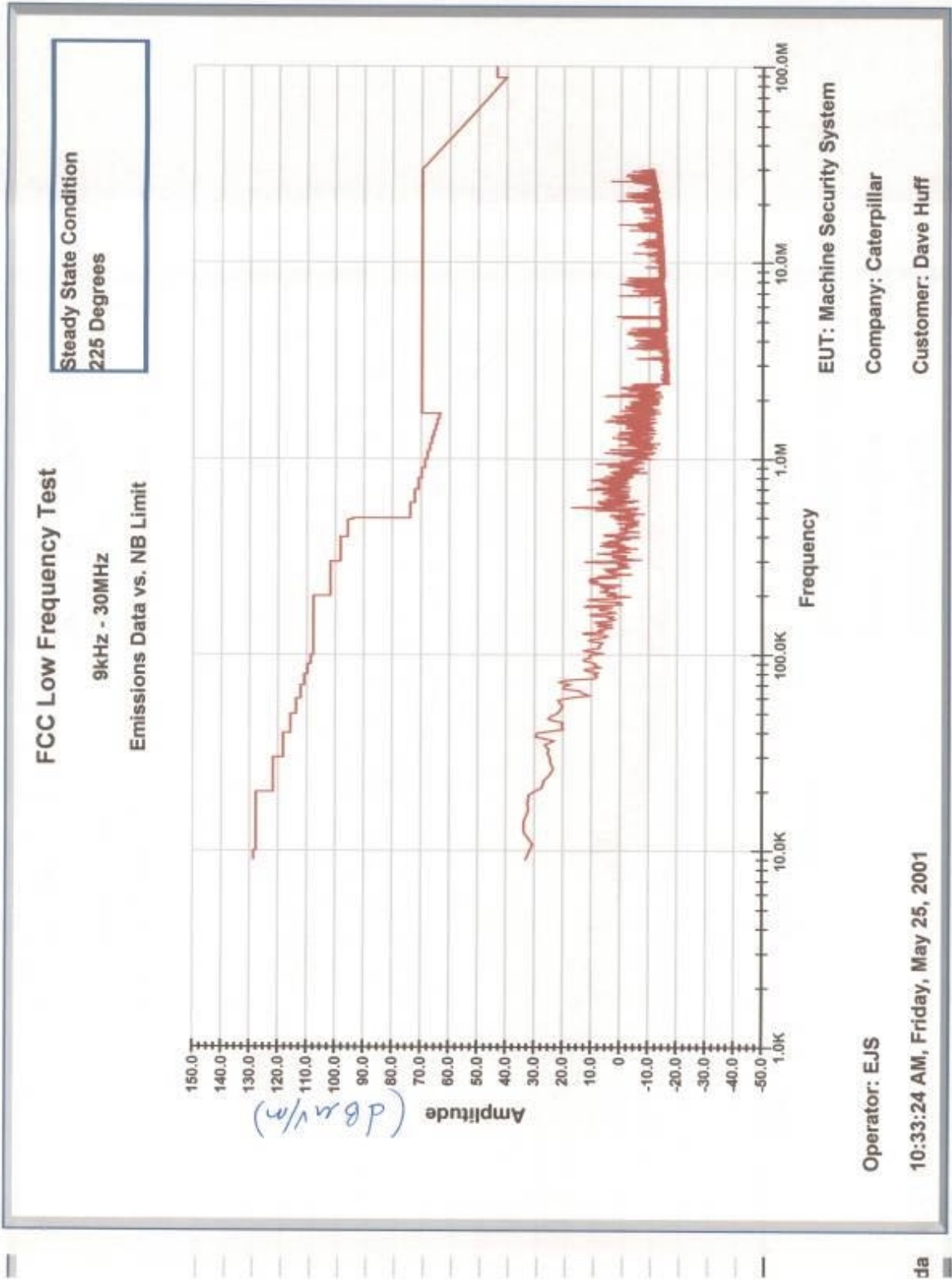


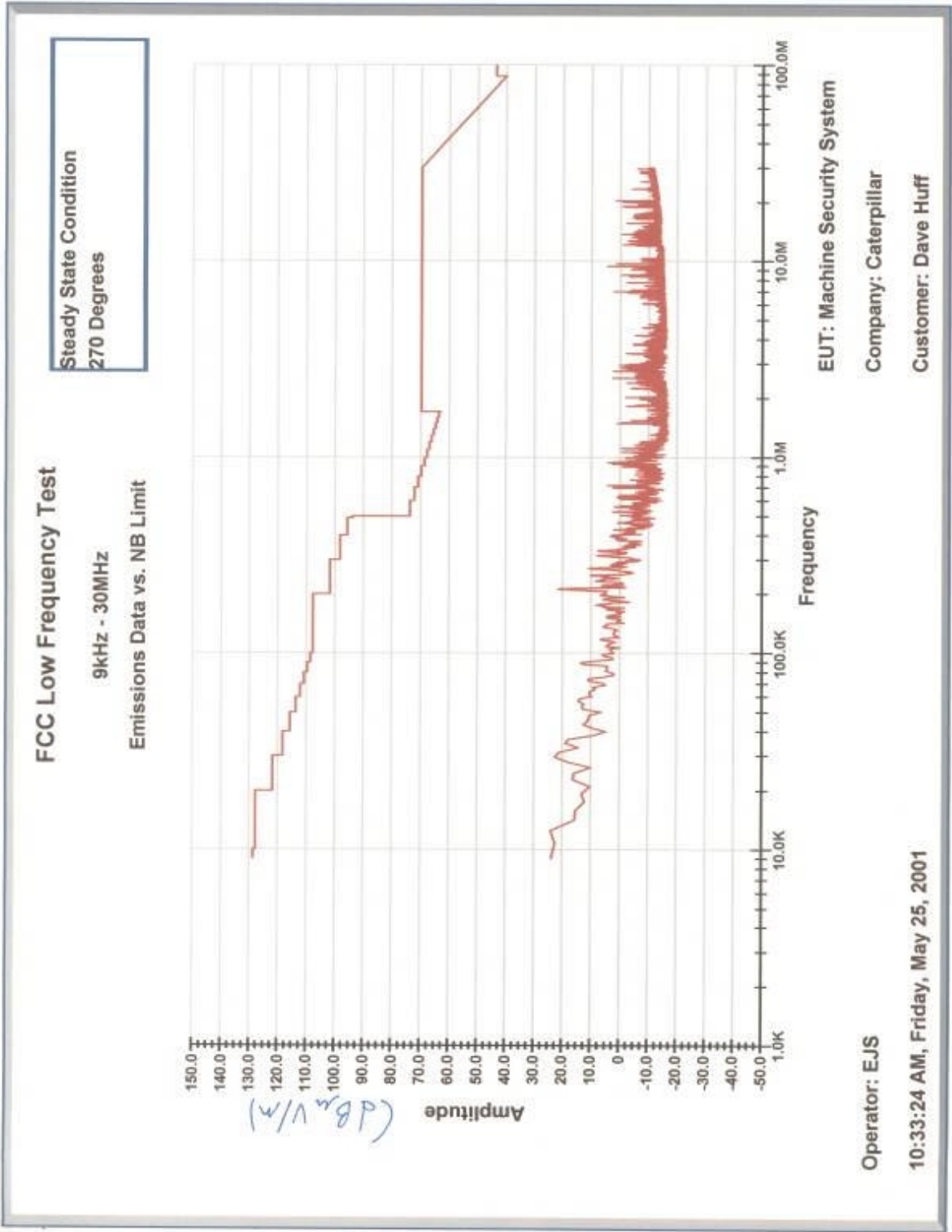












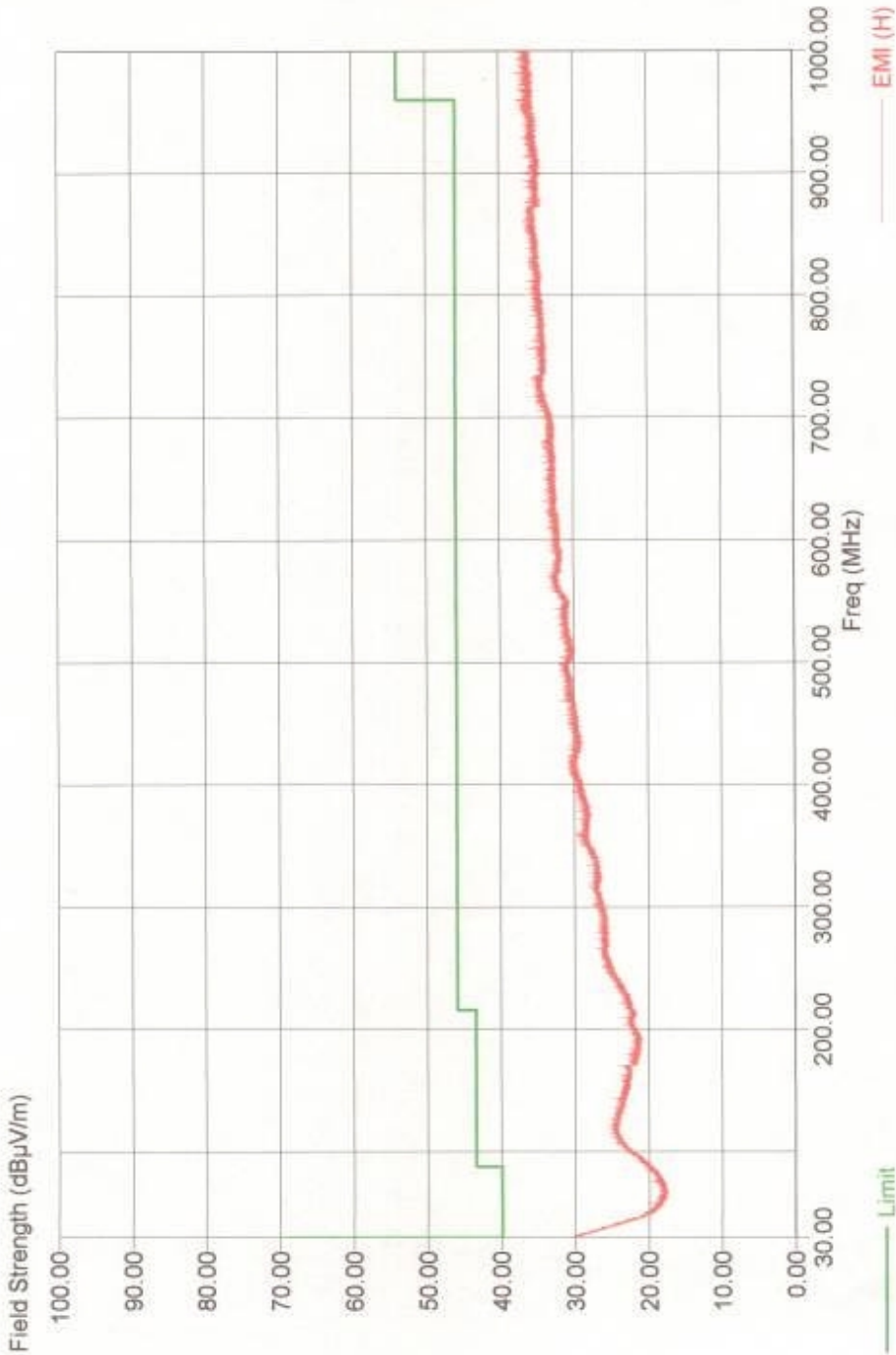


High Frequency (30 MHz to 1 GHz) - Horizontal

05/23/01 14:45:08
Sequence: Preliminary Scan

Title: Radiated Emissions 30MHz to 1GHz
File: FCC_HBAS.SET
Operator:
EUT Type: Machine Security System
EUT Condition: Baseline - Horizontal - File #499
Comments: FCC 3 meter test from 30MHz to 1GHz

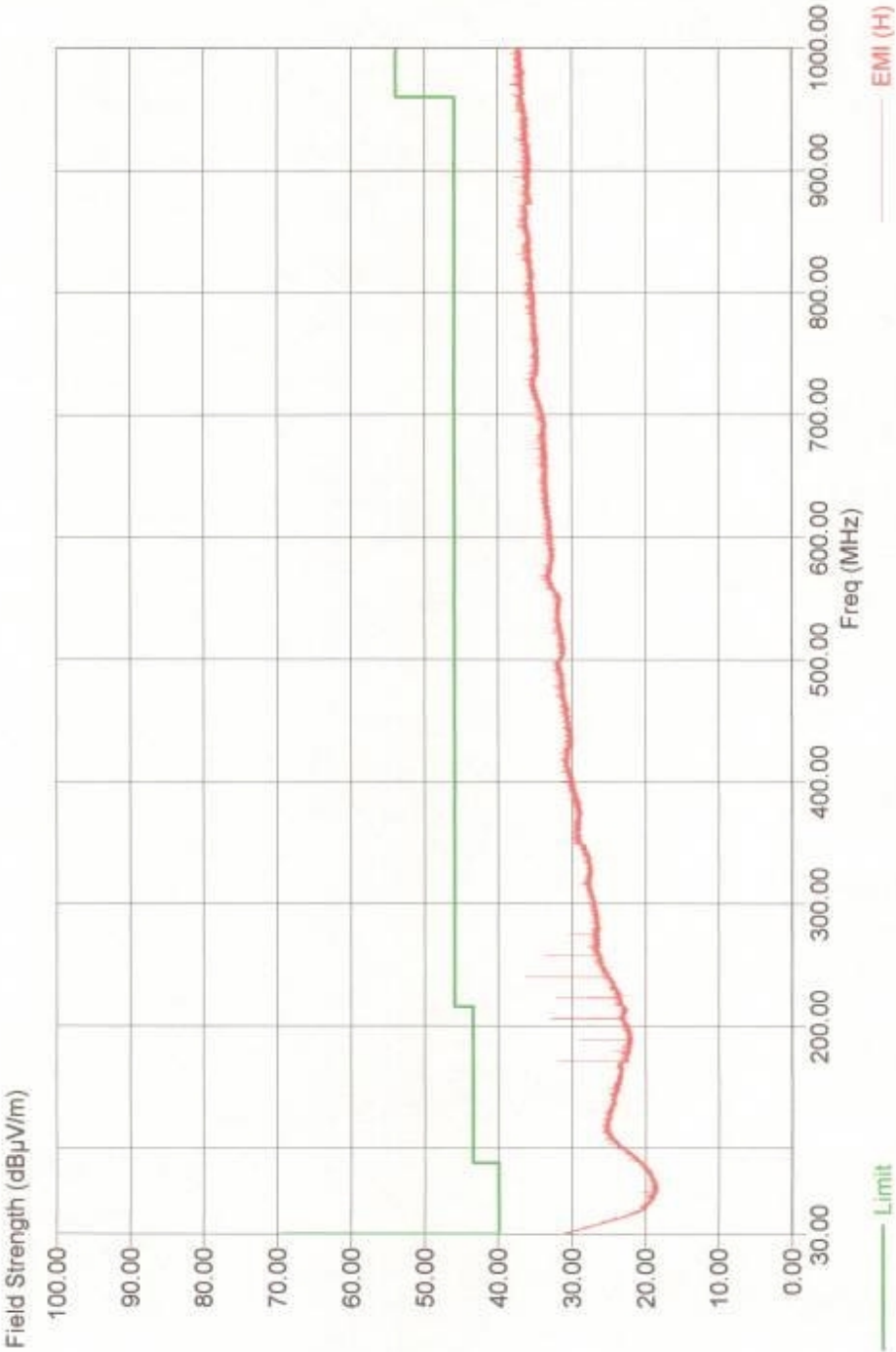
Graph4



05/24/01 08:23:02
Sequence: Preliminary Scan

Title: Radiated Emissions 30MHz to 1GHz
File: FCC_HSS.SET
Operator: EJS
EUT Type: Machine Security System
EUT Condition: Horizontal - Steady State Condition - File #499
Comments: FCC 3 meter test from 30MHz to 1GHz

Graph4



05/23/01 13:28:11
Sequence: Preliminary Scan

Title: Radiated Emissions 30MHz to 1GHz
File: FCC_HCRF.SET
Operator:
EUT Type: Machine Security System
EUT Condition: Continuous RF - Horizontal
Comments: FCC 3 meter test from 30MHz to 1GHz

Graph4

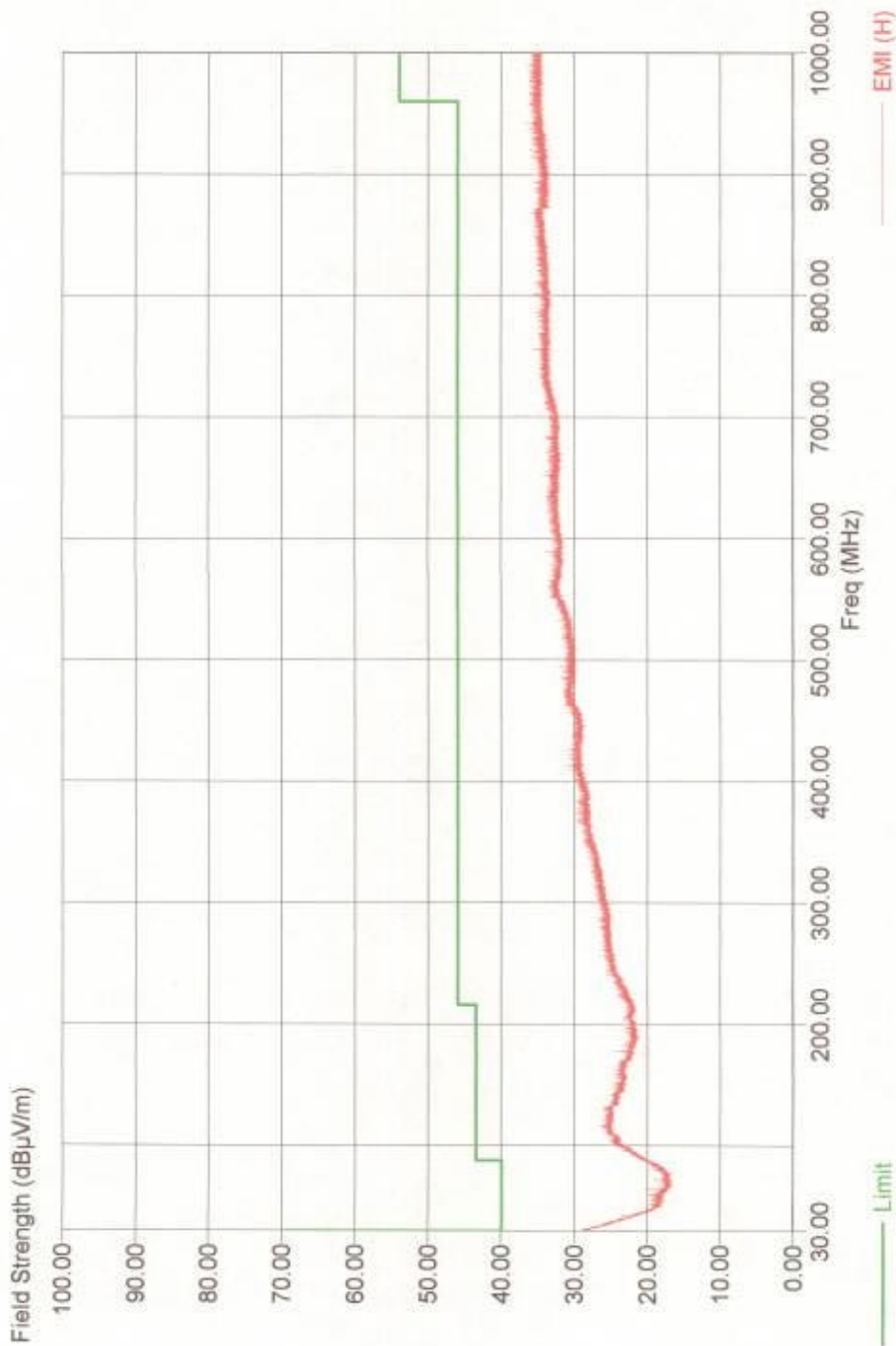


High Frequency (30 MHz to 1 GHz) - Vertical

05/23/01 14:52:09
Sequence: Preliminary Scan

Title: Radiated Emissions 30MHz to 1GHz
File: FCC_VBAS.SET
Operator:
EUT Type: Machine Security System
EUT Condition: Baseline - Vertical - File #499
Comments: FCC 3 meter test from 30MHz to 1GHz

Graph4





05/23/01 11:34:03
Sequence: Preliminary Scan

Title: Radiated Emissions 30MHz to 1GHz
File: FCC_VCRF.SET
Operator:
EUT Type: Machine Security System
EUT Condition: Continuous RF - Vertical
Comments: FCC 3 meter test from 30MHz to 1GHz

Graph4



Additional Measurements and Computations

In observing the presence of radiated emissions in the range 30 MHz to 50 MHz, even though they were found to be below the established limits for a Class A device, we ran additional testing and acquired the following supplemental data. First we examined the tabular data:

05/23/01 13:01:12
Sequence: Final Measurements

Title: Radiated Emissions 30MHz to 1GHz
File: FCCFINAL.SET
Operator: EJS
EUT Type: Machine Security System
EUT Condition: Continuous RF
Comments: Vertical - Final Scan - 3 Meter

Table9

Fre (MHz)	(QP) EMI (dBµV/m)	Limit (dBµV/m)	(QP) Margin (dB)
30.20	43.60	40.00	3.60
30.45	41.40	40.00	1.40
47.80	40.98	40.00	0.98
48.05	42.64	40.00	2.64
48.35	42.36	40.00	2.36

Next we expanded the data as shown in the next two plots:

05/23/01 14:59:07
Sequence: Preliminary Scan

Title: Radiated Emissions 30MHz to 1GHz
File: FCC_VCRF.SET
Operator:
EUT Type: Machine Security System
EUT Condition: Continuous RF - Vertical
Comments: FCC 3 meter test from 30MHz to 1GHz

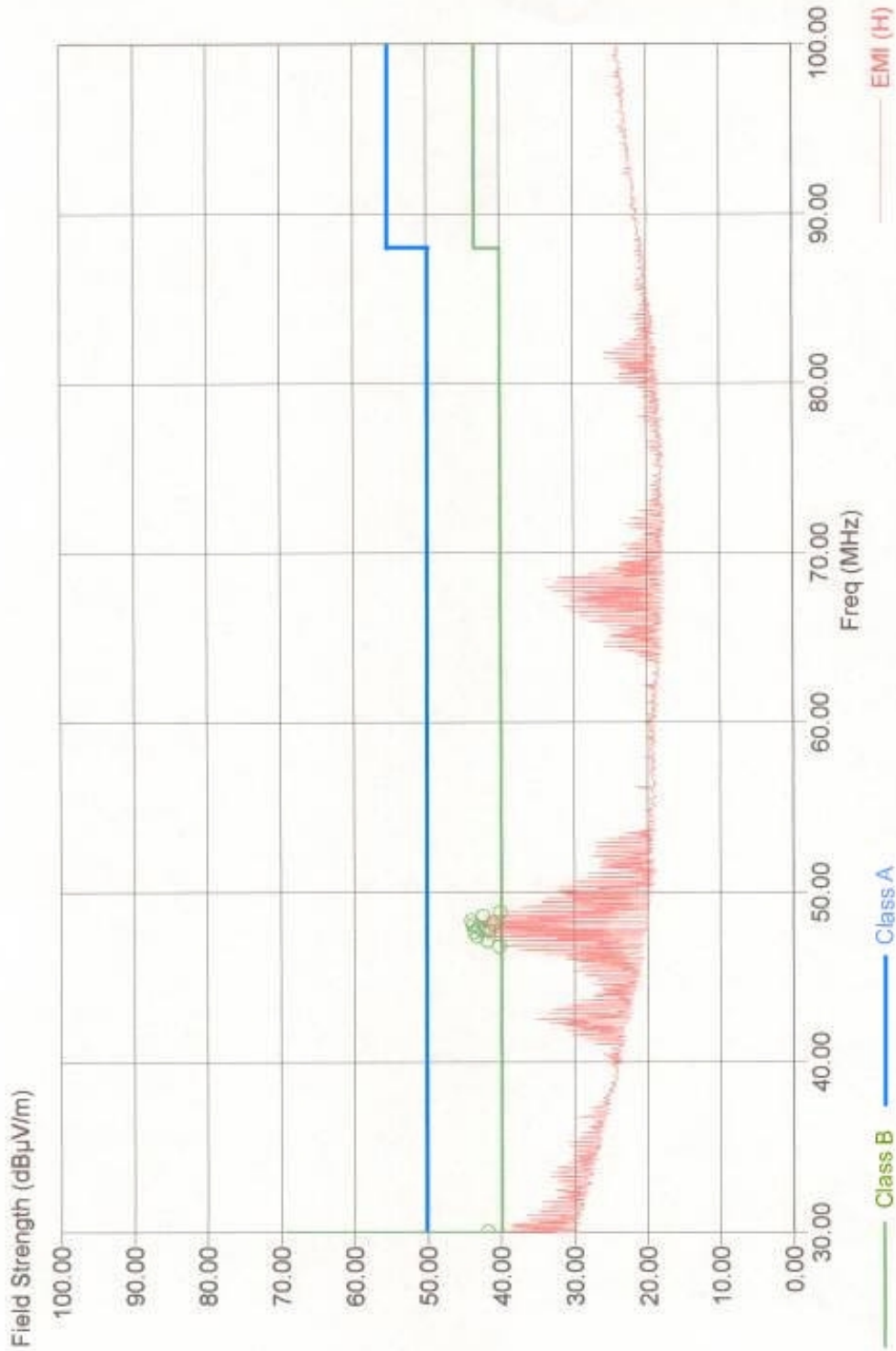
Graph4



05/23/01 15:09:28
Sequence: Preliminary Scan

Title: Radiated Emissions 30MHz to 1GHz
File: FCC_VCRF.SET
Operator:
EUT Type: Machine Security System
EUT Condition: Continuous RF - Vertical
Comments: FCC 3 meter test from 30MHz to 100MHz

Graph4



The tabular data from the above plot is shown below:

05/23/01 15:19:07
Sequence: Final Measurements

Title: Far Field Radiated Emissions 30MHz to 1GHz
File: FCCFINAL.SET
Operator: EJS
EUT Type: Machine Security System
EUT Condition: Continuous RF
Comments: Vertical - Final Scan - 30MHz to 100MHz

Table9

Fre: (MHz)	(QP) EMI (dBuV/m)	Limit (dBuV/m)	(QP) Margin (dB)
30.05	39.99	40.00	-0.01
46.85	37.91	40.00	-2.09
47.15	38.79	40.00	-1.21
47.40	42.52	40.00	2.52
47.65	39.17	40.00	-0.83
47.80	45.41	40.00	5.41
47.95			

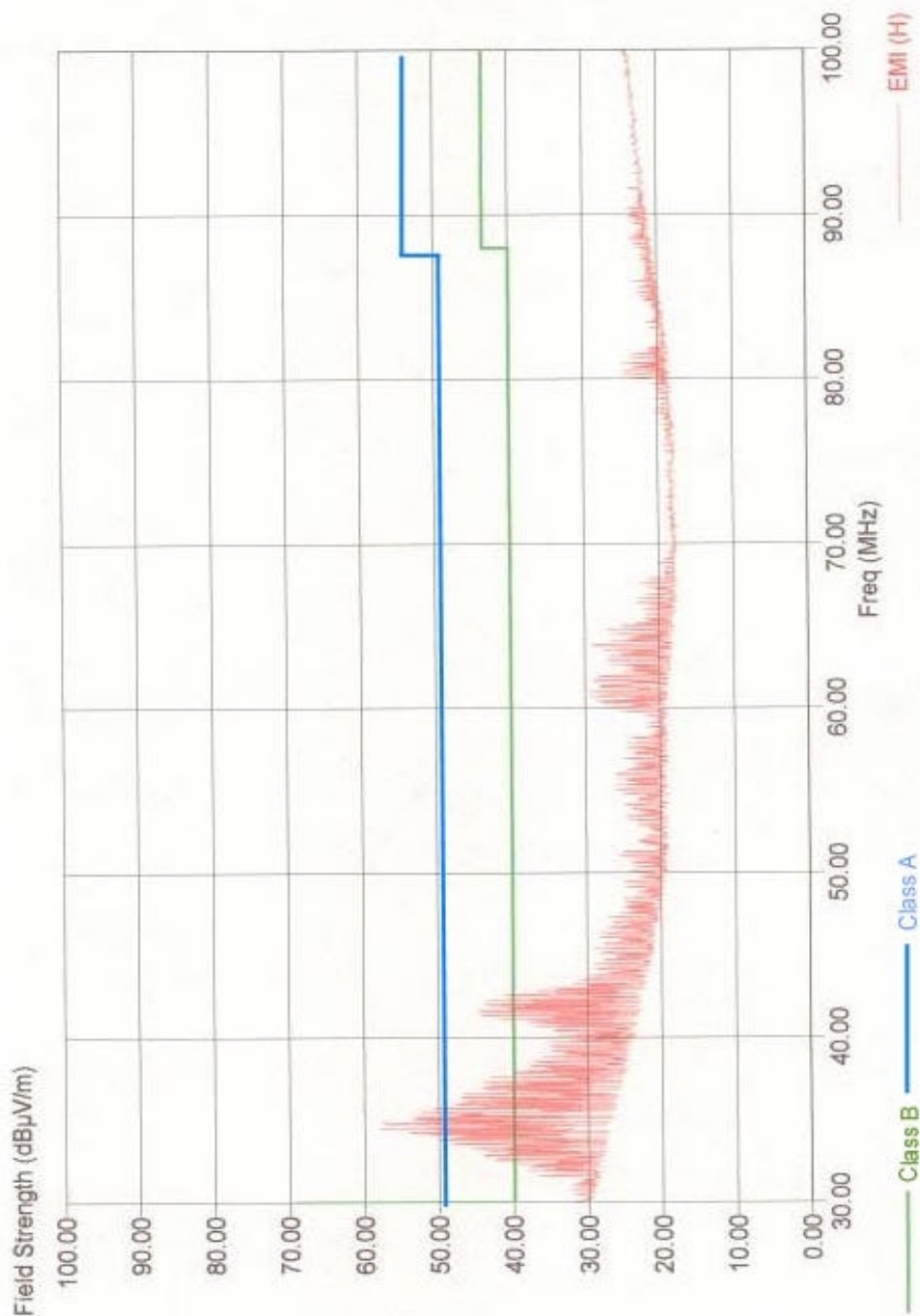
1

To demonstrate that these emissions were the result of digital processing of signals within the ECM and not harmonics of the intentional radiator portion of the system we first disconnected the exciter coil and left it as an open circuit. This gave the following plot:

Title: Radiated Emissions 30MHz to 100MHz
File: FCC_VCRF.SET
Operator:
EUT Type: Machine Security System
EUT Condition: Continuous RF - Vertical
Comments: FCC 3 meter test from 30MHz to 100MHz Approx. 12 inches of loose looped antenna harness with ferrite. 1 sweep on EMI Receiver. Antenna disconnected.

05/25/01 11:34:08
Sequence: Preliminary Scan

Graph4



Next we connected a 50-ohm resistive load to show that additional emissions which came about when we disconnected the coil were the result of reflections. These results are shown below:

05/25/01 11:46:14
Sequence: Preliminary Scan

Title: Radiated Emissions 30MHz to 100MHz
File: FCC_VCRF.SET

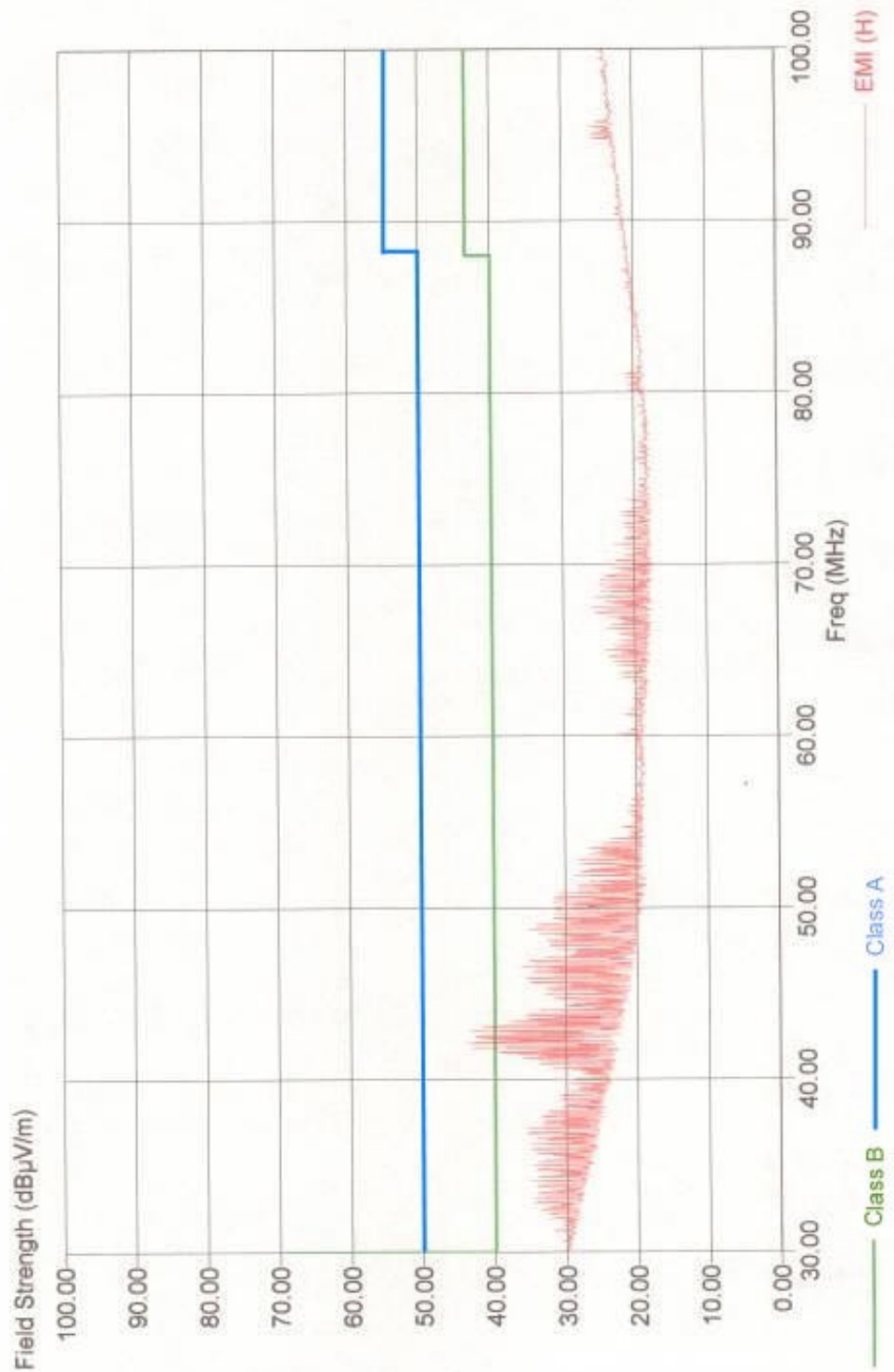
Operator:

EUT Type: Machine Security System

EUT Condition: Continuous RF - Vertical

Comments: FCC 3 meter test from 30MHz to 100MHz Approx. 12 inches of loose looped antenna harness with ferrite. Antenna disconnected - 50 ohm termination.

Graph4



Conclusions

Testing was conducted at EMC Testing, Inc. on 5/23/01 and 5/25/01 on the Machine Security System (MSS) being developed by Caterpillar, Inc. EEBU.

The testing showed that the fundamental frequency of the MSS and its harmonics are within FCC part 15 levels for an intentional radiator at 134.2 KHz. The emissions above 30 MHz are within Class A limits, however because they are generated by the digital portion of the control they are exempt by Section 15.103 (a).