



NATIONAL TECHNICAL SYSTEMS

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Test Report Prepared
for
Eaton Corporation



Issued: November 7, 2012

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CLIENT INFORMATION	
Company Name:	Eaton Corporation
Company Contact:	Rohit Arora
Address:	160 Gold Star Blvd.
City, State, Zip:	Worcester, MA 01606
Purchase Order Number:	4172-3020906 & 417203023883
Purchase Order Date:	October 23, 2012
Test Item Description	Data Center Enclosure
Test Item Part Number	N/A
Test Item Serial Number	N/A
Test Specification	GR-63-CORE I3

NTS CONTRACT INFORMATION	
NTS Project (PR) Number:	PR017449
NTS Quotation Number:	OP0119687
Quotation Revision:	0
Quotation Date:	August 10, 2012

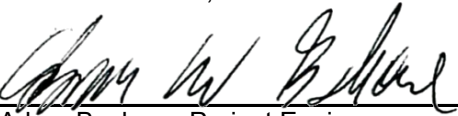
REFERENCES
ISO/IEC 17025:2005(E), <i>General Requirements for the Competence of Testing and Calibration Laboratories</i> , May 15, 2005
GR-63-CORE, <i>NEBS™ Requirements: Physical Protection</i> , Issue 3, Telcordia™ Technologies, March 2006

Rev. No.	Date	Page No.	Para. No.	Description
0	11/7/12			Original

Prepared by:


Elizabeth Furtado, Technical Writer

Approved by:


Adam Bashore, Project Engineer

Reviewed by:


Michael McCouch, Quality Representative



This report summarizes testing performed in accordance with the relevant contractual documentation listed on the Job Information Page. This document presents a clear overview of the test program and deviations. It is the responsibility of the NTS client to evaluate pass/fail criteria on test unit's functionality.

Deviations in testing range from out of tolerance conditions, unit failure, changes in test profiles or other instances that are not within the scope of the test specification would be detailed in this report as Notices of Deviations.

Test Profile Pages provide a detailed description of test levels and test results. Typically each test shall have its own Test Profile Page.

The Test Equipment List summarizes the equipment used for all testing. This list also contains calibration due dates. If a more detailed list is required containing range, accuracy etc., please contact your Program Manager at NTS.

The test sequence below summarizes the order in which testing was performed. Please refer to the product description on the Test Profile Page and/or Receiver Page.

Test	Test Description	Start Date	End Date
1	Sine Vibration	10/23/12	10/23/12
2	Seismic	10/23/12	10/24/12
3			
4			
5			
6			
7			
8			
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10			
11			
12			
13			
14			
15			
16			
17			
18			
19			
20			

COMMENTS:

**TEST PROFILE**

TR- PR017449-12T, Rev 0

Customer Name:	Eaton Corporation
Test Name:	Sine Vibration
Specification:	GR-63-CORE I3
Spec. Date	Mar-06
Para. / Method:	Zone 4

Unit(s) Under Test:	Data Center Enclosure
Quantity:	1
P/N(s):	N/A
S/N(s):	N/A

Frequency Range (Hz)	g's	in/sec	disp. p-p (in)
1-50	.2		
Sweep Rate	1 oct/min		
Number of Sweeps	1		
Duration	5:39		
Number of Axes	3		
Control Accel. Location	Base Of UUT		
Response Accel. 1 Location	Top		
Response Accel. 2 Location	Middle		
Response Accel. 3 Location	N?A		

TEST SETUP AND RESULTS

Test Started:	10/23/2012	Test Completed:	10/23/2012
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Unit Under Test Information	Y	N	N/A	Comments
Tested in shipping container:		X		
Operating during test:		X		
Operated by Client:		X		
Powered during testing:		X		
Passes post-test functionals:			X	
Physical damage noted:		X		
Does unit(s) pass requirements:	X			
Test Profile Checked	X			

COMMENTS:

The UUT was tested to the above profile in all three axes prior to running the earthquake test to note the primary resonant frequency.

Vertical Axis: None

Side-Side Axis: 5.5Hz

Front-Back Axis: 15Hz

Test Technician:	Kenneth Lesage
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Earthquake Environment and Criteria

TR- PR017449-12T, Rev 0

Customer Name:	Eaton Corportation
Test Name:	Earthquake Environment / Earthquake Resistance
Specification:	GR-63-CORE, Issue 3 / ETSI EN 300 019-2-3
Section:	4.4.1 through 4.4.3 / 4

Unit Description:	Data Center Enclosure
Quantity:	1
Part Number:	N/A
Serial Number:	N/A
Criteria:	N/A

Zones 1 & 2	
Frequency (Hz)	G's
0.3	0.2
0.6-5	2
15-50	0.6

Zone 3	
Frequency (Hz)	G's
0.3	0.2
0.6	2.0
1-5	3.0
15-50	1.0

Zone 4	
Frequency (Hz)	G's
0.3	0.2
0.6	2.0
2-5	5.0
15-50	1.6

Zone	4
Duration	30 sec/axis
Number of Axes	3
Control Accel. Location	Base
Response Accel. 1 Location	Top Rack
Response Accel. 2 Location	Mid Rack
Force Gauge Location	Base bolt

Configuration Guidelines for Shelf-Level Testing		
Shelf Mass (kg)	Shelf Location for testing	Overhead Cable Mass for Testing (kg)
$m < 12$	Top of rack*	23
$23 \leq m < 68$	Top of rack*	23
$68 \leq m < 181$	Center of rack	0
$m \geq 181$	Lowest Position or Highest Recommended by Manufacturer	0

* Populate rack from the top down. If multiple test samples are fitted, test severity is sufficient in the upper 20% of the rack mounting height to provide adequate testing.

Test Started:	10/23/2012	Test Completed:	10/24/2012
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Unit Under Test Information	Y	N	N/A	Comments
Shelf Level				
UUT Weight:				1800 lbs
UUT tested in a NTS rack:			X	Mounted in the Top position
Rack mounted via four 1/2" bolts:	X			No Torque due to design of UUT with one load ring
50 lb weight added to top of rack:	X			Simulates cable weight
Dummy load mounted below UUT:			X	Simulates a loaded rack
DVD Video recorded:	x			Not given to client.
Operating during test:			X	
Verteq II Drive wave being used	X			
Operated by Client:			X	
Passes posttest functionals:	X			
Physical damage noted:		X		
Does unit(s) pass requirement R4-68?	X			
Does unit(s) pass requirement R4-69?	X			
Does unit(s) pass requirement R4-70?	X			
Does unit(s) pass objective O4-71?				
Does unit(s) pass requirement R4-72?	X			
Does unit(s) pass objective O4-73?	X			
Does unit(s) pass objective O4-74?		X		
Does unit(s) pass requirement R4-75?	X			
Does unit(s) pass objective O4-76?			X	
Does unit(s) pass requirement R4-77?			X	Steel Plate Used
Does unit(s) pass objective O4-78?			X	Steel Plate Used
Does unit(s) pass objective O4-79?			X	Steel Plate Used
Does unit(s) pass requirement R4-80?			X	
Test Profile Checked	X			

Comments:
The UUT was tested to the Zone 4 profile in all three axes with no physical failures to note.

Test Technician:	Ken Lesage
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This equipment is calibrated according to ISO/IEC 17025:2005(E) and calibration is traceable to the National Institute of Standards and Technology (NIST). Calibration records are maintained on file at National Technical Systems.

[illegible]

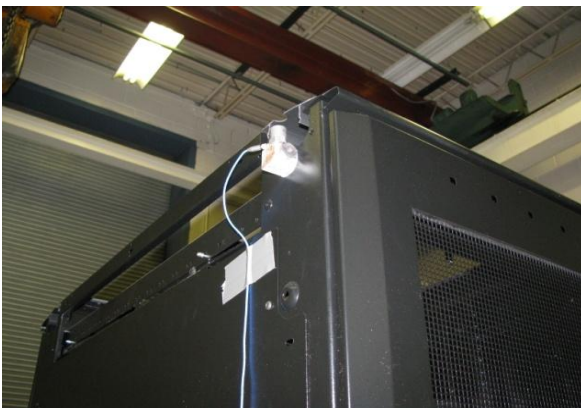
CAL = Calibrated FIO = For Indication Only NCR = No Calibration Required NPCR = No Periodic Calibration Required



50 lbs Top Weight Added



Load Ring



Top Response



Middle Response



Side-Side Axis



Front-Back Axis



Vertical Axis



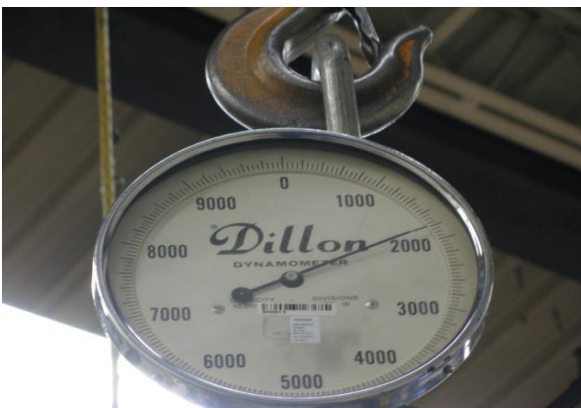
UUT



UUT weight distribution top portion in lbs



UUT weight distribution bottom portion in lbs



UUT weight



RECEIVER

TR- PR017449-12T, Rev 0

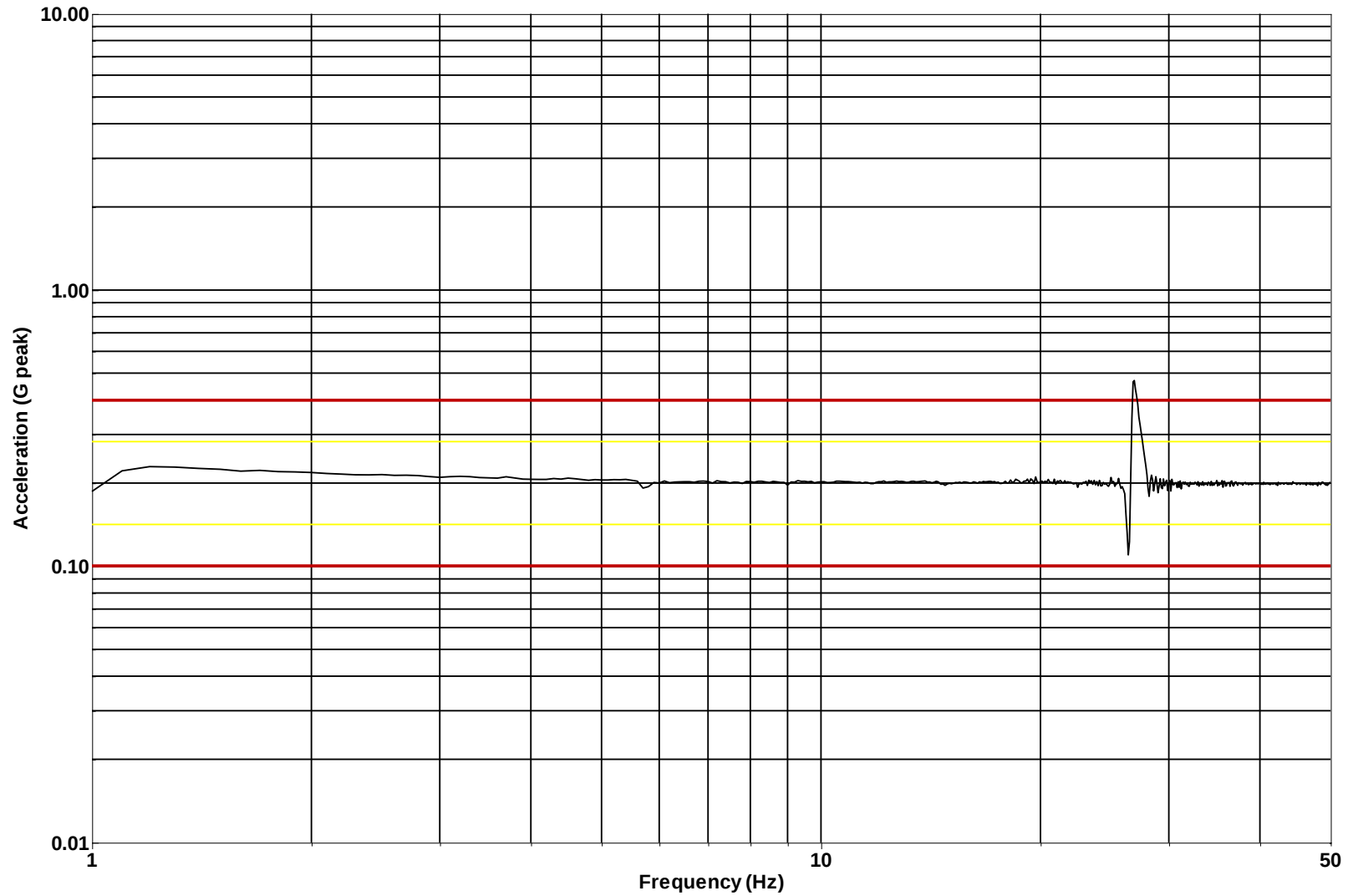
Unit(s) Received by:		Kenneth Lesage		Date:	10/23/2012
ITEM	QTY.	P/N	S/N	Description	Ready for Test
1	1	N/A	N/A	Data Center Enclosure	Yes
2					
3					
4					
5					
6					
7					
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40					



Sweep Number: 1 sweeps
Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:45
Start Time: Sep 27, 2012 14:21:31

Acceleration Profile



Control

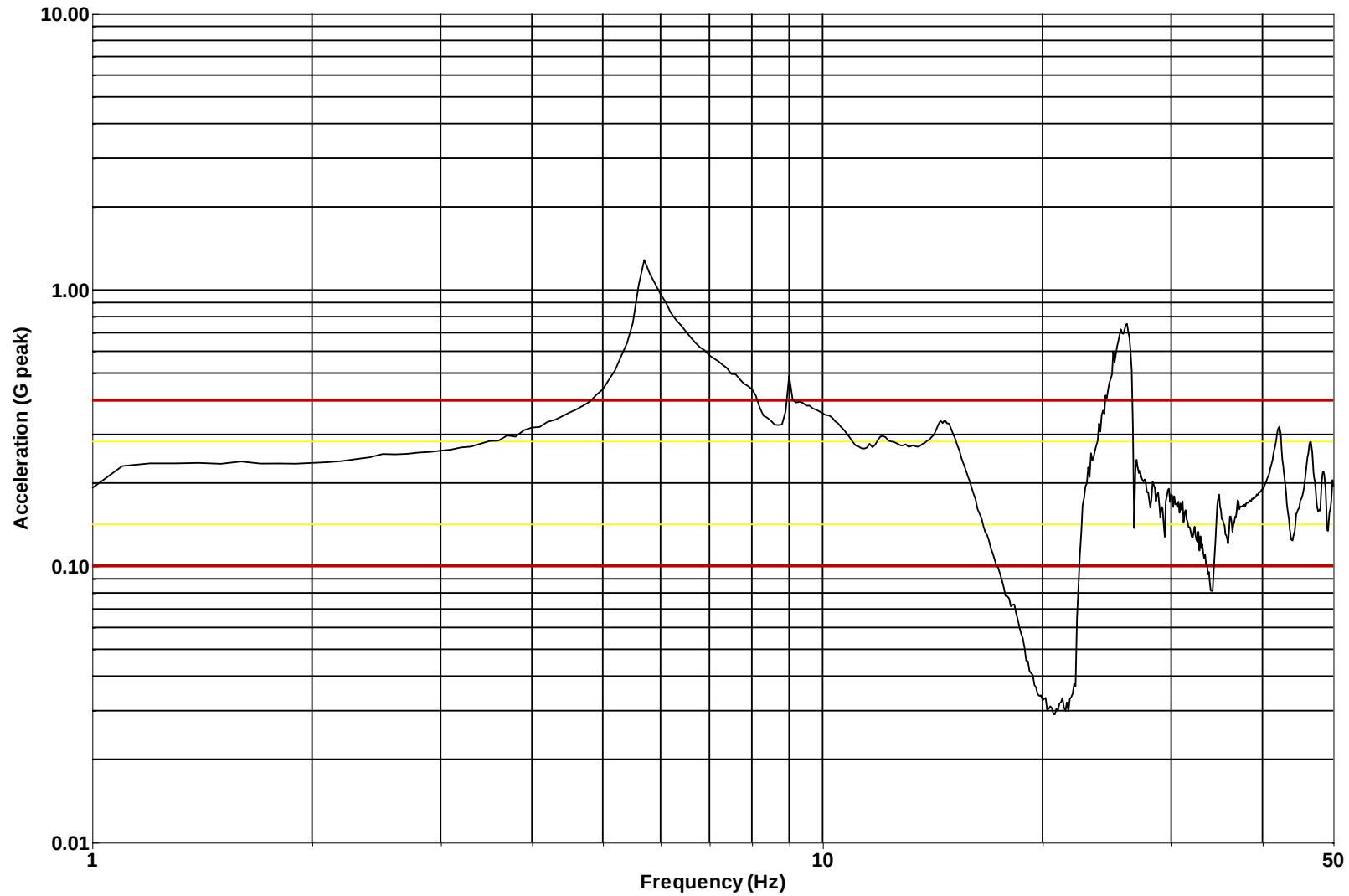
Eaton MJOPR017449
Server Rack Model
Test# 1 Side-Side Sine Survey



Sweep Number: 1 sweeps
Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:45
Start Time: Sep 27, 2012 14:21:31

Acceleration Profile



Top Rack

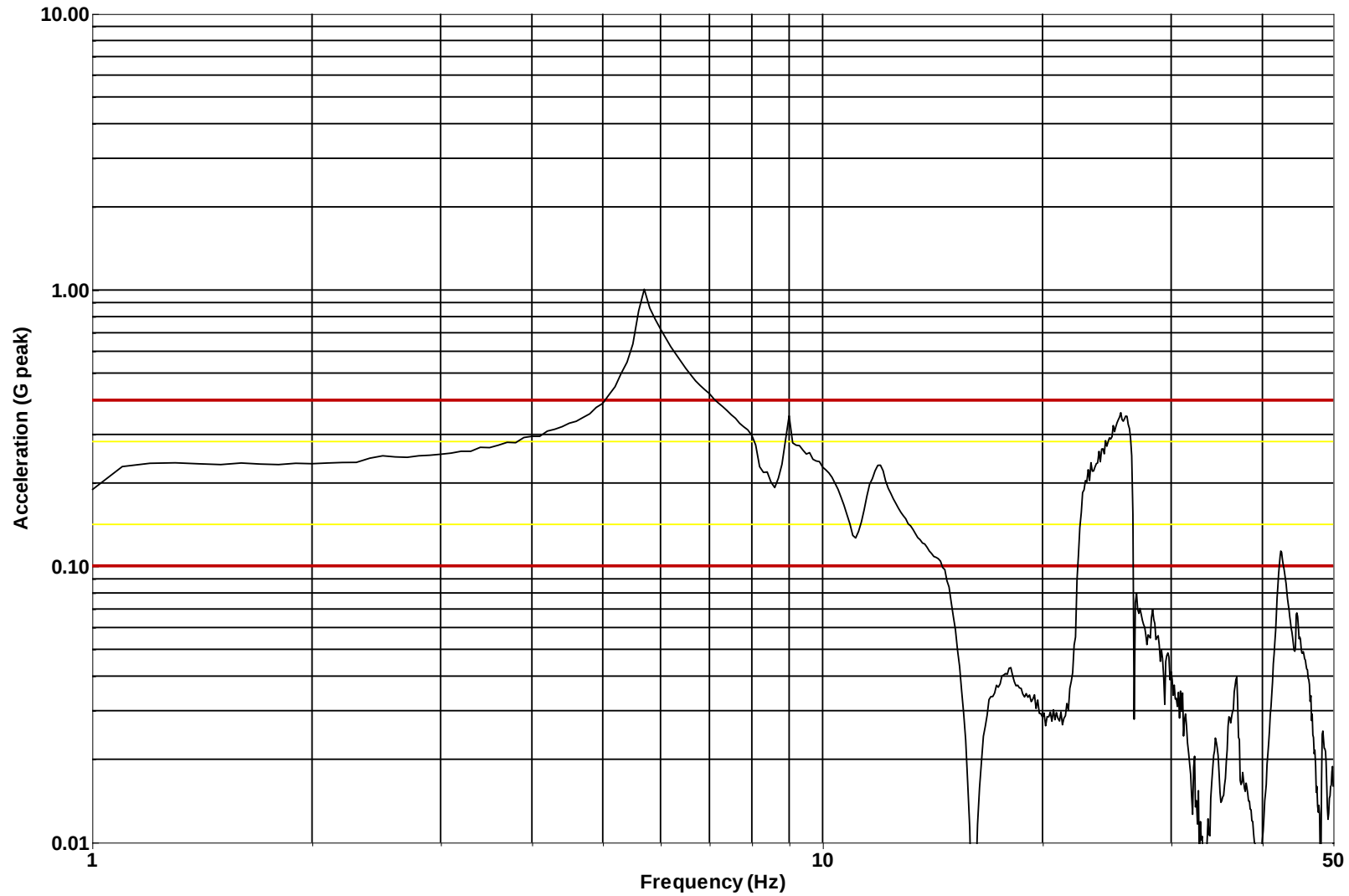
Eaton MJOPR017449
Server Rack Model
Test# 1 Side-Side Sine Survey



Sweep Number: 1 sweeps
Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:45
Start Time: Sep 27, 2012 14:21:31

Acceleration Profile



Mid Rack

Eaton MJOPR017449
Server Rack Model
Test# 1 Side-Side Sine Survey

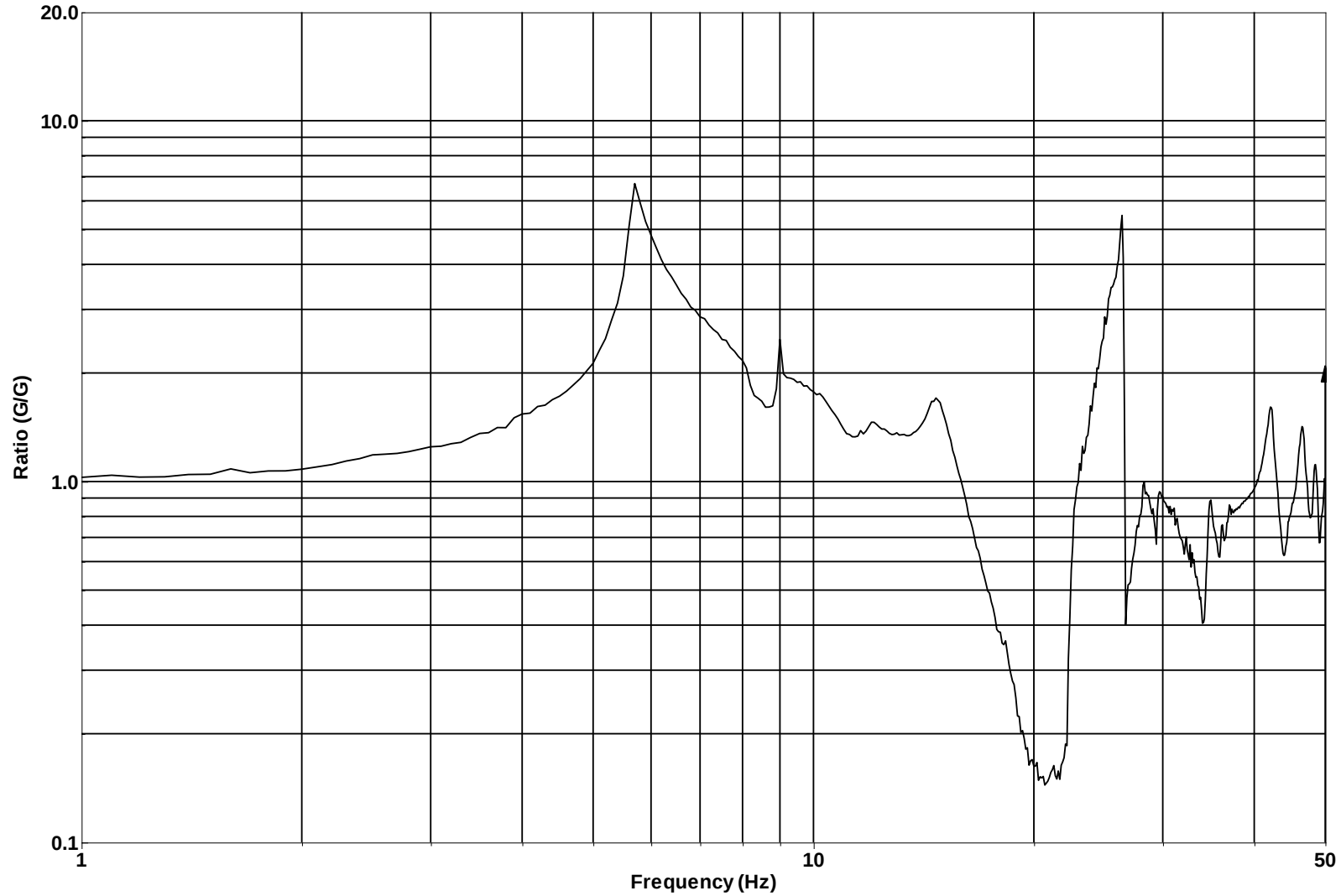
Sweep Number: 1 sweeps

Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:45

Start Time: Sep 27, 2012 14:21:31

Transmissibility (reference = Control)



Top Rack/Control

Eaton MJOPR017449

Server Rack Model

Test# 1 Side-Side Sine Survey

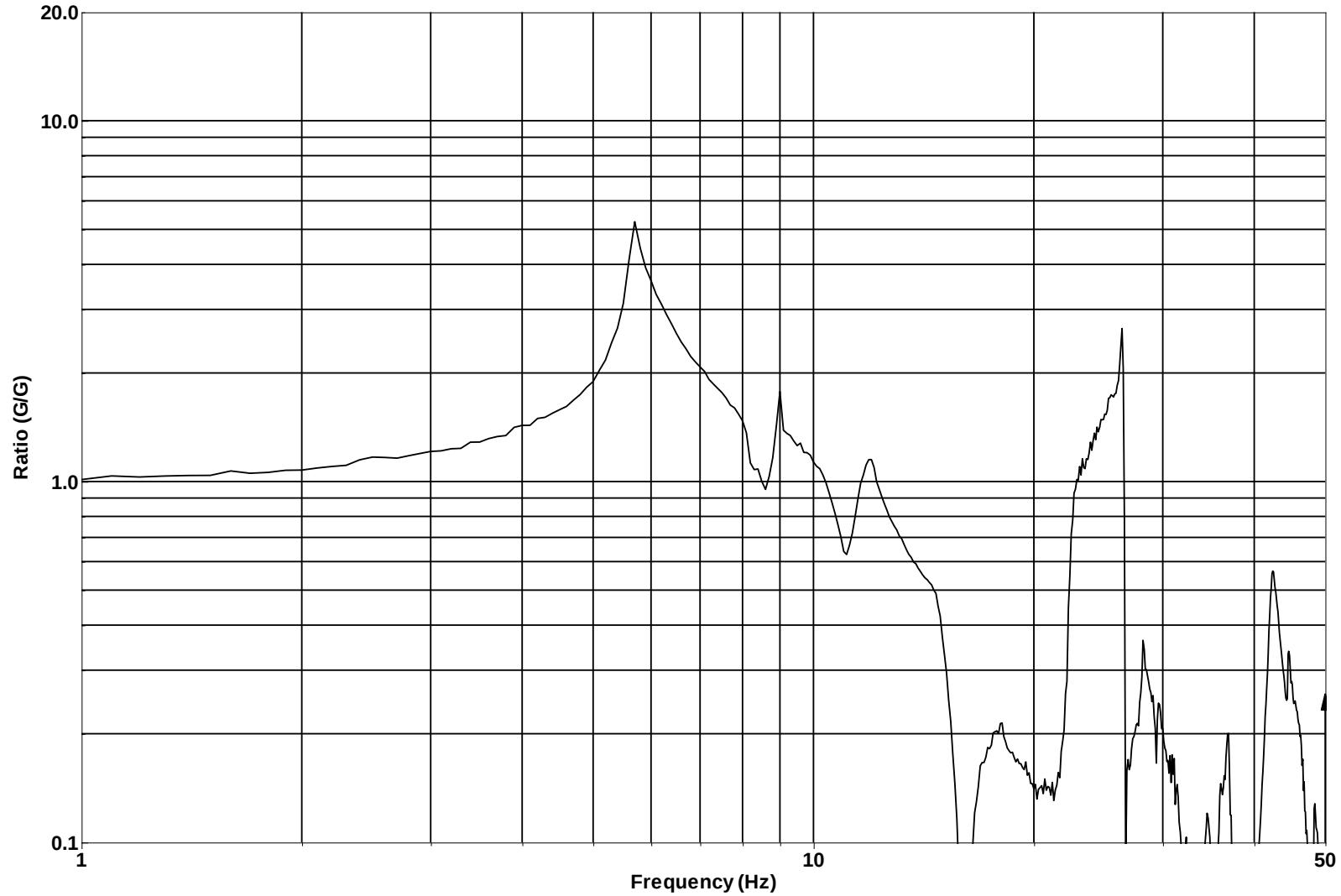
Sweep Number: 1 sweeps

Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:45

Start Time: Sep 27, 2012 14:21:31

Transmissibility (reference = Control)



Mid Rack/Control

Eaton MJOPR017449

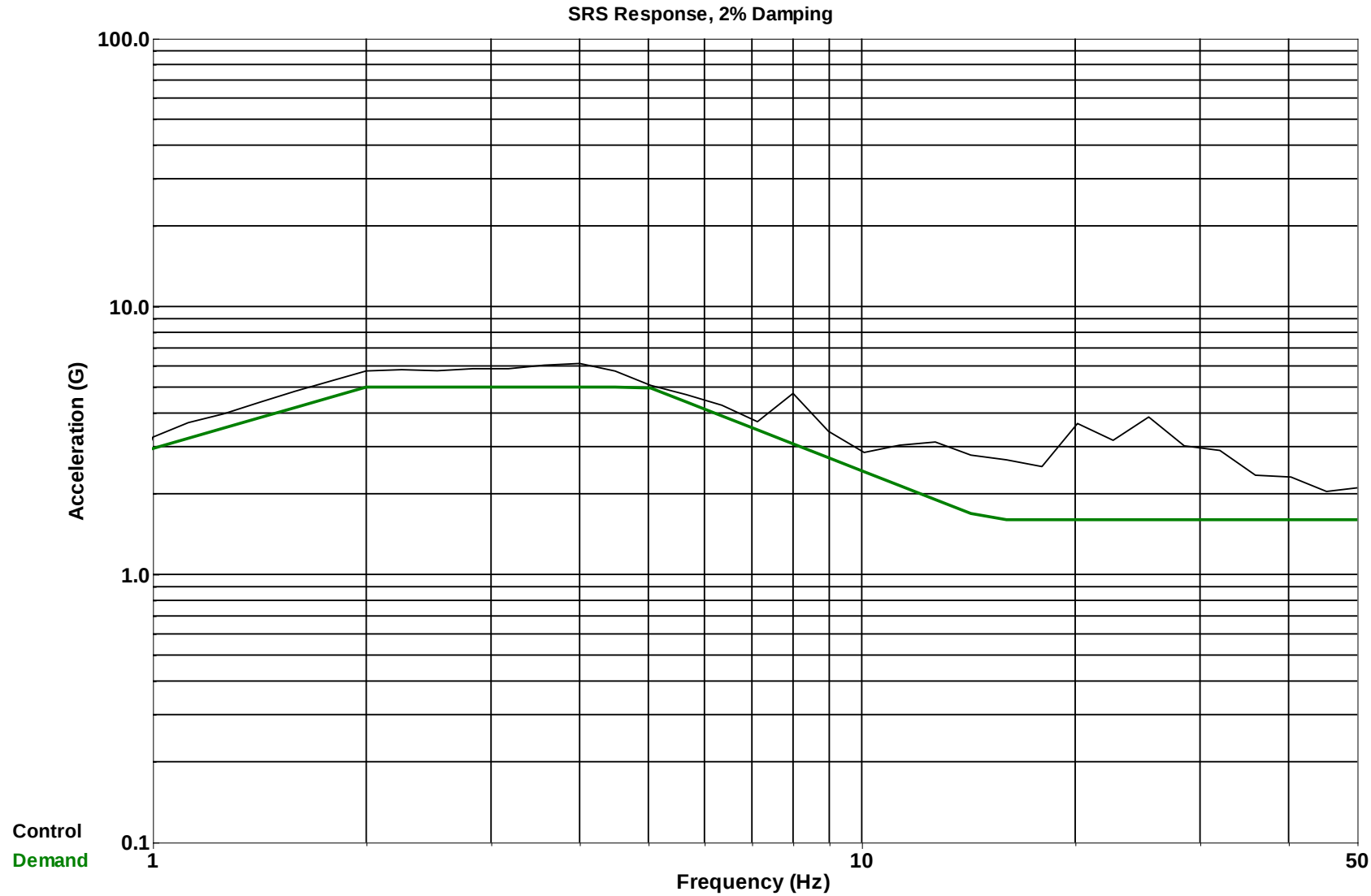
Server Rack Model

Test# 1 Side-Side Sine Survey



Modifier: 100 %
Pulse Type: SRS

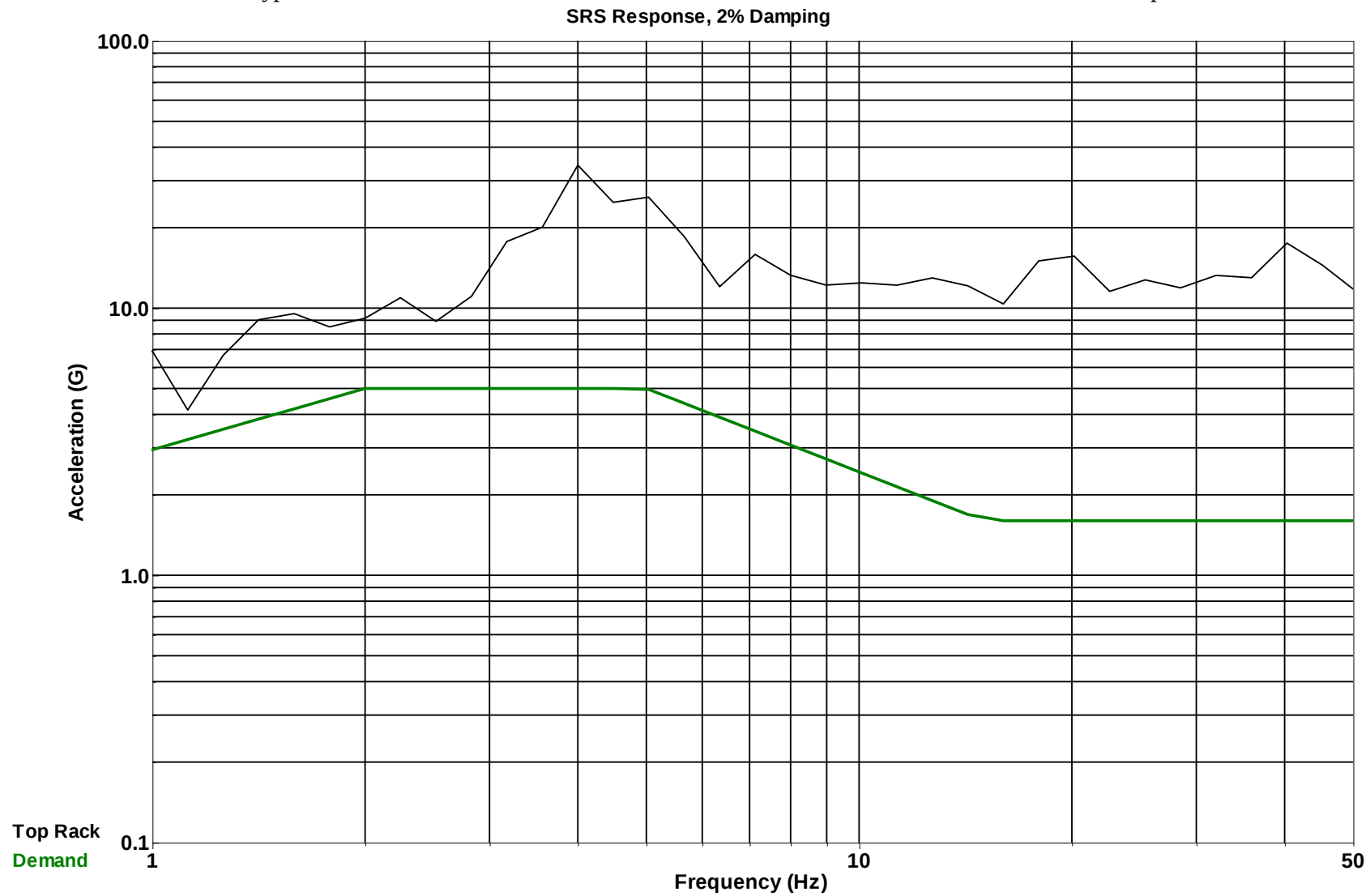
ZPA: 2.019 G
Time: Sep 27, 2012 14:36:10



Eaton PR017449
Server Rack
Test# 2 Side-Side GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA: 7.242 G
Time: Sep 27, 2012 14:36:10



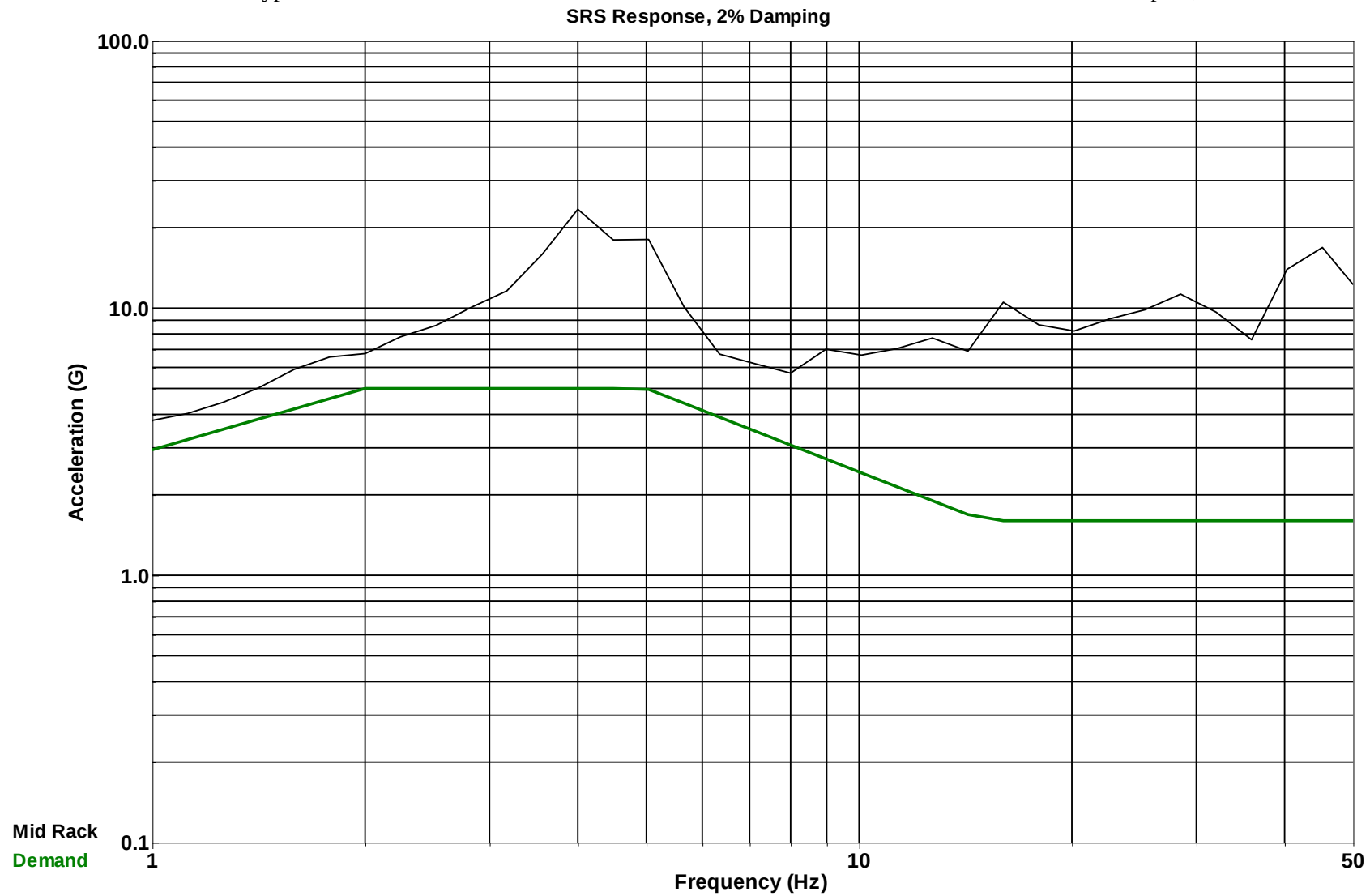
Top Rack
Demand

Eaton PR017449
Server Rack
Test# 2 Side-Side GR-63-Core Zone 4 Earthquake



Modifier: 100 %
Pulse Type: SRS

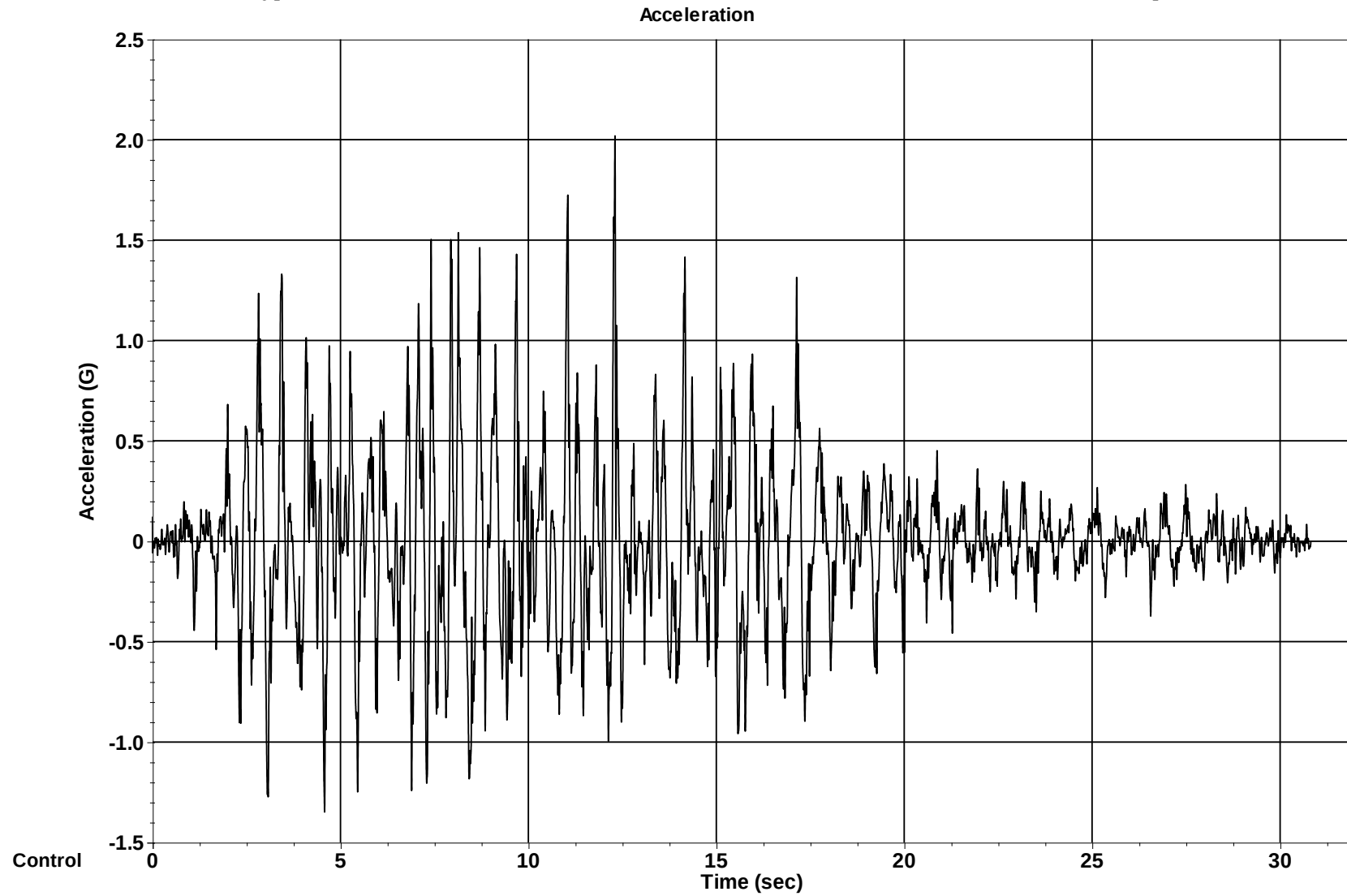
ZPA: 5.204 G
Time: Sep 27, 2012 14:36:10



Eaton PR017449
Server Rack
Test# 2 Side-Side GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

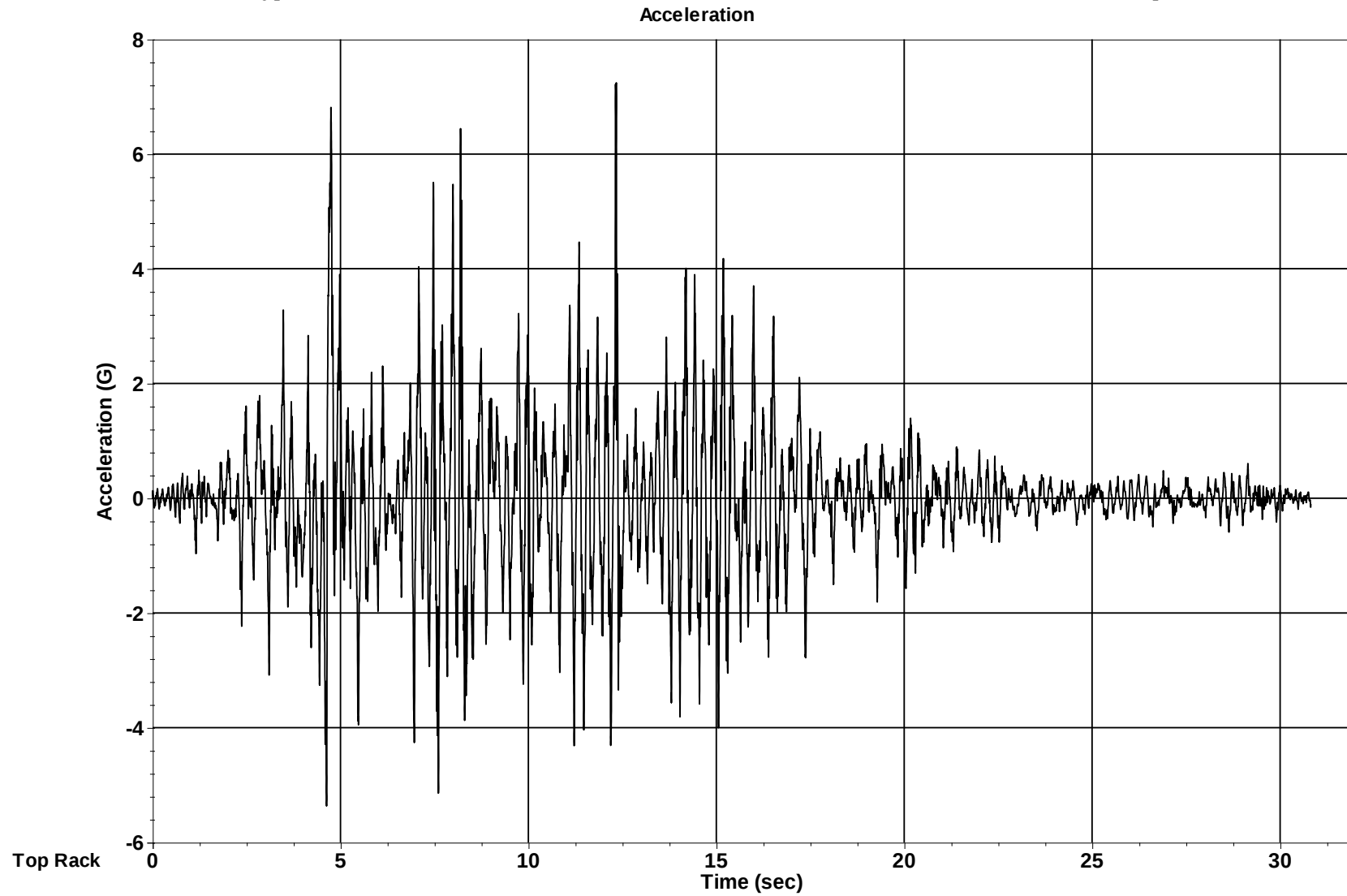
ZPA: 2.019 G
Time: Sep 27, 2012 14:36:10



Eaton PR017449
Server Rack
Test# 2 Side-Side GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

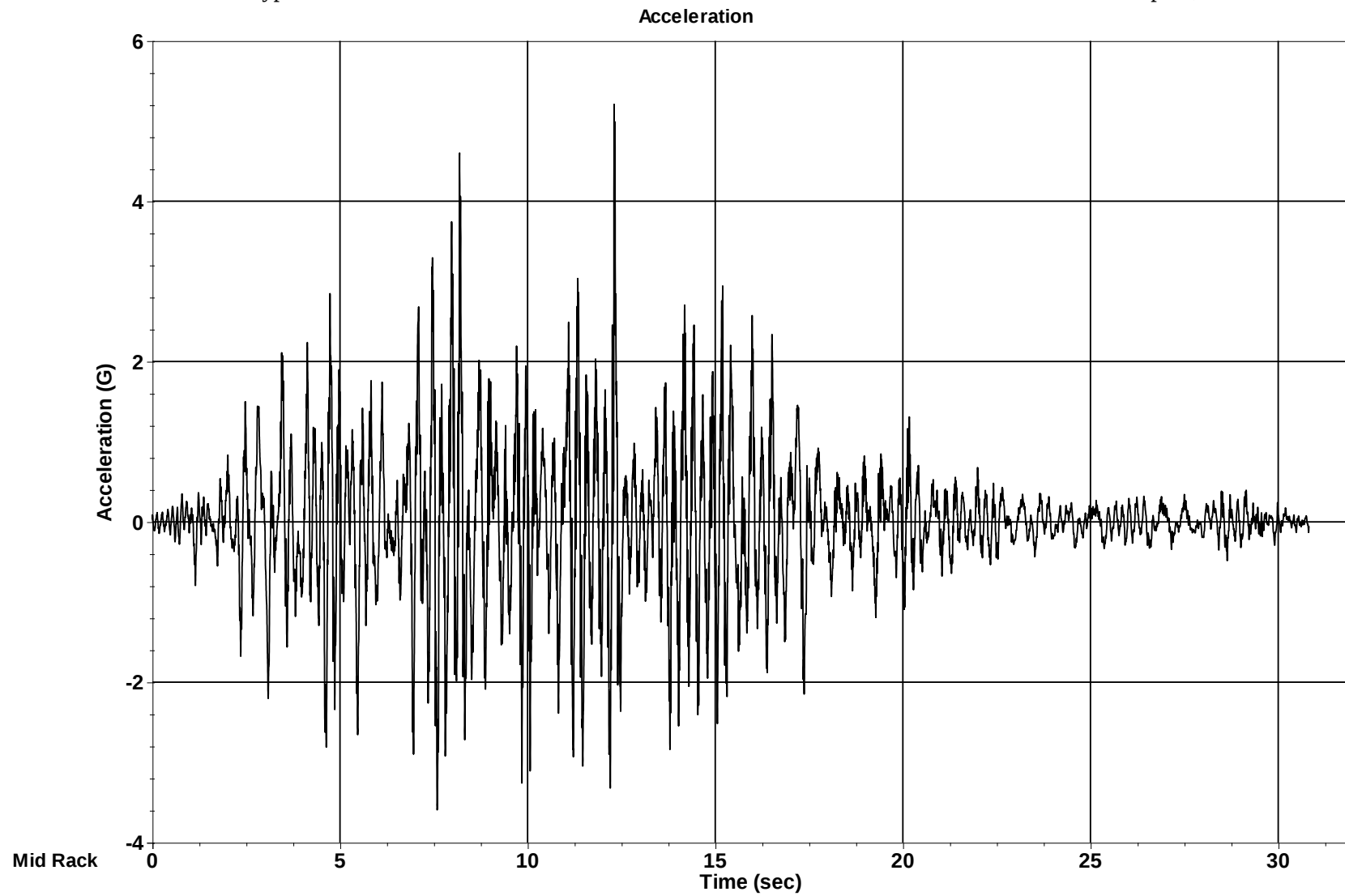
ZPA: 7.242 G
Time: Sep 27, 2012 14:36:10



Eaton PR017449
Server Rack
Test# 2 Side-Side GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA: 5.204 G
Time: Sep 27, 2012 14:36:10

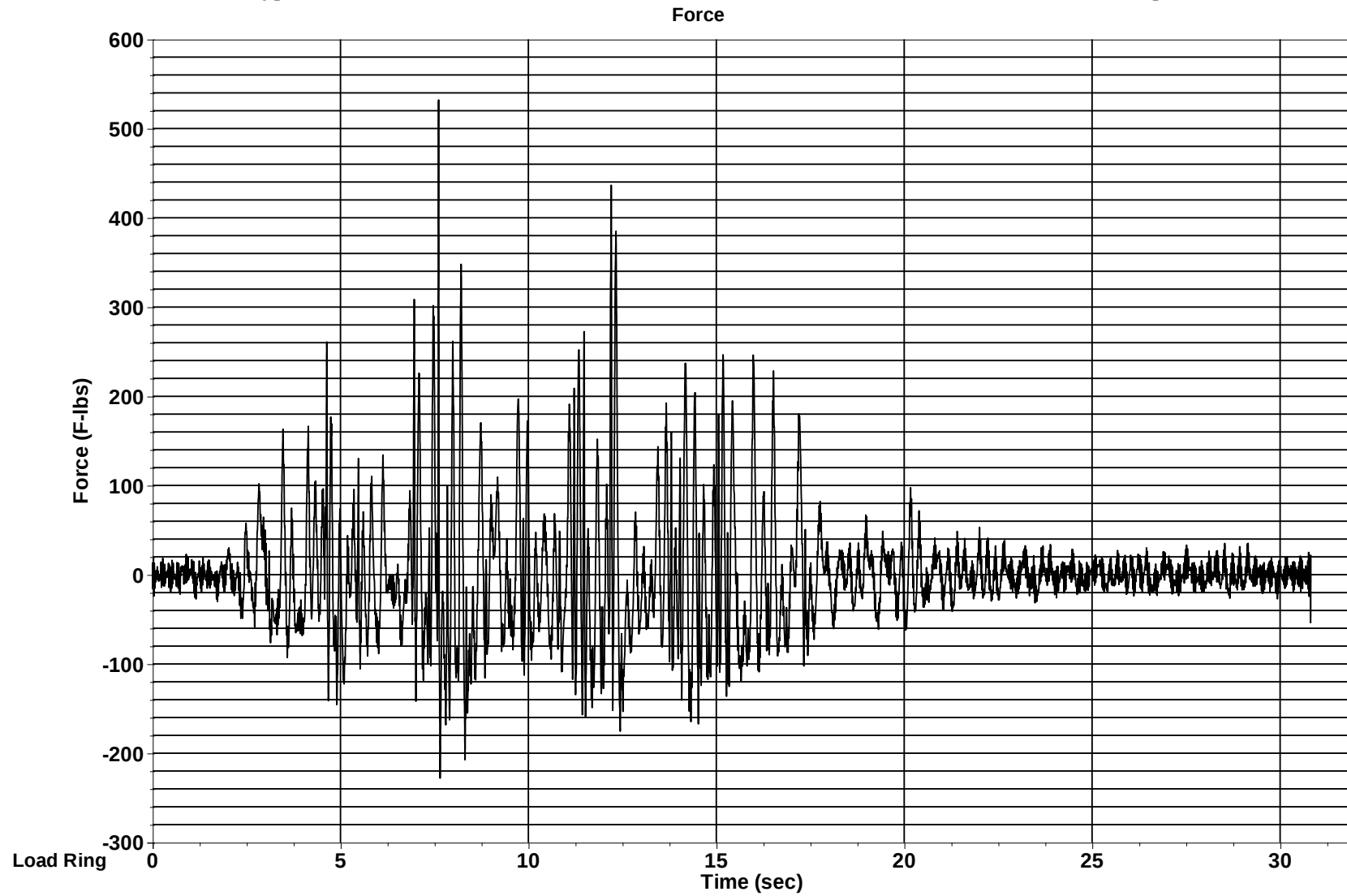


Eaton PR017449
Server Rack
Test# 2 Side-Side GR-63-Core Zone 4 Earthquake



Modifier: 100 %
Pulse Type: SRS

ZPA:
Time: Sep 27, 2012 14:36:10

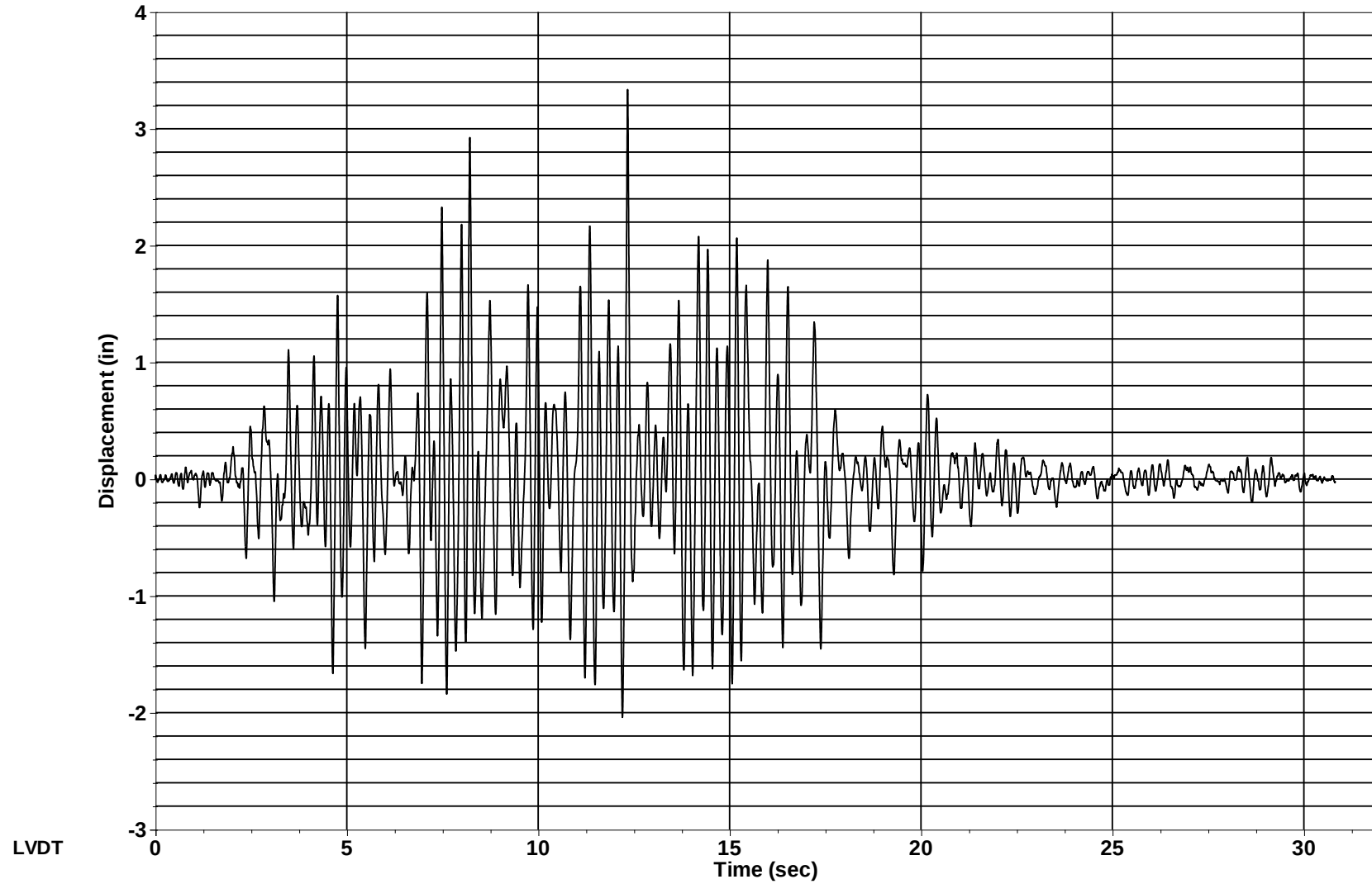


Eaton PR017449
Server Rack
Test# 2 Side-Side GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA:
Time: Sep 27, 2012 14:36:10

Displacement



Eaton PR017449
Server Rack
Test# 2 Side-Side GR-63-Core Zone 4 Earthquake

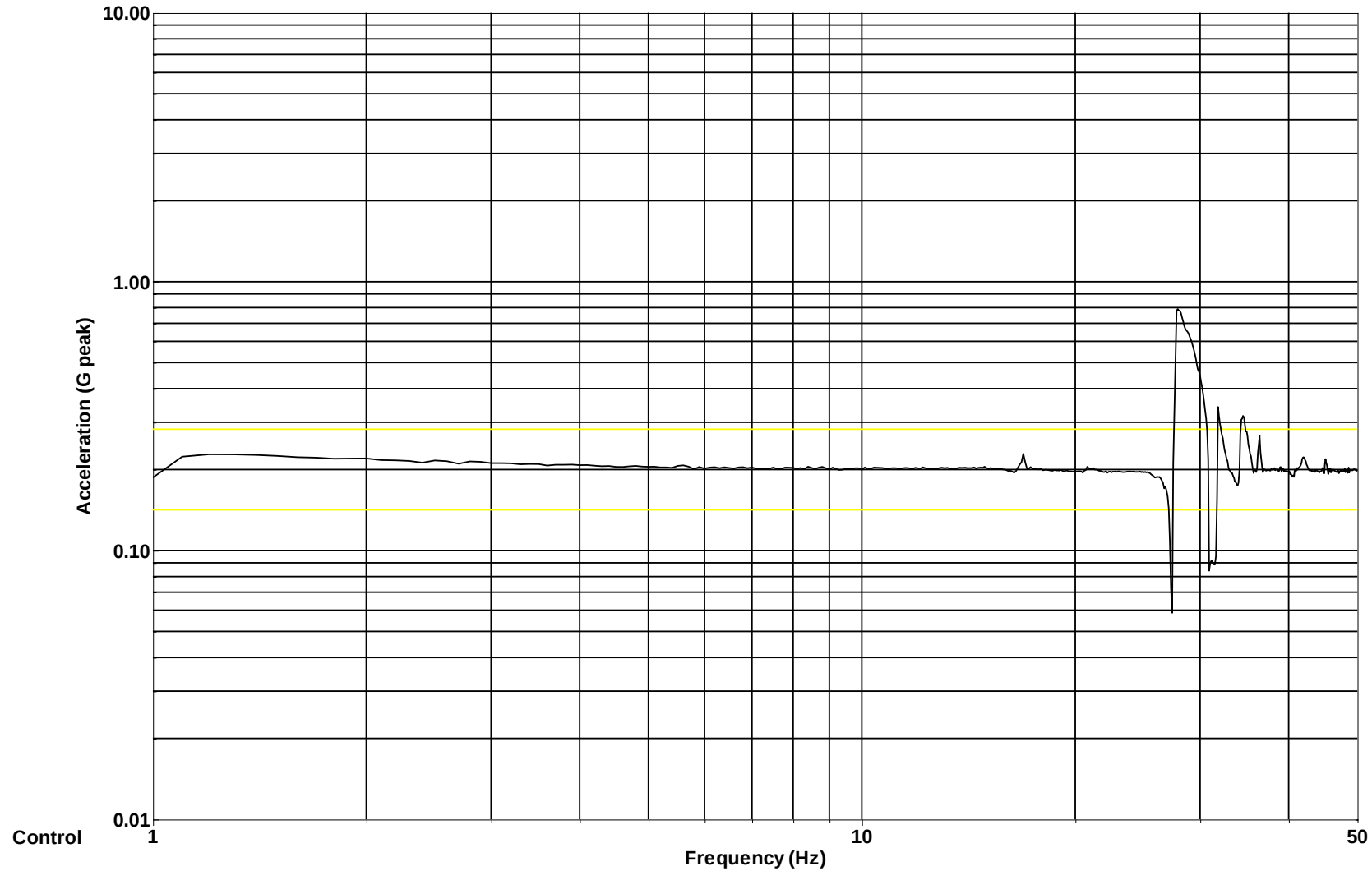
Sweep Number: 1 sweeps

Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:39

Start Time: Oct 23, 2012 20:30:28

Acceleration Profile



Eaton PR017449

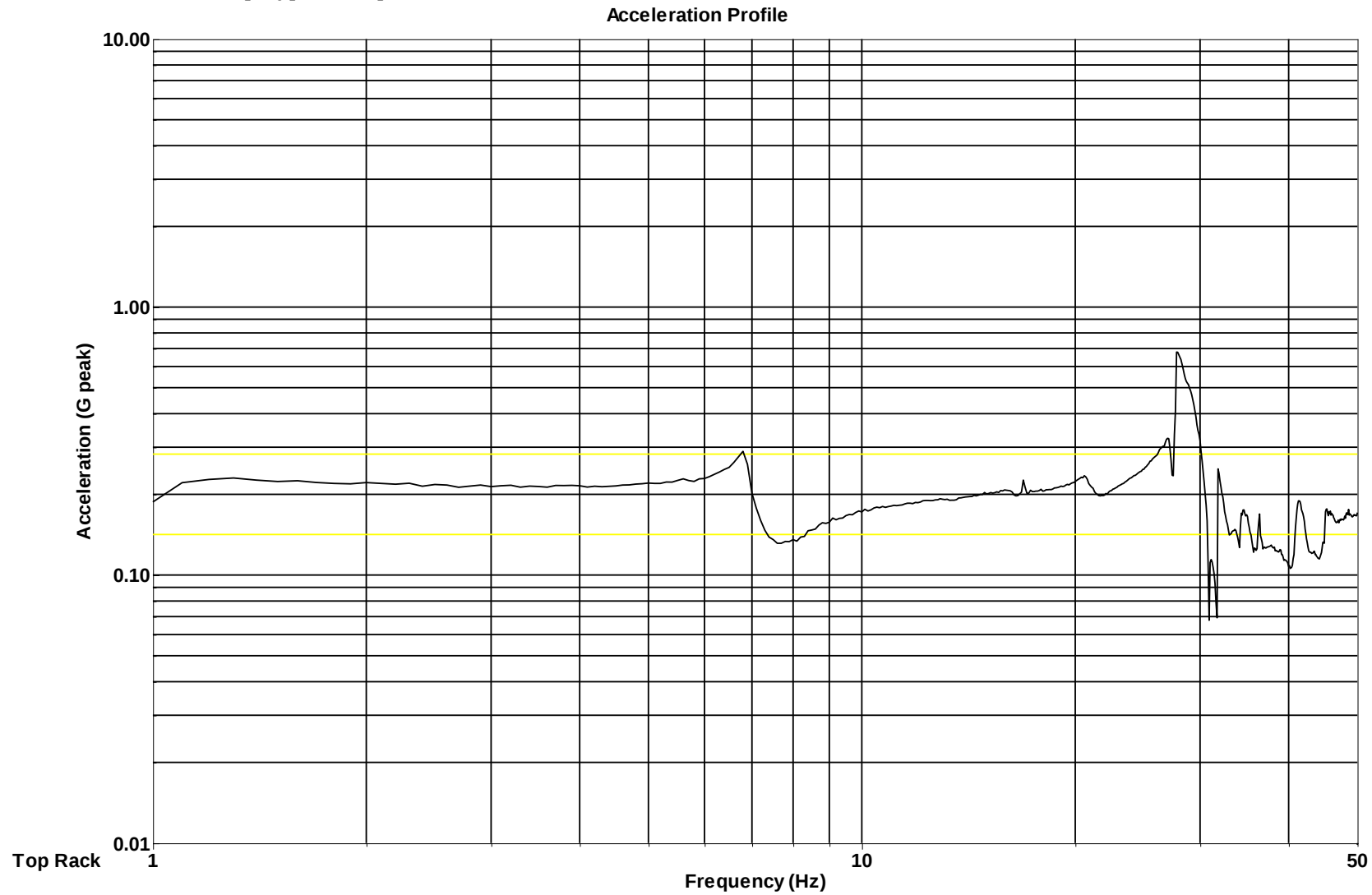
Server Rack

Test# 1 Vertical Sine Survey



Sweep Number: 1 sweeps
Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:39
Start Time: Oct 23, 2012 20:30:28

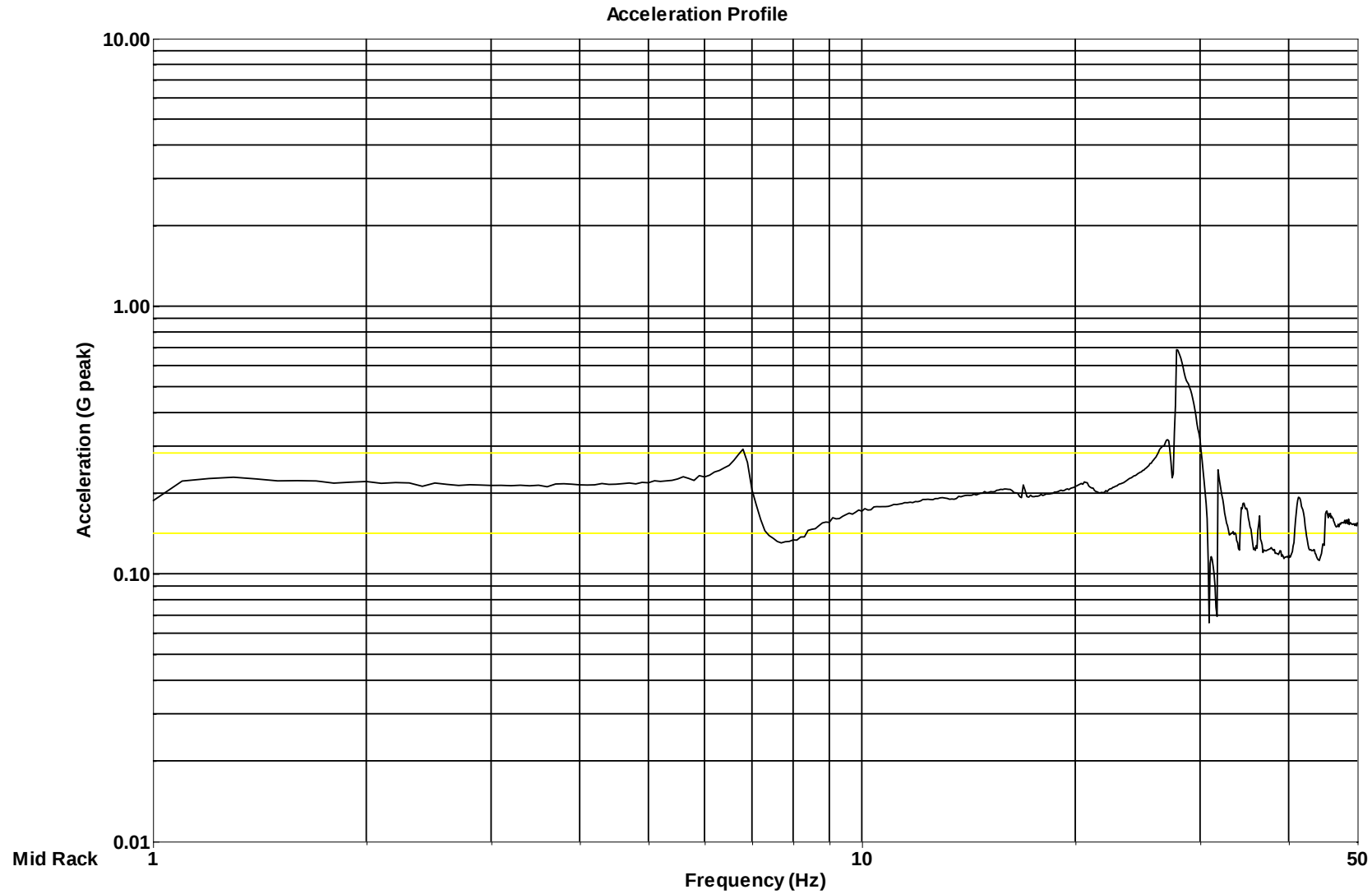


Eaton PR017449
Server Rack
Test# 1 Vertical Sine Survey



Sweep Number: 1 sweeps
Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:39
Start Time: Oct 23, 2012 20:30:28



Eaton PR017449
Server Rack
Test# 1 Vertical Sine Survey

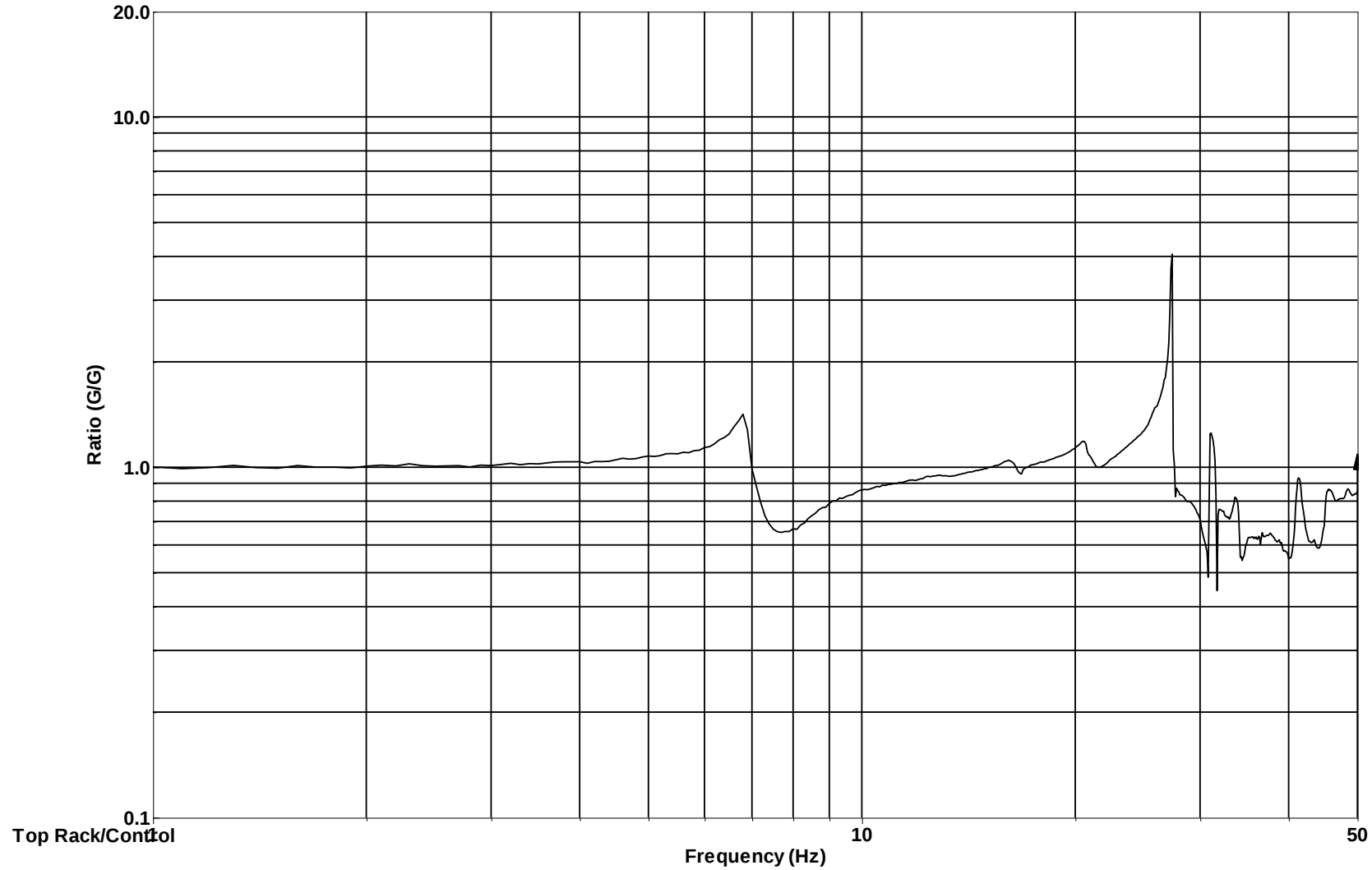
Sweep Number: 1 sweeps

Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:39

Start Time: Oct 23, 2012 20:30:28

Transmissibility (reference = Control)



Eaton PR017449

Server Rack

Test# 1 Vertical Sine Survey



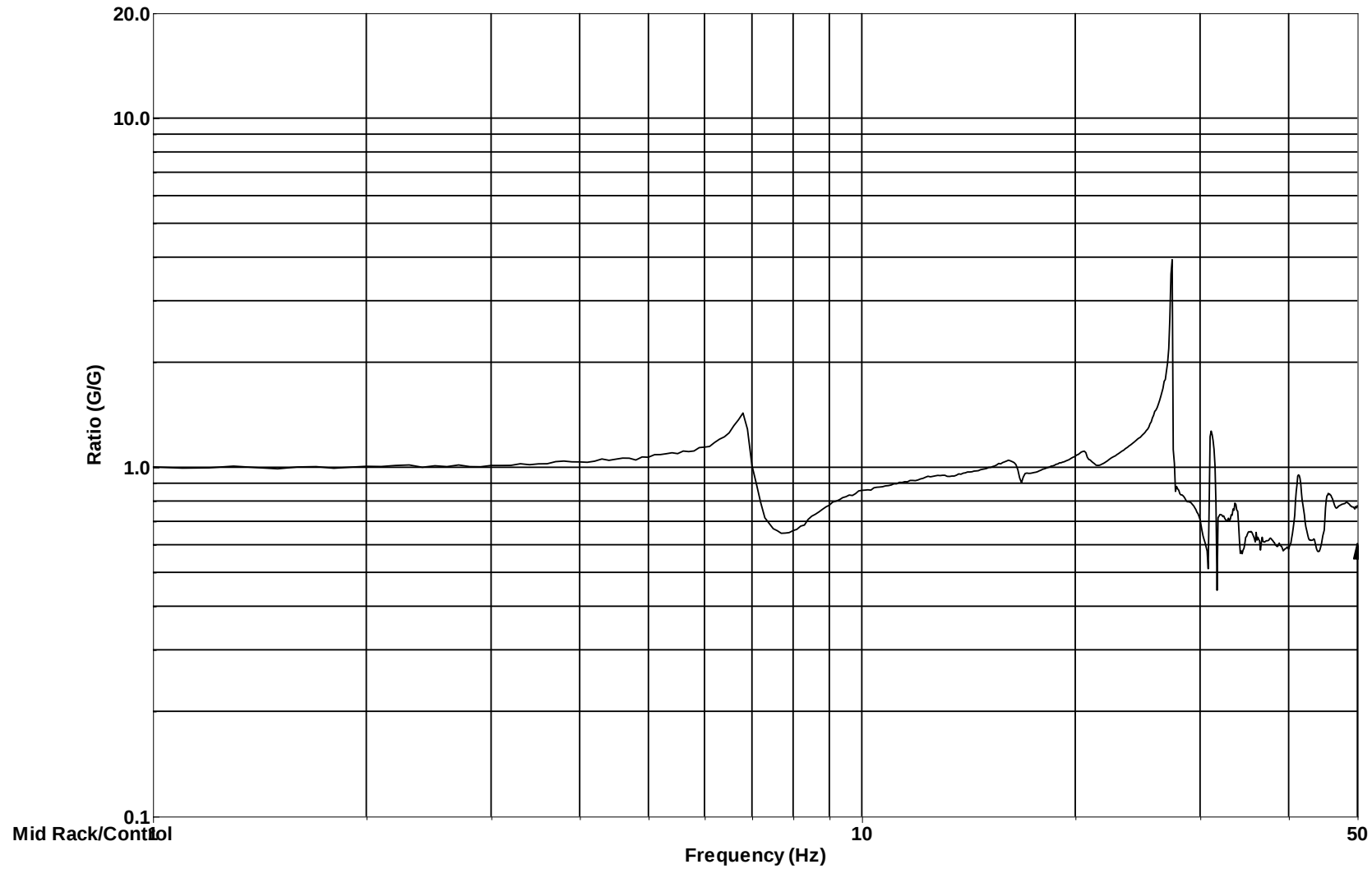
Sweep Number: 1 sweeps

Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:39

Start Time: Oct 23, 2012 20:30:28

Transmissibility (reference = Control)



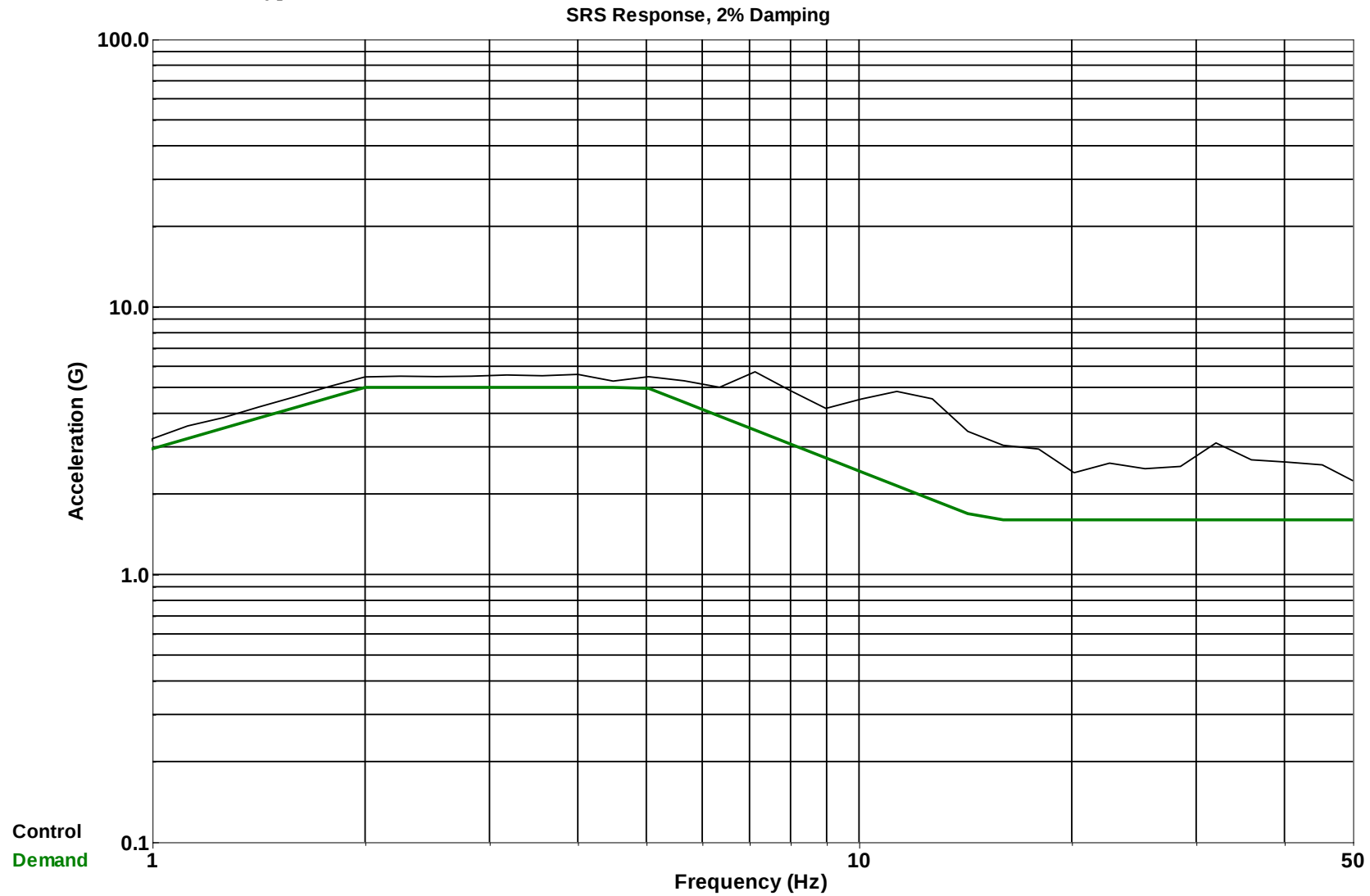
Eaton PR017449

Server Rack

Test# 1 Vertical Sine Survey

Modifier: 100 %
Pulse Type: SRS

ZPA: 2.043 G
Time: Oct 23, 2012 20:39:14

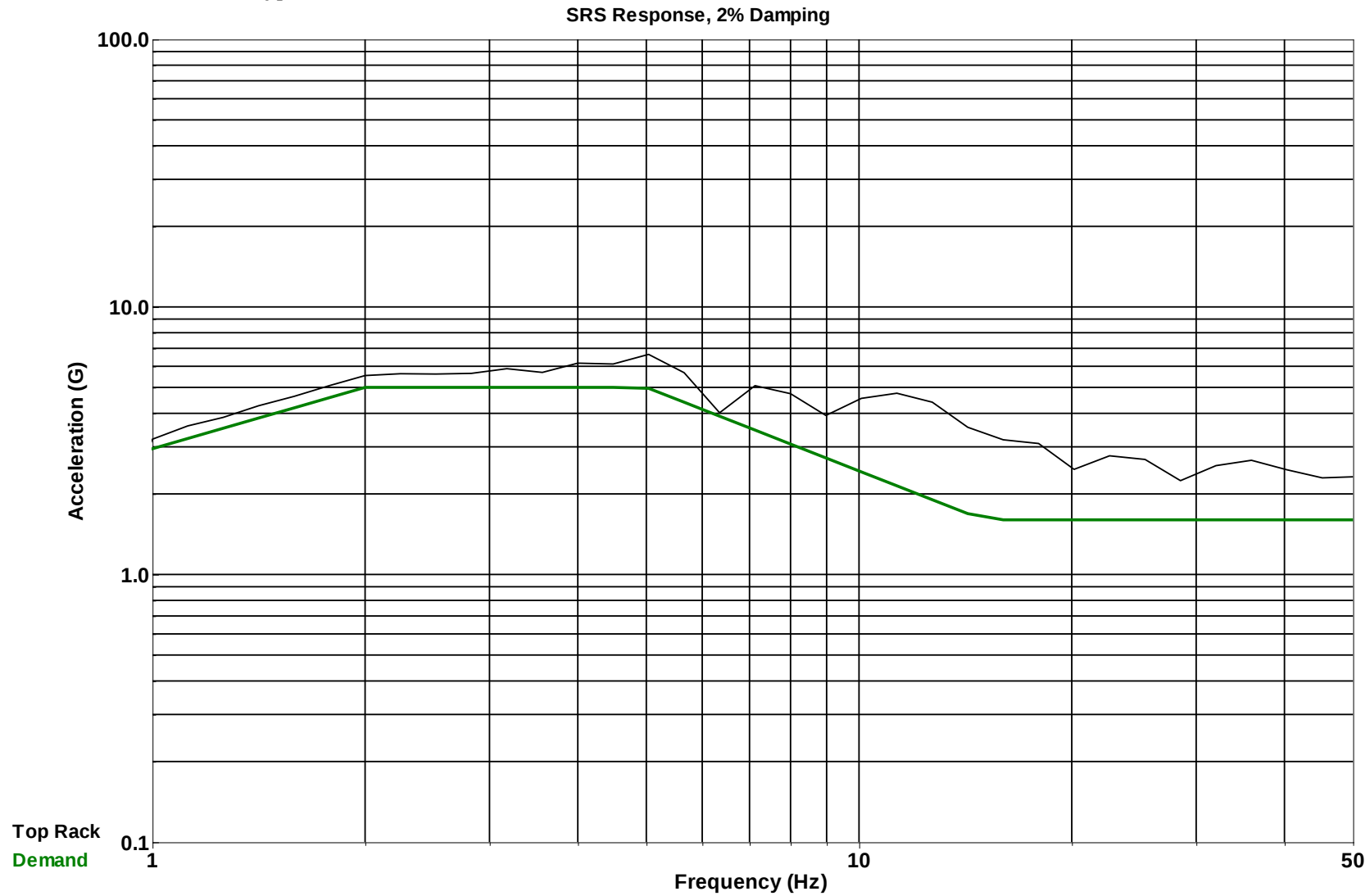


Eaton PR017449
Server Rack
Test# 2 Axis Vertical GR-63-Core Zone 4 Earthquake



Modifier: 100 %
Pulse Type: SRS

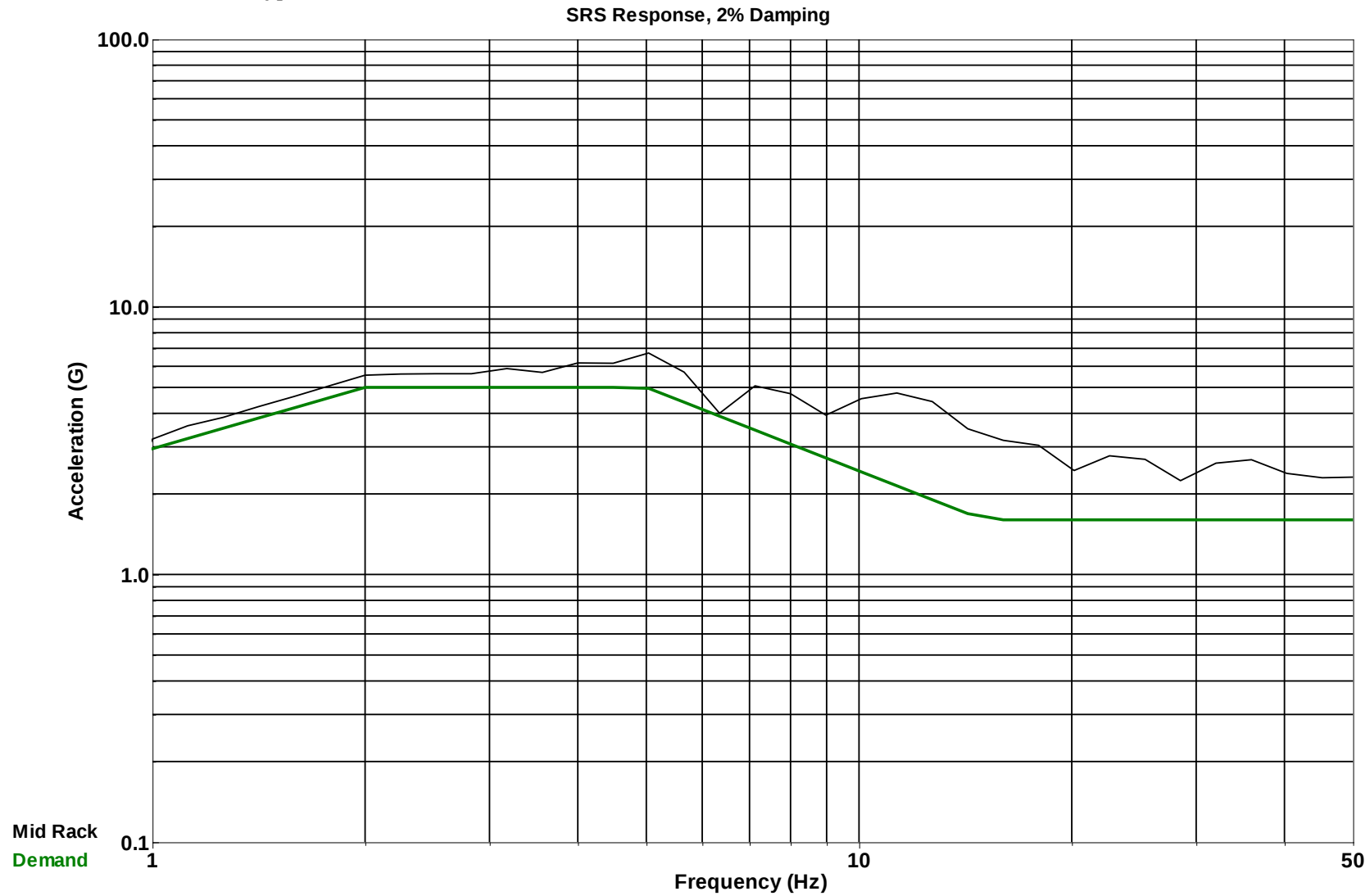
ZPA: 2.077 G
Time: Oct 23, 2012 20:39:14



Eaton PR017449
Server Rack
Test# 2 Axis Vertical GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA: 2.071 G
Time: Oct 23, 2012 20:39:14



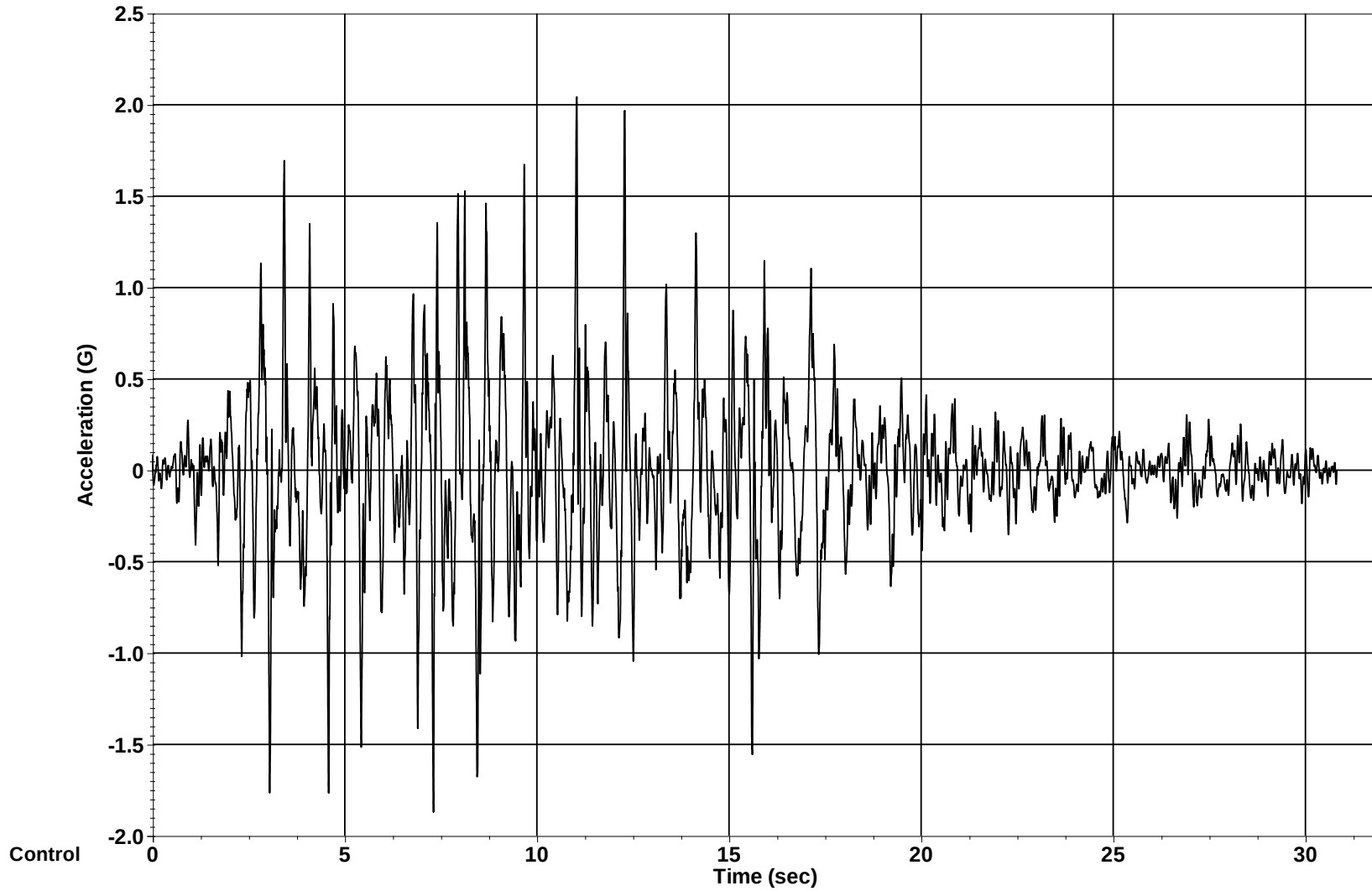
Mid Rack
Demand

Eaton PR017449
Server Rack
Test# 2 Axis Vertical GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA: 2.043 G
Time: Oct 23, 2012 20:39:14

Acceleration

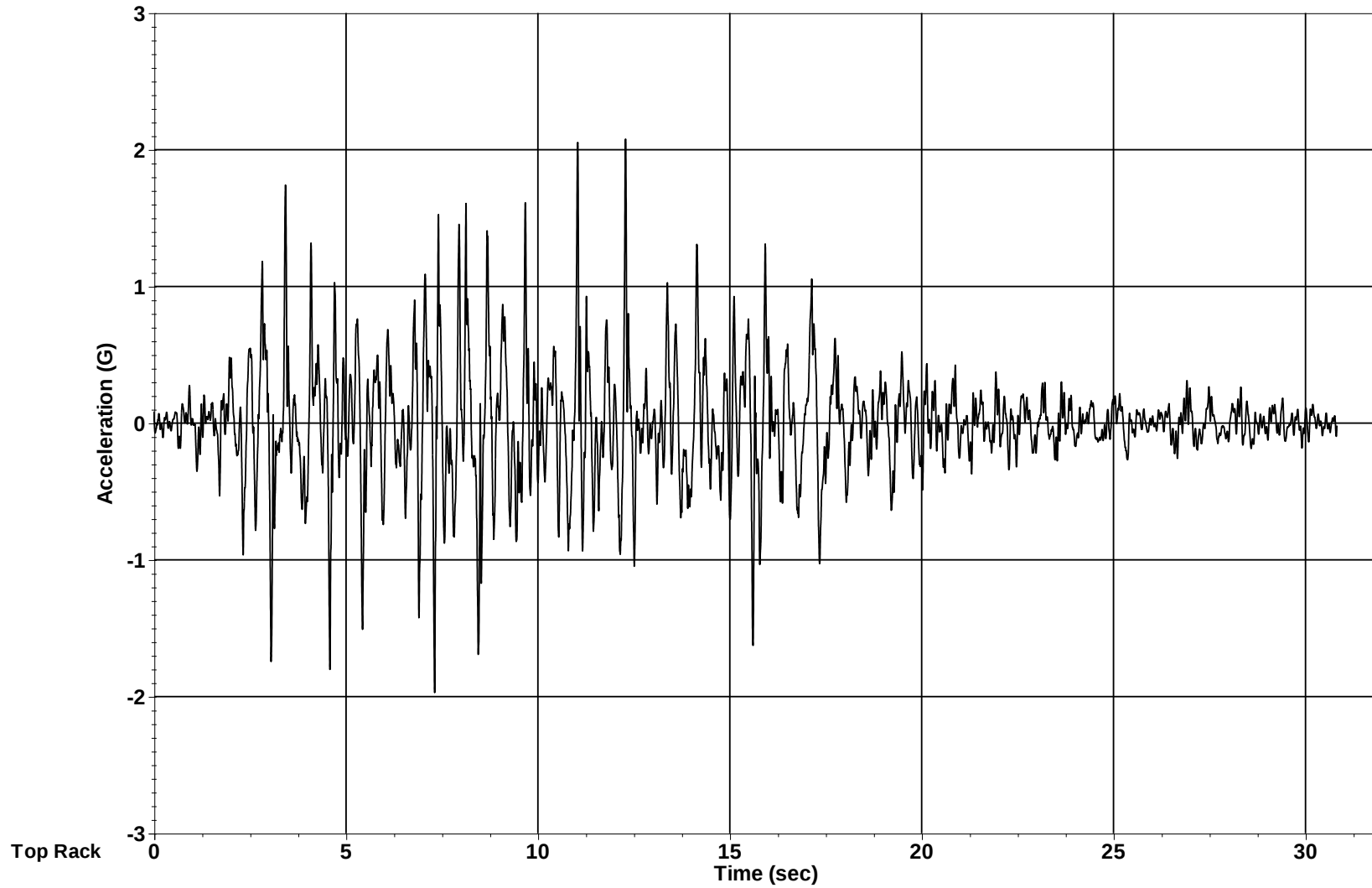


Eaton PR017449
Server Rack
Test# 2 Axis Vertical GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA: 2.077 G
Time: Oct 23, 2012 20:39:14

Acceleration

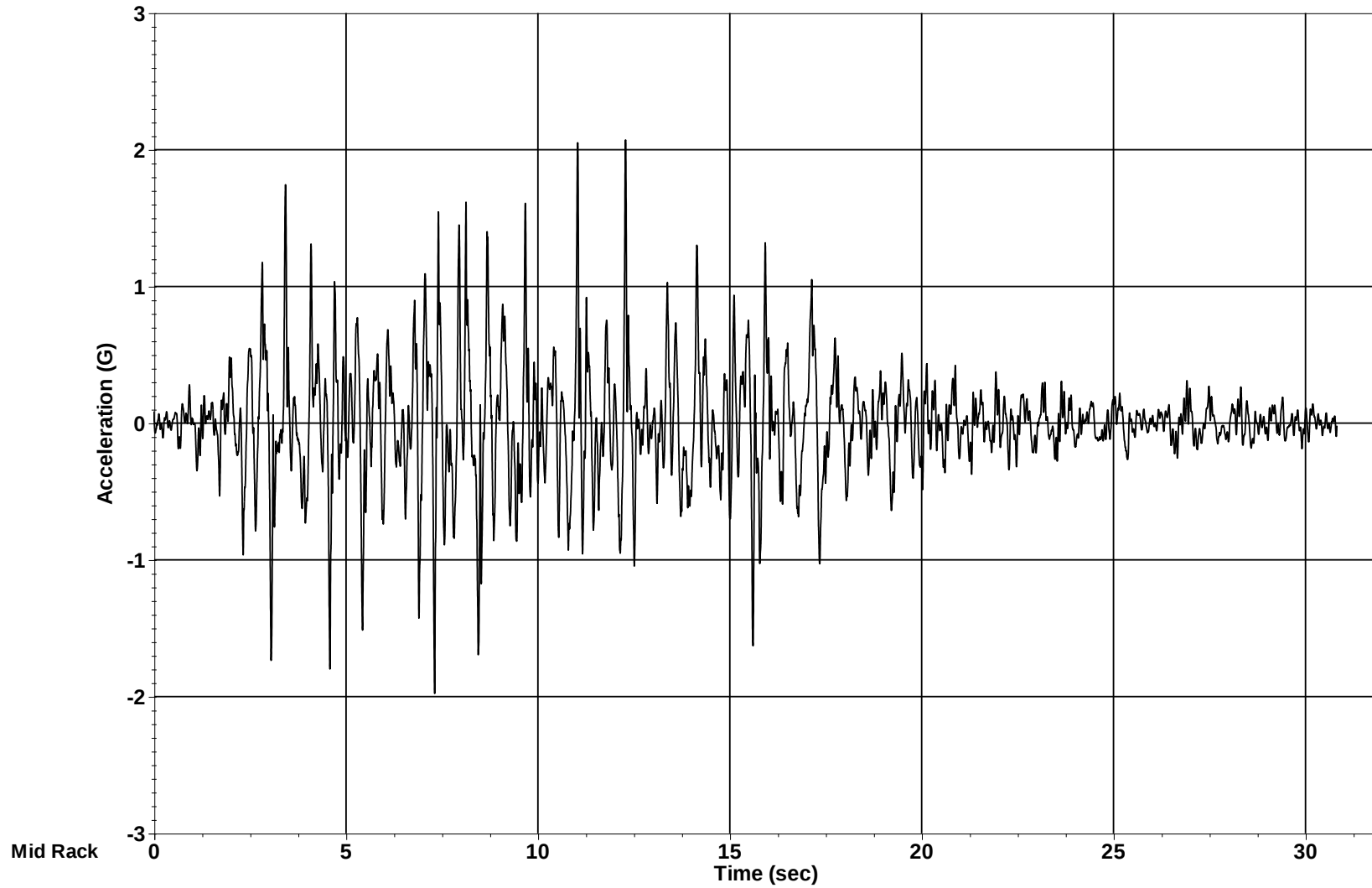


Eaton PR017449
Server Rack
Test# 2 Axis Vertical GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA: 2.071 G
Time: Oct 23, 2012 20:39:14

Acceleration

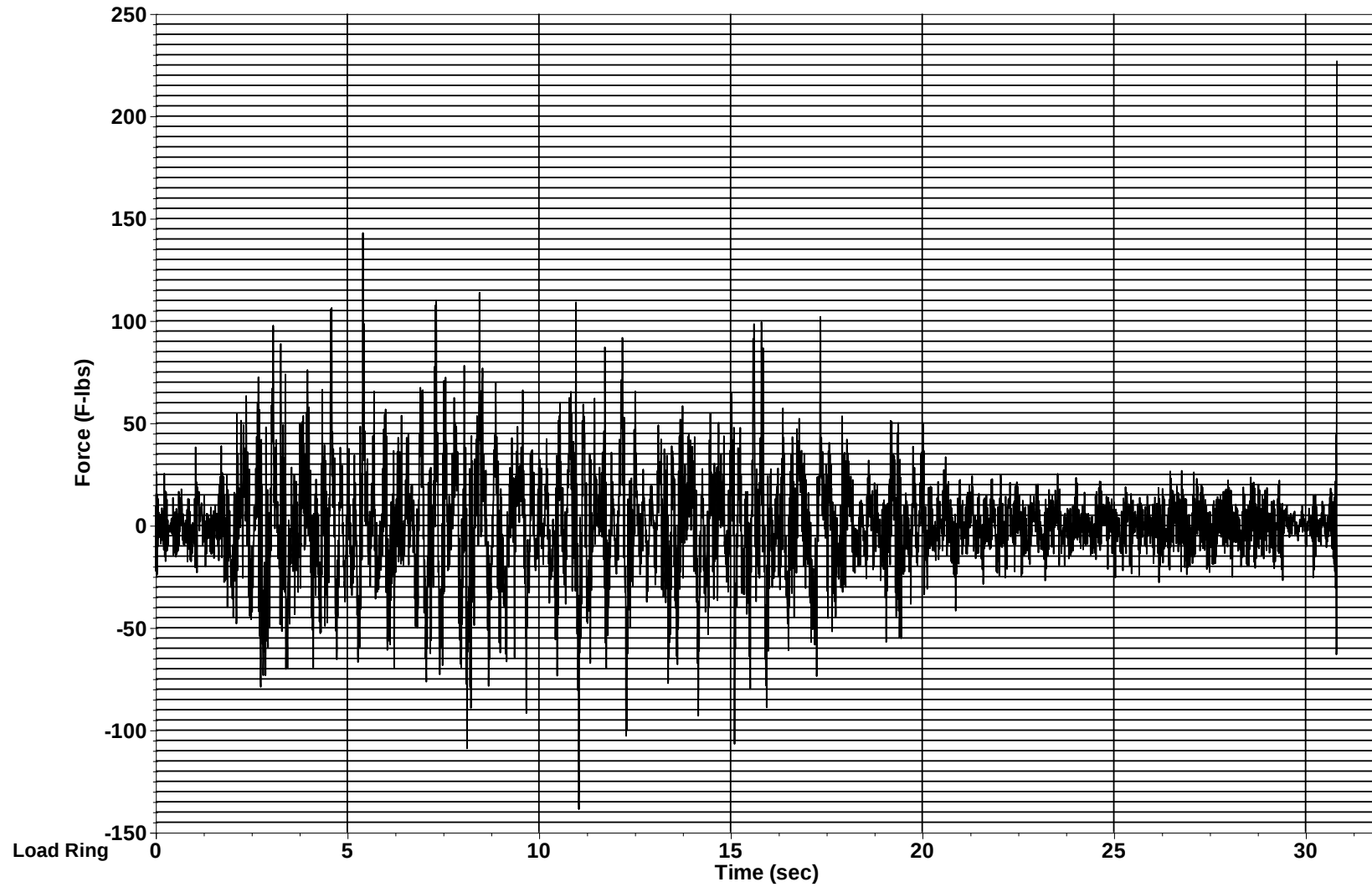


Eaton PR017449
Server Rack
Test# 2 Axis Vertical GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA:
Time: Oct 23, 2012 20:39:14

Force

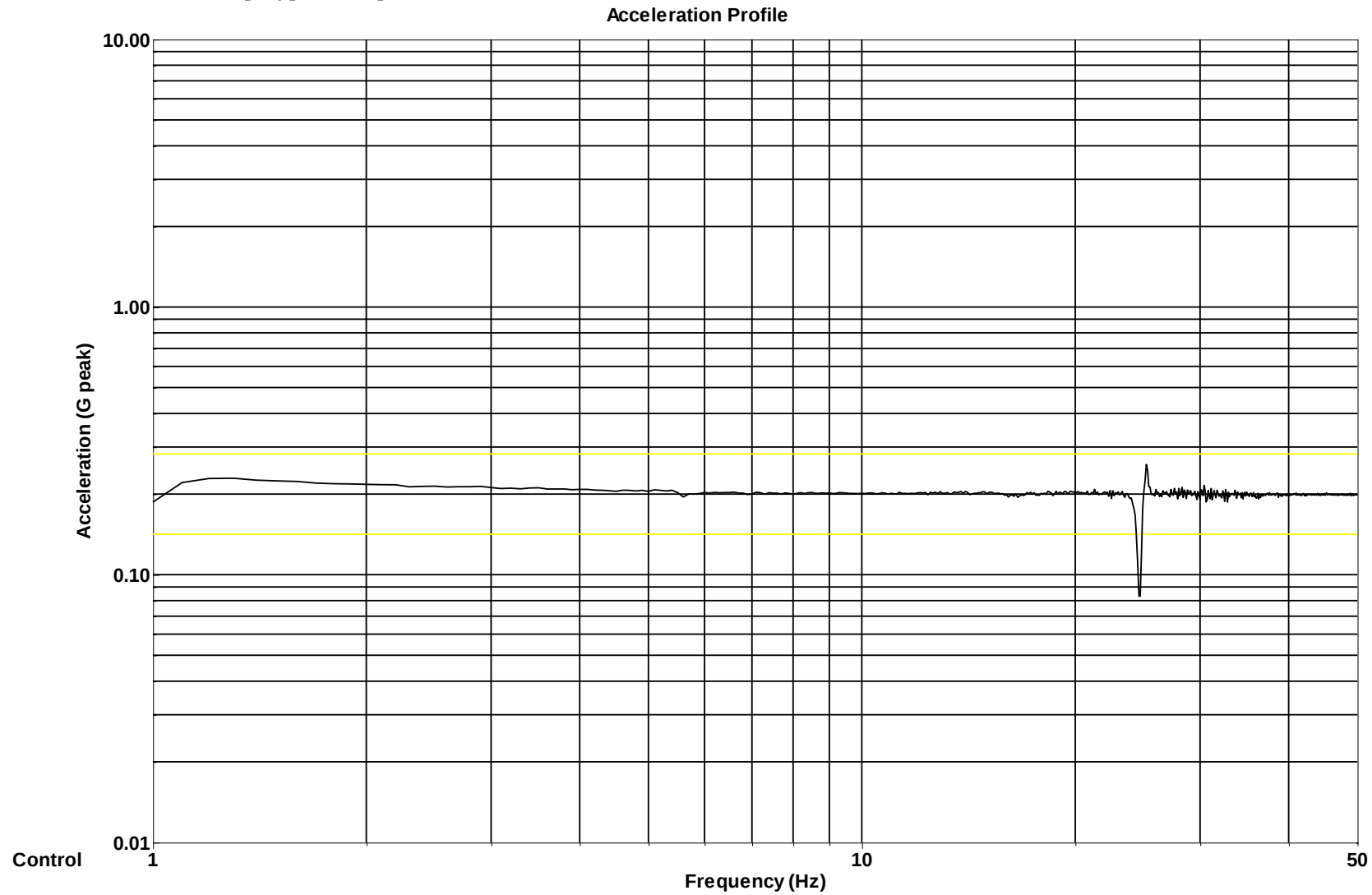


Eaton PR017449
Server Rack
Test# 2 Axis Vertical GR-63-Core Zone 4 Earthquake



Sweep Number: 1 sweeps
Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:39
Start Time: Oct 24, 2012 11:29:19

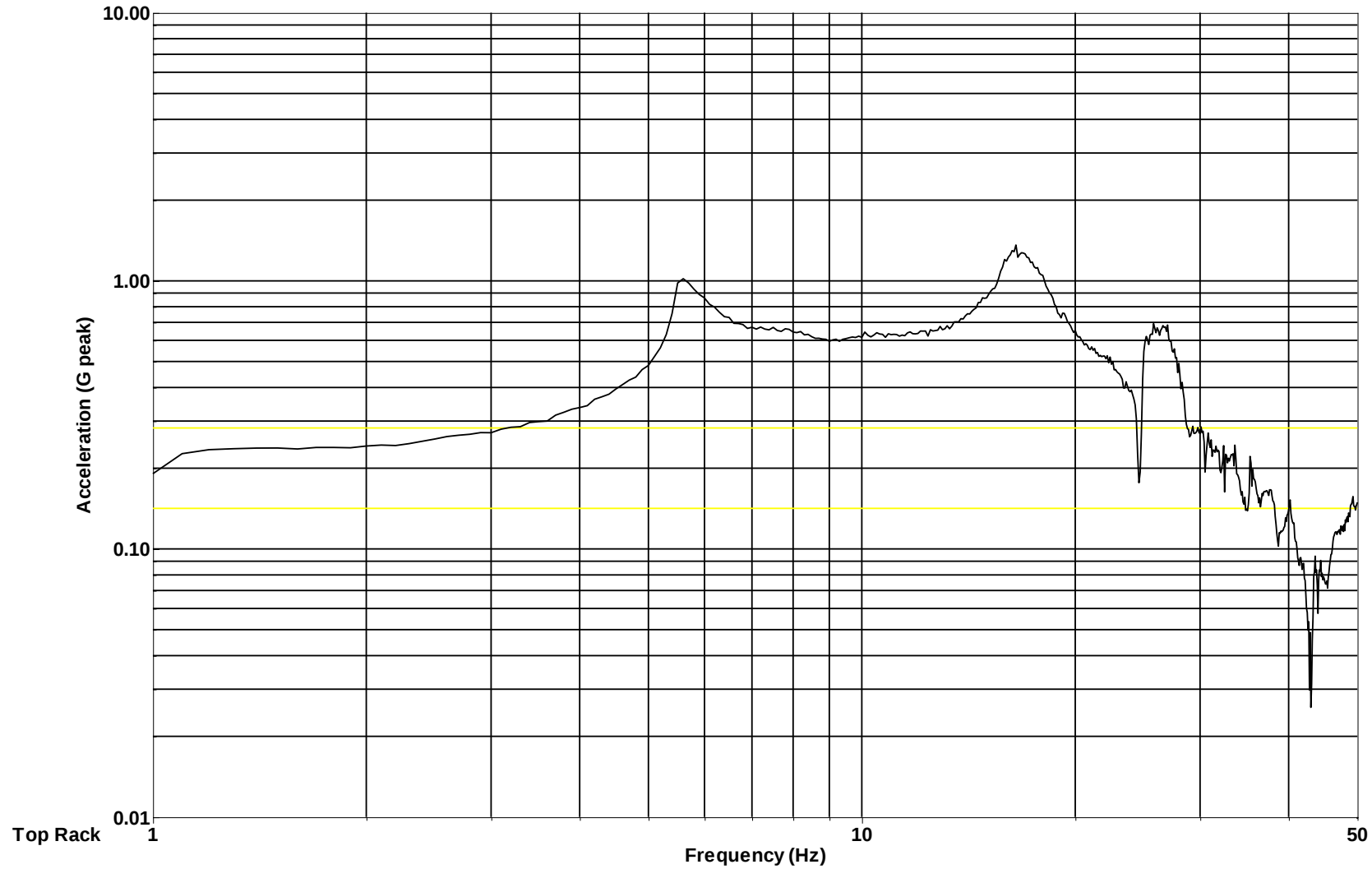


Eaton PR017449
Server Rack
Test# 3 Side-Side Sine Survey

Sweep Number: 1 sweeps
Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:39
Start Time: Oct 24, 2012 11:29:19

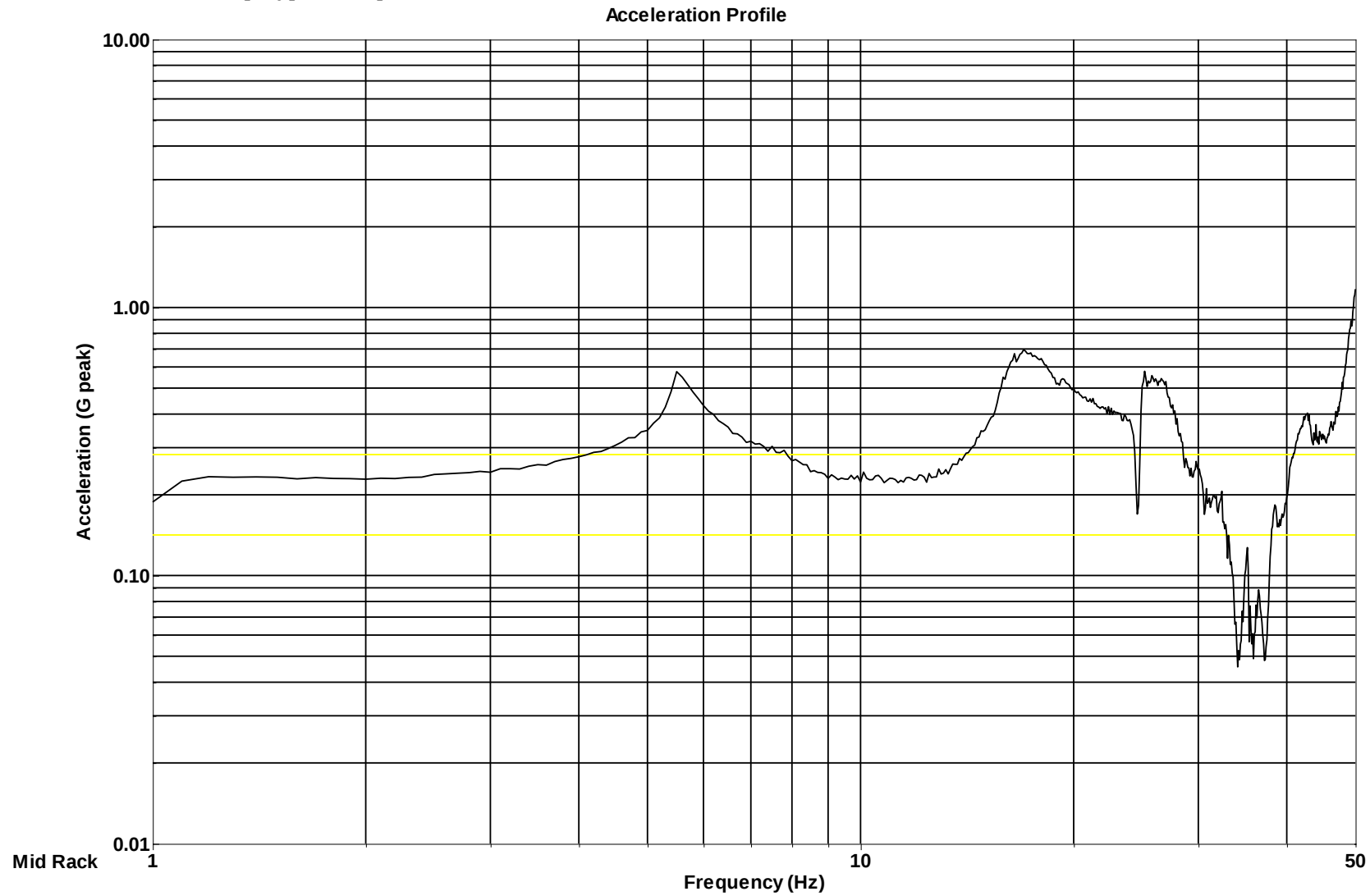
Acceleration Profile



Eaton PR017449
Server Rack
Test# 3 Side-Side Sine Survey

Sweep Number: 1 sweeps
Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:39
Start Time: Oct 24, 2012 11:29:19



Eaton PR017449
Server Rack
Test# 3 Side-Side Sine Survey

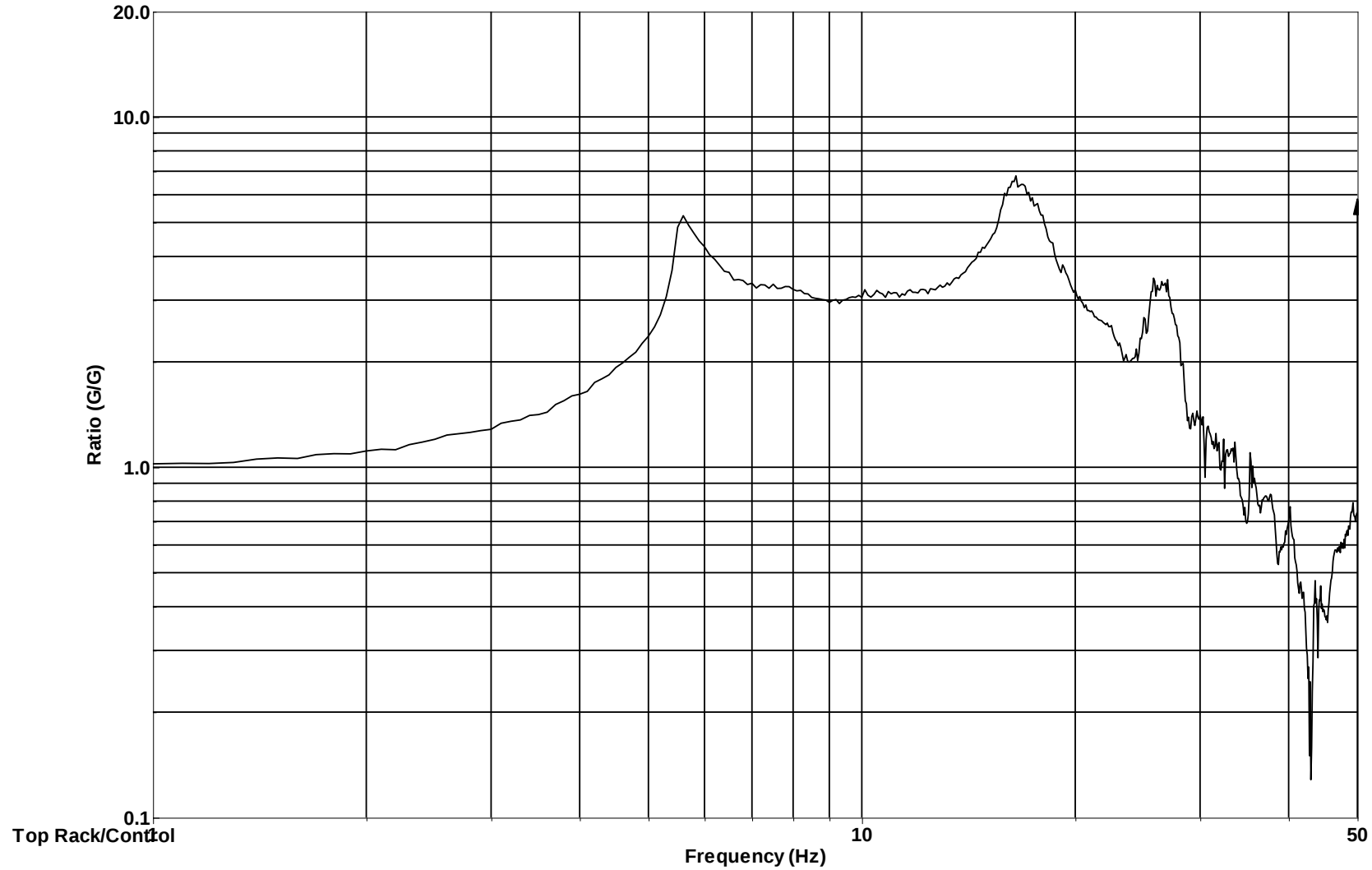
Sweep Number: 1 sweeps

Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:39

Start Time: Oct 24, 2012 11:29:19

Transmissibility (reference = Control)



Eaton PR017449

Server Rack

Test# 3 Side-Side Sine Survey

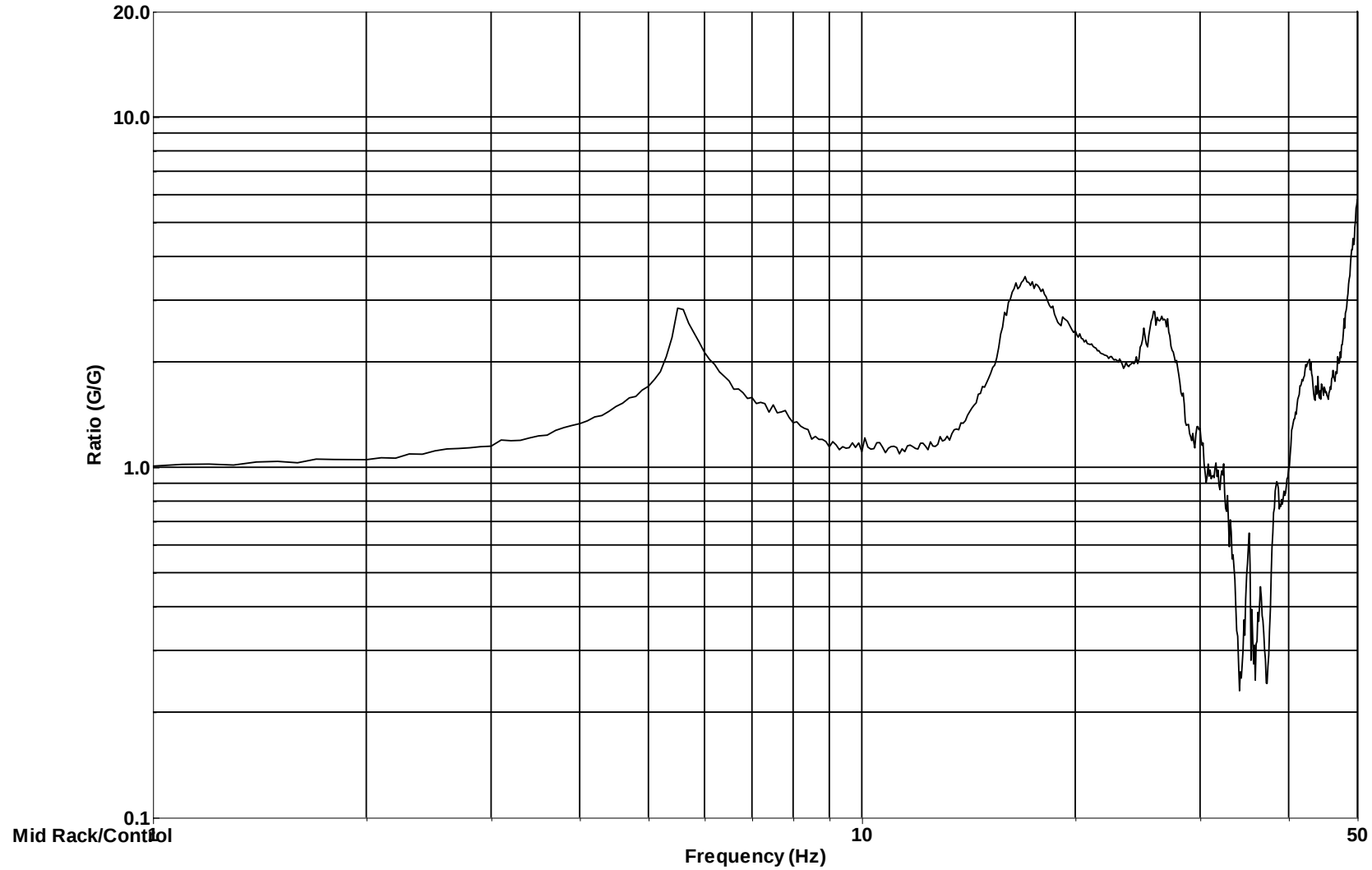
Sweep Number: 1 sweeps

Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:39

Start Time: Oct 24, 2012 11:29:19

Transmissibility (reference = Control)



Eaton PR017449

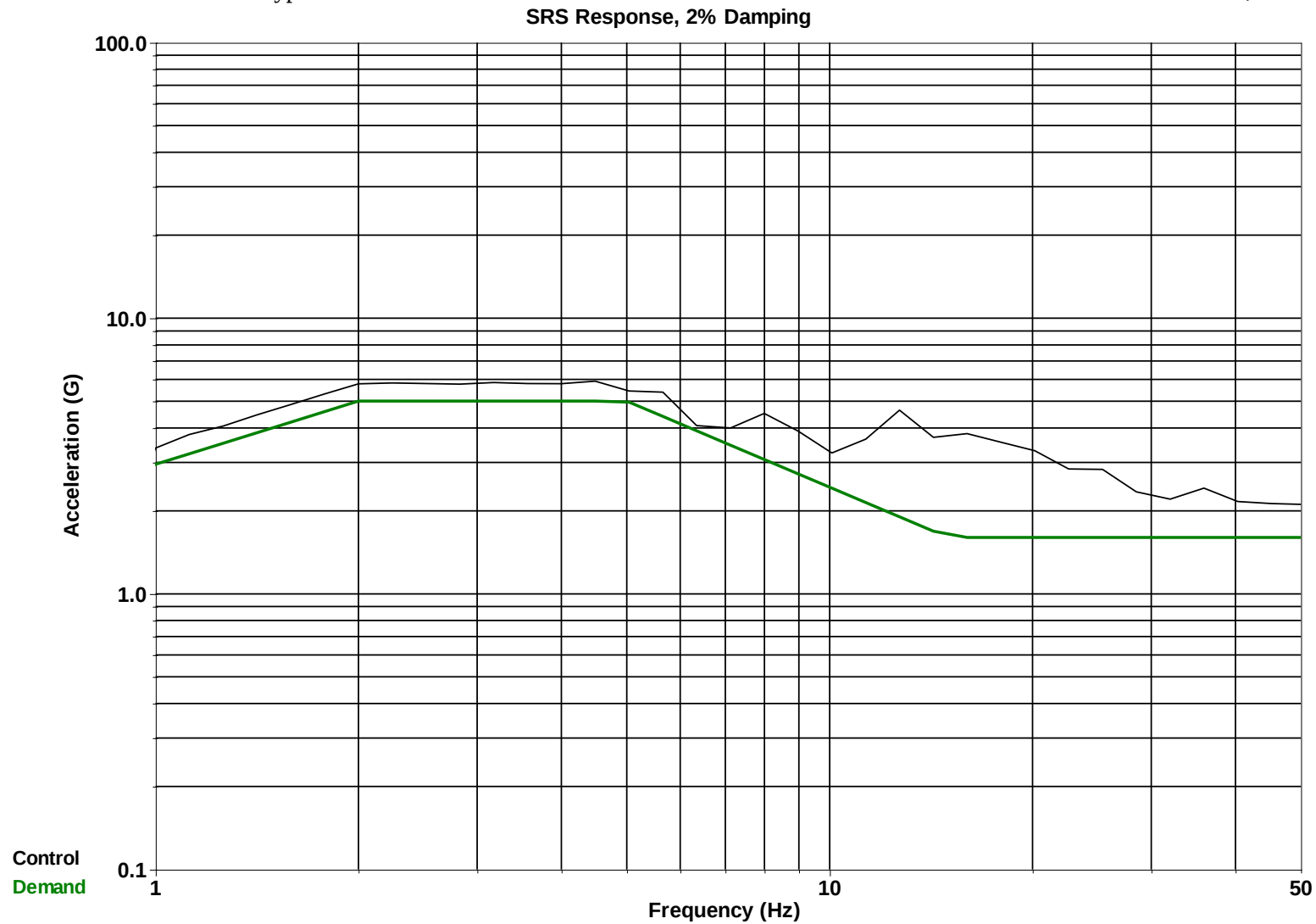
Server Rack

Test# 3 Side-Side Sine Survey



Modifier: 100 %
Pulse Type: SRS

ZPA: 2.007 G
Time: Oct 24, 2012 12:01:33

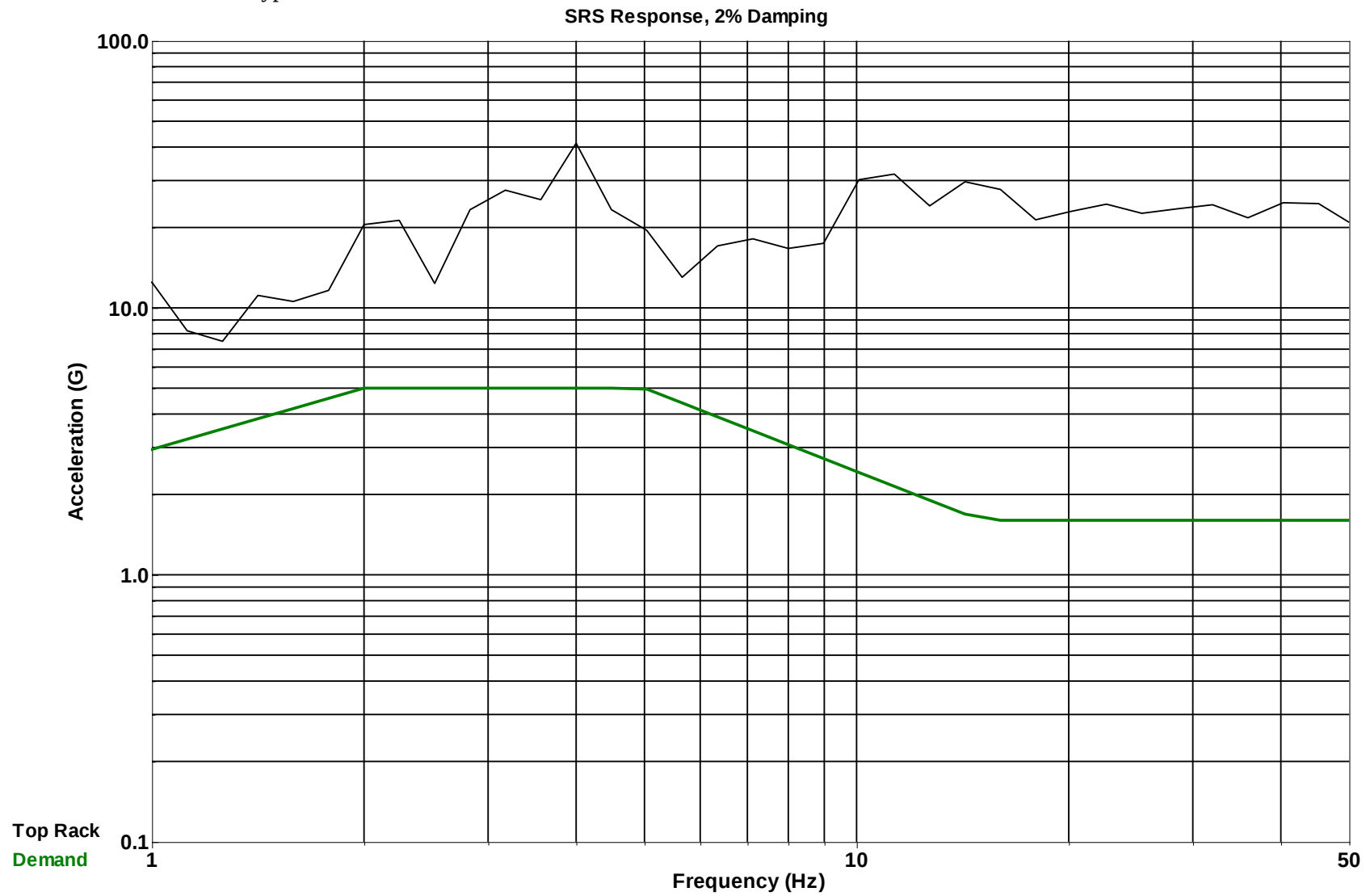


Eaton PR017449
Server Rack
Test# 4 Side-Side GR-63-Core Zone 4 Earthquake



Modifier: 100 %
Pulse Type: SRS

ZPA: 13.36 G
Time: Oct 24, 2012 12:01:33

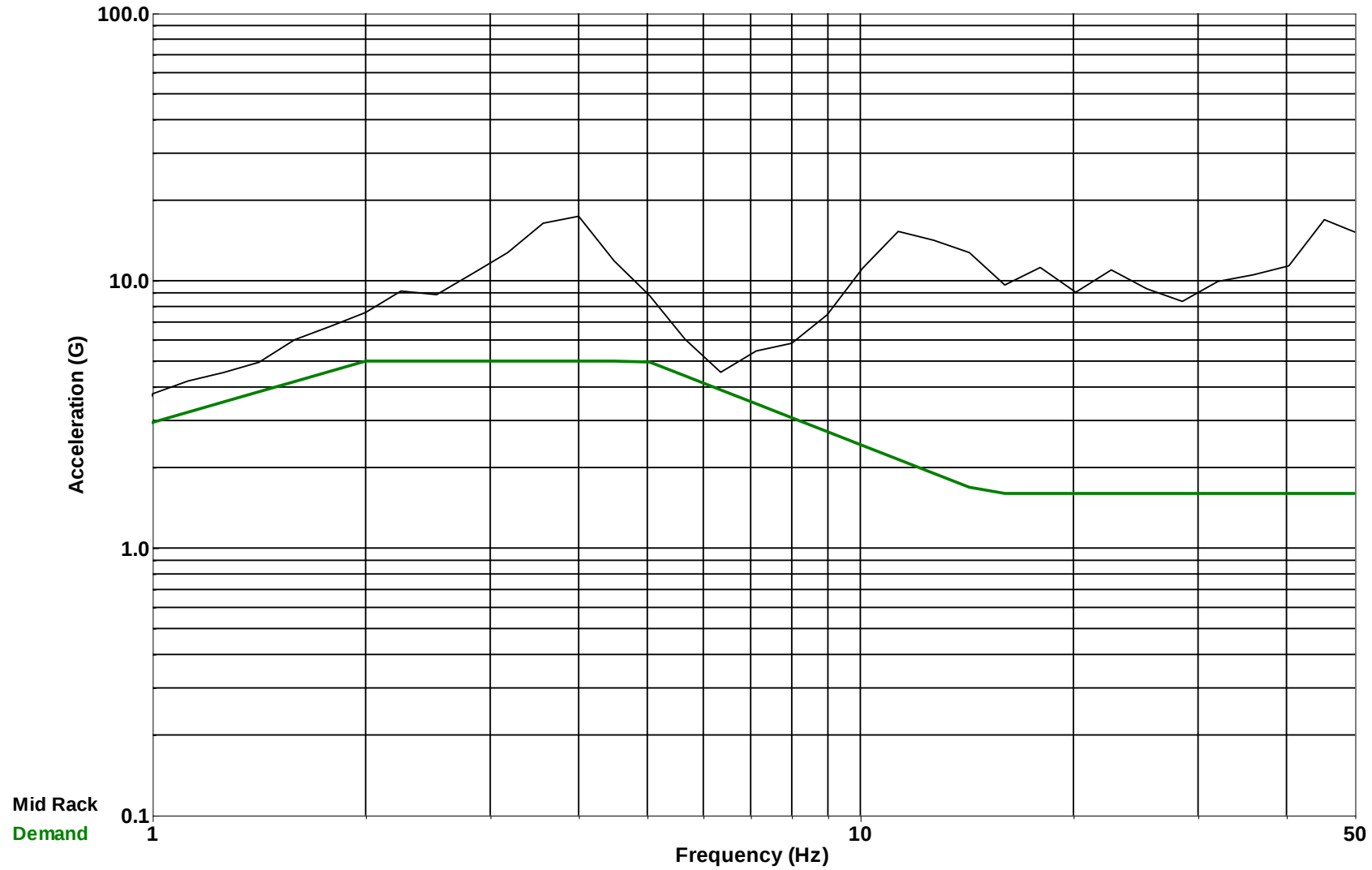


Eaton PR017449
Server Rack
Test# 4 Side-Side GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA: 5.795 G
Time: Oct 24, 2012 12:01:33

SRS Response, 2% Damping

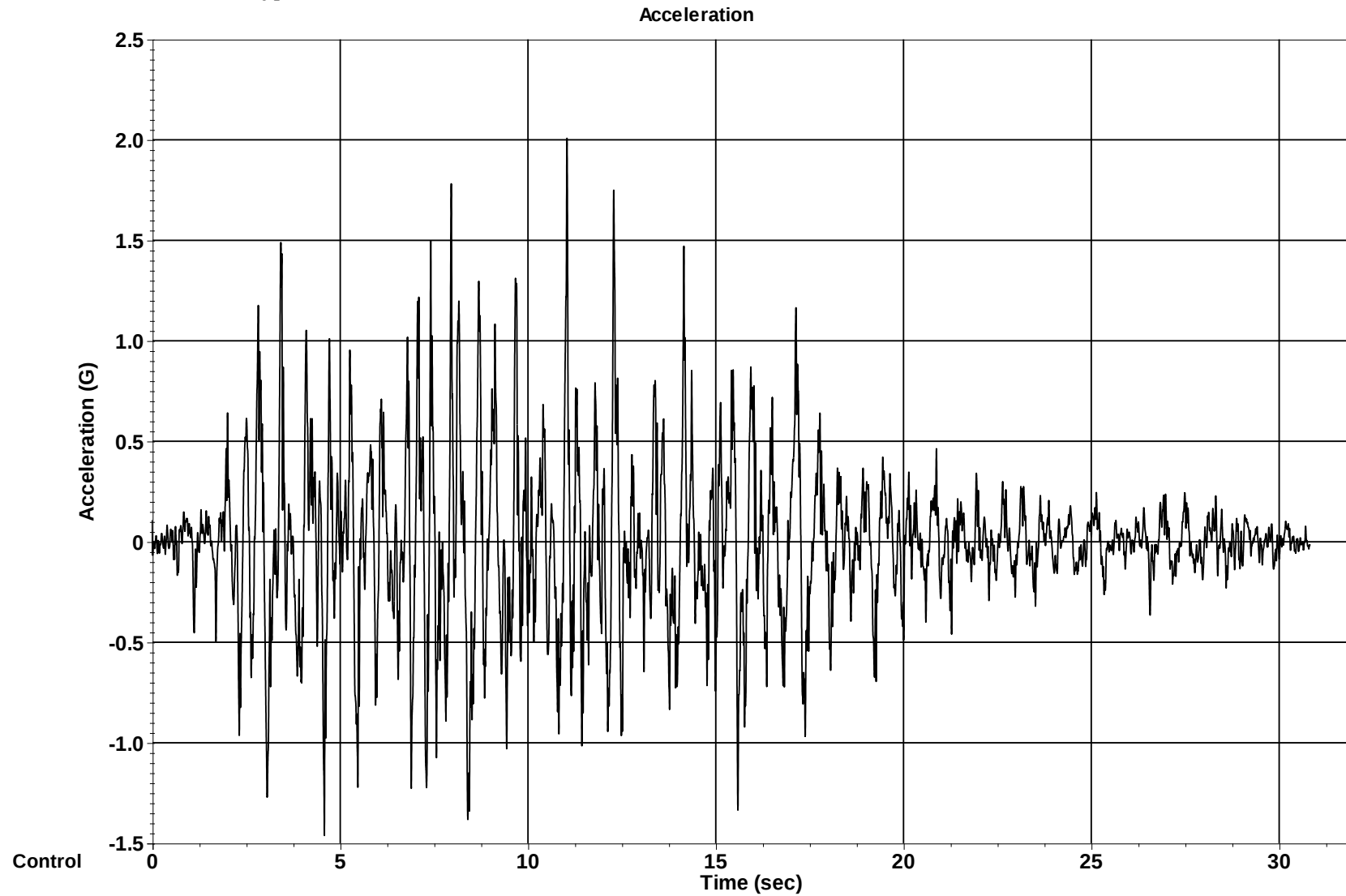


Eaton PR017449
Server Rack
Test# 4 Side-Side GR-63-Core Zone 4 Earthquake



Modifier: 100 %
Pulse Type: SRS

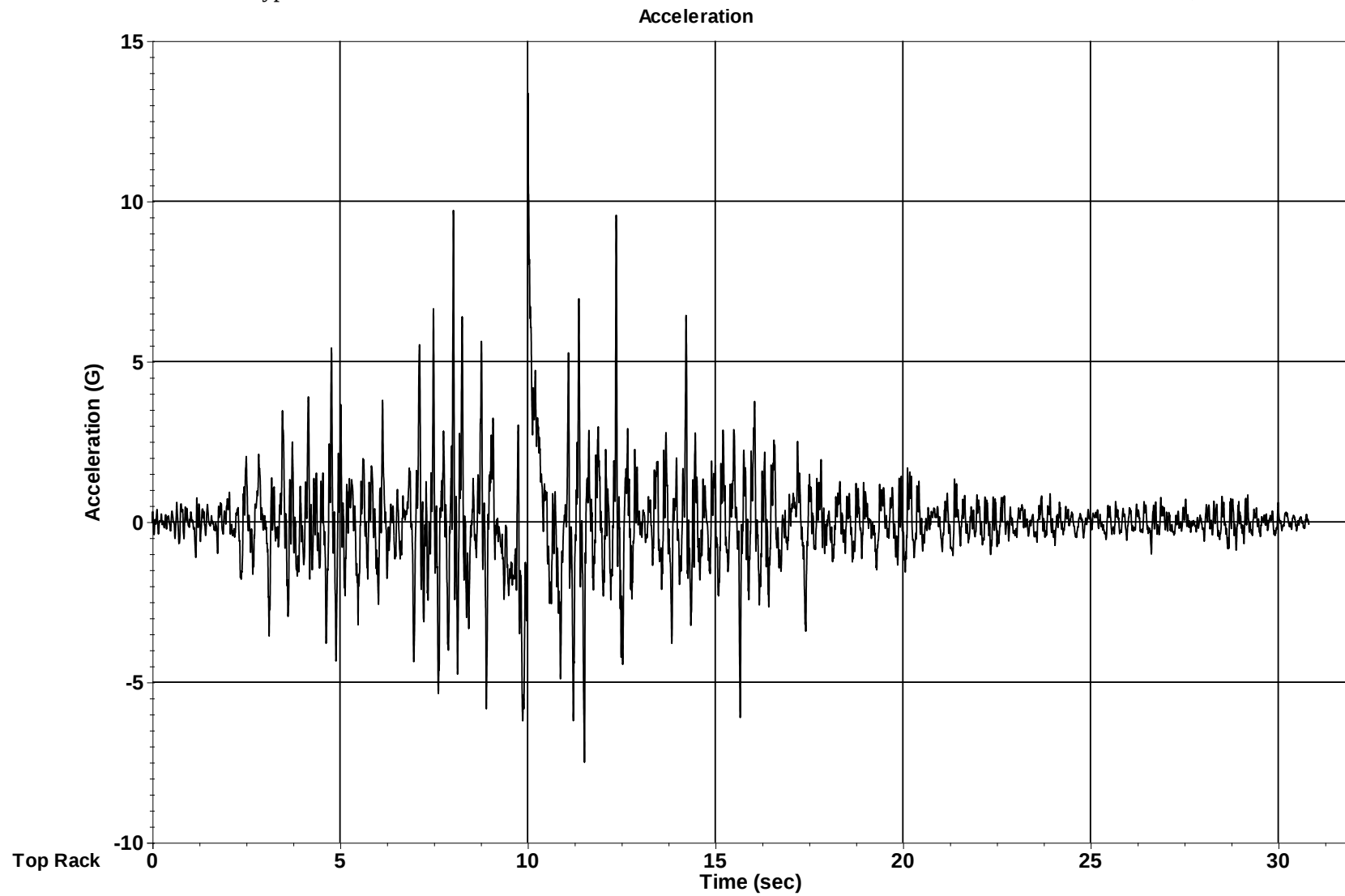
ZPA: 2.007 G
Time: Oct 24, 2012 12:01:33



Eaton PR017449
Server Rack
Test# 4 Side-Side GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA: 13.36 G
Time: Oct 24, 2012 12:01:33

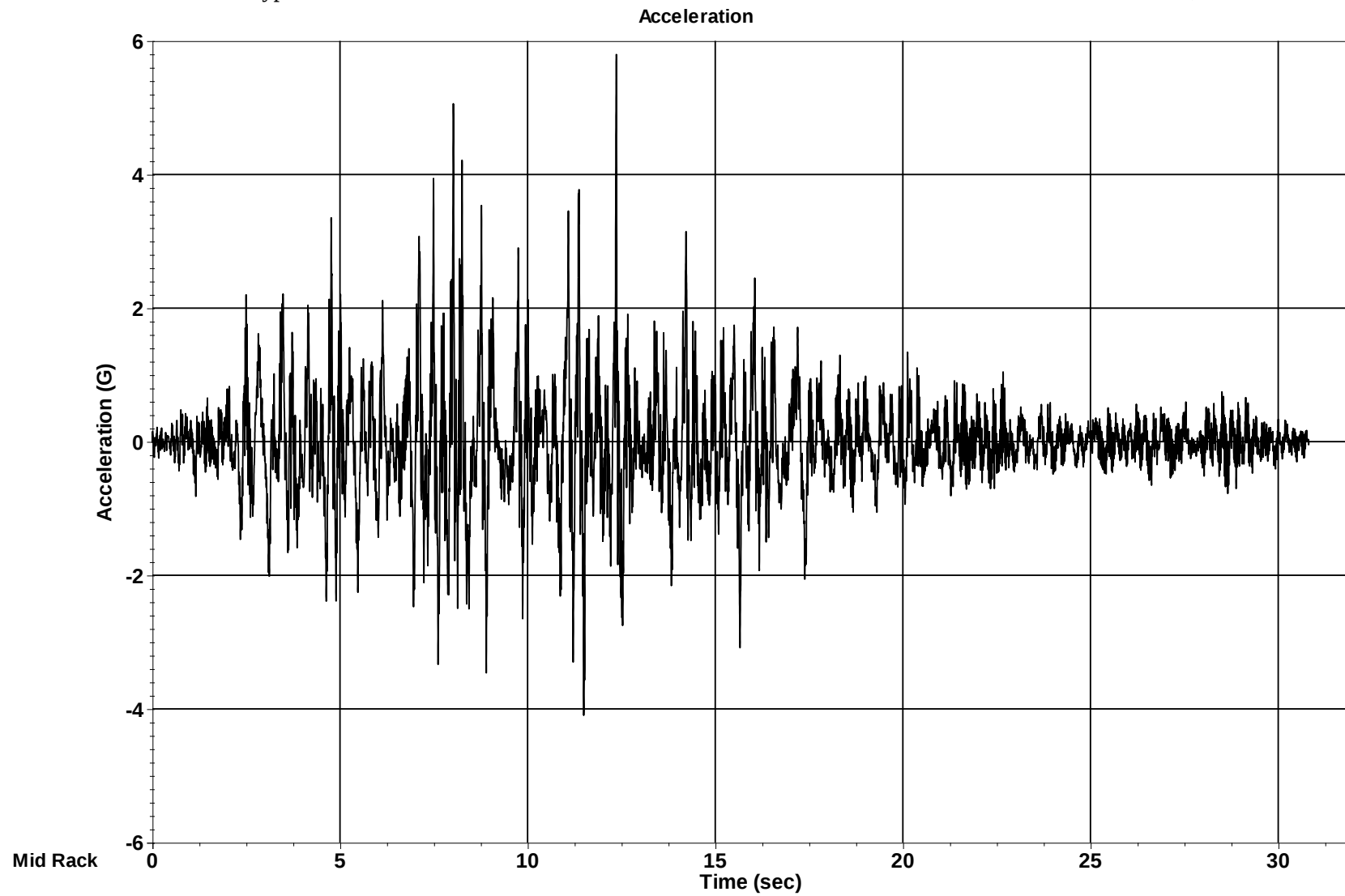


Eaton PR017449
Server Rack
Test# 4 Side-Side GR-63-Core Zone 4 Earthquake



Modifier: 100 %
Pulse Type: SRS

ZPA: 5.795 G
Time: Oct 24, 2012 12:01:33

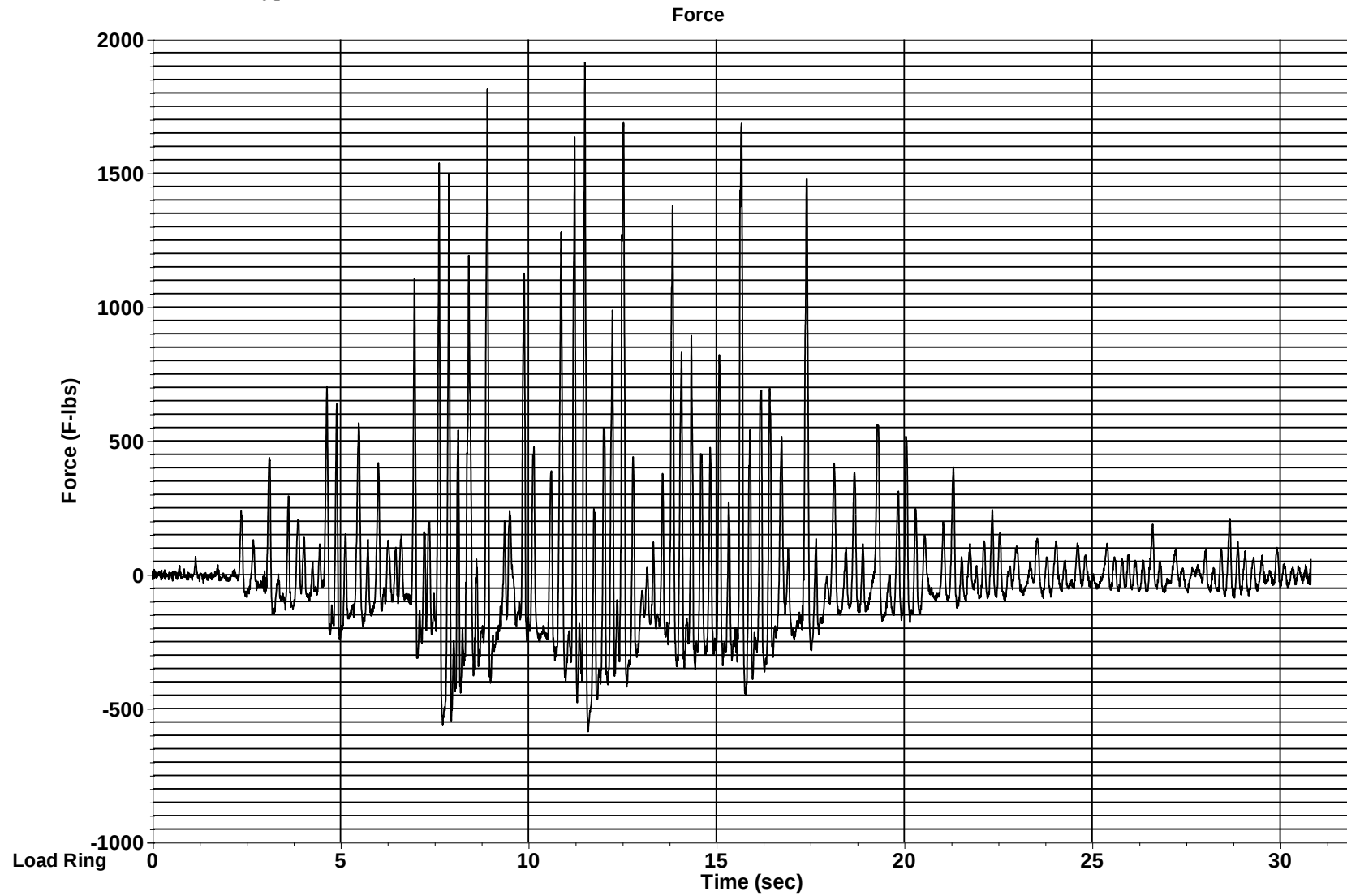


Eaton PR017449
Server Rack
Test# 4 Side-Side GR-63-Core Zone 4 Earthquake



Modifier: 100 %
Pulse Type: SRS

ZPA:
Time: Oct 24, 2012 12:01:33

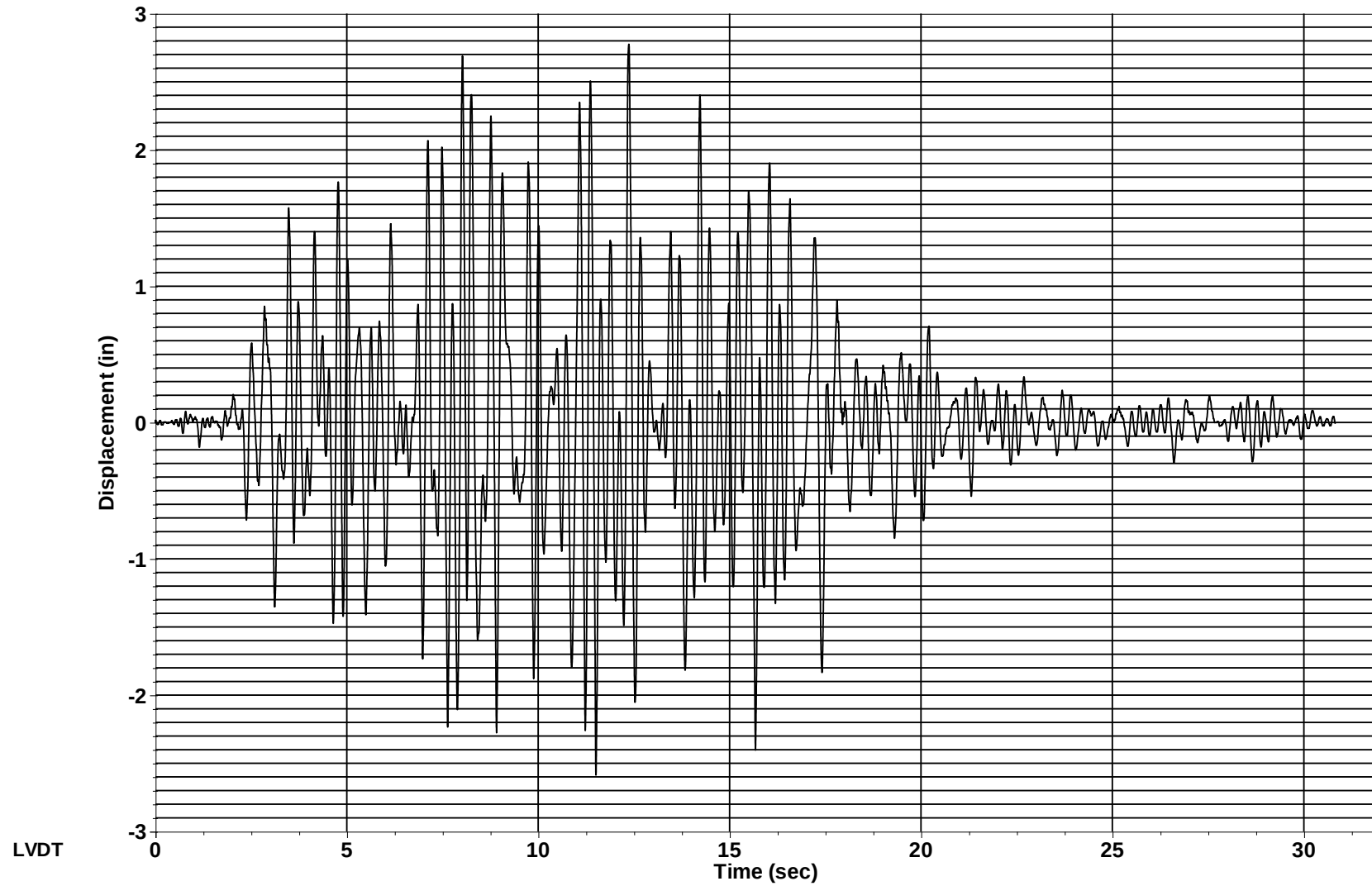


Eaton PR017449
Server Rack
Test# 4 Side-Side GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA:
Time: Oct 24, 2012 12:01:33

Displacement



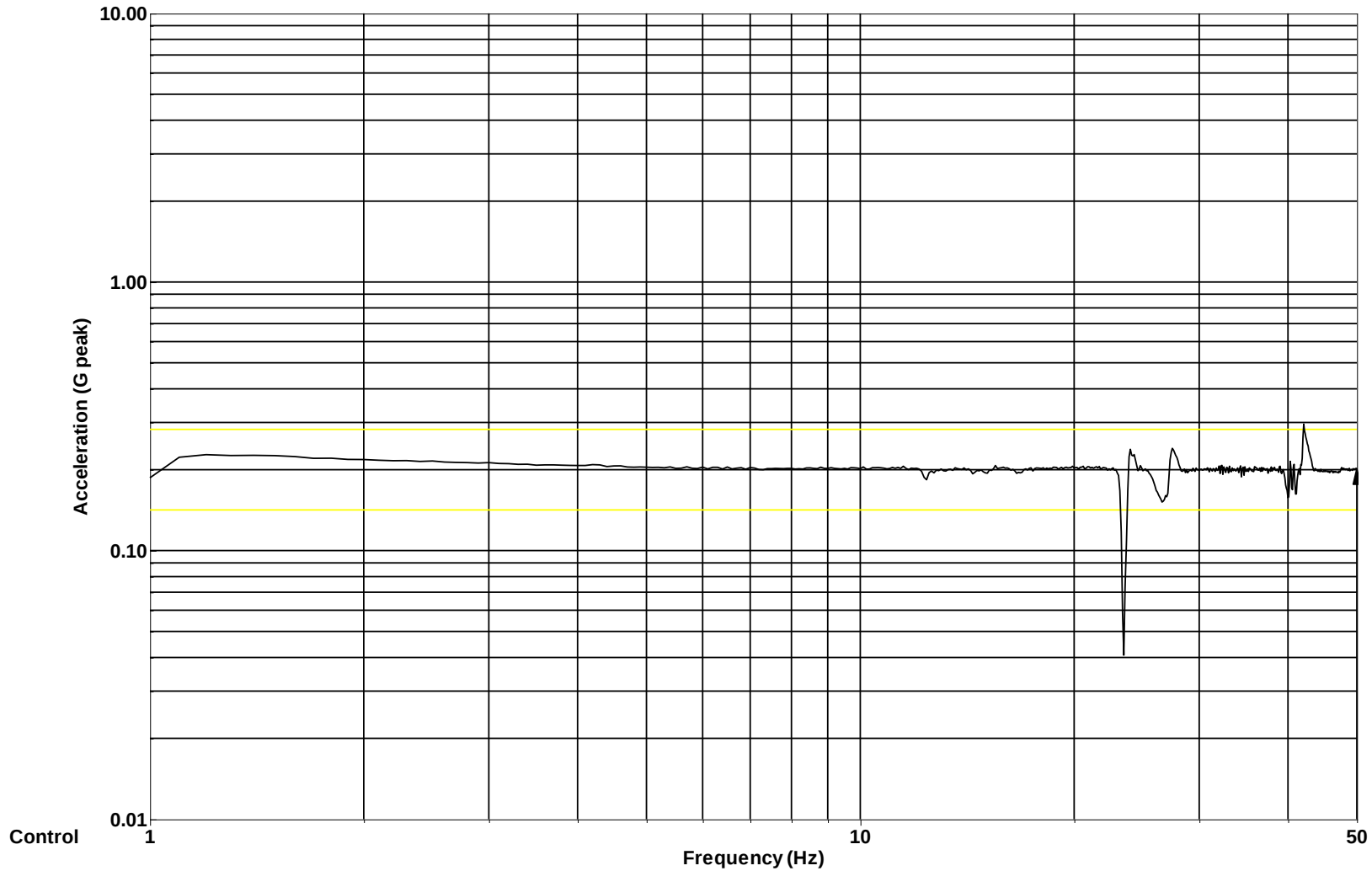
Eaton PR017449
Server Rack
Test# 4 Side-Side GR-63-Core Zone 4 Earthquake



Sweep Number: 1 sweeps
Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:39
Start Time: Oct 24, 2012 13:25:10

Acceleration Profile



Eaton PR017449
Server Rack
Test# 5 Front-Back Sine Survey

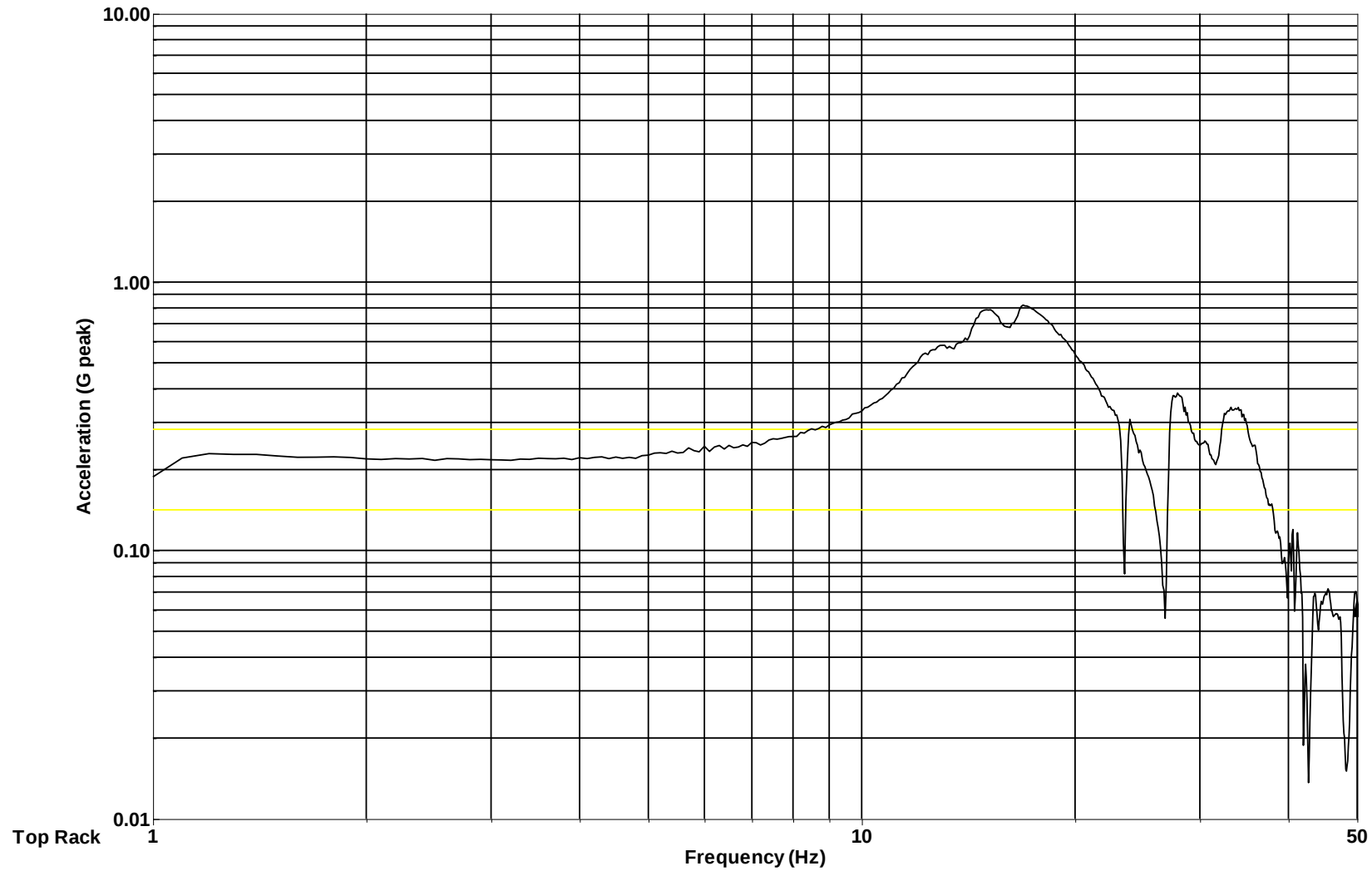


Sweep Number: 1 sweeps

Elapsed Time: 0:05:39

Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Start Time: Oct 24, 2012 13:25:10

Acceleration Profile

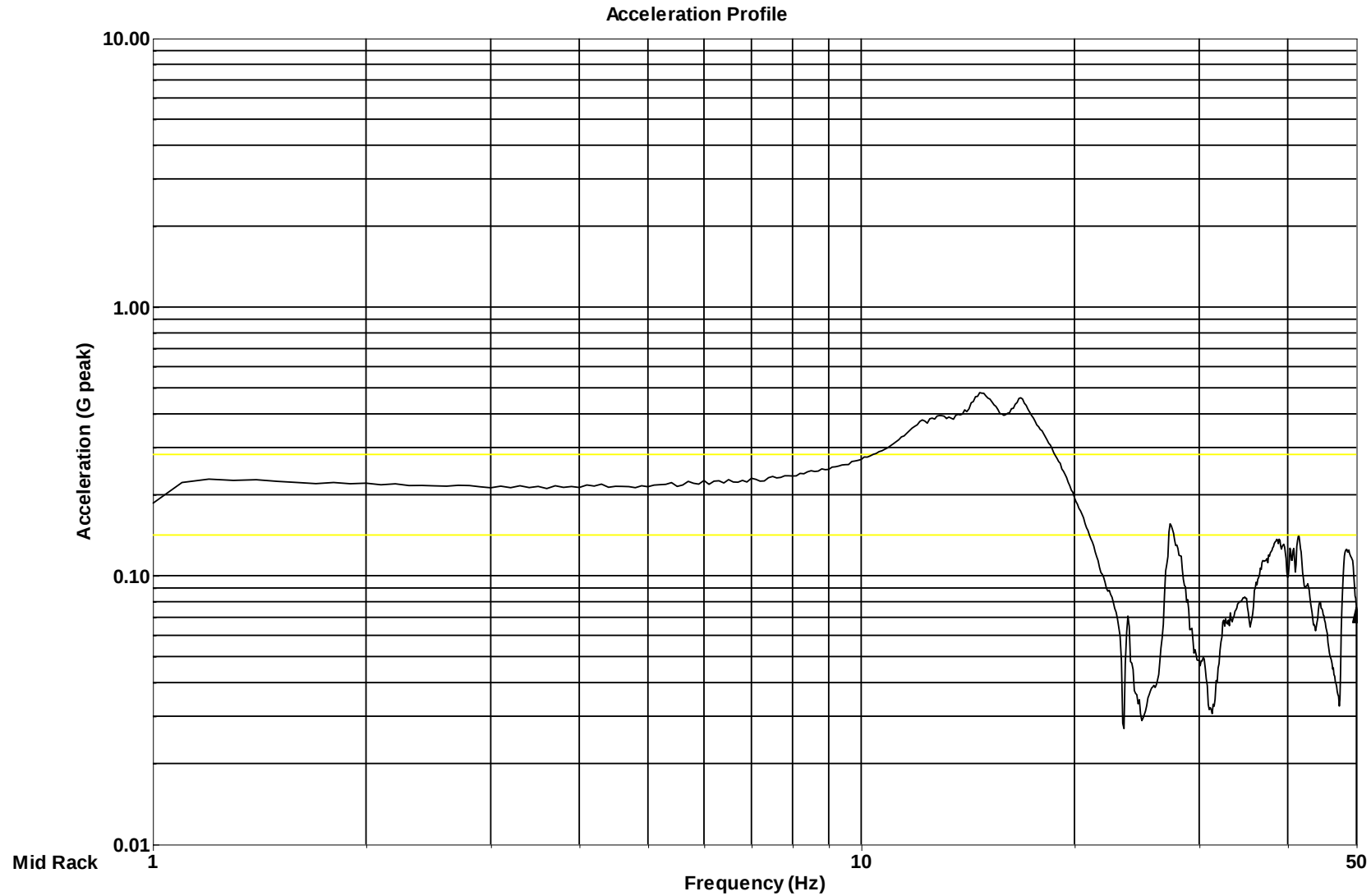
Eaton PR017449

Server Rack

Test# 5 Front-Back Sine Survey

Sweep Number: 1 sweeps
Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:39
Start Time: Oct 24, 2012 13:25:10



Eaton PR017449
Server Rack
Test# 5 Front-Back Sine Survey

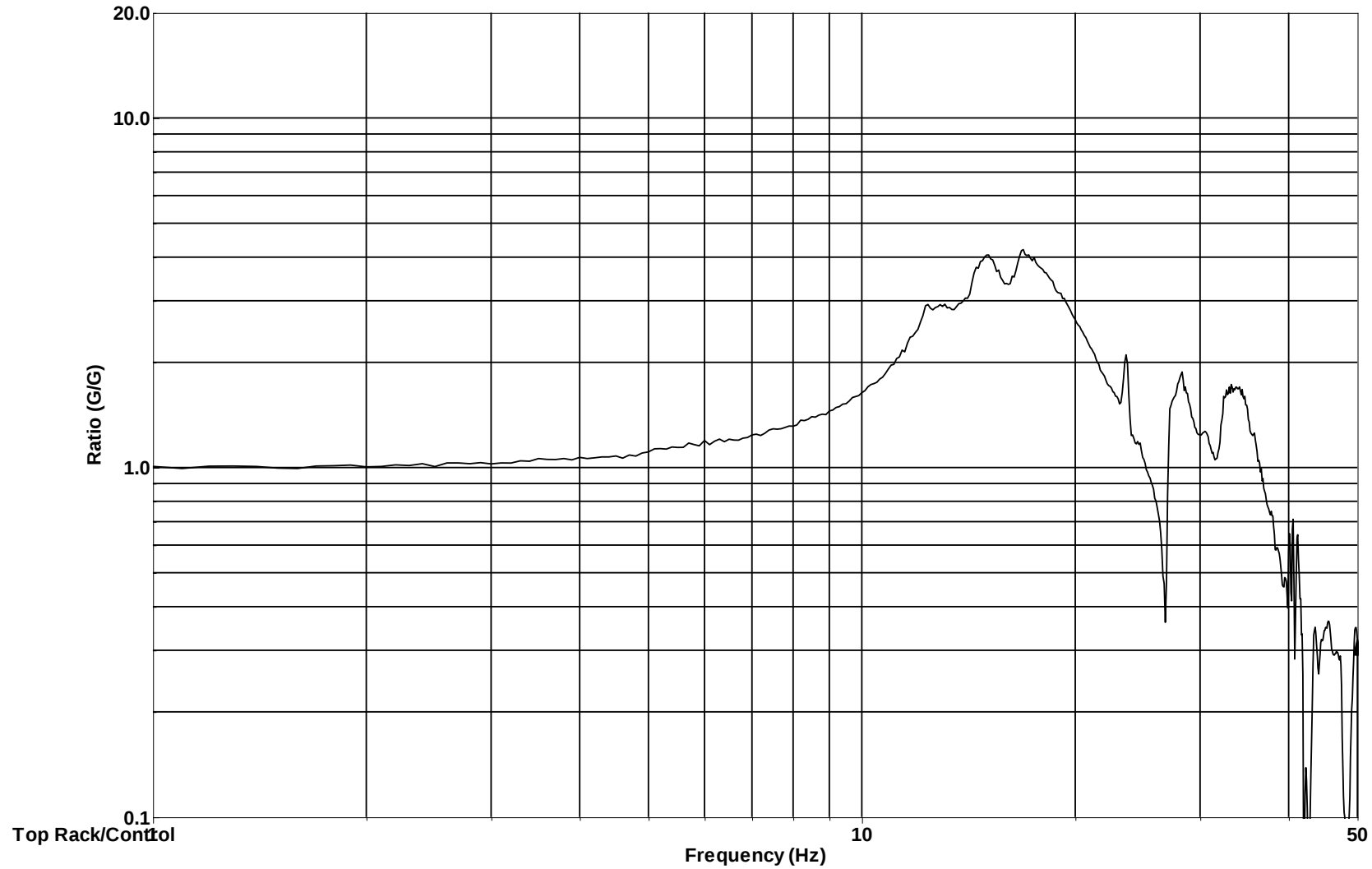
Sweep Number: 1 sweeps

Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:39

Start Time: Oct 24, 2012 13:25:10

Transmissibility (reference = Control)



Eaton PR017449

Server Rack

Test# 5 Front-Back Sine Survey

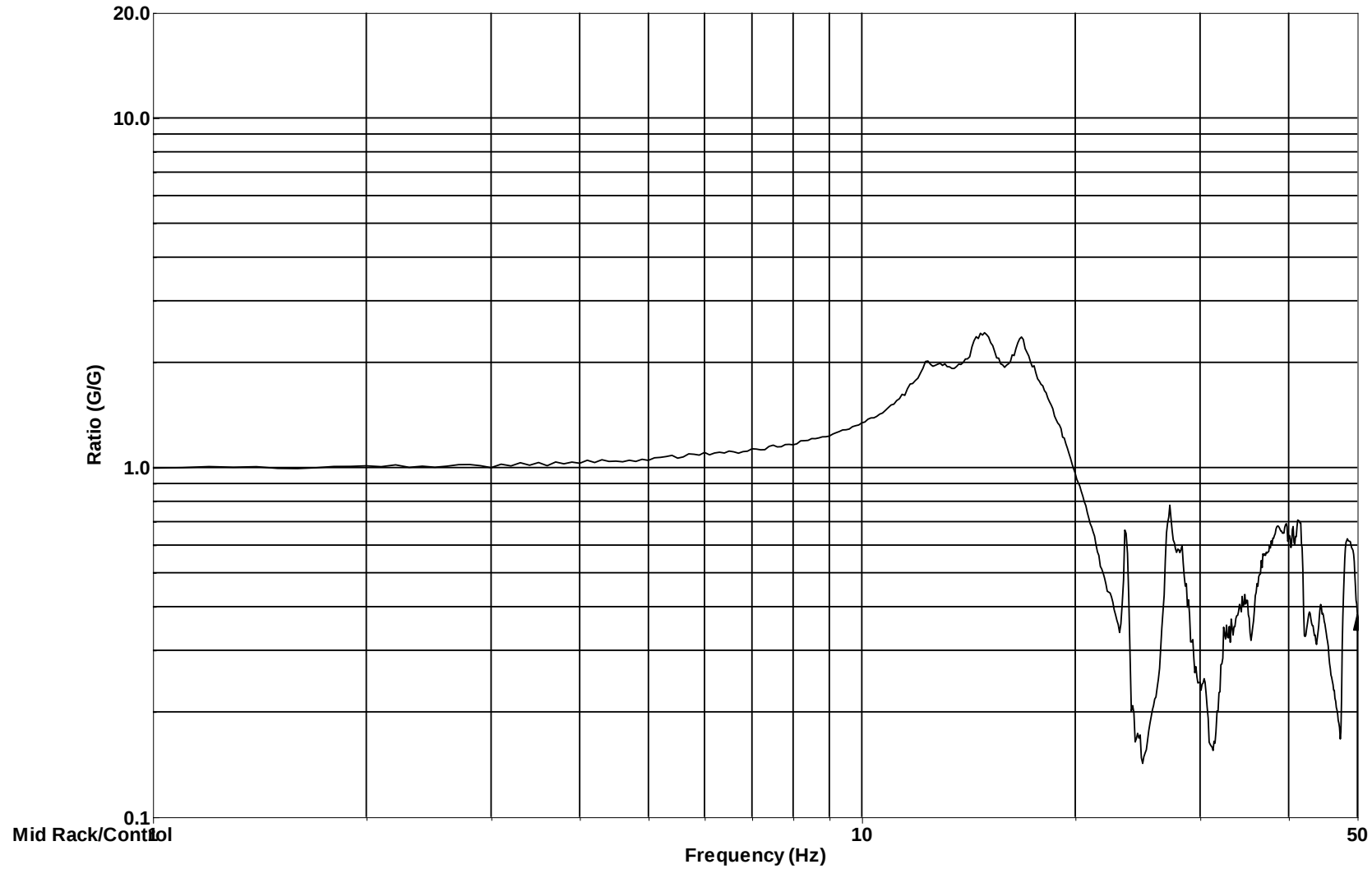
Sweep Number: 1 sweeps

Sweep Type: Sweep between 1 Hz and 50 Hz at 1 Oct/min

Elapsed Time: 0:05:39

Start Time: Oct 24, 2012 13:25:10

Transmissibility (reference = Control)



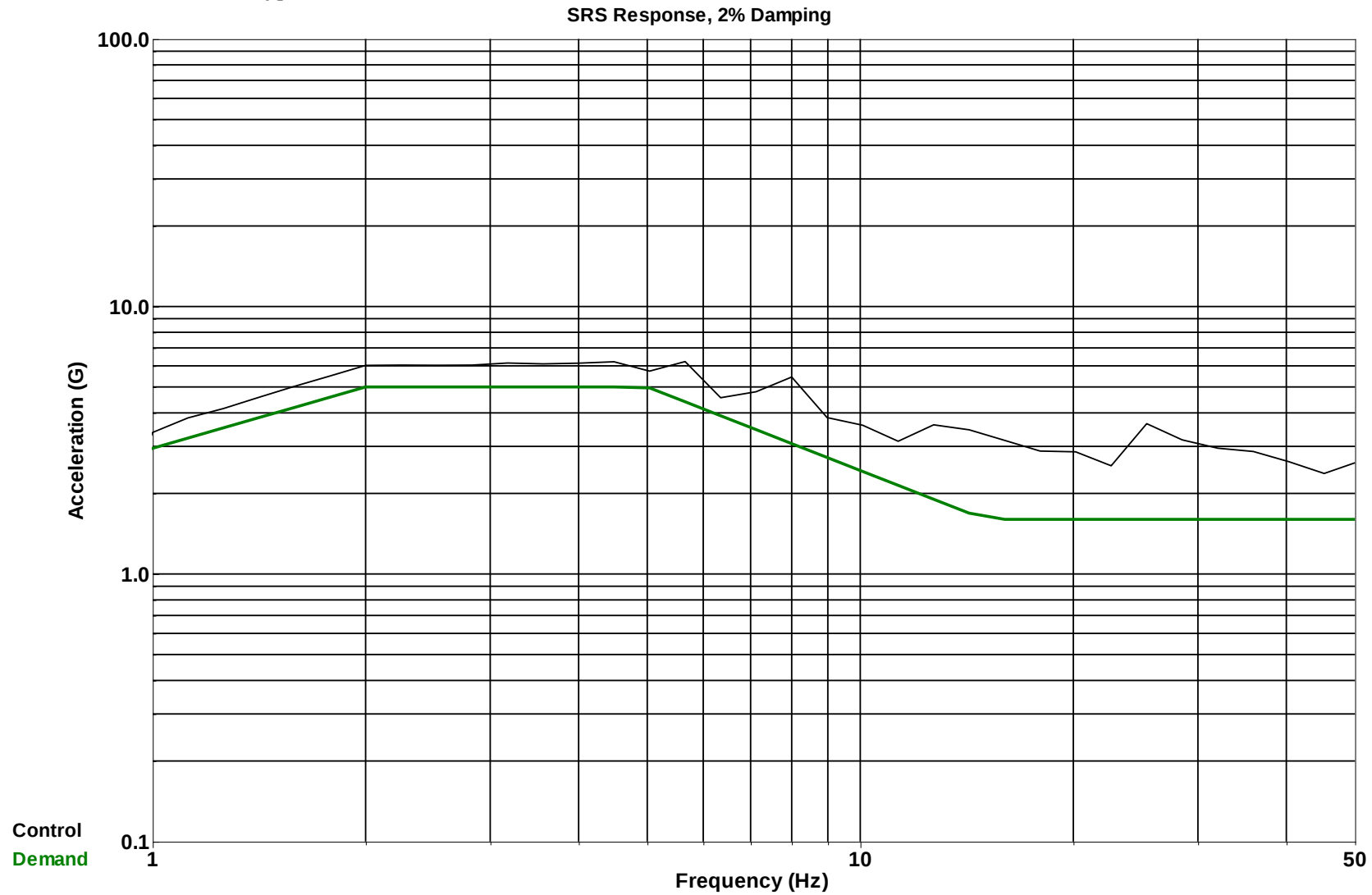
Eaton PR017449

Server Rack

Test# 5 Front-Back Sine Survey

Modifier: 100 %
Pulse Type: SRS

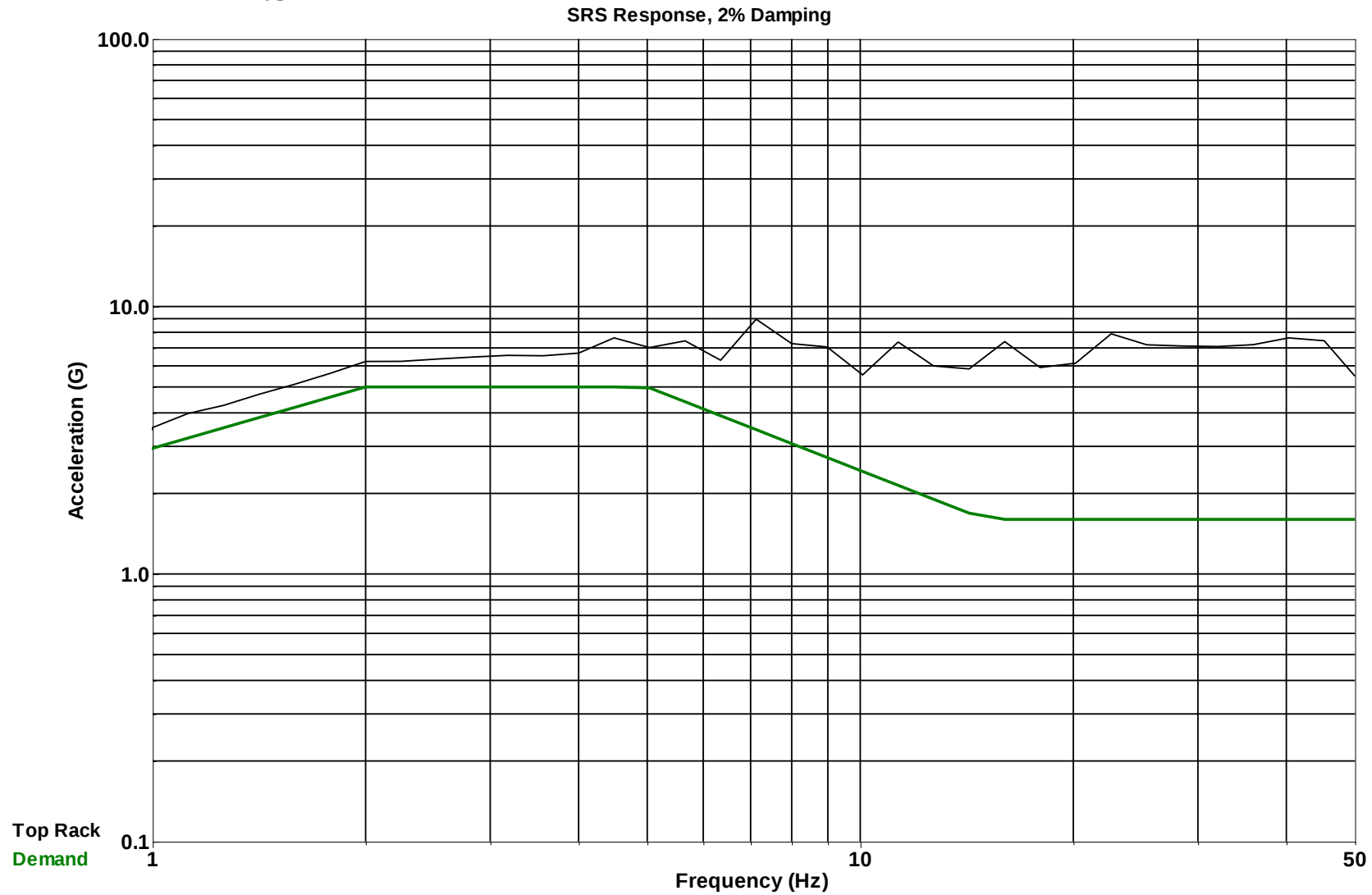
ZPA: 2.336 G
Time: Oct 24, 2012 13:33:03



Eaton PR017449
Server Rack
Test# 6 Front-Back GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA: -3.347 G
Time: Oct 24, 2012 13:33:03

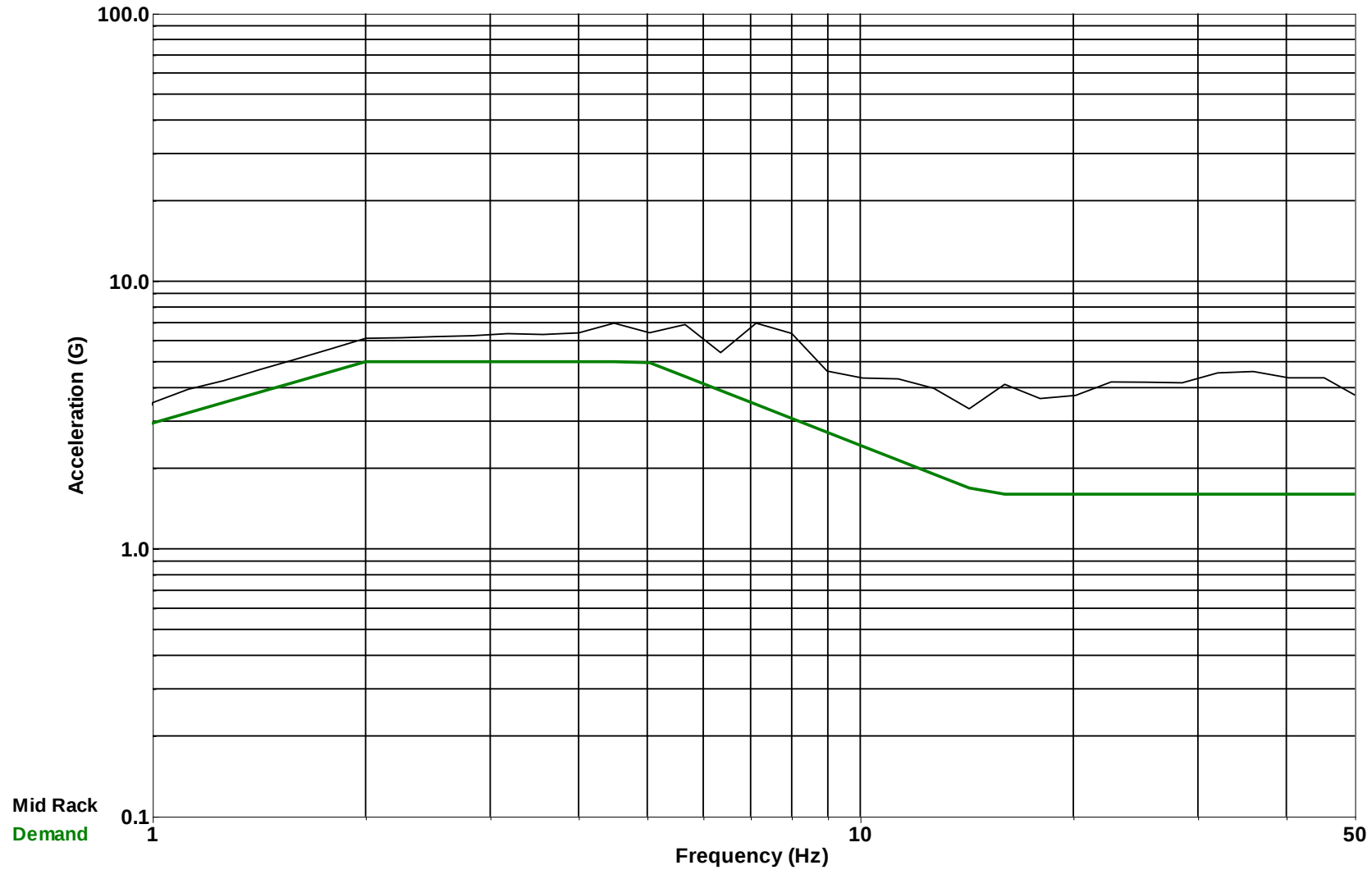


Eaton PR017449
Server Rack
Test# 6 Front-Back GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA: 2.527 G
Time: Oct 24, 2012 13:33:03

SRS Response, 2% Damping

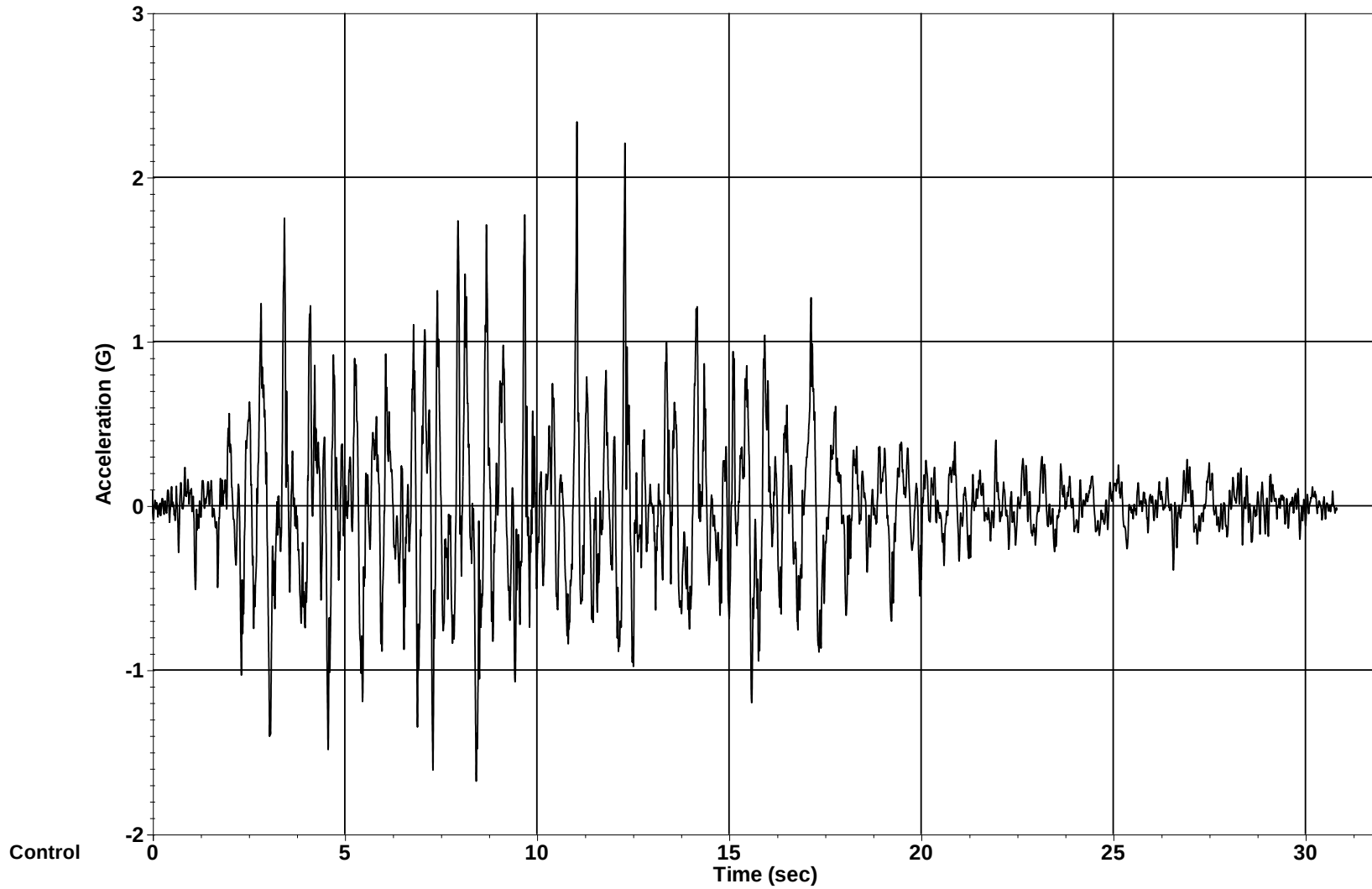


Eaton PR017449
Server Rack
Test# 6 Front-Back GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA: 2.336 G
Time: Oct 24, 2012 13:33:03

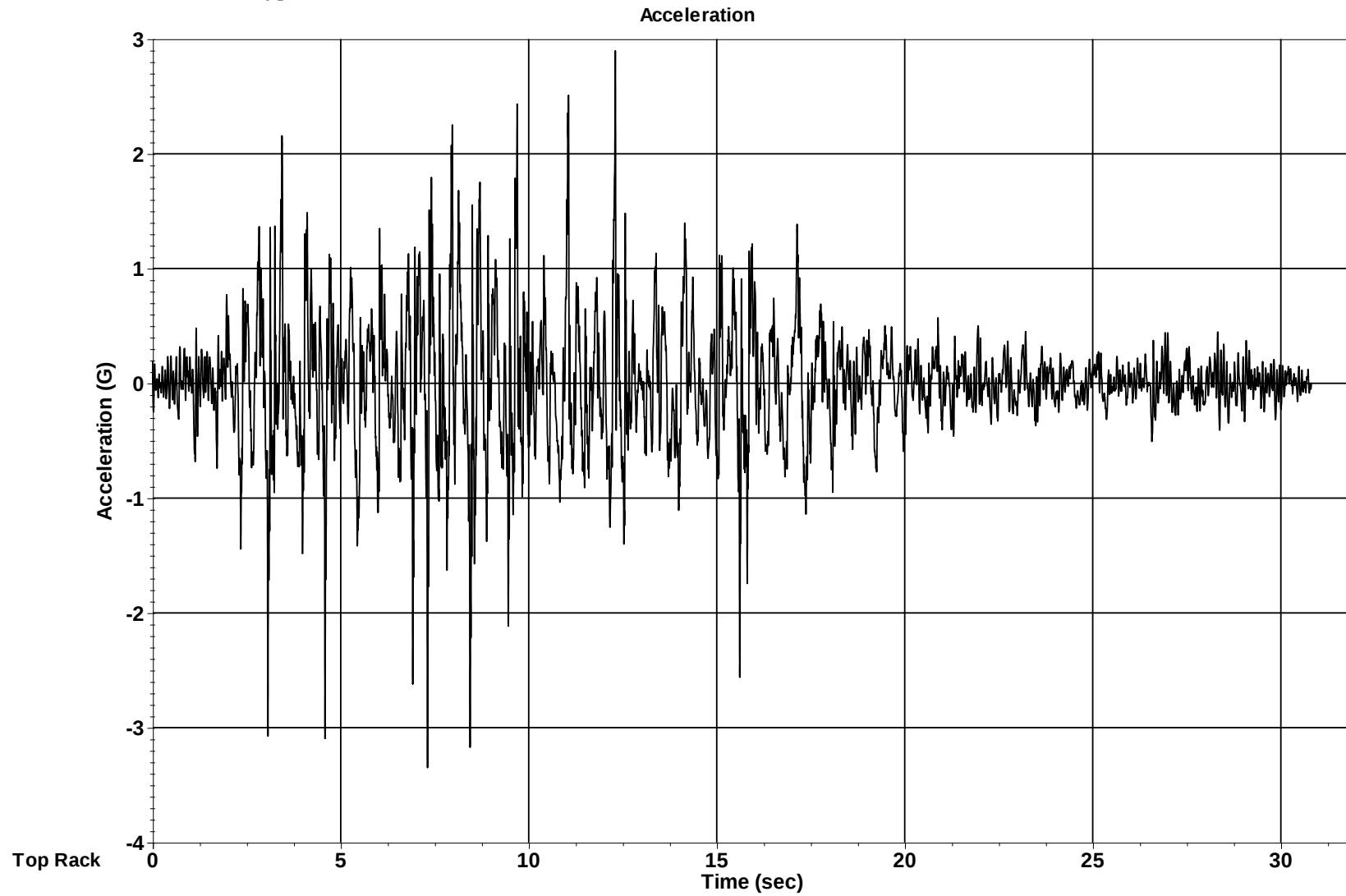
Acceleration



Eaton PR017449
Server Rack
Test# 6 Front-Back GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA: -3.347 G
Time: Oct 24, 2012 13:33:03

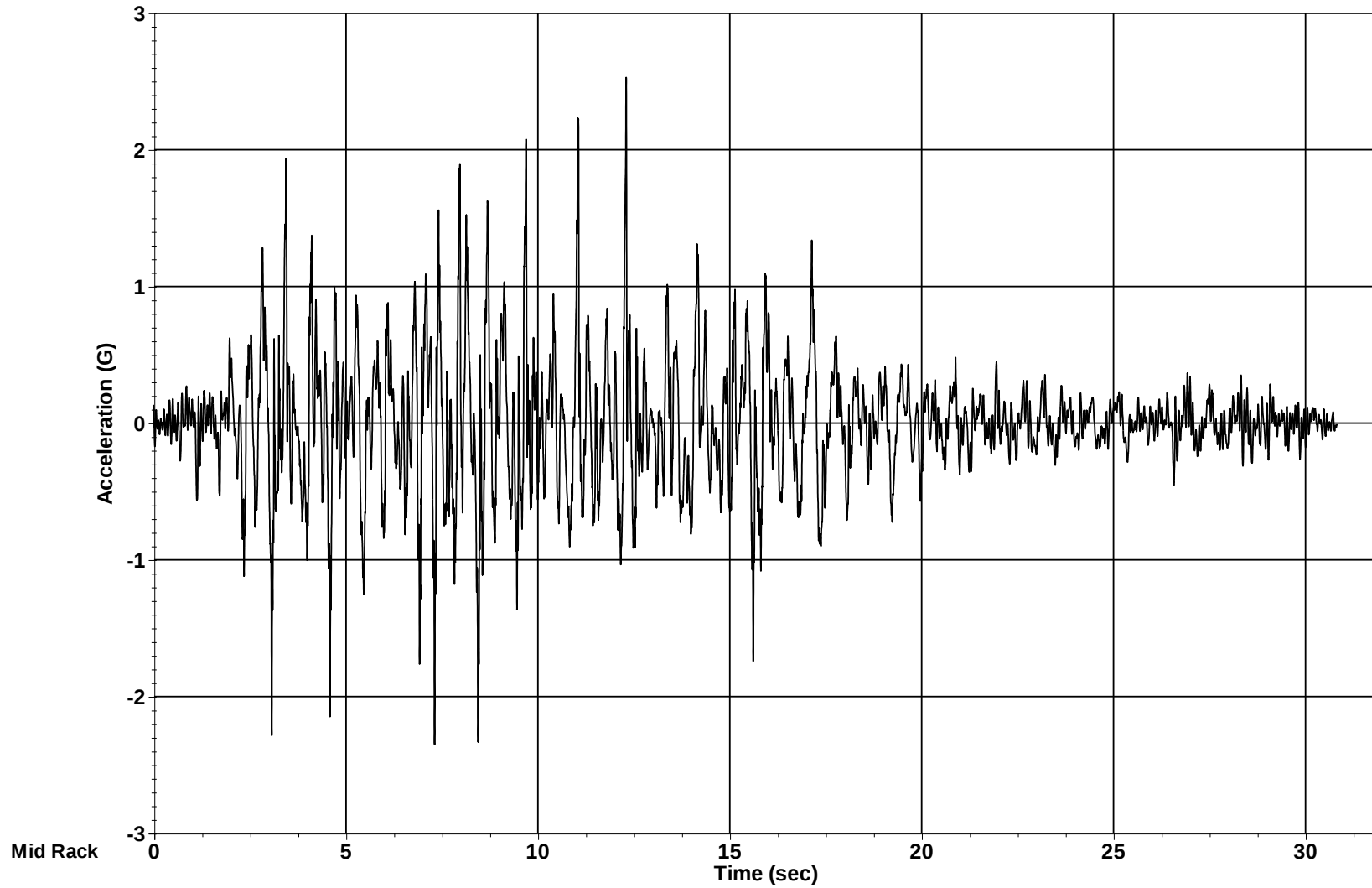


Eaton PR017449
Server Rack
Test# 6 Front-Back GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA: 2.527 G
Time: Oct 24, 2012 13:33:03

Acceleration

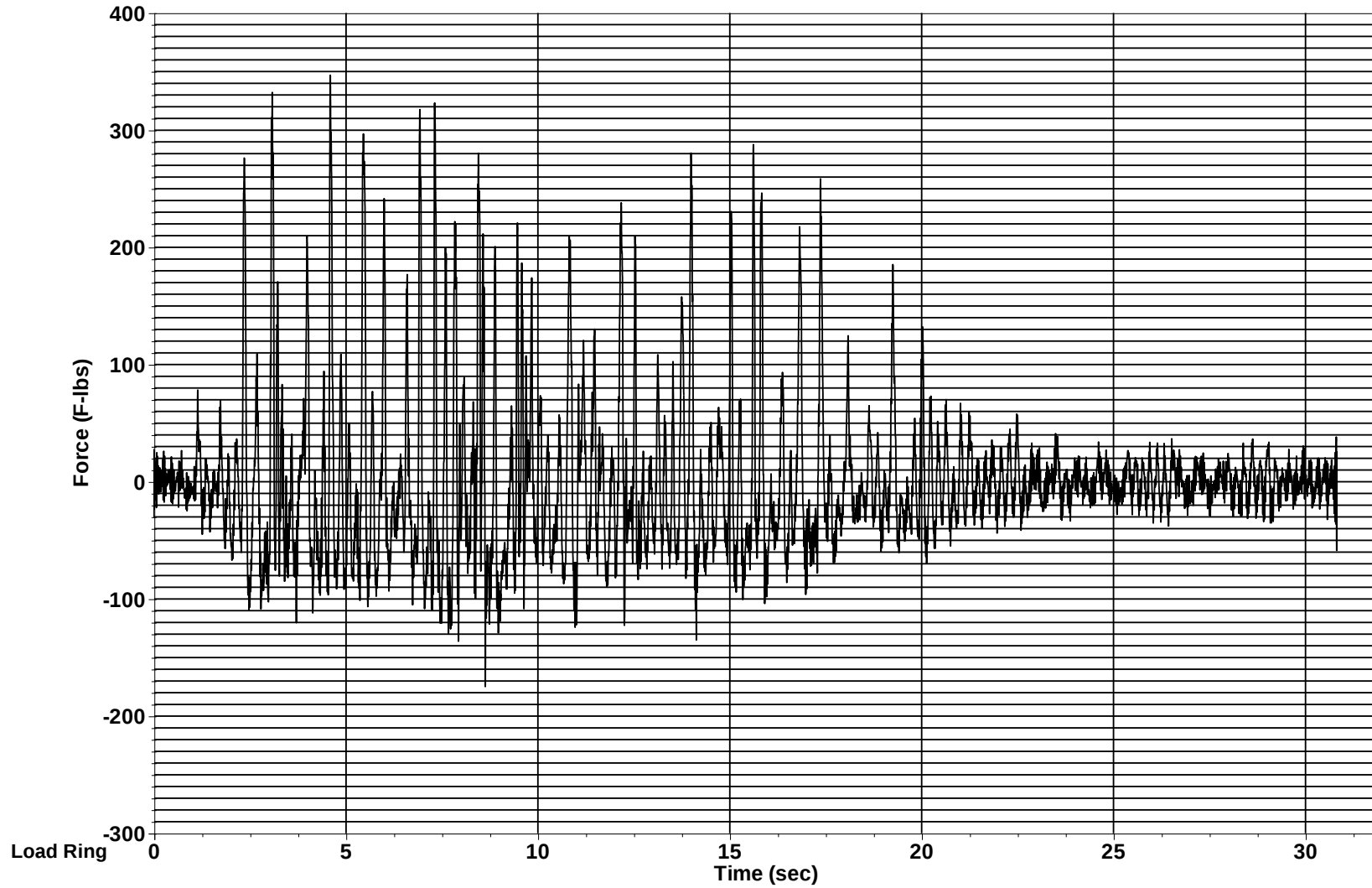


Eaton PR017449
Server Rack
Test# 6 Front-Back GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA:
Time: Oct 24, 2012 13:33:03

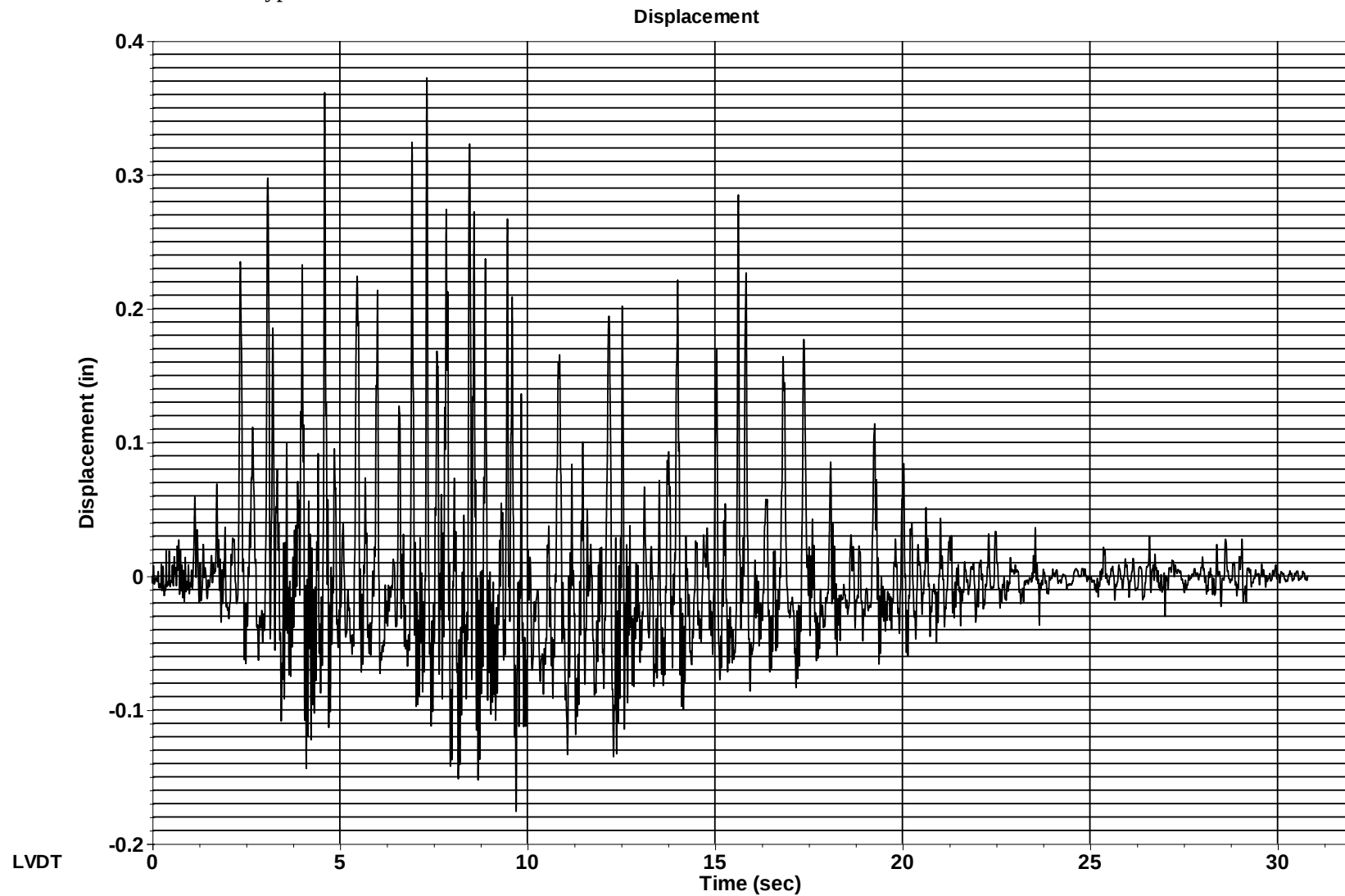
Force



Eaton PR017449
Server Rack
Test# 6 Front-Back GR-63-Core Zone 4 Earthquake

Modifier: 100 %
Pulse Type: SRS

ZPA:
Time: Oct 24, 2012 13:33:03



Eaton PR017449
Server Rack
Test# 6 Front-Back GR-63-Core Zone 4 Earthquake