



# GVK MARINE SYSTEMS

Plot No. 21, IDA Mallapur, IE Nacharam, Hyderabad-500076

(Specialized in Shock, Noise, Vibration Analysis &  
Measurements and valve testing for Marine Systems)  
**AN ISO 9001:2015 CERTIFIED COMPANY**

## TEST REPORT

### SBN MEASUREMENTS ON 50 NB Ball valve

Customer : M/s. VINPRA ENGINEERING INDIA PVT LTD  
Date : 13/07/2023  
Report No. : GVK/NV/VINPRA/02

G V RAMANUJAM  
Engineer NVH  
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## Background

As part of Design validation and acceptance criteria, Structure Borne Noise (SBN) levels are measured. Measurements were performed as per the standards and the results are given in this report.

## Objective

The aim of the project is to study the Structure Borne Noise levels above the Mounting arrangement points. The tests were conducted on the test rig. The actual boundary conditions of the valves are simulated.

## Reference standards and documents

- MIL STD 740-2 for Structural Bone Noise (Vibration)

## Description of the valve :

Client : VINPRA ENGINEERING INDIA PVT LTD  
 Drawing No. : VP/1PC/TEBV/FLG/002  
 Test Item : 50NB Ball valve  
 Model No. & S.No. : B12172  
 Material : LG4C  
 Heat No. : 15723

### Test requirements:

#### Structure Borne Noise (SBN) – Vibrations

Vibration Levels were measured above all the mounts in three perpendicular directs X, Y and Z in 1/3rd octave frequency band in the range 10 Hz to 10 kHz. All the measurements are performed in the above-mentioned operating conditions. SBN levels are measured in acceleration in dB with a reference of 1e-05 m/s<sup>2</sup>.

n

Acceleration in dB L = 10 log ( ∑ 10<sup>0.1Li</sup> ) – 10 log n

i=1

Where, L = Vibration level in AdB at any particular 1/3 octave band frequency.

Li = Vibration level in AdB measured at i<sup>th</sup> point.

n = Number of measuring points.

A<sub>ref</sub> - 1e-05 m/s<sup>2</sup>





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## Test Description

Measurements of Structure Borne Noise Levels were performed at 3 locations. Tri-axial Accelerometers were used to measure the vibrations in all three directions as Horizontal – X direction (suction and discharge side), Axial – Y direction and Vertical - Z direction.

## Acceptable values as per specifications:

**Vibration:** The vibration level 'L' as calculated above is to be compared with the vibration level of the equipment in the 1/3 octave frequency band of 10 Hz to 10 KHz in dB with respect to reference threshold  $1 \times 10^{-5} \text{ m/sec}^2$  measured above the securing bolts of the equipment should not exceed the value limited by the straight line joining 80dB at 25 Hz and 105 dB at 8 KHz respectively.

## Parameters:

SBN levels were measured using Accelerometers fixed to the valve above of all 3 mounting locations. The signal was analyzed for the SBN levels in 1/3rd Octave bands.

Frequency Bands	: 10 - 10 kHz
Sampling Frequency	: 32 kHz
Averaging time	: 20 seconds
Average type	: Linear

## Conclusions:

The performance of the 50 NB BALL valve is found to be satisfactory and the SBN levels are within the allowable limits.





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## Instrument Details:

### Data Acquisition System

Make : Bruel & Kjaer  
Model : Photon+  
DAQ : ICP  
No. of Channels : 4 Channel  
Serial No. : 5027845  
Date of Calibration : 28-10-2022  
Next Calibration : 27-10-2023

### Tri-axial Accelerometers

Make : Dytran  
Model : 3313A1  
Serial No. : 1249  
Nominal Sensitivity : 10 mV/g  
Date of Calibration : 11-10-2022  
Next Calibration : 11-10-2023





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**Table 1: 25% opening**

Freq	Suction Side			Discharge Side			Centre of valve			Max	Limits
	M1X	M1Y	M1Z	M2X	M2Y	M2Z	M3X	M3Y	M3Z		
10	52	61	59	51	64	58	57	53	51	64	76
12.5	50	56	56	46	63	56	51	54	54	63	77
16	60	58	57	57	56	52	56	64	55	64	78
20	56	53	55	60	51	52	60	58	54	60	79
25	53	57	50	53	56	52	56	59	52	59	80
31.5	53	55	53	54	57	54	55	57	54	57	81
40	56	57	69	65	66	67	72	57	64	72	82
50	65	66	78	79	79	76	77	68	72	79	83
63	64	64	73	65	66	70	68	65	71	73	84
80	66	70	67	69	72	66	65	72	66	72	85
100	72	79	70	75	82	71	67	80	62	82	86
125	82	76	76	75	76	74	73	74	71	82	87
160	77	80	73	73	81	71	73	80	71	81	88
200	82	78	79	80	78	74	75	78	77	82	89
250	76	76	75	77	79	71	79	77	77	79	90
315	73	74	79	80	85	72	82	83	81	85	91
400	77	80	75	73	80	71	79	78	75	80	92
500	80	84	75	78	82	73	79	78	77	84	93
630	80	83	75	79	77	72	74	78	77	83	94
800	90	90	82	78	82	73	73	81	78	90	95
1000	86	91	74	72	79	67	65	77	69	91	96
1250	83	92	74	79	78	71	76	87	73	92	97
1600	82	84	83	86	81	77	78	92	73	92	98
2000	79	80	86	82	82	79	79	78	82	86	99
2500	75	81	86	81	80	80	85	80	83	86	100
3150	78	82	82	79	89	85	78	87	82	89	101
4000	87	82	85	79	89	86	81	78	80	89	102
5000	82	87	92	78	85	86	80	81	86	92	103
6300	87	90	102	82	84	91	86	84	93	102	104
8000	89	89	101	86	88	98	90	91	100	101	105
10000	78	80	91	80	84	93	91	93	101	101	106



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**Table 2:** Vibration Levels in 1/3<sup>rd</sup> Octave Band in AdB at 50% opening

Freq	Suction Side			Discharge Side			Centre of valve			Max	Limits
	M1X	M1Y	M1Z	M2X	M2Y	M2Z	M3X	M3Y	M3Z		
10	54	59	58	52	54	47	47	50	49	59	76
12.5	51	60	55	47	55	50	48	50	48	60	77
16	54	54	57	54	55	48	54	60	46	60	78
20	50	48	48	57	53	51	54	53	45	57	79
25	48	51	47	48	50	44	51	53	50	53	80
31.5	49	49	48	47	50	46	50	51	47	51	81
40	53	53	62	60	59	60	67	51	61	67	82
50	67	68	77	77	76	74	75	64	72	77	83
63	50	57	66	59	59	67	64	58	67	67	84
80	55	64	57	60	64	60	56	64	58	64	85
100	60	69	60	63	71	60	60	71	52	71	86
125	77	64	69	70	70	67	68	65	63	77	87
160	71	70	63	67	72	63	67	71	62	72	88
200	77	71	70	74	70	68	75	73	70	77	89
250	74	74	72	70	76	65	74	75	74	76	90
315	70	69	74	74	80	63	74	77	74	80	91
400	73	76	70	66	75	67	70	72	70	76	92
500	76	83	68	70	78	69	71	74	71	83	93
630	72	77	70	72	70	63	66	71	70	77	94
800	76	86	75	72	76	65	67	75	72	86	95
1000	81	86	72	72	79	66	65	76	69	86	96
1250	82	81	75	78	77	70	73	81	74	82	97
1600	82	86	83	86	83	76	78	91	76	91	98
2000	79	86	82	81	79	77	91	87	91	91	99
2500	73	96	85	81	87	81	87	91	91	96	100
3150	74	83	82	77	90	82	79	89	81	90	101
4000	79	85	86	74	82	82	78	80	77	86	102
5000	80	91	98	72	80	84	81	87	87	98	103
6300	86	92	98	78	81	93	85	89	99	99	104
8000	85	86	92	83	89	91	86	84	98	98	105
10000	74	76	83	77	87	88	74	72	86	88	106





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**Table 3:** Vibration Levels in 1/3<sup>rd</sup> Octave Band in AdB at 75% opening

Freq	Suction Side			Discharge Side			Centre of valve			Max	Limits
	M1X	M1Y	M1Z	M2X	M2Y	M2Z	M3X	M3Y	M3Z		
10	51	55	57	57	57	60	51	55	56	60	76
12.5	57	63	58	55	63	59	53	57	56	63	77
16	63	63	58	63	64	57	63	66	57	66	78
20	61	58	55	61	61	55	60	56	54	61	79
25	58	57	51	56	58	51	54	56	53	58	80
31.5	56	56	53	52	56	52	52	57	53	57	81
40	57	58	68	66	65	67	69	58	65	69	82
50	72	70	77	80	77	79	78	73	78	80	83
63	59	65	72	65	67	75	65	68	72	75	84
80	63	71	66	62	71	67	59	72	66	72	85
100	64	65	63	62	68	63	60	67	59	68	86
125	66	67	66	66	66	63	62	66	59	67	87
160	65	72	68	72	70	67	68	72	63	72	88
200	64	68	67	70	73	64	67	69	70	73	89
250	74	73	79	67	82	67	78	77	80	82	90
315	73	69	75	72	78	66	71	72	74	78	91
400	69	74	69	67	73	66	69	70	68	74	92
500	71	82	70	73	76	68	70	74	72	82	93
630	66	76	70	82	80	73	70	74	74	82	94
800	75	89	73	77	80	72	72	76	73	89	95
1000	81	91	71	83	83	75	71	80	73	91	96
1250	85	91	77	79	78	75	74	88	72	91	97
1600	89	93	84	84	84	75	72	89	70	93	98
2000	83	96	80	78	90	80	78	95	76	96	99
2500	76	94	81	74	83	78	82	92	80	94	100
3150	75	82	78	74	77	79	77	91	76	91	101
4000	77	76	77	69	77	84	69	82	73	84	102
5000	78	82	86	69	78	90	79	89	86	90	103
6300	82	87	96	71	82	85	80	89	93	96	104
8000	83	87	95	69	74	78	81	87	90	95	105
10000	73	78	84	62	64	67	70	78	79	84	106





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**Table 4:** Vibration Levels in 1/3<sup>rd</sup> Octave Band in AdB at 100% opening

Freq	Suction Side			Discharge Side			Centre of valve			Max	Limits
	M1X	M1Y	M1Z	M2X	M2Y	M2Z	M3X	M3Y	M3Z		
10	58	59	55	51	61	55	60	55	59	61	76
12.5	53	59	58	52	58	54	58	57	59	59	77
16	62	63	55	64	60	58	63	66	55	66	78
20	61	54	53	59	58	54	60	58	56	61	79
25	54	55	50	56	59	50	54	60	54	60	80
31.5	55	57	51	57	60	54	54	58	54	60	81
40	55	56	65	66	60	67	70	56	63	70	82
50	61	62	71	73	67	71	77	53	66	77	83
63	49	57	62	54	56	62	58	58	65	65	84
80	60	74	63	64	74	65	59	72	66	74	85
100	69	70	62	74	69	67	69	68	60	74	86
125	70	71	74	74	70	68	65	66	61	74	87
160	66	73	67	67	74	66	65	72	64	74	88
200	67	70	69	64	74	59	65	68	70	74	89
250	77	70	79	68	82	66	77	76	80	82	90
315	75	74	72	68	77	63	71	73	73	77	91
400	76	82	74	70	78	65	68	71	69	82	92
500	69	70	65	65	73	62	65	67	69	73	93
630	73	79	70	80	77	71	76	74	74	80	94
800	76	81	76	79	81	72	76	78	71	81	95
1000	85	92	82	89	89	79	82	86	74	92	96
1250	82	84	77	81	84	76	84	84	68	84	97
1600	86	88	81	79	87	73	77	83	71	88	98
2000	93	87	93	74	83	75	79	93	77	93	99
2500	85	90	89	75	73	80	77	92	77	92	100
3150	76	86	79	76	72	84	75	82	74	86	101
4000	86	79	83	75	76	89	76	72	73	89	102
5000	80	77	85	80	81	92	76	74	80	92	103
6300	83	73	91	81	73	92	75	75	82	92	104
8000	87	77	87	70	60	80	71	69	71	87	105
10000	90	75	84	59	57	70	74	72	72	90	106







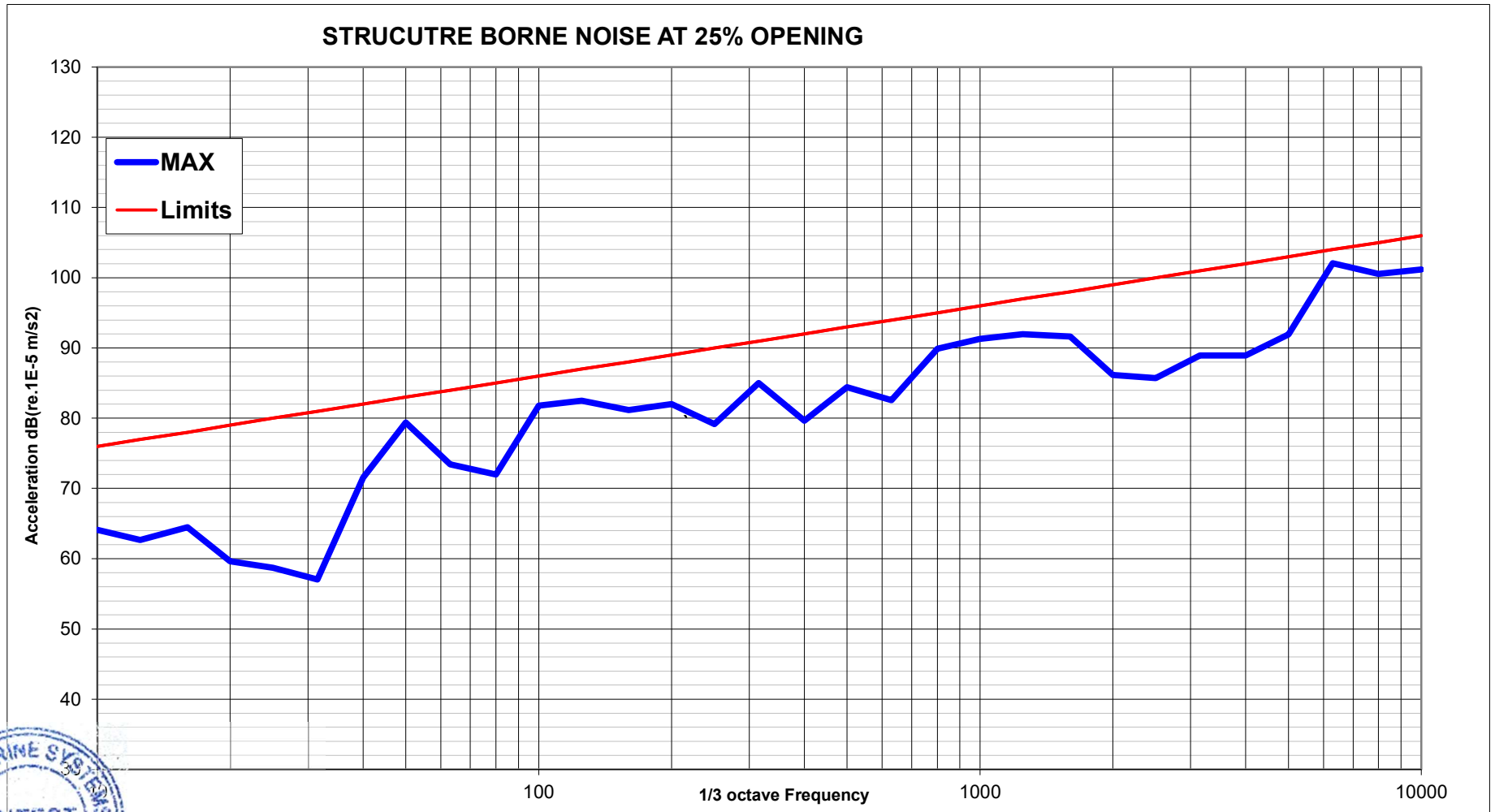
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Figure 1: Maximum SBN levels across 3 locations with Limit Levels at 25% Opening





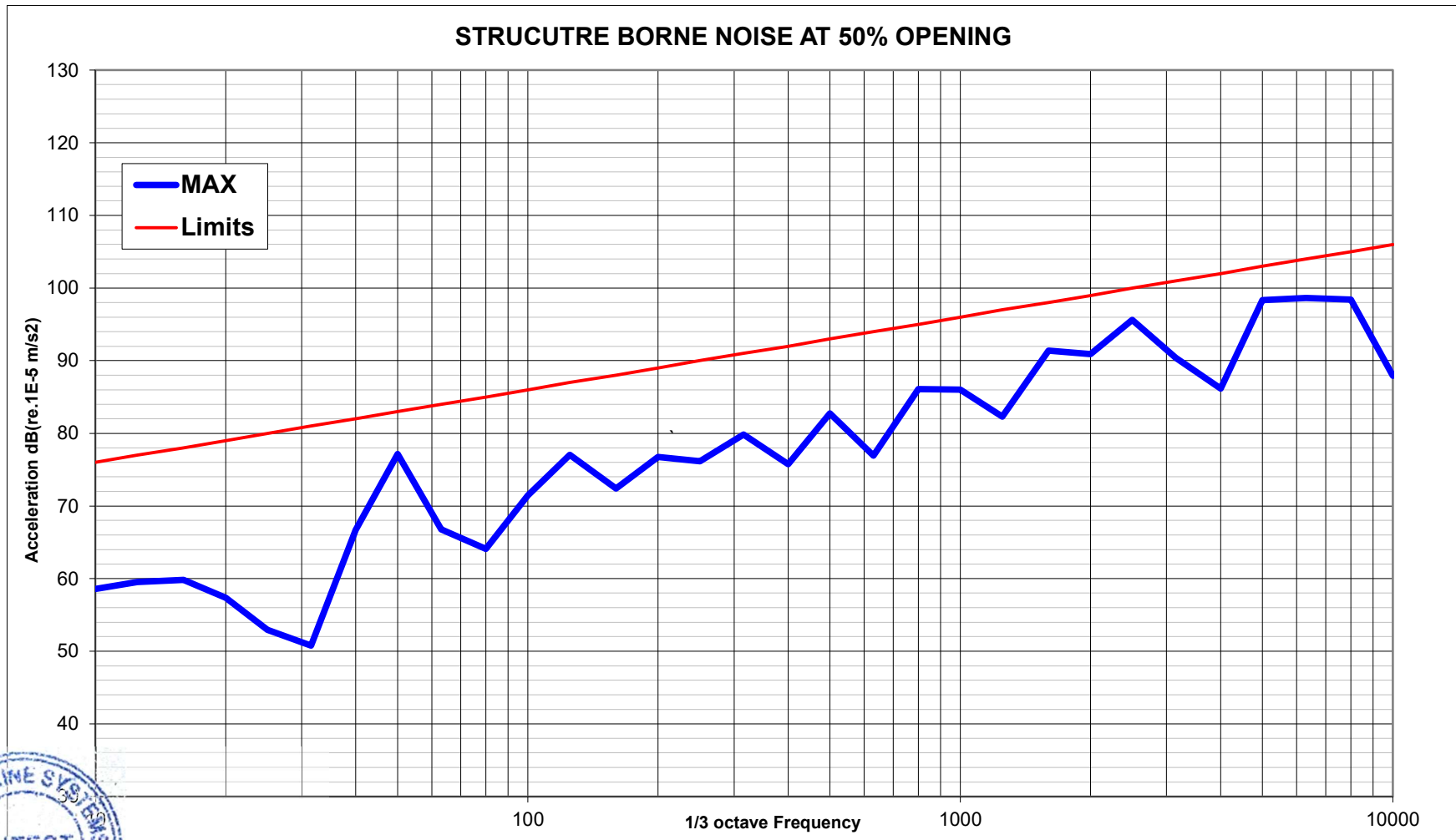
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Figure 2: Maximum SBN levels across 3 locations with Limit Levels at 50% Opening



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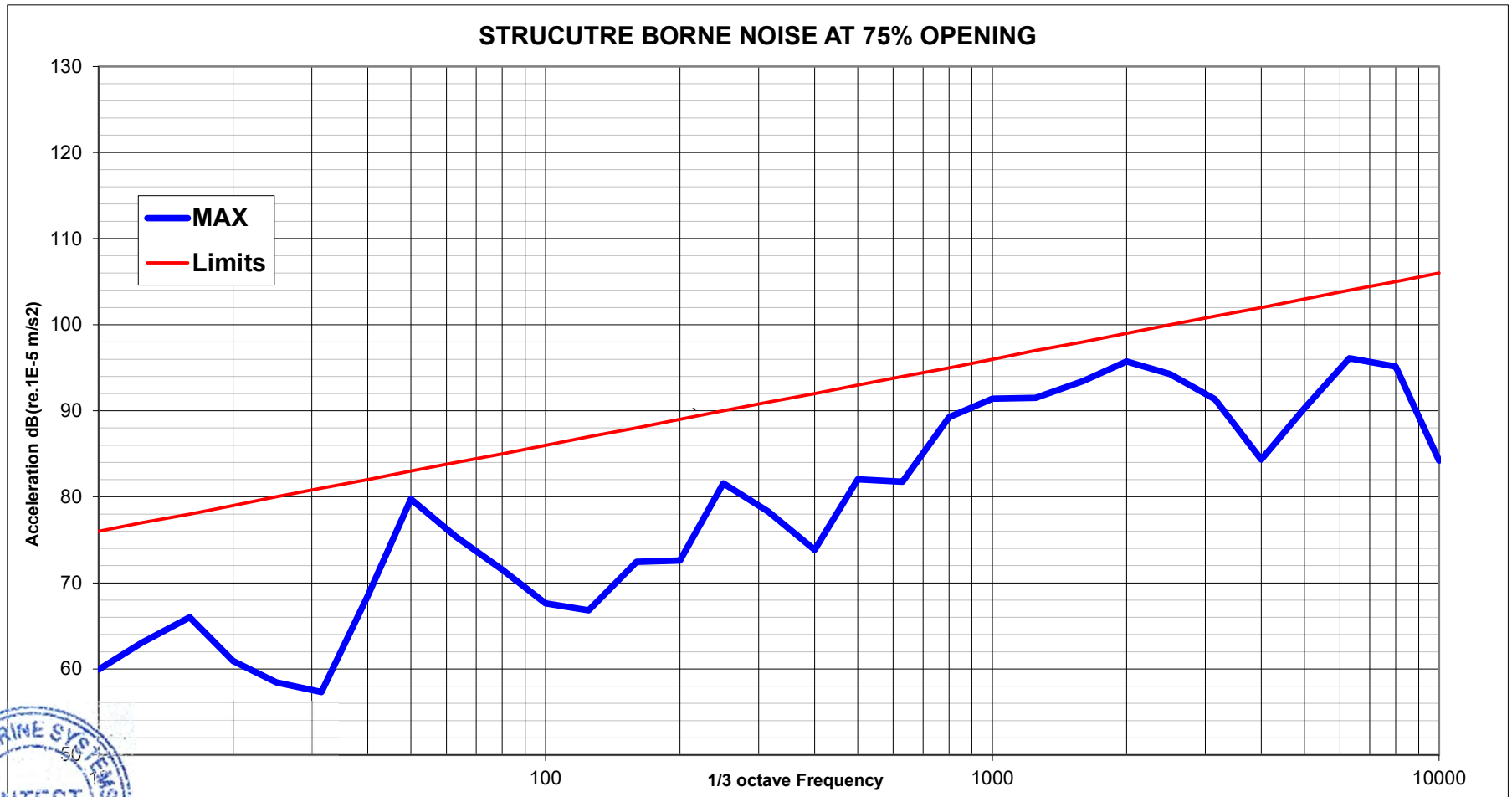
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Figure 3: Maximum SBN levels across 3 locations with Limit Levels at 75% Opening



*S. Ramesh*



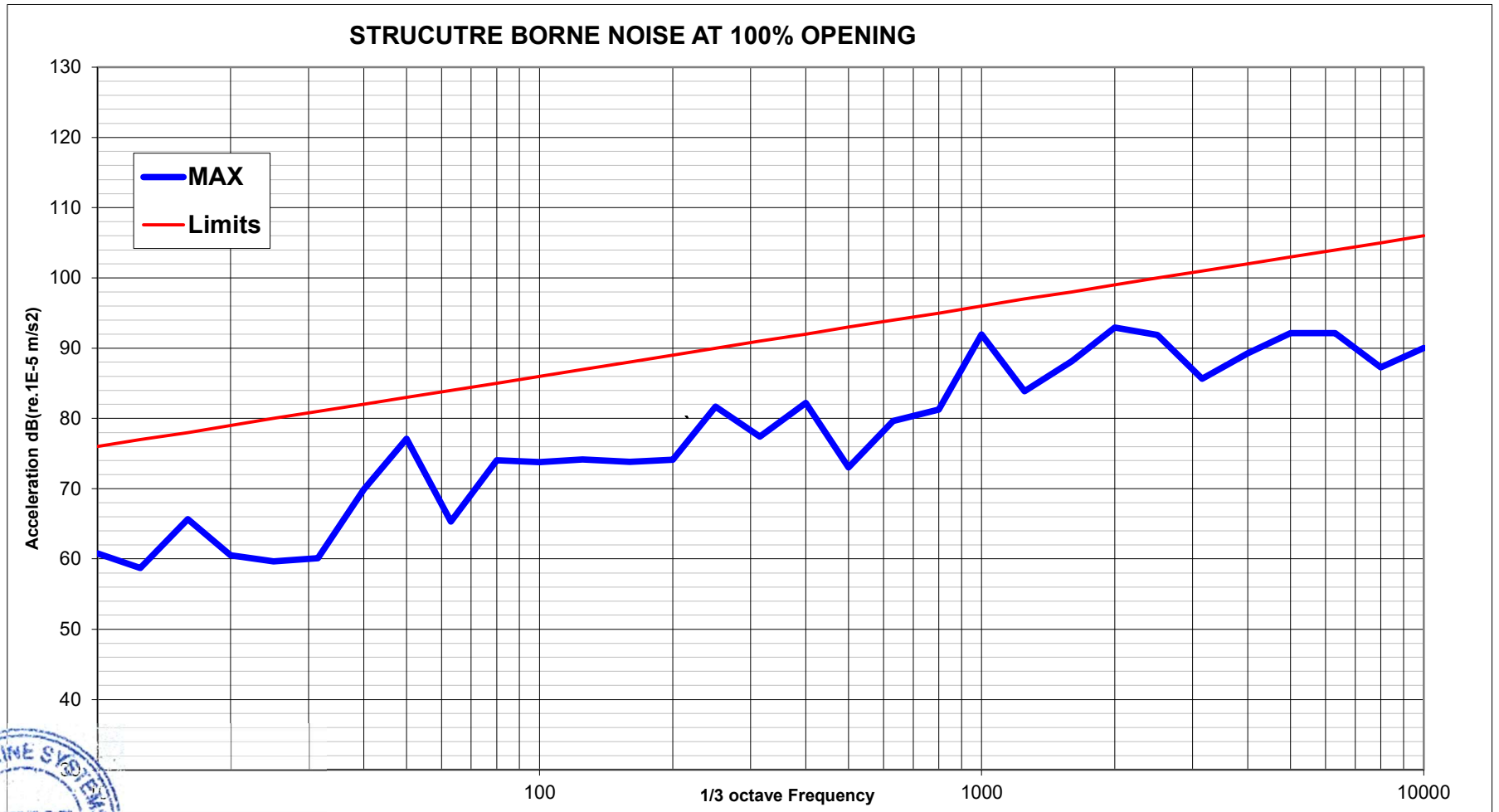
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Figure 4: Maximum SBN levels across 3 locations with Limit Levels at 100% Opening



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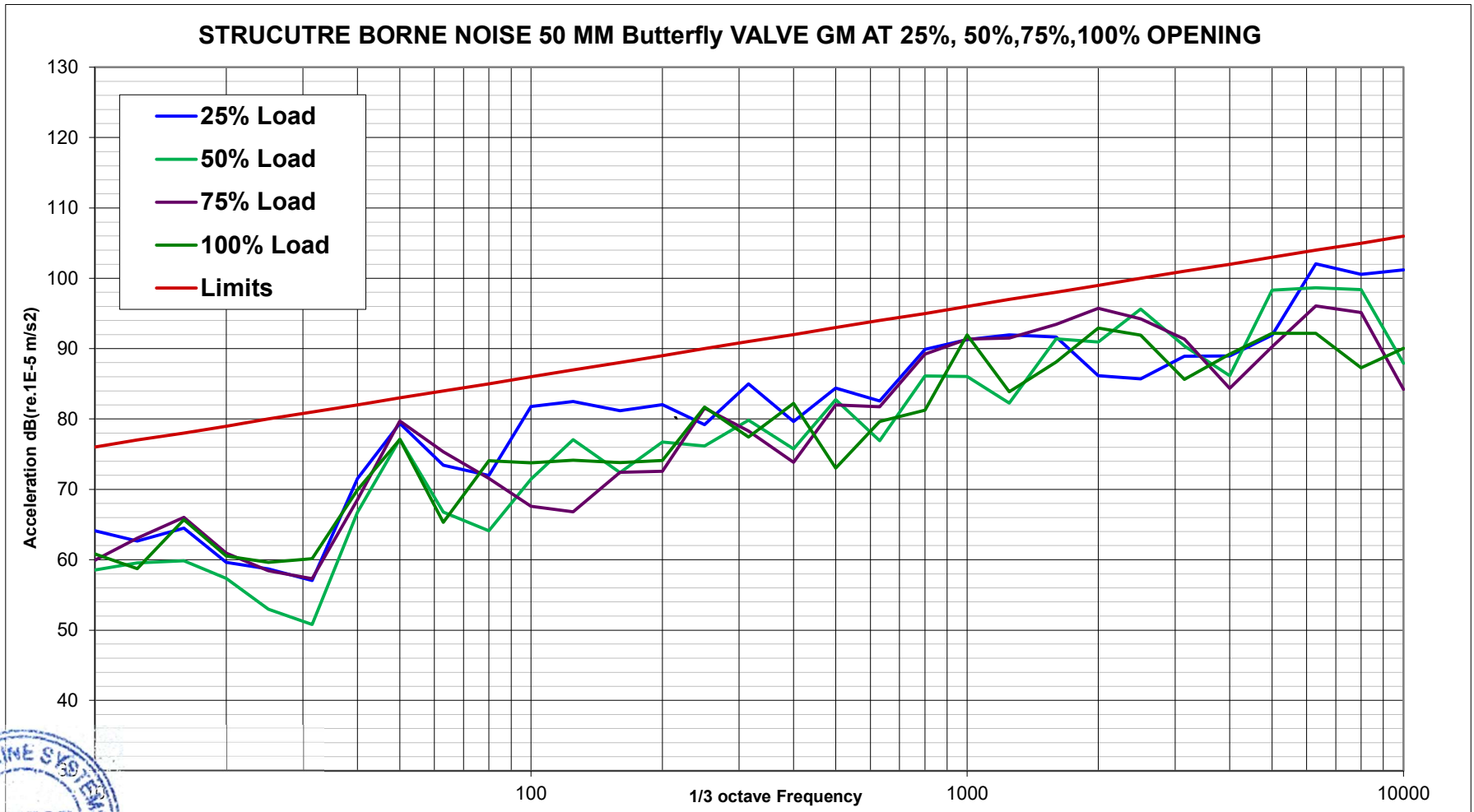
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Figure 5: Maximum SBN levels across 3 locations with Limit Levels at 25%, 50%, 75%, 100% Opening



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