ANEXOS

ANEXO Nº 1

I. EQUIPOS E INSTRUMENTOS UTILIZADOS.

Fig. A1.1 Equipos e Instrumentos Utilizados en las Pruebas Experimentales de Vibraciones.

Fig. A1.2 Analizador de Señales FFT conectado a la Chancadora de Quijada.

Fig. A1.3 Acelerómetro conectado a un Apoyo de la Chancadora de Quijada y Preparado para Recibir señales de Desplazamiento en el Eje X.

Fig. A1.4 Acelerómetro conectado a un Apoyo de la Chancadora de Quijada y Preparado para Recibir señales de Desplazamiento en el Eje Y.

ANEXO Nº 2

I. DETERMINACION DE LA MASA Y CENTRO DE GRAVEDAD DE LA CHANCADORA DE QUIJADA

Fig. A2.1 Balanzas Utilizadas para Medir el Peso Generado en Cada Apoyo de la Chancadora de Quijada.

Fig. A2.2 Ubicación de la Chancadora de Quijada para Posteriormente Apoyarla sobre las Balanzas.

Fig. A2.3 Verificación del Nivel en la Chancadora de Quijada.

Fig. A2.4 Chancadora de Quijada Apoyada sobre las Balanzas.

ANEXO Nº 3:

I. NORMA ISO 10816-3

ISO 10816 was released in August 2000, establishes the general conditions and procedures for measurement and evaluation of vibrations using measurements made on the non-rotating parts of machines. It also provides general evaluation criteria related to both operational monitoring and acceptance testing established primarily with regard to securing reliable long term operation of the machine.

ISO 10816-3 separates the working conditions into four zones:

- **Zone A Green:** Vibration values from machines just put into operation.
- **Zone B Yellow:** Continuous operation without any restrictions.
- **Zone C Orange:** Condition is acceptable only for a limited period of time.
- **Zone D Red:** Dangerous vibration values - damage could occur at any time.

It also defines four groups of machines, according to their size, base and purpose.

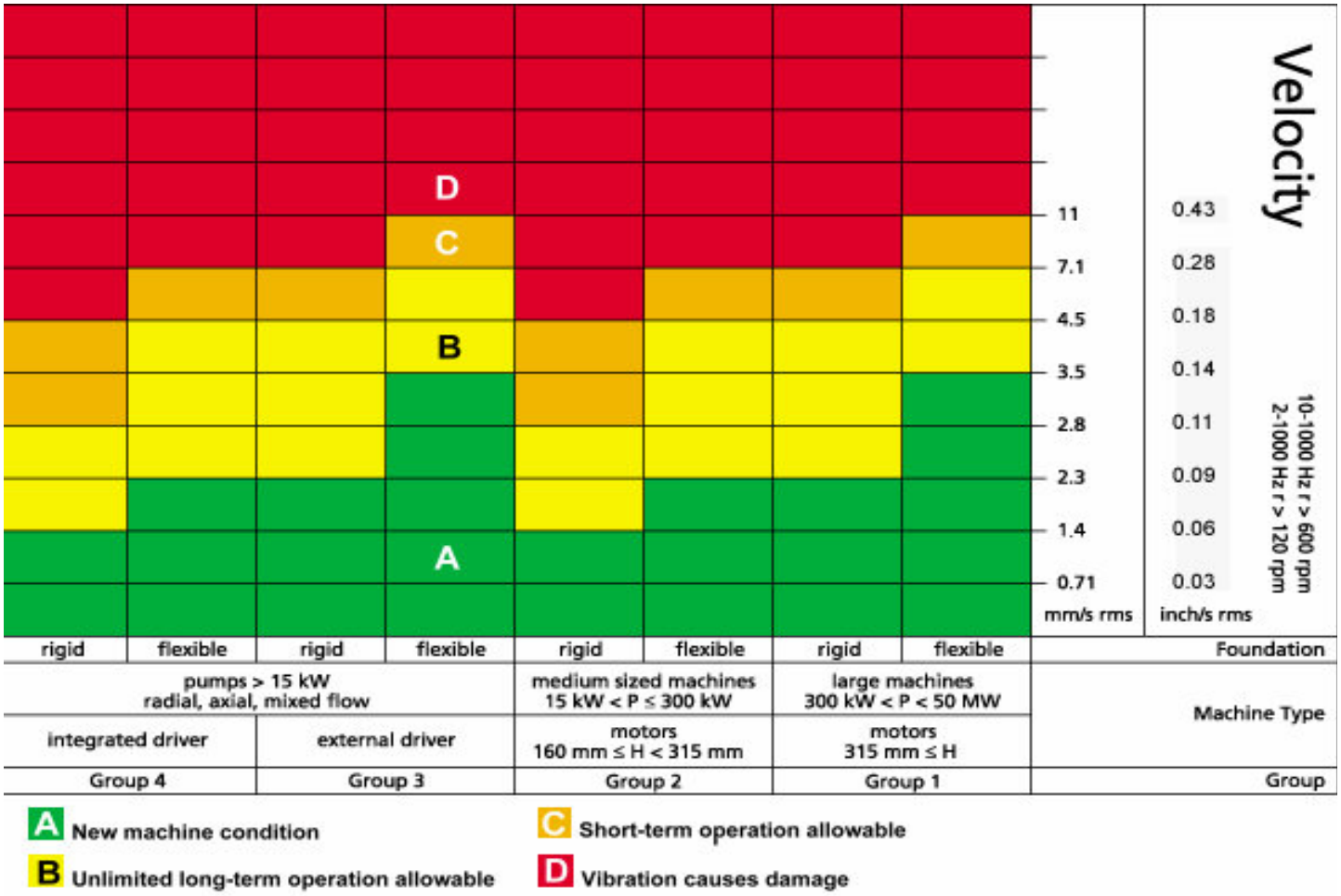


Fig. A3.1 Rango de Velocidades para las Zonas A, B, C, D de la Norma ISO 10816-3.

ANEXO Nº 4:
Anexos Capítulo III

- Anexo A4.1:

Aceleración RMS (m/s^2)
PRUEBA ESPECTRAL CHANCADORA:
EJE XYZ,Sin carga, Ancho de Banda 1.25 kHz

"Brüel & Kjær"
"Sound Analyzer Type 2260"
"FFT Software BZ7208"
"Version" 1 2

"File" "V04"

"Settings:"
"Full Scale" 180.2
"Frequency Span" 1250 Hz
"Centre Frequency" 629.8828
"Weighting" "Lin"
"Measurement Start" "Manual"

"Result:"
"2006 Aug 29" "16:02:57"
"Averaging Time" "22.800"
"Overload" "0%"

"Frequency (Hz)" "RMS (m/s²)"

Frec. (Hz)	Aceler. X RMS (m/s²)	Aceler. Y RMS (m/s²)	Aceler. Z RMS (m/s²)
2.90	1.92E-03	1.46E-03	2.29E-03
5.90	6.65E-03	5.86E-03	9.85E-03
8.80	6.46E-03	5.62E-03	9.38E-03
11.70	6.43E-03	6.82E-03	8.60E-03
14.60	1.10E-02	1.20E-02	1.50E-02
17.60	1.09E-02	1.19E-02	1.80E-02
20.50	3.65E-02	3.89E-02	6.25E-02
23.40	3.35E-02	3.56E-02	5.69E-02
26.40	4.22E-02	5.25E-02	7.05E-02
29.30	6.52E-02	8.41E-02	1.06E-01
32.20	2.95E-02	4.95E-02	4.75E-02
35.20	1.66E-02	8.13E-02	3.37E-02
38.10	2.33E-02	1.12E-01	4.14E-02
41.00	2.76E-02	1.37E-01	4.57E-02
43.90	2.28E-02	1.49E-01	4.50E-02
46.90	2.14E-02	8.68E-02	5.83E-02
49.80	1.81E-02	6.47E-02	1.15E-01
52.70	1.61E-02	5.00E-02	8.42E-02
55.70	1.83E-02	7.83E-02	5.57E-02
58.60	1.82E-02	1.04E-01	6.01E-02
61.50	1.89E-02	9.57E-02	5.97E-02
64.50	2.61E-02	1.51E-01	6.38E-02
67.40	2.87E-02	1.17E-01	4.99E-02
70.30	5.81E-02	1.15E-01	6.53E-02
73.20	6.69E-02	1.20E-01	6.89E-02

76.20	6.70E-02	8.48E-02	5.32E-02
79.10	1.27E-01	1.17E-01	8.23E-02
82.00	7.87E-02	7.27E-02	5.43E-02
85.00	8.22E-02	6.97E-02	4.26E-02
87.90	8.55E-02	7.05E-02	4.06E-02
90.80	6.03E-02	3.53E-02	5.89E-02
93.80	1.06E-01	4.61E-02	9.91E-02
96.70	5.92E-02	3.05E-02	5.96E-02
99.60	6.10E-02	2.27E-02	4.43E-02
102.50	5.82E-02	2.26E-02	4.33E-02
105.50	4.58E-02	3.63E-02	5.64E-02
108.40	6.73E-02	4.93E-02	7.51E-02
111.30	3.68E-02	3.99E-02	4.50E-02
114.30	5.81E-02	6.55E-02	5.11E-02
117.20	5.67E-02	6.94E-02	5.61E-02
120.10	4.08E-02	5.82E-02	4.71E-02
123.00	4.01E-02	5.23E-02	3.81E-02
126.00	2.83E-02	3.09E-02	4.00E-02
128.90	4.57E-02	2.24E-02	5.51E-02
131.80	3.72E-02	1.86E-02	5.12E-02
134.80	2.10E-02	2.33E-02	6.71E-02
137.70	2.06E-02	2.90E-02	8.18E-02
140.60	1.27E-02	1.99E-02	7.25E-02
143.60	1.71E-02	3.78E-02	1.26E-01
146.50	1.49E-02	2.97E-02	9.25E-02
149.40	1.86E-02	3.18E-02	1.44E-01
152.30	2.26E-02	3.88E-02	1.68E-01
155.30	1.40E-02	2.45E-02	1.23E-01
158.20	1.78E-02	4.26E-02	2.06E-01
161.10	1.55E-02	3.15E-02	1.35E-01
164.10	2.42E-02	4.14E-02	1.81E-01
167.00	2.67E-02	4.78E-02	1.88E-01
169.90	1.46E-02	2.46E-02	1.11E-01
172.90	2.28E-02	2.53E-02	1.49E-01
175.80	1.53E-02	2.08E-02	9.53E-02
178.70	1.96E-02	2.73E-02	8.31E-02
181.60	1.97E-02	2.87E-02	8.18E-02
184.60	9.54E-03	2.13E-02	1.05E-01
187.50	1.15E-02	2.33E-02	1.44E-01
190.40	7.95E-03	1.79E-02	8.83E-02
193.40	9.38E-03	2.27E-02	1.20E-01
196.30	1.06E-02	2.29E-02	1.09E-01
199.20	1.06E-02	1.89E-02	1.08E-01
202.10	1.37E-02	2.71E-02	1.48E-01
205.10	1.33E-02	1.92E-02	9.42E-02

208.00	1.96E-02	2.06E-02	1.49E-01
210.90	2.04E-02	3.21E-02	1.21E-01
213.90	2.35E-02	3.89E-02	1.20E-01
216.80	3.06E-02	3.44E-02	1.54E-01
219.70	2.30E-02	2.61E-02	1.03E-01
222.70	4.50E-02	3.96E-02	1.72E-01
225.60	4.32E-02	3.99E-02	1.33E-01
228.50	3.54E-02	5.81E-02	1.45E-01
231.40	4.33E-02	7.98E-02	1.68E-01
234.40	2.97E-02	6.23E-02	1.32E-01
237.30	4.37E-02	1.11E-01	2.14E-01
240.20	3.75E-02	9.68E-02	1.50E-01
243.20	4.49E-02	1.09E-01	1.61E-01
246.10	5.44E-02	1.31E-01	1.64E-01
249.00	4.14E-02	8.71E-02	9.42E-02
252.00	6.89E-02	1.62E-01	1.36E-01
254.90	5.86E-02	1.25E-01	9.24E-02
257.80	8.41E-02	1.33E-01	1.05E-01
260.70	9.50E-02	1.48E-01	1.02E-01
263.70	6.79E-02	7.77E-02	6.59E-02
266.60	9.51E-02	9.81E-02	7.36E-02
269.50	6.51E-02	6.57E-02	5.77E-02
272.50	5.25E-02	7.10E-02	6.29E-02
275.40	4.85E-02	7.26E-02	5.78E-02
278.30	3.42E-02	4.21E-02	5.79E-02
281.30	3.56E-02	4.88E-02	7.15E-02
284.20	2.89E-02	3.48E-02	6.58E-02
287.10	3.25E-02	3.62E-02	9.97E-02
290.00	2.95E-02	3.59E-02	8.69E-02
293.00	2.44E-02	3.14E-02	7.59E-02
295.90	3.13E-02	3.25E-02	8.74E-02
298.80	2.24E-02	3.35E-02	5.94E-02
301.80	2.92E-02	5.90E-02	8.29E-02
304.70	2.80E-02	5.47E-02	6.89E-02
307.60	3.25E-02	3.80E-02	7.66E-02
310.50	4.11E-02	4.39E-02	8.60E-02
313.50	2.55E-02	3.20E-02	4.59E-02
316.40	2.79E-02	4.23E-02	6.27E-02
319.30	2.75E-02	4.44E-02	5.30E-02
322.30	3.07E-02	5.35E-02	5.26E-02
325.20	3.73E-02	6.38E-02	5.34E-02
328.10	2.62E-02	3.96E-02	3.73E-02
331.10	2.58E-02	3.72E-02	4.80E-02
334.00	2.35E-02	3.25E-02	3.60E-02
336.90	1.90E-02	3.91E-02	3.12E-02

339.80	1.91E-02	4.54E-02	2.81E-02
342.80	1.82E-02	3.56E-02	2.72E-02
345.70	1.78E-02	4.99E-02	3.28E-02
348.60	1.82E-02	4.63E-02	2.64E-02

- **Anexo A4.2:**

Desplazamiento RMS (m)
PRUEBA ESPECTRAL CHANCADORA:
EJE XYZ,Sin carga, Ancho de Banda 1.25 kHz

"Brüel & Kjær"
"Sound Analyzer Type 2260"
"FFT Software BZ7208"
"Version" 1 2

"File" "V04"

"Settings:"
"Full Scale" 180.2
"Frequency Span" 1250 Hz
"Centre Frequency" 629.8828
"Weighting" "Lin"
"Measurement Start" "Manual"

"Result:"
"2006 Aug 29" "16:02:57"
"Averaging Time" "22.800"
"Overload" "0%"
"Frequency (Hz)" "RMS (m)"

Frec. (Hz)	Desplaz. X RMS (m)	Desplaz.Y RMS (m)	Desplaz. Z RMS (m)
2.9	5.66E-06	4.32E-06	6.75E-06
5.9	4.90E-06	4.32E-06	7.26E-06
8.8	2.12E-06	1.84E-06	3.07E-06
11.7	1.18E-06	1.26E-06	1.58E-06
14.6	1.30E-06	1.41E-06	1.77E-06
17.6	8.90E-07	9.76E-07	1.48E-06
20.5	2.20E-06	2.34E-06	3.76E-06
23.4	1.54E-06	1.64E-06	2.62E-06
26.4	1.54E-06	1.91E-06	2.57E-06
29.3	1.93E-06	2.48E-06	3.13E-06
32.2	7.19E-07	1.21E-06	1.16E-06
35.2	3.40E-07	1.67E-06	6.91E-07
38.1	4.06E-07	1.96E-06	7.23E-07
41	4.15E-07	2.06E-06	6.87E-07
43.9	2.99E-07	1.95E-06	5.90E-07
46.9	2.47E-07	1.00E-06	6.72E-07
49.8	1.84E-07	6.61E-07	1.17E-06
52.7	1.47E-07	4.56E-07	7.67E-07
55.7	1.49E-07	6.40E-07	4.55E-07
58.6	1.34E-07	7.66E-07	4.44E-07
61.5	1.27E-07	6.40E-07	3.99E-07
64.5	1.59E-07	9.23E-07	3.89E-07

67.4	1.60E-07	6.54E-07	2.79E-07
70.3	2.98E-07	5.91E-07	3.35E-07
73.2	3.16E-07	5.65E-07	3.25E-07
76.2	2.92E-07	3.70E-07	2.32E-07
79.1	5.13E-07	4.73E-07	3.33E-07
82	2.96E-07	2.74E-07	2.04E-07
85	2.88E-07	2.45E-07	1.49E-07
87.9	2.80E-07	2.31E-07	1.33E-07
90.8	1.85E-07	1.08E-07	1.81E-07
93.8	3.06E-07	1.33E-07	2.85E-07
96.7	1.61E-07	8.26E-08	1.61E-07
99.6	1.56E-07	5.79E-08	1.13E-07
102.5	1.40E-07	5.45E-08	1.04E-07
105.5	1.04E-07	8.26E-08	1.29E-07
108.4	1.45E-07	1.06E-07	1.62E-07
111.3	7.52E-08	8.17E-08	9.19E-08
114.3	1.13E-07	1.27E-07	9.92E-08
117.2	1.05E-07	1.28E-07	1.04E-07
120.1	7.16E-08	1.02E-07	8.27E-08
123	6.71E-08	8.75E-08	6.38E-08
126	4.51E-08	4.94E-08	6.39E-08
128.9	6.97E-08	3.41E-08	8.39E-08
131.8	5.43E-08	2.71E-08	7.46E-08
134.8	2.92E-08	3.25E-08	9.35E-08
137.7	2.75E-08	3.88E-08	1.09E-07
140.6	1.63E-08	2.55E-08	9.29E-08
143.6	2.10E-08	4.65E-08	1.55E-07
146.5	1.76E-08	3.50E-08	1.09E-07
149.4	2.11E-08	3.61E-08	1.64E-07
152.3	2.47E-08	4.23E-08	1.83E-07
155.3	1.47E-08	2.57E-08	1.30E-07
158.2	1.80E-08	4.31E-08	2.08E-07
161.1	1.51E-08	3.08E-08	1.32E-07
164.1	2.27E-08	3.89E-08	1.70E-07
167	2.42E-08	4.35E-08	1.71E-07
169.9	1.28E-08	2.16E-08	9.71E-08
172.9	1.93E-08	2.15E-08	1.26E-07
175.8	1.25E-08	1.71E-08	7.81E-08
178.7	1.55E-08	2.17E-08	6.59E-08
181.6	1.51E-08	2.20E-08	6.28E-08
184.6	7.10E-09	1.58E-08	7.84E-08
187.5	8.28E-09	1.68E-08	1.04E-07
190.4	5.55E-09	1.25E-08	6.17E-08
193.4	6.35E-09	1.54E-08	8.15E-08
196.3	6.95E-09	1.51E-08	7.19E-08

199.2	6.76E-09	1.21E-08	6.88E-08
202.1	8.50E-09	1.68E-08	9.16E-08
205.1	8.03E-09	1.15E-08	5.68E-08
208	1.15E-08	1.21E-08	8.75E-08
210.9	1.16E-08	1.83E-08	6.89E-08
213.9	1.30E-08	2.16E-08	6.64E-08
216.8	1.65E-08	1.86E-08	8.31E-08
219.7	1.21E-08	1.37E-08	5.43E-08
222.7	2.30E-08	2.03E-08	8.77E-08
225.6	2.15E-08	1.99E-08	6.61E-08
228.5	1.72E-08	2.82E-08	7.02E-08
231.4	2.05E-08	3.78E-08	7.97E-08
234.4	1.37E-08	2.87E-08	6.08E-08
237.3	1.97E-08	4.97E-08	9.64E-08
240.2	1.64E-08	4.25E-08	6.58E-08
243.2	1.92E-08	4.68E-08	6.89E-08
246.1	2.28E-08	5.49E-08	6.88E-08
249	1.69E-08	3.56E-08	3.85E-08
252	2.75E-08	6.45E-08	5.41E-08
254.9	2.29E-08	4.86E-08	3.60E-08
257.8	3.21E-08	5.08E-08	4.01E-08
260.7	3.54E-08	5.52E-08	3.80E-08
263.7	2.47E-08	2.83E-08	2.40E-08
266.6	3.39E-08	3.50E-08	2.62E-08
269.5	2.27E-08	2.29E-08	2.01E-08
272.5	1.79E-08	2.42E-08	2.15E-08
275.4	1.62E-08	2.43E-08	1.93E-08
278.3	1.12E-08	1.38E-08	1.89E-08
281.3	1.14E-08	1.56E-08	2.29E-08
284.2	9.07E-09	1.09E-08	2.07E-08
287.1	1.00E-08	1.11E-08	3.06E-08
290	8.88E-09	1.08E-08	2.62E-08
293	7.19E-09	9.26E-09	2.24E-08
295.9	9.06E-09	9.42E-09	2.53E-08
298.8	6.35E-09	9.50E-09	1.68E-08
301.8	8.13E-09	1.64E-08	2.31E-08
304.7	7.65E-09	1.49E-08	1.88E-08
307.6	8.69E-09	1.02E-08	2.05E-08
310.5	1.08E-08	1.15E-08	2.26E-08
313.5	6.58E-09	8.26E-09	1.18E-08
316.4	7.06E-09	1.07E-08	1.58E-08
319.3	6.84E-09	1.10E-08	1.32E-08
322.3	7.49E-09	1.31E-08	1.28E-08
325.2	8.94E-09	1.53E-08	1.28E-08
328.1	6.17E-09	9.32E-09	8.78E-09

331.1	5.96E-09	8.59E-09	1.11E-08
334	5.33E-09	7.39E-09	8.18E-09
336.9	4.23E-09	8.72E-09	6.95E-09
339.8	4.19E-09	9.95E-09	6.16E-09
342.8	3.93E-09	7.66E-09	5.86E-09
345.7	3.77E-09	1.06E-08	6.96E-09
348.6	3.79E-09	9.66E-09	5.50E-09

- **Anexo A4.3:**

Aceleración RMS (m/s^2)
PRUEBA ESPECTRAL CHANCADORA:
EJE Z,Sin carga, Ancho de Banda 20 kHz

"Brüel & Kjær"
"Sound Analyzer Type 2260"
"FFT Software BZ7208"
"Version" 1 2

"File" "V01"

"Settings:"
"Full Scale" 180.2
"Frequency Span" 20000 Hz
"Centre Frequency" 10078.12
"Weighting" "Lin"
"Measurement Start" "Manual"

"Result:"
"2006 Aug 29" "16:00:25"
"Averaging Time" "01.425"
"Overload" "0%"

"Frequency (Hz)" "RMS (m/s²)"

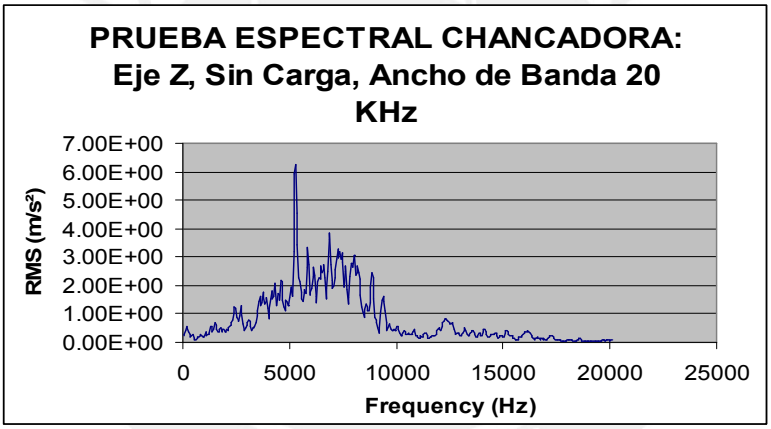
Frec. Hz	Aceler. X (m/s²)	Aceler. Y (m/s²)	Aceler. Z (m/s²)
46.9	1.87E-01	3.28E-01	2.28E-01
93.8	2.63E-01	2.62E-01	2.73E-01
140.6	1.58E-01	1.45E-01	4.28E-01
187.5	9.28E-02	1.41E-01	5.45E-01
234.4	2.35E-01	3.06E-01	5.04E-01
281.3	2.59E-01	2.99E-01	3.55E-01
328.1	1.24E-01	2.60E-01	2.64E-01
375	1.06E-01	3.66E-01	2.04E-01
421.9	1.61E-01	4.35E-01	2.26E-01
468.8	2.42E-01	6.20E-01	2.59E-01
515.6	2.36E-01	4.17E-01	1.29E-01
562.5	1.68E-01	2.64E-01	7.10E-02
609.4	1.57E-01	3.06E-01	1.08E-01
656.3	1.68E-01	2.89E-01	1.47E-01
703.1	2.23E-01	2.81E-01	1.85E-01
750	3.42E-01	2.55E-01	2.08E-01
796.9	3.75E-01	4.04E-01	2.52E-01
843.8	3.83E-01	6.21E-01	2.65E-01
890.6	3.72E-01	6.00E-01	2.13E-01

937.5	2.58E-01	6.73E-01	1.72E-01
984.4	2.73E-01	7.11E-01	1.72E-01
1031.3	3.11E-01	1.08E+00	2.47E-01
1078.1	2.74E-01	1.45E+00	3.54E-01
1125	2.49E-01	9.33E-01	2.39E-01
1171.9	3.68E-01	1.26E+00	2.56E-01
1218.8	4.18E-01	1.53E+00	2.89E-01
1265.6	4.96E-01	1.07E+00	3.41E-01
1312.5	5.30E-01	8.58E-01	5.42E-01
1359.4	4.84E-01	6.92E-01	5.70E-01
1406.3	5.24E-01	5.92E-01	3.85E-01
1453.1	4.83E-01	7.28E-01	4.67E-01
1500	4.05E-01	1.02E+00	6.78E-01
1546.9	3.55E-01	1.10E+00	6.20E-01
1593.8	3.07E-01	1.00E+00	4.66E-01
1640.6	2.62E-01	1.11E+00	3.91E-01
1687.5	2.34E-01	1.03E+00	3.77E-01
1734.4	3.34E-01	7.60E-01	4.69E-01
1781.3	3.77E-01	8.11E-01	5.04E-01
1828.1	3.04E-01	6.66E-01	3.84E-01
1875	2.44E-01	9.47E-01	4.58E-01
1921.9	2.32E-01	1.45E+00	4.67E-01
1968.8	3.34E-01	1.44E+00	3.86E-01
2015.6	3.59E-01	1.30E+00	3.66E-01
2062.5	3.38E-01	1.01E+00	4.44E-01
2109.4	3.60E-01	7.29E-01	4.29E-01
2156.3	4.54E-01	9.50E-01	5.19E-01
2203.1	7.56E-01	1.15E+00	5.44E-01
2250	7.57E-01	1.58E+00	5.92E-01
2296.9	7.19E-01	1.51E+00	6.78E-01
2343.8	8.33E-01	1.13E+00	7.82E-01
2390.6	7.55E-01	1.31E+00	1.00E+00
2437.5	7.52E-01	1.65E+00	1.24E+00
2484.4	7.38E-01	1.63E+00	1.20E+00
2531.3	6.03E-01	1.54E+00	8.64E-01
2578.1	6.00E-01	2.29E+00	8.04E-01
2625	7.66E-01	1.91E+00	7.63E-01
2671.9	9.72E-01	1.08E+00	9.12E-01
2718.8	9.99E-01	1.09E+00	1.30E+00
2765.6	7.72E-01	1.03E+00	1.02E+00
2812.5	7.04E-01	8.01E-01	6.48E-01
2859.4	7.49E-01	4.43E-01	4.44E-01
2906.3	9.85E-01	4.80E-01	4.16E-01
2953.1	1.52E+00	6.32E-01	5.21E-01
3000	2.04E+00	8.44E-01	6.09E-01

3046.9	2.30E+00	8.29E-01	7.06E-01
3093.8	1.91E+00	9.45E-01	7.83E-01
3140.6	1.34E+00	1.03E+00	7.64E-01
3187.5	1.37E+00	8.58E-01	5.69E-01
3234.4	1.32E+00	8.31E-01	4.24E-01
3281.3	8.79E-01	8.19E-01	5.15E-01
3328.1	5.22E-01	1.19E+00	5.09E-01
3375	9.79E-01	2.06E+00	5.46E-01
3421.9	1.46E+00	2.99E+00	6.75E-01
3468.8	1.39E+00	3.58E+00	9.42E-01
3515.6	1.38E+00	2.60E+00	1.13E+00
3562.5	1.16E+00	1.59E+00	1.42E+00
3609.4	1.04E+00	2.31E+00	1.61E+00
3656.3	9.53E-01	2.54E+00	1.28E+00
3703.1	8.91E-01	2.22E+00	1.39E+00
3750	9.72E-01	1.78E+00	1.78E+00
3796.9	1.38E+00	1.88E+00	1.58E+00
3843.8	1.89E+00	1.75E+00	1.37E+00
3890.6	2.52E+00	1.73E+00	1.43E+00
3937.5	2.70E+00	1.79E+00	1.57E+00
3984.4	2.07E+00	1.48E+00	1.19E+00
4031.3	2.22E+00	1.50E+00	8.20E-01
4078.1	3.13E+00	2.84E+00	1.19E+00
4125	4.16E+00	3.37E+00	1.55E+00
4171.9	4.22E+00	2.48E+00	1.79E+00
4218.8	2.44E+00	1.82E+00	1.55E+00
4265.6	1.82E+00	2.58E+00	1.63E+00
4312.5	2.79E+00	3.34E+00	2.07E+00
4359.4	3.94E+00	3.56E+00	2.04E+00
4406.3	5.12E+00	4.37E+00	1.30E+00
4453.1	4.75E+00	4.61E+00	1.69E+00
4500	2.80E+00	3.50E+00	1.66E+00
4546.9	2.05E+00	2.28E+00	1.50E+00
4593.8	2.42E+00	1.82E+00	2.19E+00
4640.6	2.04E+00	2.30E+00	2.14E+00
4687.5	2.45E+00	3.04E+00	1.49E+00
4734.4	2.62E+00	2.91E+00	1.27E+00
4781.3	2.61E+00	2.95E+00	1.13E+00
4828.1	2.85E+00	2.86E+00	1.47E+00
4875	3.68E+00	3.25E+00	1.46E+00
4921.9	6.05E+00	4.44E+00	1.31E+00
4968.8	7.91E+00	5.26E+00	1.29E+00
5015.6	8.36E+00	6.07E+00	1.59E+00
5062.5	8.28E+00	7.47E+00	1.96E+00
5109.4	7.16E+00	7.06E+00	1.84E+00

5156.3	6.01E+00	4.81E+00	1.61E+00
5203.1	5.41E+00	2.99E+00	3.21E+00
5250	5.05E+00	2.81E+00	5.95E+00
5296.9	3.51E+00	2.66E+00	6.24E+00
5343.8	1.80E+00	2.69E+00	4.53E+00
5390.6	1.22E+00	2.47E+00	3.44E+00
5437.5	1.15E+00	2.15E+00	2.26E+00
5484.4	1.72E+00	1.95E+00	2.14E+00
5531.3	2.75E+00	2.49E+00	1.77E+00
5578.1	2.96E+00	2.60E+00	1.55E+00
5625	2.20E+00	2.30E+00	1.42E+00
5671.9	2.22E+00	1.96E+00	1.74E+00
5718.8	2.81E+00	1.91E+00	1.85E+00

Con los datos experimentales obtenidos de la Tabla anterior, podemos expresarlos gráficamente en la figura siguiente:



- **Anexo A4.4:**

Desplazamiento RMS (m)
PRUEBA ESPECTRAL CHANCADORA:
EJE Z,Sin carga, Ancho de Banda 20 kHz

"Brüel & Kjær"
"Sound Analyzer Type 2260"
"FFT Software BZ7208"
"Version" 1 2

"File" "V01"

"Settings:"
"Full Scale" 180.2
"Frequency Span" 20000 Hz
"Centre Frequency" 10078.12
"Weighting" "Lin"
"Measurement Start" "Manual"

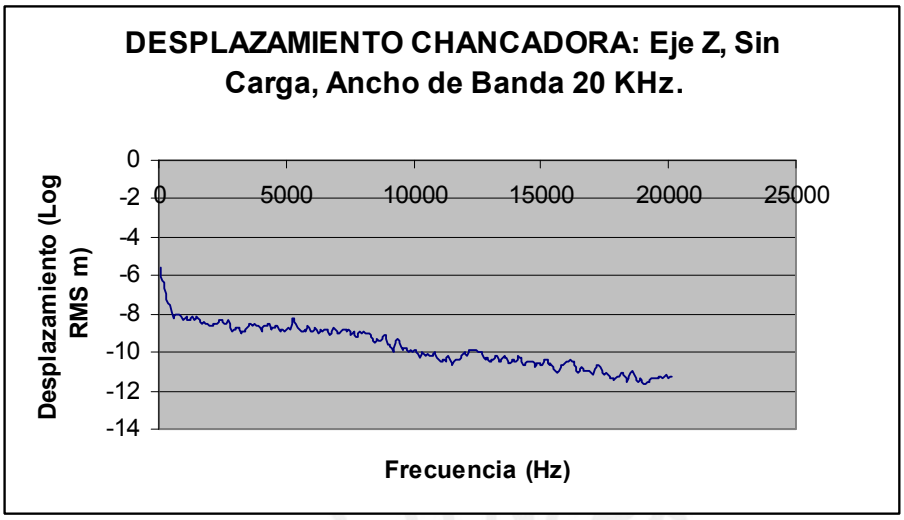
"Result:"
"2006 Aug 29" "16:00:25"
"Averaging Time" "01.425"

"Overload" "0%"

"Frequency (Hz)" "RMS (m)"

Frec. Hz	Desplaz. X (m)	Desplaz. Y (m)	Desplaz. Z (m)
46.9	2.16E-06	3.78E-06	2.63E-06
93.8	7.59E-07	7.53E-07	7.86E-07
140.6	2.03E-07	1.86E-07	5.48E-07
187.5	6.68E-08	1.02E-07	3.92E-07
234.4	1.08E-07	1.41E-07	2.33E-07
281.3	8.29E-08	9.57E-08	1.14E-07
328.1	2.91E-08	6.12E-08	6.21E-08
375	1.91E-08	6.59E-08	3.68E-08
421.9	2.30E-08	6.19E-08	3.22E-08
468.8	2.79E-08	7.15E-08	2.98E-08
515.6	2.25E-08	3.98E-08	1.22E-08
562.5	1.35E-08	2.11E-08	5.69E-09
609.4	1.07E-08	2.09E-08	7.37E-09
656.3	9.90E-09	1.70E-08	8.67E-09
703.1	1.14E-08	1.44E-08	9.48E-09
750	1.54E-08	1.15E-08	9.38E-09
796.9	1.50E-08	1.61E-08	1.01E-08
843.8	1.36E-08	2.21E-08	9.45E-09
890.6	1.19E-08	1.92E-08	6.82E-09
937.5	7.45E-09	1.94E-08	4.97E-09
984.4	7.13E-09	1.86E-08	4.50E-09
1031.3	7.40E-09	2.57E-08	5.87E-09
1078.1	5.96E-09	3.16E-08	7.71E-09
1125	4.98E-09	1.87E-08	4.79E-09
1171.9	6.79E-09	2.32E-08	4.72E-09
1218.8	7.14E-09	2.61E-08	4.93E-09
1265.6	7.84E-09	1.69E-08	5.39E-09
1312.5	7.80E-09	1.26E-08	7.97E-09
1359.4	6.64E-09	9.48E-09	7.81E-09
1406.3	6.71E-09	7.59E-09	4.94E-09
1453.1	5.79E-09	8.73E-09	5.60E-09
1500	4.56E-09	1.15E-08	7.64E-09

Con los datos experimentales obtenidos de la Tabla anterior, podemos expresarlos gráficamente en la figura siguiente:



- **Anexo A4.5:**

Aceleración RMS (m/s^2)
PRUEBA ESPECTRAL CHANCADORA:
EJE Z,Con carga, Ancho de Banda 20 kHz

"Brüel & Kjær"
"Sound Analyzer Type 2260"
"FFT Software BZ7208"
"Version" 1 2

"File" "V01"

"Settings:"
"Full Scale" 180.2
"Frequency Span" 20000 Hz
"Centre Frequency" 10078.12
"Weighting" "Lin"
"Measurement Start" "Manual"

"Result:"
"2006 Aug 29" "16:00:25"
"Averaging Time" "01.425"
"Overload" "0%"

"Frequency (Hz)" "RMS (m/s²)"

Frec. Hz	**Aceler. X (m/s²)**	**Aceler. Y (m/s²)**	**Aceler. Z (m/s²)**
46.9	5.56E-01	3.65E-01	6.85E-01
93.8	5.25E-01	3.77E-01	8.20E-01
140.6	4.06E-01	2.29E-01	1.12E+00
187.5	4.76E-01	2.52E-01	1.10E+00
234.4	8.15E-01	4.06E-01	8.70E-01
281.3	7.66E-01	3.87E-01	7.49E-01
328.1	5.04E-01	3.58E-01	5.11E-01
375	7.41E-01	4.91E-01	5.41E-01
421.9	1.18E+00	7.17E-01	6.40E-01
468.8	1.39E+00	8.79E-01	5.26E-01
515.6	2.14E+00	6.47E-01	2.67E-01

562.5	2.51E+00	5.59E-01	1.78E-01
609.4	1.67E+00	5.90E-01	1.91E-01
656.3	1.74E+00	4.27E-01	2.00E-01
703.1	2.04E+00	4.00E-01	2.37E-01
750	2.57E+00	4.78E-01	3.32E-01
796.9	2.98E+00	6.94E-01	4.07E-01
843.8	2.70E+00	6.92E-01	4.70E-01
890.6	2.49E+00	7.57E-01	3.31E-01
937.5	2.49E+00	8.09E-01	2.30E-01
984.4	2.61E+00	9.92E-01	3.21E-01
1031.3	2.64E+00	1.61E+00	4.08E-01
1078.1	2.46E+00	1.69E+00	5.64E-01
1125	1.82E+00	9.56E-01	4.95E-01
1171.9	1.44E+00	9.07E-01	4.38E-01
1218.8	1.47E+00	9.18E-01	4.85E-01
1265.6	1.51E+00	9.77E-01	5.92E-01
1312.5	1.71E+00	1.15E+00	7.66E-01
1359.4	2.21E+00	1.09E+00	7.59E-01
1406.3	2.54E+00	7.94E-01	5.81E-01
1453.1	2.46E+00	9.74E-01	6.04E-01
1500	1.92E+00	1.25E+00	7.22E-01
1546.9	1.47E+00	1.26E+00	8.36E-01
1593.8	1.30E+00	1.37E+00	9.89E-01
1640.6	1.18E+00	1.67E+00	1.44E+00
1687.5	1.09E+00	1.51E+00	2.10E+00
1734.4	1.24E+00	1.28E+00	2.74E+00
1781.3	1.62E+00	1.15E+00	2.15E+00
1828.1	1.82E+00	1.04E+00	1.61E+00
1875	2.47E+00	1.51E+00	1.66E+00
1921.9	2.83E+00	2.10E+00	1.61E+00
1968.8	3.36E+00	2.47E+00	1.19E+00
2015.6	3.55E+00	2.30E+00	8.94E-01
2062.5	3.29E+00	1.60E+00	7.32E-01
2109.4	2.81E+00	1.18E+00	5.94E-01
2156.3	2.82E+00	1.41E+00	7.37E-01
2203.1	3.15E+00	2.16E+00	1.06E+00
2250	4.01E+00	2.87E+00	1.08E+00
2296.9	4.13E+00	2.22E+00	1.11E+00
2343.8	4.37E+00	1.64E+00	1.29E+00
2390.6	4.60E+00	2.10E+00	1.59E+00
2437.5	3.80E+00	2.50E+00	1.55E+00
2484.4	4.14E+00	2.71E+00	2.14E+00
2531.3	6.27E+00	2.82E+00	2.61E+00
2578.1	6.82E+00	2.54E+00	2.35E+00
2625	6.83E+00	2.05E+00	1.58E+00

2671.9	7.76E+00	1.83E+00	1.37E+00
2718.8	6.79E+00	1.71E+00	1.96E+00
2765.6	5.71E+00	1.58E+00	1.69E+00
2812.5	7.31E+00	1.45E+00	1.11E+00
2859.4	9.29E+00	1.19E+00	7.72E-01
2906.3	1.02E+01	1.67E+00	1.08E+00
2953.1	1.21E+01	2.23E+00	1.47E+00
3000	1.19E+01	2.21E+00	1.45E+00
3046.9	1.02E+01	2.11E+00	1.31E+00
3093.8	1.04E+01	2.02E+00	1.81E+00
3140.6	7.80E+00	2.10E+00	1.79E+00
3187.5	8.65E+00	2.62E+00	1.37E+00
3234.4	9.27E+00	2.76E+00	1.03E+00
3281.3	7.71E+00	2.94E+00	1.09E+00
3328.1	8.90E+00	2.89E+00	1.30E+00
3375	9.33E+00	4.01E+00	1.16E+00
3421.9	9.91E+00	4.40E+00	1.25E+00
3468.8	1.00E+01	3.91E+00	1.45E+00
3515.6	1.25E+01	3.69E+00	1.56E+00
3562.5	1.05E+01	3.38E+00	1.79E+00
3609.4	1.06E+01	2.76E+00	2.05E+00
3656.3	1.19E+01	2.79E+00	2.13E+00
3703.1	1.17E+01	3.09E+00	2.21E+00
3750	1.40E+01	4.25E+00	2.80E+00
3796.9	1.34E+01	5.51E+00	3.51E+00
3843.8	1.11E+01	5.60E+00	3.65E+00
3890.6	1.35E+01	5.97E+00	3.68E+00
3937.5	1.73E+01	5.89E+00	3.38E+00
3984.4	1.54E+01	5.80E+00	2.44E+00
4031.3	1.63E+01	6.20E+00	1.81E+00
4078.1	1.97E+01	6.05E+00	1.84E+00
4125	1.66E+01	4.88E+00	2.06E+00
4171.9	1.59E+01	4.24E+00	2.15E+00
4218.8	1.45E+01	3.89E+00	1.74E+00
4265.6	1.33E+01	4.59E+00	1.69E+00
4312.5	1.37E+01	5.50E+00	2.11E+00
4359.4	9.90E+00	5.77E+00	2.09E+00
4406.3	8.84E+00	4.86E+00	1.73E+00
4453.1	1.14E+01	5.15E+00	1.44E+00
4500	1.43E+01	5.19E+00	1.01E+00
4546.9	1.39E+01	4.25E+00	5.71E-01
4593.8	1.22E+01	3.65E+00	8.88E-01
4640.6	1.48E+01	2.99E+00	1.70E+00
4687.5	1.36E+01	3.37E+00	2.38E+00
4734.4	1.07E+01	3.55E+00	2.75E+00

4781.3	1.05E+01	3.09E+00	2.17E+00
4828.1	1.01E+01	2.44E+00	1.83E+00
4875	1.34E+01	2.66E+00	1.66E+00
4921.9	1.83E+01	3.47E+00	1.31E+00
4968.8	1.84E+01	4.00E+00	1.03E+00
5015.6	2.10E+01	4.36E+00	1.26E+00
5062.5	2.58E+01	4.42E+00	1.70E+00
5109.4	1.95E+01	3.62E+00	1.92E+00
5156.3	1.30E+01	3.23E+00	1.47E+00
5203.1	1.37E+01	3.75E+00	9.14E-01
5250	1.43E+01	4.02E+00	1.03E+00
5296.9	1.52E+01	3.69E+00	1.37E+00
5343.8	1.32E+01	3.26E+00	1.46E+00
5390.6	1.15E+01	3.17E+00	1.35E+00
5437.5	1.24E+01	3.05E+00	1.39E+00
5484.4	1.27E+01	3.01E+00	1.46E+00
5531.3	1.27E+01	3.69E+00	1.52E+00
5578.1	1.26E+01	3.73E+00	1.83E+00
5625	1.05E+01	2.95E+00	2.07E+00
5671.9	9.44E+00	2.12E+00	1.94E+00

- Anexo A4.6:

Desplazamiento RMS (m)
PRUEBA ESPECTRAL CHANCADORA:
EJE Z,Con carga, Ancho de Banda 20 kHz

"Brüel & Kjær"
"Sound Analyzer Type 2260"
"FFT Software BZ7208"
"Version" 1 2

"File" "V01"

"Settings:"
"Full Scale" 180.2
"Frequency Span" 20000 Hz
"Centre Frequency" 10078.12
"Weighting" "Lin"
"Measurement Start" "Manual"

"Result:"
"2006 Aug 29" "16:00:25"
"Averaging Time" "01.425"
"Overload" "0%"

"Frequency (Hz)" "RMS (m)"

Frec. Hz	Desplaz. X	Desplaz. Y	Desplaz. Z
46.9	6.40E-06	4.20E-06	7.89E-06
93.8	1.51E-06	1.09E-06	2.36E-06
140.6	5.21E-07	2.93E-07	1.43E-06
187.5	3.43E-07	1.82E-07	7.92E-07

234.4	3.76E-07	1.87E-07	4.01E-07
281.3	2.45E-07	1.24E-07	2.40E-07
328.1	1.19E-07	8.41E-08	1.20E-07
375	1.34E-07	8.85E-08	9.75E-08
421.9	1.67E-07	1.02E-07	9.11E-08
468.8	1.61E-07	1.01E-07	6.07E-08
515.6	2.04E-07	6.17E-08	2.54E-08
562.5	2.01E-07	4.48E-08	1.43E-08
609.4	1.14E-07	4.02E-08	1.31E-08
656.3	1.02E-07	2.51E-08	1.17E-08
703.1	1.04E-07	2.05E-08	1.21E-08
750	1.16E-07	2.15E-08	1.49E-08
796.9	1.19E-07	2.77E-08	1.63E-08
843.8	9.63E-08	2.46E-08	1.67E-08
890.6	7.96E-08	2.42E-08	1.06E-08
937.5	7.19E-08	2.33E-08	6.64E-09
984.4	6.83E-08	2.59E-08	8.40E-09
1031.3	6.30E-08	3.82E-08	9.73E-09
1078.1	5.36E-08	3.69E-08	1.23E-08
1125	3.65E-08	1.91E-08	9.92E-09