

VIBROGRAPHY

詳細分析レポート

Detailed Analysis Report

報告日：2026年9月6日

クライアント / Client : Internal

装置 / Equipment : Toyota Car Engine

会社 / Company : SYNRA Inc.

アナリスト / Analyst : Karthik

機密





レポート構成 / Report Structure

ページ構成: カバー → 機器情報 → カメラ撮影 → 振動スペクトル → FFT → 速度 → 加速度 → 波形 → スペクトログラム → ランキング → 診断

解析手法: 上位 ROI ブロック RMS平均 → FFT → ピーク検出 → 重大度スコアリング

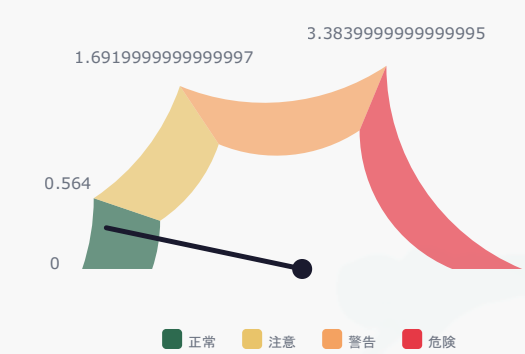
Page flow: Cover → Equipment → Camera Capture → Vibration Spectrum → FFT → Velocity → Acceleration → Waveform → Spectrogram → Ranking → Diagnosis

Analysis: Top ROI blocks RMS average → FFT → Peak detection → Severity scoring



設備情報 / Equipment Information	
対象設備 / Equipment	Toyota Car Engine
設備ID / Equipment ID	VVTi-V6-24V
お客様 / Client	Internal
設置場所 / Location	Japan
メーカー / Manufacturer	Toyota Corp.
分析者 / Analyst	Karthik
会社名 / Company	SYNRA Inc.

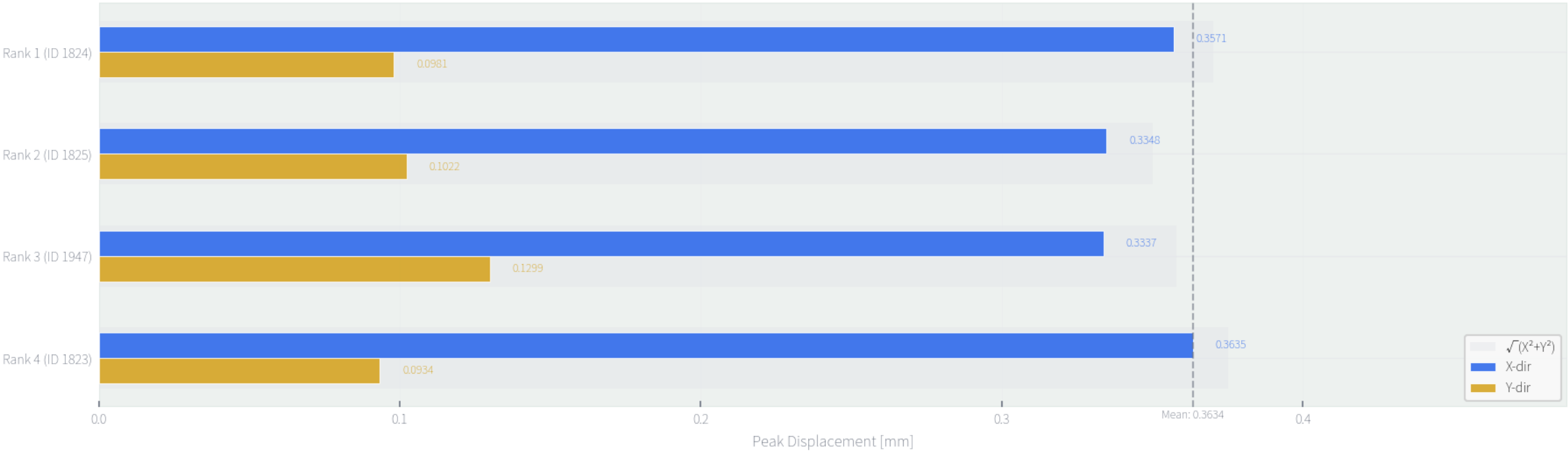
解析パラメータ / Analysis Parameters	
サンプリングレート / Sampling Rate	119.9 Hz
単位 / Unit	mm
上位 N 点 / Top N Points	4
ブロックサイズ / Block Size	128 px
ステップサイズ / Step Size	32 px
解析ウィンドウ / Analysis Window	256
解像度 / Resolution	3840×2160
フレームレート / Frame Rate	119.9 fps
総フレーム数 / Total Frames	960
録画時間 / Duration	8.01 s



0.3571 mm
正常 / Normal

計測情報 / Measurement Info	
対象設備 / Equipment	Toyota Car Engine
お客様 / Client	Internal
設置場所 / Location	Japan
日付 / Date	2026-09-06

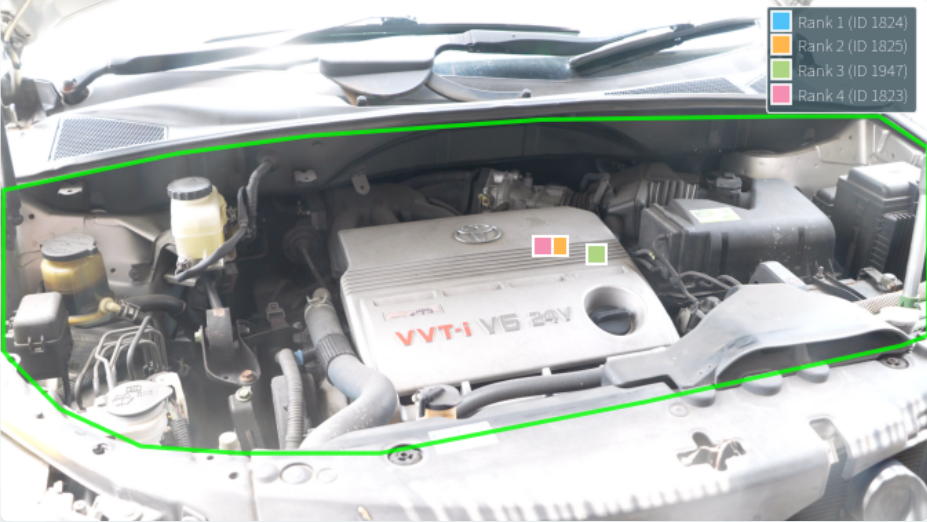
Key Findings / 主要所見	
▶	Highest severity at Rank 1 (ID 1824): 0.3571 mm
▶	Dominant frequency: 38.3 Hz (X-axis)
▶	Primary vibration axis: X-direction (4/4 points)
▶	4 measurement points analyzed



RAW CAPTURE



ANALYSIS VIEW : ROI + TOP VIBRATION POINTS

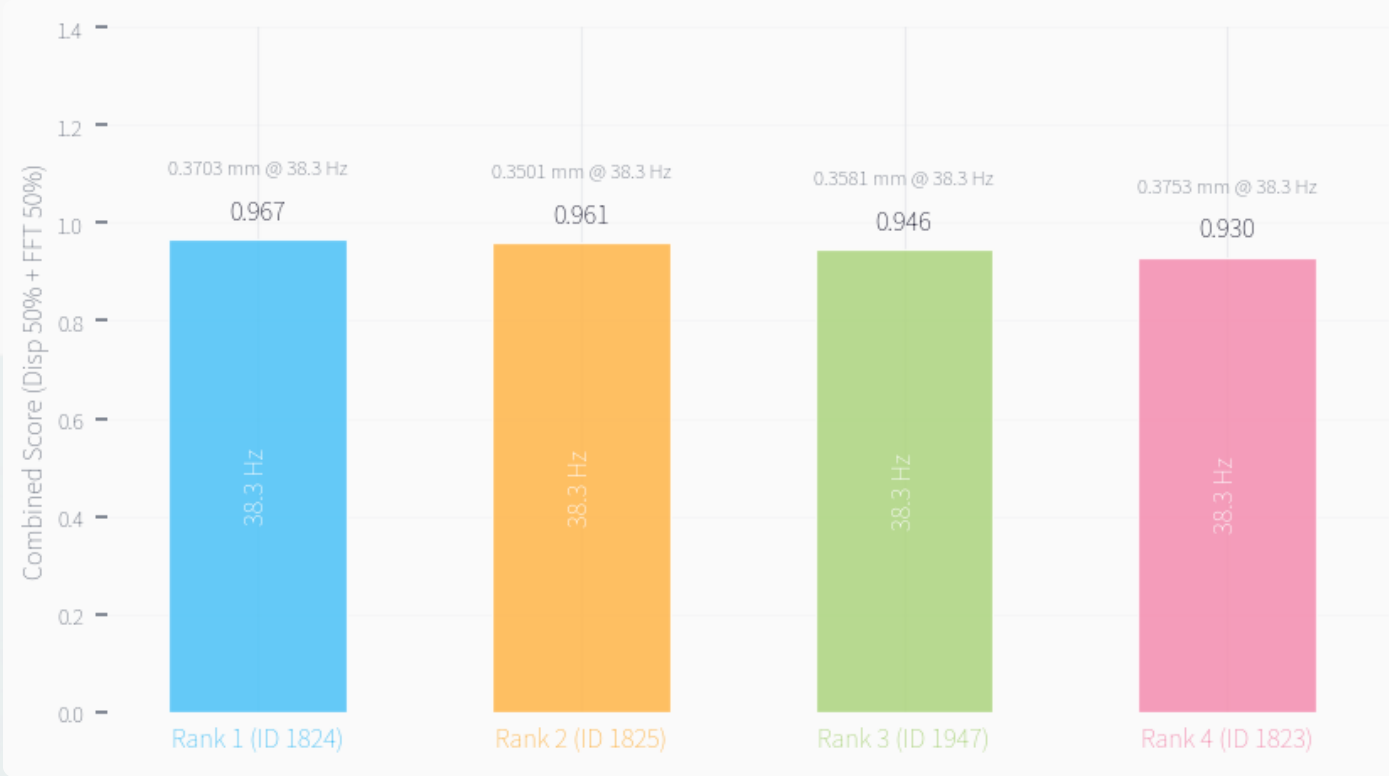


KEY VIBRATION FINDING / 主要振動所見

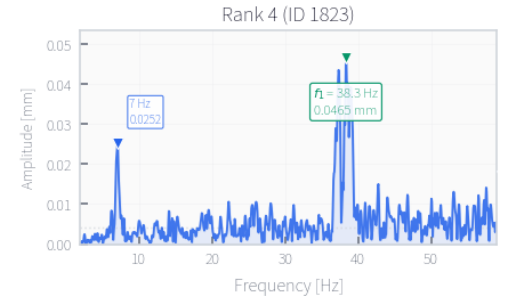
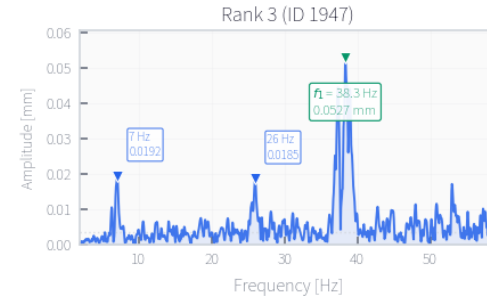
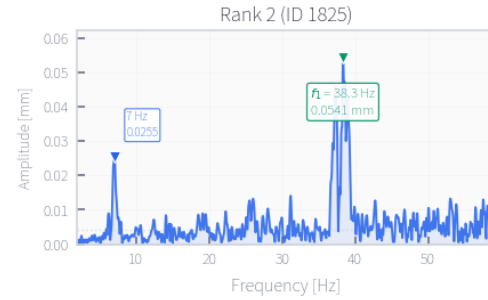
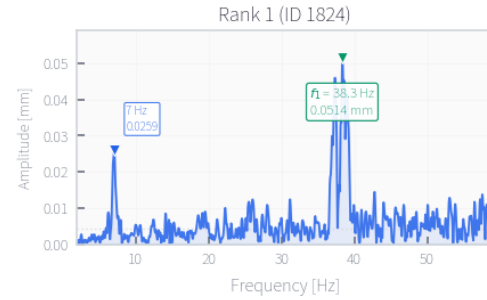
Peak displacement / ピーク変位
0.3571 mm
Rank 1 (ID 1824) · X-axis dominant

Dominant frequency / 卓越周波数
38.3 Hz

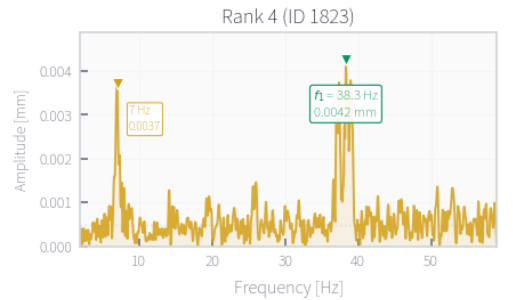
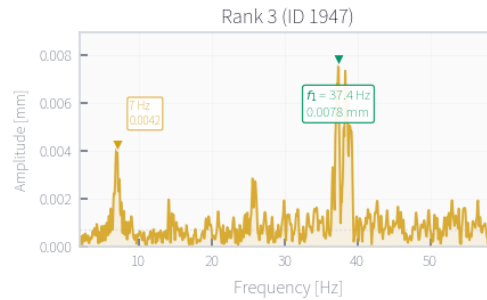
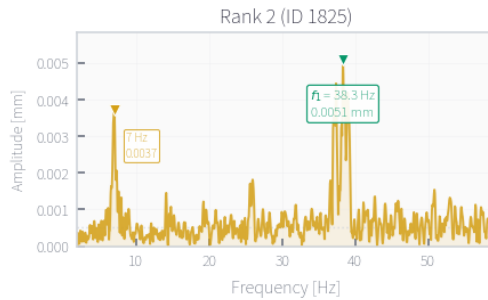
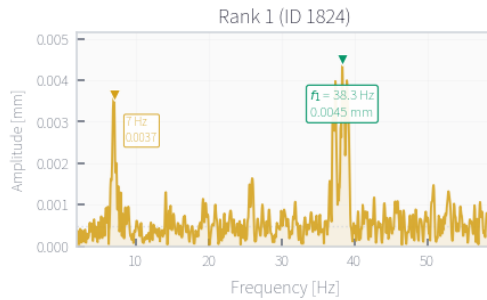
Severity / 重大度
正常 / Normal
Threshold: < 0.6 mm



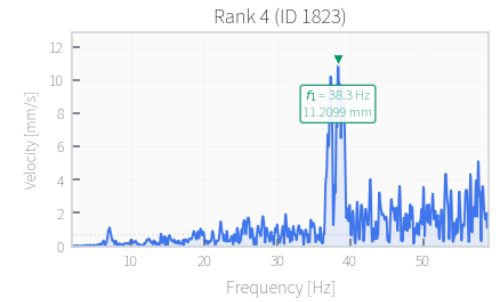
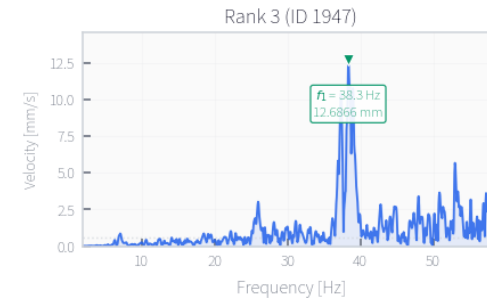
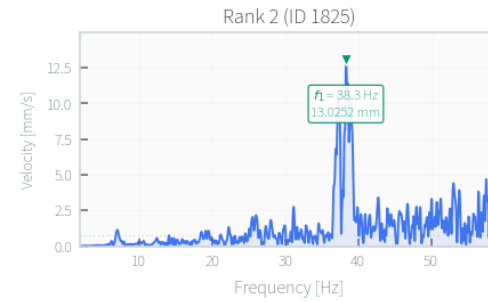
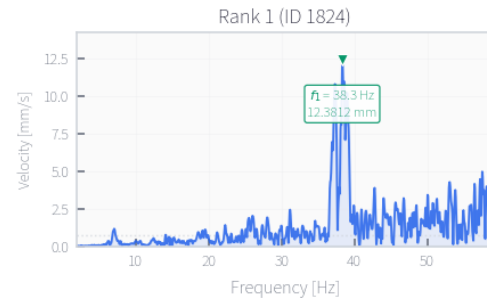
X方向
X Dir
FFT
Amplitude



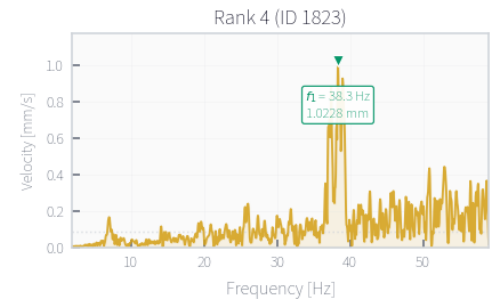
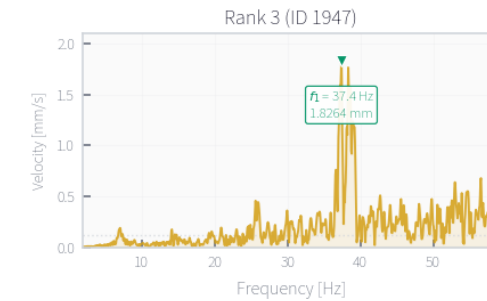
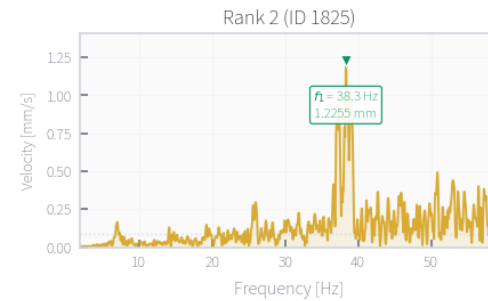
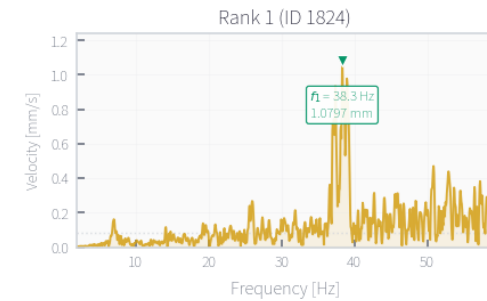
Y方向
Y Dir
FFT
Amplitude



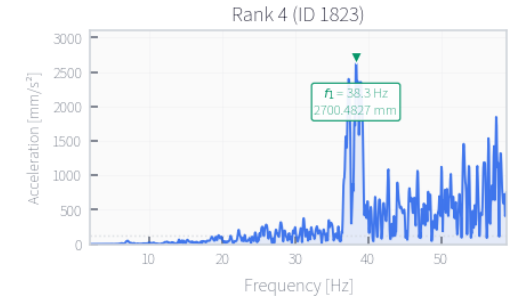
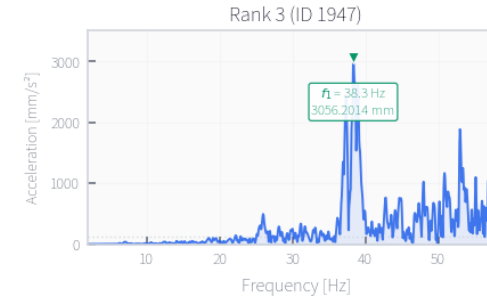
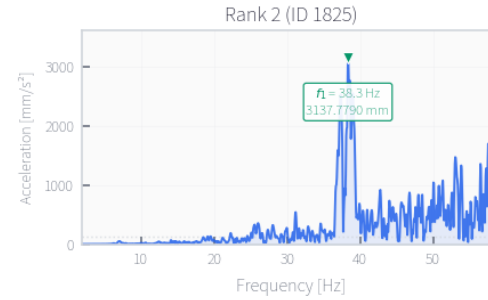
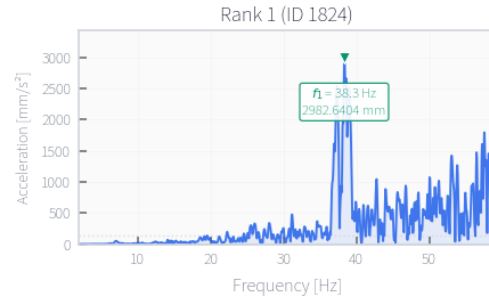
X方向
X Dir
Velocity



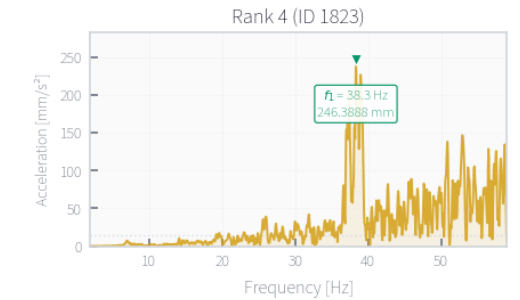
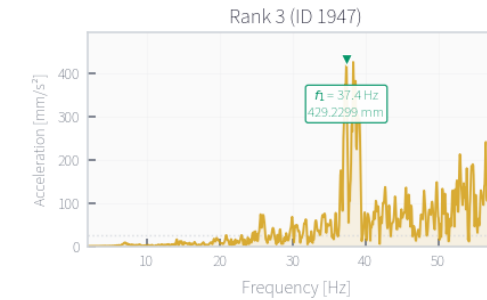
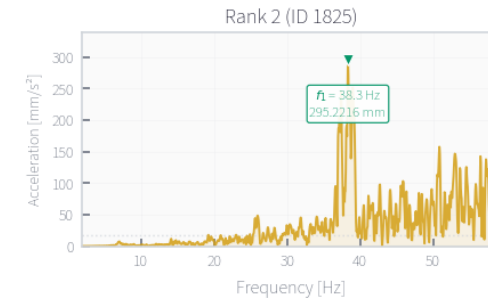
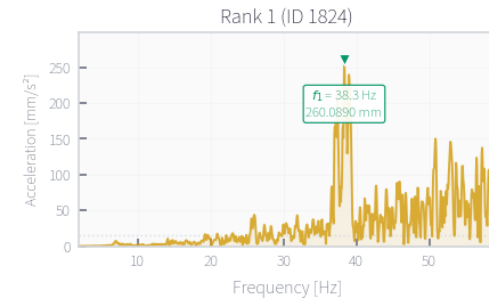
Y方向
Y Dir
Velocity



X方向
X Dir
Acceleration



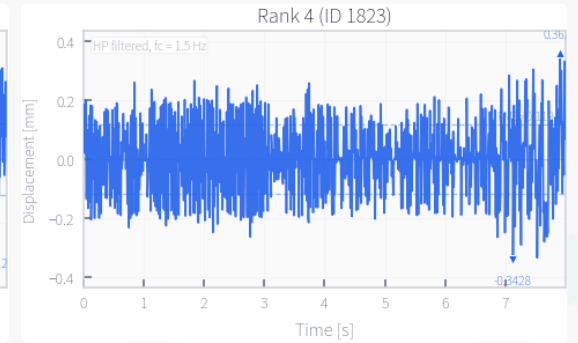
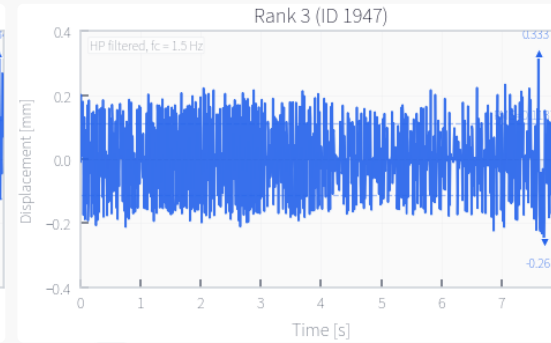
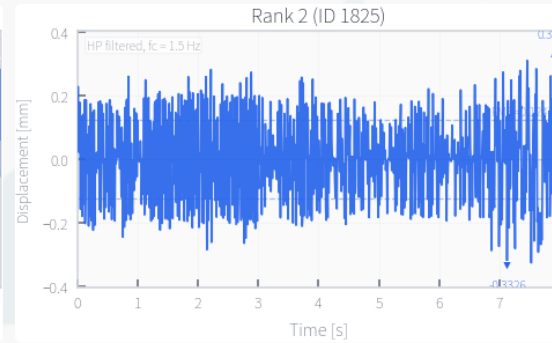
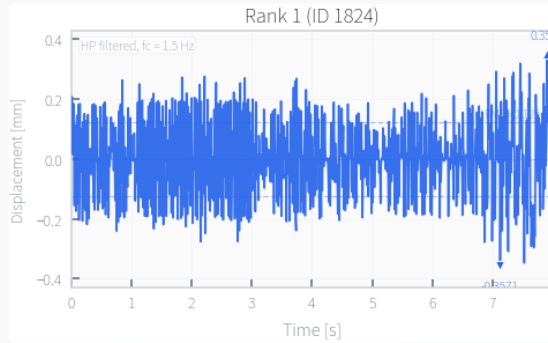
Y方向
Y Dir
Acceleration



X方向

X Dir

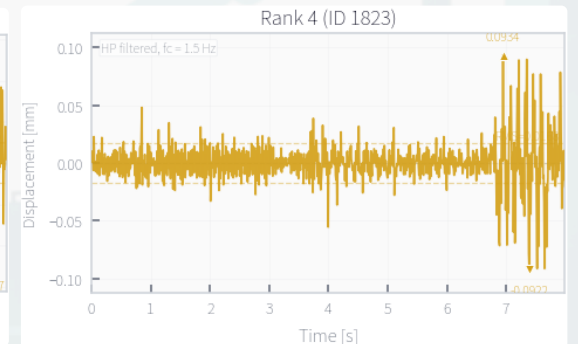
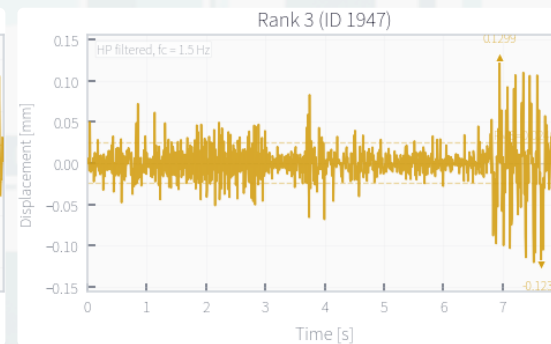
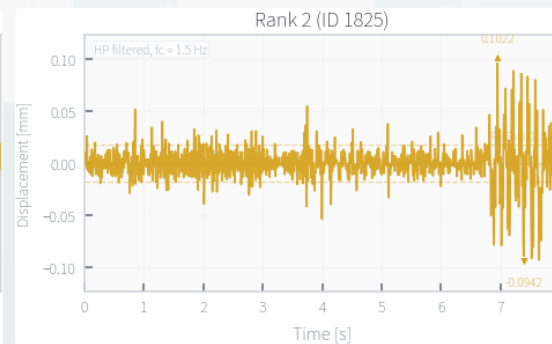
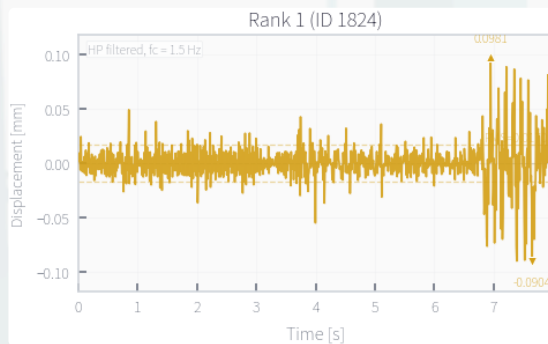
Waveform
Time vs Disp



Y方向

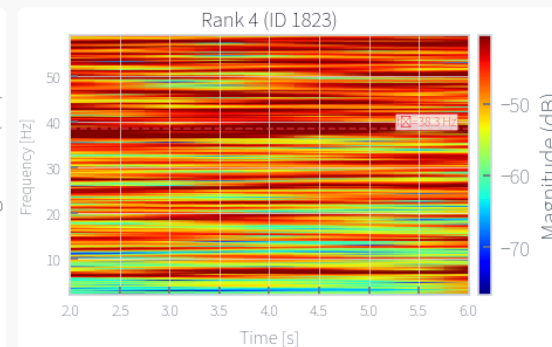
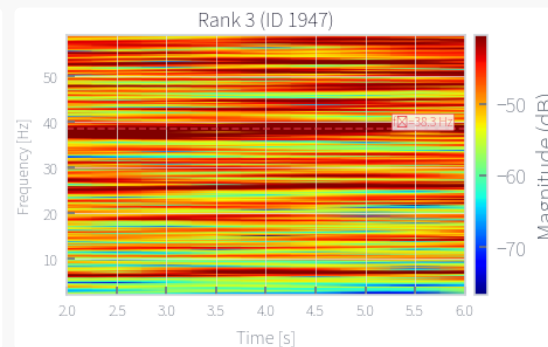
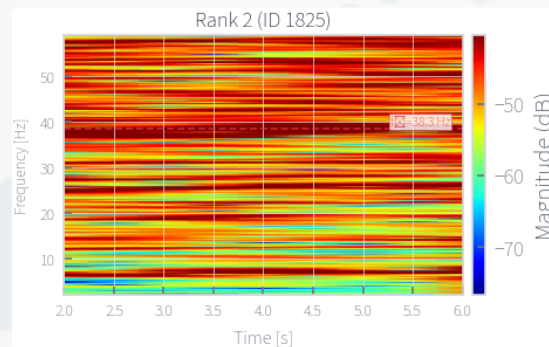
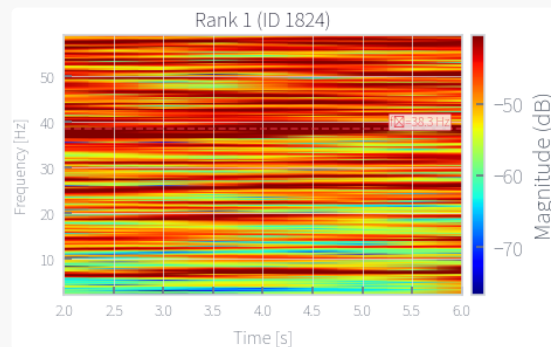
Y Dir

Waveform
Time vs Disp



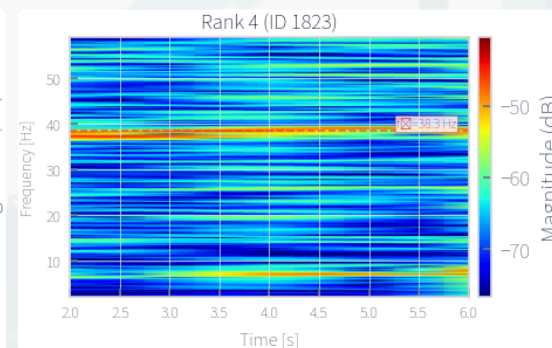
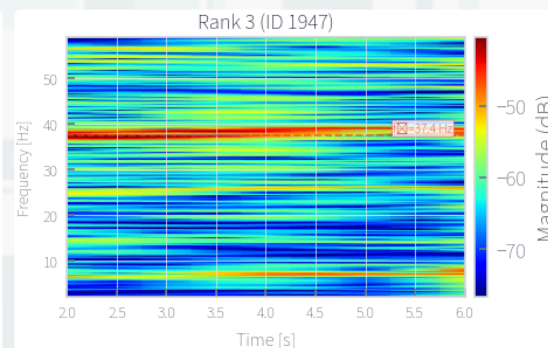
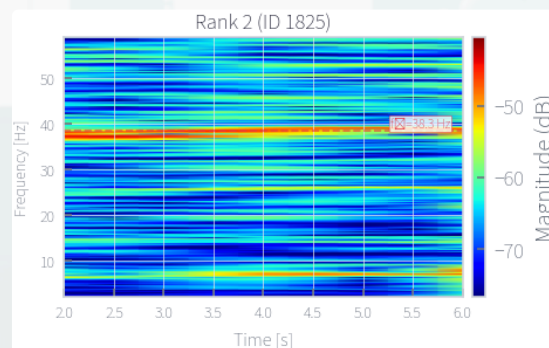
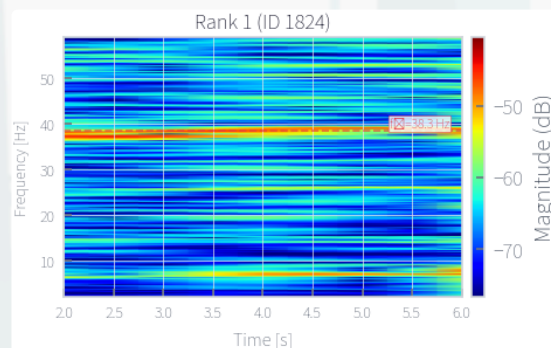
X方向 X Dir

Spectrogram
Time × Freq



Y方向 Y Dir

Spectrogram
Time × Freq

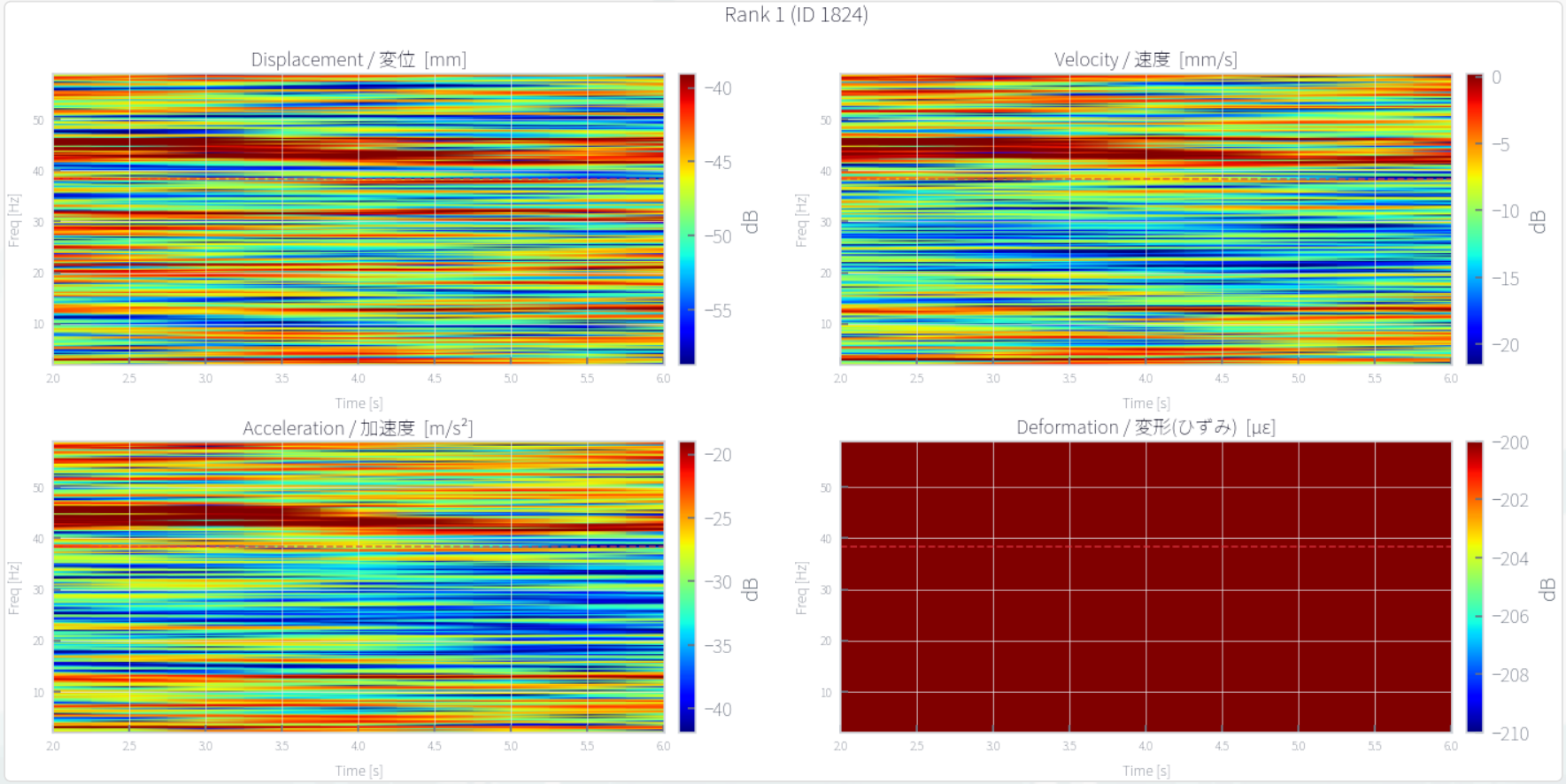


Spectrogram by Quantity

物理量別スペクトログラム（変位・速度・加速度・変形）

同一の時間周波数解析を **変位・速度・加速度・変形ひずみ** の4物理量で表示。速度＝変位の時間微分（ $\times 2\pi f$ ）、加速度＝2階微分（ $\times (2\pi f)^2$ ）。変形は ひずみパイプライン有効時のみ。 Same time–frequency analysis as displacement, its 1st/2nd time-derivatives (velocity, acceleration), and strain. Each panel auto-scales its own dB range.

変位・速度・加速度は同一信号の微分関係にあるため時間パターンは似て見えます。違いは周波数の強調度（高周波ほど速度・加速度で強調）で、FFTスペクトルのページでより明確に確認できます。 Displacement, velocity and acceleration are the same signal differentiated, so their time pattern looks alike — the real difference is the frequency emphasis (higher frequencies are boosted in velocity/acceleration), seen most clearly on the FFT-spectra pages.

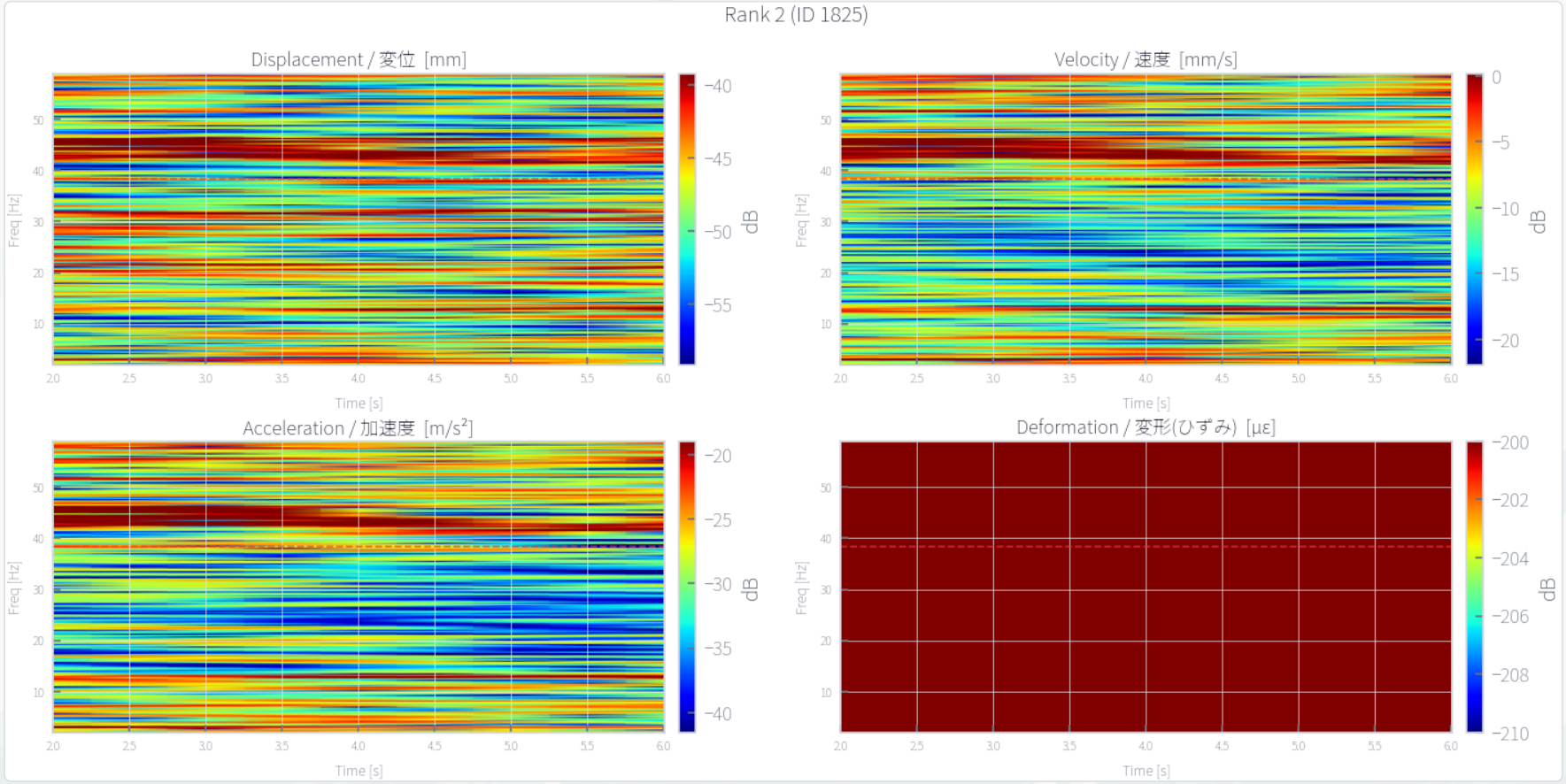


Spectrogram by Quantity

物理量別スペクトログラム（変位・速度・加速度・変形）

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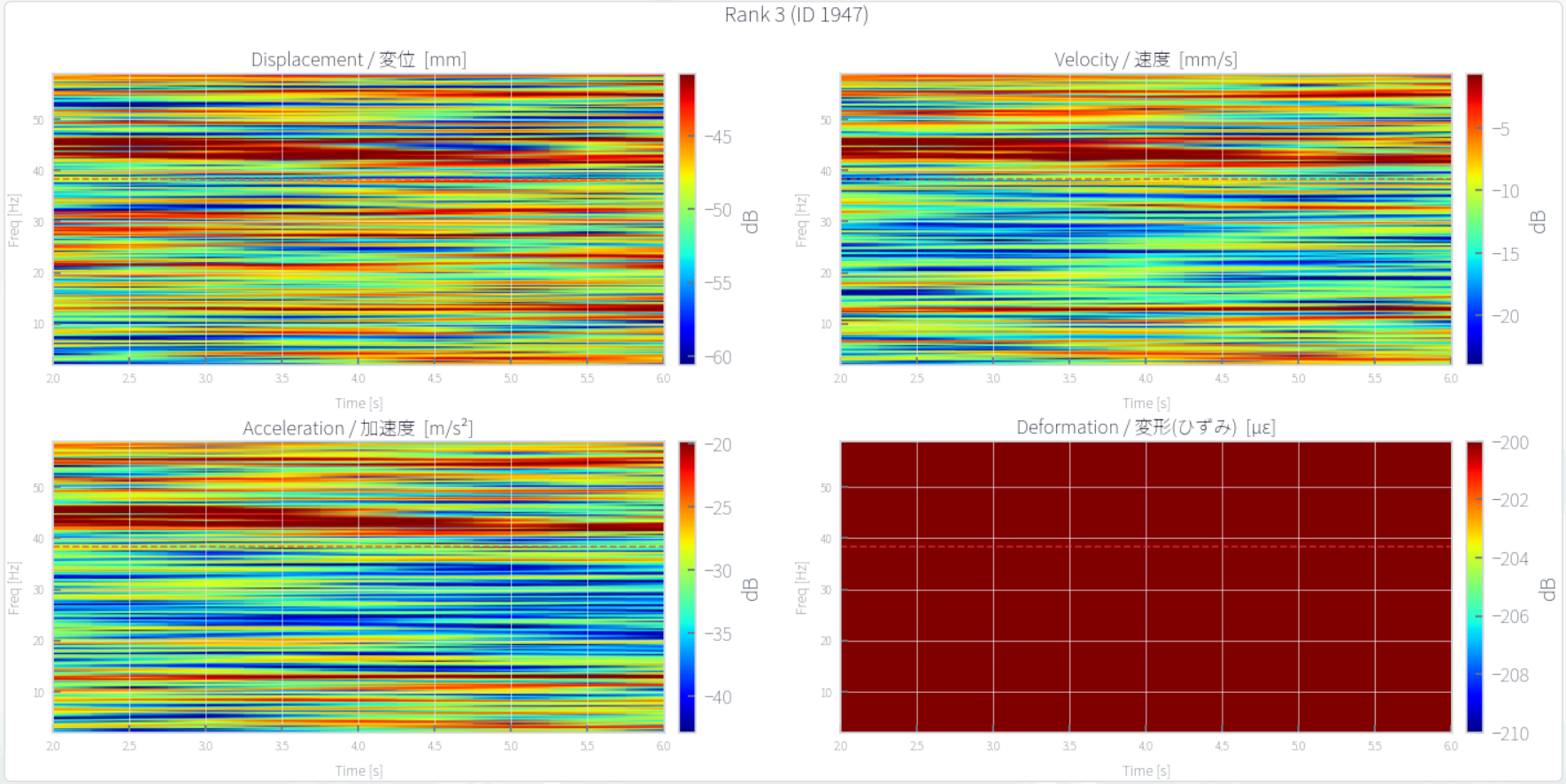


Spectrogram by Quantity

物理量別スペクトログラム（変位・速度・加速度・変形）

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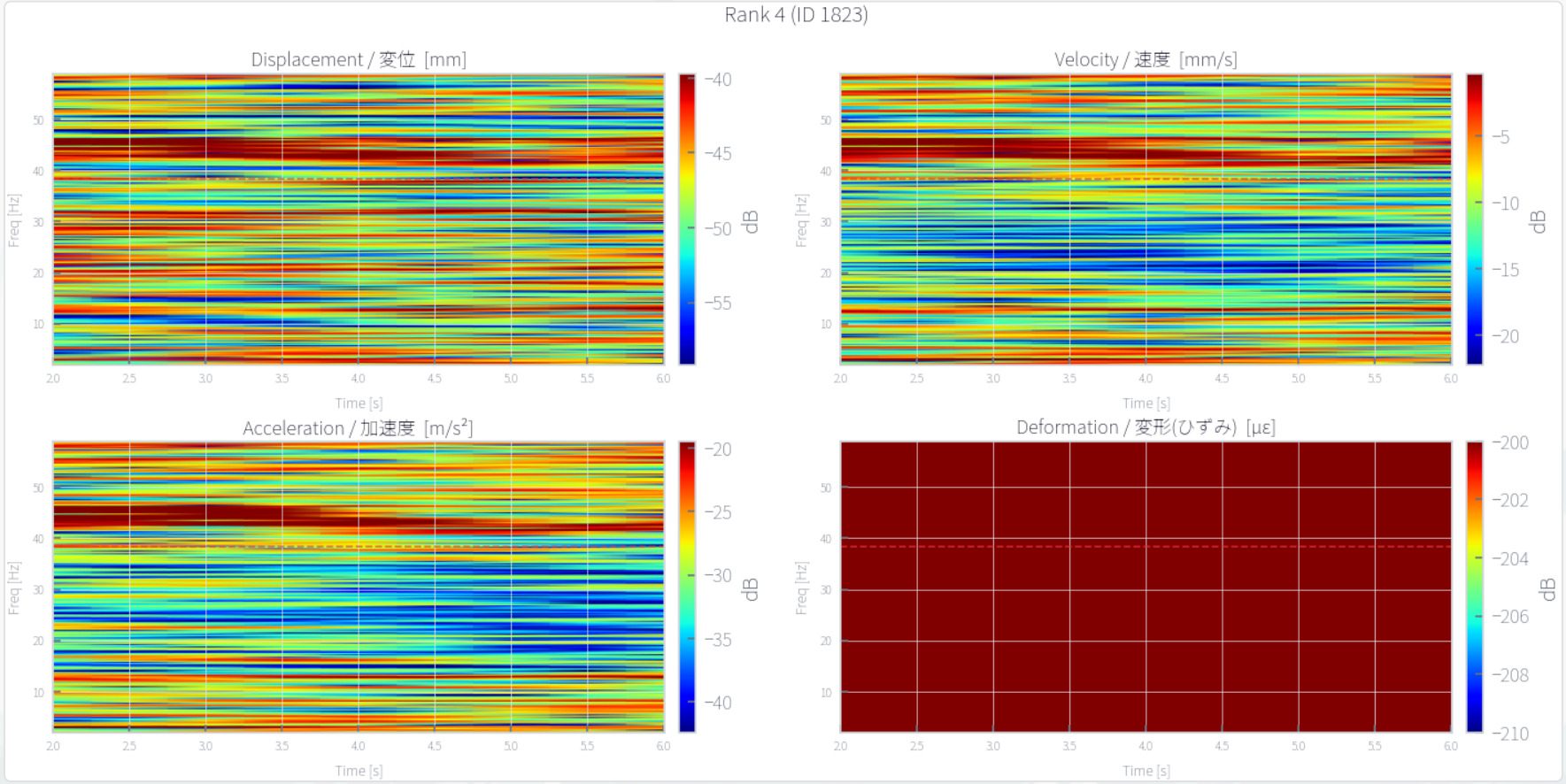


Spectrogram by Quantity

物理量別スペクトログラム（変位・速度・加速度・変形）

同一の時間周波数解析を **変位・速度・加速度・変形ひずみ** の4物理量で表示。速度＝変位の時間微分（ $\times 2\pi f$ ）、加速度＝2階微分（ $\times (2\pi f)^2$ ）。変形は ひずみパイプライン有効時のみ。 Same time–frequency analysis as displacement, its 1st/2nd time-derivatives (velocity, acceleration), and strain. Each panel auto-scales its own dB range.

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Acceleration Summary

加速度サマリー（加速度計比較用）

各計測点の卓越周波数における振幅から、変位・速度・加速度のピーク値を算出。加速度 = 変位振幅 × (2πf)²。加速度は m/s² と g で表示し、御社の加速度計の値と直接比較できます。
Peak displacement / velocity / acceleration at each point's **dominant frequency** (acceleration = displacement amplitude × (2πf)²). Acceleration is given in m/s² and g for direct comparison against your accelerometer.



計測点 / Point	卓越周波数 Dom. Freq (Hz)	ピーク変位 Peak Disp (mm)	ピーク速度 Peak Vel (mm/s)	卓越モード加速度 Peak Accel (m/s²)	広帯域RMS加速度 Broadband RMS (m/s²)	ピーク加速度 Peak Accel (g)
Rank 1 (ID 1824)	38.3	0.0514	12.38	2.983	13.42	0.3041
Rank 2 (ID 1825)	38.3	0.05407	13.03	3.138	13.37	0.32
Rank 3 (ID 1947)	38.3	0.05266	12.69	3.056	12.68	0.3116
Rank 4 (ID 1823)	38.3	0.04653	11.21	2.7	12.94	0.2754

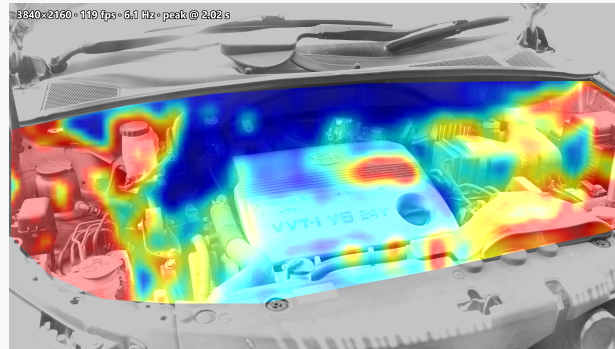
注：卓越モード加速度は卓越周波数の単一周波数振幅 × (2πf)² による代表値、広帯域RMS加速度は 解析帯域 2–60 Hz における加速度スペクトルのRMSです。Note: **Peak Accel** is the single-dominant-mode value (amplitude × (2πf)² at the dominant frequency); **Broadband RMS** is the RMS of the acceleration spectrum over the analysis band 2–60 Hz.

Vibration Spectra (Color Maps)

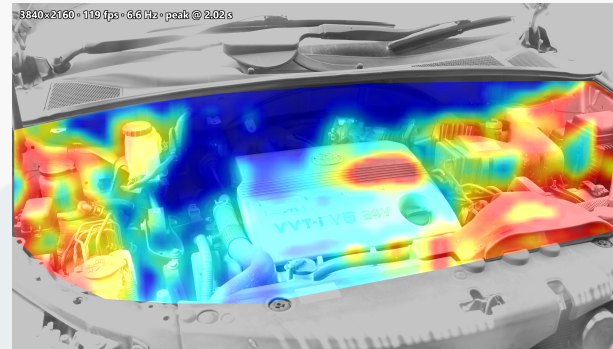
振動スペクトル (カラーマップ)

解析区間 / Analyzed window: 2.00 – 8.01 s

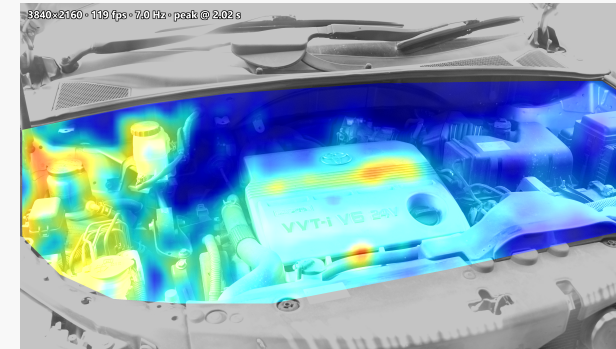
振動の強さ (相対)
Vibration strength



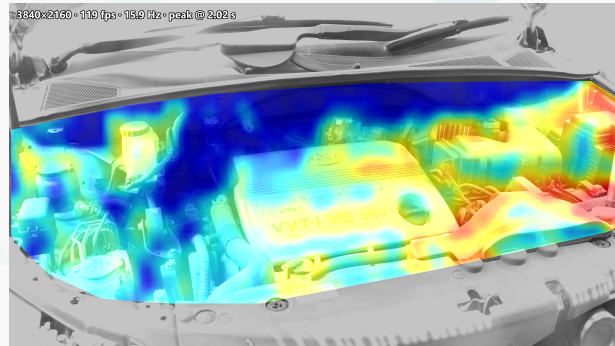
6.1 Hz
ピーク振幅 / peak 0.004869 mm
Peak @ 2.02 s



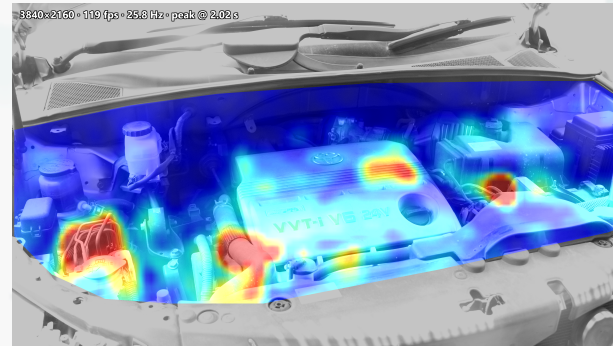
6.6 Hz
ピーク振幅 / peak 0.005802 mm
Peak @ 2.02 s



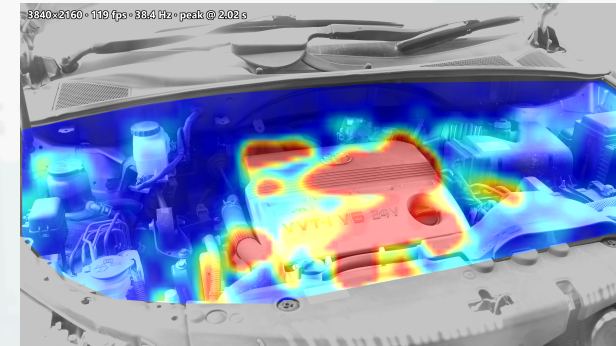
7.0 Hz
ピーク振幅 / peak 0.02507 mm
Peak @ 2.02 s



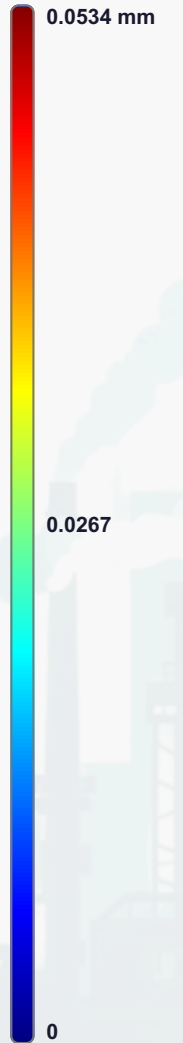
15.9 Hz
ピーク振幅 / peak 0.005092 mm
Peak @ 2.02 s



25.8 Hz
ピーク振幅 / peak 0.01463 mm
Peak @ 2.02 s



38.4 Hz
ピーク振幅 / peak 0.05338 mm
Peak @ 2.02 s

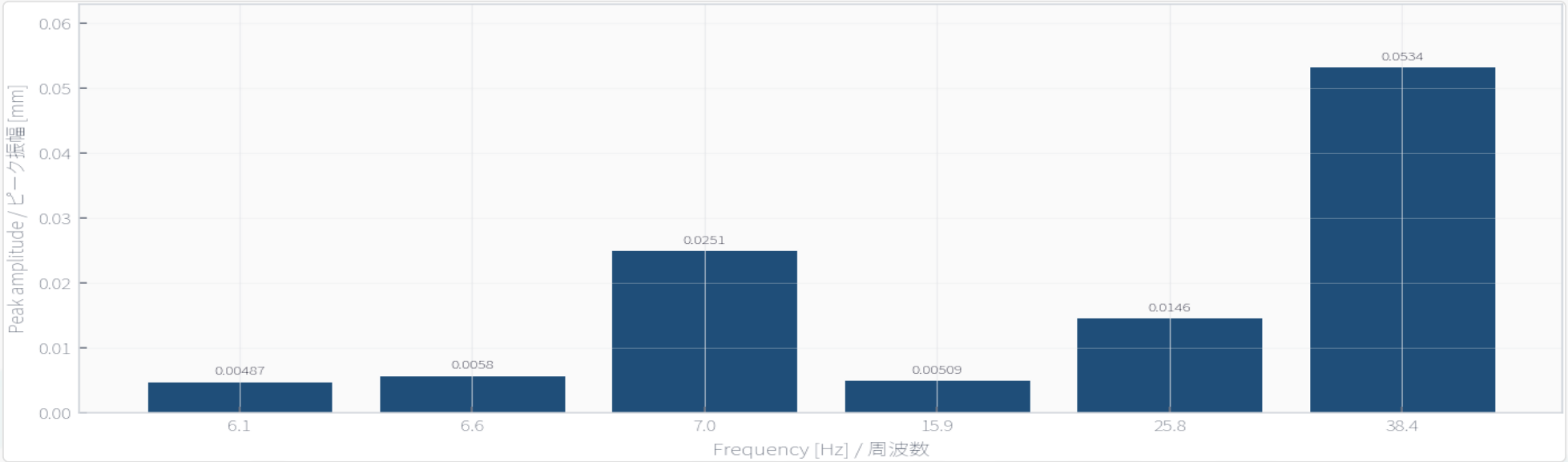


全図共通スケール
shared scale

Amplitude by Frequency

周波数別 ピーク振幅

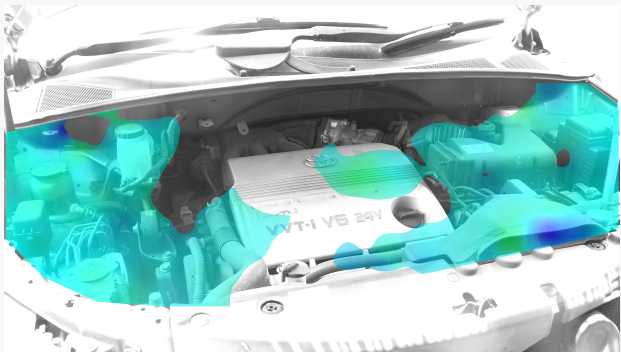
各卓越周波数におけるピーク振幅（mm）。校正済み（mm）。 Peak vibration amplitude at each dominant frequency (mm). ArUco-calibrated (mm).



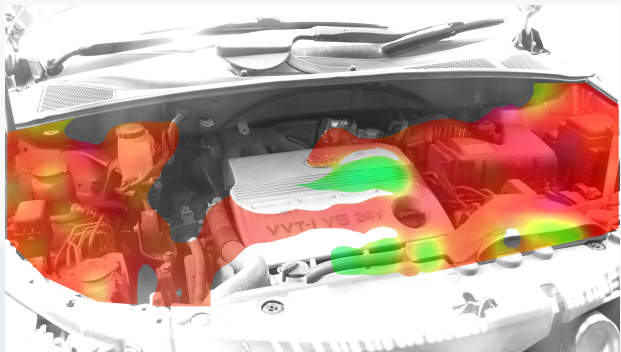
周波数 / Freq (Hz)	ピーク振幅 / Peak amplitude (mm)
6.1	0.004869
6.6	0.005802
7.0	0.02507
15.9	0.005092
25.8	0.01463
38.4	0.05338

Phase Maps (per Frequency)

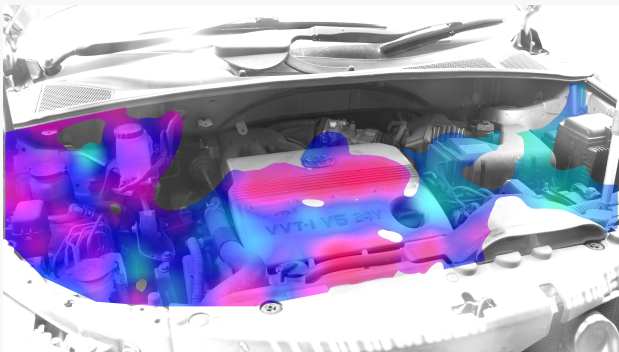
位相マップ (周波数別)



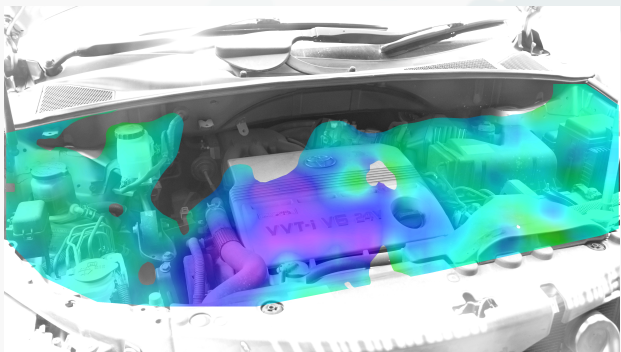
6.1 Hz



6.6 Hz



7.0 Hz



15.9 Hz



25.8 Hz



38.4 Hz

位相
Phase

+180°

0°

-180°

同色=同位相
same = in-phase



Vibration Severity Ranking / 振動重大度ランキング

Rank	Point ID	Peak Disp (mm)	Peak FFT Mag	Score	Dir	Peak Freq (X)	Peak Freq (Y)
1	1824	0.3571	0.0514	0.967	X	38.3 Hz	38.3 Hz
2	1825	0.3348	0.0541	0.961	X	38.3 Hz	38.3 Hz
3	1947	0.3337	0.0527	0.946	X	38.3 Hz	37.4 Hz
4	1823	0.3635	0.0465	0.930	X	38.3 Hz	38.3 Hz

Waveform Statistics / 波形統計

Point	Dir	RMS (mm)	Peak (mm)	P-to-P (mm)	Crest Factor	Kurtosis	Severity
ID 1824	X	0.1251	0.3571	0.7088	2.86	-0.46	正常 / Normal
ID 1824	Y	0.0170	0.0981	0.1885	5.78	8.56	正常 / Normal
ID 1825	X	0.1247	0.3348	0.6673	2.68	-0.57	正常 / Normal
ID 1825	Y	0.0180	0.1022	0.1964	5.67	7.66	正常 / Normal
ID 1947	X	0.1137	0.3337	0.5950	2.94	-0.86	正常 / Normal
ID 1947	Y	0.0246	0.1299	0.2536	5.28	6.23	正常 / Normal
ID 1823	X	0.1194	0.3635	0.7063	3.04	-0.39	正常 / Normal
ID 1823	Y	0.0168	0.0934	0.1856	5.57	8.95	正常 / Normal



解析手法 / Analysis Method		
手法 / Method	Non-Contact Video Vibrography	
センサ / Sensor	Camera (optical, no mass loading)	
原理 / Principle	Optical sub-pixel motion tracking	
空間解小 / Spatial Res.	128×128 px blocks, 32 px step	
時間解小 / Temporal Res.	1 / 119.9 s = 8.342 ms / frame	
周波数帯 / Frequency Band	0 - 59.9 Hz (Nyquist limit)	
録画時間 / Recording duration	8.01 s	
解析エンジン / Engine	vibrography_cuda 2026-09-02+g19d6205079a6	

調整済みパラメータ / Parameters Tuned		
Sampling Rate	119.9 fps	measured from frame timestamps
Frequency Range	0 - 59.9 Hz	Nyquist: $f_s/2$
Block Size	128 px	Spatial averaging window
Step Size	32 px	Grid spacing / density
Analysis Window	256 samp	Freq. resolution = f_s/N
Scale Factor	0.2820 mm/px	Physical calibration
Sub-pixel Acc.	≤ 0.1 px (sub-pixel optical)	Optical tracking accuracy
Analyst	Karthik	Measurement responsibility