

VIBROGRAPHY

詳細分析レポート

Detailed Analysis Report

報告日：2026年9月3日

クライアント / Client : Internal Usage
装置 / Equipment : Castle Structure
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

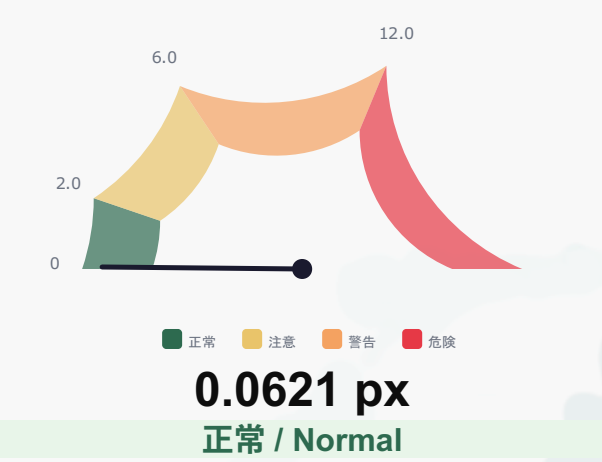
Page flow: Cover → Equipment → Camera Capture → Vibration Spectrum → FFT → Velocity → Acceleration → Waveform → Spectrogram → Ranking → Diagnosis

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



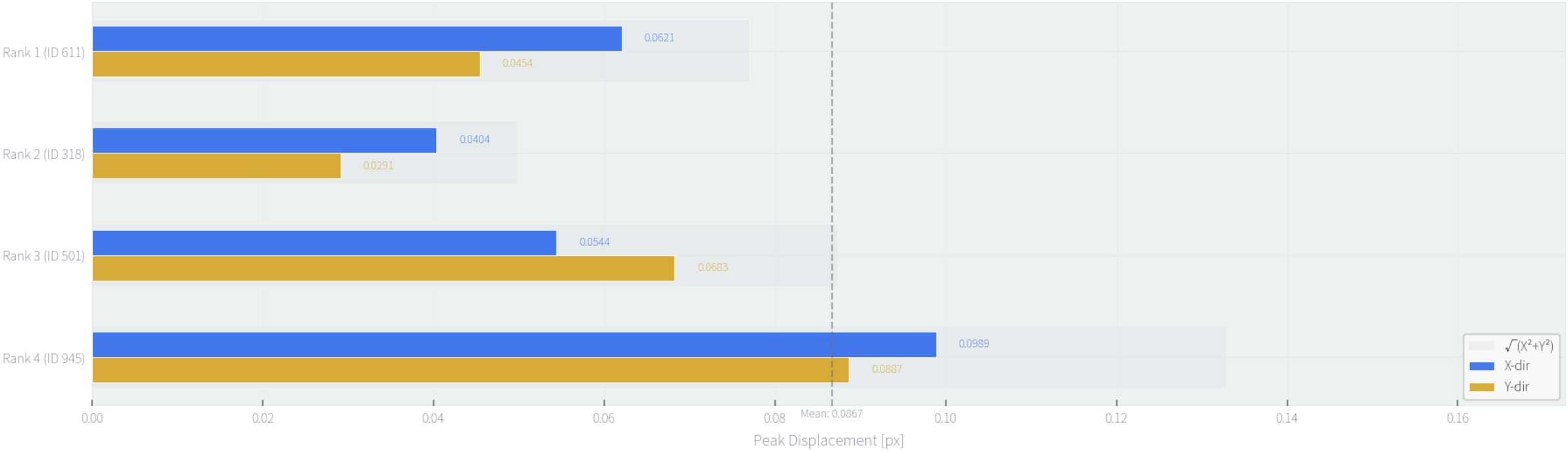
設備情報 / Equipment Information	
対象設備 / Equipment	Castle Structure
設備ID / Equipment ID	HIR-CAS-007
お客様 / Client	Internal Usage
設置場所 / Location	Test-bed, Digital Monuzokuri
メーカー / Manufacturer	Hiroshima University
分析者 / Analyst	Karthik
会社名 / Company	SYNRA Inc.

解析パラメータ / Analysis Parameters	
サンプリングレート / Sampling Rate	1000.0 Hz
単位 / Unit	px
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
STFT ウィンドウ / STFT Window	128
解像度 / Resolution	1080×1920
フレームレート / Frame Rate	1000.0 fps
総フレーム数 / Total Frames	3980
録画時間 / Duration	3.98 s



計測情報 / Measurement Info	
対象設備 / Equipment	Castle Structure
お客様 / Client	Internal Usage
設置場所 / Location	Test-bed, Digital Monuzokuri
日付 / Date	2026-09-03

Key Findings / 主要所見	
▶	Highest severity at Rank 1 (ID 611): 0.0621 px
▶	Dominant frequency: 3.7 Hz (X-axis)
▶	Primary vibration axis: X-direction (3/4 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

0.0621 px

Rank 1 (ID 611) · X-axis dominant

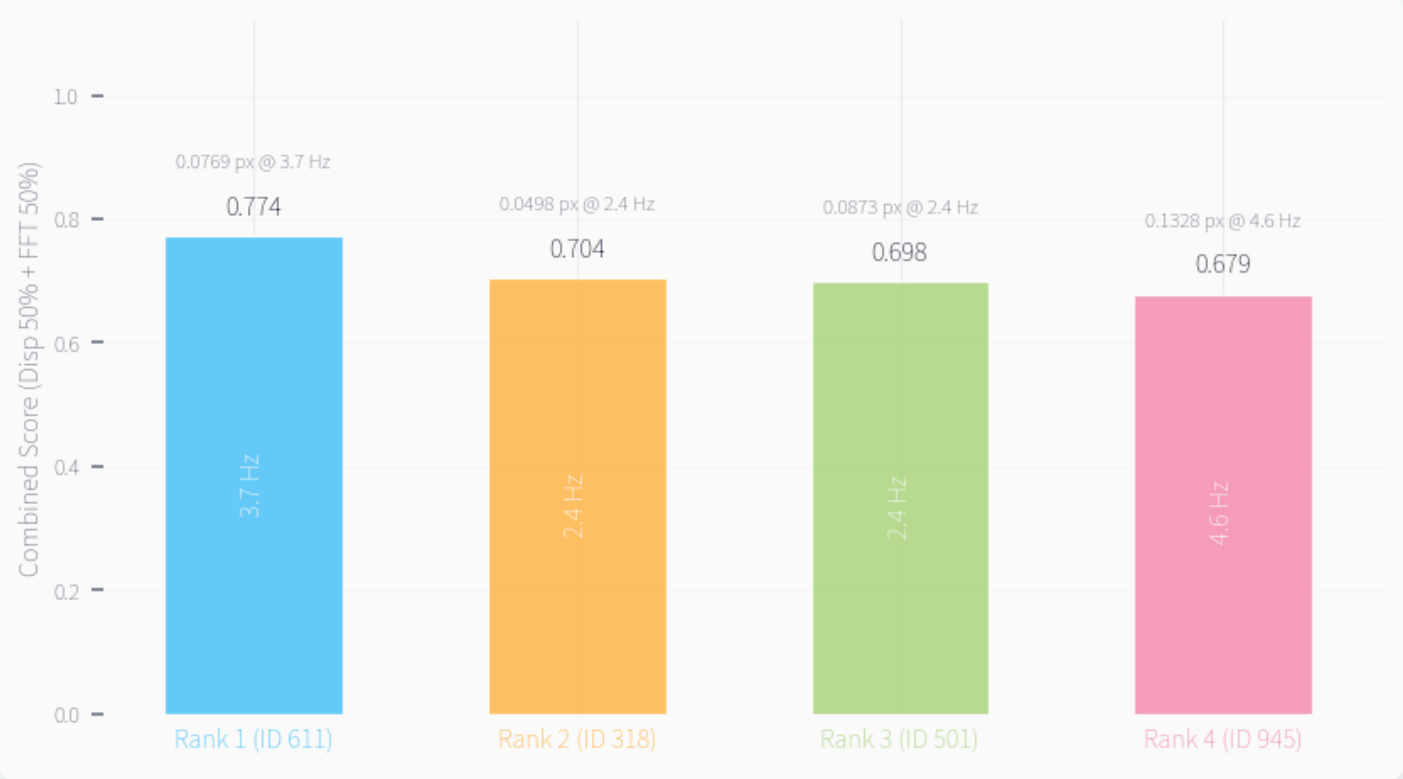
Dominant frequency / 卓越周波数

3.7 Hz

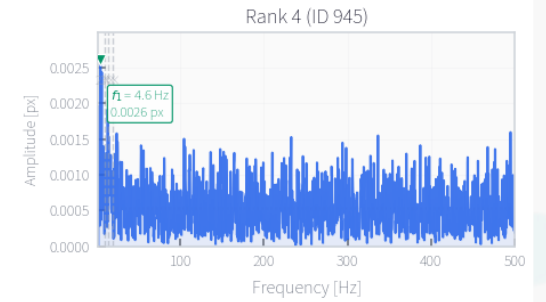
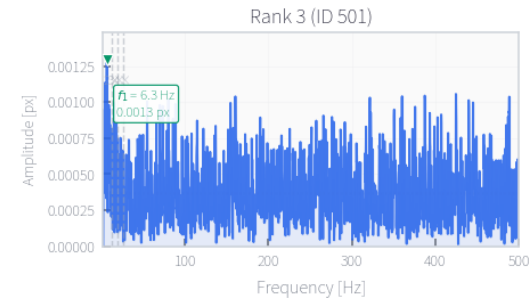
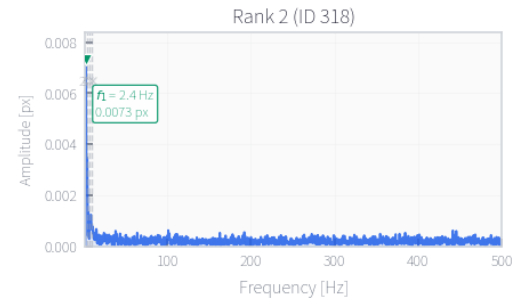
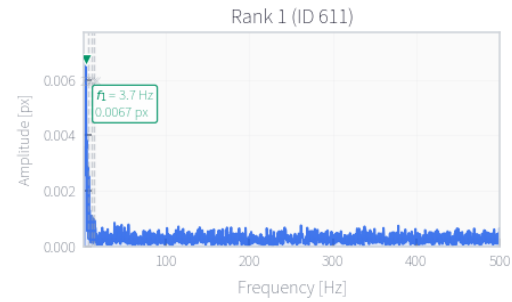
Severity / 重大度

正常 / Normal

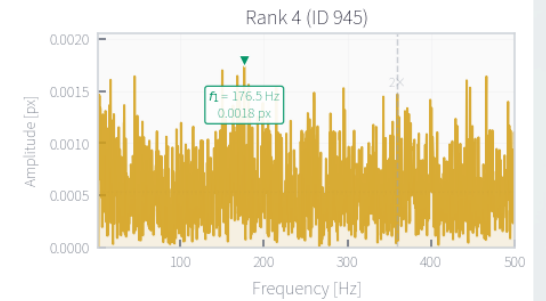
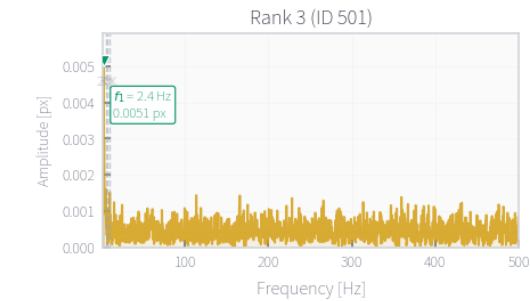
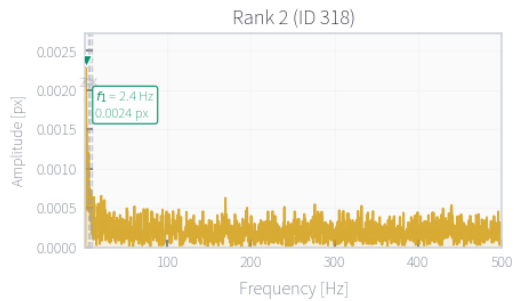
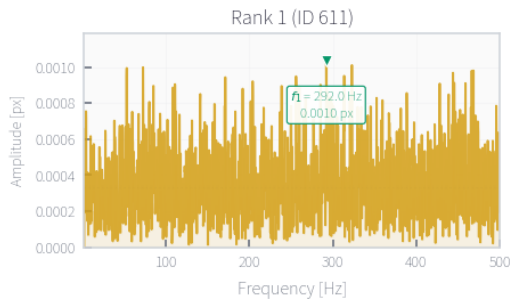
Threshold: < 2.0 px



X方向
X Dir
FFT
Amplitude



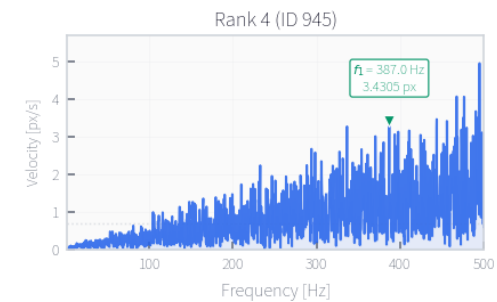
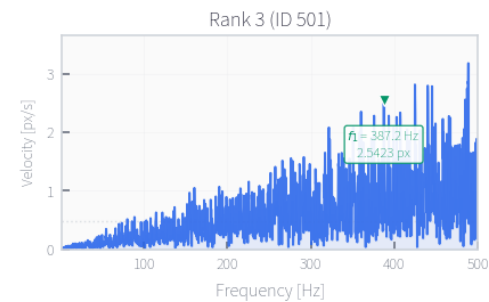
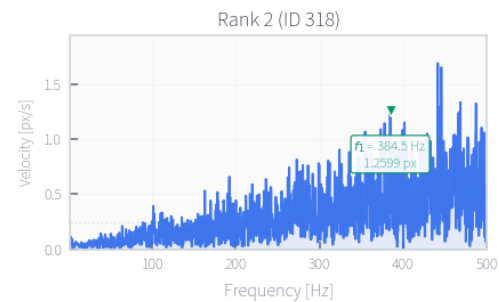
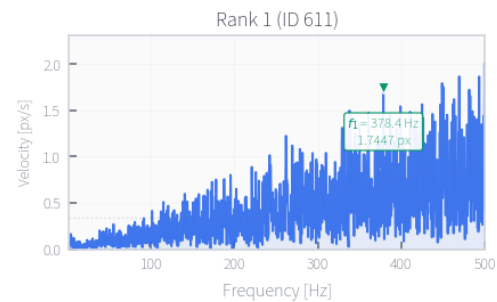
Y方向
Y Dir
FFT
Amplitude



X方向

X Dir

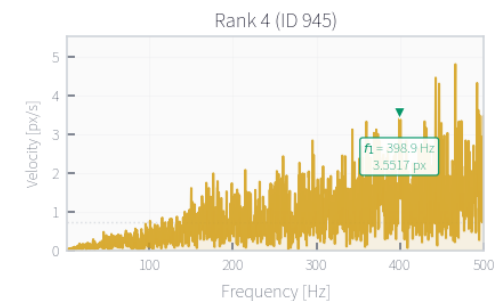
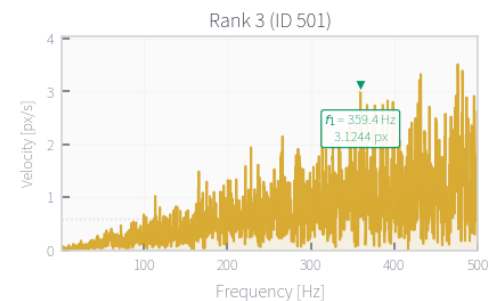
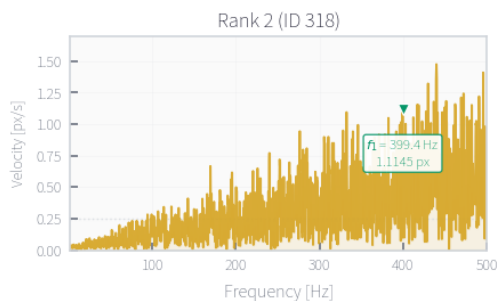
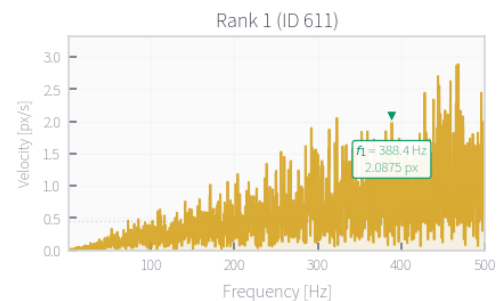
Velocity



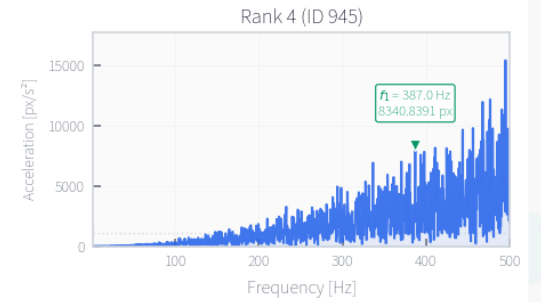
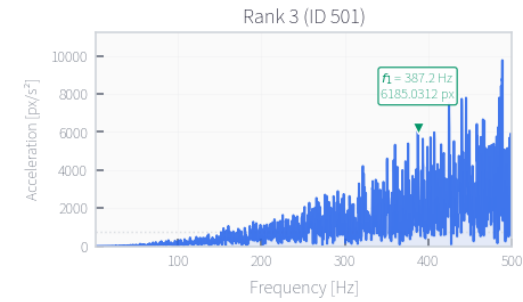
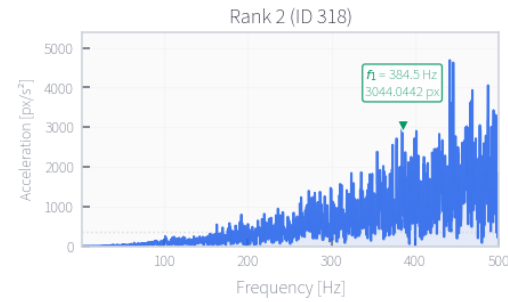
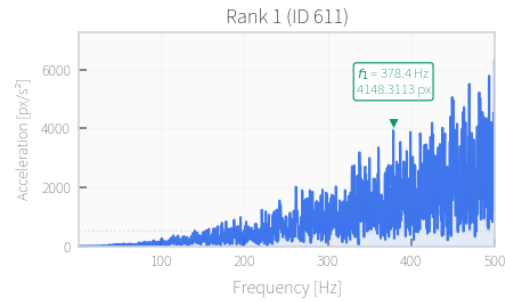
Y方向

Y Dir

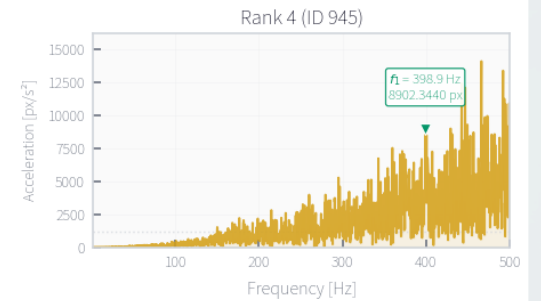
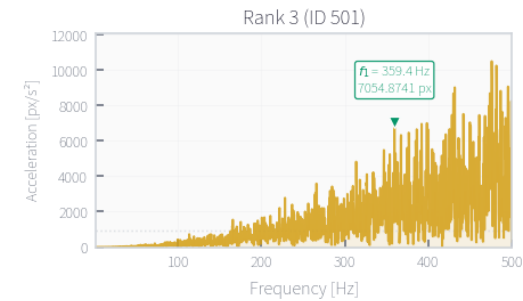
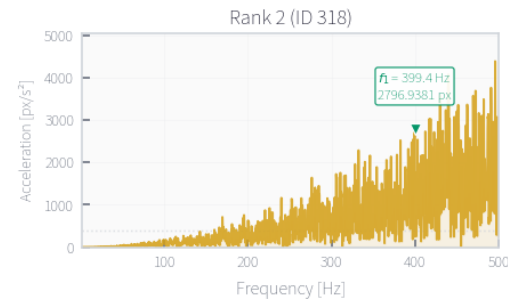
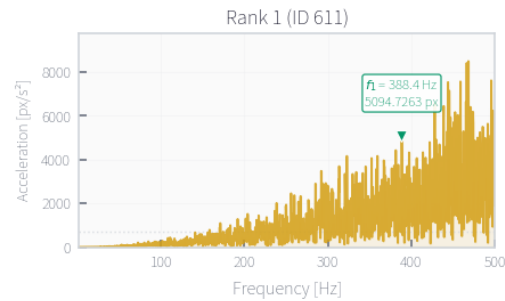
Velocity



X方向
X Dir
Acceleration



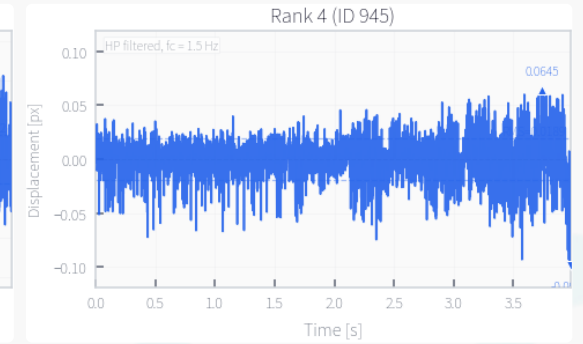
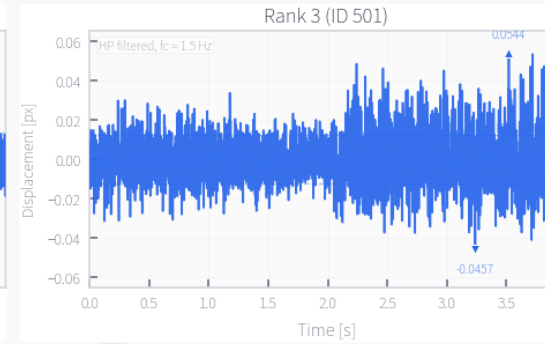
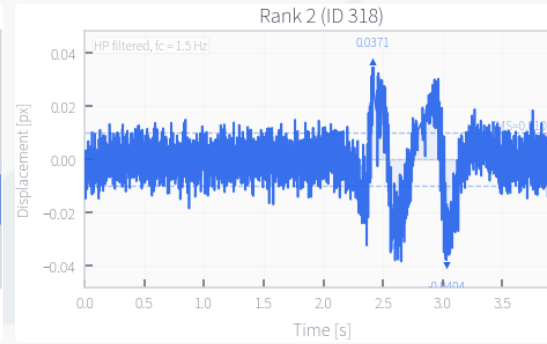
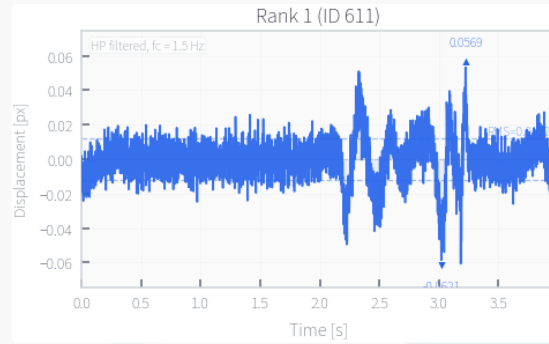
Y方向
Y Dir
Acceleration



X方向

X Dir

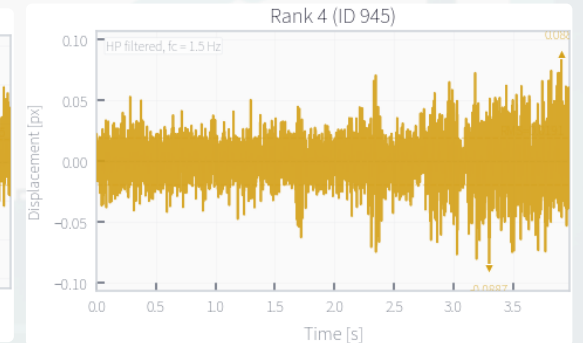
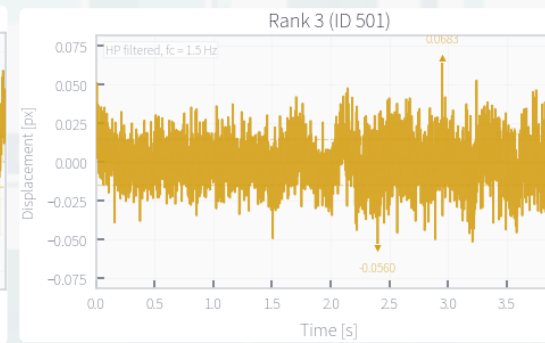
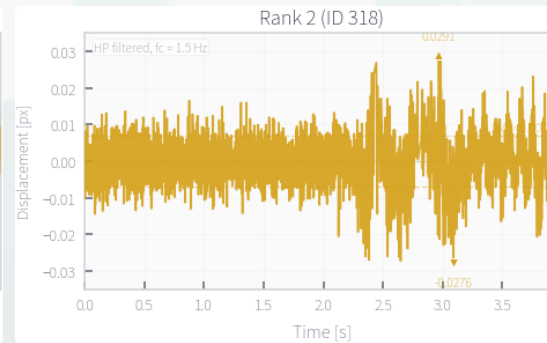
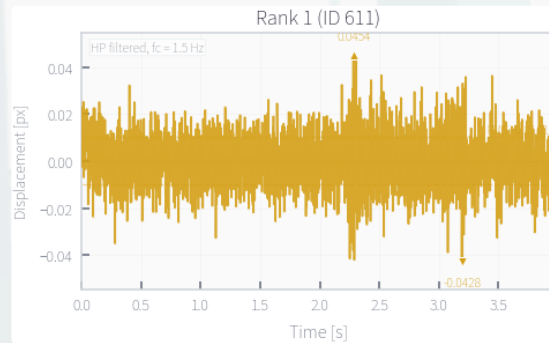
Waveform
Time vs Disp



Y方向

Y Dir

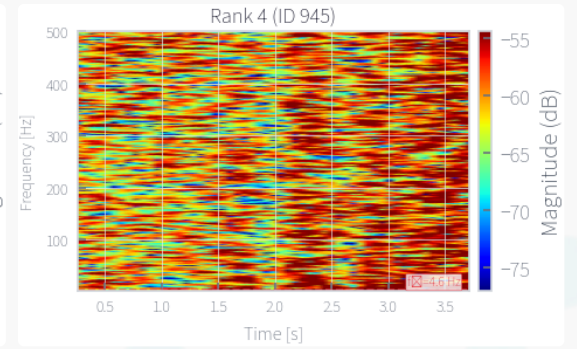
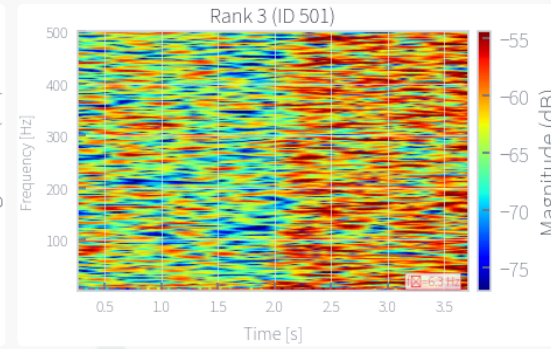
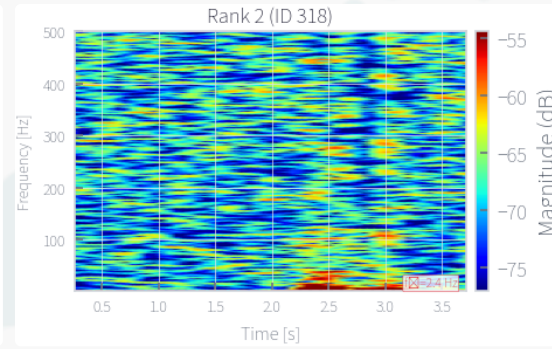
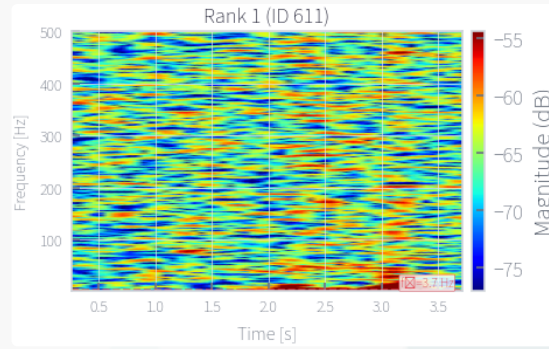
Waveform
Time vs Disp



X方向

X Dir

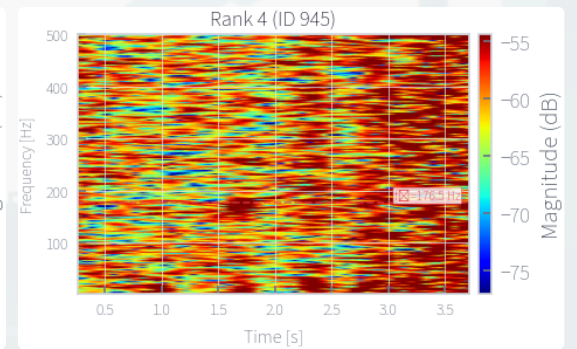
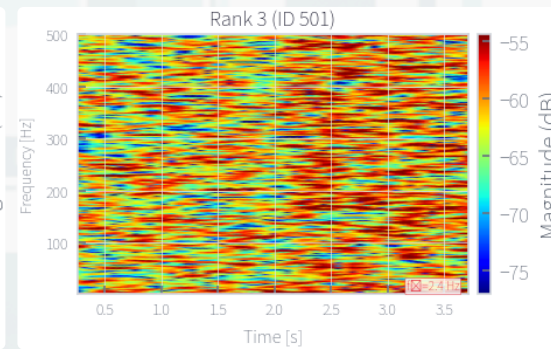
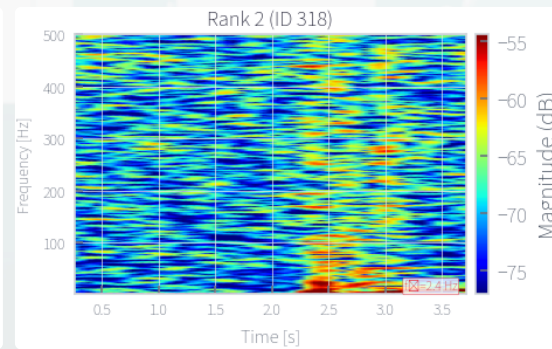
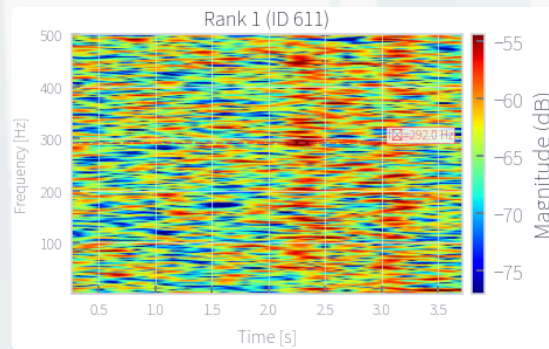
Spectrogram
Time × Freq



Y方向

Y Dir

Spectrogram
Time × Freq

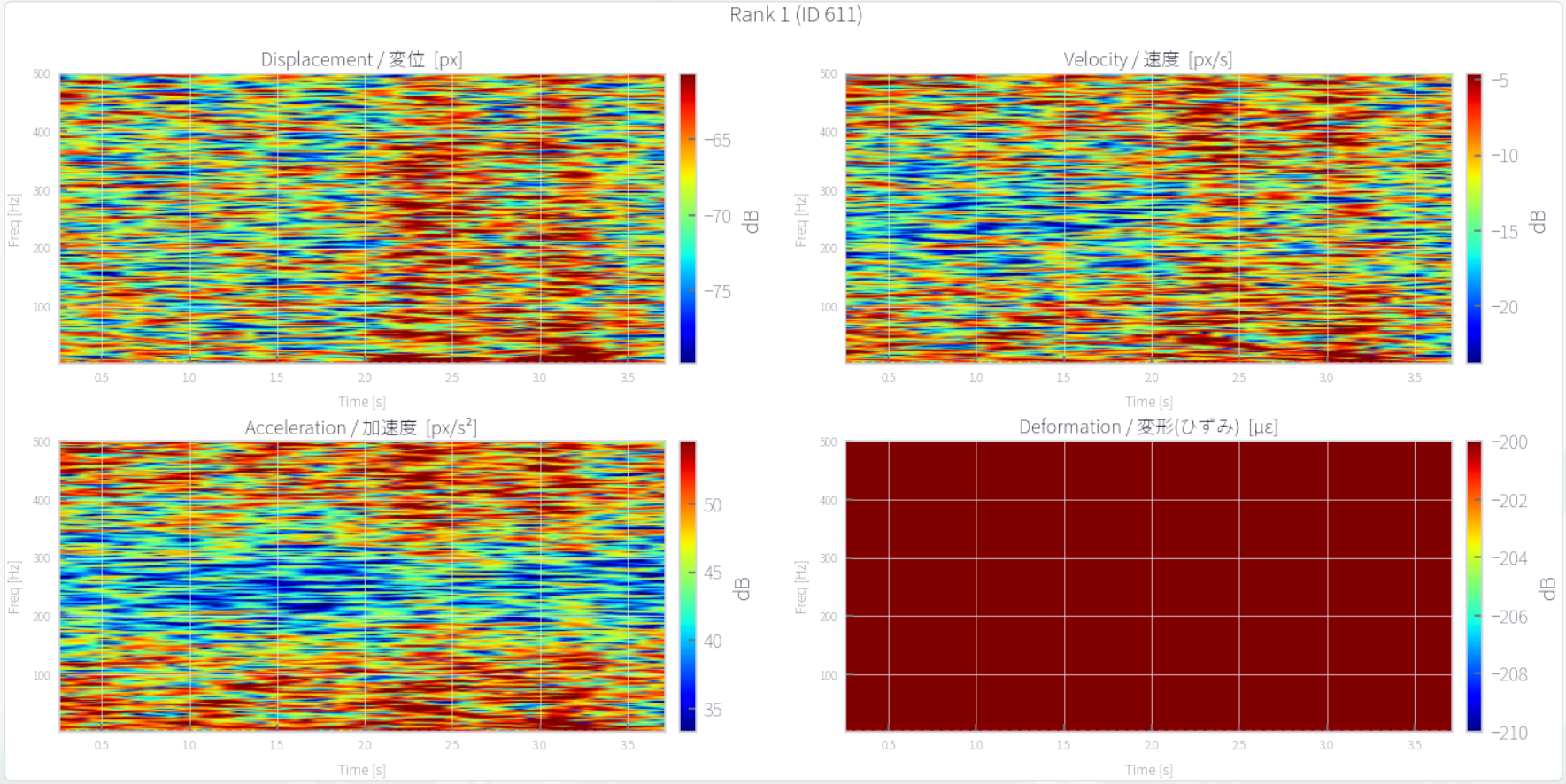


Spectrogram by Quantity

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.

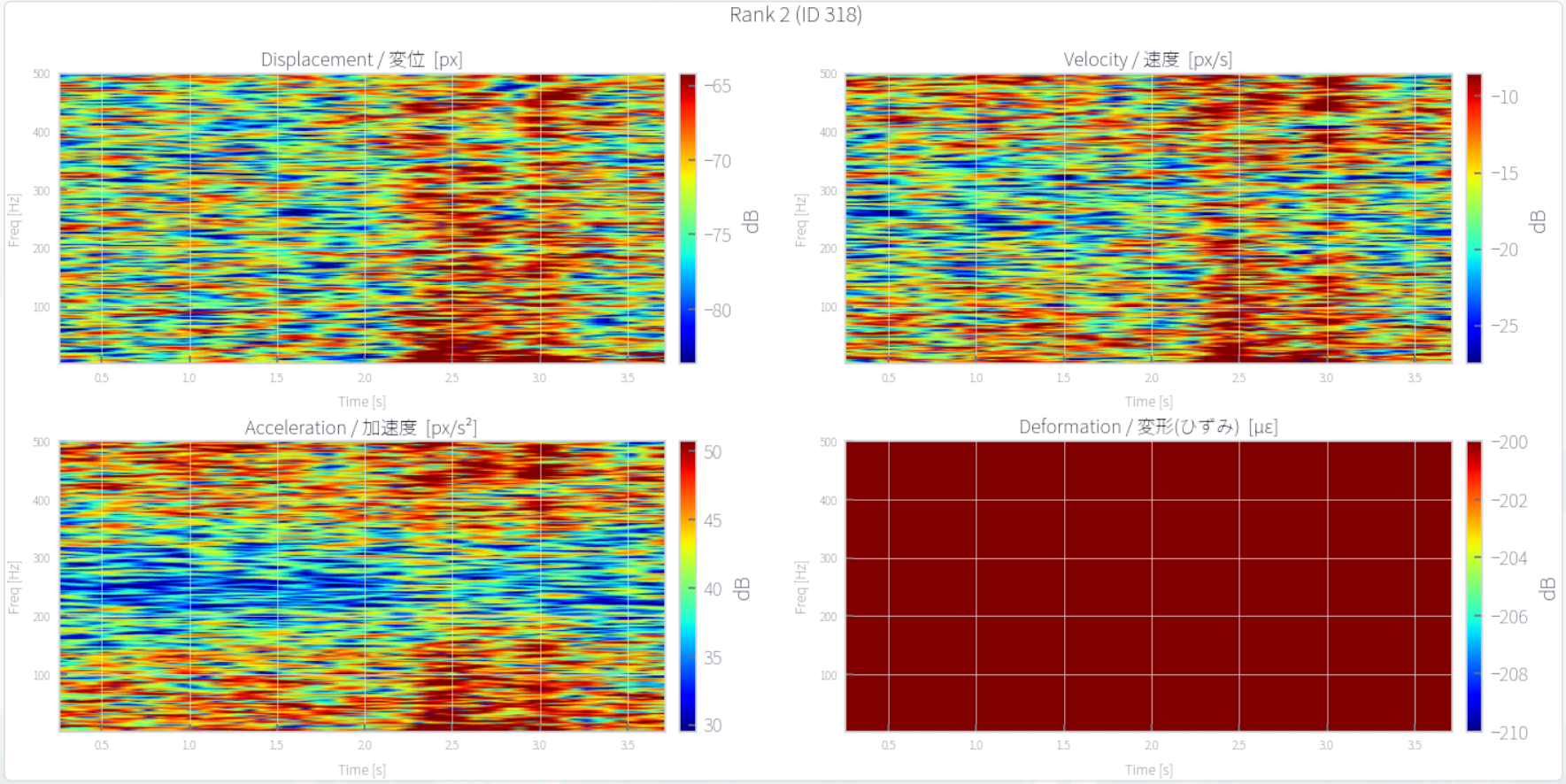


Spectrogram by Quantity

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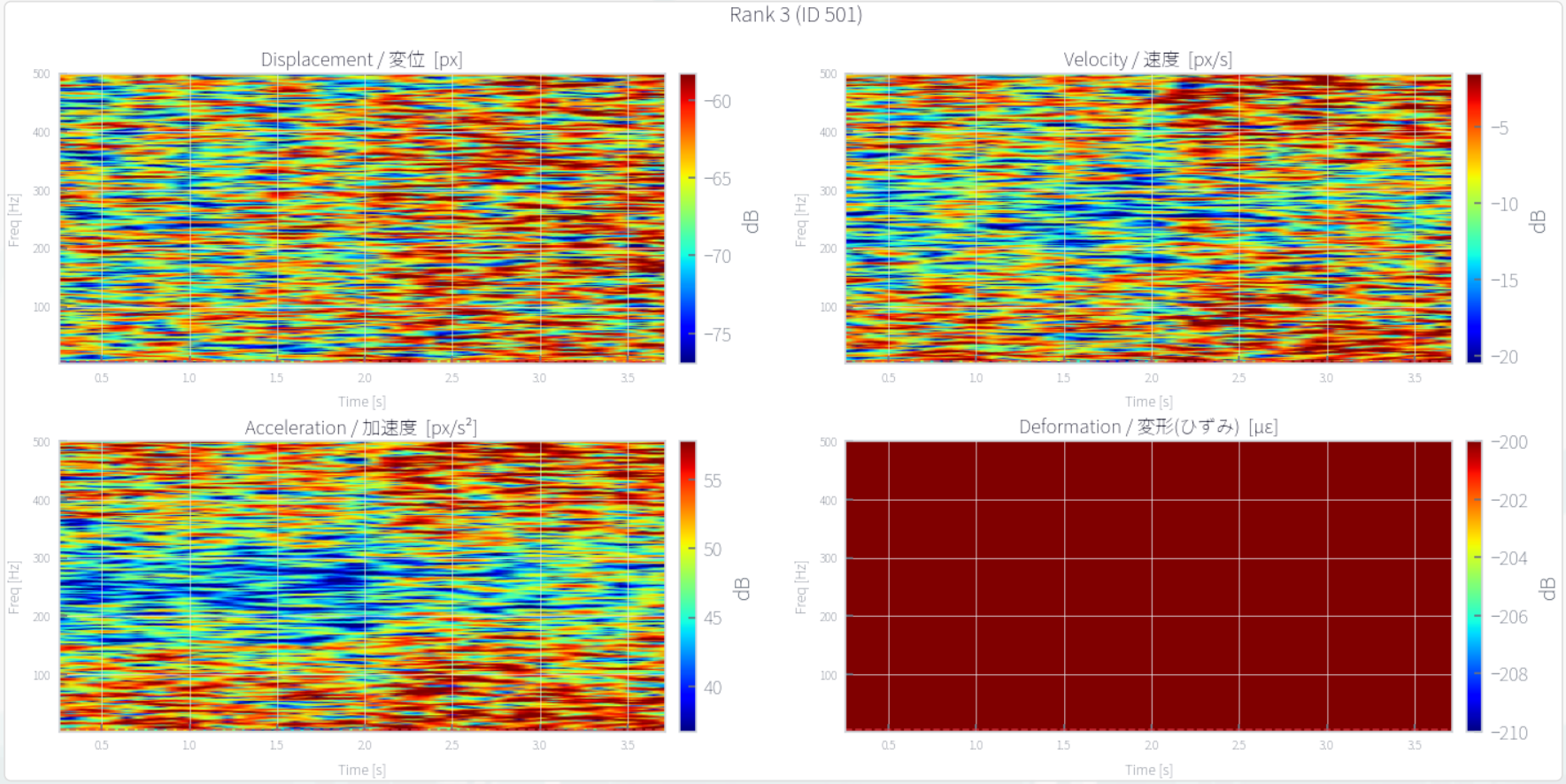


Spectrogram by Quantity

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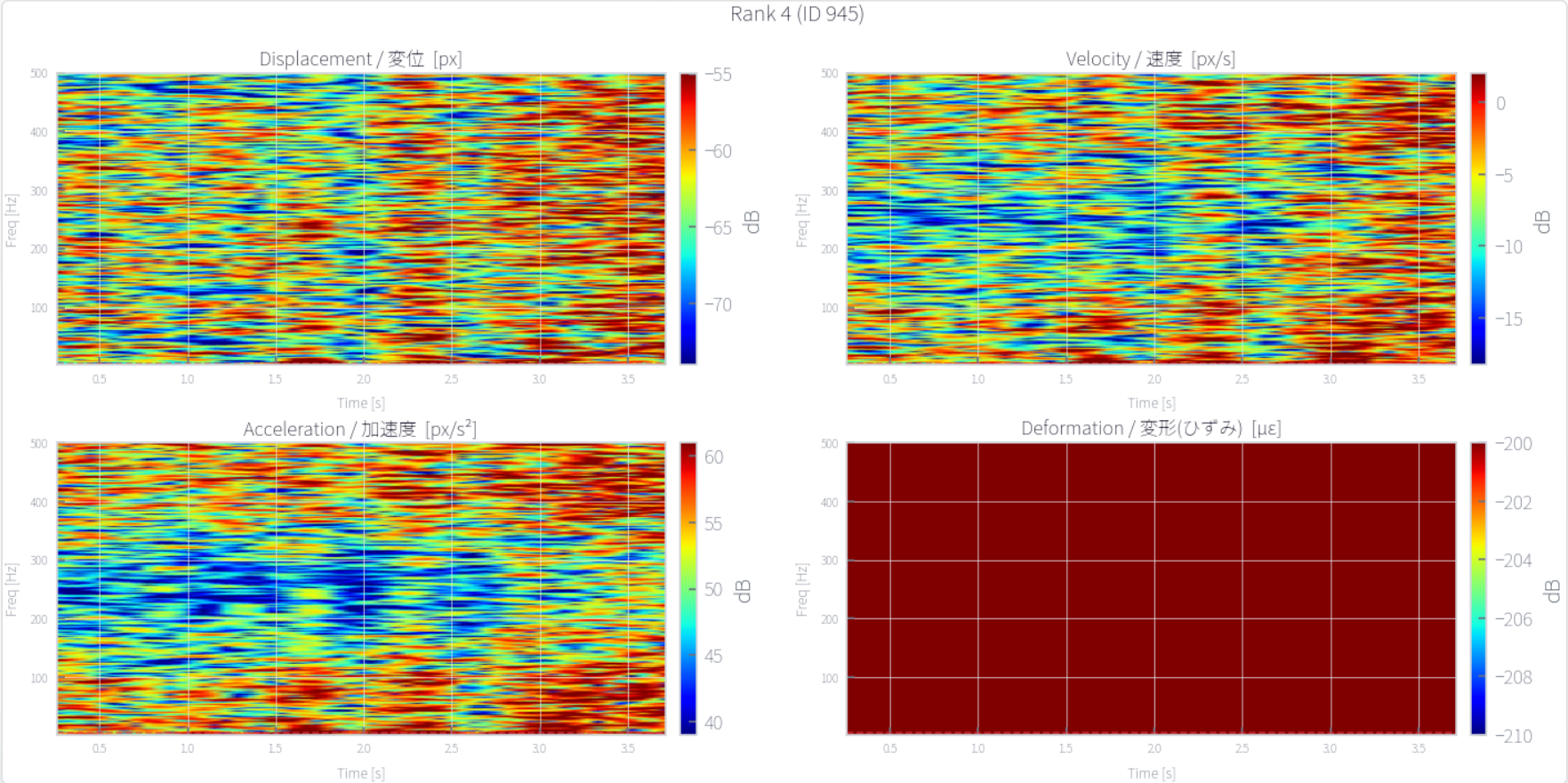


Spectrogram by Quantity

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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Acceleration Summary

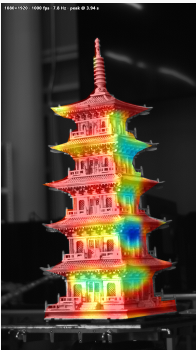
加速度サマリー（加速度計比較用）

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。未校正（ピクセル単位）：ArUcoマーカー寸法を設定して再解析すると校正済み単位で出力されます。
Peak displacement / velocity / acceleration at each point's dominant frequency (acceleration = displacement amplitude × (2πf)²). Uncalibrated (pixels) — set the ArUco marker size and re-run to get calibrated units.

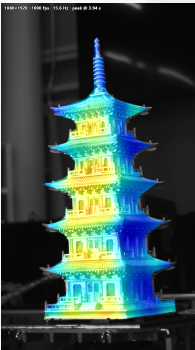


計測点 / Point	卓越周波数 Dom. Freq (Hz)	ピーク変位 Peak Disp (px)	ピーク速度 Peak Vel (px/s)	卓越モード加速度 Peak Accel (px/s²)	広帯域RMS加速度 Broadband RMS (px/s²)
Rank 1 (ID 611)	3.7	0.006701	0.1542	3.548	7.179e+04
Rank 2 (ID 318)	2.4	0.007287	0.1118	1.715	4.398e+04
Rank 3 (ID 501)	2.4	0.005147	0.07895	1.211	9.609e+04
Rank 4 (ID 945)	4.6	0.002603	0.07587	2.211	1.232e+05

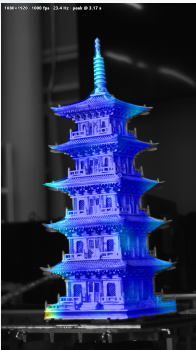
注：卓越モード加速度は卓越周波数の単一周波数振幅 × (2πf)² による代表値、広帯域RMS加速度は 解析帯域 2–500 Hz における加速度スペクトルのRMSです。Note: Peak Accel is the single-dominant-mode value (amplitude × (2πf)² at the dominant frequency); Broadband RMS is the RMS of the acceleration spectrum over the analysis band 2–500 Hz.



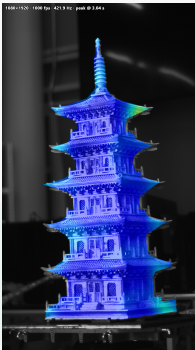
7.8 Hz
ピーク振幅 / peak 0.003192
px
Peak @ 3.94 s



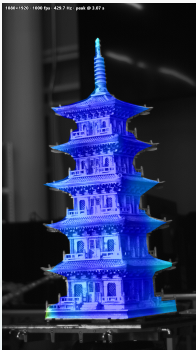
15.6 Hz
ピーク振幅 / peak 0.001701
px
Peak @ 3.94 s



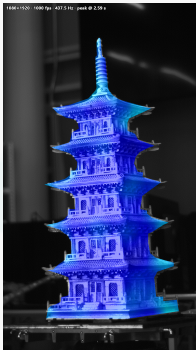
23.4 Hz
ピーク振幅 / peak 0.001462
px
Peak @ 3.17 s



421.9 Hz
ピーク振幅 / peak 0.001151
px
Peak @ 3.04 s



429.7 Hz
ピーク振幅 / peak 0.001759
px
Peak @ 3.07 s



437.5 Hz
ピーク振幅 / peak 0.001366
px
Peak @ 2.59 s

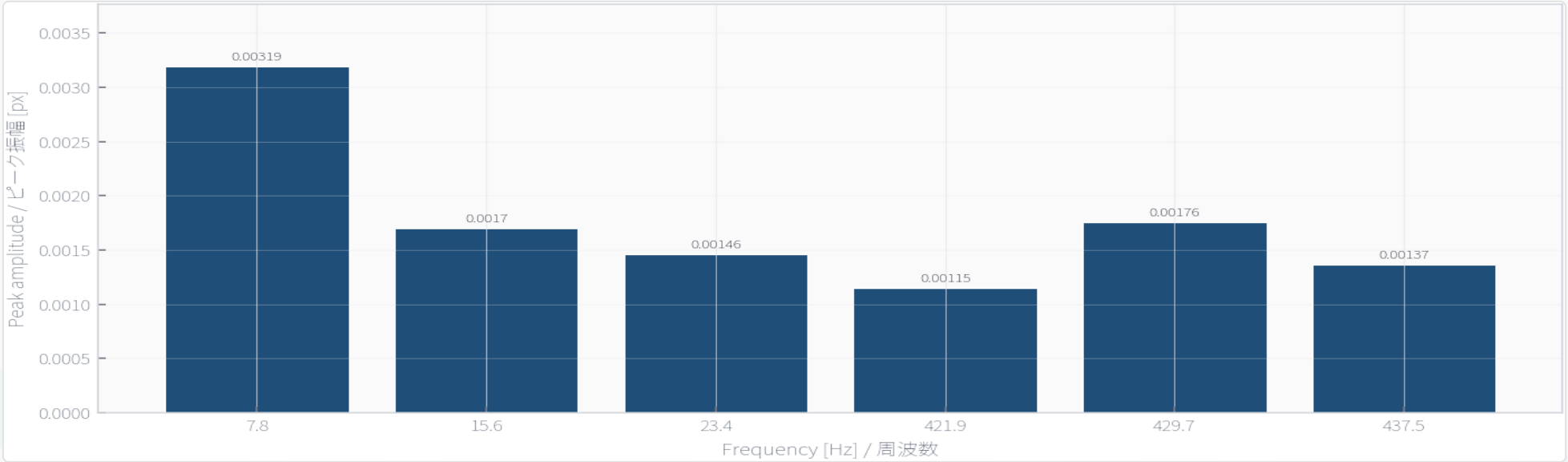


全図共通スケール
shared scale

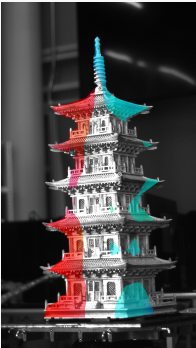
Amplitude by Frequency

周波数別 ピーク振幅

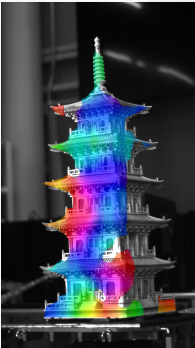
各卓越周波数におけるピーク振幅（px）。校正未設定のためピクセル単位（ArUco／手動スケールでmm表示）。 Peak vibration amplitude at each dominant frequency (px). Uncalibrated — set ArUco or a manual scale for mm.



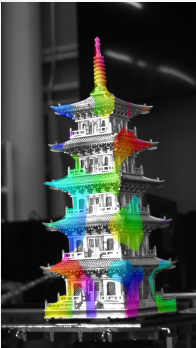
周波数 / Freq (Hz)	ピーク振幅 / Peak amplitude (px)
7.8	0.003192
15.6	0.001701
23.4	0.001462
421.9	0.001151
429.7	0.001759
437.5	0.001366



7.8 Hz



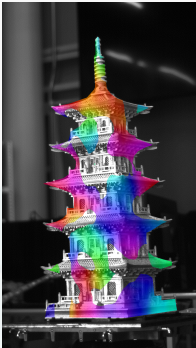
15.6 Hz



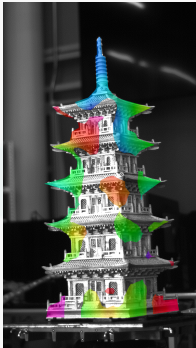
23.4 Hz



421.9 Hz

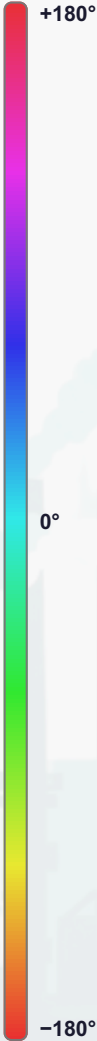


429.7 Hz



437.5 Hz

位相
Phase



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 (px)	Peak FFT Mag	Score	Dir	Peak Freq (X)	Peak Freq (Y)
1	611	0.0621	0.0067	0.774	X	3.7 Hz	292.0 Hz
2	318	0.0404	0.0073	0.704	X	2.4 Hz	2.4 Hz
3	501	0.0683	0.0051	0.698	Y	6.3 Hz	2.4 Hz
4	945	0.0989	0.0026	0.679	X	4.6 Hz	176.5 Hz

Waveform Statistics / 波形統計

Point	Dir	RMS (px)	Peak (px)	P-to-P (px)	Crest Factor	Kurtosis	Severity
ID 611	X	0.0122	0.0621	0.1190	5.09	2.24	正常 / Normal
ID 611	Y	0.0101	0.0454	0.0882	4.51	0.59	正常 / Normal
ID 318	X	0.0100	0.0404	0.0775	4.02	1.95	正常 / Normal
ID 318	Y	0.0070	0.0291	0.0568	4.15	1.53	正常 / Normal
ID 501	X	0.0122	0.0544	0.1001	4.46	0.83	正常 / Normal
ID 501	Y	0.0145	0.0683	0.1242	4.69	0.31	正常 / Normal
ID 945	X	0.0189	0.0989	0.1634	5.24	1.61	正常 / Normal
ID 945	Y	0.0191	0.0887	0.1772	4.63	1.30	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 / 1000.0 s = 1.000 ms / frame	
周波数帯 / Frequency Band	0 - 500.0 Hz (Nyquist limit)	
録画時間 / Recording duration	3.98 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	1000.0 fps	measured from frame timestamps
Frequency Range	0 - 500.0 Hz	Nyquist: $f_s/2$
Block Size	128 px	Spatial averaging window
Step Size	32 px	Grid spacing / density
STFT Window	128 samp	Freq. resolution = f_s/N
Scale Factor	Pixel units (no calibration)	Physical calibration
Sub-pixel Acc.	≤ 0.1 px (sub-pixel optical)	Optical tracking accuracy
Analyst	Karthik	Measurement responsibility