

masked_data_RG_80nM, signature fb42c503

Recording

Rat heart, ventricular fibrillation. 128 × 80 px, 3,800 frames, 1 kHz, 112.5 µm/px, deposit checks: unit range, non integer, nan mask partial, temporal smoothing, spatial smoothing. Source 10.5281/zenodo.18319102; publication 10.1093/cvr/cvaa141; licence CC-BY-4.0; Verstraeten, Bjorn; Lootens, Sebastiaan. sha256 9e30977de373f78d1b5d236bd100e46bb79c72152d3a7516b9c03c4849391076.

Run

20dfde82-4f4a-4a14-9732-14f64668db46, 2026-10-27 22:15 UTC to 2026-10-27 22:19 UTC, status done. Protocol Rat whole heart optical mapping (Zenodo 18319102), parameters v1 set by developer (not a domain scientist). Code 13d8ceb123e64ab2c7eaba9fbf51605361856f11 (clean), None workers.

Methods

Using the provisional protocol parameter set and provisional criteria, version 1, the analysis uses baseline_frames = 121, spatial_sigma = 1.0, spatial_truncate = 4.0, pad_frames = 200, rotor_threshold = 0.9, rotor_erode_px = 3, link_px = 4.0, max_gap = 5, min_cycles = 1.0, pair_dist_px = 3.0, paired_frac = 0.5, and render_step = 4. The frame rate is 1000 Hz from deposit metadata, and the pixel size is 112.5 µm from the deposit metadata midpoint of the stated range. The recording has 3800 frames, with the provisional segment definition whole_recording, labelled ventricular fibrillation (whole recording), spanning frames 0 to 3800; the analysed frames are 200 to 3600.

Verdict

Verdict: report only descriptive stable quantities for this provisional signature, not the rotor counts. The singularity-frame fraction is stable at 1.0 and dominant frequency is stable at 40.294 Hz, but neither has a cited physiological range, so physiology_ok is null rather than pass/fail. The persistent-rotor count is unstable over 204.0–464.0, the maximum concurrent persistent-rotor count is unstable over 9.0–21.0, and persistent-rotor tracks are unstable over 204.0–464.0, so those values are not reportable as single numbers; strict/default/loose tracking gave 250/303/450 persistent rotors while the tracker rule verdicts agree. The persistence-threshold rule is not applicable because there are no segment expectations or cited rotation period. Review is needed for the preprocessed deposit, transformed polarity relative to RH237, SNR dependence on preprocessing, and provisional reference thresholds; for the rotor metrics, also consider the published caution for this rat optical-mapping context that naive phase-singularity methods can yield false rotational drivers at conduction blocks (DOI 10.1371/journal.pcbi.1013963). The ranges, the stability threshold and the criteria are provisional. physiology_ok: None; send back: False. Reviewer sign-off: pending.

Parameters (as run)

```
% Rat whole heart optical mapping (Zenodo 18319102), v1, read-only
% set by developer (not a domain scientist); provisional, REVIEW_NEEDED 16
baseline_frames = 121;      % no baseline rule recorded for this run
pad_frames      = 200;      % each side, outside the window
spatial_sigma   = 1.0;      % px, Gaussian, phase only
spatial_truncate = 4.0;      % kernel radius, sigma
lowpass         = [];       % none
polarity        = 1;        % measured, skew of dV/dt
rotor_threshold = 0.9;      % turns, |winding| per plaquette
rotor_erode_px  = 3;        % px from tissue edge ignored
link_px         = 4.0;      % tracking, max step per frame
max_gap         = 5;        % frames a track may vanish
min_cycles      = 1.0;      % own rotations, min_frames = 25
pair_dist_px    = 3.0;      % opposite-charge pairing
paired_frac     = 0.5;      % max paired fraction of a track
render_step     = 4;        % movie only
```

Segments

Segment	Defined	Analysed	Cycle, frames	Expected rotors	Bounded by
Ventricular fibrillation (whole recording)	0-3,800	200-3,600	[not measured]	not stated	recording start → recording end

Metrics

Metric	Unit	Ventricular fibrillation (whole recording)	Physiological range
Rhythm			
Dominant frequency	Hz	40.294	none cited
Rotors			
Persistent rotors	count	204-464 (unstable)	none cited
Max concurrent persistent rotors	count	9-21 (unstable)	none cited
Frames with a singularity	fraction	1.000	none cited
Beats, where a global rhythm exists			
Beats	count	0	none cited
Global amplitude ratio	ratio	0.28	gate ≥ 0.30 provisional
APD50	ms	no global beat	none cited
APD90	ms	no global beat	none cited
Conduction velocity	cm/s	no global beat	none cited

Criteria and reportable values

Item	Rule or segment	Result
Design expectations	none stated for this recording's segments	no criterion to test; counts are descriptive (provisional)
persistent rotor tracks	all	204-464 count, unstable, not reportable
dominant freq (Hz)	whole recording	40.29 Hz, no cited range
persistent rotors	whole recording	204-464 count, unstable, not reportable
singularity frames fraction	whole recording	1 fraction of frames, no cited range
persistent rotor count max	whole recording	9-21 count, unstable, not reportable

Provisional rules behind this signature

Rule	Description	Expert	Status
protocol_parameter_set worker/voltage/protocol_params.py (developer_defaults, set_params)	Each protocol's fixed, versioned analysis parameters (version 1 = developer defaults); no run or agent may deviate	optical mapping analyst	provisional
filter_defaults worker/voltage/preprocess.py (Params)	Default baseline window (frames) and spatial Gaussian sigma/truncate for phase	optical mapping analyst (cardiac electrophysiology)	provisional
tissue_mask worker/voltage/io.py (tissue_mask)	Tissue = not NaN in frame 0 and nonzero temporal std	optical mapping analyst	provisional
polarity worker/voltage/preprocess.py (polarity)	Dye polarity from sign of median per-pixel skew of dV/dt	optical mapping analyst / voltage dye chemist	provisional
singularity_detection worker/voltage/preprocess.py (Params.rotor_threshold, rotor_erode_px)	Phase singularity = [winding] > threshold turns, >= erode px from tissue edge	computational cardiac electrophysiologist (phase mapping)	provisional
rotor_persistence worker/voltage/rotors.py (TrackParams)	Track linking distance/gap and minimum lifetime for a persistent rotor	computational cardiac electrophysiologist (phase mapping)	provisional
chirality_pairing worker/voltage/rotors.py (TrackParams.pair_dist_px, paired_frac)	Opposite-charge singularities within pair distance are a pair; tracks paired most of their life are excluded from rotors	computational cardiac electrophysiologist (phase mapping)	provisional
sensitivity_grid worker/voltage/sensitivity.py (SIGMAS, BASELINE_MULTIPLES, baseline_levels)	Filter levels tested: spatial sigma and baseline window values	optical mapping analyst	provisional
analysis_window worker/voltage/runs.py (default_window)	Frames analysed: whole recording minus one filter pad at each end (unless the plan narrows it)	cardiac electrophysiologist familiar with the dataset	provisional
prior_processing_flags worker/voltage/inspect.py (prior_processing)	Thresholds for flagging depositor processing (normalization, masking, temporal/spatial smoothing)	imaging scientist (camera acquisition and noise)	provisional
pipeline_check worker/agents/pipeline.py (INSTRUCTIONS, validator)	The pipeline agent's hold/proceed decision from protocol mismatches and inspector anomalies; it chooses no parameter	optical mapping analyst	provisional
physiology_reference_rates worker/voltage/physiology.py (RANGES, TOLERANCE_FRAC)	Cited physiological ranges (single-study values widened by a 25% tolerance), applied to segments by their expected rhythm; used by the critic and for frame-rate sanity checks	cardiac electrophysiologist per species	provisional

Provisional rules behind this signature

Rule	Description	Expert	Status
stability_rule worker/agents/critic.py (STABLE_FRAC, stability)	A metric is reportable only if its spread across all sensitivity settings is $\leq 25\%$ of its median (zero spread when all values are 0); otherwise 'unstable, not reportable'	biostatistician + optical mapping analyst	provisional
persistence_threshold_vari ants worker/agents/critic.py (persistence_variants)	The persistent-rotor rule is run at two lifetimes, one measured cycle of the fastest segment and the paper's cited rotation period; both verdicts stored, disagreement flagged	computational cardiac electrophysiologist (phase mapping)	provisional
persistent_rotor_criterion worker/voltage/sensitivity .py (MIN_ROTORS_PRESENT, setting MAX_ROTORS_ABSENT)	Persistent-rotor finding holds if every 'present' segment has ≥ 1 persistent rotor and every 'absent' segment has none, at every	cardiac electrophysiologist	provisional

Review items

Topic	Detail	Severity
unstable:whole_recording.persiste nt_rotors	The count ranges from 204.0 to 464.0 across filter and tracker settings, exceeding the provisional stability criterion; do not report a single count without review.	block
unstable:whole_recording.persiste nt_rotor_count_max	The maximum concurrent count ranges from 9.0 to 21.0 across settings, exceeding the block provisional stability criterion; do not report a single maximum count without review.	
unstable:persistent_rotor_tracks	Track counts range from 204.0 to 464.0 across sensitivity settings; the cited rat-data context warns that naive phase-singularity approaches can create false rotational drivers at conduction blocks (DOI 10.1371/journal.pcbi.1013963).	block
preprocessed deposit	The deposit is not raw camera data and is documented as background-subtracted, spatially binned, low-pass filtered, drift-removed, and normalized; analyses requiring raw fluorescence/counts or unfiltered noise statistics would be misleading.	warn
polarity transformed relative to dye	RH237 normally dims on depolarization, but measured polarity is non-inverted with 7/7 blocks agreeing; the depositor appears to have flipped or transformed sign, so the pipeline should orient from measured polarity.	warn
SNR depends on preprocessing	Median SNR is high, but temporal filtering and detected temporal smoothing can inflate SNR by reducing apparent frame-to-frame noise.	info
reference thresholds provisional	No frame-rate inference was needed because the deposit states 1 kHz; automated processing flags and provisional rhythm/reference-rate tools are not yet domain-scientist reviewed.	info

Provenance

```
{
  "recording": {
    "id": "73e4ebe2-6b09-4582-a1d6-ded901b7d124",
    "label": "Rat heart, ventricular fibrillation (RG 80 nM)",
    "source": "public",
    "source_ref": "10.5281/zenodo.18319102",
    "publication_ref": "10.1093/cvr/cvaa141",
    "storage_path": "public/masked_data_RG_80nM.mat",
    "format": "mat",
    "sha256": "9e30977de373f78d1b5d236bd100e46bb79c72152d3a7516b9c03c4849391076",
    "size_bytes": 293204250,
    "license": "CC-BY-4.0",
    "attribution": "Verstraeten, Bjorn; Lootens, Sebastiaan",
    "rights_source": {
      "ref": "10.5281/zenodo.18319102",
      "url": "https://zenodo.org/records/18319102",
      "kind": "deposit_metadata",
      "creators": [
        "Verstraeten, Bjorn",
        "Lootens, Sebastiaan"
      ],
      "license_as_stated": "cc-by-4.0"
    },
    "frame_rate_hz": 1000,
    "frame_rate_source": {
      "ref": "10.5281/zenodo.18319102",
      "kind": "deposit_metadata",
      "quote": "Emitted fluorescence was recorded with high-resolution CMOS cameras at a sampling rate of 1 kHz, with a spatial resolution of 128 \u00d7 80 pixels and a pixel size of approximately 100\u2013125 \u00b5m."
    },
    "pixel_size_um": 112.5,
    "pixel_size_source": {
      "ref": "10.5281/zenodo.18319102",
      "kind": "deposit_metadata",
      "note": "midpoint of the stated 100-125 um; conduction velocities carry a +/-11% range from this alone",
      "quote": "Emitted fluorescence was recorded with high-resolution CMOS cameras at a sampling rate of 1 kHz, with a spatial resolution of 128 \u00d7 80 pixels and a pixel size of approximately 100\u2013125 \u00b5m."
    },
    "frames": 3800,
    "height": 128,
    "width": 80,
    "inverted": false
  },
  "protocol": {
    "id": "a0059cf5-fbde-4942-a18f-399ebe70e9ff",
    "name": "Rat whole heart optical mapping (Zenodo 18319102)",
    "species": "rat",
    "tissue": "whole_heart",
    "params_version": 1,
  }
}
```

```

    "params_set_by": "developer (not a domain scientist)",
    "params_note": "version 1: the library defaults as of commit 363372b; provisional, see
protocol_params.py"
},
"run": {
    "id": "20dfde82-4f4a-4a14-9732-14f64668db46",
    "status": "done",
    "started_at": "2026-10-27T22:15:54.54125+00:00",
    "finished_at": "2026-10-27T22:19:16.709445+00:00",
    "code": {
        "dirty": false,
        "git_commit": "13d8ceb123e64ab2c7eaba9fbf51605361856f11"
    },
    "workers": null,
    "steps": [
        "load",
        "deposit_checks",
        "baseline_correct",
        "polarity",
        "spatial_filter(phase only)",
        "hilbert_phase",
        "phase_singularities",
        "track_and_pair",
        "beats_apd_cv",
        "sensitivity",
        "render"
    ],
    "protocol_params": {
        "params": {
            "link_px": 4.0,
            "max_gap": 5,
            "min_cycles": 1.0,
            "pad_frames": 200,
            "paired_frac": 0.5,
            "render_step": 4,
            "pair_dist_px": 3.0,
            "spatial_sigma": 1.0,
            "rotor_erode_px": 3,
            "baseline_frames": 121,
            "rotor_threshold": 0.9,
            "spatial_truncate": 4.0
        },
        "version": 1,
        "protocol_id": "a0059cf5-fbde-4942-a18f-399ebe70e9ff"
    },
    "baseline_rule": null,
    "deposit_checks": {
        "flags": [
            {
                "flag": "unit_range",
                "value": [
                    0.0,
                    1.0
                ],
            }
        ],
    },

```

```

    "suggests": "min-max normalized",
    "threshold": "[0, 1] spanned"
  },
  {
    "flag": "non_integer",
    "value": 0.0003442292944785276,
    "suggests": "not raw camera counts (camera output is integer); weak alone",
    "threshold": 0.5
  },
  {
    "flag": "nan_mask_partial",
    "value": [
      0
    ],
    "suggests": "mask encoded in a few frames only; other frames carry non-tissue values"
  },
  {
    "flag": "temporal_smoothing",
    "value": 0.959237783400513,
    "suggests": "temporally low-pass filtered (white shot noise gives dV lag-1 autocorr
near -0.5)",
    "threshold": 0.5
  },
  {
    "flag": "spatial_smoothing",
    "value": 0.9479694003115444,
    "suggests": "spatially filtered or binned (shot noise is independent between pixels)",
    "threshold": 0.8
  }
],
"status": "provisional",
"measures": {
  "max": 1.0,
  "min": 0.0,
  "frames_used": 2000,
  "integer_frac": 0.0003442292944785276,
  "negative_frac": 0.0,
  "frames_with_nan": 1,
  "dv_lag1_autocorr_median": 0.959237783400513,
  "neighbour_dv_corr_median": 0.9479694003115444
},
"processed_before_deposit": true
},
"pipeline_check": {
  "model": "openai:gpt-5.5",
  "proceed": true,
  "anomalies": [
    {
      "topic": "preprocessed deposit",
      "severity": "warn",
      "effect_on_analysis": "The recording is documented as background-subtracted, 3 \u00d7 3
spatially binned, low-pass filtered at 100 Hz, drift-removed, and normalized before deposit.
The fixed pipeline can be run, but its Gaussian phase smoothing and baseline removal are
being applied on top of prior filtering and drift correction of unknown total effect;

```

amplitude, noise, and SNR-related interpretations should not be treated as raw-camera measurements."

```
    },
    {
      "topic": "polarity transformed relative to dye",
      "severity": "warn",
      "effect_on_analysis": "RH237 normally decreases fluorescence on depolarization, but the deposited data measure as non-inverted. The pipeline should orient activation from measured polarity rather than dye expectation, so activation analysis is not expected to be made wrong if measured polarity is used."
    }
  ],
  "rationale": "The recording matches the protocol at the level needed to use the fixed parameter set: it is a rat whole-heart ventricular-fibrillation optical-mapping recording from the referenced public dataset, and no protocol field conflicts with the recording facts. The recording frame rate is 1000 Hz from deposit metadata; the protocol does not prescribe a different frame rate, and with the fixed baseline window the measured dominant rhythm is not in the caveated regime where the baseline window is shorter than about 1.5 cycles. The run should proceed, but the reader must treat the data as preprocessed rather than raw because prior binning, low-pass filtering, drift removal, and normalization affect the meaning of further smoothing, baseline correction, amplitude, and noise estimates.",
  "mismatches": [],
  "hold_reason": null,
  "protocol_id": "a0059cf5-fbde-4942-a18f-399ebe70e9ff",
  "methods_text": "Using the provisional protocol parameter set and provisional criteria, version 1, the analysis uses baseline_frames = 121, spatial_sigma = 1.0, spatial_truncate = 4.0, pad_frames = 200, rotor_threshold = 0.9, rotor_erode_px = 3, link_px = 4.0, max_gap = 5, min_cycles = 1.0, pair_dist_px = 3.0, paired_frac = 0.5, and render_step = 4. The frame rate is 1000 Hz from deposit metadata, and the pixel size is 112.5 \u00b5m from the deposit metadata midpoint of the stated range. The recording has 3800 frames, with the provisional segment definition whole_recording, labelled ventricular fibrillation (whole recording), spanning frames 0 to 3800; the analysed frames are 200 to 3600.",
  "recording_id": "73e4ebe2-6b09-4582-a1d6-ded901b7d124",
  "params_version": 1,
  "prompt_version": "pipeline-v2"
},
"signature": {
  "id": "fb42c503-638b-471d-b7b2-834ee2023623",
  "created_at": "2026-10-27T22:19:16.309409+00:00",
  "movie_path": "runs/20dfde82-4f4a-4a14-9732-14f64668db46/movie.mp4",
  "frames": {},
  "filter_params": {
    "mask": "not NaN in frame 0 and nonzero temporal std",
    "render": {
      "step": 4,
      "palettes": {
        "phase": "twilight",
        "camera": "gray",
        "voltage": "gray"
      }
    },
    "interpolation": "nearest"
  },
  "window": {
```

```

"f0": 200,
"f1": 3600,
"segments": [
  {
    "name": "whole_recording",
    "label": "ventricular fibrillation (whole recording)",
    "defined": [
      0,
      3800
    ],
    "analysed": [
      200,
      3600
    ],
    "citation": null,
    "defined_by": "developer (no comparison defined)",
    "segment_id": "1eb0a669-d021-4b1a-a0b7-d652eaabb546",
    "end_event_id": null,
    "start_event_id": null,
    "expected_persistent_rotors": null
  }
],
"illumination": null,
"frame_rate_hz": 1000.0,
"frame_rate_source": {
  "ref": "10.5281/zenodo.18319102",
  "kind": "deposit_metadata",
  "quote": "Emitted fluorescence was recorded with high-resolution CMOS cameras at a
sampling rate of 1 kHz, with a spatial resolution of 128 \u00d7 80 pixels and a pixel size
of approximately 100\u00b5m."
},
"segment_cycles_frames": {
  "whole_recording": 25
}
},
"lowpass": null,
"polarity": 1,
"tracking": {
  "link_px": 4.0,
  "max_gap": 5,
  "min_cycles": 1.0,
  "min_frames": 25,
  "paired_frac": 0.5,
  "pair_dist_px": 3.0
},
"pad_frames": 200,
"phase_method": "angle of scipy.signal.hilbert along time, on spatially filtered signal",
"spatial_sigma": 1.0,
"rotor_erode_px": 3,
"spatial_method": "scipy.ndimage.gaussian_filter per frame, mode=reflect; NaN set to 0
before filtering, non-tissue zeroed after",
"baseline_frames": 121,
"baseline_method": "scipy.ndimage.uniform_filter1d, mode=reflect, subtracted per pixel",
"polarity_method": "sign of median per-pixel skew of dV/dt on baseline-corrected signal",

```

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    "rotor_threshold": 0.9,
    "spatial_truncate": 4.0,
    "spatial_applies_to": "phase/activation only; displayed voltage is baseline-corrected
only"
  },
  "criteria_status": {
    "note": null,
    "rules": [
      {
        "id": "protocol_parameter_set",
        "expert": "optical mapping analyst",
        "status": "provisional",
        "values": {
          "set_by": "developer (not a domain scientist)",
          "protocol": "Rat whole heart optical mapping (Zenodo 18319102)",
          "protocol_id": "a0059cf5-fbde-4942-a18f-399ebe70e9ff",
          "params_version": 1
        },
        "decision": null,
        "location": "worker/voltage/protocol_params.py (developer_defaults, set_params)",
        "reviewed": false,
        "reviewer": null,
        "description": "Each protocol's fixed, versioned analysis parameters (version 1 =
developer defaults); no run or agent may deviate",
        "reviewed_at": null
      },
      {
        "id": "filter_defaults",
        "expert": "optical mapping analyst (cardiac electrophysiology)",
        "status": "provisional",
        "values": {
          "lowpass": null,
          "spatial_sigma": 1.0,
          "baseline_frames": 121,
          "spatial_truncate": 4.0
        },
        "decision": null,
        "location": "worker/voltage/preprocess.py (Params)",
        "reviewed": false,
        "reviewer": null,
        "description": "Default baseline window (frames) and spatial Gaussian sigma/truncate
for phase",
        "reviewed_at": null
      },
      {
        "id": "tissue_mask",
        "expert": "optical mapping analyst",
        "status": "provisional",
        "values": {
          "rule": "not NaN in frame 0 and nonzero std",
          "tissue_pixels": 5216
        },
        "decision": null,
        "location": "worker/voltage/io.py (tissue_mask)",

```

```

    "reviewed": false,
    "reviewer": null,
    "description": "Tissue = not NaN in frame 0 and nonzero temporal std",
    "reviewed_at": null
},
{
    "id": "polarity",
    "expert": "optical mapping analyst / voltage dye chemist",
    "status": "provisional",
    "values": {
        "method": "median skew of dV/dt",
        "result": 1
    },
    "decision": null,
    "location": "worker/voltage/preprocess.py (polarity)",
    "reviewed": false,
    "reviewer": null,
    "description": "Dye polarity from sign of median per-pixel skew of dV/dt",
    "reviewed_at": null
},
{
    "id": "singularity_detection",
    "expert": "computational cardiac electrophysiologist (phase mapping)",
    "status": "provisional",
    "values": {
        "rotor_erode_px": 3,
        "rotor_threshold": 0.9
    },
    "decision": null,
    "location": "worker/voltage/preprocess.py (Params.rotor_threshold, rotor_erode_px)",
    "reviewed": false,
    "reviewer": null,
    "description": "Phase singularity = |winding| > threshold turns, >= erode px from
tissue edge",
    "reviewed_at": null
},
{
    "id": "rotor_persistence",
    "expert": "computational cardiac electrophysiologist (phase mapping)",
    "status": "provisional",
    "values": {
        "link_px": 4.0,
        "max_gap": 5,
        "min_cycles": 1.0,
        "min_frames": 25
    },
    "decision": null,
    "location": "worker/voltage/rotors.py (TrackParams)",
    "reviewed": false,
    "reviewer": null,
    "description": "Track linking distance/gap and minimum lifetime for a persistent
rotor",
    "reviewed_at": null
},

```

```

{
  "id": "chirality_pairing",
  "expert": "computational cardiac electrophysiologist (phase mapping)",
  "status": "provisional",
  "values": {
    "paired_frac": 0.5,
    "pair_dist_px": 3.0
  },
  "decision": null,
  "location": "worker/voltage/rotors.py (TrackParams.pair_dist_px, paired_frac)",
  "reviewed": false,
  "reviewer": null,
  "description": "Opposite-charge singularities within pair distance are a pair; tracks
paired most of their life are excluded from rotors",
  "reviewed_at": null
},
{
  "id": "sensitivity_grid",
  "expert": "optical mapping analyst",
  "status": "provisional",
  "values": {
    "sigmas": {
      "light": 0.5,
      "default": 1.0,
      "heavier": 2.0
    },
    "trackers": {
      "loose": [
        6.0,
        10
      ],
      "strict": [
        2.0,
        1
      ],
      "default": [
        4.0,
        5
      ]
    },
    "baselines": {
      "run": 121,
      "3x_cycle": 75,
      "6x_cycle": 150,
      "1.5x_cycle": 38
    }
  },
  "decision": null,
  "location": "worker/voltage/sensitivity.py (SIGMAS, BASELINE_MULTIPLES,
baseline_levels)",
  "reviewed": false,
  "reviewer": null,
  "description": "Filter levels tested: spatial sigma and baseline window values",
  "reviewed_at": null
}

```

```

},
{
  "id": "analysis_window",
  "expert": "cardiac electrophysiologist familiar with the dataset",
  "status": "provisional",
  "values": {
    "f0": 200,
    "f1": 3600
  },
  "decision": null,
  "location": "worker/voltage/runs.py (default_window)",
  "reviewed": false,
  "reviewer": null,
  "description": "Frames analysed: whole recording minus one filter pad at each end
(unless the plan narrows it)",
  "reviewed_at": null
},
{
  "id": "prior_processing_flags",
  "expert": "imaging scientist (camera acquisition and noise)",
  "status": "provisional",
  "values": {
    "flags": [
      "unit_range",
      "non_integer",
      "nan_mask_partial",
      "temporal_smoothing",
      "spatial_smoothing"
    ],
    "thresholds": {
      "int_frac": 0.5,
      "neg_frac": 0.01,
      "dv_autocorr": 0.5,
      "neighbour_corr": 0.8
    }
  },
  "decision": null,
  "location": "worker/voltage/inspect.py (prior_processing)",
  "reviewed": false,
  "reviewer": null,
  "description": "Thresholds for flagging depositor processing (normalization, masking,
temporal/spatial smoothing)",
  "reviewed_at": null
},
{
  "id": "pipeline_check",
  "expert": "optical mapping analyst",
  "status": "provisional",
  "values": {
    "model": "openai:gpt-5.5",
    "proceed": true,
    "anomalies": [
      "preprocessed deposit",
      "polarity transformed relative to dye"
    ]
  }
}

```

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    ],
    "mismatches": []
  },
  "decision": null,
  "location": "worker/agents/pipeline.py (INSTRUCTIONS, validator)",
  "reviewed": false,
  "reviewer": null,
  "description": "The pipeline agent's hold/proceed decision from protocol mismatches and
inspector anomalies; it chooses no parameter",
  "reviewed_at": null
},
{
  "id": "physiology_reference_rates",
  "expert": "cardiac electrophysiologist per species",
  "status": "provisional",
  "values": {
    "ranges": [],
    "tolerance_frac": 0.25,
    "segment_rhythm_rule": "expected persistent rotors 'present' -> spiral arrhythmia"
  },
  "decision": null,
  "location": "worker/voltage/physiology.py (RANGES, TOLERANCE_FRAC)",
  "reviewed": false,
  "reviewer": null,
  "description": "Cited physiological ranges (single-study values widened by a 25%
tolerance), applied to segments by their expected rhythm; used by the critic and for frame-
rate sanity checks",
  "reviewed_at": null
},
{
  "id": "stability_rule",
  "expert": "biostatistician + optical mapping analyst",
  "status": "provisional",
  "values": {
    "unstable": [
      "whole_recording.persistent_rotors",
      "whole_recording.persistent_rotor_count_max",
      "persistent_rotor_tracks"
    ],
    "stable_frac": 0.25
  },
  "decision": null,
  "location": "worker/agents/critic.py (STABLE_FRAC, stability)",
  "reviewed": false,
  "reviewer": null,
  "description": "A metric is reportable only if its spread across all sensitivity
settings is <= 25% of its median (zero spread when all values are 0); otherwise 'unstable,
not reportable'",
  "reviewed_at": null
},
{
  "id": "persistence_threshold_variants",
  "expert": "computational cardiac electrophysiologist (phase mapping)",
  "status": "provisional",

```

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    "values": {
      "measured_cycle": 25,
      "paper_rotation": null
    },
    "decision": null,
    "location": "worker/agents/critic.py (persistence_variants)",
    "reviewed": false,
    "reviewer": null,
    "description": "The persistent-rotor rule is run at two lifetimes, one measured cycle
of the fastest segment and the paper's cited rotation period; both verdicts stored,
disagreement flagged",
    "reviewed_at": null
  },
  {
    "id": "persistent_rotor_criterion",
    "expert": "cardiac electrophysiologist",
    "status": "provisional",
    "values": {
      "max_absent": 0,
      "min_present": 1
    },
    "decision": null,
    "location": "worker/voltage/sensitivity.py (MIN_ROTORS_PRESENT, MAX_ROTORS_ABSENT)",
    "reviewed": false,
    "reviewer": null,
    "description": "Persistent-rotor finding holds if every 'present' segment has >= 1
persistent rotor and every 'absent' segment has none, at every setting",
    "reviewed_at": null
  }
],
"status": "provisional",
"all_reviewed": false,
"superseded_by_run": null
}
},
"segments": [
  {
    "id": "1eb0a669-d021-4b1a-a0b7-d652eaabb546",
    "position": 1,
    "name": "whole_recording",
    "label": "ventricular fibrillation (whole recording)",
    "start_frame": 0,
    "end_frame": 3800,
    "expected_persistent_rotors": null,
    "definition": "whole recording; no events detected or logged",
    "defined_by": "developer (no comparison defined)",
    "citation": null,
    "evidence": {},
    "provisional": true
  }
],
"events": []
}

```