M13Rec001, signature cf0c8a27

Recording

Mouse heart, spiral wave and optogenetic termination. 64 × 55 px, 9,267 frames, 1 kHz, 133 µm/px, deposit checks: negative values, nan mask all frames, temporal smoothing, spatial smoothing. Source 10.5281/zenodo.10228296; publication 10.1371/journal.pcbi.1011660; licence CC-BY-4.0; Hussaini, Sayedeh; Luther, Stefan; Lädke, Sarah L.. sha256 3f8f2e1b8f776633089b33ccd4bf3fccb4f13140b71991f1dcd0e0a12bb48cbc.

Run

faeb5ebc-ee96-4994-96b0-025811d9374b, 2026-10-27 23:05 UTC to 2026-10-27 23:11 UTC, status done. Protocol Mouse whole heart optical mapping (Luther lab), parameters v3 set by developer (not a domain scientist). Code b1be82429ddde2ad90ee88afacaae98a173e4403 (uncommitted changes), None workers.

Methods

Using provisional parameter set version 3 for protocol f65d786f-f194-4be2-88b8-10d3dd25d674, the fixed parameters were baseline_frames=901, spatial_sigma=1.0, spatial_truncate=4.0, pad_frames=500, 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 recording has 9267 frames in npy format with image size 64 by 55, frame rate 1000 Hz from publication 10.1371/journal.pcbi.1011660 with DAQ consistency, and pixel size 133 µm from the same publication. The analysed window was frames 500 to 8767, with provisional segment definitions and criteria: illuminated_arrhythmia frames 0 to 3170, illuminated_after_termination frames 3170 to 4977, and light_off frames 4977 to 9267.

Verdict

Verdict: report only stable descriptive findings and provisional presence/absence criteria, not unstable scalar values; physiology_ok is indeterminate because the only ranged check, illuminated-arrhythmia dominant frequency, is unstable over 15.356–19.85 Hz rather than reportable as a single value, although DOI 10.1371/journal.pcbi.1011660 provides same-study mouse context of approximately 20 Hz before illumination and approximately 18.75 Hz during illumination, with a 20.0 Hz rotation corresponding to 50 frames. Reportable items include stable absence of persistent rotors in light_off and illuminated_after_termination, stable persistent-rotor presence during illuminated_arrhythmia under the provisional rule, stable illuminated_arrhythmia singularity-frame fraction at 0.47902621722846445, stable light_off dominant frequency at 2.375 Hz, and stable illuminated_after_termination dominant frequency at 2.214 Hz, all with no cited physiology range except the unstable frequency context. Unstable and not reportable as single values are light_off.singularity_frames_frac over 0.0029023746701846965–0.02955145118733509, illuminated_arrhythmia.persistent_rotors over 4.0–15.0, illuminated_arrhythmia.persistent_rotor_count_max over 1.0–2.0, illuminated_arrhythmia.dominant_freq_hz over 15.356–19.85 Hz, illuminated_after_termination.singularity_frames_frac over 0.0005534034311012728–0.014941892639734366, and persistent_rotor_tracks over 4.0–15.0. Needs review: the deposited-data processing/raw label, frame-3170 event interpretation, baseline and illumination artifact, and all provisional tool thresholds; the ranges, the stability threshold, and the criteria are provisional.
physiology_ok: None; send back: False. Reviewer sign-off: pending.

Parameters (as run)

```
% Mouse whole heart optical mapping (Luther lab), v3, read-only
% set by developer (not a domain scientist); provisional, REVIEW_NEEDED 16
baseline_frames  = 901;     % >= 2 x slowest cycle (415, MAP): ok
pad_frames       = 500;     % 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 = 52
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
Illumination with arrhythmia	0–3,170	500–3,170	52 (n = 53)	present	LED on before frame 0 (DAQ) → termination step (image, ±17 frames)
Illumination after termination	3,170–4,977	3,170–4,977	415 (n = 4)	absent	termination step (image, ±17 frames) → illumination off (DAQ, ±11 frames)
Light off	4,977–9,267	4,977–8,767	411 (n = 10)	absent	illumination off (DAQ, ±11 frames) → recording end

Metrics

Metric	Unit	Illumination with arrhythmia	Illumination after termination	Light off	Physiological range
Rhythm					
Dominant frequency	Hz	15.356–19.850 (unstable)	2.214	2.375	18.75–20 Hz, one recording provisional
Rotors					
Persistent rotors	count	4–15 (unstable)	0	0	none cited
Max concurrent persistent rotors	count	1–2 (unstable)	0	0	none cited
Frames with a singularity	fraction	0.479	0.001–0.015 (unstable)	0.003–0.030 (unstable)	none cited
Beats, where a global rhythm exists					
Beats	count	57	4	9	none cited
Global amplitude ratio	ratio	0.72	0.95	0.95	gate ≥ 0.30 provisional
APD50	ms	14	16	16	none cited
APD90	ms	25	76	75	none cited
Conduction velocity	cm/s	31.3	58.5	60.0	none cited

Criteria and reportable values

Item	Rule or segment	Result
Singularities present where the design expects them, absent elsewhere	each 'present' segment: frac >= 0.1 and >= 2.0 x max frac over 'absent' segments, at every setting	holds at 12 filter settings (provisional)
Persistent rotors present where the design expects them, absent elsewhere	each 'present' segment: count >= 1; each 'absent' segment: count <= 0, at every setting	holds at 12 filter settings and 3 trackers (provisional)
Persistence threshold, paper context	lifetime ≥ 52 frames (measured cycle) and ≥ 50 frames (cited 20 Hz)	agree (provisional)
persistent rotor tracks	all	4–15 count, unstable, not reportable
dominant freq (Hz)	light off	2.375 Hz, no cited range
persistent rotors	light off	0 count, no cited range
singularity frames fraction	light off	0.0029–0.0296 fraction of frames, unstable, not reportable
persistent rotor count max	light off	0 count, no cited range
dominant freq (Hz)	illuminated arrhythmia	15.4–19.9 Hz, unstable, not reportable
persistent rotors	illuminated arrhythmia	4–15 count, unstable, not reportable
dominant freq (Hz)	illuminated after termination	2.214 Hz, no cited range
singularity frames fraction	illuminated arrhythmia	0.479 fraction of frames, no cited range
persistent rotors	illuminated after termination	0 count, no cited range
persistent rotor count max	illuminated arrhythmia	1–2 count, unstable, not reportable
singularity frames fraction	illuminated after termination	0.000553–0.0149 fraction of frames, unstable, not reportable
persistent rotor count max	illuminated after termination	0 count, no cited range

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
baseline_window_rule worker/voltage/baseline_rule.py (FACTOR, evaluate)	A run proceeds only if the protocol's baseline window is >= 2x the slowest segment's cycle, the cycle from the MAP channel when a DAQ log exists, else from per-pixel dominant frequency on linearly detrended pixels; otherwise the run is held by code	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
baseline_step_detection worker/voltage/events.py (detect_baseline_step)	Baseline step = consensus upward step in tissue-mean raw baseline (cause not inferred; first misread as light onset, contradicted by the DAQ)	optical mapping experimentalist	provisional

Provisional rules behind this signature

Rule	Description	Expert	Status
daq_interpretation worker/voltage/daq.py	DAQ channel names from depositor notebook; frames = first N triggers of closest burst; midpoint thresholds	experimentalist who recorded the data (or the depositor)	provisional
segment_definitions worker/voltage/annotations.py (MOUSE_SEGMENTS)	Mouse segments bounded by DAQ light events and the baseline step, interpreted as spiral termination under illumination (project lead, from Hussaini et al. 2023)	cardiac electrophysiologist (ideally the depositing authors)	provisional
rotor_finding_criterion worker/voltage/sensitivity.py (MIN_FRAC, MIN_RATIO)	Singularity before/after finding holds if frac(before) >= min_frac and >= min_ratio x frac(after) at every setting (also kept, superseded, for persistent rotors)	cardiac electrophysiologist + biostatistician	provisional
persistent_rotor_criterion worker/voltage/sensitivity.py (MIN_ROTORS_PRESENT, MAX_ROTORS_ABSENT)	Persistent-rotor finding holds if every 'present' segment has >= 1 persistent rotor and every 'absent' segment has none, at every setting	cardiac electrophysiologist	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
stability_rule worker/agents/critic.py (STABLE_FRAC, stability)	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'	biostatistician + optical mapping analyst	provisional
persistence_threshold_variants 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

Review items

Topic	Detail	Severity
unstable:light_off.singularity_frames_frac	Filter sensitivity is high for the light-off singularity-frame fraction; do not report a single value, and review the range 0.0029023746701846965–0.02955145118733509 fraction of frames.	warn
unstable:illuminated_arrhythmia.persistent_rotors	Persistent-rotor counts during illuminated arrhythmia vary over 4.0–15.0 across filter and tracker settings; report presence/absence only under the provisional rule and review the count before use.	warn
unstable:illuminated_arrhythmia.persistent_rotor_count_max	Maximum concurrent persistent-rotor count during illuminated arrhythmia varies over 1.0–2.0; do not report a single maximum without review.	warn
unstable:illuminated_arrhythmia.dominant_freq_hz	Dominant frequency varies over 15.356–19.85 Hz across baseline windows; because this overlaps same-study context but is unstable, it should be reviewed before reporting.	warn
unstable:illuminated_after_termination.singularity_frames_frac	Post-termination illuminated singularity-frame fraction varies over 0.0005534034311012728–0.014941892639734366; do not report a single value without review.	warn
unstable:persistent_rotor_tracks	Total persistent-rotor tracks vary over 4.0–15.0 across filter and tracker settings; the track count is not reportable as a single value.	warn
Pre-deposit processing / raw-data label	The recording is labeled raw in the README, but documentation and prior-processing flags indicate masking, spatial smoothing, temporal smoothing, and normalization; analyses requiring raw photon counts or independent pixel noise should not treat it as raw camera data.	warn
Event interpretation at frame 3170	Frame 3170 is a baseline_step image event, not light onset; illumination began before frame 0 and ended at frame 4977, so the stored spiral-termination interpretation is provisional.	warn
Baseline and illumination artifact	The publication reports blue-light crosstalk and re-normalization by recorded stimulation light signal, and this recording has a large slow baseline range and a baseline step; absolute baseline or amplitude analyses need artifact handling.	warn
Provisional tool thresholds	Event detection, processing flags, SNR, rhythm, and reference-rate thresholds are provisional and not yet reviewed by a domain scientist.	info

Provenance


```
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 "recording": {
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  "source_ref": "10.5281/zenodo.10228296",
  "publication_ref": "10.1371/journal.pcbi.1011660",
  "storage_path": "public/M13Rec001_complete.npy",
  "format": "npy",
  "sha256": "3f8f2e1b8f776633089b33ccd4bf3fccb4f13140b71991f1dcd0e0a12bb48cbc",
  "size_bytes": 260958848,
  "license": "CC-BY-4.0",
  "attribution": "Hussaini, Sayedeh; Luther, Stefan; L\u00e4dke, Sarah L.",
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   "url": "https://zenodo.org/records/10228296",
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    "Hussaini, Sayedeh",
    "Luther, Stefan",
    "L\u00e4dke, Sarah L."
   ],
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  "frame_rate_source": {
   "ref": "10.1371/journal.pcbi.1011660",
   "kind": "publication",
   "note": "Camera frames are 64 x 64 in the paper; the deposit is 64 x 55 (cropped).
Consistent with the DAQ: 10 samples per frame and a 5 s light pulse spanning 50,001 samples
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the camera (EMCCD, Cascade 128+, Photometrics) with a spatial resolution of 64 \u00d7 64
pixels (133 \u03bcm per pixel) at 1 kHz. Optical Mapping recordings were acquired with
software MultiRecorder and analysed with software PythonAnalyser (both developed by Research
Group Biomedical Physics). Electrical s",
   "section": "Materials and methods: Optical mapping experiments on ventricular arrhythmia
and its termination in the intact mouse heart"
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  "pixel_size_um": 133,
  "pixel_size_source": {
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Semrock) and finally by the camera (EMCCD, Cascade 128+, Photometrics) with a spatial
resolution of 64 \u00d7 64 pixels (133 \u03bcm per pixel) at 1 kHz. Optical Mapping
recordings were acquired with software MultiRecorder and analysed with software
PythonAnalyser (both developed by Research Group Biomedical Physics). El"
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  "height": 64,
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  "name": "Mouse whole heart optical mapping (Luther lab)",
  "species": "mouse",
  "tissue": "whole_heart",
  "params_version": 3,
  "params_set_by": "developer (not a domain scientist)",
  "params_note": "version 3: baseline 901 frames = 2.1 x the 433-frame (2.31 Hz) post-
termination cycle resolved under v2; v2's 641 frames was 1.48 cycles, on the 1.5-cycle line,
and the pipeline check held one run and passed another on the same inputs. pad 500 >= half
the window. Provisional (REVIEW_NEEDED item 16)."
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     "polarity_used": -1,
     "median_interval_ms": 52.25
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    {
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near -0.5)",
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    {
     "topic": "Baseline and illumination artifact",
     "severity": "info",
     "effect_on_analysis": "Illumination crosstalk, normalization to stimulation-light
signal, slow fluorescence change, and a fluorescence step affect absolute fluorescence and
amplitude interpretation."
    },
    {
```

```
     "topic": "baseline-window rule",
     "severity": "info",
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slowest_cycle_frames 415, required_min_frames 830, and ratio 2.171."
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the recording matches the intended mouse whole-heart optical mapping reference data and no
recording fact mismatch makes the frame-based parameters wrong. The frame rate is 1000 Hz
from the publication with DAQ consistency, and the coded baseline rule passes for the
version 3 baseline of 901 frames. Interpretation is qualified by prior processing, the
provisional frame-3170 event boundary, and illumination/normalization effects on
fluorescence amplitude.",
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f65d786f-f194-4be2-88b8-10d3dd25d674, the fixed parameters were baseline_frames=901,
spatial_sigma=1.0, spatial_truncate=4.0, pad_frames=500, 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 recording has 9267 frames in npy format with image size 64 by 55,
frame rate 1000 Hz from publication 10.1371/journal.pcbi.1011660 with DAQ consistency, and
pixel size 133 \u00b5m from the same publication. The analysed window was frames 500 to
8767, with provisional segment definitions and criteria: illuminated_arrhythmia frames 0 to
3170, illuminated_after_termination frames 3170 to 4977, and light_off frames 4977 to
9267.",
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monophasic action potential (MAP) signal (in black) before, during, and after illumination.
It shows the sinus rhythm returns after 3190 ms of illumination. Fig 2D presents a closer
look at the MAP signal of the heart during the last few rotations of arrhythmia and the
first few action potentials of sinus rhythm. Fig 2E illustrates a"
      },
      "defined_by": "project lead (not a domain scientist), following the paper's design",
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monophasic action potential (MAP) signal (in black) before, during, and after illumination.
It shows the sinus rhythm returns after 3190 ms of illumination. Fig 2D presents a closer
look at the MAP signal of the heart during the last few rotations of arrhythmia and the
first few action potentials of sinus rhythm. Fig 2E illustrates a"
      },
      "defined_by": "project lead (not a domain scientist), following the paper's design",
      "segment_id": "c1444c59-1863-45aa-b6f3-2208392bf55a",
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      "expected_persistent_rotors": "absent"
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      "analysed": [
       4977,
       8767
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      "citation": {
       "ref": "10.1371/journal.pcbi.1011660",
       "quote": "t stimulus with LI = 3.44 \u03bcW/mm2 and PL = 5 s. Fig 2C shows a
monophasic action potential (MAP) signal (in black) before, during, and after illumination.
It shows the sinus rhythm returns after 3190 ms of illumination. Fig 2D presents a closer
look at the MAP signal of the heart during the last few rotations of arrhythmia and the
first few action potentials of sinus rhythm. Fig 2E illustrates a"
      },
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      "expected_persistent_rotors": "absent"
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    "illumination": "Acquisition log (LED trigger channel, provisional interpretation):
illumination on over frames 500-4977 of the analysed frames 500-8767.",
    "frame_rate_hz": 1000.0,
    "frame_rate_source": {
     "ref": "10.1371/journal.pcbi.1011660",
     "kind": "publication",
     "note": "Camera frames are 64 x 64 in the paper; the deposit is 64 x 55 (cropped).
Consistent with the DAQ: 10 samples per frame and a 5 s light pulse spanning 50,001 samples
imply a 10 kHz DAQ.",
     "quote": " 775 \u00b1 70nm bandpass filter (FF01\u2013775/140-25, Semrock) and finally
by the camera (EMCCD, Cascade 128+, Photometrics) with a spatial resolution of 64 \u00d7 64
pixels (133 \u03bcm per pixel) at 1 kHz. Optical Mapping recordings were acquired with
software MultiRecorder and analysed with software PythonAnalyser (both developed by Research
Group Biomedical Physics). Electrical s",
     "section": "Materials and methods: Optical mapping experiments on ventricular
arrhythmia and its termination in the intact mouse heart"
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    "segment_cycles_frames": {
     "light_off": 421,
     "illuminated_arrhythmia": 52,
     "illuminated_after_termination": 452
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    "max_gap": 5,
    "min_cycles": 1.0,
    "min_frames": 52,
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    "pair_dist_px": 3.0
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   "pad_frames": 500,
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before filtering, non-tissue zeroed after",
   "baseline_frames": 901,
   "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",
   "rotor_threshold": 0.9,
   "spatial_truncate": 4.0,
   "spatial_applies_to": "phase/activation only; displayed voltage is baseline-corrected
only"
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     "status": "provisional",
     "values": {
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      "protocol": "Mouse whole heart optical mapping (Luther lab)",
      "protocol_id": "f65d786f-f194-4be2-88b8-10d3dd25d674",
      "params_version": 3
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     "decision": null,
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     "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
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    {
     "id": "baseline_window_rule",
     "expert": "optical mapping analyst",
     "status": "provisional",
     "values": {
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      "source": "MAP channel (DAQ log)",
      "required_min_frames": 830,
      "slowest_cycle_frames": 415
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     "decision": null,
     "location": "worker/voltage/baseline_rule.py (FACTOR, evaluate)",
     "reviewed": false,
     "reviewer": null,
     "description": "A run proceeds only if the protocol's baseline window is >= 2x the
slowest segment's cycle, the cycle from the MAP channel when a DAQ log exists, else from
per-pixel dominant frequency on linearly detrended pixels; otherwise the run is held by
code",
     "reviewed_at": null
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     "status": "provisional",
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      "baseline_frames": 901,
      "spatial_truncate": 4.0
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     "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
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     "expert": "optical mapping analyst",
     "status": "provisional",
     "values": {
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      "tissue_pixels": 2332
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     "decision": null,
     "location": "worker/voltage/io.py (tissue_mask)",
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     "reviewer": null,
     "description": "Tissue = not NaN in frame 0 and nonzero temporal std",
     "reviewed_at": null
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     "expert": "optical mapping analyst / voltage dye chemist",
     "status": "provisional",
     "values": {
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      "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
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     "expert": "computational cardiac electrophysiologist (phase mapping)",
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     "reviewer": null,
     "description": "Phase singularity = |winding| > threshold turns, >= erode px from
tissue edge",
     "reviewed_at": null
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     "id": "rotor_persistence",
     "expert": "computational cardiac electrophysiologist (phase mapping)",
     "status": "provisional",
     "values": {
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      "max_gap": 5,
      "min_cycles": 1.0,
      "min_frames": 52
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     "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
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    {
     "id": "chirality_pairing",
     "expert": "computational cardiac electrophysiologist (phase mapping)",
     "status": "provisional",
     "values": {
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      "pair_dist_px": 3.0
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     "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
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     "id": "sensitivity_grid",
     "expert": "optical mapping analyst",
     "status": "provisional",
     "values": {
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       "default": 1.0,
       "heavier": 2.0
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        "strict": [
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        "default": [
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         5
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       },
       "baselines": {
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        "3x_cycle": 1356,
        "6x_cycle": 2712,
        "1.5x_cycle": 678
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      "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
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      "status": "provisional",
      "values": {
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      "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
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     {
      "id": "prior_processing_flags",
      "expert": "imaging scientist (camera acquisition and noise)",
      "status": "provisional",
      "values": {
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        "non_integer",
        "nan_mask_all_frames",
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        "spatial_smoothing"
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        "neg_frac": 0.01,
        "dv_autocorr": 0.5,
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      "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
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      "expert": "optical mapping experimentalist",
      "status": "provisional",
      "values": {
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      "decision": null,
      "location": "worker/voltage/events.py (detect_baseline_step)",
      "reviewed": false,
      "reviewer": null,
      "description": "Baseline step = consensus upward step in tissue-mean raw baseline
(cause not inferred; first misread as light onset, contradicted by the DAQ)",
      "reviewed_at": null
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      "id": "daq_interpretation",
      "expert": "experimentalist who recorded the data (or the depositor)",
      "status": "provisional",
      "values": {
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        "arrhythmia_termination@3153",
        "illumination_off@4977"
       ]
      },
      "decision": null,
      "location": "worker/voltage/daq.py",
      "reviewed": false,
      "reviewer": null,
      "description": "DAQ channel names from depositor notebook; frames = first N triggers of
closest burst; midpoint thresholds",
      "reviewed_at": null
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     "status": "provisional",
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       9267
      ],
      "illuminated_arrhythmia": [
       0,
       3170
      ],
      "illuminated_after_termination": [
       3170,
       4977
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     "decision": null,
     "location": "worker/voltage/annotations.py (MOUSE_SEGMENTS)",
     "reviewed": false,
     "reviewer": null,
     "description": "Mouse segments bounded by DAQ light events and the baseline step,
interpreted as spiral termination under illumination (project lead, from Hussaini et al.
2023)",
     "reviewed_at": null
    },
    {
     "id": "rotor_finding_criterion",
     "expert": "cardiac electrophysiologist + biostatistician",
     "status": "provisional",
     "values": {
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      "min_ratio": 2.0
     },
     "decision": null,
     "location": "worker/voltage/sensitivity.py (MIN_FRAC, MIN_RATIO)",
     "reviewed": false,
     "reviewer": null,
     "description": "Singularity before/after finding holds if frac(before) >= min_frac and
>= min_ratio x frac(after) at every setting (also kept, superseded, for persistent rotors)",
     "reviewed_at": null
    },
    {
     "id": "persistent_rotor_criterion",
     "expert": "cardiac electrophysiologist",
     "status": "provisional",
     "values": {
      "expect": {
       "light_off": "absent",
       "illuminated_arrhythmia": "present",
       "illuminated_after_termination": "absent"
      },
      "max_absent": 0,
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```
      "min_present": 1,
      "spanning_rotor": "counts in every segment it overlaps",
      "min_lifetime_frames": 52
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     "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
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     "expert": "optical mapping analyst",
     "status": "provisional",
     "values": {
      "model": "openai:gpt-5.5",
      "proceed": true,
      "anomalies": [
       "Pre-deposit processing / raw-data label",
       "Event interpretation at frame 3170",
       "Baseline and illumination artifact",
       "baseline-window rule"
      ],
      "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
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    {
     "id": "physiology_reference_rates",
     "expert": "cardiac electrophysiologist per species",
     "status": "provisional",
     "values": {
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       "mouse_spiral_rotation_hz"
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      "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
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     "expert": "biostatistician + optical mapping analyst",
     "status": "provisional",
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       "illuminated_arrhythmia.persistent_rotors",
       "illuminated_arrhythmia.persistent_rotor_count_max",
       "illuminated_arrhythmia.dominant_freq_hz",
       "illuminated_after_termination.singularity_frames_frac",
       "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
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     "expert": "computational cardiac electrophysiologist (phase mapping)",
     "status": "provisional",
     "values": {
      "measured_cycle": 52,
      "paper_rotation": 50
     },
     "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
    }
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   "all_reviewed": false,
   "superseded_by_run": null
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   "position": 1,
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   "label": "illumination with arrhythmia",
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illumination)",
   "defined_by": "project lead (not a domain scientist), following the paper's design",
   "citation": {
    "ref": "10.1371/journal.pcbi.1011660",
    "quote": "t stimulus with LI = 3.44 \u03bcW/mm2 and PL = 5 s. Fig 2C shows a monophasic
action potential (MAP) signal (in black) before, during, and after illumination. It shows
the sinus rhythm returns after 3190 ms of illumination. Fig 2D presents a closer look at the
MAP signal of the heart during the last few rotations of arrhythmia and the first few action
potentials of sinus rhythm. Fig 2E illustrates a"
   },
   "evidence": {
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     "frame": 3170,
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        "step": 1.6427573561668396,
        "frame": 3170,
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        "step": 1.7134565711021423,
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      "baseline_post": 1.2153877019882202,
      "interpretation": "mean fluorescence changed; cause not determined from the image",
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      "photodiode_before": 0.015564,
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   "position": 2,
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   "end_frame": 4977,
   "expected_persistent_rotors": "absent",
   "definition": "from spiral termination (interpreted; under illumination) to
illumination_off",
   "defined_by": "project lead (not a domain scientist), following the paper's design",
   "citation": {
    "ref": "10.1371/journal.pcbi.1011660",
    "quote": "t stimulus with LI = 3.44 \u03bcW/mm2 and PL = 5 s. Fig 2C shows a monophasic
action potential (MAP) signal (in black) before, during, and after illumination. It shows
the sinus rhythm returns after 3190 ms of illumination. Fig 2D presents a closer look at the
MAP signal of the heart during the last few rotations of arrhythmia and the first few action
potentials of sinus rhythm. Fig 2E illustrates a"
   },
   "evidence": {
    "end": {
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     "frame": 4977,
     "label": null,
     "source": "acquisition_log",
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     "evidence": {
      "timing": "during_recording",
      "daq_sample": 103145,
      "led_level_after": -0.000610352,
      "led_level_before": 0.0784302,
      "photodiode_after": 0.015564,
      "photodiode_agrees": true,
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      "step": 1.6427573561668396,
      "frame": 3170,
      "window": 101
     },
     {
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      "step": 1.7134565711021423,
      "frame": 3154,
      "window": 151
     },
     {
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      "step": 1.732661247253418,
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      "window": 201
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    "baseline_post": 1.2153877019882202,
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   },
   "uncertainty_frames": 17
  }
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 "label": "light off",
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   "end_frame": 9267,
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   "citation": {
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    "quote": "t stimulus with LI = 3.44 \u03bcW/mm2 and PL = 5 s. Fig 2C shows a monophasic
action potential (MAP) signal (in black) before, during, and after illumination. It shows
the sinus rhythm returns after 3190 ms of illumination. Fig 2D presents a closer look at the
MAP signal of the heart during the last few rotations of arrhythmia and the first few action
potentials of sinus rhythm. Fig 2E illustrates a"
   },
   "evidence": {
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      "photodiode_before": 0.0177002
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   },
   "provisional": true
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   "frame": 0,
   "label": null,
   "source": "acquisition_log",
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arrhythmic interval; mapped to frames via camera triggers"
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   "frame": 3170,
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   "method": "consensus upward step in running-median baseline of tissue-mean raw signal"
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   "kind": "illumination_on",
   "frame": 3170,
   "label": null,
   "source": "image",
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   "method": "consensus upward step in running-median baseline of tissue-mean raw signal"
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   "frame": 4977,
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