

Supplementary materials

This file accompanies “Structural Limits and Observable Benchmarks for Ganzfeld-tACS Computational Modeling: A Preregistered Boundary-Setting Study.”

S0. Package layout

Item	Path
Main text	manuscripts/ganzfeld_tacs_boundary/manuscript.md
Download	manuscripts/ganzfeld_tacs_boundary/code/download_openneuro.py
Analyses	manuscripts/ganzfeld_tacs_boundary/code/analysis_pipeline.py
FIM / Welch / hybrid / copula	code/ganzfeld_fim_analysis.py, ganzfeld_welch_sensitivity.py, ganzfeld_hybrid_model.py, ganzfeld_copula_transfer.py
JSON products	manuscripts/ganzfeld_tacs_boundary/results/
Archived recovery CSV	GTAC outputs/gtac_virtual_subjects_v2/recovery/parameter_recovery.csv
Archived 3 × 3	GTAC reports_v2/per_record_3x3.csv
OpenNeuro EEG	GTAC openneuro_data/ (ds005385, ds004148, ds004902)

S1. Post-review numbers (verbatim)

FIM: N=50, log-parameter eigenvalues span ~6 decades; stiffest loadings A=0.646, a=0.657, log G=0.013. Decision: practical recovery failure under Welch PSD, not a demonstrated near-singular kinetic fiber.

Welch: 10 traces × 48 combinations; frac maintaining median $\Delta r < 0$ and $r < 0.5 = 0.0$.

Hybrid: median ΔAIC (hybrid–null) = –76.70; CV hybrid better 10/10.

Copula: ds005385–ds004148 mean coverage 0.6525, MMD p=0.010. ds004902 is sleep deprivation.

S2. How to reproduce

```
py -3 manuscripts/ganzfeld_tacs_boundary/code/download_openneuro.py py -3  
manuscripts/ganzfeld_tacs_boundary/code/analysis_pipeline.py
```

Raw EDF/FDT files are not re-fetched by the metadata download script; they must already sit in the GTAC openneuro_data tree.

Combined numerical appendix

Ganzfeld-tACS boundary-setting. This file merges the English supplement, post-review results, and archived recovery / 3x3 tables. Raw EEG are not included. Old Chinese deposit notes are omitted.

S1. FIM (N=50, seed=42)

n_fim=50. log-parameter eigenvalues: 3.543e+04, 8365, 914.6, 417.4, 73.39, 11.03, -1.016e-12

param	stiff eigenvector	loading	
A	0.6462		
B	0.2432		
a	0.6570		
b	0.2552		
p_mean	0.1619		

p_std	0.0109		
logG	0.0125		

Decision: downgrade_algorithm_dependent_recovery_failure.

S2. Welch 48-cell grid

n_traces=10, n_combos=48, frac maintaining median $r < 0.5$ and $\Delta r < 0 = 0.0$. Decision: downgrade_estimator_dependent.

S3. Hybrid aperiodic + oscillatory

n=10, median delta AIC=-76.697, median delta BIC=-70.344, CV hybrid better frac=1.0. Decision: hybrid_beats_null_revise_1f_claim.

S4. Copula transfer

A	B	MMD	MMD p	mean coverage
ds005385	ds004148	0.2103	0.010	0.652
ds005385	ds004902	0.0503	0.010	0.652
ds004148	ds004902	0.0798	0.010	0.779

Resting mean coverage=0.6525. Sleep-deprivation is not a Ganzfeld proxy: True. Decision: qualify_within_dataset_calibration.

S5. Archived synthetic recovery (Pearson r, N=50)

parameter	Pearson r true vs est
A	0.110
B	0.206
a	0.041
b	0.448
p_mean	0.100
p_std	0.173
logG	0.917

Full per-simulation columns are in parameter_recovery.csv in the analysis tree; only correlations are printed here.

S6. Archived 3x3 per-record (selected columns, A(I) and first 30 rows of full table)

arm	dataset	subject	condition	pearson_r	delta_r	success
A(I)	ds005385	6	EC	0.0938	-0.2010	False
A(I)	ds005385	6	EO	0.6937	0.0639	True
A(I)	ds005385	26	EC	0.6335	-0.0269	True
A(I)	ds005385	26	EO	0.5854	-0.2067	False
A(I)	ds005385	21	EC	0.0036	-0.0654	False
A(I)	ds005385	21	EO	0.5082	-0.1867	True
A(I)	ds004902	19	NS	0.0281	-0.1249	False
A(I)	ds004902	19	SD	0.0320	-0.0791	False
A(I)	ds004902	14	NS	0.3169	-0.5470	False

A(I)	ds004902	14	SD	0.1888	-0.2425	False
A(II)	ds005385	6	EC	0.0882	-0.2066	False
A(II)	ds005385	6	EO	0.7009	0.0711	True
A(II)	ds005385	26	EC	0.6061	-0.0542	True
A(II)	ds005385	26	EO	0.6314	-0.1606	True
A(II)	ds005385	21	EC	0.0075	-0.0615	False
A(II)	ds005385	21	EO	0.5628	-0.1320	True
A(II)	ds004902	19	NS	0.0300	-0.1229	False
A(II)	ds004902	19	SD	0.0326	-0.0785	False
A(II)	ds004902	14	NS	0.2992	-0.5647	False
A(II)	ds004902	14	SD	0.1860	-0.2454	False
A(III)	ds005385	6	EC	0.0983	-0.1965	False
A(III)	ds005385	6	EO	0.7967	0.1670	False
A(III)	ds005385	26	EC	0.6954	0.0350	False
A(III)	ds005385	26	EO	0.7029	-0.0892	False
A(III)	ds005385	21	EC	0.0082	-0.0608	False
A(III)	ds005385	21	EO	0.7456	0.0508	False
A(III)	ds004902	19	NS	0.0275	-0.1254	False
A(III)	ds004902	19	SD	0.0331	-0.0781	False
A(III)	ds004902	14	NS	0.3131	-0.5508	False
A(III)	ds004902	14	SD	0.1881	-0.2433	False

(Showing first 30 rows.)

S7. Methods lock

Kill-gates use Welch PSD. No GenSSI. No BIDS raw Ganzfeld EEG. ds004902 = sleep deprivation. Seed=42 for the archived recovery.