

Synchré Witness Atlas: Fifty-four Examples Across Context Families

Drew Higgins

How to read this atlas

Each entry supplies the same minimal template:

- the slice or subsystem being observed,
- the cycle-valued phase observable,
- the forcing mechanism (action witness, loop degree, holonomy, coupling, or mixing upgrade),
- the correct target (circle, torus, coupled subtorus, or embedded target),
- the artifact: a WSC (certificate) or a WOB (obstruction), with the regime made explicit.

Families and reduction templates

SFT breadth is not a pile of unrelated examples. Every atlas entry is a reuse of a small set of reduction templates. Each family below states its reduction as a lemma-style rule and points to the theorem file that justifies it.

Rotation and periodic forcing (action witness template)

Reduction lemma. If a slice admits a cyclic action and the declared phase observable is equivariant with nondegenerate response, then the phase sweeps a full cycle on the correct target. The certificate reduces to an action/equivariance witness plus robustness margins. (Justification: `global_universality/COC_rotation_proof.tex#thm:circle-action-template`.)

Embedded loops and defects (degree or holonomy witness)

Reduction lemma. If the full slice does not admit a usable global action but contains a declared embedded loop subsystem on which the phase has nonzero degree or nonzero holonomy multiple, then coverage holds on the induced embedded target on that subsystem. The certificate reduces to an integer witness invariant plus robustness margins. (Justification: `global_universality/COC_embedded_loop_proof.tex#thm:COC-ESW-LDW` and `global_universality/COC_embedded_loop_proof.tex#thm:COC-ESW-HW`.)

Coupled targets (CST) under multi-cycle constraints

Reduction lemma. If multiple cycles are coupled by declared integer relations, the correct target is a coupled subtorus (CST) and coverage statements must be made on CST (with coupled Haar as baseline). The certificate reduces to a free-coordinate witness on CST plus target-correctness predicates. (Justification: `global_universality/COC_multicycle_proof.tex#thm:coupling-forces-cst`.)

Torus drives and equidistribution

Reduction lemma. If independent drives produce a torus target and a nonresonance hypothesis is explicitly declared, then statistical inevitability is recorded as a convergence certificate to Haar on the correct target, not as an unqualified mixing claim. (Justification: `global_universality/COC_multicycle_proof.tex#thm:Tk-feq`.)

Noise-to-diffusion mixing upgrades

Reduction lemma. Deterministic transport is not assumed to be mixing. When a noise-to-diffusion bridge is explicitly adopted and a mixing certificate is declared, uniformity upgrades become meaningful on the correct target and baseline, and are reported as convergence certificates rather than as forced coverage claims.

Boundary obstructions

Reduction lemma. Outside COC, the engine produces named obstructions rather than vague refusals. Boundary entries exist to show sharpness and to prevent overclaiming across regime walls. (Completeness pointers: `global_universality/ENGINE_COMPLETENESS_PAGE.tex#thm:catalog-completeness` and `global_universality/WOB_CATALOG_COMPLETENESS.tex#thm:wob-catalog-complete`.)

Label	Family	Context	COC / Boundary / Artifact	SFT form (target + cert/obstruction sketch)
A1	Embedded loops	Earth rotation (local solar phase)	COC • Class C / WSC-ATLAS-0001	Embedded loop witness forces full-cycle coverage on the induced circle target, without asserting global coverage on the ambient domain.
A2	Coupled CST	Solar–lunar synodic coupling (CST)	COC • Class B / WSC-ATLAS-0002	Coupled target (CST) is the correct meaning; coverage is stated on CST with coupled Haar baseline (CTP/CHT).
A3	Embedded loops	Traveling wave on periodic medium	COC • Class C / WSC-ATLAS-0003	Embedded loop witness forces full-cycle coverage on the induced circle target, without asserting global coverage on the ambient domain.

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A4	Embedded loops	Vortex defect loop (or- der parameter)	COC • Class C / WSC-ATLAS-0004	Embedded loop witness forces full-cycle coverage on the in- duced circle target, without as- serting global coverage on the ambient domain.
A5	Rotation/ forcing	AC circuit steady- state (phase response)	COC • Class A / WSC-ATLAS-0005	Equivariant response (action witness template) forces a phase sweep on S^1 in the de- clared regime; robustness is recorded via margins.
A6	Embedded loops	Ring oscillator phase around ring	COC • Class C / WSC-ATLAS-0006	Embedded loop witness forces full-cycle coverage on the in- duced circle target, without as- serting global coverage on the ambient domain.
A7	Rotation/ forcing	Rotating machinery shaft angle	COC • Class A / WSC-ATLAS-0007	Equivariant response (action witness template) forces a phase sweep on S^1 in the de- clared regime; robustness is recorded via margins.
A8	Embedded loops	Planetary orbital phase	COC • Class C / WSC-ATLAS-0008	Embedded loop witness forces full-cycle coverage on the in- duced circle target, without as- serting global coverage on the ambient domain.
A9	Boundary	Coupled pendula reso- nance locking	Boundary • Class D / WOB-ATLAS-0009	Obstruction (WOB-10- resonant-locking): evidence explains why SFT is inappli- cable or the declared target is wrong; reissue on the correct target or revise the regime.
A10	Mixing grades	up- Stroboscopic jitter dif- fusion	COC • Class A / WSC-ATLAS-0010	Noise-to-diffusion bridge sup- ports a mixing upgrade on the correct target when the mix- ing certificate is explicitly de- clared.
A11	Boundary	Coupling mismatch (wrong target)	Boundary • Class D / WOB-ATLAS-0011	Obstruction (WOB-06- coupling-mismatch): evidence explains why SFT is inappli- cable or the declared target is wrong; reissue on the correct target or revise the regime.

Label	Family	Context	COC / Boundary / Artifact	SFT form (target + cert/obstruction sketch)
A12	Boundary	Equivariance defect beyond tolerance	Boundary Class D / WOB-ATLAS-0012	• Obstruction (WOB-09-equivariance-defect): evidence explains why SFT is inapplicable or the declared target is wrong; reissue on the correct target or revise the regime.
A13	Boundary	No cyclic subsystem available	Boundary Class D / WOB-ATLAS-0013	• Obstruction (WOB-01-no-subsystem): evidence explains why SFT is inapplicable or the declared target is wrong; reissue on the correct target or revise the regime.
A14	Boundary	Trivial winding on candidate loop	Boundary Class D / WOB-ATLAS-0014	• Obstruction (WOB-02-trivial-winding): evidence explains why SFT is inapplicable or the declared target is wrong; reissue on the correct target or revise the regime.
A15	Boundary	Measurement pinch (image misses arc)	Boundary Class D / WOB-ATLAS-0015	• Obstruction (WOB-03-pinch): evidence explains why SFT is inapplicable or the declared target is wrong; reissue on the correct target or revise the regime.
A16	Boundary	Tear/regularity failure on loop	Boundary Class D / WOB-ATLAS-0016	• Obstruction (WOB-04-tear): evidence explains why SFT is inapplicable or the declared target is wrong; reissue on the correct target or revise the regime.
A17	Boundary	Disconnected domain misses witness component	Boundary Class D / WOB-ATLAS-0017	• Obstruction (WOB-11-disconnected-slice): evidence explains why SFT is inapplicable or the declared target is wrong; reissue on the correct target or revise the regime.
A18	Boundary	Slope-zero and quotient nonsurjective	Boundary Class D / WOB-ATLAS-0018	• Obstruction (WOB-12-slope-zero-quotient-nonsurjective): evidence explains why SFT is inapplicable or the declared target is wrong; reissue on the correct target or revise the regime.

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A19	Boundary	Orbit collapse (no chiral active orbit)	Boundary Class D / WOB-ATLAS-0019	• Obstruction (WOB-08-orbit-collapse): evidence explains why SFT is inapplicable or the declared target is wrong; reissue on the correct target or revise the regime.
A20	Boundary	Mixing claim without justification	Boundary Class D / WOB-ATLAS-0020	• Obstruction (WOB-07-mixing-not-justified): evidence explains why SFT is inapplicable or the declared target is wrong; reissue on the correct target or revise the regime.
A21	Torus drives	Uncoupled two-drive torus coverage	COC • Class A / WSC-ATLAS-0021	Full-rank response produces a torus target; RNF evidence supports equidistribution when declared in the certificate.
A22	Coupled CST	Matrix coupling in T^3 (CST rank 2)	COC • Class B / WSC-ATLAS-0022	Coupled target (CST) is the correct meaning; coverage is stated on CST with coupled Haar baseline (CTP/CHT).
A23	Embedded loops	Holonomy loop witness (flux-like)	COC • Class C / WSC-ATLAS-0023	Embedded loop witness forces full-cycle coverage on the induced circle target, without asserting global coverage on the ambient domain.
A24	Embedded loops	Bloch phase winding on closed loop	COC • Class C / WSC-ATLAS-0024	Embedded loop witness forces full-cycle coverage on the induced circle target, without asserting global coverage on the ambient domain.
A25	Embedded loops	Fluid vortex ring loop witness	COC • Class C / WSC-ATLAS-0025	Embedded loop witness forces full-cycle coverage on the induced circle target, without asserting global coverage on the ambient domain.
A26	Torus drives	Nonresonant torus drive (Haar convergence)	COC • Class A / WSC-ATLAS-0026	Full-rank response produces a torus target; RNF evidence supports equidistribution when declared in the certificate.

Label	Family		Context	COC / Bound- ary / Artifact	SFT form (target + cert/obstruction sketch)
A27	Mixing grades	up-	Diffusion-enforced uniformity on CST	COC • Class B / WSC-ATLAS-0027	Noise-to-diffusion bridge sup- ports a mixing upgrade on the correct target when the mix- ing certificate is explicitly de- clared.
A28	Embedded loops		Neural oscillation ring phase wave	COC • Class C / WSC-ATLAS-0028	Embedded loop witness forces full-cycle coverage on the in- duced circle target, without as- serting global coverage on the ambient domain.
A29	Coupled CST		Gear ratio coupled phase (CST)	COC • Class B / WSC-ATLAS-0029	Coupled target (CST) is the correct meaning; coverage is stated on CST with coupled Haar baseline (CTP/CHT).
A30	Rotation/ forcing		Two-control oscillator array torus coverage	COC • Class A / WSC-ATLAS-0030	Equivariant response (action witness template) forces a phase sweep on S^1 in the de- clared regime; robustness is recorded via margins.
A31	Boundary		Holonomy defect (lift inconsistency)	Boundary • Class D / WOB-ATLAS-0031	Obstruction (WOB-05- holonomy-defect): evidence explains why SFT is inappli- cable or the declared target is wrong; reissue on the correct target or revise the regime.
A32	Boundary		Constraint inference ambiguity (partial ex- citation)	Boundary • Class D / WOB-ATLAS-0032	Obstruction (WOB-13- ambiguity): evidence explains why SFT is inapplicable or the declared target is wrong; reissue on the correct target or revise the regime.
A33	Boundary		Insufficient excitation for target inference	Boundary • Class D / WOB-ATLAS-0033	Obstruction (WOB-14- insufficient-excitation): evidence explains why SFT is inapplicable or the declared target is wrong; reissue on the correct target or revise the regime.
A34	Boundary		Resonance mask- ing (near-threshold relations)	Boundary • Class D / WOB-ATLAS-0034	Obstruction (WOB-15- resonance-masking): evidence explains why SFT is inappli- cable or the declared target is wrong; reissue on the correct target or revise the regime.

Label	Family	Context	COC / Bound- ary / Artifact	SFT form (target + cert/obstruction sketch)
A35	Rotation/ forcing	Rotating beacon sweep phase	COC • Class A / WSC-ATLAS-0035	Equivariant response (action witness template) forces a phase sweep on S^1 in the declared regime; robustness is recorded via margins.
A36	Rotation/ forcing	Stroboscopic phase under periodic forcing	COC • Class A / WSC-ATLAS-0036	Equivariant response (action witness template) forces a phase sweep on S^1 in the declared regime; robustness is recorded via margins.
A37	Rotation/ forcing	Limit-cycle oscillator phase coordinate	COC • Class A / WSC-ATLAS-0037	Equivariant response (action witness template) forces a phase sweep on S^1 in the declared regime; robustness is recorded via margins.
A38	Rotation/ forcing	Tidal forcing phase in a periodic proxy	COC • Class A / WSC-ATLAS-0038	Equivariant response (action witness template) forces a phase sweep on S^1 in the declared regime; robustness is recorded via margins.
A39	Embedded loops	Josephson junction phase slip loop	COC • Class C / WSC-ATLAS-0039	Embedded loop witness forces full-cycle coverage on the induced circle target, without asserting global coverage on the ambient domain.
A40	Embedded loops	Crystal dislocation Burgers circuit	COC • Class C / WSC-ATLAS-0040	Embedded loop witness forces full-cycle coverage on the induced circle target, without asserting global coverage on the ambient domain.
A41	Embedded loops	Optical ring cavity mode phase	COC • Class C / WSC-ATLAS-0041	Embedded loop witness forces full-cycle coverage on the induced circle target, without asserting global coverage on the ambient domain.
A42	Embedded loops	Spiral wave tip defect loop	COC • Class C / WSC-ATLAS-0042	Embedded loop witness forces full-cycle coverage on the induced circle target, without asserting global coverage on the ambient domain.
A43	Embedded loops	Magnetic flux tube loop witness	COC • Class C / WSC-ATLAS-0043	Embedded loop witness forces full-cycle coverage on the induced circle target, without asserting global coverage on the ambient domain.

Label	Family	Context	COC / Bound- ary / Artifact	SFT form (target + cert/obstruction sketch)
A44	Coupled CST	Two coupled rotors (gear ratio constraint)	COC • Class B / WSC-ATLAS-0044	Coupled target (CST) is the correct meaning; coverage is stated on CST with coupled Haar baseline (CTP/CHT).
A45	Coupled CST	PLL network with in- teger relation	COC • Class B / WSC-ATLAS-0045	Coupled target (CST) is the correct meaning; coverage is stated on CST with coupled Haar baseline (CTP/CHT).
A46	Coupled CST	Rank-2 coupling in T^3 (matrix constraint)	COC • Class B / WSC-ATLAS-0046	Coupled target (CST) is the correct meaning; coverage is stated on CST with coupled Haar baseline (CTP/CHT).
A47	Coupled CST	Circadian plus lunar entrainment (CST)	COC • Class B / WSC-ATLAS-0047	Coupled target (CST) is the correct meaning; coverage is stated on CST with coupled Haar baseline (CTP/CHT).
A48	Torus drives	Two-tone RF mixer torus phase	COC • Class A / WSC-ATLAS-0048	Full-rank response produces a torus target; RNF evidence supports equidistribution when declared in the certificate.
A49	Torus drives	Quasiperiodic optics modulator (T^2)	COC • Class A / WSC-ATLAS-0049	Full-rank response produces a torus target; RNF evidence supports equidistribution when declared in the certificate.
A50	Torus drives	Two independent control knobs (T^2) coverage	COC • Class A / WSC-ATLAS-0050	Full-rank response produces a torus target; RNF evidence supports equidistribution when declared in the certificate.
A51	Mixing up- grades	Advection plus small diffusion on S^1 (mixing upgrade)	COC • Class A / WSC-ATLAS-0051	Noise-to-diffusion bridge supports a mixing upgrade on the correct target when the mixing certificate is explicitly declared.
A52	Boundary	Monotone gradient flow with no cyclic observable	Boundary • Class D / WOB-ATLAS-0052	Obstruction (WOB-01-no-subsystem): evidence explains why SFT is inapplicable or the declared target is wrong; reissue on the correct target or revise the regime.

Label	Family	Context	COC / Boundary / Artifact	SFT form (target + cert/obstruction sketch)
A53	Boundary	Strict contraction collapses the orbit (orbit collapse)	Boundary Class D / WOB-ATLAS-0053	Obstruction (WOB-08-orbit-collapse): evidence explains why SFT is inapplicable or the declared target is wrong; reissue on the correct target or revise the regime.
A54	Boundary	Resonant locking reduces intended torus rank	Boundary Class D / WOB-ATLAS-0054	Obstruction (WOB-10-resonant-locking): evidence explains why SFT is inapplicable or the declared target is wrong; reissue on the correct target or revise the regime.