The Variable Zoo Project (variablezoo.org)

Observing plan — Lacerta Exposure-Ramp Experiment

John Rachlin · 2026-08-05 · Lowell Observatory, Flagstaff AZ · Apertura 60 mm APO + ASI294MM Pro (Bin1, 1.29″/px)

Night at a glance

Target	Lacerta Exposure-Ramp Experiment — wide-field pointing (variety survey)
Position	**J2000** 22h17m00s +54d15m00s **JNow** (2026-08-05) 22h18m00s +54d23m01s — use JNow if your mount goes to epoch-of-date
Observable (dark, alt>30°)	20:27–04:38 MST (8.2 h)
Transit	01:45 MST at altitude 71° — a German-equatorial meridian flip falls near here; frames on both sides are co-registered in sky coordinates by the pipeline
Moon	46% illuminated, 61° from the field, altitude +28° — bright but well separated — modest loss of faint depth
Field of view	3.0° × 2.0° (Bin1); 1238 catalogued variables reachable (G<14), of which **220 foldable validators** land in-frame at the chosen angle

Scientific objectives

Lacerta Exposure-Ramp Experiment is the target field for the **exposure-ramp experiment**: a repeating 30/60/90/120 s sequence, with each star later reduced at whichever exposure gives its best (unsaturated, lowest-scatter) photometry. One run does double duty — it calibrates the exposure→(magnitude, precision) relation *and* maximises the number of stars usefully measured in a single pointing.

- **Calibrate the exposure ladder.** Because every star is recorded at all exposures under one sky, we get a controlled precision-vs-magnitude curve per exposure — the empirical saturation (bright) limit and faint floor at each — replacing our current estimates with measured values.
- **Maximise per-field yield.** Merged per star by best exposure, the short frames keep the bright stars unsaturated while the long frames reach the faint ones, so one pointing spans a wider magnitude range (~5.7 mag) than any single exposure (~4 mag).
- **Science light curves.** The field carries detectable short-period δ Scuti / HADS pulsators of varying magnitude; fold the 220 in-frame validators against catalog ephemerides for clean pulsation shapes and diverse validation.
- **Degrade gracefully.** Both the calibration and the merge improve continuously with more cycles, so any fraction of the night is useful.

Exposure ladder — usable range & candidate counts

Best-estimate usable magnitude window (60 mm + ASI294MM) per exposure, and the number of catalogued variables each reaches — assuming a full cycle inside the window (**P ≤ 0.2 d**) and observability from Flagstaff (Dec ≥ -35°). The 30 / 60 s rows are **measured** (the M35 30 s/60 s pair); the longer exposures are **estimates** — **measuring the true bright/faint limit at each exposure is a primary objective of this run** (objective 1).

EXPOSURE	MAG WINDOW	MIN AMP	# VARIABLES IN DB	BASIS
30 s	9.5–13.5	0.15	1,699	measured (M35)
60 s	10.5–14.5	0.15	3,431	measured (M35)
90 s	11.0–15.0	0.18	3,481	**estimate**
120 s	11.3–15.2	0.20	3,426	**estimate**

"# variables in DB" = VSX×Gaia variables in the window with P ≤ 0.2 d, amplitude ≥ the row's floor, and Dec ≥ -35°. The ramp merges these per-star into one deep, wide catalogue from a single pointing — its union window spans **G 9.5–15.2**, wider than any single exposure.

Field composition (VSX)

1238 catalogued variables reachable (G<14) in the frame, 551 with catalog ephemerides — spanning 6 variability classes. This breadth is the point: a single pointing exercises the pipeline across the whole variable-star zoo.

VARIABILITY CLASS	REACHABLE	WITH PERIOD	EST. MEASUREMENTS
pulsating	821	324	256,152
rotating	222	39	69,264
eclipsing	98	97	30,576
other / unclassified	94	91	29,328
eruptive	2	0	624
cataclysmic	1	0	312
total	**1238**	**551**	**386,256**

Est. measurements ≈ reachable × 312 planned exposures (assumes detection in each sub; faint stars near the limit will fall short).

Notable objects in frame: MNIC V77 (UXOR), NADA-V116 (YSO:), V0341 Lac (LC), V0406 Lac (ACYG:), LX Lac (SRB), CzeV2565 (SR), ASASSN-V J220612.30+534900.5 (SR), V0448 Cep (EB:).

Centering & camera angle

1. Center on 22h17m00s +54d15m00s (J2000) — or 22h18m00s +54d23m01s (JNow) for an epoch-of-date mount.
2. Rotate the camera to a **CAA / rotator reading of ≈ 347° (to be confirmed at the scope)** — derived from last night's 284.7° dial → 75.7° E of N solve, valid with the target east of the meridian and the rotator un-reindexed since parking. Then fine-tune so the bright-star pattern in your preview matches the acquisition chart below (north up, east left). A plate-solve angle of **≈ 138° East of North** is the target. Confirm the CAA number against the visual match; if they disagree, trust the chart. A meridian flip near transit rotates the field 180° (leave the camera be — the pipeline co-registers across it). Log the solved angle either way.
3. Get it close, and log what you land on. The photometry of whatever is in frame is robust to rotation (every frame is plate-solved independently), so a small offset won't hurt tonight. But rotation *does* decide which extra high-value targets you capture, and matching it across nights lets us co-add a multi-night dataset on the same field — so aim for the pattern below, and note the solved angle so we can reproduce this framing next time.

The planned angle is optimized to pull the most foldable validators into the frame: 220 at 138° versus 210 at north-up — extra eclipsers, RR Lyrae and δ Scuti with catalog ephemerides, so a single pointing yields both the headline target and the validation content.

Exposure sequence

FILTER	# EXPOSURES	EXPOSURE	PRIORITY	PURPOSE
G	78	30 s	Ramp	holds the bright stars unsaturated (to G≈9.4)
G	78	60 s	Ramp	mid-range dynamic-range coverage
G	78	90 s	Ramp	mid-range dynamic-range coverage
G	78	120 s	Ramp	deepest reach (to G≈15.2) for the faint end

Each star is reduced at its **best** exposure in post-processing — short frames keep bright stars unsaturated, long frames reach the faint ones. Per-star cadence is ~one point per cycle at the brightness extremes, and higher for mid-range stars usable in several exposures.

ASIAir setup — repeating exposure ramp

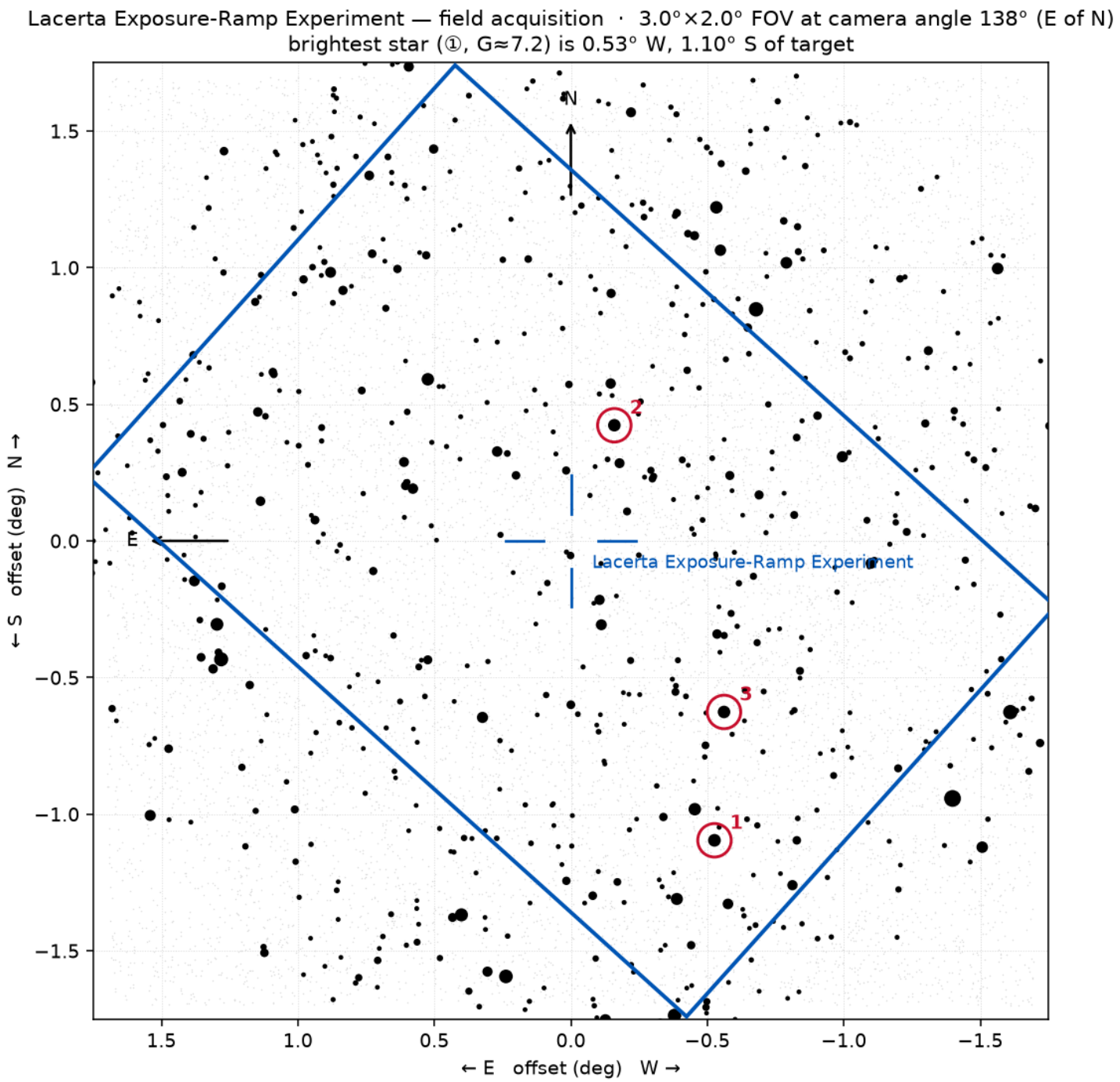
This run is a **repeating cycle** of 4 Green exposures (30/60/90/120 s), not a single grouped block: in processing, each star is measured at whichever exposure gives its best (unsaturated, lowest-scatter) photometry. One cycle ≈ **6.3 min**; loop it to fill the window — about **78 cycles** (~312 frames, ≈ 8.2 h).

How to enter it: use the ASIAir **Plan** feature — one Green step per exposure below — and set the plan to **loop/repeat** for the session. (A grouped Autorun would run each exposure to completion rather than interleaving; interleaving is what spreads every star's best-exposure points across the whole night.)
Bin 1, autoguide on.

STEP	FILTER	N	EXP	BIN	CYCLE (MIN)
1	**G**	1	30 s	1	0.8
2	**G**	1	60 s	1	1.3
3	**G**	1	90 s	1	1.8
4	**G**	1	120 s	1	2.3
	one cycle	**4**			**6.3**

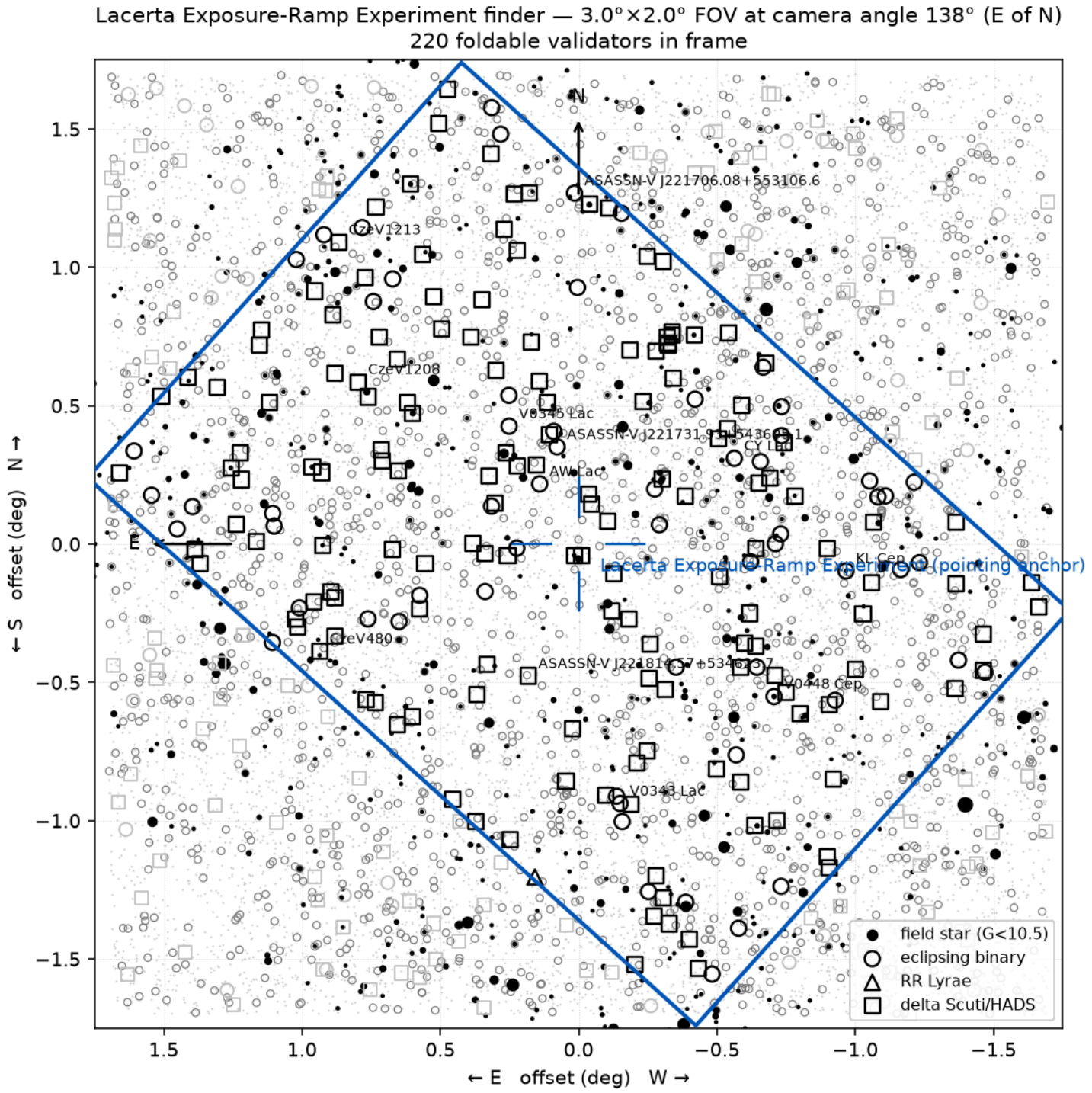
Requires matched **dark libraries at each exposure** (30/60/90/120 s) — dark current scales with exposure time.

Field acquisition chart



3.0° × 2.0° field at camera angle 138° (E of N), for lining up against your camera preview or planetarium view. North up, east left. Black dots are Gaia field stars sized by brightness — the same asterism a short preview shows; the three brightest in-frame stars are ringed and numbered (① = brightest) as rotation anchors. The blue reticle marks the pointing anchor Lacerta Exposure-Ramp Experiment at the field center. Rotate until the pattern matches the box; deliberately uncluttered by variable markers.

Field variables (science reference)



The same field with the science targets marked: open shapes are foldable validators (circle = eclipsing binary, triangle = RR Lyrae, square = δ Scuti/HADS), black in-frame and grey outside the FOV; named variables labeled. These — not the field center — are the targets. The center reticle is only the pointing anchor (Lacerta Exposure-Ramp Experiment) — the science is the varied field of variables, not the cluster itself.