Compliance sheet — star-sigma

Everything a supplier qualification, a legal review or an export check usually asks about star-sigma 0.1.0, in one document.

1. Identity

Document	STAR-PKG-STAR-SIGMA-EN · v2.3 · 2026-11-14
Package	star-sigma
Version	0.1.0
Capability	star.statistics.sigma-coverage
Maturity	Released & Verified (RELEASED)
Python	>=3.9
Source commit	dc09f61d
Source	https://github.com/Andrea07072000/S.T.A.R.-/tree/main/packages/star_sigma

2. Licence and obligations

Apache License 2.0. You may use, copy, modify and distribute it, also commercially, and you receive a patent licence from the contributors. When you redistribute it: keep the LICENSE file and the copyright notices (and a NOTICE file, if a future version adds one), and state in modified files that you changed them. You may not use the S.T.A.R. name to endorse your product.

3. What it needs at run time

Nothing beyond the Python standard library: it works offline.

4. Integrity

SHA-256 fingerprints of the files published on this website. Check a downloaded file with:

```
python -c "import
hashlib,sys;print(hashlib.sha256(open(sys.argv[1],'rb').read()).hexdigest())" star_sigma-
0.1.0-py3-none-any.whl
```

FILE	SHA-256
star_sigma-0.1.0-py3-none-any.whl	de41f1e657714cc9b203a8709a6d67b0b9258776692de7d2a056addc4464aa50
star_sigma.py	84ed2154cc1d8d7a7df7f4075731af5eff78ed90034aeb5906540a7550a7e748
star_sigma-0.1.0-source.zip	f620b45bad6df2b46a15724d682ba2e22c2c6465639a14b20956b16c2692efea

5. What it does, and its limits

Coverage, tail probability and inverse of n sigma for a Gaussian error in one, two and three dimensions, and the normal distribution function and quantile; within 1.9e-13 relative of mpmath at 40 digits and 2.4e-13 of SciPy on 600 cases, tails included; reproduces the published normal and chi-square tables.

A Gaussian error with a known covariance: real orbit-determination errors are often not Gaussian and the covariance is often optimistic, so these probabilities are those of the model, not of the truth. No collision probability: that needs the geometry of the encounter. Dimensions 1, 2 and 3 only. The 1.9e-13 relative error in the far tails comes from the platform's erfc. A coverage given as 1 − 1e-17 cannot be distinguished from 1: use the tail.

- `normal_cdf`, `normal_sf`, `normal_quantile` for the standard normal distribution, accurate in both tails. Reproduce the published table values Φ(1), Φ(1.959964), Φ(2.575829).
- `sigma_coverage(n, dims)` and `sigma_tail(n, dims)` for dims 1, 2, 3 (the chi-square law of the squared Mahalanobis distance), each computed directly so that neither loses digits; `sigma_for_coverage(p, dims)` is the inverse. Reproduce the 68-95-99.7 rule and the published chi-square percentage points for 1, 2 and 3 degrees of freedom.
- Measured on 600 cases (z to ±37, n from 1e-4 to 12, probabilities from 1e-12 to 1 − 1e-12), as RELATIVE differences: distribution functions and tails within 1.9e-13 of mpmath at 40 digits and 2.4e-13 of SciPy; coverage within 8e-16 of mpmath; the inverses reproduce the requested tail probability within 1.3e-14.
- Every function returns a finite float or raises `ValueError`: non-numeric, boolean, NaN or infinite input, z beyond ±38, n outside [0, 38], a probability outside the open or half-open interval stated, dims not

1, 2 or 3.

6. Export, use and certification

The package is published and freely available. That usually takes software out of export-control lists, but not every use of it: read the page on space activities and export control before using it in a controlled programme. It is not certified or qualified for flight; the evidence describes what was tested and how.

7. Citation and bill of materials

```
@software{cavazzini_star_sigma_0_1_0,
  author  = {Cavazzini, Andrea},
  title   = {{star-sigma}: What "n sigma" means in one, two and three dimensions},
  version = {0.1.0},
  year    = {2026},
  url     = {https://andrea07072000.github.io/S.T.A.R.-/software/star_sigma/},
  note    = {Apache-2.0. Source: https://github.com/Andrea07072000/S.T.A.R.-, commit dc09f61d}
}
```

CITATION.cff · BibTeX · SBOM CycloneDX 1.5 · SBOM SPDX 2.3

8. Warranty and liability

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