A MARGINALISED BAYESIAN NOISE WAVE CALIBRATION METHOD

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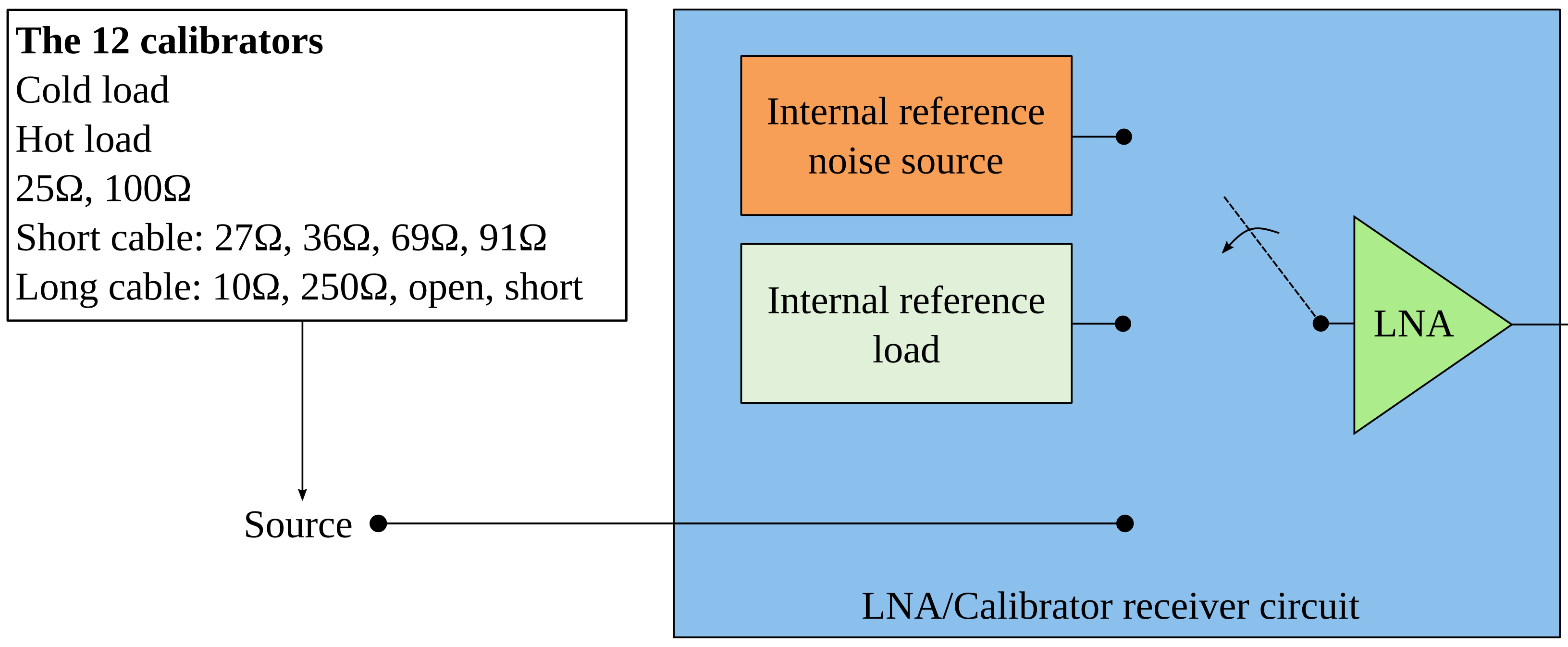
REACH

REACH CALIBRATION



METHOD

- **Fit polynomials** to Noise Wave Parameters of the LNA
  $T_s(\nu) = X_{\text{unc}}T_{\text{unc}} + X_{\text{cos}}T_{\text{cos}} + X_{\text{sin}}T_{\text{sin}} + X_{\text{NS}}T_{\text{NS}} + X_{\text{L}}T_{\text{L}}$
- **Analytically marginalise** over polynomial coefficients
- Numerically sample **calibrator noise parameters** and **polynomial order**

BENEFITS

- Samples polynomial order posterior with **nested sampling** - other methods use **gradient descent** methods which can **get stuck in local minima**
- Doesn't make the assumption that **all calibrators have same noise**
  - Calibrator PSDs have **radiometric noise** e.g. hot load will have higher noise
  - Noise is **scaled inversely by reflection coefficient** e.g. open/short loads will have higher noises

NOISE ESTIMATION

- Assume PSD noise is **Gaussian** and S11 noise is **negligible**
- **Propagate noise** through noise wave parameter equation
- **Compare** calibrated temperature noise with analytic estimation

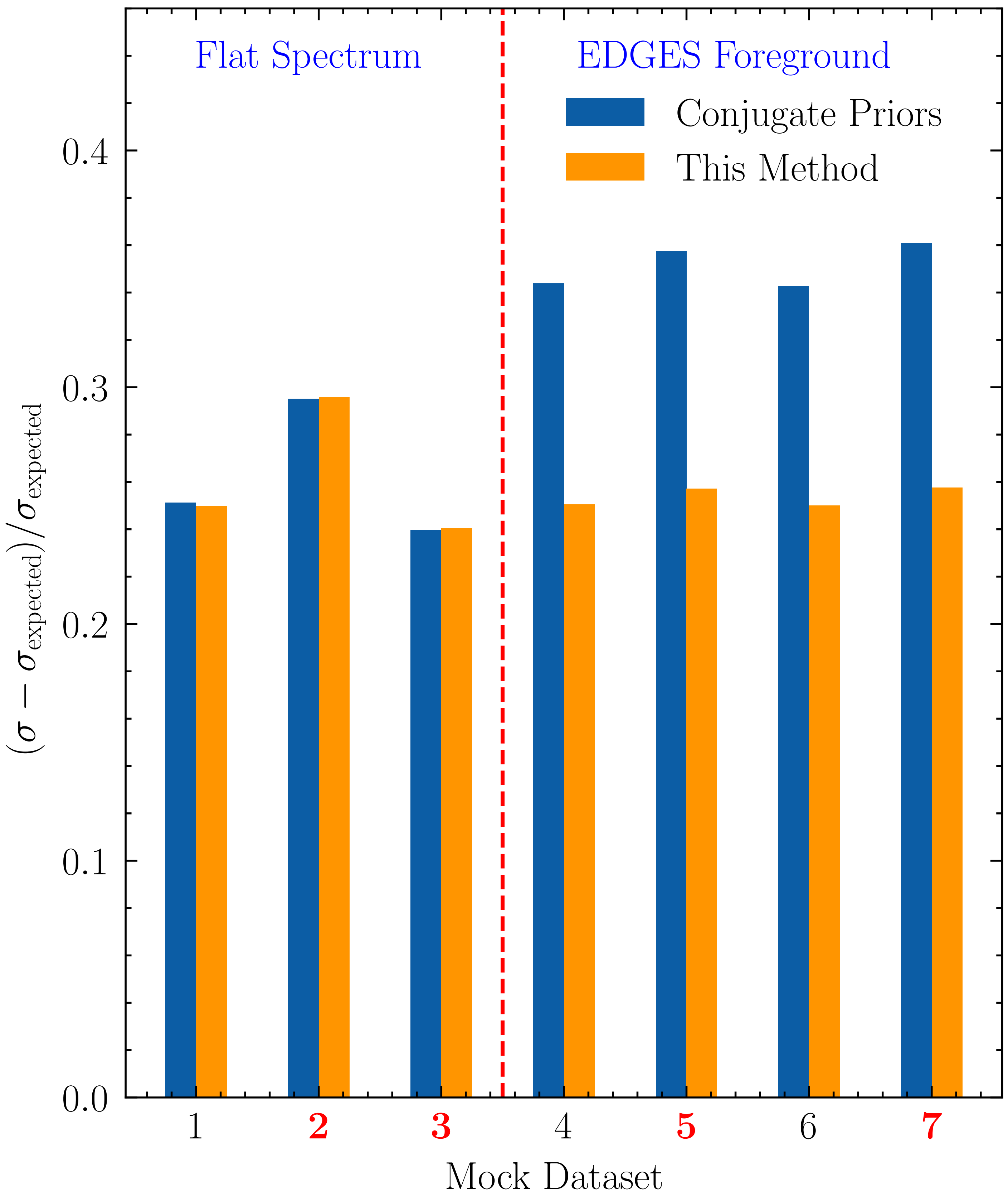
$$(\sigma_{T_s})^2 = \frac{(T_{\text{NS}}^{\text{fit}})^2(X_{\text{L}})^2}{E^2}\left(\sigma_A^2 + \sigma_B^2 - 2\sigma_{AB} + \frac{D^2}{E^2}(\sigma_B^2 + \sigma_C^2 - 2\sigma_{BC}) - \frac{2D}{E}\sigma_{DE}\right)$$

TESTING

- Mock dataset **using REACH LNA measurements**
- Seven datasets with increasing complexity

RESULTS

- Comparison of this work to the **conjugate priors method** (Roque et al. 2021)



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