LISA Science Group activities: update

Elena M. Rossi co-chair
with Jon Gair & Michele Vallisneri

3 June 2021 virtual consortium meeting

Summary

- Figures of Merit
- Activities within the Calibration Working Group
- Internal and external reorganisation

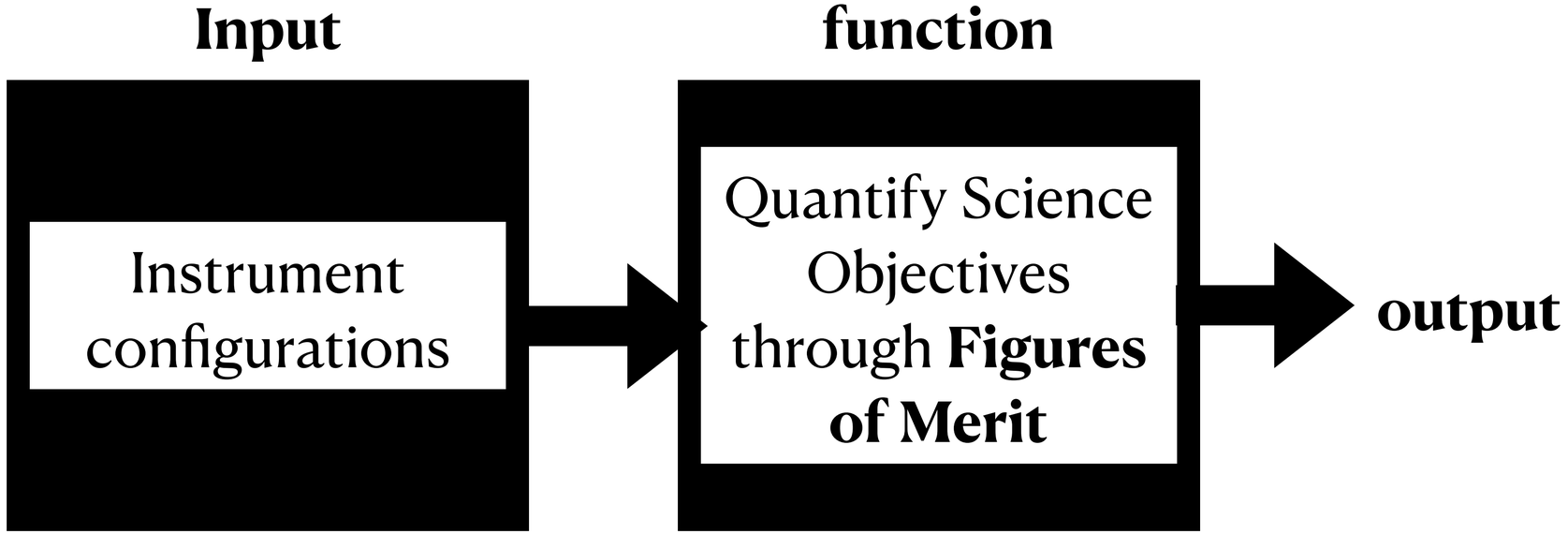
LSG ongoing Work on “Figures of Merit”

- **Goal**: to translate *Science* Requirements into *Instrument* Requirements

Work led by the Science Interpretation WP team + Multi-Messenger-Multi Band WP team + LISA Data challenging WG in collaboration with LISA Data Processing Group

Strategy

Quantifying Science Investigations (SIs) through Figures of Merit (numbers) that must fall into an acceptable (green) ranges for their fulfilment



Output Scale (interpretation)

red range: SI not fulfilled

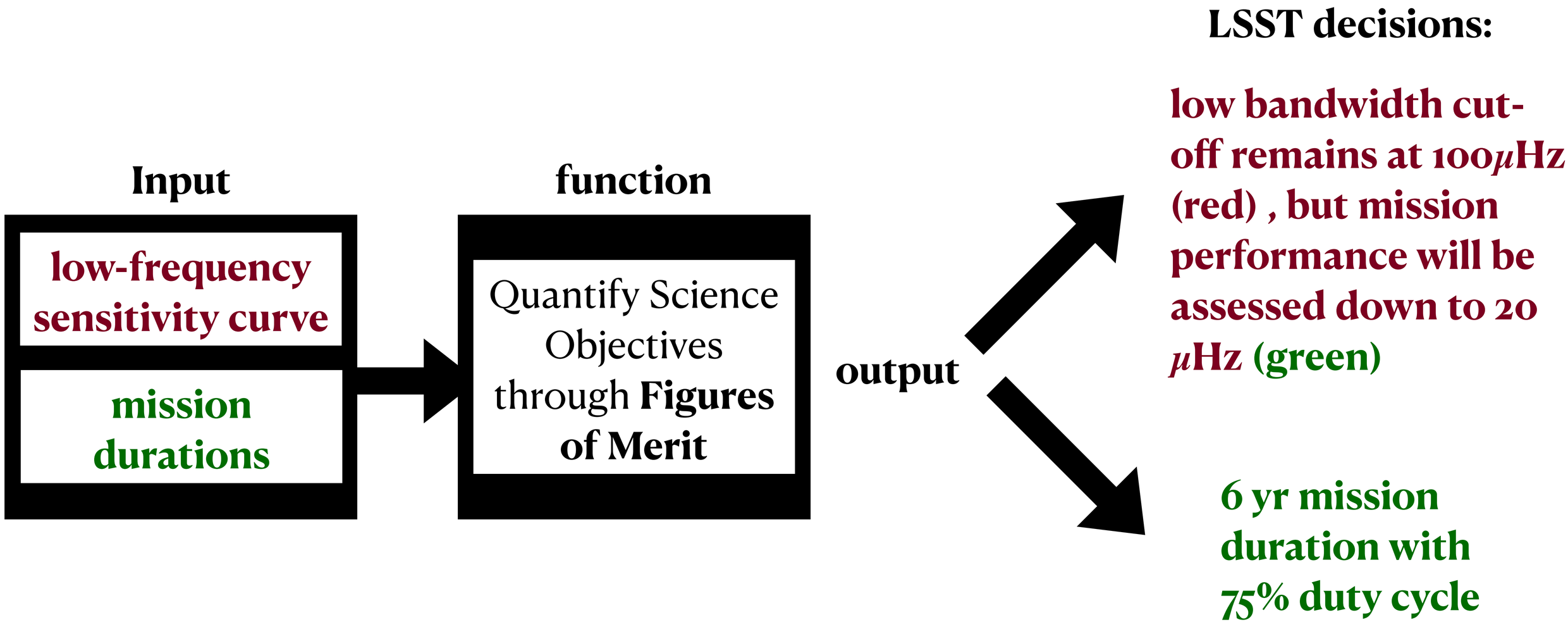
yellow range: SI may not be fulfilled

green range: SI fulfilled

blue range: SI fulfilled, exceeding expectation

Figures of Merit can be seen as functions that map instrument configuration into “numbers” that quantify the performance of the instrument w.r.t. reaching the science objectives

Used in earlier investigations:



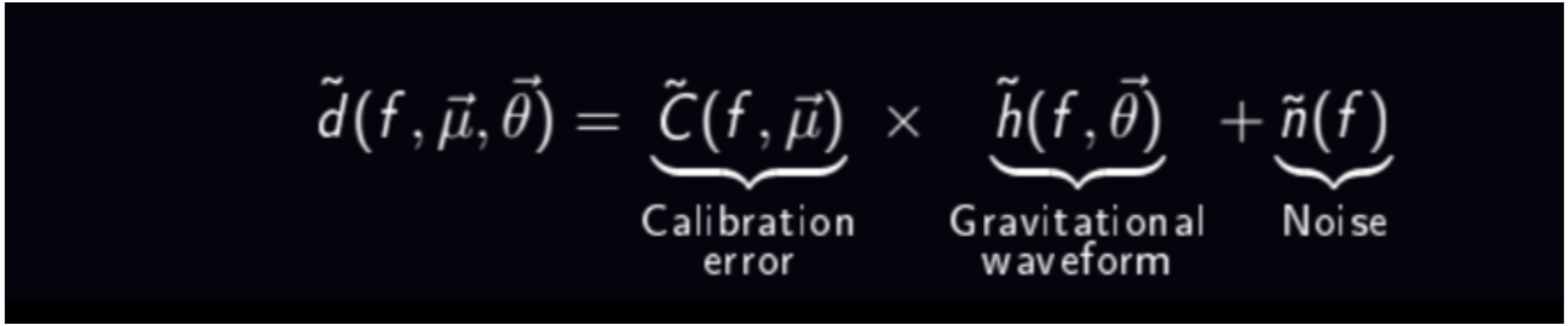
Figures of Merit can be seen as functions that map instrument configuration into “numbers” that quantify the performance of the instrument w.r.t. reaching the science objectives

See SI WP chairs' talk for detail on current investigations

Calibration Working Group

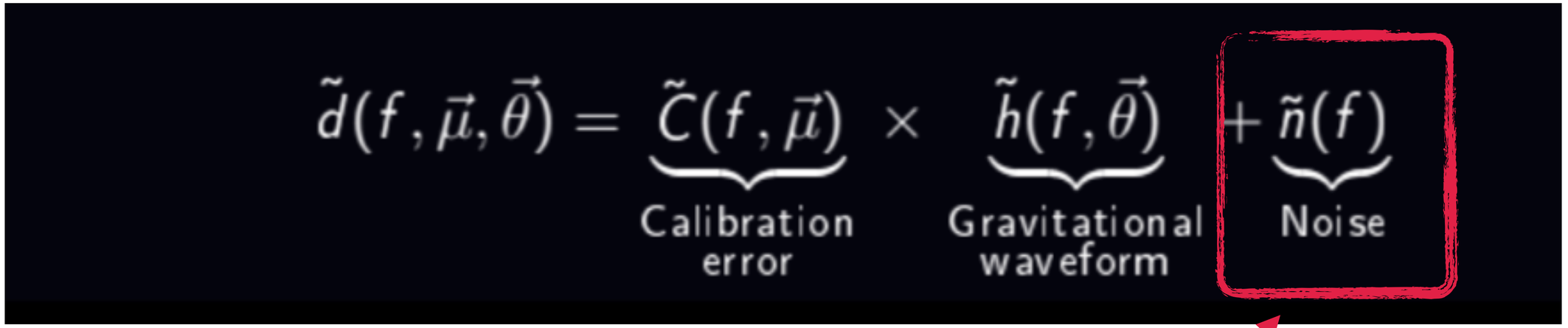
- Composition: ESA WG (Nora chiring), including LISA Science Study Team + Consortium (w LSG chairs, LDC chairs)

Setting the stage



Courtesy of E. Savalle

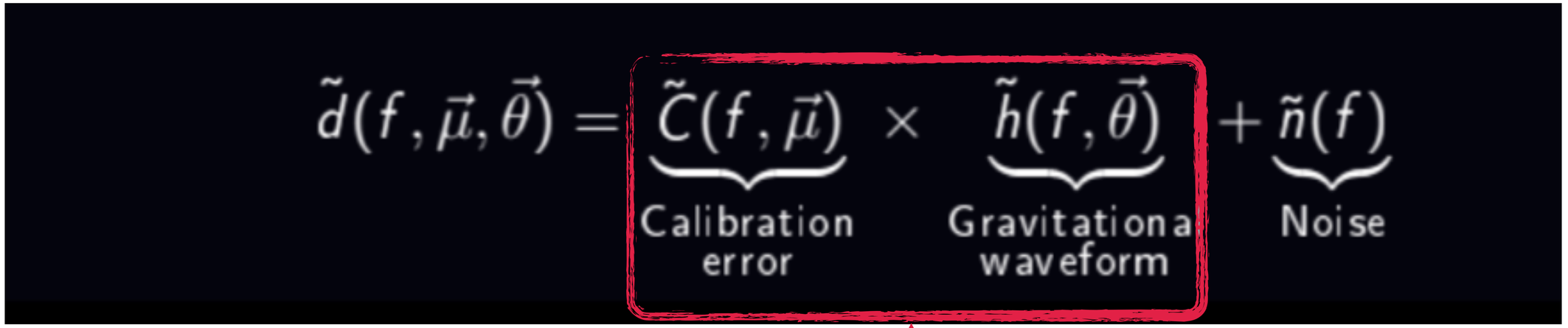
LISA Science Group' goals



Courtesy of E. Savalle

- Translate Science Requirements into
  - Requirements on signal chain calibration (i.e. what is the max calibration uncertainty we can effort wo impacting science objectives)
  - Requirements on noise model calibration (i.e. what is the max uncertainty on noise model we can effort…)

LISA Science Group'work goals



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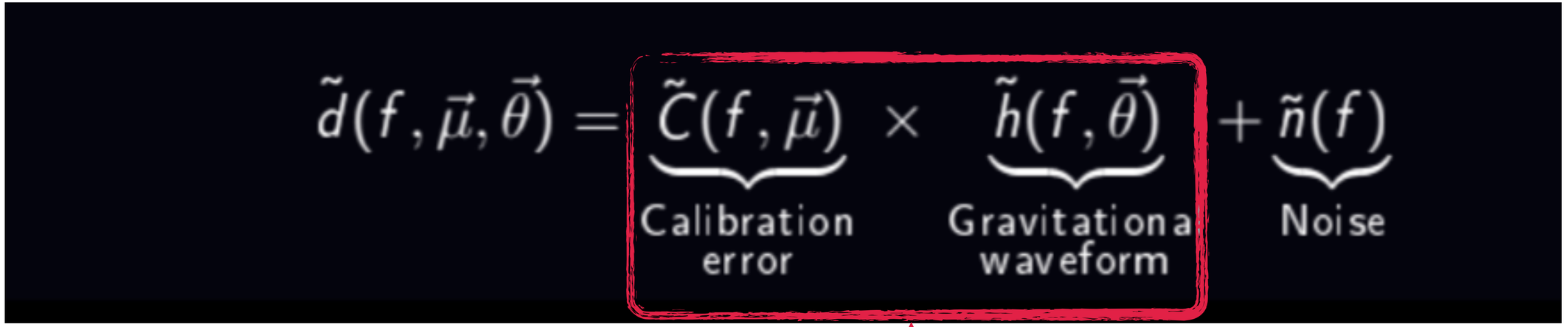


Courtesy of E. Savalle

Under Study NOW

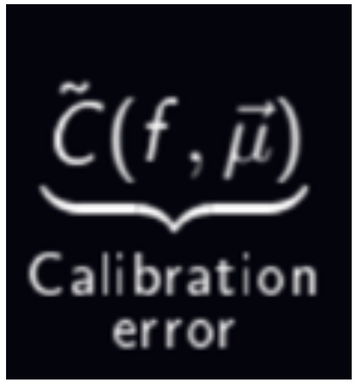
work led by Etienne Savalle + S. Babak & A. Petiteau

Strategy

Assume model for Error Calibration Function

Compute Fisher Matrix for all parameters

Calculate Figures of Merit



compare uncertainties on source parameters

w.r.t. those from prefectly calibrated signal

compare “traffic light” performances w.r.t. those from prefectly calibrated signal

The Work is underway

Assume model for Error Calibration Function

Compute Fisher Matrix for all parameters

Calculate Figures of Merit

$$\underbrace{\tilde{C}(f,\vec{\mu})}_{\text{Calibration error}} \times \underbrace{\tilde{h}(f,\vec{\theta})}_{\text{Gravitational waveform}}$$

Galactic Binaries
(monochromatic sources)

Reorganisation

External

- The Coordination team (with LSG chairs) —-> **Formulation management Team (wo LSG chairs)**
- **Biweekly meetings between LDPG and LSG chairs** to coordinate activities for the building of the Science Ground Segment (SGS)
  - define the SGS logical flow
  - define L1 data content specifically
  - Prepare for what needed to be demonstrated by Mission Formulation Review and Adoption

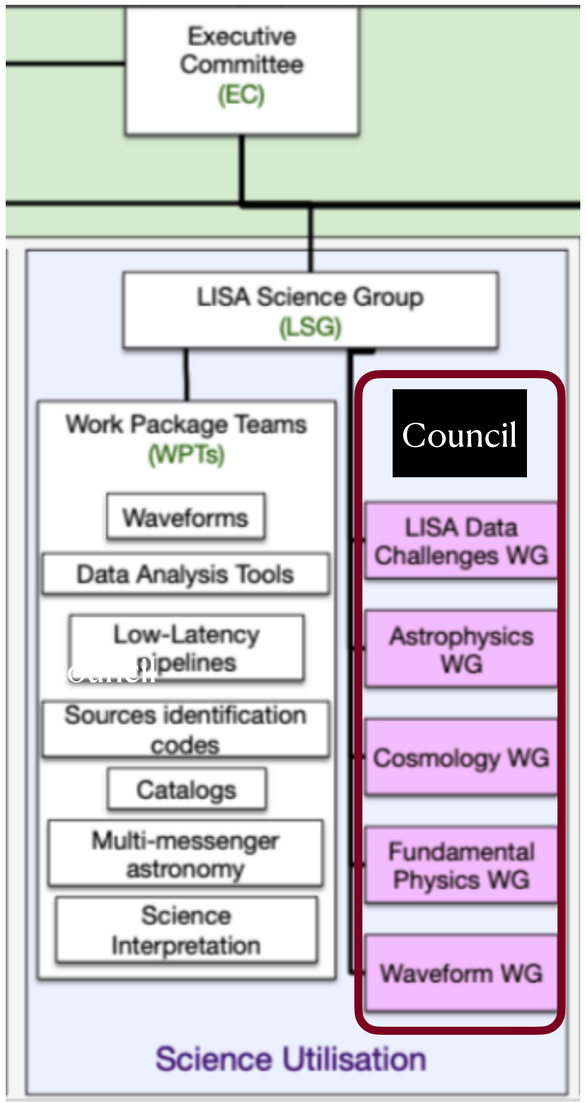
Reorganisation

Internal

All Working Groups together form the **“LISA Science User Group”** overseen by a Council

The Council report to LSG chairs

The LSG chairs report to the Executive Committee



Courtesy of M. Hewitson

Next Talk for full description of current council activities including White Papers coordination and WG elections