RÉPUBLIQUE FRANÇAISE
Liberté
Égalité
Fraternité

cnes
CENTRE NATIONAL D'ÉTUDES SPATIALES

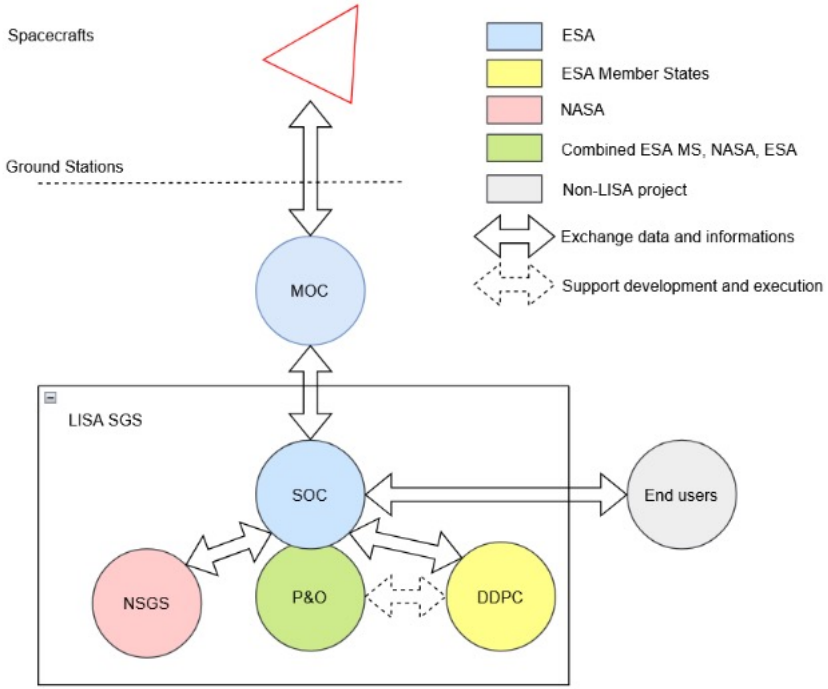
DDPC OVERVIEW

LISAFRANCE 2026, IAP

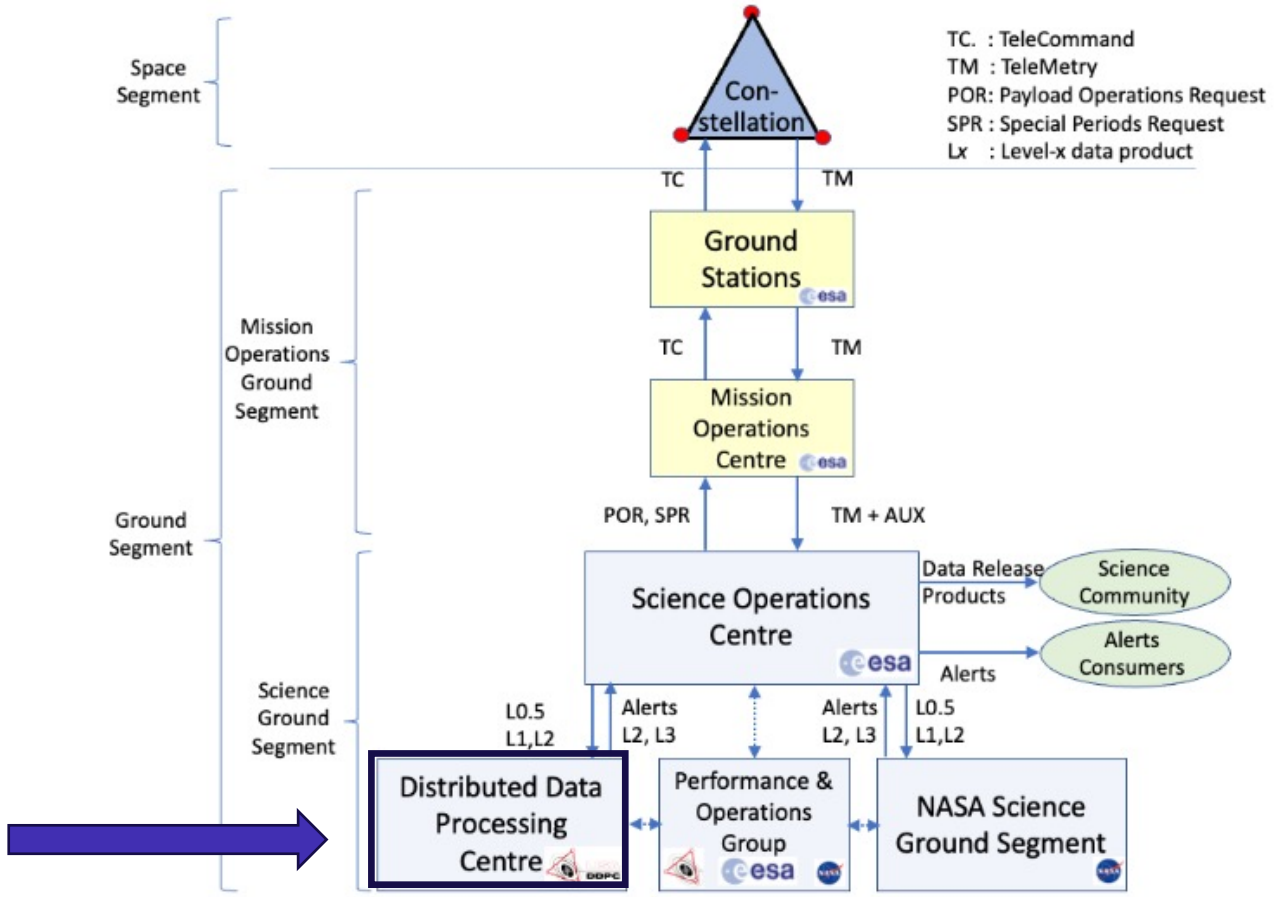
4TH MAY

LISA
DDPC

DDPC ORGANISATION


Spacecrafts
Ground Stations
MOC
LISA SGS
SOC
End users
NSGS
P&O
DDPC
ESA
ESA Member States
NASA
Combined ESA MS, NASA, ESA
Non-LISA project
Exchange data and informations
Support development and execution

DDPC RESPONSIBILITIES

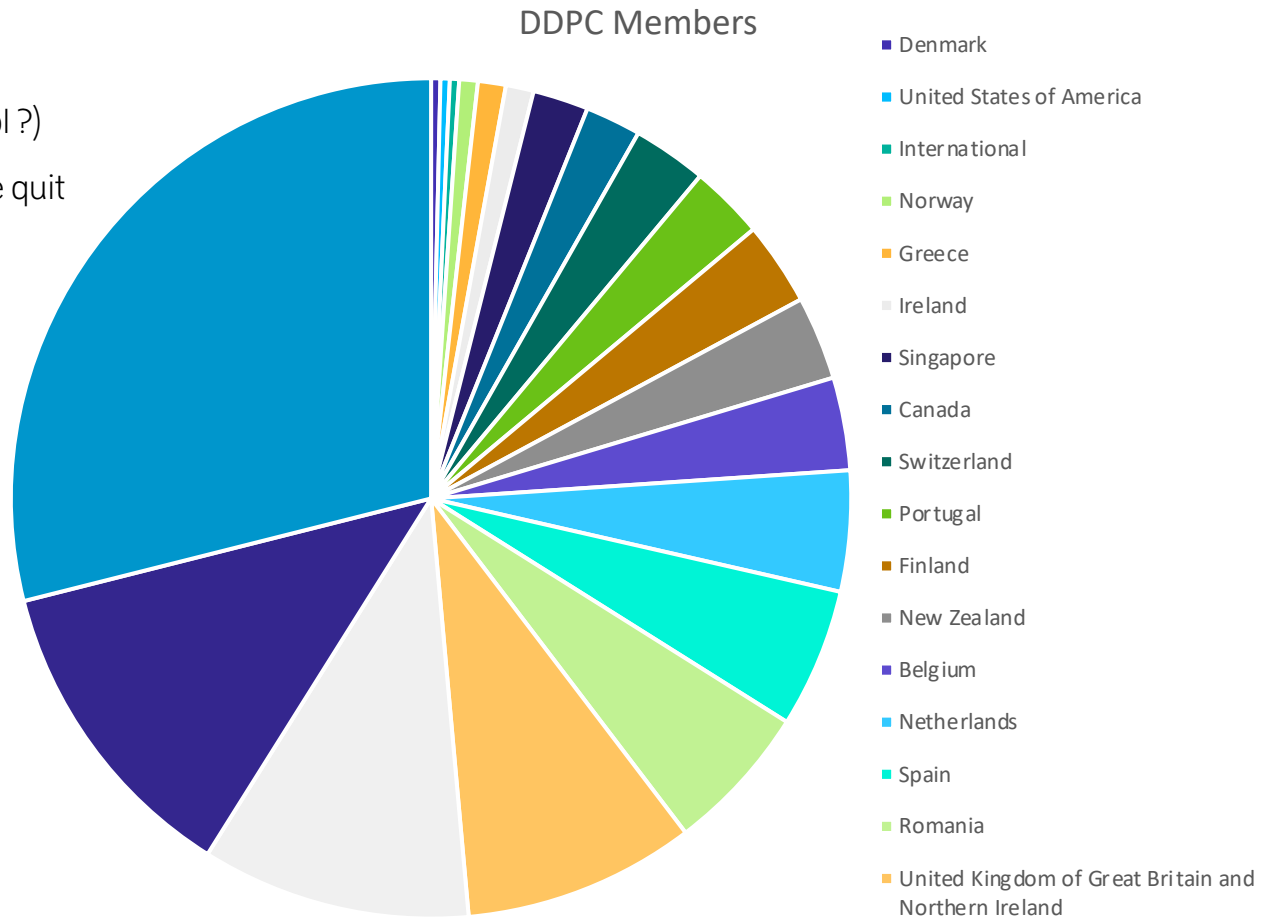


DDPC MEMBERS

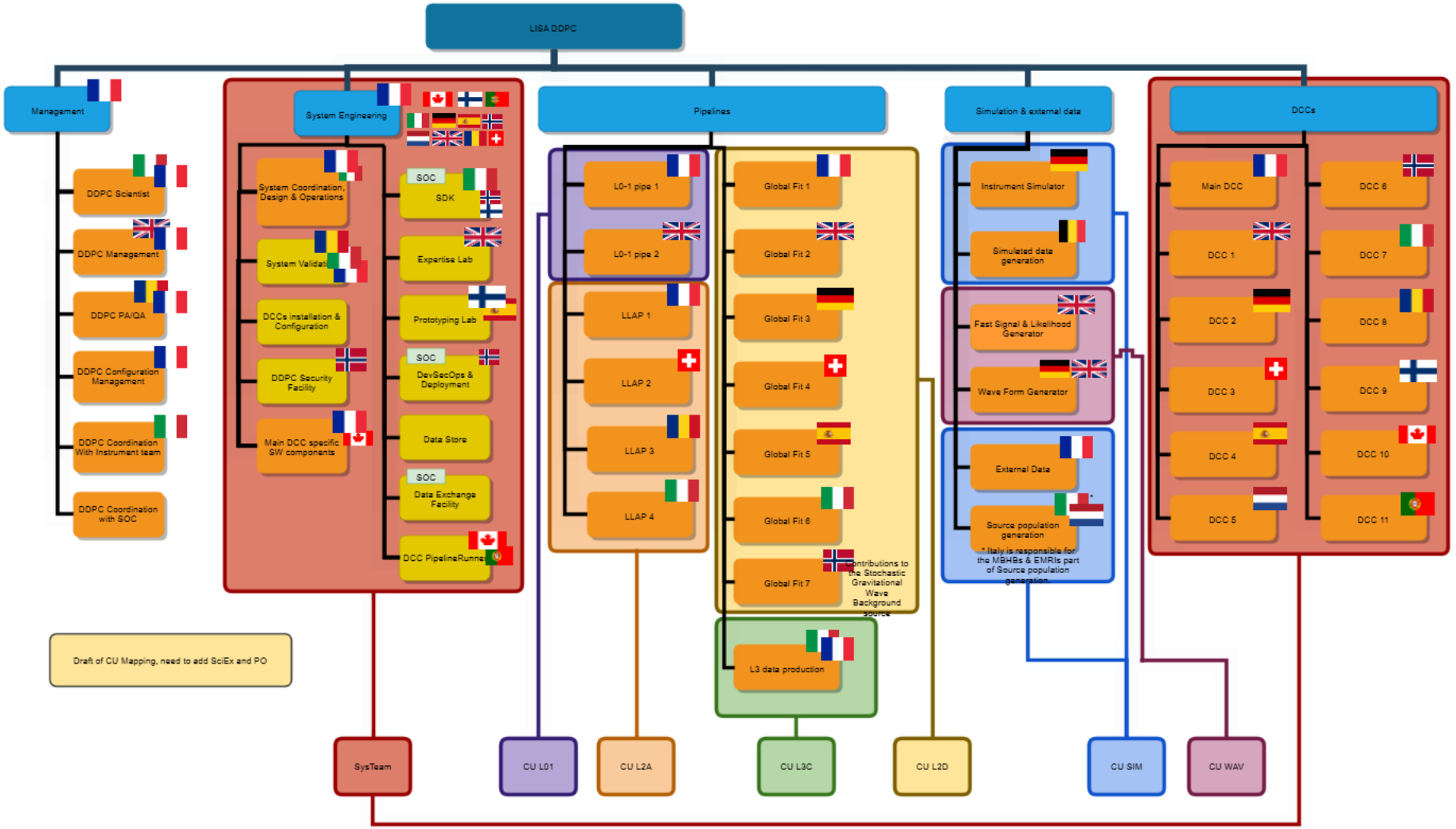
280 registered

⇒ Progress to be made to have the number of FTEs (tool ?)

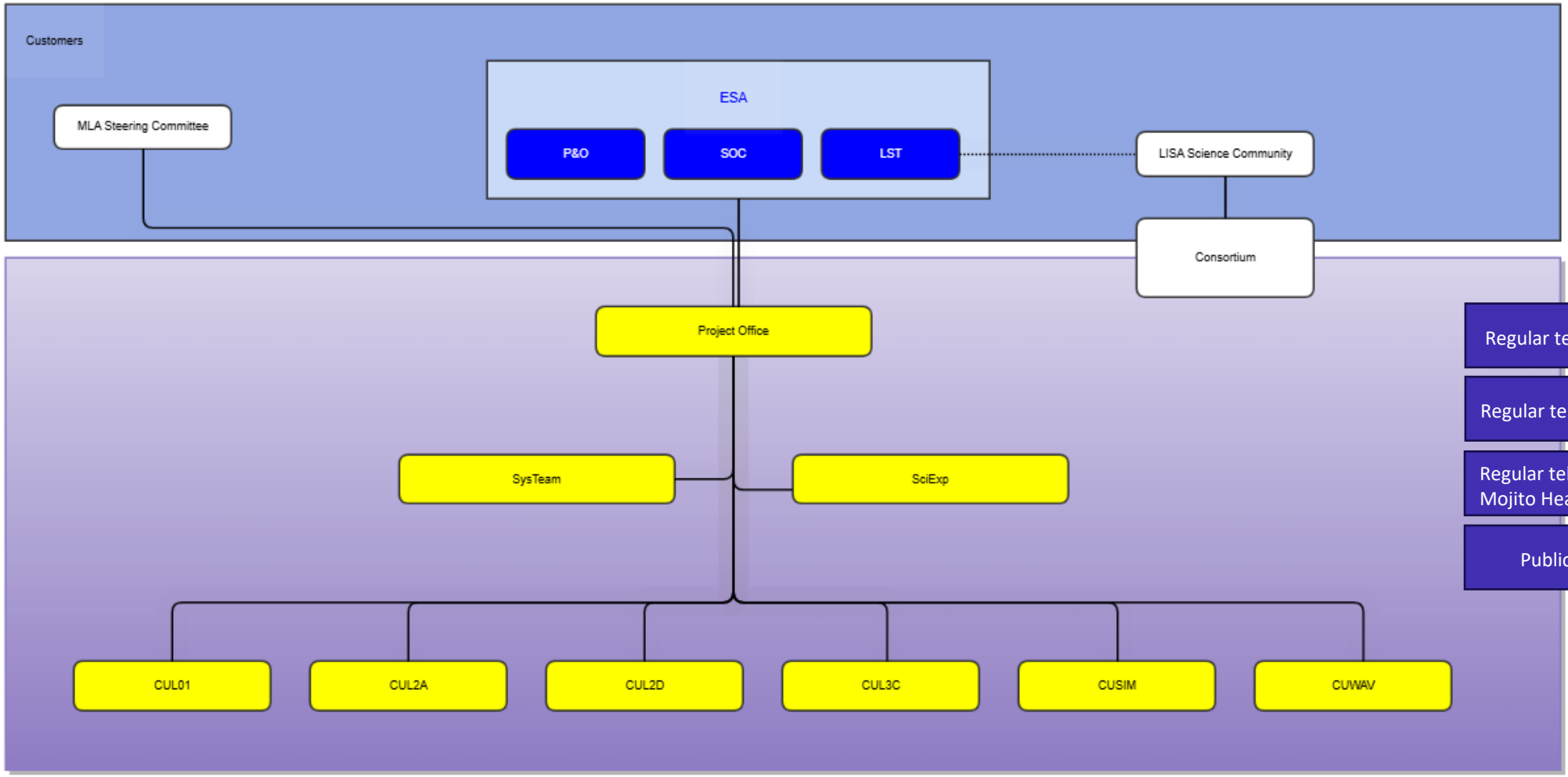
⇒ Progress to be made to do the follow up when people quit



WORKPACKAGES AND CUS

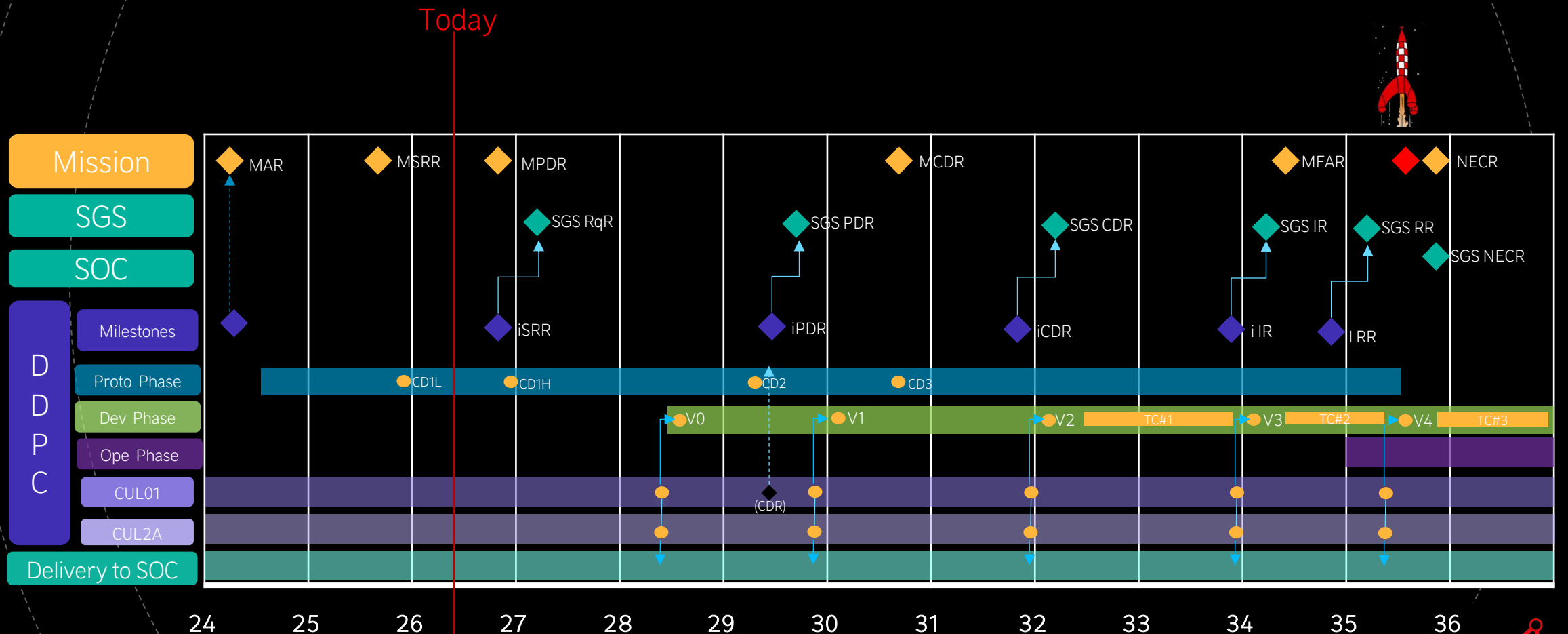


DDPC MANAGEMENT STRUCTURE



- Regular telecons in each group
- Regular telecons inter Cus
- Regular telecon dedicated to Mojito Heavy Data Generation
- Publication Task Force

DDPC MASTER SCHEDULE



DDPC Science
Common Datasets

Antoine Petiteau (CEA/IRFU/DPhP)

LISA France

IAP, 5-6th May 2026

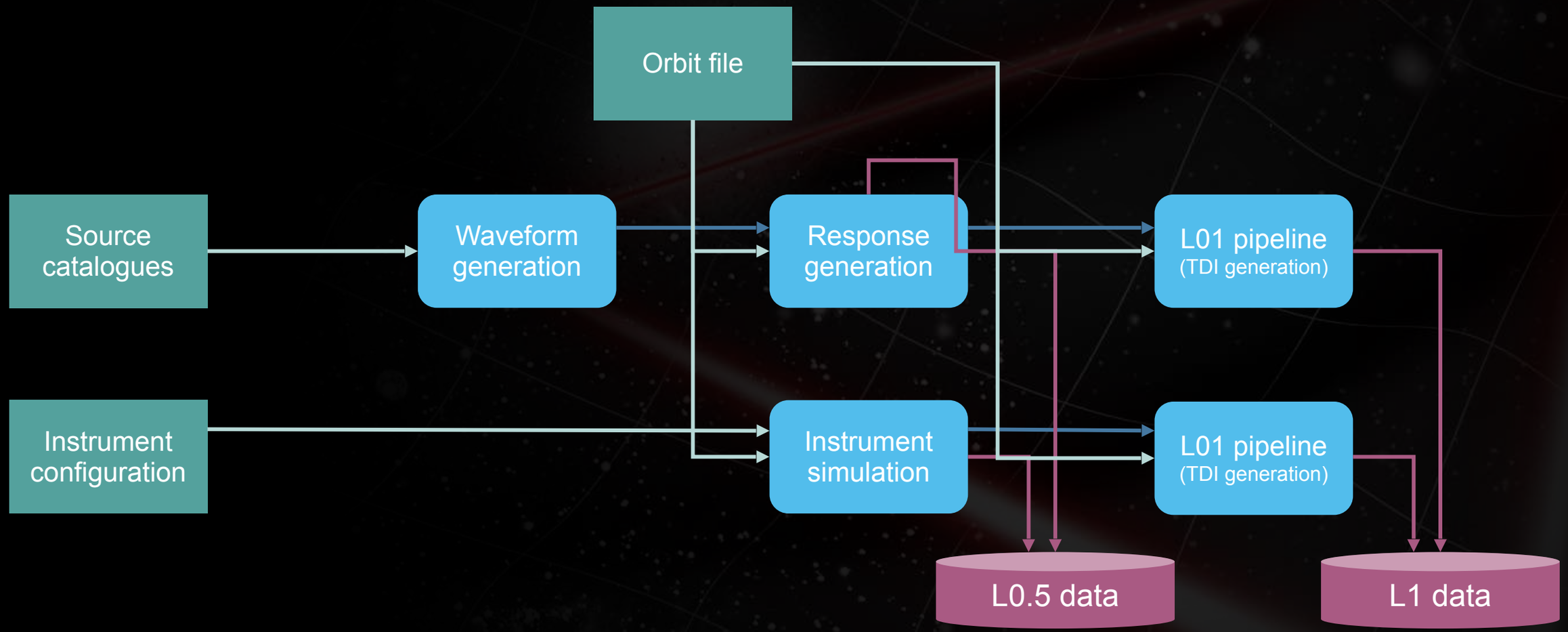
Mojito Light content

- Major step from last LDC:
  - Data at 4 Hz for 2 years with realistic TDI processing and real orbits from ESA
  - Advanced and solid versions of instrument simulator, L0-L1 processing and generators of waveforms
- LEGO type dataset:
  - 1 brick = L1 data at 4 Hz for 2 years (35GB) with multiple TDI channels (A,E,T,X,Y,Z,etas), orbits, armlenghts and derivatives, noise estimation
  - 1 combined dataset + 1 brick for each source and noises => 37 bricks which can be combined

- Gravitational wave sources

Source		Populations	Physical effects	Waveforms	Sec.
Galactic Stellar Binaries	WD-WD	- detached + interacting WD binaries (idem Heavy) - verification Galactic binaries (idem Heavy)	- circular - frequency evolution ($\dot{f}$) - no eccentricity	JAXGB accurate	3.3.1
	BH-BH				
Extra-Galactic Stellar Binaries	WD-WD				3.3.2
	BH-BH	- 6 extracted from Heavy catalogue	- 1.5 PN - no precession - no eccentricity	pyEFPE	3.3.3
MBHBs		- 20 sources extracted from Heavy catalogue	- higher modes - no precession - no eccentricity	PhenomTPHM	3.3.4
EMRIs		- 8 sources extracted from Heavy catalogue	- Kerr equatorial - eccentricity	SF0_PA FEW	3.3.5

Data generation



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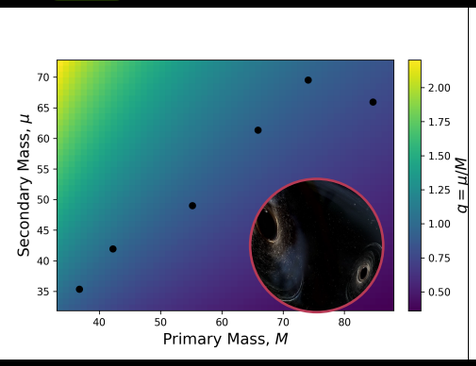
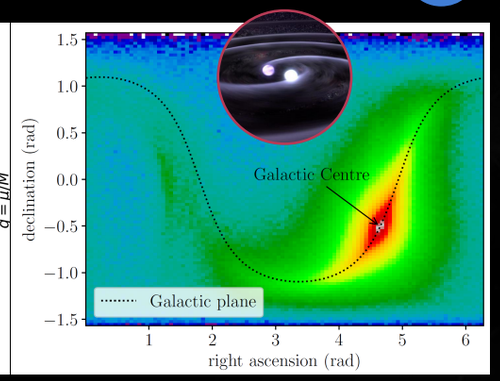
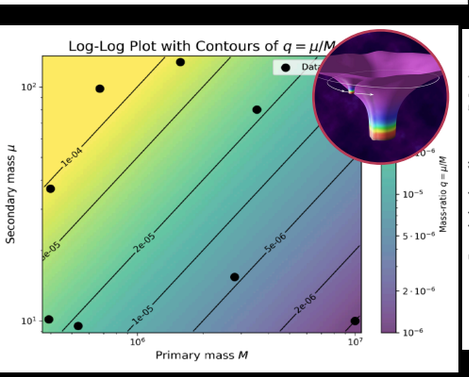
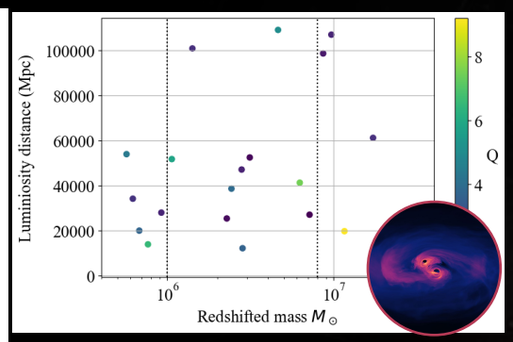








Orbit file

Source catalogues

Waveform generation

Response generation

L01 pipeline (TDI generation)

Instrument configuration

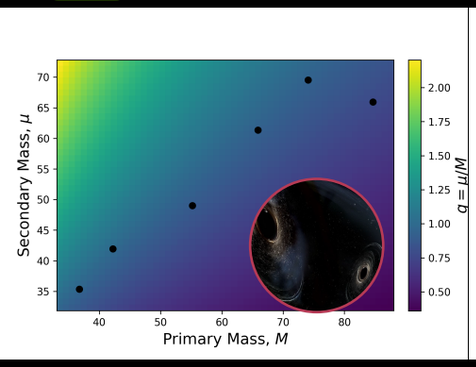
Instrument simulation

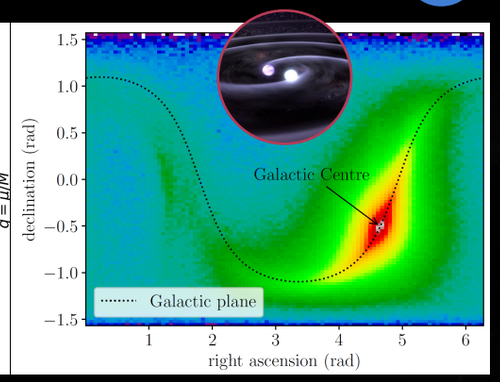
L01 pipeline (TDI generation)

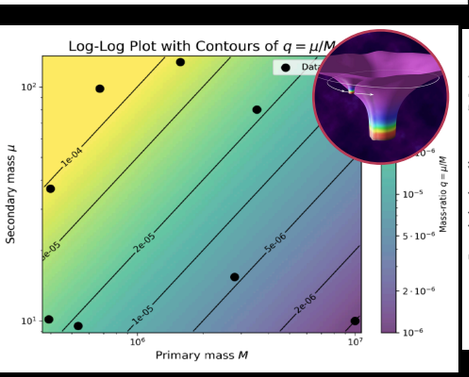
L0.5 data

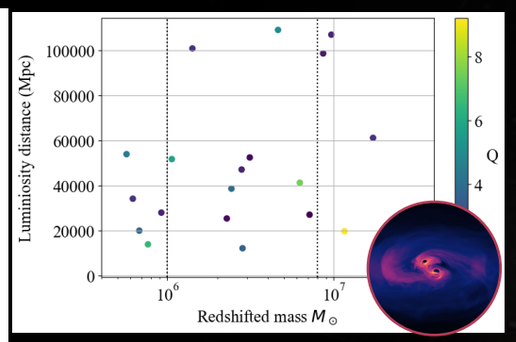
L1 data

Data generation









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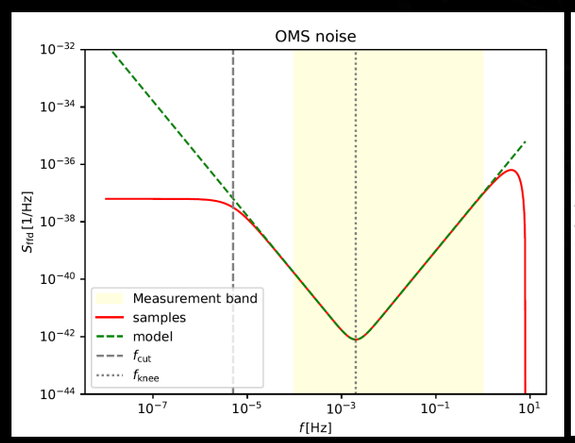
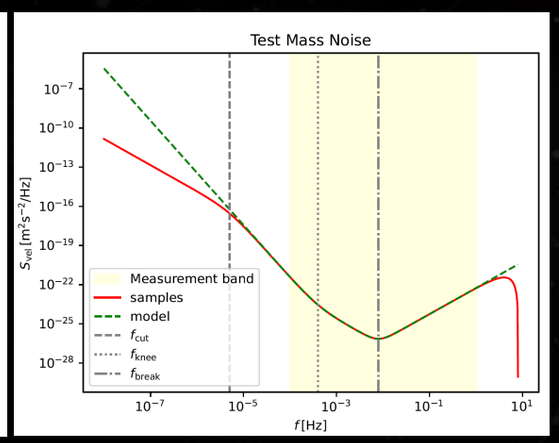
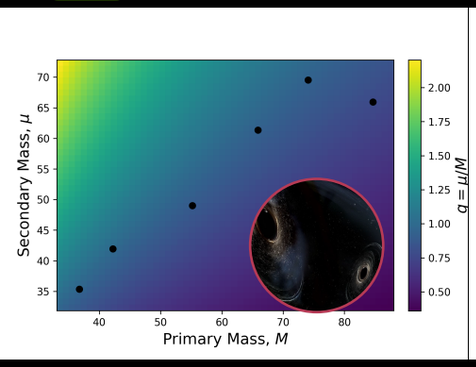
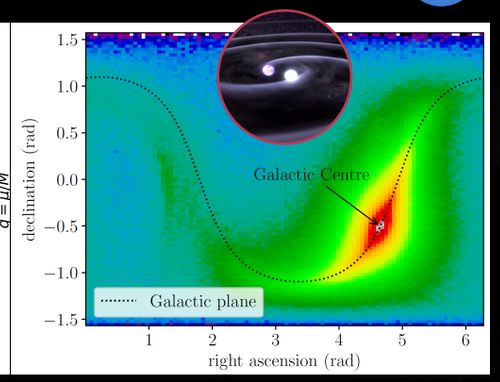
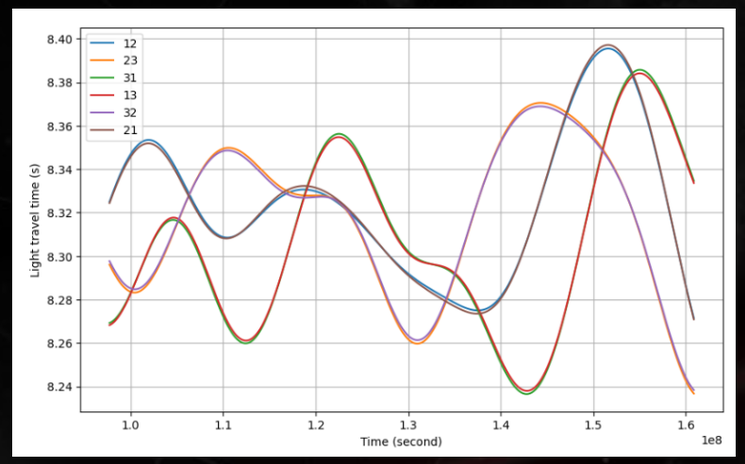


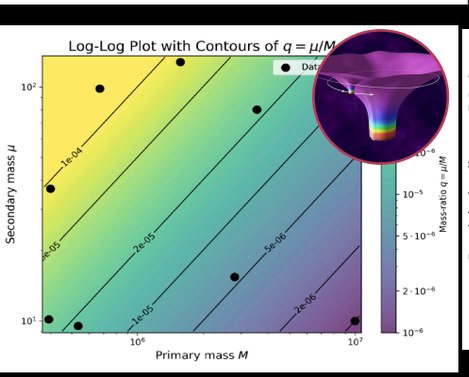


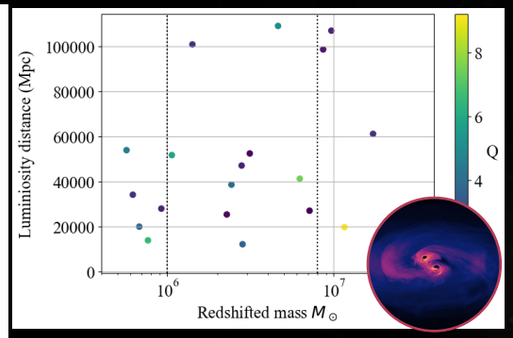
Data generation











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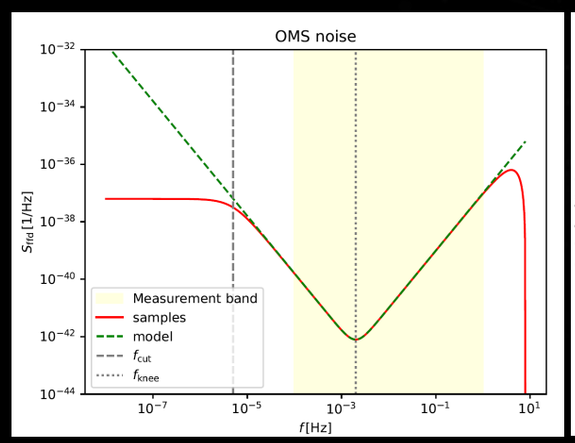
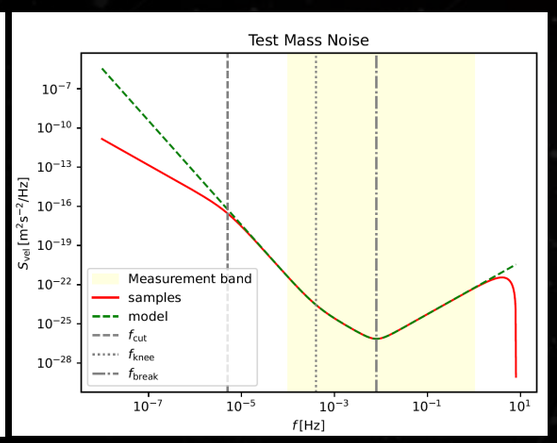
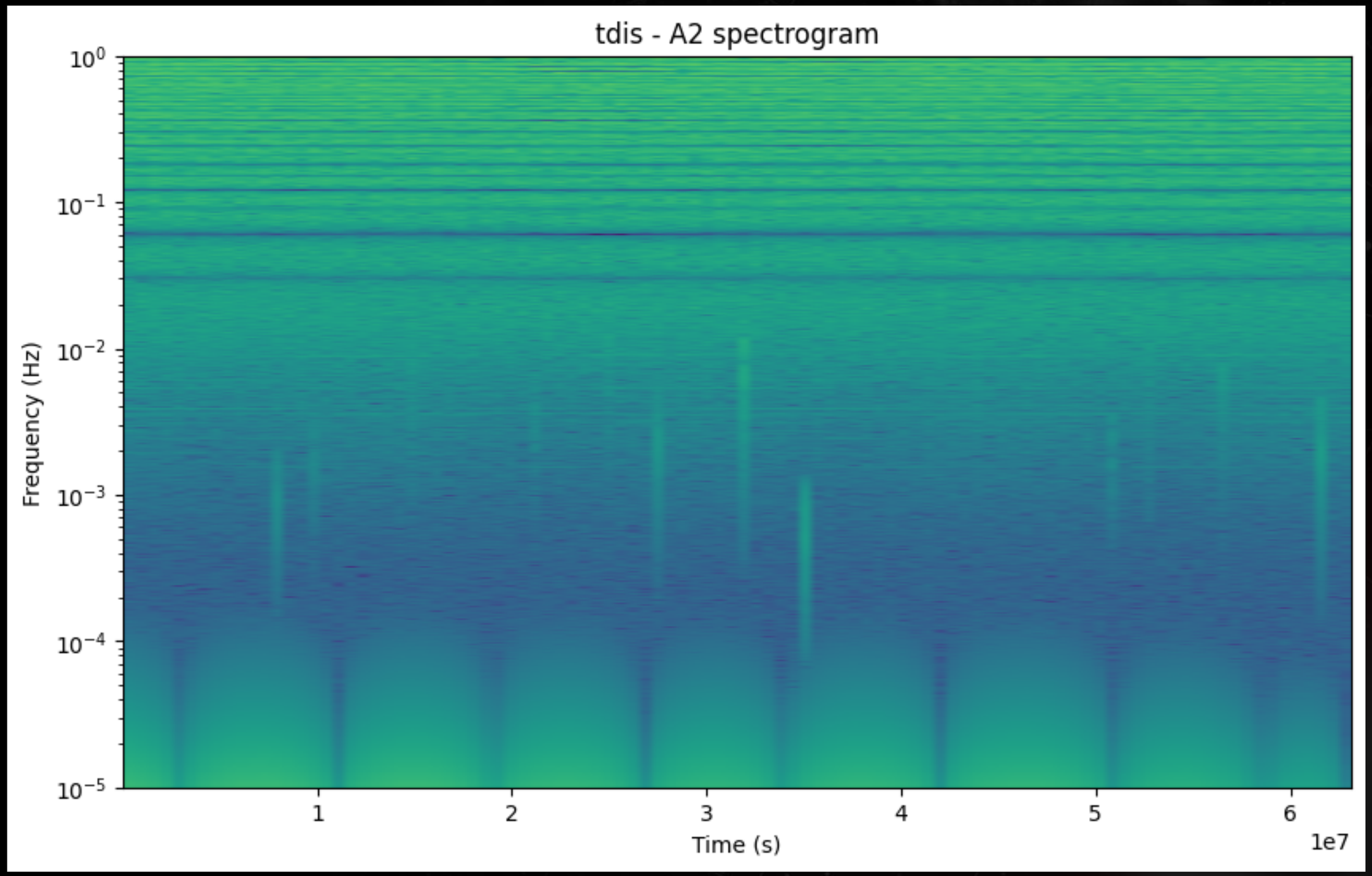
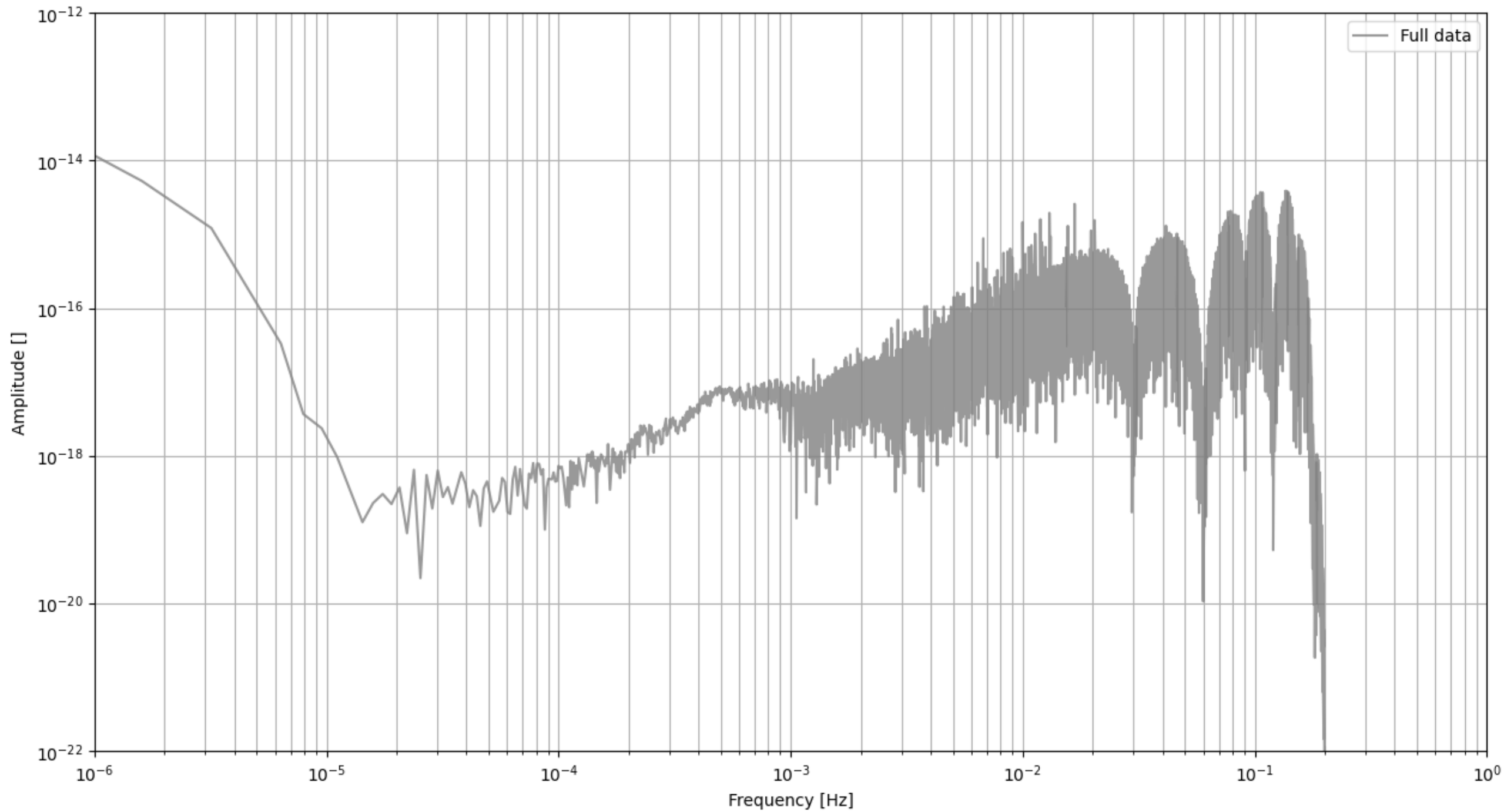




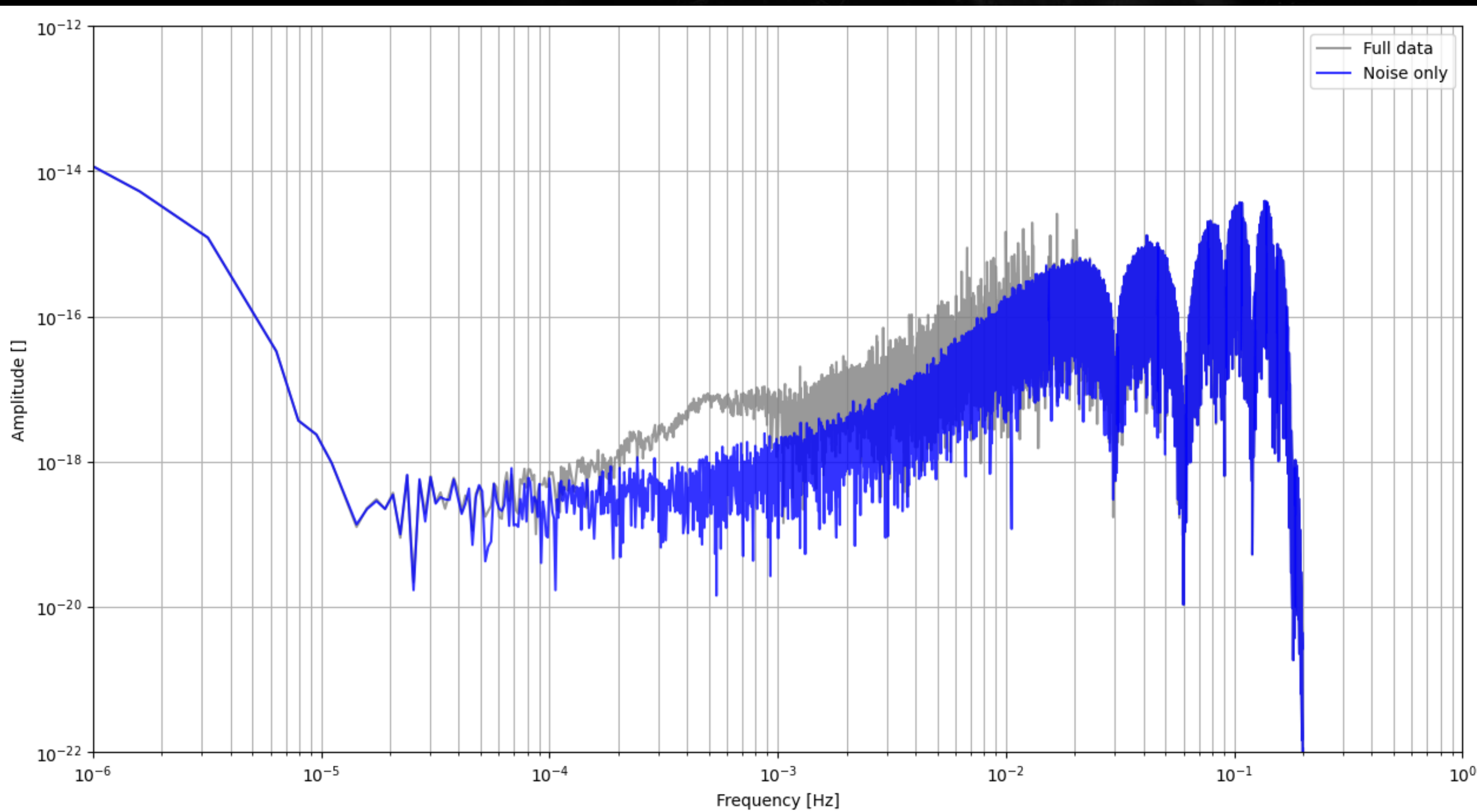
Mojito Light: spectrogram



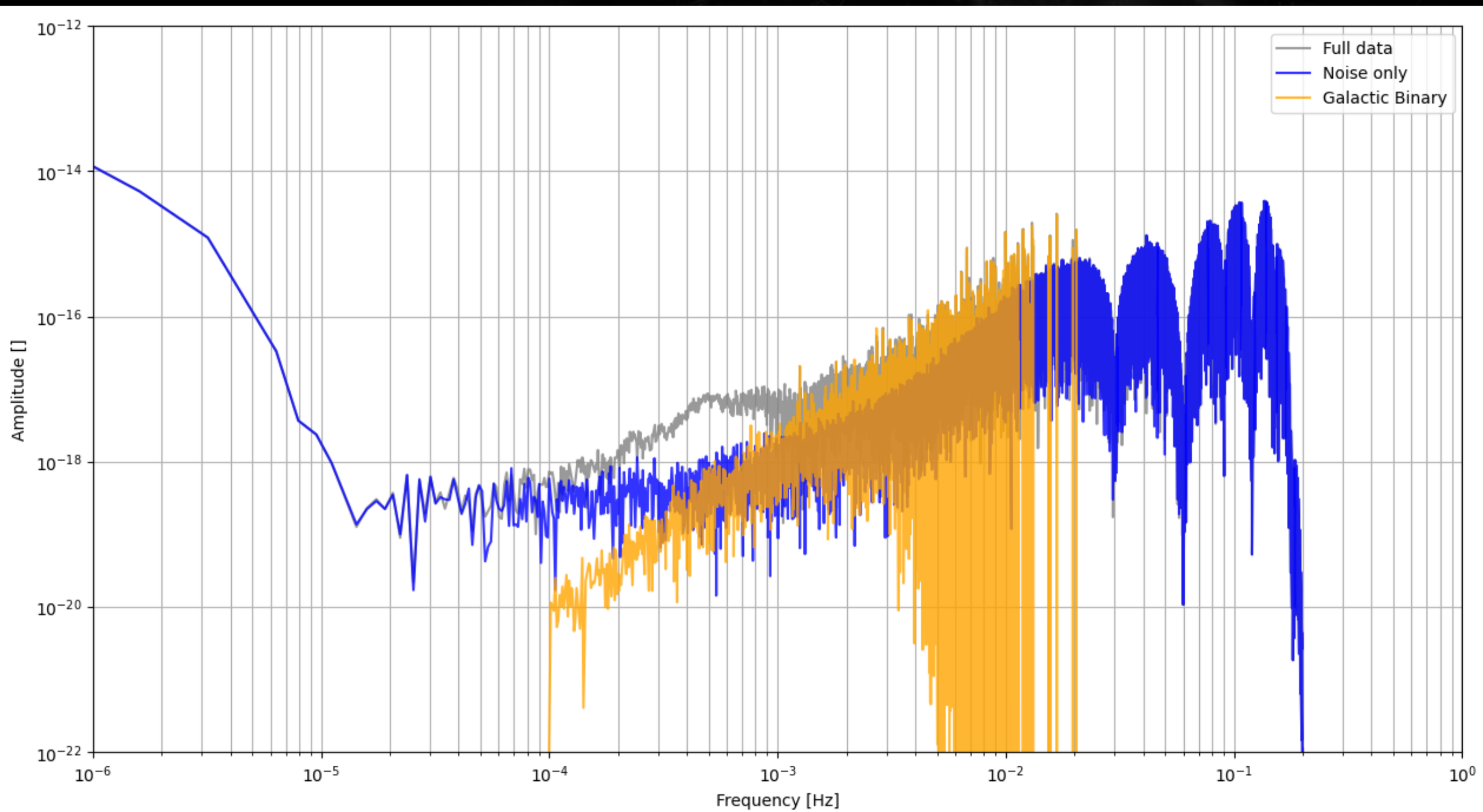
Mojito Light: Full



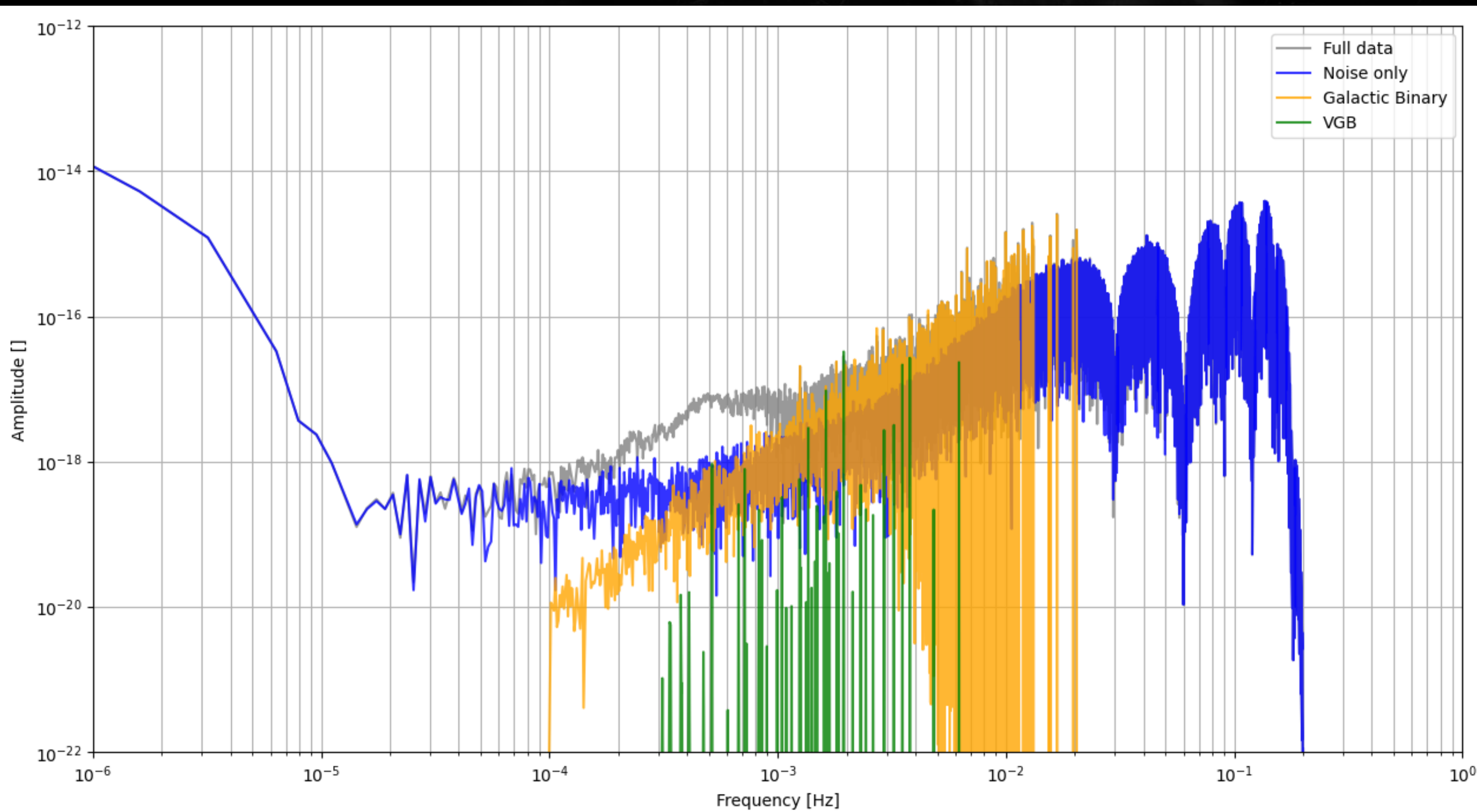
Mojito Light: Full + noise



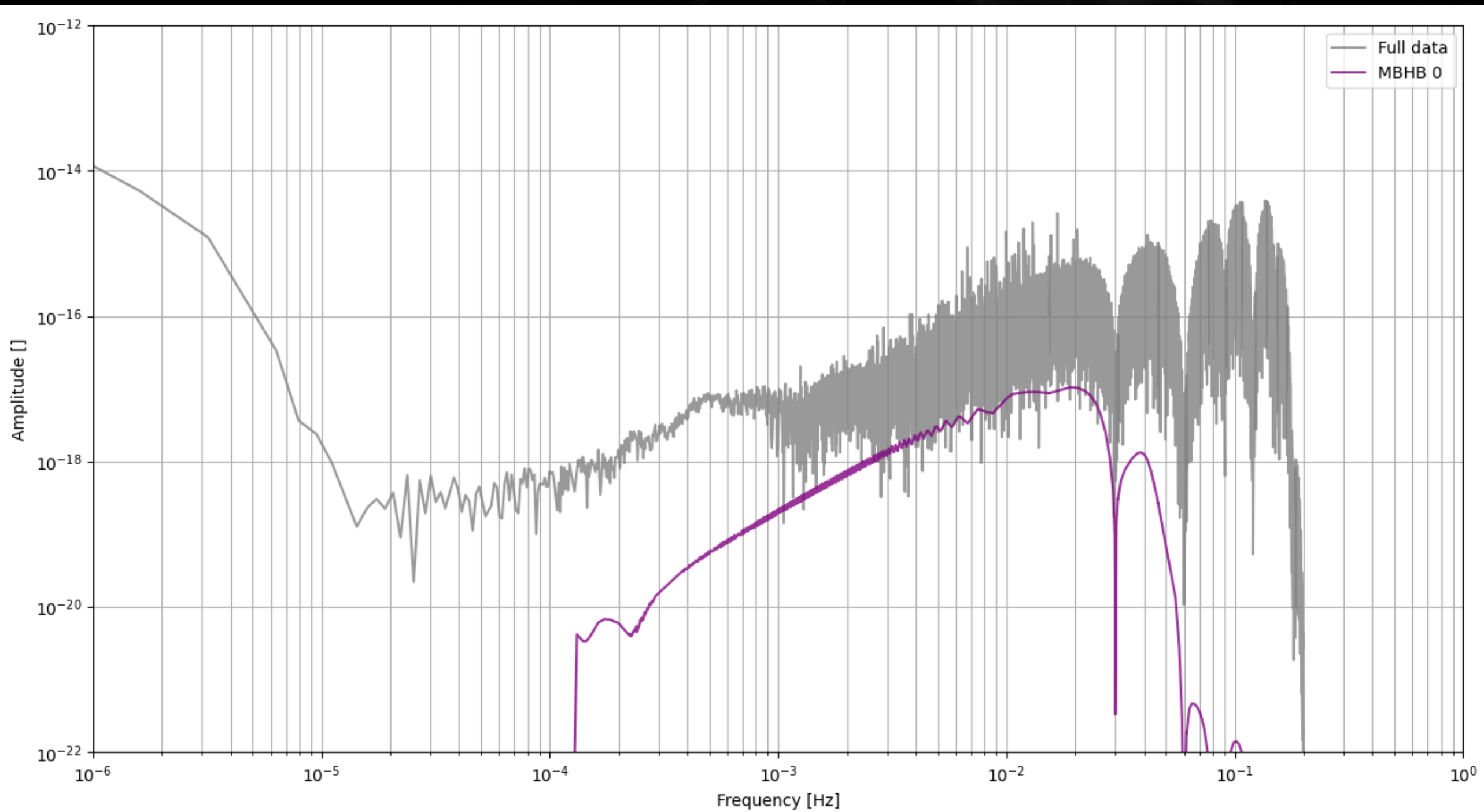
Mojito Light: Full + noise + GB



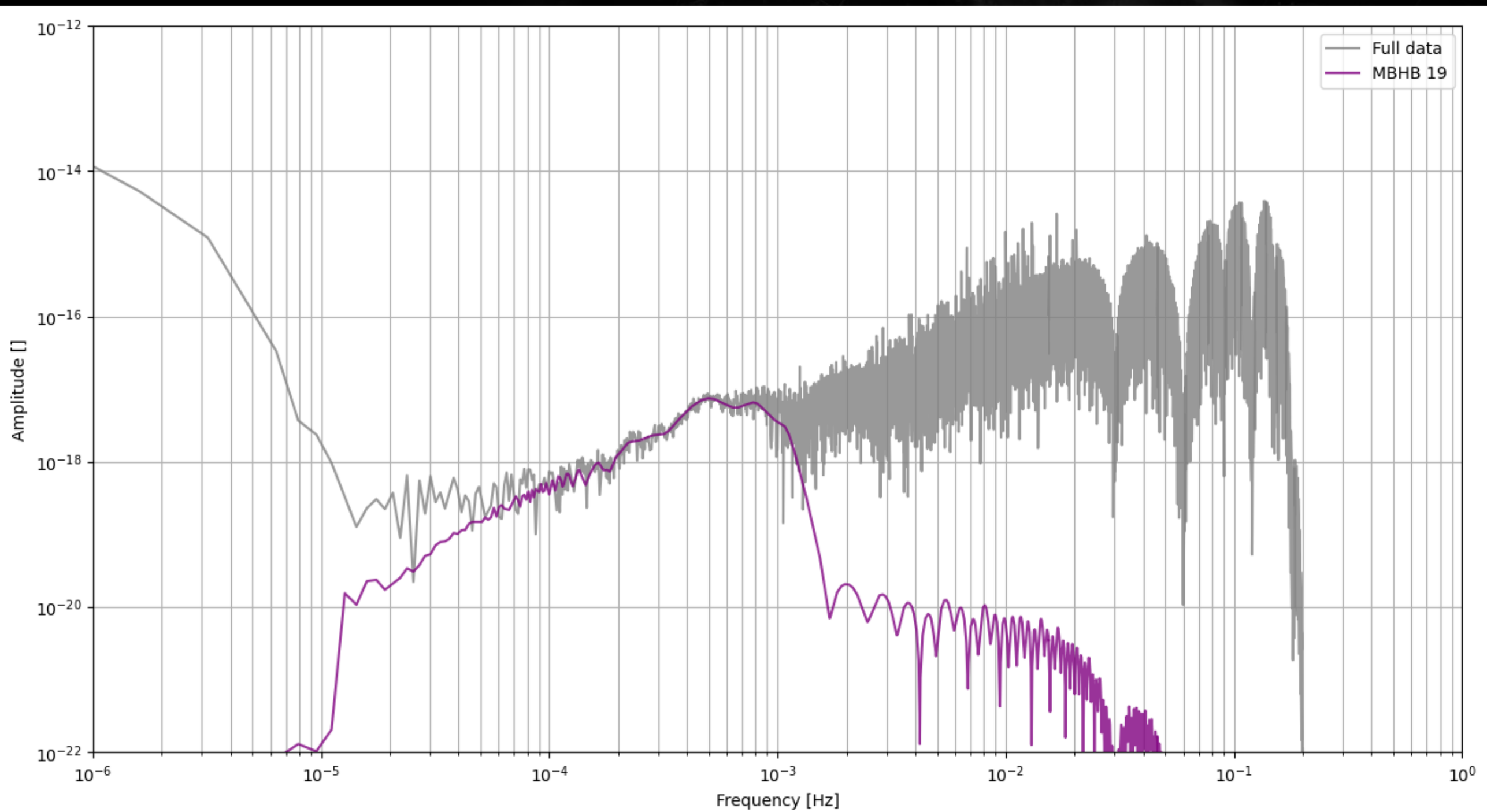
Mojito Light: Full + noise + GB + VGB



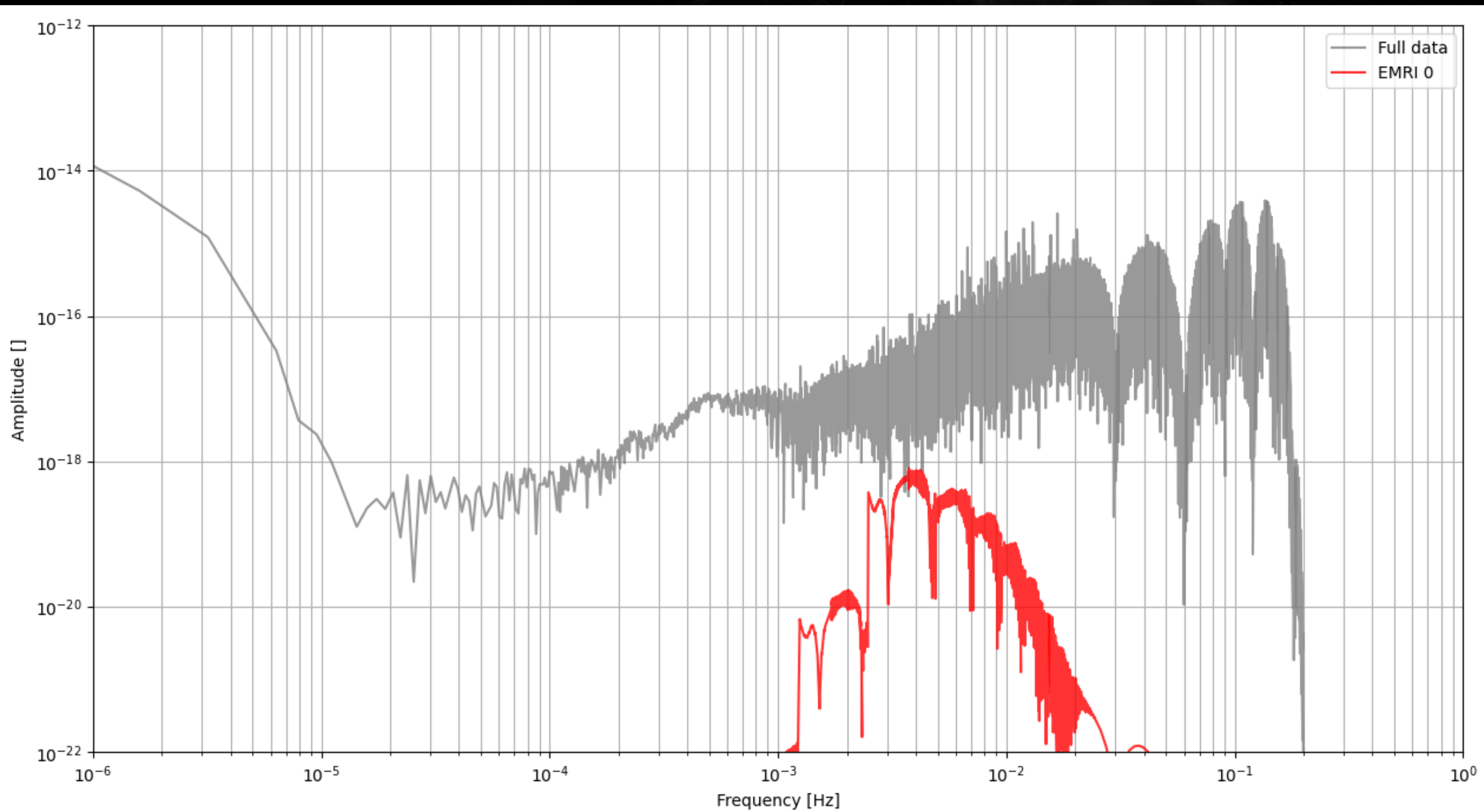
Mojito Light: MBHB



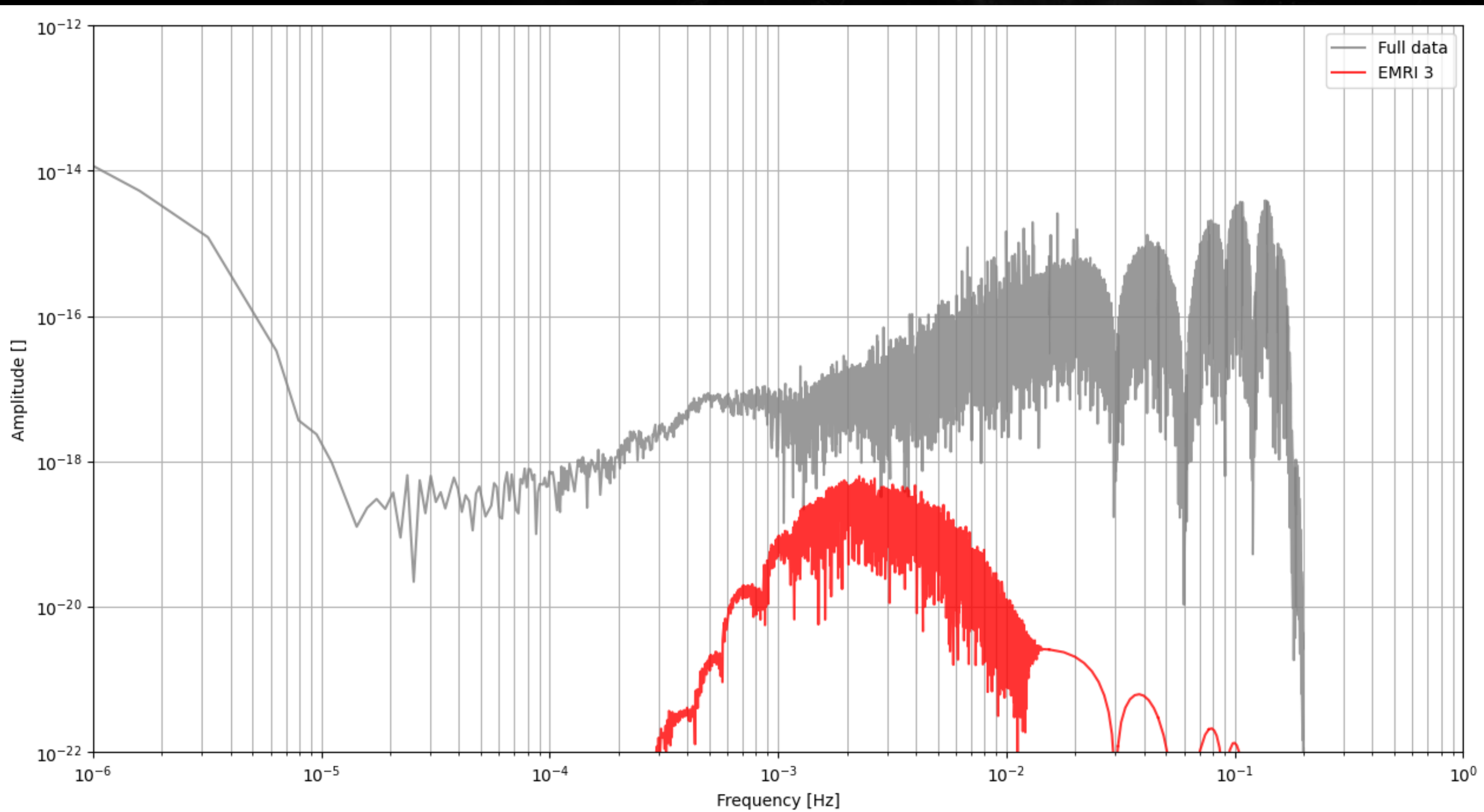
Mojito Light: MBHB



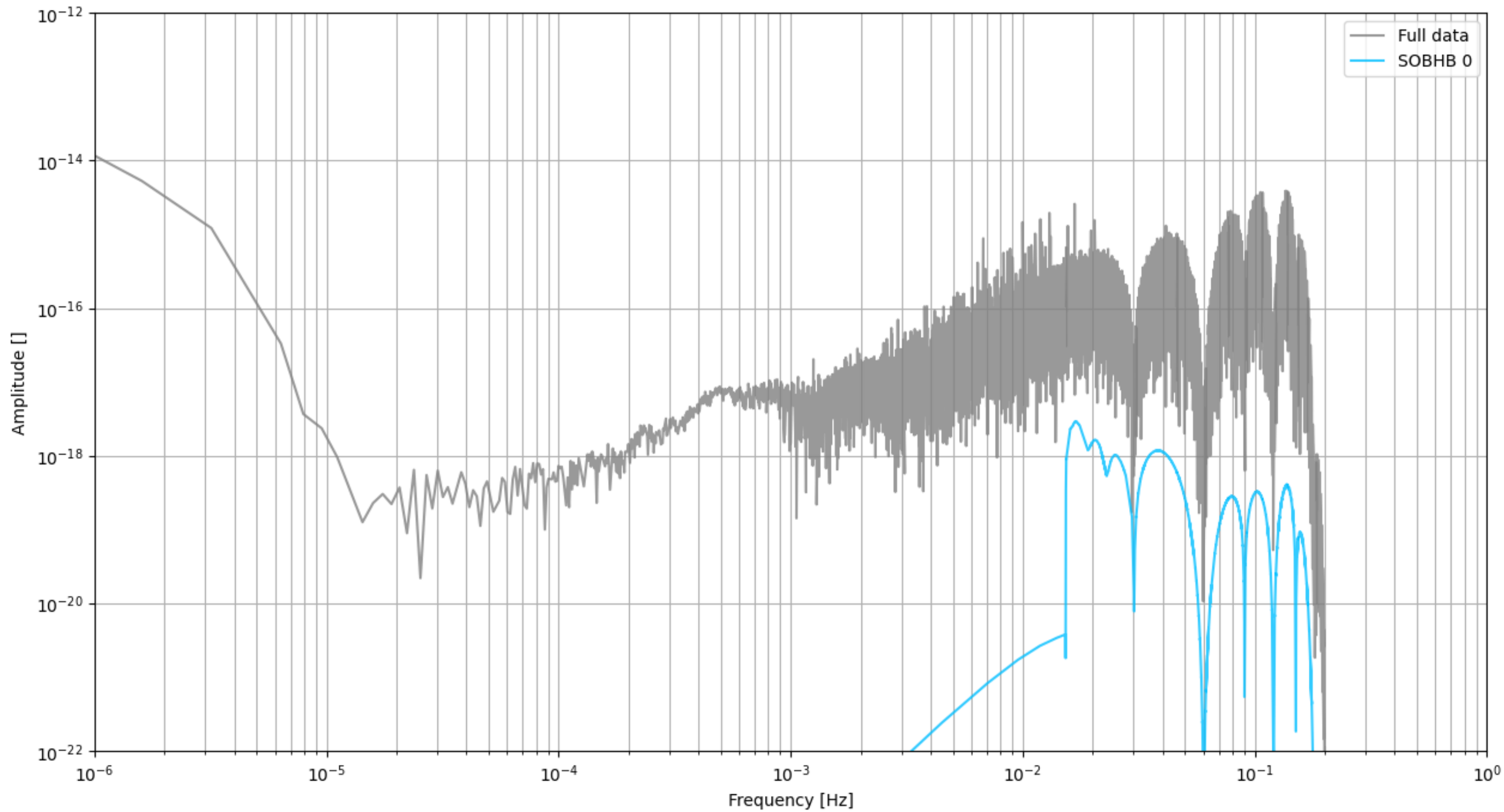
Mojito Light: EMRI



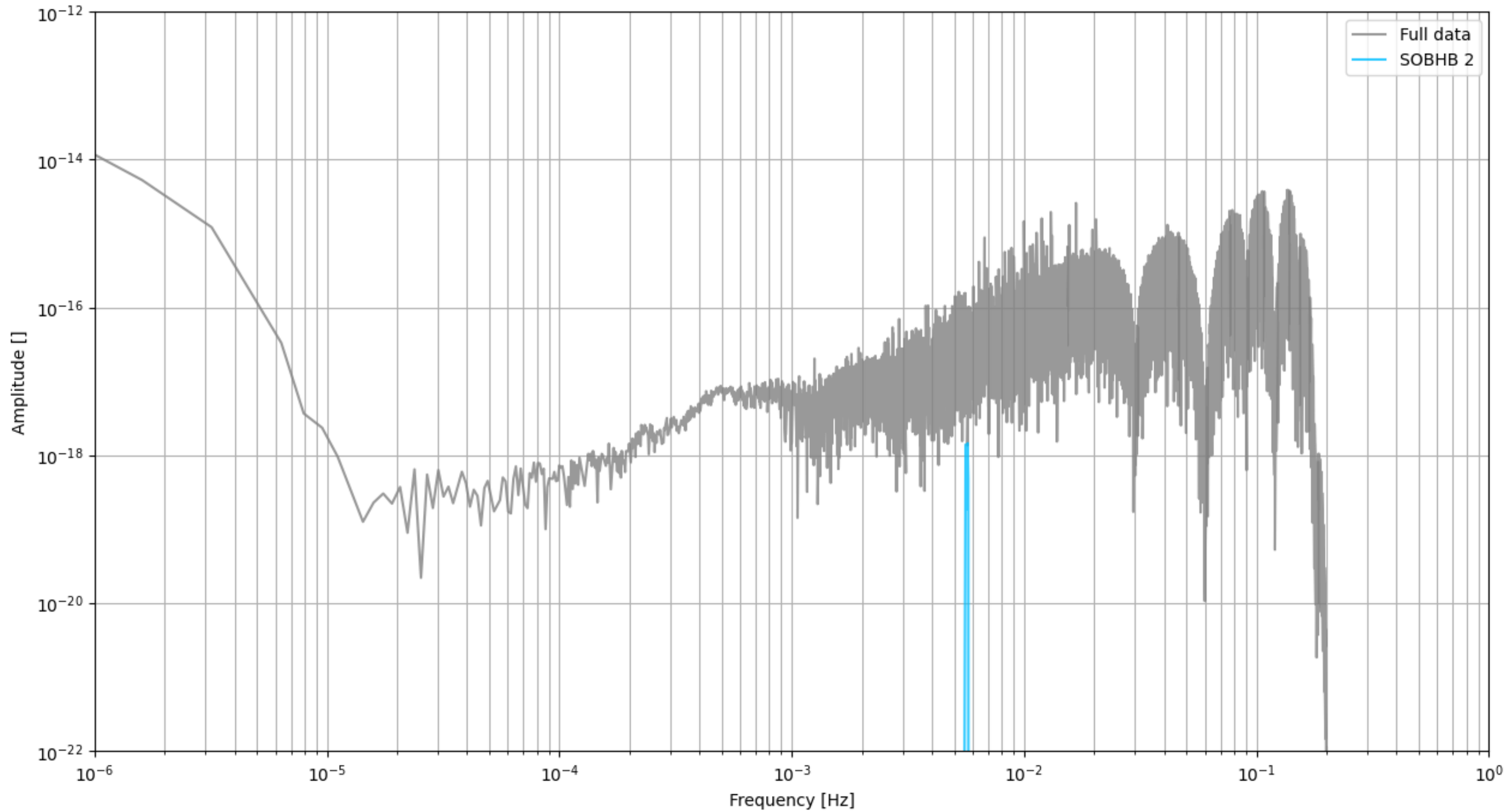
Mojito Light: EMRI



Mojito Light: SOBHB

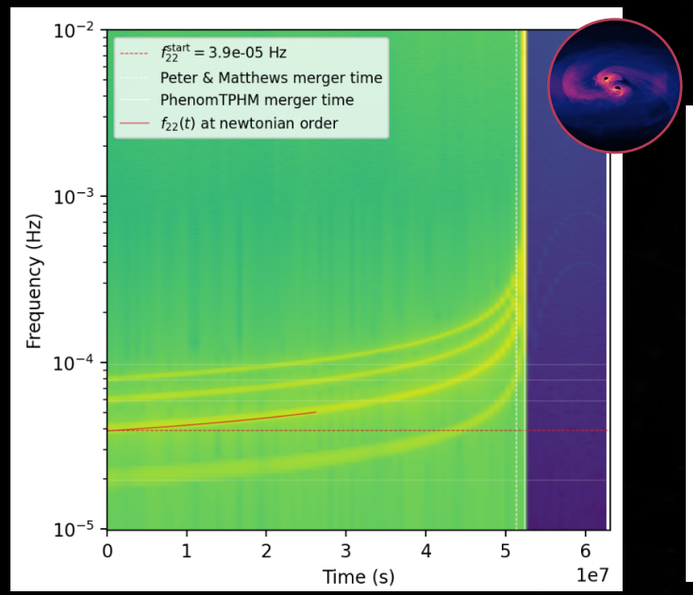


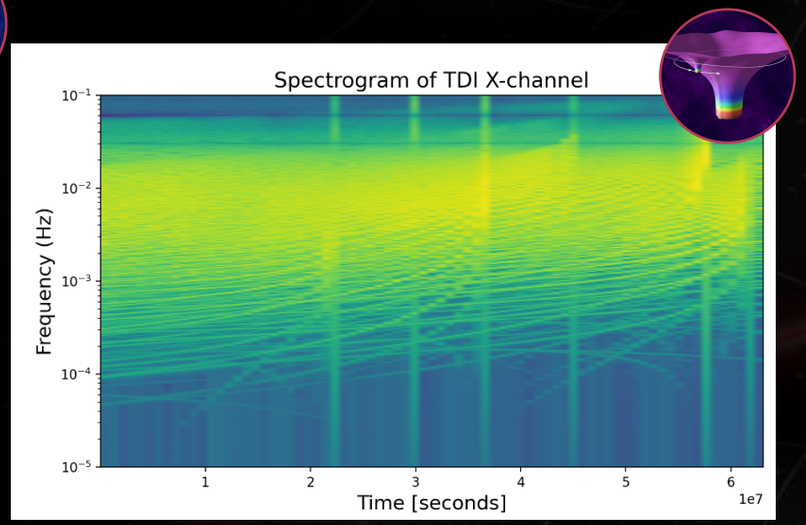
Mojito Light: SOBHB

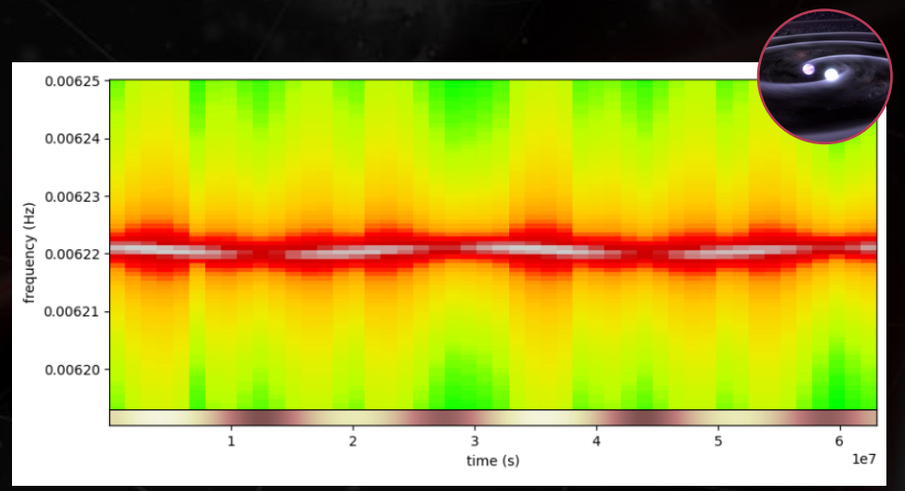


Data Validation

- Inspection of time-frequency evolution for different sources:

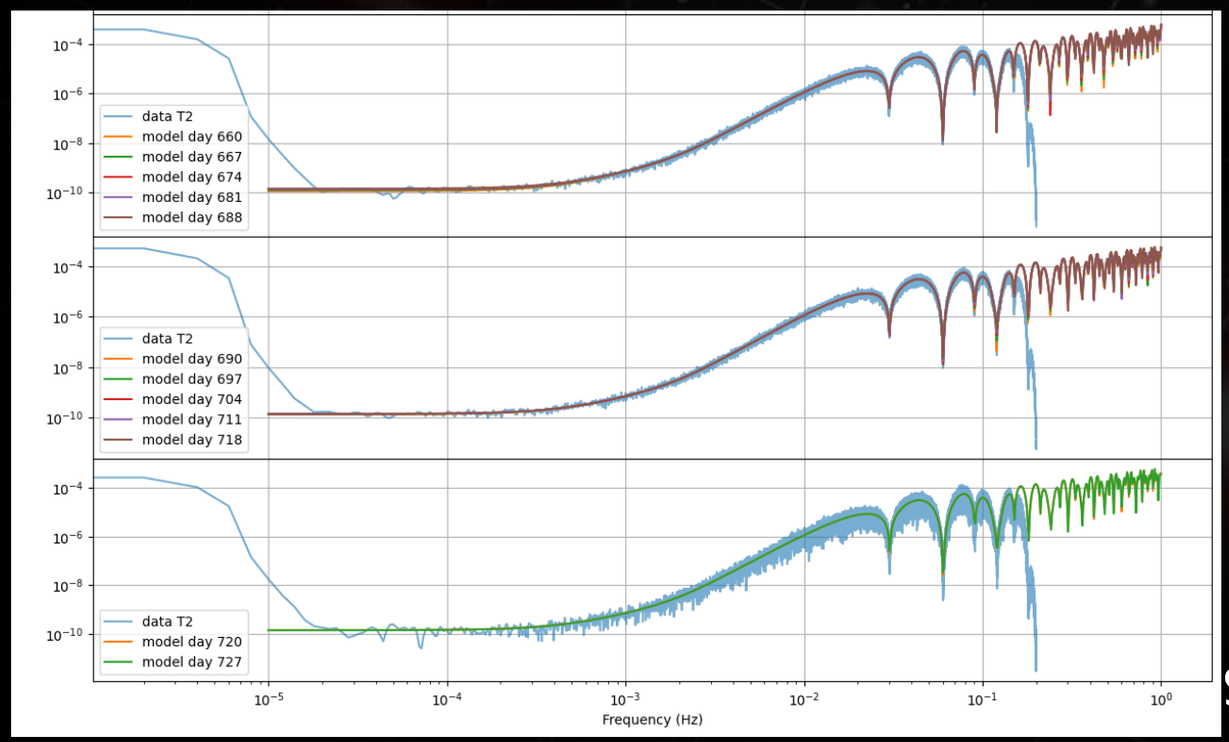






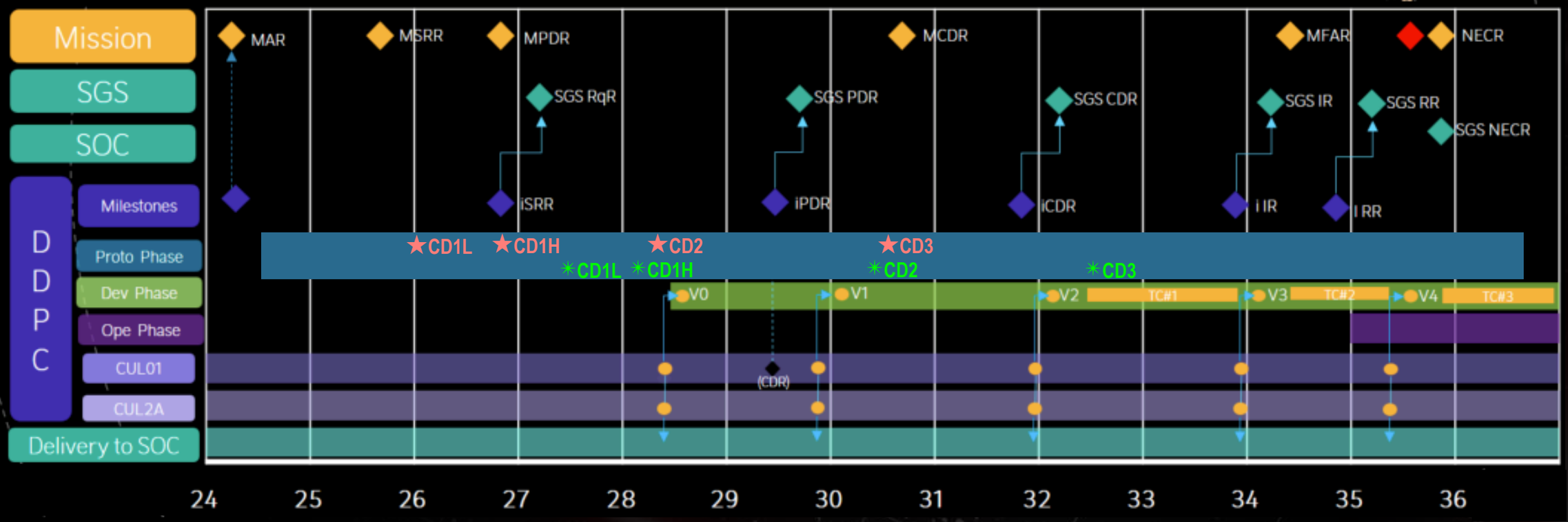
1 merging MBHB All EMRI sources 1 verification Galactic binary

- Noise data:



Planning

- Ground segment and DDPC planning



- DDPC protyping milestones: the common datasets

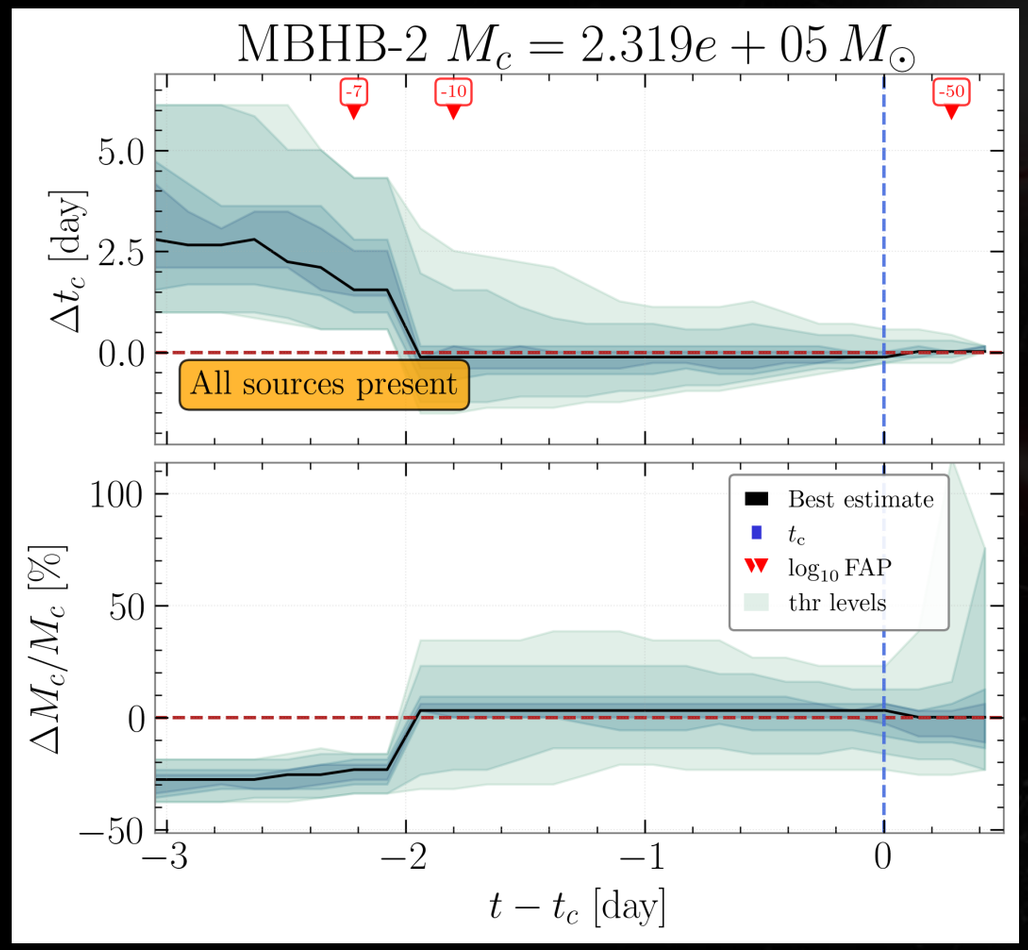
Dataset	Production	Validation	End of analysis	Generation of catalogues
CD1 Light	24/09/2025	18/12/2025	17/07/2026	25/06/2027
CD1 Heavy	11/05/2026	15/10/2026	25/06/2027	25/02/2028
CD2	15/10/2027	24/03/2028	20/07/2029	12/04/2030
CD3	15/03/2030	30/08/2030	31/08/2031	25/06/2032

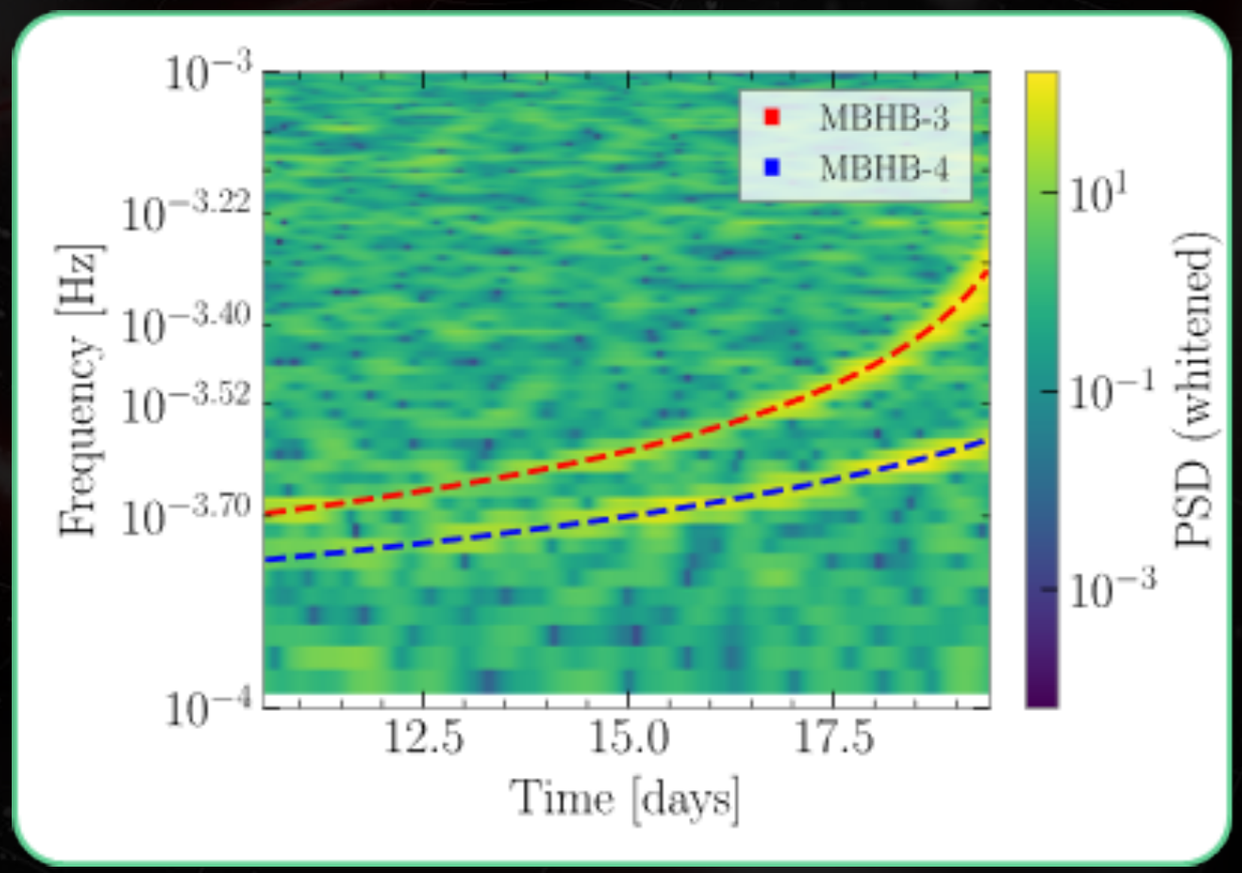
Mojito Light Analysis

- Global fit (CU-L2D) analysis
  - Ongoing analysis
  - 2 main methods:
    - Many sub-modules in each method
  - Roadmap organized into several runs:
    - Run-0: validation of GW source bricks data with the template used in L2D
    - Run-1: data of 9 months duration, assuming perfect knowledge of sources present in the data → it should be ready by May 12th.
    - Run-2: same as Run-1 but including the search for the sources in the data restricting only to GBs and MBHBs
    - Run-3: demonstrate time-iterative analysis, using only MBHBs and GBs
    - Run-4: if not implemented in previous runs, will be dedicated to time-frequency
    - Run-5: Full Mojito-light run

Mojito Light Analysis

- Low Latency Alerts (CU-L2A) pipeline development
  - 3 MBHBs for Mojito Light used to start





Mojito Heavy content (preliminary)

- Noise
  - Simple noise (same as Mojito Light)
  - Complex noise:
    - Laser noise
    - Frequency plan
    - Secondary noise:
      - Different levels for the same type of subsystem
      - Non-stationary noises
      - Partially noise level from the performance model
    - TTL assuming we know the coefficients
- Glitches
- Gaps

Mojito Heavy content (preliminary)

- GW sources
  - Parameter space: changes compared to Mojito Light
    - MBHB:
      - Precession
      - Few merging outside the band
    - GBs:
      - Additional eccentric sources (ecc<0.6)
  - Waveforms:
    - MBHB: 2 models (PhenomTOHM and SEOBNRPHMv5)
    - EMRI: 1 PA in addition to 0PA if available
  - Population:
    - 100 MBHBs
    - 100 EMRIs (85 eccentric + 15 circular) ?
    - smBHB from O3 or O4?
    - SGWB with 3 models
    - GBs: Galaxy + 42 eccentric

Ongoing discussion in SciExp

ESA | NASA
lisa

LISA
DDPC

cea irfu

LISA FRANCE