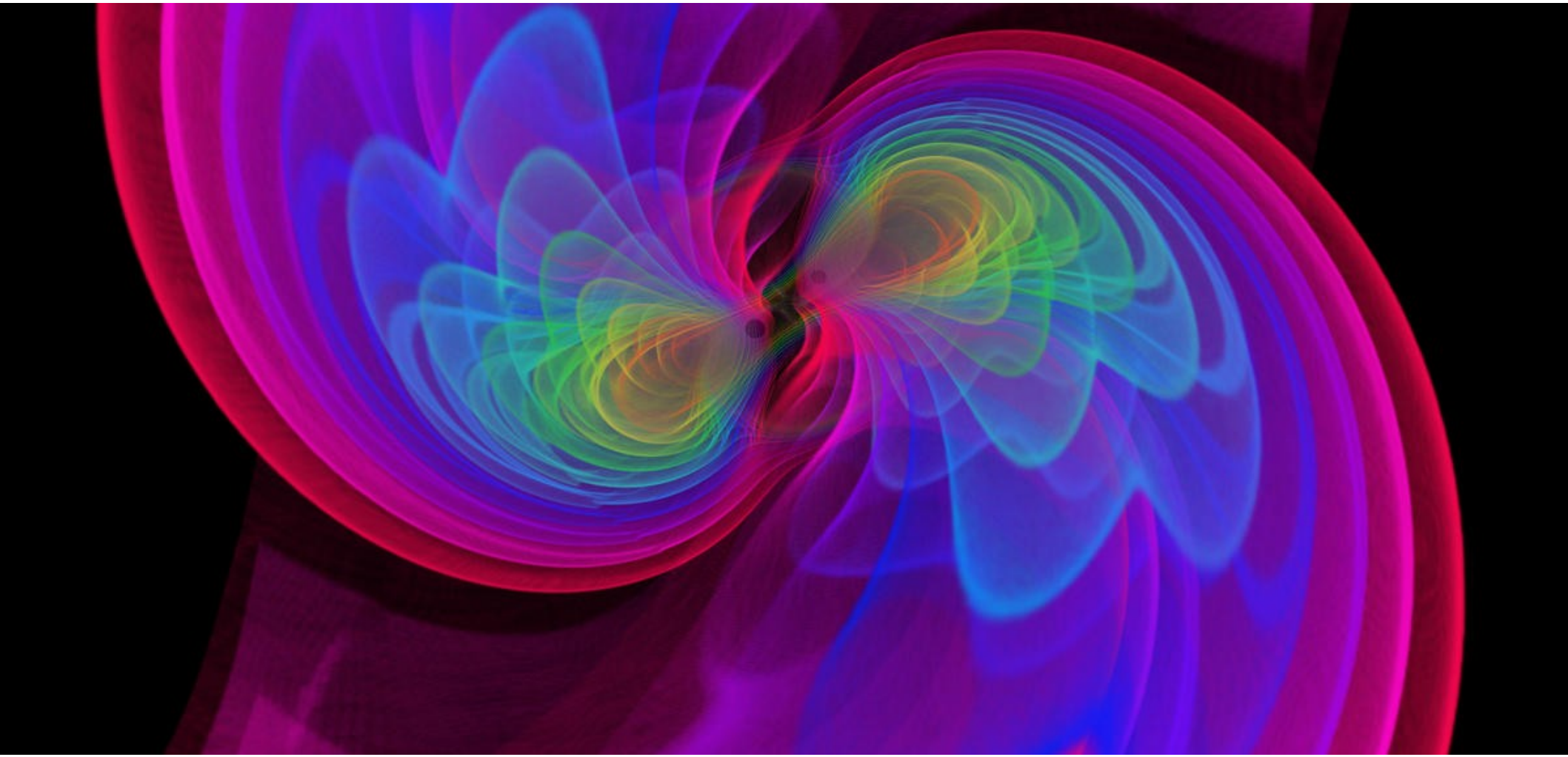
Journée de prospectives pour le futur des ondes gravitationnelles



Avec le soutien de:

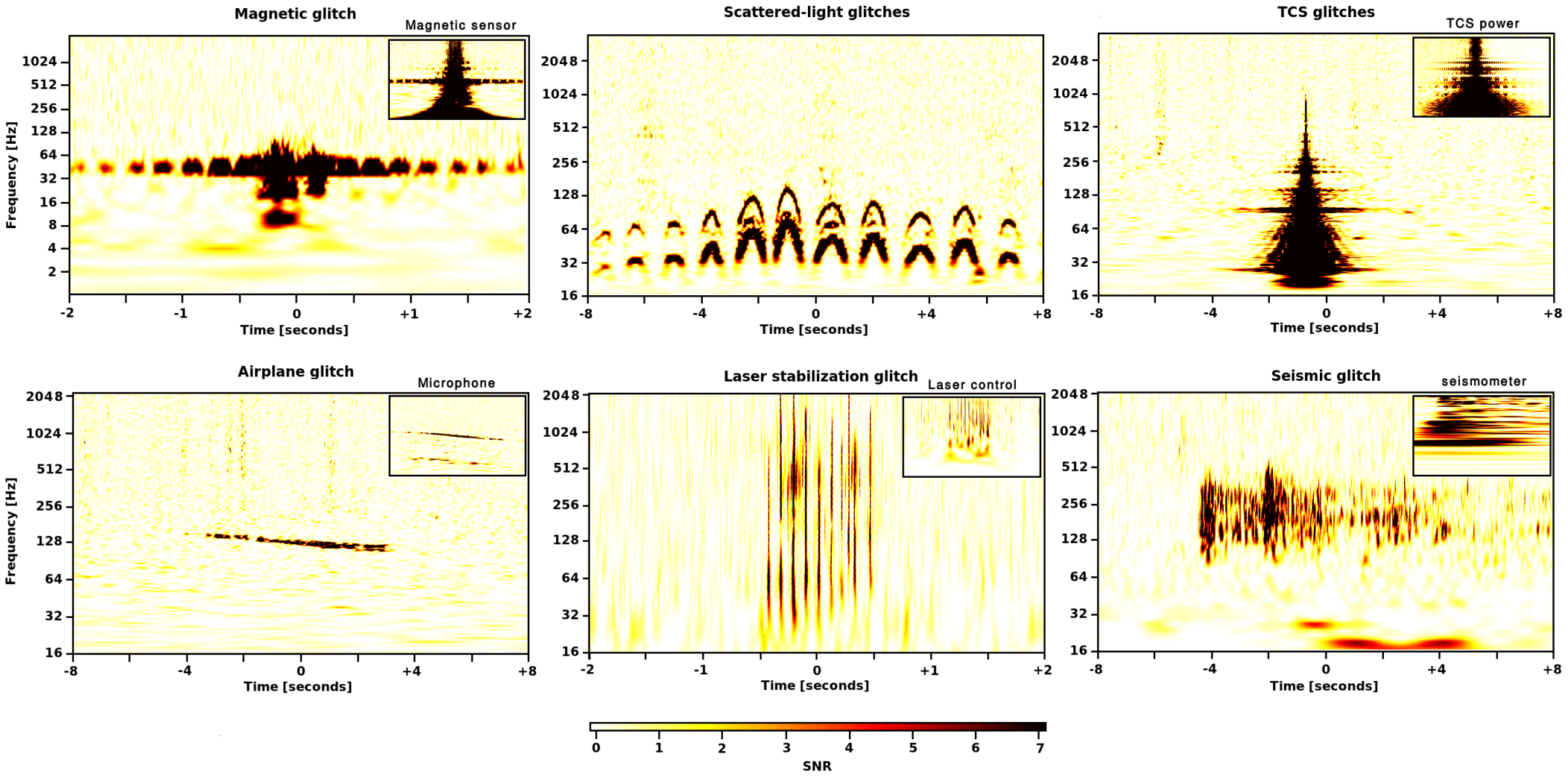
P2IO Physique des 2 Infinis et des Origines

UNIVERSITÉ PARIS SUD

Organisateurs:

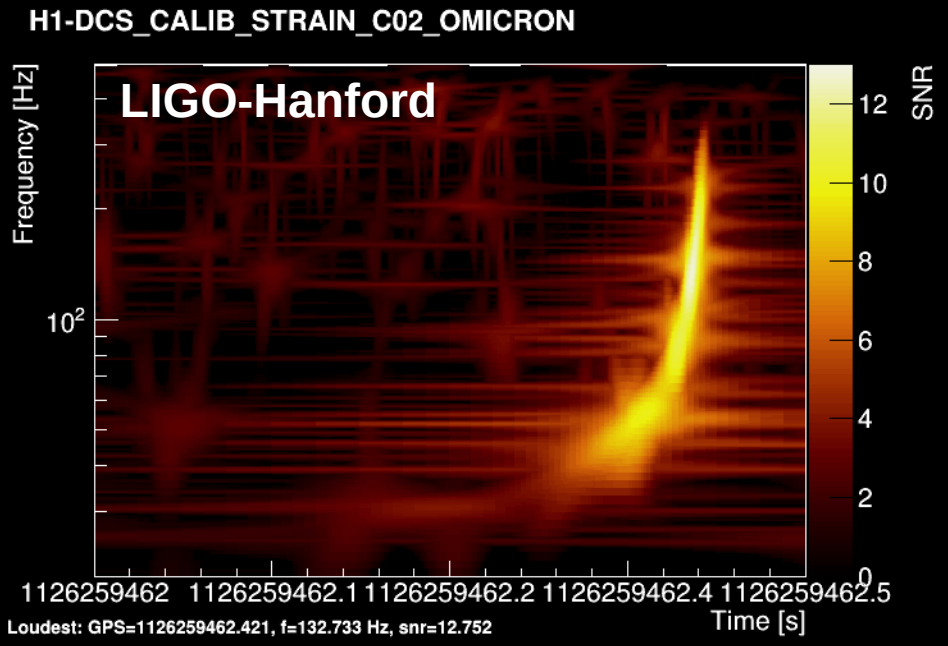
- Virgo (LAL): Nicolas Arnaud, Marie-Anne Bizouard, Fabien Cavalier, Patrice Hello, Nicolas Leroy, Florent Robinet
- Eugenie Babichev (LPT)
- Jonathan Biteau (IPNO)
- Philippe Busson (LLR)
- Christos Chamousis (LPT)
- Mathieu de Naurois (LLR)
- Hervé Dole (IAS)
- Thierry Foglizzo (CEA/Irfu)
- Deirdre Horan (LLR)
- Vincent Tatischeff (CSNSM)

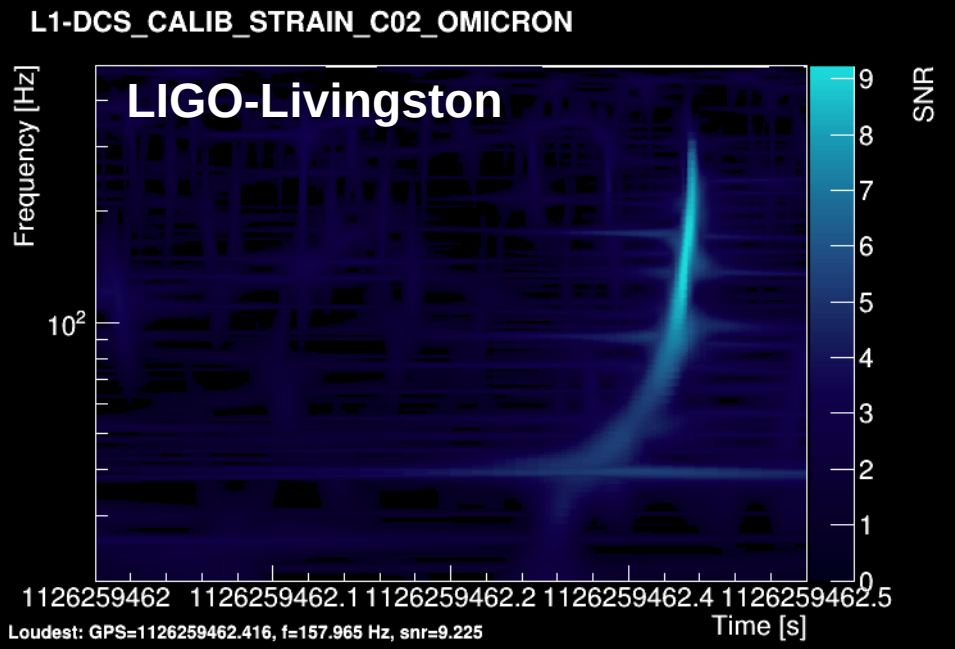
For a very long time (2005-2015), we measured noise...

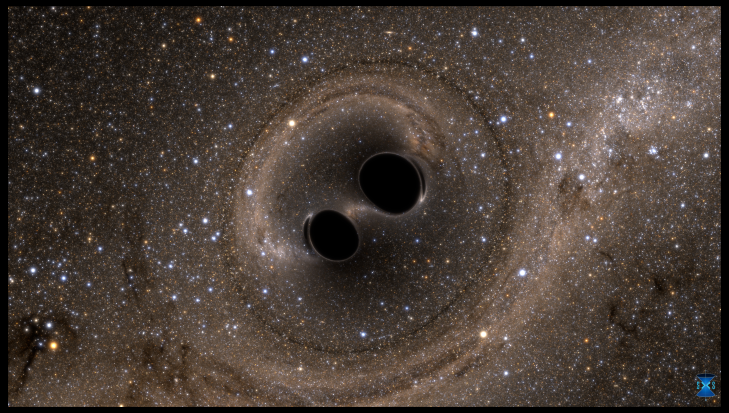


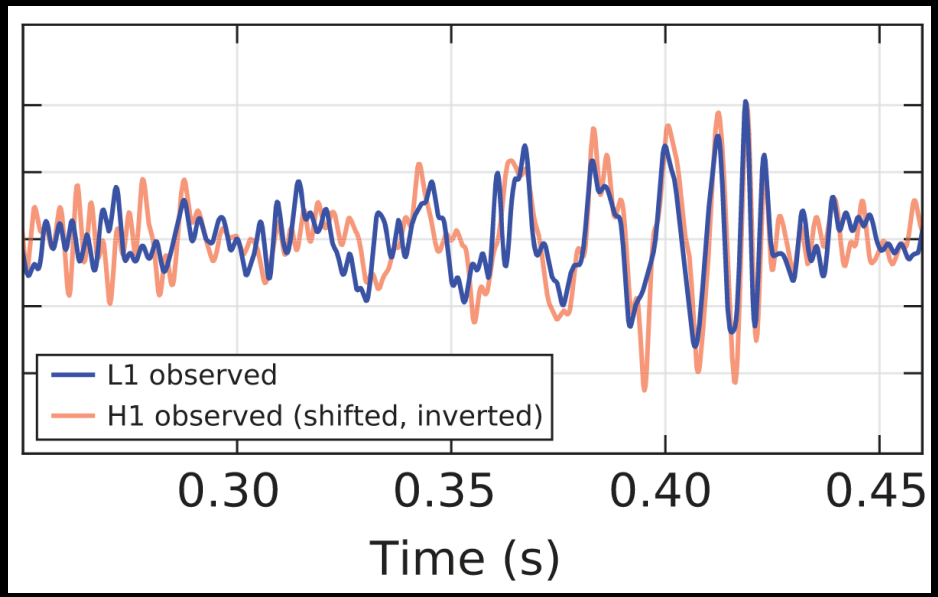
…until one day in September 2015

Sept. 14, 2015: the first GW from a binary black hole merger is detected by LIGO

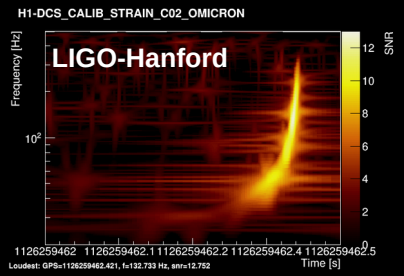


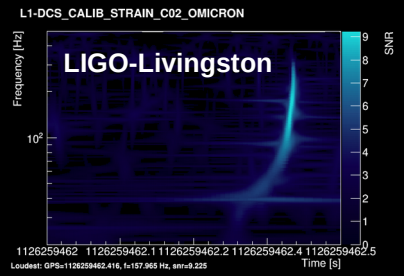




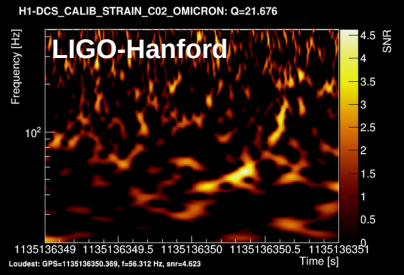


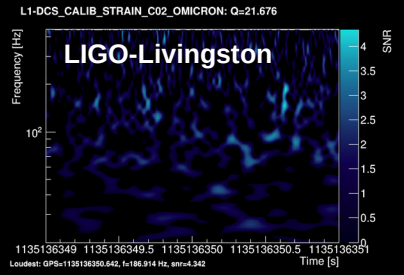
Journée de prospectives pour le futur des ondes gravitationnelles



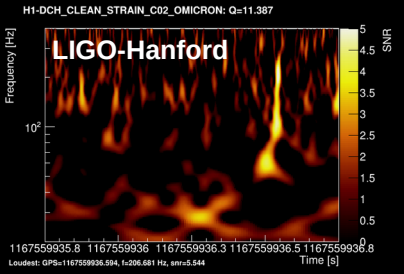


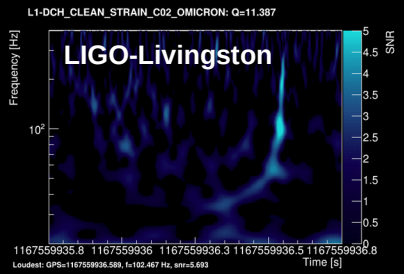
GW150914



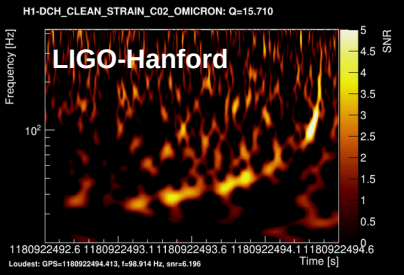


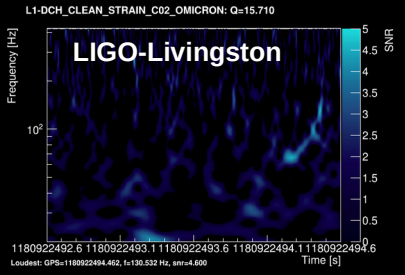
GW151226



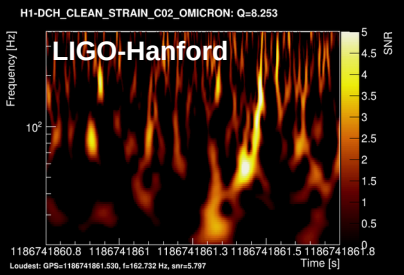


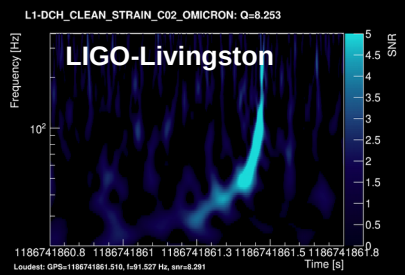
GW170104

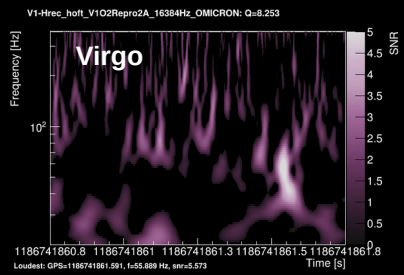




GW170608

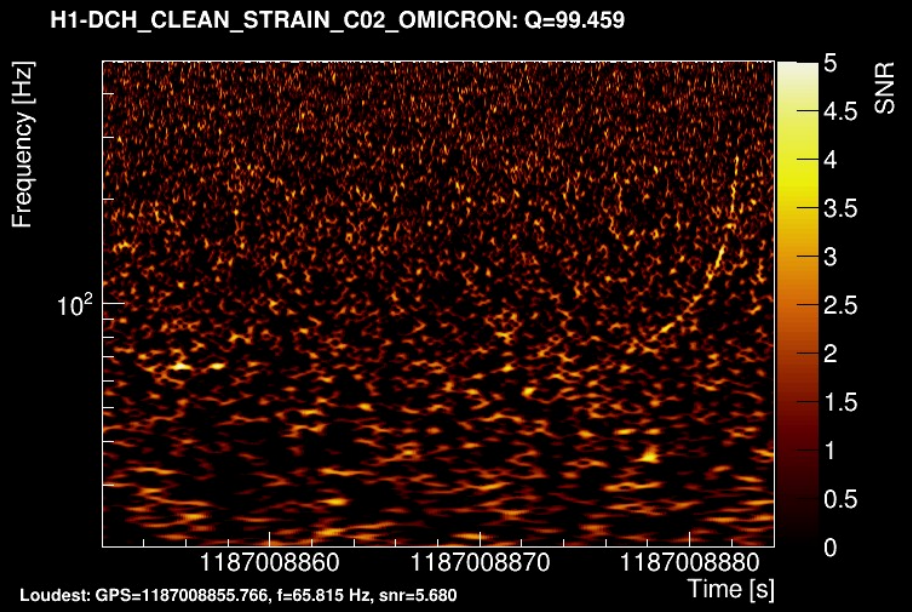


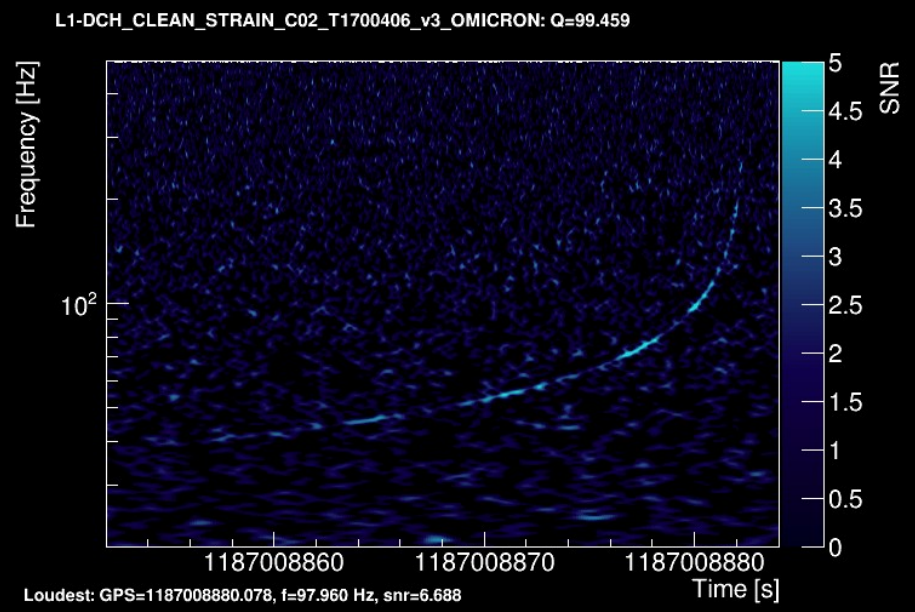


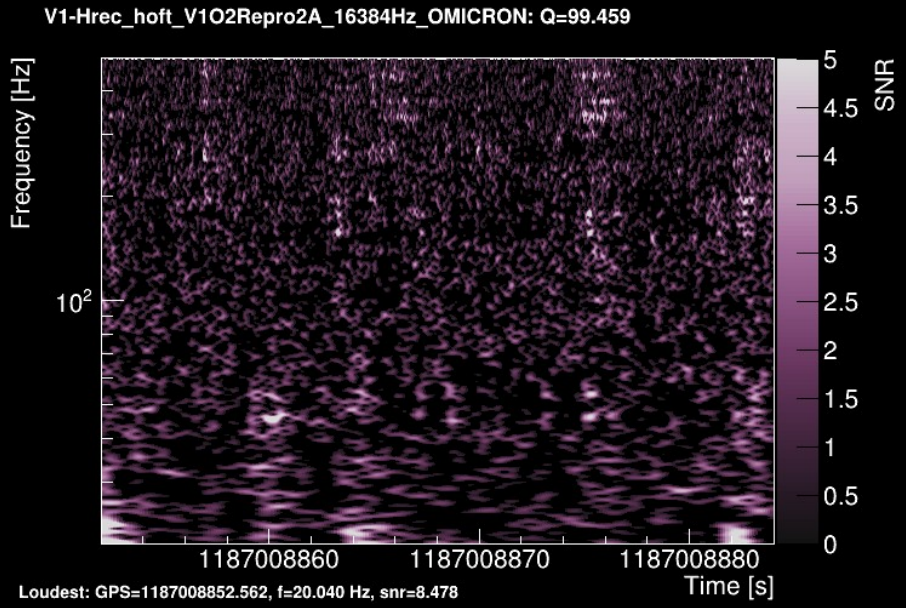


GW170814

GW170817

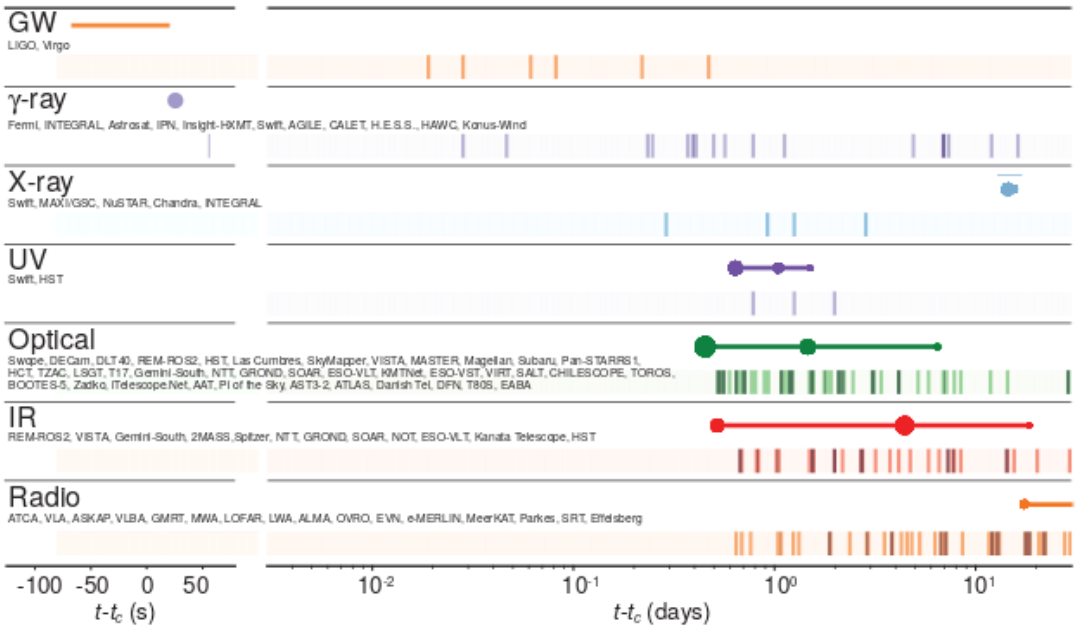

H1-DCH_CLEAN_STRAIN_C02_OMICRON: Q=99.459
Frequency [Hz]
10^2
1187008860
1187008870
1187008880
Time [s]
SNR
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Loudest: GPS=1187008855.766, f=65.815 Hz, snr=5.680


L1-DCH_CLEAN_STRAIN_C02_T1700406_v3_OMICRON: Q=99.459
Frequency [Hz]
10^2
1187008860
1187008870
1187008880
Time [s]
SNR
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Loudest: GPS=1187008880.078, f=97.960 Hz, snr=6.688


V1-Hrec_hoft_V1O2Repro2A_16384Hz_OMICRON: Q=99.459
Frequency [Hz]
10^2
1187008860
1187008870
1187008880
Time [s]
SNR
5
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
Loudest: GPS=1187008852.562, f=20.040 Hz, snr=8.478

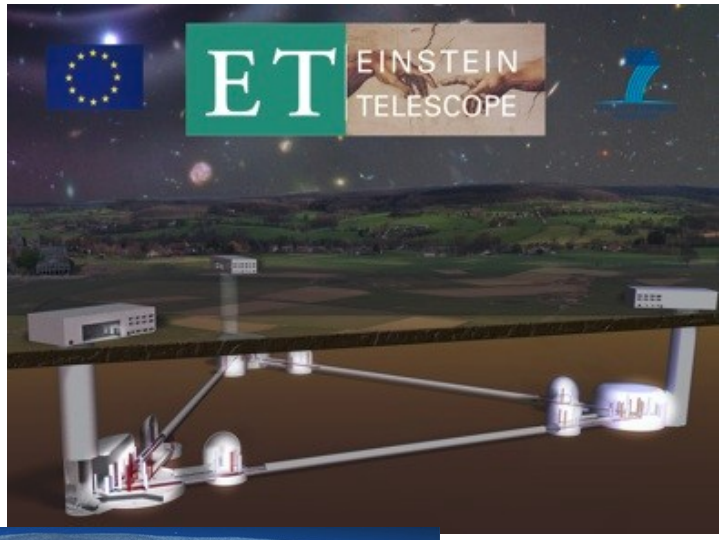

Fermi

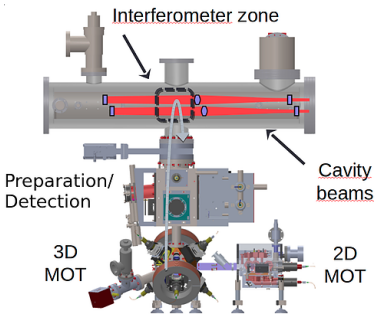

INTEGRAL



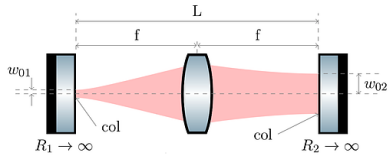
Dawn of multi-messenger / multi-wavelengths astronomy

Journée de prospectives pour le futur des ondes gravitationnelles



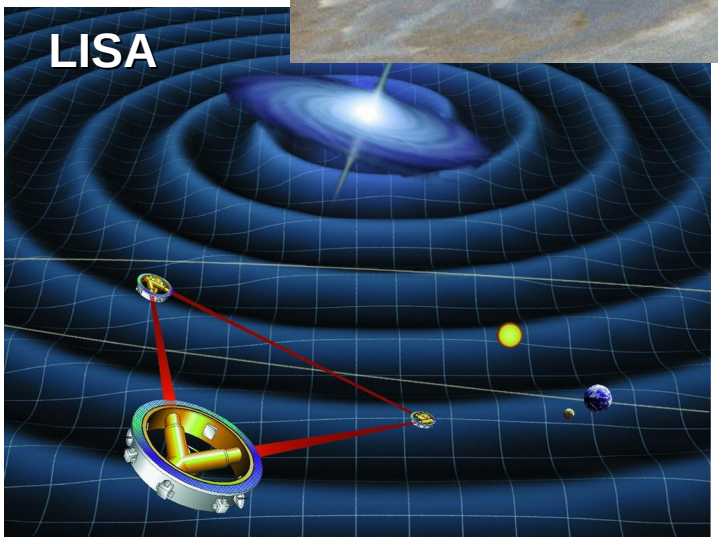


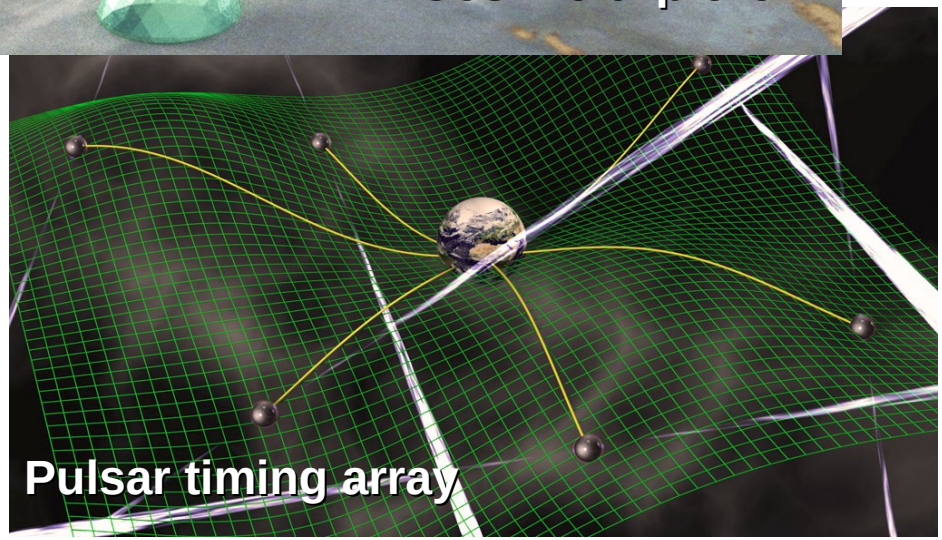
(a) Scheme of the experiment



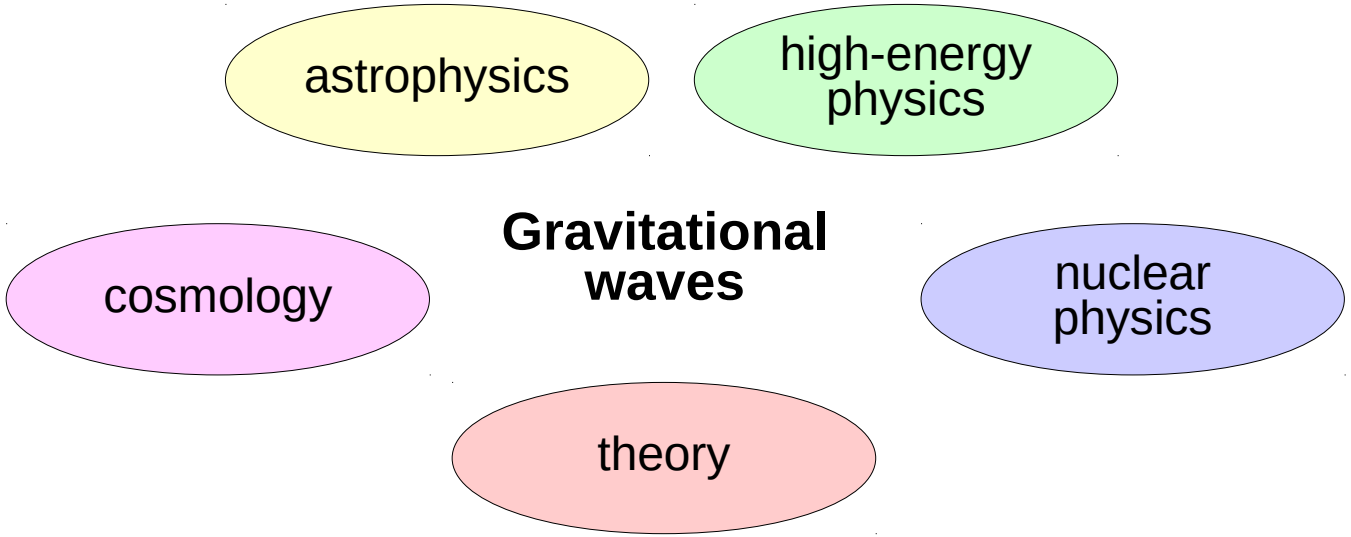
(b) Cavity geometry

MIGA





Journée de prospectives pour le futur des ondes gravitationnelles



Journée de prospectives pour le futur des ondes gravitationnelles

astrophysics

high-energy physics

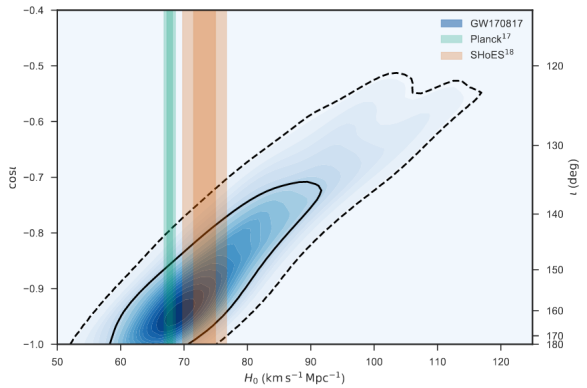
cosmology

Gravitational waves

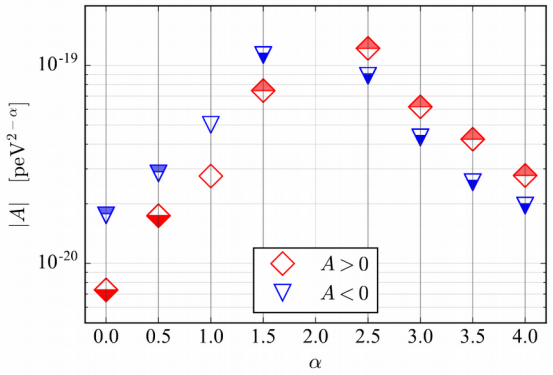
nuclear physics

theory

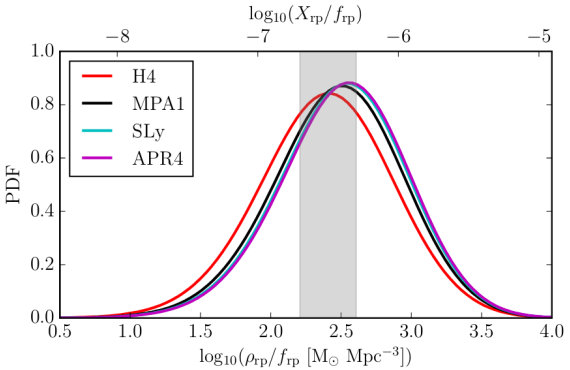
Hubble constant



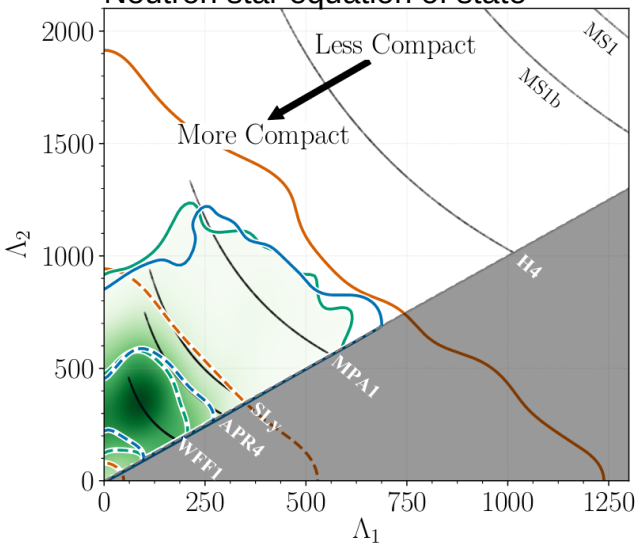
Lorentz invariance violation



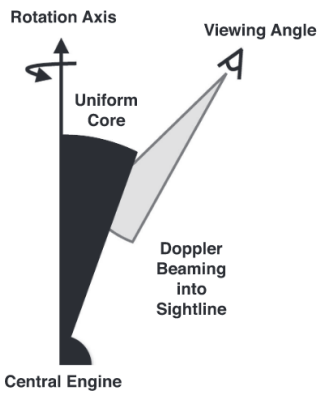
r-process material density



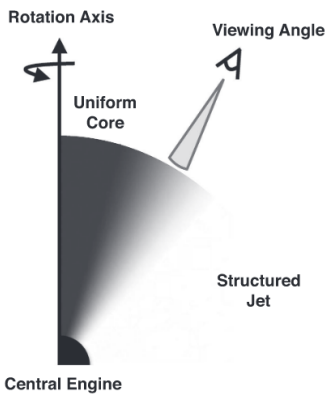
Neutron star equation of state



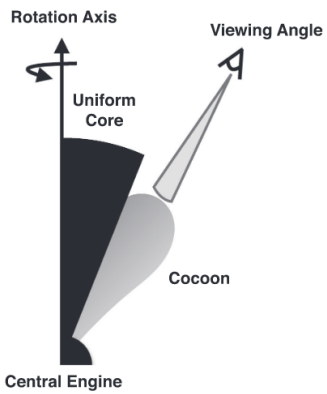
Scenario i: Uniform Top-hat Jet



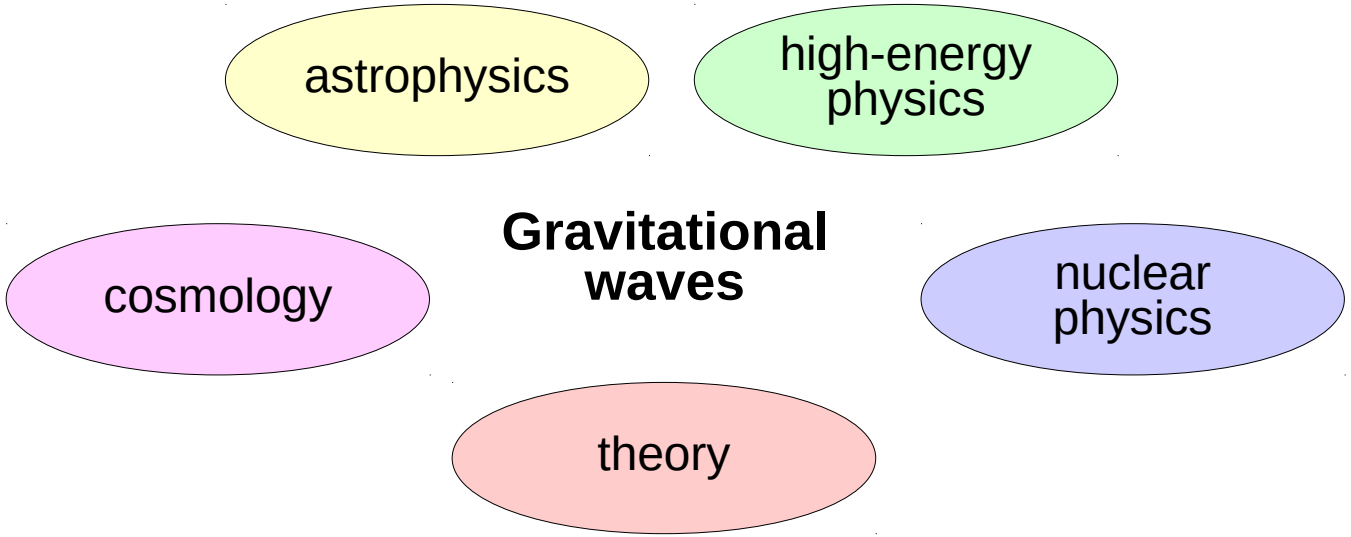
Scenario ii: Structured Jet



Scenario iii: Uniform Jet + Cocoon



Journée de prospectives pour le futur des ondes gravitationnelles



Goals for today:

→ Federate a local community around gravitational waves

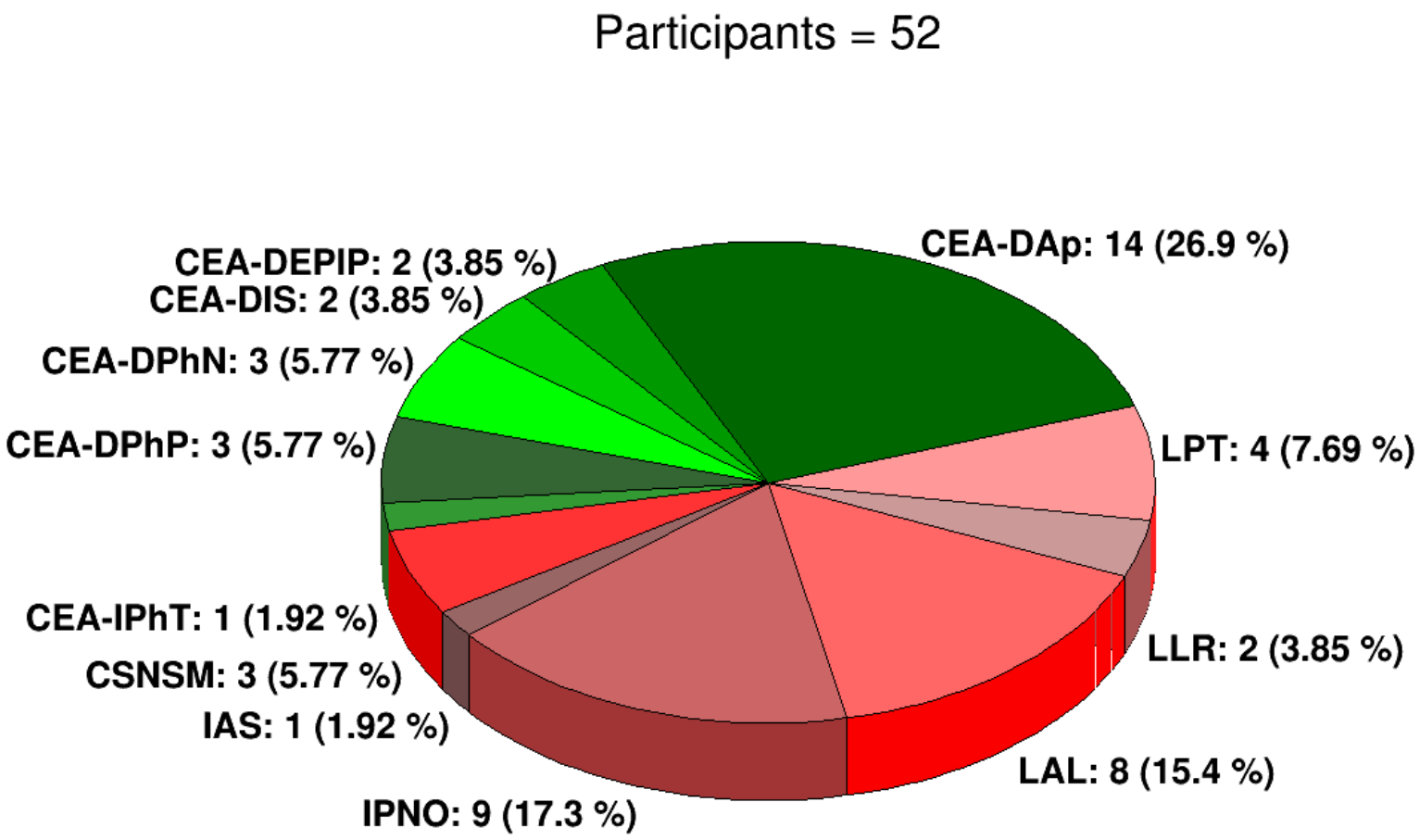
→ Identify common interests → initiate working groups / collaborations

→ Contribute to technical developments for future detectors

→ Join an international collaboration

→ Initiate a local road-map for research with gravitational-waves

→ Improve international visibility


Participants = 52
CEA-DAp: 14 (26.9 %)
CEA-DEPIP: 2 (3.85 %)
CEA-DIS: 2 (3.85 %)
CEA-DPhN: 3 (5.77 %)
CEA-DPhP: 3 (5.77 %)
LPT: 4 (7.69 %)
CEA-IPhT: 1 (1.92 %)
CSNSM: 3 (5.77 %)
IAS: 1 (1.92 %)
LLR: 2 (3.85 %)
LAL: 8 (15.4 %)
IPNO: 9 (17.3 %)

Journée de prospectives pour le futur des ondes gravitationnelles

Morning

Introduction — *Florent Robinet*
Auditorium Joliot-Curie, IPNO 09:35 - 09:50

Overview: science goals and future detectors — *Prof. Nelson Christensen*
Auditorium Joliot-Curie, IPNO 09:50 - 10:30

10:00

Advanced Virgo: present and future — *Nicolas Leroy*
Auditorium Joliot-Curie, IPNO 10:30 - 11:00

11:00

Coffee break
Auditorium Joliot-Curie, IPNO 11:00 - 11:30

3rd generation of ground-based detectors: Einstein Telescope — *Michele Punturo*
Auditorium Joliot-Curie, IPNO 11:30 - 12:00

12:00

Space detectors: LISA — *Antoine Petiteau*
Auditorium Joliot-Curie, IPNO 12:00 - 12:30

Detecting gravitational waves with pulsars: PTA — *Antoine Petiteau*
Auditorium Joliot-Curie, IPNO 12:30 - 12:50

13:00

Lunch

Afternoon

Afternoon introduction
Auditorium Joliot-Curie, IPNO 14:10 - 14:30

Round table: science contributions (Nucleosynthesis, Astrophysics, Cosmology, GR, Fundamental Physics, Beyond Standard Models) — *Dr Jonathan Biteau*
Auditorium Joliot-Curie, IPNO 14:30 - 15:05

15:00

Round table: detector contributions (Optics, Cryogenics, Electronics, Mechanics, Vacuum systems, System controls, Computing, Space technology) — *Nicolas Leroy*
Auditorium Joliot-Curie, IPNO 15:05 - 15:40

Coffee break
Auditorium Joliot-Curie, IPNO 15:40 - 16:00

16:00

Round table: data analysis — *Marie-Anne Bizouard*
Auditorium Joliot-Curie, IPNO 16:00 - 16:30

Round table: EM astronomy, Multimessenger, Low latency GW alerts — *Prof. Sylvain Chaty*
Auditorium Joliot-Curie, IPNO 16:30 - 17:00

17:00

Roadmap for GW@Paris-Saclay — *Florent Robinet*
Auditorium Joliot-Curie, IPNO 17:00 - 17:15

Roadmaps (GWIC, APPEC, CNRS) — *Marie-Anne Bizouard*
Auditorium Joliot-Curie, IPNO 14:10 - 14:20

Joining Virgo/LISA/ET: how does the collaboration work?
Auditorium Joliot-Curie, IPNO 14:20 - 14:30

Identify the interests of participants
Auditorium Joliot-Curie, IPNO 14:30 - 14:40

Summary and conclusions
Auditorium Joliot-Curie, IPNO 14:40 - 14:50

Local expertise vs. project needs
Auditorium Joliot-Curie, IPNO 15:05 - 15:15

R&D for future detectors
Auditorium Joliot-Curie, IPNO 15:15 - 15:25

Summary and conclusions
Auditorium Joliot-Curie, IPNO 15:25 - 15:35

Summary and conclusions
Auditorium Joliot-Curie, IPNO 16:00 - 16:10

Summary and conclusions
Auditorium Joliot-Curie, IPNO 16:30 - 16:40