



NEWS



European Commission



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Gravitational Wave Physics



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WP2 Outline (webpage by M. Razzano)

Gravitational Wave Physics

Two main themes

- 1) Joint GW Science
- 2) 3G Detector Roadmap

Collaborating Partners

INFN (leading)

CNRS

UNIPG

UNIRO

UNINA

7 researchers 15 m

2 researchers 2 m

2 researchers 8 m

1 researcher 1 m

2 researchers 3 m

Due to the rush to engage Science run O2 and following activities (O2 analysis and O3 preparation)

**No secondments so far
We expect starting after month 6**

hosting  CALIFORNIA INSTITUTE OF TECHNOLOGY CORP

Norna Robertson joined RISE-NEWS as co-chair, she is in charge for exchange stages at CALTECH

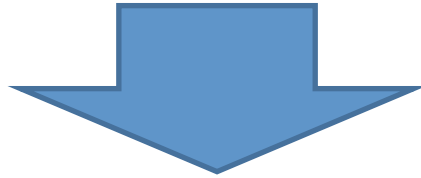
WP2 Outline (objectives)

- O2.1: Establish a **network** for searches of electromagnetic counterparts to Gravitational Waves.
- O2.2: Reduce the **localization latency** for gravitational wave events with electromagnetic counterparts.
- O2.3: Develop a collaboration network for **third generation** detectors.
- O2.4: Collaborate with LIGO on digital preservation of **gravitational wave data**.

The success of the scientific run O2 reinforces the expectations and adding relevant perspective to these objectives

WP2 Science and data (MS2 tasks)

- T2.1: Optimization of localization strategy



MS2 (deliverable m24)

The multi-messenger approach requires to know with a very low latency the localization of a *GW* event, if an electromagnetic follow up is required.

- T2.4: Preparation of a Virgo digital preservation structure

WP2 Science and data (MS2 tasks)

T2.1 (1-48): Optimization of localization strategy

- Having more detector helps for a smaller localization area
- However, **fast search algorithms are required**
 - Detection now can be fast (<~ mins)
 - Building a sky-map for localization still requires time (~hours)

We need to enhance the exchange of position reconstruction know-how from US=>Europe

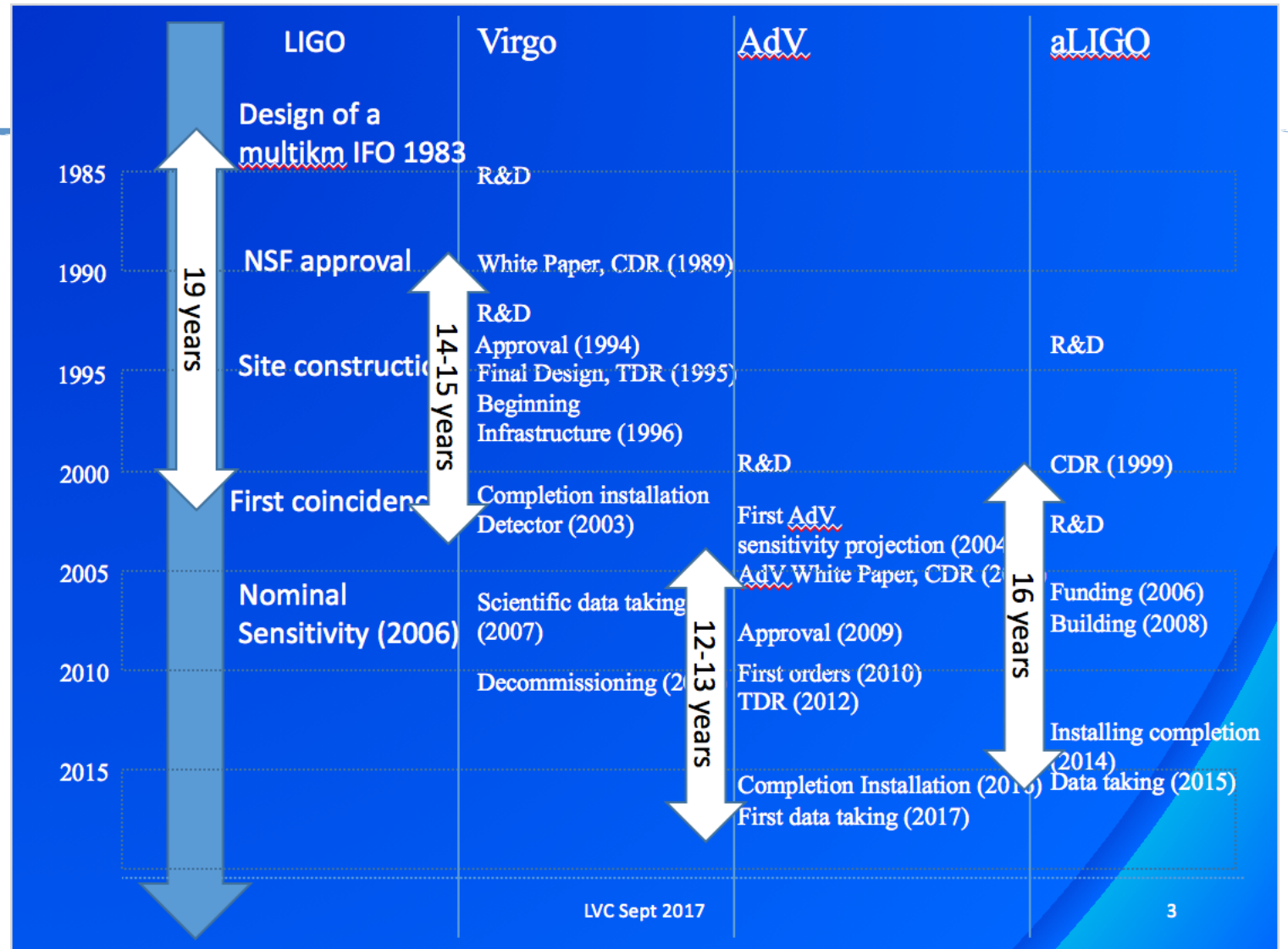
- Develop and test new approaches (e.g. PCA, machine learning, GPU-based code)

NEWS will contribute supporting the stages of the young researcher already engaged but we need more young manpower to be involved

Typical Timelines

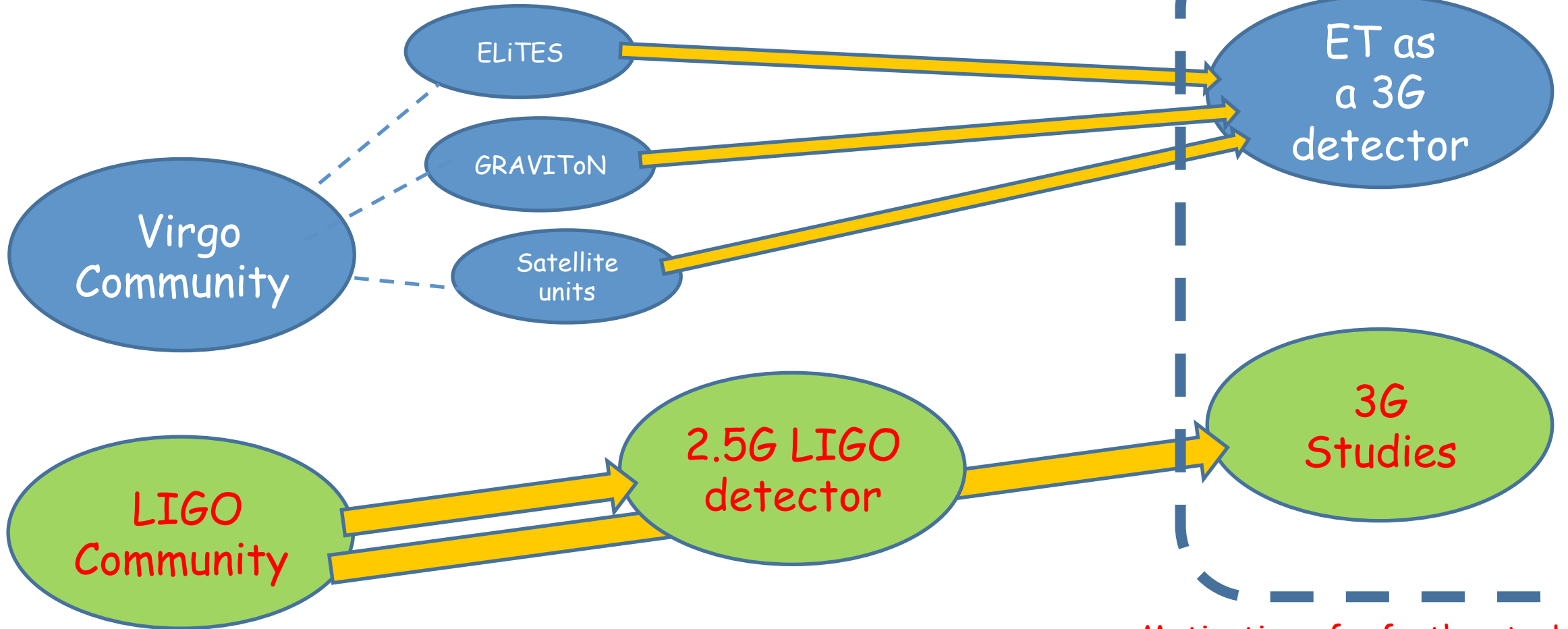
M. Punturo at LVC Aug 28 2017
Toward a 3G GW network

- GW detectors are scientific infrastructures with a long “time constant”
 - Ideas in the '70s
 - Projects in the '80
 - 1st generation at the end of '90s
- The typical time constant (CDR-to-realisation) for a GW detector is about 14-16 years



T2.2 (1-48): Evolution of 2nd generation detectors (2G) towards 3G: HW design and options.

very different scenarios comparing US vs Europe

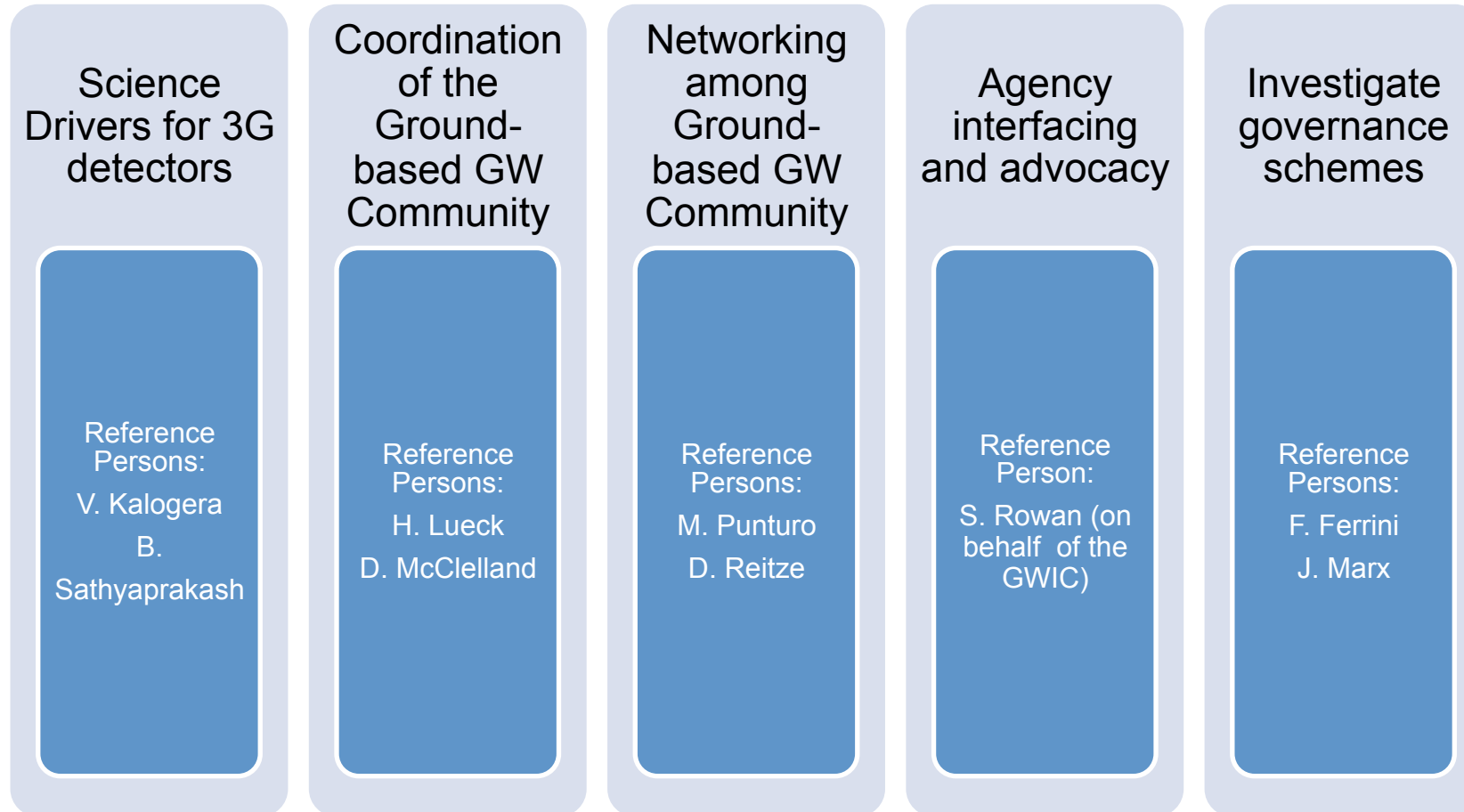


Motivation of a further task T2.3

International collaboration panels to make affordable and speed-up G3 roadmap

M. Punturo at LVC Aug 28 2017

Toward a 3G GW network



Science Team

The hypothesis of a common detector design for 3G design is reasonable but hardly achievable in practice !

→ The **Science case** seems is a must:

- Favourite Sources
- Sensitivity
- Detection bandwidth
- Optimal orientation and localization of the detector
- Japanese Science teams have to be more and more involved
- **NEWS HAS TO SUPPORT THIS EFFORT**

3G SCIENCE CASE TEAM

- 18 members in all including 2 co-chairs
- Matthew Bailes <mbailes@swin.edu.au>
- Marie Anne Bizouard <mabizoua@lal.in2p3.fr>
- Alessandra Buonanno <alessandra.buonanno@aei.mpg.de>
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- Matt Evans <mevans@ligo.mit.edu>
- Stephen Fairhurst <FairhurstS@cardiff.ac.uk>
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- Mansi M. Kasliwal <mansi@astro.caltech.edu>
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- Sanjay Reddy <sareddy@u.washington.edu>
- Stephan Rosswog <stephan.rosswog@astro.su.se>
- B.S. Sathyaprakash (Co-chair) <bss25@psu.edu>
- Chris Van Den Broeck <vdbroeck@nikhef.nl>

▪ T2.3 (1-48): Future networks (including 3G)

- Due to structural reasons the roadmap towards 3G was initiated through quite different path.
- In LIGO it is significantly based also upon the researchers directly involved in 2G operation
- After GW observation LIGO is promoting a common effort
- Serious issues urge to be discussed collaboratively :
 - feasibility of common design
 - accounting different frameworks as India, Australia and, remarkably, Japan
- Unifying the Science case seems to be the only viable case
- Science in the hybrid case (2G+3G)



MS1 (deliverable m36)

Roadmap for Third Generation Gravitational Wave Detectors.

WP2 status

- The engagement of Virgo in O2 Science run has enhanced the relevance of RISE-NEWSWP2
→ Even more evident than before
- CVs of the researchers involved have still to be loaded
- Secondments will start after month 6 due to the strong engagement in the running experiments