TG14

Discussion Forum on
Radiometry to Support Gravitational Wave Detection

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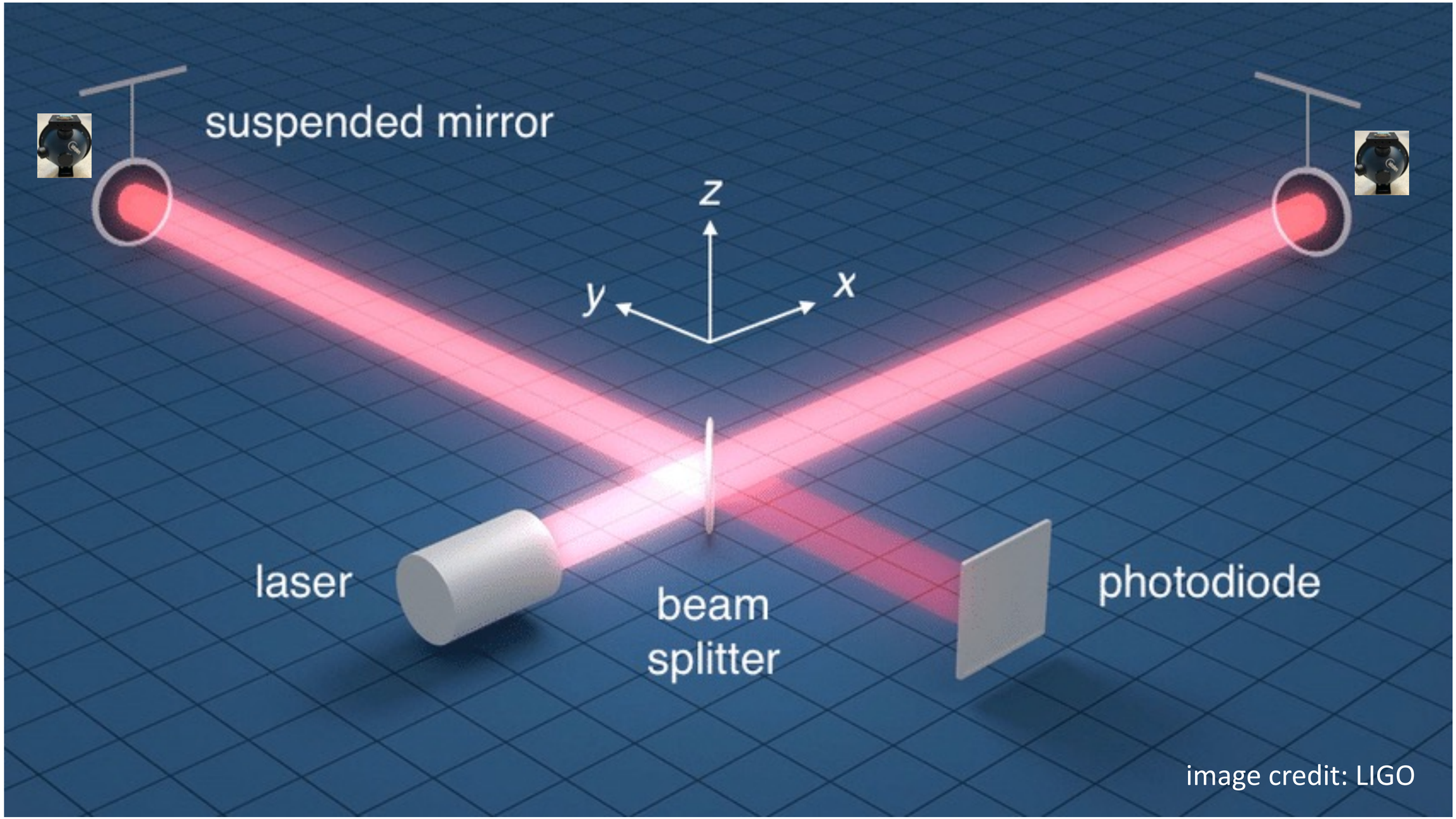
NIST

1. If we get power wrong, we get GW distance wrong

2. If we disagree, we get GW location wrong

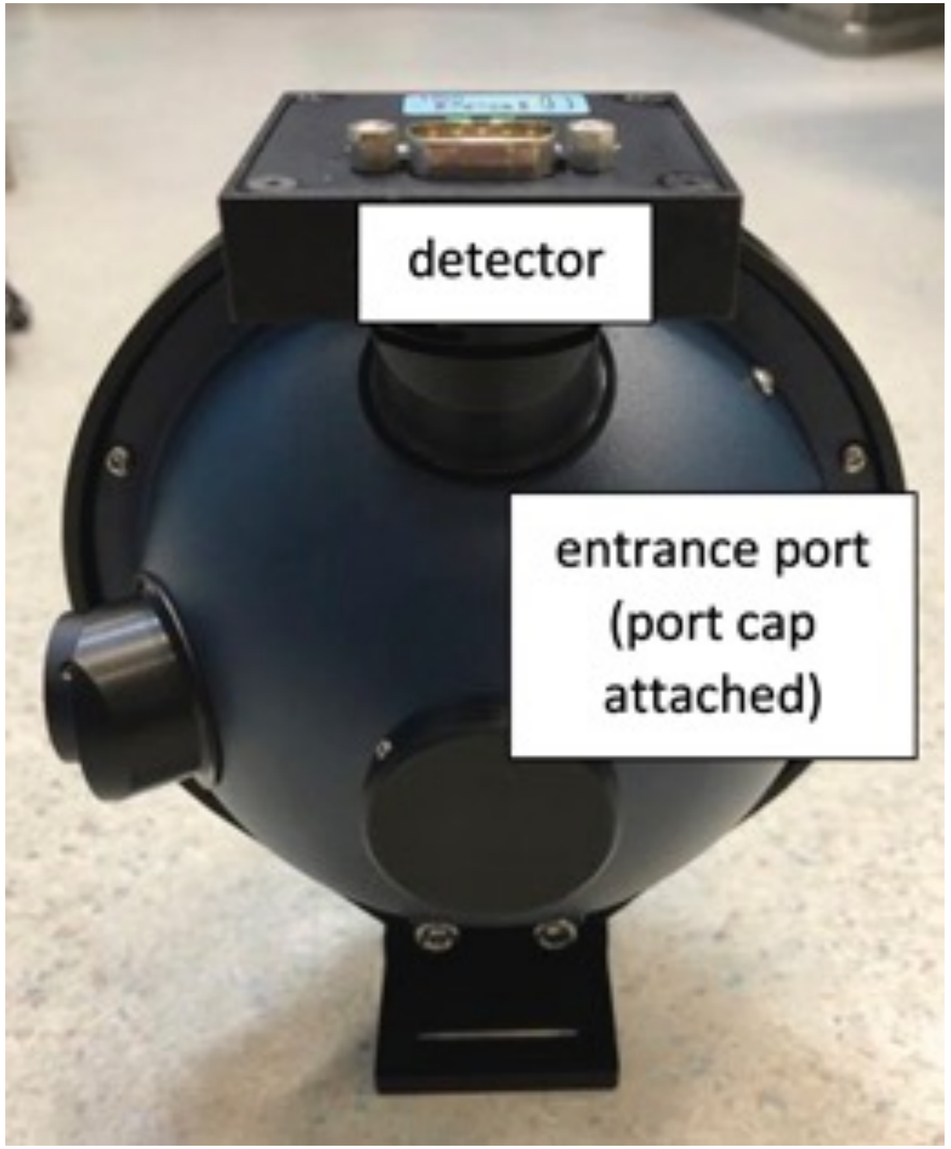
3. If we agree and we're wrong, we get the Hubble constant wrong

Boulder GW Workshop, March 2019


suspended mirror
z
y
x
laser
beam
splitter
photodiode
image credit: LIGO

PCAL Sensor

- InGaAs Photodiode
- ø100 mm diameter integrating sphere with an aluminum outer shell
- sintered PTFE inner shell
- ø25 mm diameter entrance aperture
- ø12.7 mm diameter detector port



Not really 1 W: 300 mW, sinusoidal in practice.

Update

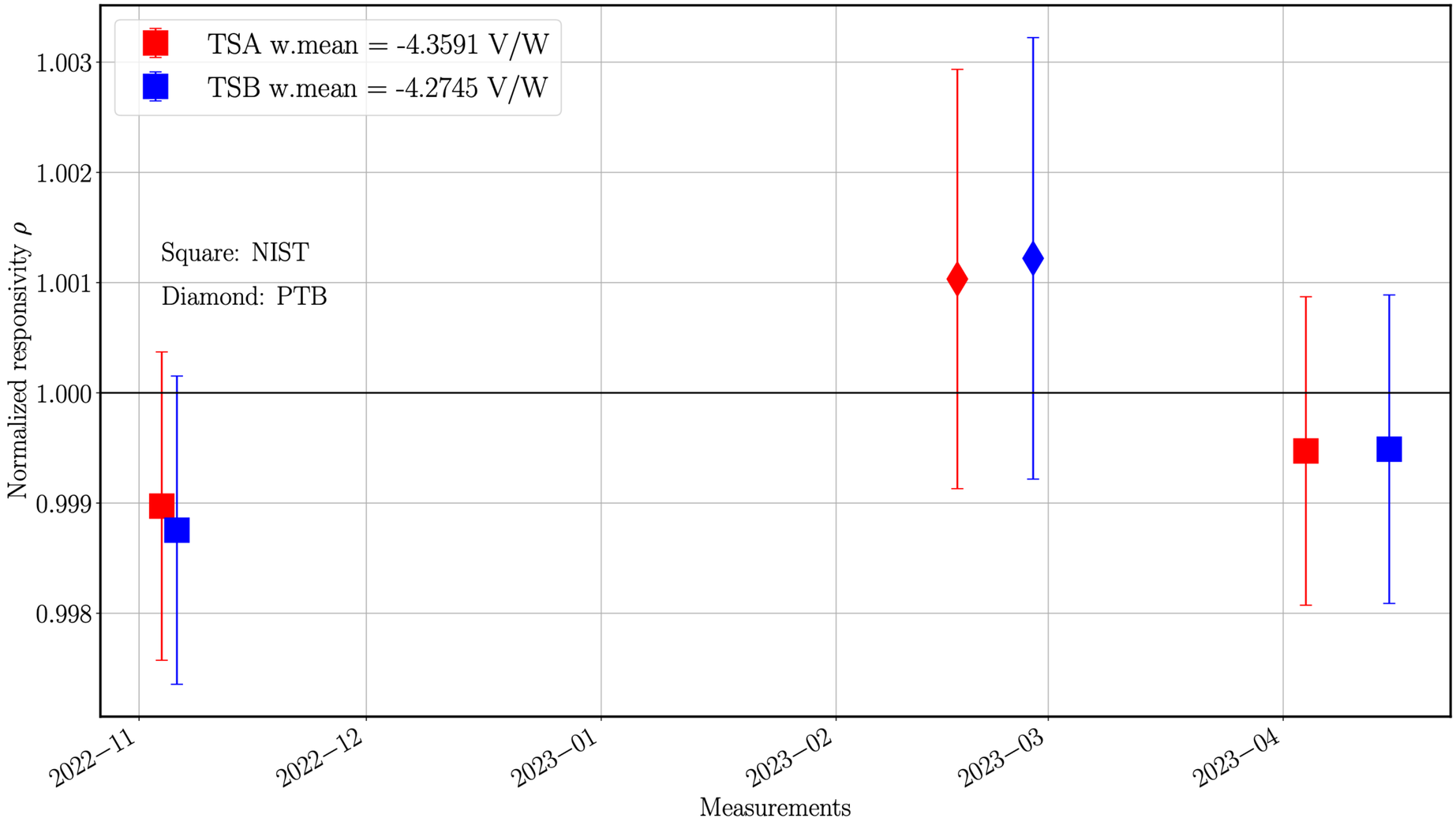
- NIST-PTB bilateral study, 2022-2023
    - Calculation of consensus responsivity and bilateral DoE
    - NEWRAD conference in September 2023
    - Potential publication
- Implementation of the calibration subway map
- Discussions have begun with respect to including VIRGO and eventually KAGRA

NIST-PTB bilateral comparison, GW detectors calibration plan

NIST, PTB, LIGO Hanford

06/13/2023

Bilateral results



Previous bilateral comparison
M. Slidell, et al.,
Metrologia **58** (2021) 055011

100 mW: DoE = -0.07% U (k=2)= 0.91 %
300mW : DoE = -0.23% U (k=2)= 0.91 %

Composite: DoE= -0.15% U (k=2) = 0.87 %

NEWRAD, 2023

- Abstract has been accepted for oral presentation

Calibrating the global network of gravitational wave observatories via laser power calibration at NIST and PTB.

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DCC link: https://dcc.ligo.org/LIGO-G2300653/public

Calibration subway map

Both transfer standards currently at LIGO Hanford