



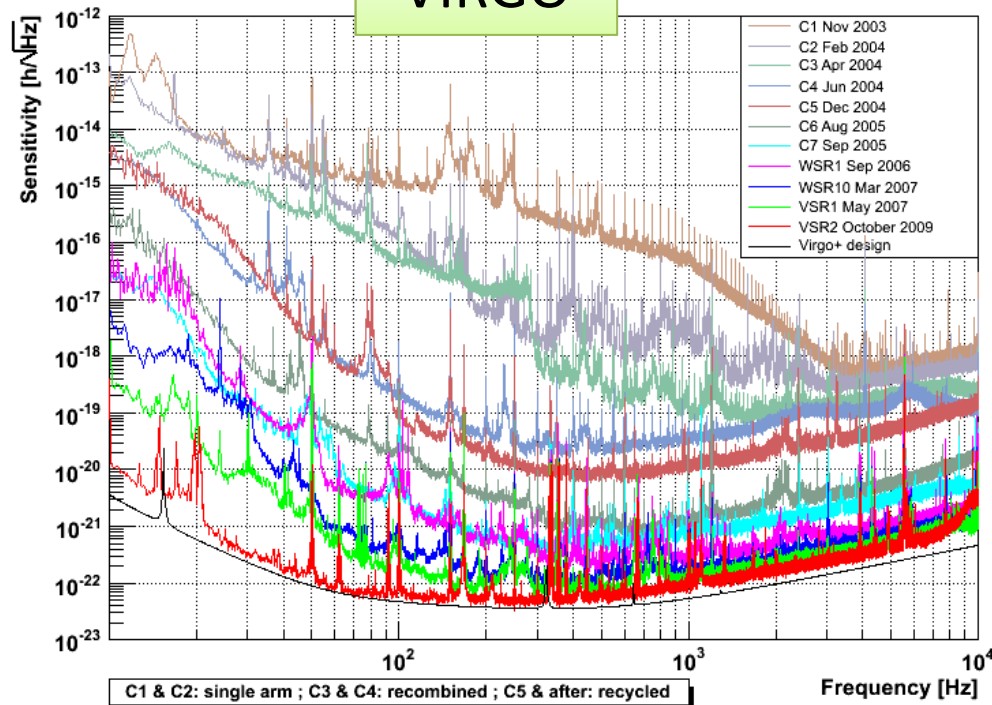
Building up a commissioning network

G1300576 – v1

Lisa Barsotti
MIT-LIGO Laboratory

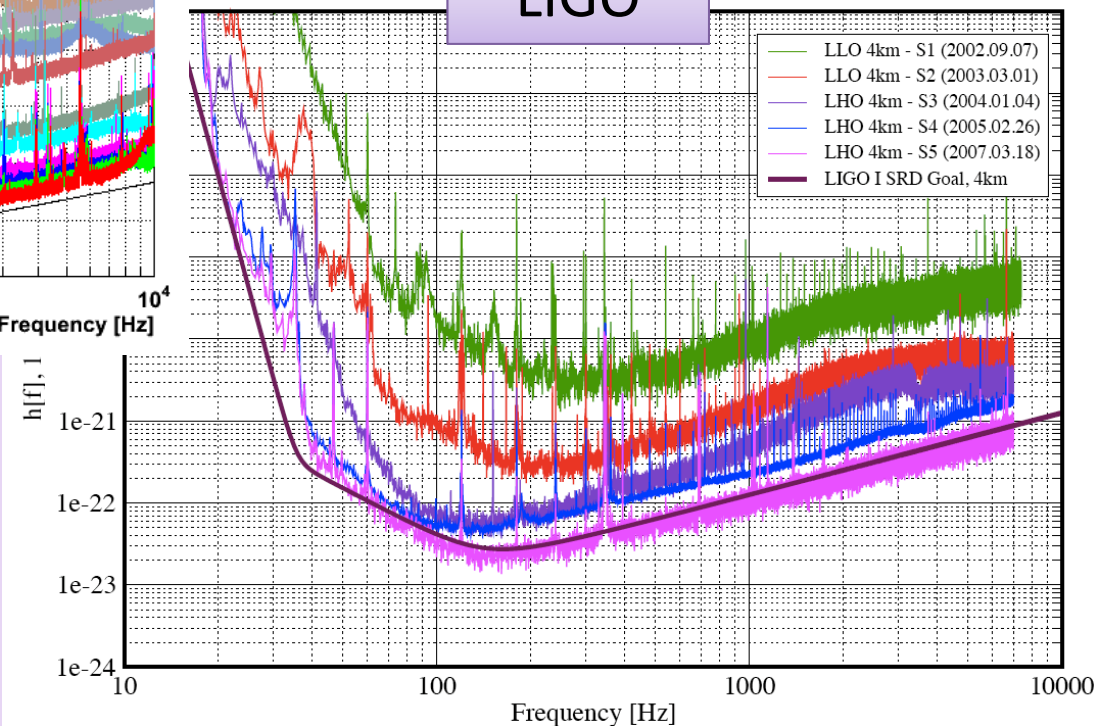
Why do we need a commissioning network?

VIRGO



An interferometer is not a gravitational wave detector until you make it work

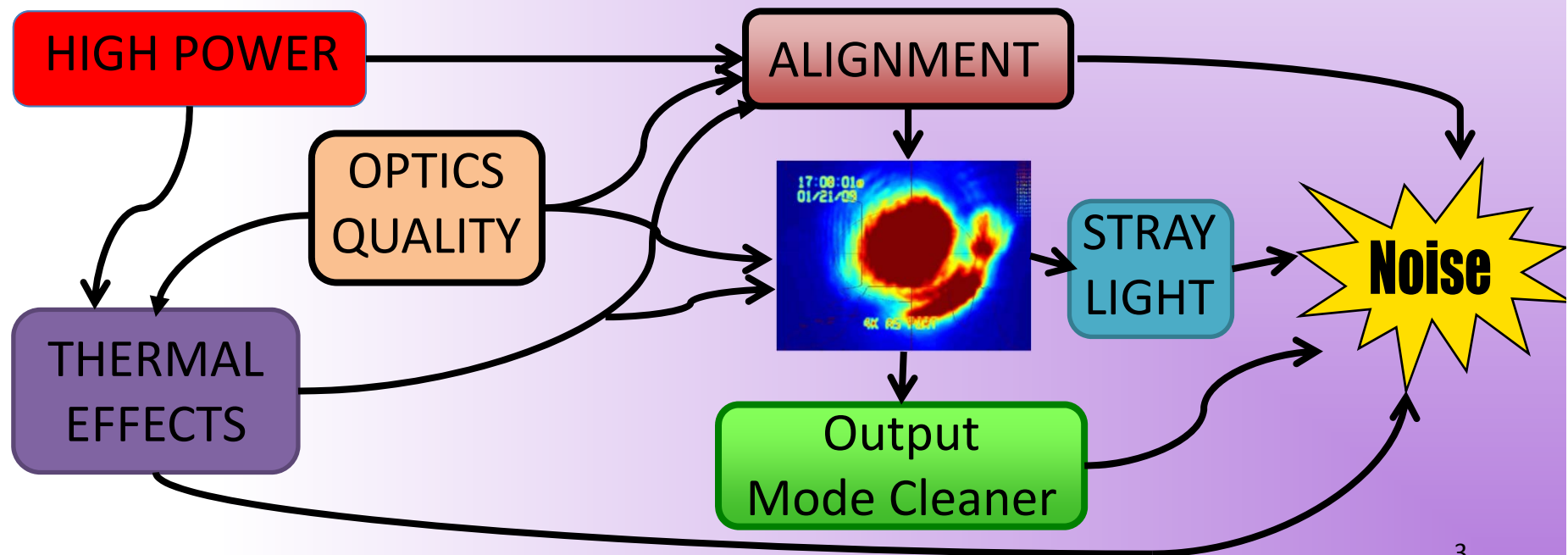
LIGO



Why do we need a commissioning network?

Difficult problems to solve, no time to spare,
need to spread good ideas, can't afford to repeat mistakes

Enhanced LIGO, ~ 1 year of struggling



How I saw the commissioning network evolve

Length Sensing and Control (Full ITF locking)

Arai, Barsotti, Barsuglia, Braccini, Evans, Flaminio, Ruggi

05:28, Wednesday 20 October 2004 (6858)

Virgo Logbook (2004-2007)

VIRGO Control
Room 2004



Length Sensing and Control (Full ITF locking)

ballmer - 13:57, Sunday 31 July 2005 (9695)

Frequency noise coupling to dark port

Alignment (Alignment)

Grote, Heitmann, De Rosa, Marque - 00:18, Thursday 13 July 2006 (12774)

GEO Centering system test for alignment diodes

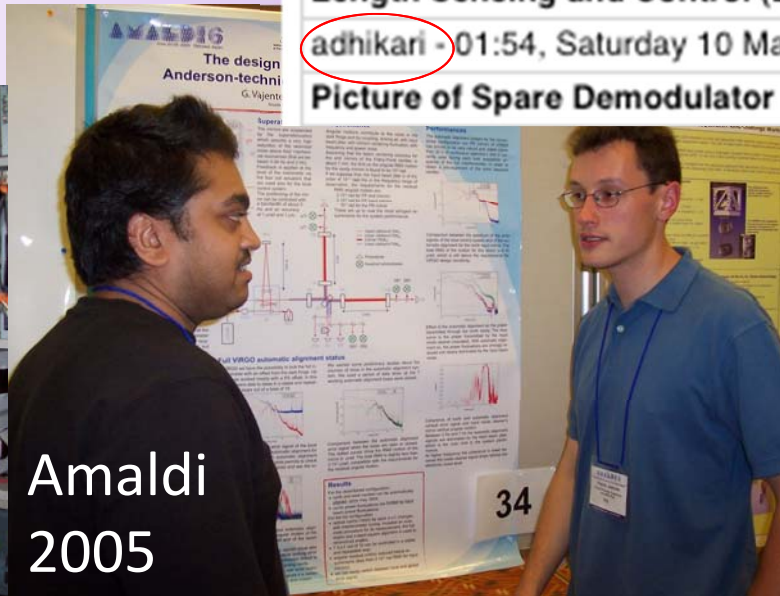
TAMA
Control Room
2005



Length Sensing and Control (Longitudinal Control Noise)

adhikari - 01:54, Saturday 10 March 2007 (15554)

Picture of Spare Demodulator Board



Amaldi
2005

VIRGO – GEO



(My) take from the past

- ✧ “First” generation of commissioning network kind of happened naturally “when needed”, not a real plan
 - ✧ Clear positive impact
 - ✧ Maximum benefit from networking happens when people actually work together on a problem, don’t just talk about it
- ➔ What we want is a flexible “organization” which brings commissioners to work together on problems

“Advanced” Networking: TANGO

TerrestriAI Network of Gravitational wave Observatories

Cascina, July 2012



Livingston, January 2013



Technical Note	LIGO-T1200464-v2	2012/10/16
<p>Report of the GW Detector Commissioning Workshop (2012 Cascina)</p>		
<p>B. Swinkels, R. X. Adhikari, J. Marque, G. Vajente, H. Grote, L. Barsotti, V. Frolov, K. L. Dooley, J. Leong, M. Mantovani, P. Ruggi, R. Day, M. Tacca</p>		

Technical Note	<p>WORK in Progress Kate Dooley, Aidan Brooks</p>	2013/05/06
<p>Report from the LLO Commissioning Workshop - January 2013</p>		
<p>LVC, ACIGA, GEO, KAGRA</p>		

Questions we asked ourselves

- ✧ What are the hard problems we faced in the past, and we could face again in the future, that we should study now?
- ✧ Are there things that we could learn now in prototypes & working interferometers (and simulations), that could help us later?
- ✧ What are the good things that we learned that we can share?
- ✧ What are the mistakes that we made that we should prevent others from making?

Problems common to all the interferometers

Scattered
Light

High order
modes

Sideband
unbalance

Thermal
Effects

Optics
Quality

Up-conversion

Offsets in the
length/alignment
error signals

Control noise

Things that worked for LIGO

Scattered
Light

High order
modes

Sideband
unbalance

Thermal
Effects

Optics
Quality

Up-conversion

FEED-FORWARD

Offsets in the
length/alignment
error signals

Control noise

Things that didn't work for LIGO

Scattered
Light

High order
modes

Sideband
unbalance

Thermal
Effects

Optics
Quality

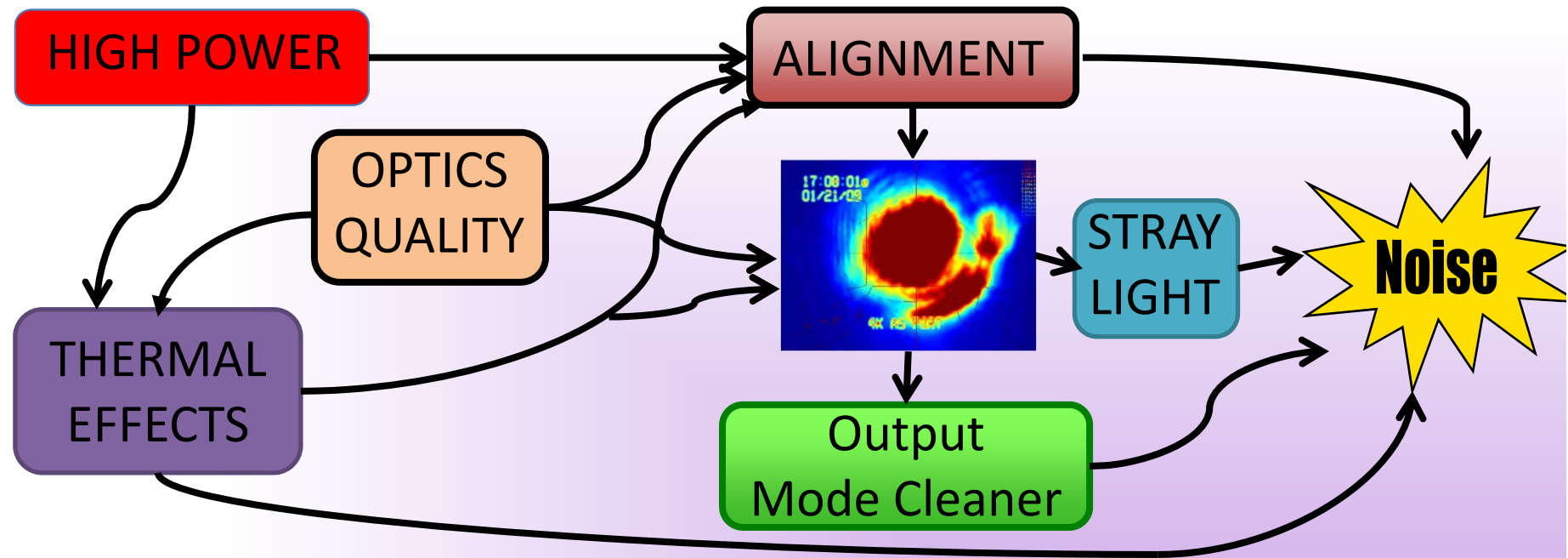
**Dither alignment
for the Output
Mode Cleaner**

Up-conversion

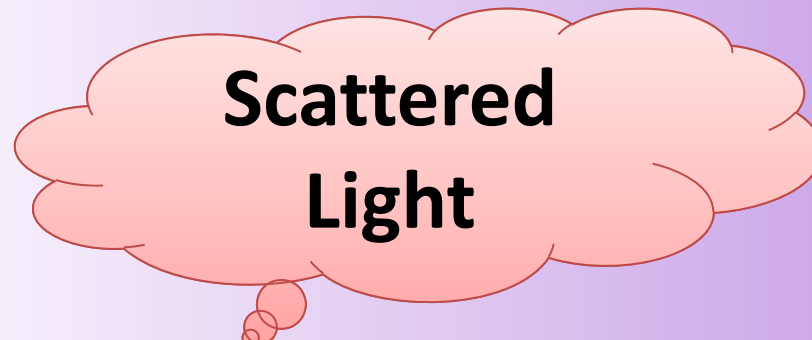
Offsets in the
length/alignment
error signals

Control noise

January 2013 Workshop @ Livingston



June 2013 Workshop @ GEO600



The Message

- ✧ Effort on going to try to facilitate networking between commissioners
- ✧ There is a winning strategy: work together on problems
- ✧ Create a network ahead of time, so when things get messy, we are ready!

Questions to keep in mind

- ✧ What are the hard problems we faced in the past, and we could face again in the future, that we should study now?
- ✧ Are there things that we could learn now in prototypes & working interferometers (and simulations), that could help us later?
- ✧ What are the good things that we learned that we can share?
- ✧ What are the mistakes that we made that we should prevent others from making?