

# S5 Commissioning Status

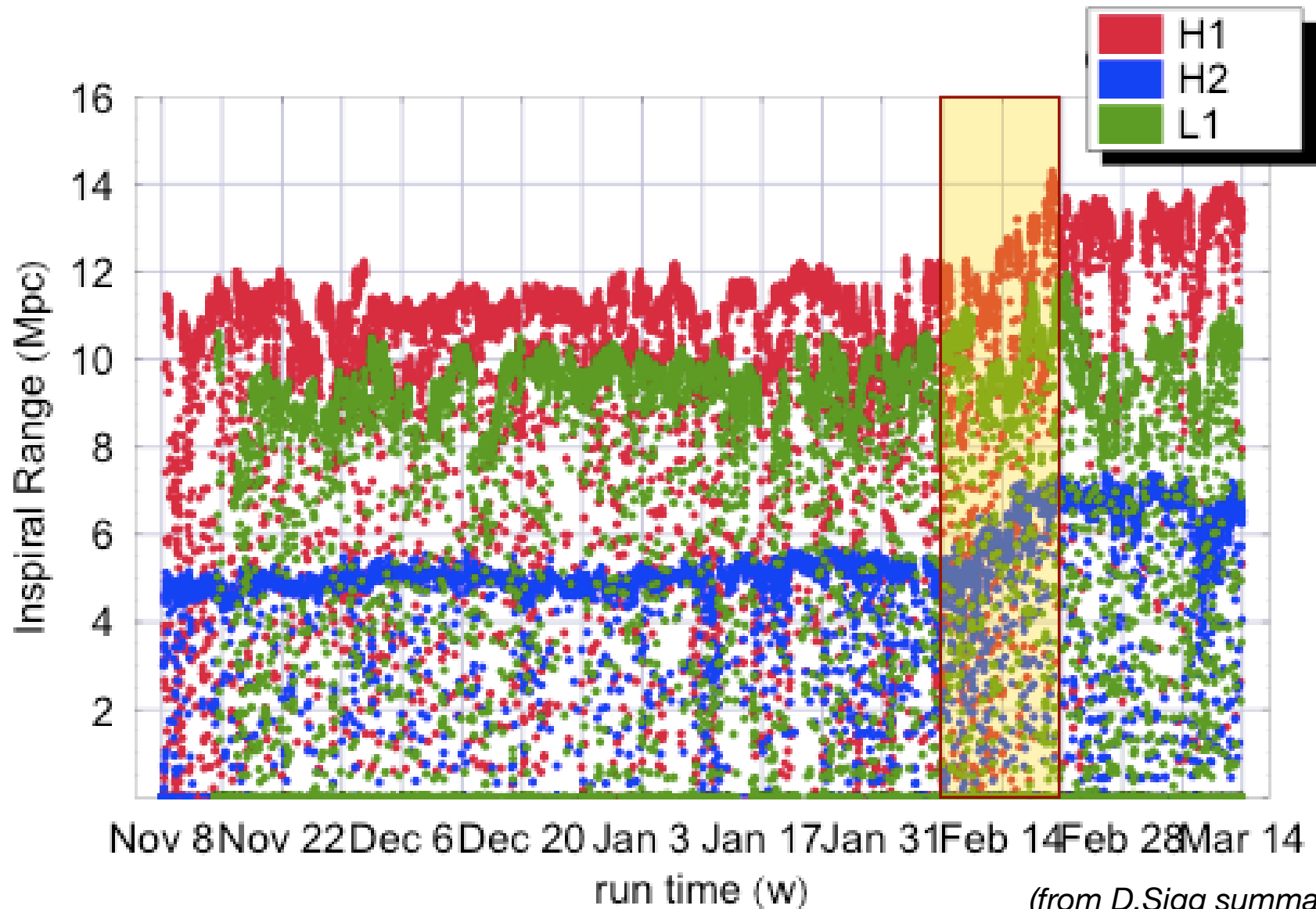
March 2006 LSC Meeting  
Hanford, WA

Sam Waldman  
LIGO Caltech

# Completed work (since Aug. LSC mtg.)

- LLO laser replacement (thanks 40m)
- 2.75 spare lasers from JDSU/LWE
- Fast shutters to protect diodes
- REFL beam stabilization for H1/L1
- New timing system on H2
- Crystal oscillators on all IFOs
- Floating H2 output table very positive
- H1/H2 REFL table acoustic enclosures
- AS port dust covers on all IFOs
- Photon calibrators operating on all IFOs
- No conclusive evidence for/against beam tube baffles

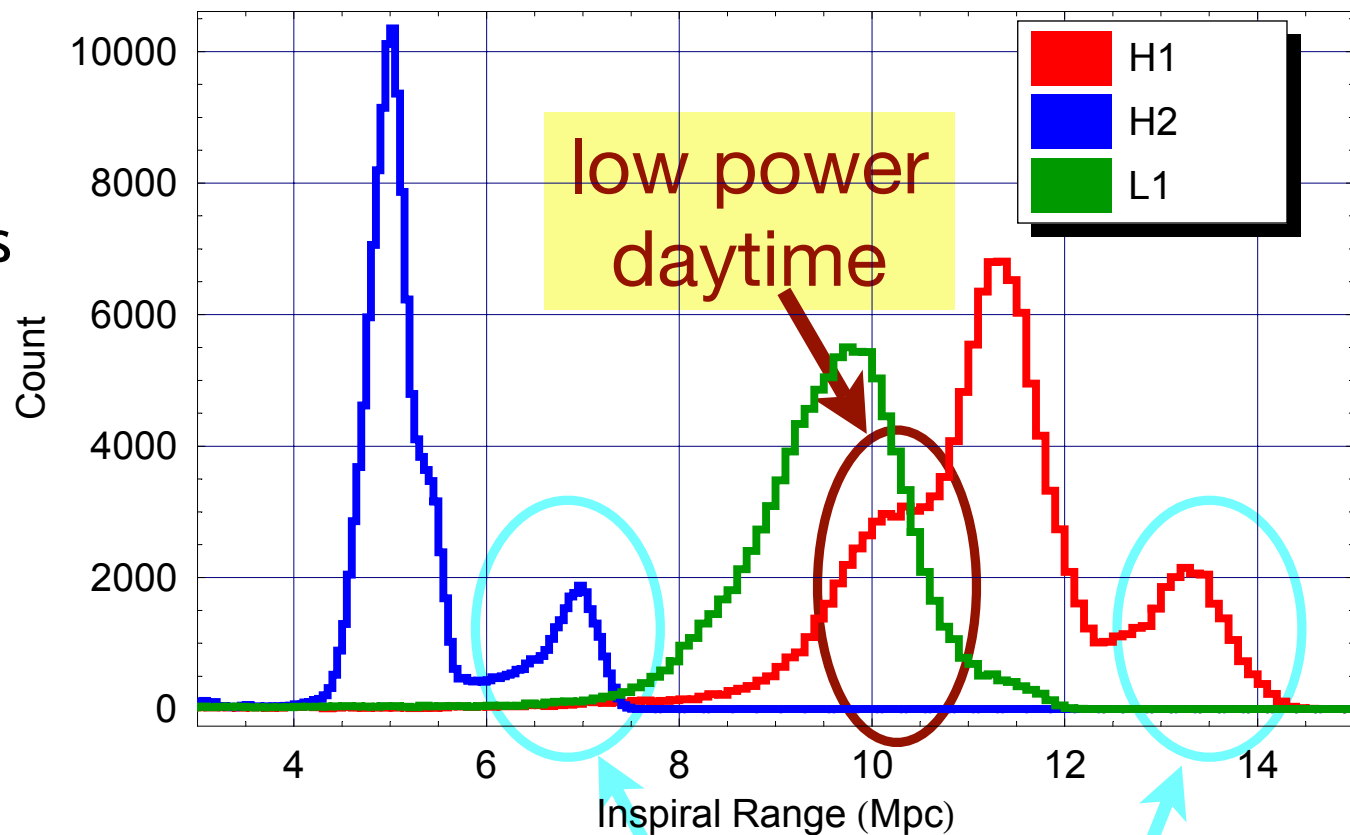
# S5 Performance



(from D.Sigg summary)

# Range histogram

- mid-Feb. improvements
- Low power daytime operation
- Large range variance



**mid-run comm.**

(from D.Sigg summary)



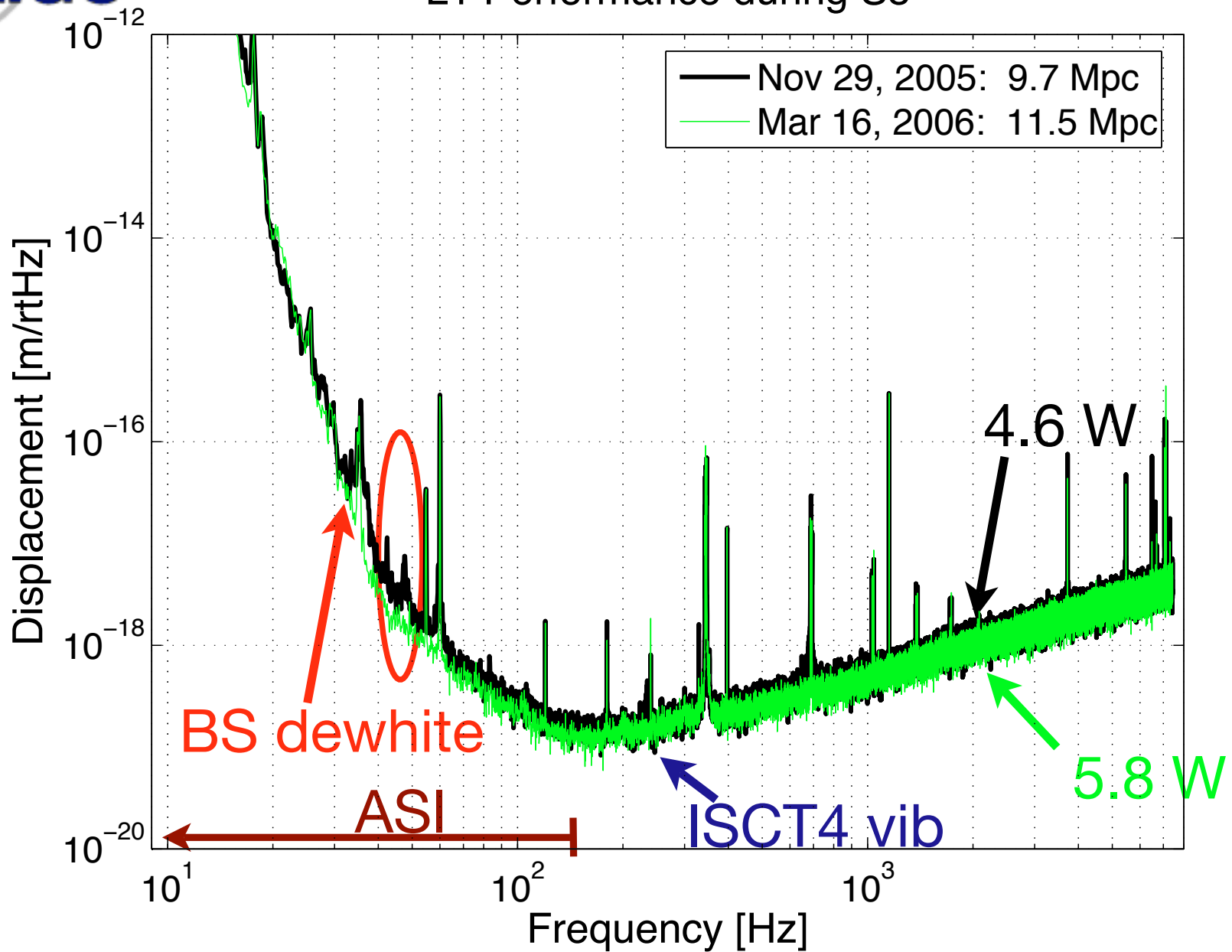
# mid-S5 Upgrades

H1	H2	L1
HVAC flow reduction (mid Feb. '06)	HVAC flow reduction (mid Feb. '06)	BS dewhite replacement (Jan. 17 '06)
WFS bandwidth increase (mid Feb. '06)	MICH/PRC noise (mid Feb. '06)	ASPD3 ASI gain increase (Dec. 1 '05)
RF distribution and ASI (mid Feb. '06)	ASC filtering (mid Feb. 06)	Laser power increase (Feb 17. '06)
Laser power increase (mid Feb. '06)	OSEM filtering (mid Feb. '06)	ISCT4 vibration reduction (continuing)
TCS vibration coupling (mid Feb. '06)	TCS tuning (mid Feb. '06)	
IOO rack electronics noise (mid Feb. '06)	REFL1 power increase (mid Feb. '06)	



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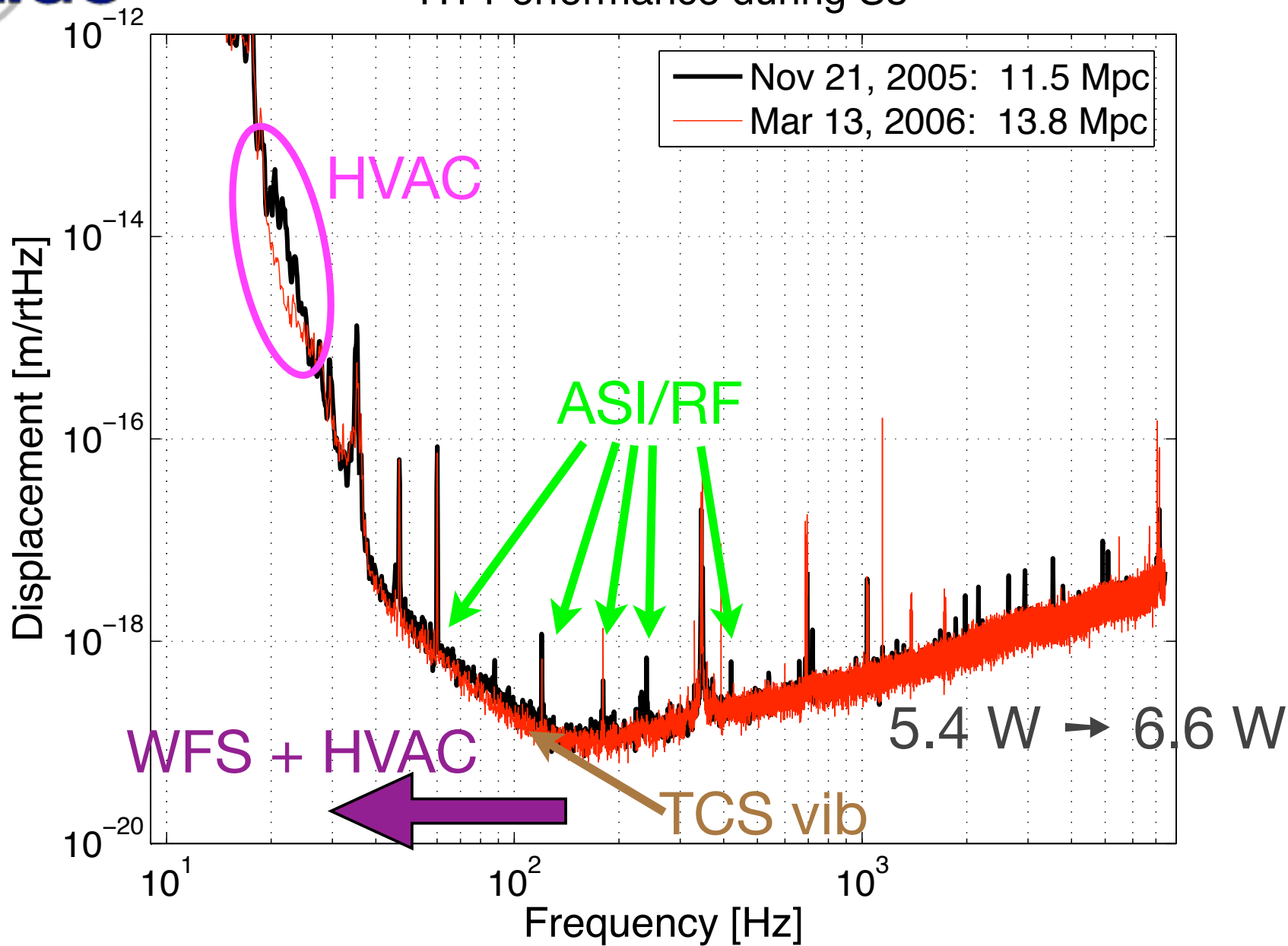
# L1 Performance during S5





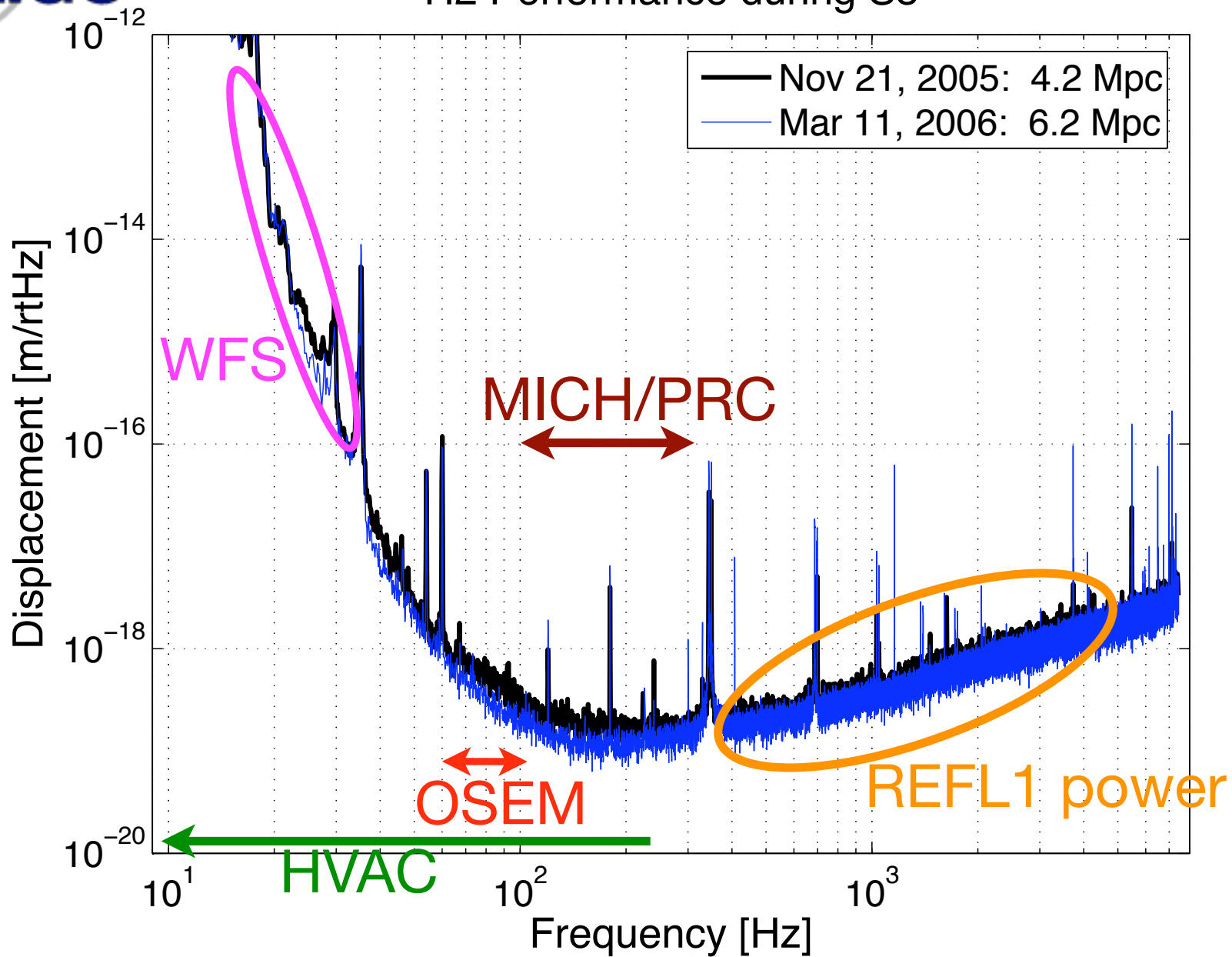
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# H1 Performance during S5



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### H2 Performance during S5

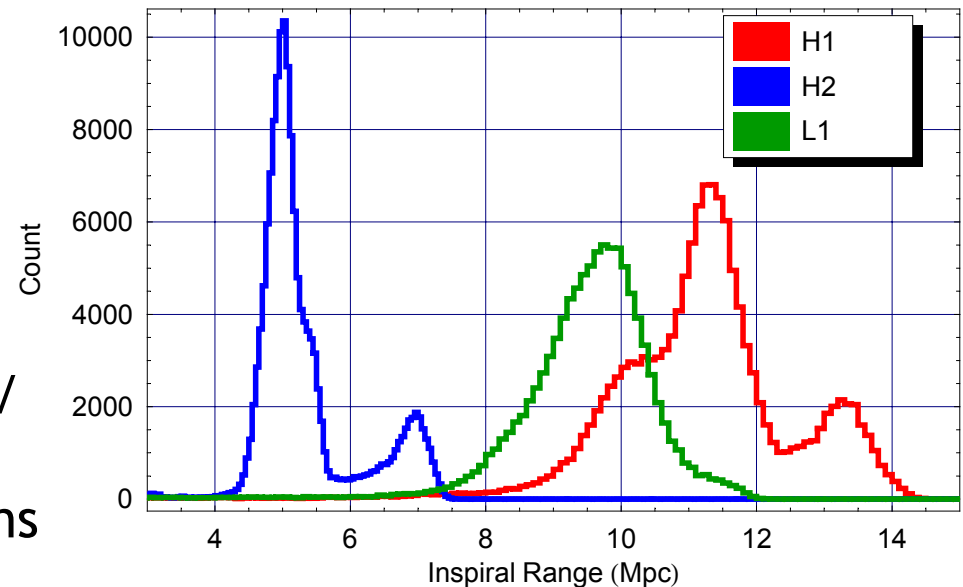




# LLO commissioning

(April 3-14, 2006)

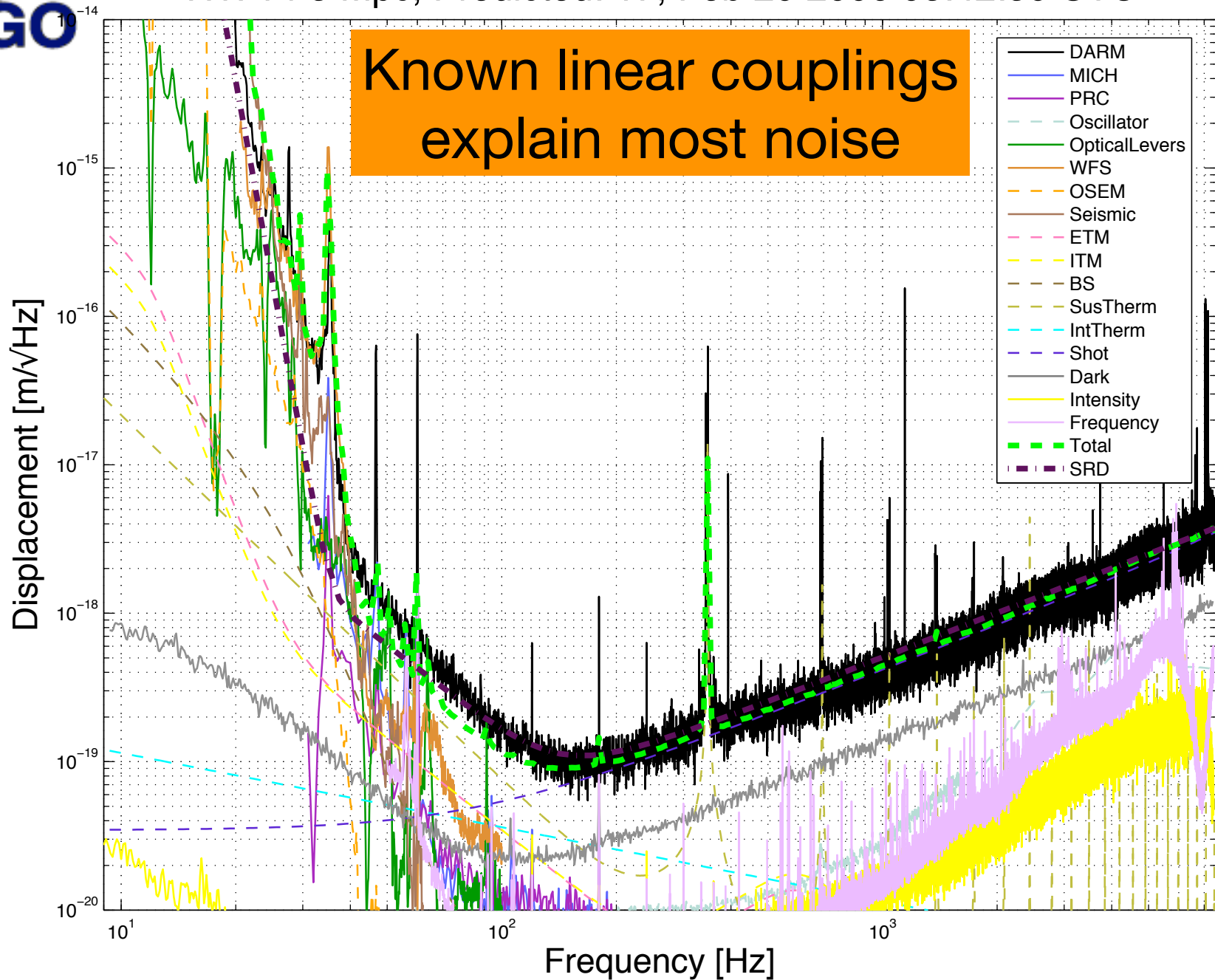
- High bandwidth WFS
- ISCT4 vibration isolation
- WFS2,5 to ISCT4
- Use POX instead of POB for MICH/PRC, decrease shot noise
- Multi-db increase in LSC loop gains
- Resolve RM/BS DAC glitching
- HEPI to handle high wind/seismic
- TCS at high power
- PSL power increase
- Explore upconversion mechanisms





H1: 14.5 Mpc, Predicted: 17, Feb 20 2006 05:42:50 UTC

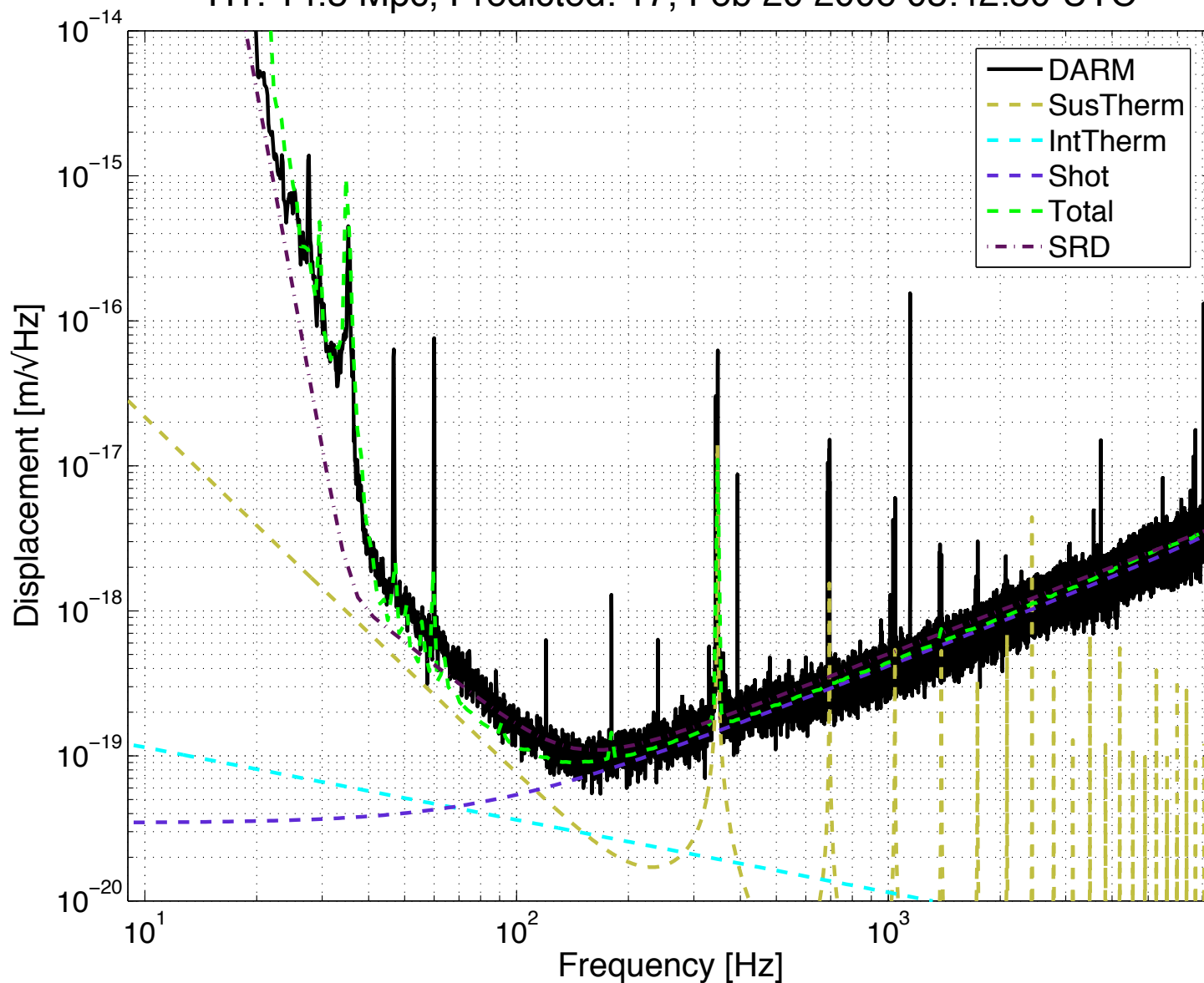
Known linear couplings  
explain most noise



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# “Fundamental” Noise

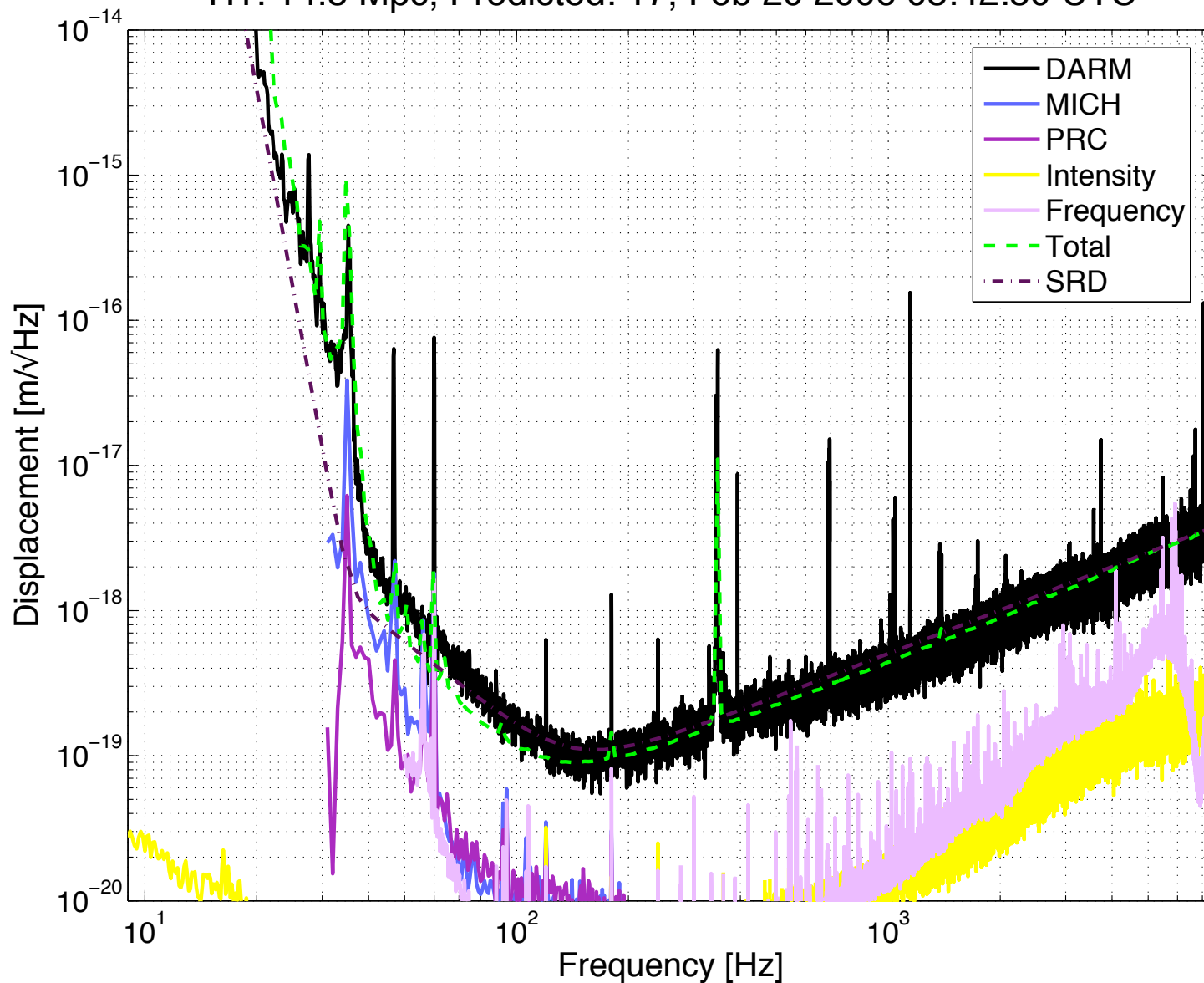
H1: 14.5 Mpc, Predicted: 17, Feb 20 2006 05:42:50 UTC



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# “Auxiliary DOF” Noise

H1: 14.5 Mpc, Predicted: 17, Feb 20 2006 05:42:50 UTC





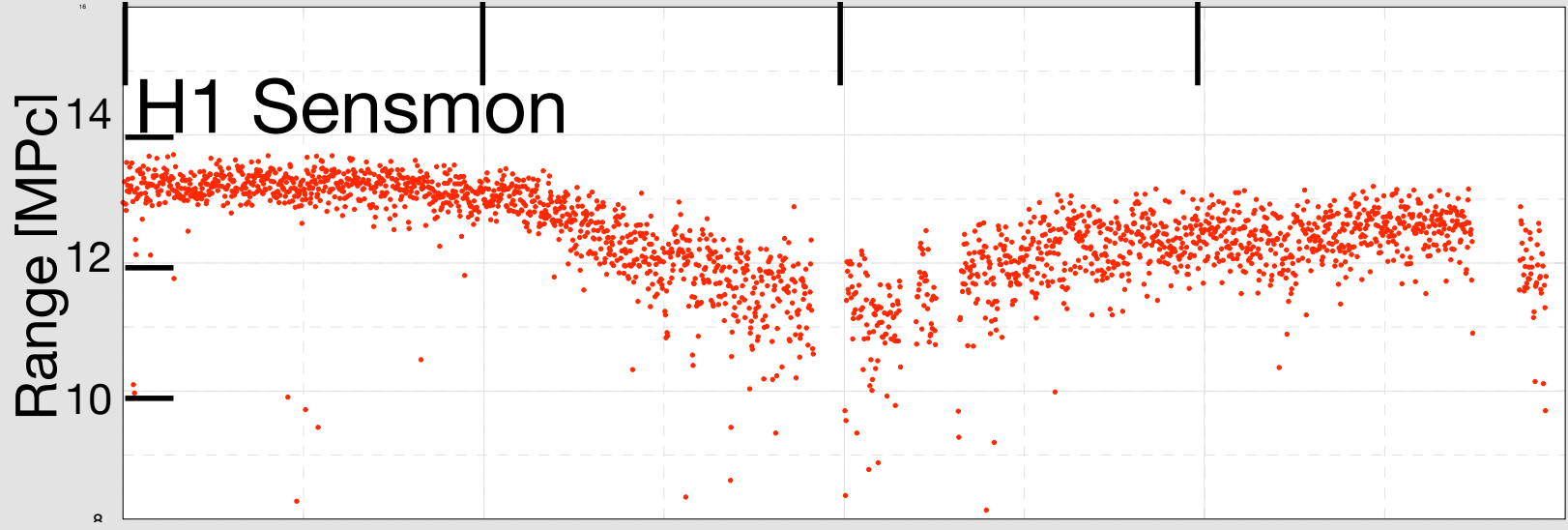
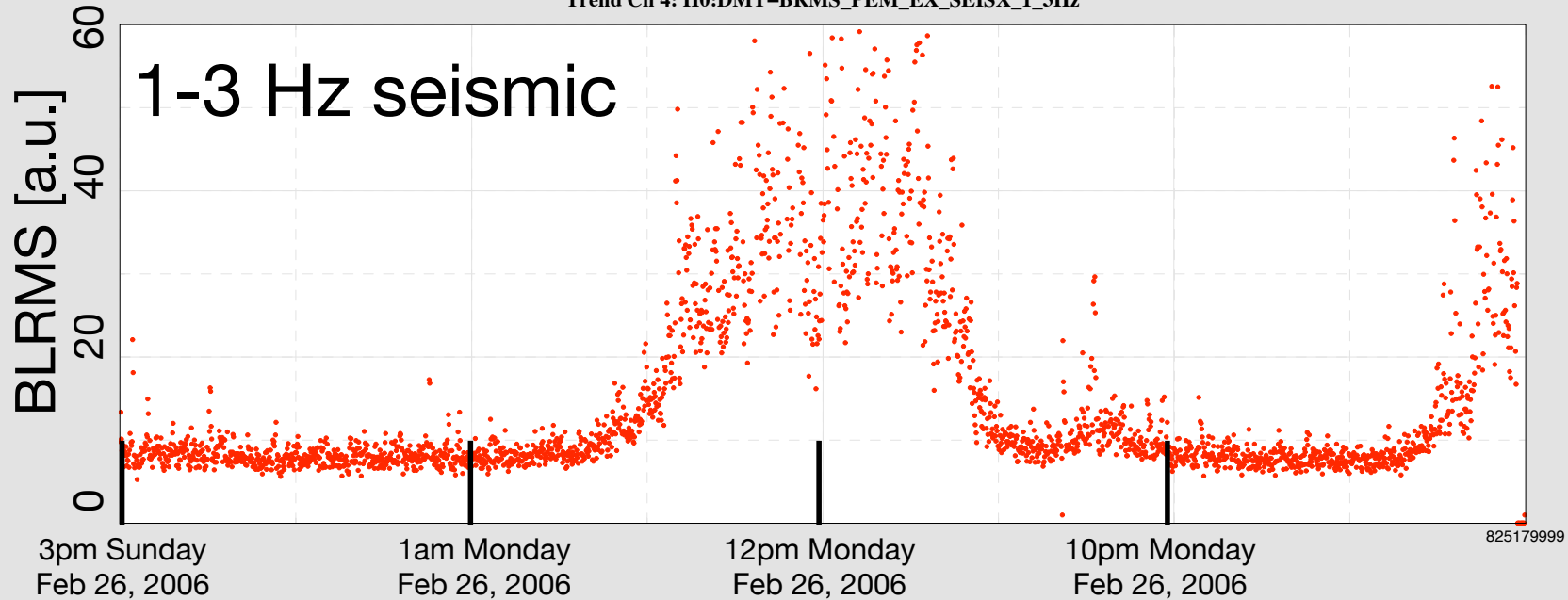




• MEAN

Trend 2500 minutes from 06-2-26-22-59-47 to 06-2-28-16-38-47

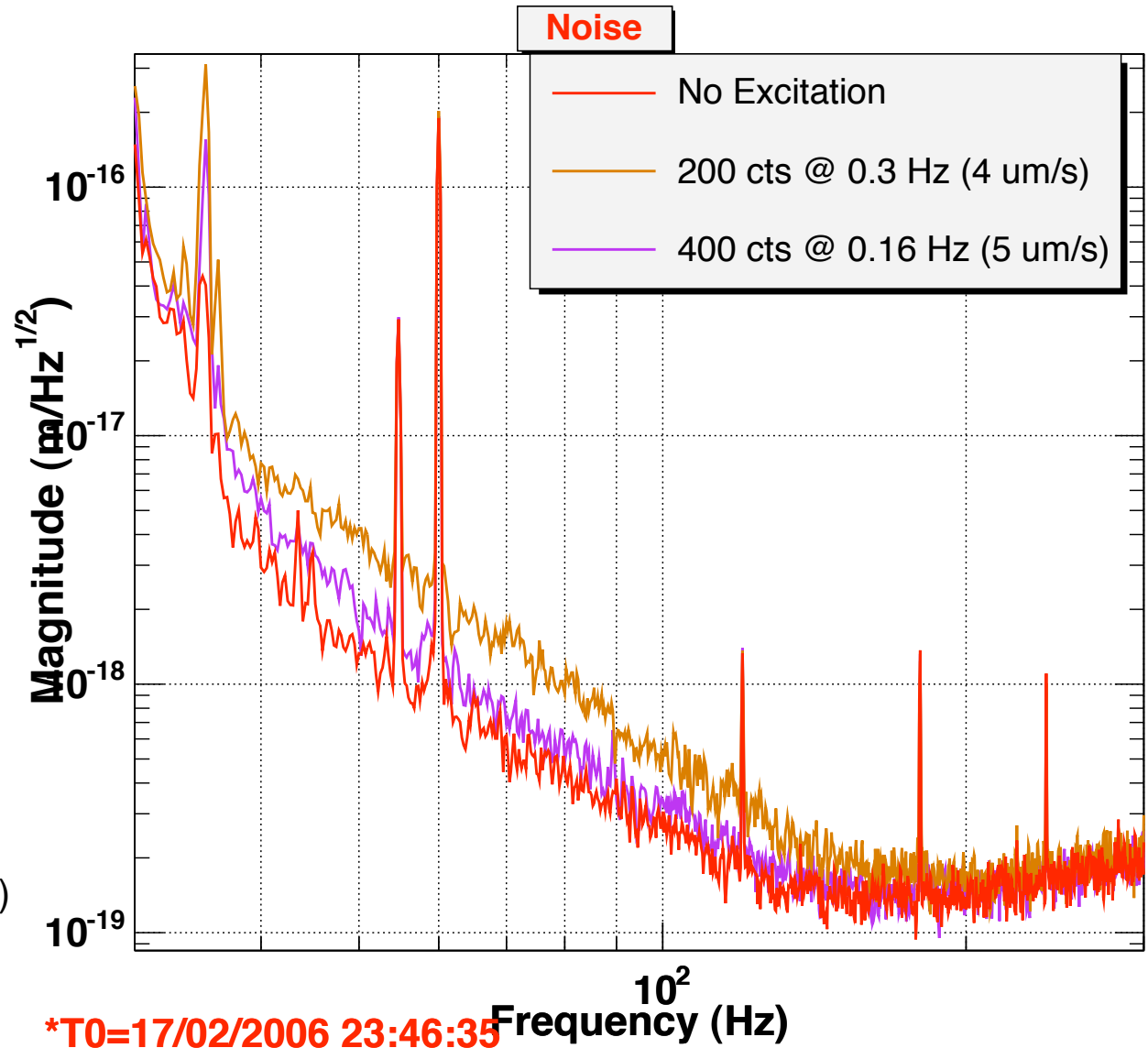
Trend Ch 4: H0:DMT-BRMS\_PEM\_EX\_SEISX\_1\_3Hz



# HEPI up-conversion

- Frequency dependent
- Seen only for TMs
- Motion estimated from SUSPOS
- See also Schofield G050617-00-Z

(from O'Reilly & Frolov 2/17/06)



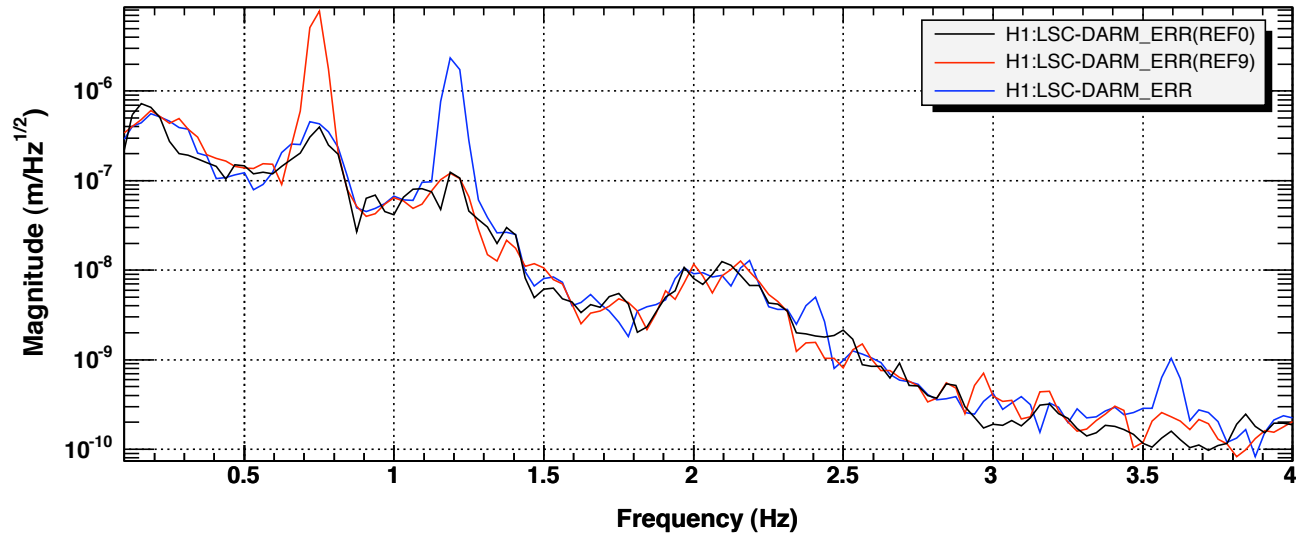


# Up-conversion

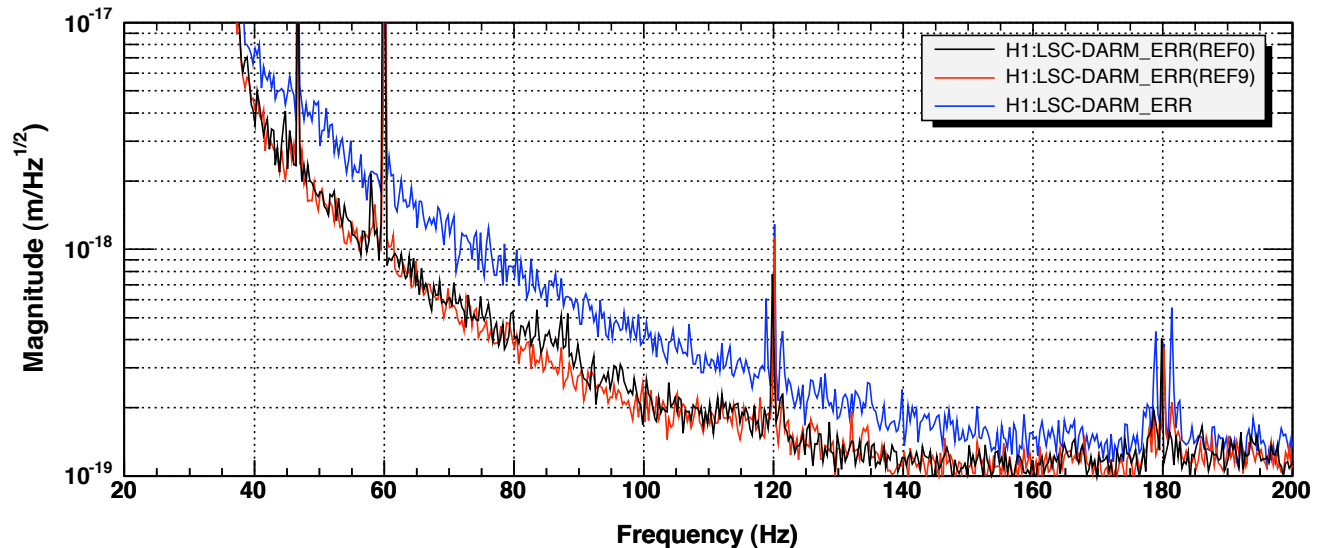
Mid-Y ground injections: Black: none, Red: 0.75 Hz, Blue: 1.2 Hz

- Ground noise at 1.2 Hz generates in-band noise
- Not specific to 1.2 Hz
- Not associated with optic motion alone
- New DetChar group

(from RobertS 02/19/06)



Same color scheme



\*T0=03/12/2005 23:00:55

\*Avg=1/Bin=10

\*BW=0.0468662

# Duty Cycle

Run	S2	S3	S4	S5 Target
L1	37%	22%	75%	85%
H1	74%	69%	81%	85%
H2	58%	63%	81%	85%
3-way	22%	16%	57%	70%

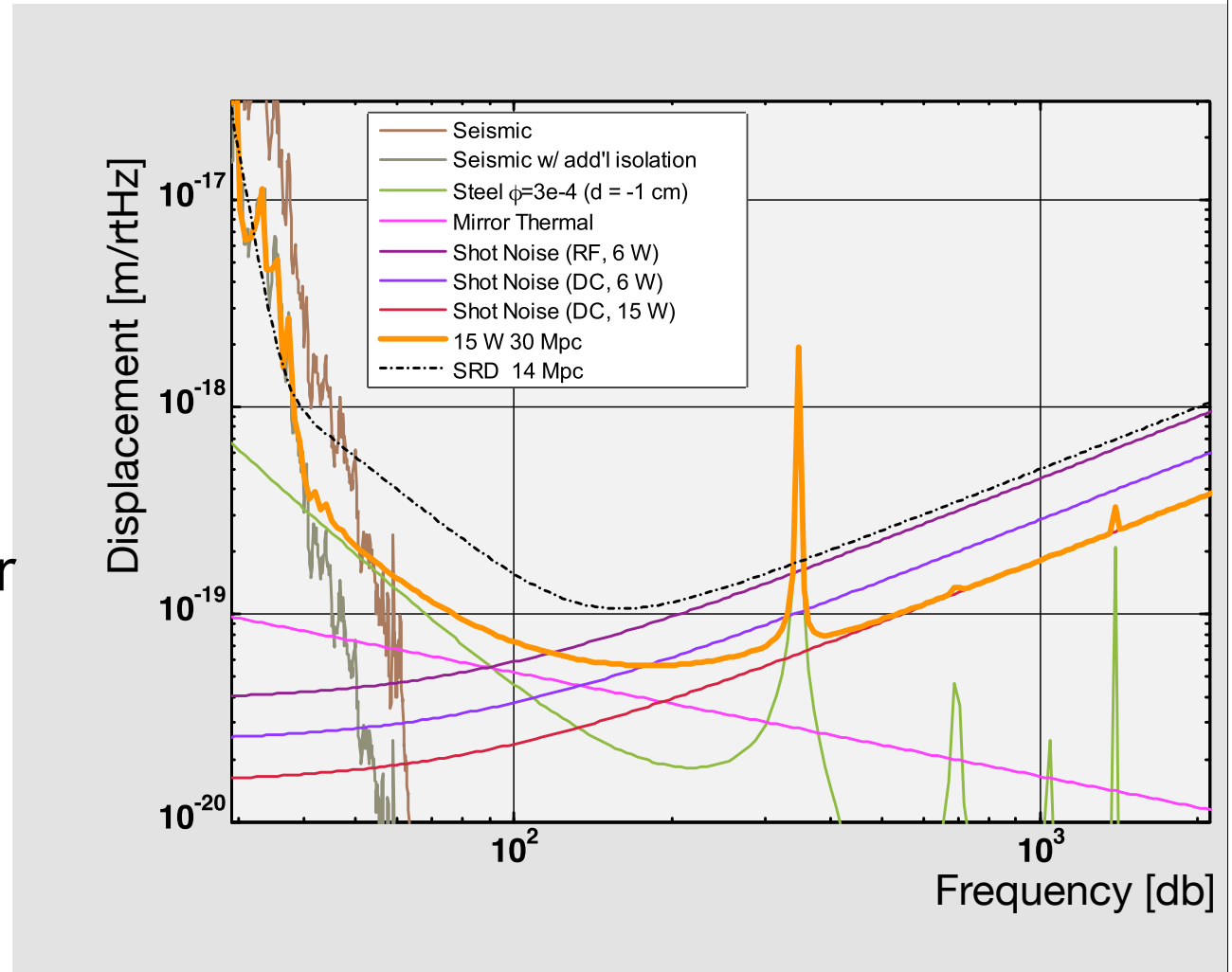
- Start Nov. 4 at LHO, Nov.14 a LLO
- Need to improve duty cycle
- = 45 days triple coincidence
- See S5 run summary by V.Sandberg

Run	S5 to-date
L1	55%*
H1	64%
H2	73%
3-way	~39%*

\*) depends on run start time

# LIGO-I Upgrades

- post-S5, pre-AdLIGO
- Output Mode Cleaner
- High power laser
- Miscellaneous
- See R.Adhikari's talk



(from R. Adhikari G060030-1)

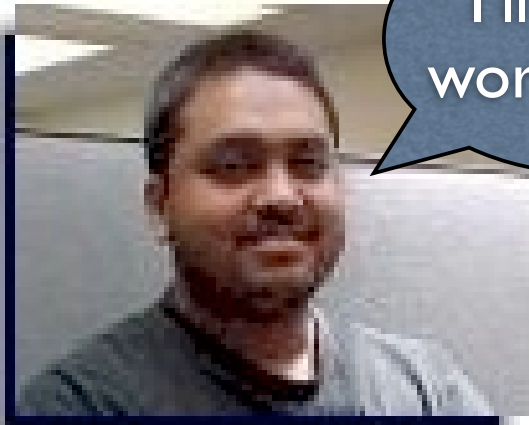
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# Advertising

- Has all 4 wheels
- Roof almost closes
- Perfect for Sunny LA



Must Go!



I'll get to  
work faster



More perfect for Sunny LA

# Conclusions

- Very positive Feb. commissioning at LHO
- Upcoming Apr. commissioning at LLO
- Upconversion still unexplained
- Duty cycle needs work
- post-S5 upgrades to come

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