CALIFORNIA INSTITUTE OF TECHNOLOGY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Laser Interferometer Gravitational Wave Observatory (LIGO) Project

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Refer to:	LIGO-T040235-00
Date:	December 23, 2004

ICS130 Whitening Board Test Procedure

Required equipment:

The required equipment is.

- Dual power supply ±24V
- Oscilloscope
- Function generator
- Network analyzer (1 Hz to 100 kHz)
- Spectrum analyzer (100 kHz bandwidth)

Preparations:

Test Engineer	Date	Pass

Write down revision, serial number and whether it is a mode cleaner board or a interferometer common mode board.

Board	Revision	Serial
D040425		

Hook up the ±24V power supply to JP1.

Power up the board and check that the current drawn from the ±24V power supply is between 0.025 A and 0.035 A.

Power supply	Current	Nominal
+24V		0.07
–24V		0.07

Test for oscillations:

Use scope on all outputs and make sure they are not oscillating.

Output	Channel 1	Channel 2	Channel 3	Channel 4
Check				

Noise spectra:

Ground inputs of channel 1 through 4. Measure the noise density at the corresponding outputs. Write down the values divided by the gain at 100 Hz, 1 kHz, 10 kHz, 37.5 kHz and 75 kHz (referred input noise). Attach hardcopies of the measured spectra; see Appendix A1 for typical examples. Units are nV/√Hz.

Frequency	Channel 1	Channel 2	Channel 3	Channel 4	Nominal
100 Hz					< 40
1 kHz					< 25
37.5 kHz					< 25

Channel-to-channel crosstalk:

Inject a sine wave at 37.5 kHz with an amplitude of ~10 mV into channel 1 of the board and measure the signal at channels 2 through 4. Reapeat the measurement by injecting into channels 2 thorugh 4 and measure at the remaining ones. Write the numbers down in dB and make sure they are all below –70 dB.

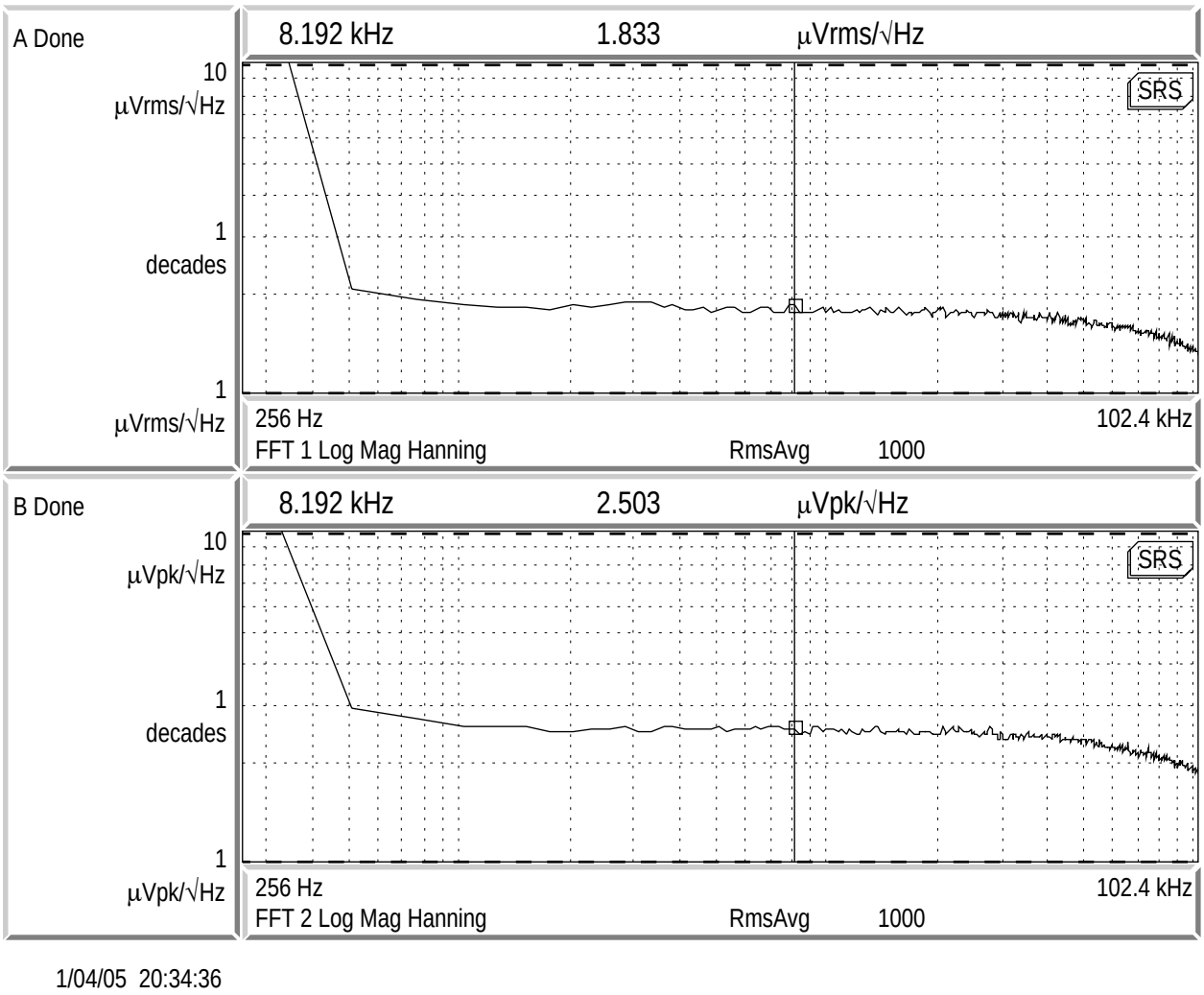
Cross-talk	Inject chn 1	Inject chn 2	Inject chn 3	Inject chn 4
Channel 1				
Channel 2				
Channel 3				
Channel 4				

Transfer functions:

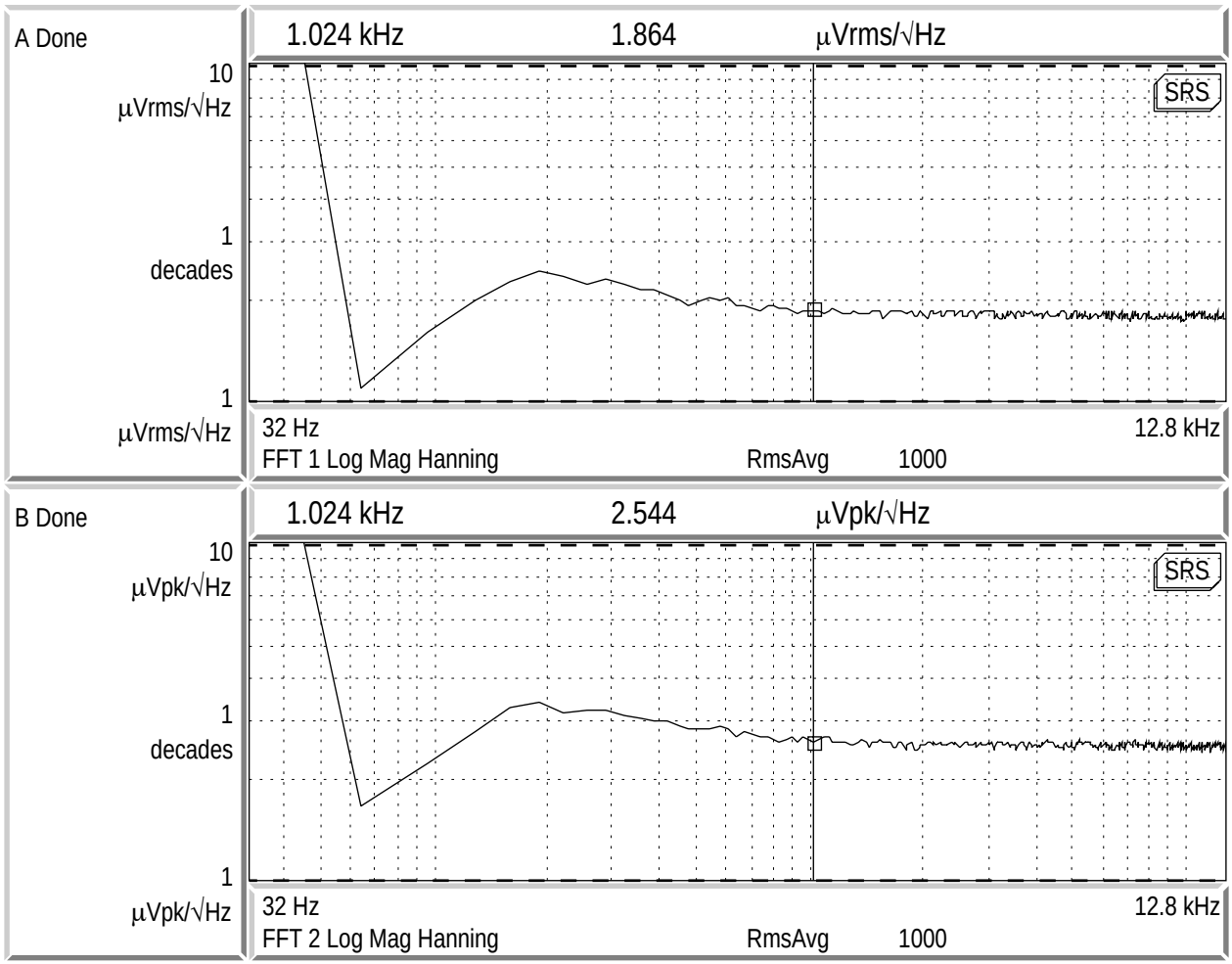
Use a network analyzer to measure the transfer function of each channel. Sweep the frequency from 100 kHz down to 1 Hz with 10 mV source amplitude. Write down the gain at dc, at 1 kHz, at 37.5 kHz and at 75 kHz; make sure the transfer function is within specification, i.e., no more than 1 dB error and no more than 3° of phase error. Attach hardcopies of the measured transfer function; see Appendix A2 for typical examples.

Frequency	Gain [dB]	Nominal	Phase [deg]	Nominal
Channel 1:				
dc		–14		–171
1 kHz		42		–162
37.5 kHz		41.5		+142
75 kHz		40		+101
Channel 2:				
dc		–14		–171
1 kHz		42		–162
37.5 kHz		41.5		+142
75 kHz		40		+101
Channel 3:				
dc		–14		–171
1 kHz		42		–162
37.5 kHz		41.5		+142
75 kHz		40		+101
Channel 4:				
dc		–14		–171
1 kHz		42		–162
37.5 kHz		41.5		+142
75 kHz		40		+101

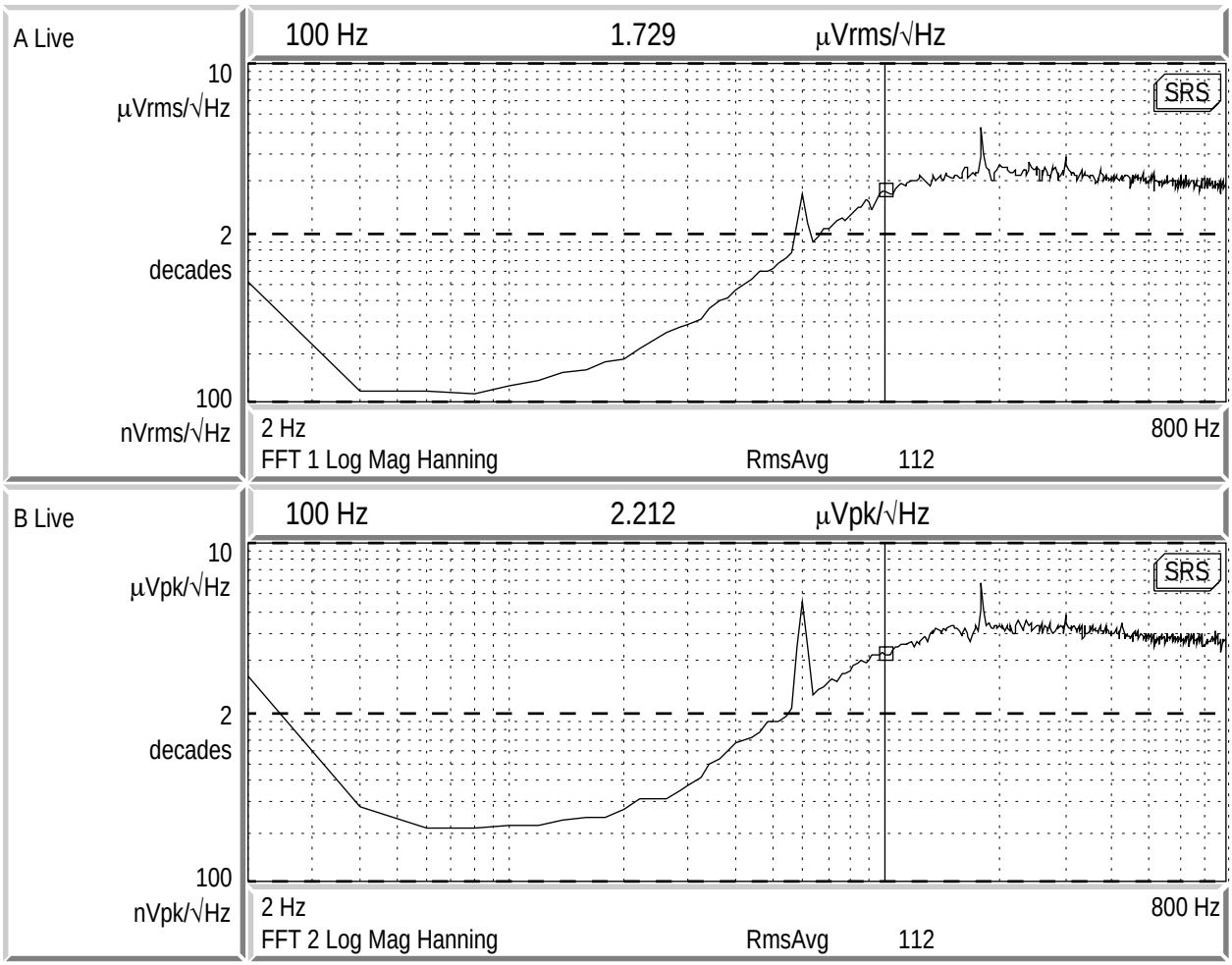
Appendix A1: Noise spectra



Noise spectra for channel 1 (top) and channel 2 (bottom).

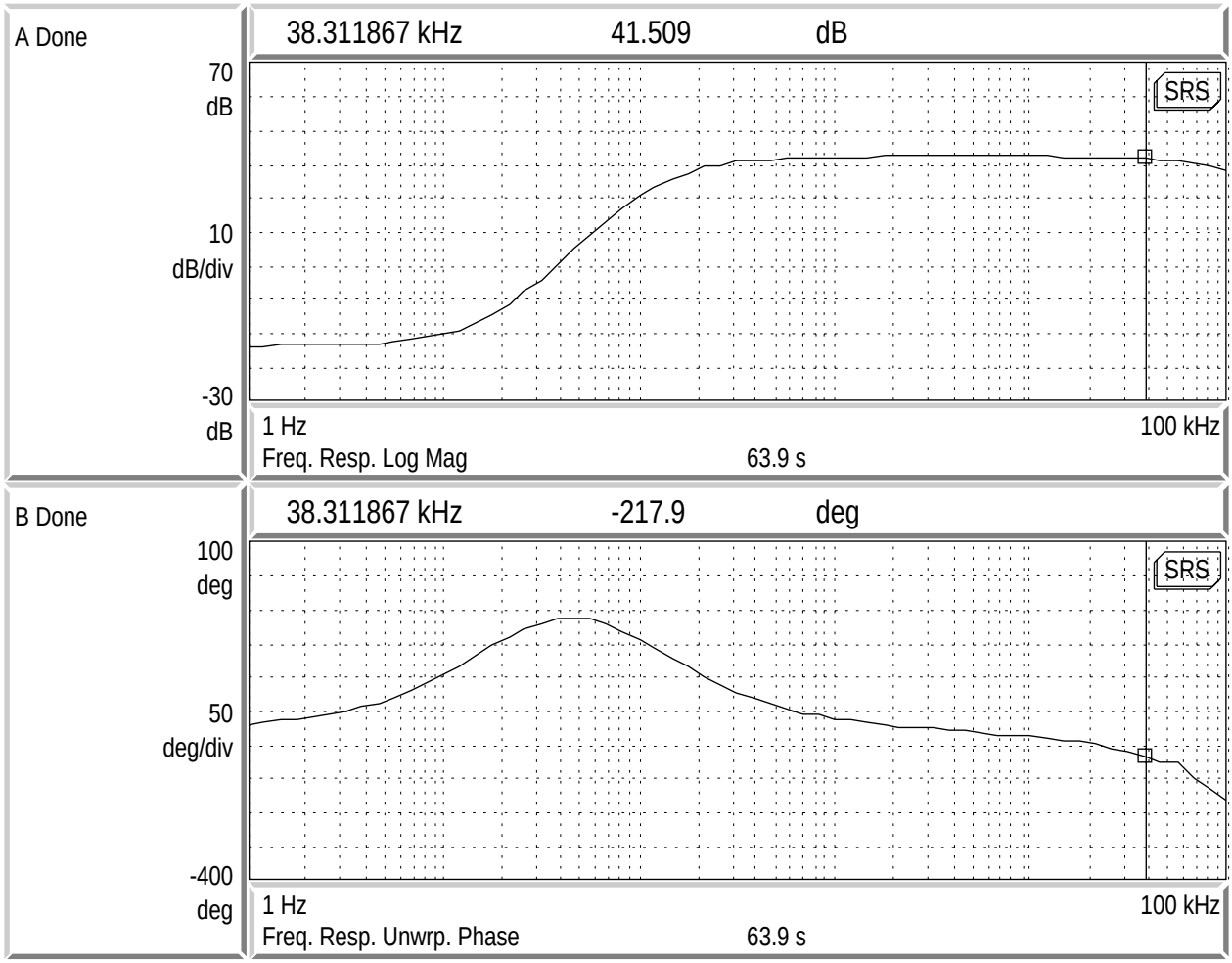


Noise spectra for channel 1 (top) and channel 2 (bottom).



Noise spectra for channel 1 (top) and channel 2 (bottom).

Appendix A2: Transfer functions



Transfer function of channel 1. Same for channels 2 through 4