

LASER INTERFEROMETER GRAVITATIONAL WAVE OBSERVATORY

- LIGO -

CALIFORNIA INSTITUTE OF TECHNOLOGY  
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| <b>Transfer Function Measurements and Fits for<br/>the Revision C8 Dewhitening Filters</b> |                          |            |
| Brian O'Reilly   |                          |            |

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LIGO Scientific Collaboration

**California Institute of Technology**

**LIGO Project - MS 51-33**

**Pasadena CA 91125**

Phone (626) 395-2129

Fax (626) 304-9834

E-mail: [info@ligo.caltech.edu](mailto:info@ligo.caltech.edu)

**Massachusetts Institute of Technology**

**LIGO Project - MS 20B-145**

**Cambridge, MA 01239**

Phone (617) 253-4824

Fax (617) 253-7014

E-mail: [info@ligo.mit.edu](mailto:info@ligo.mit.edu)

WWW: <http://www.ligo.caltech.edu/>

# 1 Summary

The new rev. C8 dewhitening filter transfer functions have been measured and fit. We have three boards Serial number 173,174 and 175. The plots on the following pages are the fits to these boards. It was necessary to add a high frequency real pole to accurately fit the transfer function phase. The tables show the poles and zeros obtained from the fits to the measured data.

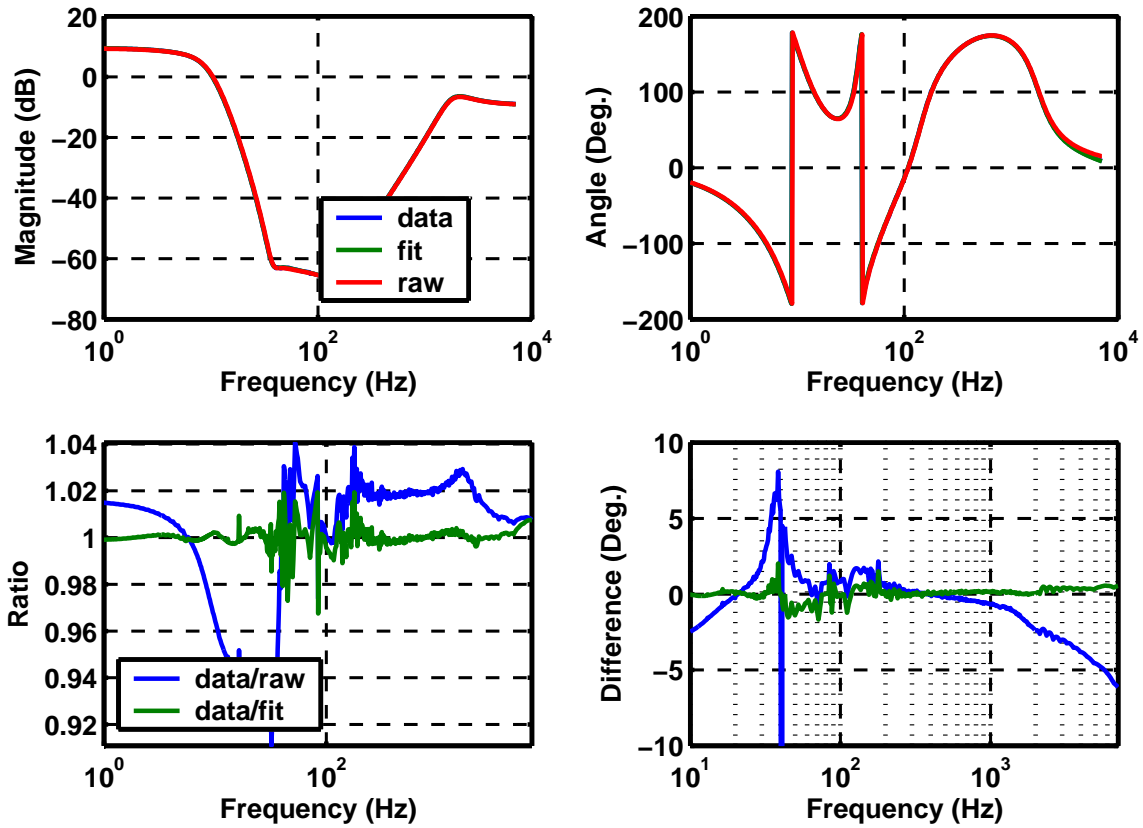
On October 3, 2003 Serial No. 173 was inserted in EX and Serial No. 174 was inserted in EY. The channel to coil mapping is:

|          |           |
|----------|-----------|
| <b>1</b> | <b>UL</b> |
| <b>2</b> | <b>LL</b> |
| <b>3</b> | <b>UR</b> |
| <b>4</b> | <b>LR</b> |

Here are the nominal poles and zeros for these filters taken from the schematic.

| Poles (rad.) |           | Zeros (rad.) |           |
|--------------|-----------|--------------|-----------|
| Real         | Imaginary | Real         | Imaginary |
| 3839.0       | 10529.10  | 307.10       | 842.19    |
| 56.00        | 61.29     | 168.00       | 291.33    |
| 29.32        | 50.84     | 32.07        | 235.59    |
| 7414.16      | -         | 2469.29      | -         |
| 36.25        | -         | 544.75       | -         |

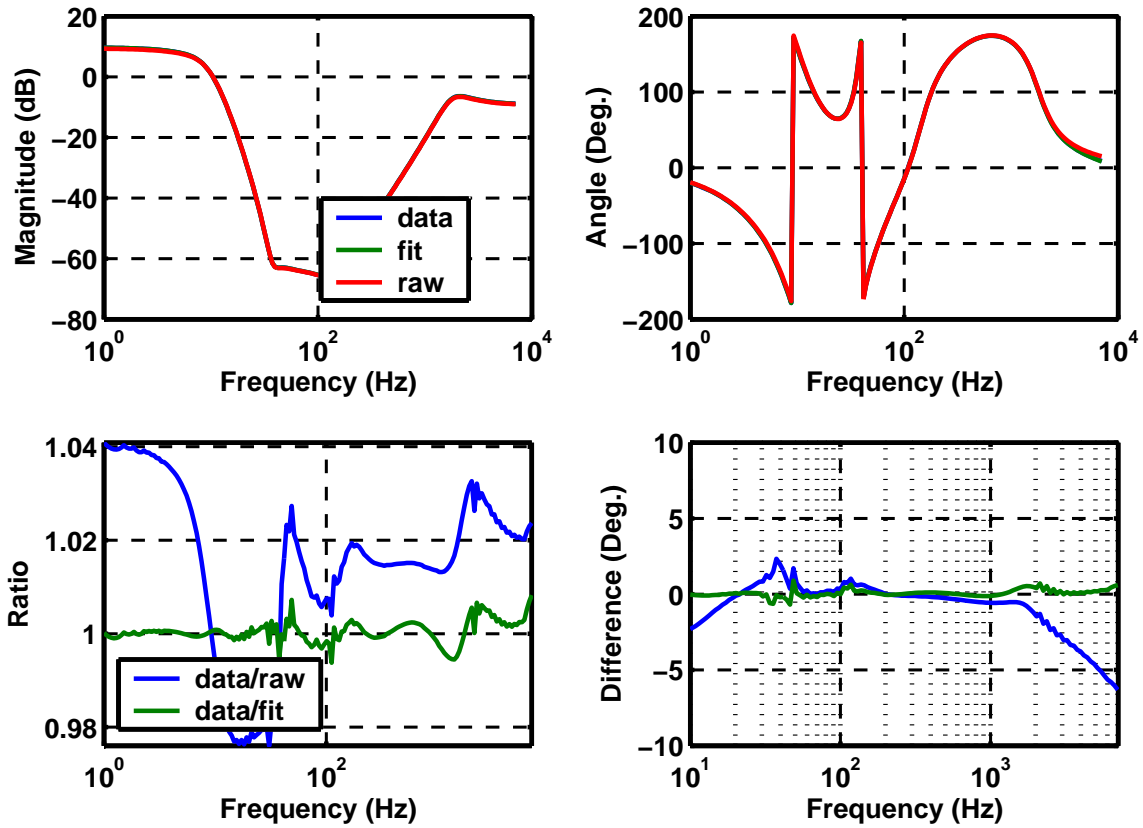
# Fit to DW 173, Channel 1



| Poles (rad.)        |           | Zeros (rad.) |           |
|---------------------|-----------|--------------|-----------|
| Real                | Imaginary | Real         | Imaginary |
| 3778.3              | 10550.96  | 309.36       | 838.91    |
| 53.46               | 63.87     | 178.81       | 285.14    |
| 28.61               | 49.04     | 31.49        | 233.38    |
| 7282.23             | -         | 2465.74      | -         |
| 34.02               | -         | 490.16       | -         |
| 396650 <sup>1</sup> | -         | -            | -         |

<sup>1</sup>Used to get a better fit to the phase. Not used in Foton.

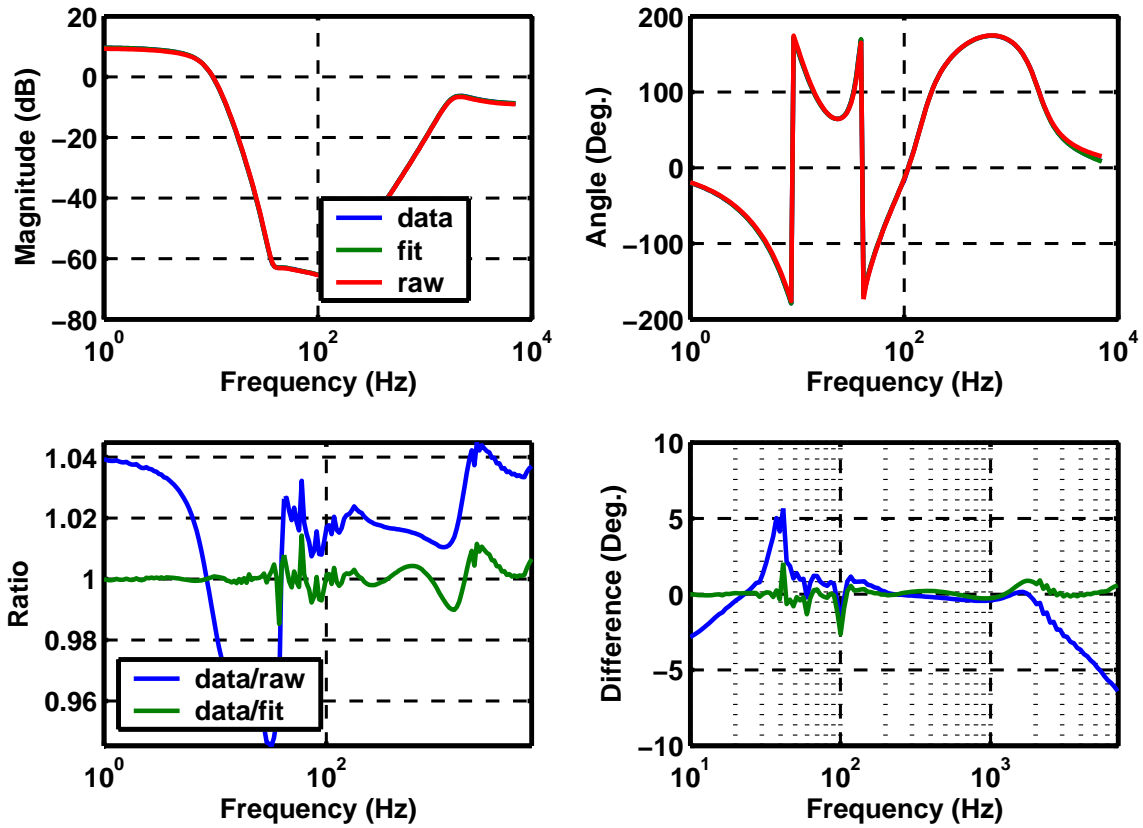
## Fit to DW 173, Channel 2



| Poles (rad.)        |           | Zeros (rad.) |           |
|---------------------|-----------|--------------|-----------|
| Real                | Imaginary | Real         | Imaginary |
| 3798.7              | 10543.77  | 307.61       | 840.95    |
| 55.63               | 61.56     | 172.40       | 290.59    |
| 28.92               | 49.70     | 31.95        | 234.60    |
| 7578.15             | -         | 2529.83      | -         |
| 35.30               | -         | 517.21       | -         |
| 362461 <sup>2</sup> | -         | -            | -         |

<sup>2</sup>Used to get a better fit to the phase. Not used in Foton.

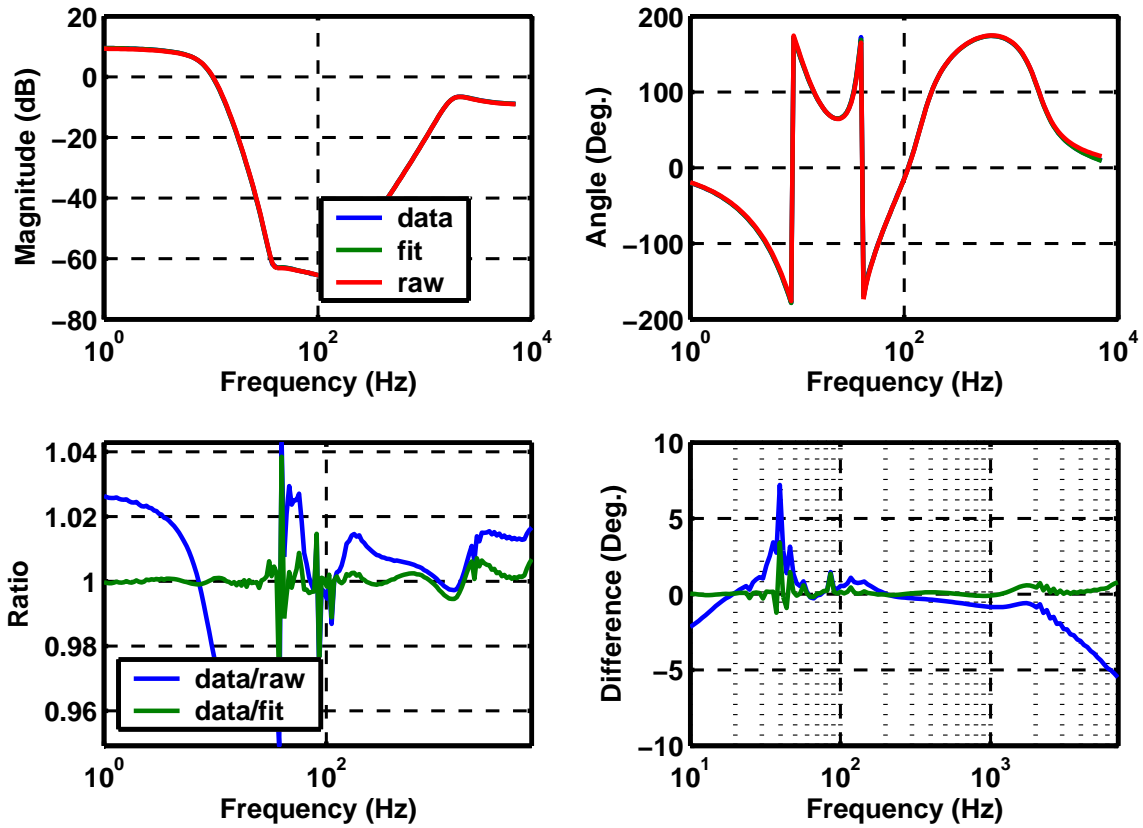
### Fit to DW 173, Channel 3



| Poles (rad.) |           | Zeros (rad.) |           |
|--------------|-----------|--------------|-----------|
| Real         | Imaginary | Real         | Imaginary |
| 3809.6       | 10539.83  | 306.21       | 842.29    |
| 53.40        | 61.27     | 170.42       | 290.32    |
| 28.91        | 49.66     | 31.53        | 233.36    |
| 7851.38      | -         | 2620.01      | -         |
| 35.10        | -         | 508.66       | -         |
| $345809^3$   | -         | -            | -         |

<sup>3</sup>Used to get a better fit to the phase. Not used in Foton.

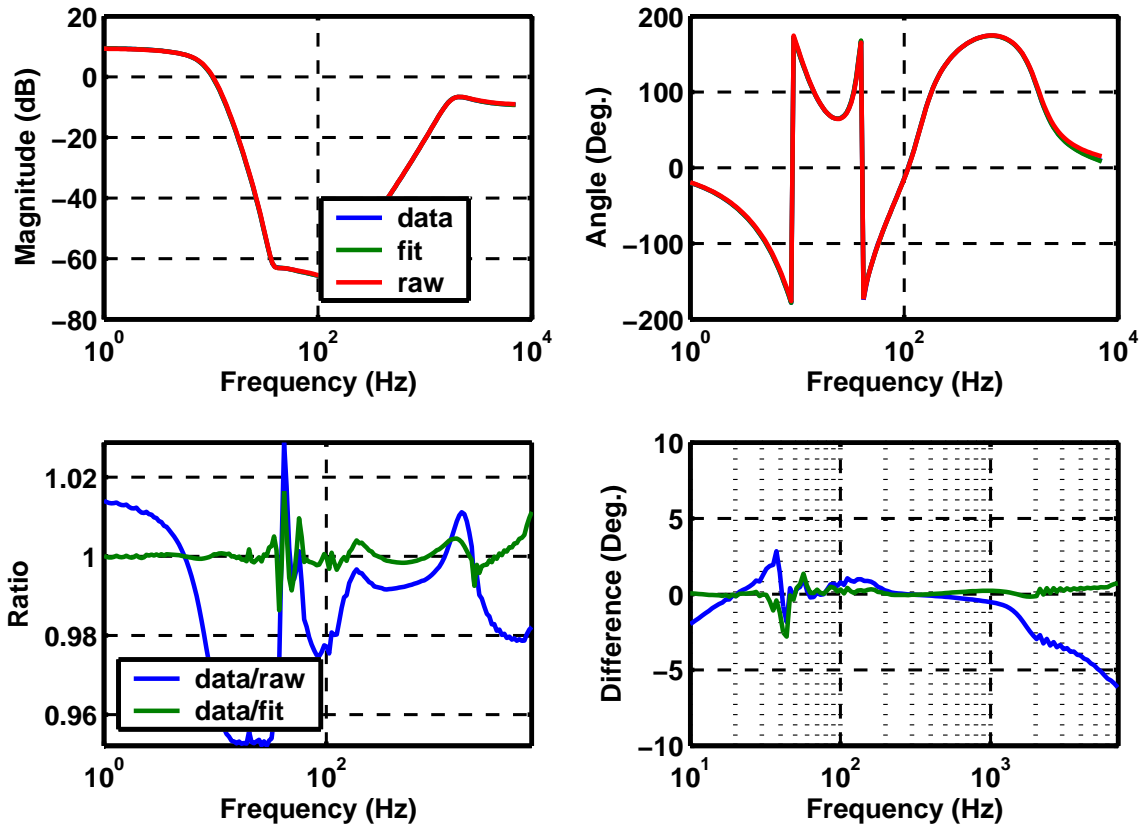
# Fit to DW 173, Channel 4



| Poles (rad.)        |           | Zeros (rad.) |           |
|---------------------|-----------|--------------|-----------|
| Real                | Imaginary | Real         | Imaginary |
| 3862.7              | 10520.61  | 307.98       | 838.42    |
| 55.83               | 61.94     | 176.65       | 291.83    |
| 28.82               | 49.68     | 31.36        | 233.88    |
| 7635.23             | -         | 2553.51      | -         |
| 34.81               | -         | 505.37       | -         |
| 386095 <sup>4</sup> | -         | -            | -         |

<sup>4</sup>Used to get a better fit to the phase. Not used in Foton.

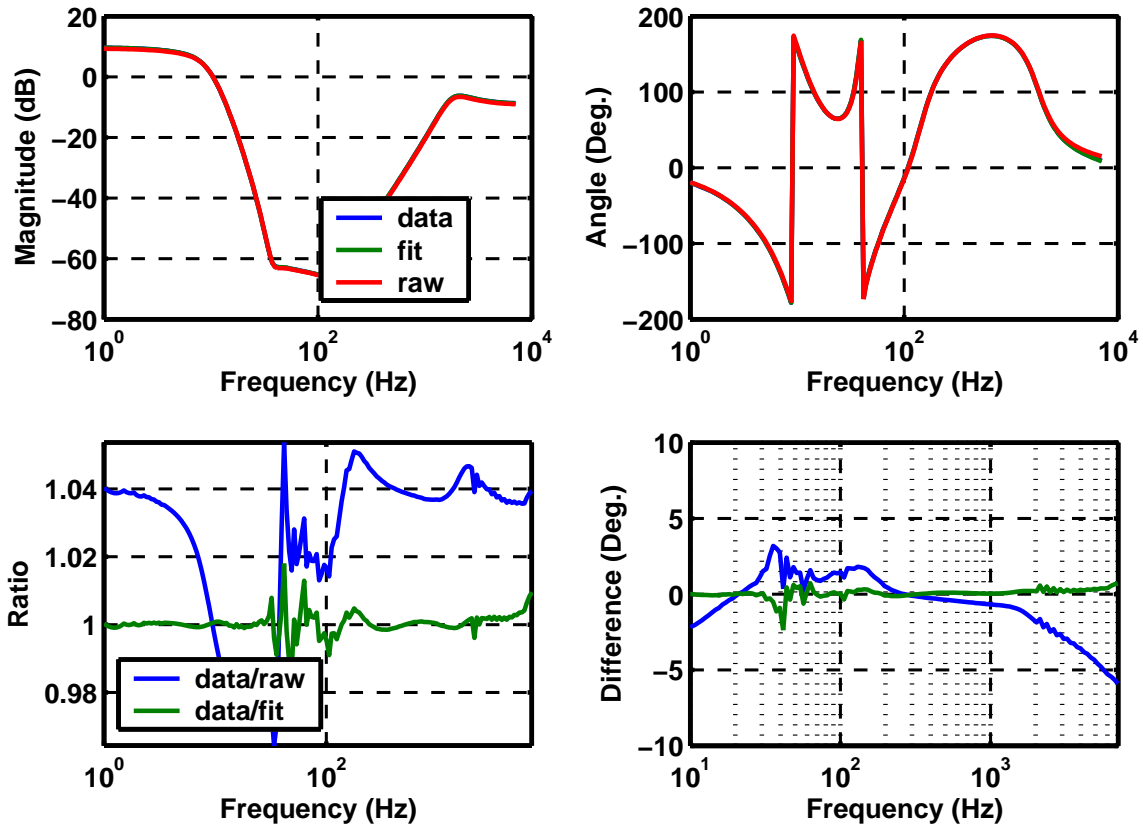
# Fit to DW 174, Channel 1



| Poles (rad.)        |           | Zeros (rad.) |           |
|---------------------|-----------|--------------|-----------|
| Real                | Imaginary | Real         | Imaginary |
| 3743.8              | 10563.21  | 309.19       | 838.38    |
| 56.26               | 61.11     | 171.71       | 293.44    |
| 29.13               | 49.91     | 32.14        | 233.72    |
| 7208.38             | -         | 2426.54      | -         |
| 35.34               | -         | 530.41       | -         |
| 393650 <sup>5</sup> | -         | -            | -         |

<sup>5</sup>Used to get a better fit to the phase. Not used in Foton.

## Fit to DW 174, Channel 2

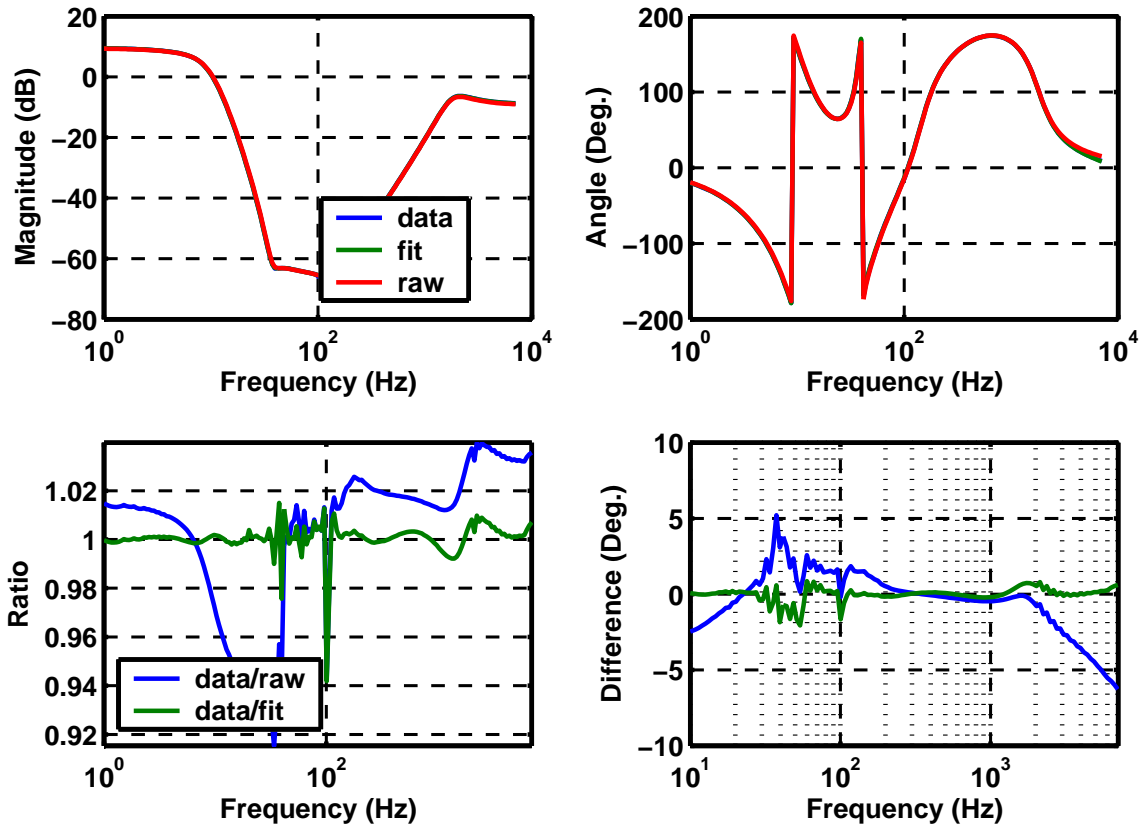


| Poles (rad.)        |           | Zeros (rad.) |           |
|---------------------|-----------|--------------|-----------|
| Real                | Imaginary | Real         | Imaginary |
| 3795.4              | 10544.92  | 307.50       | 838.15    |
| 56.00               | 61.51     | 169.84       | 293.25    |
| 28.79               | 49.90     | 31.92        | 233.47    |
| 7492.04             | -         | 2549.33      | -         |
| 35.17               | -         | 508.00       | -         |
| 386347 <sup>6</sup> | -         | -            | -         |

<sup>6</sup>Used to get a better fit to the phase. Not used in Foton.



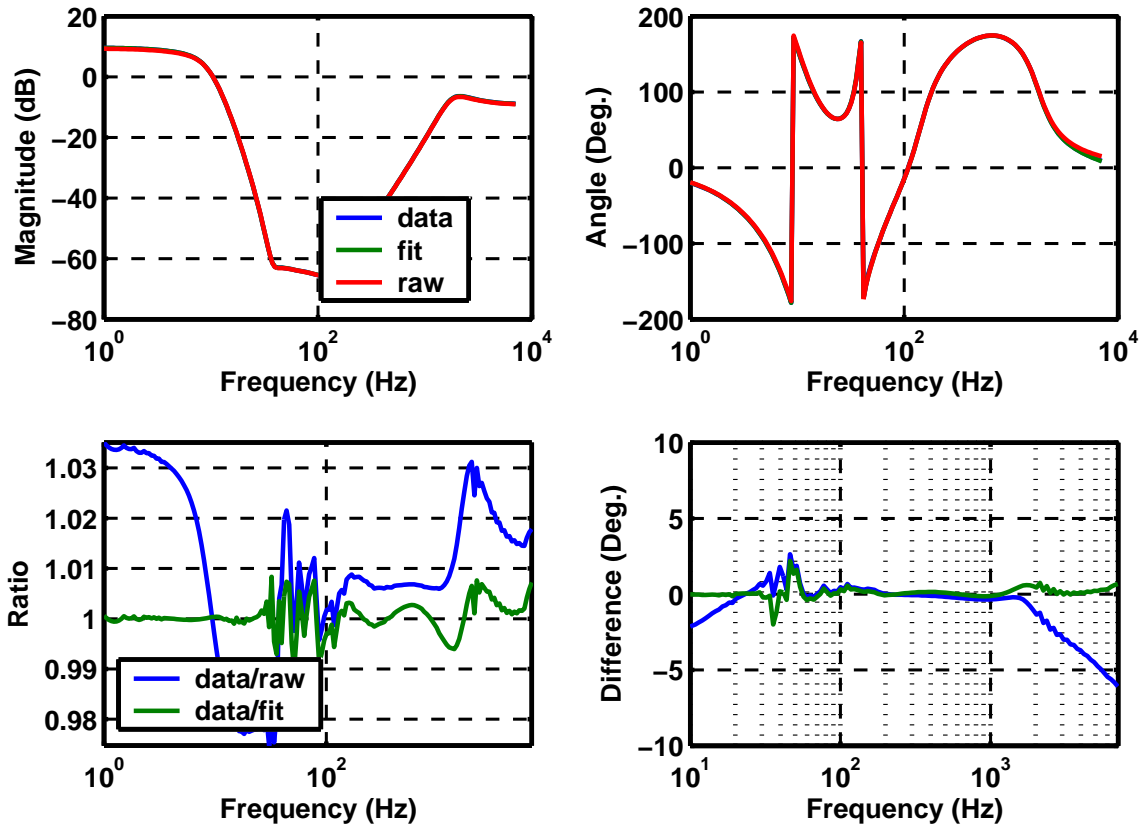
### Fit to DW 174, Channel 3



| Poles (rad.)        |           | Zeros (rad.) |           |
|---------------------|-----------|--------------|-----------|
| Real                | Imaginary | Real         | Imaginary |
| 3825.5              | 10534.19  | 308.20       | 839.16    |
| 53.34               | 63.31     | 178.37       | 287.91    |
| 28.63               | 49.04     | 30.98        | 234.17    |
| 7786.79             | -         | 2608.97      | -         |
| 34.31               | -         | 471.96       | -         |
| 350620 <sup>7</sup> | -         | -            | -         |

<sup>7</sup>Used to get a better fit to the phase. Not used in Foton.

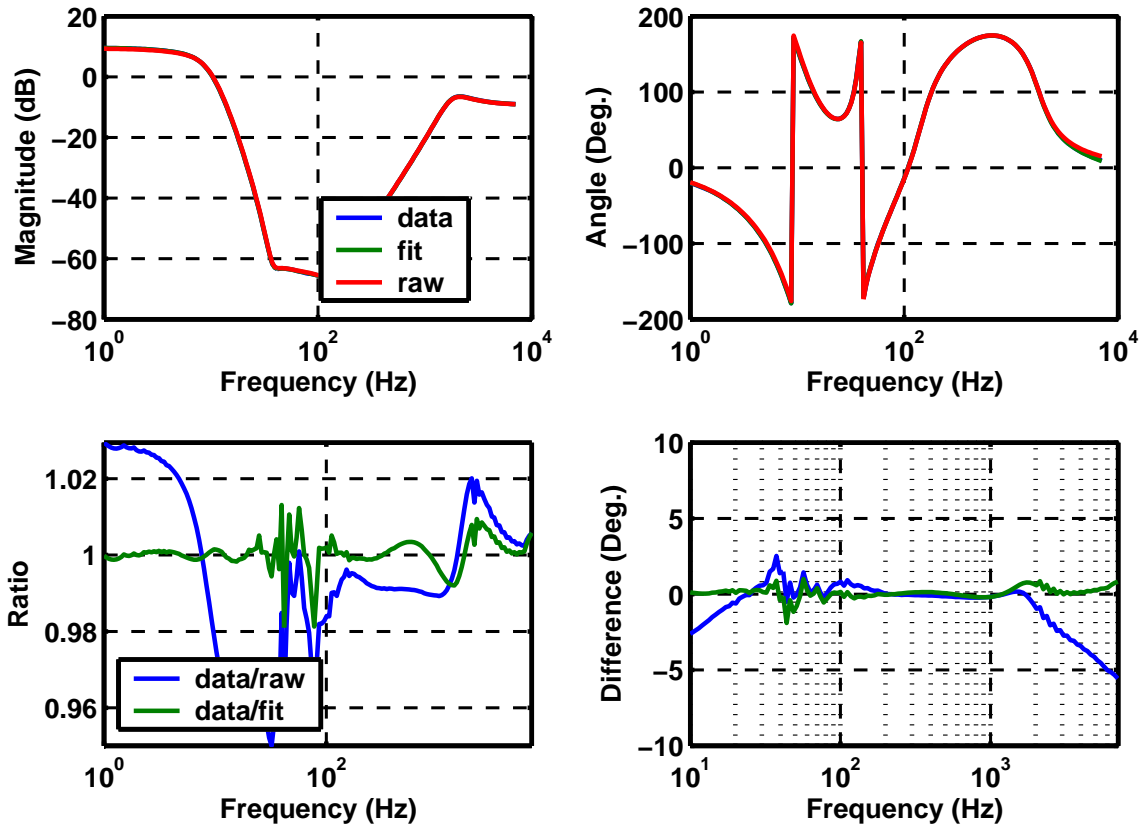
# Fit to DW 174, Channel 4



| Poles (rad.)        |           | Zeros (rad.) |           |
|---------------------|-----------|--------------|-----------|
| Real                | Imaginary | Real         | Imaginary |
| 3780.6              | 10550.23  | 309.36       | 838.91    |
| 56.24               | 60.72     | 178.81       | 285.14    |
| 28.97               | 50.11     | 31.49        | 233.38    |
| 7629.03             | -         | 2465.74      | -         |
| 35.72               | -         | 490.16       | -         |
| 370742 <sup>8</sup> | -         | -            | -         |

<sup>8</sup>Used to get a better fit to the phase. Not used in Foton.

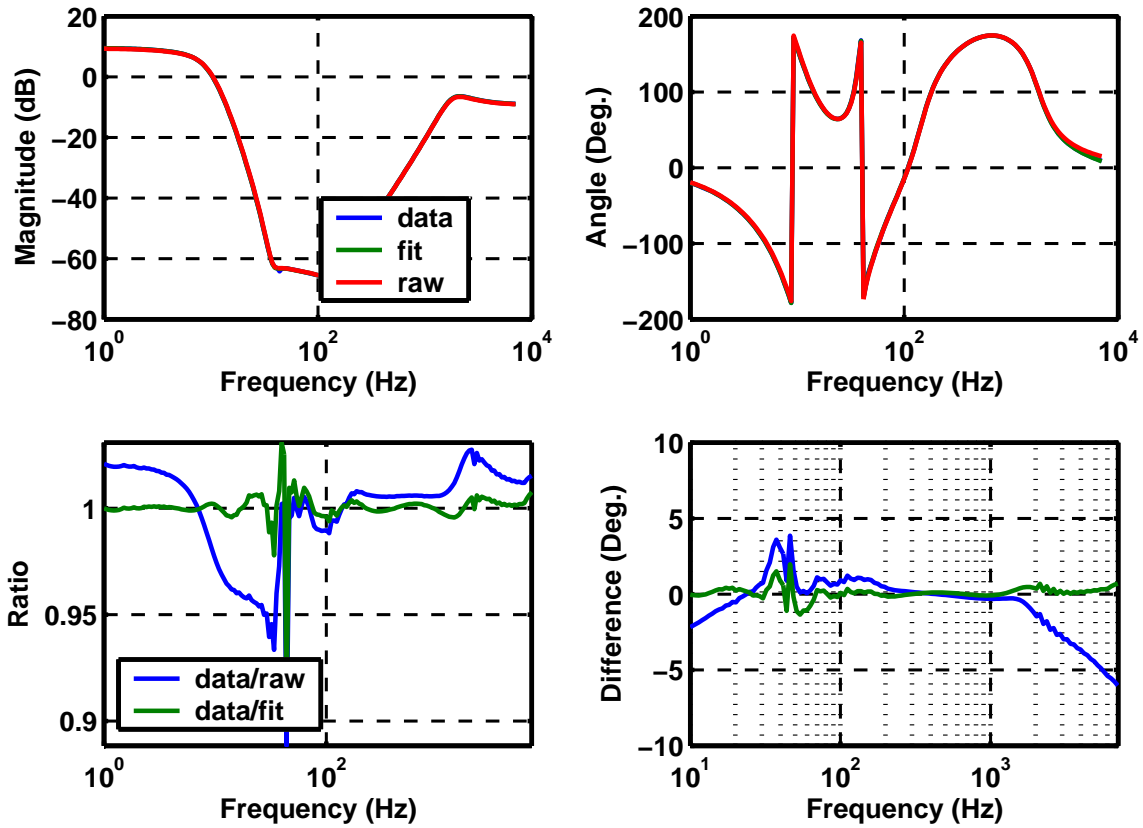
# Fit to DW 175, Channel 1



| Poles (rad.)        |           | Zeros (rad.) |           |
|---------------------|-----------|--------------|-----------|
| Real                | Imaginary | Real         | Imaginary |
| 3775.5              | 10552.26  | 309.91       | 839.88    |
| 54.30               | 62.88     | 175.94       | 290.55    |
| 28.78               | 49.19     | 31.65        | 235.13    |
| 7708.68             | -         | 2567.31      | -         |
| 34.61               | -         | 496.29       | -         |
| 388539 <sup>9</sup> | -         | -            | -         |

<sup>9</sup>Used to get a better fit to the phase. Not used in Foton.

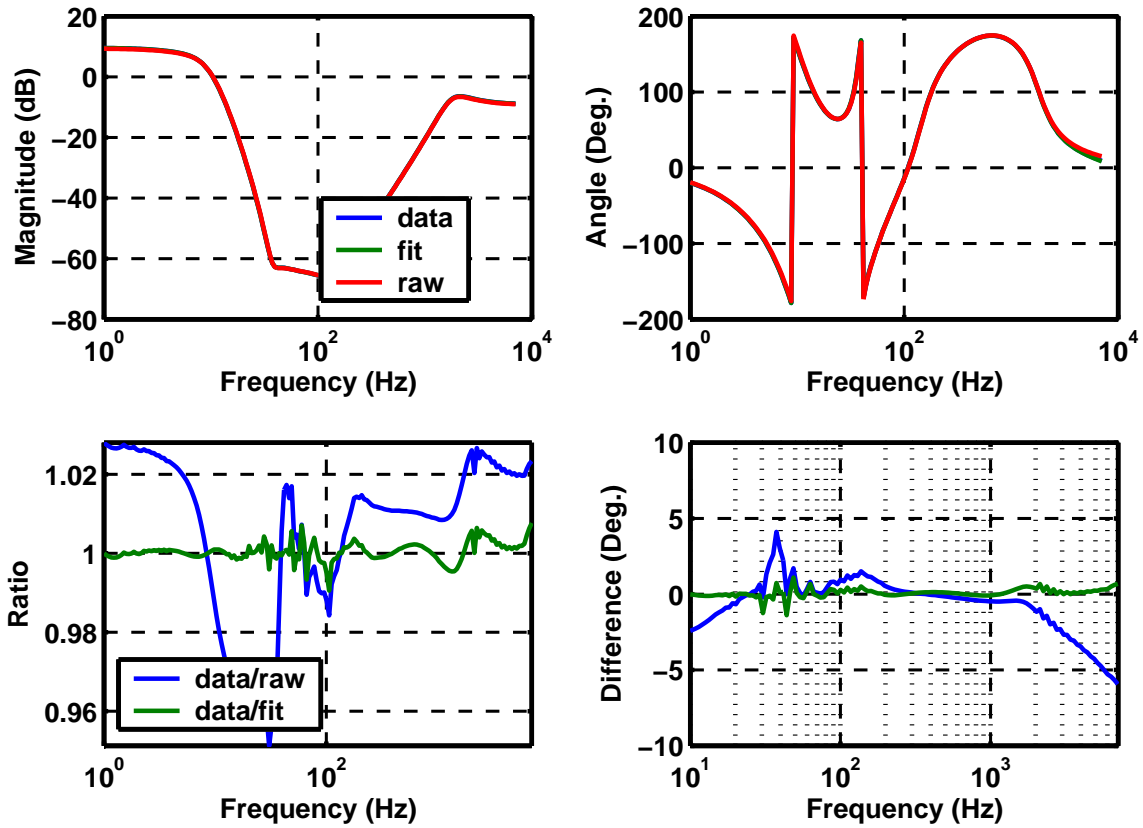
# Fit to DW 175, Channel 2



| Poles (rad.)         |           | Zeros (rad.) |           |
|----------------------|-----------|--------------|-----------|
| Real                 | Imaginary | Real         | Imaginary |
| 3779.3               | 10550.69  | 307.09       | 842.02    |
| 52.08                | 64.07     | 176.17       | 286.19    |
| 29.17                | 48.79     | 32.03        | 235.30    |
| 7617.03              | -         | 2563.49      | -         |
| 34.53                | -         | 481.84       | -         |
| 374036 <sup>10</sup> | -         | -            | -         |

<sup>10</sup>Used to get a better fit to the phase. Not used in Foton.

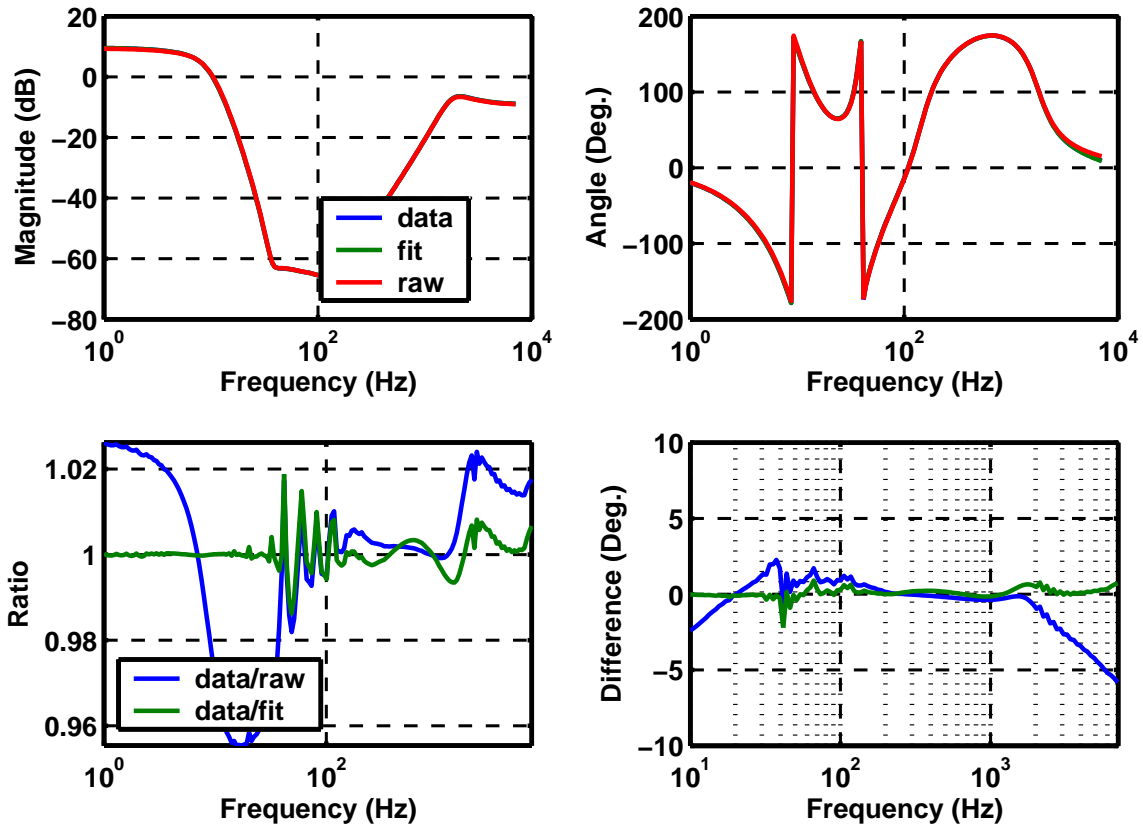
### Fit to DW 175, Channel 3



| Poles (rad.)         |           | Zeros (rad.) |           |
|----------------------|-----------|--------------|-----------|
| Real                 | Imaginary | Real         | Imaginary |
| 3819.3               | 10536.39  | 305.40       | 839.80    |
| 55.43                | 62.12     | 171.98       | 292.93    |
| 28.64                | 49.72     | 31.95        | 233.75    |
| 7652.63              | -         | 2561.24      | -         |
| 34.96                | -         | 506.18       | -         |
| 371557 <sup>11</sup> | -         | -            | -         |

<sup>11</sup>Used to get a better fit to the phase. Not used in Foton.

# Fit to DW 175, Channel 4



| Poles (rad.)         |           | Zeros (rad.) |           |
|----------------------|-----------|--------------|-----------|
| Real                 | Imaginary | Real         | Imaginary |
| 3805.3               | 10541.36  | 306.50       | 842.52    |
| 56.28                | 60.36     | 168.49       | 290.70    |
| 29.15                | 49.91     | 32.38        | 234.68    |
| 7734.04              | -         | 2583.54      | -         |
| 35.54                | -         | 519.05       | -         |
| 374384 <sup>12</sup> | -         | -            | -         |

<sup>12</sup>Used to get a better fit to the phase. Not used in Foton.

## **A MATLAB scripts**