

## PCAL End Station Measurement Trends

## TXWS

Date None  $\pm$  SD\_None

|           |                      |
|-----------|----------------------|
| D20230110 | -1.0825 $\pm$ 0.0005 |
| D20230206 | -1.0819 $\pm$ 0.0005 |
| D20230207 | -1.0819 $\pm$ 0.0005 |
| D20230227 | -1.0824 $\pm$ 0.0004 |
| D20230228 | -1.0824 $\pm$ 0.0004 |
| D20230314 | -1.0822 $\pm$ 0.0004 |
| D20230404 | -1.0818 $\pm$ 0.0005 |
| D20230613 | -1.0810 $\pm$ 0.0004 |
| D20230821 | -1.0810 $\pm$ 0.0004 |
| D20230822 | -1.0821 $\pm$ 0.0004 |
| D20231031 | -1.0827 $\pm$ 0.0005 |
| D20231205 | -1.0824 $\pm$ 0.0004 |
| D20240229 | -1.0776 $\pm$ 0.0006 |
| D20240423 | -1.0760 $\pm$ 0.0005 |
| D20240702 | -1.0769 $\pm$ 0.0009 |
| D20240730 | -1.0765 $\pm$ 0.0006 |
| D20240924 | -1.0773 $\pm$ 0.0006 |
| D20241126 | -1.0777 $\pm$ 0.0006 |
| D20250128 | -1.0777 $\pm$ 0.0006 |
| D20250325 | -1.0784 $\pm$ 0.0006 |
| D20250701 | -1.0774 $\pm$ 0.0006 |
| D20250819 | -1.0774 $\pm$ 0.0005 |
| D20251104 | -1.0783 $\pm$ 0.0005 |
| D20260127 | -1.0779 $\pm$ 0.0005 |

## Description:

## Tx/WS ratio:

This ratio,  $\alpha_{TW}$ , is the Tx to Working Standard output with the backgrounds subtracted and is made using M1 - M7

## TXWS

Summary of TS / WS ratio

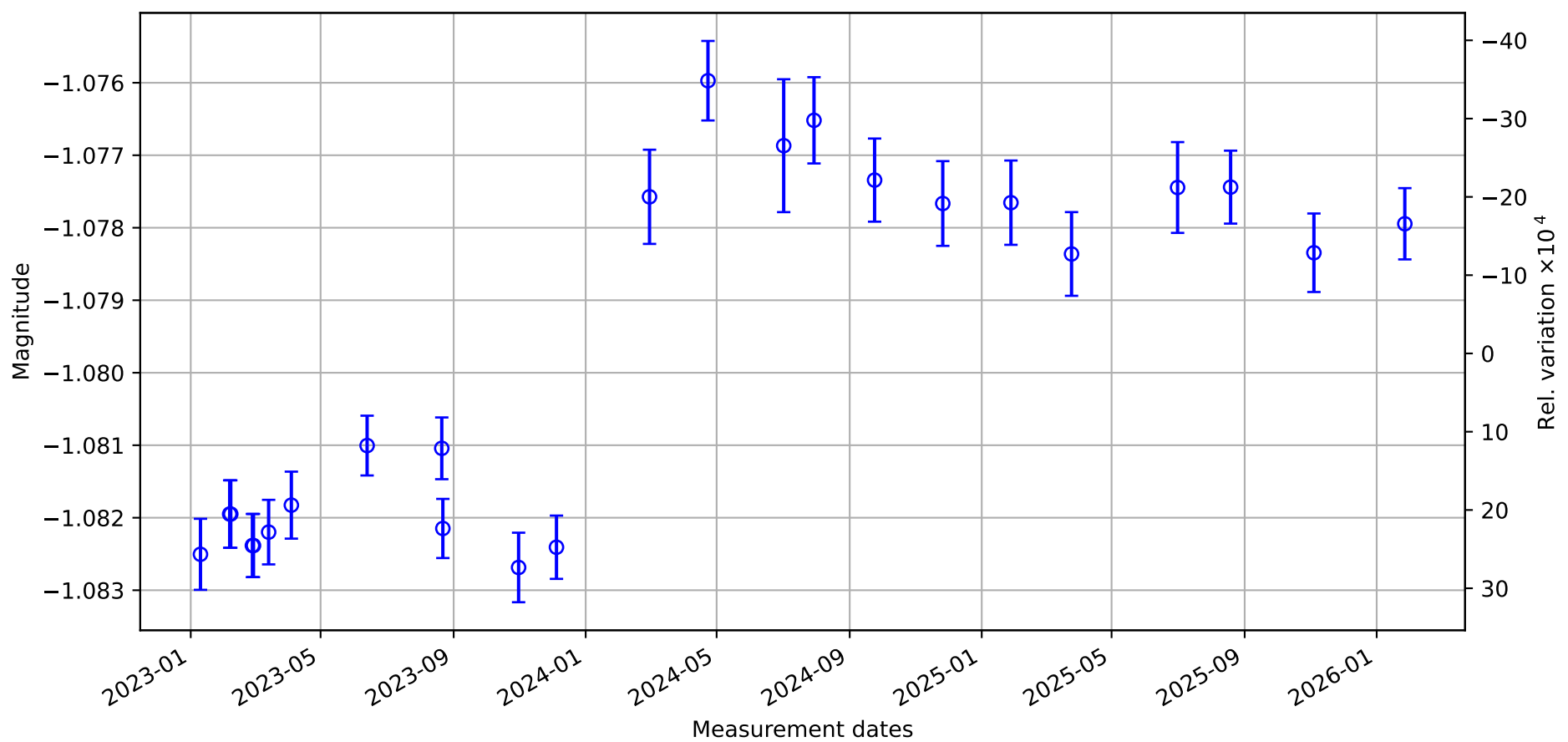
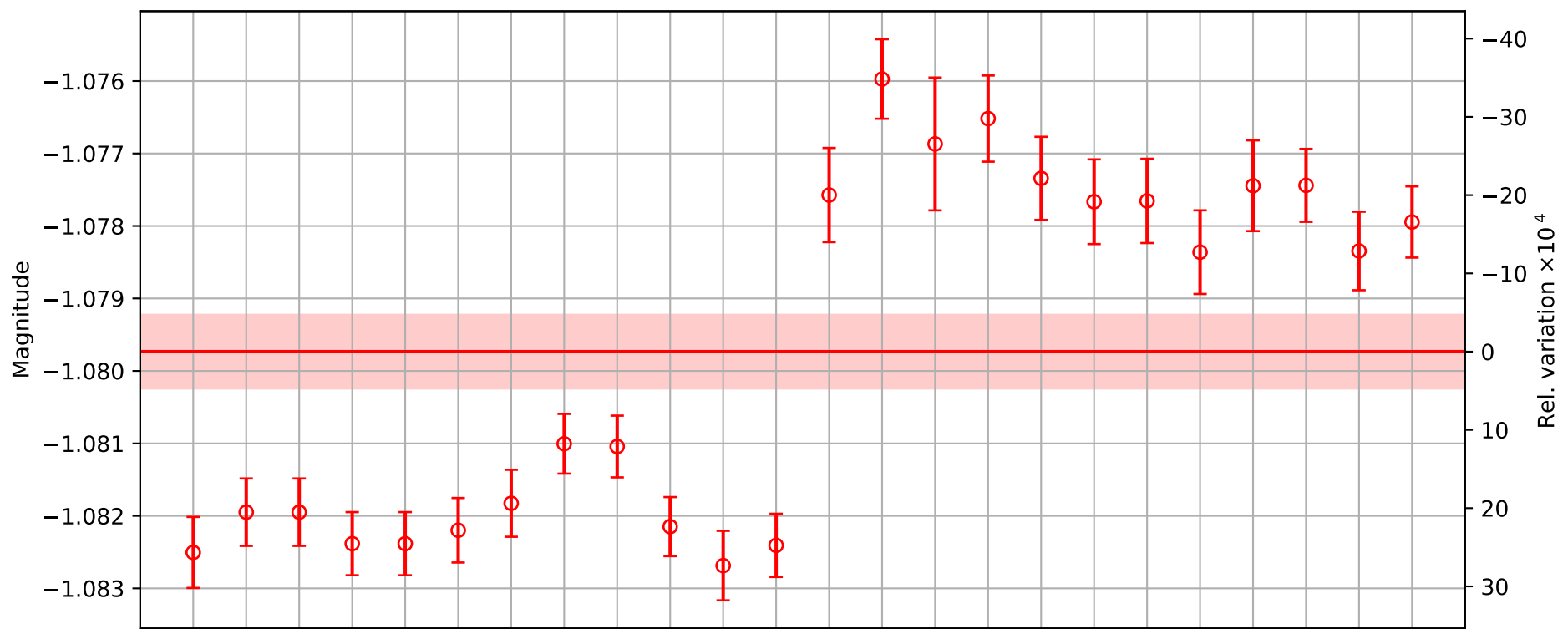
Mean value: -1.079734

Standard deviation: 0.002434

Standard error: 0.000507

Relative Standard error: -0.000470

# TS / WS ratio



# RXWS

Date None  $\pm$  SD\_None

|           |                      |
|-----------|----------------------|
| D20230110 | -1.3881 $\pm$ 0.0004 |
| D20230206 | -1.3873 $\pm$ 0.0004 |
| D20230207 | -1.3873 $\pm$ 0.0004 |
| D20230227 | -1.3886 $\pm$ 0.0004 |
| D20230228 | -1.3886 $\pm$ 0.0004 |
| D20230314 | -1.3889 $\pm$ 0.0003 |
| D20230404 | -1.3882 $\pm$ 0.0003 |
| D20230613 | -1.3866 $\pm$ 0.0004 |
| D20230821 | -1.3863 $\pm$ 0.0004 |
| D20230822 | -1.3874 $\pm$ 0.0004 |
| D20231031 | -1.3900 $\pm$ 0.0004 |
| D20231205 | -1.3897 $\pm$ 0.0004 |
| D20240229 | -1.3905 $\pm$ 0.0005 |
| D20240423 | -1.3913 $\pm$ 0.0005 |
| D20240702 | -1.3901 $\pm$ 0.0008 |
| D20240730 | -1.3895 $\pm$ 0.0006 |
| D20240924 | -1.3904 $\pm$ 0.0006 |
| D20241126 | -1.3920 $\pm$ 0.0006 |
| D20250128 | -1.3920 $\pm$ 0.0006 |
| D20250325 | -1.3918 $\pm$ 0.0006 |
| D20250701 | -1.3911 $\pm$ 0.0006 |
| D20250819 | -1.3912 $\pm$ 0.0005 |
| D20251104 | -1.3929 $\pm$ 0.0006 |
| D20260127 | -1.3936 $\pm$ 0.0006 |

## Description:

Rx/WS ratio

This ratio,  $\alpha_{RW}$ , is the Rx to Working Standard output with the backgrounds subtracted and is made using M7 - M9.

# RXWS

Summary of RX / WS ratio

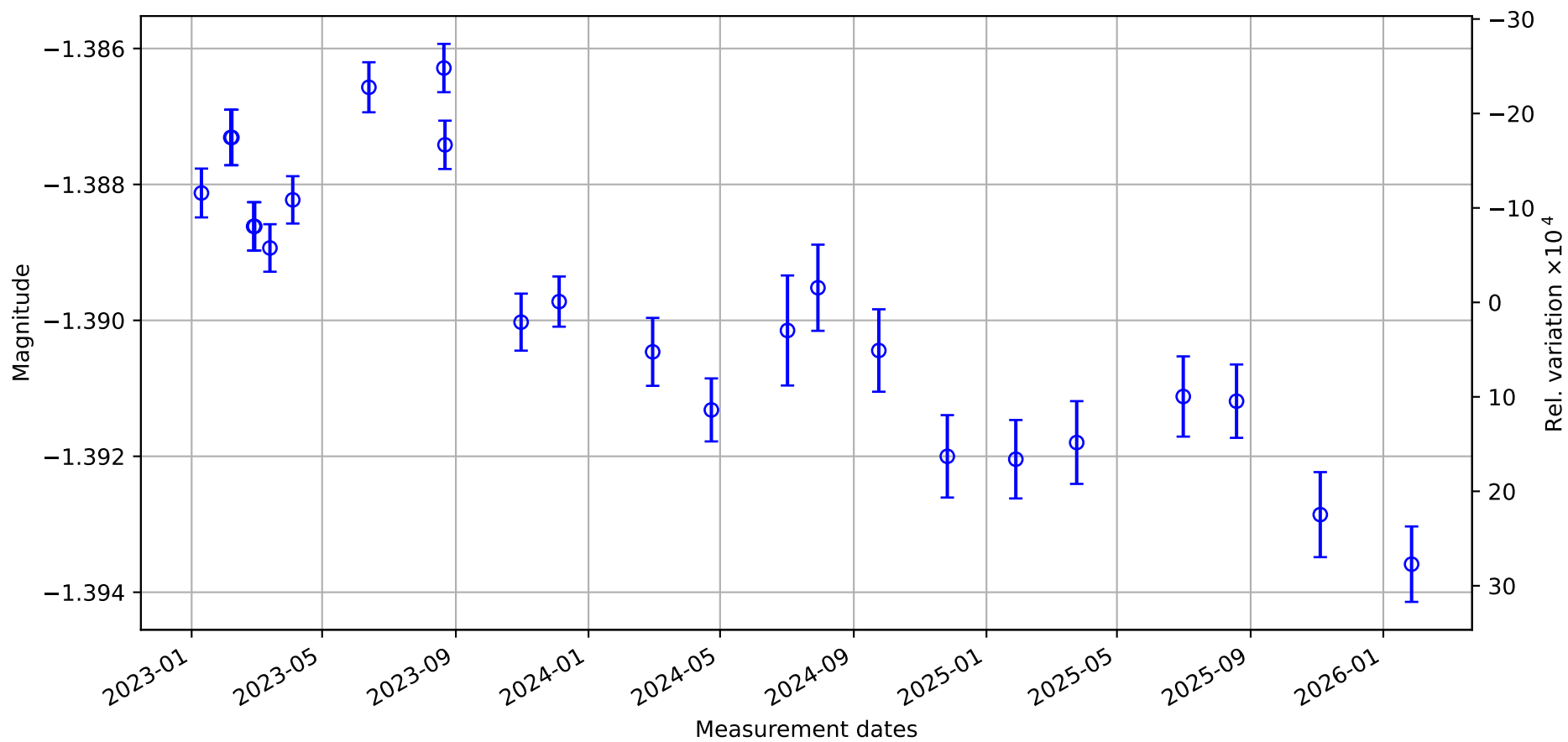
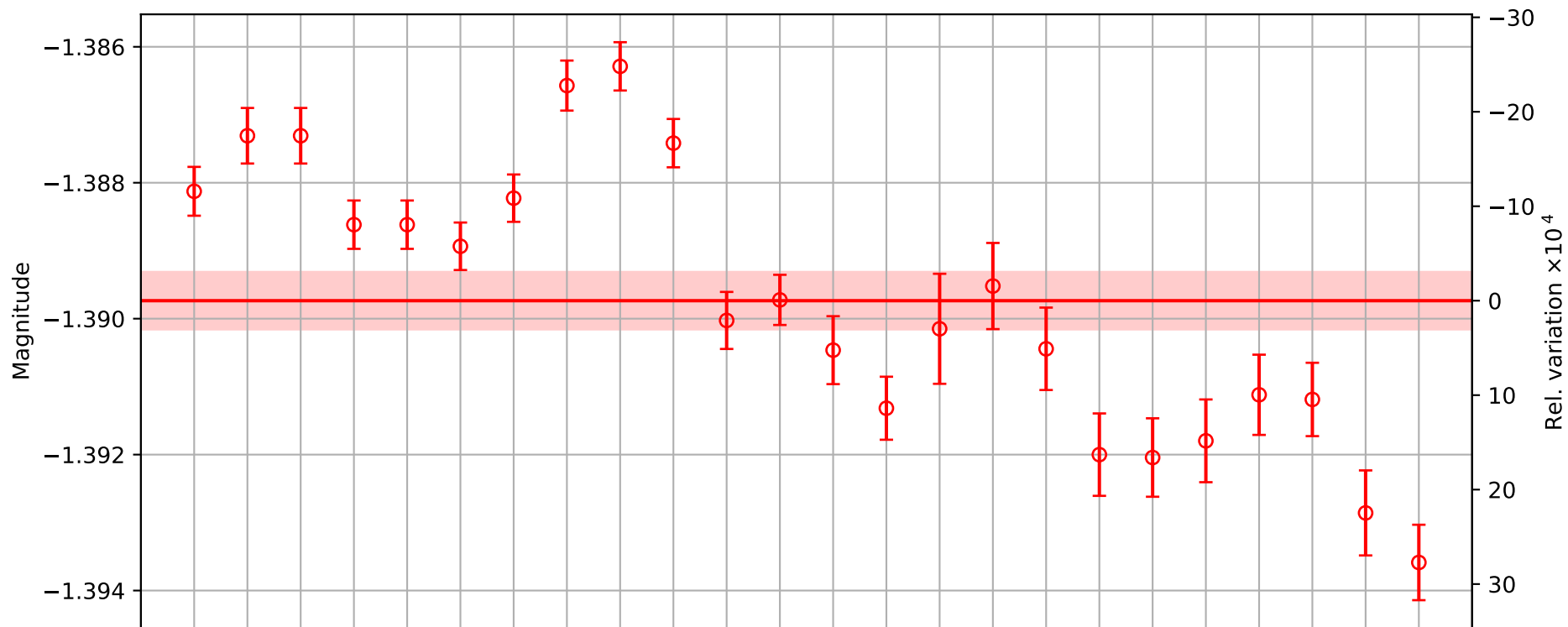
Mean value: -1.389735

Standard deviation: 0.002024

Standard error: 0.000422

Relative Standard error: -0.000304

# RX / WS ratio



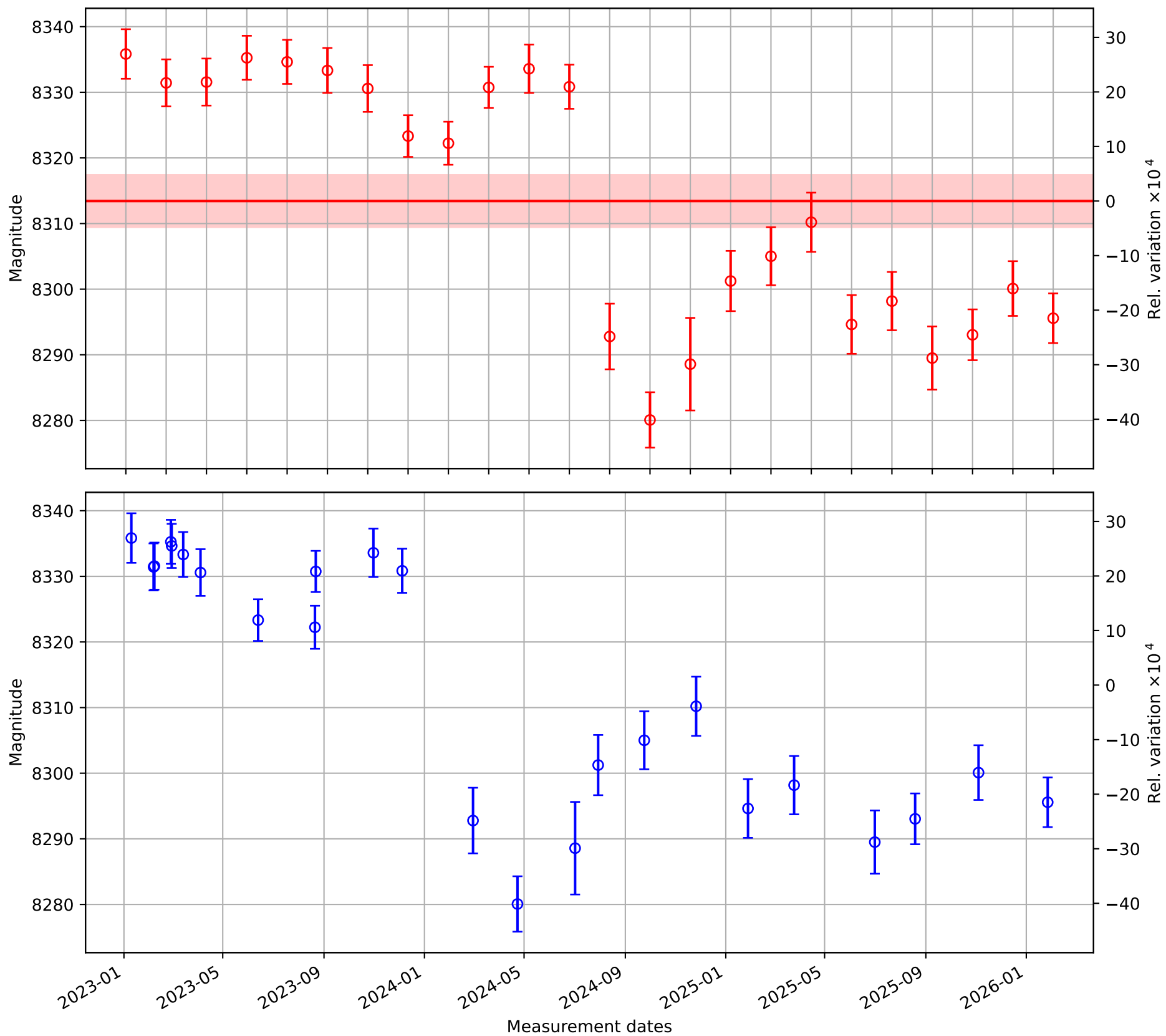
|                 | rho_T              |
|-----------------|--------------------|
| Date m5 ± SD_m5 |                    |
| D20230110       | 8335.8363 ± 3.7737 |
| D20230206       | 8331.4346 ± 3.5832 |
| D20230207       | 8331.5608 ± 3.5832 |
| D20230227       | 8335.2565 ± 3.3557 |
| D20230228       | 8334.6371 ± 3.3555 |
| D20230314       | 8333.3272 ± 3.4285 |
| D20230404       | 8330.5796 ± 3.5576 |
| D20230613       | 8323.3328 ± 3.1747 |
| D20230821       | 8322.2378 ± 3.2788 |
| D20230822       | 8330.7448 ± 3.1393 |
| D20231031       | 8333.5847 ± 3.6905 |
| D20231205       | 8330.8458 ± 3.3593 |
| D20240229       | 8292.7841 ± 4.9992 |
| D20240423       | 8280.0701 ± 4.2208 |
| D20240702       | 8288.5717 ± 7.0540 |
| D20240730       | 8301.2386 ± 4.5879 |
| D20240924       | 8305.0146 ± 4.4201 |
| D20241126       | 8310.1994 ± 4.5070 |
| D20250128       | 8294.6229 ± 4.4760 |
| D20250325       | 8298.1767 ± 4.4438 |
| D20250701       | 8289.5025 ± 4.8182 |
| D20250819       | 8293.0446 ± 3.8730 |
| D20251104       | 8300.0920 ± 4.1682 |
| D20260127       | 8295.5749 ± 3.7830 |

### Description:

TX Responsivity rho\_T:  $\rho_{Tx} = \alpha_{TW} * \rho_{WS}$  The responsivity of the TxPD, calculated using  $\rho_{WS}$ . Trending this parameter is useful in determining if there has been a change in the input Laser Power and for estimating how much power is incident on the ETM once corrected for optical losses inside the vacuum chamber.

| rho_T                             |
|-----------------------------------|
| Summary of TX Responsivity rho_T  |
| Mean value: 8313.427922           |
| Standard deviation: 19.126770     |
| Standard error: 3.987286          |
| Relative Standard error: 0.000480 |

# TX Responsivity $\rho_T$



|           | rho_R               |
|-----------|---------------------|
| Date      | None ± SD_None      |
| D20230110 | 10689.2786 ± 2.7664 |
| D20230206 | 10682.8253 ± 3.1470 |
| D20230207 | 10682.9872 ± 3.1471 |
| D20230227 | 10693.5125 ± 2.7393 |
| D20230228 | 10692.7178 ± 2.7391 |
| D20230314 | 10695.3109 ± 2.6911 |
| D20230404 | 10690.0120 ± 2.6817 |
| D20230613 | 10676.0753 ± 2.8342 |
| D20230821 | 10672.1188 ± 2.7358 |
| D20230822 | 10680.8116 ± 2.7371 |
| D20231031 | 10699.2242 ± 3.2295 |
| D20231205 | 10696.1371 ± 2.8415 |
| D20240229 | 10700.7205 ± 3.8462 |
| D20240423 | 10706.7924 ± 3.5673 |
| D20240702 | 10699.8690 ± 6.2313 |
| D20240730 | 10714.8547 ± 4.8884 |
| D20240924 | 10718.6424 ± 4.6756 |
| D20241126 | 10734.1288 ± 4.6754 |
| D20250128 | 10714.4497 ± 4.4426 |
| D20250325 | 10710.1187 ± 4.6850 |
| D20250701 | 10702.8135 ± 4.5407 |
| D20250819 | 10707.9670 ± 4.1548 |
| D20251104 | 10720.9199 ± 4.8150 |
| D20260127 | 10724.6672 ± 4.2715 |

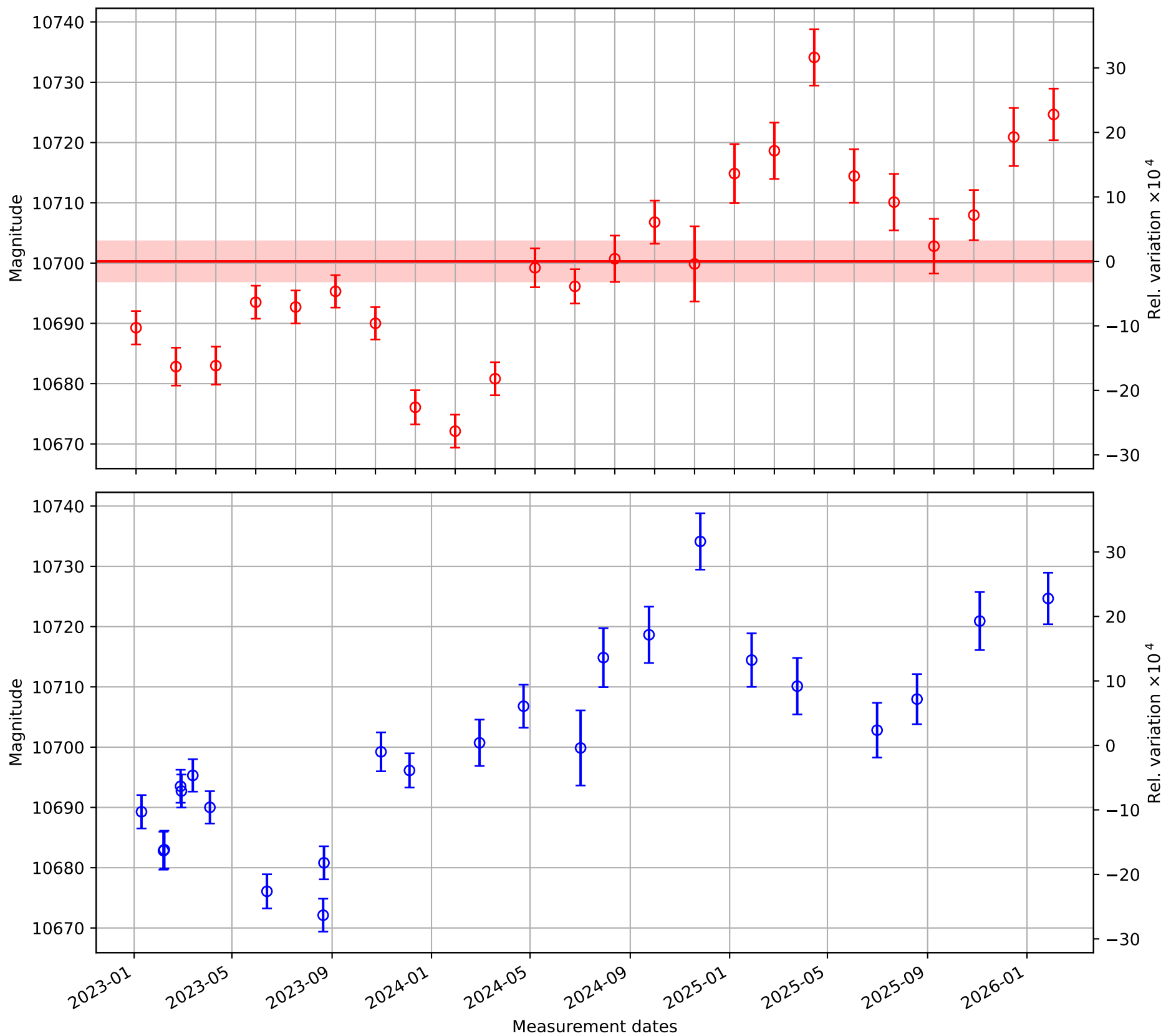
| rho_R                             |
|-----------------------------------|
| Summary of RX Responsivity rho_R  |
| Mean value: 10700.289786          |
| Standard deviation: 15.956471     |
| Standard error: 3.326386          |
| Relative Standard error: 0.000311 |

Description:

RX Responsivity rho\_R:  $p_{Rx} = \alpha_{RW} * p_{WS}$  The responsivity of the RxPD, calculated using pWS. Trending this parameter is useful in estimating how much power is incident on the ETM once corrected for optical losses inside the vacuum chamber.



# RX Responsivity $\rho_R$



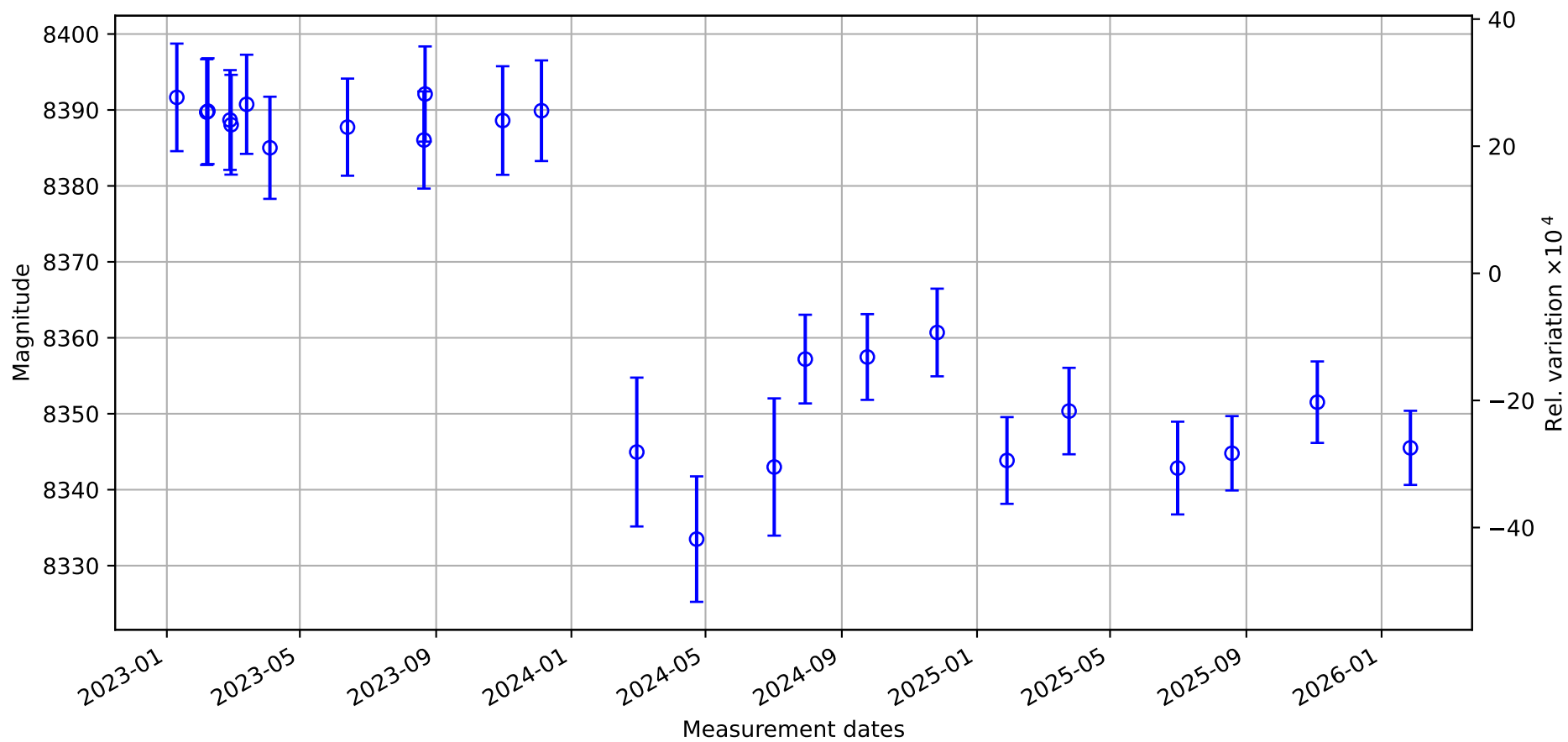
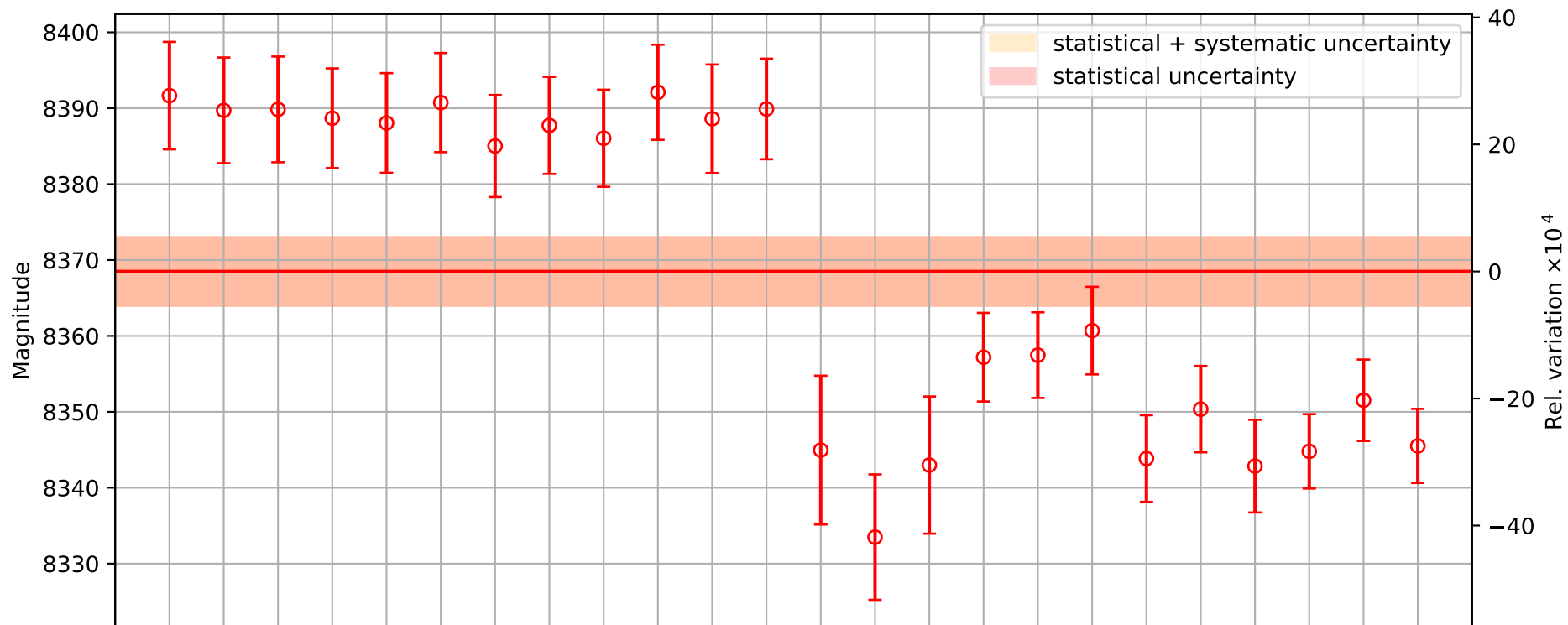
|           | rhoT_prime         |
|-----------|--------------------|
| Date      | None ± SD_None     |
| D20230110 | 8391.6574 ± 7.0818 |
| D20230206 | 8389.7169 ± 6.9611 |
| D20230207 | 8389.8439 ± 6.9612 |
| D20230227 | 8388.6783 ± 6.5688 |
| D20230228 | 8388.0549 ± 6.5683 |
| D20230314 | 8390.7454 ± 6.5279 |
| D20230404 | 8385.0193 ± 6.7238 |
| D20230613 | 8387.7359 ± 6.3941 |
| D20230821 | 8386.0437 ± 6.3956 |
| D20230822 | 8392.0998 ± 6.2670 |
| D20231031 | 8388.6083 ± 7.1489 |
| D20231205 | 8389.8996 ± 6.6251 |
| D20240229 | 8344.9589 ± 9.7997 |
| D20240423 | 8333.4924 ± 8.2620 |
| D20240702 | 8342.9862 ± 9.0346 |
| D20240730 | 8357.1960 ± 5.8391 |
| D20240924 | 8357.4704 ± 5.6429 |
| D20241126 | 8360.7000 ± 5.7712 |
| D20250128 | 8343.8479 ± 5.7107 |
| D20250325 | 8350.3545 ± 5.6914 |
| D20250701 | 8342.8482 ± 6.1068 |
| D20250819 | 8344.7947 ± 4.8963 |
| D20251104 | 8351.5242 ± 5.3638 |
| D20260127 | 8345.5094 ± 4.8815 |

### Description:

Tx Responsivity Corrected for Optical Efficiency:  
 $\rho_{Tx}' = \rho_{Tx} * ET$   
 Rho\_Tx^Prime is the estimated responsivity of the Tx integrating sphere if the Tx Sphere were to be located at ETM. This provides a nice sanity check for the Rx Sphere, which historically has been the main sensor for calibration.

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 Summary of Tx Responsivity Corrected  
 for Optical Efficiency  
 Mean value: 8368.491076  
 Standard deviation: 21.680442  
 Standard error: 4.519640  
 Relative Standard error: 0.000540

# Tx Responsivity Corrected for Optical Efficiency



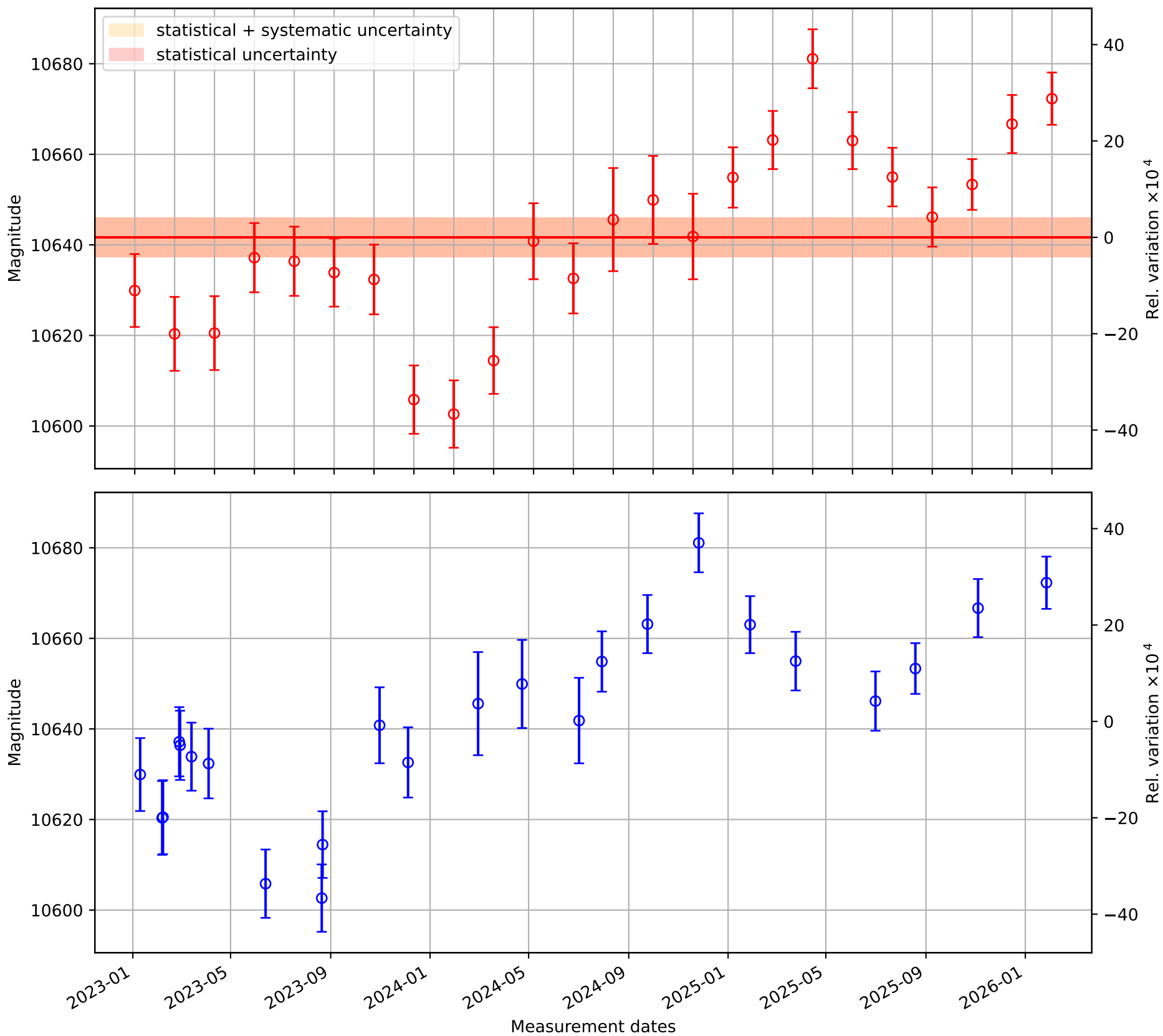
|           | rhoR_prime           |
|-----------|----------------------|
| Date      | None ± SD_None       |
| D20230110 | 10629.9242 ± 8.0551  |
| D20230206 | 10620.3530 ± 8.1594  |
| D20230207 | 10620.5139 ± 8.1595  |
| D20230227 | 10637.1713 ± 7.6462  |
| D20230228 | 10636.3809 ± 7.6456  |
| D20230314 | 10633.8774 ± 7.5141  |
| D20230404 | 10632.3603 ± 7.6934  |
| D20230613 | 10605.8257 ± 7.5452  |
| D20230821 | 10602.6395 ± 7.4380  |
| D20230822 | 10614.4571 ± 7.3641  |
| D20231031 | 10640.8070 ± 8.3872  |
| D20231205 | 10632.6039 ± 7.7518  |
| D20240229 | 10645.5847 ± 11.3904 |
| D20240423 | 10649.9286 ± 9.7264  |
| D20240702 | 10641.8462 ± 9.4440  |
| D20240730 | 10654.8891 ± 6.6613  |
| D20240924 | 10663.1539 ± 6.4237  |
| D20241126 | 10681.0993 ± 6.5151  |
| D20250128 | 10663.0264 ± 6.3007  |
| D20250325 | 10654.9740 ± 6.4735  |
| D20250701 | 10646.1462 ± 6.5451  |
| D20250819 | 10653.3380 ± 5.6041  |
| D20251104 | 10666.6871 ± 6.4178  |
| D20260127 | 10672.2946 ± 5.7749  |

## Description:

Rx Responsivity Corrected for Optical Efficiency:  
 $\rho_{Rx}' = \rho_{Rx} / ER$   
 Rho\_Rx^Prime is the estimated responsivity of the Rx integrating sphere if the Rx Sphere were to be located at ETM.

-----  
 Summary of Rx Responsivity Corrected  
 for Optical Efficiency  
 Mean value: 10641.661762  
 Standard deviation: 20.317874  
 Standard error: 4.235591  
 Relative Standard error: 0.000398

# Rx Responsivity Corrected for Optical Efficiency



|           | WS                   |
|-----------|----------------------|
| Date      | WS $\pm$ SD_WS       |
| D20230110 | -4.7051 $\pm$ 0.0000 |
| D20230206 | -4.7051 $\pm$ 0.0000 |
| D20230207 | -4.7051 $\pm$ 0.0000 |
| D20230227 | -4.7051 $\pm$ 0.0000 |
| D20230228 | -4.7051 $\pm$ 0.0000 |
| D20230314 | -4.7051 $\pm$ 0.0000 |
| D20230404 | -4.7051 $\pm$ 0.0000 |
| D20230613 | -4.7051 $\pm$ 0.0000 |
| D20230821 | -4.7051 $\pm$ 0.0000 |
| D20230822 | -4.7051 $\pm$ 0.0000 |
| D20231031 | -4.7051 $\pm$ 0.0000 |
| D20231205 | -4.7051 $\pm$ 0.0000 |
| D20240229 | -4.7051 $\pm$ 0.0000 |
| D20240423 | -4.7051 $\pm$ 0.0000 |
| D20240702 | -4.7023 $\pm$ 0.0000 |
| D20240730 | -4.7113 $\pm$ 0.0000 |
| D20240924 | -4.7098 $\pm$ 0.0000 |
| D20241126 | -4.7114 $\pm$ 0.0000 |
| D20250128 | -4.7024 $\pm$ 0.0000 |
| D20250325 | -4.7016 $\pm$ 0.0000 |
| D20250701 | -4.7005 $\pm$ 0.0000 |
| D20250819 | -4.7022 $\pm$ 0.0000 |
| D20251104 | -4.7018 $\pm$ 0.0000 |
| D20260127 | -4.7018 $\pm$ 0.0000 |

## Description:

WS

WS is the Working standard Responsivity as measured from the Gold standard in the lab.

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 Summary of Working Standard  
 Responsivity rho\_WS

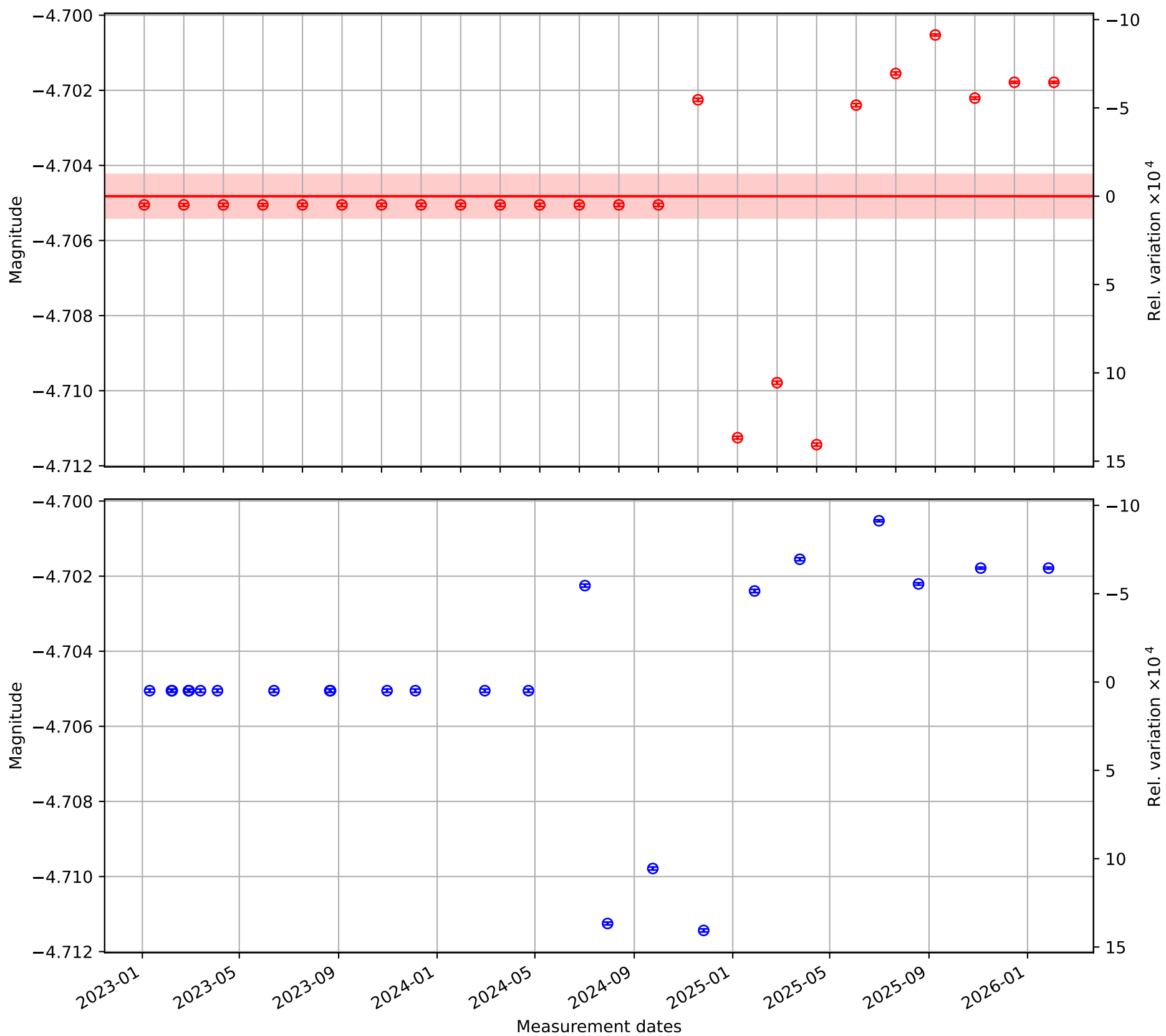
Mean value: -4.704820

Standard deviation: 0.002777

Standard error: 0.000579

Relative Standard error: -0.000123

# Working Standard Responsivity rho\_WS



|           | Date | $e_i \pm SD_{e_i}$  |
|-----------|------|---------------------|
| D20230110 |      | $0.9880 \pm 0.0010$ |
| D20230206 |      | $0.9868 \pm 0.0010$ |
| D20230207 |      | $0.9868 \pm 0.0010$ |
| D20230227 |      | $0.9873 \pm 0.0009$ |
| D20230228 |      | $0.9873 \pm 0.0009$ |
| D20230314 |      | $0.9862 \pm 0.0010$ |
| D20230404 |      | $0.9869 \pm 0.0010$ |
| D20230613 |      | $0.9866 \pm 0.0009$ |
| D20230821 |      | $0.9856 \pm 0.0009$ |
| D20230822 |      | $0.9867 \pm 0.0009$ |
| D20231031 |      | $0.9874 \pm 0.0010$ |
| D20231205 |      | $0.9867 \pm 0.0010$ |
| D20240229 |      | $0.9892 \pm 0.0014$ |
| D20240423 |      | $0.9887 \pm 0.0012$ |
| D20240702 |      | $0.9878 \pm 0.0010$ |
| D20240730 |      | $0.9869 \pm 0.0006$ |
| D20240924 |      | $0.9883 \pm 0.0006$ |
| D20241126 |      | $0.9880 \pm 0.0006$ |
| D20250128 |      | $0.9881 \pm 0.0006$ |
| D20250325 |      | $0.9881 \pm 0.0006$ |
| D20250701 |      | $0.9866 \pm 0.0006$ |
| D20250819 |      | $0.9878 \pm 0.0005$ |
| D20251104 |      | $0.9883 \pm 0.0006$ |
| D20260127 |      | $0.9893 \pm 0.0005$ |

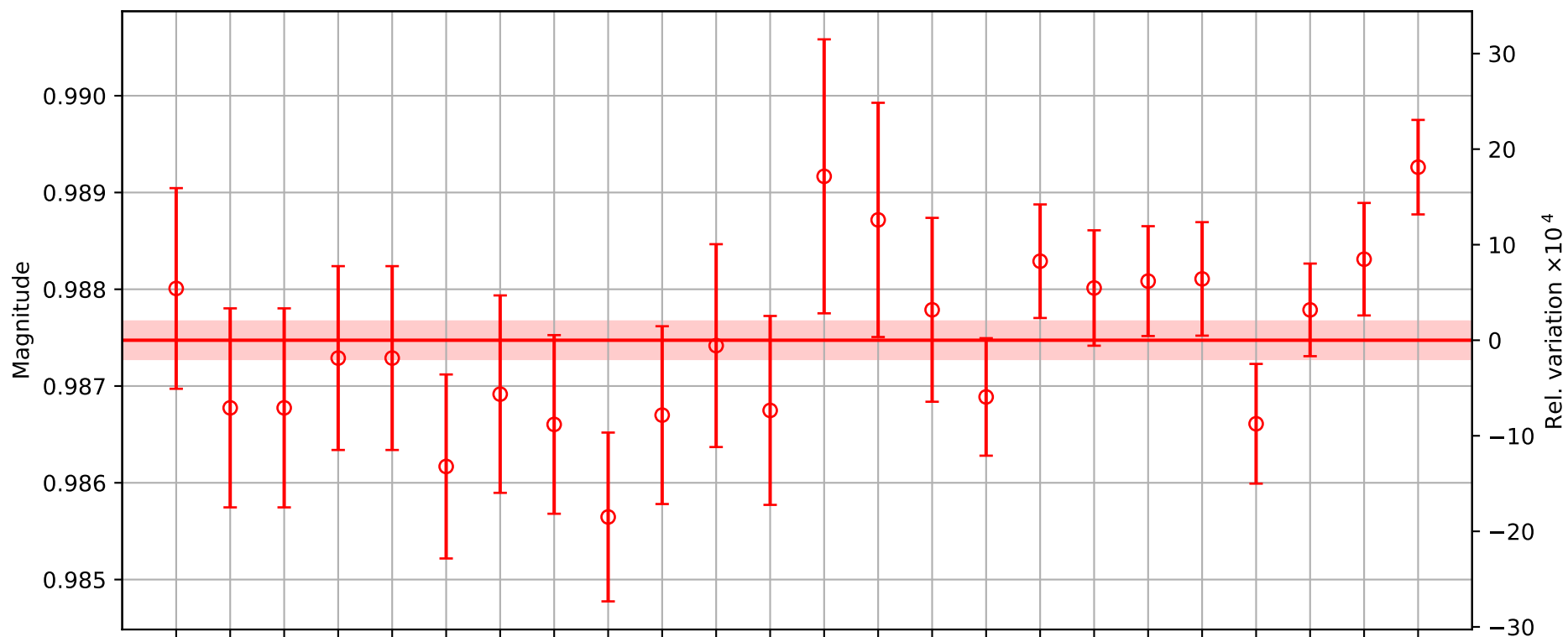
### Description:

Optical Efficiency (Inner beam):  $e_i = (W_{ri}/T_{ti}) / (W_{ti}/T_{ti})$   
 This parameter is the ratio of the Working Standard (WS) output in both the Rx module and Tx module with only the inner beam on it, normalized by the Tx Output. This parameter involves M1 and M5 and is useful for determining overall optical Efficiency.

| Summary of Optical Efficiency (Inner Beam) |          |
|--------------------------------------------|----------|
| Mean value:                                | 0.987473 |
| Standard deviation:                        | 0.000930 |
| Standard error:                            | 0.000194 |
| Relative Standard error:                   | 0.000196 |



# Optical Efficiency (Inner Beam)



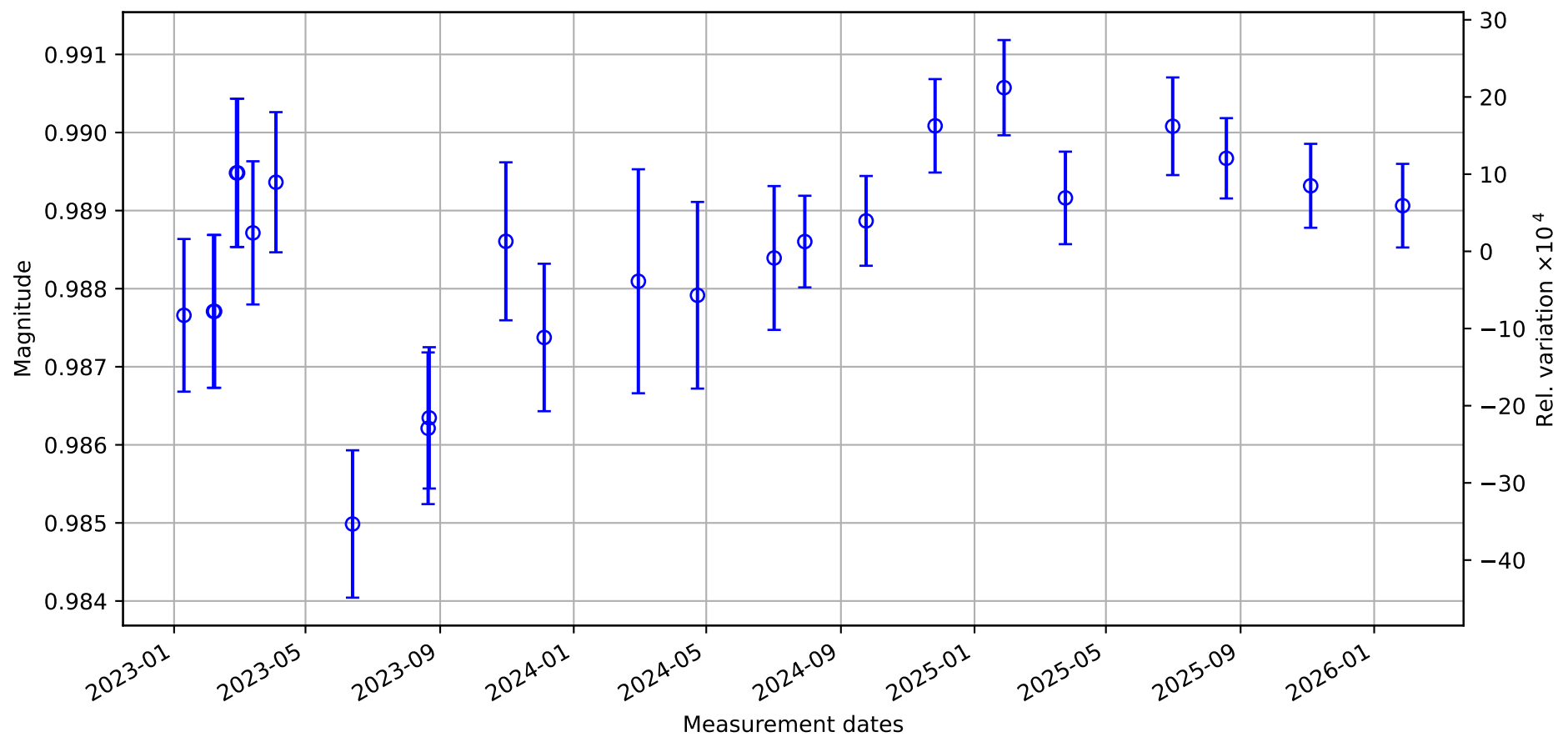
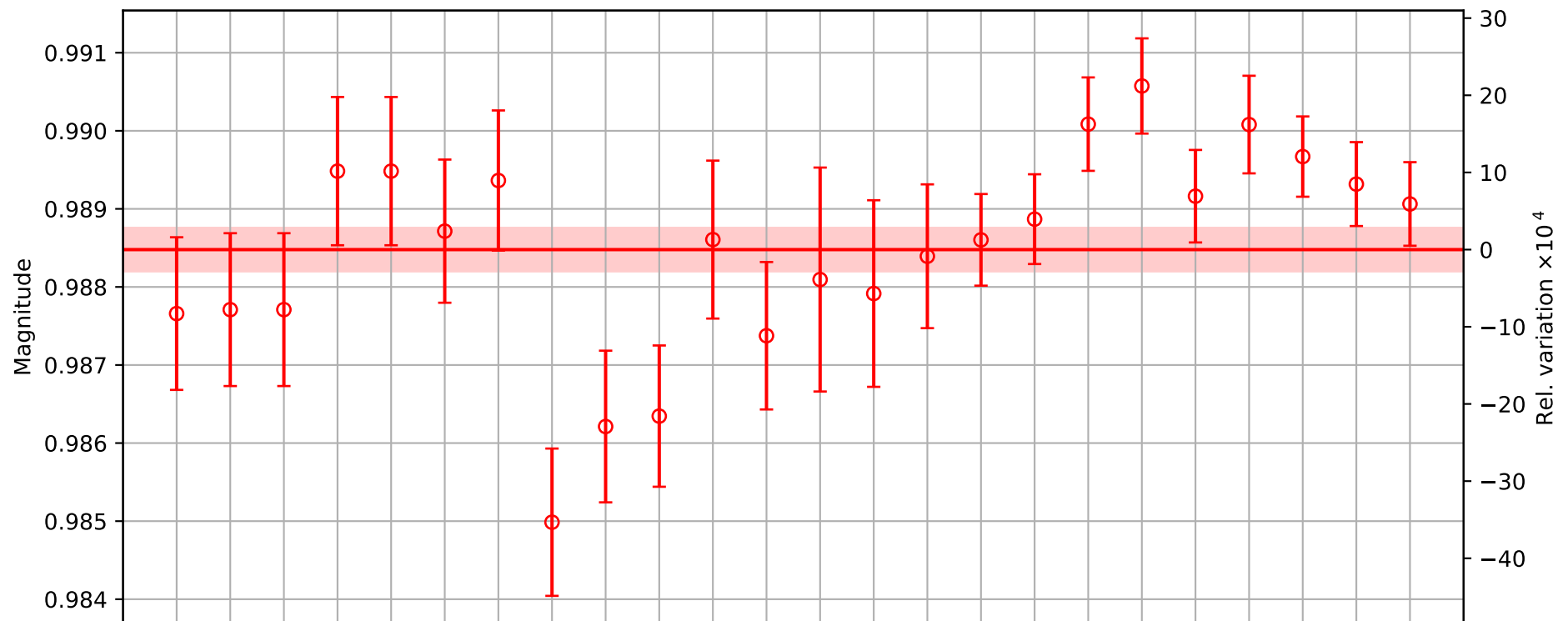
|           | e_o             |
|-----------|-----------------|
| Date      | e_o ± SD_e_o    |
| D20230110 | 0.9877 ± 0.0010 |
| D20230206 | 0.9877 ± 0.0010 |
| D20230207 | 0.9877 ± 0.0010 |
| D20230227 | 0.9895 ± 0.0009 |
| D20230228 | 0.9895 ± 0.0009 |
| D20230314 | 0.9887 ± 0.0009 |
| D20230404 | 0.9894 ± 0.0009 |
| D20230613 | 0.9850 ± 0.0009 |
| D20230821 | 0.9862 ± 0.0010 |
| D20230822 | 0.9863 ± 0.0009 |
| D20231031 | 0.9886 ± 0.0010 |
| D20231205 | 0.9874 ± 0.0009 |
| D20240229 | 0.9881 ± 0.0014 |
| D20240423 | 0.9879 ± 0.0012 |
| D20240702 | 0.9884 ± 0.0009 |
| D20240730 | 0.9886 ± 0.0006 |
| D20240924 | 0.9889 ± 0.0006 |
| D20241126 | 0.9901 ± 0.0006 |
| D20250128 | 0.9906 ± 0.0006 |
| D20250325 | 0.9892 ± 0.0006 |
| D20250701 | 0.9901 ± 0.0006 |
| D20250819 | 0.9897 ± 0.0005 |
| D20251104 | 0.9893 ± 0.0005 |
| D20260127 | 0.9891 ± 0.0005 |

### Description:

Optical Efficiency (Outer beam):  $e_o = (W_{ro}/T_{to}) / (W_{to}/T_{to})$   
 This parameter is the ratio of the Working Standard (WS) output in both the Rx module and Tx module with only the outer beam on it, normalized by the Tx Output. This parameter involves M2 and M4 and is useful for determining overall optical Efficiency.

| -----                                      |          |
|--------------------------------------------|----------|
| Summary of Optical Efficiency (Outer Beam) |          |
| Mean value:                                | 0.988478 |
| Standard deviation:                        | 0.001334 |
| Standard error:                            | 0.000278 |
| Relative Standard error:                   | 0.000281 |

# Optical Efficiency (Outer Beam)



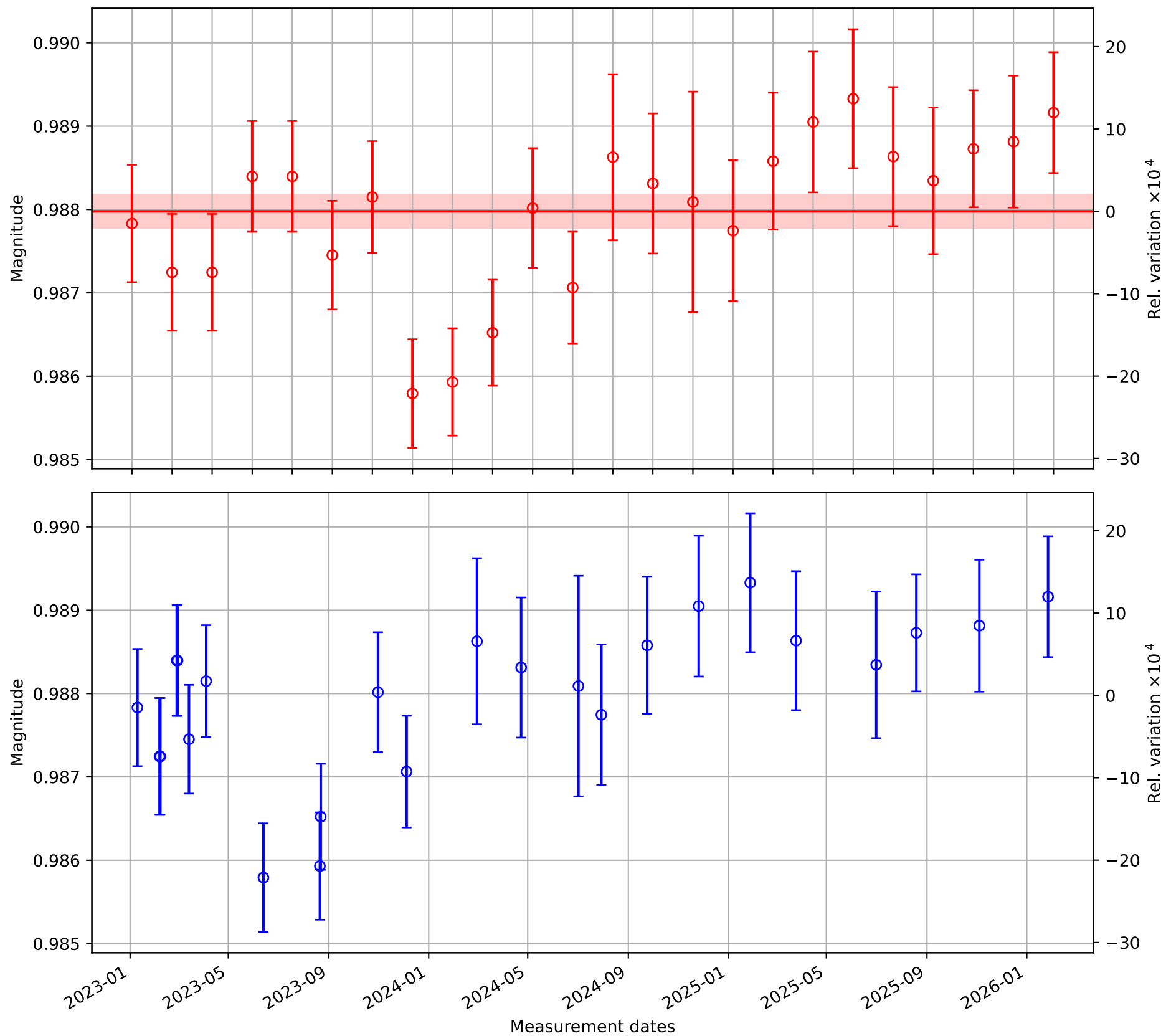
|           | e                   |
|-----------|---------------------|
| Date      | None $\pm$ SD_None  |
| D20230110 | 0.9878 $\pm$ 0.0007 |
| D20230206 | 0.9872 $\pm$ 0.0007 |
| D20230207 | 0.9872 $\pm$ 0.0007 |
| D20230227 | 0.9884 $\pm$ 0.0007 |
| D20230228 | 0.9884 $\pm$ 0.0007 |
| D20230314 | 0.9875 $\pm$ 0.0007 |
| D20230404 | 0.9881 $\pm$ 0.0007 |
| D20230613 | 0.9858 $\pm$ 0.0007 |
| D20230821 | 0.9859 $\pm$ 0.0006 |
| D20230822 | 0.9865 $\pm$ 0.0006 |
| D20231031 | 0.9880 $\pm$ 0.0007 |
| D20231205 | 0.9871 $\pm$ 0.0007 |
| D20240229 | 0.9886 $\pm$ 0.0010 |
| D20240423 | 0.9883 $\pm$ 0.0008 |
| D20240702 | 0.9881 $\pm$ 0.0013 |
| D20240730 | 0.9877 $\pm$ 0.0008 |
| D20240924 | 0.9886 $\pm$ 0.0008 |
| D20241126 | 0.9890 $\pm$ 0.0008 |
| D20250128 | 0.9893 $\pm$ 0.0008 |
| D20250325 | 0.9886 $\pm$ 0.0008 |
| D20250701 | 0.9883 $\pm$ 0.0009 |
| D20250819 | 0.9887 $\pm$ 0.0007 |
| D20251104 | 0.9888 $\pm$ 0.0008 |
| D20260127 | 0.9892 $\pm$ 0.0007 |

### Description:

Overall Optical Efficiency:  $e = (e_o + e_i)/2$   
 This parameter is just the average efficiency of both the inner and outer beams. This uses M1 ,M2, M4, & M5 and is used to determine how much power is lost inside the vacuum chamber.

|                                       | e        |
|---------------------------------------|----------|
| Summary of Overall Optical Efficiency |          |
| Mean value:                           | 0.987978 |
| Standard deviation:                   | 0.000952 |
| Standard error:                       | 0.000198 |
| Relative Standard error:              | 0.000201 |

# Overall Optical Efficiency



|           | E_T             |
|-----------|-----------------|
| Date      | E_T ± SD_E_T    |
| D20230110 | 0.9933 ± 0.0007 |
| D20230206 | 0.9931 ± 0.0007 |
| D20230207 | 0.9931 ± 0.0007 |
| D20230227 | 0.9936 ± 0.0007 |
| D20230228 | 0.9936 ± 0.0007 |
| D20230314 | 0.9932 ± 0.0007 |
| D20230404 | 0.9935 ± 0.0007 |
| D20230613 | 0.9923 ± 0.0007 |
| D20230821 | 0.9924 ± 0.0006 |
| D20230822 | 0.9927 ± 0.0006 |
| D20231031 | 0.9934 ± 0.0007 |
| D20231205 | 0.9930 ± 0.0007 |
| D20240229 | 0.9937 ± 0.0010 |
| D20240423 | 0.9936 ± 0.0008 |
| D20240702 | 0.9935 ± 0.0007 |
| D20240730 | 0.9933 ± 0.0004 |
| D20240924 | 0.9937 ± 0.0004 |
| D20241126 | 0.9940 ± 0.0004 |
| D20250128 | 0.9941 ± 0.0004 |
| D20250325 | 0.9938 ± 0.0004 |
| D20250701 | 0.9936 ± 0.0004 |
| D20250819 | 0.9938 ± 0.0004 |
| D20251104 | 0.9938 ± 0.0004 |
| D20260127 | 0.9940 ± 0.0004 |

### Description:

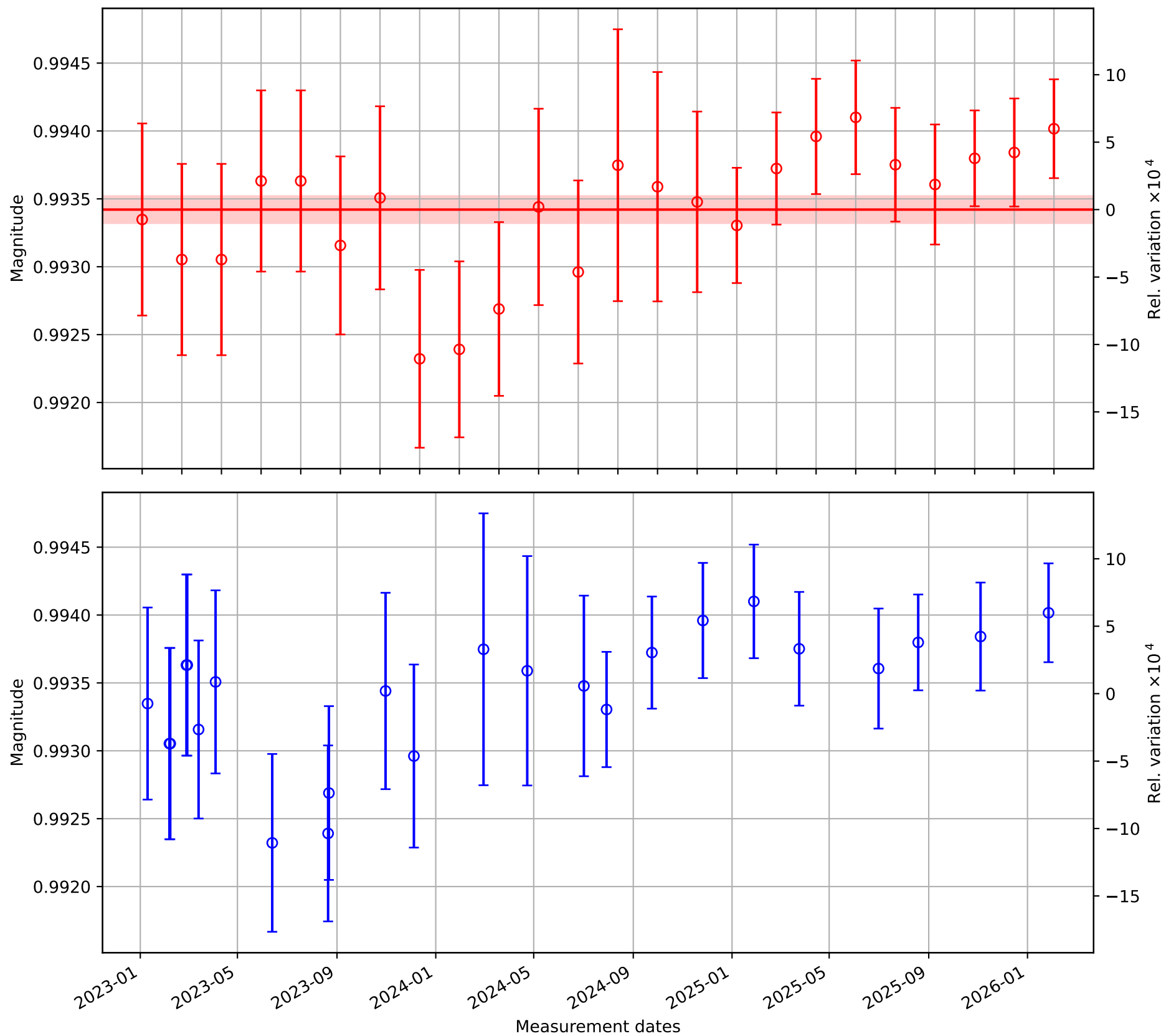
Tx side Optical Efficiency Correction Factor:  $E_T = \sqrt{e \cdot \beta}$

This parameter is used to apportion the optical loss inside the vacuum chamber to before the ETM and after the ETM, and uses the Optical Efficiency (e) along with the last in-chamber measurements (DCC- T1800107). The in-chamber measurements yield a ratio of optical efficiencies between the Tx side and Rx side, referred to as  $\beta$ , which we assume have not changed. Applying this correction factor corrects for the optical loss on the Tx side, providing the Rx and Tx responsivities at the ETM.

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| Summary of Input Side Optical Efficiency correction factor |          |
|------------------------------------------------------------|----------|
| Mean value:                                                | 0.993421 |
| Standard deviation:                                        | 0.000479 |
| Standard error:                                            | 0.000100 |
| Relative Standard error:                                   | 0.000100 |

# Input Side Optical Efficiency correction factor



|           | E_R             |
|-----------|-----------------|
| Date      | None ± SD_None  |
| D20230110 | 0.9944 ± 0.0007 |
| D20230206 | 0.9942 ± 0.0007 |
| D20230207 | 0.9942 ± 0.0007 |
| D20230227 | 0.9947 ± 0.0007 |
| D20230228 | 0.9947 ± 0.0007 |
| D20230314 | 0.9943 ± 0.0007 |
| D20230404 | 0.9946 ± 0.0007 |
| D20230613 | 0.9934 ± 0.0007 |
| D20230821 | 0.9935 ± 0.0006 |
| D20230822 | 0.9938 ± 0.0006 |
| D20231031 | 0.9945 ± 0.0007 |
| D20231205 | 0.9941 ± 0.0007 |
| D20240229 | 0.9948 ± 0.0010 |
| D20240423 | 0.9947 ± 0.0008 |
| D20240702 | 0.9946 ± 0.0007 |
| D20240730 | 0.9944 ± 0.0004 |
| D20240924 | 0.9948 ± 0.0004 |
| D20241126 | 0.9951 ± 0.0004 |
| D20250128 | 0.9952 ± 0.0004 |
| D20250325 | 0.9949 ± 0.0004 |
| D20250701 | 0.9947 ± 0.0004 |
| D20250819 | 0.9949 ± 0.0004 |
| D20251104 | 0.9949 ± 0.0004 |
| D20260127 | 0.9951 ± 0.0004 |

| Summary of Output Side Optical Efficiency correction factor |          |
|-------------------------------------------------------------|----------|
| Mean value:                                                 | 0.994520 |
| Standard deviation:                                         | 0.000479 |
| Standard error:                                             | 0.000100 |
| Relative Standard error:                                    | 0.000100 |

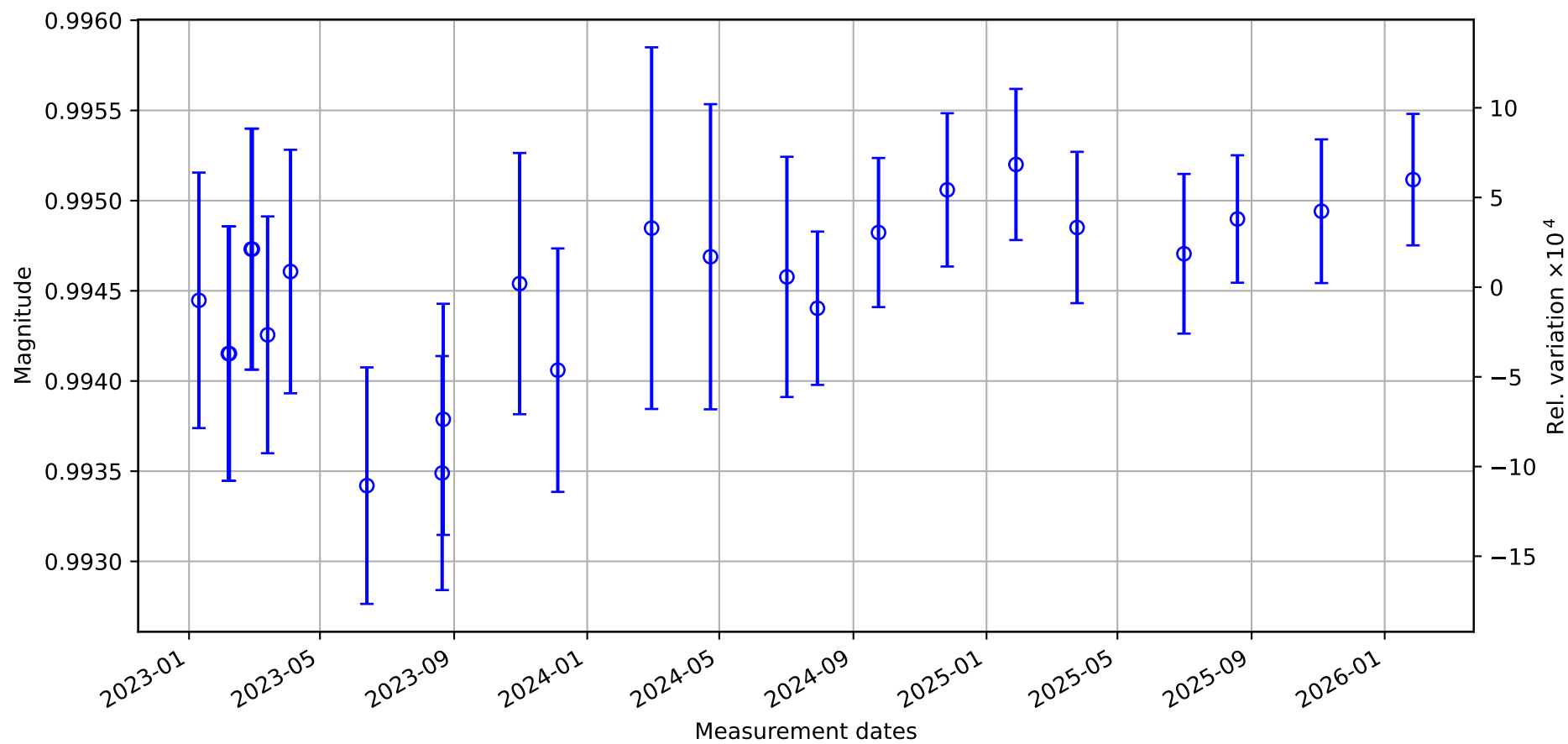
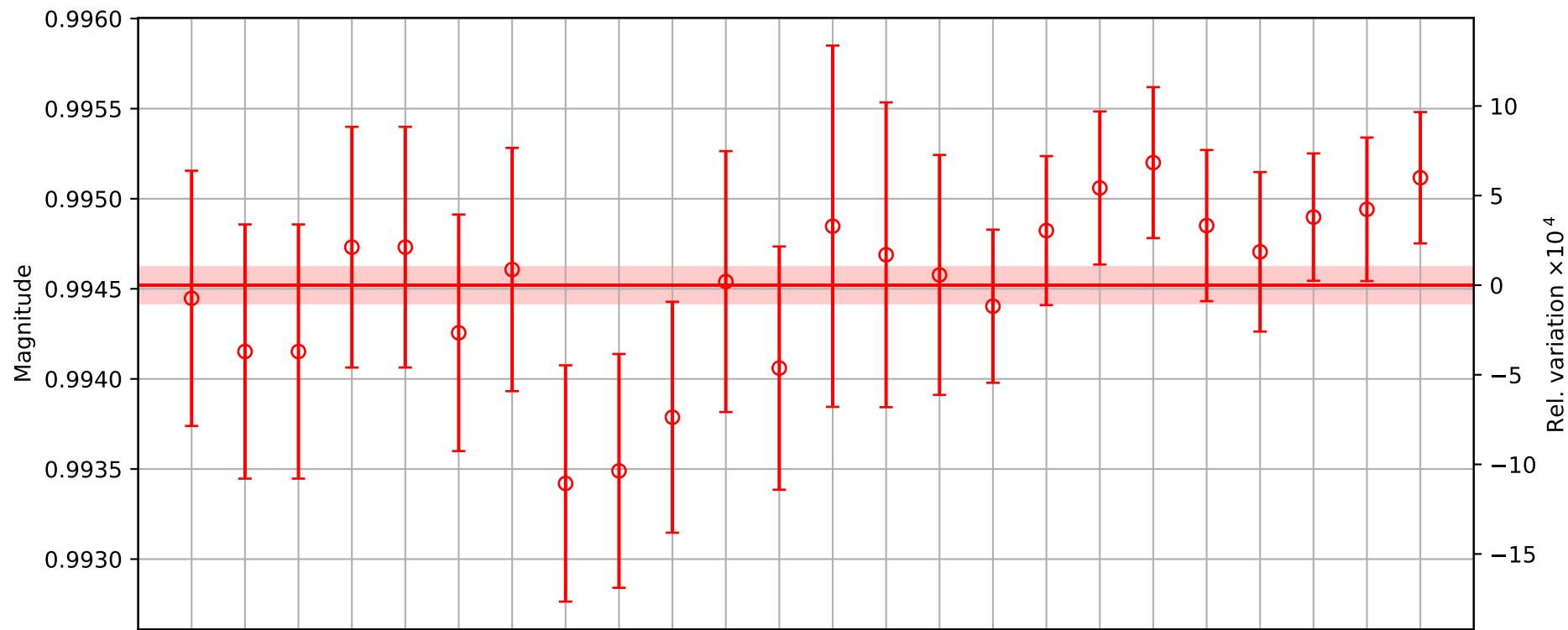
Description:

Rx side Optical Efficiency Correction Factor: $E_R = \sqrt{e/\beta}$

This parameter is used to apportion the optical loss inside the vacuum chamber to before the ETM and after the ETM, and uses the Optical Efficiency (e) along with the last in-chamber measurements (DCC- T1800107). The in-chamber measurements yield a ratio of optical efficiencies between the Tx side and Rx side, referred to as  $\beta$ , which we assume have not changed. Applying this correction factor corrects for the optical loss on the Rx side, providing the Rx and Tx responsivities at the ETM.



# Output Side Optical Efficiency correction factor



|           | PowerImbalance  |
|-----------|-----------------|
| Date      | None ± SD_None  |
| D20230110 | 0.9850 ± 0.0005 |
| D20230206 | 0.9832 ± 0.0005 |
| D20230207 | 0.9832 ± 0.0005 |
| D20230227 | 0.9813 ± 0.0004 |
| D20230228 | 0.9813 ± 0.0004 |
| D20230314 | 0.9834 ± 0.0004 |
| D20230404 | 0.9843 ± 0.0005 |
| D20230613 | 0.9935 ± 0.0004 |
| D20230821 | 0.9922 ± 0.0004 |
| D20230822 | 0.9940 ± 0.0004 |
| D20231031 | 0.9853 ± 0.0005 |
| D20231205 | 0.9884 ± 0.0004 |
| D20240229 | 0.9870 ± 0.0006 |
| D20240423 | 0.9816 ± 0.0005 |
| D20240702 | 0.9924 ± 0.0009 |
| D20240730 | 0.9927 ± 0.0006 |
| D20240924 | 0.9925 ± 0.0012 |
| D20241126 | 0.9899 ± 0.0012 |
| D20250128 | 0.9786 ± 0.0012 |
| D20250325 | 0.9898 ± 0.0012 |
| D20250701 | 0.9912 ± 0.0013 |
| D20250819 | 0.9896 ± 0.0011 |
| D20251104 | 0.9887 ± 0.0012 |
| D20260127 | 0.9789 ± 0.0010 |

### Description:

Power Imbalance:  
 The Power imbalance is a measurement of Inner Beam Power divided by Outer Beam Power, as measured by the Working Standard inside the TX module. M1/M2.

|                            | PowerImbalance |
|----------------------------|----------------|
| Summary of Power Imbalance |                |
| Mean value:                | 0.987002       |
| Standard deviation:        | 0.004848       |
| Standard error:            | 0.001011       |
| Relative Standard error:   | 0.001024       |

# Power Imbalance

