

Force Coefficient Trends

| GENERATED FOR LHO_EndX

Report Generated on February 11, 2020

Contents

1	About	1
2	Gold Standard (ρ_{GS})	2
3	WS to GS Responsivity (α_{WG})	3
4	TxPD to WS Responsivity (α_{TW})	4
5	RxPD to WS Responsivity (α_{RW})	5
6	Optical Efficiency (e)	6
7	Beta (β)	7
8	Input Optical efficiency factor ($\mathcal{E}_T$)	8
9	Output Optical efficiency factor ($\mathcal{E}_R$)	9
10	TxPD to WS prime ($\alpha_{TW'}$)	10
11	RxPD to WS prime ($\alpha_{RW'}$)	11
12	TxPD Force Coefficient (Γ_{TX})	12
13	RxPD Force Coefficient (Γ_{RX})	13

1 About

The force coefficients are calculated according to

Force Coefficient = $[1/(\text{GS} \cdot \text{WSGS} \cdot \text{TX}(\text{RX})\text{WS})] \cdot [2 \cdot \cos(\text{theta})/c]$

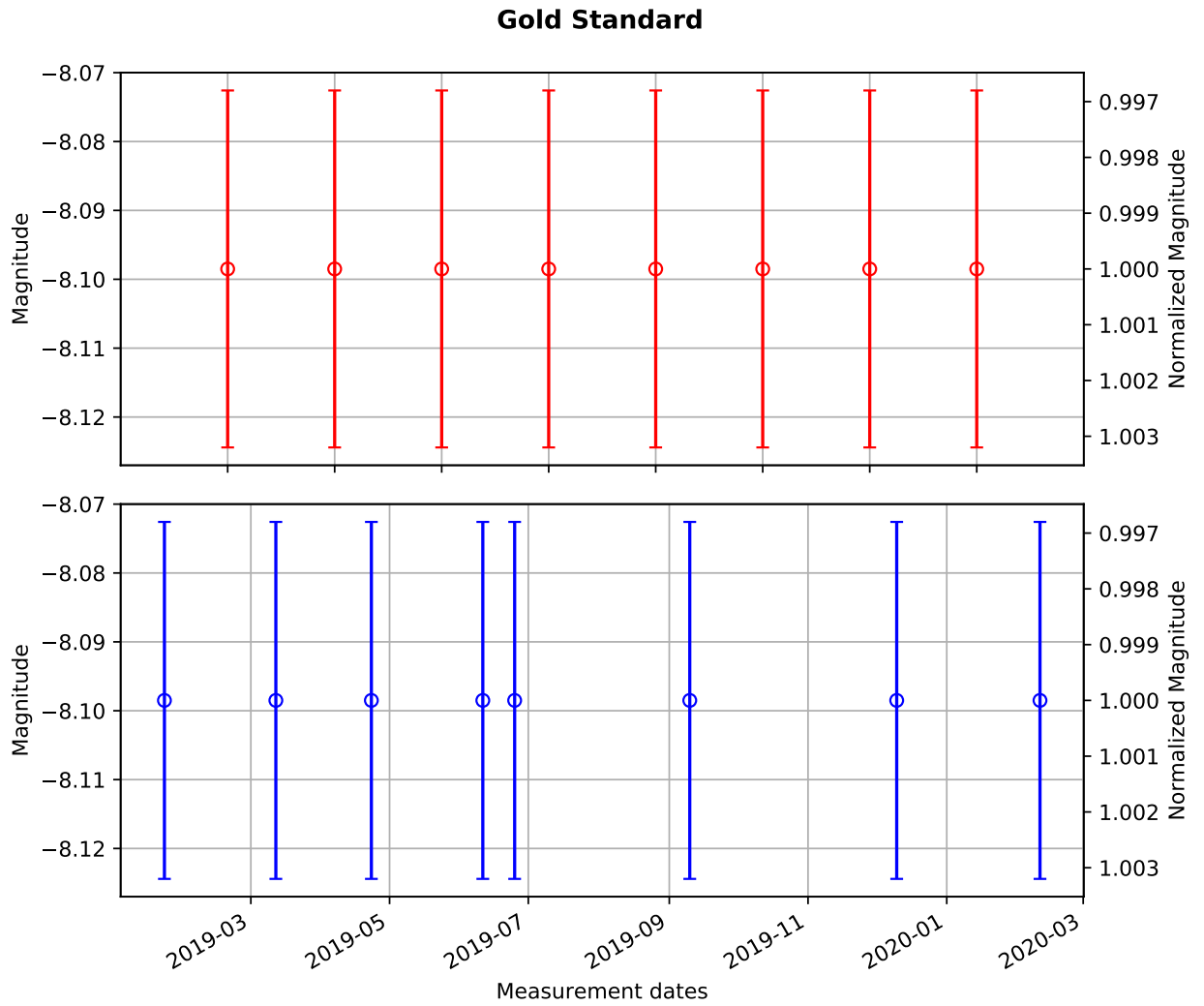
Angle of Incidence (theta) = 8.75 deg

Speed of light (c) = 299792458 m/s

2 Gold Standard (ρ_{GS})

List of Measurements

Date	GS $\pm$ SE_GS	Normalized
D20190122	-8.098500 $\pm$ -0.025915	(1 $\pm$ 0.003200)
D20190312	-8.098500 $\pm$ -0.025915	(1 $\pm$ 0.003200)
D20190423	-8.098500 $\pm$ -0.025915	(1 $\pm$ 0.003200)
D20190611	-8.098500 $\pm$ -0.025915	(1 $\pm$ 0.003200)
D20190625	-8.098500 $\pm$ -0.025915	(1 $\pm$ 0.003200)
D20190910	-8.098500 $\pm$ -0.025915	(1 $\pm$ 0.003200)
D20191210	-8.098500 $\pm$ -0.025915	(1 $\pm$ 0.003200)
D20200211	-8.098500 $\pm$ -0.025915	(1 $\pm$ 0.003200)



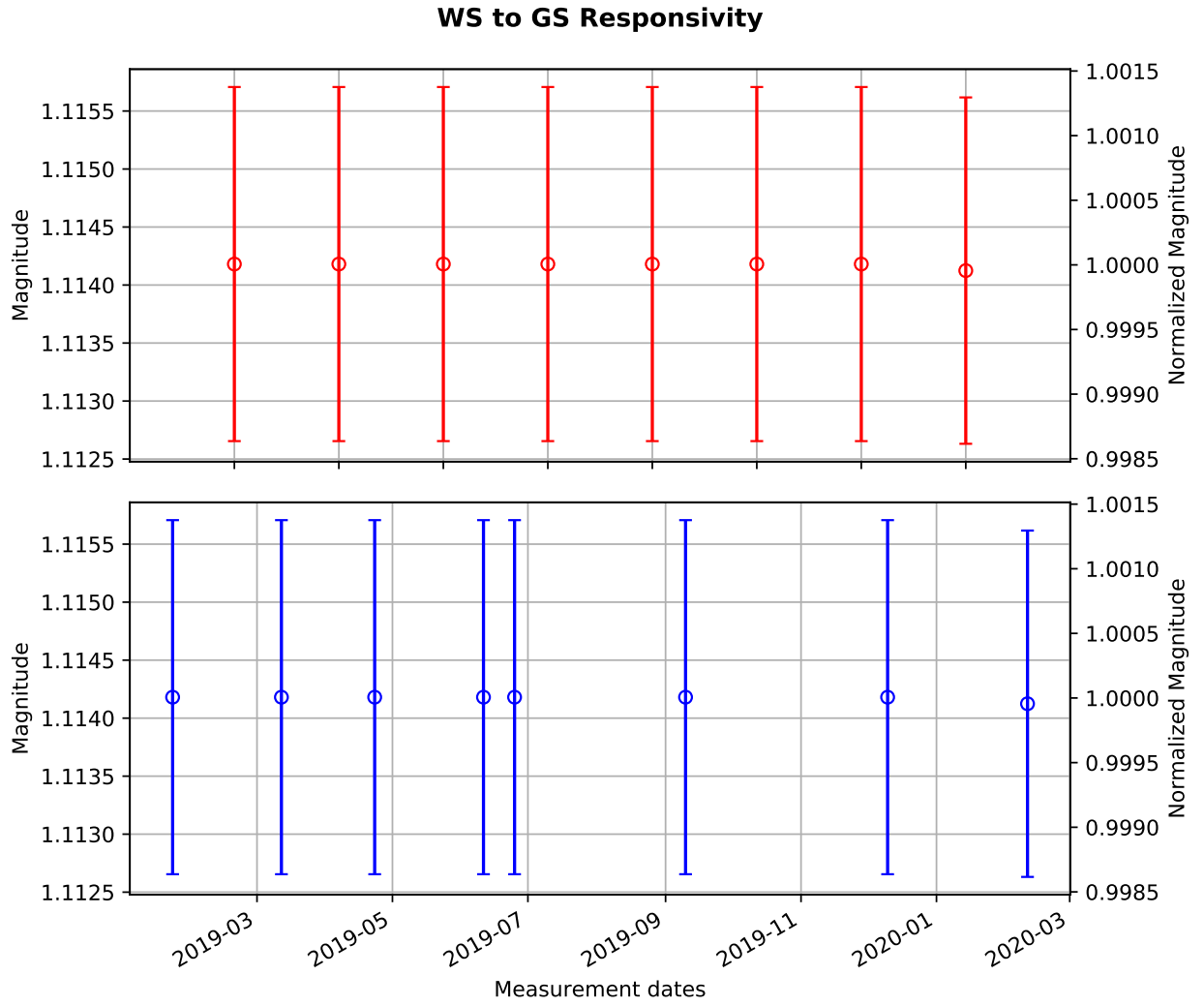
Summary of Gold Standard

Mean value:	-8.098500
Standard deviation:	0.000000
Standard error:	0.000000
Relative Standard error:	0.000000

3 WS to GS Responsivity (α_{WG})

List of Measurements

Date	WSGS $\pm$ SE_WSGS	Normalized
D20190122	1.114181 $\pm$ 0.001526	(1 $\pm$ 0.001370)
D20190312	1.114181 $\pm$ 0.001526	(1 $\pm$ 0.001370)
D20190423	1.114181 $\pm$ 0.001526	(1 $\pm$ 0.001370)
D20190611	1.114181 $\pm$ 0.001526	(1 $\pm$ 0.001370)
D20190625	1.114181 $\pm$ 0.001526	(1 $\pm$ 0.001370)
D20190910	1.114181 $\pm$ 0.001526	(1 $\pm$ 0.001370)
D20191210	1.114181 $\pm$ 0.001526	(1 $\pm$ 0.001370)
D20200211	1.114124 $\pm$ 0.001493	(1 $\pm$ 0.001340)



Summary of WS to GS Responsivity

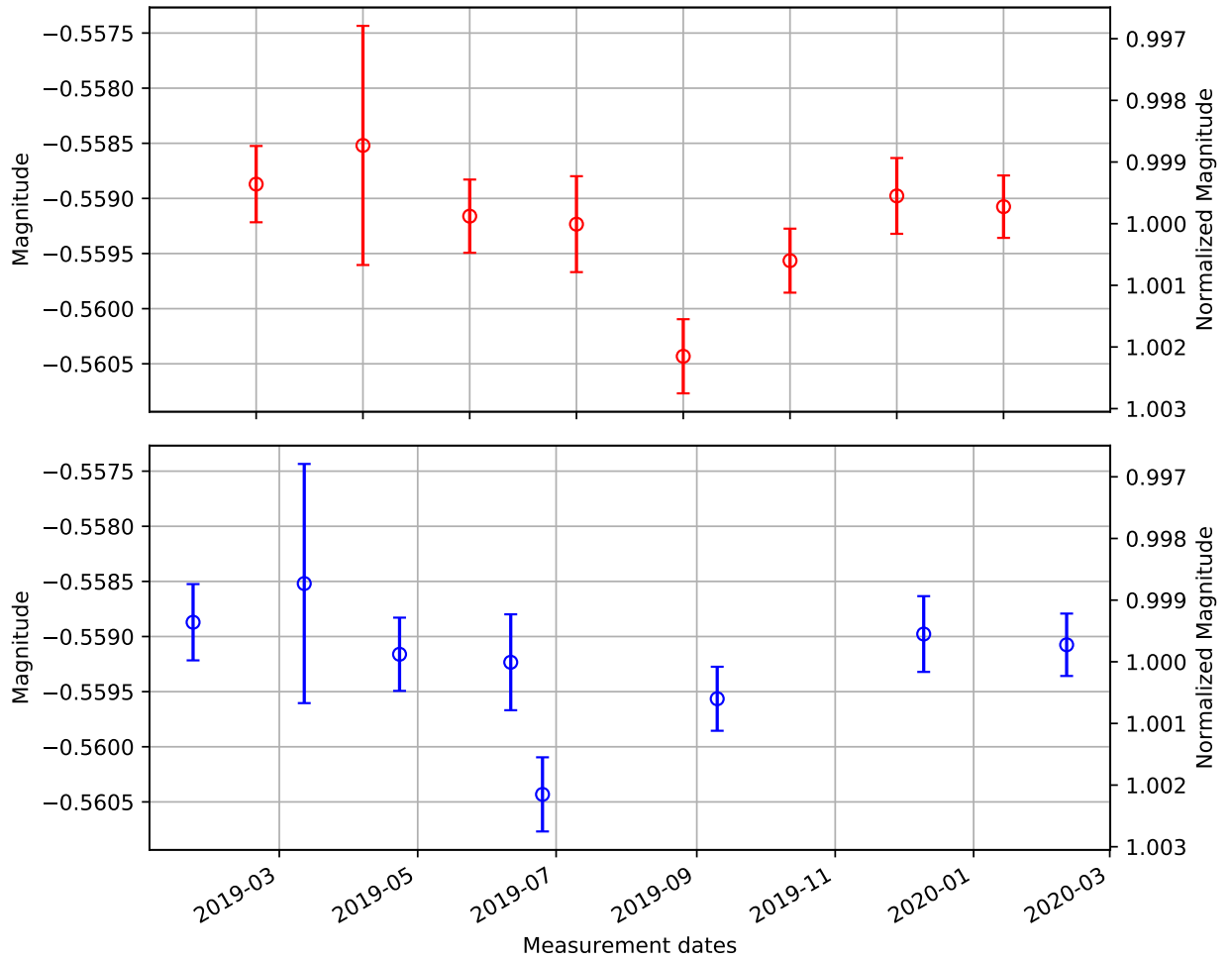
Mean value:	1.114174
Standard deviation:	0.000020
Standard error:	0.000008
Relative Standard error:	0.000007

4 TxPD to WS Responsivity (α_{TW})

List of Measurements

Date	TXWS $\pm$ SE_TXWS	Normalized
D20190122	-0.558870 $\pm$ 0.000346	(1 $\pm$ -0.000619)
D20190312	-0.558519 $\pm$ 0.001085	(1 $\pm$ -0.001942)
D20190423	-0.559161 $\pm$ 0.000332	(1 $\pm$ -0.000594)
D20190611	-0.559233 $\pm$ 0.000435	(1 $\pm$ -0.000778)
D20190625	-0.560432 $\pm$ 0.000336	(1 $\pm$ -0.000600)
D20190910	-0.559565 $\pm$ 0.000290	(1 $\pm$ -0.000519)
D20191210	-0.558977 $\pm$ 0.000344	(1 $\pm$ -0.000615)
D20200211	-0.559075 $\pm$ 0.000283	(1 $\pm$ -0.000506)

TxPD to GS Responsivity



Summary of TxPD to GS Responsivity

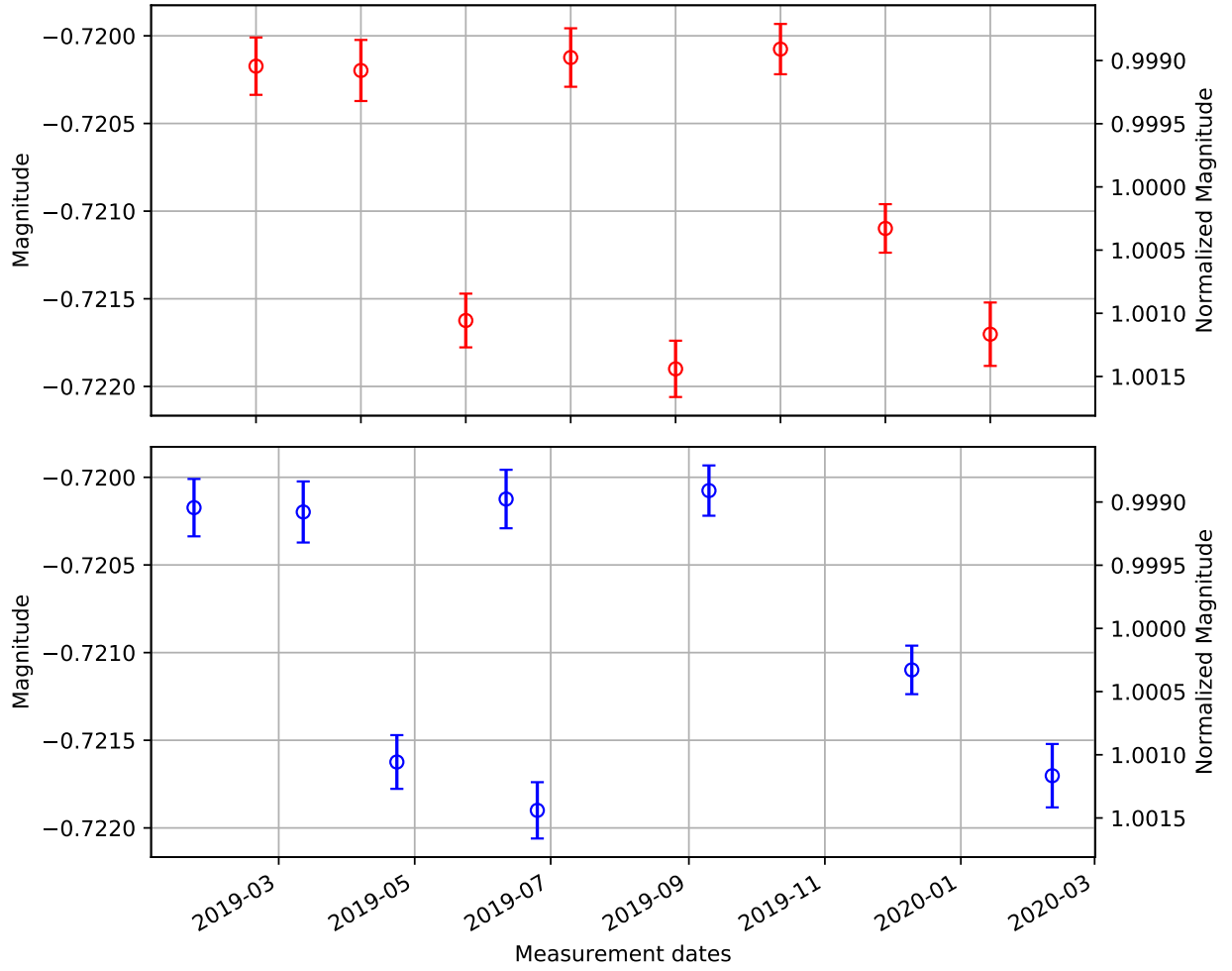
Mean value:	-0.559229
Standard deviation:	0.000571
Standard error:	0.000215
Relative Standard error:	0.000385

5 RxPD to WS Responsivity (α_{RW})

List of Measurements

Date	RXWS $\pm$ SE_RXWS	Normalized
D20190122	-0.720173 $\pm$ 0.000164	(1 $\pm$ -0.000227)
D20190312	-0.720198 $\pm$ 0.000174	(1 $\pm$ -0.000242)
D20190423	-0.721624 $\pm$ 0.000153	(1 $\pm$ -0.000212)
D20190611	-0.720124 $\pm$ 0.000167	(1 $\pm$ -0.000232)
D20190625	-0.721900 $\pm$ 0.000161	(1 $\pm$ -0.000222)
D20190910	-0.720076 $\pm$ 0.000143	(1 $\pm$ -0.000199)
D20191210	-0.721099 $\pm$ 0.000138	(1 $\pm$ -0.000192)
D20200211	-0.721702 $\pm$ 0.000181	(1 $\pm$ -0.000251)

RxPD to GS Responsivity



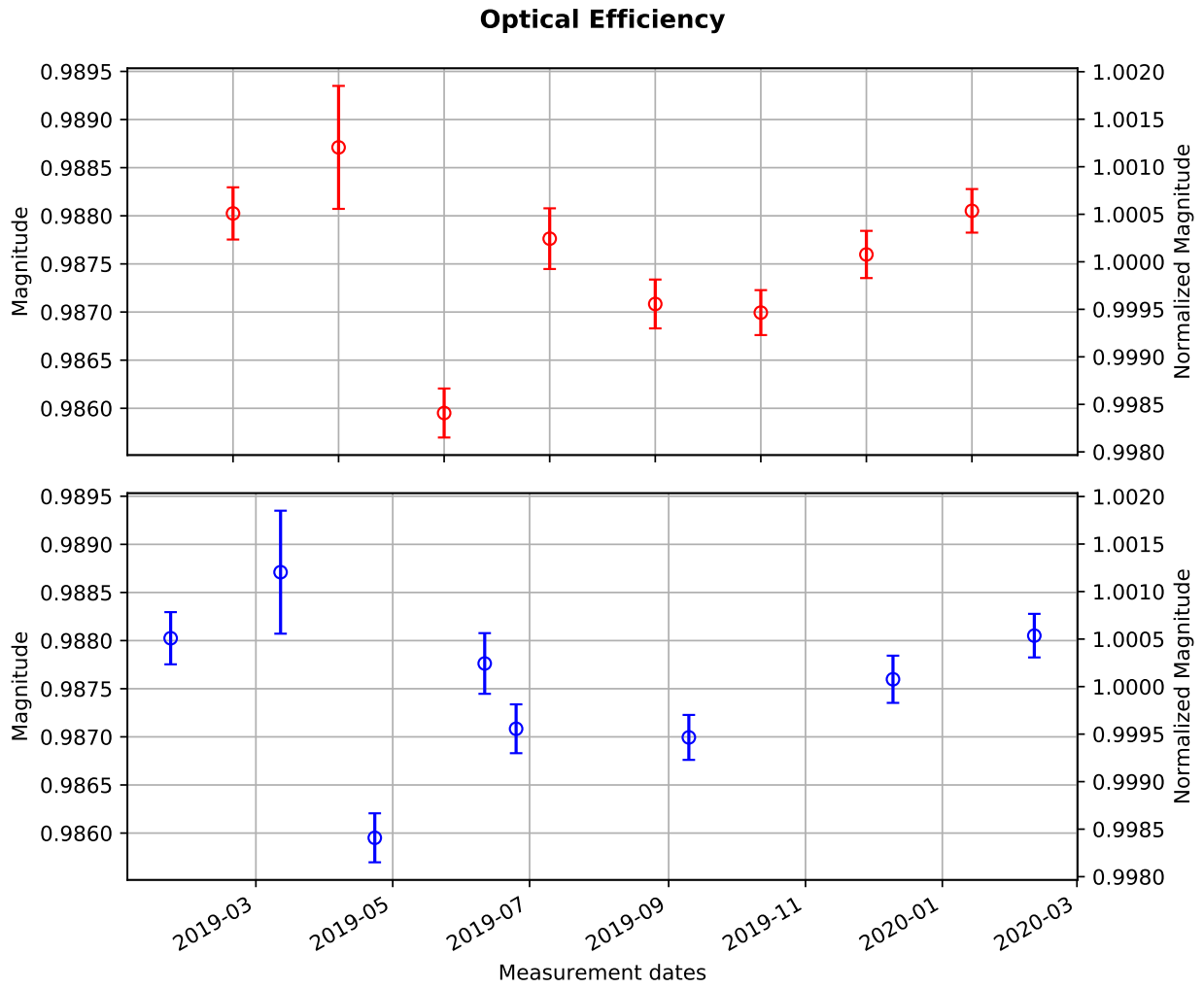
Summary of RxPD to GS Responsivity

Mean value:	-0.720862
Standard deviation:	0.000802
Standard error:	0.000302
Relative Standard error:	0.000419

6 Optical Efficiency (e)

List of Measurements

Date	$e \pm SE_e$	Normalized
D20190122	0.988025 ± 0.000271	(1 ± 0.000275)
D20190312	0.988711 ± 0.000639	(1 ± 0.000646)
D20190423	0.985951 ± 0.000254	(1 ± 0.000258)
D20190611	0.987762 ± 0.000315	(1 ± 0.000319)
D20190625	0.987084 ± 0.000254	(1 ± 0.000257)
D20190910	0.986994 ± 0.000234	(1 ± 0.000237)
D20191210	0.987598 ± 0.000245	(1 ± 0.000248)
D20200211	0.988051 ± 0.000226	(1 ± 0.000229)



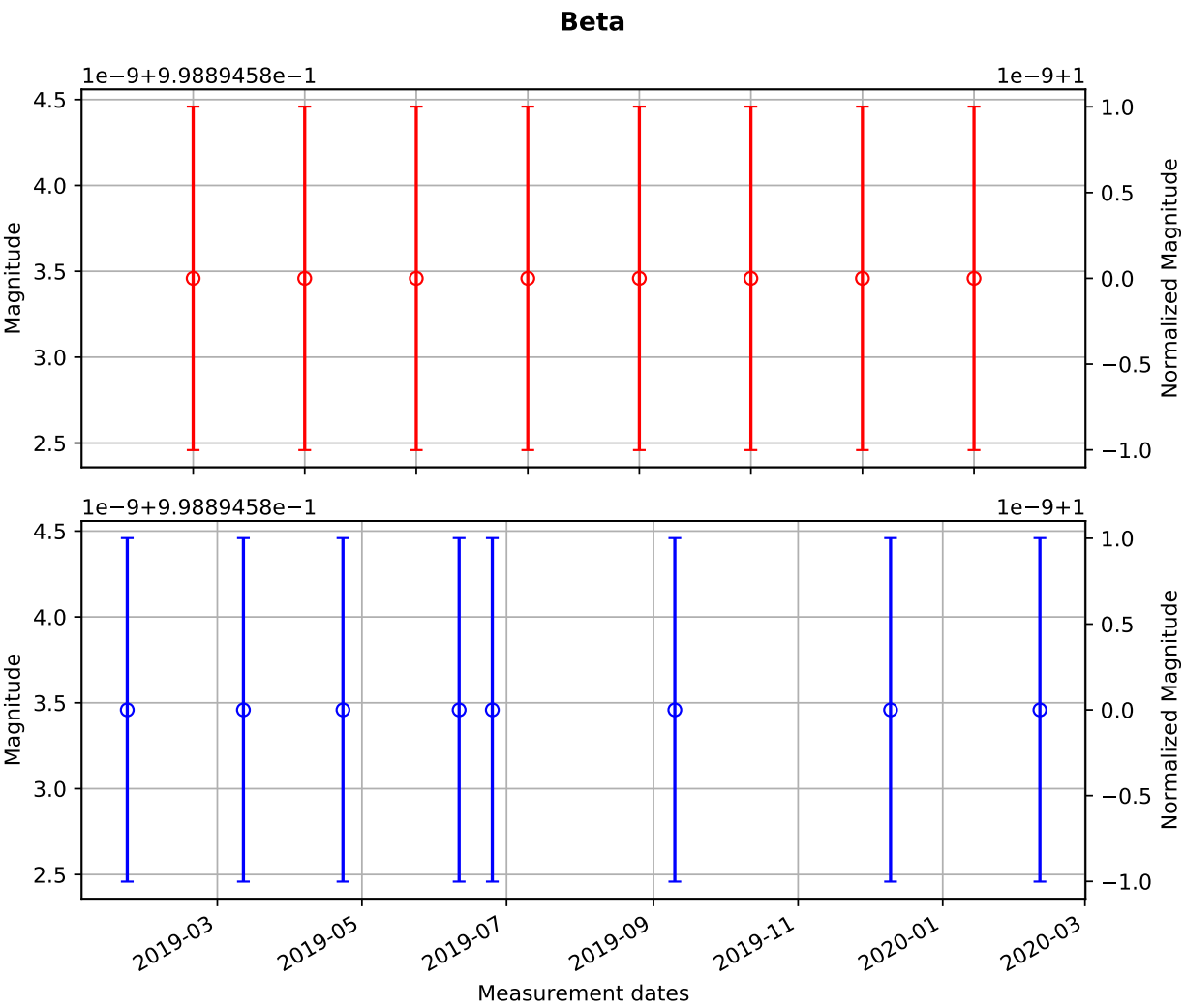
Summary of Optical Efficiency

Mean value:	0.987522
Standard deviation:	0.000841
Standard error:	0.000317
Relative Standard error:	0.000321

7 Beta (β)

List of Measurements

Date	beta $\pm$ SE_beta	Normalized
D20190122	0.998895 $\pm$ 0.000000	(1 $\pm$ 0.000000)
D20190312	0.998895 $\pm$ 0.000000	(1 $\pm$ 0.000000)
D20190423	0.998895 $\pm$ 0.000000	(1 $\pm$ 0.000000)
D20190611	0.998895 $\pm$ 0.000000	(1 $\pm$ 0.000000)
D20190625	0.998895 $\pm$ 0.000000	(1 $\pm$ 0.000000)
D20190910	0.998895 $\pm$ 0.000000	(1 $\pm$ 0.000000)
D20191210	0.998895 $\pm$ 0.000000	(1 $\pm$ 0.000000)
D20200211	0.998895 $\pm$ 0.000000	(1 $\pm$ 0.000000)

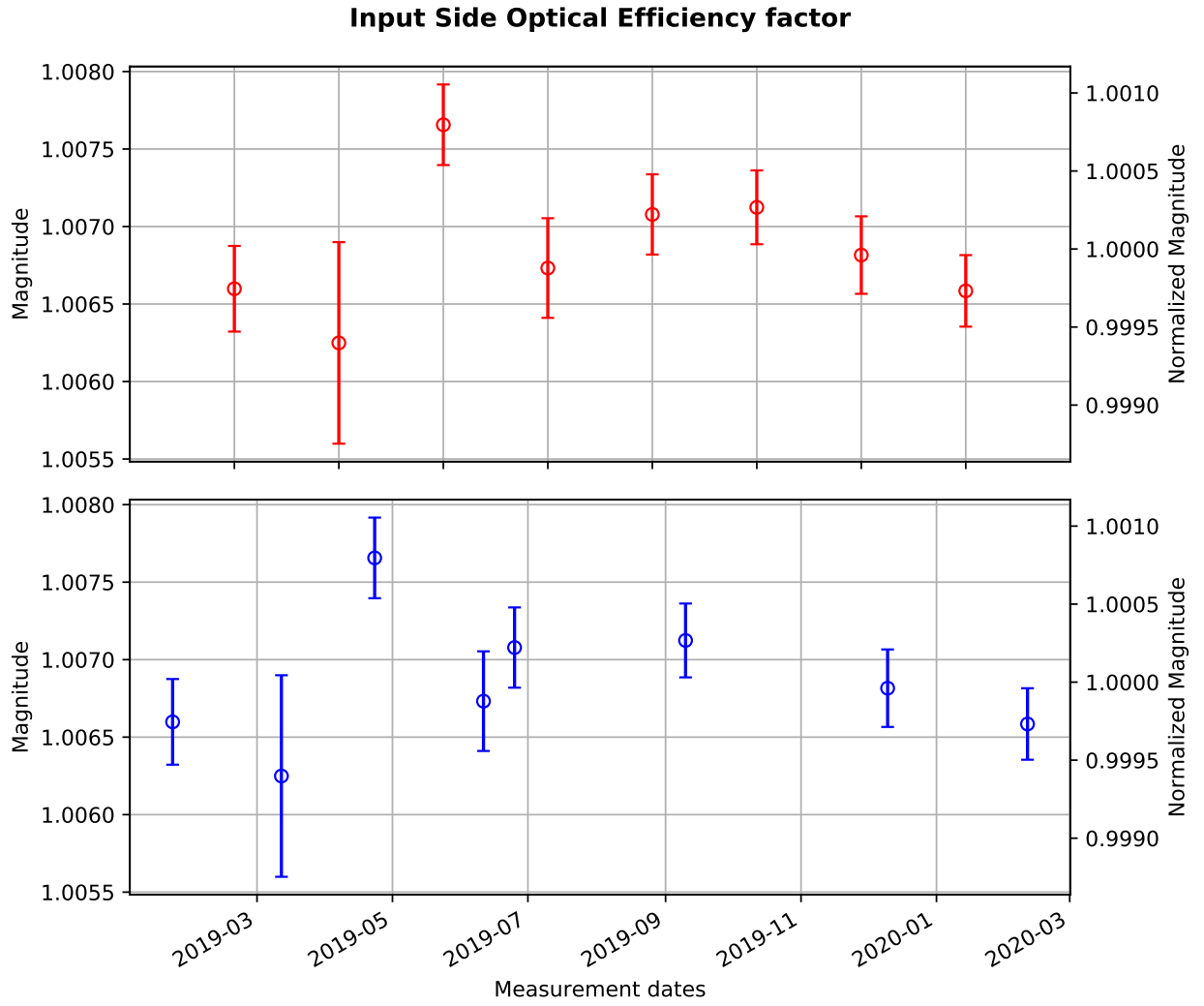


Summary of Beta	Mean value:	0.998895
	Standard deviation:	0.000000
	Standard error:	0.000000
	Relative Standard error:	0.000000

8 Input Optical efficiency factor ($\mathcal{E}_T$)

List of Measurements

Date	E_T $\pm$ SE_E_T	Normalized
D20190122	1.006599 $\pm$ 0.000276	(1 $\pm$ 0.000275)
D20190312	1.006249 $\pm$ 0.000650	(1 $\pm$ 0.000646)
D20190423	1.007657 $\pm$ 0.000260	(1 $\pm$ 0.000258)
D20190611	1.006732 $\pm$ 0.000321	(1 $\pm$ 0.000319)
D20190625	1.007078 $\pm$ 0.000259	(1 $\pm$ 0.000257)
D20190910	1.007124 $\pm$ 0.000238	(1 $\pm$ 0.000237)
D20191210	1.006816 $\pm$ 0.000250	(1 $\pm$ 0.000248)
D20200211	1.006585 $\pm$ 0.000231	(1 $\pm$ 0.000229)

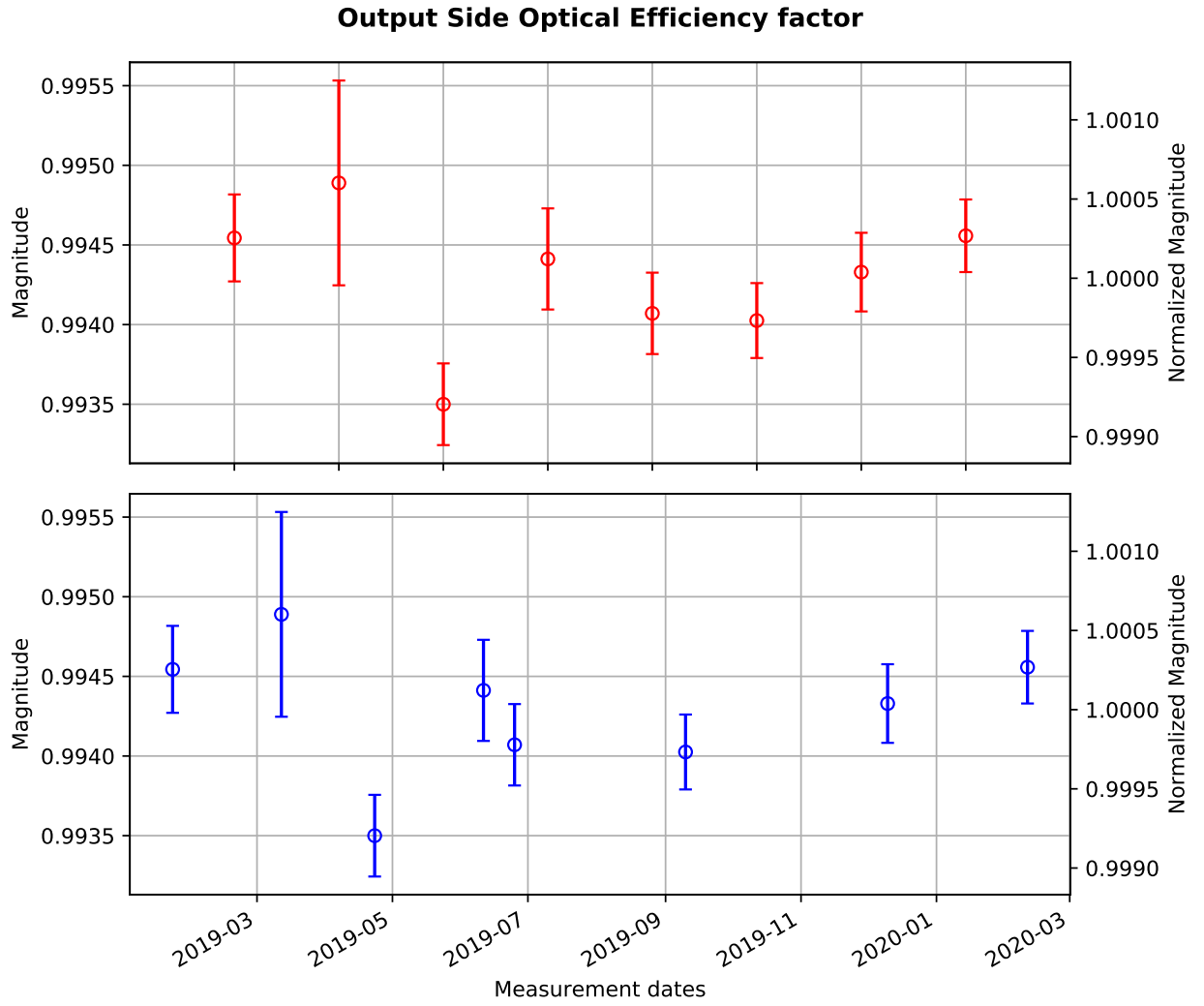


Summary of Input Side Optical Efficiency factor		
Mean value:	1.006855	
Standard deviation:	0.000429	
Standard error:	0.000162	
Relative Standard error:	0.000161	

9 Output Optical efficiency factor ($\mathcal{E}_R$)

List of Measurements

Date	E_R $\pm$ SE_E_R	Normalized
D20190122	0.994544 $\pm$ 0.000273	(1 $\pm$ 0.000275)
D20190312	0.994889 $\pm$ 0.000643	(1 $\pm$ 0.000646)
D20190423	0.993500 $\pm$ 0.000256	(1 $\pm$ 0.000258)
D20190611	0.994412 $\pm$ 0.000317	(1 $\pm$ 0.000319)
D20190625	0.994071 $\pm$ 0.000256	(1 $\pm$ 0.000257)
D20190910	0.994025 $\pm$ 0.000235	(1 $\pm$ 0.000237)
D20191210	0.994329 $\pm$ 0.000247	(1 $\pm$ 0.000248)
D20200211	0.994558 $\pm$ 0.000228	(1 $\pm$ 0.000229)

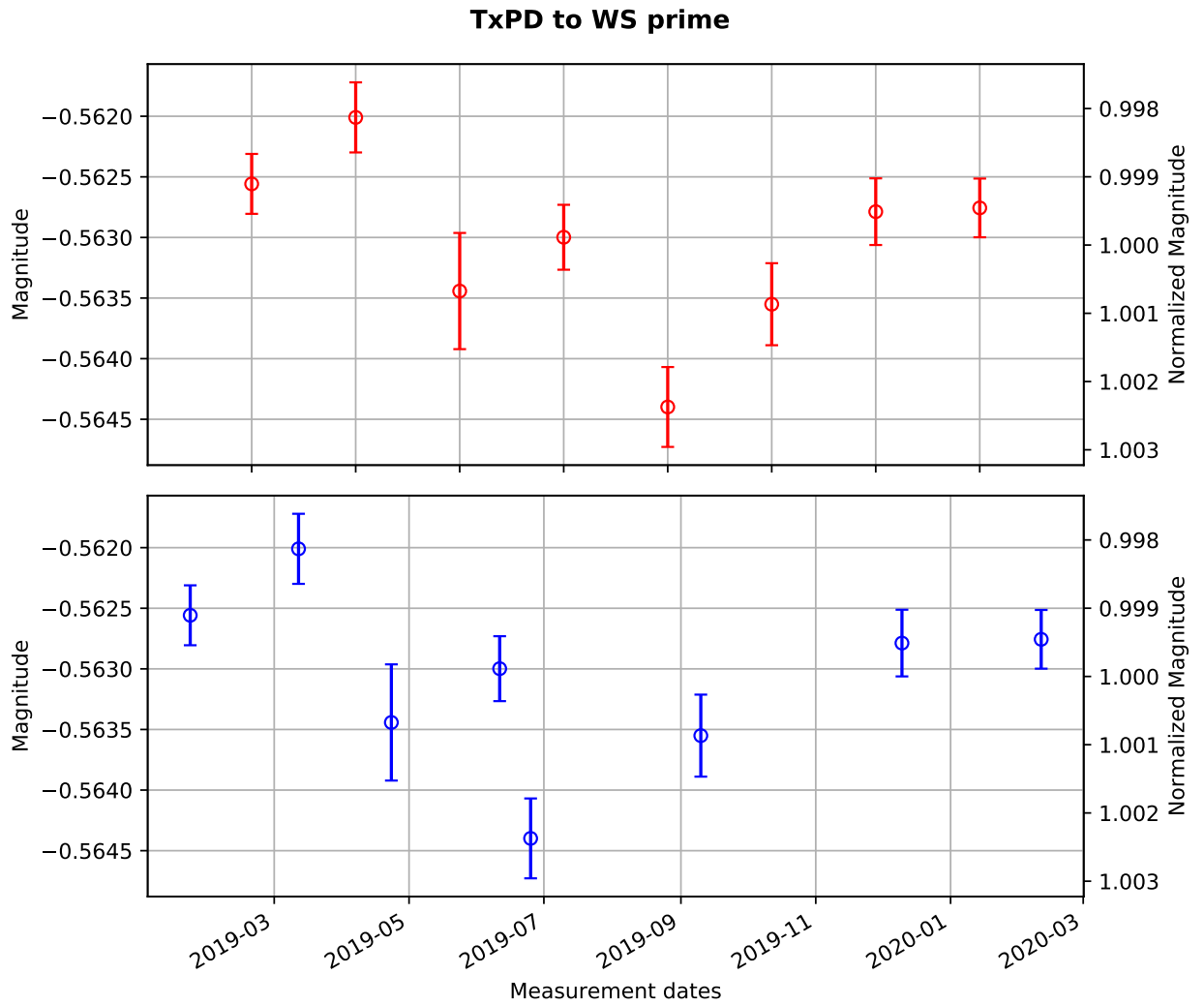


Summary of Output Side Optical Efficiency factor		
Mean value:	0.994291	
Standard deviation:	0.000423	
Standard error:	0.000160	
Relative Standard error:	0.000161	

10 TxPD to WS prime ($\alpha_{TW'}$)

List of Measurements

Date	alphaTXWS_prime $\pm$ SE_alphaTXWS_prime	
Normalized		
D20190122	-0.562558 $\pm$ -0.000247	(1 $\pm$ 0.000439)
D20190312	-0.562010 $\pm$ -0.000289	(1 $\pm$ 0.000514)
D20190423	-0.563442 $\pm$ -0.000479	(1 $\pm$ 0.000851)
D20190611	-0.562998 $\pm$ -0.000268	(1 $\pm$ 0.000476)
D20190625	-0.564399 $\pm$ -0.000329	(1 $\pm$ 0.000584)
D20190910	-0.563551 $\pm$ -0.000338	(1 $\pm$ 0.000600)
D20191210	-0.562787 $\pm$ -0.000275	(1 $\pm$ 0.000489)
D20200211	-0.562756 $\pm$ -0.000242	(1 $\pm$ 0.000430)



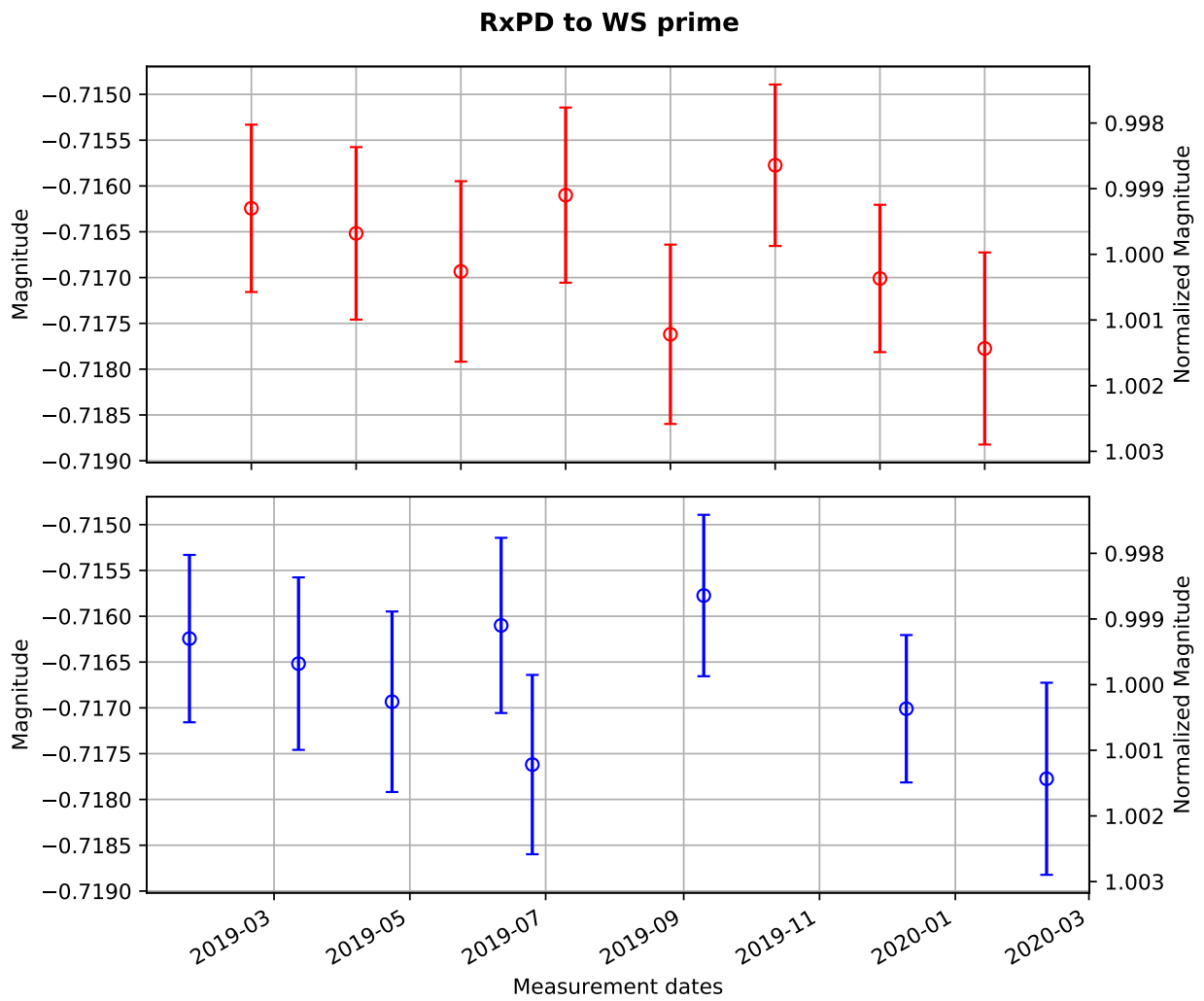
Summary of TxPD to WS prime

Mean value:	-0.563063
Standard deviation:	0.000727
Standard error:	0.000274
Relative Standard error:	0.000487

11 RxPD to WS prime (α_{RW}')

List of Measurements

Date	alphaRXWS_prime $\pm$ SE_alphaRXWS_prime	
Normalized		
D20190122	-0.716244 $\pm$ -0.000914	(1 $\pm$ 0.001276)
D20190312	-0.716517 $\pm$ -0.000941	(1 $\pm$ 0.001314)
D20190423	-0.716933 $\pm$ -0.000985	(1 $\pm$ 0.001374)
D20190611	-0.716100 $\pm$ -0.000956	(1 $\pm$ 0.001335)
D20190625	-0.717619 $\pm$ -0.000979	(1 $\pm$ 0.001364)
D20190910	-0.715774 $\pm$ -0.000881	(1 $\pm$ 0.001231)
D20191210	-0.717010 $\pm$ -0.000805	(1 $\pm$ 0.001122)
D20200211	-0.717774 $\pm$ -0.001049	(1 $\pm$ 0.001461)

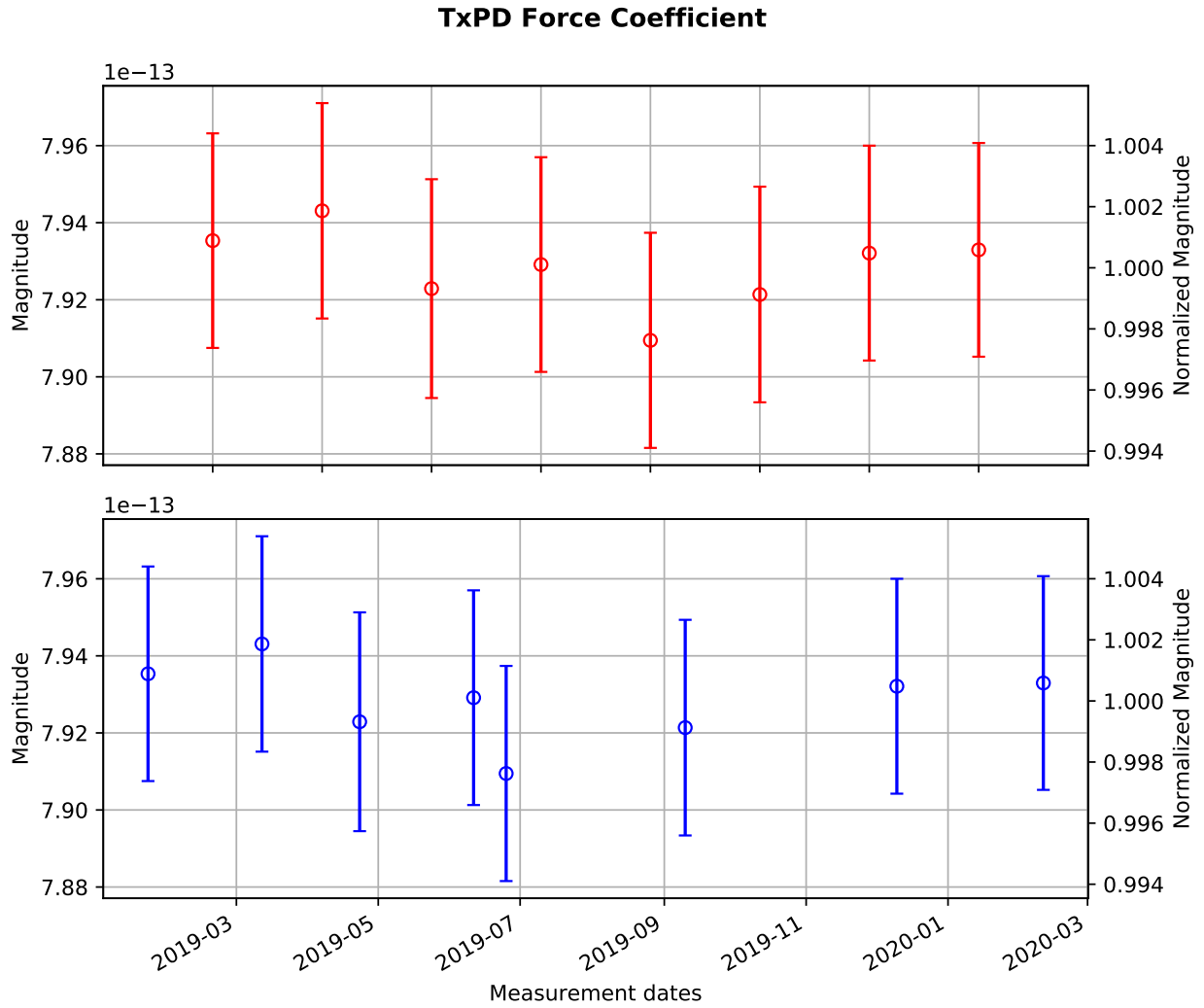


Summary of RxPD to WS prime			
	Mean value:	-0.716746	
	Standard deviation:	0.000716	
	Standard error:	0.000270	
	Relative Standard error:	0.000377	

12 TxPD Force Coefficient (Γ_{TX})

List of Measurements

Date	FC_TxPD $\pm$ SE_FC_TxPD	Normalized
D20190122	7.935345e-13 $\pm$ 2.784503e-15	(1 $\pm$ 3.508987e-03)
D20190312	7.943089e-13 $\pm$ 2.795314e-15	(1 $\pm$ 3.519178e-03)
D20190423	7.922894e-13 $\pm$ 2.839416e-15	(1 $\pm$ 3.583812e-03)
D20190611	7.929139e-13 $\pm$ 2.786075e-15	(1 $\pm$ 3.513716e-03)
D20190625	7.909468e-13 $\pm$ 2.792022e-15	(1 $\pm$ 3.529975e-03)
D20190910	7.921367e-13 $\pm$ 2.798435e-15	(1 $\pm$ 3.532768e-03)
D20191210	7.932114e-13 $\pm$ 2.788538e-15	(1 $\pm$ 3.515505e-03)
D20200211	7.932952e-13 $\pm$ 2.773637e-15	(1 $\pm$ 3.496349e-03)



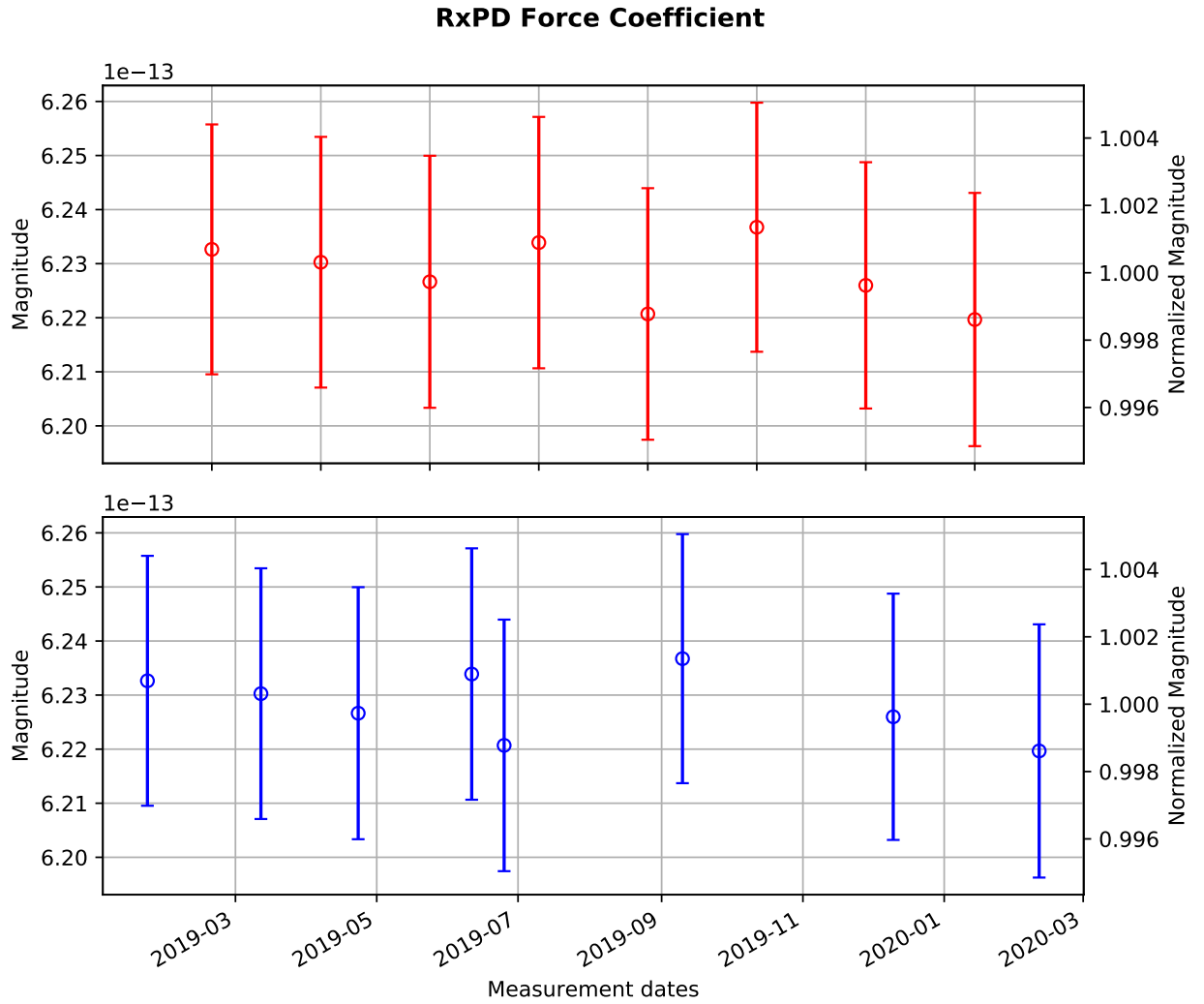
Summary of TxPD Force Coefficient

Mean value:	7.928296e-13
Standard deviation:	1.026223e-15
Standard error:	3.869626e-16
Relative Standard error:	4.880779e-04

13 RxPD Force Coefficient (Γ_{RX})

List of Measurements

Date	FC_RXPD $\pm$ SE_FC_RXPD	Normalized
D20190122	$6.232642\text{e-}13 \pm 2.310887\text{e-}15$	$(1 \pm 3.707716\text{e-}03)$
D20190312	$6.230266\text{e-}13 \pm 2.318319\text{e-}15$	$(1 \pm 3.721060\text{e-}03)$
D20190423	$6.226650\text{e-}13 \pm 2.330520\text{e-}15$	$(1 \pm 3.742815\text{e-}03)$
D20190611	$6.233895\text{e-}13 \pm 2.324452\text{e-}15$	$(1 \pm 3.728730\text{e-}03)$
D20190625	$6.220698\text{e-}13 \pm 2.325999\text{e-}15$	$(1 \pm 3.739129\text{e-}03)$
D20190910	$6.236738\text{e-}13 \pm 2.303034\text{e-}15$	$(1 \pm 3.692689\text{e-}03)$
D20191210	$6.225986\text{e-}13 \pm 2.277312\text{e-}15$	$(1 \pm 3.657753\text{e-}03)$
D20200211	$6.219669\text{e-}13 \pm 2.341568\text{e-}15$	$(1 \pm 3.764780\text{e-}03)$



Summary of RxPD Force Coefficient

Mean value:	$6.228318\text{e-}13$
Standard deviation:	$6.159694\text{e-}16$
Standard error:	$2.322665\text{e-}16$
Relative Standard error:	$3.729201\text{e-}04$