RxPD and TxPD Calibration Trends

GENERATED FOR LHO_EndX

Report Generated on February 11, 2020

Contents

1 About

This document contains the Pcal PD (TxPD and RxPD) Calibration trends. The first six sections contain the six ratios measured at the end-station labeled as m1, m2 ……m6. The section that follows contains the relevant information calculated from these measurements which include Optical Efficiency, Power Imbalance, TX/WS and RX/WS ratio.

Understanding Each Section

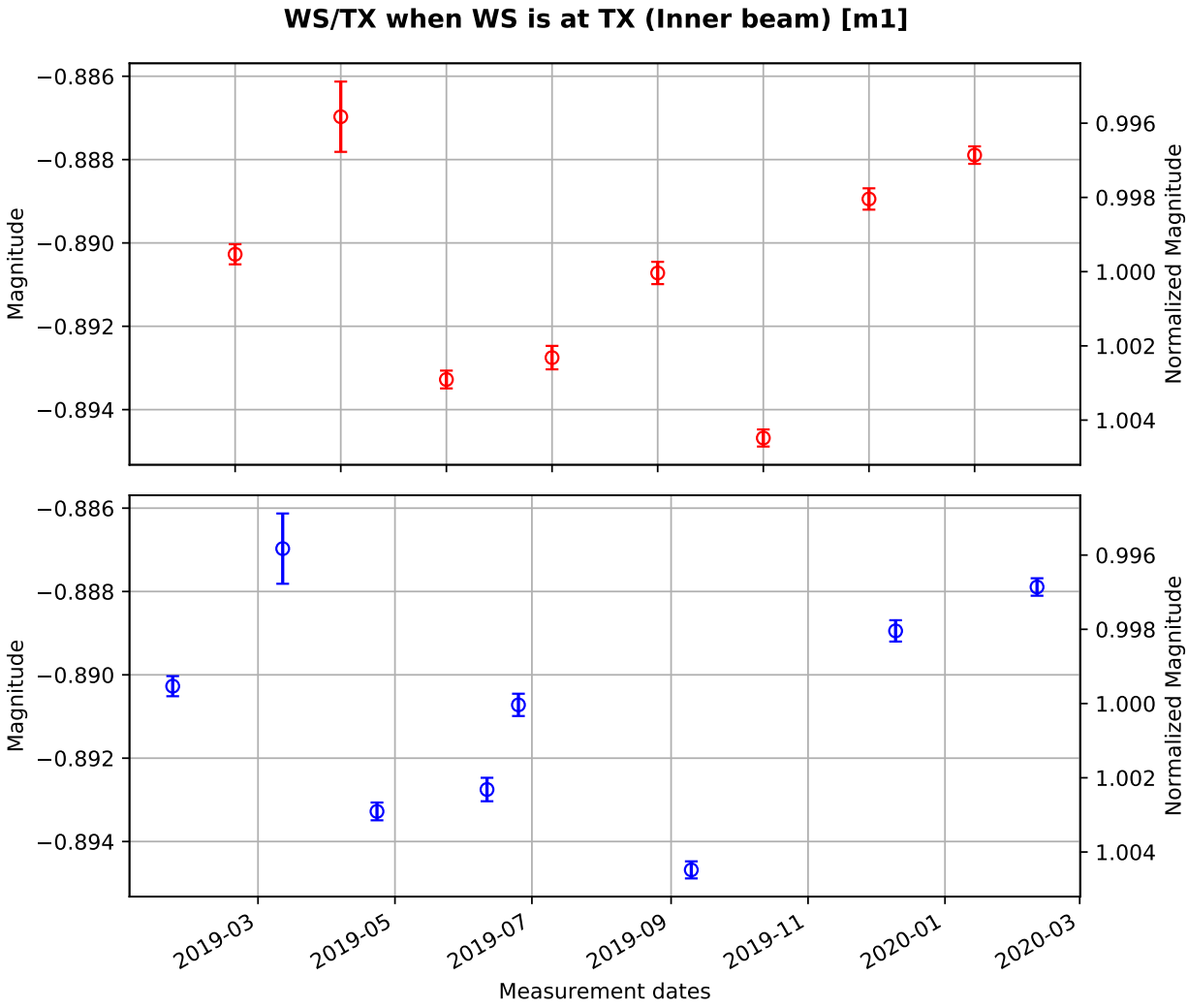
Each section contains a list of measurements with Magnitude, Standard Error (Std Err) and Relative Error (Rel Err) for each measurement. The list is followed by two plot figures with Magnitude on the first plot and the the Normalized Magnitude on the second. Each section ends with a summary that contains the weighted mean of all the measurement along with their Standard Deviation (Std Dev), Std Err and Rel Err where each of these terms are defined as:

```
Mean = sum(x(i)*w(i))/sum(w(i))
Std Dev = sqrt(sum(w(i)*(x(i)-x_mean)^2)/((n-1)/n*sum(w(i))))
Std Err = Std Dev/sqrt(n)
Rel Err = Std Err/Mean
```

2 WS/TX Ratio when WS is at TX (Inner Beam)

List of Measurements

Date	m1 ± SE_m1	Normalized
D20190122	-0.890272 ± 0.000242	(1 ± 0.000271)
D20190312	-0.886971 ± 0.000843	(1 ± 0.000951)
D20190423	-0.893277 ± 0.000214	(1 ± 0.000239)
D20190611	-0.892752 ± 0.000282	(1 ± 0.000315)
D20190625	-0.890721 ± 0.000267	(1 ± 0.000300)
D20190910	-0.894681 ± 0.000205	(1 ± 0.000229)
D20191210	-0.888945 ± 0.000256	(1 ± 0.000288)
D20200211	-0.887892 ± 0.000210	(1 ± 0.000236)



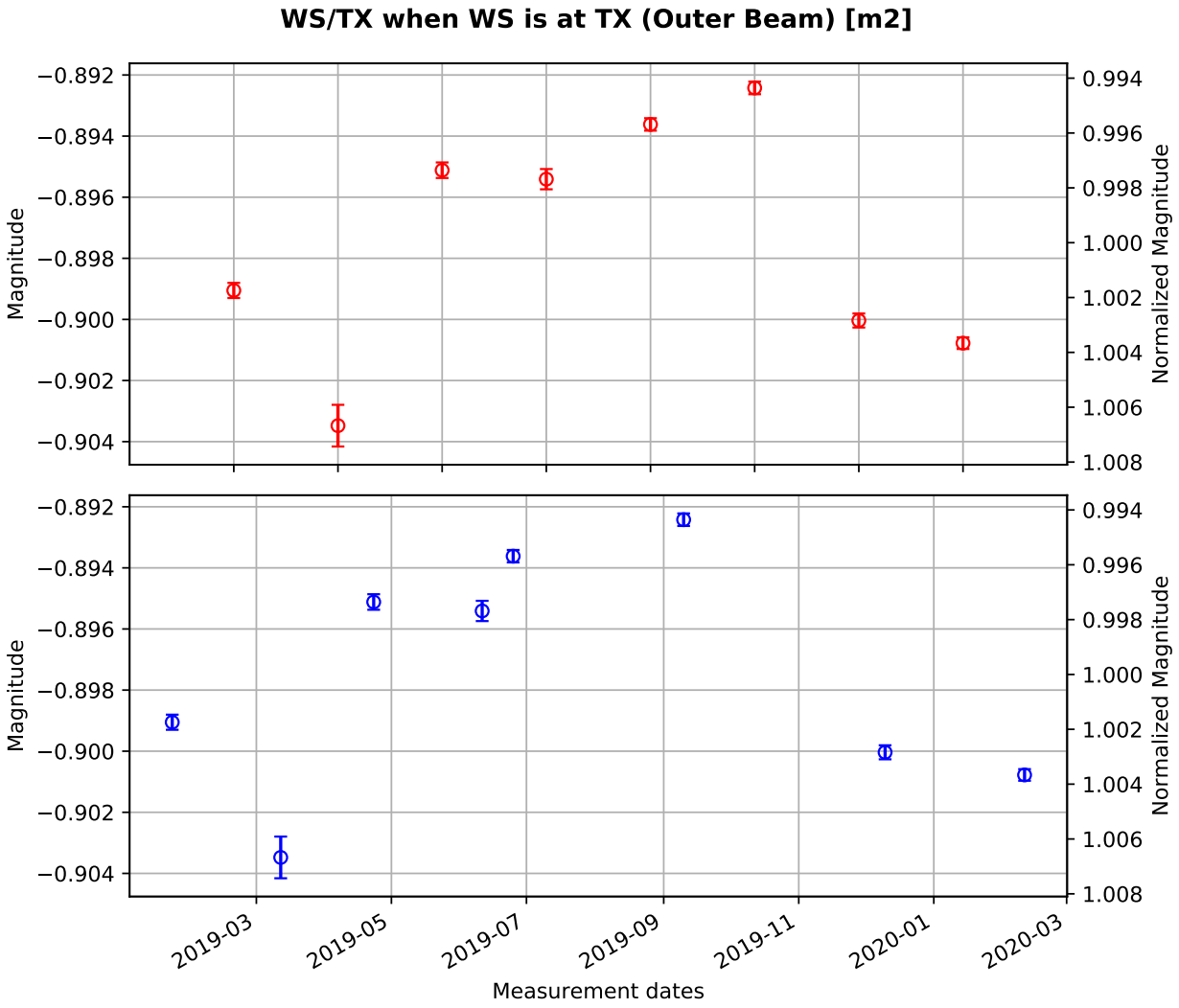
Summary of WS/TX when WS is at TX (Inner beam) [m1]

Mean value:	-0.890689
Standard deviation:	0.002719
Standard error:	0.001025
Relative Standard error:	0.001151

3 WS/TX Ratio when WS is at TX (Outer Beam)

List of Measurements

Date	m2 ± SE_m2	Normalized
D20190122	-0.899052 ± 0.000248	(1 ± 0.000275)
D20190312	-0.903477 ± 0.000682	(1 ± 0.000755)
D20190423	-0.895117 ± 0.000254	(1 ± 0.000284)
D20190611	-0.895410 ± 0.000331	(1 ± 0.000370)
D20190625	-0.893618 ± 0.000204	(1 ± 0.000228)
D20190910	-0.892423 ± 0.000206	(1 ± 0.000230)
D20191210	-0.900036 ± 0.000230	(1 ± 0.000255)
D20200211	-0.900777 ± 0.000190	(1 ± 0.000211)



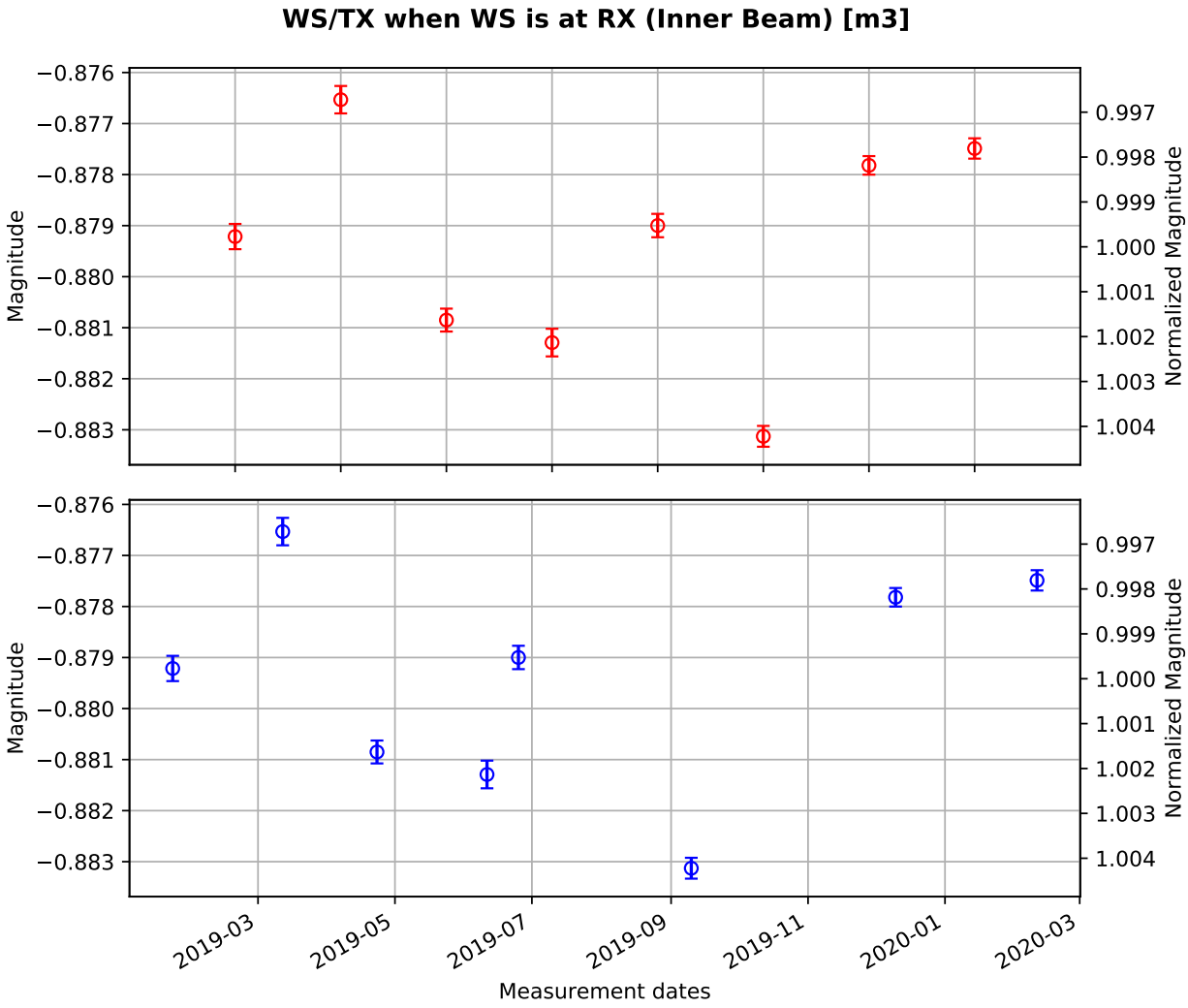
Summary of WS/TX when WS is at TX (Outer Beam) [m2]

Mean value:	-0.897489
Standard deviation:	0.003895
Standard error:	0.001469
Relative Standard error:	0.001636

4 WS/TX Ratio when WS is at RX (Inner Beam)

List of Measurements

Date	m3 ± SE_m3	Normalized
D20190122	-0.879214 ± 0.000247	(1 ± 0.000281)
D20190312	-0.876532 ± 0.000269	(1 ± 0.000307)
D20190423	-0.880851 ± 0.000224	(1 ± 0.000255)
D20190611	-0.881291 ± 0.000271	(1 ± 0.000307)
D20190625	-0.878999 ± 0.000229	(1 ± 0.000260)
D20190910	-0.883128 ± 0.000204	(1 ± 0.000231)
D20191210	-0.877819 ± 0.000182	(1 ± 0.000207)
D20200211	-0.877488 ± 0.000199	(1 ± 0.000227)

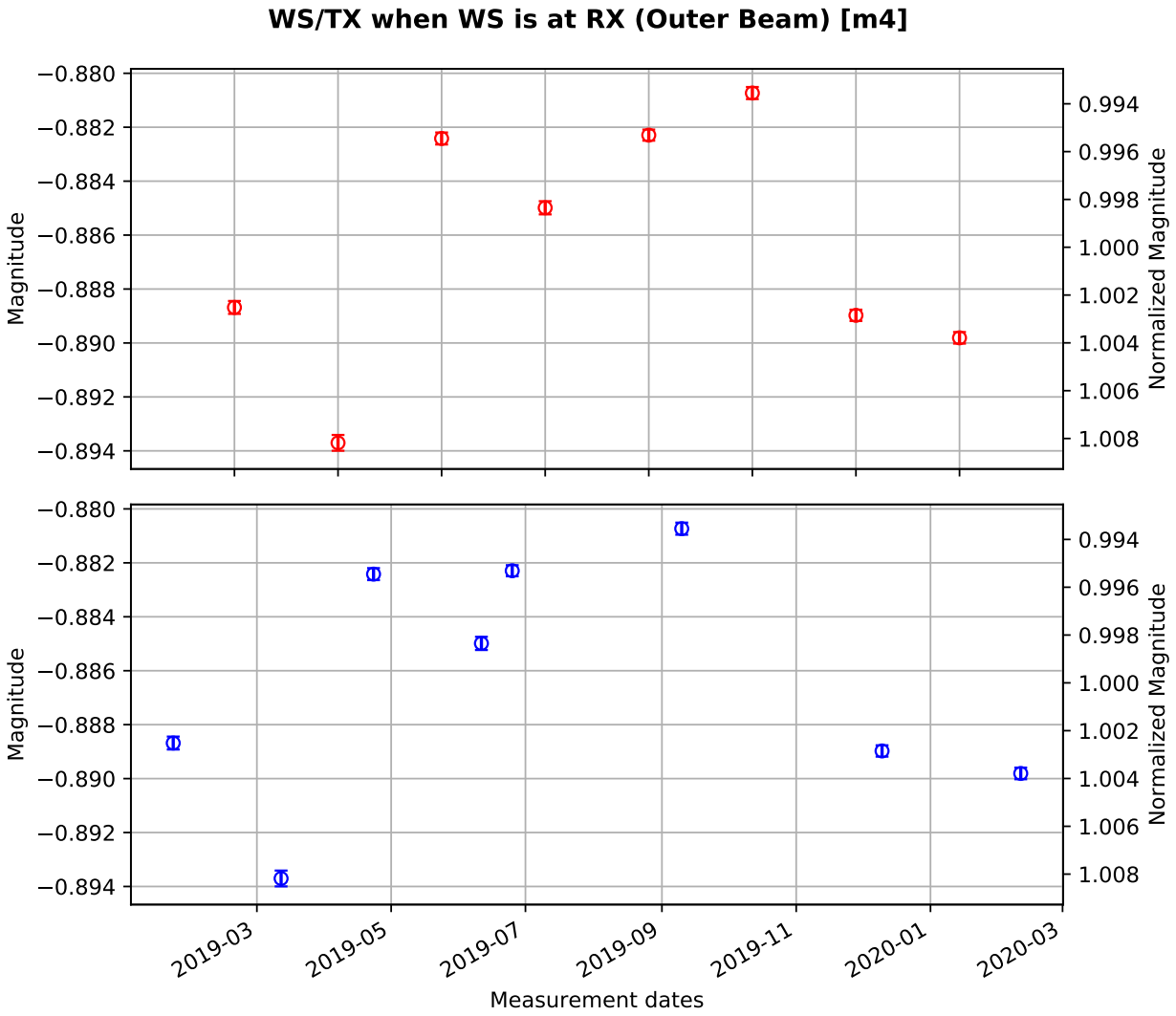


Summary of WS/TX when WS is at RX (Inner Beam) [m3]	
Mean value:	-0.879415
Standard deviation:	0.002209
Standard error:	0.000833
Relative Standard error:	0.000947

5 WS/TX Ratio when WS is at RX (Inner Beam)

List of Measurements

Date	m4 ± SE_m4	Normalized
D20190122	-0.888682 ± 0.000240	(1 ± 0.000270)
D20190312	-0.893703 ± 0.000294	(1 ± 0.000328)
D20190423	-0.882418 ± 0.000223	(1 ± 0.000252)
D20190611	-0.884988 ± 0.000245	(1 ± 0.000277)
D20190625	-0.882293 ± 0.000206	(1 ± 0.000233)
D20190910	-0.880733 ± 0.000224	(1 ± 0.000255)
D20191210	-0.888975 ± 0.000210	(1 ± 0.000237)
D20200211	-0.889809 ± 0.000215	(1 ± 0.000242)



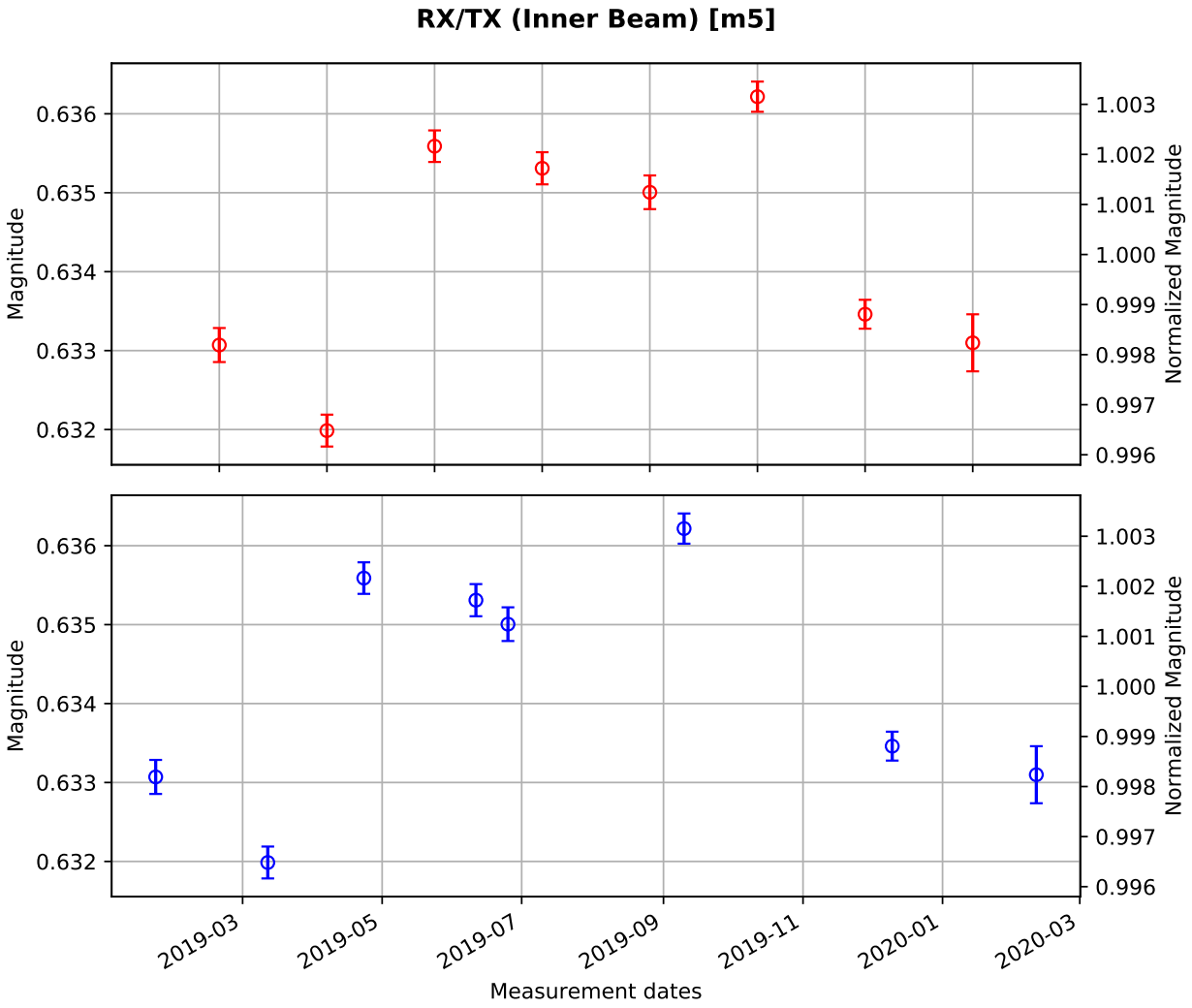
Summary of WS/TX when WS is at RX (Outer Beam) [m4]

Mean value:	-0.886450
Standard deviation:	0.004529
Standard error:	0.001708
Relative Standard error:	0.001927

6 RX/TX Ratio (Inner Beam)

List of Measurements

Date	m5 ± SE_m5	Normalized
D20190122	0.633071 ± 0.000216	(1 ± 0.000341)
D20190312	0.631987 ± 0.000202	(1 ± 0.000320)
D20190423	0.635590 ± 0.000200	(1 ± 0.000314)
D20190611	0.635310 ± 0.000204	(1 ± 0.000321)
D20190625	0.635006 ± 0.000213	(1 ± 0.000336)
D20190910	0.636217 ± 0.000191	(1 ± 0.000301)
D20191210	0.633461 ± 0.000183	(1 ± 0.000289)
D20200211	0.633099 ± 0.000361	(1 ± 0.000571)



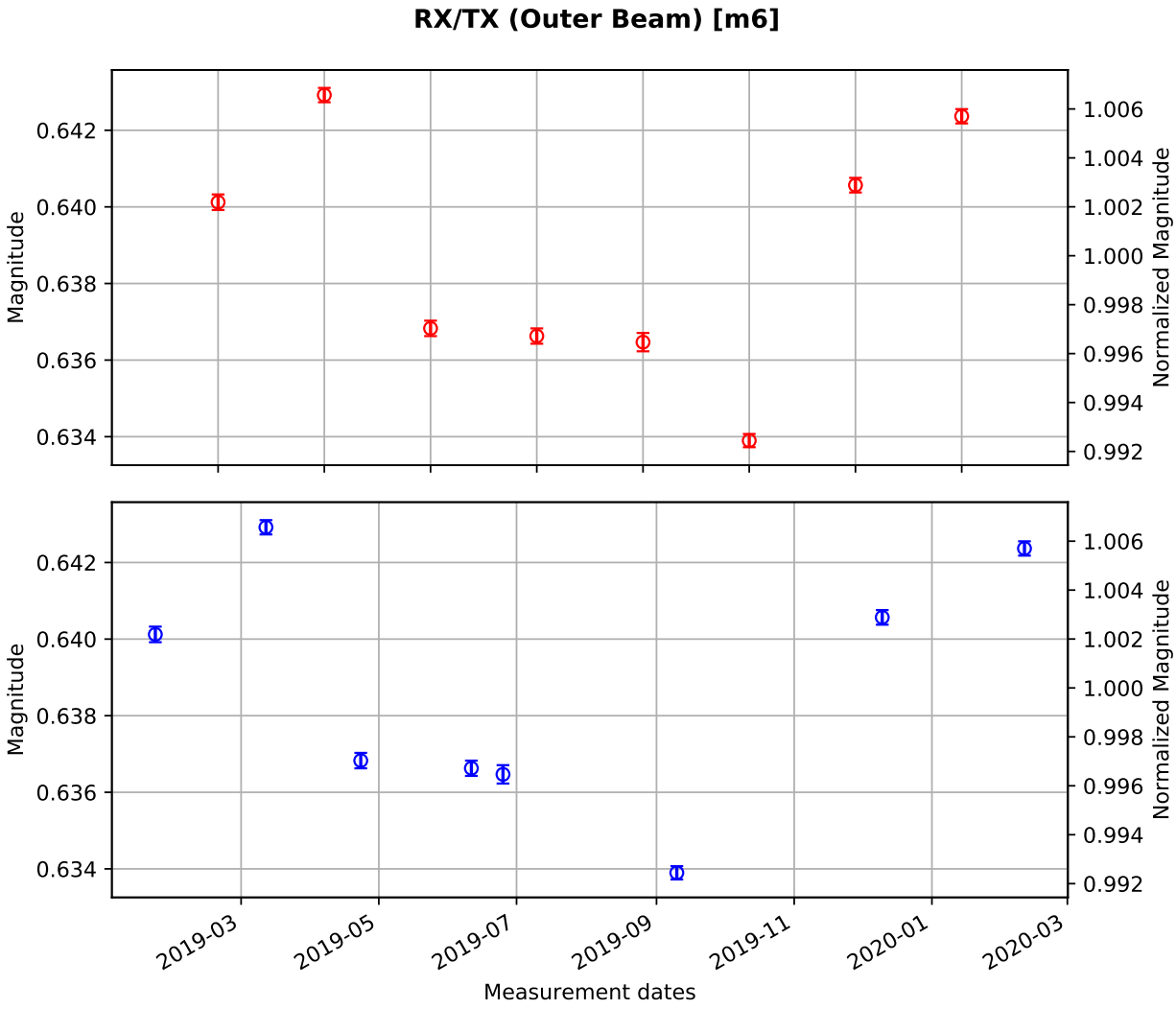
Summary of RX/TX (Inner Beam) [m5]

Mean value:	0.634217
Standard deviation:	0.001503
Standard error:	0.000567
Relative Standard error:	0.000894

7 RX/TX Ratio (Outer Beam)

List of Measurements

Date	m6 ± SE_m6	Normalized
D20190122	0.640122 ± 0.000203	(1 ± 0.000317)
D20190312	0.642919 ± 0.000187	(1 ± 0.000291)
D20190423	0.636828 ± 0.000201	(1 ± 0.000316)
D20190611	0.636627 ± 0.000200	(1 ± 0.000313)
D20190625	0.636468 ± 0.000240	(1 ± 0.000377)
D20190910	0.633898 ± 0.000173	(1 ± 0.000273)
D20191210	0.640567 ± 0.000191	(1 ± 0.000298)
D20200211	0.642366 ± 0.000187	(1 ± 0.000291)



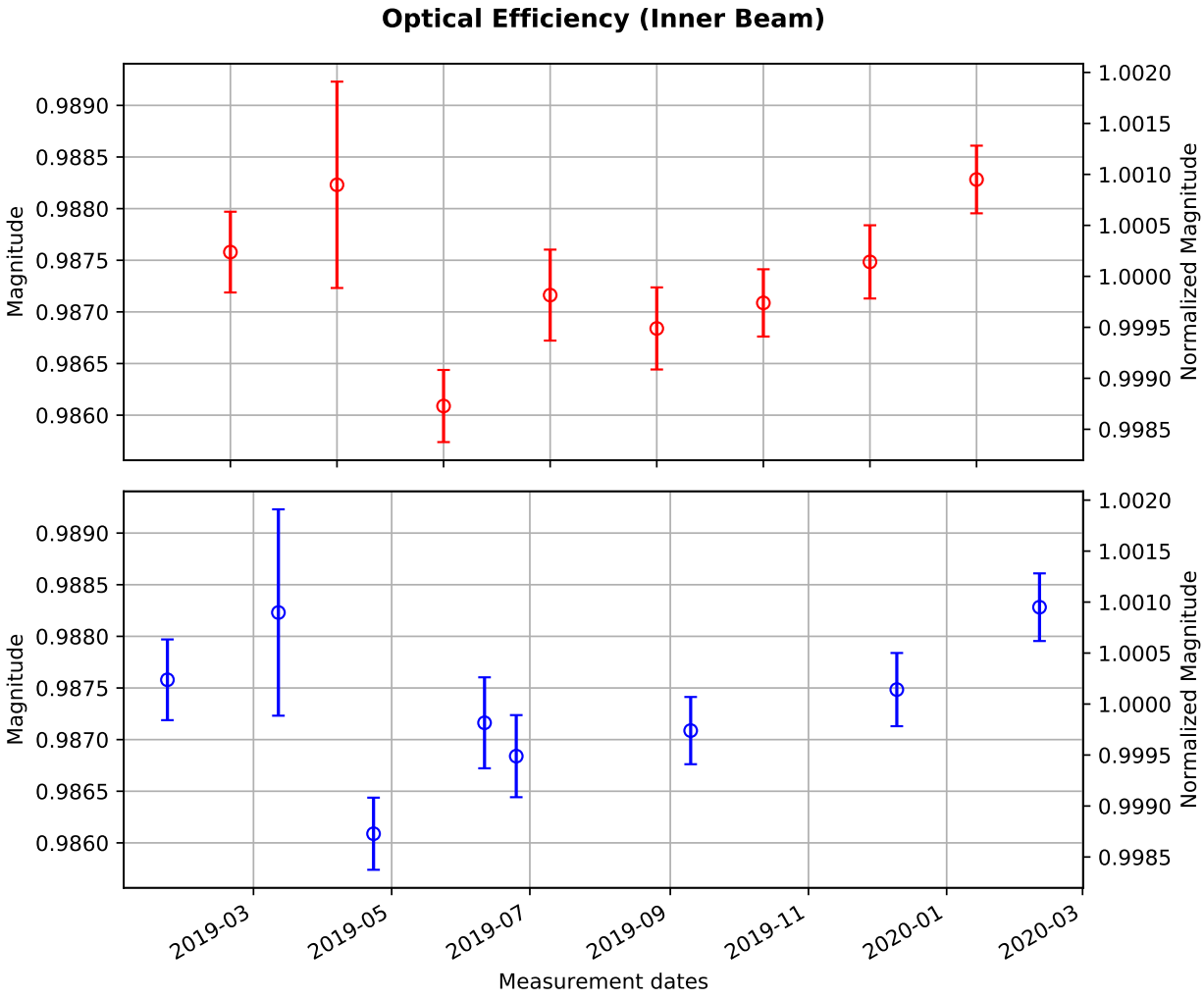
Summary of RX/TX (Outer Beam) [m6]

Mean value:	0.638724
Standard deviation:	0.003220
Standard error:	0.001214
Relative Standard error:	0.001901

8 Optical Efficiency of Inner Beam

List of Measurements

Date	e_i ± SE_e_i	Normalized
D20190122	0.987579 ± 0.000391	(1 ± 0.000396)
D20190312	0.988231 ± 0.000999	(1 ± 0.001011)
D20190423	0.986089 ± 0.000349	(1 ± 0.000354)
D20190611	0.987163 ± 0.000440	(1 ± 0.000446)
D20190625	0.986840 ± 0.000398	(1 ± 0.000403)
D20190910	0.987087 ± 0.000326	(1 ± 0.000330)
D20191210	0.987484 ± 0.000354	(1 ± 0.000359)
D20200211	0.988282 ± 0.000328	(1 ± 0.000331)



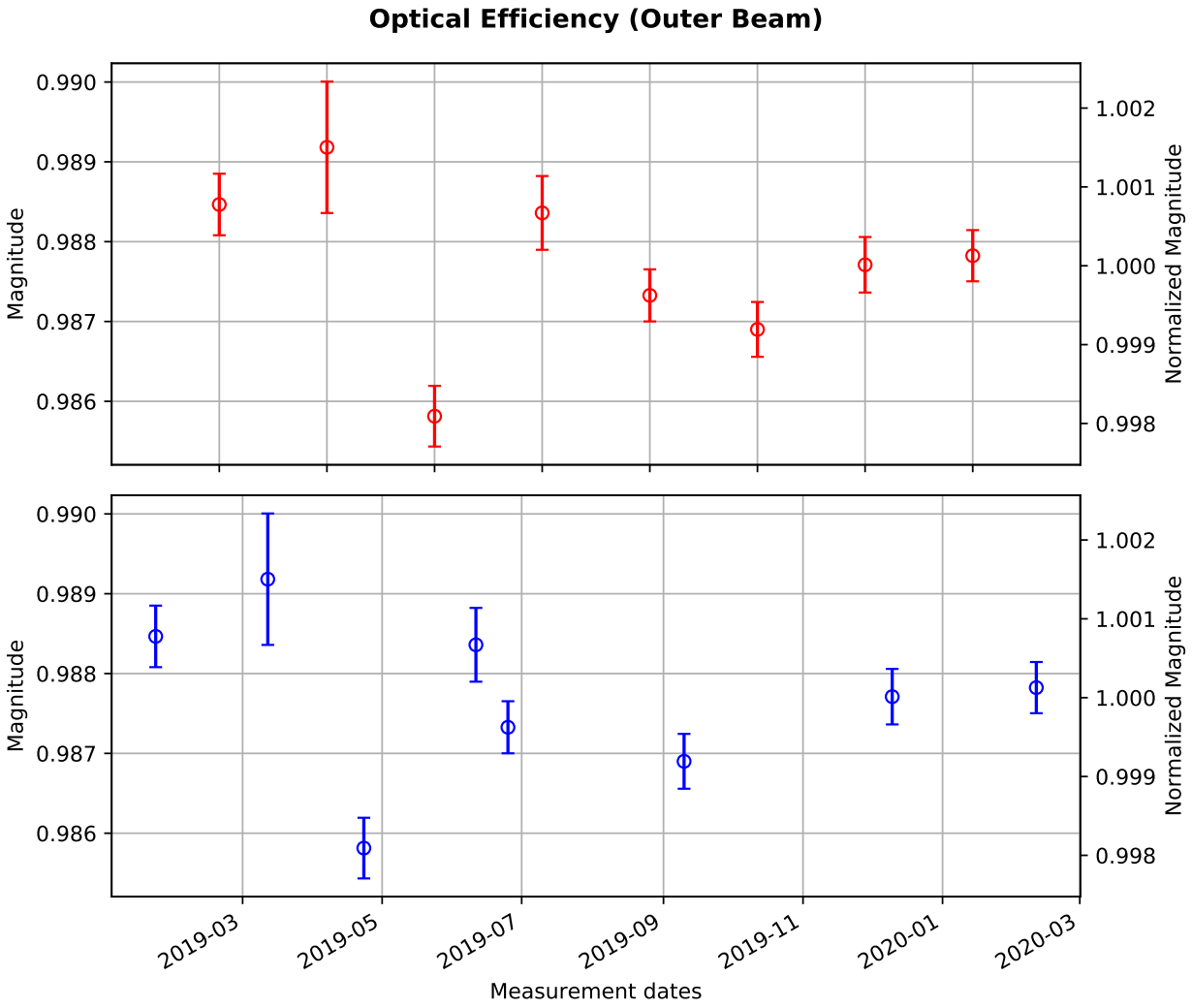
Summary of Optical Efficiency (Inner Beam)

Mean value:	0.987344
Standard deviation:	0.000724
Standard error:	0.000273
Relative Standard error:	0.000277

9 Optical Efficiency of Outer Beam

List of Measurements

Date	e_o ± SE_e_o	Normalized
D20190122	0.988466 ± 0.000386	(1 ± 0.000390)
D20190312	0.989182 ± 0.000823	(1 ± 0.000832)
D20190423	0.985814 ± 0.000380	(1 ± 0.000386)
D20190611	0.988360 ± 0.000462	(1 ± 0.000468)
D20190625	0.987327 ± 0.000326	(1 ± 0.000331)
D20190910	0.986901 ± 0.000343	(1 ± 0.000348)
D20191210	0.987711 ± 0.000348	(1 ± 0.000352)
D20200211	0.987824 ± 0.000321	(1 ± 0.000325)



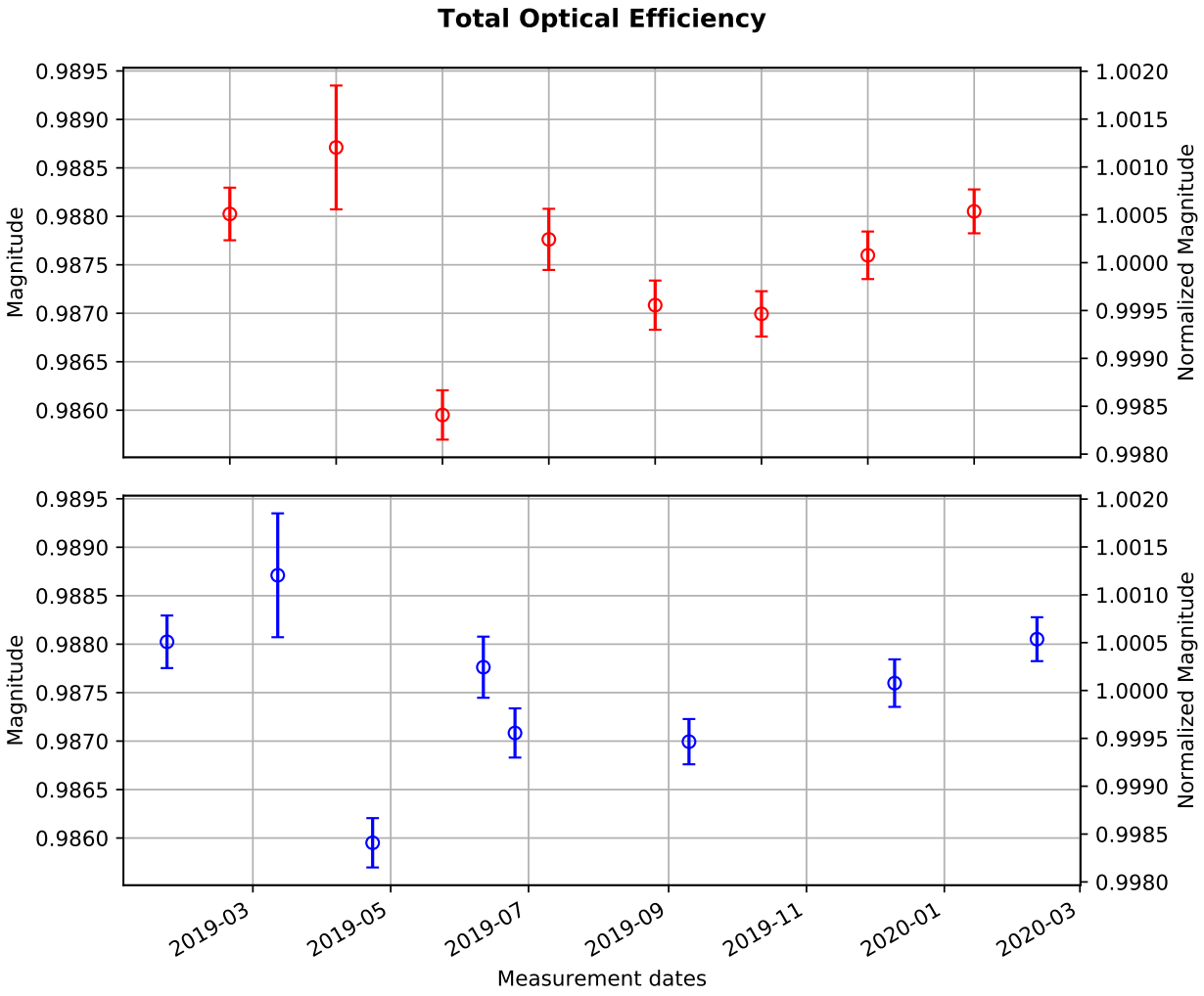
Summary of Optical Efficiency (Outer Beam)

Mean value:	0.987698
Standard deviation:	0.001040
Standard error:	0.000392
Relative Standard error:	0.000397

10 Total Optical Efficiency

List of Measurements

Date	e ± 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)



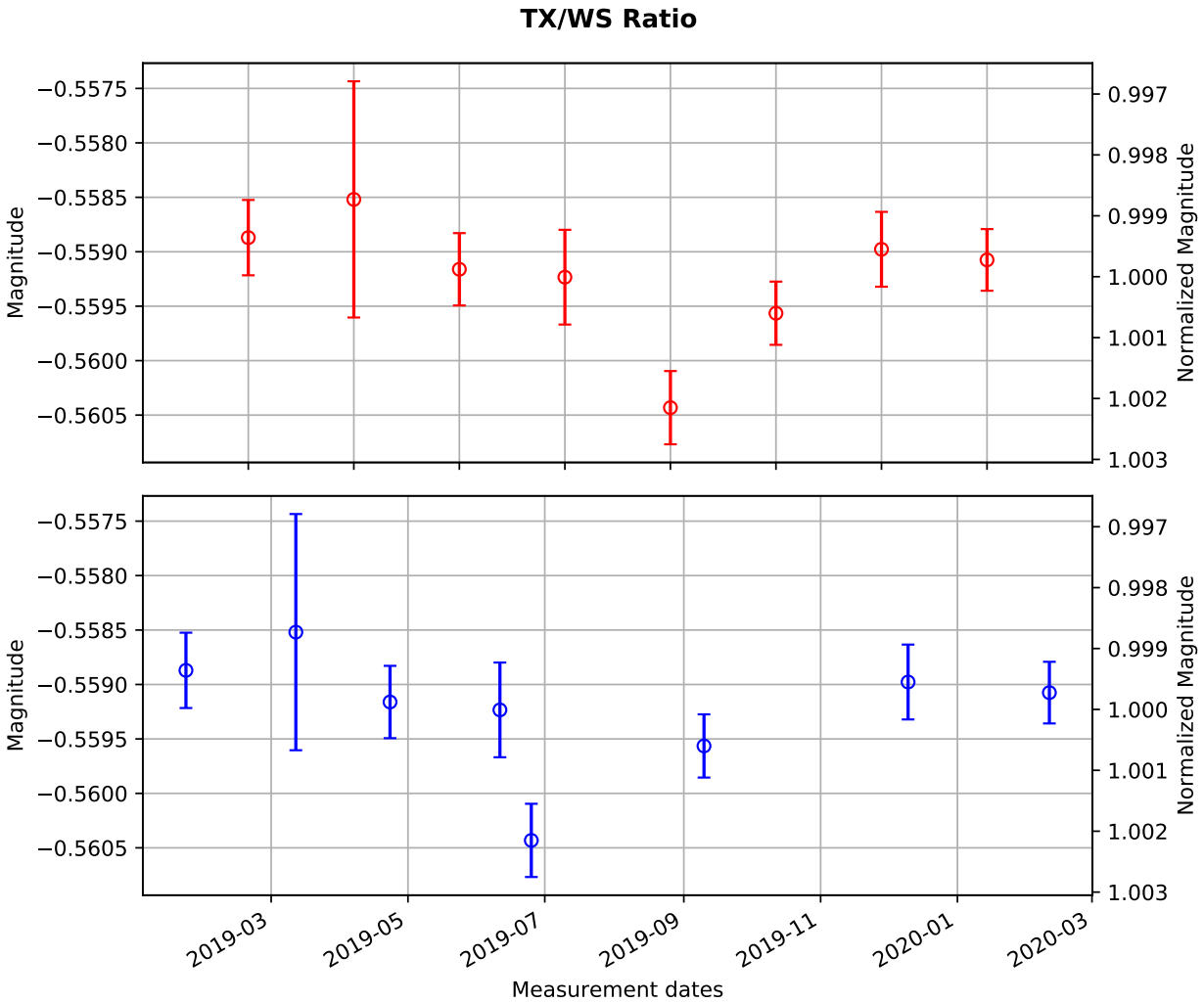
Summary of Total Optical Efficiency

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

11 TX/WS Ratio

List of Measurements

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



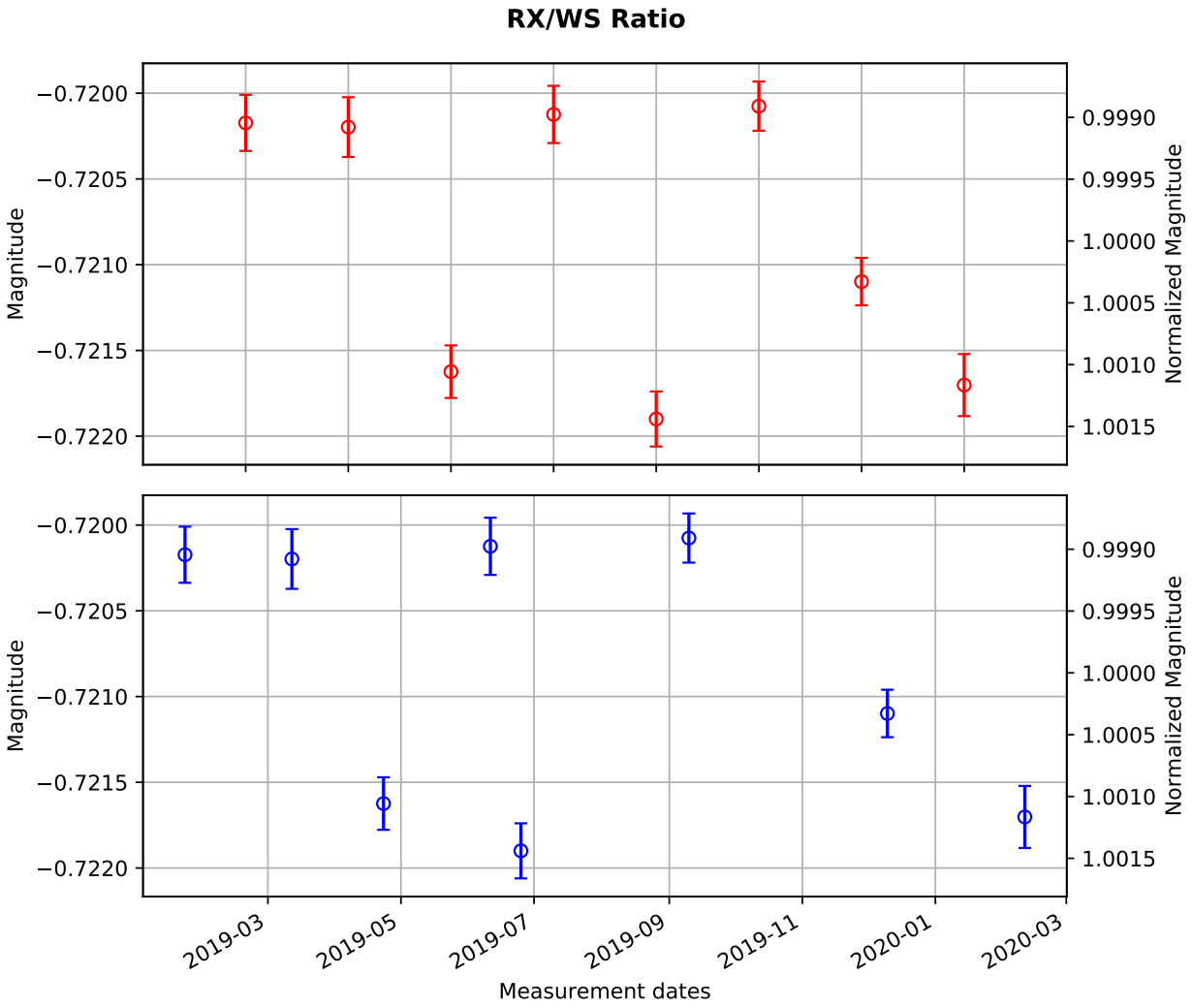
Summary of TX/WS Ratio

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

12 RX/WS Ratio

List of Measurements

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



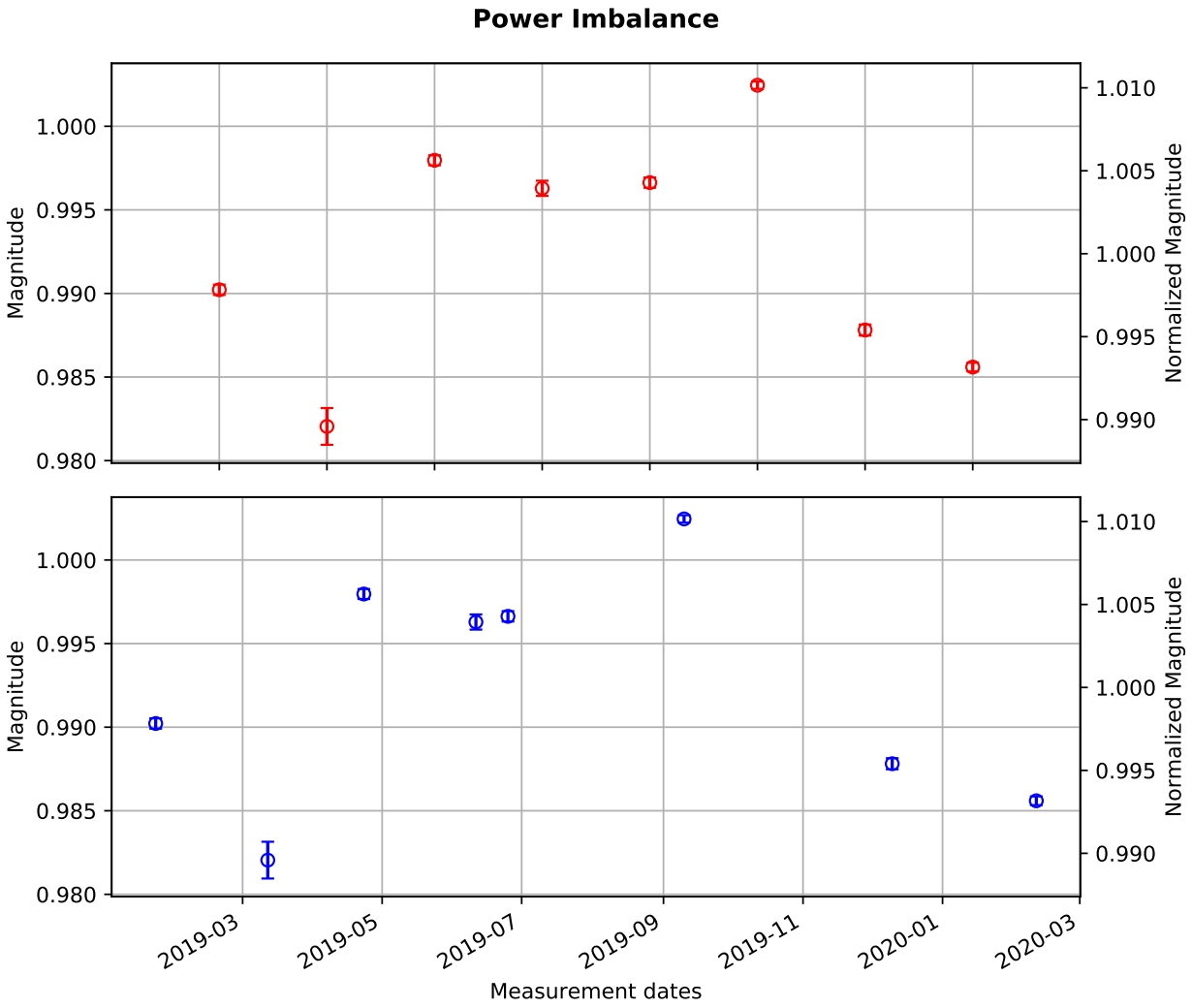
Summary of RX/WS Ratio

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

13 Power Imbalance

List of Measurements

Date	PI ± SE_PI	Normalized
D20190122	0.990220 ± 0.000309	(1 ± 0.000312)
D20190312	0.982046 ± 0.001100	(1 ± 0.001120)
D20190423	0.997965 ± 0.000299	(1 ± 0.000299)
D20190611	0.996290 ± 0.000454	(1 ± 0.000456)
D20190625	0.996631 ± 0.000309	(1 ± 0.000310)
D20190910	1.002457 ± 0.000223	(1 ± 0.000222)
D20191210	0.987813 ± 0.000331	(1 ± 0.000335)
D20200211	0.985596 ± 0.000259	(1 ± 0.000263)



Summary of Power Imbalance

Mean value:	0.992377
Standard deviation:	0.007015
Standard error:	0.002645
Relative Standard error:	0.002665