Calculated Drift Rates for Mars Orbiters

List of spacecraft orbiting Mars:

2001 Mars Odyssey (NASA)
Mars Express (ESA)
Mars Reconnaissance Orbiter (NASA)
Mars Orbiter Mission (ISRO)
MAVEN (NASA)
ExoMars Trace Gas Orbiter (ESA & Roscosmos)
Emirates Mars Mission (EMM) – Hope (UAE Space Agency)
Tianwen 1 (CNSA)

From: https://en.wikipedia.org/wiki/List_of_Mars_orbiters

List of active missions on Mars' surface (as of Feb 11):

Mars Science Laboratory (Curiosity)
Insight Lander

Drift Rate Calculations:

Mars Odyssey:

JPL Horizons can't produce the ephemeris past 31 Jan. 2021.

Mars Express:

deldot:

18:20 UTC: 17.2303262
18:25 UTC: 17.2808751
18:30 UTC: 17.3300396

Operating frequency: ~8.4 GHz (https://mars.nasa.gov/express/mission/comm_summary.html)

Drift rate between 18:20 and 18:25 UTC: -4.7173546458073154 Hz/s
Drift rate between 18:25 and 18:30 UTC: -4.588157316994184 Hz/s
Drift rate between 18:25 and 18:55 UTC: -4.304050608121621 Hz/s

Mars Reconnaissance Orbiter:

deldot:

18:20 UTC: 15.9279768
18:25 UTC: 16.1656228
18:30 UTC: 16.4443977
18:55 UTC: 17.6653253

Operating frequency: 8439.444444 MHz (https://uhf-satcom.com/dsn/mars-reconnaissance-orbiter#:~:text=The%20Mars%20Reconnaissance%20Orbiter%20(MRO,the%20frequency%20has%20changed%20significantly.&text=The%20receive%20frequency%20was%20around%208438.957522%20MHz.)

Drift rate between 18:20 and 18:25 UTC: -22.282063056868893 Hz/s
Drift rate between 18:25 and 18:30 UTC: -26.13832847282773 Hz/s
Drift rate between 18:25 and 18:55 UTC: -23.435608820528525 Hz/s

Mars Orbiter Mission (Mangalyaan):

deldot:

18:20 UTC: 16.4464503
18:25 UTC: 16.4474153
18:30 UTC: 16.4486019
18:55 UTC: 16.4577068

Operating frequency: 8.4 GHz (no idea actually)

Drift rate between 18:20 and 18:25 UTC: -0.09005679200929888 Hz/s
Drift rate between 18:25 and 18:30 UTC: -0.11073719029215737 Hz/s
Drift rate between 18:25 and 18:55 UTC: -0.16007244217436925 Hz/s

MAVEN:

deldot:

18:20 UTC: 16.3116486
18:25 UTC: 16.3264391
18:30 UTC: 16.3455332
18:55 UTC: 16.5280898

Operating frequency: 8.4 GHz (not sure this is the right frequency, but it does have an X-Band system)

Drift rate between 18:20 and 18:25 UTC: -1.3802964951220726 Hz/s
Drift rate between 18:25 and 18:30 UTC: -1.7819219317026878 Hz/s
Drift rate between 18:25 and 18:55 UTC: -3.13644516916754 Hz/s

ExoMars Trace Gas Orbiter (ESA & Roscosmos)

deldot:

18:20 UTC: 18.9407104
18:25 UTC: 18.2234485
18:30 UTC: 17.3953004
18:55 UTC: 13.6646209

Operating frequency: 8.4 GHZ (not sure this is the right freq but it has an X-Band system)

Drift rate between 18:20 and 18:25 UTC: 66.93615165727198 Hz/s
Drift rate between 18:25 and 18:30 UTC: 77.28464645291744 Hz/s
Drift rate between 18:25 and 18:55 UTC: 70.9075587825311 Hz/s

Emirates Mars Mission (EMM) – Hope (UAE Space Agency)

deldot:

18:20 UTC: 16.3348209
18:25 UTC: 16.3384640
18:30 UTC: 16.3422721
18:55 UTC: 16.3637390

Operating frequency: 8.402655 GHZ
(https://destevez.net/2020/07/decoding-emirates-mars-mission-hope/)

Drift rate between 18:20 and 18:25 UTC: -0.3400930972457258 Hz/s
Drift rate between 18:25 and 18:30 UTC: -0.3554962782951641 Hz/s
Drift rate between 18:25 and 18:55 UTC: -0.3932480673213972 Hz/s

Tianwen 1 (CNSA):

No ephemeris.

Mars Science Laboratory:

deldot:

18:20 UTC: 16.7067824
18:25 UTC: 16.7047947
18:30 UTC: 16.7029496
18:55 UTC: 16.6958840

Operating frequency: 8.4 GHz (assumed) https://sandilands.info/sgordon/communications-with-mars-curiosity

Drift rate between 18:20 and 18:25 UTC: 0.18549800682139503 Hz/s
Drift rate between 18:25 and 18:30 UTC: 0.17219015785050443 Hz/s
Drift rate between 18:25 and 18:55 UTC: 0.13859545785160055 Hz/s

Mars Insight:

deldot:

18:20 UTC: 16.7140194
18:25 UTC: 16.7120464

18:30 UTC: 16.7102124
18:55 UTC: 16.7031539

Operating frequency: 8.4 GHz (assumed)

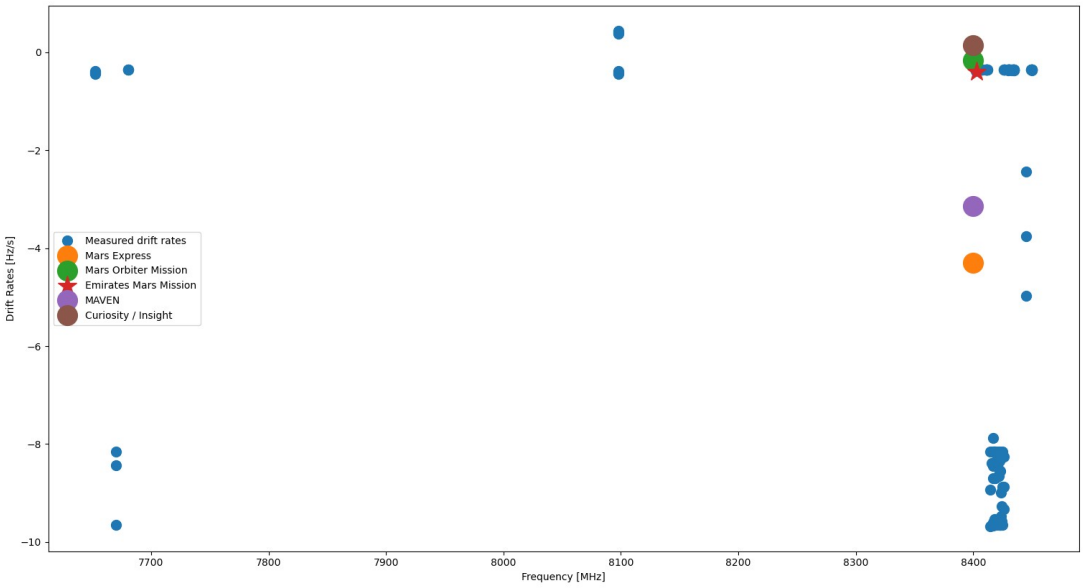
Drift rate between 18:20 and 18:25 UTC: 0.18412615071927732 Hz/s
Drift rate between 18:25 and 18:30 UTC: 0.17115426492836608 Hz/s
Drift rate between 18:25 and 18:55 UTC: 0.13831237156342632 Hz/s

Summary of Drift Rate Calculations:

Here's a summary of the calculated drift rate results. Note that if the spacecraft name has an asterisk, the frequency was unknown and an estimated value (8.4 GHz) was used.

Spacecraft Name	**Frequency (MHz)**	**Drift Rate, Hz/s (18:20, 18:25 UTC)**	**Drift Rate, Hz/s (18:25, 18:30 UTC)**	**Drift Rate, Hz/s (18:25, 18:55 UTC)**
2001 Mars Odyssey		N/A (no ephemeris)	N/A	N/A
Mars Express*	8400	-4.71735	-4.58816	-4.30405
Mars Reconnaissance Orbiter	8439.444444	-22.28206	-26.13833	-23.43561
Mars Orbiter Mission*	8400	-0.09006	-0.11074	-0.16007
MAVEN	8400	-1.38030	-1.78192	-3.13645
ExoMars Trace Gas Orbiter*	8400	66.93615	77.28465	70.90756
Emirates Mars Mission	8402.655	-0.34009	-0.35550	-0.39325
Tianwen 1		N/A (no ephemeris)	N/A	N/A
Curiosity*	8400	0.18550	0.17219	0.13860
Insight*	8400	0.18413	0.17115	0.13831

Freq. vs. Drift Rates Plot



Summary of Measured Drift Rates:

Drift Rate (Hz/s)	Frequency (MHz)
0.383	8097.677273
0.411	8097.677455
0.44	8097.677658
-0.14	8402.578895
-0.22	8402.578407
-0.25	8402.562555
-0.33	8402.562116
-0.35	7680.546672
-0.35	8407.554271
-0.35	8411.386337
-0.35	8411.386561
-0.35	8411.886282
-0.35	8426.214662
-0.35	8426.714606

-0.35	8426.714829
-0.35	8430.546672
-0.35	8430.547122
-0.35	8431.046617
-0.35	8431.046840
-0.35	8450.206952
-0.36	7680.546878
-0.36	7680.547101
-0.36	8407.554474
-0.36	8407.554700
-0.36	8410.886375
-0.36	8410.886599
-0.36	8410.886822
-0.36	8411.386766
-0.36	8411.886484
-0.36	8411.886710
-0.36	8426.214867
-0.36	8426.215091
-0.36	8426.715035
-0.36	8429.546766
-0.36	8429.546989
-0.36	8429.547216
-0.36	8430.046710
-0.36	8430.046934
-0.36	8430.546878
-0.36	8431.047045
-0.36	8432.976397
-0.36	8432.976621
-0.36	8433.878776
-0.36	8433.879000
-0.36	8433.879226
-0.36	8434.378721
-0.36	8434.378944
-0.36	8434.878665
-0.36	8434.878888

-0.36	8449.207045
-0.36	8449.207268
-0.36	8449.207495
-0.36	8449.706989
-0.36	8449.707213
-0.36	8449.707439
-0.36	8450.207157
-0.37	8402.578639
-0.37	8430.047139
-0.37	8432.976826
-0.37	8434.379149
-0.37	8434.879094
-0.37	8450.207362
-0.38	7652.321037
-0.38	8097.677273
-0.38	8402.562522
-0.41	7652.320727
-0.41	8097.677455
-0.44	7652.320398
-0.44	8097.677658
-2.43	8445.293666
-3.76	8445.289136
-4.98	8445.283973
-7.87	8417.193845
-8.16	7669.814523
-8.16	8414.571950
-8.16	8415.620465
-8.16	8416.668979
-8.16	8417.717494
-8.16	8418.241751
-8.16	8418.766008
-8.16	8419.814523
-8.16	8421.911552
-8.16	8422.960067
-8.16	8425.057096

-8.24	8424.008410
-8.26	8420.862829
-8.26	8426.105397
-8.29	8421.387006
-8.29	8423.484035
-8.35	8422.435399
-8.39	8415.625414
-8.44	7669.819373
-8.44	8417.722350
-8.44	8419.819373
-8.44	8420.867888
-8.45	8417.198073
-8.53	8422.440470
-8.55	8422.964685
-8.66	8421.391670
-8.66	8421.915970
-8.70	8416.673309
-8.70	8418.246075
-8.70	8418.770332
-8.87	8425.061068
-8.87	8426.109532
-8.93	8414.575756
-8.99	8423.488018
-9.27	8424.011710
-9.33	8426.114332
-9.47	8423.492781
-9.54	8418.249985
-9.57	8417.725762
-9.57	8421.395566
-9.57	8421.919823
-9.58	8424.016792
-9.59	8420.871222
-9.60	8417.201342
-9.63	8418.774143
-9.65	7669.822596

-9.65	8415.628534
-9.65	8419.822596
-9.65	8422.443840
-9.65	8422.968098
-9.65	8425.065119
-9.67	8416.676957
-9.68	8414.579911