

# Frequency Mixer

# TUF-R1SM+

## Typical Performance Data

RF (IN) (MHz)	LO (MHz)	CONVERSION LOSS IF FIXED @IF(OUT)=30MHz (dB)		
		@LO (dBm)		
		+4	+7	+10
4.00	34.00	6.35	6.06	5.89
6.00	36.00	6.22	5.95	5.78
8.00	38.00	6.18	5.89	5.73
10.00	40.00	6.15	5.89	5.72
15.00	45.00	6.17	5.90	5.74
23.50	53.50	6.20	5.91	5.75
32.00	62.00	6.22	5.92	5.76
40.50	70.50	6.23	5.94	5.78
49.00	79.00	6.24	5.93	5.78
57.50	87.50	6.24	5.94	5.78
66.00	96.00	6.23	5.94	5.79
74.50	104.50	6.24	5.95	5.80
83.00	113.00	6.25	5.95	5.80
91.50	121.50	6.23	5.95	5.80
100.00	130.00	6.24	5.95	5.80
130.00	160.00	6.20	5.95	5.80
160.00	190.00	6.20	5.95	5.82
190.00	220.00	6.17	5.94	5.80
220.00	250.00	6.20	5.96	5.81
250.00	280.00	6.17	5.95	5.83
280.00	310.00	6.20	5.96	5.82
310.00	340.00	6.30	5.96	5.83
340.00	370.00	6.13	5.93	5.80
370.00	400.00	6.16	5.93	5.80
400.00	430.00	6.18	5.97	5.83
442.50	472.50	6.21	5.99	5.84
485.00	515.00	6.30	6.02	5.89
527.50	557.50	6.36	6.08	5.91
570.00	600.00	6.40	6.18	6.01
585.00	615.00	6.44	6.24	6.08
600.00	630.00	6.44	6.25	6.11

RF (IN) (MHz)	LO (MHz)	IP3 INPUT (dBm)		
		@LO (dBm)		
		+4	+7	+10
4.00	34.00	17.82	18.64	18.92
6.00	36.00	19.17	19.80	20.21
8.00	38.00	19.35	21.21	20.76
10.00	40.00	18.55	20.49	16.01
15.00	45.00	19.17	18.74	18.92
23.50	53.50	19.65	19.89	18.47
32.00	62.00	16.31	21.73	16.19
40.50	70.50	20.75	18.70	18.82
49.00	79.00	18.98	16.89	17.95
57.50	87.50	16.59	16.25	19.04
66.00	96.00	16.64	16.07	21.22
74.50	104.50	15.75	16.13	24.04
83.00	113.00	16.64	17.60	24.08
91.50	121.50	15.21	17.46	24.17
100.00	130.00	14.93	16.82	29.26
130.00	160.00	14.81	21.80	19.91
160.00	190.00	16.04	22.25	22.14
190.00	220.00	24.58	18.08	18.67
220.00	250.00	19.54	17.21	19.58
250.00	280.00	16.46	17.94	23.37
280.00	310.00	16.58	16.52	17.96
310.00	340.00	16.35	18.87	21.74
340.00	370.00	17.57	18.24	21.73
370.00	400.00	14.62	16.74	23.74
400.00	430.00	12.67	16.94	23.44
442.50	472.50	12.07	13.41	18.22
485.00	515.00	21.04	25.56	18.50
527.50	557.50	17.15	16.08	16.49
570.00	600.00	13.35	21.73	16.48
585.00	615.00	11.58	18.95	16.92
600.00	630.00	10.38	14.10	22.27

RF (IN) (MHz)	LO (MHz)	COMPRESSION @RF IN=+1dBm (dB)		
		@LO (dBm)		
		+4	+7	+10
4.00	34.00	1.04	0.82	0.60
6.00	36.00	1.16	0.91	0.69
8.00	38.00	1.18	0.94	0.72
10.00	40.00	1.18	0.98	0.73
15.00	45.00	1.21	0.81	0.58
23.50	53.50	1.20	0.95	0.73
32.00	62.00	1.14	0.90	0.68
40.50	70.50	1.16	0.91	0.67
49.00	79.00	1.13	0.89	0.65
57.50	87.50	1.13	0.86	0.65
66.00	96.00	1.14	0.89	0.65
74.50	104.50	1.13	0.87	0.65
83.00	113.00	1.10	0.86	0.63
91.50	121.50	1.09	0.84	0.62
100.00	130.00	1.12	0.88	0.64
130.00	160.00	1.12	0.87	0.64
160.00	190.00	1.11	0.86	0.63
190.00	220.00	1.08	0.82	0.61
220.00	250.00	1.11	0.83	0.61
250.00	280.00	1.05	0.77	0.58
280.00	310.00	1.05	0.79	0.60
310.00	340.00	1.06	0.80	0.60
340.00	370.00	1.05	0.80	0.60
370.00	400.00	1.03	0.79	0.59
400.00	430.00	0.98	0.75	0.57
442.50	472.50	1.00	0.74	0.57
485.00	515.00	1.02	0.78	0.58
527.50	557.50	1.05	0.84	0.64
570.00	600.00	1.14	0.89	0.70
585.00	615.00	1.14	0.89	0.70
600.00	630.00	1.18	0.92	0.71



# Frequency Mixer

# TUF-R1SM+

## Typical Performance Data

IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=300MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=2MHz (dB)	IF (OUT) (MHz)	LO (MHz)	CONVERSION LOSS VS. IF FREQUENCY @RF(IN)=600MHz (dB)
		@LO (dBm)			@LO (dBm)			@LO (dBm)
		+7			+7			+7
299.75	0.25	6.33	0.25	2.25	6.64	597.75	2.25	6.17
299.50	0.50	6.09	0.75	2.75	6.62	597.25	2.75	6.15
299.25	0.75	6.06	1.25	3.25	6.62	596.75	3.25	6.15
299.00	1.00	6.03	2.00	4.00	6.58	596.00	4.00	6.15
298.00	2.00	5.99	6.00	8.00	6.57	592.00	8.00	6.12
296.00	4.00	5.96	10.00	12.00	6.52	588.00	12.00	6.10
294.00	6.00	5.94	14.00	16.00	6.50	584.00	16.00	6.08
292.00	8.00	5.96	18.00	20.00	6.50	580.00	20.00	6.08
290.00	10.00	5.93	22.00	24.00	6.51	576.00	24.00	6.08
288.00	12.00	5.93	26.00	28.00	6.54	572.00	28.00	6.08
284.00	16.00	5.92	30.00	32.00	6.55	568.00	32.00	6.07
280.00	20.00	5.88	40.00	42.00	6.58	558.00	42.00	5.99
276.00	24.00	5.90	50.00	52.00	6.62	548.00	52.00	5.97
272.00	28.00	5.91	60.00	62.00	6.57	538.00	62.00	5.94
268.00	32.00	5.90	70.00	72.00	6.52	528.00	72.00	5.91
265.00	35.00	5.91	80.00	82.00	6.55	518.00	82.00	5.90
250.00	50.00	6.03	90.00	92.00	6.57	508.00	92.00	5.86
235.00	65.00	5.81	100.00	102.00	6.58	498.00	102.00	5.84
220.00	80.00	5.78	110.00	112.00	6.61	488.00	112.00	5.84
205.00	95.00	5.78	120.00	122.00	6.60	478.00	122.00	5.82
190.00	110.00	5.77	130.00	132.00	6.60	468.00	132.00	5.81
175.00	125.00	5.80	138.00	140.00	6.61	460.00	140.00	5.82
160.00	140.00	5.78	175.50	177.50	6.59	422.50	177.50	5.83
145.00	155.00	5.76	213.00	215.00	6.69	385.00	215.00	5.84
130.00	170.00	5.76	250.50	252.50	6.61	347.50	252.50	5.85
115.00	185.00	5.78	288.00	290.00	6.71	310.00	290.00	5.87
110.00	190.00	5.78	325.50	327.50	6.69	272.50	327.50	5.89
85.00	215.00	5.82	363.00	365.00	6.74	235.00	365.00	5.91
60.00	240.00	5.83	400.50	402.50	6.74	197.50	402.50	5.96
35.00	265.00	5.85	438.00	440.00	6.81	160.00	440.00	6.00
10.00	290.00	5.91	458.00	460.00	6.77	140.00	460.00	5.98
8.00	292.00	5.92	472.00	474.00	6.73	126.00	474.00	5.96
7.00	293.00	5.93	486.00	488.00	6.69	112.00	488.00	5.97
6.00	294.00	5.92	500.00	502.00	6.72	98.00	502.00	5.96
5.00	295.00	5.93	514.00	516.00	6.74	84.00	516.00	5.97
4.00	296.00	5.94	528.00	530.00	6.83	70.00	530.00	6.01
3.00	297.00	5.95	542.00	544.00	6.88	56.00	544.00	6.02
2.00	298.00	5.95	556.00	558.00	6.96	42.00	558.00	6.06
1.00	299.00	5.99	570.00	572.00	7.01	28.00	572.00	6.08
0.65	299.35	5.98	584.00	586.00	7.05	14.00	586.00	6.12
0.30	299.70	6.02	598.00	600.00	7.13	0.50	599.50	6.23



# Frequency Mixer

# TUF-R1SM+

## Typical Performance Data

LO (MHz)	LO-RF ISOLATION (dB)			LO-IF ISOLATION (dB)		
	@LO (dBm)			@LO (dBm)		
	+4	+7	+10	+4	+7	+10
34.00	66.23	66.56	66.24	62.54	61.24	60.11
36.00	66.03	66.02	65.92	62.51	61.15	59.84
38.00	66.19	65.88	65.65	62.27	60.90	59.68
40.00	65.38	65.37	65.00	62.03	60.45	59.12
45.00	63.98	63.80	63.62	60.34	58.78	57.60
53.50	63.00	62.82	62.81	59.93	58.42	57.09
62.00	61.71	61.99	61.88	58.97	57.62	56.62
70.50	61.30	61.46	61.63	59.06	57.67	56.55
79.00	59.92	60.24	60.31	57.59	56.26	55.34
87.50	59.45	59.54	59.45	57.26	55.54	54.45
96.00	57.95	58.07	58.00	55.93	54.36	53.11
104.50	58.13	58.24	58.16	56.28	54.77	53.51
113.00	57.41	57.74	57.93	55.92	54.71	53.52
121.50	57.28	57.54	57.73	55.82	54.68	53.35
130.00	56.36	56.70	56.71	54.91	53.58	52.23
160.00	54.79	55.17	55.30	54.14	52.65	51.25
190.00	53.19	53.29	53.13	52.26	50.36	48.72
220.00	52.60	52.91	53.02	52.39	50.86	49.47
250.00	51.50	51.73	51.72	50.74	49.52	48.19
280.00	50.52	50.55	50.44	49.94	48.71	47.13
310.00	50.40	50.63	50.58	49.21	48.52	47.61
340.00	49.68	49.80	49.66	47.81	47.68	46.36
370.00	49.14	49.37	49.25	45.67	46.42	46.42
400.00	48.15	48.60	48.85	44.46	44.61	44.76
430.00	46.72	46.91	46.99	43.35	43.69	43.30
472.50	45.99	46.17	46.29	42.44	43.81	44.35
515.00	46.52	46.56	46.57	42.23	43.19	43.67
557.50	46.67	46.85	46.70	41.47	41.81	42.35
600.00	46.75	46.83	46.81	41.42	42.51	42.78
615.00	46.39	46.00	45.51	41.23	42.39	42.58
630.00	46.12	45.82	45.48	40.96	42.54	43.15

RF (IN) (MHz)	LO (MHz)	RF-IF ISOLATION (dB)		
		@LO (dBm)		
		+4	+7	+10
4.00	34.00	54.95	54.10	53.95
6.00	36.00	51.03	55.14	55.04
8.00	38.00	52.32	51.68	51.43
10.00	40.00	46.33	45.90	45.52
15.00	45.00	50.29	46.49	46.32
23.50	53.50	45.36	45.05	44.86
32.00	62.00	43.02	42.83	42.67
40.50	70.50	41.22	41.07	40.93
49.00	79.00	39.76	39.70	39.64
57.50	87.50	38.54	38.51	38.49
66.00	96.00	37.51	37.50	37.51
74.50	104.50	36.60	36.61	36.65
83.00	113.00	35.79	35.82	35.88
91.50	121.50	35.08	35.13	35.20
100.00	130.00	34.42	34.49	34.59
130.00	160.00	32.73	32.84	32.97
160.00	190.00	31.49	31.64	31.78
190.00	220.00	30.67	30.76	30.91
220.00	250.00	30.13	30.32	30.49
250.00	280.00	29.79	29.96	30.20
280.00	310.00	29.86	29.99	30.17
310.00	340.00	30.26	30.50	30.70
340.00	370.00	30.57	31.15	31.64
370.00	400.00	30.80	31.70	32.47
400.00	430.00	30.93	31.47	31.91
442.50	472.50	31.02	31.22	31.32
485.00	515.00	31.34	31.98	32.49
527.50	557.50	30.30	31.32	32.41
570.00	600.00	27.21	27.68	28.19
585.00	615.00	25.97	26.28	26.63
600.00	630.00	24.94	25.07	25.25

# Frequency Mixer

# TUF-R1SM+

## Typical Performance Data

RF (IN) (MHz)	LO (MHz)	RF VSWR (:1)			LO (MHz)	LO VSWR (:1)			IF (OUT) (MHz)	IF VSWR @LO=600MHz (:1)		
		@LO (dBm)				@LO (dBm)				@LO (dBm)		
		+4	+7	+10		+4	+7	+10		+4	+7	+10
4.00	34.00	1.34	1.36	1.39	34.00	1.85	2.64	3.74	0.30	1.61	1.48	1.33
6.00	36.00	1.22	1.25	1.29	36.00	1.84	2.58	3.63	2.00	1.69	1.55	1.39
8.00	38.00	1.17	1.20	1.24	38.00	1.86	2.62	3.71	6.00	1.70	1.55	1.39
10.00	40.00	1.13	1.17	1.22	40.00	1.91	2.70	3.84	10.00	1.71	1.56	1.39
15.00	45.00	1.09	1.14	1.19	45.00	1.92	2.71	3.81	30.80	1.71	1.56	1.40
23.50	53.50	1.06	1.12	1.18	53.50	1.82	2.54	3.55	68.40	1.72	1.57	1.41
32.00	62.00	1.05	1.11	1.18	62.00	1.88	2.65	3.73	106.00	1.74	1.58	1.42
40.50	70.50	1.04	1.11	1.17	70.50	1.92	2.72	3.86	124.80	1.74	1.59	1.42
49.00	79.00	1.04	1.11	1.17	79.00	1.82	2.56	3.63	143.60	1.75	1.59	1.43
57.50	87.50	1.04	1.11	1.17	87.50	1.90	2.67	3.75	162.40	1.76	1.60	1.44
66.00	96.00	1.04	1.11	1.18	96.00	1.77	2.47	3.40	181.20	1.76	1.61	1.45
74.50	104.50	1.03	1.11	1.17	104.50	1.89	2.64	3.66	200.00	1.77	1.62	1.46
83.00	113.00	1.03	1.11	1.18	113.00	1.88	2.65	3.74	220.00	1.78	1.63	1.46
91.50	121.50	1.03	1.11	1.18	121.50	1.84	2.59	3.66	242.50	1.79	1.64	1.48
100.00	130.00	1.04	1.11	1.18	130.00	1.90	2.68	3.77	265.00	1.80	1.65	1.49
130.00	160.00	1.05	1.12	1.19	160.00	1.94	2.75	3.89	287.50	1.82	1.66	1.51
160.00	190.00	1.06	1.13	1.19	190.00	1.88	2.61	3.56	310.00	1.83	1.68	1.52
190.00	220.00	1.07	1.14	1.20	220.00	1.91	2.67	3.76	355.00	1.85	1.70	1.55
220.00	250.00	1.07	1.15	1.21	250.00	1.96	2.79	4.00	400.00	1.88	1.74	1.58
250.00	280.00	1.09	1.15	1.21	280.00	1.86	2.55	3.45	420.00	1.90	1.75	1.60
280.00	310.00	1.10	1.16	1.22	310.00	1.89	2.63	3.62	440.00	1.91	1.76	1.61
310.00	340.00	1.12	1.17	1.22	340.00	1.91	2.74	3.93	450.00	1.92	1.77	1.62
340.00	370.00	1.13	1.20	1.26	370.00	1.82	2.48	3.37	460.00	1.93	1.77	1.63
370.00	400.00	1.13	1.20	1.26	400.00	1.85	2.53	3.42	480.00	1.94	1.79	1.64
400.00	430.00	1.13	1.18	1.23	430.00	1.94	2.76	3.92	500.00	1.96	1.80	1.66
442.50	472.50	1.15	1.20	1.25	472.50	1.95	2.74	3.85	522.50	1.96	1.81	1.67
485.00	515.00	1.18	1.24	1.29	515.00	2.01	2.76	3.82	545.00	1.98	1.83	1.69
527.50	557.50	1.21	1.27	1.33	557.50	2.03	2.74	3.72	567.50	1.99	1.85	1.71
570.00	600.00	1.23	1.28	1.34	600.00	2.01	2.69	3.57	590.00	2.03	1.88	1.74
585.00	615.00	1.23	1.28	1.33	615.00	2.06	2.86	3.96	594.50	2.04	1.90	1.77
600.00	630.00	1.24	1.29	1.34	630.00	1.90	2.47	3.14	599.70	1.98	1.90	1.83

## Harmonics Tables

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	21	32	26	47	24	39	27	47	33	46
1	-	24	+0	31	11	32	17	34	27	42	44	41
2	> 90	> 70	62	> 70	63	> 70	62	> 70	62	70	69	> 70
3	> 90	> 70	> 70	> 70	> 70	> 70	62	> 70	65	> 70	> 70	> 70
4	> 90	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70
5	> 90	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70
6	> 90	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70
7	> 90	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70	> 70
8	> 90	> 70	> 70	> 70	65	> 70	63	> 70	> 70	> 70	> 70	> 70
9	> 90	> 70	69	> 70	63	> 70	62	> 70	63	> 70	63	> 70
10	> 90	41	44	42	27	34	16	32	11	30	+0	23
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

### LO HARMONICS ORDER

Test conditions: RF IN: 300.00 MHz; -14.00 dBm.  
 LO IN: 330.00 MHz; +7.00 dBm  
 IF OUT: 30.00 MHz; -20.13 dBm

RF HARMONICS ORDER

	(-dBm)	(-dBc)										
0	-	-	31	42	38	53	36	55	40	58	50	62
1	-	24	+0	30	12	35	18	38	30	48	48	50
2	72	75	56	69	56	69	57	70	55	66	61	73
3	> 90	51	44	59	44	62	45	54	40	54	49	58
4	> 90	> 80	68	73	68	73	69	72	65	> 80	71	80
5	> 90	72	62	62	56	67	55	67	55	77	58	72
6	> 90	72	58	77	55	67	55	68	56	62	61	72
7	> 90	79	72	> 80	65	73	68	72	68	71	68	79
8	> 90	58	49	54	40	54	45	62	45	59	44	52
9	> 90	73	61	66	55	70	57	69	57	69	56	74
10	> 90	49	48	48	30	38	18	35	12	30	+0	24
	RF CAL	0	1	2	3	4	5	6	7	8	9	10

### LO HARMONICS ORDER

Test conditions: RF IN: 300.00 MHz; -4.00 dBm.  
 LO IN: 330.00 MHz; +7.00 dBm  
 IF OUT: 30.00 MHz; -10.04 dBm

- Notes: 1. All Harmonics are in (dBc) relative to IF OUTPUT.  
 2. + entry denotes harmonics are in (dBc) above IF OUTPUT.  
 3. RF Cal represent the Harmonics level of the RF input signal to the mixer.