Y-Factor to Noise Figure Conversion Table

The "Y-factor" method of measuring a mixer or receiver noise figure involves measuring the system noise power output when the input is terminated 1) with a "hot" termination of known temperature of 2) with a "cold" termination of known temperature. Then, the true mixer noise figure is calculated from this data explained below. The noise power output of the mixer/receiver when terminated in "hot" and "cold" loads is P_{HOT} and P_{COLD} respectively. The "Y-factor" is computed from this information as follows:

Symbols: $Y|_{dB}$ = Y-factor; $NT|_{°K}$ = noise temperature;
$NF|_{dB}$ = noise figure (dB)
$Y|_{dB}$ = 10 log (dY), where

$dY = (P_{HOT})/(P_{COLD}) = (T_{HOT} + T_{MIXER})/(T_{COLD} + T_{MIXER})$

T_{HOT} is the temperature of the "hot" load (295°K, room temperature) and T_{COLD} is the temperature of the "cold" load (77°K, liquid nitrogen).

Noise Temperature (NT):

$NT|_{°K} = T_{Mixer}|_{°K} = -77°K(dY - 3.83)/(dY-1)$

Noise Figure (NF):

$NF|_{dB} = 10 \log [(T_{Mixer}/295°K)+1]$

The following table converts the measured "Y" factors directly to system noise figure and is based on using liquid nitrogen as T_{COLD}.

Y, dB	Noise Temperature, °K	Noise Figure, dB	Y, dB	Noise Temperature, °K	Noise Figure, dB	Y, dB	Noise Temperature, °K	Noise Figure, dB
0.01	94,451.0	25.06	0.41	2,124.9	9.14	0.81	986.2	6.38
0.02	47,133.0	22.06	0.42	2,069.9	9.04	0.82	972.0	6.33
0.03	31,360.0	20.31	0.43	2,017.6	8.94	0.83	958.1	6.28
0.04	23,473.0	19.06	0.44	1,967.6	8.85	0.84	944.6	6.23
0.05	18,472.0	18.10	0.45	1,919.8	8.76	0.85	931.4	6.19
0.06	15,587.0	17.31	0.46	1,874.1	8.66	0.86	918.5	6.14
0.07	13,334.0	16.65	0.47	1,830.3	8.58	0.87	905.9	6.10
0.08	11,644.0	16.07	0.48	1,788.4	8.49	0.88	893.5	6.05
0.09	10,330.0	15.57	0.49	1,748.2	8.40	0.89	881.5	6.01
0.10	9,282.0	15.11	0.50	1,709.6	8.32	0.90	869.7	5.96
0.11	8,421.4	14.71	0.51	1,672.5	8.24	0.91	858.2	5.92
0.12	7,704.2	14.33	0.52	1,637.0	8.16	0.92	846.9	5.88
0.13	7,097.3	13.99	0.53	1,602.6	8.08	0.93	835.9	5.84
0.14	6,577.2	13.67	0.54	1,569.5	8.01	0.94	825.1	5.79
0.15	6,126.4	13.38	0.55	1,537.7	7.93	0.95	814.6	5.75
0.16	5,731.9	13.10	0.56	1,507.0	7.86	0.96	804.2	5.71
0.17	5,383.9	12.84	0.57	1,477.4	7.79	0.97	794.1	5.67
0.18	5,074.5	12.60	0.58	1,448.8	7.72	0.98	784.2	5.63
0.19	4,797.8	12.37	0.59	1,421.1	7.65	0.99	774.5	5.59
0.20	4,548.6	12.15	0.60	1,394.4	7.58	1.00	764.9	5.55
0.21	4,323.3	11.95	0.61	1,368.6	7.51	1.05	720.1	5.37
0.22	4,118.4	11.75	0.62	1,343.6	7.45	1.10	679.3	5.19
0.23	3,931.3	11.56	0.63	1,319.4	7.38	1.15	642.1	5.02
0.24	3,759.8	11.38	0.64	1,296.0	7.32	1.20	608.0	4.86
0.25	3,602.1	11.21	0.65	1,273.3	7.26	1.25	601.5	4.83
0.26	3,456.5	11.04	0.66	1,251.2	7.19	1.30	547.7	4.56
0.27	3,321.6	10.88	0.67	1,229.9	7.13	1.35	520.9	4.42
0.28	3,196.7	10.73	0.68	1,209.1	7.07	1.45	473.0	4.16
0.29	3,080.9	10.58	0.69	1,189.0	7.02	1.50	451.4	4.03
0.30	2,971.1	10.44	0.70	1,169.4	6.96	1.55	431.3	3.91
0.31	2,869.4	10.30	0.71	1,150.4	6.90	1.60	412.4	3.80
0.32	2,774.0	10.17	0.72	1,132.0	6.85	1.70	378.0	3.58
0.33	2,684.4	10.04	0.73	1,114.0	6.79	1.80	347.5	3.38
0.34	2,600.0	9.92	0.74	1,096.5	6.74	1.90	320.0	3.19
0.35	2,520.05	9.80	0.75	1,079.5	6.68	2.00	295.6	3.01
0.36	2,445.4	9.68	0.76	1,062.9	6.63	2.33	229.6	2.50
0.37	2,374.4	9.57	0.77	1,046.8	6.58	2.73	172.5	2.00
0.38	2,307.1	9.45	0.78	1,031.1	6.53	3.22	121.7	1.50
0.39	2,243.2	9.35	0.79	1,015.7	6.48	3.84	76.4	1.00
0.40	2,182.6	9.24	0.80	1,000.8	6.43	4.14	59.7	0.80