

**RESPONSE TO REQUEST FOR
ADDITIONAL INFORMATION ON FCCID:NQ3TCP-CO**

FCC Reference Number: 1463

July 7, 1998

The following are the responses to the request for additional information as described by Rich Fabina, FCC Application Processing Branch. The field strength measurements and corrections for range losses were performed by James Pollock of Smith Electronics, Inc. at the Smith Electronics Test Facility in Cleveland, Ohio on July 6, 1998. The resulting data is tabulated in this response.

1. The field strength of the fundamental was re-measured employing a quasi-peak detector function. In addition, the transmitter was configured for a continuous waveform (cw) output in order to eliminate any averaging effect. The 916.65 MHz fundamental peak field strength level is 92.8 dB μ V/m or 43,562 μ V/m. This is less than the specified 50,000 μ V/m limit.
2. The calculated average field strength levels for the 2nd through the 10th harmonics are as follows;

Freq. (MHz)	FS (dBμV/m)	Duty Cycle Factor (dB)	FSadj (dBμV/m)	FSadj (μV/m)	FSlim (μV/m)
1833.30	58.1 @ 1m	12.4	45.7	192.8	1,500
2749.95	50.9 @ 1m	12.4	38.5	84.1	1,500
3666.60	59.3 @ 1m	12.4	46.9	221.3	1,500
4583.25	55.8 @ 1m	12.4	43.4	147.9	1,500
5499.90	59.4 @ 1m	12.4	47.0	223.9	1,500
6416.55	56.4 @ 1m	12.4	44.0	158.5	1,500
7333.20	<65.9 @ .5m	12.4	<52.6	<426.6	3,000
8249.85	<67.2 @ .5m	12.4	<54.8	<549.5	3,000
9166.50	<65.8 @ .5m	12.4	<53.4	<467.7	3,000

Note: The Field Strength Limits have been adjusted to reflect measurements taken at 1 m and 0.5 m distances. Measurements were taken at these distances to provide an observed signal strength greater than the noise floor of the HP8593EM spectrum analyzer.

3. A Duty Cycle Factor resulting from ON-OFF Keying and pulse train duration was calculated to be 12.4 dB. The receiver requires a dc balanced bit pattern in order to establish and maintain a threshold level for the bit slice detector. The data to transmit are ASCII characters from 0 to 255 decimal in value. These 256 characters have been mapped into 10 bit dc balanced bit patterns. Start and stop bits supplement the translated character into 12 bits in length. To establish a dc residue on the bit slice input an 8 character preamble is transmitted. The preamble character is 0665hex. The bit pattern for this character is dc balanced. DC balancing yields a duty cycle of 0.5.

Preamble Character Breakdown

b1	b2	b3	b4	b5	b6	b7	b8	b9	b10	b11	b12
0	0	1	1	0	0	1	1	0	1	0	1
6 h				6 h				5 h			
start	d9	d8	d7	d6	d5	d4	d3	d2	d1	d0	stop

Character Map - 8 to 10 bit (start and stop bits included)

	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
0	06F	077	07B	0AF	0B7	0BB	0BD	0CF	0D7	0DB	0DD	0E7	0EB	0ED	0F3	0F5
1	12F	137	13B	13D	14F	157	15B	15D	167	16B	16D	173	175	179	18F	197
2	19B	19D	1A7	1AB	1AD	1B3	1B5	1B9	1C7	1CB	1CD	1D3	1D5	1D9	1E3	1E5
3	1E9	22F	237	23B	23D	24D	24F	257	25B	25D	267	26B	26D	273	275	279
4	28F	295	297	29B	29D	2A5	2A7	2AB	2AD	2B3	2B5	2B9	2C7	2C9	2CB	2CD
5	2D3	2D5	2D9	2E3	2E5	2E9	2F1	30F	317	31B	31D	325	327	32B	32D	333
6	335	339	347	349	34B	34D	353	355	359	363	365	369	371	387	38B	38D
7	393	395	399	3A3	3A5	4A9	3B1	3C3	3C5	2C9	3D1	42F	437	43B	43D	44F
8	457	45B	45D	467	46B	46D	473	475	479	48F	497	499	49B	49D	4A5	4A7
9	4A9	4AB	4AD	4B3	4B5	4B9	4C7	4CB	4CD	4D3	4D5	4D9	4E3	4E5	4E9	4F1
A	50F	517	51B	51D	527	52B	52D	533	535	539	547	54B	54D	553	555	559
B	55B	563	565	569	56B	56D	571	587	58B	58D	593	595	599	5A3	5A5	5A9
C	5AD	5B1	5B5	5C3	5C5	5C9	5D1	5E1	617	61B	61D	627	62B	62D	633	635
D	639	647	64B	64D	653	655	659	65B	663	5B3	669	66B	66D	671	687	68B
E	68D	693	695	699	6A3	6A5	6A9	6B1	6C3	6C5	6C9	6D1	6D5	6E1	70B	70D
F	713	715	719	723	725	729	731	743	745	749	751	761	785	789	791	7A1

The baud rate of the communications is 19.2 kbaud resulting in a bit time of 50 μ s. The maximum data characters in a packet is 64. The data is preceded with STX, FROM, TO, and NUM characters then followed by a four character checksum (refer to TCP-CO External Communications Specification for exact protocol format). Along with the 8 preamble characters, a total of 80 characters may be in the packet. With 12 bits per character, 80 characters results in 960 bit times or 48 ms. DC balancing reduces the cumulative pulse duration by 50% to a value of 24 ms. This 24 ms 'ON' time over a 100 ms period results in a duty cycle factor of 12.40 dB. This device uses only 32 of the maximum 64 characters in its largest packet. This increases the duty cycle factor by 6 dB to 18.4 dB. The calculation in #2 above demonstrates that the device complies even when evaluated at its theoretical maximum packet size.

4. A JPEG image file of the radio board without the shield is attached to this document as NQ3TCP.JPG.

If there are any further questions or discrepancies, please contact Richard Miller via e-mail (millerr%smitherie@mcimail.com). I will submit a contact change through the website.

FUNDAMENTAL AND SPURIOUS EMISSIONS
TCPCO TRANSMITTER
July 6, 1998

Freq. (Mhz)	Value (dBμV)	AF (dB)	CL (dB)	FS (dBμV/m)	FS (μV/m)	Limit (μV/m)
*916.65	62.0 @3m	29.1	1.7	92.8	43,652	50,000
1833.30	29.8@1m	28.0	0.3	58.1	804	1,500
2749.95	20.5@1m	30.0	0.4	50.9	351	1,500
3666.60	25.9@1m	33.0	0.4	59.3	923	1,500
4583.25	22.3@1m	33.0	0.5	55.8	617	1,500
5499.90	22.9@1m	36.0	0.5	59.4	933	1,500
6416.55	19.7@1m	36.0	0.7	56.4	661	1,500
7333.20	<28.1@.5m	37.0	0.8	65.9	<1,972	3,000
8249.85	<28.4@.5m	38.0	0.8	67.2	<2,290	3,000
9166.50	<26.8@.5m	38.0	1.0	65.8	<1,950	3,000

* = Fundamental Frequency

AF = Antenna Factor

CL = Coax Loss Factor

FS = Field Strength

For measurement purposes, the transmitter was fixed to emit a non-modulated carrier signal. For this signal, peak, quasi-peak and average measurements should produce the same readings on the meter. This was verified with both the receiver and the spectrum analyzer used.

The fundamental frequency was measured using a tuned dipole antenna and a receiver with a quasi-peak detector. The harmonics were measured with a double ridged guide horn antenna and the HP8593EM spectrum analyzer. Peak measurements were made using a 1 Mhz resolution bandwidth and a 100 kHz video bandwidth to reduce the instrument noise level to permit the low level signals to be observed. As previously noted, the reduced video bandwidth has no effect on the measurement of a cw signal other than to reduce the effects of instrument noise.

NOTE: The above emissions table and text were generated by James Pollock with Smith Electronics Inc, Cleveland Ohio. They were re-entered here for uploading to the FCC.