

May 18, 2004

Mr. Ritch Wells
City of Glendale
613 East Broadway, #200
Glendale, CA 91206

Dear Mr. Wells:

At the direction of the City of Glendale, Kramer.Firm, Inc. has have reviewed Charter Cable's 'Winter 2004' FCC-required Proof-of-Performance report ("POP"). The underlying tests were conducted by Charter during February, 2004.

Charter maintains their underlying records on a database, and uses a standard template to produce their POP reports. The actual POP report contains very little back-up data to support the results reported by Charter.

After careful examination of the POP report, Charter's POP fails to comply with the FCC testing requirements for the following reasons:

- I. Charter's test channel plan does not represent channels across the entire analog spectrum of channels.

Charter's tests begin at Channel 24 at 223.2500 MHz. This selection completely ignores the standard VHF television spectrum (Channels 2 through 13, as well as the cable "mid-band" channels of 14 through 22, and 96 through 99. This is in violation of the FCC's rules at 47CFR 76.601(b)(2), reprinted below with the relevant section highlighted.

76.601(b)(2) Proof-of-performance tests to determine the extent to which a cable television system complies with the standards set forth in § 76.605(a) (3), (4), and (5) shall be made on each of the NTSC or similar video channels of that system. Unless otherwise as noted, proof-of-performance tests for all other standards in § 76.605(a) shall be made on a minimum of four (4) channels plus one additional channel for every 100 MHz, or fraction thereof, of cable distribution system upper frequency limit (e.g., 5 channels for cable television systems with a cable distribution system upper frequency limit of 101 to 216 MHz; 6 channels for cable television systems with a cable distribution system upper frequency limit of 217-300 MHz; 7 channels for cable television systems with a cable distribution upper frequency limit to 300 to 400 MHz, etc.). **The channels selected for testing must be representative of all the channels within the cable television system.**



Kramer.Firm inc.

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Charter's Glendale Channel Line Up is included at Attachment I, below.



2. During the Winter 2004 test period, Charter intentionally relocated 10 of its FCC POP test points. This mass relocation caused Charter to fail to collect the 6 month system performance comparison test data as required in 76.605 (A)(4), reproduced in part below:

76.605(a)(4) The visual signal level on each channel, as measured at the end of a 30 meter cable drop that is connected to the subscriber tap, ***shall not vary more than 8 decibels within any six-month interval which must include four tests performed in six-hour increments during a 24-hour period in July or August and during a 24-hour period in January or February. . .***

While movement of test points is impliedly permitted under the FCC rules (usually in connection with a major plant rebuild or reconfiguration), the mass-movement of the test points in this test period does not appear to be connected with a rebuild. There is no supporting engineer's statement or other indication contained in the POP document that would support any exception from the 6-month reporting requirement contained in 76.605 (A)(4).

3. 24 Hour signal stability tests are summarized in the proof summary sheet, but back-up data from the actual signal meter printouts are not available to substantiate the summary data in the proof package. There is no way to validate the numbers without the original back-up data available in the supplementary data section. The lack of substantiating data makes the POP, on its face, unreliable.
4. Charter's test procedure descriptions are vague and incomplete, thus fail to meet the FCC requirements on point. In the section titled "Equipment Setup", Charter has included very basic test diagrams with regards to making test measurements.

The FCC rule on point, 76.601(b)(1), requires a "description" of the test procedures, and not merely a simple block diagram.

The test equipment calibration data indicates the presence of a subscriber amplifier, but there is no mention of its use or setup in the test descriptions. In many cases, the test levels recorded as part of the 24-hour test are insufficient to provide accurate and reliable carrier to noise or distortion measurements using either the Calan or the HP spectrum analyzers.

Charter must provide an accurate and expansive description of the appropriate test measurement techniques and equipment used to collect the measurements.



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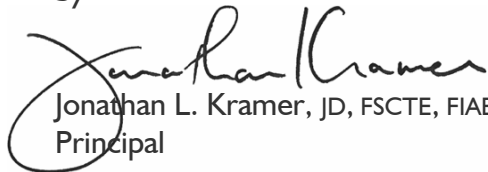
Due to the substantive failures discussed above, we recommend that the City find that Charter has failed to properly conduct and report its Winter 2004 Proof of Performance tests. Charter should be directed to correct their procedures to fully comply with the FCC rules during all future tests. Charter should be ordered to tender subsequent POP reports to the City for at least twenty-four months (4 proof periods) to permit the City to determine whether Charter has corrected the failures noted here, and further demonstrates compliance going forward with all FCC POP rules.

Steve Allen, BCE of my staff joined me in this review of Charter's documents. Our credentials to conduct these reviews are attached below.

Respectfully submitted,

Kramer.Firm, Inc.

by


Jonathan L. Kramer, JD, FSCTE, FIAE
Principal

JK:SA/bm

Attachments: (2)

1. Glendale Channel Line Up
2. FCC POP Rules



Attachment I: Charter Cable Channel Line Up

Glendale/Burbank, CA

Glendale, CA

1	Charter 1	Advanced Digital Services
2	KCBS-TV - CBS	Analog Basic
3	KCET - PBS	Analog Basic
4	KNBC - NBC	Analog Basic
5	KTLA - WBN	Analog Basic
6	Government Access	Analog Basic
7	KABC-TV - ABC	Analog Basic
8	KVEA - TMO	Analog Basic
9	KCAL-TV - IND	Analog Basic
10	KDOC-TV - IND	Analog Basic
11	KTTV - FOX	Analog Basic
12	KTBN-TV - TBN	Analog Basic
13	KCOP - UPN	Analog Basic
14	TBS	Analog Basic
15	Educational Access	Analog Basic
16	Government Access	Analog Basic
17	KPXN - PAX	Analog Basic
18	KSCI - IND	Analog Basic
19	KRCA - IND	Analog Basic



20	KMEX-TV - UNV	Analog Basic
21	Government Access	Analog Basic
22	KWHY-TV - TMO	Analog Basic
23	KLCS - PBS	Analog Basic
24	KJLA - IND	Analog Basic
25	P.E.G. (Access)	Analog Basic
25	CSPAN2	Analog Basic
26	Leased Access	Analog Basic
27	KFTR - TEL	Analog Basic
28	KXLA - N/A	Analog Basic
29	KVMD - IND	Analog Basic
30	Leased Access	Analog Basic
31	Leased Access	Analog Basic
32	KAZA	Analog Basic
33	Nickelodeon-West	Expanded Basic
34	Cartoon Network	Expanded Basic
35	The Disney Channel	Expanded Basic
36	ABC Family	Expanded Basic
37	TV Land	Expanded Basic
38	History	Expanded Basic
39	A&E	Expanded Basic
40	Oxygen	Expanded Basic
41	TNT	Expanded Basic
42	Golf Channel	Expanded Basic



43	Travel Channel	Expanded Basic
44	The Learning Channel	Expanded Basic
45	The Discovery Channel	Expanded Basic
46	Animal Planet	Expanded Basic
47	Court TV	Expanded Basic
48	GSN (Game Show)	Expanded Basic
49	Sci-Fi	Expanded Basic
50	USA	Expanded Basic
51	Lifetime	Expanded Basic
52	Comedy Central	Expanded Basic
53	Galavision	Expanded Basic
54	Toon Disney	Expanded Basic
55	Armenian Cable Television	Expanded Basic
56	Fox Sports World	Expanded Basic
56	Speed Channel	Expanded Basic
57	ESPN	Expanded Basic
58	ESPN2	Expanded Basic
59	ESPN Classic	Expanded Basic
60	Fox Sports Net West	Expanded Basic
61	Fox Sports Net West2	Expanded Basic
62	fx	Expanded Basic
63	Turner Classic Movies	Expanded Basic
64	AMC	Expanded Basic
65	Bravo	Expanded Basic
66	CNN	Expanded Basic



67	CNN Headline News	Expanded Basic
68	FOX News Channel	Expanded Basic
69	CNBC	Expanded Basic
70	MSNBC	Expanded Basic
71	E!	Expanded Basic
72	HGTV/Home and Garden Television	Expanded Basic
73	Food Network	Expanded Basic
74	The Weather Channel	Expanded Basic
75	Spike TV (TNN)	Expanded Basic
76	VH-1	Expanded Basic
77	MTV	Expanded Basic
78	BET	Expanded Basic
86	SARA/Scientific Atlanta	Advanced Digital Services
95	CSPAN	Analog Basic
96	QVC	Analog Basic
97	Home Shopping Network	Analog Basic
99	techtv	Analog Basic
100	Interactive TV Channel	Advanced Digital Services
101	Charter Channel	Advanced Digital Services
102	Boomerang	Digital Family and Information Tier
104	Discovery Kids	Digital Family and Information Tier
106	Nickelodeon Games and Sports	Digital Family and Information Tier



108	Nickelodeon Toons	Digital Family and Information Tier
110	Noggin	Digital Family and Information Tier
114	Discovery Home Channel	Digital Family and Information Tier
116	Discovery Wings	Digital Family and Information Tier
118	Discovery Health	Digital Family and Information Tier
120	The Science Channel	Digital Family and Information Tier
121	Discovery En Espanol	Digital Family and Information Tier
122	Women's Entertainment	Digital Family and Information Tier
123	Lifetime Movie Network	Digital Family and Information Tier
124	Sundance-West	Digital Family and Information Tier
125	Independent Film Channel	Digital Family and Information Tier
126	Biography	Digital Family and Information Tier
127	Soap Net	Digital Family and Information Tier
128	Bloomberg	Digital Family and Information Tier
130	CNNFN/Money	Digital Family and Information Tier
132	National Geographic	Digital Family and Information Tier
134	History Channel International	Digital Family and Information Tier



136	BBC America	Digital Family and Information Tier
138	Discovery Times	Digital Family and Information Tier
140	Do It Yourself	Digital Family and Information Tier
141	Style	Digital Family and Information Tier
142	International Channel	Digital Family and Information Tier
144	MTV2 (M2)	Digital Family and Information Tier
145	MTV Espanol	Digital Family and Information Tier
146	MTV Hits	Digital Family and Information Tier
148	MTV Jams	Digital Family and Information Tier
150	VH-1 Classic	Digital Family and Information Tier
152	VH-1 Country	Digital Family and Information Tier
154	VH-1 Mega Hits	Digital Family and Information Tier
156	VH-1 Soul	Digital Family and Information Tier
158	Fuse (Much Music)	Digital Family and Information Tier
401	Fox Sports Digital Atlantic	Digital Sports Tier
402	Fox Sports Digital Central	Digital Sports Tier
403	Fox Sports Digital Pacific	Digital Sports Tier
406	ESPNews	Digital Sports Tier
408	Fuel	Digital Sports Tier



409	Fox Sports World	Digital Sports Tier
415	NHL Center Ice/MLB Extra Innings	Digital PPV
416	NHL Center Ice/MLB Extra Innings	Digital PPV
417	NHL Center Ice/MLB Extra Innings	Digital PPV
418	NHL Center Ice/MLB Extra Innings	Digital PPV
419	NHL Center Ice/MLB Extra Innings	Digital PPV
420	NHL Center Ice/MLB Extra Innings	Digital PPV
421	NHL Center Ice/MLB Extra Innings	Digital PPV
422	NHL Center Ice/MLB Extra Innings	Digital PPV
423	NHL Center Ice/MLB Extra Innings	Digital PPV
424	NHL Center Ice/MLB Extra Innings	Digital PPV
499	Charter DVR	Advanced Digital Services
500	HBO-West	Digital Premium
501	HBO-East	Digital Premium
502	HBO 2-West	Digital Premium
503	HBO 2-East	Digital Premium
504	HBO Signature-West	Digital Premium
506	HBO Family-West	Digital Premium
508	HBO Comedy-West	Digital Premium
510	HBO Zone-West	Digital Premium
512	HBO Latino-West	Digital Premium
550	Cinemax-West	Digital Premium
552	More Max-West	Digital Premium
554	Action Max-West	Digital Premium



556	Thriller Max-West	Digital Premium
567	Armenian Public TV	Digital Premium
600	Showtime-West	The Movie Tier
601	Showtime-East	The Movie Tier
602	Showtime Too-West	The Movie Tier
604	Showtime Showcase-West	The Movie Tier
606	Showtime Extreme-West	The Movie Tier
608	Showtime Beyond-W	The Movie Tier
610	FLIX-W	The Movie Tier
650	The Movie Channel-West	The Movie Tier
652	TMC Xtra-West	The Movie Tier
700	Starz!-West	Digital Premium
702	Starz! Theater-West	Digital Premium
704	Black Starz!-West	Digital Premium
706	Starz! Cinema-West	Digital Premium
730	Encore-West	The Movie Tier
731	Encore Action-West	The Movie Tier
732	Encore Love-West	The Movie Tier
733	Encore Mystery-West	The Movie Tier
734	Encore True Stories-West	The Movie Tier
735	Encore Westerns-West	The Movie Tier
770	HDNet Movies	Hi-Def Tier
771	HDNet	Hi-Def Tier
773	ESPN HD	Hi-Def Tier
775	Discovery HD Theater	Hi-Def Tier



777	HBO HDTV-West	Hi-Def Service
778	Showtime HDTV-West	Hi-Def Service
781	KTTV-DT - FOX	Hi-Def Broadcaster
784	KNBC-DT - NBC	Hi-Def Broadcaster
787	KABC-DT - ABC	Hi-Def Broadcaster
800	iNDEMAND Previews-A	Digital Premium
801	iN DEMAND 1	Digital PPV
802	iN DEMAND 2	Digital PPV
803	iN DEMAND 3	Digital PPV
804	iN DEMAND 4	Digital PPV
805	iN DEMAND 5	Digital PPV
806	iN DEMAND 6	Digital PPV
807	iN DEMAND 7	Digital PPV
808	iN DEMAND 8	Digital PPV
809	iN DEMAND 9	Digital PPV
810	iN DEMAND 10	Digital PPV
811	iN DEMAND 11	Digital PPV
812	iN DEMAND 12	Digital PPV
813	iN DEMAND 13	Digital PPV
814	iN DEMAND 14	Digital PPV
815	iN DEMAND 15	Digital PPV
816	iN DEMAND 16	Digital PPV
817	iN DEMAND 17	Digital PPV
818	iN DEMAND 18	Digital PPV



819	iN DEMAND 19	Digital PPV
820	iN DEMAND 20	Digital PPV
821	iN DEMAND 21	Digital PPV
822	iN DEMAND 22	Digital PPV
823	iN DEMAND 23/NASCAR In Car	Digital PPV
824	iN DEMAND 24/NASCAR In Car	Digital PPV
825	iN DEMAND 25/NASCAR In Car	Digital PPV
826	iN DEMAND 26/NASCAR In Car	Digital PPV
827	iN DEMAND 27/NASCAR In Car	Digital PPV
828	iN DEMAND 28/NASCAR In Car	Digital PPV
829	iN DEMAND 29/NASCAR In Car	Digital PPV
830	iN DEMAND 30	Digital PPV
891	ETC (Erotic TV Clips)	Digital Adult - PPV
892	The Erotic Network	Digital Adult - PPV
893	The Pleasure Network	Digital Adult - PPV
894	The Hot Network	Digital Adult - PPV
897	Playboy	Digital Adult - PPV
899	Spice 2	Digital Adult - PPV
901	MC - Showcase	Music Audio (Digital Converter)
902	MC - Today's Country	Music Audio (Digital Converter)
903	MC - Classic Country	Music Audio (Digital Converter)
904	MC - Americana	Music Audio (Digital Converter)
905	MC - Bluegrass	Music Audio (Digital Converter)



906	MC - R&B and Hip-Hop	Music Audio (Digital Converter)
907	MC - Classic R&B	Music Audio (Digital Converter)
908	MC - Smooth R&B	Music Audio (Digital Converter)
909	MC - Rap	Music Audio (Digital Converter)
910	MC - Metal	Music Audio (Digital Converter)
911	MC - Rock	Music Audio (Digital Converter)
912	MC - Power Rock	Music Audio (Digital Converter)
913	MC - Classic Rock	Music Audio (Digital Converter)
914	MC - Alternative Rock	Music Audio (Digital Converter)
915	MC - Electronica	Music Audio (Digital Converter)
916	MC - Dance	Music Audio (Digital Converter)
917	MC - Progressive/Adt Altrntv	Music Audio (Digital Converter)
918	MC - Soft Rock	Music Audio (Digital Converter)
919	MC - Hit List	Music Audio (Digital Converter)
920	MC - Party Favorites	Music Audio (Digital Converter)
921	MC - 80s	Music Audio (Digital Converter)
922	MC - New Wave	Music Audio (Digital Converter)



923	MC - 70s	Music Audio (Digital Converter)
924	MC - Solid Gold Oldies	Music Audio (Digital Converter)
925	MC - Singers & Standards	Music Audio (Digital Converter)
926	MC - Big Band & Swing	Music Audio (Digital Converter)
927	MC - Easy Listening	Music Audio (Digital Converter)
928	MC - Smooth Jazz	Music Audio (Digital Converter)
929	MC - Jazz	Music Audio (Digital Converter)
930	MC - Blues	Music Audio (Digital Converter)
931	MC - Reggae	Music Audio (Digital Converter)
932	MC - Soundscapes	Music Audio (Digital Converter)
933	MC - Classical Masterpieces	Music Audio (Digital Converter)
934	MC - Opera	Music Audio (Digital Converter)
935	MC - Light Classical	Music Audio (Digital Converter)
936	MC - Show Tunes	Music Audio (Digital Converter)
937	MC - Contemporary Christian	Music Audio (Digital Converter)
938	MC - Gospel	Music Audio (Digital Converter)
939	MC - For Kids Only	Music Audio (Digital Converter)
940	MC - Sound of the Seasons	Music Audio (Digital Converter)



		Converter)
941	MC - Musica Latina	Music Audio (Digital Converter)
942	MC - Salsa Merengue	Music Audio (Digital Converter)
943	MC - Rock 'En Espanol	Music Audio (Digital Converter)
944	MC - Latin Love Songs	Music Audio (Digital Converter)
945	MC - Mexicana	Music Audio (Digital Converter)
951	iTV Customer Service Channel	Advanced Digital Services
955	iTV Shopping Channel	Advanced Digital Services
960	iTV Games Channel	Advanced Digital Services
970	iTV Sports Channel	Advanced Digital Services
978	iTV Money Channel	Advanced Digital Services
979	iTV News Channel	Advanced Digital Services
980	iTV Weather Channel	Advanced Digital Services
985	iTV Entertainment Channel	Advanced Digital Services
986	HBO On Demand	Advanced Digital Services
987	Showtime On Demand	Advanced Digital Services
988	Starz! On Demand	Advanced Digital Services
989	Cinemax On Demand	Advanced Digital Services



991	Kids Unlimited	Advanced Digital Services
992	On Demand Previews	Advanced Digital Services
996	MagRack	Advanced Digital Services
999	Video On Demand-NCUBE	Advanced Digital Services

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Attachment 2: FCC Rules

This attachment contains the full text of the FCC proof of performance and signal quality rules.

§76.601 Performance tests

(a) The operator of each cable television system shall be responsible for insuring that each such system is designed, installed, and operated in a manner that fully complies with the provisions of this subpart.

(b) The operator of each cable television system shall conduct complete performance tests of that system at least twice each calendar year (at intervals not to exceed seven months), unless otherwise noted below. The performance tests shall be directed at determining the extent to which the system complies with all the technical standards set forth in § 76.605(a) and shall be as follows:

(1) For cable television systems with 1000 or more subscribers but with 12,500 or fewer subscribers, proof-of-performance tests conducted pursuant to this section shall include measurements taken at six (6) widely separated points. However, within each cable system, one additional test point shall be added for every additional 12,500 subscribers or fraction thereof (e.g., 7 test points if 12,501 to 25,000 subscribers; 8 test points if 25,001 to 37,500 subscribers, etc.). In addition, for technically integrated portions of cable systems that are not mechanically continuous (i.e., employing microwave connections), at least one test point will be required for each portion of the cable system served by a technically integrated microwave hub. The proof-of-performance test points chosen shall be balanced to represent all geographic areas served by the cable system. At least one-third of the test points shall be representative of subscriber terminals most distant from the system input and from each microwave receiver (if microwave transmissions are employed), in terms of cable length. The measurements may be taken at convenient monitoring points in the cable network: Provided, that data shall be included to relate the measured performance of the system as would be viewed from a nearby subscriber terminal. An identification of the instruments, including the makes, model numbers, and the most recent date of calibration, a description of the procedures utilized, and a statement of the qualifications of the person performing the tests shall also be included.

(2) Proof-of-performance tests to determine the extent to which a cable television system complies with the standards set forth in § 76.605(a) (3), (4), and (5) shall be made on each of the NTSC or similar video channels of that system. Unless otherwise as noted, proof-of-performance tests for all other standards in § 76.605(a) shall be made on a minimum of four (4) channels plus one additional channel for every 100 MHz, or fraction thereof, of cable distribution system upper frequency limit (e.g., 5 channels for cable television systems with a cable distribution system upper frequency limit of 101 to 216 MHz; 6 channels for cable television systems with a cable distribution system upper frequency limit of 217300 MHz; 7 channels for cable television systems with a cable distribution upper frequency limit to 300 to 400 MHz, etc.). The channels selected for testing must be representative of all the channels within the cable television system.



(3) The operator of each cable television system shall conduct semi-annual proof-of-performance tests of that system, to determine the extent to which the system complies with the technical standards set forth in § 76.605(a)(4) as follows. The visual signal level on each channel shall be measured and recorded, along with the date and time of the measurement, once every six hours (at intervals of not less than five hours or no more than seven hours after the previous measurement), to include the warmest and the coldest times, during a 24-hour period in January or February and in July or August.

(4) The operator of each cable television system shall conduct triennial proof-of-performance tests of its system to determine the extent to which the system complies with the technical standards set forth in § 76.605(a)(11).

(c) Successful completion of the performance tests required by paragraph (b) of this section does not relieve the system of the obligation to comply with all pertinent technical standards at all subscriber terminals. Additional tests, repeat tests, or tests involving specified subscriber terminals may be required by the Commission or the local franchiser to secure compliance with the technical standards.

(d) The provisions of paragraphs (b) and (c) of this section shall not apply to any cable television system having fewer than 1,000 subscribers: Provided, however, that any cable television system using any frequency spectrum other than that allocated to over-the-air television and FM broadcasting (as described in §§ 73.603 and 73.210 of this chapter) is required to conduct all tests, measurements and monitoring of signal leakage that are required by this subpart. A cable television system operator complying with the monitoring, logging and the leakage repair requirements of § 76.614, shall be considered to have met the requirements of this paragraph. However, the leakage log shall be retained for five years rather than the two years prescribed in § 76.1706.

Note 1: Prior to requiring any additional testing pursuant to § 76.601(c), the local franchising authority shall notify the cable operator who will be allowed thirty days to come into compliance with any perceived signal quality problems which need to be corrected. The Commission may request cable operators to test their systems at any time.

Note 2: Section 76.1717 contains recordkeeping requirements for each system operator in order to show compliance with the technical rules of this subpart.

Note 3: Section 76.1704 contains recordkeeping requirements for proof of performance tests.

§76.605 Technical standards

(a) As of December 30, 1992, unless otherwise noted, the following requirements apply to the performance of a cable television system as measured at any subscriber terminal with a matched impedance at the termination point or at the output of the modulating or processing equipment (generally the headend) of the cable television system or otherwise as noted. The requirements are applicable to each NTSC or similar video downstream cable television channel in the system:

(1)



(i) The cable television channels delivered to the subscriber's terminal shall be capable of being received and displayed by TV broadcast receivers used for off-the-air reception of TV broadcast signals, as authorized under part 73 of this chapter; and

(ii) Cable television systems shall transmit signals to subscriber premises equipment on frequencies in accordance with the channel allocation plan set forth in the Electronics Industries Association's "Cable Television Channel Identification Plan, EIA IS-132, May 1994" (EIA IS-132). This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 522(a) and 1 CFR Part 51. Cable systems are required to use this channel allocation plan for signals transmitted in the frequency range 54 MHz to 1002 MHz. This incorporation by reference was approved by the Director of the Federal Register in accordance with 5 U.S.C. 522(a) and 1 CFR Part 51. Copies of EIA IS-132 may be obtained from: Global Engineering Documents, 2805 McGraw Ave., Irvine CA 92714. Copies of EIA IS-132 may be inspected during normal business hours at the following locations: Federal Communications Commission, 1919 M Street, NW, Dockets Branch (Room 239), Washington, DC, or the Office of the Federal Register, 800 North Capitol Street, NW., suite 700, Washington, DC. This requirement is applicable on May 31, 1995, for new and re-built cable systems, and on June 30, 1997, for all cable systems.

(2) The aural center frequency of the aural carrier must be 4.5 MHz +/- 5 kHz above the frequency of the visual carrier at the output of the modulating or processing equipment of a cable television system, and at the subscriber terminal.

(3) The visual signal level, across a terminating impedance which correctly matches the internal impedance of the cable system as viewed from the subscriber terminal, shall not be less than 1 millivolt across an internal impedance of 75 ohms (0 dBmV). Additionally, as measured at the end of a 30 meter cable drop that is connected to the subscriber tap, it shall not be less than 1.41 millivolts across an internal impedance of 75 ohms (+3 dBmV). (At other impedance values, the minimum visual signal level, as viewed from the subscriber terminal, shall be the square root of $0.0133(z)$ millivolts and, as measured at the end of a 30 meter cable drop that is connected to the subscriber tap, shall be 2 times the square root of $0.00662(z)$ millivolts, where Z is the appropriate impedance value).

(4) The visual signal level on each channel, as measured at the end of a 30 meter cable drop that is connected to the subscriber tap, shall not vary more than 8 decibels within any six-month interval which must include four tests performed in six-hour increments during a 24-hour period in July or August and during a 24-hour period in January or February, and shall be maintained within:

(i) 3 decibels (dB) of the visual signal level of any visual carrier within a 6 MHz nominal frequency separation;

(ii) 10 dB of the visual signal level on any other channel on a cable television system of up to 300 MHz of cable distribution system upper frequency limit, with a 1 dB increase for each additional 100 MHz of cable distribution system upper frequency limit (e.g., 11 dB for a system at 301-400 MHz; 12 dB for a system at 401-500 MHz, etc.); and



(iii) A maximum level such that signal degradation due to overload in the subscriber's receiver or terminal does not occur.

(5) The rms voltage of the aural signal shall be maintained between 10 and 17 decibels below the associated visual signal level. This requirement must be met both at the subscriber terminal and at the outputs of the modulating and processing equipment (generally the headend). For subscriber terminals that use equipment which modulate and demodulate the signal (e.g., baseband converters), the rms voltage of the aural signal shall be maintained between 6.5 and 17 decibels below the associated visual signal level at the subscriber terminal.

(6) The amplitude characteristic shall be within a range of +/- 2 decibels from 0.75 MHz to 5.0 MHz above the lower boundary frequency of the cable television channel, referenced to the average of the highest and lowest amplitudes within these frequency boundaries.

(i) Prior to December 30, 1999, the amplitude characteristic may be measured after a subscriber tap and before a converter that is provided and maintained by the cable operator.

(ii) As of December 30, 1999, the amplitude characteristic shall be measured at the subscriber terminal.

(7) The ratio of RF visual signal level to system noise shall be as follows:

(i) From June 30, 1992, to June 30, 1993, shall not be less than 36 decibels.

(ii) From June 30, 1993 to June 30, 1995, shall not be less than 40 decibels.

(iii) As of June 30, 1995, shall not be less than 43 decibels.

(iv) For class I cable television channels, the requirements of paragraphs (a)(7)(i), (a)(7)(ii) and (a)(7)(iii) of this section are applicable only to:

(A) Each signal which is delivered by a cable television system to subscribers within the predicted Grade B contour for that signal;

(B) Each signal which is first picked up within its predicted Grade B contour;

(C) Each signal that is first received by the cable television system by direct video feed from a TV broadcast station, a low power TV station, or a TV translator station.

(8) The ratio of visual signal level to the rms amplitude of any coherent disturbances such as intermodulation products, second and third order distortions or discrete-frequency interfering signals not operating on proper offset assignments shall be as follows:

(i) The ratio of visual signal level to coherent disturbances shall not be less than 51 decibels for noncoherent channel cable television systems, when measured with modulated carriers and time averaged; and



(ii) The ratio of visual signal level to coherent disturbances which are frequency-coincident with the visual carrier shall not be less than 47 decibels for coherent channel cable systems, when measured with modulated carriers and time averaged.

(9) The terminal isolation provided to each subscriber terminal:

(i) Shall not be less than 18 decibels. In lieu of periodic testing, the cable operator may use specifications provided by the manufacturer for the terminal isolation equipment to meet this standard; and

(ii) Shall be sufficient to prevent reflections caused by open-circuited or short-circuited subscriber terminals from producing visible picture impairments at any other subscriber terminal.

(10) The peak-to-peak variation in visual signal level caused by undesired low frequency disturbances (hum or repetitive transients) generated within the system, or by inadequate low frequency response, shall not exceed 3 percent of the visual signal level. Measurements made on a single channel using a single unmodulated carrier may be used to demonstrate compliance with this parameter at each test location.

(11) As of June 30, 1995, the following requirements apply to the performance of the cable television system as measured at the output of the modulating or processing equipment (generally the headend) of the system:

(i) The chrominance-luminance delay inequality (or chroma delay), which is the change in delay time of the chrominance component of the signal relative to the luminance component, shall be within 170 nanoseconds.

(ii) The differential gain for the color subcarrier of the television signal, which is measured as the difference in amplitude between the largest and smallest segments of the chrominance signal (divided by the largest and expressed in percent), shall not exceed +/- 20%.

(iii) The differential phase for the color subcarrier of the television signal which is measured as the largest phase difference in degrees between each segment of the chrominance signal and reference segment (the segment at the blanking level of 0 IRE), shall not exceed +/- 10 degrees.

(12) As an exception to the general provision requiring measurements to be made at subscriber terminals, and without regard to the type of signals carried by the cable television system, signal leakage from a cable television system shall be measured in accordance with the procedures outlined in §76.609(h) and shall be limited as follows:

Frequencies	Signal leakage limit (microvolts/meter)	Distance in meters(m)
Up to and include 54 MHz:	15	30
Over 54 up to and including 216 MHz:	20	3

(b) Cable television systems distributing signals by using methods such as nonconventional coaxial cable techniques, noncoaxial copper cable techniques, specialized coaxial cable and fiber optical cable hybridization techniques or specialized compression techniques or specialized receiving



devices, and which, because of their basic design, cannot comply with one or more of the technical standards set forth in paragraph (a) of this section, may be permitted to operate: Provided, that an adequate showing is made pursuant to §76.7 which establishes that the public interest is benefited. In such instances, the Commission may prescribe special technical requirements to ensure that subscribers to such systems are provided with an equivalent level of good quality service.

Note 1: Local franchising authorities of systems serving fewer than 1000 subscribers may adopt standards less stringent than those in §76.605(a). Any such agreement shall be reduced to writing and be associated with the system's proof-of-performance records.

Note 2: For systems serving rural areas as defined in §76.5, the system may negotiate with its local franchising authority for standards less stringent than those in §§76.605(a)(3), 76.605(a)(7), 76.605(a)(8), 76.605(a)(10) and 76.605(a)(11). Any such agreement shall be reduced to writing and be associated with the system's proof-of-performance records.

Note 3: The requirements of this section shall not apply to devices subject to the provisions of §§15.601-15.626.

Note 4: Should subscriber complaints arise from a system failing to meet §76.605(a)(6) prior to December 30, 1999, the cable operator will be required to provide a converter that will allow the system to meet the standard immediately at the complaining subscriber's terminal. Further, should the problem be found to be system-wide, the Commission may order all converters on the system be changed to meet the standard.

Note 5: Should subscriber complaints arise from a system failing to meet §76.605(a)(10), the cable operator will be required to remedy the complaint and perform test measurements on §76.605(a)(10) containing the full number of channels as indicated in §76.601(b)(2) at the complaining subscriber's terminal. Further, should the problems be found to be system-wide, the Commission may order the full number of channels as indicated in §76.601(b)(2) be tested at all required locations for future proof-of-performance tests.

Note 6: No State or franchising authority may prohibit, condition, or restrict a cable system's use of any type of subscriber equipment or any transmission technology.

§ 76.609 Measurements

(a) Measurements made to demonstrate conformity with the performance requirements set forth in §§76.601 and 76.605 shall be made under conditions which reflect system performance during normal operations, including the effect of any microwave relay operated in the Cable Television Relay Service (CARS) intervening between pickup antenna and the cable distribution network. Amplifiers shall be operated at normal gains, either by the insertion of appropriate signals or by manual adjustment. Special signals inserted in a cable television channel for measurement purposes should be operated at levels approximating those used for normal operation. Pilot tones, auxiliary or substitute signals, and non-television signals normally carried on the cable television system should be operated at normal levels to the extent possible. Some exemplary, but not mandatory, measurement procedures are set forth in this section.



(b) When it may be necessary to remove the television signal normally carried on a cable television channel in order to facilitate a performance measurement, it will be permissible to disconnect the antenna which serves the channel under measurement and to substitute therefor a matching resistance termination. Other antennas and inputs should remain connected and normal signal levels should be maintained on other channels.

(c) As may be necessary to ensure satisfactory service to a subscriber, the Commission may require additional tests to demonstrate system performance or may specify the use of different test procedures.

(d) The frequency response of a cable television channel may be determined by one of the following methods, as appropriate:

(1) By using a swept frequency or a manually variable signal generator at the sending end and a calibrated attenuation and frequency-selective voltmeter at the subscriber terminal; or

(2) By using either a multiburst generator or vertical interval test signals and either a modulator or processor at the sending end, and by using either a demodulator and either an oscilloscope display or a waveform monitor display at the subscriber terminal.

(e) System noise may be measured using a frequency-selective voltmeter (field strength meter) which has been suitably calibrated to indicate rms noise or average power level and which has a known bandwidth. With the system operating at normal level and with a properly matched resistive termination substituted for the antenna, noise power indications at the subscriber terminal are taken in successive increments of frequency equal to the bandwidth of the frequency-selective voltmeter, summing the power indications to obtain the total noise power present over a 4 MHz band centered within the cable television channel. If it is established that the noise level is constant within this bandwidth, a single measurement may be taken which is corrected by an appropriate factor representing the ratio of 4 MHz to the noise bandwidth of the frequency-selective voltmeter. If an amplifier is inserted between the frequency-selective voltmeter and the subscriber terminal in order to facilitate this measurement, it should have a bandwidth of at least 4 MHz and appropriate corrections must be made to account for its gain and noise figure. Alternatively, measurements made in accordance with the NCTA Recommended Practices for Measurements on Cable Television Systems, 2nd edition, November 1989, on noise measurement may be employed.

(f) The amplitude of discrete frequency interfering signals within a cable television channel may be determined with either a spectrum analyzer or with a frequency-selective voltmeter (field strength meter), which instruments have been calibrated for adequate accuracy. If calibration accuracy is in doubt, measurements may be referenced to a calibrated signal generator, or a calibrated variable attenuator, substituted at the point of measurement. If an amplifier is used between the subscriber terminal and the measuring instrument, appropriate corrections must be made to account for its gain.

(g) The terminal isolation between any two terminals in the cable television system may be measured by applying a signal of known amplitude to one terminal and measuring the amplitude of



that signal at the other terminal. The frequency of the signal should be close to the midfrequency of the channel being tested. Measurements of terminal isolation are not required when either:

- (1) The manufacturer's specifications for subscriber tap isolation based on a representative sample of no less than 500 subscribers taps or
- (2) Laboratory tests performed by or for the operator of a cable television system on a representative sample of no less than 50 subscriber taps, indicates that the terminal isolation standard of §76.605(a)(9) is met.

To demonstrate compliance with §76.605(a)(9), the operator of a cable television system shall attach either such manufacturer's specifications or laboratory measurements as an exhibit to each proof-of-performance record.

(h) Measurements to determine the field strength of the signal leakage emanated by the cable television system shall be made in accordance with standard engineering procedures. Measurements made on frequencies above 25 MHz shall include the following:

- (1) A field strength meter of adequate accuracy using a horizontal dipole antenna shall be employed.
- (2) Field strength shall be expressed in terms of the rms value of synchronizing peak for each cable television channel for which signal leakage can be measured.
- (3) The resonant half wave dipole antenna shall be placed 3 meters from and positioned directly below the system components and at 3 meters above ground. Where such placement results in a separation of less than 3 meters between the center of the dipole antenna and the system components, or less than 3 meters between the dipole and ground level, the dipole shall be repositioned to provide a separation of 3 meters from the system components at a height of 3 meters or more above ground.
- (4) The horizontal dipole antenna shall be rotated about a vertical axis and the maximum meter reading shall be used.
- (5) Measurements shall be made where other conductors are 10 or more feet away from the measuring antenna.

(i) Annual measurements of frequency stability of set top converters, when such converters are supplied by the cable television operator, are not required when either of the following indicates that the requirements of §76.605(a)(2) are met: (1) manufacturer's specifications based on a representative sample of the converters, or (2) laboratory tests performed by or for the cable television system operator on a representative sample of the converters. Proof of performance tests for frequency stability will not be required for converters ordered from the manufacturer prior to September 6, 1977.

(i) For systems using cable traps and filters to control the delivery of specific channels to the subscriber terminal, measurements made to determine compliance with §76.605(a) (5) and (6) may be performed at the location immediately prior to the trap or filter for the specific channel. The effects of these traps or filters, as certified by the system engineer or the equipment manufacturer, must be attached to each proof-of-performance record.

(j) Measurements made to determine the differential gain, differential phase and the chrominance-luminance delay inequality (chroma delay) shall be made in accordance with the NCTA



Recommended Practices for Measurements on Cable Television Systems, 2nd edition, November 1989, on these parameters.

§ 76.1704 Proof-of-performance test data

(a) The proof of performance tests required by § 76.601 shall be maintained on file at the operator's local business office for at least five years. The test data shall be made available for inspection by the Commission or the local franchiser, upon request.

(b) The provisions of paragraph (a) of this section shall not apply to any cable television system having fewer than 1,000 subscribers, subject to the requirements of § 76.601(d).

Note to § 76.1704: If a signal leakage log is being used to meet proof of performance test recordkeeping requirements in accordance with § 76.601, such a log must be retained for the period specified in § 76.601(d).

§ 76.1717 Compliance with technical standards

Each system operator shall be prepared to show, on request by an authorized representative of the Commission or the local franchising authority, that the system does, in fact, comply with the technical standards rules in part 76, subpart K.

<End of Attachment I >



Attachment 2: Statement of Qualifications

JONATHAN L. KRAMER, FIAE

- Licensed by the Federal Communications Commission (General Radiotelephone Operator License PG-11-35289, with Ship Radar Endorsement) (Previously licensed as a Second Class Radio Telephone Operator, September 1975; First Class Radio Telephone Operator, November 1977; General Radiotelephone Operator License, June 1987)
- Licensed by the Federal Communications Commission as an amateur radio operator since November 1970; currently licensed as an Extra class operator (W6JLK)
- Former National Board of Directors member, National Association of Telecommunications Officers and Advisors (NATOA), an affiliate of the National League of Cities (Terms: 1997-2000, 1992-1994)
- Former Co-chair of National Technical Standards Committee appointed by NATOA, National League of Cities, and US Conference of Mayors to develop the national technical standards for cable television systems adopted by the FCC in February 1992
- NATOA's 1997 Member of the Year (honored for information delivery to NATOA members)
- NATOA's 1991 Member of the Year (honored for achievements in developing and negotiating national cable television technical standards)
- Former Co-chair of National Technical Standards committee appointed by NATOA, National League of Cities, and US Conference of Mayors to develop the national technical standardized testing manual to determine compliance with the FCC rules
- Senior Member of Society of Cable Telecommunications Engineers (Senior Member since April 1993; Member since 1981)
- Fellow, Institute for the Advancement of Engineering (FIAE) (Nominated by Institute of Electrical and Electronics Engineers)
- Member, International Right of Way Association
- Witness before the FCC in Cable TV re-regulation hearings, March 1990, representing NATOA, et al



- Right-of-Way engineering and management expertise related to telecommunications networks and radio communications siting

- Testifying expert witness in federal and state court cases

- Technology speaker at every NATOA National Conference since 1988; Technology speaker at many regional and local NATOA meetings

- Communications technology speaker at Society of Cable Telecommunications Engineers conferences and cable industry conferences

- Published author of book and magazine articles on communications technology, Plant safety, construction, and administration

- Cable system engineering and technical management experience six years before forming firm; Chief Technician, Technical Manager, Regional Engineer.

- Former Field Engineering Representative for Motorola Communications and Electronics, Area F Program Management team — Areas of experience include microwave radio; baseband RF and audio; digital signaling; UHF and VHF two-way radio (including high stability Simulcast® radio operations); telephony; and command and control communications.

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STEVEN C. ALLEN - BCE, BTCS

7/01 to Present Kramer.Firm, Inc. Senior Broadband Technologist

Broadband and cable system inspection specialist; RF technology. Reports directly to and under the supervision of Jonathan L. Kramer, Kramer.Firm's Principal.

5/00 to 7/01 Cisco Systems, Inc Consulting System Engineer (CSE) Cable and Wireless Business

Provided technical expertise and industry knowledge to the development and sale of broadband cable modems, Cable Modem Termination Systems (CMTS), video products, and wireless Internet products.

Prepared and delivered focused product training and presentations to internal work groups and Cisco customers. Assisted in the development of specifications and features of next generation Cisco products and worked with customer account teams on product evaluations or deployments.

Worked with local Account Managers and System Engineers to resolve specific operational problems at customer locations. Providing feedback to manufacturing or product development on requirements or improvements to products. Provided training to customer staff on Cisco products. Provided RF/HFC experience and industry knowledge to Cisco sales and marketing departments to better acquaint them with the broadband cable industry. (Industry point of view). Leveraged extensive vendor contacts to provide information and possible solutions to specific product development requirements.

11/98 to 5/2000 TVC Communications, Inc Western Regional Sales Engineer:

Responsible for technical sales and training support to major Broadband providers including CATV, Telco, Manufacturing, Broadcast and Satellite networks in California and Nevada. Sales Engineer for 2nd largest broadband distributor in USA. Specializing in complex headend and outside Plant products. Primary product lines include Tektronix analog and digital test equipment, Motorola Optical and HFC Distribution equipment, fiber optic splicing and termination systems, including enclosures, fusion splicers, fiber management systems. Work closely with regional account managers to assist in product specifications, RFP's, training related needs and hands-on training for customer staff. Assist in identification of system needs, and design solutions based on offered products and services.

12/95 to 11/98 Roseville Telephone Company Broadband Systems Engineer:



Working in a combined Broadband/Telco environment, helped implement one of the first experiments in Fiber to the Curb (FTTC) architecture in Del Webb's Sun City development in Roseville, California. Responsible for design and implementation of new centralized network powering system, HFC design review, network monitoring system for system power, new product and technology evaluations, staff training, and Broadband overviews for management.

Directly involved in mapping and conducting signal surveys in the Sacramento area for wireless PCS coverage. I worked with several right-of-way contractors and Lucent, to secure cellular and co-locate sites for network build-out.

12/86-12/95 Jones Intercable, Inc. System Engineering Manager:

Responsible for all aspects of inside and outside Plant for cable television system serving Roseville, California. Supervised staff of 15 installers, technicians and construction personnel. Designed and implemented new office building telecommunications services and placement. Designed and implemented new CATV headend encompassing towers, satellite receiving dishes, central grounding network, and data services. Coordinated cut-over from old headend and services to all new facilities. Designed and installed first fiber optic CATV network in the Sacramento area employing a Cable Area Network design devised by Jones Intercable. Worked with other departments to insure that system goals and business plans were met. Administered OSHA/CALOSHA Hazmat/Hazcom program. Provided temporary engineering support and management supervision to related Jones Intercable business units in other areas of Northern California.

1/85 to 12/86 Viacom Cablevision Headquarters Corporate Staff Engineer:

Responsible for technical support for home terminal products and converter repair facilities at Viacom systems in USA. Provided staff assistance at system level to resolve technical difficulties beyond scope of local personnel. Worked with product vendors to develop solutions to technical problems. Assisted corporate purchasing department in developing cost effective alternatives to vendor provided services or materials.

10/82 to 1/85 Viacom Cablevision- North Bay Region Regional Systems Engineer:

Responsible for all headends, microwave systems, and FCC liaison for systems in North Bay region including San Rafael, Petaluma, Napa, Pinole, Crockett, and Rodeo. Supervised and supported a crew of 4 headend technicians in maintaining headend equipment including off-air processors, FM, AML microwave, FM terrestrial microwave, Satellite TVRO and Fiber optic links. Also responsible for overseeing Viacom Plant training program and coordinating activities of regional Plant trainer. Additional responsibilities included Regional Engineer for the Bay Area Interconnect, a microwave trunk system de-



livering advertiser supported satellite programming to 500 thousand cable subscribers in the greater San Francisco Bay area.

6/79 to 10/82 Viacom Cablevision Chief Technician:

Responsible for operation of system Plant in Oroville, Paradise, Colusa, Gridley and Biggs, California. Supervise a crew of 4 system technicians. Maintain 6 headends with AML microwave transmitters and receivers, satellite TVRO, FM Microwave, processors, antennas and associated equipment.

1/79-6/79 Nor-Cal Cablevision System Technician:

Responsible for system maintenance on distribution and house drop level. Perform routine service calls in response to customer requests.

2/78 to 12/78 Cal-Com Systems Sales Engineer:

Design and market mobile communications systems for RCA Mobile Communications Division in the San Francisco Bay Area.

1/76 to 1/78 Concord TV Cable (A unit of Western Communications) Construction Technician:

Duties involved construction and proof of new overhead and underground cable Plant. Construction leader during complete rebuild of Concord system in 1977. Promoted to Field Technical Supervisor for rebuild. Also involved in production work for local origination department.

6/75 to 1/76 United States Air Force Reserve Basic Training

6/73 to 6/75 State TV Cable (A unit of Western Communications) Construction Linemen:

Duties involved construction of new overhead and underground Plant. Construction lineman for complete electronics change out for CATV franchises in Willows, Corning and Orland, California

6/70 to 6/73 Concord TV Cable (A unit of Western Communications) Installer:

Education:

9/73 - 5/75 California State University Chico, Chico, California BA degree, Telecommunications



9/71 - 5/72 San Diego State University, San Diego, California Undergraduate work,
Broadcasting
9/69 - 6/71 Diablo Valley College, Pleasant Hill, California Associate of Arts Degree,
General Education emphasis on Broadcasting

Professional Associations:

Society of Cable Telecommunications Engineers (SCTE) 1979 to Present
1991 National Member of the Year
Elevated to Senior Member in 1991

SCTE Offices held:

SCTE Region I National Director (CA, NV, HI)
SCTE Western Vice Chairman
SCTE Executive Committee member
Vice President, Sierra Chapter, SCTE serving Sacramento
Member, SCTE National Planning Committee
Member, SCTE BCT/E Industry Certification Committee.
Chairman, SCTE Northern California Vendors Day

National Cable Television Association

Member, Cable Pioneers Club, Class of 1993

Credentials:

FCC General Class Radiotelephone License; prior licensed as a Second Class General
Radiotelephone
License (continuously licensed since 1980)
SCTE Broadband Certified Engineer (BCE); continually certified since 1988
SCTE certified Broadband Telecom Center Specialist, BTCS. Since 2002
FCC Amateur Radio Licensee (Call sign: KC6VCC; continuously licensed since 1991)

Military Service: 1975-1981

USAF Reserve Law Enforcement Specialist. Chico
California Honor Graduate USAF Police Academy

USN Reserve Avionics Technician. Alameda, California
Honorably discharged May 1981

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