Appendix C
ASIA Analysis of 10, 13, and 16 dBW/4kHz Downlink EIRP Densities

I. Introduction

In Appendix C to the *Fifth Report and Order* in this proceeding, the Commission provides a summary of its analysis supporting its decision to increase the Ku-band downlink EIRP density limit from 6 to 10 dBW/4kHz. Here, the Commission provides a more detailed version of the analysis in Appendix C.

Sections 25.134(a) and 25.212(c) set a 6 dBW/4kHz criteria on the maximum Ku-band[1] downlink EIRP density[2] that can be routinely processed. A number of comments support increasing this downlink EIRP density criteria for the routine processing of earth station applications. Most commenters support increasing this criteria to 9 dBW/4kHz, and some commenters support increasing this criteria to 10 dBW/4kHz. The proposed 9 or 10 dBW/4kHz criteria would apply to all wideband and narrowband digital services. Other commenters propose the creation of a new routine processing criteria for wideband and dual carrier per transponder digital services. Criteria at both 13 dBW/4kHz and 16 dBW/4kHz have been proposed for these wideband and dual carrier per transponder services.

In this appendix, we examine the interference impact of raising the downlink EIRP density criteria for routine processing. Based on those comments, as supplemented by our analysis in this appendix, we conclude that increasing the Ku-band downlink EIRP density limit to 10 dBW/4kHz is consistent with the Commission's 2° spacing satellite technical standards.

The 6 dBW/4kHz routine processing criteria was originally established in the *1986 VSAT Order*[3] and applied only to digital VSAT networks with outbound gross bit rates up to 3.088 Mbps. In the *1996 Streamlining Order,*[4] this downlink EIRP density criteria was extended to all Ku-band digital transmissions, regardless of bandwidth or bit rate.

In 1985 and 1986, a number of VSAT earth station network applications were pending.[5] These applications proposed a variety of antenna sizes, data rates, uplink power density levels, and downlink EIRP density levels.[6] At that time, the Commission's interference analysis found that the highest downlink power density levels could cause excessive levels of interference into existing services[7] and accordingly limited the downlink EIRP density for routine processing to 6 dBW/4kHz.

In order to assess the interference impact of raising this routine processing criteria to levels greater than 6 dBW/4kHz, the staff has preformed an ASIA[8] analysis using a series of baseline systems. ***First***, an outbound digital

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[1] Specifically, the downlink EIRP density limit being considered here applies only in the 11.7-12.2 GHz band.

[2] The 6 dBW/4kHz downlink EIRP density criteria applies only to the routine processing of wideband and narrowband digital services.

[3] Routine Licensing of Large Networks of Small Antenna Earth Stations Operating in the 12/14 GHz Frequency Bands, *Declaratory Order*, Common Carrier Bureau, Released Apr. 9, 1986 *(1986 VSAT Order)*.

[4] Streamlining the Commission's Rules and Regulations for Satellite Application and Licensing Procedures, *Report and Order*, IB Docket No. 95-117, 11 FCC Rcd 21581 (1996) (*1996 Streamlining Order*).

[5] *1986 VSAT Order* at n. 2.

[6] *1986 VSAT Order* at para. 9. The highest downlink EIRP density proposed was +10.3 dBW/4kHz.

[7] *1986 VSAT Order* at para. 15.

[8] The Adjacent Satellite Interference Analysis (ASIA) computer program and interference assessment methodology is cited in Section 25.134(b) of our Rules. The ASIA program and methodology was originally employed to analyze the impact of 2° orbital spacing in the C and Ku bands in Appendices B and C of the *Two Degree Spacing Order.* Specifically, version 1.2 of ASIA was used in the analyses considered in this appendix. Version 1.2 is identical to version

VSAT reference system with 5.0 and 1.2 meter antennas operating at the routine processing levels of §25.134(a) and §25.212(c) was considered. This reference system consists of six (6) carrier links at both 6 dBW/4kHz and 10 dBW/4kHz downlink EIRP density levels[9]. ***Second***, a narrowband analog reference system, with 5.0 and 1.2 meter antennas operating at the routine processing levels of §25.134(a) and §25.212(c) was also defined. This narrowband analog system consists of eight (8) carrier links providing audio program and voice grade circuits at both downlink EIRP density levels of 13 dBW/4kHz and 17.0 dBW/4kHz[10]. ***Third***, a generic reference system of general communications carrier links was also considered. This system consists of 107 generic Ku-band carrier links. Some of these generic links were originally analyzed in Appendix C of the 1983 *Two Degree Spacing Order*[11] and later, these generic links were adjusted to include the domestic space station applications filed on November 7, 1983. These generic links were used in the staff's original analysis in the *1986 VSAT Order*. The set of 107 generic links considered in this appendix is a revised version of those generic links used in the *1986 VSAT Order*. Those used in the *1986 VSAT Order* were reviewed and several obsolete links were removed.[12] Additionally a few new links from a recent space station application[13] were added to this set to complete the 107 generic links used in the analyses in this appendix.[14] Note that the receive satellite antenna gain and downlink EIRP levels for these generic links are generally characteristic of nominal edge of coverage.[15] ***Fourth***, a set of baseline digital carriers, both wideband and narrowband, operating at the routine processing levels of §25.212(c) was considered. This baseline digital system consists of twelve carrier links operating at both downlink EIRP density levels of 6 dBW/4kHz and 10 dBW/4kHz[16]. And ***fifth***, a set of baseline full and dual wideband digital carrier links operating at the routine processing levels of §25.212(c) was considered. This wideband and dual carriers per transponder baseline system consists of 24 carrier links operating at downlink EIRP density levels of 6 dBW/4kHz, 10 dBW/4kHz, 13 dBW/4kHz, and 16 dBW/4kHz.[17]

II. Interference Analysis Results

20% Noise Allocation to Adjacent Satellite Interference: Generally, for all but a few of the above described baseline systems,[18] the single entry adjacent satellite interference objectives used in the staff's analyses in this appendix have been

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1.1, with the addition of listing the computed values of power density and eirp density. The input data used in these analyses are listed in tables C-25 through C-30. Source code for ASIA, input data files, and results of these analyses can will be made available on the Commission's website.

[9] See tables C-1 and C-26 for the link parameters of the digital VSAT reference system.

[10] See tables C-2 and C-27 for the link parameters of this narrowband analog reference system.

[11] Licensing of Space Stations in the Domestic Fixed-Satellite Service and Related Revisions of Part 25 of the Rules and Regulations, *Report and Order*, CC Docket No. 81-704, FCC 83-184, 54 Rad. Reg. 2d 577 (released Aug. 16, 1983); Licensing Space Stations in the Domestic Fixed-Satellite Service, 48 F.R. 40233 (Sept. 6, 1983) (*Two Degree Spacing Order*).

[12] The *1986 VSAT Order* generic links were adjusted by removing the following: (1) all digital non-VSAT-like BPSK links, (2) all analog FDM/FM and CSSB/AM mult-channel telephone links, (3) all narrowband analog SCPC/FM telephony links, (4) analog TV/FM distribution links to small antennas (< 3.0 meters), (5) all digital links with on-board satellite processing, and (6) links characteristic of satellite systems that were never built.

[13] Links characteristic of three (3) satellite systems (SES Americom, Loral, and PanAmSat) were added. The link parameters for these last 16 generic links come from the ASIA analysis presented in SES Americom's space station application for Americom-9 at 79° W.L. (Attachment B to SAT-LOA-20020114-00008, S2434, filed Jan. 14, 2002). The downlink receive earth station antenna gains for the Americom 2.4 and 6.0 meter antennas have been revised. The receive gain for the 2.4 meter antennas have been changed to 47.4 dBi from 41.3, 41.8, and 49.3 dBi. The receive gain for the 6.0 meter antenna has been changed to 55.3 dBi from 49.3 dBi.

[14] See tables C-3 and C-28 for the link parameters of the generic Ku band reference links.

[15] Downlink EIRP levels for the generic links are generally about 3 dB lower than for the peak EIRP levels at the satellite antenna pattern's boresite.

[16] See tables C-4 and C-29 for the link parameters of the baseline digital systems.

[17] See tables C-5 and C-30 for the link parameters of the wideband and dual carriers per transponder links.

[18] The last 16 links (SES Americom, Loral, and PanAmSat) in the 107 generic links are the exception. The single entry

based upon a 20% of noise allocation to total adjacent satellite interference.[19] This differs from the analyses conducted in the 1983 *Two Degree Spacing Order* and the *1986 VSAT Order*. Before 1983, 10% of the noise budget, in most cases, was allocated to total adjacent satellite interference. With the implementation of uniform 2° orbital spacing, however, satellite operators began to increase their noise budget allocations to total adjacent satellite interference. Today the general practice is to allocate 20% of the noise budget to total adjacent satellite interference. This adjustment, while holding all other parameters constant, would allow for a 3 dB increase in uplink power density and downlink EIRP density levels[20] with respect to those established in the *1986 VSAT Order*. Accordingly, this factor would allow the increase of the Ku-band downlink EIRP density criteria to 9 dBW/4kHz without causing harmful interference to most satellite systems in operation today.

Tables C-6 through C-25 summarize the results of the staff's ASIA analysis of these baseline systems.[21] Table C-0 summarizes the result tables for the various interference cases. For example, Table C-18 provides the summary results for the Digital-to-Generic interference case and table C-18a provides the details for those Digital-to-Generic interference cases with negative margins.

Table C-0: Summary of ASIA Analysis Results (See the listed tables for results)

Victim Data Sets	Interfering Data Sets			
	Baseline VSAT (Tables C-1 & C-26)	Narrowband Analog SCPC/FM (Tables C-2 & C-27)	Baseline Digital (Tables C-4 & C-29)	Wideband & Dual Carrier (Tables C-5 & C-30)
Baseline VSAT (Tables C-1 & C-26)	Table C-6	Table C-11	Tables C-16 & C16a	Tables C-21, C-21a, C-21b, and C-21c
Narrowband Analog SCPC/FM (Tables C-2 & C-27)	Tables C-7 & C-7a	Tables C-12 & C-12a	Tables C-17 & C-17a	Tables C-22, C-22a, C-22b, and C-22c
Generic Carriers (Tables C-3 & C28)	Tables C-8 & C-8a	Tables C-13 & C-13a	Tables C-18 & C-18a	Tables C23, C-23a, C-23b, and C-23c
Baseline Digital (Tables C-4 & C-29)	Table C-9	Table C-14	Tables C-19 & C-19a	Tables C24 & C-24a
Wideband & Dual Carrier (Tables C-5 & C-30)	Table C-10	Table C-15	Tables C-20 & C20a	Tables C-25 & C-25a

A. 10 dBW/4kHz Downlink EIRP Densities:

An examination of the summary results of the staff's ASIA analyses[22] in this appendix indicates that very few

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interference objectives for these links are as stated in Attachment B to the space station application, SAT-LOA-20020114-0008. See the last column of table C-28 for the single entry C/I ratio used for these last 16 links.

[19] $C/I_{se} = C/N_{req} - 10 \log(0.20) - 10 \log(0.40) = C/N_{req} + 7$ dB + 4 dB = C/N_{req} + 11 dB. The single entry allocation is 40% of the total adjacent satellite allocation.

[20] A 10% of noise allocation to adjacent satellite interference gives a C/I_{se} which is 3 dB higher than with a 20% of noise allocation. $C/I_{se} = C/N_{req} - 10 \log(0.10) - 10 \log(0.40) = C/N_{req} + 10$ dB + 4 dB = C/N_{req} + 14 dB.

[21] Negative margins in tables C-6 through C-25 are highlighted in a **bold** font. The the C/I level in the worst link, either uplink or downlink, is also highlighted in a **bold** font.

[22] See tables C-6, C-7, C-8, C-9, C-10, C-11, C-12, C-13, C-14, C-15, C-16, C-17, C-18, C-19, C-20, C-21, C-22, C-23,

communication links suffer negative margins from a 10 dBW/4kHz downlink EIRP density. Those cases that do experience negative margins are generally links operating at low levels of downlink EIRP density. Except for the case of narrowband analog SCPC/FM carriers, most of these links can increase their downlink EIRP density to compensate for the negative margins. Some of the analog SCPC/FM carriers that expericence negative margins already operate at the routinely licensed downlink EIRP density level of 13 dBW/4kHz in §25.212. In order to recover a positive margin for these narrowband analog carriers, we have also increased their downlink EIRP density criteria by 4.0 dB to 17 dBW/4kHz. In the rest of this section, we examine the cases with negative margins in detail.

A-1. Interference into VSAT network carriers. Only link V4 has a negative margin from carriers operating at 10 dBW/4kHz downlink EIRP densities. Negative magins occur in tables C16 and C-21 from medium to wideband digital carriers. Of the nine (9) cases with a negative margin, three (3) have negative margins of –0.5 dB, five (5) have negative margins of –0.6 dB, and one (1) has a negative margin of –0.9 dB[23]. Link V4 is a VSAT link between 1.2 meter antennas operating at a downlink EIRP density of 6 dBW/4kHz. The adoption of 10 dBW/4kHz downlink EIRP density criteria will allow this link to regain a positive margin by increasing its downlink EIRP density by 1.0 dB or less.

A-2. Interference into Narrowband Analog Carriers. Two (2) narrowband analog links have negative margins from carriers operating at 10 dBW/4kHz downlink EIRP densities. These carriers are FMot and VCot with negative margins in tables C-7, C-12, C-17, and C-22. An examination of the detailed C/I ratio levels in tables C-7a, C-12a, C-17a, and C-22a shows that these analog carriers have negative margins of –3.2 dB or less for interference from digital carriers and –3.6 dB or less for interference from high-powered narrowband analog carriers. These two (2) carriers (FMot and VCot) are outbound program-quality and voice-grade circuits from 5.0 meter to 1.2 meter antennas operating at the routine analog downlink EIRP density of 13 dBW/4kHz. In order to compensate for the shortfall in these SCPC/FM links, we have also examined the consequences of raising the routine processing level of the downlink EIRP density for narrowband analog signals. In particular, we have examined raising the downlink EIRP density limit for narrowband analog systems to 17 dBW/4kHz. This 4.0 dB downlink EIRP density increase allows these narrowband analog carriers to recover a positive margin by increasing their downlink EIRP densities.

A-3. Interference into Generic carriers. Twenty-three (23)[24] of the 107 generic carriers show negative margins from digital carriers operating at 10 dBW/4kHz and analog carriers operating at 17 dBW/4kHz downlink EIRP densities. We will examine these cases in turn.

Carrier N003 has negative margins of –0.3 and –0.4 dB in tables C-18a and C-23a. This digital carrier has a very low downlink EIRP density of –0.01 dBW/4kHz. A slight increase in this downlink EIRP density would recover a positive margin for this carrier.

Carrier N035 has a negative margin of –0.1 dB in tables C-18a and C-23a. This digital carrier operates at a downlink EIRP density of 3.25 dBW/4kHz. A slight increase in this downlink EIRP density would recover a positive margin for this carrier.

Carrier N036 has a negative margin of –1.1 dB in table C-13a. This digital carrier operates at a downlink EIRP density of 0.47 dBW/4kHz. A slight increase in this downlink EIRP density would recover a positive margin for this carrier.

Carrier N037 has negative margins of –1.9, –3.6, -2.3, and -2.2 dB in tables C-8a, C-13a, C-18-a, and C-23a. This digital carrier operates at a downlink EIRP density of 0.47 dBW/4kHz. An increase in this downlink EIRP density would recover a positive margin for this carrier.

C-24, and C-25.

[23] See tables C-16a and C-21a for detailed C/I ratio levels.

[24] The carriers with negative margins in tables C-8, C-13, C-18, and C-23 are N003, N035, N036, N037, N045, N046, N052, N053, N056, N057, N058, N073, N079, N087, N092, N093, N096, N097, N101, N103, N105, N106, and N107. The following links show a failure in the tables, however they have a margin of 0.0 dB: N040.

Carrier N045 has worst-case negative margins of –0.7 and –0.9 dB in tables C-18-a, and C-23a. This digital carrier operates at a downlink EIRP density of 1.34 dBW/4kHz. An increase in this downlink EIRP density would recover a positive margin for this carrier.

Carrier N046 has a negative margin of –0.2 dB in table C-23a. This digital carrier operates at a downlink EIRP density of 2.14 dBW/4kHz. A slight increase in this downlink EIRP density would recover a positive margin for this carrier

Carrier N052 has negative margins of –0.1 and –0.6 dB in tables C-18-a, and C-23a. This two-carrier per transponder analog video carrier into a 5.5 meter receiving antenna operates at a downlink EIRP of 40.5 dBW per carrier. The worst-case C/I for this link is 24.8 dB. An increase in this downlink EIRP would recover a positive margin for this carrier.

Carrier N053 has a worst-case negative margin of –1.1 dB in tables C-18-a, and C-23a. This two-carrier per transponder analog video carrier into a 5.5 meter receiving antenna operates at a downlink EIRP of 40.5 dBW per carrier. The worst-case C/I for this link is 24.3 dB. An increase in this downlink EIRP would recover a positive margin for this carrier.

Carrier N056 has a worst-case negative margin of –0.3 and -1.5 dB in tables C13-a, C-18-a, and C-23a. This single-carrier per transponder analog video carrier into a 3.0 meter receiving antenna operates at a downlink EIRP of 41.0 dBW per carrier. The worst-case C/I for this link is 20.0 dB. An increase in this downlink EIRP would recover a positive margin for this carrier.

Carrier N057 has a worst-case negative margin of –0.9 and -1.5 dB in tables C-18-a, and C-23a. This two-carrier per transponder analog video carrier into a 5.5 meter receiving antenna operates at a downlink EIRP of 36.5 dBW per carrier. The worst-case C/I for this link is 21.6 dB. An increase in this downlink EIRP would recover a positive margin for this carrier.

Carrier N058 has a worst-case negative margin of –0.8 and -2.1 dB in tables C13-a, C-18-a, and C-23a. This two-carrier per transponder analog video carrier into a 5.5 meter receiving antenna operates at a downlink EIRP of 36.5 dBW per carrier. The worst-case C/I for this link is 21.0 dB. An increase in this downlink EIRP would recover a positive margin for this carrier.

Carrier N073 has a worst-case negative margin of –0.1, -1.4, and –1.6 dB in tables C13-a, C-18-a, and C-23a. This digital carrier operates at a downlink EIRP density of 3.62 dBW/4kHz. An increase in this downlink EIRP density would recover a positive margin for this carrier.

Carrier N079 has a worst-case negative margin of –1.0 dB in tables C-18-a, and C-23a. This two-carrier per transponder analog video carrier into a 7.0 meter receiving antenna operates at a downlink EIRP of 37.5 dBW per carrier. The worst-case C/I for this link is 23.0 dB. An increase in this downlink EIRP would recover a positive margin for this carrier.

Carrier N087 has a negative margin of –0.4 dB in tables C-18-a, and C-23a. This digital carrier operates at a downlink EIRP density of 3.92 dBW/4kHz. An increase in this downlink EIRP density would recover a positive margin for this carrier.

Carrier N092 has a negative margin of –0.7 and -1.5 dB in tables C13-a, C-18-a, and C-23a. This digital carrier operates at a downlink EIRP density of 11.26 dBW/4kHz and is a 40 Mbps QPSK carrier with a bandwidth of 36 MHz being received by a 0.9 meter receiving antenna. The negative margins in this link are with respect to a single entry C/I objective (C/I_{se}) of 20 dB as indicated in the source document for this link[25]. A C/I_{se} of 20 dB is likely characteristic of an approximate 10% of noise allocation to total adjacent satellite interference. A 20% of noise allocation to total adjacent

[25] Attachment B to SES Americom's space station application, SAT-LOA-20020114-00008, S2434, filed Jan. 14, 2002.

satellite interference, as is used for most links in the analyses in this appendix would give C/I_{se} = 17.7 dB[26]. After accounting for a 20% noise allocation, the margins are all positive for this carrier.

Carrier N093 has a negative margin of –2.0 and –2.2 dB in tables C-18-a, and C-23a. This digital carrier operates at a downlink EIRP density of 5.45 dBW/4kHz. An increase in this downlink EIRP density would recover a positive margin for this carrier.

Carrier N096 has a negative margin of –3.3, -4.8, and -3.6 dB in tables C-8a, C-13a, C-18-a, and C-23a. This digital carrier operates at a downlink EIRP density of 8.30 dBW/4kHz and is a 56 kbps QPSK carrier with a bandwidth of 35 kHz received by a 1.2 meter receiving antenna. The negative margins in this link are with respect to a single entry C/I objective (C/I_{se}) of 22 dB as indicated in the source document for this link. A C/I_{se} of 22 dB is likely characteristic of an approximate 10% of noise allocation to total adjacent satellite interference. A 20% of noise allocation to total adjacent satellite interference, as is used for most links in the analyses in this appendix would give C/I_{se} = 19.1 dB[27]. After accounting for a 20% noise allocation, the worst shortfall is 1.9 dB, which can be recovered with an increase in the downlink EIRP density for this carrier.

Carrier N097 has a negative margin of –2.1, -1.5, -3.9, and –4.2 dB in tables C-8a, C-13a, C-18a, and C-23a. This digital carrier operates at an uplink power density of –17.1 dBW/4kHz and a downlink EIRP density of 5.4 dBW/4kHz. This is a digital QPSK T1 carrier between a 1.8 meter uplink antenna and a 2.4 meter downlink antenna. The negative margins in this link are with respect to a single entry C/I objective (C/I_{se}) of 21.8 dB as indicated in the source document for this link. A C/I_{se} of 21.8 dB is characteristic of an approximate 15% of noise allocation to total adjacent satellite interference. A 20% of noise allocation to total adjacent satellite interference, as is used for most links in the analyses in this appendix would give C/I_{se} = 19.1 dB[28]. After accounting for a 20% noise allocation, the worst shortfall is 2.7 dB, which can be recovered with an increase in the uplink power density and downlink EIRP density for this carrier.

Carrier N101 has a negative margin of –0.2, -0.1, and –0.2 dB in tables C-13a, C-18a, and C-23a. All of the C/I shortfalls for this link occur in the uplink which operates at an uplink power density of –16.8 dBW/4kHz. An slight increase in the uplink power density would recover a positive margin for this carrier.

Carrier N103 has a negative margin of –0.1 dB in tables C-18a, and C-23a. This digital carrier operates at a downlink EIRP density of 9.88 dBW/4kHz. A very slight increase in this downlink EIRP density would recover a positive margin for this carrier.

Carrier N104 has a negative margin of –0.1 dB in table C-23a. This digital carrier operates at a downlink EIRP density of 9.8 dBW/4kHz. A very slight increase in this downlink EIRP density would recover a positive margin for this carrier.

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[26] $C/I_{se} = C/N_{req} + 10 \log(1/0.20) + 4$ dB, where $C/N_{req} = E_b/N_o + 10 \log($ Data Rate/Bandwidth $)$. For soft decision decoding modems a 10^{-7} BER is achieved with an E_b/N_o = 6.0 dB with ½ rate FEC coding and with an E_b/N_o = 7.5 dB with ¾ rate FEC coding. This link uses 0.531 rate FEC coding with a data rate of 40 Mbps and a bandwidth of 36 MHz. Interpolating gives E_b/N_o = 6.2 dB for 0.531 rate FEC coding. This results in a C/N_{req} = 6.2 + 0.5 = 6.7 dB and a C/I_{se} = 6.7 + 7.0 + 4.0 = 17.7 dB.

[27] $C/I_{se} = C/N_{req} + 10 \log(1/0.20) + 4$ dB, where $C/N_{req} = E_b/N_o + 10 \log($ Data Rate/Bandwidth $)$. For soft decision decoding modems a 10^{-7} BER is achieved with an E_b/N_o = 6.0 dB with ½ rate FEC coding and with an E_b/N_o = 7.5 dB with ¾ rate FEC coding. This link uses 0.531 rate FEC coding with a data rate of 56 kbps and a bandwidth of 35 kHz. Interpolating gives E_b/N_o = 6.2 dB for 0.531 rate FEC coding. This results in a C/N_{req} = 6.2 + 1.9 = 8.1 dB and a C/I_{se} = 8.1 + 7.0 + 4.0 = 19.1 dB.

[28] $C/I_{se} = C/N_{req} + 10 \log(1/0.20) + 4$ dB, where $C/N_{req} = E_b/N_o + 10 \log($ Data Rate/Bandwidth $)$. For soft decision decoding modems a 10^{-7} BER is achieved with an E_b/N_o = 7.5 dB with ¾ rate FEC coding. This link uses ¾ rate FEC coding with a data rate of 1.544 Mbps and a bandwidth of 1.029 MHz. This results in a C/N_{req} = 7.5 + 1.8 = 9.3 dB and a C/I_{se} = 9.3 + 7.0 + 4.0 = 20.3 dB.

Carrier N105 has a negative margin of –2.6, -4.1, -3.0, and –2.9 dB in tables C-8a, C-13a, C-18a, and C-23a. This digital carrier operates at a downlink EIRP density of 5.76 dBW/4kHz. The negative margins in this link are with respect to a single entry C/I objective (C/I_{se}) of 20 dB as indicated in the source document for this link. A C/I_{se} of 20 dB is characteristic of a 10% of noise allocation to total adjacent satellite interference. A 20% of noise allocation to total adjacent satellite interference, as is used for most links in the analyses in this appendix would give C/I_{se} = 17 dB[29]. After accounting for a 20% noise allocation, the shortfall is 1.1 dB, which can be recoved with an increase in the downlink EIRP density for this carrier.

Carrier N106 has negative margins of –1.4 and –1.7 dB in tables C-18a and C-23a. This digital carrier operates at a downlink EIRP density of 8.8 dBW/4kHz. The negative margins in this link are with respect to a single entry C/I objective of 21.8 dB as indicated in the source document for this link. A C/I_{se} of 20.3 dB would be characteristic of a 20% noise allocation to total adjacent satellite interference[30]. After accounting for a 20% noise allocation, the shortfall is 0.2 dB, which can be recoverd with an increase in the downlink EIRP density for this carrier.

Carrier N107 has negative margins of –3.4, -2.7, -3.9 and –3.9 dB in tables C-8a, C-13a, C-18a and C-23a. This digital carrier operates at a downlink EIRP density of 1.74 dBW/4kHz. An increase in this downlink EIRP density would recover a positive margin for this carrier.

A-4. Interference into Digital carriers. Only one (1) baseline digital carrier, D3-6, has a negative margin of –0.1 dB from carriers operating at 10 dBW/4kHz downlink EIRP densities. Negative magins occur in tables C-19 and C-24 from medium to wideband digital carriers. Tables C-19a and C-24a show that the shortfall for this carrier is only 0.1 dB. This carrier operating at a downlink EIRP density of 6 dBW/4kHz. The adoption of 10 dBW/4kHz downlink EIRP density criteria will allow this link to regain a positive margin by slightly increasing its downlink EIRP density.

A-5 Interference into Full & Dual Wideband Digital Carrier. Only one (1) wideband digital carrier, 06M1, has a negative margin of –0.1 dB from carriers operating at 10 dBW/4kHz downlink EIRP densities. Negative magins occur in tables C-20 and C-25 from medium to wideband digital carriers. Tables C-20a and C-25a show that the shortfall for this carrier is only 0.1 dB. This carrier operating at a downlink EIRP density of 6 dBW/4kHz. The adoption of 10 dBW/4kHz downlink EIRP density criteria will allow this link to regain a positive margin by slightly increasing its downlink EIRP density.

B. 13 dBW/4kHz Downlink EIRP Densities:

An examination of the summary results of the staff's ASIA analyses[31] in this appendix indicates that a number of communication links suffer negative margins from a 13 dBW/4kHz downlink EIRP density for full and dual wideband digital carriers. With respect to interference into digital VSAT carriers operating at 10 dBW/4kHz only a failure of 0.1 dB is seen for link V5 in table C-21b. With respect to narrowband analog carriers operating at 17 dBW/4kHz failures of 2.2 and 0.2 dB are seen for links FMot+ and VCot+, respectively, in table C-22b. All margins are positive for 10 dBW/4kHz carriers in table 24 (digitial carriers) and table 25 (full and dual wideband digital carriers).

With respect to interference into digital VSAT carriers operating at 6 dBW/4kHz, failures of 2.7 and 3.3 dB is seen for

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[29] $C/I_{se} = C/N_{req} + 10 \log(1/0.20) + 4$ dB, where $C/N_{req} = E_b/N_o + 10 \log($ Data Rate/Bandwidth $)$. For soft decision decoding modems a 10^{-7} BER is achieved with an E_b/N_o = 6.0 dB with ½ rate FEC coding. This link uses ½ rate FEC coding with a data rate of 64 kbps and a bandwidth of 64 kHz. This results in a C/N_{req} = 6.0 dB and a C/I_{se} = 6.0 + 7.0 + 4.0 = 17.0 dB.

[30] $C/I_{se} = C/N_{req} + 10 \log(1/0.20) + 4$ dB, where $C/N_{req} = E_b/N_o + 10 \log($ Data Rate/Bandwidth $)$. For soft decision decoding modems a 10^{-7} BER is achieved with an E_b/N_o = 9.4 dB with ¾ rate FEC coding. This link uses ¾ rate FEC coding with a data rate of 1.544 mbps and a bandwidth of 1.030 MHz. This results in a C/N_{req} = 9.3 dB and a C/I_{se} = 9.3 + 7.0 + 4.0 = 20.3 dB.

[31] See tables C-21, C-22, C-23, C-24, and C-25.

links V2 and V4, respectively, in table C-21b. With respect to narrowband analog carriers operating at 13 dBW/4kHz failures of 0.4, 6.1, and 4.1 dB are seen for links FMin, FMot, and VCot, respectively, in table C-22b. With respect to digital carriers operating at 6 dBW/4kHz only link D3-6 fails by 3.0 dB in table C-24a. With respect to full and dual wideband digital carriers operating at 6 dBW/4kHz, links 06M1 fails by 3.0 dB in table C-25a.

With respect to interference into the generic carriers, 56 of the 107 links show a negative margin in table C-23.

C. 16 dBW/4kHz Downlink EIRP Densities:

An examination of the summary results of the staff's ASIA analyses[32] in this appendix indicates that the majority of communication links suffer negative margins from 16 dBW/4kHz downlink EIRP density for full and dual wideband digital carriers. In particular, VSAT links V2 and V4 fail by 5.4 and 6.0 dB respectively[33]. VSAT links V2 and V4 operate at 6 dBW/4kHz downlink EIRP density. Even increasing the downlink EIRP density to 10 dBW/4kHz for these two (2) links (V3 and V5) still causes 1.5 and 2.5 dB failures, respectively. Additionally, analog SCPC/FM links FMot and VCot fail by 9.1 and 7.1 dB, respectively[34]. These SCPC/FM links operate at 13 dBW/4kHz downlink EIRP density. Even increasing the downlink EIRP density to 17 dBW/4kHz for these two (2) narrowband analog links (FMot+ and VCot+) still causes 5.1 and 3.1 dB failures, respectively. Likewise, digital carrier D3-6 fails by 5.9 dB. This digital carrier operates at 6 dBW/4kHz. Even increasing the downlink EIRP density to 10 dBW/4kHz (link D3-X) still has a 2.0 dB failure.

IV. Conclusion

Analysis of 10 dBW/4kHz downlink EIRP density for VSAT and other digital carriers indicates that this level is compatible with 2° orbital spacings. The 4.0 dB increase in downlink EIRP density for digital carriers, however, will also require a 4.0 dB increase in the downlink EIRP density for narrowband analog SCPC/FM to 17 dBW/4kHz. Both of these increases are compatible with 2° orbital spacings.

Analysis of 13 dBW/4kHz downlink EIRP density for full and dual wideband digital carriers indicates that this level might require some adjustments to existing operations that presently conform to the current routine processing criteria of 6 dBW/4kHz (digital) and 13 dBW/4kHz (analog) in §25.212. It is expected, however, that 13 dBW/4kHz downlink EIRP density for full and dual wideband digital carriers might be compatible with 2° orbital spacings at some time in the future. This possibility will have to be re-examined at that time.

Analysis of 16 dBW/4kHz downlink EIRP density for full and dual wideband digital carriers indicates that this level is not compatible with 2° orbital spacings.

Table C-1: VSAT network carriers

Signal Type & (carriers/transponder)	Band-width (MHz)	E.S. Antenna Diameter (m) Up/Down	EIRP (dBW) Up/Down	Max. Density (dBW/4kHz) PWRu/EIRPd *	C/N Ratio (dB) Up/Down/Total **	Single Entry C/I Objective (dB) ***
V1. BPSK / 56 kbps	0.134	1.2 / 5.0	43.4 /	-14.0 / -3.7	11.4 / 11.5 / 8.5	14.3

[32] See tables C-21, C-22, C-23, C-24, and C-25.
[33] See table C-21c.
[34] See table C-22c.

(536)			10.8			
V2. BPSK / 256 kbps (16)	0.614	5.0 / 1.2	62.2 / 27.1	-14.0 / 6.0	23.3 / 9.6 / 9.5	14.3
V3. BPSK / 256 kbps (16)	0.614	5.0 / 1.2	62.2 / 31.1	-14.0 / 10.0	23.3 / 13.6 / 13.2	14.3
V4. BPSK / 256 kbps (16)	0.614	1.2 / 1.2	50.0 / 27.1	-14.0 / 6.0	11.4 / 9.6 / 7.4	14.3
V5. BPSK / 256 kbps (16)	0.614	1.2 / 1.2	50.0 / 31.1	-14.0 / 10.0	11.4 / 13.6 / 9.4	14.3

* Calculated based upon the center density of a $(\sin(x)/x)^2$ spectral shape. The uplink density is the power density into the antenna and the downlink density is the transmit satellite EIRP density. Note that §25.211(c) provides for the routine licensing of these digital services with an uplink transmit power density of ≤ –14 dBW/4kHz and a downlink EIRP density of ≤ +6 dBW/4kHz.

** Clear sky conditions with a satellite G/T of -1.5 dB/K and earth station receive noise temperature of 250K.

*** Based upon a 20% of noise allocation to the aggregate adjacent satellite interference. The single entry level is 40% of the aggregate.

Table C-2: Narrowband analog carriers (program and voice grade)

Signal Type & (carriers/transponder)	Band-width (MHz)	E.S. Antenna Diameter (m) Up/Down	EIRP (dBW) Up/Down	Max. Density (dBW/4kHz) PWRu/EIRPd *	C/N Ratio (dB) Up/Down/Total **	Single Entry C/I Objective (dB) ***
FMin. SCPC/FM (100)	0.180	1.2 / 5.0	46.0 / 24.1	-8.0 /13.0	12.7 / 23.6 / 12.4	20.0
FMot. SCPC/FM (100)	0.180	5.0 / 1.2	58.2 / 24.1	-8.0 /13.0	24.6 / 12.0 / 11.7	20.0
VCin. SCPC/FM (890)	0.025	1.2 / 5.0	37.4 / 15.5	-8.0 /13.0	12.7 / 23.5 / 12.3	18.0
VCot. SCPC/FM (890)	0.025	5.0 / 1.2	49.6 / 15.5	-8.0 /13.0	24.6 / 11.9 / 11.7	18.0
FMin+. SCPC/FM (100)	0.180	1.2 / 5.0	46.0 / 28.1	-8.0 /17.0	12.7 / 27.6 / 12.6	20.0
FMot+. SCPC/FM (100)	0.180	5.0 / 1.2	58.2 / 28.1	-8.0 /17.0	24.6 / 16.0 / 15.4	20.0
VCin+. SCPC/FM (890)	0.025	1.2 / 5.0	37.4 / 19.5	-8.0 /17.0	12.7 / 27.5 / 12.5	18.0
VCot+. SCPC/FM (890)	0.025	5.0 / 1.2	49.6 / 19.5	-8.0 /17.0	24.6 / 15.9 / 15.4	18.0

* Calculated based upon a peaking factor of 5.5 dB over the average spectral density. The uplink density is a power density into the antenna and the downlink density is a transmit satellite EIRP density. Note that §25.211(c) provides for the routine licensing of these narrowband analog services with an uplink transmit power density of ≤ –8 dBW/4kHz and a downlink EIRP density of ≤ 13 dBW/4kHz.

** Clear sky conditions with a satellite G/T of -1.5 dB/K and earth station receive noise temperature of 250K.

*** Based upon a 20% of noise allocation to the aggregate adjacent satellite interference. The single entry level is 40% of the aggregate. For program channels, the required C/N is 9.0 dB, and for voice grade channels, the required C/N is 7.0 dB.

Table C-3: Generic carriers (Doc 81-704 & 1986 VSAT Order)

Signal Type & (carriers/transponder)	Band-width (MHz)	E.S. Antenna Diameter (m) Up/Down	EIRP (dBW) Up/Down	Max. Density (dBW/4kHz) PWRu/EIRPd *	C/N Ratio (dB) Up/Down/Total **	Single Entry C/I Objective (dB) ***
N001:QPSK/ 90 MBPS	54.000	7.0/7.0	82.0/50.0	-16.51/9.49	23.1/28.0/21.9	25.0
N002:QPSK/ 60 MBPS	36.000	7.0/7.0	82.0/42.0	-14.75/3.25	24.9/21.7/20.0	25.0
N003:QPSK/ 12 MBPS (4)	10.000	7.0/7.0	70.0/33.0	-21.01/-0.01	18.5/18.3/15.4	23.0
N004:TV/FM (2)	26.000	7.0/7.0	77.9/45.2	-18.28/7.22	26.2/26.1/23.1	62.1 S/N+ =27.2 C/I_n
N005:TV/FM (2)	26.000	7.0/7.0	77.9/45.2	-18.28/7.22	26.2/26.1/23.1	62.1 S/N+ =27.2 C/I_n
N006:QPSK/ 6.312 MBPS (8)	3.600	7.0/7.0	68.1/35.2	-19.65/5.65	25.0/24.7/21.8	22.8
N007:QPSK/1.544 MBPS (24)	0.900	5.0/5.0	63.3/30.4	-15.44/6.96	26.3/23.0/21.3	22.8
N008:QPSK/56.0 kbps (354)	0.038	3.0/3.0	52.1/18.5	-7.73/9.47	28.8/20.4/19.8	22.8
N009:CDM/SS/BPSK/56 kbps	28.448	3.0/3.0	73.4/50.0	-15.87/11.53	-3.1/-3.3/-6.2	-8.1
N010:CDM/SS/BPSK/56 kbps	28.448	1.0/1.0	70.4/50.0	-9.27/11.53	-5.8/-12.7/-13.6	-8.1
N011:BPSK/ 16.8 MBPS	67.200	7.7/1.9	78.5/44.9	-19.24/5.66	41.2/8.7/8.7	12.9
N012:BPSK/56.0 KBPS (150)	0.224	1.9/7.7	47.5/19.4	-13.47/4.93	30.8/21.8/21.3	12.9
N013:TV/FM (1)	36.000	10.0/10.0	83.1/42.0	-15.78/4.02	25.0/25.8/22.4	62.1 S/N+ =24.6 C/I_n
N014:TV/FM (1)	36.000	7.0/7.0	83.1/42.0	-12.68/4.02	25.2/22.7/20.8	62.1 S/N+ =24.6 C/I_n
N015:QPSK/ 60 MBPS	36.000	10.0/10.0	83.1/42.0	-17.13/2.67	25.0/25.8/22.4	21.0
N016:QPSK/ 60 MBPS	36.000	7.0/7.0	83.1/42.0	-14.03/2.67	25.2/22.7/20.8	21.0
N017:QPSK/ 8 MBPS (5)	6.000	10.0/10.0	66.4/30.0	-25.75/-1.25	16.1/21.6/15.0	19.7
N018:QPSK/ 8 MBPS (5)	6.000	7.0/7.0	66.4/30.0	-22.65/-1.25	16.3/18.5/14.3	19.7
N019:TV/FM (1)	36.000	5.0/3.5	83.2/45.0	-9.68/7.02	25.3/16.8/16.3	59.9 S/N+ =22.4 C/I_n
N020:TV/FM (1)	36.000	5.0/2.5	83.2/45.0	-9.68/7.02	25.3/15.2/14.8	58.4 S/N+ =20.9 C/I_n
N021:TV/FM (1)	36.000	5.0/1.8	83.2/45.0	-9.68/7.02	25.3/11.9/11.7	55.4 S/N+ =17.8 C/I_n
N022:QPSK/ 60 MBPS	36.000	2.5/2.5	77.2/45.0	-11.03/5.67	19.6/15.2/13.8	21.0
N023:QPSK/ 8 MBPS (5)	6.000	5.0/5.0	65.3/33.0	-20.85/1.75	15.2/16.8/12.9	19.7

N024:TV/FM (1)	36.000	7.5/7.5	79.5/47.0	-17.48/9.02	26.4/29.5/24.7	62.1 S/N+ =21.9 C/I_n
N025:TV/FM (1)	36.000	5.5/5.5	79.5/47.0	-14.78/9.02	26.4/26.8/23.6	62.1 S/N+ =21.9 C/I_n
N026:QPSK/ 90 MBPS	54.000	5.0/5.0	79.5/47.0	-16.21/6.49	24.7/24.1/21.3	25.0
N027:QPSK/ 60 MBPS	36.000	7.5/7.5	79.5/47.0	-18.25/8.25	26.4/29.5/24.7	24.9
N028:QPSK/ 60 MBPS	36.000	5.5/5.5	79.5/47.0	-15.55/8.25	26.4/26.8/23.6	24.9
N029:QPSK/56.0 KBPS (562)	0.039	7.5/7.5	51.5/14.5	-16.53/5.47	28.1/26.7/24.3	23.7
N030:QPSK/56.0 KBPS (562)	0.039	5.5/5.5	51.5/14.5	-13.83/5.47	28.1/24.0/22.5	23.7
N031:TV/FM (1)	36.000	7.5/7.5	79.5/42.0	-17.48/4.02	23.5/24.5/21.0	62.1 S/N+ =21.9 C/I_n
N032:TV/FM (1)	36.000	5.5/5.5	79.5/42.0	-14.78/4.02	23.5/21.8/19.6	62.1 S/N+ =21.9 C/I_n
N033:QPSK/ 90 MBPS	54.000	5.0/5.0	79.5/43.0	-16.79/1.91	21.7/20.1/17.8	22.6
N034:QPSK/ 60 MBPS	36.000	7.5/7.5	79.5/42.0	-18.25/3.25	23.5/24.5/21.0	24.9
N035:QPSK/ 60 MBPS	36.000	5.5/5.5	79.5/42.0	-15.55/3.25	23.5/21.8/19.6	24.9
N036:QPSK/56.0 KBPS (562)	0.039	7.5/7.5	51.5/9.5	-16.53/0.47	25.2/21.7/20.1	23.7
N037:QPSK/56.0 KBPS (562)	0.039	5.5/5.5	51.5/9.5	-13.83/0.47	25.2/19.0/18.0	23.7
N038:TV/FM (2)	25.000	7.0/7.0	73.6/44.0	-22.88/6.02	20.1/25.2/18.9	60.1 S/N+ =24.9 C/I_n
N039:TV/FM (2)	25.000	7.0/7.0	73.6/44.0	-22.88/6.02	20.1/25.2/18.9	60.1 S/N+ =24.9 C/I_n
N040:QPSK/ 80 MBPS	45.700	4.5/4.5	76.5/48.5	-18.78/7.92	20.4/23.3/18.6	26.0
N041:QPSK/ 50 MBPS	28.600	2.0/2.0	76.5/48.5	-9.64/9.96	22.7/18.6/17.2	22.7
N042:QPSK/1.544 MBPS (24)	0.882	3.5/3.5	58.9/30.2	-16.94/6.76	19.9/19.8/16.9	22.8
N043:QPSK/1.544 MBPS (10)	0.882	2.0/2.0	62.7/34.0	-8.34/10.56	24.0/18.9/17.7	22.8
N044:QPSK/900.0 KBPS (33)	0.720	3.5/3.5	59.6/24.8	-13.66/3.04	21.5/14.8/14.0	19.5
N045:QPSK/900.0 KBPS (31)	0.720	3.5/3.5	63.6/23.1	-9.66/1.34	27.4/13.1/13.0	19.5
N046:QPSK/900.0 KBPS (41)	0.720	3.5/3.5	62.4/23.9	-10.86/2.14	26.2/13.9/13.7	19.5
N047:TV/FM (1)	26.000	8.0/8.0	81.5/43.5	-15.78/5.52	29.7/26.7/24.9	60.1 S/N+ =24.9 C/I_n
N048:QPSK/1.544 MBPS (20)	0.882	3.5/3.5	62.5/30.5	-13.44/7.06	25.4/21.6/20.1	22.0

N049:QPSK/1.544 MBPS (20)	1.029	3.5/3.5	62.5/28.5	-14.10/4.40	25.3/18.9/18.0	20.3
N050:TV/FM (1)	30.000	7.7/5.5	81.2/45.0	-16.28/7.02	28.9/21.9/21.1	62.1 S/N+ =24.6 C/I_n
N051:TV/FM (1)	24.000	7.7/3.0	81.2/45.0	-16.28/7.02	29.9/17.9/17.6	56.1 S/N+ =18.9 C/I_n
N052:TV/FM (2)	26.000	7.7/5.5	76.2/40.5	-21.28/2.52	24.5/21.5/19.7	62.1 S/N+ =25.4 C/I_n
N053:TV/FM (2)	26.000	7.7/5.5	76.2/40.5	-21.28/2.52	24.5/21.5/19.7	62.1 S/N+ =25.4 C/I_n
N054:QPSK/ 80 MBPS	45.714	10.0/10.0	81.2/45.0	-20.98/4.42	26.9/28.9/24.8	25.2
N055:QPSK/1.544 MBPS (20)	1.029	10.0/10.0	57.2/26.0	-28.50/1.90	19.3/26.4/18.6	20.3
N056:TV/FM (1)	26.000	7.7/3.0	85.1/41.0	-11.08/3.02	29.9/15.6/15.4	56.7 S/N+ =21.5 C/I_n
N057:TV/FM (2)	26.000	5.5/5.5	80.1/36.5	-13.38/-1.48	24.9/17.7/17.0	58.3 S/N+ =23.1 C/I_n
N058:TV/FM (2)	26.000	5.5/5.5	80.1/36.5	-13.38/-1.48	24.9/17.7/17.0	58.3 S/N+ =23.1 C/I_n
N059:QPSK/ 80 MBPS	54.000	10.0/10.0	85.3/41.0	-15.88/0.42	26.7/23.7/21.9	22.1
N060:QPSK/1.544 MBPS (20)	1.030	10.0/10.0	61.1/22.0	-23.60/-2.10	19.7/21.9/17.7	20.2
N061:BPSK/56.0 KBPS (110)	0.140	1.2/7.0	46.7/17.8	-10.67/3.33	14.5/22.7/13.9	12.7
N062:BPSK/56.0 KBPS (131)	0.140	7.0/1.2	49.5/22.4	-23.07/7.93	17.0/10.3//9.5	12.7
N063:QPSK/ 50 MBPS	43.000	5.5/5.5	79.8/46.7	-13.46/8.74	24.0/23.1/20.5	24.2
N064:QPSK/ 50 MBPS	25.000	5.5/5.5	79.8/46.7	-13.46/8.74	26.3/25.4/22.8	25.4
N065:QPSK/ 50 MBPS	43.000	7.7/7.7	82.7/43.7	-13.46/5.74	26.9/23.0/21.5	24.2
N066:QPSK/ 50 MBPS	25.000	7.7/7.7	82.7/43.7	-13.46/5.74	29.2/25.3/23.8	25.4
N067:QPSK/ 50 MBPS	43.000	5.5/5.5	79.8/43.7	-13.46/5.74	24.0/20.1/18.6	24.2
N068:QPSK/ 50 MBPS	25.000	5.5/5.5	79.8/43.7	-13.46/5.74	26.3/22.4/20.9	25.4
N069:QPSK/ 50 MBPS	28.600	5.5/5.5	79.8/43.7	-14.04/5.16	25.7/21.8/20.4	22.7
N070:QPSK/120 MBPS	60.000	7.7/7.7	82.7/47.0	-17.26/5.24	25.4/24.8/22.1	25.4
N071:QPSK/ 6 MBPS (6)	7.200	5.0/7.7	67.0/31.7	-19.06/-0.06	18.9/18.7/15.8	16.0
N072:QPSK/ 6 MBPS (6)	7.200	7.7/5.0	67.0/31.7	-23.26/-0.06	18.9/14.4/13.1	16.0
N073:BPSK/512.0 KBPS (8)	1.229	7.7/1.2	63.3/27.7	-19.28/3.62	22.9//5.3//5.2	13.0
N074:BPSK/512.0 KBPS (8)	1.229	1.2/7.7	51.3/16.0	-15.08/-8.08	11.2/10.7//7.9	13.0

N075:QPSK/125 MBPS	72.000	7.0/7.0	87.2/42.4	-12.94/0.46	26.4/18.1/17.5	23.7
N076:QPSK/125 MBPS	72.000	10.0/10.0	87.2/42.4	-16.04/0.46	26.2/22.1/20.7	23.7
N077:QPSK/1.544 MBPS (46)	1.030	9.2/9.2	57.4/23.4	-27.20/-0.70	14.9/20.6/13.8	20.3
N078:TV/FM (2)	26.000	9.2/7.0	77.9/37.5	-20.58/-0.48	22.6/18.6/17.1	59.1 S/N+ =23.9 C/I_n
N079:TV/FM (2)	26.000	9.2/7.0	77.9/37.5	-20.58/-0.48	22.6/18.6/17.1	59.1 S/N+ =23.9 C/I_n
N080:QPSK/ 60 MBPS	36.000	9.2/9.2	80.9/41.8	-18.35/3.05	24.2/23.4/20.8	25.5
N081:QPSK/1.544 MBPS (20)	1.029	5.0/5.0	61.9/25.0	-17.50/0.90	20.8/17.3/15.7	20.3
N082:TV/FM (1)	54.000	6.0/3.0	84.0/45.0	-10.68/7.02	26.8/16.4/16.0	62.1 S/N+ =20.7 C/I_n
N083:TV/FM (1)	54.000	6.0/6.0	78.0/45.0	-16.68/7.02	20.8/21.0/17.9	62.1 S/N+ =20.7 C/I_n
N084:TV/FM (2)	24.000	6.0/6.0	79.0/40.5	-15.68/2.52	25.3/20.0/18.9	58.1 S/N+ =22.7 C/I_n
N085:TV/FM (2)	24.000	6.0/6.0	79.0/40.5	-15.68/2.52	25.3/20.0/18.9	58.1 S/N+ =22.7 C/I_n
N086:QPSK/ 80 MBPS	45.714	7.0/7.0	78.5/44.5	-19.50/4.50	22.0/22.7/19.3	26.6
N087:QPSK/ 80 MBPS	45.714	7.0/5.0	78.5/44.5	-20.08/3.92	22.0/19.7/17.7	25.2
N088:QPSK/1.544 MBPS (14)	1.190	5.0/5.0	58.5/30.5	-20.04/7.06	17.8/21.5/16.3	21.2
N089:QPSK/1.544 MBPS (16)	1.190	5.0/7.0	58.0/30.0	-20.54/6.56	17.3/24.0/16.5	21.2
N090:QPSK/56.0 KBPS (300)	0.037	5.0/3.0	45.5/17.5	-18.63/8.47	19.9/20.5/17.2	21.6
N091:QPSK/56.0 KBPS (425)	0.037	5.0/5.0	44.0/16.0	-20.13/6.97	18.4/22.1/16.9	21.6
N092:QPSK/ 40 MBPS	36.000	6.1/0.9	78.2/51.0	-18.74/11.26	23.6/15.0/14.4	20.0
N093:QPSK/ 8 MBPS (5)	5.300	3.7/2.4	61.0/36.7	-23.05/5.45	14.8/17.5/12.9	20.0
N094:8-PSK/ 60 MBPS	36.000	6.1/2.4	78.2/51.0	-19.30/10.70	23.6/23.5/20.5	25.0
N095:16-PSK/110 MBPS	36.000	9.0/6.0	81.5/51.0	-19.46/10.54	26.7/31.3/25.4	25.0
N096:QPSK/56.0 KBPS (90)	0.035	1.8/1.2	43.6/19.5	-14.20/8.30	19.5/16.6/14.8	22.0
N097:QPSK/1.544 MBPS (15)	1.029	1.8/2.4	53.6/29.5	-17.10/5.40	14.8/17.4/12.9	21.8
N098:TV/FM (2)	27.000	2.4/8.1	71.9/49.0	-15.28/11.02	16.9/32.4/16.7	51.8 S/N+ =16.4 C/I_n
N099:QPSK/45 MBPS	36.000	5.5/5.5	77.6/48.8	-17.25/10.05	21.0/25.6/19.7	25.0
N100:QPSK/ 3 MBPS (10)	1.800	4.6/2.4	61.6/35.9	-19.04/10.16	18.0/18.4/15.2	20.0

N101:BPSK/64.0 KBPS (250)	0.115	1.8/9.2	43.2/21.9	-16.80/8.10	11.9/30.7/11.8	20.0
N102:TV/FM (2)	36.000	4.6/1.8	74.5/48.0	-18.38/10.02	16.4/14.9/12.6	53.2 S/N+ =15.9 C/I_n
N103:QPSK/45.358 MBPS	36.000	4.6/1.8	74.5/48.0	-18.52/9.88	16.4/14.9/12.6	20.9
N104:QPSK/ 3 MBPS (15)	2.275	4.6/1.8	63.8/37.3	-18.60/9.80	17.7/16.2/13.9	21.2
N105:QPSK/64.0 KBPS (220)	0.064	4.6/1.8	44.3/17.8	-22.64/5.76	13.7/12.2//9.9	20.0
N106:QPSK/1.544 MBPS (25)	1.030	4.6/1.8	59.4/32.9	-19.60/8.80	16.8/15.3/12.9	21.8
N107:BPSK/128 KBPS (100)	0.256	4.6/1.8	46.3/19.8	-26.66/1.74	9.7/8.2/5.9	17.0

* Calculated based upon the center density of the spectrum. Digital carriers are modeled as $(\sin(x)/x)^2$ spectral shape, CSSB/AM carriers are modeled with a flat power distribution over the baseband region of the signal, and FDM/FM carriers are modeled as a gaussian spectral shape. The uplink density is a power density into the antenna and the downlink density is a transmit satellite EIRP density.

** Clear sky conditions with various satellite and earth station G/T figures as considered in the Docket 81-704 Report and Order and the various VSAT orders.

*** Based upon a 20% of noise allocation to the aggregate adjacent satellite interference. The single entry objective is 40% of the aggregate interference.

+ Interference into analog video has been assessed on a signal to interference (S/I) ratio basis. The interference objectives were computed as $S/I_{se} = PR_0 - (53 - S/N_{sys}) + R_{tv} + 4$ dB. PR_0 is the protection ratio for just perceptible interference to a reasonablely critical still screen from a TV/FM interfering signal. $S/N_{sys} = S/N_{calc} - 3$ dB for $S/N_{sys} < 53$ dB. R_{tv} = TV-to-TV receiver transfer characteristic. The C/Ise objectives equate to an impairment grade (CCIR Rec 500-1) of 4.60 for carriers N004, N005, N013, N014, N024, N025, N031, N032, N050, N052, N053, N082, and N083; an impairment grade of 4.54 for carriers N019, N038, N039, and N047; an impairment grade of 4.51 for carriers N078 and N079; an impairment grade of 4.49 for carriers N020, N057, N058, N084, and N085; an impairment grade of 4.45 for carrier N056; an impairment grade of 4.43 for carrier N051; an impairment grade of 4.41 for carrier N021; an impairment grade of 4.30 for carrier N102; and an impairment grade of 4.18 for carrier N098. The definitions of the impairment grades are: 4.60 = just perceptible or just unperceptible (highest achievable grade), 4.30 = approximate grade for CATV aggregate C/I objective of 18 dB, and 4.00 = perceptible, but not annoying. C/I_n is the equivalent C/I ratio from noise-like interference sources.

Table C-4: Baseline Digital Carriers

Signal Type & (carriers/transponder)	Band-width (MHz)	E.S. Antenna Diameter (m) Up/Down	EIRP (dBW) Up/Down	Max. Density (dBW/4kHz) PWRu/EIRPd *	C/N Ratio (dB) Up/Down/Total **	Single Entry C/I Objective (dB) ***
D1-6. QPSK / 90 mbps (1)	54.0	7.0 / 7.0	84.5 / 46.5	-14.0 / 6.0	26.1 / 24.5 / 22.2	25.0
D2-6. QPSK / 60 mbps (1)	36.0	7.0 / 7.0	82.8 / 44.8	-14.0 / 6.0	26.2 / 24.6 / 22.3	25.0
D3-6. BPSK / 8.8 mbps (3)	16.6	7.0 / 3.0	77.4 / 39.4	-14.0 / 6.0	24.2 / 15.5 / 15.0	21.0
D4-6. BPSK/ 6.312 mbps (3)	15.15	5.0 / 5.0	75.9 / 41.0	-14.0 / 6.0	23.1 / 21.3 / 19.1	16.0
D5-6. QPSK/1.544 mbps(30)	1.029	5.0 / 5.0	65.0 / 30.1	-14.0 / 6.0	23.8 / 22.1 / 19.9	20.3
D6-6. BPSK / 56 kbps (400)	0.064	5.0 / 5.0	52.9 / 18.0	-14.0 / 6.0	23.8 / 22.1 / 19.8	20.5
D1-X. QPSK / 90 mbps (1)	54.0	7.0 / 7.0	84.5 / 50.5	-14.0 / 10.0	26.1 / 28.5 / 24.2	25.0
D2-X. QPSK / 60 mbps (1)	36.0	7.0 / 7.0	82.8 / 48.8	-14.0 / 10.0	26.2 / 28.6 / 24.2	25.0
D3-X. BPSK / 8.8 mbps (3)	16.6	7.0 / 3.0	77.4 / 43.4	-14.0 / 10.0	24.2 / 19.5 / 18.2	21.0
D4-X. BPSK/6.312 mbps (3)	15.15	5.0 / 5.0	75.9 / 45.0	-14.0 / 10.0	23.1 / 25.3 / 21.0	16.0
D5-X. QPSK/1.544 mbps(30)	1.029	5.0 / 5.0	65.0 / 34.1	-14.0 / 10.0	23.8 / 26.1 / 21.8	20.3
D6-X. BPSK / 56 kbps (400)	0.064	5.0 / 5.0	52.9 / 22.0	-14.0 / 10.0	23.8 / 26.1 / 21.8	20.5

* Calculated based upon the center density of a $(\sin(x)/x)^2$ spectral shape. The uplink density is the power density into the antenna and the downlink density is the transmit satellite EIRP density. Note that §25.211(c) provides for the routine licensing of these digital services with an uplink transmit power density of ≤ -14 dBW/4kHz and a downlink EIRP density of $\leq +6$ dBW/4kHz.

** Clear sky conditions with a satellite G/T of -1.5 dB/K and earth station receive noise temperature of 250K.

*** Based upon a 20% of noise allocation to the aggregate adjacent satellite interference. The single entry level is 40% of the aggregate.

Table C-5: Full & Dual Wideband Digital Carriers

Signal Type & (carriers/transponder)	Band-width (MHz)	E.S. Antenna Diameter (m) Up/down	EIRP (dBW) Up/Down	Max. Density (dBW/4kHz) PWRu/EIRPd *	C/N Ratio (dB) Up/Down/Total **	Single Entry C/I Object-ive (dB) ***
06F1. QPSK/90 mbps (1)	54.0	7.0 / 7.0	84.5 / 46.5	-14.0 / 6.0	26.1 / 24.5 / 22.2	25.0
06F2. QPSK/60 mbps (1)	36.0	7.0 / 7.0	82.8 / 44.8	-14.0 / 6.0	26.2 / 24.6 / 22.3	25.0
06F3. QPSK/45 mbps (1)	36.0	5.0 / 5.0	79.7 / 44.8	-14.0 / 6.0	23.1 / 21.4 / 19.1	17.9
06M1. BPSK/8.8 mbps (1 & 2)	16.6	7.0 / 3.0	77.4 / 39.4	-14.0 / 6.0	24.2 / 15.5 / 15.0	21.0
06M2. BPSK/6.312 mbps (1 & 2)	15.15	5.0 / 5.0	75.9 / 41.0	-14.0 / 6.0	23.1 / 21.3 / 19.1	16.0
06M3. QPSK/50 mbps (1 & 2)	25.0	7.0 / 7.0	82.0 / 43.9	-14.0 / 6.0	27.0 / 25.2 / 23.0	25.4
10F1. QPSK/90 mbps (1)	54.0	7.0 / 7.0	84.5 / 50.5	-14.0 / 10.0	26.1 / 28.5 / 24.2	25.0
10F2. QPSK/60 mbps (1)	36.0	7.0 / 7.0	82.8 / 48.8	-14.0 / 10.0	26.2 / 28.6 / 24.2	25.0
10F3. QPSK/45 mbps (1)	36.0	5.0 / 5.0	79.7 / 48.8	-14.0 / 10.0	23.1 / 25.4 / 21.1	17.9
10M1. BPSK/8.8 mbps (1 & 2)	16.6	7.0 / 3.0	77.4 / 43.4	-14.0 / 10.0	24.2 / 19.5 / 18.2	21.0
10M2. BPSK/6.312 mbps (1 & 2)	15.15	5.0 / 5.0	75.9 / 45.0	-14.0 / 10.0	23.1 / 25.3 / 21.0	16.0
10M3. QPSK/50 mbps (1 & 2)	25.0	7.0 / 7.0	82.0 / 47.9	-14.0 / 10.0	27.0 / 29.2 / 25.0	25.4
13F1. QPSK/90 mbps (1)	54.0	7.0 / 7.0	84.5 / 53.5	-14.0 / 13.0	26.1 / 31.5 / 25.0	25.0
13F2. QPSK/60 mbps (1)	36.0	7.0 / 7.0	82.8 / 51.8	-14.0 / 13.0	26.2 / 31.6 / 25.1	25.0
13F3. QPSK/45 mbps (1)	36.0	5.0 / 5.0	79.7 / 51.8	-14.0 / 13.0	23.1 / 28.4 / 22.0	17.9
13M1. BPSK/8.8 mbps (1 & 2)	16.6	7.0 / 3.0	77.4 / 46.4	-14.0 / 13.0	24.2 / 22.5 / 20.3	21.0
13M2. BPSK/6.312 mbps (1 & 2)	15.15	5.0 / 5.0	75.9 / 48.0	-14.0 / 13.0	23.1 / 28.3 / 21.9	16.0
13M3. QPSK/50 mbps (1 & 2)	25.0	7.0 / 7.0	82.0 / 50.9	-14.0 / 13.0	27.0 / 32.2 / 25.9	25.4
16F1. QPSK/90 mbps (1)	54.0	7.0 / 7.0	84.5 / 56.5	-14.0 / 16.0	26.1 / 34.5 / 25.6	25.0
16F2. QPSK/60 mbps (1)	36.0	7.0 / 7.0	82.8 /	-14.0 / 16.0	26.2 / 34.6 /	25.0

			54.8		25.6	
16F3. QPSK/45 mbps (1)	36.0	5.0 / 5.0	79.7 / 54.8	-14.0 / 16.0	23.1 / 31.4 / 22.5	17.9
16M1. BPSK/8.8 mbps (1 & 2)	16.6	7.0 / 3.0	77.4 / 49.4	-14.0 / 16.0	24.2 / 25.5 / 21.8	21.0
16M2. BPSK/6.312 mbps (1 & 2)	15.15	5.0 / 5.0	75.9 / 51.0	-14.0 / 16.0	23.1 / 31.3 / 22.5	16.0
16M3. QPSK/50 mbps (1 & 2)	25.0	7.0 / 7.0	82.0 / 53.9	-14.0 / 16.0	27.0 / 35.2 / 26.4	25.4

* Calculated based upon the center density of a $(\sin(x)/x)^2$ spectral shape. The uplink density is the power density into the antenna and the downlink density is the transmit satellite EIRP density. Note that §25.211(c) provides for the routine licensing of these digital services with an uplink transmit power density of ≤ -14 dBW/4kHz and a downlink EIRP density of $\leq +6$ dBW/4kHz.

** Clear sky conditions with a satellite G/T of -1.5 dB/K and earth station receive noise temperature of 250K.

*** Based upon a 20% of noise allocation to the aggregate adjacent satellite interference. The single entry level is 40% of the aggregate.

Table C-6: Results for VSAT systems interfering into VSAT systems (2° Spacing)
Matrix shows combinations failing to meet single entry interference objective by "X" dB.

```
          | INTERFERING LINK* -->
 WANTED   |V V V V V
  LINK    |1 2 3 4 5
---------+-----------
V1      1|
V2      2|
V3      3|
V4      4|
V5      5|
```

* Note that links V3 and V5 are the 10 dBW/4kHz downlink EIRP density carriers.

Table C-7a: Results for VSAT systems interfering into narrowband analog SCPC/FM systems (2° Spacing)
Matrix shows combinations failing to meet single entry interference objective by "X" dB.

```
          | INTERFERING LINK* -->
 WANTED   |V V V V V
  LINK**  |1 2 3 4 5
---------+-----------
FMin    1|
FMot    2|    3   3
VCin    3|
VCot    4|    1   1
FMin+   5|
FMot+   6|
VCin+   7|
VCot+   8|
```

* Links V3 and V5 are the 10 dBW/4kHz downlink EIRP density carriers.
** Links not labeled with the "+" have 6 dBW/4kHz downlink EIRP densities and those labeled with the "+" have 10 dBW/4kHz downlink EIRP densities.

Table C-7b: Details for VSAT systems interfering into narrowband analog SCPC/FM systems

Interfering Signal (see table C-1)	Desired Signal (see table C-2)	C/I_u (dB)	C/I_d (dB)	C/I_t (dB)	S.E. Objective (dB)	Margin (dB)
V3 & V5	FMot	33.6	**17.4**	17.3	20.0	**-2.7**
V3 & V5	VCot	33.4	**17.2**	17.1	18.0	**-0.9**

Table C-8a: Results for VSAT systems interfering into Generic systems (2° Spacing)
Matrix shows combinations failing to meet single entry interference objective by "X" dB.

Link* WANTED LINK	Interfering V1	V2	V3	V4	V5
ASC+ N001					
ASC+ N002					
ASC+ N003					
CGC+ N004					
CGC+ N005					
CGC+ N006					
CGC+ N007					
CGC+ N008					
CGC+ N009					
CGC+ N010					
FED+ N011					
FED+ N012					
FAS+ N013					
FAS+ N014					
FAS+ N015					
FAS+ N016					
FAS+ N017					
FAS+ N018					
FAS+ N019					
FAS+ N020					
FAS+ N021					
FAS+ N022					
FAS+ N023					
GTEs N024					
GTEs N025					
GTE+ N026					
GTEs N027					
GTEs N028					
GTEs N029					
GTEs N030					
GTEm N031					
GTEm N032					
GTE+ N033					
GTEm N034					
GTEm N035					
GTEm N036					
GTEm N037		2		2	
GAL+ N038					
GAL+ N039					
GAL+ N040					
GAL+ N041					
GAL+ N042					
GAL+ N043					
ISOC N044					
ISOC N045					
ISOC N046					
MARs N047					
MARs N048					
MARc N049					
RCAc N050					
RCAc N051					
RCAc N052					
RCAc N053					
RCAc N054					
RCAc N055					
RCAm N056					
RCAo N057					
RCAm N058					
RCAo N059					
RCAo N060					
RCA+ N061					
RCA+ N062					
SBSo N063					
SBS& N064					
SBSo N065					
SBS& N066					
SBSo N067					
SBS& N068					
SBSu N069					
SBS+ N070					
SCHL N071					
SCHL N072					
SCHL N073					
SCHL N074					
SPCo N075					
SPC& N076					
SPC+ N077					
SPC+ N078					
SPC+ N079					
SPC+ N080					
SPC+ N081					
WUc+ N082					
WUc+ N083					
WUc+ N084					
WUc+ N085					
WUc+ N086					
WUcu N087					
WUc+ N088					
WUc+ N089					
WUc+ N090					
WUc+ N091					
A12K N092					
A12K N093					
A12K N094					
A12K N095					
A12K N096	1	3	1	3	
A12K N097	1	2	1	2	
LOT8 N098					
LOT8 N099					
LOT8 N100					
LOT8 N101					
PAS N102					
PAS N103					
PAS N104					
PAS N105		3		3	
PAS N106					
PAS N107	1	3	1	3	

* Links V3 and V5 are the 10 dBW/4kHz downlink EIRP density carriers.

Table C-8b: Details for VSAT systems interfering into Generic systems

Interfering Signal (see table C-1)	Desired Signal (see table C-3)	C/I_u (dB)	C/I_d (dB)	C/I_t (dB)	S.E. Objective (dB)	Margin (dB)
V1	N037	33.5	35.9	31.5	23.7	7.8
V2 & V4	N037	33.4	26.1	25.3	23.7	1.6
V3 & V5	N037	33.4	**22.1**	21.7	23.7	**-1.9**
V1	N096	26.0	33.4	25.3	22.0	3.3
V2 & V4	N096	25.9	**23.6**	21.6	22.0	**-0.4**
V3 & V5	N096	25.9	**19.6**	18.7	22.0	**-3.3**
V1	N097	22.8	35.8	22.6	21.8	0.8
V2 & V4	N097	**23.1**	26.4	21.4	21.8	**-0.4**
V3 & V5	N097	23.1	**22.4**	19.7	21.8	**-2.1**
V1	N105	24.4	32.5	23.8	20.0	3.8
V2 & V4	N105	24.0	22.4	20.1	20.0	0.1
V3 & V5	N105	24.0	**18.4**	17.5	20.0	**-2.6**
V1	N107	21.6	29.7	21.0	17.0	4.0
V2 & V4	N107	20.3	**18.7**	16.4	17.0	**-0.6**
V3 & V5	N107	20.3	**14.7**	13.6	17.0	**-3.4**

Table C-9: Results for VSAT systems interfering into Digital systems (2° Spacing)

Matrix shows combinations failing to meet single entry interference objective by "X" dB.

WANTED LINK**	INTERFERING LINK* V 1	V 2	V 3	V 4	V 5
D1-6 1					
D2-6 2					
D3-6 3					
D4-6 4					
D5-6 5					
D6-6 6					
D1-X 7					
D2-X 8					
D3-X 9					
D4-X 10					
D5-X 11					
D6-X 12					

* Links V3 and V5 are the 10 dBW/4kHz downlink EIRP density carriers.

** Links labeled with the "xx-6" have 6 dBW/4kHz downlink EIRP densities and those labeled with the "xx-X" have 10 dBW/4kHz downlink EIRP densities.

Table C-10: Results for VSAT systems interfering into Full & Dual Wideband Digital Carriers
Matrix shows combinations failing to meet single entry interference objective by "X" dB.

WANTED LINK**		INTERFERING LINK* V1	V2	V3	V4	V5
06F1	1					
06F2	2					
06F3	3					
06M1	4					
06M1	5					
06M2	6					
06M2	7					
06M3	8					
06M3	9					
10F1	10					
10F3	11					
10F5	12					
10M1	13					
10M1	14					
10M2	15					
10M2	16					
10M3	17					
10M3	18					

WANTED LINK**		INTERFERING LINK* V1	V2	V3	V4	V5
13F1	19					
13F3	20					
13F5	21					
13M1	22					
13M1	23					
13M2	24					
13M2	25					
13M3	26					
13M3	27					
16F1	28					
16F3	29					
16F5	30					
16M1	31					
16M1	32					
16M2	33					
16M2	34					
16M3	35					
16M3	36					

* Links V3 and V5 are the 10 dBW/4kHz downlink EIRP density carriers.
** Desired link labels start with "xx" where "xx" is the downlink EIRP density for the link. Thus "06F1", "10F1", "13F1", and "16F1" have 6, 10, 13, and 16 dBW/4kHz downlink EIRP densities, respectively.

Table C-11: Results for narrowband analog SCPC/FM systems interfering into VSAT systems (2° Spacing)
Matrix shows combinations failing to meet single entry interference objective by "X" dB.

WANTED LINK*		INTERFERING LINK**							
		FMin	FMot	VCin	VCot	FMin+	FMot+	VCin+	VCot+
V1	1								
V2	2								
V3	3								
V4	4								
V5	5								

* Links V3 and V5 are the 10 dBW/4kHz downlink EIRP density carriers, while V2 and V4 are 6 dBW/4kHz downlink EIRP density carriers.

** Links not labeled with the "+" have 6 dBW/4kHz downlink EIRP densities and those labeled with the "+" have 10 dBW/4kHz downlink EIRP densities.

Table C-12a: Results for narrowband analog SCPC/FM systems interfering into narrowband analog SCPC/FM systems (2° Spacing)
Matrix shows combinations failing to meet single entry interference objective by "X" dB.

WANTED LINK*		INTERFERING LINK*							
		FMin	FMot	VCin	VCot	FMin+	FMot+	VCin+	VCot+
FMin	1								
FMot	2			4	4	2	2		
VCin	3								
VCot	4			3	3	2	2		
FMin+	5								
FMot+	6								
VCin+	7								
VCot+	8								

* Links not labeled with the "+" have 6 dBW/4kHz downlink EIRP densities and those labeled with the "+" have 10 dBW/4kHz downlink EIRP densities.

Table C-12b: Details for narrowband analog SCPC/FM systems interfering into narrowband analog SCPC/FM systems

Interfering Signal (see table C-2)	Desired Signal (see table C-2)	C/I_u (dB)	C/I_d (dB)	C/I_t (dB)	S.E. Objective (dB)	Margin (dB)
FMin & Fmot	FMot	33.6	20.4	20.2	20.0	0.2
VCin & Vcot	FMot	35.3	22.1	21.9	20.0	1.9
FMin+ &	FMot	33.6	**16.4**	16.3	20.0	**-3.6**

Fmot+						
VCin+ & Vcot+	Fmot	35.3	**18.1**	18.0	20.0	**-1.9**
FMin & Fmot	Vcot	32.7	19.5	19.3	18.0	1.3
VCin & VCot	Vcot	33.6	20.4	20.2	18.0	2.2
FMin+ & FMot+	Vcot	32.7	**15.5**	15.4	18.0	**-2.6**
VCin+ & VCot+	VCot	33.6	**16.4**	16.3	18.0	**-1.6**

Table C-13a: Results for narrowband analog SCPC/FM systems interfering into Generic systems (2° Spacing)
Matrix shows combinations failing to meet single entry interference objective by "X" dB.

Wanted Link*	Interfering Link*	F M i	F M o	V C i	V C o	F M i	F M o	V C i	V C o
--ASC+ N001									
ASC+ N002									
ASC+ N003									
CGC+ N004									
CGC+ N005									
CGC+ N006									
CGC+ N007									
CGC+ N008									
CGC+ N009									
CGC+ N010									
FED+ N011									
FED+ N012									
FAS+ N013									
FAS+ N014									
FAS+ N015									
FAS+ N016									
FAS+ N017									
FAS+ N018									
FAS+ N019									
FAS+ N020									
FAS+ N021									
FAS+ N022									
FAS+ N023									
GTEs N024									
GTEs N025									
GTE+ N026									
GTEs N027									
GTEs N028									
GTEs N029									
GTEs N030									
GTEm N031									
GTEm N032									
GTE+ N033									
GTEm N034									
GTEm N035									
--GTEm N036						1	1		
GTEm N037						4	4	1	
GAL+ N038									
GAL+ N039									
GAL+ N040									
GAL+ N041									
GAL+ N042									
GAL+ N043									
ISOC N044									
ISOC N045									
ISOC N046									
MARs N047									
MARs N048									
MARc N049									
RCAc N050									
RCAc N051									
RCAc N052									
RCAc N053									
RCAc N054									
RCAc N055									
RCAm N056								1	
RCAo N057									
RCAm N058								1	
RCAo N059									
RCAo N060									
RCA+ N061									
RCA+ N062									
SBSo N063									
SBS& N064									
SBSo N065									
SBS& N066									
SBSo N067									
SBS& N068									
SBSu N069									
SBS+ N070									
--SCHL N071									
SCHL N072									
SCHL N073									1
SCHL N074									
SPCo N075									
SPC& N076									
SPC+ N077									
SPC+ N078									
SPC+ N079									
SPC+ N080									
SPC+ N081									
WUc+ N082									
WUc+ N083									
WUc+ N084									
WUc+ N085									
WUc+ N086									
WUcu N087									
WUc+ N088									
WUc+ N089									
WUc+ N090									
WUc+ N091									
A12K N092									1
A12K N093									
A12K N094									
A12K N095									
A12K N096	2	2				5	5	2	2
A12K N097						1	1		
LOT8 N098									
LOT8 N099									
LOT8 N100									
LOT8 N101	1	1				1	1		

PAS N102| PAS N103| PAS N104|	PAS N105|1 1 4 4 1 1 PAS N106|	PAS N107| 3 3 2 2

* Links not labeled with the "+" have 6 dBW/4kHz downlink EIRP densities and those labeled with the "+" have 10 dBW/4kHz downlink EIRP densities.