- Space station characteristics
    - < 1 degree spot beams

If large trunking type satellite networks were to utilize the same guidelines, they could also share the arc with VSATs and two degrees spacing anywhere in the 27.7-30.0/17.8-20.2 GHz band.

APPENDIX A
VSAT SHARING-LINK ANALYSIS

TABLE A1 Link Analysis for 0.7 meter Baseline Networks

		DOWNLINK			UPLINK		
		Edge	Peak		Edge	peak	
Transmitter		beam	beam	adj. sat	beam	beam	adj. sat
Frequency	GHz	19.9	19.9	19.9	29.7	29.7	29.7
Power	dBW	15	15	15	-3.8	-3.8	-3.8
Ant Gain	dB	41	45	45	44.5	44.5	14.5
Ckt Loss	dB	0	0	0	0	0	0
Pointing Loss	dB	0	0	0	0	0	0
EIRP	dBWi	56	60	60	40.7	40.7	10.7
BW	dB-Hz	80	80	80	55.8	55.8	55.8
EIRP Density	dBW/Hz	-24	-20	-20	-15.1	-15.1	-45.1
System Losses							
Slant Range	km	37,000	37,000	37,000	37,000	37,000	37,000
Space Loss	dB	-209.8	-209.8	-209.8	-213.3	-213.3	-213.3
Atmosphere	dB	0	0	0	0	0	0
Rain	dB	0	0	0	0	0	0
Total	dB	-209.8	-209.8	-209.8	-213.3	-213.3	-213.3
Receiver							
Pointing/polariz	dB						
Ant Gain	dB	41.5	41.5	16.5	41	45	45
Revr Input	dBW	-112.3	-108.3	-133.3	-131.6	-127.6	-157.6
Ts	°K	250	250		575	575	
Noise Density	dBW/Hz	-204.6	-204.6		-201	-201	
Bandwidth	dB-Hz	80	80		55.8	55.8	
Noise Power	dBW	-124.6	-124.6		-145.2	-145.2	
Link C/N	dB	12.3	16.3		13.6	17.6	
Adj. Beams C/I	dB	23	27		23	27	
4 Adjacent Sats C/I	dB	16.7	20.7		21.7	25.7	
link C/(N + I)	dB	10.7	14.7		12.6	16.6	
Required C/N	dB	6	6		8	8	
Static Margin	dB	4.7	8.7		4.6	8.6	
Other							
Rec. / MHz	dBW/m^2	-126.4	-122.4	-122.4	-117.5	-117.5	-147.5
G/T	dBi/T	17.5	17.5		13.4	17.4	
Single Entry Io/No	dB			-8.7			-12.4
Single Entry Io/No	%			13.6			5.8
Io/No with GSOs ±4°	%			36.2			15.5
2° Ant Discrim	dB	-25	-25		-30	-30	

TABLE A2 Link Analysis for 0.7 meter with Average Side Lobes

		DOWNLINK			UPLINK		
		Edge	Peak		Edge	peak	
Transmitter		beam	beam	adj. sat	beam	beam	adj. sat
Frequency	GHz	19.9	19.9	19.9	29.7	29.7	29.7
Power	dBW	15	15	15	-10	-10	-10
Ant Gain	dB	41	45	45	44.5	44.5	21.5
Ckt Loss	dB	0	0	0	0	0	0
Pointing Loss	dB	0	0	0	0	0	0
EIRP	dBWi	56	60	60	34.5	34.5	11.5
BW	dBHz	80	80	80	55.8	55.8	55.8
EIRP Density	dBW/Hz	-24	-20	-20	-21.3	-21.3	-44.3
System Losses							
Slant Range	km	37,000	37,000	37,000	37,000	37,000	37,000
Margin	dB	0	0	0	0	0	0
Space Loss	dB	-209.8	-209.8	-209.8	-213.3	-213.3	-213.3
Atmosphere	dB	0	0	0	0	0	0
Rain	dB	0	0	0	0	0	0
Total	dB	-209.8	-209.8	-209.8	-213.3	-213.3	-213.3
Receiver							
Pointing/polariz	dB						
Ant Gain	dB	41	41	22	41	45	45
Revr Input	DBW	-112.8	-108.8	-127.8	-137.8	-133.8	-156.8
Ts	K	250	250		575	575	
Noise Density	dBW/Hz	-204.6	-204.6		-201	-201	
Bandwidth	dB-Hz	80	80		55.8	55.8	
Noise Power	dBW	-124.6	-124.6		-145.2	-145.2	
Link C/N	dB	11.8	15.8		7.4	11.4	
Adj. Beams C/I	dB	23	27		23	27	
4 Adjacent Sats C/I	dB	10.7	14.7		14.7	18.7	
link C/(N + I)	dB	8.1	12.1		6.6	10.6	
Required C/N	dB	6	6		8	8	
Static Margin	dB	2.1	6.1		-1.4	2.6	
Other							
Rec. / MHz	dBW/m^2	-126.4	-122.4	-122.4	-123.7	-123.7	-146.7
G/T	dBi/T	17	17		13.4	17.4	
Single Entry Io/No	dB			-3.2			-11.6
Single Entry Io/No	%			48.2			7
Io/No with GSOs ±4°	%			128.5			18.6
2° Ant Discrim	dB	-19	-19		-23	-23	

TABLE A3 Link Analysis for 1.5 meter networks

		DOWN LINK			UP LINK		
		Edge	Peak		Edge	peak	
Transmitter		beam	beam	adj. sat	beam	beam	adj. sat
Frequency	GHz	19.9	19.9	19.9	29.7	29.7	29.7
Power	dBW	15	15	15	-9	-9	-9
Ant Gain	dB	41	45	45	50.5	50.5	20.5
Ckt Loss	dB	0	0	0	0	0	0
Pointing Loss	dB	0	0	0	0	0	0
EIRP	dBWi	56	60	60	41.5	41.5	11.5
BW	dBHz	80	80	80	55.8	55.8	55.8
EIRP Density	dBW/Hz	-24	-20	-20	-14.3	-14.3	-44.3
System Losses							
Slant Range	km	37,000	37,000	37,000	37,000	37,000	37,000
Space Loss	dB	-209.8	-209.8	-209.8	-213.3	-213.3	-213.3
Atmosphere	dB	0	0	0	0	0	0
Rain	dB	0	0	0	0	0	0
Total	dB	-209.8	-209.8	-209.8	-213.3	-213.3	-213.3
Receiver							
Pointing/polariz	dB						
Ant Gain	dB	47	47	20	41	45	45
Revr Input	dBW	-106.8	-102.8	-129.8	-130.8	-126.8	-156.8
Ts	K	250	250		575	575	
Noise Density	dBW/Hz	-204.6	-204.6		-201	-201	
Bandwidth	dB-Hz	80	80		55.8	55.8	
Noise Power	dBW	-124.6	-124.6		-145.2	-145.2	
Link C/N	dB	17.8	21.8		14.4	18.4	
Adj. Beams C/I	dB	23	27		23	27	
4 Adjacent Sats C/I	dB	18.7	22.7		21.7	25.7	
link C/(N + I)	dB	14.6	18.6		13.2	17.2	
Required C/N	dB	6	6		8	8	
Static Margin	dB	8.6	12.6		5.2	9.2	
Other							
Rec. / MHz	dBW/m^2	-126.4	-122.4	-122.4	-116.7	-116.7	-146.7
G/T	dBi/T	23	23		13.4	17.4	
Single Entry Io/No	dB			-5.2			-11.6
Single Entry Io/No	%			30.4			7
Io/No with GSOs ±4°	%			81.1			18.6
2° Ant Discrim	dB	-27	-27		-30	-30	

APPENDIX B

Analysis of Orbital Sharing between KaBand Networks with 4 meter antennas

Table B1 summarizes the characteristics the approximate operational KaBand networks which have been communicated with the Radio Bureau. In this appendix, sharing between larger trunking networks is analyzed by examining the associated off axis pfd values when operating in accordance with their AP3. These networks are characterized by point to point service, bent pipe transponders, high data rates, half degree spot beams, large fixed margins, and up to 4 meter earth terminals which conform to 29-25log in dBi.

Table B1
Generic Trunking
20/30 GHz Technical Characteristics

Parameter	Up link	Down Link
Transponder	transparent	transparent
Modulation	QPSK	QPSK
Coding	minimal	minimal
Access	FDMA	FDMA
Min. Link C/(N+I)	20	10
Typ/ Data Rate (Mbps)	120	120
Satellite Antenna	49 dBi (0.5°)	49 dBi (0.5°)
Edge of Beam	43 dBi	43 dBi
Noise Temp	900°K	325°K
Adaptive Power Control	no	no
Static Link Margin	15-20 dB	10-15 dB

In the links shown in Table B2 it is assumed that two networks as described in Table B1 are spaced two degrees apart and operating to 4 meter earth stations which conform to the mask of 29-25log.

TABLE B.2 Link Analysis for GSO network operating to 4 meter earth terminals

			DOWN LINK			UP LINK	
		Edge	Peak		Edge	peak	
Transmitter		beam	beam	adj. sat	beam	beam	adj. sat
Frequency	GHz	19.9	19.9	19.9	29.7	29.7	29.7
Power	dBW	11	11	11	22	22	22
Ant Gain	dB	43	49	49	60.5	60.5	20
Ckt Loss	dB	0	0	0	0	0	0
Pointing Loss	dB	0	0	0	0	0	0
EIRP	dBWi	54	60	60	82.5	82.5	42
BW	dBHz	80.8	80.8	80.8	80.8	80.8	80.8
EIRP Density	dBW/Hz	-26.8	-20.8	-20.8	1.7	1.7	-38.8
System Losses							
Slant Range	km	37,000	37,000	37,000	37,000	37,000	37,000
Space	dB	-209.8	-209.8	-209.8	-213.3	-213.3	-213.3
Atmosphere	dB	0	0	0	0	0	0
Rain	dB	0	0	0	0	0	0
Total	dB	-209.8	-209.8	-209.8	-213.3	-213.3	-213.3
Receiver							
Pointing/polariz	dB						
Ant Gain	dB	57.2	57.2	20	43	49	49
Revr Input	dBW	-98.6	-92.6	-129.8	-87.8	-81.8	-122.3
Ts	K	325	325		900	900	
Noise Density	dBW/Hz	-203.5	-203.5		-199.1	-199.1	
Bandwidth	dB-Hz	80.8	80.8		80.8	80.8	
Noise Power	dBW	-122.7	-122.7		-118.3	-118.3	
Link C/N	dB	24.1	30.1		30.5	36.5	
Adj. Beams C/I	dB	21	27		21	27	
4 Adjacent Sats C/I	dB	26.9	32.9		30.2	36.2	
link C/(N + I)	dB	18.6	24.6		20.1	26.1	
Required C/N	dB	10	10		20	20	
Static Margin	dB	8.6	14.6		0.1	6.1	
Other							
Rec. pfd / MHz	dBW/m^2	-129.2	-123.2	-123.2	-100.7	-100.7	-141.2
G/T	dBi/T	32.1	32.1		13.5	19.5	
Single Entry Io/No	dB			-7.1			-4
Single Entry Io/No	%			19.5			39.7
Io/No with GSOs ±4°	%			51.9			105.9
2° Ant Discrim	dB	-37	-37		-40	-40	

Attachment B

§ 25.138 Licensing Provisions for Ka-Band Earth Stations in the Geostationary Fixed-Satellite Service Operating in the 19.7-20.2 and 29.5-30.0 GHz Bands

(a) All applications for a blanket earth station license in the geostationary fixed-satellite service for digital transceivers operating in the 19.7-20.2 GHz and 29.5-30.0 GHz bands will be processed routinely provided they include the following:

(i) a general narrative statement describing the applicant and overall system operation;

(ii) a completed FCC Form 312 and associated technical specifications for each type of earth station;

(iii) designation of a point of contact to maintain quantity and types of earth stations manufactured, sold and deployed; and

(iv) description of a safety interlock system if remote control authority is requested.

(b) For the bands listed below, the following Power Flux Density (PFD) and Equivalent Isotropic Radiated Power (EIRP) Density levels apply:

(i) 19.7-20.2 GHz: maximum satellite downlink PFD of -122 dBW/m^2/MHz;

(ii) 29.5-30.0 GHz: maximum earth station uplink EIRP densities of:

15 dBW/MHz at 2.2° from antenna boresite
10 dBW/MHz at 4.4° from antenna boresite; and

(c) The term of such blanket earth station license shall be [TBD].

Assumptions in the Derivation of 25.138(b) (see ADHOC 4A/4 rev. 3):

1. The spacing in the GSO orbital arc is 2°.

2. Power Control:

   a) Adaptive on the uplink.

   b) Fixed on the downlink.

3. Antenna size of 0.7 meters

   a) 2.2° Antenna discrimination for earth terminal:

      i) -25 dB for downlink.

      ii) -30 dB for uplink.

   b) 4.4° Antenna discrimination for earth terminal:

      i) -30 dB for downlink.

      ii) -35 dB for uplink.

4. Antenna size of 1.5 meters

   a) 2.2° Antenna discrimination for earth terminal:

      i) -27 dB for downlink.

      ii) -30 dB for uplink.

   b) 4.4° Antenna discrimination for earth terminal:

      i) -32 dB for downlink.

      ii) -35 dB for uplink.