In our case, p(i) is a normal law with a mean value m ($m = N_e \mu$) and a variance of $\sigma^2 = N_e \mu (1-\mu)$.

To obtain the number of simultaneous emitters Ni which will be exceeded with a probability of 1%, we compute as follows:

$$Ni = m + 2.3\sigma$$
$$Ni = Ne\ \mu + 2.3\sqrt{Ne\ \mu(1-\mu)}$$

A table of values of carrier-to-noise density can now be computed for various values of N_i and different traffic assumptions. The carrier-to-noise density is computed by subtracting the interfering noise power from the power of the desired signal. Thus

$$CND = e.i.r.p._{desired} - PL - \text{other losses} + \text{rcvr gain} - P_{noise}$$

An example of this calculation is shown in Appendix II.

3.2.2 Overall LEO MSS CDMA system performance analysis

The performance of the VHF spread-spectrum CDMA LEO MSS system for both the forward and return Earth-to-space and space-to-Earth links in the presence of thermal noise, interference from other users within the LEO MSS system, and interference from terrestrial mobile transmitters has been analysed and is summarized in this section. The forward and return channels use the same transponder and frequencies, and constitute the intrasystem interference for the desired carriers to be received at the central station and at the user terminals. Accordingly, RF budgets are calculated considering all the possible interferences and the model used will serve ultimately to optimize the system design.

Appendix II shows the forward and return, up- and down-link budgets using conservative values to achieve the adequate system margins. We expect to continue to refine the LEO MSS system parameters so as to improve the performance still further.

It is instructive to follow through one complete computation of composite carrier-to-noise density (CND), including the effects of all interferers. This is done in detail in Appendix II. The overall approach is described here.

Having computed the carrier level for each of the four links (forward up link, forward down link, return up link, and return down link), we can treat the interference on each link as the sum of all of the undesired carriers in the receiver. We compute (C/N) resulting from each source of interference and add the various equivalent noise powers. The carrier-to-noise densities combine using the familiar reciprocal of the sum of the reciprocals formula. Note that the noise levels are computed per Hz of bandwidth. For a 1.0 MHz bandwidth this in effect adds 60 dB to the carrier-to-noise densities and provides the "spreading" gain.

For example, let us compute the total carrier-to-noise density (CND) for the forward up-link channel. We calculate the C/No resulting from considering thermal noise. The desired signal in this case has a carrier level of Cf dBW. The noise due to interference from the return up link is n times the return carrier level Cr, where n is the number of simultaneous users. Spread over a bandwidth B, this noise is:

$$N = 10*\log(n) - Cr - 10*\log(B)$$

which results in a $(CND)_1$ of Cf- N. On this same link, there is also interference from the other (m-1) up-link channels which have different spreading codes (m = number of spreading codes

The "undesired" carriers contribute

$N2 = 10*\log(m-1)-Cf-10*\log(B)$

of noise, giving us

$(CND)_2 = Cf - N2$ dBHz.

The CND of the interfering fixed and land mobile systems contribute noise as a function of traffic intensity. For the case of E Erlang in the forward link, $(CND)_3$ can be computed as shown in the previous section.

Next we can compute the composite C/N for the forward up link as:

$1/(CND) = 1/(CND)_0 + 1/(CND)_1 + 1/(CND)_2 + 1/(CND)_3$

Having computed a composite CND for both the up link and down link, an overall "up and down" composite can be computed by the same technique. This number is to be compared to the required value which is easily arrived at from the bit rate and the practical value for Eb/No.

Thus

$(CND)_{reqd} = Eb/No + Rb$

Thus the CND margin is

$Margin = (CND) - (CND)_{reqd}$

Appendix II shows a complete analysis for an interference traffic level of 0.1 Erlang. The link budget shown there includes the effect of elevation angle on interference margin. That is, for a given level of interference traffic, an elevation angle can be found for which there is a positive operating margin for the LEO system. For any MSS user terminal within the cone defined by the specified elevation angle, operation with a positive margin is possible.

The analysis can be repeated for different values of interference traffic to produce values of service area as a function of interference. Inspection of the example produced by this analysis method shows how a CDMA LEO MSS degrades gracefully with increasing interference.

3.2.3 A means of reducing potential interference to a LEO MSS CDMA system from high-power, narrow-band emitters

The above calculations assume that all the interfering signals are spread across the spectrum as noise. In this case fixed-mobile system base stations will appear to the LEO MSS system as high power narrow-band jammers. There are well-known techniques[1] for combating the effects of such jammers. The technique is to locate the gamer in frequency and then attenuate the gamer with a notched filter. With digital signal processing, it is easy to locate the narrow-band, high-power jammers in the frequency spectrum. One computes the fast Fourier transform (FFT). The signals in question are confined to a band of one megahertz. By translating the signal down to the band from d.c. to one megahertz, the signals are well within the frequency range for which digital signal processing chips can compute the FFT as fast as the signals are received in a pipeline processor. Clipping the few sharp peaks that will appear when high-power, narrow-band

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[1] "Adaptive Narrow-Band Interference Rejection in a DS Spread Spectrum Intercept Receiver Using Transform Domain Signal Processing Techniques," J. Gevargiz et al, IEEE Transactions on Communications, Vol. 37, No. 12, December 1989.

signals are present is the same as using notched filters. The signals can then be converted back to the time domain by an inverse FFT. The computation could be done by a common signal processor chip set used for cross correlating, Doppler tracking, and Fourier transforms. As the notched filters produce a small distortion of the desired signal, they would probably be used only against the more severe interferers. If there are no more than the equivalent of ten such filters, then there should be no problem with signal detection after the inverse FFT.

For a particular interval of time, we must find the probability that some number of the base stations will transmit during that interval. The data intervals are short compared to the mean holding time of the average land mobile user. Thus it is appropriate to consider the probability of n transmissions being initiated in any mean holding time interval. If, during that interval, n transmissions are initiated, then at some instant of time, all n will be transmitting.

The appropriate formula for the probability of k arrivals in a time interval t given n potential users is

$$p = \binom{h}{k} p^h q^{n-k}$$

where

n is the total number of active licensees;

k is the number transmitting in the designated interval;

p is the probability that a station is active in the interval t;

q=(1-p) is the probability that a station is inactive;

$\binom{h}{k}$ is the binomial coefficient

Since the proposed narrow-band interference rejection system will reject only those base stations that present the maximum signal to the satellite, we wish to compute the probability of exceeding number of active stations in a given time interval for several cases. For example, if 200 stations have power above the clipping threshold, the probability that more than 10 stations will be active simultaneously (and thus will be clipped) is 5%. If 150 stations have sufficient power to exceed the clipping threshold, the probability that more than 10 stations will be clipped is only about 0.1%.

When the FFT and clipping technique is applied, distortion will result if too many signals are clipped. The distortion of the individual equivalent notched filters is additive. Thus we must set the clipping threshold to eliminate the higher powered base stations and not clip the mobile stations. This can be done without hampering the feasibility or efficiency of the system.

APPENDIX I

TYPICAL CDMA LEO MSS AND GROUND MOBILE SYSTEM PARAMETERS

Typical CDMA MSS system parameters are shown in Table A.1-1. A message input at a certain bit rate is encoded to produce a coded message of a certain symbol rate. Each symbol is "chipped" to produce the output spread-spectrum signal at the chip rate. The resulting spectrum is then filtered to eliminate out-of-band emissions.

TABLE A.1-1

System parameters for a typical LEO MSS CDMA system

Orbital altitude	h	1,300 km
Range at 5°	d	3,753 km
Orbital period	T	111.6 min
Overhead pass	Tp	21 min
Message bit rate	Rb	1400 bits/sec
Coded symbol rate	Rs	2800 bits/sec
Chips per symbol	Rc	255 chips/sym
Output filter Roll off factor		1.4
Error probability	Pc	10^-5
Req'd Eb/No	(Eb/No)r	2.3dB theoretical 4.0dB practical
No. simult. users	Nu	4
No. CDA codes	Nc	4
e.i.r.p. of user		3 dBW (up) -2.3 dBW (down)
e.i.r.p. of CDA		8.5 dBW (up) 4.0 dBW (down)

Table A.1-2 is an example link budget for a typical CDMA spread-spectrum LEO MSS system. There may be some differences between communication parameters in this table and those in Table A.1-1, but the values shown are nevertheless typical and representative of actual practical values.

TABLE A.1-2

Typical CDMA spread-spectrum system link budget

	Forward		Return	
	Up	Down	Up	Down
Net PT(W)/chnl	0.1	2.0	2.0	1.0
G_t (dBi)	16	2.0	1.0	3.0
EIRP (dBW)	6.0	5.0	3.0	3.0
L_s (dB)	147.37	146.76	147.37	146.76
Pol Loss (dB)	2	2	2	2
Rec. Loss (dB)	0.5	2	0.5	2
G_R (dBi)	3.0	1.0	3.0	16
Carrier lvl(dBW)	-140.87	-144.76	-143.87	-131.76
TS (dBK)	425	500	425	300
G_R/T_s dB/K	-23.3	-26	-23.	-8.8
C/N_o (dBHz)	61.45	56.85	58.45	72.07
R_s (b/s)	8334	8334	4167	4167
E_b/N_o available	22.24	17.64	22.25	35.87

Table A.1-3 shows system parameters for the automatic picture taking (APT) channel of NOAA meteorological satellites.

TABLE A.1-3

Meteorological satellite parameters

Effective power	8.8 dBW
G/T of receiver	-30.8 dB/K
Rcvr noise temp	600 K
C/No required	51 dB
Polarization loss	2 dB (estimated)
Orbital altitude	870 km

APPENDIX II

Example calculations demonstrating the application of certain sharing methodologies described in the annex to CCIR SG 8D-5/2

A.2.1 Examples of analysis of interference from a CDMA LEO MSS system to typical MS and meteorological systems

There are two scenarios to consider to analyse interference between a CDMA LEO MSS and mobile systems. In one case, we have to consider irradiation of earth stations by transmissions from a LEO satellite. In the other case, we consider the effect of MSS user terminals and ground stations on nearby MS receivers.

A.2.1.1 Example of analysis of interference from a spread-spectrum VHF MSS satellite to a receiver in the meteorological-satellite service

It has been determined that the mobile system most likely to experience interference from a spread-spectrum LEO MSS is a meteorological ground station. Using MSS system parameters and meteorological system parameters from Appendix I, we can compute the degradation of communication margin for an automatic picture taking (APT) channel receiver. The worst interference case affecting a meteorological satellite ground receiver is obtained when a LEO MSS satellite is briefly aligned with a meteorological satellite and the meteorological ground receiving station. Table A.2-1 shows the operating margin for a typical meteorological down-link channel both with and without MSS satellite interference.

TABLE A.2-1

Down-link meteorological beacon transmitting channel

Satellite Effective Power	8.8 dBW
Path loss at maximum range	139.7 dB
Polarization loss	2 dB
KT receiver	-200.8 dBW/Hz
G/T receiver	-30.8 dB
C/No required	51 dBHz
C/No without interference	64.9 dBHz
Down link margin (without interference)	13.9 dB
Adjacent MSS satellite interference	-193.8 dBW/Hz
C/No with interference	57.1 dBHz
Margin (with interference)	7.8 dB

The analysis shows that even with the worst-case MSS interference, the meteorological earth station will operate with a positive margin. This example is considered to be representative of the kind of interference scenario to be encountered.

A.2.1.2 Example of analysis of interference induced by a VHF CDMA spread-spectrum LEO MSS system on a mobile system

Using the parameters shown in Table A.1-3 and using the equations found in section 3.1 of the annex, we can compute coordination distances for various situations.

A.2.1.2.1 Analysis of interference induced by MSS user terminals on MS receivers

In the case of a mobile or fixed service receiver being subject to interference from a MSS user terminal, we substitute 2 Watts into the above referenced equation to get a coordination distance of 31.8 km. Fixed or ground mobile stations may be subject to short bursts of radiofrequency energy from CDMA user terminals within a 32 km radius. This separation will be larger for airborne MS receivers depending upon the altitude of the airborne receivers. Assuming a uniform distribution of 1 million users over the usable (5° elevation) footprint of the LEO satellite, only 99 of those users would be in the local region of the station subject to interference. If those 99 terminals were to transmit once an hour, and if every transmission were received at a level above receiver sensitivity, then a potential for interference would exist less than 0.3% of the time. Since the 100-millisecond burst from a CDMA MSS station is probably too short to break squelch, no interference would be apparent to an inactive receiver. For an active receiver, one whose squelch is already opened by a desired signal, a 100-millisecond burst might be noticed, but it would not be considered harmful to radiotelephone traffic.

Thus, sharing between MSS LEO user terminals and MS receivers is practical with an appropriate consideration for the coordination distance recommended above. Within this coordination distance, MS receiver performance is expected to be only minimally impacted due to the short burst nature and low duty cycle of MSS transmissions.

A.2.1.2.2 Analysis of interference induced by MSS CDA stations on fixed and mobile service ground station receivers

For CDMA LEO control and data acquisition (CDA) stations, substituting 8.5 dBW for MSS e.i.r.p. into the formula shown in section 3.1 of the annex yields a coordination distance of about 44 km which will protect other services from the CDA transmissions. The coordination distance for airborne MSS receivers will be greater depending on aircraft altitude. (Note that to protect the CDA from fixed-station interference of a 100-Watt level, an 84 km coordination distance is suggested. The directional nature of the CDA antenna should mitigate most of this interference, so the 44 km coordination distance is probably sufficient for mutual protection.)

Sharing between MSS LEO CDA stations and fixed or mobile ground receivers is practical with an appropriate consideration for the coordination distance recommended above. Because of the directive nature of the steerable CDA antenna, a nearby fixed or mobile ground receiver will be minimally affected by harmful interference for most CDA antenna elevation angles even if it is within the coordination radius.

A.2.2 Examples of analysis of interference from existing fixed and mobile systems and meteorological systems to a CDMA LEO MSS system

This section provides numerical examples demonstrating the application of the sharing methods presented in the annex for determining interference from existing systems and a typical CDMA LEO MSS system.

A.2.2.1 Example of determination of interference from a meteorological satellite to a CDMA MSS receiver

Using values from Appendix I and the equation shown in section 2.2, a noise interfering power of

8.8 - 140 - 60 = -191.2 dBW/Hz

will be present at the MSS receiver.

A.2.2.2 Example of computation of total noise induced by terrestrial services on a CDMA spread-spectrum LEO MSS

A typical VHF spread-spectrum CDMA LEO MSS system with overall system parameters as shown in Appendix I uses one megahertz of a 1.9 MHz band of frequencies at approximately 150 MHz for the Earth-to-space link. This band is currently allocated to mobile and fixed services. Of the 3,700 total users in the United States, it is reasonable to assume that about 50% are in service at any one time. Assuming a uniform distribution of users over the band and a voice activity factor of 33%, we could expect to have approximately 321 simultaneous users at any time within the United States.

A mobile licensee, such as a fire department or a commercial delivery service, normally has one base station and a number of mobile terminals. Base and aeronautical stations have up to 100 Watts of power. The mobile terminals usually operate with 5 to 10 Watts. Since the base and mobile stations transmit alternately, a practical assumption is that the average power of all such transmissions is 30 Watts.

Using the method described in section 3 of the annex, we can compute the effect of these mobile transmitters on a typical CDMA LEO MSS system. The results of the calculations are summarized in Tables A.2-2, A.2-3, and A.2-4.

It may be of interest to note that when values from Appendix I are substituted into the integral for P_{TOT}, the result is

$$P_{TOT} = 2.18\ N_i\ A$$

or

$$\text{Noise/Hz} = 10 \log(2.18\ N_i) - A(\text{dB}) - 10 \log(\text{bandwidth})$$

$$= 10 \log(2.18\ N_i) - 204$$

Table A.2-2 shows the power induced by a fixed and mobile systems for various values of interference traffic. Values from this table will be used in the example computation of link budget. Table A.2-3 shows operating margin for a given level of traffic in Erlangs and a specific value for user-satellite elevation angle. By computing this link budget table for different traffic assumptions and adjusting the elevation angle for non-negative operating margin, Table A.2-4 can be created. Table A.2-4 shows the graceful degradation that a CDMA system will experience in the presence of increasing interference.

TABLE A.2-2

Example computation of power induced by fixed and mobile systems

Voice Factor = 0.3 N_e = 321

Traffic Erlang	Ni at 1% (2.3 σ)	(dBw)	P_{tot} dBw/Hz	Carrier-to-Noise Density Forward	Return
0.1	44	19.8	-184.3	47.93	42.41
0.2	80	22.4	-181.7	45.34	39.82
0.3	115	24.0	-180.2	43.79	38.28
0.4	148	25.1	-179.1	42.69	37.17
0.5	181	25.9	-178.2	41.83	36.31
0.6	212	26.6	-177.5	41.13	35.61
0.7	243	27.2	-176.9	40.54	35.03
0.8	273	27.7	-176.4	40.04	34.53
0.9	301	28.2	-176.0	39.62	34.10

TABLE A.2-3

Example link budget showing operating margin for specified interference traffic and user terminal elevation angle

Simult.Users	4
Forward channels	4
RF Band.(KHz)	1000
Inter.Traffic (E)	0.1
Elevation angle	12

	Forward		Return	
	Up	Down	Up	Down
Pt (watts)	0.11	1.26	1.58	0.30
Gt (dBi)	18.00	2.50	1.00	3.00
eirp	8.50	3.50	2.99	-2.30
Ls(dB)(at 12°)	145.87	145.18	145.87	145.18
Lp(dB)	2.00	2.00	2.00	2.00
Lr(dB)	0.50	1.00	0.50	1.00
Gr(dB)	3.50	2.00	3.50	19.00
Carrier(dBW)	-136.37	-142.67	-141.89	-131.48
Ts(K)	450.00	500.00	450.00	475.00
Gr/Ts (dB/K)	-23.03	-24.99	-23.03	-7.77
C/No (dBHz)	65.69	58.94	60.18	70.35
Rb (b/s)	8334	8334	4167	4167
Eb/No (dB)	26.48	19.73	23.98	34.16
C/No	65.69	58.94	60.18	70.35
Users CND	59.49	59.78	55.23	55.23
Channels CND	55.23	55.23	48.47	48.17
Interference CND	47.93	100.00	42.41	100.00
Composite U & D	46.88	52.73	41.22	47.37
Fwd & Rtn	45.88		40.27	
Required Eb/No	4.0		4.0	
Required CND	43.21		40.20	
Margin	2.67		0.08	

TABLE A.2-4

Results of link budget analyses for various interference levels

Traffic, Erlangs	Minimum Elevation Angle, degrees	Service Area, thousands of square km²
0.0	0	32,345
0.1	12	21,456
0.2	25	10,094
0.3	35	5,694
0.4	43	3,570
0.5	51	2,175
0.6	60	1,159
0.7	70	475
0.8	90	0

LEOAC-13

CHARTER FOR THE BELOW 1 GHz LEO NEGOTIATED RULEMAKING COMMITTEE

A. The Committee's Official Designation

The official designation of the advisory committee will be the "Below 1 GHz LEO Negotiated Rulemaking Committee."

B. The Committee's Objective and Scope of its Activity

The purpose of the committee is to provide recommendations to the Federal Communications Commission to be used in the formulation of technical rules governing the provision of low-Earth orbit satellite services operating below 1 GHz (little LEOs). The committee will also assist the FCC in resolving questions relating 1) to the maximum sharing of available frequencies for low-Earth orbit services, and 2) to coordination of little LEO services with existing and future terrestrial and/or satellite services, domestically and internationally. The scope of the activity of the committee will include all steps necessary to assemble data, perform analyses and provide advice to the FCC concerning the technical, licensing and coordination issues presented by this new satellite service.

C. Period of Time Necessary for the Committee to Carry Out Its Purpose

The committee will require 37 days to carry out its purpose.

D. Official to Whom the Committee Reports

Chief, Common Carrier Bureau, Federal Communications Commission.

E. Agency Responsible for Providing Necessary Support

The Federal Communications Commission will provide the necessary support for the committee, including facilities needed for the conduct of the meetings of the committee. Private sector members of the committee will serve without any government compensation, nor will they be entitled to travel expenses or per diem subsistence allowances.

F. Description of the Duties for Which the Committee is Responsible

The duties of the committee will be to gather and discuss information necessary to form recommendations to the FCC for the regulation, licensing and coordination of little LEO satellite services.

G. Estimated Operating Costs in Dollars and Staff Years

Estimated staff years that will be expended by the committee are .04 for the FCC staff and .2 for the private sector and other governmental representatives. The estimated cost to the FCC of operating the committee is $3,000.

H. Estimated Number and Frequency of Committee Meetings

We expect that there will be 6 meetings, with possibly more meetings of informal subcommittees.

I. Committee's Termination Date

The committee will terminate September 16, 1992.

J. Date Original Charter Filed

August 10, 1992.

LEOAC-14

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of Establishment of an Advisory Committee to Negotiate Proposed Regulations for Low-Earth Orbit Satellite Services Operating Below 1 GHz	CC Docket No. 92-76

Jointly Filed Comments of ORBCOMM, STARSYS and VITA

In order to expedite the introduction of innovative low-Earth orbit satellite services which will provide new and less costly services to the public, the Commission recently proposed to establish an Advisory Committee to negotiate proposed technical and service rules appropriate to Non-Voice Non-Geostationary Satellite Services operating in low-Earth orbit ("LEO") in the bands below 1 GHz specified by the Commission.[1/] Orbital Communications Corporation ("ORBCOMM"), STARSYS Global Positioning, Inc. ("STARSYS") and Volunteers in Technical Assistance, Inc. ("VITA"), the applicants for the proposed

1/ Public Notice, DA 92-443, released April 16, 1992. The Commission had earlier proposed allocating spectrum for low-Earth orbit satellite services. Amendment of Section 2.106 of the Commission's Rules to Allocate Spectrum to the Fixed-Satellite Service and to the Mobile-Satellite Service for Low-Earth Orbit Satellites, ET Docket No. 91-280, FCC 91-305, released October 18, 1991 (hereinafter "Allocation NPRM").

service (collectively the "Applicants"),[2] are jointly filing these comments on the Commission's proposal to use a Negotiated Rulemaking for the promulgation of proposed regulations.

As an initial matter, the Applicants applaud the Commission's initiative in proposing to utilize Negotiated Rulemaking Act[3] procedures as a means of expediting the adoption of rules for these valuable services. Particularly in light of the positive attention that small LEO satellite services received at the recently completed World Administrative Radio Conference (WARC) and the strong public interest in expediting these services, it is imperative that the Commission continue to move ahead quickly in order to maintain the U.S. lead in this promising new small satellite technology.

The Applicants, in large part as a response to the FCC's proposal to utilize a Negotiated Rulemaking procedure, have held several informal meetings among themselves as a means of trying to reach agreement on technical and service rules for Non-Voice Non-Geostationary satellite services operating under 1 GHz.[4] Those meetings have proven to be very fruitful, and the

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2/ A fourth applicant for the service, Leosat, had its application dismissed as untimely filed. Leosat Corporation, File No. 12-DSS-P-9-91(2), DA 92-463, released April 20, 1992.

3/ 47 U.S.C.S. §§ 594 et seq.

4/ In addition, the Applicants held informal discussions with representatives of the National Telecommunications and Information Administration's ("NTIA") Office of Spectrum Management with respect to the intergovernmental coordination aspects of the proposed rules for LEO satellite services operating below 1 GHz.

Applicants have reached agreement on the issues critical to the establishment of rules for the proposed service.[5/]

Attached to these comments are the Applicants' proposed regulations to govern Non-Voice Non-Geostationary satellite services operating below 1 GHz in the bands identified in the Allocation NPRM. The rules largely draw on the preexisting Part 25 rules governing satellite services generally, and modify those regulations to accommodate the unique aspects of Non-Voice Non-Geostationary satellite services. The suggested rules would establish the application requirements, licensee qualifications and technical conditions for the Non-Voice Non-Geostationary satellite services proposed by the Applicants in their applications and petitions for rulemaking. In addition, the suggested rules will accommodate the non-commercial services proposed by VITA.

The suggested rules are structured as a new sub-Part to Part 25 of the Commission's Rules (along with some explicit cross-references between other relevant Part 25 provisions). Proposed Section 25.401 specifies the information to be provided in the application, including information demonstrating that the spectrum will be used efficiently (analogous to requirements for the domestic and international fixed satellite services).

5/ The agreement amongst the Applicants on the suggested service rules is predicated on the assumption that all three systems will be able to coexist. Although the Applicants encountered some last-minute problems with the sharing scheme preliminarily agreed to, the Applicants are optimistic that a suitable sharing arrangement can be crafted. The Applicants will keep the Commission apprised of relevant developments, and believe that the Commission should expeditiously issue the suggested rules as an NPRM.

Proposed Section 25.402 sets forth the eligibility requirements, and allows the applicant to request common carrier or non-common carrier status (with non-dominant treatment for common carriers). Proposed Section 25.403 specifies the license terms for the space stations comprising the systems and any replacement satellites. This provision is based on current Section 25.120, but has been adjusted to account for the fact that the Applicants anticipate that services will be provided by a constellation of Non-Geostationary satellites.

Proposed Section 25.404 specifies the renewal procedures and the renewal expectancy. These provisions are based closely on the renewal rules the Commission recently adopted in Part 21 for the Domestic Public Cellular Radio Telecommunications service, which also uses systems comprised of numerous radio stations. Proposed Section 25.405 details the financial qualifications, including the availability of a two-stage financial showing. Proposed Section 25.406 provides milestone conditions as a means of ensuring that spectrum is not warehoused, and is based on similar measures adopted in 1986 for the radiodetermination satellite service. Proposed Section 25.407 generally describes the frequency assignment policies that would govern multiple system operations in these bands.[6/] Proposed Section 25.408 describes operating conditions to govern co-primary sharing of the bands with authorized governmental

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6/ The suggested rule "brackets" the 399.9-400.05 MHz Transit band, in light of the uncertainty regarding that spectrum because of the absence of an international allocation of those frequencies for Non-Geostationary satellite services at the WARC.

users under NTIA's jurisdiction, and obviates the need for the five restrictive conditions set forth in proposed Footnote 320 set forth in the Allocation NPRM. Proposed Section 25.409 would allow blanket licensing of individual user transceivers, and is the functional equivalent of the provision applicable to user transceivers in the radiodetermination satellite service (47 C.F.R. §25.141(c)). Finally, Proposed Section 25.410 defines eligibility for applicants seeking to provide noncommercial services and specifies the particular conditions applicable to such services.

The Applicants also discussed their ability to coexist in the spectrum the Commission proposed to allocate to these Non-Voice Non-Geostationary satellite services. Based on the technical information exchanged among the Applicants, the Applicants believe that all three systems could be accommodated within the spectrum proposed to be allocated by the Commission. The Applicants will continue to discuss means of sharing the spectrum among themselves, and will keep the Commission informed as to the progress of those talks.

The Applicants believe that their efforts in developing proposed technical and service rules have obviated the need for the Commission to proceed with its proposed formal Negotiated Rulemaking procedure. In light of the current agreement of the Applicants with respect to suggested rules for Non-Voice Non-Geostationary satellite services operating below 1 GHz, the procedures proposed by the Commission have become unnecessary. Indeed, it would be counterproductive to the goal of expedition

shared by the Commission and the Applicants to proceed with a more formal process to reach agreement on suggested rules when the parties most significantly affected by any rules have already informally reached such an agreement.[7] In addition to imposing delay and being redundant, use of the formal Negotiated Rulemaking procedures would require the expenditure of scarce Commission resources in providing a facilitator and monitoring the process.

The Applicants thus respectfully request that the Commission decline to institute a Negotiated Rulemaking procedure, but instead release the Applicants' suggested rules in an NPRM as quickly as possible. Taking this step will allow all interested parties with an opportunity to comment on the proposed rules (thus providing procedural fairness), while also allowing service to become available in as rapid a manner as possible. In addition to release of the Applicants' suggested rules as an NPRM, the Applicants also urge the Commission to continue its efforts to expedite the availability of these important new services, including allocation of the spectrum as proposed in the NPRM and parallel processing of the applications with the adoption of service rules. The Applicants believe that this course of action will best serve the public interest.

In conclusion, the Applicants believe that the Commission's expressed desire to utilize alternative resolution mechanisms, including Negotiated Rulemakings, represents a

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7/ Indeed, the suggested rules represent the consensus of all of the parties preliminarily identified in the Public Notice as participants in the Negotiated Rulemaking process.

positive and important step in the direction of streamlining government processes so as to expedite the introduction of important new technologies and services. Prompt release of a notice of proposed rulemaking containing these suggested licensing and service rules, the adoption of an allocation order, and parallel processing of the applications are the necessary and appropriate actions to further the public interest and the Commission's goals.

Respectfully submitted,

Stephen L. Goodman

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PROPOSED RULE PROVISIONS FOR THE NON-VOICE NON-GEOSTATIONARY SATELLITE SERVICE (< 1 GHz)

1. **Modify Section 25.114(c)(18) by adding the following sentence at the end of the subsection:**

Applications for non-voice non-geostationary satellite systems in frequency bands below 1 GHz shall provide the information required by Section 25.405.

2. **Add new subsection (27) to Section 25.114(c), as follows:**

(27) Applications for authorizations in the Non-Voice Non-Geostationary Satellite Service (< 1 GHz) shall also provide all information specified in § 25.401.

3. **Modify Part 25 of the Commission's Rules by Adding New Subpart F, as follows:**

§ 25.401. Space Station Application Requirements for the Non-Voice Non-Geostationary Satellite Service (< 1 GHz).

(a) Each application for a space station license in the Non-Voice Non-Geostationary Satellite Service (< 1 GHz) shall describe in detail the proposed Non-Voice Non-Geostationary Satellite system, setting forth all pertinent technical and operational aspects of the system, and the technical, legal, and financial qualifications of the applicant. In particular, each application shall include the information specified in Section 25.114, except that in lieu of the information concerning orbital locations requested in Section 25.114(c)(6), the applicant shall specify the number, altitude(s), argument(s) of perigee, service arc(s), right ascension of ascending node(s), and orbital plane(s) of the space stations that will comprise its system. Applicants must also file information demonstrating compliance with all requirements of this section, and demonstrating that they will not cause harmful interference to any authorized or licensed Non-Voice Non-Geostationary Satellite Service (< 1 GHz) system.

(b) Applicants for commercial systems in the Non-Voice Non-Geostationary Satellite Service (< 1 GHz) must demonstrate in their applications that within six years of the grant of a nonconditional construction permit, they will be able to provide service to the United States, with service being available at least 75% of the time. For purposes of measuring compliance with this provision, service is deemed to be available if there is the potential for a user transceiver to transmit and/or receive a message directly to or from a space station operated as part of a commercial system.

§ 25.402. Noncommon Carrier/Common Carrier Operation; Eligibility For License.

(a) Applicants for space station licenses in the Non-Voice Non-Geostationary Satellite Service (< 1 GHz) may request that the space stations in their proposed systems be licensed on either a noncommon carrier or a common carrier basis. Applicants for multiple space station licenses in the Non-Voice Non-Geostationary Satellite Service (< 1 GHz) must request either noncommon carrier status or common carrier status with regard to all space stations that would be operated as part of a single system.

(b) Common carrier Non-Voice Non-Geostationary Satellite Service (< 1 GHz) space station licenses shall be classified as nondominant carriers, and shall be subject to streamlined tariff filing and facilities authorization procedures under Parts 61 and 63 of the Commission's rules.

(c) The Commission will preempt any conflicting state regulations over technical standards and entry regulation of the space segment.

§ 25.403. License Term; Replacement Space Stations.

(a) Space Station License Term. The license terms for Non-Voice Non-Geostationary Satellite Service (< 1 GHz) space stations that are operated as a single system will begin simultaneously at 3 a.m. EST on the date that the licensee certifies to the Commission that the minimum number of space stations required to enable the licensee to conform the operations of its system fully to the terms and conditions of its instrument of authorization have been successfully placed into orbit. As additional space stations originally authorized as part of the system are brought into service, the expiration dates of the licenses of such stations shall be the date ten years after the date on which the licensee made the certification contemplated by this paragraph.

(b) Replacement Space Stations. In the case of Non-Voice Non-Geostationary Satellite Service (< 1 GHz) systems consisting of multiple space stations that are operated as a single system, or in the case of noncommercial space stations in the Non-Voice Non-Geostationary Satellite Service (< 1 GHz) (as provided for in Section 25.410), the licensee shall be authorized, upon application to the Commission, to construct, launch, and operate space stations to replace failed or retired space stations authorized as part of the original system. If an application for authority to launch and operate such a replacement space station is filed before the last date for submission of a renewal application, as set forth in Section 25.404, the license of said space station shall expire at the end of the license term of the space station it is to replace. If an application for authority to launch and operate a replacement space station is filed after the last date for submission of a renewal application, as set forth in Section 25.404, the license shall expire at the end of the renewal term if the renewal application is granted, or at such time as the Commission may otherwise determine if the renewal application is dismissed and/or denied.

§ 25.404. Space Station License Renewal.

(a) Space Station Renewal. A licensee of a Non-Voice Non-Geostationary Satellite Service (< 1 GHz) satellite system consisting of multiple space stations that are operated as a single system shall file a blanket application for renewal of the licenses of the space stations that comprise such system. A licensee of a noncommercial Non-Voice Non-Geostationary Satellite Service (< 1 GHz) satellite system, as provided for in Section 25.410, may file a blanket application for renewal of the licenses of the space stations that comprise such system. Renewal applications shall be filed by the licensee no earlier than ninety (90) days and no later than (30) days prior to the end of the sixth year of the license term.

(b) Renewal Expectancy. A Non-Voice Non-Geostationary Satellite Service (< 1 GHz) renewal applicant involved in a comparative renewal proceeding shall receive a preference, commonly referred to as a renewal expectancy, which is the most important comparative factor to be considered in the proceeding, if its past record for the relevant license period demonstrates that the renewal applicant:

(1) Has substantially used its spectrum for its intended purpose;

(2) Has substantially complied with applicable Commission rules, policies, and the Communications Act; and

(3) Has not otherwise engaged in substantial relevant misconduct.

(c) Public Notice. All applications for renewal of licenses of space stations in the Non-Voice Non-Geostationary Satellite Service (< 1 GHz) shall be placed on public notice.

§ 25.405. Financial Qualifications.

(a) Each application for authority to construct, or to construct, launch, and operate a space station in the Non-Voice Non-Geostationary Satellite Service (< 1 GHz) shall include a detailed statement of the:

(1) Estimated costs of proposed construction and/or launch, and any other initial expenses for the space station(s); and

(2) Estimated operating expenses for one year after launch of the proposed space station(s).

(3) The source(s) or potential source(s) of funding of the proposed system for one year, including the identity of financiers and their letters of financial interest, or other sources of funding.

(b) Applicants for multiple licenses of Non-Voice Non-Geostationary Satellite Service (< 1 GHz) space stations that would be operated as a single system must make the showings required in paragraph (a) of this section as to all of the space stations in their proposed systems, and the showing required by in paragraph (a)(2) shall be for the period commencing on the date that the licensee expects to be able to make the certification required by Section 25.403(a).

(c) Any applicant that makes the showing required in paragraph (a) or paragraph (b) of this section shall be found financially qualified to receive a conditional construction permit. A conditional construction permit for a space station(s) does not permit the applicant to commence construction of such station.

(d) In order to commence construction, an applicant must demonstrate its current financial ability to meet the costs specified in paragraph (a) of this section, by submitting the following financial information verified by affidavit:

(1) An applicant relying on internal funds to finance its system must submit a balance sheet current for the latest fiscal year and documentation of any financial commitments reflected in the balance sheet, together with an exhibit demonstrating that the applicant has current assets and operating income sufficient to satisfy the requirements of paragraph (a) of this section. If the applicant is owned by more than one corporate parent, it must submit evidence of a commitment to the proposed satellite program by management of the corporate parent(s) upon whom it is relying;

(2) An applicant relying on external sources of funding must submit the information called for in paragraph (d)(1) of this section, along with an exhibit indicating that the estimated income or revenues anticipated from the proposed operation of the Non-Voice Non-Geostationary Satellite Service (< 1 GHz) system are sufficient to meet the estimated construction, launch, and first year operating costs not met by internal funds, along with any additional information requested by the Commission, which would include scheduled debt financing or stock issues, established lines of credit or other forms of internal financing; provided, however, that applicants for noncommercial systems (as provided for in Section 25.410) relying on external funding may satisfy the requirement specified in this paragraph by submitting copies of grant commitment letters or other evidence of funding commitments.