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

In the Matter of	)	
	)	
Spectrum Policy:	)	
	)	
Solicitation of Public Comment	)	ET Docket No. 02-135
by the Spectrum Policy Task Force	)	
	)	
	)	

To: The Commission

COMMENTS OF

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Appendix 4

Appendix C of the PSWAC Technology Subcommittee Final Report
pp. 80 (270) - 84 (274)

APPENDIX C

TECHNICAL PARAMETERS FOR FORECASTING SPECTRUM DEMAND

The model which has been selected for the computation of the spectrum need of public safety is described in the report of the Spectrum Subcommittee. That model calls for technological parameters to be projected through the year 2010 for the identified user service needs, and then used to compute the spectrum needed. The user service needs which have been identified by the Operational Requirements Subcommittee are: Voice Dispatch, Telephone Interconnect, Transaction Processing, Facsimile, Snapshot, Remote File Access, and Slow and Full Scan Video. The following provides a detailed description of the technology parameters used in the process and identifies a recommended value for each parameter.

TECHNOLOGY PARAMETERS

Description	Abbreviation
RF Transmission Rate	RATE
Error Control and Overhead	ERR
Source Content	SRC
Channel Occupancy	LOAD
Coding Improvement	COD

1.0 RF Transmission Rate (RATE)

The word RATE will be used to designate the RF transmission rate in the model. It is described in bits per second per Hertz (b/s/Hz). The leading edge technology in use was projected to be 3.5 b/s/Hz in the year 2000 and 5.0 in the year 2010. Assuming a 15 year life, the systems in use in the year 2010 will be the accumulation of systems sold starting with those purchased today and including those that will be sold in the year 2010. Those sold today include some which are at the level of about 2.5 b/s/Hz and some that are less than 1.0 b/s/Hz. Those sold in the year 2010 will likewise have a range of values. Projected values are summarized in Table 1.

Table 1
Transmission Rate

Service	**b/s/hz**
all except video and remote file transfer	1.5
video and remote file transfer	3.5

2.0 Error Control and Overhead (ERR)

In the model, we will use ERR to represent the subject parameter, and it will be expressed in the average percent of transmitted bit rate that is dedicated to this function.

Coding of the information bits allows more and more compression to take place. However, each bit then becomes more important, and the error correcting function then becomes more important. In addition, over time, linear modulation schemes are being used with higher transmission rates. Because of the multipath propagation environment, it becomes necessary to provide synchronization and equalization functions that also may use some capacity.

Table 2
Error Control and Overhead

Today	Future
55 %	50 %

3.0 Source Content (SRC)

The content of the source message to be transmitted is represented by the shortened form SRC in the equations to follow. In the future, it is projected that all services provided will be implemented in a digital format. Therefore, this parameter will be expressed in kilobits per second (kb/s).

The offered load that has been developed in User Traffic Profile White Paper [1] is based on a source content of 6 kb/s per second for all categories except special data, and that will be used herein. For special data, consisting of video and remote file access, it will be prohibitive to limit the channel to such a slow data rate. In Appendix C of the Prediction Model White Paper[2] values are developed for these latter services, and a nominal rate developed there is 384 kb/s. That is the value which will be used for the spectrum computation.

The magnitude of the source content is that which is contained in the state of the art message today, including any coding improvement that has been done to date. Advances in coding in

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[1] United States Department of Justice, Immigration and Naturalization Service, Headquarters Radio Systems Section, "Public Safety Wireless Communications User Traffic Profiles and Grade-Of-Servic e Recommendations", March 13, 1996, prepared by Dr. Gregory M. Stone. Referenced here as "User Traffic Profiles White Paper."

[2] White Paper "Model For Prediction Of Spectrum Need Through The Ye ar 2010", Version 2.0, May 27, 1996, presented To PSWAC by Motorola Inc. Referenced here as "Prediction Model White Paper."

the future are addressed in the parameter COD developed below. The resulting content of the advanced features for SRC is summarized in Table 3.

4.0 Channel Occupancy (LOAD)

Channel loading is the portion of time the channel has RF transmitted over it expressed in percent of the total time the channel is available. It is represented by the term LOAD, and is a complex subject that is a function of many parameters. These parameters include the kind and urgency of the message, the number of users of the channel, how many servers are available for the channel, and the length of message and number of them per hour offered by the users.

An example of a situation where a lightly loaded channel is necessary is when a group of scattered police officers are waiting to simultaneously close in on a suspect with a hostage. They operate on a single channel, and It is imperative that when the word go is uttered they all move with the greatest of speed. The channel in use must be **very** lightly loaded, LOAD less than 5 percent, to assure that the short message will not be blocked.

An example of a situation where a heavily loaded channel can be used involves trunked systems that carry routine messages. Data requests for license plate checks can wait two or three seconds as the officer writes a ticket. A dispatcher request for present location usually takes a few seconds for a voice reply as the officer reaches for the radio to reply. That too will not suffer greatly if two or three seconds of blockage occur. LOAD can be 20 to 25 percent on a single channel system and as much as 70 to 80 percent on 20 channel trunked systems and meet this criteria.

Finally, there are messages that can wait for a few minutes before delivery to the intended party. These may include a FAX sent to an individual driving a car (we recommend that they keep their eyes on the road as opposed to reading a FAX), and E-Mail message, or a long file which is to be used at some time in the future. Single channel systems can be loaded up to 50 percent and 20 channel systems up to 95 percent and provide this service. For purposes of the analysis of spectrum need a value of 55 percent is recommended.

5.0 Coding Improvement (COD)

The coding improvement is a dimensionless factor that describes the anticipated improvement in coding that will take place between the years 1996 and the year 2010. The shortened term COD is used in the model. For various services, the value of COD varies from 1 to 3 as shown in Table 3.

6.0 Recommended Parameters For Model

Based on the discussions above, the technological parameters have been quantified for each of parameters identified are summarized in Table 3.

Table 3
SUMMARY OF TECHNOLOGY PARAMETERS

SERVICE	RATE b/sec/Hz	ERR %	SRC kb/s	LOAD %	COD
Voice Dispatch	1.5	50	6	55	2
Telephone Interconnect	1.5	50	6	55	2
Transaction Processing	1.5	50	6	55	2
Facsimile	1.5	50	6	55	1
Snapshot	1.5	50	6	55	1
Remote File Transfer	3.5	50	384	55	3
Slow Scan Video	3.5	50	384	55	3
Full Motion Video	3.5	50	384	55	3