

The wireless cable industry today stands at the intersection of the two most powerful trends in the video marketplace -- the digitization of video and the emerging demand for interactivity. By this application and one being filed simultaneously, People's Choice TV Corp. ("PCTV") requests permission to engage in a series of experiments in Kansas City, MO and experiments and market tests in Houston, TX^{1/} aimed at developing technology and methodologies that will permit wireless cable operators to rapidly introduce interactive digital services in the 2.1 and 2.5 GHz bands.

PCTV has long been at the forefront of the wireless cable industry. Its Tucson, AZ system is generally recognized as one of the most successful in the nation. When it became evident that digital compression technology presented a possible solution to the chronic channel shortage facing wireless cable operators, a PCTV subsidiary received one of the first authorizations in the Experimental Radio Service permitting research into the use of digital technology in the 2.1 and 2.5 GHz bands. More recently, PCTV founded the Wireless Cable Research and Development Center ("Wireless R&D Center") in conjunction with several other wireless cable operators and telecommunications equipment manufacturers,^{2/} and has been actively experimenting with digital transmissions in conjunction with the Wireless R&D Center.

For all its success of late, the wireless cable industry is at a critical juncture. In the near future, a wireless cable operator will not only have to face competition from the entrenched cable operator in its area, but will also have to compete against 28 GHz systems, video dialtone providers and direct telephone company entrants into the multichannel video marketplace, all of which are promising to introduce interactive applications. While no one can today predict with precision how the marketplace will

^{1/} Pursuant to Section 5.206 of the Commission's Rules, PCTV will own all of the transmitting and receiving equipment to be utilized during the experimentation and market tests. PCTV shall inform anyone participating in the experiment that the service is provided under an experimental authorization and is strictly temporary.

^{2/} In addition to PCTV, wireless cable operators Cross Country Telecommunications, Inc., American Telecasting, Inc., WJB-TV Limited Partnership d/b/a Coastal Wireless Cable, and ACS Enterprises, Inc. have founded the Wireless R&D Center. Among the major telecommunications equipment manufacturers committed to participating in the Wireless R&D Center are Zenith Electronics Corp., Phillips Electronics Corp., the Jerrold Communications Division of General Instruments Co., Scientific Atlanta, Andrew Corporation, Lance Industries, Comwave, ITS Corp., EMCEE Broadcast Products, Conifer Corp., California Amplifier, Inc., Microwave Filter, NTN Communications, CMIS, Ltd., Pacific Monolithics, Inc., Cablewave Systems, and Qualcomm, Inc.

look five years from now, one thing is certain -- wireless cable systems will have to offer their subscribers far more than the maximum thirty-three channels of video programming available today.

As the trade press^{3/} and the Commission^{4/} have recognized, the wireless cable industry, led by PCTV, has been at the forefront of efforts to develop the digital compression technology required to meet the competitive challenge. PCTV is taking an active role in exploring the issues associated with utilizing digital technology to meet consumer demand for additional services. Through participation in the Wireless R&D Center and on its own, PCTV is working towards refinement of the technical specifications for wireless cable digital transmission and reception equipment and developing interactive video, data, and voice capabilities in the wireless cable bands which will permit additional applications for both the consumer and educational markets. Digital technology, particularly when used in conjunction with a cellular topology, can provide the channel capacity needed to add interactivity through the use of compression while affording the flexibility necessary to provide various two-way services.

PCTV has accumulated the right to utilize twelve Multipoint Distribution Service ("MDS") and twelve Instructional Television Fixed Service ("ITFS") channels in the Kansas City, MO metropolitan area. Because of other corporate priorities, PCTV does not anticipate launching its wireless cable service in Kansas City for at least a year. As a result, the Kansas City market presents a prime opportunity to conduct initial, basic experiments to evaluate the issues raised by the introduction of digital technology into the 2.1 and 2.5 GHz bands. Given the vast number of channels under PCTV's domain in the market, tests can be conducted without fear of interference to other authorized facilities.

Through its subsidiary, People's Choice TV of Houston, Inc. ("PCTV-Houston"), PCTV is poised to launch shortly a new wireless cable system serving the Houston, TX consolidated metropolitan statistical area. PCTV-Houston has entered into a series of agreements that will result in it being able to utilize all of the MDS and ITFS

^{3/} "Zenith Demos Compression at Wireless Show," *Multichannel News*, at 39 (Aug. 9, 1993); "WCA pursues digital dreams and technological realities," *Broadcasting & Cable*, at 21 (Aug. 2, 1993); "Wireless cable will benefit more from digital compression," *Communications Daily*, at 7 (Aug. 24, 1992); Kim, "WCA Throws Down The Gauntlet," *Multichannel News*, at 31 (Aug. 10, 1992).

^{4/} *Amendment of Part 74 of the Commission's Rules Governing Use of the Frequencies in the Instructional Television Fixed Service*, 8 FCC Rcd 2828, 2832-33 (1993).

channels in the 2.1 and 2.5 GHz bands for its service. Applications have been filed with the Commission for authority to co-locate all of these thirty-one channels atop 1000 Louisiana Street in downtown Houston. All of these applications have been found acceptable for filing, several have been granted, and the remainder are expected to be granted shortly. The launch of a new system by PCTV-Houston provides PCTV an ideal opportunity to experiment with and conduct market tests regarding the use of digital technology to provide consumers with interactive communications services. Once the initial basic experimentation has been completed in Kansas City, PCTV envisions conducting developmental and market tests of digital and interactive consumer services in conjunction with some or all of its subscribers in the Houston market.

Digital operation offers a number of opportunities for improving the efficiency of spectrum utilization in both the distribution and return channels of the interactive systems under development. In particular, the presence of an adaptive equalizer in the receiving system is expected to permit transmission of identical data (programming) from multiple points within a region without destructive interference between the signals. This occurs because the adaptive equalizer treats the several signals as a direct signal and several echoes. It then quite effectively cancels the echoes (signals from alternate transmission points) and delivers a usable output. The result permits effective use of distributed transmission for a form of "cellular" operation.

PCTV envisions the development of a cell at each of its wireless cable headend sites in Kansas City and Houston, which are identified in response to question 5(b), as well as at multiple sites within 30 miles of those headends. Transmission from multiple points will permit higher efficiency by making it possible to reach a larger proportion of the potential subscriber base. Since lower powers and lower elevations will be required for such cellular transmission, it may also help to reduce interference outside the service area by providing a faster fall-off of signal levels outside the intended area of operations. Furthermore, the smaller coverage areas of each of the transmitters will result in a more reliable service by reducing the range of fading possible along the path.

Multiple transmission points will automatically provide multiple receiving points for the return signals. This is important because it will allow a higher density of channel utilization through reuse of the same channels in each of the cells. The intention is to develop a reciprocal system in which the same antennas are used in both directions and in which the transmission characteristics are balanced so that, when a path works in one direction, it will work in the other. The directivity of the antennas used at the subscriber locations will aid in permitting such frequency reuse.

PCTV intends to explore the feasibility of using the 2.1 and 2.5 GHz bands for interactive use by transmitting digital and analog signals from its headend^{5/} and by transmitting digital signals along the return path. At various times, the channel used for the return path will be transmitting from the headend either no signal, a digital signal or an analog signal. Among the aspects to be explored under the authorization sought are the optimum channel coding and modulation characteristics, the required power levels, interference to and from co-channel and adjacent channel facilities transmitting using various digital and analog modulation schemes, required equipment characteristics, and the effects of multipath in the 2.1 and 2.5 GHz bands on interactive applications.

Initially, testing will take place in Kansas City, where the digital signals will carry pseudo-random noise ("PN") data sequences to permit characterization of the error types (e.g. random vs. burst) and error rates resulting from different attributes of the 2.1 and 2.5 GHz bands environment. PCTV intends to begin testing with 16-QAM as the modulation scheme. Depending upon the level of success achieved, other modulation types, such as 64-QAM and 2-VSB/4-VSB, may be explored. The need for testing of more exotic modulation methods will hinge on the attainment (or lack thereof) of satisfactory performance with existing equipment designs and types using the more conventional approaches.

The initial period of testing, based upon the aforementioned PN transmissions, will involve a wide-ranging field test of a multiplicity of sites in the coverage area. After the coverage area is explored to identify the prevalence of the various environmental conditions, sites will be selected to include examples likely to encounter all expected forms of interference and distortions.

At the conclusion of the initial stage of field testing, key sites will be identified that exemplify all of the conditions necessary to be considered in later stages of testing. These will be used for all subsequent testing to avoid the need for repetition of the full field test as operating conditions are varied. They will also be used to track the effects of changes in the radio frequency environment that occur with changes in the seasons.

Later stages of testing will be used to help in selection of a source coding (digital compression) method or methods for standard and high definition television, as well as return path applications. Testing in this stage will include the transmission of actual program material in digitally compressed form and digitally encoded return

^{5/} No experimental authorization for the analog transmissions is necessary because of PCTV's current rights to utilize all thirty-one channels for NTSC transmissions.

path information to confirm that the desired level of performance is achieved with the selected channel coding techniques. The required characteristics of the transmission and reception equipment will be verified under actual program conditions. Ultimately, an expected final system configuration will be completely assembled and tested in Houston in conjunction with PCTV's newly-launched system. At the same time, consumer acceptance of various services will be market tested.

A number of modulation methods will be utilized during the program of testing. Each of these will be appropriate for use within a 6 MHz channel. Since the tests will be conducted utilizing fixed stations that will be shared with operating MDS and ITFS stations, it is necessary to have all channels available so that use for testing purposes can be made of channels not in use for their regular applications at any given time. Mobile transmissions will be for the purpose of developing a return channel capability, and will also employ a variety of modulation methods during the testing program.

All of the planned transmissions are fundamentally digital in nature. The emission designators for the fixed transmissions include a system that uses vestigial sideband modulation of a reduced (pilot) carrier with 4-level and 6-level NRZ digital signals (C1W); a system that uses Quadrature Amplitude Modulation (QAM) at selectable data levels (16, 32, or 64 points in the constellation) (D7W); and a system that uses a multiplicity of QAM signals coded to provide resistance to path deficiencies (X7W). The emission designators for the mobile transmissions provide for both QAM and pulse code modulation.

The modulating signal for the fixed transmissions will be a digital data stream comprised of a multiplex containing a combination of digitally compressed video, digitally compressed audio, control data, auxiliary data, synchronizing information, and the like. The data format will be flexible and permit a varying mixture of the types of information to be carried, depending upon system and user requirements at any given moment. The symbol rates and the total data rates (including forward error correction) applied with the various modulation schemes are shown in the following table:

Emission Type	Description	Symbol Rate	Data Rate
6M00 C1W	4-VSB	10.76 MS/s	21.5 Mb/s
	6-VSB	10.76 MS/s	26.9 Mb/s
6M00 D7W	16 QAM	4.88-5.28 MS/s	19.51-21.15 Mb/s
	32 QAM	4.88-5.28 MS/s	24.39-26.43 Mb/s
	64 QAM	4.88-5.28 MS/s	29.27-31.72 Mb/s
6M00 X7W	COFDM 16	5 MS/s	20 Mb/s
	COFDM 32	5 MS/s	25 Mb/s
	COFDM 64	5 MS/s	30 Mb/s

The modulating signal for the mobile transmissions will be a digital data stream comprised of various information channels of the type that would be multiplexed together for transmission back to a headend operation. These might include such signals as viewer survey responses, purchase orders, selection information, and other forms of upstream communications.

The necessary bandwidth for the fixed transmissions in all cases is 6 MHz. This derives from the selection of the symbol rates and the pulse shaping of the inputs to the modulators to just fill a standard television channel of that width. In addition, each of the systems has a filter (normally a Surface Acoustic Wave filter) to limit the energy to the 6 MHz channel and to shape the energy near the band edges. Appropriate guard bands are included within the 6 MHz.

The necessary bandwidth for the mobile transmissions will depend upon the amount of information to be communicated. This will be an element of the experimentation. The bandwidth will be no greater than the 6 MHz appropriate for the channels on which the transmissions will be conducted. The same forms of bandwidth limitation used for the fixed transmissions will also be applied to the mobile transmissions.

The program of experimentation is expected to contribute to the utilization of the radio art by developing the means through which PCTV and others in the wireless cable industry can participate in the future world of digital television. This will both keep PCTV competitive with other delivery media and assure that the 2.1 and 2.5 GHz bands are utilized as fully and efficiently as possible.

EXHIBIT 2
FCC FORM 442

The equipment listed in Item 13 will not be capable of station identification in many of the modes that will be used during the proposed test program. This results from the fact that digital test signal generators will be modulating the signals in those cases, with no ability to encode pictures or sound in the digital domain during those stages of experimentation. The same method is proposed for both base and mobile operations. Therefore, it is requested that the requirement for station identification set forth in Section 5.152 of the Commission's Rules be waived.