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SATELLITE TELEVISION, SIGNAL ENCRYPTION, ANI THE FUTURE OF BROADBAND DISTRIBUTION

September 19, 1985

Seminar Notes

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Technology Session:

Allen Ecker, Scientific Atlanta

Jerrold Heller, M/A Com Linkabit

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John Sie, Tele-Communications, Inc.

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SATELLITE TELEVISION, SIGNAL ENCRYPTION, AND THE FUTURE OF BROADBAND DISTRIBUTION

Technology Session

Dr. Jerrold Heller - M / A Com Linkabit

The technology for scrambling and encrypting TV signals poses a complicated problem as it entailed not only scrambling and encrypting but it also required the flexibility to allow the programming to be distributed and sold to owners of backyard TV Receive Only (TVRO) terminals, currently estimated as one million to 1.2 million and growing at approximately 40,000 per month.

The system approach taken by M/A Com, is called Video Cipher II (VCII). The primary objective in this system is to have a high level of security to ensure that pirating on an economic basis was not possible. The company intends to address two distribution systems which are almost independent. One, the existing satellite distribution to about 6000 to 7000 cable systems around the U.S., and second, to address the backyard TVRO market and DBS (Direct Broadcast Satellite) market. In the process of developing their system to encrypt and scramble, M/A Com has been also able to include other services and features. This was possible he said, as a result of the excess memory available in the microcomputers that were being used for scrambling and encrypting.

Heller noted that the most important constraint of the system was that, to be used in the home environment, the descrambler unit would have to be of very low cost. This has been achieved using standard digital custom LSI techniques. Heller went on to differentiate between the two techniques used by M/A Com and Scientific Atlanta. M/A Com used the NTSC TV standard (B-NTSC) while Scientific Atlanta had chosen to use the MAC (B-MAC) standard. The NTSC TV standard used he said, was really NTSC which was modified for transmission over satellite and for encryption. The primary difference being that at least two channels of audio are digitized, buffer-compressed, and sent during the hours of the unused horizontal blanking intervals of these lines. These horizontal lines are not visible on the TV screens. He said that B-MAC was proposed as a standard in Europe primarily because of its transmission on the FM medium. He claimed that compared with B-NTSC, B-MAC video performance would actually be inferior for most subscribers. He mentioned that though video signal-to-noise ratio was virtually the same in both formats, when converting back to NTSC the video signal-to-noise ratio was poorer for B-MAC than for B-NTSC. B-NTSC does not require additional signal bandwidth as does B-MAC. Also B-MAC based descramblers require additional circuitry to convert back to NTSC resulting in higher costs. B-MAC was a compression scheme on a single band, unlike NTSC. This he said was not important on a satellite line but if it had to be put directly down onto the cable system it would require redefinition of the

frequency plan on the cable system which was not an easily acceptable thing to do and would result in fewer channels. It was for these reasons that M/A Com preferred to use NTSC.

Heller noted that four premium program services namely Home Box Office (HBO), Cinemax, Showtime and Movie Channel were committed to scrambling using the Video Cipher II, NTSC approach. He said that HBO already had about 12000 of their descramblers as well as the head-end scrambling equipment. Scrambling currently took place on a 12-hour basis and it was expected to soon expand to 24 hours. Showtime was also presently accepting delivery of their equipment. M/A Com, viewed VCII as the defacto standard for C-band scrambling. He added that, from a consumer cost point of view, it would be wiser to stick to one type of scrambling to enable the consumer to eventually tune into all the available programs rather than only a part.

Heller then went on to list some of the features of VCll. In addition to high security there was also high quality since the system is virtually transparent to the fact that there is scrambling. In fact, the signal improves as a result of scrambling because the audio does not require separate subcarriers and, as a result, power is not lost from a video signal. The system allows flexible addressing for upto 15 million subscribers. Heller suggested that there could be two ways in which programming could be served. One, the so-called tier program service where one could buy various packages of programming for a monthly fee or something similar. This offers all desired combinations of 56 separate service elements. The other was impulsive purchase on a pay-per-view basis. The system could handle this kind of operation as well. He also noted its ability to 'blackout' specific programs, such as sporting events. There is also message service capability to transmit personal messages and database access capability.

Annexure 1 describes the secure satellite transmission system. Heller mentioned that in terms of video security it was done mostly by video masking. All the syncronization information in TV signals was eliminated. The color burst level was shifted so as not to trigger the TV horizontal syncronization circuit. Encryption was done on the audio with the DES algorithm. Each subscriber, he said, would have a descrambler with a unique unit address and a set of secret keys. The unit key is buried with the custom chip. A 56-bit authorization word is transmitted to each descrambler with its monthly authorization key and 56-bit program mask is transmitted with each program. The system also has provision for the descrambler to keep a track of credit available to the subscriber which is updated via addressed message either when a payment is made or a deduction is made by impulse program selection. Finally, he mentioned an information service feature of up to 256 pages per channel, which could include headline news, stock prices, sports scores, program guides etc.

Allen Ecker - Scientific Atlanta

Allen Ecker began by outlining Scientific Atlanta's areas of business. The main areas are antenna measurements, telecommunication testing, vibration testing, and tracking systems. 60-65% of their business is in satellite communication and cable television. They are a full line supplier in cable TV and provide uplink, downlink and TVRO equipment to the satellite business. Recently, they introduced addressable systems - set-top terminals addressable with a computer control manager which allows tiering and authorisation from the head-end without a service call. Over 270 of these systems with over 1 3/4 million addressable units are in operation right now. With this experience and their satellite digital audio experience, Scientific Atlanta has, during the past four years, developed a system for secure video, audio, text, and data transmission called B-MAC.

Ecker said that it was only in the last two years that they had developed the B-MAC system. MAC for multiplex analog components and B for the audio and control information in the base-band of the blanking interval.

Ecker mentioned that NTSC was an ingenious scheme developed in the early 50's to allow good AM modulation since that was the common broadcast medium and to have black-and-white/color compatibility since everything in those days was black-and-white. But now he said, distribution in most instances is FM over satellite link, and most TV sets are color. The picture in the tube uses component color display and the trend in studios is also towards component color. He therefore believed the future of source and display material to be in component form. He pointed out that several Japanese TV manufacturers offer component inputs in many of their sets. Scientific Atlanta's philosophy therefore is not to have the transmission medium between source and display components be a limiting factor. NTSC, he said, was designed with a subcarrier at 3.58 MHz which carries the color so the chrominance and luminance are really frequency multipliers. The horizontal blanking interval has synchronisation and color burst information. Scientific Atlanta took the opportunity to optimize their satellite transmission format. Since they had to deal with non-linearities in the satellite link they designed a much more rugged signal from the point of view of video format synchronization and audio. The format was designed for frequency modulation over satellite where the same video line was used for chrominance compressed to 1/3 of it's normal width and luminance compressed to 2/3. Neither luminance nor chrominance occur simultaneously, and therefore the operation can stand sinificantly more non-linearities in the channel. Also, because there is no synchronization and saturated color possibility for the chrominance on the subcarrier the full signal can be used for video.

He then displayed on screen an enlarged version of the horizontal and vertical blanking intervals. The horizontal blanking interval is used for 6 digital audio channels using a Dolby delta modulation algorithm that allows transport of very high quality sound in almost 1/3 of the range used by the M/A Com

system. He said that they also have a utility data channel of 64 kpbs used for such things as unloading computer programs. The first of the vertical blanking intervals are used for digital information carrying synchronization control followed by addressing information and telex.

Ecker commented on Heller's reference to threshold performance for B-MAC and B-NTSC. Ecker said that with the below threshold B-NTSC signal white spots commonly called comet tails appeared. This he said was a result of impulse noise below threshold for the FM process. However he pointed out that an identical calibrated channel with B-MAC had fewer impulse clicks with comet tails 1/5 the size of the former. In B-MAC he said there were no subcarriers for audio, color, etc.

Ecker then turned to scrambling and defined it as a way of denying information in an analog signal, while defining encryption as a way of encoding and decoding digital signals. He said that they fully encrypt all their digital signals for full security. For scrambling they had looked at a variety of techniques. He claimed that sync denial which M/A Com is using in Video Cipher 11 was very easy to defeat. This was possible using a new digital TV set and 'sync-ing' up on a signal, with amplitude reversal and line segmentation followed by a reconstruction of the signal. Ecker said that Scientific Atlanta's technique called line translational scrambling had as its major objective that it be a hard scrambling technique not possible to defeat on a commercial basis. The picture is completely obscured while scrambling and descrambling, and no artifact is introduced. It was, he said, necessarily a low-cost implementation process which was very important for use in the home. Essentially, it was based on a principle of changing on a random sequence basis the time and horizontal blanking interval. The random sequence is encrypted in the digital data with signal changes every 1/4 second. This allows a shuffled line translation system. He said that several institutions (Australian Dept. of Communications, British Telecom, CBS, etc) had evaluated this scrambling and descrambling process and verified that it does not introduce any artefacts into the system.

In closing Ecker summarized some of the features of the B-MAC system. The system of addressing scrambling and encrypting is computer controlled and has multiple keys and addresses which allow multiple business entities feeding one control system. There is also provision for a number of multiple independent control systems operating into the same decoder box. The company had developed several types of integrated circuits to enable them scramble descramble coompress and decompress the video. Additional features of the B-MAC system provide for full color teletex, news, graphics, messages, emergency warnings, wide and standard screen transmission. The system also allows credit purchase of programs and personalized accounts.

Speakers' Comments and Responses to Questions

In response to a question relating to the speed with which a new customer receives the 'authorization', Ecker said that their system addresses a million an hour and he believed that M/A Com addresses 100,000 an hour. Ecker claimed that Sientific Atlanta had a queueing system, and a new subscriber is put at the top of the queue and can be addressed in 6 minutes. Heller disagreed that M/A Com address 100,000 an hour, claiming that their rate was about the same as Scientific Atlanta's.

Heller picking up the question of their capacity to handle 15 million subscribers, said that it was not a 'hard' limit but one that was imposed by the computer system. He further explained that their monthly authorization messages to subscribers would be sent 5-10 times a month, so that if it was received with an error or rejected there would be another opportunity to receive it. And amendments could be sent out in a matter of seconds depending on the queue into which it is put.

To a question of cost/pricing, Heller stated that they had the 'stand alone' descramblers that would up grade existing backyard TVRO systems. These he expected would cost in the region of $395 for a complete package. However, implemental cost for scrambling in the future he said, when it is added as a modular or circuit card in a receiver, would be more along the lines of $100-$250.

Ecker in response to query regarding the need for export licenses stated that their equipment for Australia was manufactured by their subsidiary in Canada. The export license was handled through Canada and they had full authorization for it. His understanding of export restrictions was that they varied country by country.

Regarding the issue of the penalty involved in DBS transmission to the home - i.e. wiping out of the digital audio signal by the subcarriers stealing power from the video - Heller stated that this was the reason M/A Com began using two channels for audio transmission. They wanted an extremely high quality system, and this he said, was one of their best features. He felt that quality such as in this area, was very much more important than additional services. Ecker disagreed, saying that the additional services were entirely to do with the uplink portion of the system which is a job for the computer. He further claimed that Scientific Atlanta's B-MAC system allowed the use of audio subcarriers at lower frequencies than the M/A Com system, because of the methods used for architecture and coding.

SATELLITE TELEVISION, SIGNAL ENCRYPTION AND THE FUTURE OF BROADBAND DISTRIBUTION

Policy Session

Roy Neel - Legislative Director for Sen. Albert Gore

Roy Neel began by saying that they got into the policy environment of satellite TV programming rather late and so had everybody else. He said that a couple of years ago there was really no Federal policy dealing with the marketing or delivery of satellite TV programming. However, there were some who thought that there were laws that served their interest and this resulted in a number of law suits between operators, dealers, programmers and users. The essential question was related to the legality of manufacture, possession and use of earth stations. He said it was apparent to them that it was illegal to use a satellite delivered program and rebroadcast it for direct or indirect gain. They therefore set about to define a law relating to the private use of earth stations about which time a bill had been introduced in Congress to essentially outlaw privately owned earth stations. This legislation, he said, had some advocates and was promoted by Hollywood interests. It received little opposition and began to move when SPACE lobbied against it as they were convinced that it would shut down entirely a new industry and one which offered considerable opportunity for rural residents.

In 1984, Sen. Gore (then Congressman) introduced a bill that essentially declared the private reception and viewing of satellite delivered TV programming legal as long as the signal was unencrypted. Also, it required that scrambled programs should be made available to backyard earth station owners at fair and reasonable rates. At that time there was just no interest in moving that legislation since on one side there were the advocates of the earth station industry and SPACE, while on the other side essentially everyone else (Hollywood interests, large cable interests, cable trade associations, etc.). There was little or no chance, he said, of passing this as a stand alone legislation. However, fortunately for them the cable deregulation bill was moving through Congress at the time which offered a unique opportunity to "piggy back" on something that had a constituency and was going to pass. They were therefore able to add provisions onto the cable act that essentially made use of earth stations by private individuals a legal activity. But they could not include provisions relating to scrambled programs. These are contained in the new bill, which has just been introduced and is now in committee.

Neel went on to say that after the passage of the deregulation bill there were many in Congress who did not favor further legislation and instead expected the market to take care of the problems. However, he said, that even as recently as a few years ago few, if any, of the programmers would even consider

serving the home earth station market. HBO in fact had told them directly that this market was a nuisance and that they had no intention of serving it. Ironically HBO, he said, was the first programmer to suggest direct marketing of programs some time ago. The issue was not whether the home earth station market would be served but how, since it is over a million strong and would continue to grow. If there was a broad unfettered market without artificial interference there would be little reason for the Federal government to intervene. However, the problem is perceived by at least the earth station industry and TVRO owners to be not just latent but a very real one, as the threat of scrambling was being used by some local cable operators to slow down sales of earth stations. As a result, he said, there are those in Congress who strongly advocate a 2-year clampdown on scrambling to alleviate the confusion in the marketplace (the Judd-Gregg bill in the House of Representatives). But there are many who believe that a programmer has a very legitimate need to scramble to protect his signal from commercial theft as is done by bars, taverns, motels etc., and theft abroad. Therefore he believed it unlikely that scrambling would be prohibited. Also because, with the exception of HBO's limited scrambling, there is little scrambling at present. He predicted that once half a dozen programmers or more scrambled full time, there would probably be a groundswell of outcry from TVRO owners in rural areas. They are dispersed widely and would certainly become a strong voice. Therefore he would not shut out the potential for legislation in the future.

Neel went on further to say that Gore's view on scrambling was more moderate: Programmers who scramble must those signals available to earth station users in a fair and negotiated marketplace agreement. He felt that this would be acceptable to most TVRO who would be willing to sign up for a decoder at say $400/- since they would have already spent $3000/- to $6000/- on an earth station system. He felt that even the monthly charges, if they were reasonable, would not be a significant barrier.

Neel said that not long ago the National Cable TV Association announced its intention to form a consortium and as he understood it, it was a means to accelerate the process of scrambling by signing up programmers as partners in this consortium. However, there was a hook in it for the programmers, in that they could participate making their signal available to the consortium, but if they did not scramble, some of the larger operators would refuse to carry their program. This he viewed as substantial market clout being exercised to force scrambling. The consortium had since changed its stand but not a single programmer had yet agreed to participate because of the doubt regarding the legality of the arrangement (specifically, antitrust implications) and also because the programmers are not really excited about turning over distribution of their signal to cable operators. This posed another complication to Neel who felt that the ownership of large cable operations together with vertical integration existing in this business could create enormous potential for undue leverage over a customer. This fear, he said, was further enhanced as a number of cable

officials had openly mentioned their intention to drive down earth station sales. He felt that in the policy arena, particularly Congress, where many constituencies are represented, and in their case, a large rural constituency, this kind of arrangement just did not seem fair. While antitrust laws could be applied and and pursued by earth station industry for example it was common knowledge that access to justice was not exactly equal. It would, in his opinion, be more equal for a cable operator than for an earth station user. In addition there was a great deal off concern in Congress at present, regarding the returning of rural people into a kind of "dark ages" without communication. This is the first time that there was a technology that had come to rural areas.

Looking toward the future, Neel did not anticipate an easy solution but rather an uphill fight as on one side there was a small relatively weak trade association compared to a strong well-financed trade association and Hollywood and on the other side. However, the former group he expected would get support from a number of rural legislators and others in Congress who were concerned for excessive and abusive use of marketplace leverage over weak earth station owners and users.

John Sie - Telecommunications Inc.

John Sie began by stressing that the subject was very important. He regretted however, that it had become an emotional subject. He mentioned that TCI was the largest cable operator and that it was purely a cable company. It has 1 1/2 billion dollars worth of shareholders assets, and it was their intention to ensure that return on those investments were preserved in the best way possible.

He agreed with a number of points raised by Roy Neel, however, he emphasized that the point of departure was related to government intervention without sufficient regard for public interest. He pointed out that TCI had no intention whatsoever of quashing the TVRO business by charging unreasonable rates, but the question was who should determine these rates and how they should be determined. He asked whether they were to be related to the return on investment or whether they were to be artificially fixed without relation to cost, which in effect would undermine free enterprise.

TCI's position as to the reason for scrambling was basically two fold. Firstly, with the proliferation of TVRO's, a large number of which (probably a third) were moving into franchise areas, they wanted to protect the product integrity in their franchise area. This, he said, was what Roy Neel mentioned in his address regarding the illegal stealing of satellite signals by bars, motels, taverns, apartment complexes etc., with the reducing cost of earth stations. Sie mentioned that though they had the right to legally prosecute, it was very time consuming and difficult. Recently they had compiled a list of

legitimate SMATV operators in their franchise area and were astounded by the number of illegal operators. Secondly, it was very difficult for them to sell their product at a price (to recover their own expenses), when next door to their prospective buyer a dish owner does not pay a cent. He said TCI was not asking for inreasonable prices but just equity in the playing field. He further added that there were confusion and misrepresentations on the TVRO dealer's side following the passing of the Cable Act, which would also be solved with scrambling.

Sie mentioned that from a technology point of view both M/A Com and Scientific Atlanta on the previous panel listed the feature of reliability and quality of the reconstituted encrypted signal rather low, which infact to TCI was of the highest priority, because 99% of their revenue came from delivering reliable products. In this context he mentioned that TCI had chosen M/A Com because over the last six months they had held actual field tests and felt comfortable about the reliability and field performance of the technology.

TCI certainly agrees that it should make satellite cable programs accessible to TVRO owners at reasonable prices, and he said they try to set a single technical standard in order to avoid a "multiple boxes syndrome" (i.e., having to get different boxes for different services). In this context, he believed that scrambling should be introduced in an orderly manner. That is he said, if they were to assume that there were 1.2 million TVRO stations and say a million of them would buy the service, everybody would go to buy the decoders and from any projection he could make, the day after scrambling the demand for decoders would drop to 1/10th. He did not believe any manufacturer to be foolish enough or be forced to a 'ramp-up' schedule such as a requirement of a million decoders in one month followed by 50,000 the next month. TCI's suggestion was very simple, he said, and is fully in conformity with the law. He asked that a decision be given on scrambling by cable programers, which did not have to be coincidental, and also the cable operators in the franchise area be given the non-exclusive right to market to TVRO owners prior to full scale scrambling. If the TVRO owners did not want to pay for the programming now, they would just have to wait for the decoders to come if they decided to purchase programming after scrambling. If on the other hand they were willing to pay now for programming, the decoder requirement will be known and manufacturers could plan to produce decoders in advance of the scrambling date.

Sie mentioned that as for the question of pricing being reasonable, it would be related to a reasonable return on investment. He estimated the cost of scrambling to the cable industry to be between 50 and 90 million dollars. That is to equip the cable head-ends with decoders for say 20 channels, looking at approximately 7500 head-ends. Within this universe there would be about 240,000 to 250,000 TVRO owners and assuming that after scrambling the TVRO population would eventually double to say 500,000 in five years. This he said would therefore average about 65 TVRO's per average cable system. He estimated a cost of $12,000/- to equip each cable system and assuming a 12% return on investment just on the capital cost (not the

incremental cost) would equate to about $320/- per month or about $6.35 per subscriber per month assuming 80% penetration is achieved. In addition to this, whatever a programmer charges the cable operators would be passed on with a margin to the consumer. Also Sie mentioned that there were several other negotiations in progress with possibilities of other arrangements. He said that if the cable industry starts to scramble, it would save any third party interested in selling scrambled programming to TVRO owners, 50 to 60 million dollars of upfront cash, because the cable industry would already have paid for the cable head-end decoders. He believed this was necessary to protect product integrity and he said programming would certainly be accessible to the rural areas and TVRO owners; and those within the franchise areas would have the choice of an economic decision in the C-band area between cable and satellite reception.

In closing he said some trade magazines had suggested that TCI was really interested in scrambling C-band in order to launch its Ku-band DBS systems. This, he said, was not true. TCI views C-band scrambling as protecting product integrity and Ku-band as an adjunct - additional revenue, new revenue, and businesses in different markets. Ku-band would primarily fit urban markets, whereas C-band would be more suitable for rural areas. He emphasized that what they had accepted as suitable technology C-band had no relevance to their thinking for Ku-band, both in cost and performance.

Sie also said that they wanted to serve TVROs within TCI's franchise areas, because it has in place marketing and service organization and can offer TVRO owners this service option. TCI he said, would like to certainly evolve into delivering information and entertainment within geographic territories which happens to start with cable franchise areas. He said they were not wedded to co-axial cables. When they have the capability to serve a consumer in any efficient manner they would like to compete for that service.

Taylor Howard - Chaparral Communications / SPACE / Stanford Univ.

Taylor Howard began by briefly relating his background in satellite communications. He spoke of the 'planners dilemma' - that planners are not able to schedule scientific breakthrough. He also noted that there was no market survey that could tell what consumers would buy in the future. He then focussed on the planning for Direct Broadcast Satellites (DBS) in the light of technology and marketing as one now knows it - that is, after the breakthroughs have been made and the market survey replaced with practical experience and hindsight.

No one planned or foresaw that C-band (4GHz) would ever be used as it was today as a broadcast satellite. He said that technological reasons primarily relating to receiver sensitivity, international treaties, and the use of C-band by terrestrial

services, dictated that C-band would be a point-to-point service. He then went on to explain the 'marketing surprise'; Planners had always thought that a few channels would be adequate for providing entertainments, news, sports, religion, etc. This was convenient because it was possible to build a few high transponder satellites sending signals to two-foot antennas on earth. But now over 400 transponders are available at C-band. there has been a sudden expansion in the program base available. Six or 12 channels will no longer sell. He said that cable operators had long known that the 12 channel system was a dinosaur and that a very large number of channels were needed to succeed. The competition was at 150 and rising. Accordingly he said DBS's planning was changing. What was making the low power satellites usable on the ground was rapid advancement in low noise amplification technology driven by the burgeoning C-band market.

Howard noted that 5 years ago a few people recognized that K-band DBS as planned would not work and that C-band as an interim service would be with us for many years. To ensure that the "voice and light" were not turned off, they formed the Society of Private and Commercial Earth Stations (SPACE) which is the satellite industry's trade association. They were concerned at that time and for 4 years thereafter that each year legislation would appear in Congress outlawing satellite receiving systems.

Howard said that SPACE's three goals were, first, to affirm their right to exist by seeking and obtaining legislation and judicial rulings affirming the right to manufacture, sell, own and use home satellite earth station systems. This was achieved in 1984 via Section 705 of the Communications Act. Their second goal was to increase public awareness. Their third goal has been to promote C-band direct as a successful competitor among TV delivery systems domestically and internationally. This involves recognition of the need to compensate programmers.

SPACE, he said, made numerous offers to pay for programming and had also stated that scrambling was an appropriate mechanism to obtain payment. This they had said in Congress every year from 1980 to the present. He also mentioned that SPACE had given its word to pay for signals when obtaining the 1984 legislation, even if they were unscrambled, as long as it was on a fair and equitable basis.

Howard agreed that there were inequities and real problems with the present system and said that cable had a legitimate gripe when it came to earth stations receiving premium signals free, particularly when they are located in franchise areas. Scrambling he said, would solve the problem of signal theft for commercial use, by motels, bars, hotels, etc.; however, curiously scrambling would not solve cable's problem of internal theft - the 3 to 7 million homes stealing signals off the cable systems.

Howard said that although technology had developed rapidly, business and political aspects had not been taken care of, and two issues of money and power had been confused in some minds. The American system could take care of the confusion if

allowed to operate, and toward that end, SPACE had developed a specific position concerning payment and scrambling. First, the consumer should have the right of access to all signals coming from satellites and in particular to the means for decoding commercial programming. Second, programmers should be paid either through advertising, subscription, pay-per-view, or some yet to be conceived plan. Third, rates should be reasonable either through unrestricted competition or by legislation including regulation. Fourth, SPACE supports the entrepreneurial spirit of the advertiser supported services, encourages them to maximize their viewing audiences, and asks them not to succumb to anticompetitive moves by power seekers. Fifth, scrambling equipment should be low cost, user friendly, and widely available. Tha system should allow every screen to be addressed, decoded, and billed.

In conclusion, he said that we were right in the middle of making history. Soon there would be enough satellite earth stations installed, and they would be recognized in their own right. However, he felt that it was "better to get it late if necessary, but get it right." On the other hand, he said, cable would continue to be there and it had unique possibilities that satellite television would never have as did terrestrial broadcasting.

Speakers' Comments and Responses to Questions

Roy Neel - He said that John Sie and TCI were honorable players in this game and they made it sound awfully good in that they want to serve earth stations and they do expect prices to be fair and reasonable. If the marketplace does service these hopes that would be just fine. Legislation he said, in this case is a kind of hammer in the event that the marketplace develops differently.

He mentioned that Sie's mathematical analysis of low cost recovery was somewhat persuasive. Listening to M/A Com and Scientific Atlanta's presentations he said that there is a kind of concern for cable operators if the systems are entirely addressable from the head-end (programmers end). In which case there would not be much incentive in a few years for local cable operators. He inquired whether it would not be more sensible for a business enterprise to plant a $300/- dish instead of hardwiring every house in the community. This he said, may be the next real crisis for cable operators.

John Sie - He suggested that TCI was probably the first TVRO dealer 5-6 years ago when they formed a joint venture with Scientific Atlanta called Homesat. They wanted to sell dishes to individual homes very much like TVRO dealers today, but being a legitimate company they were forced to tell the buyers that they would have to negotiate viewing rights from the programmers. When Homesat was doing this and others were not, it was obvious they could not win, and as a result they finally withdrew from this

business.

The other point he addressed was that of theft from the cable systems, emphasizing that two wrongs did not make it right. He confirmed that they were working diligently in an attempt to stop cable theft by using a better audit and a better systems technology. But this did not have to stop them from working on the other side as well. He further said that TCI had been a partner which was granted the franchise to operate a cable vision in Washington, DC for which TCI had agreed to serve all in 5 years. However, they are under the protection of the cable act,as regards economic viability. The implied consent to operate, was on the basis that where it was possible to use alternate technology they would do so. In other words, TCI was not trying to stop TVRO dealers but trying to do whatever seemed to make economic sense, so that everybody could get a good return on investment. TCI is hopeful that some day Ku-band will come, in a different form than just simply a cable translation.

John Sie commented on the number of channels, confirming that there are 154. However, consumers, he believed, will never ask for, or use that many. He believed that there are only about 50 channels of programming that would appeal to most people. Out of which viewing habits would further reduce this number to perhaps 15 (i.e. in terms of regular viewing).

In response to a question, Sie said that TCI did not ask for exclusivity in its "talking" paper. He did not want TCI's request for a consortium for technical standards to be confused with its business request (on a one-on-one basis) for exclusive distribution. He said that TCI had a right to ask for exclusivity and the individual programmers had a right to give it to them on a one-to-one basis. He claimed that it was clearly a business decision. The problem only occured if they were to get in to a horizontal or positional group activity or conspiracy.

Taylor Howard - Howard expressed his fears on behalf of the trade association - that some group not necessarily cable, was going to dictate prices and tell people what they could watch and so on. He said that their push in the legislative and publicity arena, was to make sure it stayed a free and open market. In this context he noted that the cable industry had responded to it, as their plans had changed from white paper to white paper, and now essentially they were saying what John Sie stated. However, Sie voiced his disagreement, saying that they had maintained their open position for sometime.
