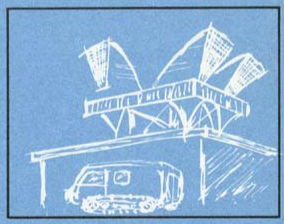
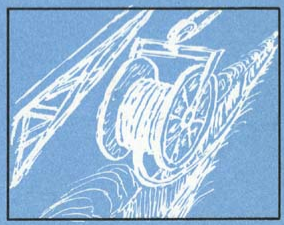
T&R NOTES

Transmission and Radio Notes

Volume 3, No. 3 September 1968





American Telephone & Telegraph Company
Engineering Department

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(4) New VHF Maritime Rules Adopted

On July 24, the FCC released a Report and Order setting forth new rules for the VHF Maritime radio services. These rules are to implement changes adopted at the World Administrative Radio Conference held in Geneva in 1967. While the new rules provide many changes for this service, this will discuss only those rule changes affecting VHF Maritime Class IIIB public coast stations and their ship station correspondents. The basic changes are a reduction of channel bandwidth to 25 kc instead of 50 kc. Deviation is reduced to ±5 kc instead of ±15 kc. Use of the narrowband channels results in an increase in Public Correspondence channels to 9 instead of the presently available 5.

The changeover period is scheduled to begin March 1, 1969 and will extend to July 1, 1974. On March 1, 1969, all U.S. licensees (coast and ship stations) will be required to operate with ±5 kHz transmitter deviation. All transmitters type accepted after this date must meet the new frequency tolerance of ±10 parts per million. Existing equipment may continue to operate with the present ±20 parts per million frequency tolerance until January 1, 1974. Ship station power has been set at 25 watts output and coast stations will be required to operate at 50 watts output except in special cases. Existing stations may continue present power until January 1, 1974. In addition a post limiter filter must be provided on all presently licensed transmitters at coast stations by January 1, 1971, and on existing shipboard transmitters by January 1, 1974. All equipment type accepted after March 1, 1969 must be so equipped.

The requirement that coast stations operate with domestic ships operating at ±5 kHz deviation and foreign vessels using ±15 kHz deviation and the 20 ppm frequency tolerance permitted until January 1, 1974, dictates the continued use of wideband receivers at the coast stations. In order to compensate for the 9.5 dB change in audio output of the receiver resulting from the decreased deviation, a compromise volume setting midway between the two levels is required. This will result in wideband modulated signals being delivered from the receiver about 4 to 5 dB above the optimum level and narrowband modulated signals a similar amount below this level. This condition is not desirable but it can be tolerated during the changeover period.

The assignment of the new narrowband channels has been scheduled for any time after March 1, 1969 through December 31, 1970 on a non-interference basis. After January 1, 1971 the rules specify that the assignment of these channels be assigned in accordance with the priority numbers specified in the rules. The probability of problems in this area will depend on VHF service growth and the pattern of that growth. Individual problems can undoubtedly be worked out when and if they arise.

The new rules designate 156.8 MHz for "Distress, Safety and Calling," and therefore this frequency must be monitored by coast stations at all times they are in operation unless a special exemption of the rules is obtained.

The changeover period from March 1, 1969 to January 1, 1974, will not allow optimum system operation but will permit reasonable service to be provided. Other means of achieving the changeover objective were suggested but were not adopted by the WARC on Maritime Mobile Services. These rules will ultimately make possible a better VHF Maritime service capable of considerably larger capacity than was possible under the existing rules.

V.B Robinett

1.05.2 Preparation of BSPs on FCC Procedures

As promised in the last issue of these NOTES, here is further information about this project. The planning and organizing phase has been completed.

The new sections will be located in Layer 5 of Plant Series Division 400 to be entitled, "FCC Regulatory Information." There will be three basic subdivisions covering: (1) general information, (2) procedures for establishing radio stations subdivided according to the class of service, and (3) miscellaneous information.

The general section will cover a brief history of radio regulation, the Communications Act of 1934 and the creation of the FCC including its organization and procedures. The various parts of the Rules and Regulations will be summarized and a glossary of terms frequently encountered in "FCC work" will be included.

Each of the "establishment" groups will consist of two A.T.& T. Standard BSPs for each class of service; e.g., point-to-point, mobile, rural radio, maritime, etc. In each case the first practice will discuss the procedures to be followed in establishing the particular type of radio station, and the second will cover preparation of the forms required.

Among the subjects to be discussed in the "procedure" section will be time schedules of when the various forms or applications should be initiated in order to meet the desired service date. The need for supporting documentation, or special forms, such as land approval, where public lands are involved, or FAA clearance where towers are near airports, will be included. In short, it is hoped that by specifying what is needed, why it is needed, when it is needed and to whom it is to be sent, an individual, perhaps one not highly experienced, will be assisted in complying with the FCC rules for establishing the station. Modifications to existing stations and the necessity for renewing licenses will also be covered.

The second practice in each group of two will cover the actual preparation of the forms involved – the applications for a construction permit and the license. Here the method of treatment will be to illustrate the completed forms with appropriate entries and an accompanying text to expand on the meaning or significance of the entry where desirable. Cross references between the sample entries and the text will be provided. We recognize that arranging the material in this manner will provide some redundancy. There are, or will be, considerable similarity between, for example, completing an application for a CP for a microwave station and a mobile station. There are, however, enough differences or points to be emphasized in one case and not the other that we feel having a series of self-contained "packages" – each covering a particular class of service – is an advantage for which it is worth accepting some duplication.

The third group will cover information on miscellaneous forms required in some instances but not in all. U.S. Forest Service, Coast and Geodetic Survey, FAA, etc., forms will be covered. Here we shall probably cover all of the information on the form in one practice (when it is applicable, how to fill it out, and special instructions relating to a particular class of service, if any).

Recognizing that no matter how one attempts to standardize procedures of this nature there are always local circumstances peculiar to a company or area, we have attempted to plan for a logical integration of augmenting local instruction. A company, or area, may supplement the standard instructions for a service package in the usual manner by addending the appropriate A.T.& T. section or issuing a replacement section for either the "procedure" practice or the "preparation of forms" practice. Alternatively, all of the supplementing local instructions may be gathered together irrespective of class of radio service, and issued as a single local section in numerical location we have reserved for that purpose. The choice of method will probably be best made on the basis of the nature and extent of the local instructions desired.

A general view of the status of this project is as follows. The Pacific Telephone and Telegraph Company task force referred to in the previous T.& R. NOTES article is preparing the "Completion of Forms" sections on point-to-point microwave radio, mobile radio, rural radio, telephone maintenance radio, and the miscellaneous section on the completion of the FCC Form 714 (FAA compliance). The companion "procedure" sections on point-to-point microwave and mobile radio are in preparation by

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2.10 Maintenance Test Equipment for All Systems

2.10.1

DuMont RF Coaxial Attenuator

An RF variable coaxial attenuator has proved to be a useful device when measuring the frequency and deviation of base station and mobile transmitters. It permits feeding small controlled amounts of transmitter RF energy to the measuring equipment. For a number of years the DuMont Company manufactured a model 21-1CBA attenuator, described in BSP 104-201-000, which is well suited for this purpose. Recently reduced demand has influenced the supplier to suspend production. However, if sufficient interest is evidenced by the Operating Companies through the placing of immediate orders, W.E. Co. can perhaps encourage the manufacturer to start producing them again. Although the final price cannot be determined at this time, we expect it to be in the $60-$75 range.

A call to Paul Redding, Area Code 212 393-2415, with a firm estimate of quantities immediately required by your company would prove very helpful. P.E.L. 6309 (1S3.7-90, dated August 19, 1958) describes the use of the 21-1CBA attenuator.

P.B. Redding

2.10.2 Computer Assistance in ATMS Planning

A study is underway to determine the need and usefulness of computer assistance in planning for the application of automatic transmission measuring equipment. The basis for the study is a computer program developed by the Bell Telephone Laboratories with appropriate modifications for adapting it to the associated company needs.

The input to the program consists of office and trunk data. The program then determines the optimum locations for test frames and remote office test lines, simulates the office by office installation, and provides the cost of each implementation step. The "optimum" choice is made through the consideration of cost per measurement.

Program flexibility is intended to allow rapid consideration of growth predictions, unique local requirements and equipment availability. The concept and procedures are now being validated through the use of actual associated company requirements. Upon satisfactory completion of this work, an engineering letter will provide details for the program use.

T.A. Saunders

2.11 Mobile Radio Systems

2.11.2) 3) Traffic Loading for IMTS

The Companies are continually asking for information regarding the number of customers that should be served on a mobile telephone system. There is no simple answer to this question. In this service, the Bell System is confronted with two masters, the FCC and the user. The FCC is interested in high spectrum use and the user is looking for a good grade of service.

While we may want to give the mobile user the grade of service he has come to expect from his land line telephone, this is not possible today. We must make some compromises. In planning for an inital mobile system or an addition, three parameters have to be considered: a) customer satisfaction, b) FCC requirements and c) economics.

If we add too many customers to a system, some customers may soon become dissatisfied with the service and discontinue it. On the other hand, if too few customers are serviced, the Commission will question an application for additional channels. Finally, the profitability of a system is greatly dependent on the number of customers serviced, as a larger number of customers reduces the revenue requirements for the common (land) equipment.

In order to provide some guidance on the "number of customers" question, we have prepared the graph shown herewith. On the graph we have superimposed the recommendations outlined in the latest Traffic Letter on the MK System (450 MHz IMTS) dated August 8, 1967, and in E.M. 337 dated June 26, 1967 which discusses FCC matters. The smaller systems, 1 to 3 channels, cannot meet both criteria, the FCC 50% occupancy requirement and the Traffic Department's minimum grade of service requirement. In such cases the FCC requirement is usually controlling. The larger systems can achieve both objectives and improved economics.

J.C. Salazar

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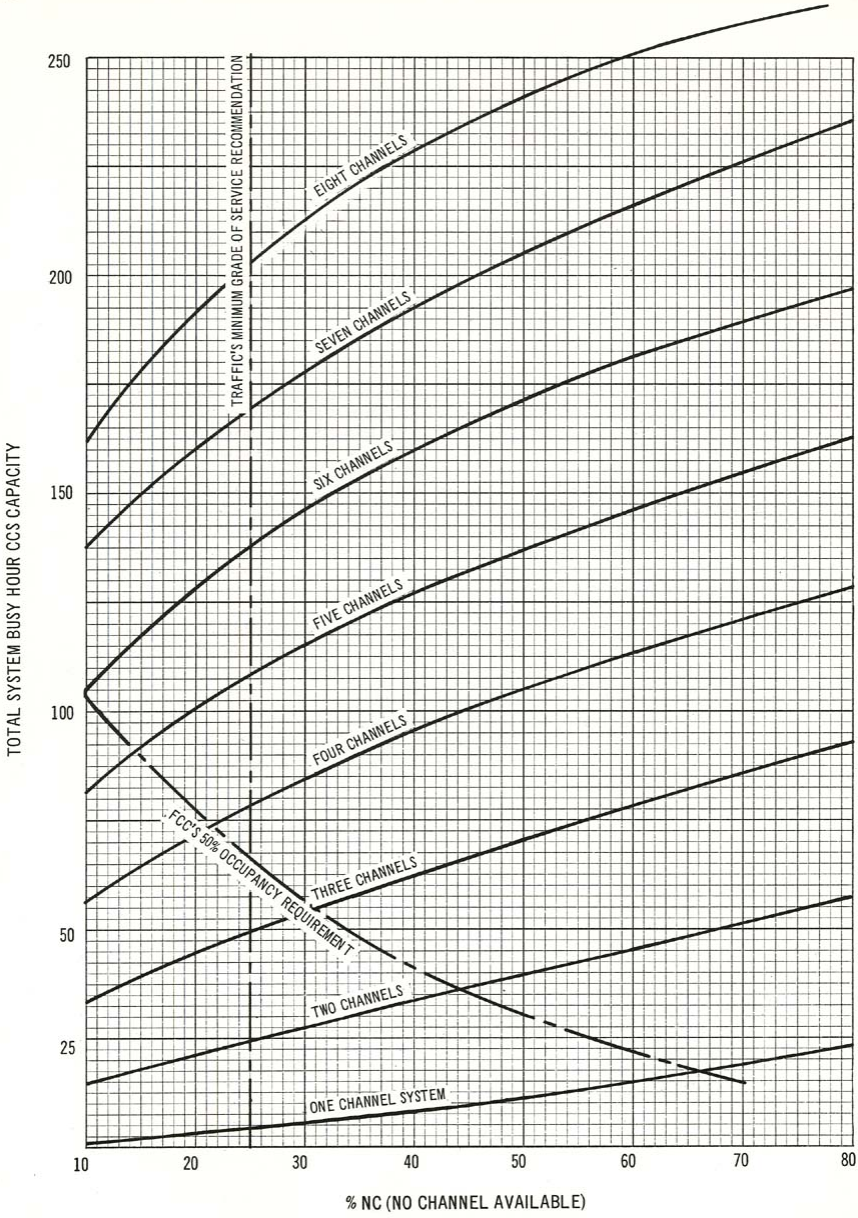
250
200
150
100
50
25
TOTAL SYSTEM BUSY HOUR CCS CAPACITY
TRAFFIC'S MINIMUM GRADE OF SERVICE RECOMMENDATION
EIGHT CHANNELS
SEVEN CHANNELS
SIX CHANNELS
FIVE CHANNELS
FOUR CHANNELS
THREE CHANNELS
TWO CHANNELS
ONE CHANNEL SYSTEM
FCC'S 50% OCCUPANCY REQUIREMENT
10
20
30
40
50
60
70
80
% NC (NO CHANNEL AVAILABLE)

3. PLANNING ENGINEERING

3.05 Pole Line Radio

A study is under way to determine Bell System application of a digital Pole Line radio system utilizing frequencies above 12 GHz, possibly in the 18 to 20 GHz band if suitable spectrum allocation can be obtained.

Under the present thinking, the physical configuration of a Pole Line repeater will consist of a 60 to 100-foot metal pole with a cylindrical container on top, housing both the solid state electronic apparatus and an "inverted periscope" antenna. The repeater could be powered either by commercially available power or by a thermoelectric generator located at the base of the pole, or a combination of both. Maintenance of the repeaters, though expected to be infrequent, would probably employ an aerial platform or "cherry picker" to move the man up to the repeater apparatus.

The Pole Line concept now being considered is a medium- or long-haul route-diversity system with average repeater hop lengths of about three miles for use where moderate circuit cross-sections from a few thousand to 32,000 voice channels or equivalent will be required. (32,000 circuits can be realized with the following qualifications – that there be a 2 GHz bandwidth allocated, that dual polarity be used, and that 4 level modulation techniques can be successfully employed.) It could also serve as a feeder to very high capacity backbone routes such as T5 and L5 coaxial systems and future waveguide systems. For intrastate networks, Pole Line could be used to carry a combination of telephone circuits, television and PICTUREPHONE, or other digital services. It is anticipated that by paralleling Pole Line systems, major long haul routes with high capacity, multiples of 32,000 voice channels, could be realized. Interference studies are under way to investigate the amount of degradation caused by a number of systems operating reasonably close to each other.

Preliminary cost analysis indicates that Pole Line will be economical and will fill a need between existing systems and future high capacity systems such as L5 and T5 with multitube coaxials and waveguide systems. However, it is not expected to be competitive where service requirements are within the capability of TM/TL Radio and similar systems.

Could such a system be useful to you, say 5 to 10 years hence? We would appreciate receiving your thoughts as to potential application in your company.

J.L. Boyette

3.06 Digits on TD-2A Radio (M2R) Terminal

Several developments are underway to permit the transmission of PICTUREPHONE signals over long haul facilities. Two developments of major importance are "Digits on TD-2A" and "Digits on L4 Mastergroup." In this edition of T.& R. NOTES we will introduce the "Digits on TD-2A" transmission system.

Digits on TD-2A is a time division multiplex digital transmission system operating at baseband over TD-2A or B radio channels. Essentially, the M2R system terminals time multiplex three 6.3 Mb/s binary inputs at T2 line speed into a four level 2 0 Mb/s (10 Megabauds per second) baseband signal. Each of the three digital inputs can be employed to transmit 6.3 Mb/s encoded signals from a PICTUREPHONE Codec, widband digital data or 96 T2 encoded voice channels. Digits on TD-2A is obviously not economically competitive with LMX for voice transmission over TD-2.

Digital regeneration is required at 250 mile intervals, preferably at regular TD-2 FM terminal locations. For long multihop radio links significantly greater than 250 miles, regeneration will be provided by equipping intermediate protection switching main stations with 3A FM terminals and baseband regenerators.

The first application of Digits on TD-2A will be between New York and Pittsburgh during the latter part of this year for the Westinghouse PICTUREPHONE Product Trial. We are preparing an introductory E.M. which will describe the Digits on TD-2A system in greater detail.

T.F. Benewicz

3.08 Coaxial Cable Carrier Systems

3.08.1 L5 Carrier

Development of a new coaxial carrier system has been authorized. Designated L5, it is expected to provide 9,000 telephone circuits (15 mastergroups) per pair of standard 0.375-inch coaxial units. This will be accomplished in a bandwidth of about 60 MHz and with nominal one-mile repeater spacings. The circuits will meet the long-haul noise objective of 40 dBrnc0 in 4,000 miles. It is expected that the 15 mastergroups will be arranged into two "jumbogroups" of 6 mastergroups and a partial jumbogroup at the top of the band with only 3 mastergroups. The top jumbogroup may be useful at full six mastergroup capacity for restoration purposes with considerable degradation in noise performance in the top 3 mastergroups.

It is planned that a digital signal of about 13.3 Mb/s rate will be transmitted in each mastergroup slot as with mastergroups 2 through 6 in L4. It is also expected that a digital signal of about 96.4 Mb/s rate can be accommodated in each of the jumbogroup slots including the top one. Thus, with regenerators at appropriate intervals, each coaxial unit can handle 200 to 300 Mb/s of digital information.

First message service for L5 is planned for 1973.

R. C. Harris

3.08.2 T5 Carrier

E.L. 75 announced the development of a high-speed digital carrier system designated T4. As development has proceeded, it has been decided that the bit rate, and hence the capacity, could be increased by increasing the number of signal levels while maintaining essentially the same baud rate with repeaters spaced at about one-mile intervals. Development is now directed toward such a system with a capacity of 8064 telephone circuits or 84 PICTUREPHONE circuits per pair of coaxial units. Alternatively, a pair of tubes could furnish six video channels in each direction. Television, data and PICTUREPHONE can be mixed with telephone circuits in any combination up to the maximum capacity of the system. This new system will be designated T5 rather than T4.

Firm schedules have not been established but the 1971 estimated service date for T4 will not be met by the T5 system. Service for T5 is expected in the mid-seventies.

R.C. Harris

4.02 ORGANIZATION

Transmission Section

Effective April 1, Mr. James O. Dodson, of the Illinois Bell Telephone Company accepted a position as engineer in the Transmission Performance Group. Mr. Dodson will be responsible for Transmission Design and maintenance considerations of Subscriber Loop Systems. He is located in room 1130A and may be reached on Area Code 212 393-4049.

Effective April 15, Mr. W.C. Herron, of the Transmission Performance Group accepted a position with the Indiana Bell Telephone Company, Indianapolis, Indiana.

Effective June 1, Mr. Harry Vickroy, Jr., of the Northwestern Bell Telephone Company, accepted a position in the Transmission Performance Group. Mr. Vickroy will be working on the Practices dealing with Transmission Performance Indexes. He will be located in room 1128A and can be reached on Area Code 212 393-3231.

Effective June 17, Mr. John J. Jetzt, of the Outside Plant Section, accepted a position as engineer in the Transmission Performance Group. Mr. Jetzt will be responsible for work dealing with Long Subscriber Routes. He is located in room 1128A and may be reached on Area Code 212 393-3027.

Effective July 1, Mr. Thomas A. Saunders, of Southern Bell Telephone and Telegraph Company accepted a temporary assignment in the Short Haul Transmission Systems Group. Mr. Saunder's work is concerned with application methods for the Automatic Transmission Measuring System and Remote Office Test Lines. He is located in room 1131A and may be reached on Area Code 212 393-3495.

Effective July 1, Mr. Donald L. Whitney, of Southern Bell Telephone and Telegraph Company accepted a temporary assignment in the Transmission Performance Group. Mr. Whitney's work is concerned with the Loop Transmission Design Index Plan. He is located in room 1128A and may be reached on Area Code 212 393-3877.

Effective July 15, Mr. Lawrence A Hohmann, Jr., of the Bell Telephone Laboratories, has accepted a position as Engineering Manager – Transmission Studies. He will be responsible for studies relating to improvement of transmission engineering methods. Mr. Hohmann is located in room 1126C and may be reached on Area Code 212 393-3701.

Effective July 22, Miss Patricia A. Roach accepted the position of Special Stenographer in the Short Haul Transmission Systems Group. Miss Roach is located in room 1135A and may be reached on Area Code 212 393-3576.

Effective July 22, Miss Christine M. Majchrzak accepted the position of General Clerk in the Coordination and Protection Group. She is located in room 1132 and may be reached on Area Code 212 393-3340.

Effective August 15, Mr. G.A. Faneuf, of the Transmission Performance Group accepted a position with the New England Telephone and Telegraph Company in Boston, Massachusetts.

Effective September 1, Mr. W.D. Gramley of the Short Haul Transmission Systems Group accepted the position of Switching-Supervisor with the Illinois Bell Telephone Company.

Radio and Guided Waves Section

Effective September 16, 1968, Mr. V.B. Robineet, Engineer in the Radio Frequency Coordination Group, has accepted a position in the Chief Engineer's organization of Pacific Telephone and Telegraph Company, Los Angeles – Central Area.

Effective August 26, 1968, Miss Teresa C. Matier accepted the position of Special Stenographer in the Radio Frequency Coordination Group. Miss Matier is located in room 1704 and may be reached on Area Code 212 393-4448.

5. TRANSMISSION AND RADIO INFORMATION

The following information has been forwarded since the last issue of TRANSMISSION AND RADIO NOTES.

E.M.'s

E.M. 788 – Bell System Practices – Plant Series – Cancellation of Section 940-330-101

E.M. 797 – U1 Carrier System – Design Changes for Improved Performance

E.M. 813 – Short Haul Radio – Buildings, Housings and Associated Equipment (1S3.8-29)

E.M. 835 – Local Television Transmission Service – Effective Date for Frequency Changes (1S4.1-314)

E.M. 865 – Broadband Terminals – LMX – Carrier Systems – Status of Equipment Changes (1S3.16F-22)

E.M. 878 – TD-2 Radio Receiver Control Panel, J68330B-1 – False Cycling of Protection Switching Caused by Oscillations in 313C Gas Tube (1S3.9G-81)

E.M. 879 – Television – Hewlett-Packard 653A Oscillator (1S3.17B-5)

E.M. 885 – TD-2 Microwave Radio, Clarification of Wiring Information for Filters for 130 Volt and 250 Volt D-C Power Leads in J68331A Auxiliary Station Repeater Bays

E.M. 912 – Western Electric Turnkey Service for Microwave Systems (1S3.9F-119, 1S3.9G-83)

E.M. 929 – FCC Rules – Revision of Parts 21.701 and 21.703 (1S4.1-317)

E.M. 930 – Telephone Maintenance Service – Narrowband Radio Channels in 450-470 MHz Band

E.M. 931 – FCC Radio Equipment List – March 5, 1968 (1S4.1-318)

E.M. 936 – Short Haul Radio – Crosstalk in TL/TM Order Wire and Alarm Panel (1S3.9U-31)

E.M. 938 – Broadband Terminals – LMX – Use of T-Type Connectors for Inserting 560 MHz Restoration Pilots (1S3.16F-23)

E.M. 943 – Broadband Terminals – Primary Frequency Supply (J68857M) – Modification of Maintenance Fixture Assembly (ED-50904-30 G1) (1S3.16F-24)

E.M. 945 – Replacement of 2A Sending Panels

E.M. 959 – N and ON Carrier

E.M. 963 – New Test Power Outlet Providing -26 dBm at 1000 Hz for N2 and N3 Packaged Bays

E.M. 968 – Point-to-Point Microwave – FCC Emission Designator (1S4.1-321)

E.M. 980 – TD-3 Radio – Differential Absolute Delay Equalization

E.M. 982 – Use of E3C, E4C and E5D Signaling Units in Trunks Measured with TP2

E.M. 983 – Modification Equipment for AC Operation of 3A Noise Measuring Sets

E.M. 988 – 3CR Noise Measuring Set (J94003CR)

E.M. 993 – KS-20312 Program Amplifier

E.M. 1004 – ON Carrier Systems – Channel New Gain Instability due to Excessive Shift in Frequency of Received Carriers

E.M. 1011 – Procedures for Using 25A Gate – 6A Combinations and the 6F with the 7A CFNMS

E.M. 1014 – Bell System Practices – Rearrangement of Division 405

E.M. 1015 – Renewal of Rural Radio Service Licenses (1S4.1-320)

E.M. 1022 – T1 Carrier – General Engineering Complaint 1532000

RADIO AND GUIDED WAVES SECTION

Organization

H.E. WEPPLER – Engineering Director – Radio and Guided Waves (3291)

Miss Thomas – Secretary (3292)

G.G. Ericson – Engineering Manager – Microwave Systems

Microwave Systems
Wire Line Entrance Links
Control Systems for Broadband Facilities
Video Transmission Systems (Intercity and Local)

R.C. Harris – Engineering Manager – Microwave and Guided Wave Planning

Planning for future transmission systems for the long haul network, including microwave radio and satellite systems, and coaxial cable and other guided wave systems

R.T. James – Engineering Manager – Guided Wave Systems

Long Haul Carrier (L1, L3, L4, T5, etc.)
Broadband Multiplex Terminals
Submarine Cable Systems
RF Cable Distribution Systems (CATV, etc.)

J.B. Keane – Engineering Manager – Radio Frequency Coordination

Frequency allocations and FCC liaison. Also, radio frequency interference and radiation matters, and functions common to the entire Section.

G.S. Zilis – Engineering Manager – Mobile and Special Radio Systems

Radio services below 1000 MHz, includes vehicular, air-ground and hand-carried mobile radio systems; maritime services; high frequency overseas radio; and VHF/UHF point-to-point systems.

MICROWAVE SYSTEMS GROUP

G.G. Ericson (Grant) – Engineering Manager – Microwave Systems (393-3604)

J.D. Crawford (Jack) – 393-3315

TM Microwave Systems
TL Microwave Systems
Tropospheric Scatter Systems

C.W. Houchin (West) – 393-3770

Outside Suppliers Microwave Equipment
Wire-Line Entrance Links
TV Pickup and Portable Microwave Equipment

W.H. Keller (Bill) – 393-2120

TJ Microwave Systems
TJ/TM-1 Microwave Systems
Broadband Channel Restoration

R.W. Krieger (Bob) – 393-2294

TD-2 Microwave Systems
TH-1 Microwave Systems
3B FM Terminals
Protection Switching Systems

C.L. Ostrofe (Charlie) – 393-2484

Video Transmission Channels (Intercity and Local)
TIDISOUND

J.P. Robertson (Jim) – 393-2455

TH-3 Microwave Systems
TD-3 Microwave Systems
3A FM Terminals
200A Terminal Switching

Miss L.V. Meadows (Linda) – 393-2286

Section Clerical Activities
Filing, Typing
Attendance Records

Miss J.M. Zimmermann (Joan) – 393-3605

Maintenance of Correspondence Records, Dictation and Typing
Filing, Assistance on Engineering Studies
Systems Data

MICROWAVE AND GUIDED WAVE PLANNING GROUP

R.C. Harris (Bob) – Engineering Manager – Microwave and Guided Wave Planning (393-3751)

J.L. Boyette, Jr. (Joe) – 393-3329

Studies of Pole Line Radio

T.G. Cross (Tom) – 393-2462

Studies of Communication Satellite Systems

O.C. Foster (Tony) – 393-3044

Studies of Communication Satellite Systems
CCIR – Space Communications

A.S. May (Al) – 393-4344

Studies of Future Radio Relay System Needs
CCIR – Radio Relay Systems

A.J. Uhlmann (Al) – 393-2611

Studies of Future Coaxial System Needs
Studies of Proposed Waveguide Systems

Miss M.F. Scola (Marilyn) – 393-2286

Maintenance of CCIR Records
Assistance in Engineering Studies
Stenographic

GUIDED WAVE SYSTEMS GROUP

R.J. James (Dick) – Engineering Manager – Guided Wave Systems (393-4497)

T.F. Benewicz (Tom) – 393-2002

- MMX (Cable and Radio)
- Digital Systems
  - T5 Transmission System
  - Digital Multiplex (Primary Responsibility)
  - Digits on TD-2; L4
- PICTUREPHONE Transmission Systems
  - Trial Arrangements
- Spectrum Usage Problems
- Synchronization Problems
- Standard Frequency Supply
- L1, L3 Transmission Systems
  - (Secondary Responsibility)

G.W. Hatch (George) – 393-4366

- LMX (Except Channel Banks)
- Digital Multiplex (Secondary Responsibility)

A.J. Haushamer (Al) – 393-3350

- BSP Activities

E.V. O'Connell (Ed) – 393-2923

- CATV Transmission Systems
  - Sub-Channel Systems
- Closed Circuit TV (Cable Systems)
  - Education and Industrial TV
- Bell System Internal TV Applications

W.F. Spencer (Bill) – 393-4209

- Special Coaxial Systems
  - Studies and Application
- Noise Studies
- L4 Transmission Systems (Secondary Responsibility)
- L5 Transmission Systems
- Trunk Conditioning
- CATV Transmission Systems (Secondary Responsibility)

J.A. Wood (Jim) – 393-2586

- Type J and K Transmission Systems
- Type L1, L3, L4 Transmission Systems
- Submarine Cable Systems
  - TASI
  - Other Speech Compression Systems
- L5 Transmission Systems (Secondary Responsibility)

Miss E. Parada (Elaine) – 393-4498

- Maintenance of Group Records
- Special Dictation
- Assistance to Engineers in the Group

RADIO FREQUENCY COORDINATION GROUP

J.B. Keane (Jim) – Engineering Manager – Radio Frequency Coordination (393-4447)

B.C. Jamison (Jamie) – 393-2254

FCC-Telephone Co. liaison relating to:
- Land Mobile, Rural, BELLBOY Radio Services
- Telephone Maintenance Radio Service
- Interstate facilities (Section 214 of the Comm. Act)

FCC liaison relating to microwave system engineering matters
Matters relating to antenna towers (FCC and FAA)

R.M. Reid (Dick) – 393-2180

FCC-Telephone Co. liaison relating to:
- Common carrier microwave services
- Interstate facilities (Section 214 of the Comm. Act)
- CATV

– 393-3017

FCC-Telephone Co. liaison relating to:
- Experimental, Maritime, Air-Ground Radio Services
- Certification and compliance with FCC Rules, Parts 15 and 18
- Interference and Coordination
- Mechanized station records
- Radiation matters
- CCIR Administration

J.B. Fitch (Jack) – 393-2946

BSP Coordination for entire Section
Preparation of BSP's on FCC radio application procedures

Miss A.M. Boyne (Alice) – 393-3926

Managing Editor, TRANSMISSION AND RADIO NOTES
BSP and General Letter record files
Preparation of Conference Material

Miss M. Nigro (Madeline) – 393-2394

Records of Bell System Radio and 214 Applications filed with the FCC
Bell System Radio Station Records
Bell System Broadband Map

Miss T. Matier (Terry) – 393-4448

Maintenance of FCC Rules and Regulations; FCC Dockets, Public Notices and Correspondence
Records of General Letters
Circulation Records, TRANSMISSION AND RADIO NOTES

MOBILE AND SPECIAL RADIO SYSTEMS GROUP

G.S. Zilis (George) – Engineering Manager – Mobile and Special Radio Systems (393-3465)

P.D. Bodman (Phil) – 393-2773

Preparation of Practices on Mobile and Special Radio matters, primarily of an engineering nature.
Review of all new and revised mobile and special radio BSPs.
B.S.R.S.

E.W. Borden (Ed) – 393-3860

Mobile Radio Transmission, Propagation, Interference and Antenna Problems
Special Studies
CCIR Study Group XIII

M.C. Fruehauf (Milt) – 393-3550

BELLBOY Personal Signaling Service
Public Air-Ground Systems
Telephone Company Maintenance Systems
Private Mobile Systems for Military and Federal Government

R.G. Buck (Bob) – 393-3029

Vehicular Mobile Telephone Systems (MJ, MK, Manual, Railroad)
Rural Radio Systems, including VHF/UHF Point-to-Point

J.C. Salazar (Joe) – 393-2517

Planning for Future Mobile Systems below 1000 MHz including:
High Capacity Systems
"Lineless" Extension

P.B. Redding (Paul) – 393-2415

HF Point-to-Point
Maritime Services (High Seas, VHF, Coastal Harbor)
R.T.C.M.
Test Equipment

Miss P. Kelly (Pat) – 393-3466

Dictation, typing and filing