

Radio Notes

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FREQUENCY ALLOCATIONS - 25 TO 890 MEGACYCLES

1

AROUND AND AROUND SHE GOES . . .

Although Bell Laboratories still hasn't officially disclosed the gender of Telstar, we like to think of this little beauty as "she." We should all be very proud of her accomplishments in behalf of the United States and the Bell System. Practically every time she goes around, some new record or spectacular first is established and probably will be for some time to come. Below is a partial highlight summary of accomplishments.

July 10

First satellite telephone call — Mr. Kappel to Vice President Johnson

First television — live and taped — from Andover (seen in England and France)

First facsimile (pictures transmitted) — received at Andover, New York, Washington and Holmdel, N.J.

First data transmission — 1000 words per minute — Andover to New York

Eight simultaneous telephone calls to various U.S. points

Satellite distance measurements

July 11

Television — taped — from France to Andover

Television — live — from England to Andover

Television test patterns to England and France

July 12

Received television test patterns (photographed and measured) from England Satellite signal strength measurements

Two-way telephone measurements to England and France

July 13

First transatlantic ceremonial telephone calls

1. To Paris — Messrs. McNeely, Wingert and Botkin to Mr. Marrette, General Gavin and Mr. Marzin

2. To England — Mr. McNeely to Sir Ronald German (Director General of BPO)

Facsimile (photo transmission) — simultaneously sending and receiving with England

Andover to Andover television measurements

Two-way telephone and noise measurements to England and France

July 14

Tracking experiments with England

Circuit performance measurements with England

Simulated 600 one-way phone calls to England

Noise measurements

July 15

Color television measurements

Signal interference tests

Tracking experiments

July 16

Noise and power level measurements

Television noise and interference tests

Television tests and measurements

July 17

Color television slides, without sound, from Goonhilly, England to Andover

Television tests to England

Distortion tests

July 18

Transmission tests to Holmdel

Antenna measurements

Noise measurements with England

Television and telephone loading tests

July 19

Color television slides with accompanying sound from Murray Hill to Andover and England

24 two-way phone calls — London to New York (press calls) — 4 sets of 6 simultaneous conversations

July 20

Facsimile (photo transmission) Paris to New York and New York to Paris

Technical data transmission tests (magnetic tape to magnetic tape) — Andover to Pleumeur Bodou and Pleumeur Bodou to Andover

In addition to the tests and experiments listed, the Telstar satellite is transmitting back on every visible pass 115 measurements of operating conditions such as:

Satellite temperature and pressure

Radiation intensity and damage

Battery condition

Satellite position relative to the sun

Currents and voltages of the satellite radio equipment

2

TELSTAR TECHNICAL TOPICS

Tracking and prediction operations are proceeding very well, sufficiently so that on succeeding passes, the main horn can acquire the satellite directly from predicted coordinates without need of assistance from the VHF beacon or precision microwave tracker.

Transmission characteristics are normal or are the same as when measured on the ground. Digitalized voice signals have been tried and worked successfully. High speed data (> forty kilobits) has not been tried as yet nor have measurements of doppler effects.

Ground station limited bandwidth with FM feedback is about 3 mc — with feedback removed about 5 mc. Color signals sent with feedback removed were good and had only 1 db of differential gain and 5° of differential phase. However, system FM break margin is reduced to only a low 4 to 5 db without feedback. Subsequent alignment brought figures down to less than 1 db and 2°, respectively.

The orbit is near perfect, with its satellite spin axis oriented 89° from a line to the sun. This measurement is good within $\pm 1^\circ$. This accuracy is attributed largely to the BTL-developed Titan guidance system (there have been 80 launches using this guidance system and only one failure, TIROS V).

The satellite spin rate is close to estimated and is now spinning at 178 rpm. This rate is decreasing by 0.44 rpm per day. The rate will be only about 2/3 of its present rate in 1 year and in 2 years it will spin at only about 100 rpm. After 3 or 4 years its rate may be only about 20 rpm and it may begin to tumble which would seriously decrease its usefulness.

Measurements indicate that radiation is somewhat more intense than expected. Some degradation in output from test solar cells has been observed. The solar cells seem to be performing efficiently (1/2 ampere output at 27-1/2 volts). Operation of the VHF beacon requires 2 watts, telemetry 1 watt, and with the main communication traveling wave tube amplifier turned on, a total of 35 watts is consumed.

The satellite was operating continuously in sunlight until July 21 and it now is occasionally in the earth's shadow.

The major axis of the elliptical orbit of the satellite will precess with time and by next fall the perigee will be over the northern hemisphere and not in a good position for testing due to short visibility time.

Nothing appears to have been damaged or hurt in the launching operation. The satellite design seems to be solid.

3

PUBLIC PHONE SERVICE INAUGURATED TO COMMERCIAL JETS

Recently two commercial airlines started offering public airground telephone service to their passengers on two jet aircraft utilizing the ten ground stations being provided by the Bell Operating Companies in the northeast quadrant of the United States.

Trans World Airlines inaugurated the service on July 25th on one of its Convair 880 jets flying between New York, Chicago and St. Louis; and American Airlines followed a few days later by equipping one of its Convair 990 jets for the service. Initially, the service is being offered on an experimental basis. After a period of evaluation, it is expected that service will be expanded to include additional commercial aircraft in the near future.

At present a total of some 40 aircraft are equipped for air-to-ground telephone service.

4

TL PACKAGED BUILDING

To minimize TL radio station costs where an outdoor cabinet is not used, the Western Electric is preparing to offer a "packaged building" for this purpose. Such a building or hut would be completely equipped, wired and tested at the Merrimack Valley Works prior to shipment.



SMALLER BUILDING

Although these shelters can be provided in any desired size, two sizes will be standardized:

- (1) 7 x 7 x 8 feet
- (2) 7 x 16 x 8 feet

The smaller hut will house a complete diversity repeater (4 TL and 1 miscellaneous bay) while the larger will accommodate a fully loaded TL repeater (12 TL and 2 miscellaneous bays). These huts have unpainted aluminum exterior, about 2-inch fiberglass insulation and hard-board inner walls. A roof mount is being designed to hold two 5-foot dish antennas.

Cost of the smaller building is estimated to be about \$1800. Shipping a completely equipped station should result in significant savings of time and installation effort, when compared to an "on site" installation at a remote location.

5

VHF MARITIME MOBILE SERVICE AFFECTED BY ADOPTION OF FCC DOCKET 14375

As mentioned in the January issue of RADIO NOTES, the FCC has issued a Notice of Proposed Rule Making (Docket 14375) which would affect the VHF maritime radio service. This docket, which was changed from its original version was adopted by the Commission on July 13, 1962 and will make substantial changes to Parts 7, 8 and 14 of the FCC Rules and Regulations. The amended Rules will become effective October 1, 1962.

Two additional duplex channels in the VHF maritime band have been authorized for public correspondence use. This increases the total to five. The paired frequencies for these public correspondence channels will be 161.80/157.20 mc, 161.85/157.25 mc, 161.90/157.30 mc, 161.95/157.35 mc and 162.00/157.40 mc. These frequencies are also among the international list of public correspondence channels.

Voluntarily-equipped ship owners will be permitted to use single channel VHF radiotelephone equipment instead of the currently required multi-channel equipment. The cost of the multi-channel equipment was considered too high by many ship owners and therefore they did not install any radiotelephone equipment. With a single channel radiotelephone the cost is reduced and therefore this is less of a deterrent to the installation of the equipment. From a safety viewpoint, having a single channel radio communications system is preferable to not having any equipment. Since the single channel may be a public correspondence channel, it is believed this new

ruling will stimulate growth in our VHF maritime mobile service.

If the ship customer is not equipped with selective signaling equipment, voice calling from the VHF maritime coast station will be required. This is a departure from our previous policy of stressing the use of selective ringing. The Commission, however, feels that voice calling, especially to foreign ships, is a requisite at this time. Although the advantages of selective ringing are recognized, it was noted that a standardized international selective calling system has not yet been adopted.

Several areas affected by these rule changes are currently being reviewed at "195":

- (1) Traffic Operating Procedures
- (2) VHF Maritime Mobile Service tariff revisions
- (3) Frequency tolerance requirements of coast station and ship equipment effective January 1, 1964

These items will be covered in more detail in the future.

6

NEW MICROWAVE TOWER CHANGES LOS ANGELES SKYLINE

A most challenging project recently completed by the Pacific Company in Los Angeles is the erection of a new microwave antenna tower. This tower is atop the company's new toll building in downtown Los Angeles.

The structure was needed to meet the in service date for the final link of the Los Angeles-Salt Lake City TD-2 route.

The architectural features of this tower were necessary to satisfy requirements of a community redevelopment agency. The height was needed to assure radio path clearances of present and future tall buildings in the civic center area of Los Angeles. This area is about 1 mile north of the toll office.

In considering future growth, the horn deck has space for a total of eight horn reflectors (four converging routes). The uppermost point of the structure reaches 234' above the rooftop, a total of 321' above ground, and the horn deck is 281' above the sidewalk.



7

PREPARATION FOR TELSTAR TV PROGRAM TO EUROPE

Northwestern Bell radio people spent a hectic ten days preparing for the South Dakota portion of the Telstar TV program to the European networks on July 23. Three camera pickup locations were involved, one in the middle of the buffalo grazing area of Custer State Park, one on top of Mt. Coolidge and the third at Mt. Rushmore. Voice circuits of various kinds as well as



CUSTER STATE PARK AND BUFFALO GRAZING AREA MICROWAVE TRANSMITTER POINTING TO MT. COOLIDGE

program channels were also required to complete the overall production.

Radio men from Minnesota, Iowa and Nebraska, equipped with portable microwave and VHF radio systems, cable, amplifiers, clampers, compasses and binoculars, converged on the Black Hills area. All equipment was installed and interconnected successfully despite the sometimes potential hazards of mountain goats, wild donkeys, antelope, buffalo, rattlesnakes and tourists.



MT. RUSHMORE - RECEIVING TERMINAL FROM MT. COOLIDGE - RUSHMORE MONUMENT IN BACKGROUND.

The arrangement consisted of one 8-mile microwave link, with audio, from Custer Park to Mt. Coolidge, one 9-mile link, with audio, from Mt. Coolidge to Mt. Rushmore and two 15-mile channels from Mt. Rushmore to Hermosa. This is a microwave repeater station owned by KOTA-TV of Rapid City, which extends south to a point near Cheyenne. This system was reversed for the Telstar broadcast and interconnected with the TD-2 system at Cheyenne. From here

the program was fed to Los Angeles and back over the network via New York to the Telstar transmitting station at Andover.

Audio program service was provided over two VHF channels from Mt. Rushmore to Rapid City.

8

REPAINTING ALUMINUM PORTABLE TOWERS

An Unnumbered Letter dated July 11, 1962 has been issued to Chief Engineers with copies for General Plant Managers, recommending a repainting procedure for portable aluminum towers.

It had been noted that some portable aluminum scaffold type tower sections were impaired as the result of improper processing while being stripped of paint in preparation for repainting. Aluminum scaffold sections were immersed in a strong bath of sal soda solution and then sand blasted. The stripping solution and sand entered the partially closed tubular members and was not removed after cleaning. Subsequently, while in use, moisture entering the non-watertight members encouraged corrosive action between the alkaline substance and the aluminum. That portion of the tube in which the alkaline substance lodged was eventually eaten away from the inside. Fortunately good inspection procedures were followed and this situation was recognized before any accident occurred.

A recommended procedure is attached to the General Letter for refinishing any portable aluminum tower or scaffold sections.

9

CONELRAD CHANGES

The Department of Defense's re-evaluation of requirements for CONELRAD has resulted in a determination that many of the previous needs no longer exist.

Pursuant to the DOD's determination the FCC released an order on July 16, 1962 which deletes CONELRAD Plans, Rules and Manuals associated with services other than broadcast, marine and aviation.

Specifically the Domestic Radio Facility Division has informally indicated to us that

pending and future applications under Part 21 will not have to provide for CONELRAD requirements. In some instances, even though Part 21 has not included specific rules covering CONELRAD, special conditions have been specified on authorizations to insure compliance with the CONELRAD Plan. These conditions will have to be met until such time as license modification procedures have been worked out and completed.

A letter is being prepared which will give more details on the CONELRAD changes.

10

WHAT DOES Gc MEAN?

Gc, of course, is "gigacycle." We used it recently in RADIO NOTES items on the allocations of frequencies for space communications and received several inquiries concerning its meaning. As a result, we thought it might be of interest to give here the table of metric multiplier prefixes used for extremely large and extremely small quantities.

Prefix	Abbreviation	Multiplier
tera	T	10^{12}
giga	G	10^9
mega	M	10^6
kilo	k	10^3
hecto	h	10^2
deca	da	10
deci	d	10^{-1}
centi	c	10^{-2}
milli	m	10^{-3}
micro	m	10^{-6}

nano	n	10^{-9}
pico	p	10^{-12}

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CONTRIBUTIONS ACKNOWLEDGED

Two of the Associated Companies have contributed articles to RADIO NOTES this month. Claude Stevens, Radio Transmission Engineer, Minnesota Area, Northwestern Bell Telephone Company, sent us the article on the preparation of the Telstar program, and W. A. Miller, Staff Engineer, Los Angeles Area, Pacific Telephone and Telegraph Company, gave us the story on the new type of microwave tower construction.

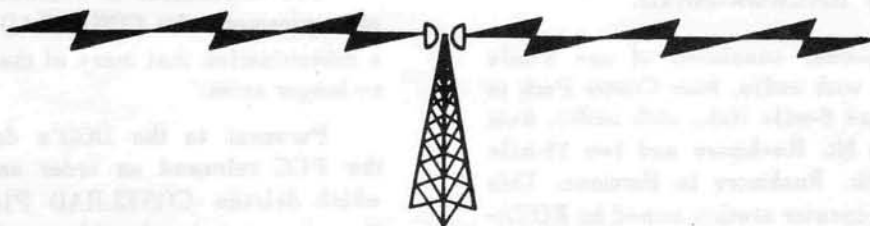
These contributions are very much appreciated and we would like to urge others in the Associated Companies to send us any material they think would be of interest to readers of RADIO NOTES.

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ORGANIZATION CHANGE

On August 16, D. Lanier Bonner of the Southern Bell Telephone Company joined the Mobile Radio Group. He will assume responsibility for BELLBOY systems and for the administration of the Radio Series of Bell System Practices. He will be located in Room 1710B and may be reached on Area Code 212 393-2517.

On September 1, Al Fernald, Special Projects Radio Engineer, is returning to the New England Company as Transmission and Protection Engineer, Boston.



RADIO INFORMATION

The following have been forwarded since the last issue of RADIO NOTES.

BSPM 825 R90.314.31, Issue 2 - J68331 Transmitter-Receiver Bay -
Bay Tests (TD-2 Radio System) -
Transmission Characteristics -
TD-2 Radio Receiver All Stations

R90.314.32, Issue 2 - J68331 Transmitter-Receiver Bay -
Bay Tests (TD-2 Radio System) -
Transmission Characteristics -
TD-2 Radio Transmitter Auxiliary
Stations Only

R90.314.33, Issue 2 - J68331 Transmitter-Receiver Bay -
Bay Tests (TD-2 Radio System) -
Transmission Characteristics -
TD-2 Radio Transmitter Main Sta-
tions Only

Cancelled Sections

R90.314.41, Issue 1 - J68331A Transmitter-Receiver Bay -
(TD-2 Radio System) - Bay Tests
Using the J68345A Transmitter-
Receiver Test Set Transmission
Characteristics - TD-2 Radio Re-
ceiver - All Stations

R90.314.42, Issue 1 - J68331A Transmitter-Receiver Bay
(TD-2 Radio System) - Bay Tests
Using the J68345A Transmitter-Re-
ceiver Test Set - Transmission
Characteristics - TD-2 Radio Trans-
mitter - Auxiliary Stations Only

R90.314.43, Issue 1 - J68331A Transmitter-Receiver Bay
(TD-2 Radio System) - Bay Tests
Using the J68345A Transmitter-Re-
ceiver Test Set Transmission Char-
acteristics - TD-2 Radio Trans-
mitter - Main Stations Only

BSPM 825A -

BSPM 825B -

BSPM 826 R10.312.00, Issue 2 - J68336K FM Terminal Transmitter -
(TD-2 Radio System) - (Operating
Methods)

- R10.314.10, Issue 2 - J68336K FM Terminal Transmitter - (TD-2 Radio System) - (Maintenance Methods) - J68336M Control Unit
- R10.314.43, Issue 2 - Tests and Adjustments of the J68336F Limiter-Amplifier Using the J68345A Transmitter-Receiver Test Set
- R10.314.44, Issue 2 - Tests and Adjustments of the J68336F Limiter-Amplifier Using the J68337A FM Test Set
- R10.314.52, Issue 2 - Tests and Adjustments of the J68336N AFC Unit Using the J68337A FM Terminal Test Set
- R10.314.53, Issue 2 - Tests and Adjustments of the J68336N AFC Unit Using the J68337H FM Terminal Test Set
- R10.314.54, Issue 2 - Tests and Adjustments of the J68336N AFC Unit Using the J68340A Test Bay
- R10.314.55, Issue 2 - Tests and Adjustments of the J68336N AFC Unit Using the J68345A, List 1 or List 3 Transmitter-Receiver Test Set
- R60.500.00, Issue 1 - TD-2 Radio Automatic Switching System (General)
- R60.503.00, Issue 1 - TD-2 Radio Automatic Switching System (Maintenance Routines)
- R60.504.01, Issue 1 - TD-2 Radio Automatic Switching System - System Operate Tests in Service (Maintenance Methods)
- R90.310.00, Issue 4 - J68331 Transmitter-Receiver Bay - (TD-2 Radio System)
- R90.314.34, Issue 2 - J68331 Transmitter-Receiver Bay - Bay Tests (TD-2 Radio System) - IF Return Loss
- AA636.770, Issue 1 - TH Microwave Radio - Broadband and Auxiliary Channel Equipment - Auxiliary Channel Transmitter and Receiver - Performance Requirements
- AB26.404.22, Issue 1 - Coaxial Cable Television Transmitting Systems - RF Type Primary Feeder Systems Using SKL 211C Amplifiers

Cancelled Section

R90.314.44, Issue 1 - J68331A Transmitter-Receiver Bay
(TD-2 Radio System) - Bay Tests
Using the J68345A Test Set - IF
Return Loss Measurements

BSPM 826A -

BSPM 826B - 318-203-506, Issue 1 - Television Systems - A2A Video
Transmission System - Over-All
Channel Alignment - Delay Equal-
ization Check

318-500-591, Issue 1 - Coaxial Cable Television Trans-
mission Systems - RF Type Using
211C Amplifiers - Over-all Line-up
Procedures

318-700-508, Issue 1 - Television Systems - Over-all Line-
up of Video Facilities - Measure-
ment of Distortion Between 15 kc
and 300 kc

BSPM 827 R90.314.51, Issue 2 - J68331 Transmitter-Receiver Bay -
(Bench Tests) (TD-2 Radio Sys-
tem) - Receiver Converter and IF
Preamplifier

R90.314.52, Issue 2 - J68331 Transmitter-Receiver Bay -
(Bench Tests) (TD-2 Radio Sys-
tem) - IF Preamplifier

Appendix 2

AA266.046, Issue 1 - TD Radio - Automatic and Channel
Maintenance Switching - General
Requirements - Toll Systems

Appendix 3

AA266.067, Issue 1 - TH Radio System - General Require-
ments - Toll Systems

Cancelled Sections

R90.314.61, Issue 1 - J68331A Transmitter-Receiver Bay
(TD-2 Radio System) - Bench Tests
Using the J68345A Test Set - Re-
ceiver Converter and IF Preamplifier

R90.314.62, Issue 1 - J68331A Transmitter-Receiver Bay
(TD-2 Radio System) - Bench Tests
Using the J68345A Test Set - IF
Preamplifier

BSPM 827B -

- P.E.L. 7014 – FCC Equipment List, Part C, April 9, 1962 (1S4.1-244)
- P.E.L. 7034 – TD-2 Radio System – Automatic Switching – IF Resupply Automatic Transfer Panel (1S3.6-85)
- P.E.L. 7038 – TD-2 Radio System – FM Terminal Transmitter Improvements
P.O.L. 2056 (1S3.1-104)
- P.E.L. 7039 – Renewal of Rural Radio Service Licenses (1S4.1-245)
- P.E.M. 7989 – TD-2 Microwave Radio J68330G, List 4 Microwave Generator (1S3.9G-38)
- P.E.M. 8009 – Mobile Telephone Service – Radio Specialty FM Deviation Meter (1S3.7-109)
- P.E.M. 8039 – Mobile Telephone Service – Battery Calibration Control Modification to Budelman Electronics Corporation Model 17A-Type Frequency Deviation Meter (1S3.7-110)

Unnumbered Letter to Selected Traffic Managers

- 6-27-62 Air-Ground Radiotelephone Service – Statistics on Number of Connections (File No. 3B7.5)
- 7-3-62 Air-Ground Service – Direct Reading Rate Tables (File No. 3B5.9)

Unnumbered Letters to Traffic Managers

- 6-27-62 Mobile Telephone Service – Notes on Air-Ground Service (File No. 3B5.9)
- 6-28-62 Airplanes Equipped for Air-Ground Radiotelephone Service (File No. 3B5.9)
- 6-29-62 Traffic Operating Practices – Mobile Service (File No. 3B5.9)

Unnumbered Letter to Marketing Department Mailing List and Bell Independent Relations People

- 6-29-62 Air-Ground Telephone Service – Developmental Procedures

Unnumbered Letter to Plant Supervisors

- 6-29-62 Mobile Radio Cost Results Summary

Unnumbered Letter to Chief Engineers

- 6-27-62 Portable Towers – Aluminum – Repainting Procedure (1S3.4-150)
- 7-11-62 TL Towers (1S3.4-151)

7-12-62

Public Radiotelephone Service to Aircraft – Preliminary Engineering and Equipment Information (IS1.12-10)

Unnumbered Letter to Certain Transmission Engineers

7-10-62

Television – Regional Programming

Unnumbered Letter to Marketing Departments

7-13-62

Connection of Private Mobile Systems with Extension Stations of PBX Systems