UHF Radio Propagation Data for Low Antenna Heights
Volume II

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for Low Antenna Heights
Volume II

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Institute for Telecommunication Sciences
Boulder, Colorado
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This report is a presentation in two volumes of measurement techniques, data, comparisons, and conclusions obtained from a UHF propagation measurement program at 230 and 415.9 MHz. Antenna heights were 3 m or less above ground. Vertical polarization was used, and the antennas were omnidirectional in the horizontal plane. The terrain was generally rocky, hilly, and relatively free of trees. Path lengths varied from 2 to 45 km. Volume 1 describes the equipment, techniques, and results and presents data from the Wyoming area, including some buried antenna tests. Volume II presents data obtained in Idaho and Washington.

This volume continues presenting path pictures, data, and supporting information begun in Volume I. Down path pictures were obtained at each site. Path profiles were plotted from U.S. Geological Survey maps. Basic transmission loss was derived for each frequency and for each of the transmitting antenna heights, 0.75 m and 3 m above ground.
Idaho PATH 1 - 3

From site 3 toward site 1

From site 1 toward site 3
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 3
Transmitter Site 2
Vertical Polarization

- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height above m.s.l. in Meters

Distance in Kilometers
Idaho PATH 3 - 17

From site 3 toward 17

From site 17 toward site 3
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 3
Transmitter Site 17
Vertical Polarization
- 230 MHz
- 415.9 MHz

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Distance in Kilometers
From site 23 toward site 12

From site 12 toward site 23
IDaho Path 12-23

Path Loss Measurements

September 1968
Receiver Site 23
Transmitter Site 12
Vertical Polarization

- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

Terrain Profile

Distance in Kilometers

Height Above M.S.L. in Meters

Site 23
Site 12
Earth Curvature

- 153 -
Idaho PATH 13 - 18

From site 13 toward site 18

From site 18 toward site 13
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 13
Transmitter Site 18
Vertical Polarization

- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Site 13
Site 18

Earth Curvature

Distance in Kilometers

- 155 -
From site 15 toward site 18
IDaho Path 15 - 18

Path Loss Measurements

September 1968
Receiver Site 15
Transmitter Site 18
Vertical Polarization - 230 MHz

Basic Transmission Loss in Decibels vs. Receiving Antenna Height Above Ground in Meters

Terrain Profile

Height Above M.S.L. in Meters vs. Distance in Kilometers

Site 15
Site 18
Earth Curvature
From site 22 toward site 20
PATH LOSS MEASUREMENTS

- September 1968
- Receiver Site 22
- Transmitter Site 20
- Vertical Polarization
  - 230 MHz
  - 415.9 MHz

Receiving Antenna Height Above Ground in Meters

DISTANCE IN KILOMETERS

RECEIVING ANTENNA HEIGHT ABOVE GROUND IN METERS

SITE 22

SITE 20

Earth Curvature

Distance in Kilometers

- 159 -
Idaho PATH 21 - 26

From site 26 toward site 21

From site 21 toward site 26
IDAH PATH 22-23

PATH LOSS MEASUREMENTS

September 1968
Receiver Site 22
Transmitter Site 23
Vertical Polarization
- 230 MHz
- 415.9 MHz

Basic Transmission Loss in Decibels

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Site 22
Site 23
Earth Curvature

Distance in Kilometers

-163-
Idaho PATH 22 - 24

From site 22 toward site 24

From site 24 toward site 22
IDaho Path 22-24

Path Loss Measurements

September 1968
Receiver Site 22
Transmitter Site 24
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

Terrain Profile

Height Above M.S.L. in Meters

Site 22
Site 24
Earth Curvature

Distance in Kilometers
Idaho PATH 22 - 28

From site 22 toward site 28
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 22
Transmitter Site 28
Vertical Polarization

- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

RECEIVING ANTENA HEIGHT ABOVE GROUND IN METERS

Terrain Profile

Height Above m.s.l. in Meters

Distance in Kilometers

Earth Curvature

Site 22
Site 28
Idaho PATH 23 - 27

From site 23 toward site 27

From site 27 toward site 23
PATH LOSS MEASUREMENTS

- September 1968
- Receiver Site 23
- Transmitter Site 27
- Vertical Polarization
  - 230 MHz
  - 415.9 MHz

Vertical Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Distance in Kilometers

Height Above m.s.l. in Meters

Site 23
Site 27
Earth Curvature
Idaho PATH 23 - 28

From site 23 toward site 28

From site 28 toward site 23
PATH LOSS MEASUREMENTS

September 1966
Receiver Site 23
Transmitter Site 28
Vertical Polarization
- 230 MHz
- 415.9 MHz

Basic Transmission Loss in Decibels

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Site 23
Site 28
Earth Curvature

Height Above m.s.l. in Meters

Distance in Kilometers

- 171 -
Idaho PATH 25 - 26

From site 26 toward site 25

From site 25 toward site 26
Idaho PATH 26 - 29

From site 26 toward site 29

From site 29 toward site 26
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 26
Transmitter Site 29
Vertical Polarization
- 230 MHz
- 415.9 MHz

Basic Transmission Loss in Decibels

Receiving Antenna Height Above Ground in Meters

TRANSMITTING ANTENNA HEIGHT IN METERS

0.75
0.75
3
3

- 175 -
Idaho PATH 26 - 30

From site 26 toward site 30

From site 30 toward site 26

- 176 -
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 26
Transmitter Site 30
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Site 26
Site 30
Earth Curvature

Height Above m.s.l. in Meters

0 5 10 15 20 25
Distance in Kilometers

1100 1200 1300 1400 1500 1600 1700
From site 32 toward site 26

From site 26 toward site 32
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 32
Transmitter Site 26
Vertical Polarization
- 230 MHz
- 415.9 MHz

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Site 26
Site 32
Earth Curvature

Distance in Kilometers

- 179 -
From site 31 toward site 28.

From site 28 toward site 31.
IDaho Path 28—31

Path Loss Measurements

- September 1968
- Receiver Site 31
- Transmitter Site 28
- Vertical Polarization
  - 230 MHz
  - 415.9 MHz

Receiving Antenna Height Above Ground in Meters vs. Basic Transmission Loss in Decibels

Transmitting Antenna Height in Meters

0.75
3
3

Terrain Profile

Height Above m.s.l. in Meters vs. Distance in Kilometers

Site 31
Site 28
Earth Curvature
Idaho PATH 28 - 32

From site 32 toward site 28

From site 28 toward site 32
IDaho Path 28—32

Path Loss Measurements

- September 1968
- Receiver Site 32
- Transmitter Site 28
- Vertical Polarization
- 230 MHz
- 415.9 MHz

Terrain Profile

- Site 28
- Site 32
- Earth Curvature
Idaho PATH 29 - 32

From site 32 toward site 29

From site 29 toward site 32
Idaho PATH 30 - 32

From site 32 toward site 30

From site 30 toward site 32
PATH LOSS MEASUREMENTS

September 1966
Receiver Site 32
Transmitter Site 30
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters
- 3
- 3
- 0.75
- 0.75

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Site 30
Site 32
Earth Curvature

Distance in Kilometers
Idaho PATH 34-35

From site 34 toward site 35

From site 35 toward site 34
Idaho PATH 34 - 36

From site 34 toward site 36

From site 36 toward site 34
IDAHO PATH 34—36

PATH LOSS MEASUREMENTS

![Graph showing path loss measurements with data points for September 1968, receiver site 34, transmitter site 36, vertical polarization at 230 MHz and 415.9 MHz, and receiving antenna height above ground in meters.]

TERRAIN PROFILE

![Graph showing terrain profile with height above m.s.l. in meters and distance in kilometers, with site 34 and site 36 markers and earth curvature line.]
Idaho PATH 34 - 41

From site 34 toward site 41

From site 41 toward site 34
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 34
Transmitter Site 41
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna
Height in Meters

Receiving Antenna Height Above Ground in Meters

- 193 -
From site 35 toward site 36

From site 36 toward site 35
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 35
Transmitter Site 36
Vertical Polarization

- 230 MHz

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Distance in Kilometers
Idaho PATH 35 - 41.

From site 35 toward site 41

From site 41 toward site 35
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 35
Transmitter Site 41
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters
3
3
0.75
0.75

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Site 35
Site 41

Earth Curvature

Height Above m.s.l. in Meters

Distance in Kilometers

- 197 -
Idaho PATH 36 - 41

From site 36 toward site 41

From site 41 toward site 36
Idaho PATH 37 - 38

From site 38 toward site 37

From site 37 toward site 38
PATH LOSS MEASUREMENTS

- September 1968
- Receiver Site 38
- Transmitter Site 37
- Vertical Polarization
  - 230 MHz
  - 415.9 MHz

Transmitting Antenna Height in Meters

Basic Transmission Loss in Decibels

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Site 37

Site 38

Earth Curvature

Distance in Kilometers
Idaho PATH 37 - 41

From site 37 toward site 41

From site 41 toward site 37
PATH LOSS MEASUREMENTS

- September 1968
- Receiver Site 37
- Transmitter Site 41
- Vertical Polarization
  - 230 MHz
  - 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Distance in Kilometers
Idaho PATH 38 - 39

From site 38 toward site 39

From site 39 toward site 38
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 38
Transmitter Site 39
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Distance in Kilometers
Washington PATH 3 - 6

From site 6 toward site 3

From site 3 toward site 6
From site 11 toward site 3

From site 3 toward site 11
Washington PATH 5 - 6

From site 6 toward site 5

From site 5 toward site 6
PATH LOSS MEASUREMENTS

- September 1968
- Receiver Site 6
- Transmitter Site 5
- Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

- Site 5
- Site 6
- Earth Curvature

Distance in Kilometers

Height Above m.s.l. in Meters
Washington PATH 6 - 7

From site 6 toward site 7

From site 7 toward site 6
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 6
Transmitter Site 7
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters
Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters
Earth Curvature

Distance in Kilometers

Site 6
Site 7

- 213 -
From site 6 toward site 8

From site 8 toward site 6
Washington PATH 6 - 9

From site 6 toward site 9

From site 9 toward site 6
From site 6 toward site 10

From site 10 toward site 6
PATH LOSS MEASUREMENTS

October 1968
Receiver Site 6
Transmitter Site 10
Vertical Polarization

- 230 MHz
- 415.9 MHz

TRANSMITTING ANTEEIO HEIGHT IN METERS

RECEIVING ANTENNA HEIGHT ABOVE GROUND IN METERS

TERRAIN PROFILE

HEIGHT ABOVE M.S.L. IN METERS

DISTANCE IN KILOMETERS
Washington PATH 6 - 11

From site 11 toward site 6

From site 6 toward site 11
PATH LOSS MEASUREMENTS

October 1968
Receiver Site 11
Transmitter Site 6
Vertical Polarization

230 MHz
415.9 MHz

Receiving Antenna Height Above Ground in Meters

Transmission Antenna Height in Meters

0.75
1.0

Distance in Kilometers

TERRAIN PROFILE

Height Above m.s.l. in Meters

Site 6
Site 11
Earth Curvature

Distance in Kilometers
Washington PATH 6 - 12

From site 6 toward site 12

From site 12 toward site 6
PATH LOSS MEASUREMENTS

October 1968
Receiver Site 6
Transmitter Site 12
Vertical Polarization
230 MHz

Transmitting Antenna
Height in Meters

Basic Transmission Loss in Decibels

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Site 6
Site 12
Earth Curvature

Height Above m.s.l. in Meters

Distance in Kilometers
From site 6 toward site 13

From site 13 toward site 6
PATH LOSS MEASUREMENTS

October 1968
Receiver Site 6
Transmitter Site 13
Vertical Polarization
230 MHz

PATH LOSS MEASUREMENTS

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Distance in Kilometers

WASHINGTON PATH 6 — 13

- 225 -
Washington PATH 6 - 33

From site 6 toward site 33

From site 33 toward site 6
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 6
Transmitter Site 33
Vertical Polarization
230 MHz
415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Distance in Kilometers

Site 6
Site 33
Earth Curvature
Washington PATH 6 - 56

From site 6 toward site 56

From site 56 toward site 6
WASHINGTON PATH 6 — 56

PATH LOSS MEASUREMENTS

September 1968
Receiver Site 6
Transmitter Site 56
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Site 6
Site 56

Earth Curvature

Distance in Kilometers

- 229 -
Washington PATH 7 - 11

From site 11 toward site 7

From site 7 toward site 11
Washington PATH 8 - 11

From site 11 toward site 8

From site 8 toward site 11
PATH LOSS MEASUREMENTS

- October 1968
- Receiver Site 11
- Transmitter Site 8
- Vertical Polarization
  - 230 MHz
  - 415.9 MHz

TRANSMITTING ANTENNA HEIGHT IN METERS

- 0.75
- 3

RECEIVING ANTENNA HEIGHT ABOVE GROUND IN METERS

- 0
- 1
- 2
- 3

- HEIGHT IN METERS

TERRAIN PROFILE

- Site 8
- Site 11
- EARTH CURVATURE

DISTANCE IN KILOMETERS

- 0
- 5
- 10
- 15
- 20
- 25
- 30
- 35
- 40

- 100
- 300
- 500
- 700
- 900

HEIGHT ABOVE M.S.L. IN METERS
From site 34 toward site 8

From site 8 toward site 34
PATH LOSS MEASUREMENTS

October 1968
Receiver Site 34
Transmitter Site 8
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Site 8
Site 34
Earth Curvature

Height Above M.S.L. in Meters

Distance in Kilometers

- 235 -
From site 11 toward site 9

From site 9 toward site 11
PATH LOSS MEASUREMENTS

October 1968
Receiver Site 11
Transmitter Site 9
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna
Height in Meters

0.75
1.0

Basic Transmission Loss in Decibels

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Site 9

Site 11

Earth Curvature

Height Above m.s.l. in Meters

Distance in Kilometers
Washington PATH 9 - 36

From site 9 toward site 36

From site 36 toward site 9
From site 9 toward site 37

From site 37 toward site 9
WASHINGTON PATH 9—37

PATH LOSS MEASUREMENTS

Basic Transmission Loss in Decibels

Receiving Antenna Height Above Ground in Meters

Transmitting Antenna Height in Meters

October 1968
Receiver Site 9
Transmitter Site 37
Vertical Polarization
230 MHz
415.9 MHz

TERRAIN PROFILE

Height Above m.s.l. in Meters

Distance in Kilometers

Site 9
Site 37
Earth Curvature
From site 9 toward site 38

From site 38 toward site 9
PATH LOSS MEASUREMENTS

October 1968
Receiver Site 9
Transmitter Site 38
Vertical Polarization
- 230 MHz
- 415.9 MHz

Basic Transmission Loss in Decibels

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Distance in Kilometers
From site 9 toward site 39

From site 39 toward site 9
PATH LOSS MEASUREMENTS

October 1968
Receiver Site 9
Transmitter Site 39
Vertical Polarization

- 230 MHz
- 415.9 MHz

Transmitting Antenna
Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Site 9
Site 39
Earth Curvature

Height Above m.s.l. in Meters

Distance in Kilometers
From site 9 toward site 40

From site 40 toward site 9
PATH LOSS MEASUREMENTS

October 1968
Receiver Site 9
Transmitter Site 40
Vertical Polarization
- 23.0 MHz
- 415.9 MHz

Transmitting Antenna
Height in Meters

0.75
0.75

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Site 9
Site 40
Earth Curvature

Distance in Kilometers

- 247 -
Washington PATH 9 - 42

From site 9 toward site 42

From site 42 toward site 9
WASHINGTON PATH 9—42

PATH LOSS MEASUREMENTS

- Transmitter Site 42
- Receiver Site 9
- October 1968
- Vertical Polarization
- 230 MHz
- 415.9 MHz

Receiving Antenna Height Above Ground in Meters

Transmitting Antenna Height in Meters

Terrain Profile

Site 9
Site 42
Earth Curvature

Distance in Kilometers
Washington PATH 10 - 11

From site 11 toward site 10

From site 10 toward site 11
PATH LOSS MEASUREMENTS

October 1968
Receiver Site 11
Transmitter Site 10
Vertical Polarization
- 230 MHz
- 415.9 MHz

TRANSMITTING ANTENNA
Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Site 10
Site 11
Earth Curvature

Height Above m.s.l. in Meters

Distance in Kilometers
Washington PATH 11 - 12

From site 11 toward site 12

From site 12 toward site 11
PATH LOSS MEASUREMENTS

October 1968
Receiver Site 11
Transmitter Site 12
Vertical Polarization

- 230 MHz -
- 415.9 MHz -

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Earth Curvature

Distance in Kilometers

- 253 -
From site 11 toward site 13

From site 13 toward site 11
From site 11 toward site 29.

From site 29 toward site 11.
PATH LOSS MEASUREMENTS

October 1968
Receiver Site II
Transmitter Site 29
Vertical Polarization
230 MHz
415.9 MHz

TERRAIN PROFILE

Earth Curvature
Washington PATH 11 - 30

From site 11 toward site 30

From site 30 toward site 11
Washington PATH 11 - 30A

From site 11 toward site 30A

From site 30A toward site 11
Washington PATH 11 - 31

From site 11 toward site 31

From site 31 toward site 11
Washington PATH 11 - 32

From site 11 toward site 32

From site 32 toward site 11
Washington PATH 11 - 33

From site 11 toward site 33

From site 33 toward site 11

- 266 -
Washington PATH 11 - 34

From site 11 toward site 34

From site 34 toward site 11
Washington PATH 11 - 36

From site 11 toward site 36.

From site 36 toward site 11.
From site 11 toward site 56

From site 56 toward site 11
PATH LOSS MEASUREMENTS

October 1968
Receiver Site 11
Transmitter Site 56
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Distance in Kilometers

Earth Curvature

Site 11
Site 56
From site 23 toward site 17.

From site 17 toward site 23.
From site 28 toward site 17

From site 17 toward site 28
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 28
Transmitter Site 17
Vertical Polarization

- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Site 17
Site 28
Earth Curvature

Distance in Kilometers
Washington PATH 18 - 23

From site 23 toward site 18

From site 18 toward site 23
WASHINGTON PATH 18—23

PATH LOSS MEASUREMENTS

September 1968
Receiver Site 23
Transmitter Site 18
Vertical Polarization

- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above M.S.L. in Meters

Distance in Kilometers

Site 18
Site 23
Earth Curvature

- 279 -
From site 23 toward site 20

From site 20 toward site 23
WASHINGTON PATH 20—23

PATH LOSS MEASUREMENTS

September 1968
Receiver Site 23
Transmitter Site 20
Vertical Polarization
---230 MHz
---415.9 MHz

Basic Transmission Loss in Decibels

Receiving Antenna Height Above Ground in Meters

Transmitting Antenna Height in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Site 20
Site 23

Earth Curvature

Distance in Kilometers
From site 28 toward site 20

From site 20 toward site 28
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 28
Transmitter Site 20
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Site 20
Site 28
Earth Curvature

Distance in Kilometers

Height Above M.S.L. in Meters

- 283 -
Washington PATH 21 - 23

From site 23 toward site 21

From site 21 toward site 23
Washington PATH 21 - 28

From site 28 toward site 21

From site 21 toward site 28
From site 23 toward site 22.

From site 22 toward site 23.
Washington PATH 22 - 28

From site 28 toward site 22

From site 22 toward site 28
From site 28 toward site 23
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 23
Transmitter Site 28
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Site 23
Site 28
Earth Curvature

Height Above m.s.l. in Meters

Distance in Kilometers
From site 23 toward site 43

From site 43 toward site 23
WASHINGTON PATH 23 — 43

PATH LOSS MEASUREMENTS

- September 1968
- Receiver Site 23
- Transmitter Site 43
- Vertical Polarization
- 230 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

- Site 23
- Site 43
- Earth Curvature

Distance in Kilometers

- 295 -
Washington PATH 23 - 44

From site 23 toward site 44

From site 44 toward site 23
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 23
Transmitter Site 44
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Site 23
Site 44
Earth Curvature

Distance in Kilometers
Washington PATH 28 - 43

From site 28 toward site 43

From site 43 toward site 28

- 298 -
From site 28 toward site 44

From site 44 toward site 28
From site 28 toward site 45

From site 45 toward site 28
PATH LOSS MEASUREMENTS

September 1968
Receiver Site 28
Transmitter Site 45
Vertical Polarization
- 230 MHz
- 415.9 MHz

Receiving Antenna Height Above Ground in Meters

Transmitting Antenna Height in Meters

TERRAIN PROFILE

Distance in Kilometers

Site 28
Site 45
Earth Curvature
From site 34 toward site 36

From site 36 toward site 34
PATH LOSS MEASUREMENTS

October 1968
Receiver Site 34
Transmitter Site 36
Vertical Polarization
230 MHz

Basic Transmission Loss in Decibels

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Site 34

Site 36

Earth Curvature

Distance in Kilometers

- 305 -
From site 34 toward site 37

From site 37 toward site 34
WASHINGTON PATH 34—37

PATH LOSS MEASUREMENTS

October 1968
Receiver Site 34
Transmitter Site 37
Vertical Polarization
---230 MHz
---415.9 MHz

Transmitting Antenna
Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Site 37
Site 34
Earth Curvature

Height Above m.s.l in Meters

Distance in Kilometers

- 307 -
From site 34 toward site 38

From site 38 toward site 34
Washington PATH 34 - 39

From site 34 toward site 39

From site 39 toward site 34
PATH LOSS MEASUREMENTS

October 1968
Receiver Site 34
Transmitter Site 39
Vertical polarization
230 MHz

Receiving Antenna Height Above Ground in Meters

TERAIN PROFILE

Site 34
Site 39

Earth Curvature

Height Above m.s.l. in Meters

Distance in Kilometers

- 311 -
From site 34 toward site 42

From site 42 toward site 34
PATH LOSS MEASUREMENTS

October 1968
Receiver Site 34
Transmitter Site 42
Vertical Polarization

230 MHz

Basic Transmission Loss in Decibels

Receiving Antenna Height Above Ground in Meters

TRANSMITTING ANTENNA HEIGHT IN METERS

0.75

TERRAIN PROFILE

Height Above M.S.L. in Meters

Site 34
Site 42
Earth Curvature

Distance in Kilometers

- 313 -
WASHINGTON PATH A - B

From site A toward site B

From site B toward site A

- 314 -
PATH LOSS MEASUREMENTS

October 1968
Receiver Site A
Transmitter Site B
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Site A
Site B

Distance in Kilometers
Washington PATH A - C

From site A toward site C

From site C toward site A
Washington PATH A - D

From site A toward site D

From site D toward site A
Washington PATH A - E

From site A toward site E

From site E toward site A

- 320 -
WASHINGTON PATH A—E

PATH LOSS MEASUREMENTS

October 1968
Receiver Site A
Transmitter Site E
Vertical Polarization
230 MHz

Basic Transmission Loss in Decibels
Receiving Antenna Height Above Ground in Meters

Transmitting Antenna Height in Meters
3
0.75

TERRAIN PROFILE

Height Above m.s.l. in Meters
Distance in Kilometers

Site A
Site E
From site A toward site G

From site G toward site A
WASHINGTON PATH A - G

PATH LOSS MEASUREMENTS

October 1968
Receiver Site A
Transmitter Site G
Vertical Polarization

- 230 MHz
- 415.9 MHz

Basic Transmission Loss in Decibels

Receiving Antenna Height Above Ground in Meters

TRANSMITTING ANTENNA
Height in Meters

3
0.75
0.75

TERRAIN PROFILE

Height Above m.s.l. in Meters

Distance in Kilometers

Site A

Site G
Washington PATH A - H

From site A toward site H

From site H toward site A
From site A toward site I

From site I toward site A
Washington PATH A - J

From site A toward site J

From site J toward site A
WASHINGTON PATH A—J

PATH LOSS MEASUREMENTS

October 1968
Receiver Site A
Transmitter Site J
Vertical Polarization
- 230 MHz
- 415.9 MHz

Transmitting Antenna Height in Meters

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Distance in Kilometers

Site A
Site J

- 329 -
Washington PATH A - K

From site A toward site K

From site K toward site A
WASHINGTON PATH A – K

PATH LOSS MEASUREMENTS

October 1968
Receiver Site A
Transmitter Site K
Vertical Polarization
- 230 MHz
- 415.9 MHz

Basic Transmission Loss in Decibels

Receiving Antenna Height Above Ground in Meters

TRANSMITTING ANTENNA
Height in Meters

0.75

3

TERRAIN PROFILE

Height Above m.s.l. in Meters

Distance in Kilometers

Site K

Site A

- 331 -
Washington PATH A - L

From site A toward site L

From site L toward site A
WASHINGTON PATH A–L

PATH LOSS MEASUREMENTS

October 1968
Receiver Site A
Transmitter Site L
Vertical Polarization

Basic Transmission Loss in Decibels

Receiving Antenna Height Above Ground in Meters

TERRAIN PROFILE

Height Above m.s.l. in Meters

Distance in Kilometers
Washington PATH A - M

From site A toward site M

From site M toward site A
WASHINGTON PATH A – M

PATH LOSS MEASUREMENTS

October 1968
Receiver Site A
Transmitter Site M
Vertical Polarization
230 MHz
415.9 MHz

Basic Transmission Loss in Decibels

Receiving Antenna Height Above Ground in Meters

TRANSMITTING ANTENNA
Height in Meters

0 1 2 3

Terrain Profile

Height Above m.s.l. in Meters

Site M
Site A

Distance in Kilometers

- 335 -
Washington PATH A - N

From site A toward site N

From site N toward site A
WASHINGTON PATH A—N

PATH LOSS MEASUREMENTS

October 1968
Receiver Site A
Transmitter Site N
Vertical Polarization
- 230 MHz
- 415.9 MHz

Receiving Antenna Height Above Ground in Meters

Basic Transmission Loss in Decibels

Distance in Kilometers

Transmitting Antenna Height in Meters

0.75

0.75

Site N

Site A

Distance in Kilometers

- 337 -
Washington PATH A - O

From site A toward site O

From site O toward site A
Washington PATH A - P

From site A toward site P

From site P toward site A

- 340 -