# 12 Bay TFL3Y 98.1MHz 

November 2015



## General data of antenna System

TX station
Site Name
System of coordinates WGS84
Longitude
Latitude
Ground level a.s.I. (m)
1.0

Antenna system height (m)
Transmitter power(Watt)
20.0

Carrier wave frequency (MHz)
Antenna system central frequency (MHz)
Antenna base diagrams type 1
Polarization (H/V/C/X)
Transmitting cable attenuation (dB)
1.000

Additional attenuations(dB)
98.100
98.100

TFL3Y
V

Base diagrams sectors ( $\mathrm{T}=$ All, $\mathrm{F}=$ Front)
Velocity factor of cables to Antennas ( $0 \div 1$ )
0.0

Coordinate System(C = cartesian, $\mathrm{P}=$ polar)
Mast side / diameter(cm)
0.0

Mast cross section (T/Q/C)
Structure rotation w.r.t. North ( ${ }^{\circ}$ )
T
1.00

Mast rotation w.r.t. North ( ${ }^{\circ}$ ) 0.0
P
0.0

Q
0.0

Information about antennas used in the System

|  | Antenna |
| :--- | :--- |
| Manufacturer | Telecom |
| Antenna model | TFL3Y |
| Band start(MHz) | 87 |
| Band stop(MHz) | 108 |
| diagrams Frequency(MHz) | 98.10 |
| Polariz (H/V/C/X) | V |
| Vertical dist (cm) | 154 |
| Height (cm) | 174 |
| Width (cm) | 18 |
| Thickness (cm) | 154 |
| Weight (Kg) | 13.5 |
| Maximum power (KW) | 3.5 |
| Gain (dBd) | 3.9 |
| North E.C. $(\mathrm{cm})$ | 60 |
| East E.C. $(\mathrm{cm})$ | 0 |
| Return loss $(\mathrm{dB})$ | 0 |
| R.C.Phase $\left(^{\circ}\right)$ | 0 |

Geometrical and electrical data of antenna System

|  | Power <br> (\%) | $\begin{aligned} & \text { Tilt } \\ & \left({ }^{\circ}\right) \end{aligned}$ | Az. <br> ( $\%$ N) |  | Phase <br> ( ${ }^{\circ}$ | $\checkmark$ dist. <br> ( $m$ ) | Scr-d (cm) | Scr-Az <br> ( $\%$ N) | $\begin{aligned} & \text { Rot. } \\ & (1 \div 4) \end{aligned}$ | $\begin{aligned} & \text { Type } \\ & (1 \div 2) \end{aligned}$ | L cables (cm) | Car. phase <br> $\left({ }^{\circ}\right)$ |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 1 | 8.333 | 0 | 0 | 0 | +0.0 | 14.30 | 0.0 | 0.0 | 1 | 1 | 0.0 | 0.0 |
| 2 | 8.333 | 0 | 0 | 0 | +0.0 | 11.70 | 0.0 | 0.0 | 1 | 1 | 0.0 | 0.0 |
| 3 | 8.333 | 0 | 0 | 0 | +0.0 | 9.10 | 0.0 | 0.0 | 1 | 1 | 0.0 | 0.0 |
| 4 | 8.333 | 0 | 0 | 0 | +0.0 | 6.50 | 0.0 | 0.0 | 1 | 1 | 0.0 | 0.0 |
| 5 | 8.333 | 0 | 0 | 0 | +0.0 | 3.90 | 0.0 | 0.0 | 1 | 1 | 0.0 | 0.0 |
| 6 | 8.333 | 0 | 0 | 0 | +0.0 | 1.30 | 0.0 | 0.0 | 1 | 1 | 0.0 | 0.0 |
| 7 | 8.333 | 0 | 0 | 0 | +0.0 | -1.30 | 0.0 | 0.0 | 1 | 1 | 0.0 | 0.0 |
| 8 | 8.333 | 0 | 0 | 0 | +0.0 | -3.90 | 0.0 | 0.0 | 1 | 1 | 0.0 | 0.0 |
| 9 | 8.333 | 0 | 0 | 0 | +0.0 | -6.50 | 0.0 | 0.0 | 1 | 1 | 0.0 | 0.0 |
| 10 | 8.333 | 0 | 0 | 0 | +0.0 | -9.10 | 0.0 | 0.0 | 1 | 1 | 0.0 | 0.0 |
| 11 | 8.333 | 0 | 0 | 0 | +0.0 | -11.70 | 0.0 | 0.0 | 1 | 1 | 0.0 | 0.0 |
| 12 | 8.333 | 0 | 0 | 0 | +0.0 | -14.30 | 0.0 | 0.0 | 1 | 1 | 0.0 | 0.0 |

## Plan of antenna system



## Side of antenna system



## Antennas arrays data

Note: calculation of single antennas arrays data (without taking into account mutual effects)

| A. Antennas array azimuth ( $\left.{ }^{\circ} / \mathrm{N}\right)$ | 0 |
| :--- | :--- |
| B. Number of antennas | 12 |
| C. Nominal power supply (W) | 1.00 |
| D. Losses (addit. + cables) (dB) | 0.0 |
| E. Effective power supply (W) | 1.00 |
| F. Theor. maximum gain (dBd) | 14.69 |
| G. Distribution losses (dB) | 0.00 |
| H. Nominal max gain F - G (dBd) | 14.69 |
| I. Compensation losses (dB) | 0.20 |
| J. Effec. max gain H - I (dBd) | 14.4 |
| K. Effec. max gain (times) | 28.14 |
| L. Effec. max power E * K (KW) | 0.0281 |
| M. Max power depr. angle ( ${ }^{\circ}$ ) | 0.1 |
| N. Max power az. angle $\left({ }^{\circ}\right)$ | 358 |

## Diagram in dBK calculated at horizon

| Az. $\left({ }^{\circ} / \mathrm{N}\right)$ | dBK | Az. $\left({ }^{\circ} / \mathrm{N}\right)$ | dBK | Az. $\left({ }^{\circ} / \mathrm{N}\right)$ | dBK | Az. $\left({ }^{\circ} / \mathrm{N}\right)$ | dBK |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0 | -15.5 | 90 | -19.8 | 180 | -27.4 | 270 | -20.7 |
| 10 | -15.6 | 100 | -21.0 | 190 | -27.6 | 280 | -19.4 |
| 20 | -15.7 | 110 | -22.5 | 200 | -27.7 | 290 | -18.2 |
| 30 | -15.9 | 120 | -23.8 | 210 | -27.5 | 300 | -17.3 |
| 40 | -16.1 | 130 | -25.0 | 220 | -27.3 | 310 | -16.6 |
| 50 | -16.5 | 140 | -26.0 | 230 | -26.6 | 320 | -16.2 |
| 60 | -17.1 | 150 | -26.6 | 240 | -25.4 | 330 | -15.8 |
| 70 | -17.8 | 160 | -27.0 | 250 | -24.0 | 340 | -15.7 |
| 80 | -18.7 | 170 | -27.2 | 260 | -22.3 | 350 | -15.6 |

Diagram in dBK calculated at horizon
( without -20dBl's lower limit vs maximum power )

| Az. ( $/ \mathrm{N})$ | dBK | Az. $\left({ }^{\circ} / \mathrm{N}\right)$ | dBK | Az. $\left({ }^{\circ} / \mathrm{N}\right)$ | dBK | Az. $\left({ }^{\circ} / \mathrm{N}\right)$ | dBK |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0 | -15.5 | 90 | -19.8 | 180 | -27.4 | 270 | -20.7 |
| 10 | -15.6 | 100 | -21.0 | 190 | -27.6 | 280 | -19.4 |
| 20 | -15.7 | 110 | -22.5 | 200 | -27.7 | 290 | -18.2 |
| 30 | -15.9 | 120 | -23.8 | 210 | -27.5 | 300 | -17.3 |
| 40 | -16.1 | 130 | -25.0 | 220 | -27.3 | 310 | -16.6 |
| 50 | -16.5 | 140 | -26.0 | 230 | -26.6 | 320 | -16.2 |
| 60 | -17.1 | 150 | -26.6 | 240 | -25.4 | 330 | -15.8 |
| 70 | -17.8 | 160 | -27.0 | 250 | -24.0 | 340 | -15.7 |
| 80 | -18.7 | 170 | -27.2 | 260 | -22.3 | 350 | -15.6 |

## Horizontal diagram at $0.0^{\circ}$ tilt (Total Antenna)



Horizontal diagram at $0.0^{\circ}$ tilt (Total Antenna)

| $\mathrm{Az}\left({ }^{\circ}\right)$ | Er (\%) | ERP (W) | $\mathrm{Az}\left({ }^{\circ}\right)$ | Er (\%) | ERP (W) | $\mathrm{Az}\left({ }^{\circ}\right)$ | Er (\%) | ERP (W) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0.0 | 99.5 | 27.9 | 60.0 | 83.6 | 19.6 | 120.0 | 38.5 | 4.2 |
| 1.0 | 99.5 | 27.9 | 61.0 | 82.6 | 19.2 | 121.0 | 37.8 | 4.0 |
| 2.0 | 99.3 | 27.7 | 62.0 | 82.2 | 19.0 | 122.0 | 37.2 | 3.9 |
| 3.0 | 99.5 | 27.9 | 63.0 | 81.7 | 18.8 | 123.0 | 36.8 | 3.8 |
| 4.0 | 99.1 | 27.6 | 64.0 | 80.9 | 18.4 | 124.0 | 36.2 | 3.7 |
| 5.0 | 99.1 | 27.6 | 65.0 | 80.2 | 18.1 | 125.0 | 35.7 | 3.6 |
| 6.0 | 100.0 | 28.1 | 66.0 | 79.4 | 17.7 | 126.0 | 35.1 | 3.5 |
| 7.0 | 99.1 | 27.6 | 67.0 | 78.9 | 17.5 | 127.0 | 34.8 | 3.4 |
| 8.0 | 99.1 | 27.6 | 68.0 | 78.3 | 17.3 | 128.0 | 34.4 | 3.3 |
| 9.0 | 99.1 | 27.6 | 69.0 | 77.4 | 16.9 | 129.0 | 33.8 | 3.2 |
| 10.0 | 98.9 | 27.5 | 70.0 | 76.7 | 16.6 | 130.0 | 33.4 | 3.1 |
| 11.0 | 98.9 | 27.5 | 71.0 | 76.0 | 16.3 | 131.0 | 33.0 | 3.1 |
| 12.0 | 99.1 | 27.6 | 72.0 | 75.3 | 16.0 | 132.0 | 32.6 | 3.0 |
| 13.0 | 98.6 | 27.4 | 73.0 | 74.5 | 15.6 | 133.0 | 32.3 | 2.9 |
| 14.0 | 98.4 | 27.2 | 74.0 | 73.6 | 15.2 | 134.0 | 31.9 | 2.9 |
| 15.0 | 98.4 | 27.2 | 75.0 | 73.1 | 15.0 | 135.0 | 31.5 | 2.8 |
| 16.0 | 98.4 | 27.2 | 76.0 | 72.1 | 14.6 | 136.0 | 31.2 | 2.7 |
| 17.0 | 98.2 | 27.1 | 77.0 | 71.7 | 14.5 | 137.0 | 30.9 | 2.7 |
| 18.0 | 98.4 | 27.2 | 78.0 | 70.6 | 14.0 | 138.0 | 30.6 | 2.6 |
| 19.0 | 98.2 | 27.1 | 79.0 | 70.2 | 13.9 | 139.0 | 30.3 | 2.6 |
| 20.0 | 97.9 | 27.0 | 80.0 | 69.3 | 13.5 | 140.0 | 30.0 | 2.5 |
| 21.0 | 97.7 | 26.9 | 81.0 | 68.3 | 13.1 | 141.0 | 29.8 | 2.5 |
| 22.0 | 97.7 | 26.9 | 82.0 | 67.7 | 12.9 | 142.0 | 29.5 | 2.4 |
| 23.0 | 97.7 | 26.9 | 83.0 | 66.6 | 12.5 | 143.0 | 29.3 | 2.4 |
| 24.0 | 97.3 | 26.6 | 84.0 | 66.3 | 12.4 | 144.0 | 29.1 | 2.4 |
| 25.0 | 97.1 | 26.5 | 85.0 | 65.2 | 12.0 | 145.0 | 28.8 | 2.3 |
| 26.0 | 97.1 | 26.5 | 86.0 | 64.6 | 11.8 | 146.0 | 28.7 | 2.3 |
| 27.0 | 96.8 | 26.4 | 87.0 | 63.8 | 11.4 | 147.0 | 28.5 | 2.3 |
| 28.0 | 96.4 | 26.1 | 88.0 | 63.2 | 11.2 | 148.0 | 28.2 | 2.2 |
| 29.0 | 96.4 | 26.1 | 89.0 | 62.3 | 10.9 | 149.0 | 28.1 | 2.2 |
| 30.0 | 96.1 | 26.0 | 90.0 | 61.2 | 10.5 | 150.0 | 27.9 | 2.2 |
| 31.0 | 95.8 | 25.8 | 91.0 | 60.7 | 10.4 | 151.0 | 27.8 | 2.2 |
| 32.0 | 95.6 | 25.7 | 92.0 | 59.9 | 10.1 | 152.0 | 27.5 | 2.1 |
| 33.0 | 95.2 | 25.5 | 93.0 | 59.0 | 9.8 | 153.0 | 27.5 | 2.1 |
| 34.0 | 95.2 | 25.5 | 94.0 | 58.0 | 9.5 | 154.0 | 27.3 | 2.1 |
| 35.0 | 94.7 | 25.2 | 95.0 | 57.4 | 9.3 | 155.0 | 27.2 | 2.1 |
| 36.0 | 94.5 | 25.1 | 96.0 | 56.3 | 8.9 | 156.0 | 27.2 | 2.1 |
| 37.0 | 94.1 | 24.9 | 97.0 | 55.6 | 8.7 | 157.0 | 26.9 | 2.0 |
| 38.0 | 93.9 | 24.8 | 98.0 | 54.8 | 8.5 | 158.0 | 26.8 | 2.0 |
| 39.0 | 93.4 | 24.6 | 99.0 | 53.9 | 8.2 | 159.0 | 26.7 | 2.0 |
| 40.0 | 93.4 | 24.6 | 100.0 | 53.2 | 8.0 | 160.0 | 26.7 | 2.0 |
| 41.0 | 93.0 | 24.3 | 101.0 | 52.1 | 7.6 | 161.0 | 26.7 | 2.0 |
| 42.0 | 92.4 | 24.0 | 102.0 | 51.4 | 7.4 | 162.0 | 26.5 | 2.0 |
| 43.0 | 92.2 | 23.9 | 103.0 | 50.4 | 7.1 | 163.0 | 26.5 | 2.0 |
| 44.0 | 91.7 | 23.7 | 104.0 | 49.5 | 6.9 | 164.0 | 26.4 | 2.0 |
| 45.0 | 91.1 | 23.3 | 105.0 | 49.1 | 6.8 | 165.0 | 26.3 | 1.9 |
| 46.0 | 90.9 | 23.2 | 106.0 | 48.0 | 6.5 | 166.0 | 26.2 | 1.9 |
| 47.0 | 90.3 | 22.9 | 107.0 | 47.2 | 6.3 | 167.0 | 26.0 | 1.9 |
| 48.0 | 89.8 | 22.7 | 108.0 | 46.6 | 6.1 | 168.0 | 26.0 | 1.9 |
| 49.0 | 89.3 | 22.4 | 109.0 | 45.8 | 5.9 | 169.0 | 25.9 | 1.9 |
| 50.0 | 89.1 | 22.3 | 110.0 | 45.0 | 5.7 | 170.0 | 25.9 | 1.9 |
| 51.0 | 88.7 | 22.1 | 111.0 | 44.4 | 5.5 | 171.0 | 26.0 | 1.9 |
| 52.0 | 88.3 | 21.9 | 112.0 | 43.6 | 5.4 | 172.0 | 25.7 | 1.9 |
| 53.0 | 87.3 | 21.4 | 113.0 | 42.9 | 5.2 | 173.0 | 25.5 | 1.8 |
| 54.0 | 87.1 | 21.3 | 114.0 | 42.3 | 5.0 | 174.0 | 26.0 | 1.9 |
| 55.0 | 86.3 | 20.9 | 115.0 | 41.7 | 4.9 | 175.0 | 25.8 | 1.9 |
| 56.0 | 85.9 | 20.8 | 116.0 | 40.9 | 4.7 | 176.0 | 25.6 | 1.9 |
| 57.0 | 85.3 | 20.5 | 117.0 | 40.2 | 4.5 | 177.0 | 25.6 | 1.8 |
| 58.0 | 84.7 | 20.2 | 118.0 | 39.8 | 4.5 | 178.0 | 25.3 | 1.8 |
| 59.0 | 84.1 | 19.9 | 119.0 | 38.9 | 4.3 | 179.0 | 25.3 | 1.8 |

Horizontal diagram at $0.0^{\circ}$ tilt (Total Antenna)

| $\mathrm{Az}\left({ }^{\circ}\right)$ | Er (\%) | ERP (W) | $\mathrm{Az}\left({ }^{\circ}\right)$ | Er (\%) | ERP (W) | $\mathrm{Az}\left({ }^{\circ}\right)$ | Er (\%) | ERP (W) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 180.0 | 25.4 | 1.8 | 240.0 | 31.9 | 2.9 | 300.0 | 81.3 | 18.6 |
| 181.0 | 25.3 | 1.8 | 241.0 | 32.4 | 2.9 | 301.0 | 81.8 | 18.8 |
| 182.0 | 25.4 | 1.8 | 242.0 | 32.8 | 3.0 | 302.0 | 82.8 | 19.3 |
| 183.0 | 25.3 | 1.8 | 243.0 | 33.4 | 3.1 | 303.0 | 83.0 | 19.4 |
| 184.0 | 25.2 | 1.8 | 244.0 | 33.9 | 3.2 | 304.0 | 83.6 | 19.6 |
| 185.0 | 25.1 | 1.8 | 245.0 | 34.4 | 3.3 | 305.0 | 84.7 | 20.2 |
| 186.0 | 25.1 | 1.8 | 246.0 | 34.9 | 3.4 | 306.0 | 84.9 | 20.3 |
| 187.0 | 25.0 | 1.8 | 247.0 | 35.7 | 3.6 | 307.0 | 86.1 | 20.9 |
| 188.0 | 25.1 | 1.8 | 248.0 | 36.4 | 3.7 | 308.0 | 86.5 | 21.0 |
| 189.0 | 25.0 | 1.8 | 249.0 | 37.0 | 3.9 | 309.0 | 87.3 | 21.4 |
| 190.0 | 25.0 | 1.8 | 250.0 | 37.7 | 4.0 | 310.0 | 88.1 | 21.8 |
| 191.0 | 24.8 | 1.7 | 251.0 | 38.3 | 4.1 | 311.0 | 89.3 | 22.4 |
| 192.0 | 25.0 | 1.8 | 252.0 | 39.2 | 4.3 | 312.0 | 89.1 | 22.3 |
| 193.0 | 24.8 | 1.7 | 253.0 | 39.7 | 4.4 | 313.0 | 89.3 | 22.4 |
| 194.0 | 24.7 | 1.7 | 254.0 | 40.8 | 4.7 | 314.0 | 90.1 | 22.8 |
| 195.0 | 24.7 | 1.7 | 255.0 | 41.6 | 4.9 | 315.0 | 90.7 | 23.1 |
| 196.0 | 24.6 | 1.7 | 256.0 | 42.3 | 5.0 | 316.0 | 90.9 | 23.2 |
| 197.0 | 24.7 | 1.7 | 257.0 | 43.0 | 5.2 | 317.0 | 91.5 | 23.6 |
| 198.0 | 24.7 | 1.7 | 258.0 | 43.9 | 5.4 | 318.0 | 91.9 | 23.8 |
| 199.0 | 24.7 | 1.7 | 259.0 | 44.9 | 5.7 | 319.0 | 92.2 | 23.9 |
| 200.0 | 24.6 | 1.7 | 260.0 | 45.7 | 5.9 | 320.0 | 92.6 | 24.1 |
| 201.0 | 24.7 | 1.7 | 261.0 | 46.3 | 6.0 | 321.0 | 93.0 | 24.3 |
| 202.0 | 24.7 | 1.7 | 262.0 | 47.4 | 6.3 | 322.0 | 93.6 | 24.7 |
| 203.0 | 24.5 | 1.7 | 263.0 | 48.4 | 6.6 | 323.0 | 93.9 | 24.8 |
| 204.0 | 24.6 | 1.7 | 264.0 | 49.3 | 6.8 | 324.0 | 94.3 | 25.0 |
| 205.0 | 24.7 | 1.7 | 265.0 | 50.0 | 7.0 | 325.0 | 94.5 | 25.1 |
| 206.0 | 24.8 | 1.7 | 266.0 | 51.0 | 7.3 | 326.0 | 95.2 | 25.5 |
| 207.0 | 24.7 | 1.7 | 267.0 | 51.7 | 7.5 | 327.0 | 95.4 | 25.6 |
| 208.0 | 24.7 | 1.7 | 268.0 | 53.1 | 7.9 | 328.0 | 95.8 | 25.8 |
| 209.0 | 24.7 | 1.7 | 269.0 | 53.7 | 8.1 | 329.0 | 95.8 | 25.8 |
| 210.0 | 25.1 | 1.8 | 270.0 | 55.0 | 8.5 | 330.0 | 96.2 | 26.0 |
| 211.0 | 24.7 | 1.7 | 271.0 | 55.7 | 8.7 | 331.0 | 96.4 | 26.1 |
| 212.0 | 24.8 | 1.7 | 272.0 | 56.5 | 9.0 | 332.0 | 96.6 | 26.3 |
| 213.0 | 24.9 | 1.8 | 273.0 | 57.7 | 9.4 | 333.0 | 96.8 | 26.4 |
| 214.0 | 25.0 | 1.8 | 274.0 | 58.3 | 9.6 | 334.0 | 96.8 | 26.4 |
| 215.0 | 24.9 | 1.7 | 275.0 | 59.5 | 10.0 | 335.0 | 97.5 | 26.7 |
| 216.0 | 25.1 | 1.8 | 276.0 | 60.3 | 10.2 | 336.0 | 97.5 | 26.7 |
| 217.0 | 25.3 | 1.8 | 277.0 | 61.2 | 10.5 | 337.0 | 97.7 | 26.9 |
| 218.0 | 25.5 | 1.8 | 278.0 | 62.0 | 10.8 | 338.0 | 97.9 | 27.0 |
| 219.0 | 25.6 | 1.8 | 279.0 | 63.2 | 11.2 | 339.0 | 98.2 | 27.1 |
| 220.0 | 25.7 | 1.9 | 280.0 | 64.2 | 11.6 | 340.0 | 98.2 | 27.1 |
| 221.0 | 25.9 | 1.9 | 281.0 | 65.1 | 11.9 | 341.0 | 98.6 | 27.4 |
| 222.0 | 26.2 | 1.9 | 282.0 | 66.1 | 12.3 | 342.0 | 98.9 | 27.5 |
| 223.0 | 26.2 | 1.9 | 283.0 | 66.5 | 12.4 | 343.0 | 98.6 | 27.4 |
| 224.0 | 26.3 | 1.9 | 284.0 | 67.8 | 12.9 | 344.0 | 98.9 | 27.5 |
| 225.0 | 26.6 | 2.0 | 285.0 | 68.8 | 13.3 | 345.0 | 98.9 | 27.5 |
| 226.0 | 26.8 | 2.0 | 286.0 | 69.6 | 13.6 | 346.0 | 99.1 | 27.6 |
| 227.0 | 27.1 | 2.1 | 287.0 | 70.7 | 14.1 | 347.0 | 99.1 | 27.6 |
| 228.0 | 27.3 | 2.1 | 288.0 | 71.2 | 14.3 | 348.0 | 99.3 | 27.7 |
| 229.0 | 27.6 | 2.1 | 289.0 | 72.1 | 14.6 | 349.0 | 99.3 | 27.7 |
| 230.0 | 27.8 | 2.2 | 290.0 | 72.9 | 15.0 | 350.0 | 99.1 | 27.6 |
| 231.0 | 28.2 | 2.2 | 291.0 | 74.0 | 15.4 | 351.0 | 99.3 | 27.7 |
| 232.0 | 28.5 | 2.3 | 292.0 | 74.6 | 15.7 | 352.0 | 99.8 | 28.0 |
| 233.0 | 28.8 | 2.3 | 293.0 | 75.7 | 16.1 | 353.0 | 99.5 | 27.9 |
| 234.0 | 29.2 | 2.4 | 294.0 | 76.2 | 16.3 | 354.0 | 99.8 | 28.0 |
| 235.0 | 29.5 | 2.4 | 295.0 | 76.9 | 16.6 | 355.0 | 99.5 | 27.9 |
| 236.0 | 30.0 | 2.5 | 296.0 | 78.0 | 17.1 | 356.0 | 99.3 | 27.7 |
| 237.0 | 30.3 | 2.6 | 297.0 | 78.3 | 17.3 | 357.0 | 99.8 | 28.0 |
| 238.0 | 30.9 | 2.7 | 298.0 | 79.8 | 17.9 | 358.0 | 100.0 | 28.1 |
| 239.0 | 31.2 | 2.7 | 299.0 | 80.2 | 18.1 | 359.0 | 99.5 | 27.9 |

## Vertical diagram at an azimuth of $5.4^{\circ}$



Vertical diagram at an azimuth of $5.4^{\circ}$

| Dep ( ${ }^{\circ}$ ) | Er (\%) | ERP (W) | Dep $\left({ }^{\circ}\right)$ | Er (\%) | ERP (W) | Dep ( ${ }^{\circ}$ ) | Er (\%) | ERP (W) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 0.0 | 100.2 | 27.8 | 16.1 | 6.5 | 0.1 | 32.2 | 7.1 | 0.1 |
| 0.3 | 100.0 | 27.7 | 16.3 | 4.8 | 0.1 | 32.4 | 7.3 | 0.1 |
| 0.5 | 99.1 | 27.2 | 16.6 | 3.1 | 0.0 | 32.7 | 7.3 | 0.1 |
| 0.8 | 97.4 | 26.3 | 16.9 | 1.4 | 0.0 | 33.0 | 7.1 | 0.1 |
| 1.1 | 95.0 | 25.0 | 17.2 | 0.3 | 0.0 | 33.2 | 6.9 | 0.1 |
| 1.3 | 91.9 | 23.4 | 17.4 | 2.0 | 0.0 | 33.5 | 6.6 | 0.1 |
| 1.6 | 88.1 | 21.5 | 17.7 | 3.5 | 0.0 | 33.8 | 6.1 | 0.1 |
| 1.9 | 83.8 | 19.5 | 18.0 | 5.0 | 0.1 | 34.0 | 5.6 | 0.1 |
| 2.1 | 78.9 | 17.3 | 18.2 | 6.3 | 0.1 | 34.3 | 5.0 | 0.1 |
| 2.4 | 73.5 | 15.0 | 18.5 | 7.4 | 0.2 | 34.6 | 4.3 | 0.1 |
| 2.7 | 67.7 | 12.7 | 18.8 | 8.4 | 0.2 | 34.8 | 3.6 | 0.0 |
| 2.9 | 61.6 | 10.5 | 19.0 | 9.2 | 0.2 | 35.1 | 2.8 | 0.0 |
| 3.2 | 55.3 | 8.5 | 19.3 | 9.8 | 0.3 | 35.4 | 2.0 | 0.0 |
| 3.5 | 48.8 | 6.6 | 19.6 | 10.2 | 0.3 | 35.6 | 1.2 | 0.0 |
| 3.8 | 42.2 | 4.9 | 19.8 | 10.3 | 0.3 | 35.9 | 0.3 | 0.0 |
| 4.0 | 35.5 | 3.5 | 20.1 | 10.3 | 0.3 | 36.2 | 0.5 | 0.0 |
| 4.3 | 29.0 | 2.3 | 20.4 | 10.0 | 0.3 | 36.4 | 1.3 | 0.0 |
| 4.6 | 22.6 | 1.4 | 20.6 | 9.6 | 0.3 | 36.7 | 2.1 | 0.0 |
| 4.8 | 16.4 | 0.7 | 20.9 | 9.0 | 0.2 | 37.0 | 2.8 | 0.0 |
| 5.1 | 10.6 | 0.3 | 21.2 | 8.3 | 0.2 | 37.3 | 3.5 | 0.0 |
| 5.4 | 5.1 | 0.1 | 21.4 | 7.3 | 0.1 | 37.5 | 4.1 | 0.0 |
| 5.6 | 0.1 | 0.0 | 21.7 | 6.3 | 0.1 | 37.8 | 4.7 | 0.1 |
| 5.9 | 4.7 | 0.1 | 22.0 | 5.2 | 0.1 | 38.1 | 5.2 | 0.1 |
| 6.2 | 8.9 | 0.2 | 22.2 | 4.0 | 0.0 | 38.3 | 5.6 | 0.1 |
| 6.4 | 12.5 | 0.4 | 22.5 | 2.7 | 0.0 | 38.6 | 6.0 | 0.1 |
| 6.7 | 15.6 | 0.7 | 22.8 | 1.5 | 0.0 | 38.9 | 6.2 | 0.1 |
| 7.0 | 18.1 | 0.9 | 23.0 | 0.2 | 0.0 | 39.1 | 6.4 | 0.1 |
| 7.2 | 20.1 | 1.1 | 23.3 | 1.1 | 0.0 | 39.4 | 6.5 | 0.1 |
| 7.5 | 21.5 | 1.3 | 23.6 | 2.3 | 0.0 | 39.7 | 6.4 | 0.1 |
| 7.8 | 22.4 | 1.4 | 23.9 | 3.5 | 0.0 | 39.9 | 6.3 | 0.1 |
| 8.0 | 22.7 | 1.4 | 24.1 | 4.5 | 0.1 | 40.2 | 6.2 | 0.1 |
| 8.3 | 22.5 | 1.4 | 24.4 | 5.5 | 0.1 | 40.5 | 5.9 | 0.1 |
| 8.6 | 21.9 | 1.3 | 24.7 | 6.3 | 0.1 | 40.7 | 5.6 | 0.1 |
| 8.8 | 20.9 | 1.2 | 24.9 | 7.0 | 0.1 | 41.0 | 5.2 | 0.1 |
| 9.1 | 19.4 | 1.0 | 25.2 | 7.6 | 0.2 | 41.3 | 4.7 | 0.1 |
| 9.4 | 17.6 | 0.9 | 25.5 | 8.0 | 0.2 | 41.5 | 4.2 | 0.0 |
| 9.6 | 15.5 | 0.7 | 25.7 | 8.3 | 0.2 | 41.8 | 3.7 | 0.0 |
| 9.9 | 13.3 | 0.5 | 26.0 | 8.4 | 0.2 | 42.1 | 3.1 | 0.0 |
| 10.2 | 10.8 | 0.3 | 26.3 | 8.4 | 0.2 | 42.3 | 2.4 | 0.0 |
| 10.5 | 8.2 | 0.2 | 26.5 | 8.2 | 0.2 | 42.6 | 1.8 | 0.0 |
| 10.7 | 5.6 | 0.1 | 26.8 | 7.9 | 0.2 | 42.9 | 1.1 | 0.0 |
| 11.0 | 3.0 | 0.0 | 27.1 | 7.4 | 0.2 | 43.1 | 0.4 | 0.0 |
| 11.3 | 0.5 | 0.0 | 27.3 | 6.8 | 0.1 | 43.4 | 0.2 | 0.0 |
| 11.5 | 2.0 | 0.0 | 27.6 | 6.1 | 0.1 | 43.7 | 0.9 | 0.0 |
| 11.8 | 4.3 | 0.1 | 27.9 | 5.3 | 0.1 | 44.0 | 1.5 | 0.0 |
| 12.1 | 6.4 | 0.1 | 28.1 | 4.4 | 0.1 | 44.2 | 2.2 | 0.0 |
| 12.3 | 8.3 | 0.2 | 28.4 | 3.5 | 0.0 | 44.5 | 2.7 | 0.0 |
| 12.6 | 10.0 | 0.3 | 28.7 | 2.5 | 0.0 | 44.8 | 3.3 | 0.0 |
| 12.9 | 11.4 | 0.4 | 28.9 | 1.5 | 0.0 | 45.0 | 3.8 | 0.0 |
| 13.1 | 12.4 | 0.4 | 29.2 | 0.5 | 0.0 | 45.3 | 4.2 | 0.0 |
| 13.4 | 13.2 | 0.5 | 29.5 | 0.5 | 0.0 | 45.6 | 4.7 | 0.1 |
| 13.7 | 13.7 | 0.5 | 29.7 | 1.5 | 0.0 | 45.8 | 5.0 | 0.1 |
| 13.9 | 13.9 | 0.5 | 30.0 | 2.5 | 0.0 | 46.1 | 5.3 | 0.1 |
| 14.2 | 13.8 | 0.5 | 30.3 | 3.3 | 0.0 | 46.4 | 5.5 | 0.1 |
| 14.5 | 13.4 | 0.5 | 30.6 | 4.2 | 0.0 | 46.6 | 5.7 | 0.1 |
| 14.7 | 12.8 | 0.5 | 30.8 | 4.9 | 0.1 | 46.9 | 5.8 | 0.1 |
| 15.0 | 11.9 | 0.4 | 31.1 | 5.6 | 0.1 | 47.2 | 5.8 | 0.1 |
| 15.3 | 10.8 | 0.3 | 31.4 | 6.1 | 0.1 | 47.4 | 5.8 | 0.1 |
| 15.5 | 9.5 | 0.2 | 31.6 | 6.6 | 0.1 | 47.7 | 5.8 | 0.1 |
| 15.8 | 8.0 | 0.2 | 31.9 | 6.9 | 0.1 | 48.0 | 5.7 | 0.1 |

Vertical diagram at an azimuth of $5.4^{\circ}$

| Dep ( ${ }^{\circ}$ ) | Er (\%) | ERP (W) | Dep ( ${ }^{\circ}$ ) | Er (\%) | ERP (W) | Dep ( ${ }^{\circ}$ ) | Er (\%) | ERP (W) |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| 48.2 | 5.5 | 0.1 | 64.3 | 2.6 | 0.0 | 80.4 | 0.4 | 0.0 |
| 48.5 | 5.2 | 0.1 | 64.6 | 2.9 | 0.0 | 80.7 | 0.5 | 0.0 |
| 48.8 | 4.9 | 0.1 | 64.9 | 3.1 | 0.0 | 80.9 | 0.5 | 0.0 |
| 49.0 | 4.6 | 0.1 | 65.1 | 3.2 | 0.0 | 81.2 | 0.6 | 0.0 |
| 49.3 | 4.2 | 0.0 | 65.4 | 3.4 | 0.0 | 81.5 | 0.6 | 0.0 |
| 49.6 | 3.8 | 0.0 | 65.7 | 3.6 | 0.0 | 81.7 | 0.6 | 0.0 |
| 49.8 | 3.4 | 0.0 | 65.9 | 3.7 | 0.0 | 82.0 | 0.7 | 0.0 |
| 50.1 | 2.9 | 0.0 | 66.2 | 3.8 | 0.0 | 82.3 | 0.7 | 0.0 |
| 50.4 | 2.4 | 0.0 | 66.5 | 3.9 | 0.0 | 82.5 | 0.7 | 0.0 |
| 50.7 | 1.9 | 0.0 | 66.7 | 4.0 | 0.0 | 82.8 | 0.7 | 0.0 |
| 50.9 | 1.4 | 0.0 | 67.0 | 4.1 | 0.0 | 83.1 | 0.7 | 0.0 |
| 51.2 | 0.9 | 0.0 | 67.3 | 4.1 | 0.0 | 83.3 | 0.7 | 0.0 |
| 51.5 | 0.4 | 0.0 | 67.5 | 4.2 | 0.0 | 83.6 | 0.8 | 0.0 |
| 51.7 | 0.2 | 0.0 | 67.8 | 4.2 | 0.0 | 83.9 | 0.8 | 0.0 |
| 52.0 | 0.7 | 0.0 | 68.1 | 4.2 | 0.0 | 84.2 | 0.8 | 0.0 |
| 52.3 | 1.2 | 0.0 | 68.3 | 4.2 | 0.0 | 84.4 | 0.8 | 0.0 |
| 52.5 | 1.7 | 0.0 | 68.6 | 4.2 | 0.0 | 84.7 | 0.8 | 0.0 |
| 52.8 | 2.1 | 0.0 | 68.9 | 4.1 | 0.0 | 85.0 | 0.8 | 0.0 |
| 53.1 | 2.6 | 0.0 | 69.1 | 4.0 | 0.0 | 85.2 | 0.8 | 0.0 |
| 53.3 | 3.0 | 0.0 | 69.4 | 4.0 | 0.0 | 85.5 | 0.8 | 0.0 |
| 53.6 | 3.4 | 0.0 | 69.7 | 3.9 | 0.0 | 85.8 | 0.7 | 0.0 |
| 53.9 | 3.7 | 0.0 | 69.9 | 3.8 | 0.0 | 86.0 | 0.7 | 0.0 |
| 54.1 | 4.0 | 0.0 | 70.2 | 3.7 | 0.0 | 86.3 | 0.7 | 0.0 |
| 54.4 | 4.3 | 0.1 | 70.5 | 3.6 | 0.0 | 86.6 | 0.7 | 0.0 |
| 54.7 | 4.6 | 0.1 | 70.8 | 3.5 | 0.0 | 86.8 | 0.7 | 0.0 |
| 54.9 | 4.8 | 0.1 | 71.0 | 3.4 | 0.0 | 87.1 | 0.7 | 0.0 |
| 55.2 | 5.0 | 0.1 | 71.3 | 3.3 | 0.0 | 87.4 | 0.6 | 0.0 |
| 55.5 | 5.1 | 0.1 | 71.6 | 3.2 | 0.0 | 87.6 | 0.6 | 0.0 |
| 55.7 | 5.2 | 0.1 | 71.8 | 3.0 | 0.0 | 87.9 | 0.6 | 0.0 |
| 56.0 | 5.2 | 0.1 | 72.1 | 2.9 | 0.0 | 88.2 | 0.6 | 0.0 |
| 56.3 | 5.2 | 0.1 | 72.4 | 2.8 | 0.0 | 88.4 | 0.6 | 0.0 |
| 56.5 | 5.2 | 0.1 | 72.6 | 2.7 | 0.0 | 88.7 | 0.6 | 0.0 |
| 56.8 | 5.2 | 0.1 | 72.9 | 2.5 | 0.0 | 89.0 | 0.5 | 0.0 |
| 57.1 | 5.1 | 0.1 | 73.2 | 2.4 | 0.0 | 89.2 | 0.5 | 0.0 |
| 57.4 | 5.0 | 0.1 | 73.4 | 2.2 | 0.0 | 89.5 | 0.5 | 0.0 |
| 57.6 | 4.8 | 0.1 | 73.7 | 2.1 | 0.0 | 89.8 | 0.5 | 0.0 |
| 57.9 | 4.6 | 0.1 | 74.0 | 2.0 | 0.0 | 90.0 | 0.5 | 0.0 |
| 58.2 | 4.4 | 0.1 | 74.2 | 1.8 | 0.0 | 90.3 | 0.5 | 0.0 |
| 58.4 | 4.2 | 0.0 | 74.5 | 1.7 | 0.0 | 90.6 | 0.5 | 0.0 |
| 58.7 | 4.0 | 0.0 | 74.8 | 1.6 | 0.0 | 90.9 | 0.5 | 0.0 |
| 59.0 | 3.7 | 0.0 | 75.0 | 1.4 | 0.0 | 91.1 | 0.5 | 0.0 |
| 59.2 | 3.4 | 0.0 | 75.3 | 1.3 | 0.0 | 91.4 | 0.5 | 0.0 |
| 59.5 | 3.1 | 0.0 | 75.6 | 1.2 | 0.0 | 91.7 | 0.5 | 0.0 |
| 59.8 | 2.7 | 0.0 | 75.8 | 1.0 | 0.0 | 91.9 | 0.5 | 0.0 |
| 60.0 | 2.4 | 0.0 | 76.1 | 0.9 | 0.0 | 92.2 | 0.5 | 0.0 |
| 60.3 | 2.1 | 0.0 | 76.4 | 0.8 | 0.0 | 92.5 | 0.5 | 0.0 |
| 60.6 | 1.7 | 0.0 | 76.6 | 0.7 | 0.0 | 92.7 | 0.5 | 0.0 |
| 60.8 | 1.4 | 0.0 | 76.9 | 0.6 | 0.0 | 93.0 | 0.5 | 0.0 |
| 61.1 | 1.0 | 0.0 | 77.2 | 0.5 | 0.0 | 93.3 | 0.5 | 0.0 |
| 61.4 | 0.7 | 0.0 | 77.5 | 0.4 | 0.0 | 93.5 | 0.5 | 0.0 |
| 61.6 | 0.3 | 0.0 | 77.7 | 0.3 | 0.0 | 93.8 | 0.5 | 0.0 |
| 61.9 | 0.0 | 0.0 | 78.0 | 0.2 | 0.0 | 94.1 | 0.5 | 0.0 |
| 62.2 | 0.3 | 0.0 | 78.3 | 0.1 | 0.0 | 94.3 | 0.5 | 0.0 |
| 62.4 | 0.7 | 0.0 | 78.5 | 0.0 | 0.0 | 94.6 | 0.5 | 0.0 |
| 62.7 | 1.0 | 0.0 | 78.8 | 0.1 | 0.0 | 94.9 | 0.5 | 0.0 |
| 63.0 | 1.3 | 0.0 | 79.1 | 0.1 | 0.0 | 95.1 | 0.5 | 0.0 |
| 63.2 | 1.6 | 0.0 | 79.3 | 0.2 | 0.0 | 95.4 | 0.5 | 0.0 |
| 63.5 | 1.9 | 0.0 | 79.6 | 0.3 | 0.0 | 95.7 | 0.5 | 0.0 |
| 63.8 | 2.2 | 0.0 | 79.9 | 0.3 | 0.0 | 95.9 | 0.5 | 0.0 |
| 64.1 | 2.4 | 0.0 | 80.1 | 0.4 | 0.0 | 96.2 | 0.5 | 0.0 |

