Antenna 1

Antenna 1 Re-radiated Signal Strength at 100 ft outside the building

(1) $P_{Rerad} = P_{Rec} + G_1 + G_2 – AT_1 + A_1 – C_1 – C_2 – FL$

Where: P_{Rerad} = Re-radiated signal strength 100 ft outside the building
P_{Rec} = Received Power from Satellites = -130 dBm
G_1 = Roof Antenna Gain = 43 dBi
G_2 = Re-radiating Antenna Gain = 3.0 dBi
AT_1 = Attenuator Value = 1 dB
A_1 = Amplified Splitter Gain = 34 dB
C_1 = Coax Attenuation, Roof Antenna to Attenuator
= 10.1 dB/100 ft X 116 ft
= 11.7 dB
C_2 = Coax Attenuation, Amplified Splitter to Re-radiating Antenna
= 10.1 dB/100 ft X 78 ft
= 7.9 dB
FL = Freespace Loss

(2) FL = 20LogF + 20LogD + 36.56

Where: F = Frequency in MHz = 1575.42
D = Distance in Miles
= (Distance from antenna to outer wall in feet + 100)/5280
= (54 + 100)/5280

Inserting the values for F and D into equation (2) yields

FL = 20Log(1575.42) + 20Log((54 +100)/5280) +36.56
= 69.8 dB

Inserting these values into equation (1) then becomes:

P_{Rerad} = -130 + 43 + 3.0 –1 + 34 – 11.7 – 7.9 – 69.8
= - 140.4 dBm EIRP

Power radiated from Antenna 1

(3) $P_{Ant} = P_{Rerad} + FL$

Where: P_{Ant} = power radiated from the antenna

Using values from (1) and (2) above, equation (3) becomes:

P_{Ant} = -140.4 + 69.8 = -70.6 dBm EIRP

(4) $P = P_{In} [\log^{-1}(P_{Ant}/10)]$

Where: P = Power in Watts
P_{In} = Input (Reference) Power = 0.001 W

$P = 0.001[\log^{-1}(-70.6/10)]$
= 87.1 pW EIRP = 53.1 pW ERP

Antenna 2

Antenna 2 Re-radiated Signal Strength at 100 ft outside the building

(1) $P_{Rerad} = P_{Rec} + G_1 + G_2 – AT_1 + A_1 – C_1 – C_2 – FL$

Where: P_{Rerad} = Re-radiated signal strength 100 ft outside the building
P_{Rec} = Received Power from Satellites = -130 dBm
G_1 = Roof Antenna Gain = 43 dBi
G_2 = Re-radiating Antenna Gain = 3.0 dBi
AT_1 = Attenuator Value = 1 dB
A_1 = Amplified Splitter Gain = 34 dB
C_1 = Coax Attenuation, Roof Antenna to Attenuator
= 10.1 dB/100 ft X 116 ft
= 11.7 dB
C_2 = Coax Attenuation, Amplified Splitter to Re-radiating Antenna
= 10.1 dB/100 ft X 90 ft
= 9.1 dB
FL = Freespace Loss

(2) FL = 20LogF + 20LogD + 36.56

Where: F = Frequency in MHz = 1575.42
D = Distance in Miles
= (Distance from antenna to outer wall in feet + 100)/5280
= (51 ft + 100 ft)/5280

Inserting the values for F and D into equation (2) yields

FL = 20Log(1575.42) + 20Log((51 +100)/5280) +36.56
= 69.6 dB

Inserting these values into equation (1) then becomes:

P_{Rerad} = -130 + 43 + 3.0 –1 + 34 – 11.7 – 9.1 – 69.6
= - 141.4 dBm EIRP

Power radiated from Antenna 2

(3) $P_{Ant} = P_{Rerad} + FL$

Where: P_{Ant} = power radiated from the antenna

Using values from (1) and (2) above, equation (3) becomes:

P_{Ant} = -141.4 + 69.6 = -71.8 dBm EIRP

(4) $P = P_{In} [\log^{-1}(P_{Ant}/10)]$

Where: P = Power in Watts
P_{In} = Input (Reference) Power = 0.001 W

$P = 0.001[\log^{-1}(-76.8/10)]$
= 66.1 pW EIRP = 40.3 pW ERP

Antenna 3

Antenna 3 Re-radiated Signal Strength at 100 ft outside the building

(1) $P_{Rerad} = P_{Rec} + G_1 + G_2 – AT_1 + A_1 – C_1 – C_2 – FL$

Where: P_{Rerad} = Re-radiated signal strength 100 ft outside the building
P_{Rec} = Received Power from Satellites = -130 dBm
G_1 = Roof Antenna Gain = 43 dBi
G_2 = Re-radiating Antenna Gain = 3.0 dBi
AT_1 = Attenuator Value = 1 dB
A_1 = Amplified Splitter Gain = 34 dB
C_1 = Coax Attenuation, Roof Antenna to Attenuator
= 10.1 dB/100 ft X 116 ft
= 11.7 dB
C_2 = Coax Attenuation, Amplified Splitter to Re-radiating Antenna
= 10.1 dB/100 ft X 76 ft
= 7.7 dB
FL = Freespace Loss

(2) FL = 20LogF + 20LogD + 36.56

Where: F = Frequency in MHz = 1575.42
D = Distance in Miles
= (Distance from antenna to outer wall in feet + 100)/5280
= (51 ft + 100 ft)/5280

Inserting the values for F and D into equation (2) yields

FL = 20Log(1575.42) + 20Log((51 +100)/5280) +36.56
= 69.6 dB

Inserting these values into equation (1) then becomes:

P_{Rerad} = -130 + 43 + 3.0 –1 + 34 – 11.7 – 7.7 – 69.6
= - 140.0 dBm EIRP

Power radiated from Antenna 3

(3) $P_{Ant} = P_{Rerad} + FL$

Where: P_{Ant} = power radiated from the antenna

Using values from (1) and (2) above, equation (3) becomes:

P_{Ant} = -140.0 + 69.6 = -70.4 dBm EIRP

(4) $P = P_{In} [\log^{-1}(P_{Ant}/10)]$

Where: P = Power in Watts
P_{In} = Input (Reference) Power = 0.001 W

$P = 0.001[\log^{-1}(-70.4/10)]$
= 91.2 pW EIRP = 55.6 pW ERP

Antenna 4

Antenna 4 Re-radiated Signal Strength at 100 ft outside the building

(1) $P_{Rerad} = P_{Rec} + G_1 + G_2 – AT_1 + A_1 – C_1 – C_2 – FL$

Where: P_{Rerad} = Re-radiated signal strength 100 ft outside the building
P_{Rec} = Received Power from Satellites = -130 dBm
G_1 = Roof Antenna Gain = 43 dBi
G_2 = Re-radiating Antenna Gain = 3.0 dBi
AT_1 = Attenuator Value = 1 dB
A_1 = Amplified Splitter Gain = 34 dB
C_1 = Coax Attenuation, Roof Antenna to Attenuator
= 10.1 dB/100 ft X 116 ft
= 11.7 dB
C_2 = Coax Attenuation, Amplified Splitter to Re-radiating Antenna
= 10.1 dB/100 ft X 75 ft
= 7.6 dB
FL = Freespace Loss

(2) FL = 20LogF + 20LogD + 36.56

Where: F = Frequency in MHz = 1575.42
D = Distance in Miles
= (Distance from antenna to outer wall in feet + 100)/5280
= (74 ft + 100 ft)/5280

Inserting the values for F and D into equation (2) yields

FL = 20Log(1575.42) + 20Log((74 +100)/5280) +36.56
= 70.9 dB

Inserting these values into equation (1) then becomes:

P_{Rerad} = -130 + 43 + 3.0 –1 + 34 – 11.7 – 7.6 – 70.9
= - 141.2 dBm EIRP

Power radiated from Antenna 4

(3) $P_{Ant} = P_{Rerad} + FL$

Where: P_{Ant} = power radiated from the antenna

Using values from (1) and (2) above, equation (3) becomes:

P_{Ant} = -141.2 + 70.9 = -70.3 dBm EIRP

(4) $P = P_{In} [\log^{-1}(P_{Ant}/10)]$

Where: P = Power in Watts
P_{In} = Input (Reference) Power = 0.001 W

P = $0.001[\log^{-1}(-70.3/10)]$
= 93.3 pW EIRP = 56.9 pW ERP