

Exhibit 1

In connection with this renewal application, the following is noted:

1. Attached hereto are the licensee's calculations demonstrating compliance with NTIA GPS Re-Radiation Criteria – Section 8.3.28 of NTIA Regulations Maximum Equivalent Isotropically Radiated Power.
2. Location No. 2 on the Station WE2XXG license (Nashua (HILLSBOROUGH), NH - NL 42-42-14; WL 71-26-56) is no longer being operated. Therefore, upon grant of this renewal application, it is requested that Location No. 2 be deleted from the license.
3. Please note the following changes in the Stop Buzzer information for Locations 1 and 3 on the license. Upon grant of this renewal application, it is requested that Special Condition No. 7 on the license be updated to reflect this new Stop Buzzer information:

- Location (1), Nashua (HILLSBOROUGH), NH - NL 42-42-14; WL 71-26-46

Primary Stop Buzzer: Bruce Cole, 603-885-5923

Secondary Stop Buzzer: BAE Systems Emergency Services Center, 603-885-3842

- Location (3), Hudson (HILLSBOROUGH), NH - NL 42-42-09; WL 71-25-52

Primary Stop Buzzer: John Allen, 603-885-2084

Secondary Stop Buzzer: BAE Systems Emergency Services Center, 603-885-3842

Compliance with NTIA GPS Re-Radiation Criteria – Section 8.3.28 of NTIA Regulations Maximum Equivalent Isotropically Radiated Power

The system re-radiates the GPS L1 (1575.42 MHz) and L2 (1227.60 MHz) signals at several locations inside the buildings designated NHQ Building 2, and PTP02. Both systems (dual band) are configured similarly with an active receiving antenna, a signal-boost amplifier (where necessary), a leveling amplifier, RF distribution network and a re-radiating antenna for both frequencies at each site.

The leveling amplifier (GLI-METRO, manufactured by GPS Source) is an amplifier module that is operated in the fixed power control mode, maintaining a fixed output signal level. As a result, the compliance calculation is separated into two steps; calculating the input signal to the leveling amplifier to verify correct input power level, and calculating re-radiating power level of the system using the fixed output of the leveling amp as the starting point.

Calculations are performed based on Section 8.3.28 of the NTIA regulations¹, wherein item 6 states “the maximum equivalent isotropically radiated power must be such that the calculated emissions are no greater than -140dBm/24 MHz at a distance of 100 feet (30 meters) from the building where the test is being conducted.” In accordance with the regulation, building attenuation has been ignored. This calculation shows that the re-radiated signal strength is in compliance with NTIA requirements. The calculations are performed for each of the repeater sites in parts A, B, and C below.

The input signal level to the leveling amplifier is a summation of the received power, receive antenna gain, receive antenna amplifier gain, and RF connection losses in the coaxial cables.

$$(1) \text{ Pin_lvlamp} = \text{Prcv} + \text{Grcv_ant} + \text{Grcv_amp} + \text{LSI}$$

Where:

Pin_lvlamp = RF signal strength into leveling amplifier

Prcv = Received power from GPS Satellites (-130 dBm)

Grcv_ant = Roof active antenna, (Antcom P/N: 123GM1215A4-XS-1)
= 7.7dBic (L1) and 4.7 dBic (L2)

Grcv_amp = Roof active antenna amplifier gain = 40 dB (L1) and 40 dB (L2)

LSI = summation of coaxial cable loss and in-line amplifier gain (if necessary) from the roof antenna amplifier output to leveling amplifier input port

The compliance calculation for the re-radiated signal is a summation of the leveling amplifier output power, RF distribution network losses/gains (power splitter, cables, and additional amplifiers as necessary), and the re-radiating antenna gain.

¹ See *Manual of Regulations and Procedures for Federal Radio Frequency Management* Para 8.3.28 (Rev May 2011).

$$(2) P_{sig} = P_{out_lvlamp} + LS2 + Grad_ant + L_{prop}$$

Where:

P_{sig} = Re-radiated signal strength located 100 ft from the building exterior wall

P_{out_lvlamp} = RF signal strength out of the leveling amplifier (fixed)

$LS2$ = summation of the coaxial cable attenuation, RF splitter loss, and in-line amplifier gain (if necessary) between the leveling amplifier output and the re-radiating antenna input

$Grad_ant$ = Re-radiating antenna, (Antcom P/N: 2.3G1215P-XRS-4)
[2.7dBic (L1) and 1.5 dBic (L2)]

L_{prop} = Free space propagation (spreading loss) defined in Equation 3 below

$$(3) L_{prop} = 36.6 + 20\log_{10}((D/5280)*freq)$$

Where:

D = Distance (in feet)

$Freq$ = frequency (in MHz)

Part A – Nashua Location NL 42-42-14; WL 71-26-46

Determination of signal strength at 100 feet from NHQ Building 2 at the South Nashua, NH facility, coordinates NL 42-42-14; WL 71-26-46.

This configuration has a 350 ft coaxial cable (Times LMR400) connecting the receive antenna amplifier to an in-line compensating amplifier (Tallysman Model TW141). Another 350 ft coaxial cable connects the output of this amplifier to the input of the leveling amplifier. A 10 dB coaxial attenuator is placed before the input of the leveling amplifier to limit the input signal. Calculating $LS1$ to use in Equation 1:

$$(4) LS1 = L_{cable_1} + G_{amp} + L_{cable_2} + Atten$$

Where:

L_{cable_1} = attenuation of 350 ft of LMR400 coaxial cable (negative number)

G_{amp} = Gain of in-line amplifier

L_{cable_2} = attenuation of 350 ft of LMR400 coaxial cable (negative number)

$Atten$ = attenuation of coaxial attenuator (negative number)

$$LS1 \text{ (dB)} = -18.4 \text{ dB} + 40 \text{ dB} - 18.4 \text{ dB} - 10 \text{ dB} = -6.8 \text{ dB [for freq L1]}$$

$$LS1 \text{ (dB)} = -16.2 \text{ dB} + 40 \text{ dB} - 16.2 \text{ dB} - 10 \text{ dB} = -2.4 \text{ dB [for freq L2]}$$

Calculation of the leveling amplifier input signal from Equation 1:

$$Pin_lvlamp = -130 \text{ dBm} + 7.7 \text{ dBic} + 40 \text{ dB} - 6.8 \text{ dB} = -89.1 \text{ dBm [for freq L1]}$$

$$Pin_lvlamp = -130 \text{ dBm} + 4.7 \text{ dBic} + 40 \text{ dB} - 2.4 \text{ dB} = -87.7 \text{ dBm [for freq L2]}$$

The rated input range for the GLI-METRO leveling amplifier is -115 dBm to -85 dBm.

For this installation the GLI-METRO leveling amplifier is operated in the fixed mode with the

output signal strength set at -85 dBm. The signal is distributed to 9 paths with various cable lengths, each connecting to re-radiating antenna (Antcom P/N 2.3G1215P-XRS-4). The re-radiating antenna closest to the building wall is located 10 feet from the building exterior. Therefore, the worst-case propagation loss is calculated for a distance of 110 feet. From Equation 3:

$$L_{prop} = 36.6 + 20\log_{10}((110/5280)*1575) = 66.9 \text{ dB [for freq L1]}$$

$$L_{prop} = 36.6 + 20\log_{10}((110/5280)*1227) = 64.8 \text{ dB [for freq L2]}$$

Between the leveling amplifier output and the re-radiating antenna input is an RF network comprised of a short cable, a signal-boosting amplifier (MiniCircuits P/N ZX60-2522M), a 12-way RF power splitter (MiniCircuits P/N ZN12PD-252-S+) with 9 utilized output ports (unused ports are terminated with 50-ohm loads). Each utilized output port has a coaxial attenuator and a cable connecting to the re-radiating antenna. The 9 cable lengths are 10 ft, 44 ft (2x), 32 ft (3x), 24 ft, 30 ft, and 38 ft. The worst-case (least loss) occurs for the 10 ft (shortest) cable. Calculating LS2 to use in Equation 2:

$$(5) LS2 = L_{cable_3} + G_{amp} + L_{splitter} + L_{atten} + L_{cable_4}$$

Where:

$$L_{cable_3} = \text{attenuation of 2 ft LMR200 cable} = -0.3 \text{ dB [L1]}, -0.2 \text{ dB [L2]}$$

$$G_{amp} = \text{Gain of in-line amplifier} = 23.5 \text{ dB [L1]}, 23.0 \text{ dB [L2]}$$

$$L_{splitter} = \text{attenuation from RF splitter} = -11.3 \text{ dB [L1]}, -11.2 \text{ dB [L2]}$$

$$L_{atten} = \text{attenuation from coaxial attenuator} = -3.0 \text{ dB [L1 \& L2]}$$

$$L_{cable_4} = \text{attenuation of 10 ft LMR200 cable} = -1.3 \text{ dB [L1]}, -1.2 \text{ dB [L2]}$$

$$LS2 = -0.3 \text{ dB} + 23.5 \text{ dB} - 11.3 \text{ dB} - 3 \text{ dB} - 1.3 \text{ dB} = 7.6 \text{ dB [for freq L1]}$$

$$LS2 = -0.2 \text{ dB} + 23.0 \text{ dB} - 11.2 \text{ dB} - 3 \text{ dB} - 1.2 \text{ dB} = 7.4 \text{ dB [for freq L2]}$$

Therefore the signal strength at a point 100 feet away from the building from Equation 2 is calculated:

$$P_{sig} = -85 \text{ dBm} + 7.6 \text{ dB} + 2.7 \text{ dBic} - 66.9 \text{ dB} = -141.6 \text{ dBm [for freq L1]}$$

$$P_{sig} = -85 \text{ dBm} + 7.4 \text{ dB} + 1.5 \text{ dBic} - 64.8 \text{ dB} = -140.8 \text{ dBm [for freq L2]}$$

This demonstrates compliance to the -140 dBm requirement.

Converting the re-radiated power based on EIRP (Equivalent Isotropically Radiated Power) at 100 ft from the building to ERP (Effective Radiated Power) in pico-watts from the re-radiating antenna requires the subtraction of 2.148:

For L1

$$\begin{aligned} Prad_{(ERP)} &= P_{sig} - 2.148 - L_{prop} \\ &= -141.6 \text{ dBm} - 2.148 - (-66.9 \text{ dB}) \\ &= -76.868 \text{ dBm} \\ &= 20.57 \text{ pW (which is less than the maximum 55.46 pW in the license)} \end{aligned}$$

For L2

$$\begin{aligned} Prad_{(ERP)} &= P_{sig} - 2.148 - L_{prop} \\ &= -140.8 \text{ dBm} - 2.148 - (-64.8 \text{ dB}) \end{aligned}$$

$$= -78.218 \text{ dBm}$$

$$= 15.07 \text{ pW (which is less than the maximum 31.19 pW in the license)}$$

Part B – Hudson Location NL 42-42-09; WL 71-25-52

Determination of signal strength at 100 feet from Building PTP02 at the Hudson, NH facility, coordinates NL 42-42-09; WL 71-25-52.

This configuration has a 50 ft coaxial cable (RG-58) connecting the receive antenna amplifier to the input of the leveling amplifier. Calculating LS1 to use in Equation 1:

$$(6) \text{ LS1} = \text{Lcable_1}$$

Where:

Lcable_1 = attenuation of 50 ft of RG-58 coaxial cable (negative number)

$$\text{LS1 (dB)} = -12.7 \text{ dB [for freq L1]}$$

$$\text{LS1 (dB)} = -10.7 \text{ dB [for freq L2]}$$

Calculation of the leveling amplifier input signal from Equation 1:

$$\text{Pin_lvlamp} = -130 \text{ dBm} + 7.7 \text{ dBic} + 40 \text{ dB} - 12.7 \text{ dB} = -95.0 \text{ dBm [for freq L1]}$$

$$\text{Pin_lvlamp} = -130 \text{ dBm} + 4.7 \text{ dBic} + 40 \text{ dB} - 10.7 \text{ dB} = -96.0 \text{ dBm [for freq L2]}$$

The rated input range for the GLI-METRO leveling amplifier is -115 dBm to -85 dBm.

For this installation the GLI-METRO leveling amplifier is operated in the fixed mode with the output signal strength set at -77 dBm. The signal is distributed to 3 paths, each with the same transmitting antenna, but differing cable lengths. The re-radiating antenna closest to the building wall is located next to the building exterior. Therefore, the worst-case propagation loss is calculated for a distance of 100 feet. From Equation 3:

$$\text{Lprop} = 36.6 + 20\text{Log}_{10}((100/5280)*1575) = 66.1 \text{ dB [for freq L1]}$$

$$\text{Lprop} = 36.6 + 20\text{Log}_{10}((100/5280)*1227) = 63.9 \text{ dB [for freq L2]}$$

Between the leveling amplifier output and the re-radiating antenna input is an RF network comprised of a signal-boosting amplifier (MiniCircuits P/N ZX60-33LN), an 8-way RF power splitter (MiniCircuits P/N ZN8PD1-53+) with 3 utilized output ports (unused ports are terminated with 50-ohm loads). Each utilized output port has a coaxial attenuator and a cable connecting to the re-radiating antenna. Compliance is calculated for each path below.

ENG LAB PATH

The re-radiating antenna is connected to the RF splitter through a 10 dB attenuator and a 6 foot coaxial cable (Times LMR200). Calculating LS2 to use in Equation 2:

$$(7) \text{ LS2} = \text{Lcable_3} + \text{Gamp} + \text{Lsplitter} + \text{Latten} + \text{Lcable_4}$$

Where:

Lcable_3 = 0 dB (no cable between leveling amp and in-line amp)

G_{amp} = Gain of in-line amplifier = 16.4 dB [L1], 17.9 dB [L2]
 $L_{splitter}$ = attenuation from RF splitter = -9.7 dB [L1], -9.6 dB [L2]
 L_{atten} = attenuation from coaxial attenuator = -10.0 dB [L1 & L2]
 L_{cable_4} = attenuation of 6 ft LMR200 cable = -0.8 dB [L1], -0.7 dB [L2]

$$LS2 = 0 \text{ dB} + 16.4 \text{ dB} - 9.7 \text{ dB} - 10 \text{ dB} - 0.8 \text{ dB} = -4.1 \text{ dB [for freq L1]}$$

$$LS2 = 0 \text{ dB} + 17.9 \text{ dB} - 9.6 \text{ dB} - 10 \text{ dB} - 0.7 \text{ dB} = -2.4 \text{ dB [for freq L2]}$$

Therefore the signal strength at a point 100 feet away from the building from Equation 2 is calculated:

$$P_{sig} = -77 \text{ dBm} - 4.1 \text{ dB} + 2.7 \text{ dBic} - 66.1 \text{ dB} = -144.5 \text{ dBm [for freq L1]}$$

$$P_{sig} = -77 \text{ dBm} - 2.4 \text{ dB} + 1.5 \text{ dBic} - 63.9 \text{ dB} = -141.8 \text{ dBm [for freq L2]}$$

This demonstrates compliance to the -140 dBm requirement for the ENG LAB Path.

Converting the re-radiated power based on EIRP at 100 ft from the building to ERP in pico-watts from the re-radiating antenna requires the subtraction of 2.148:

For L1

$$\begin{aligned}
 Prad_{(ERP)} &= P_{sig} - 2.148 - L_{prop} \\
 &= -144.5 \text{ dBm} - 2.148 - (-66.1 \text{ dB}) \\
 &= -80.548 \text{ dBm} \\
 &= 8.81 \text{ pW (which is less than the maximum 72.78 pW in the license)}
 \end{aligned}$$

For L2

$$\begin{aligned}
 Prad_{(ERP)} &= P_{sig} - 2.148 - L_{prop} \\
 &= -141.8 \text{ dBm} - 2.148 - (-63.9 \text{ dB}) \\
 &= -80.048 \text{ dBm} \\
 &= 9.89 \text{ pW (which is less than the maximum 41.88 pW in the license)}
 \end{aligned}$$

BSOT LAB PATH

The re-radiating antenna connected to the RF splitter through a 100 foot coaxial cable (Times LMR200). Calculating LS2 to use in Equation 2:

$$(8) LS2 = L_{cable_3} + G_{amp} + L_{splitter} + L_{atten} + L_{cable_4}$$

Where:

L_{cable_3} = 0 dB (no cable between leveling amp and in-line amp)
 G_{amp} = Gain of in-line amplifier = 16.4 dB [L1], 17.9 dB [L2]
 $L_{splitter}$ = attenuation from RF splitter = -9.7 dB [L1], -9.6 dB [L2]
 L_{atten} = no coaxial attenuator = 0 dB [L1 & L2]
 L_{cable_4} = attenuation of 100 ft LMR200 cable = -13.2 dB [L1], -11.7 dB [L2]

$$LS2 = 0 \text{ dB} + 16.4 \text{ dB} - 9.7 \text{ dB} - 0 \text{ dB} - 13.2 \text{ dB} = -6.5 \text{ dB [for freq L1]}$$

$$LS2 = 0 \text{ dB} + 17.9 \text{ dB} - 9.6 \text{ dB} - 0 \text{ dB} - 11.7 \text{ dB} = -3.4 \text{ dB [for freq L2]}$$

Therefore the signal strength at a point 100 feet away from the building from Equation 2 is calculated:

$$P_{sig} = -77 \text{ dBm} - 6.5 \text{ dB} + 2.7 \text{ dBic} - 66.1 \text{ dB} = -146.9 \text{ dBm} \text{ [for freq L1]}$$

$$P_{sig} = -77 \text{ dBm} - 3.4 \text{ dB} + 1.5 \text{ dBic} - 63.9 \text{ dB} = -142.8 \text{ dBm} \text{ [for freq L2]}$$

This demonstrates compliance to the -140 dBm requirement for the BSOT LAB Path.

Converting the re-radiated power based on EIRP at 100 ft from the building to ERP in pico-watts from the re-radiating antenna requires the subtraction of 2.148:

For L1

$$\begin{aligned} Prad_{(ERP)} &= P_{sig} - 2.148 - L_{prop} \\ &= -146.9 \text{ dBm} - 2.148 - (-66.1 \text{ dB}) \\ &= -82.948 \text{ dBm} \\ &= 5.07 \text{ pW (which is less than the maximum 72.78 pW in the license)} \end{aligned}$$

For L2

$$\begin{aligned} Prad_{(ERP)} &= P_{sig} - 2.148 - L_{prop} \\ &= -142.8 \text{ dBm} - 2.148 - (-63.9 \text{ dB}) \\ &= -81.048 \text{ dBm} \\ &= 7.86 \text{ pW (which is less than the maximum 41.88 pW in the license)} \end{aligned}$$

CHAMBERS PATH

The signal from the RF splitter is connected via 80 ft cable (Time LMR-200) to a 2-way splitter, with each output connecting to a re-radiating antenna via a 55 ft coaxial cable. Calculating LS2 to use in Equation 2:

$$(9) LS2 = L_{cable_3} + G_{amp} + L_{splitter} + L_{atten} + L_{cable_4} + L_{splitter2} + L_{cable_5}$$

Where:

L_{cable_3} = 0 dB (no cable between leveling amp and in-line amp)

G_{amp} = Gain of in-line amplifier = 16.4 dB [L1], 17.9 dB [L2]

$L_{splitter}$ = attenuation from RF splitter = -9.7 dB [L1], -9.6 dB [L2]

L_{atten} = no coaxial attenuator = 0 dB [L1 & L2]

L_{cable_4} = attenuation of 80 ft LMR200 cable = -10.6 dB [L1], -9.4 dB [L2]

$L_{splitter2}$ = attenuation from RF splitter = -3.2 dB [L1], -3.2 dB [L2]

L_{cable_5} = attenuation of 55 ft LMR200 cable = -7.3 dB [L1], -6.5 dB [L2]

$$LS2 = 0 \text{ dB} + 16.4 \text{ dB} - 9.7 \text{ dB} - 0 \text{ dB} - 10.6 \text{ dB} - 3.2 \text{ dB} - 7.3 \text{ dB} = -14.4 \text{ dB} \text{ [for freq L1]}$$

$$LS2 = 0 \text{ dB} + 17.9 \text{ dB} - 9.6 \text{ dB} - 0 \text{ dB} - 9.4 \text{ dB} - 3.2 \text{ dB} - 6.5 \text{ dB} = -10.8 \text{ dB} \text{ [for freq L2]}$$

Therefore the signal strength at a point 100 feet away from the building from Equation 2 is calculated:

$$P_{sig} = -77 \text{ dBm} - 14.4 \text{ dB} + 2.7 \text{ dBic} - 66.1 \text{ dB} = -154.8 \text{ dBm} \text{ [for freq L1]}$$

$$P_{sig} = -77 \text{ dBm} - 10.8 \text{ dB} + 1.5 \text{ dBic} - 63.9 \text{ dB} = -150.2 \text{ dBm} \text{ [for freq L2]}$$

This demonstrates compliance to the -140 dBm requirement for the CHAMBERS Path.

Converting the re-radiated power based on EIRP at 100 ft from the building to ERP in pico-watts from the re-radiating antenna requires the subtraction of 2.148:

For L1

$$\begin{aligned}\text{Prad}_{(\text{ERP})} &= P_{\text{sig}} - 2.148 - L_{\text{prop}} \\ &= -154.8 \text{ dBm} - 2.148 - (-66.1 \text{ dB}) \\ &= -90.848 \text{ dBm} \\ &= 0.82 \text{ pW (which is less than the maximum 72.78 pW in the license)}\end{aligned}$$

For L2

$$\begin{aligned}\text{Prad}_{(\text{ERP})} &= P_{\text{sig}} - 2.148 - L_{\text{prop}} \\ &= -150.2 \text{ dBm} - 2.148 - (-63.9 \text{ dB}) \\ &= -88.848 \text{ dBm} \\ &= 1.43 \text{ pW (which is less than the maximum 41.88 pW in the license)}\end{aligned}$$

Part C – Nashua Location NL 42-42-14; WL 71-26-56

Determination of signal strength at 100 feet from Building PTP06 at the Hudson, NH facility, coordinates NL 42-42-14; WL 71-26-56.

At the time of the renewal application of the license granted under File No 0294-EX-RR-2010, there is no operation at the Nashua location NL 42-42-14; WL 71-26-56, designated as Station Location (2).