

Attachment K

This letter serves as the engineering attestation to the performance claims of the Tarana G1 radio equipment in this 2023 Nebraska Broadband Bridge Program (NBBP) grant application.

TECHNICAL PARAMETERS

This document is for Tarana G1 Base Node (BN) and Remote Node (RN) radios operating in the 3.5 GHz CBRS spectrum. BN devices are for base stations and RN devices are for premises (end devices).

The max aggregate¹ capacity for a premise or RN device is 392 Mbps.

Each BN device has a max aggregate capacity of 2.4 Gbps (2400 Mbps). Four devices per site equates to 9.6 Gbps (9600 Mbps) aggregate capacity. Using a worst-case scenario, a four-sector site can theoretically provide 100/100 Mbps to 48 premises².

The performance of the Tarana G1 devices vary include but not limited to:

1. Capacity profile – the ratio of download to upload (DL:UL) speeds.
 - a. Tarana offers three capacity profiles: 4.5:1, 2.67:1 and 1.75:1 with a rated distance of 15 km between BN and RN devices.
2. Channel size – bandwidth to a premise
 - a. Each BN device has two 40 MHz channels.
 - b. It is possible to allow both channels to connect to a premise for an effective single 80 MHz channel which doubles the speed to the premise.

GRANT APPLICATION SPEEDS

4.5:1 CAPACITY PROFILE - 100/100 MBPS

Using a 4.5:1 capacity profile, a premise is considered covered to 100/100 Mbps on an 80 MHz channel if the RN device on the premise is predicted to receive at least -72.1 dBm of power. On a 40 MHz channel, it's currently not possible to achieve 100/100 Mbps using 4.5:1.

¹ Download + Upload speed. 100/100 Mbps = 200 Mbps aggregate.

² Assuming all 48 premises are requiring 100/100 Mbps

2.67:1 CAPACITY PROFILE - 100/100 MBPS

Using a 2.67:1 capacity profile, a premise is considered covered to 100/100 Mbps on an 80 MHz channel if the RN device on the premise is predicted to receive at least -77.1 dBm of power. On a 40 MHz channel, a premise would need -67.1 dBm of power to achieve 100/100 Mbps.

1.75:1 CAPACITY PROFILE - 100/100 MBPS

Using a 1.75:1 capacity profile, a premise is considered covered to 100/100 Mbps on an 80 MHz channel if the RN device on the premise is predicted to receive at least -81.1 dBm of power. On a 40 MHz channel, a premise would need -72.1 dBm of power to achieve 100/100 Mbps.

INCLEMENT WEATHER PERFORMANCE

The ITU-R P.838-3 provides a recommended equation to calculate the total rain attenuation on a wireless link.

Worst case scenario:

- Assuming a 'violent' rain rate of 60 mm/hr. and a 30 km distance between a BN and RN device operating at 3.5 GHz, the expected rain attenuation will be 1.16 dB.³
- If the requirement for 100/100 Mbps service is -72.1 dBm, then the premise would need at least -70.94 dBm (-72.1 + 1.16) of power to maintain 100/100 Mbps service during violent rain at 30 km.

ATTESTATION

The scope of this attestation is limited to communications and documentation provided by Tarana.

Very truly yours,

Black & Veatch
 Luke Musser
 Electrical Engineer – P.E.*
 *licensed in Kansas

³ Assuming vertical polarization