

Revised Exhibit 1 – Narrative Description

Introduction

This exhibit is provided in support of the modification application (“Application”) submitted by Toggle Communications LLC (“Applicant”) relating to its existing experimental license, FCC Call Sign WI2XAJ (the “License”). Specifically, Applicant seeks to modify its License to (a) change the location of one of its authorized stations, (b) add five additional spectrum bands, (c) deploy antennas [REDACTED], and (d) increase transmitter power levels from 1 kW to 6 kW. Grant of the Application will support Applicant’s efforts to carryout tests and experimentations in technical radio research, as permitted under the FCC’s rules regarding conventional Experimental Radio Service licenses.¹

Purpose

The Applicant intends to determine the feasibility of [REDACTED] for transmission of short messages in the high-frequency (“HF”) radio band between 5 MHz and 25 MHz.

The proposed system would [REDACTED] which could be used for low-latency [REDACTED] or [REDACTED]

Experimental Specifics

The proposed experimentations will explore potential high-frequency long-distance data communications. The proposed communications system will use [REDACTED] with channels of up to 24 kHz [REDACTED] and [REDACTED]

[REDACTED] to transmit very short, low-latency messages [REDACTED]

Applicant’s research will explore the feasibility of delivering high data rates for short messages that [REDACTED] For example, the minimum channel occupancy [REDACTED]

[REDACTED] If these experiments prove successful, Applicant could approach a spectral efficiency improvement [REDACTED] present-day capabilities.⁷

Under the experimental application, Applicant’s transmission system will [REDACTED] [REDACTED] The proposed system will:

- be used for [REDACTED]
- have spectrum efficiency [REDACTED]
- have a minimal [REDACTED]

- have a maximum channel occupancy time [REDACTED]
[REDACTED]
[REDACTED]
- use [REDACTED]
[REDACTED]

Need for Modification of the License

Locations

Applicant seeks authority to conduct its experimental operations at the locations specified in the Form 442 and the attached Exhibits 3 and 4 to this Application. [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Spectrum Bands

Applicant is currently authorized to operate over transmit frequencies 6.795 – 7.000, 9.040 – 9.400, 10.150 – 11.175, 14.350 – 14.990, and 15.800 – 16.360 MHz. Applicant seeks authority to expand its experimental operations to include transmit frequencies 5.060 – 5.450, 12.100 – 12.230, 18.168 – 18.780, 20.010 – 21.000, and 23.350 – 24.890 MHz [REDACTED] Applicant seeks to conduct its experimental operations over these five additional frequency bands [REDACTED]
[REDACTED]
[REDACTED]

Antennas

Applicant seeks authority to [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
and shown in the attached Exhibit 4.

Power Levels

Applicant seeks authority to operate at transmitter power levels up to a maximum of 6000 Watts.
[REDACTED]
[REDACTED]

General Operations and Technical Parameters

Transmitter

New York

Transmit power: [REDACTED] 6000 Watts

Transmitter model: Ettus Research USRP N210

Transmit frequencies: 6.795 – 7.000, 9.040 – 9.400, 10.150 – 11.175, 14.350 – 14.990, and 15.800 – 16.360 MHz

Transmit bandwidth: 24 kHz

Channel occupation time: [REDACTED]

Duty Cycle: [REDACTED]

Illinois

Transmit power: [REDACTED]

Transmitter model: Ettus Research USRP N210

Transmit frequencies: 5.060 – 5.450, 6.795 – 7.000, 9.040 – 9.400, 10.150 – 11.175, 12.100 – 12.230, 14.350 – 14.990, 15.800 – 16.360, 18.168 – 18.780, 20.010 – 21.000, and 23.350 – 24.890 MHz

Transmit bandwidth: 24 kHz

Channel occupation time: [REDACTED]

Duty Cycle: [REDACTED]

[REDACTED], Applicant seeks authority to use ten frequency bands. The requested frequencies are allocated for fixed services by 47 C.F.R. § 2.106.

Emission/Modulation Type

The proposed system is [REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Antenna

New York

M2 Model No.: 6-10LP5; Gain: 10.5 dBi

M2 Model No.: 7&10-30LP8; Gain: 10.5 dBi

Feedline: Coaxial, LMR-600, 200 ft.

Illinois

[REDACTED] M2 Antennas; Model No.: 6-10LP5; [REDACTED] 12.9 dBi

[REDACTED] M2 Antennas; Model No.: 7&10-30LP8; [REDACTED] 15.2 dBi

Feedline: Coaxial, LMR-600, 200 ft.

To minimize transmitter power radiated outside of the proposed testing locations, Applicant will use high-directivity antennas. [REDACTED]

[REDACTED] Antenna vertical profile sketches are provided as Exhibits 3 and 4 to this Application. Azimuth and elevation antenna patterns are provided as Exhibits 5 and 6 to this Application.

Antenna Support Structure

Vertical profile sketches of the antennas and their support structures are provided as Exhibits 3 and 4 to this Application.

ERP Calculation

New York

ERP (All Bands) = [REDACTED]
[REDACTED] = 36kW

Illinois

ERP (5-10 MHz) = [REDACTED]
[REDACTED] = 62kW

ERP (10-25 MHz) = [REDACTED]
[REDACTED] = 105kW

Other Operational Issues

Experiment Duration

To [REDACTED] a
24-month experimental license is requested.

Interference Avoidance

Applicant will employ a “listen-before-send” system for dynamic channel selection [REDACTED]
[REDACTED]
[REDACTED]

Due to [REDACTED] and to the “listen-before-send” channel selection strategy, Applicant does not expect its proposed operations to interfere with any existing licensees.

Protection of FCC Monitoring Stations

There are no FCC Monitoring Stations described in 47 C.F.R. § 5.85 and listed in 47 C.F.R. 0.121(b) within 80 kilometers of the proposed transmit locations.

RF Exposure

Applicant does not expect ground level RF field exposure in excess of 47 C.F.R. § 1.1310, due to [REDACTED]

Station Identification Waiver

One of Applicant’s primary research goals [REDACTED]
[REDACTED] Applicant requests a waiver of the “station identification” provisions of 47 C.F.R. § 5.115.

Stop Buzzer Contact

Stop buzzer contact information is provided as Exhibit 2 to this Application.

¹ See 47 C.F.R. § 5.3.

1. [REDACTED]
 2. [REDACTED]
 3. [REDACTED]
 4. [REDACTED]
 5. [REDACTED]
 6. [REDACTED]
 7. [REDACTED]

§ 87(2)(b)

§ 87(2)(b)

§ 87(2)(b)

■ [REDACTED]

1. [REDACTED]

§ 87(2)(b)

§ 87(2)(b)

■ [REDACTED]
[REDACTED]
[REDACTED]

(b) (7)(C), (b) (7)(D)

■ [REDACTED]
[REDACTED]