SUPPLEMENTAL STATEMENT OF ZIVA CORP.

FILE NO. 0833-EX-CN-2020

This application is a continuation of work done under the experimental STA which is about to end, File Number 0431-EX-ST-2020. Ziva has been transmitting under this license for 4 months and has received no interference complaints or even inquiries from nearby primary licensees.

The requested 2 year experimental license will support continued development and testing under two Army contracts:

Agency: Army, C5ISR Center S&TCD FCDD-IST-PL, APG
Contract Number: W56KGU-19-C-0020
Govt Pt of Contact: Archie Kujawski
Govt Pt of Contact Phone: (443) 395-7588

Agency: Army, C5ISR / ACC-APG DIVISION A, APG
Contract Number: W56KGU-19-C-0025
Govt Pt of Contact: Dr. Yoonkee Kim
Govt Pt of Contact Phone: (443) 395-1678

The goal of these contracts is to develop distributed coherence technology, including wireless time transfer to permit coherent RF transmission from multiple radio systems.

As the time transfer accuracy necessary for coherent processing depends on carrier frequency, as well as the amount of Doppler shift for a given level of movement, Ziva requests the use of both a high and a low band supporting sufficient bandwidth necessary for accurate time transfer, that is also within the capabilities of its software defined radio system (100 MHz – 5 GHz). We are requesting limited access to 2 bands which both have a primary Government Radiolocation allocation and a secondary Amateur Radio Service allocation: 420-450 MHz (70 cm) and 3.3-3.4 GHz (9 cm). As the calculation below show, we believe that these will not cause interference to the nearest ARS repeaters due to the low power spectral density that will be used and the timing and intermittent nature of the tests.

The majority of Ziva's testing will be conducted indoors at low power (<100 mW), with periodic short outdoor testing at up to 1W occurring within 5 km of Ziva's facility at 6440 Lusk Blvd., San Diego, CA 92121. All of Ziva's signals are direct sequence spread spectrum with QPSK to >10 MHz Bandwidth (BW), and when the system is running typically have duty cycles of 5-10%. Outdoor experiments last for durations of 5 minutes to 20 minutes, and a day of experimenting typically consists of 4-5 sets of experiments, for a total of an hour of 5% duty cycle transmission. The location will be our offices at 6440 Lusk Blvd., San Diego CA

The antennas will be as follows:

> For the 420-450 MHz band: Most transmission will use a 0 dBi antenna, a few transmissions will use a single 13 dBi antenna
>
> For the 3.3-3.4 GHz: Most transmissions will use a 3 dBi RHCP omnidirectional antenna. A few transmissions will use a single 9.5 dBi RHCP antenna

The transmitters used all will have 1 Watt maximum output power but will rarely use full power. For 99% of testing we use ~10 mW. Omni directional antennas (~3 dBi) is 99% of our use cases, with occasional 2X per year we will use a 13 dBi Yagi on a single radio (the radio performing the beamforming analysis, which has an extremely low transmit duty cycle of <5%) for a long range test so we get sufficient RX SNR to evaluate the beamforming performance.

Between 3-11 transmitters are used simultaneously in the experiment. They are time-slotted and the majority of timeslots have a single transmitter on. We do have a beamforming period where all but one of the transmitters are on to test our coherent beamforming. This is typically low duty cycle <30%

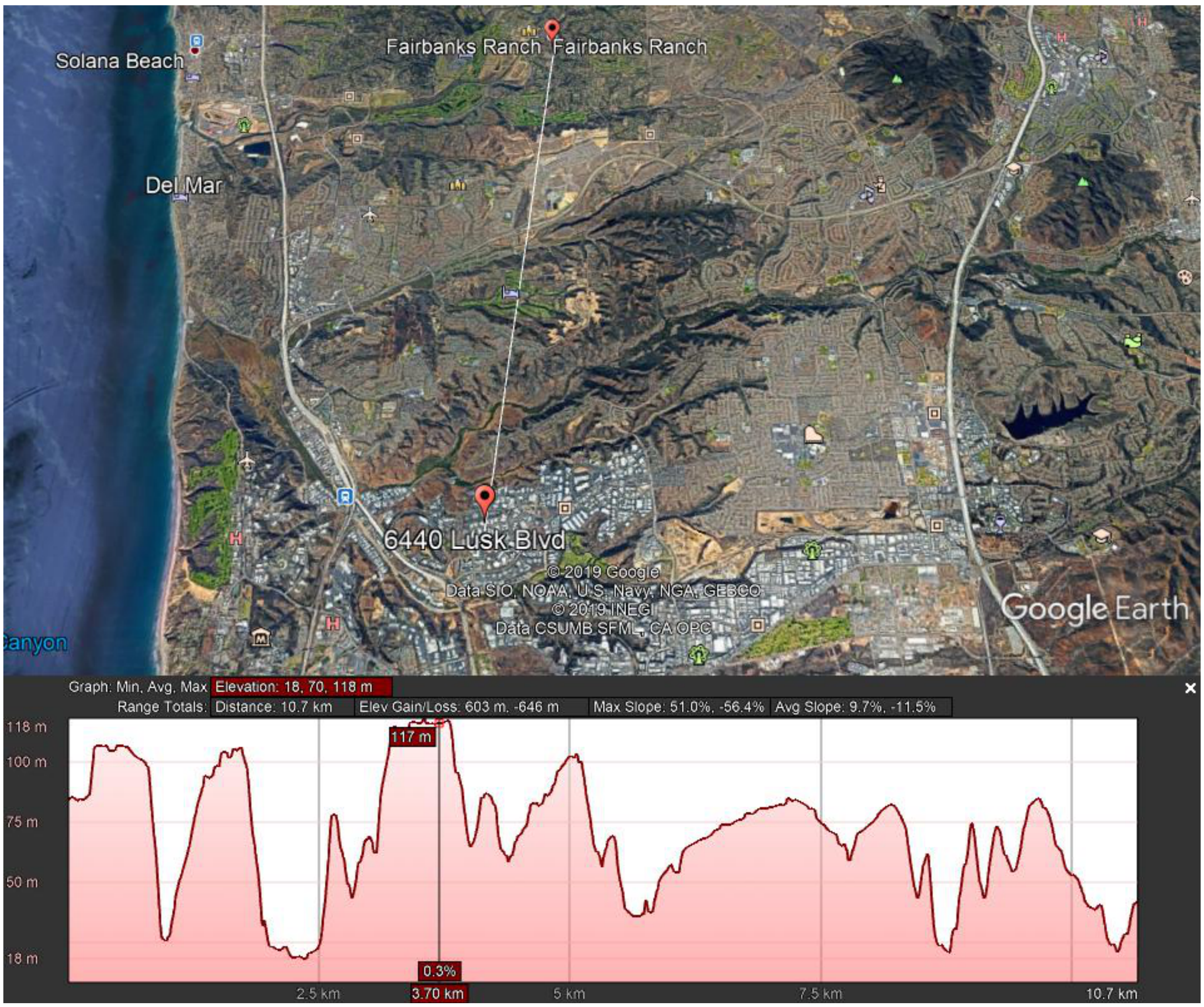
We like to do outdoor testing in canyons, as interference affects our measurement precision.

ZIVA
corporation

INTERFERENCE ISSUES

1.1 70 CM HAM BAND (430-450 MHZ)

Nearest located 70cm band repeater: Fairbanks Ranch, CA K6RYA Repeater ID: 06-8523 449.9/444.9

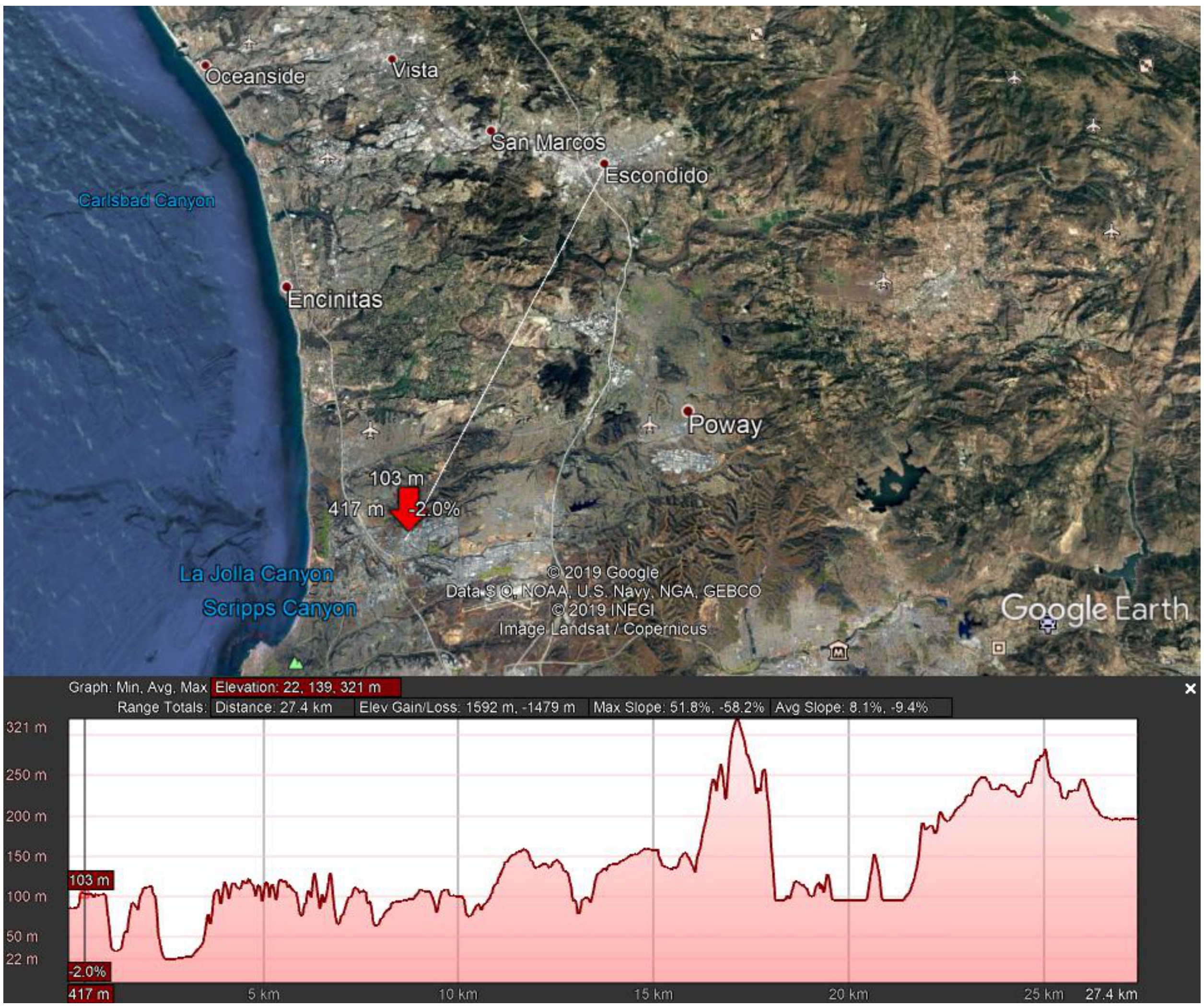


Assuming the 70cm users have a 12.5 kHz BW and a 3 dB NF, the noise floor at 300K is -133 dBm. Ziva's transmissions are 1W peak spread over 10 MHz BW, so the 12.5 kHz bandpass filtering will reject an additional 29 dB of Ziva's 10 MHz signal.

Path Loss Model	Path Loss	Interference Power	Ziva's Signal to Repeater's Noise Floor
Okumura-Hata (Urban)	142.6 dB	-141.6 dBm	-8.6 dB
Okumura-Hata (Suburban)	134.3 dB	-133.3 dBm	-0.3 dB

(449 MHz, 10.7 km distance, 50 m Base Station height, 5 m Mobile Station (Ziva TX) height. Okumura-Hata-based path loss is calculated using Extended-Hata model described in Annex 17 of SEAMCAT Manual in CEPT ECC Report 252 (2016). Model validity defined by: F=30-3000MHz, height of Base Station=30-200m, height of Mobile Station =1.5-10m, distance 0.1-40 km) Ziva believes based on the hilly topology of the area that the path loss will far exceed even the Urban Okumura-Hata model.

Other identified active repeaters in the area: Location: Escondido Frequency: 449.120 -Call Sign: K6JSI



1.2 9 CM HAM BAND (3.3 – 3.5 GHZ)

Assuming the 70cm users have a 12.5 kHz BW and a 3 dB NF, the noise floor at 300K is -133 dBm. Ziva's transmissions are 1W peak spread over 10 MHz BW, so the 12.5 kHz bandpass filtering will reject an additional 29 dB of Ziva's 10 MHz signal.
Path loss analysis for 3400 MHz at 5 km distance:

Path Loss Model	Path Loss	Interference Power	Ziva's Signal to Noise Floor
FSPL + Rural	135.5 dB	-134.5 dBm	-1.5 dB
FSPL + Urban	172.5 dB	-171.5 dBm	-38.5 dB

FSL-based path loss model is derived from fundamental FSL equation (cf. Eq.4 in Recommendation ITU-R P.525-3(2016)), modified with changing distance gradient factors: Rural=25*log(d[m]), Urban=35*log(d[m])

The STOP BUZZER contact for this experiment is
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