0328-EX-ST-2001

Saraband Wireless, Inc.
3915 Old Lee Highway
Suite 23 D
Fairfax, Virginia 22030-2432
August 23, 2001

FEDERAL COMMUNICATIONS COMMISSION
Experimental Radio Service
P.O. Box 358320
Pittsburgh, PA 15251-5320

This letter is to request a special temporary authority (STA) to operate a transmitter in the bands from 82.0 MHz to 88.0 MHz in Fairfax Virginia, as described below. In accordance with 47 CFR chapter 1, (10-1-00 edition), section 5.61, the following information is being provided to support the application.

(1) Name, address, phone number (also email address and facsimile number, if available) of the applicant.

Donald Arnstein
President
Saraband Wireless, Inc.
3915 Old Lee Highway
Suite 23 D
Fairfax, VA 22030-2432

703-359-0900
703-359-0388 fax

don.arnstein@att.net

(2) Description of why an STA is needed.

Saraband Wireless is developing a channel calibration device for use initially in the MMDS/ITFS bands, and later for use in other licensed and unlicensed bands under 5 GHz, for wireless LANs and long-range wireless Internet delivery systems. The reason for the STA request is to perform preliminary field testing and software debugging at the IF frequency of the device, selected purposely for this test as 82 - 88 MHz, rather than at its final RF frequency. The rationale for testing at IF frequency is that phase noise of the IF signal will be much lower than at RF. Certain processing steps need to be validated without the presence of phase noise.

Secondly, multipath effects at IF are much lower than at RF, making the device's functionality much easier to determine at IF, that is, without phase noise disturbing the signal. Transmitter - receiver separation will be kept under 1000m to insure high signal-to-noise. The combination of low phase noise, low multipath, and high signal-to-noise, is invaluable to finalize the design of the link calibrator, and is the reason for the STA request.

Figure 1 shows the configuration of the temporary test setup that is to be used during this STA.

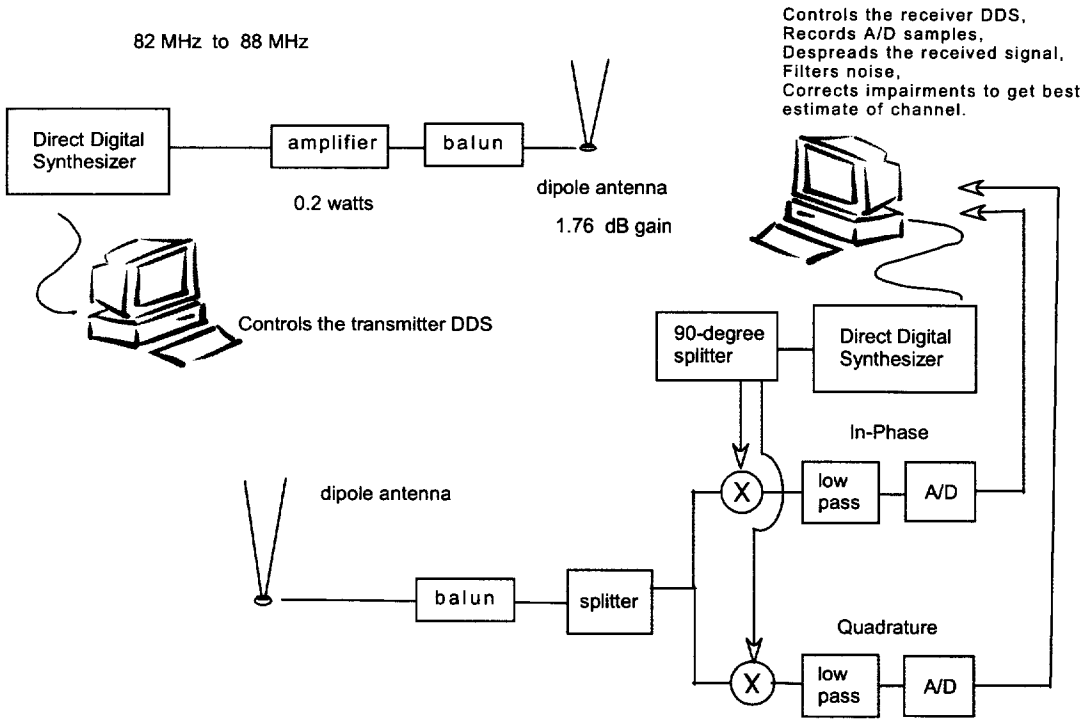
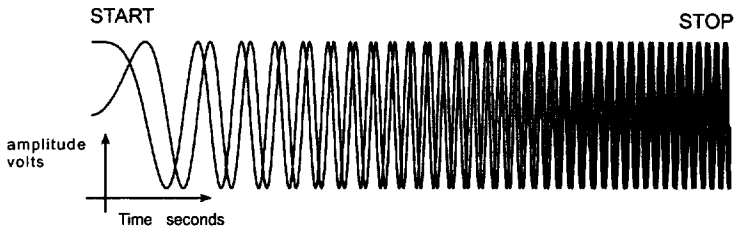
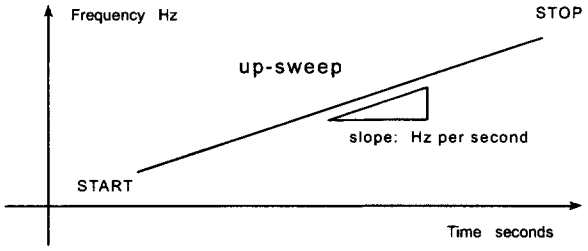


Figure 1 Configuration of Transmitter and Receiver to be Used During This STA

The signal to be transmitted is made up of segments as shown here in Figure 2.



(a) Time Domain Plot of Linear FM Signal's In-Phase and Quadrature Components



(b) Frequency Domain Plot of Linear FM Signal

Figure 2 Signal to be Used During This STA is Made Up of Linear FM Sweep Segments

The actual signal is a repetitive constant envelope linear FM signal with equal up-going and down-going frequency sweeps, as shown in the sawtooth pattern, Figure 3. The signal will always have continuous phase at the transitions from UP to DOWN.

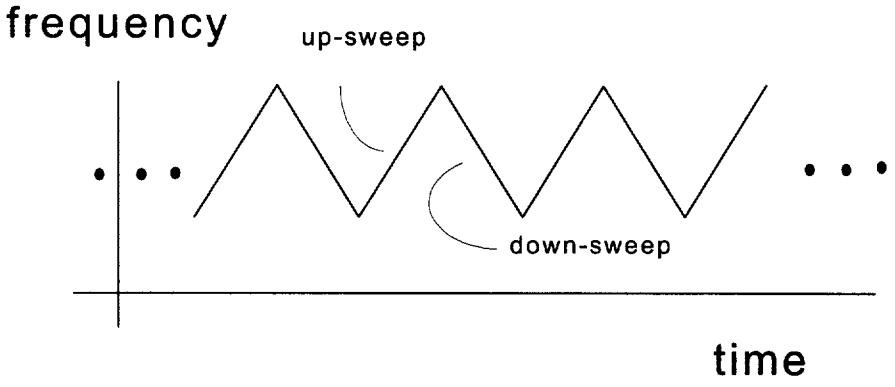


Figure 3 Actual Signal is Continuous Constant-Envelope Repetitive Linear FM Sweep Signal Having Rectangular Power Spectrum

This type of signal has a rectangular power density spectrum (uniform energy dispersal) with very low spill-over outside the band due to the continuous phase nature of the signal.

The band from 82 to 88 MHz is the television station *channel 6* which is not used in the Washington D.C. - Northern Virginia area. A functional description of the device is given next.

The channel calibrator shown in Figure 1, will be sending out FM modulated signals that need to be received and synchronized. The receiver, at some distance from the transmitter and starting from a power-off condition, does not have any pre-knowledge of the waveform's timing epoch or exact center frequency, but does know the triangular sweep range and period. Hence, the receiver needs to go through a "training" period, called *acquisition*, where it must "discover" the start-stop times of the transmit signal, and must learn when the signal is going "UP" and when it is going "DOWN". Once acquisition is achieved, the receiver must fine-tune to follow the transmit signal precisely in time sync and frequency sync. The fine tuning phase is called *tracking*.

In summary, the STA is needed to carry out final design, debugging, and validation of acquisition and tracking processing software in a wireless channel calibrator in the relatively benign but temporary environment of 82 - 88 MHz. The STA will permit Saraband Wireless to develop the correct acquisition and tracking modes of its device by removing phase noise effects, reducing multipath to negligible or minor levels, and improving the signal-to-noise ratio at the temporary frequency location of 82 MHz to 88 MHz.

Figure 4 is a map showing the vicinity of Saraband Wireless where the outdoor tests will be carried out. The receiver will be located at Saraband Wireless' facility at 3915 Old Lee Highway in Fairfax City, right near the intersection of Main Street (VA Rt 236) and VA Rt 123.

The transmitter will be hand-carried to various outdoor locations within about 1000m from the Saraband Wireless office, to put the receiver through its "paces", namely allowing propagation through trees and foliage, around obstructions such as buildings, and to the outer limits of the signal handling capacity of the receiver A/D converter.

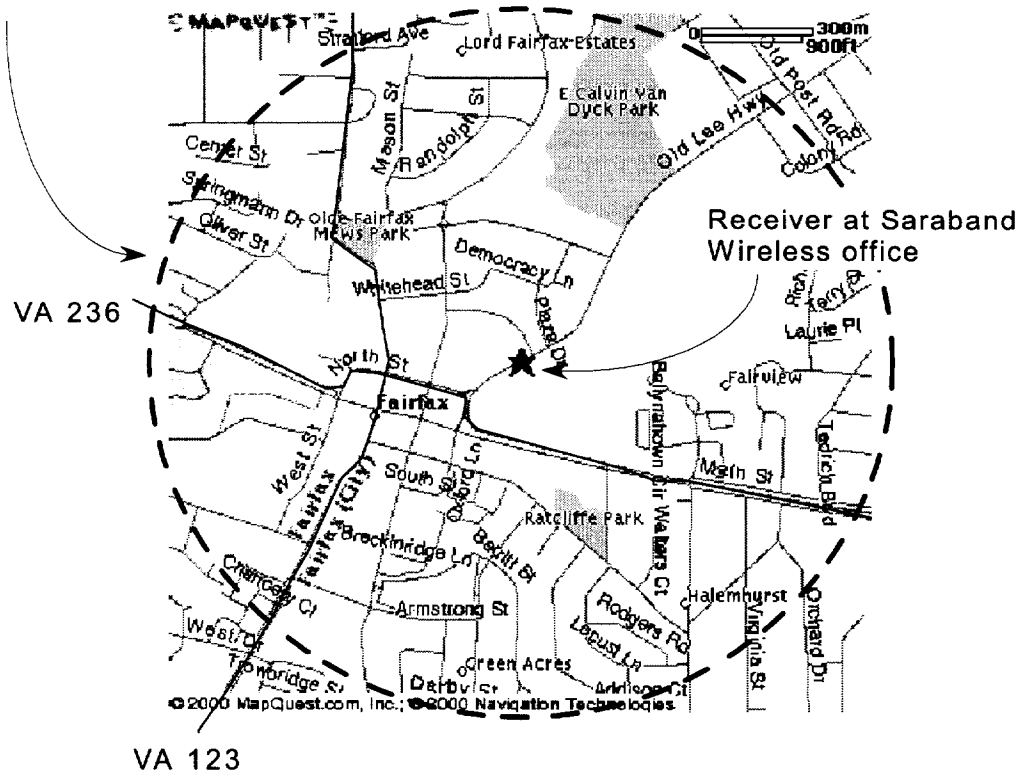


Figure 4 Location of Testing Where STA is Needed: 3915 Old Lee Highway, Fairfax Virginia (1000m Radius of Operation Shown)

(3) Description of the operation to be conducted and its purpose

A measurement and software verification session will require about one hour of outdoor activity followed by one hour of indoor activity. Coordination between outdoor and indoor locations will take place by cell phone. Initial outdoor testing will be done right in the vicinity of the Saraband Wireless office location, in the parking lot and street. At each location, a range of system parameters need to be tested, including the period of the triangular sweep signal, the transmit power, and the frequency sweep range. The outdoor unit, being a battery-operated transmitter, will be held stationary for the duration of the test.

(4) Time and dates of proposed operation.

There will be time in one day for three sessions of testing, each from a different location. It is anticipated that tests will be run during business hours and on weekends during daylight, beginning around September 17 2001 and extending until about January 18, 2002. No additional STA is anticipated beyond January 17, 2002.

(5) Class(es) of station (fixed, mobile, fixed and mobile) and call sign of station (if applicable).

The transmitter will be fixed most of the time. Once software has been debugged to insure proper acquisition and tracking from a powered-off to powered-on situation, some limited motion (walking) studies may be done to see if the receiver, located at the Saraband Wireless office, can track changes in the link.

(6) Description of the location(s) and, if applicable, geographic coordinates of the proposed operation.

All transmit signals will be from ground-level (street) locations within the dashed circle shown in Figure 5 (1000m radius from Saraband Wireless office).

(7) Equipment to be used, including name of manufacturer, model and number of units.

The Direct Digital Synthesizer, Figure 1, is made by Analog Devices, and is their Model Number AD9852/PCB. The 30 dB amplifier with 0.2 watts output is made by Q-Bit and is their model number QB-500-2 RF Amplifier 8718-11. The transmit antenna is a 300 ohm television rabbit ears. A balun is used to match the Q-Bit amplifier to the antenna. The same transmit unit will be used to run all of the tests, so only one transmission will ever be on the air at one time.

(8) Frequencies Desired

This STA request is for 82 MHz to 88 MHz. The frequency sweep waveform is completely settable by the Analog Devices direct digital synthesizer. It is planned to always leave 100 kHz at either end as guard bands. In other words, the actual frequency sweep signal will never exceed the limits, 82.1 MHz to 87.9 MHz.

(9) Maximum effective radiated power (ERP) or equivalent isotropically radiated power (EIRP)

A television rabbit ears, which is the equivalent of a short dipole, has maximum gain 1.77 dB [1] . Two tenths of a watt into 1.77 dB gain antenna results in an EIRP of -5.2 dBw or about 25 dBm.

(10) Emission designator (see paragraph 2.201) or describe emission (bandwidth, modulation, etc.)

---

[1] Gagliardi, Robert M., *Satellite Communications*, Second Edition, Van Nostrand Reinhold, New York, © 1991, Table 3.1 Antenna Patterns.

The signal transmitted will be a repetitive FM energy dispersal function with linear frequency up-ramp and down-ramp having continuous phase at the transitions. The period of the FM signal will vary during the STA testing from 0.2 seconds to 2 seconds long.

According to paragraph 2.201 of 47 CFR Chapter 1 (10-1-99 Edition), this signal has emission designator **F3N**, **F** for frequency modulation, **3** for single channel containing analog information (the sawtooth shown in Figure 4), and **N** for no information transmitted since no additional information is carried other than the sawtooth.

(11) Overall height of antenna structure above the ground (if greater than 6 meters above the ground or an existing structure, see part 17 of this chapter concerning notification to the FAA).

The transmitter will be hand-held and battery operated from a 12 volt power supply. It will always be operated outdoors and at street level.

It is important to have the baseline operation as determined during this STA completely finished in time to engineer the channel calibrator for its intended RF operation, no later than November 2001, with minor modifications acceptable out to January of 2002. Saraband Wireless has submitted proposals to the National Science Foundation, to the Army, and to the Navy, based on having the full RF version of the channel calibrator ready to go by award date, which could be in the November 2001 to December 2001 time frame. Therefore, Saraband Wireless respectfully requests the FCC to expedite the approval of this STA request.

Sincerely

Donald Arnstein
President
Saraband Wireless, Inc.