HARRIS CORPORATION
GCSD
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Fax Cover Sheet

DATE:	January 31,1997	**TIME:**	3:00 P.M.
TO:	Mr. Doug Young	**PHONE:**	202-418-2440
		FAX:	202-418-1918
FROM:	Art Stewart Harris Corporation	**PHONE:**	407-727-6923
		FAX:	407-729-3535
RE:	Experimental License Application 5515-EX-PL-96		

Number of pages including cover sheet: [3]

Message

Dear Mr. Young,

As discussed in our phone conversation on 1/31/97, we incorrectly identified our emission designator in the original experimental license application submitted 10/23/96 as 4M0DVID. This was an error and does not accurately describe our waveform. The correct emission designator is 4M00-FID. Also included in this fax is an updated Exhibit A to correctly describe our waveform. Please insert this Exhibit A in place of the original provided on 10/23/96.

Thanks,

Art Stewart

Wireless Products and Systems

After additional consideration of the spectral characteristics and implementation aspects of the waveform previously described, some changes have been made in the waveform. The waveform can no longer be accurately described as a pulse train. While transmitting, the carrier is always on. Transition between symbols now occurs at fixed intervals. These changes eliminate the pulsed amplitude aspects of the waveform. An additional symbol has been added for the reference chirp. Each of the 33 symbols consist of a 3.96 MHz wide chirp. The starting frequency of the 33 chirps are offset from each other by 990 Hz. Thus total spectral occupancy is 3.96 MHz + 32* 990 = 3.991680 MHz. With this waveform and since the effect of the modulation is to vary the frequency of the carrier, the emission designator is more properly 4M00F1D.

Modified Exhibit A

Revised Waveform Description

The transmitted waveform as depicted in Figure 1 shall consist of one or more frames, each containing 6 linear frequency chirps. The center frequency for the chirps shall be 906.87 or 924.62 MHz. The chirp width shall be 3.96 MHz and each chirp shall take 4.096 ms. With these chirp rates, bandwidth will be slightly less than 4MHz. Data shall be conveyed in code shift keyed symbols by selecting the starting frequency for each chirp depending on the bits to be encoded into the symbol. With 5 bits per symbol, there are 32 possible starting positions for data symbols which shall encode bit patterns as indicated in Table 1 for a center frequency of 906.87 MHz. A similar table can be constructed for the center frequency of 924.62 MHz. The first chirp in each frame shall indicate start of message. The second and subsequent chirps shall start at fixed times from the reference chirp and at a frequency determined by the bit pattern to be encoded. From this starting frequency, a full 3.96 MHz chirp shall follow. Thus the transmitted waveform appears as the top half of Figure 1, with the transition region between symbols having different appearance depending on the bit pattern encoded into both the previous and next symbols. The output of a receiver consisting of a matched filter for the chirp appears as the bottom half of Figure 1. The pulse corresponding to the reference chirp is followed by a pulse delayed by an amount equal to 2n microseconds where n is the number of the modulation symbol being sent and varies from 1 to 32. Those two pulses are followed by additional pulses, one for each symbol, until the end of message.

Table 1, Chirp Symbol Encoding, 906.87 MHz Center Frequency

Data	Symbol	Start	Data	Symbol	Start
Reference	0	904.874056818	01000	17	904.890496256
00000	1	904.875023844	11000	18	904.891463282
00000	2	904.875990869	11001	19	904.892430307
00001	3	904.876957895	11011	20	904.893397333
00011	4	904.877924921	11010	21	904.894364359
00010	5	904.878891947	11110	22	904.895331385
00110	6	904.879858972	11111	23	904.896298410
00111	7	904.880825998	11101	24	904.897265436
00101	8	904.881793024	11100	25	904.898232462
00100	9	904.882760050	10100	26	904.899199488
01100	10	904.883727075	10101	27	904.900166513
01101	11	904.884694101	10111	28	904.901133539
01111	12	904.885661127	10110	29	904.902100565
01110	13	904.886628153	10010	30	904.903067591
01010	14	904.887595178	10011	31	904.904034616
01011	15	904.888562204	10001	32	904.905001642
01001	16	904.889529230			

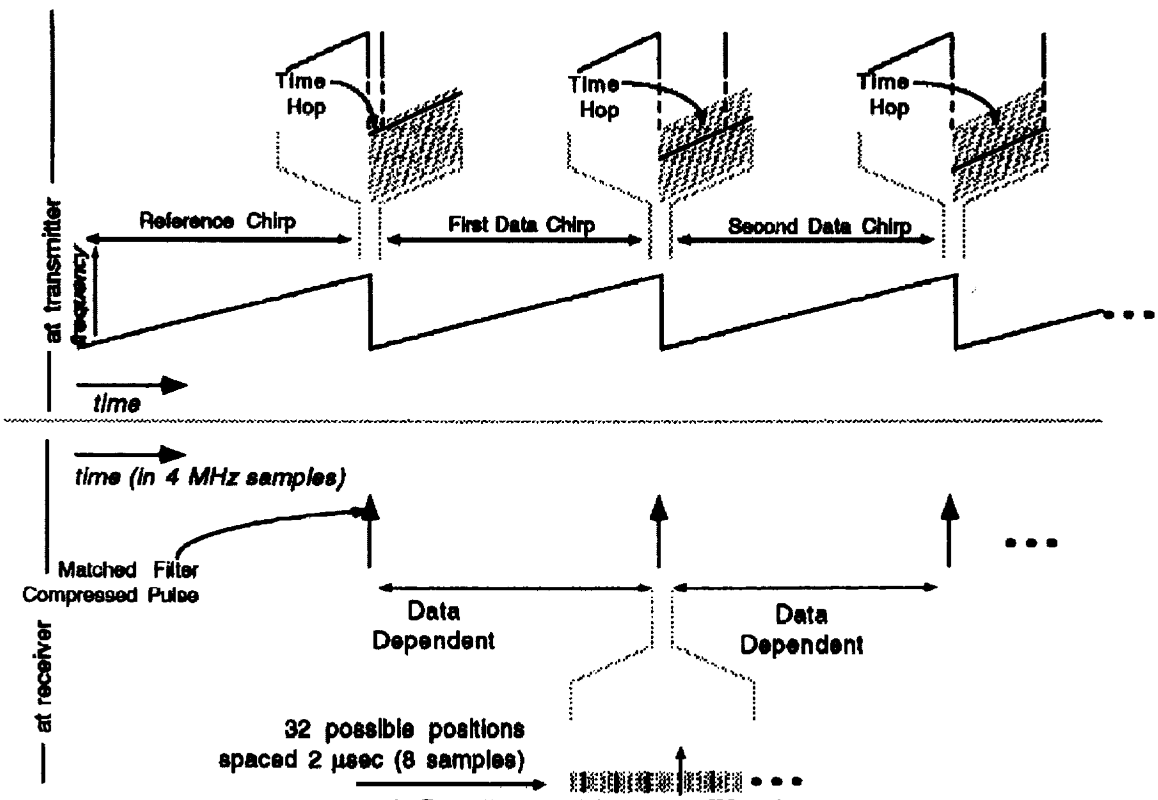

Figure 1, Chirp Position Modulation Waveform

Exhibit B

Research Program Description

a) System Description for Proposed Research Program

The Harris Tracking and Location System will provide the capability to locate people and objects to within 300 ft. in a metropolitan area. Our strategy is to provide this capability through a network of receive only antennas linked to a central location as depicted in Figure 1. These antennas will receive low power beacon-type transmissions from our portable tracking devices. The central location contains a location processor and either an application processor or links to an application processor at a different location. The application processor provides an interface to actual system users including fleet operators and consumers. As depicted Figure 2, the Harris Tracking and Location System will consist of three major components: (1) miniaturized tags mounted on personnel or objects to be tracked; (2) receiver sites distributed throughout the area of interest; and (3) central location processor which will provide the capability to calculate locations from the tag transmissions, and store the locations for retrieval. The Harris Tracking and Location System tags, receive sites, and location processor will provide a "location server" function which could be accessed over a high speed computer to computer interface by a customer-owned and -provided application processor which provides interfaces to system users. Tags can be integrated into the power and alarm systems of host vehicles or independently implanted on cargo, trailers, or personnel. A flexible appliqué interface and programmable features provide for activation of the tag by the vehicle alarm, a panic button, detection of motion, or loss of primary power. In addition, the tag status, including secondary battery state of charge and panic/alarm status can be communicated.

Receiver sites will provide the capability to determine the time of arrival of a tag's transmissions to within ten nanoseconds and selected sites will provide the capability to determine the angle of arrival to within one degree. The time and angle of arrival of each transmission, along with the associated data bits, will be transmitted over leased telecommunications facilities to the central location where the location processor provides the capability to determine a tag's location to within 300 feet, even in the presence of multipath and interfering signals as is common in the ISM band where the system will operate. The location processor will interface to a customer-provided application processor to deliver tag locations and transmitted data.

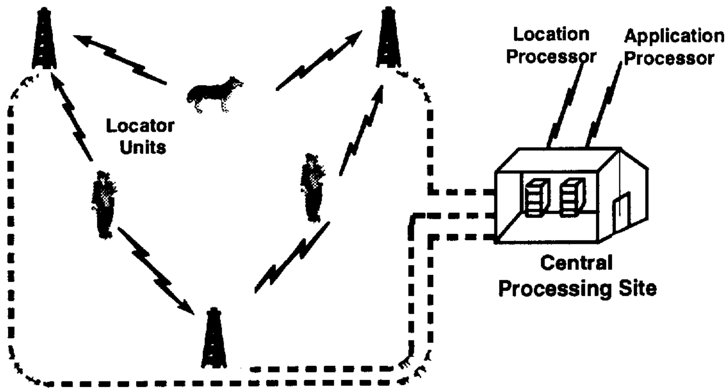

Figure 1 Harris Tracking and Location System Architecture

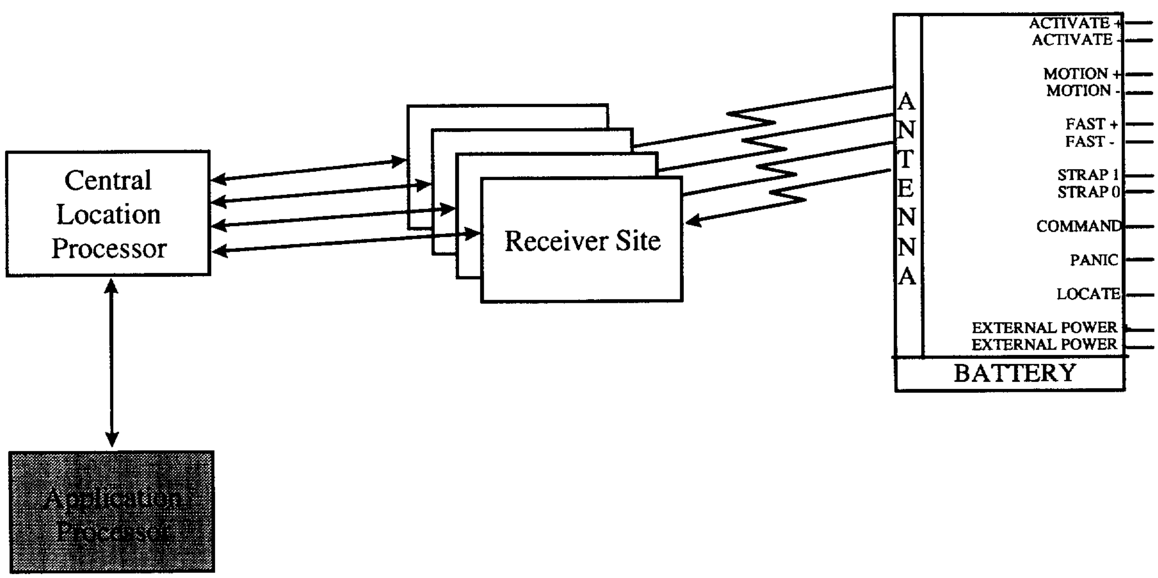

Figure 2 Harris Tracking and Location System Components

b) Specific objectives to be accomplished:

Harris Corporation proposes a research program for the development of a metropolitan area based tracking and location system for people and assets. The results of this IR&D project will have multiple uses for military, law enforcement and commercial markets. Testing of the prototype system will prove the viability of the following applications:

Personal tracking - commercial and battlefield applications
Asset Tracking / Inventory management - commercial and military
Law Enforcement - Non cooperative tracking and location

Research will be applied to proving technical concepts in geolocation method and accuracy, low power urban and in-building performance and high capacity asynchronous protocols through the development of a prototype system. Equipment will be developed for up to 30 receive antenna sites, base station location processing software and 100 portable tracking tags in order to prove the high capacity nature of the system architecture.

Experimentation at our facility and in representative urban terrain will enable the development of a new state of the art tracking system. The project will culminate with field testing of a prototype system first at our facility in Melbourne and then in two candidate urban settings. We have chosen both Miami and Orlando for their proximity to our development facility and representative urban terrain.

c) Radio art expansion:

This research program will demonstrate a unique approach to geolocation that substitutes a random distribution of periodic, low power transmitters for high power, elevated tower transmission and mobile response type systems. Our transmitting waveform passes the tests specified for Part 15 compliance, yet does not meet the strict definition of the waveform, and we are currently exploring with the FCC feasibility for unlicensed operation. This research will provide key data for that determination.

applicant talked to Bruce ~~Fra~~ Franca, Lynne Romly, John Reed

It is our intent to prove a unique architectural approach to utilizing the spectrum which minimizes complexity, size and cost of the mobile tracking unit and compensates with sophisticated signal processing techniques in the receiver infrastructure. This architecture will open up new services to the public that are currently not available nor planned for, such as personal security with an emergency locator, low cost asset tracking, emergency 911 location reporting, etc..

d) Experimentation plans and follow up reporting:

It is our intent during this period of experimentation, to carefully monitor the effect our low power transmitting location beacons have on the radio spectrum environment. Over 10 years of experience in tracking and location and the specific use of this waveform give us high confidence that we will not provide interference to existing unlicensed Part 15 users nor licensed LMS band users. We will monitor performance and compile test results into a report that will be provided to the FCC. If our system works the way we anticipate, it is our objective to follow through with application of waiver for Part 15 compliance.

e) Location of experiments:

Three coordinate sets were supplied in section 5 c) identifying the central locus of operation for our mobile transmitting beacons. These locations correspond to our plans of first integrating and testing the equipment at our development facility in Melbourne, Florida. We will then pack up the equipment and transport it first to Miami for a period of urban testing, and then repeat this process in Orlando. During testing, there will be 100 mobile transmitting units that will be deployed within a 12 mile radius around the supplied coordinates:

Melbourne, Florida	28 1' 22"N	80 36' 11"W
Miami, Florida	25 46' 23"N	80 13' 1"W
Orlando, Florida	28 32' 24"N	80 13' 1"W