Exhibit A

INTRODUCTION

The purpose of this Exhibit is to provide additional information in support of the attached application for authorization of location and monitoring service (LMS) under Section 90 of the Rules. The accompanying application proposes to use TransCore Amtech technology reader with an antenna that will be mounted on mobile system with limited range of travel.

ELIGIBILITY

The applicant is eligible under the Sections of Part 90.351 of the FCC Rules. The applicant will use the proposed location and monitoring service to identify position markers that have been tagged by or in cooperation with the applicant. The system operation helps provide accurate position and control information to the onboard logic controller.

NATURE OF THE PROJECT AND PUBLIC INTEREST SHOWING

By this request, the applicant seeks to operate an LMS system. The system is to be installed is designed to provide location and control information to onboard control systems. The installation will serve the public interest in that it will provide for more accurate and rapid position information thereby increasing both efficiency and safety of the applicant's operations.

DESCRIPTION OF SYSTEM OPERATION (90.351)

This section supplies a detailed description of the manner in which the proposed system will operate. As such, it provides the information required by Section 90.351 of the Rules.

A. Introduction

The TransCore Amtech® Technology consists of Tags (transponders), and Readers (interrogators). The System works by having a Reader send out a radio frequency beam toward a Tag. The Tag modifies a portion of the signal and reflects it back to the Reader. It is the reflected signal that carries the identification code. These Tags are attached to an object such as a railcar, container, or guideway structure. When the Reader approaches an object, an identification code is retrieved electronically from the Tag. The Reader then relays the identification code to the onboard control system (PLC).

The Tags can be either beam powered (no battery) or battery powered, but neither type emits an identification signal unless interrogated by a Reader. Beam powered tags use the signal energy from the reader to power the tag circuitry.[1] There is no RF transmitter on either version of the tag. Thus, the Tag is not a transmitter and does not contain components to generate RF signals. This slight modification of the signal includes the unique identification code of the Tag. This method of communication is called "modulated backscatter". These battery-powered Tags stay energized at all times, and battery life is not affected by the number of times a Tag is read. Both forms of tags use less power, and are simpler and less expensive, than many other reader/tag technologies.

The block diagram of Figure 1 indicates the function of each component. The RF Module transmits an unmodulated signal in the direction of a Tag (f_{cw}). The RF Module receives the reflected signal from the Tag and relays this information to the Reader. The Reader decodes the information contained in the Tag and relays the information to a host computer for subsequent use to identify, track and schedule the tagged objects. Operation of the system is somewhat similar to the low power continuous wave (CW) doppler radar used by law enforcement agencies to determine the speed of cars. The actual installation will use two antennas per vehicle with only one antenna per vehicle active at any given time.

B. Description of System Equipment

1. RF Module

The RF Module is composed of an RF Oscillator, RF Processor, Homodyne Receiver, and Preamplifier. The RF Module is responsible for transmitting and receiving radio energy. RF energy is generated by the RF Oscillator and amplified by the RF Processor. This energy is transmitted through the Antenna, and the RF energy reflected by the Tag is also received by the same Antenna. For SeGo a separate downlink interrogation frequency is often used.

The RF Module transmits the uplink frequency of RF energy and receives that same frequency after is reflected as a modulated signal from the tag.

Transmitter output power is typically 2 watts or less. Maximum effective radiated power (ERP) is as indicated in this application. Actual ERP will often be less than the maximum in order to operate with the least power that will provide reliable service.

Some products incorporate RF module components in the reader, which may also house the antenna.

2. Reader

[1] *Batteries are used only to power the tag microprocessor circuitry facilitating reading from certain high-speed vehicles.*

The RF Module receives the modulated signal from the Tag and passes the 20 and 40 kHz modulating frequencies to the Reader.[2] The Reader decodes the frequencies into binary information equivalent to the 64 or 128 bits of data stored in the Tag. The Reader is composed of the Amplifier, Decoding and Error Checking circuit, Microprocessor, Real-Time Clock circuit, and Power Supply.

This low power signal will be continuously directed at the area into which tags will be located (on guideway structure below vehicle). Accordingly, we request authority for continuous transmission.

3. Antenna

The Reader System uses a single antenna to transmit and receive RF energy to and from the Tag. Note that the antenna is for localized coverage in a specific direction; the antenna does not have omnidirectional coverage patterns. The Antenna will be mounted underneath a Peoplemover and normally canted downward. Height above average terrain ranges between approximately 10 ft - 25 ft with an average height approximately 23 ft.

Some readers may be equipped with up to 4 antennas and be operated in time division multiplexing between the antennas.

4. Tag

The Amtech Tag is composed of the Modulator, Power, Code Generator and Clock, Memory, and Antenna circuits. All of the Tag's circuits are located on a single printed circuit board. The Clock circuit sequences all circuit functions such that information stored in the memory circuits is conveyed to the Reader System within precise timing. The information stored in the Memory circuit is permanent, and is a unique code that is specified by the owner prior to installation of the Tag onto its respective object (container, rail car, truck, etc.).

The Code Generator encodes the information stored in the Memory circuit. The Modulator collects the encoded information from the Code Generator and controls the Antenna circuit such that the encoded information modulates the RF signal that is reflected to the Reader System.

Amtech has the capability of producing two versions of the Tag: battery-powered and nonbattery-powered. The nonbattery Tag must be sufficiently close to the Reader System's Antenna in order to collect enough energy to activate the Tag's electronics. The battery-powered Tag does not require as close proximity to the Reader System's Antenna since the battery powers the Tag's electronics at all times. Advantages of the battery Tag include greater range and reduced RF power required from the Reader System, and the advantages of the nonbattery Tag are an extended life and a lower price. Regardless of

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[2] *For a discussion of the system bandwidth, see below.*

whether the Tag has a battery or not, a Tag does not transmit RF energy, it only reflects energy transmitted by the Reader System.

The Tag conveys 64 or 128 bits of digital information (depending upon model) by modulating the reflected energy. The reflected energy is modulated by varying the efficiency of the Tag's Antenna.

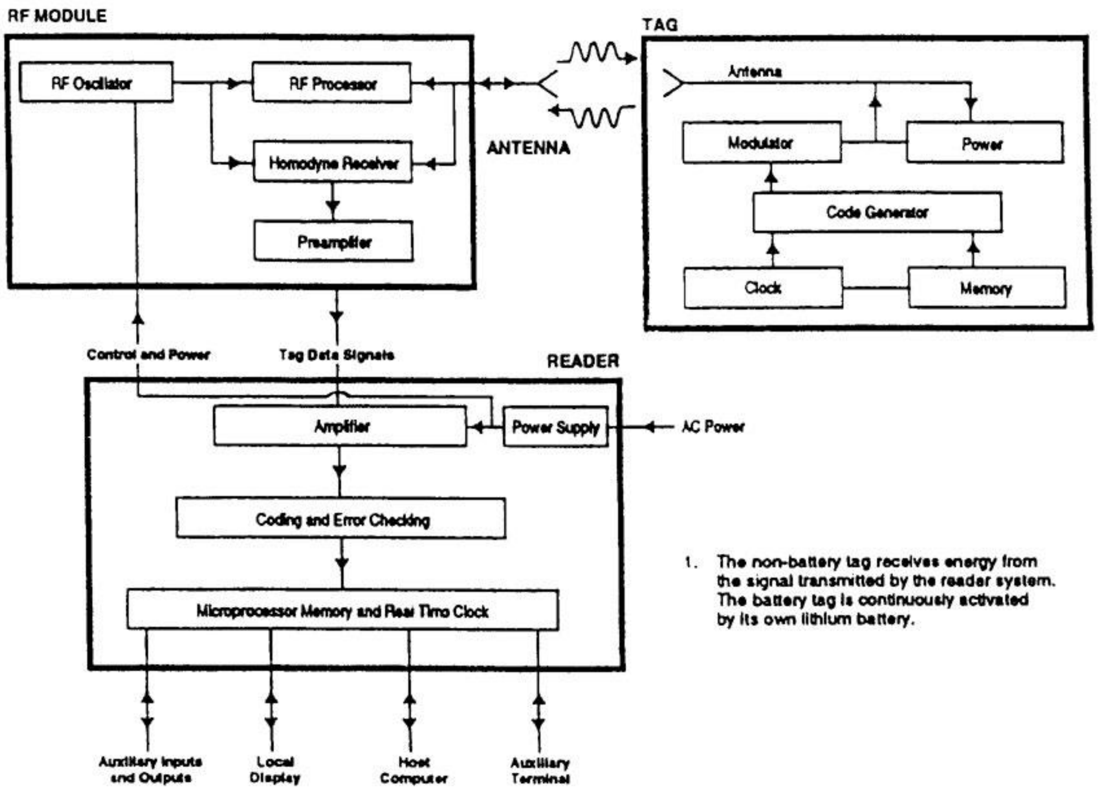


FIGURE 1 Block Diagram of the RF Module, Reader, Antenna and Tag

The Homodyne Receiver is used to separate the transmitted CW energy from the information reflected by the Tag. The Tag information is encoded into 20 and 40 kHz signals which modulate the RF energy reflected by the Tag.

The Tag has a used data capacity of 20 alphanumeric characters, externally encodable, with a specified minimum operating life. Some characters may conform to industry standards.

C. <u>Bandwidth</u>

In order to accommodate transmitter drift, the bandwidth of the signal transmitted by the reader is specified as approximately 50 kHz: Emission Designation 50K0N0N. When reflected from the tag, however, this signal spreads over a wider bandwidth. The occupied bandwidth of the reflected signal is about 2.5 MHz.

D. *Vehicle Location Update Rates*

The vehicle location update rate is every time a vehicle mounted reader passes a tagged location. At such times, its tag ID is read and the vehicle's location is updated.

E. *Power and Modulation Techniques*

Each RF Module emits a CW signal. The system has the following specifications:

DESCRIPTION	***VALUE***
Nominal RF power (measured at transmitter)	2 Watts or less
Standard transmit and receive frequency	902 to 928 MHz
Transmitter occupied Bandwidth (including tolerance for drift)	50 kHz
ATA emission code 50K0N0N SeGo emission code 506KL1D	
Antenna Gain AA3233 10 dbi =7.85 dbd, Beamwidth 72 degrees 12.2 W	
Antenna Gain AA3234 9.5 dbi =7.36 dbd, Beamwidth 80 degrees 10.9 W	
Receiver bandpass at -6 dB points	130 kHz
Tag Reflected Signal occupied Bandwidth	2.5 MHz
Tag Reflected Signal necessary Bandwidth	800 kHz

The RF Module's power can be reduced if a certain application requires that tagged objects not be read beyond a specific distance. Most applications require this reduction in order to record accurately tagged objects passing through a particular gate or lane. In such cases, if the power was not reduced, the Reader System would read tagged objects passing close to the gate but not through the gate.

F. *System Codes*

FCC rules require a table of bit frequencies and their alphanumeric or indicator equivalents, and a statement of bit rise time, bit transmission rates, bit duration and interval between bits. The allocation and format of transponder data characters is as follows:

Transponder Data Allocation

User Data *	Bits 1 through 60
First Check Sum **	Bits 61, 62
Framing Bits	63, 64
User Data *	Bits 65 through 118
Second Check Sum **	Bits 125, 126
Frame Marker ***	Bits 127, 128

* All user character frames shall contain the most significant bit first, followed through the least significant bit last.

** A Check sum shall be calculated by adding the total number of bits in the preceding data field (60 bits, 54 bits) and truncating the binary result to two bits, with one most significant bit first and the least significant bit last.

*** The “end of frame” marker shall consist of six 40 kHz cycles followed by one 20 kHz cycle.

The transponder electronics shall cause the data to scroll repeatedly without pause from bit “cell” 128 of a frame (a frame is the complete 128-bit set) to bit “cell” 1 of the succeeding frame. For some tag products the 64 bits are repeated twice to fill the 128 bit frame.

Bit rate is a nominal 10,000 bits per second. Bits are encoded in a frequency shift keying code as described in Section G. Signal rise times are less than 1 microsecond. Bit duration is a nominal 100 microseconds. The time interval between bits is zero, not allowing for rise and fall times.

The user data shall be encoded in a modified ASCII six-bit code as follows:

User Data Character Bit Code

Character	Code	Character	Code	Character	Code
(space)	0	6	22	L	44
!	1	7	23	M	45
“	2	8	24	N	46
#	3	9	25	O	47
$	4	:	26	P	48
%	5	;	27	Q	49
&	6	<	28	R	50
‘	7	=	29	S	51
(	8	>	30	T	52
)	9	?	31	U	53
=	10	@	32	V	54
+	11	A	33	W	55
‘	12	B	34	X	56
-	13	C	35	Y	57
.	14	D	36	Z	58
/	15	E	37	[	59
0	16	F	38	\	60
1	17	G	39	]	61
2	18	H	40	^	62
3	19	I	41	_	63
4	20	J	42		
5	21	K	43		

Specific industry standards use a bit packing scheme.

Some tag products are coded in Weigand format. Character usage, other products use a binary field sub-field definition.

Other tags use the SeGo format, organized into 64 bit pages.

G. ***Statement of Interrogation and Reply Formats***

A bit is coded by the tag with a modified FSK (frequency shift keying) code using two harmonically related frequencies, one (40 kHz) being the exact double of the other (20 kHz), with a frequency tolerance of + 10%. A "0" bit consists of one 20 kHz square wave cycle followed by two 40 kHz square wave cycles. A "1" bit consists of two 40 kHz square wave cycles followed by one 20 kHz square wave cycle. All transmissions are phase continuous. The bit transmitter rate of the reflected signal is 10,000 bps. No synchronization pulses are used, although the frame marker is used to indicate the start of a message.

The newer SeGo protocol is also used in some installations, having a higher signaling rate, but no sub-bit encoding, rather using a checksum.

Below is a diagram providing an example of a typical message transmission.

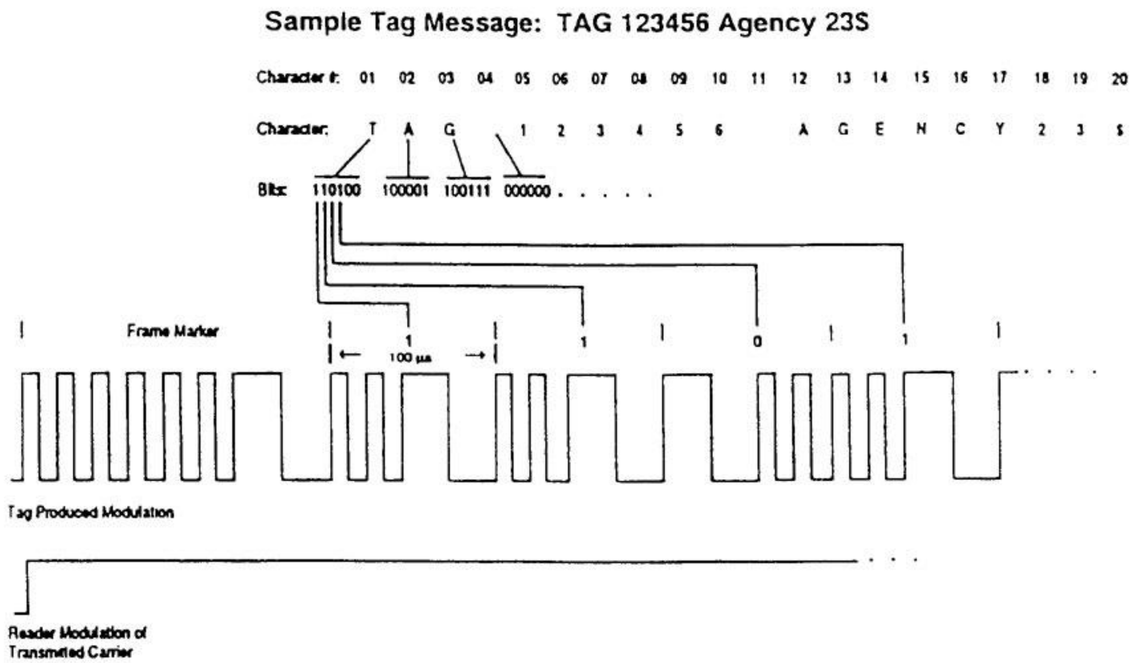


FIGURE 2 Typical Pulse Transmission of ATA Protocol

H. Planned Installation

The applicant anticipates installation of the number of transmitters specified on the application within twelve months of the grant of this application.

PRIOR LICENSING HISTORY

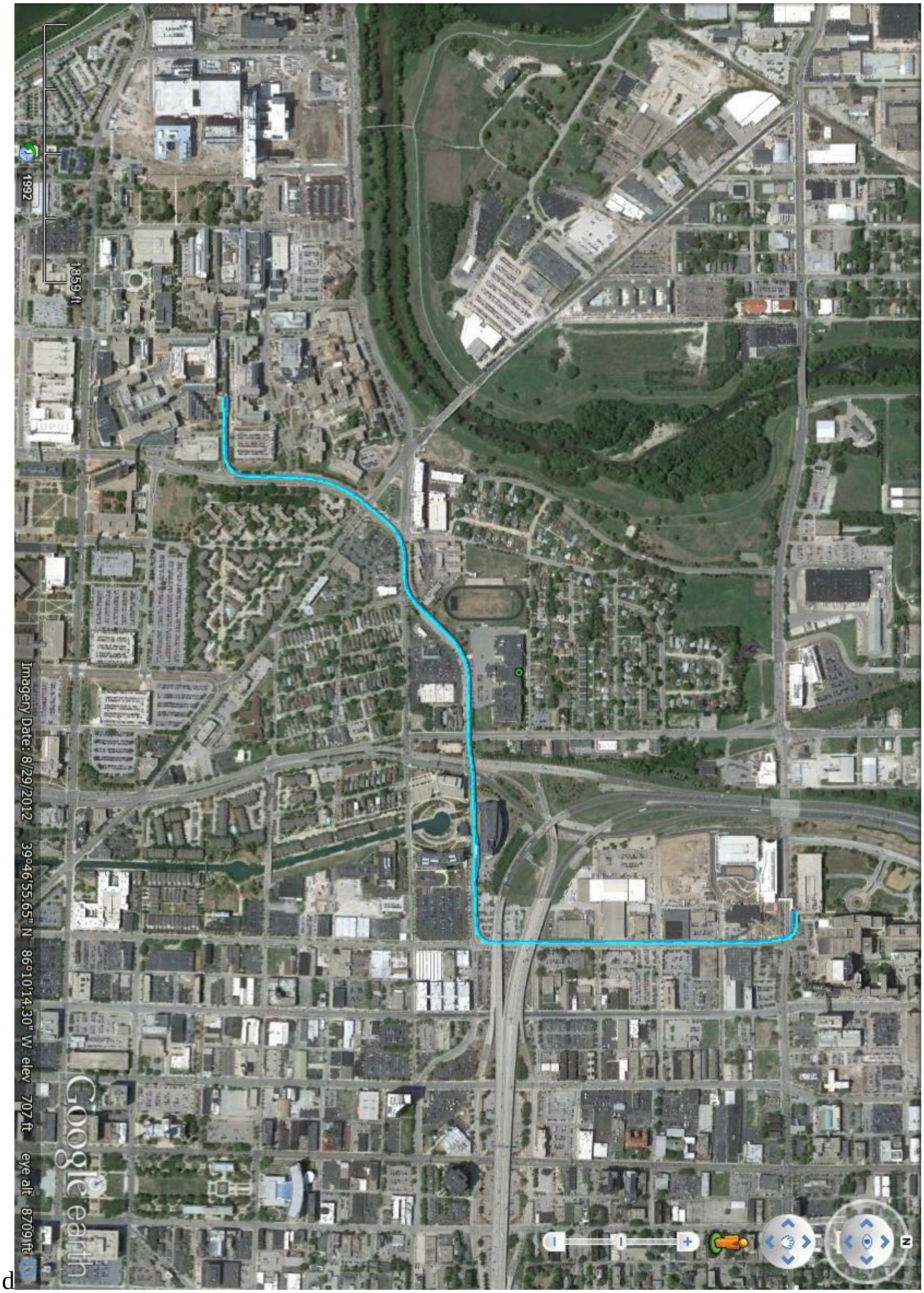
The Commission has granted a host of identical or similar applications throughout the 902-904 and 909.75 to 921.75 MHz band previously.

FAA NOTIFICAITON EXEMPTION

Part 17.14(a) Statement on Exemption of Antenna Structure notification to FAA

The antennas for this Automatic Vehicle Identification system are mounted less than 30 feet above ground level, and/or are on the lower side of a rail locomotive. Thus, FAA antenna notification is NOT required.

LAT 39-46-58.4 N LONG 086-10-09.8 W



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