TADIRAN Telematics

Description of Modulating Signals in NTATULIP-US

The TULIP (NTATULIP-US) transmissions signals include two types of signal. The first is a wideband direct-sequence Spread-Spectrum signal and the other is a short burst narrow-band signals. The detailed description of the modulating signals is as follow.

1. Wide-Band Signal (Location signal) Modulation

The Location signal composed of a Pseudo Noise sequence (symbol = chip). The transmission of location signal is as response to TULIP addressing through the forward channel and in timing that synchronized with the forward channel

1.1 Location Channel Parameters

Single Channel.

RF Frequency:	907.997333 Mhz.
Channel Band-Width:	2.5 Mhz (IF BW)
Modulation:	BPSK (with base band shaping)
Chip Rate:	1.49341666 Mhz.
Sampling Ck output:	4*chip rate.
Nominal Output Power:	7 Watts

1.2 "Location" Signal Modulation

CPSK - Continuous Phase Shift Keying with constant envelope.
This modulation is based on BPSK modulation with pulse shaping that achieve the spectrum requirement with constant envelope.

1.3 PN Code generator - Rate & Length.

The PN code generator generates a ML (Maximal Length) sequences according to the Metro ID selected.
PN "chip" Rate = 1.493416667 Mhz (=13440750/9)
PN code Period Length = 1023 chips.

1.4 Location Signal Transmission Length

The transmission ON time shall be berst interval of 26 msec (61 pocsag bits duration) for 8 frames/batch or 13 msec for 16 frames/batch (see Figure 1). In RCM mode the TULIP shall transmit a location signal for 29 POCSAG bits followed by RCM transmission.

2. Narrow-Band Signal (ECM/RCM) Modulation

ECMs and RCMs are short burst messages. The TULIP shall transmit RCM in response to paging.

2.1 Narrow-band Channel Parameters

Single Channel.	
RF Frequency:	907.997333 Mhz.
Channel Band-Width:	23 Khz (IF BW)
Modulation:	BPSK
Chip Rate:	1.49341666 Mhz.
Bit Rate:	chip rate/ 128 (~11.7 KBps)
Nominal Output Power:	7 Watts

2.2 Narroe-Band (ECM/RCM) signal modulation

The modulation of the ECM or RCM_A signal shall be BPSK .

Data Rate:	11.667 KHz (PN Clock /128)
Transmission length:	128 bits.

2.3 ECM / RCM_A Data Format

The 128 bits ECM / RCM_A data structure is as follow:

D0 to D33	- 34 preamble bits (1,0,1,0..)
D34 to D41	- 8 Metro ID Code
D42 to D64	- 23 SYNC word bits.
D65 to D100	- 36 ECM/RCM_A message bits (as follows).
D101 to D127	- 27 BCH code bits.

Preamble (34)	Metro ID (8)	SYNC Word (23)	Message (36)	BCH Code (27)