TECHNICAL EXHIBIT

In this application, Globalstar Licensee LLC ("Globalstar") requests a minor modification to its 1.6/2.4 GHz MSS space station license (Call Sign S2115) to permit implementation of additional ATC Frequency Division Duplex (FDD) modes in addition to the already authorized cdma2000 architecture. Globalstar also requests a waiver to permit implementation of ATC Time Division Duplex (TDD) modes in its authorized S-Band ATC frequencies. Such flexibility will give Globalstar the option to deploy the latest technologies in conjunction with various partners in different regions across the United States, allowing deployments to be locally optimized for spectral and cost efficiency within the specific inter-system coordination environment. One of the key strategic goals given on the FCC's website is encouraging and facilitating an environment that stimulates investment and innovation in broadband technologies and services. Another strategic FCC goal is conducting effective and timely licensing activities that encourage efficient use of spectrum. Authorization of the requested technologies for flexible Globalstar ATC deployments will promote both of these objectives. With the minor exceptions requested in this Exhibit, each Globalstar ATC technology option described will comply with all requirements of the Commission's Rules regulating ATC for 1.6/2.4 GHz MSS systems, certified in Part II of the main application and described in more detail in specific sections of this exhibit:

A-1: Globalstar ATC Modes

As a consequence of the *ATC Modification Order*[1/], Globalstar is authorized to operate its ATC base stations and mobile earth terminals ("METs") using cdma2000/IS-95 in the 1610-1617.775 MHz band and the 2483.5-2495 MHz band (each in forward-band mode). Since

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[1/] *See* Spectrum and Service Rules for Ancillary Terrestrial Components in the 1.6/2.4 GHz Big LEO Bands, *Report and Order and Order Proposing Modification*, IB Docket No. 07-253, FCC 08-98 (rel. April 10, 2008) ("*ATC Modification Order*"). On November 9, 2007, the Commission adopted an order revising the Big LEO MSS band plan by reducing Globalstar's L-band spectrum assignment. *See* Review of the Spectrum Sharing Plan Among Non-Geostationary Satellite Orbit Mobile Satellite Service Systems in the 1.6/2.4 GHz Bands, *Second Order on Reconsideration and Second Report and Order*, 22 FCC Rcd 19733 (2007). Although that decision has not become final, *see Globalstar, Inc. v. FCC*, DC Cir. Case No 08-1046 (Petition for Review filed Feb. 5, 2008), Globalstar's analysis herein nevertheless is based upon the Commission's most recent Big LEO band plan.

Globalstar filed its initial application in March 2005, additional technology standards have been fully developed and are now being utilized around the world.[2/] Globalstar requests authority to deploy other technologies as described in the FDD ATC section below. Besides authority to deploy alternative FDD ATC technologies, Globalstar requests a waiver of the forward-band-only restriction in section 25.149(a)(1) of the rules to deploy a TDD ATC mode in the 2483.5-2495 MHz S-band only.

For all technologies applied for herein, Globalstar will ensure that harmful interference is not caused to services sharing the same frequencies or adjacent frequencies through observing current FCC Rules that limit transmit power and out-of-band (OOB) emissions to compatible levels. Examples of prospective terrestrial technologies are given in the following sections. No greater interference potential will result from using these alternative technologies compared with cdma2000, as all of the network equipment will be certified to meet the emission limits set forth in 47 C.F.R. 25.254 of the Commission's rules.

1.1 Globalstar TDD ATC in the S-Band

1.1.1 WiMAX

Globalstar seeks authority to deploy one TDD ATC architecture: WiMAX. WiMAX or Worldwide Interoperability for Microwave Access, is a technology that has been standardized by the Institute of Electronic and Electrical Engineers (IEEE) and the International Telecommunications Union (ITU) that has the promise of providing broadband wireless access, including mobile applications, to rural and underserved areas. The most current version of the WiMAX standard, IEEE 802.16e, utilizes Orthogonal Frequency Division Multiple Access (OFDMA) to carry data in a 10 MHz bandwidth. Globalstar expects to use this standard for its initial ATC deployment. Adaptive modulation and coding is supported in order to provide maximum throughput allowable under channel conditions. Multiple-In Multiple-Out (MIMO) antennas are also supported to provide favorable conditions for Non-Line-of-Sight (NLOS) links. The Medium Access Control (MAC) layer of WiMAX provides the means of encapsulating various network protocols, including the Internet Protocol (IP) on the air interface. Users will typically have data rates of 1-5 Mbps available but, depending on distance from the base station, could experience data rates as high as 37 Mbps. Cell sizes of 10 km in radius, depending on terrain, are possible. Applications that can be supported by WiMAX include voice-over-IP (VoIP), mobile multi-media services based on IP, and on-line video gaming.

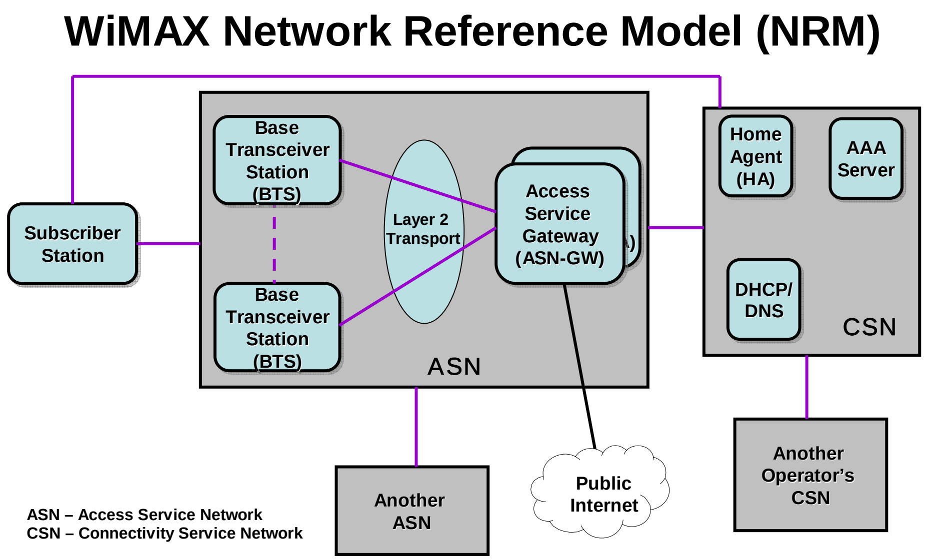
The WiMAX Forum[3/] introduced mobile WiMAX into the IMT-2000 family of third-generation radio technologies and this inclusion was approved at the recent 2007 ITU-R

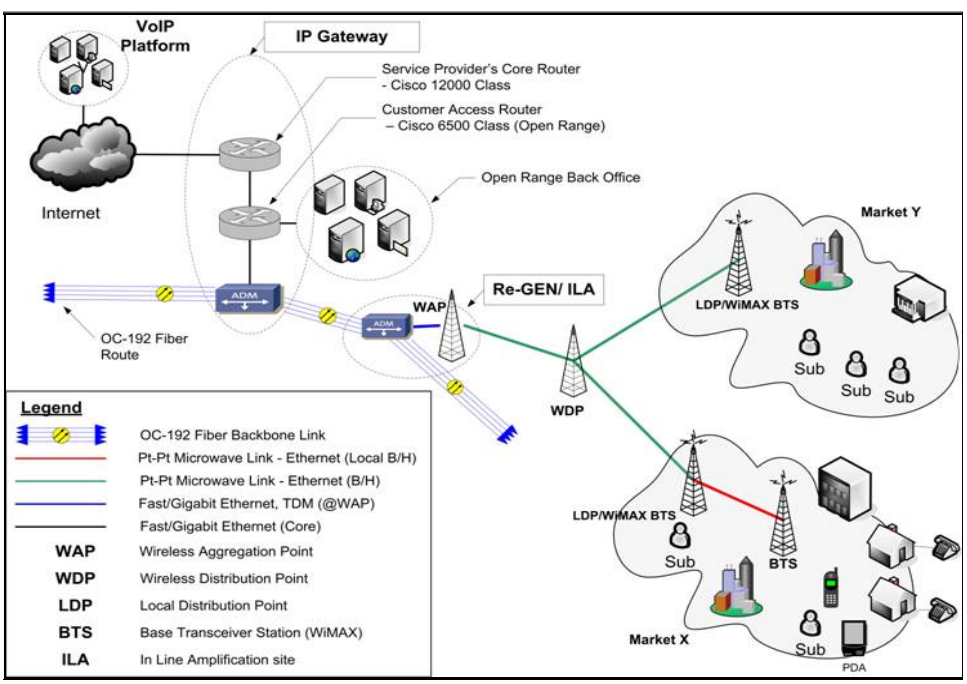
[2/] The 3rd Generation Partnership Project (3GPP), a voluntary collaboration of industry associations, has specified many of these technologies. *See* http://www.3gpp.org/About/about.htm.

[3/] *See* http://www.wimaxforum.org/about/.

Radiocommunication Assembly. Since the mobile terminal power is significantly lower than the base station power, no greater interference potential results from using TDD WiMAX compared with cdma2000. A more detailed analysis appears in Section A-6. A network diagram is shown in the figures below.

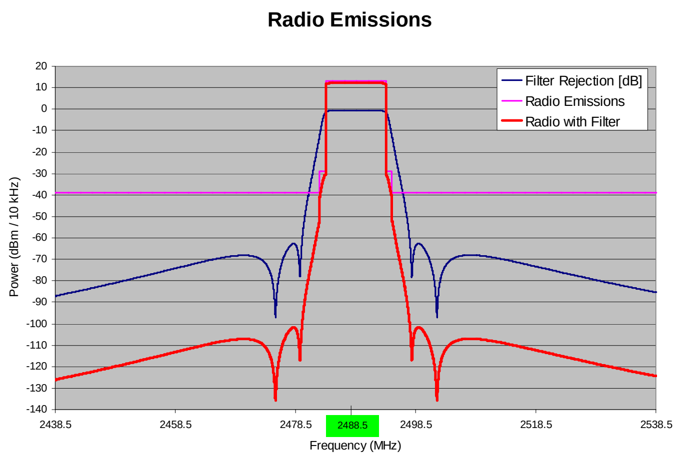
Globalstar ATC TDD WiMAX Network Architecture





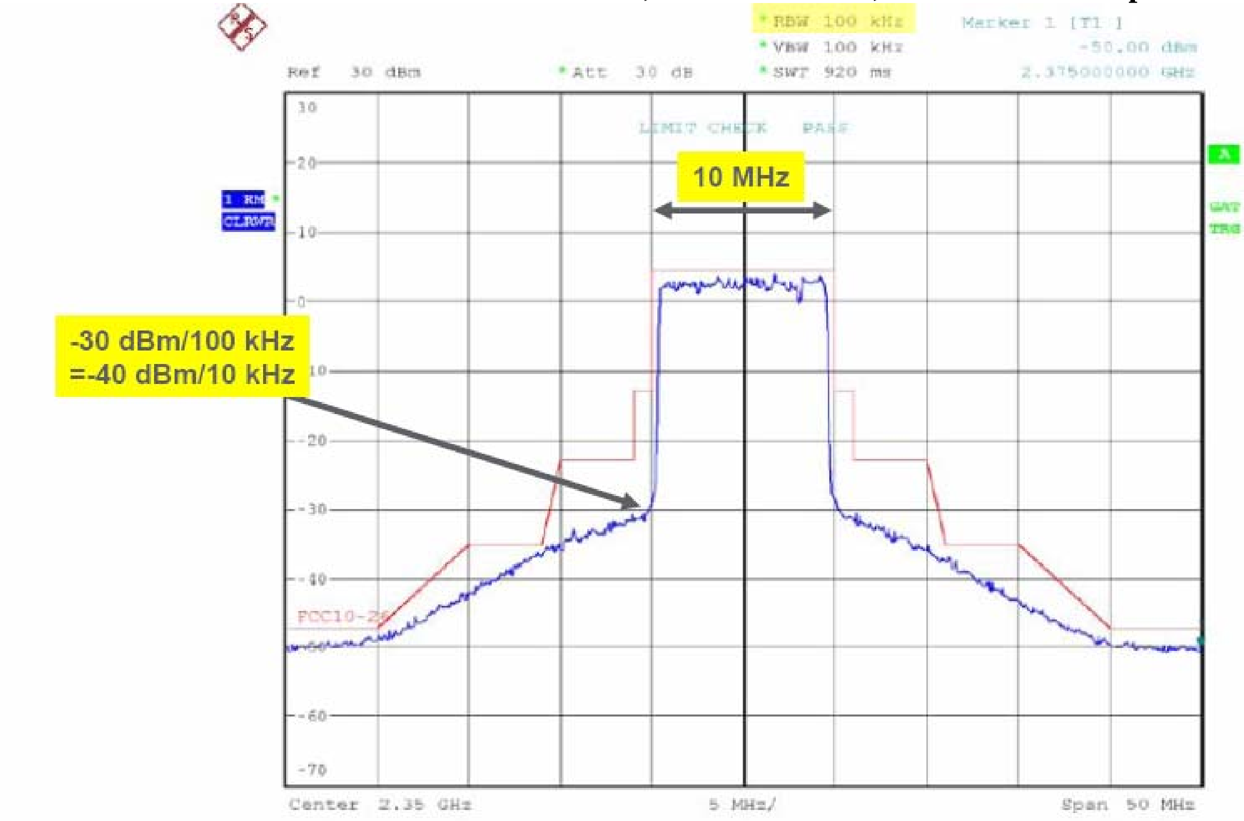
The following figures characterize the emissions from ATC base stations and mobile terminals using WiMAX. Note that the depicted carrier center frequencies shown are representative, but may be moved in the licensed band as appropriate to provide best performance in each deployment while still maintaining in-band and out-of band emission requirements.

WiMAX Base Station Transmit Emissions, 10 MHz carrier, center frequency = 2488.5 MHz



Emissions at the BTS Antenna Connector
WiMAX16.e TDD Signal, 10MHz, TDD=2:1
Tx Power: 14.3W per Tx chain
Center frequency: 2,488.5MHz

WiMAX Mobile Station Transmit Emissions, 10 MHz carrier, 23 dBm transmit power



1.2 Globalstar FDD ATC in the L- and S-Bands

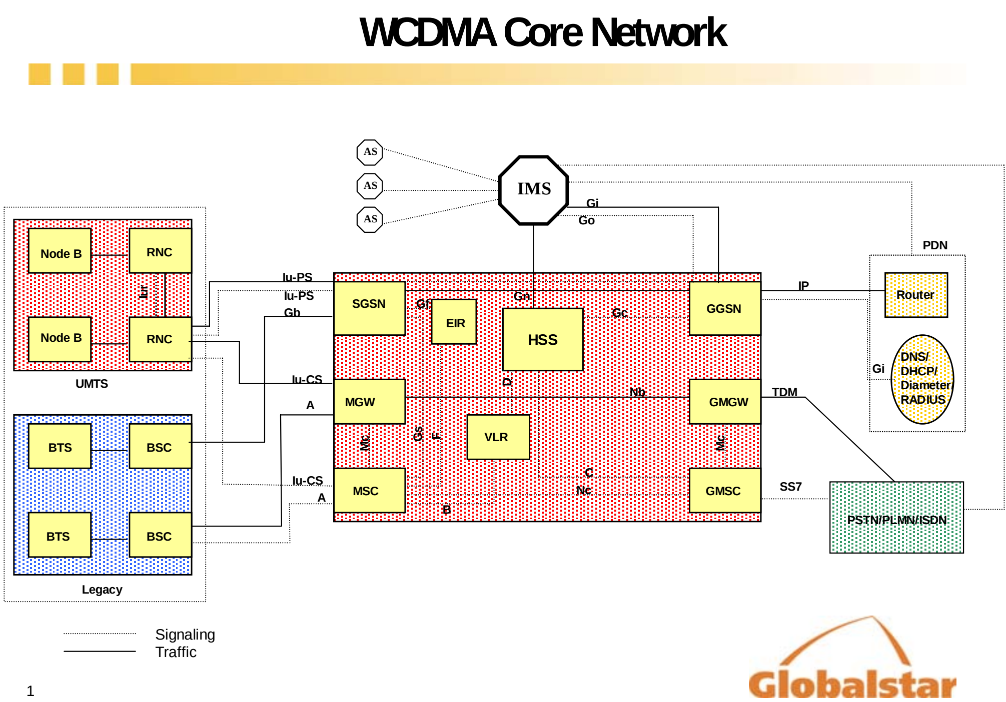
In this modification application, Globalstar requests additional authority to deploy the following newer technologies in FDD mode: the 3GPP WCDMA (Wideband Code Division Multiple Access) architecture, the 3GPP TD-CDMA (Time Division Code Division Multiple Access) architecture and the 3GPP LTE (Long Term Evolution) architecture. The particular architecture choice may be local or regional, and the overall Globalstar MSS/ATC network will likely consist of various ATC technologies.

1.2.1 WCDMA

WCDMA is a 3G mobile network technology that is primarily used across continents in the International Mobile Telecommunications (IMT) frequency bands. WCDMA was designed to provide cost-efficient capacity for both mobile multimedia applications and mobile telephone services. WCDMA spreads user data over a bandwidth of 5 MHz. This wide bandwidth supports high data transfer rates and also provides performance benefits due to the diversity of broadcast frequency achieved. In addition, a technology called High Speed Packet Access (HSPA) brings even higher uplink and downlink speeds over WCDMA radio access networks. Users can, for example, enhance a mobile voice call with online live video, or surf the Web faster than previously possible while simultaneously speaking on the phone. WCDMA provides faster, more efficient and more flexible service for data transmission, is designed to support simultaneous services with different service quality requirements in terms of throughput, transfer delay, and bit error rate, and is a global technology with nearly universal adoption.

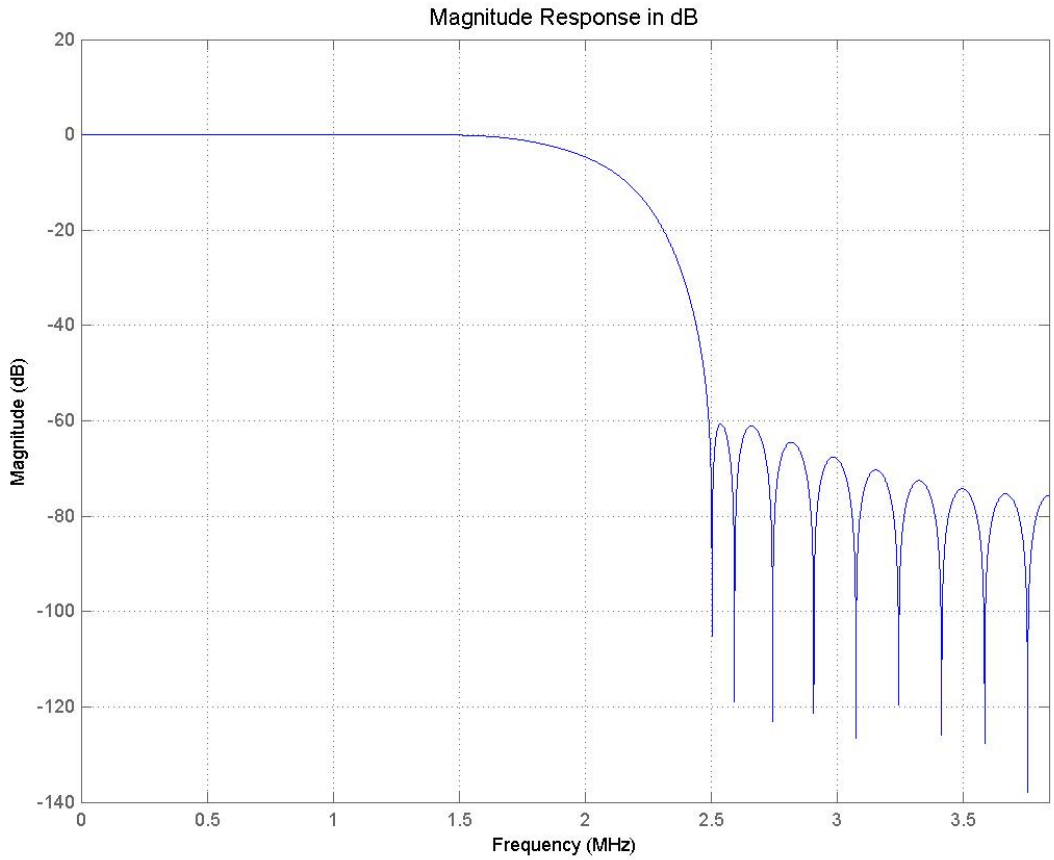
WCDMA METs and base stations would transmit only in the forward-band mode of their respective bands in accordance with section 25.149(a)(1) of the Commission's rules. A network diagram appears below.

Globalstar ATC FDD WDMA Network Architecture



The following figure characterizes the baseband filter response for ATC base stations and mobile terminals using WCDMA.

WCDMA Base Station and Mobile Terminal Baseband Filter Response, 5 MHz carrier

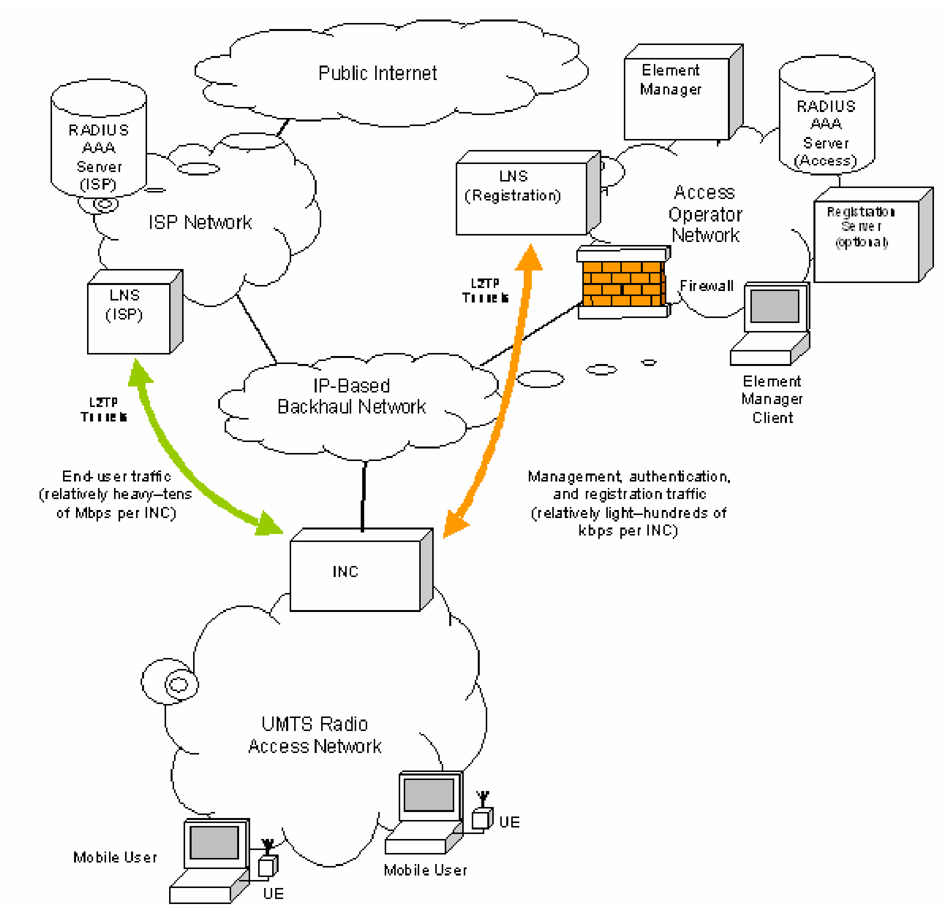


1.2.2 TD-CDMA

TD-CDMA, like WCDMA, supports wireless broadband applications. TD-CDMA complies with the 3GPP Universal Mobile Telecommunications Systems Time Division Duplexing (UMTS TDD) standard. As part of 3GPP, TD-CDMA has the backing of international standards bodies. Globalstar will only be deploying TD-CDMA in FDD mode. TD-CDMA permits greater coverage with fewer base stations by employing advanced power control mechanisms that allow the data throughput to gradually decrease as a terminal gets farther away from the base station. TD-CDMA subscriber terminals can support mobility by automatically detecting the signal strength of surrounding base station cells and informing the network of a better signal before the existing connection is broken. Automatic signal detection thus enables a transparent handoff as the user moves from the coverage area of one base station to another. TD-CDMA technology also supports dedicated air interface channels for VoIP traffic when a user voice session is set up, as well as supporting end-to-end Quality of Service (QoS). TD-CDMA, together with the 3GPP-defined core network QoS, ensures that neither the air-interface nor the core network becomes a bottleneck for voice traffic, traditionally a critical limitation for voice services over a shared packet data network.

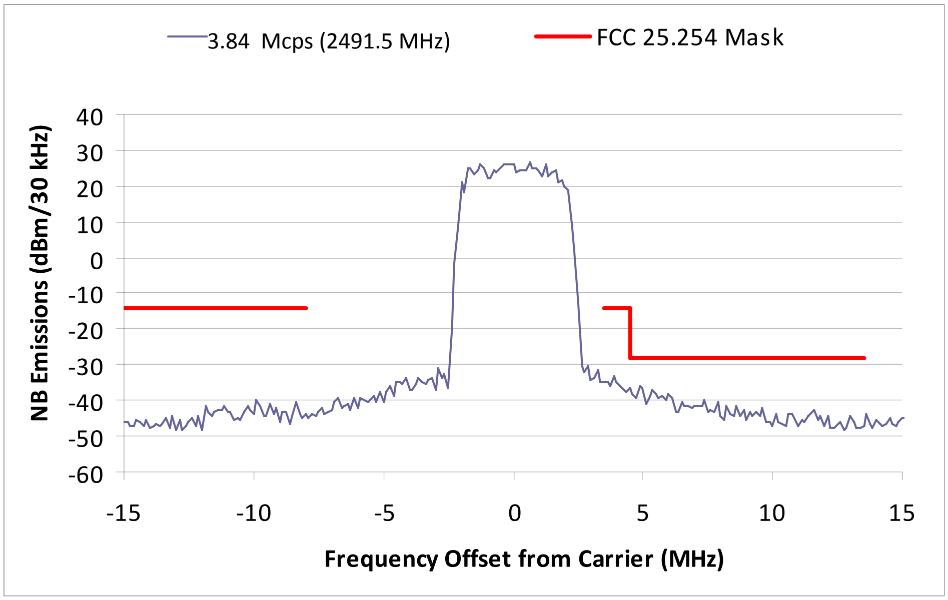
In the Globalstar ATC FDD mode, TD-CDMA would utilize 5 MHz carriers in the L-band and 5 MHz and 10 MHz carriers in the S-band. The 3.84 Mcps TD-CDMA option uses a nominal channel spacing of 5 MHz, but this can be adjusted to optimize performance in a particular deployment scenario. Similarly, the 7.68 Mcps TD-CDMA option uses a nominal channel spacing of 10 MHz, but can also be adjusted for performance. TD-CDMA ATC METs and base stations would only transmit in the forward-band mode in their respective bands in accordance with section 25.149(a)(1) of the Commission's rules. A network diagram appears below.

Globalstar ATC FDD TD-CDMA Network Architecture

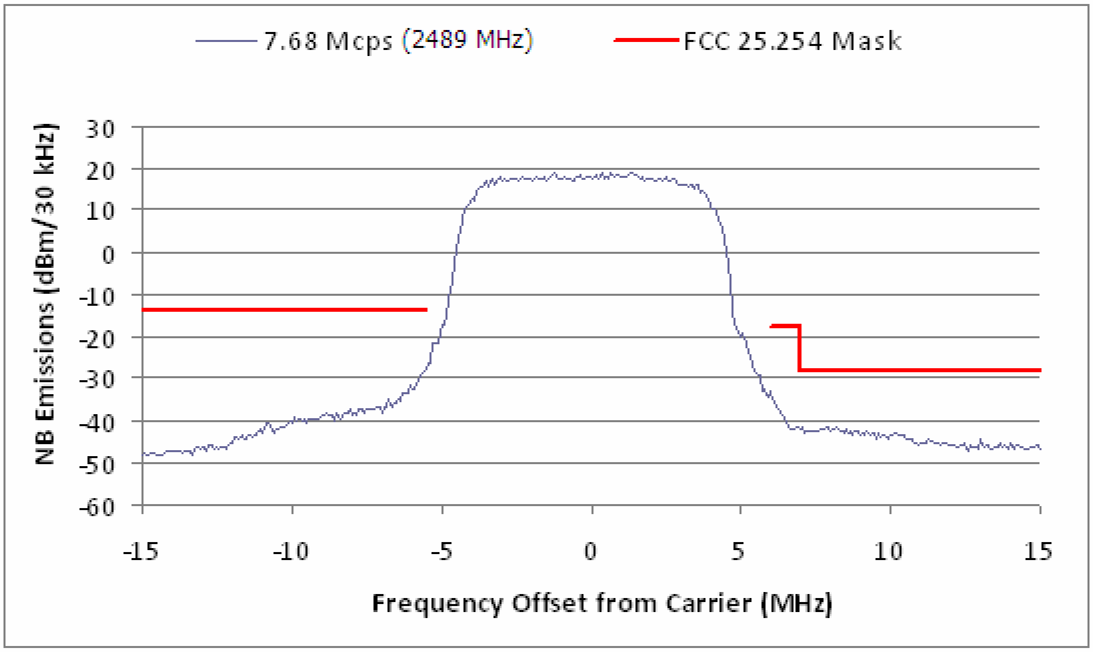


The following figures characterize the emissions from ATC base stations and mobile terminals using TD-CDMA. Note that the carrier center frequencies depicted in the figure titles below are representative, but may be moved slightly in the licensed band as appropriate to provide best performance in each deployment while still maintaining in-band and out-of-band emission requirements.

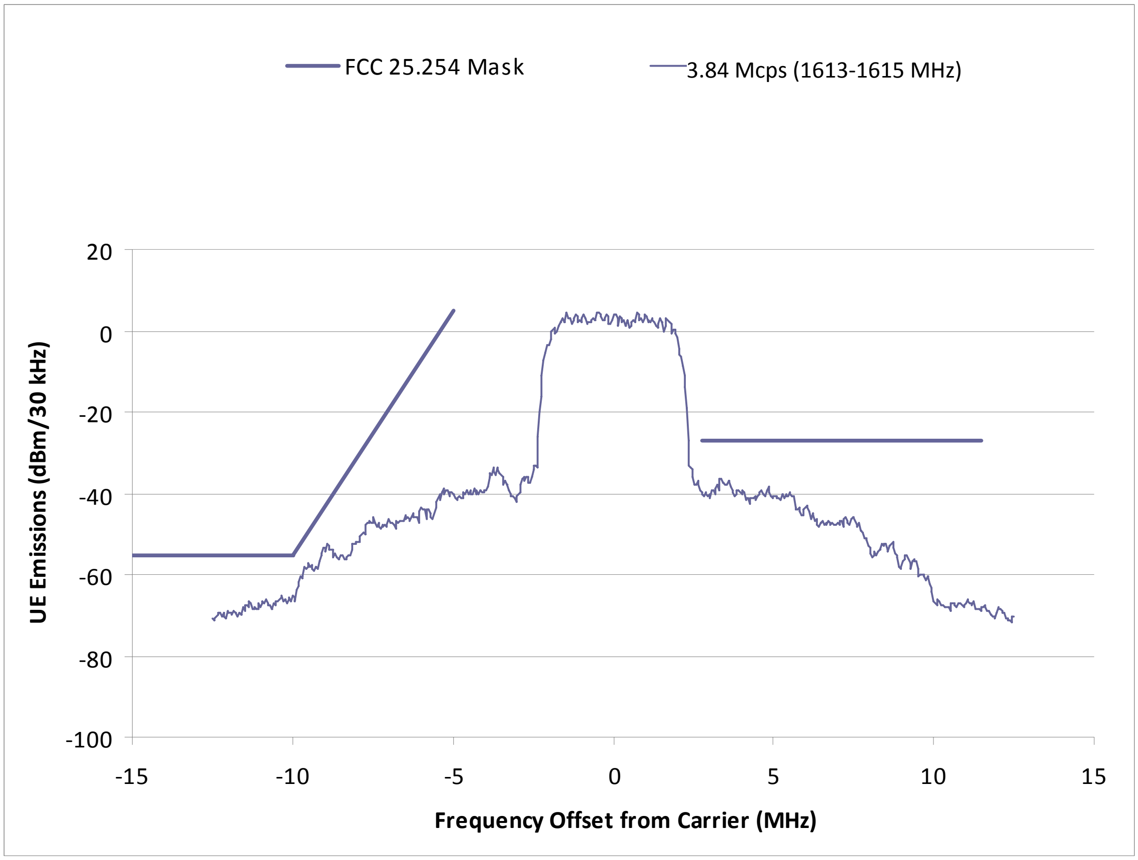
TD-CDMA Base Station Transmit Emissions, 5 MHz carrier, center frequency = 2491.5 MHz



TD-CDMA Base Station Transmit Emissions, 10 MHz carrier, center frequency = 2489.0 MHz



TD-CDMA Transmit Emissions, center frequency = 1613-1615 MHz



1.2.3 LTE

3GPP LTE is the name given to a project within the 3GPP to improve the UMTS mobile phone standard to cope with future requirements. Goals include improving efficiency, lowering costs, improving services, making use of new spectrum opportunities, and achieving better integration with other open standards. The LTE project is not a standard, but it will result in the new evolved release 8 of the UMTS standard, including mostly or wholly extensions and modifications of the UMTS system. The architecture that will result from this work is called EPS (Evolved Packet System) and comprehends E-UTRAN (Evolved UMTS Terrestrial Radio Access Network) on the access side and EPC (Evolved Packet Core) on the core side. While 3GPP Release 8 has yet to be finalized, much of the standard will be oriented around upgrading UMTS to a so-called fourth generation mobile communications technology, essentially a wireless broadband Internet system with voice and other services built on top. The current state of the standard includes:

- Peak download rates of 326.4 Mbit/s for 4x4 antennas, 172.8 Mbit/s for 2x2 antennas for every 20 MHz of spectrum
- Peak upload rates of 86.4 Mbit/s for every 20 MHz of spectrum

- At least 200 active users in every 5 MHz cell. (i.e., 200 active data clients)
- Sub-5ms latency for small IP packets
- Increased spectrum flexibility, with spectrum slices as small as 1.25 MHz (and as large as 20 MHz) supported
- Optimal cell size of 5 km, 30 km sizes with reasonable performance, and up to 100 km cell sizes supported with acceptable performance
- Co-existence with legacy standards (users can transparently start a call or transfer of data in an area using an LTE standard, and, should coverage be unavailable, continue the operation without any action on their part using GSM/GPRS or WCDMA-based UMTS).

A large amount of the work is aimed at simplifying the architecture of the system, as it transitions from the existing UMTS circuit plus packet switching combined network, to an all-IP system. A characteristic of so-called "4G" networks including Evolved UMTS is that they are fundamentally based upon TCP/IP, the core protocol of the Internet, with higher level services such as voice, video, and messaging, built on top of this. In 2004, the 3GPP proposed this as the future of UMTS and began feasibility studies into the so-called All IP Network (AIPN).

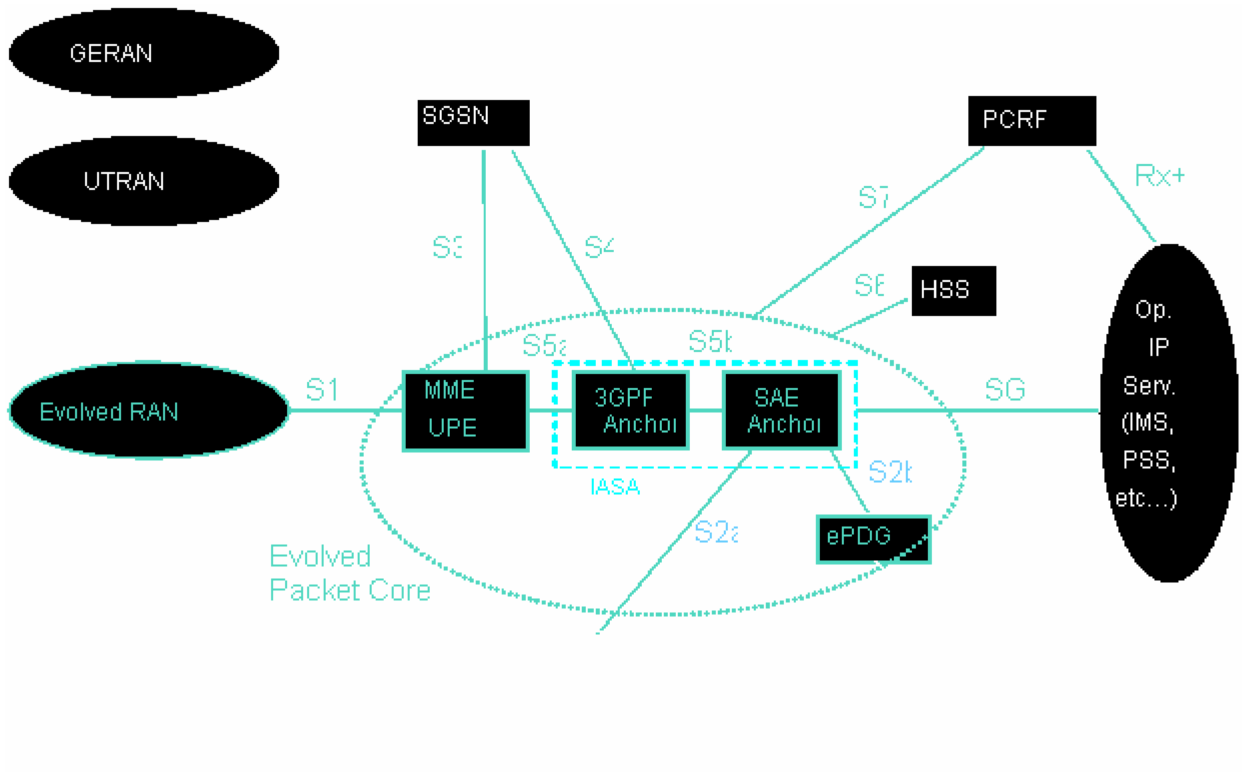
Release 8's air interface, *E-UTRA* (Evolved UMTS Terrestrial Radio Access, the E-prefix being common to the evolved equivalents of older UMTS components) would be used by UMTS operators deploying their own wireless networks. It is important to note that Release 8 is intended for use over any IP network, including WiMAX and WiFi, and even wired networks. The proposed E-UTRA system uses OFDMA for the downlink (tower to handset) and Single Carrier FDMA (SC-FDMA) for the uplink and employs MIMO with up to four antennas per station. The channel coding scheme for transport blocks is turbo coding and a contention-free quadratic permutation polynomial (QPP) turbo code internal interleaver. The use of Orthogonal Frequency Division Multiplex (OFDM), a system where the available spectrum is divided into thousands of very thin carriers, each on a different frequency, each carrying a part of the signal, enables E-UTRA to be much more flexible in its use of spectrum than the older CDMA based systems that dominated 3G. OFDM has a link spectral efficiency greater than CDMA, and when combined with modulation formats such as 64QAM, and techniques as MIMO, E-UTRA should be considerably more efficient than WCDMA with HSPA.

The subcarrier spacing in the OFDM downlink is 15 kHz and there is a maximum of 2048 subcarriers available. Mobile devices must be capable of receiving all 2048 subcarriers but a base station need only support transmitting 72 subcarriers. The transmission is divided into time slots of duration 0.5 ms and subframes of duration 1.0 ms. A radio frame is 10 ms long. Supported modulation formats on the downlink data channels are QPSK, 16QAM and 64QAM. For MIMO operation, a distinction is made between single user MIMO, for enhancing one users data throughput, and multi user MIMO for enhancing the cell throughput.

The currently proposed uplink uses SC-FDMA multiplexing, and QPSK or 16QAM (64QAM optional) modulation. SC-FDMA is used because it has a low Peak-to-Average Power Ratio (PAPR). Each mobile device has at least one transmitter. If virtual MIMO / Spatial division multiple access (SDMA) is introduced the data rate in the uplink direction can be increased depending on the number of antennas at the base station. With this technology more than one mobile can reuse the same resources.

Channel bandwidths for LTE are 1.4, 3, 5, and 10 MHz. LTE ATC METs and base stations would only transmit in the forward-band mode in their respective bands in accordance with section 25.149(a)(1) of the Commission's rules. A network diagram appears below.

Globalstar ATC FDD LTE Overall Network Architecture



Additional details on the above architecture and the development of the LTE standards can be obtained at the 3GPP website at http://www.3gpp.org/Highlights/LTE/LTE.htm. The following figures characterize the emissions from ATC base stations for LTE from 3GPP Release 8. The baseband filtering is RRC, similar to WCDMA but with different chip rates.

Additional operating band unwanted emission limits for E-UTRA bands >1GHz

Channel bandwidth	Frequency offset of measurement filter -3dB point, Δf	Frequency offset of measurement filter center frequency, f_offset	Minimum requirement	Measurement bandwidth
1.4 MHz	0 MHz ≤ Δf < 1 MHz	0.005 MHz ≤ f_offset < 0.995 MHz	-14 dBm	10 kHz
3 MHz	0 MHz ≤ Δf < 1 MHz	0.015 MHz ≤ f_offset < 0.985 MHz	-13 dBm	30 kHz
5 MHz	0 MHz ≤ Δf < 1 MHz	0.015 MHz ≤ f_offset < 0.985 MHz	-15 dBm	30 kHz
10 MHz	0 MHz ≤ Δf < 1 MHz	0.05 MHz ≤ f_offset < 0.95 MHz	-13 dBm	100 kHz
All	1 MHz ≤ Δf < Δf_{max}	1.5 MHz ≤ f_offset < f_offset_{max}	-13 dBm	1 MHz

A-2: Description of Globalstar ATC System

Globalstar described its ATC system at length in an Exhibit to its March 2005 application.[4/] There are no substantive changes to that description, which is incorporated herein by reference.

A-3: Compliance with RF Radiation Guidelines

Globalstar described its compliance with RF radiation guidelines in an Exhibit to its March 2005 application.[5/] There are no substantive changes to that description, which is incorporated herein by reference.

A-4: Description of ATC Base Station Operation

For its ATC service, Globalstar, in concert with its ATC business partners, plans to utilize terrestrial base stations and antennas very similar to those currently deployed by terrestrial PCS and broadband wireless systems. The Globalstar ATC base station and antennas will transmit and receive in the 2483.5-2495 MHz band where TDD WiMAX is deployed, or transmit

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[4/] Application of Globalstar LLC, File No. SAT-MOD-20050301-00054, filed March 1, 2005, at Exhibit B-1.

[5/] Application of Globalstar LLC, File No. SAT-MOD-20050301-00054, filed March 1, 2005, at Exhibit B-2.

in the 2483.5-2495 MHz band and receive in the 1610-1617.775 MHz band where an FDD technology is deployed. MSS and ATC operations will share the same frequencies. The Globalstar MSS/ATC control center, which will be integrated into Globalstar's existing control center in California, will allocate frequencies to MSS and ATC so that "MSS only" frequency(ies) will exist within ATC coverage zones if self-interference would otherwise become too great. This ensures that MSS-only users will be served when in ATC coverage. In other words, Globalstar ATC base stations will be designed to operate on less than all available MSS frequencies when using all available frequencies for ATC base station operations would exclude otherwise available signals from MSS space stations as required by section 25.149(a)(6) of the rules.

Globalstar will require that the base station and base station antenna supplier(s) provide equipment and any necessary filtering in order to comply with the applicable Commission Rules. Globalstar's ATC base stations will produce no greater interference than is permitted by the Commission's technical specifications, which are based on a cdma2000 system architecture. Specifically:

- ATC base stations will not exceed a peak EIRP of 32 dBW in 1.25 MHz.

- ATC base stations will not exceed out-of-channel emission of -44.1 dBW/30 kHz at the edge of the Globalstar's authorized assignment.

- ATC base stations will also not exceed the following Part 27 out-of-band emission limits, now incorporated in 47 C.F.R. § 25.254 (d):
  - -43 dBW/1% of carrier bandwidth at the band edge
  - -43 dBW/MHz at 1 MHz from the band edge for any size carrier
  - -67 dBW/MHz at 3 MHz from the band edge for a documented interference complaint for base stations separated by at least 1.5 km or by 67 + 10logP - 20 $\log(d_{km}/1.5)$ for distances less than 1.5 km

- ATC base stations operating in the 2483.5-2495 MHz band will meet all out-of band emission limits below 1610 MHz including:
  - ATC base stations will not exceed an EIRP density in the 1605-1610 MHz band that is determined by linear interpolation from -70 dBW/MHz at 1605 MHz to -10 dBW/MHz at 1610 MHz, for wideband emissions.
  - ATC base stations will not exceed an EIRP density in the 1559-1605 MHz band of -70 dBW/MHz for wideband emissions and -80 dBW for narrowband emissions (discrete emissions of less than 700 Hz bandwidth).

A-5: Description of ATC User Terminal Operation

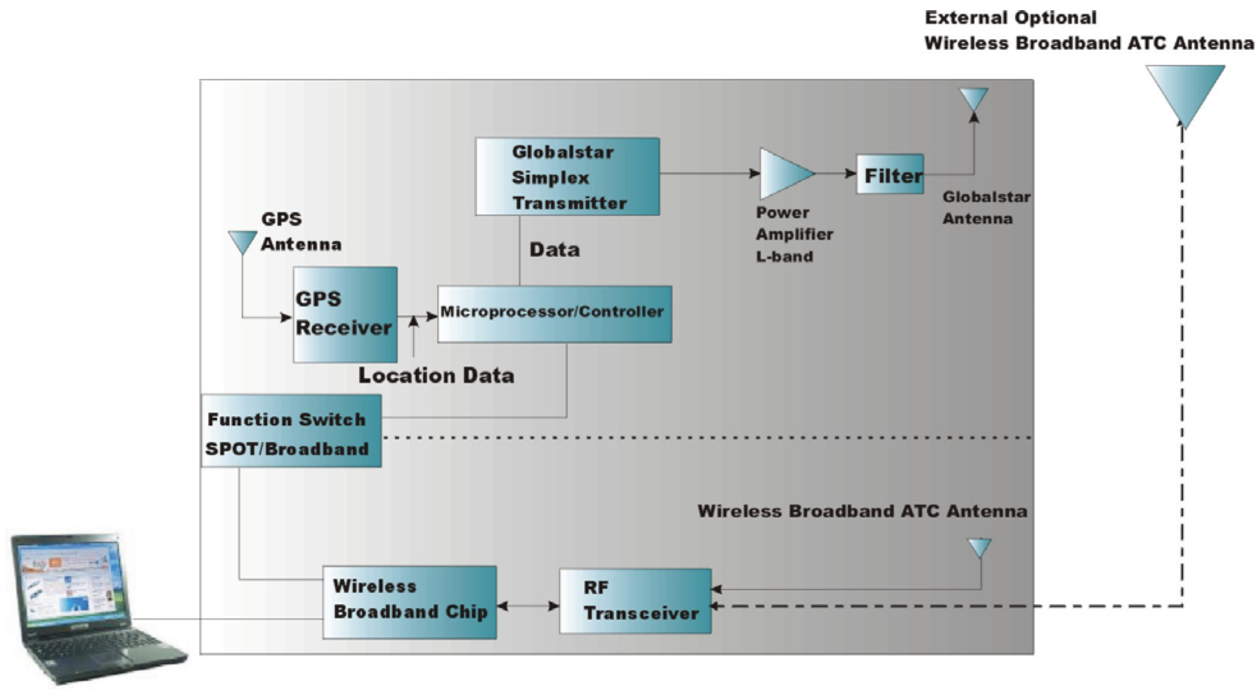
As noted in the Application, Globalstar's MSS/ATC services will evolve as Globalstar's second-generation constellation is deployed and the Open Range network is being built out. In all phases of this evolution, Globalstar plans to offer integrated MSS/ATC service by utilizing dual-mode MSS/ATC terminals that can communicate with both the MSS network and the MSS

ATC component. The Globalstar MSS/ATC terminal with antenna will transmit in the 1610-1617.775 MHz band for FDD ATC mode, and transmit in the 1610-1618.725 MHz band for MSS mode. The terminal will transmit, for TDD ATC mode, and receive, for both FDD and TDD ATC modes, in the 2483.5-2495 MHz band, and receive in the 2483.5-2500 MHz band for MSS mode. In the initial phase, the user terminal will be an integrated device that combines the MSS functionality of Globalstar's SPOT service with wireless broadband service over the Open Range network. While commercial versions of these terminals have not yet been designed, Globalstar anticipates that they will initially be similar to the current SPOT Satellite Messenger ("SMessenger") handheld device, built by Axxon, for sending user location telemetry data (pictured below). When Globalstar's second-generation constellation and ground segment are deployed in the U.S., Globalstar will offer additional MSS/ATC terminals which will operate as a broadband modem in both the satellite and ATC modes.

Globalstar SPOT SMessenger Handset

For MSS/ATC, the terminal will be modified to include both a satellite and terrestrial mode. In the initial phase, the terminal will operate as a Satellite Messenger device in the satellite mode and as a terrestrial wireless broadband device in the ATC mode. The device will have a USB port so that a user can connect the device to a computer and have broadband wireless access, or the user can use the MSS tracking service. There will be no simultaneous transmission in ATC and MSS modes for this device. A preliminary simplified block diagram of the terminal is shown below. Both the MSS and ATC antennas will be housed within the device and will not be removable. This device will also be offered with an optional, detachable high gain ATC antenna.

Globalstar MSS/ATC Terminal Preliminary Block Diagram



At the moment, the Globalstar ATC system does not contemplate in-call hand off between the MSS mode and the ATC mode. Accordingly, if a user crosses a service boundary between ATC coverage and MSS coverage, a call in progress could be dropped. The indicators on the handset display will advise the user that the mode has changed.

5.1 SPOT Satellite Messenger

SPOT is the world's first satellite messenger. The device provides a "Check In" function to let contacts know where the user is and that they are okay, a "Track Progress" function to send and save the user's location using a mapping application, an "Ask For Help" function requesting non-emergency assistance at the user's location from the user's designated contact, and an "Alert 9-1-1" function to dispatch emergency responders to the user's location. A complete description of the device and additional information can be found at www.findmespot.com.

The Alert 9-1-1 function is used in the event of a life threatening or other critical emergency to notify emergency services of the user's location and that they need assistance. The GEOS International Emergency Response Center alerts the appropriate agencies worldwide, e.g. contacting 911 responders (Public Safety Answering Points or PSAPs) in North America or 112 responders in Europe. The SPOT will acquire its coordinates from the GPS network and send that location along with a distress message every five minutes until cancelled. Based on the user's location and personal information, the Emergency Response Center notifies the appropriate emergency responders, which may include local police, highway patrol, the Coast Guard, an embassy or consulate if outside the United States, or other emergency response or search and rescue teams, as well as notifying the user's designated emergency contact(s) about the receipt of a distress signal. Even if SPOT cannot acquire its location from the GPS network, it will attempt to send a distress signal, without GPS location, to the Emergency Response Center, which will still notify the user's contacts and continue to monitor the network for further messages.

In sum, SPOT is an extremely attractive satellite device that will be useful to anyone who lives in the rural areas proposed to be served by Open Range.

5.2 Satellite Mode Operational Parameters

a) Frequency of Operation: Transmit band of 1610 to 1618.725 MHz

b) Antenna Polarization: Left hand circular

c) Emission Designator: 2M50G2D

d) Maximum EIRP: The maximum EIRP of -3.0 dBW is dictated by the maximum available transmitter power of the radio and its peak antenna gain. The EIRP density is the EIRP divided by the channel bandwidth of 2.50 MHz and further corrected for the required 4 kHz bandwidth.

e) Maximum EIRP Density

New Radio Type and Antenna Type	Max Tx Power Available (dBW)	Peak Antenna Gain (dBic or dBi)	Max EIRP (dBW)	(e) Max EIRP Density/Carrier (dBW/4 kHz)*
SMessenger or PTracker	**-8.0**	**5.0**	**-3.0**	**-31.0**

* Meets the -15 dBW/4 kHz MES limit specified in the FCC General Rules and Regulations governing Frequency Allocations and Radio Treaty Matters (47 C.F.R. Part 2), Section 2.106, footnote S5.364.

f) Description of Modulation: The Globalstar™ SPOT SMessenger MES transmitter utilizes direct sequence CDMA at a chip rate of 2.50 MHz on BPSK modulation. Baseband filtering is implemented to meet the out-of-band emissions requirements. Each transmission is done at a constant power level, i.e. this MES terminal does not use power control.

5.2.1 MSS Antenna Facilities

The antenna pertinent to this license modification, the SPOT SMessenger, has been designed by Axxon LLC of Covington, LA. In production, it may be fabricated by a third party manufacturer. The MES radio type corresponding to this application modification is indicated below:

Radio Type	Radio Designator	Services Offered	Frequency Bands (MHz)	Antenna Designation
SMessenger or PTracker	Single mode	Globalstar™	Tx*: 1610-1618.725	GS TX

* Tx - transmit band

The radio is equipped with one Globalstar™ transmit antenna. The antenna has hemispherical coverage with a quasi omni-directional gain pattern, and is integrated in a single housing with the radio unit.

The SPOT SMessenger uses an active patch antenna designed by Axxon. The patch antenna is 1.75 inches square and 0.3 inches thick and its peak gain is 5.0 dBic. The patch antenna is mounted with the radio in a waterproof housing 4.38 x 2.75 x 1.5 inches.

Key characteristics are summarized in the table below:

Globalstar™ SMessenger Antenna
(GS TX)

Parameter	Transmit Antenna
Frequency	1610 to 1618.725 MHz
Polarization	Left Hand Circular
Peak Gain	<5.0 dBic
Elevation Plane Coverage	10 to 90 degrees
Azimuth Plane Coverage	360 degrees
Gain below 10 degrees elevation	<0 dBic
Size	1.75” square, 0.3” thick

5.2.2 MSS Antenna Heights

The extremely small size of the mobile terminal makes FAA notification unnecessary. See Section 17.14(b) of the FCC rules.

The SPOT SMessenger is intended to be used as a handheld portable radio at roughly waist level of approximately three to four feet above ground level (AGL), but will still operate if held higher or set down on a surface.

5.3 ATC Mode Operational Parameters

The ATC terminal transmitter performance requirements are summarized below:

Phone Type and Mode	Max Tx Power Available (dBW)	Peak Antenna Gain (dBic or dBi)	Max EIRP (dBW)	Max EIRP Density (dBW/1.25 MHz)	Max EIRP Density (dBW/4 kHz)
Handheld ATC	-7.0	2.0	-5.0	-5.0	-29.9
Fixed ATC (external antenna)	-7.0	12.0	5.0	1.0	-19.9

The handheld values are consistent with the power levels that will be used in the SAR testing.

The following user equipment (UE) power classes pertain to the different ATC technology options. Note that the ATC terminal falls within the particular power classes identified, but will not exceed a maximum transmit power of 23 dBm.

UE Power Classes for WCDMA

Power Class 3		**Power Class 3bis**		**Power Class 4**	
Power (dBm)	**Tol (dB)**	**Power (dBm)**	**Tol (dB)**	**Power (dBm)**	**Tol (dB)**
+24	+1/-3	23	+2/-2	+21	+2/-2

UE Power Class for TD-CDMA

UE power classes for FDD TD-CDMA	**Nominal maximum output power**	**Tolerance**
2	+24 dBm	+1 dB / -3 dB

<u>WirelessMAN-OFDMA Power Class profiles (802.16)</u>

A power class profile contains the class(es) of BS and Subscriber Station (SS) transmitters used in a system. A power class profile may contain transmitters from more than one class, with the profile indicating the highest power level class permitted. The power classes for BS and SS transmitters in a system are listed below:

Class identifier Tx power (dBm)
Class 2 20 PTx,max < 23
Class 3 23 PTx,max < 30
Class 4 30 PTx,max

5.3.1 ATC Antenna Facilities

The internal ATC antenna for the handheld terminal will radiate with near spherical pattern coverage and a peak gain less than 2 dBi. The optional high gain ATC antenna will be separate and detachable. General characteristics are given below.

As with the ATC base stations, Globalstar will require its ATC terminal supplier(s) to provide equipment in compliance with the applicable FCC rules governing ATC, including:

- ATC mobile terminals will meet a peak EIRP density limit of 1.0 dBW/1.25 MHz.

- ATC mobile terminals will meet an out-of channel EIRP limit of -57.1 dBW/30 kHz at the edge of Globalstar's licensed MSS frequency assignment.

- ATC mobile terminals placed into service before 2012 will not exceed an EIRP spectral density in the 1559-1610 MHz band per the following table:

Frequency (MHz)	**ATC Mobile Terminal EIRP Spectral Density**	
	dBW/MHz	**dBW/kHz**
1559 - 1590	-90	-100
1590 - 1600	-90 to -85, linearly interpolated	-100 to -95, linearly interpolated
1600 - 1605	-85	-95
1605 - 1610	-85 to -42, linearly interpolated	-95 to -52, linearly interpolated

- ATC mobile terminals placed into service after 2012 will not exceed an EIRP spectral density in the 1559-1610 MHz band per the following table:

Frequency (MHz)	**ATC Mobile Terminal EIRP Spectral Density**	
	dBW/MHz	**dBW/kHz**
1559 - 1605	-95	-105
1605 - 1610	-95 to -47, linearly interpolated	-105 to -57, linearly interpolated

5.3.1.1 ATC Handheld Antenna

Parameter	**Value**
Frequency Bands	1610-2500 MHz
Polarization	Vertical
Peak Gain	<2.0 dBi
Elevation Plane Coverage	-45 to 45 degrees
Azimuth Plane Coverage	360 degrees
Size	<0.5” diameter, <1” length

5.3.1.2 ATC High Gain External Antenna

Parameter	**Value**
Frequency Bands	2483.5-2495 MHz
Polarization	Vertical
Peak Gain	<12.0 dBi
Elevation Plane Coverage	-45 to 45 degrees
Azimuth Plane Coverage	360 degrees
Size	<1.5” diameter, < 11” length

5.3.2 ATC Antenna Heights

The extremely small size of the mobile terminal makes FAA notification unnecessary. See Section 17.14(b) of the FCC rules.

The MSS/ATC terminal is intended to be used as a handheld portable radio at roughly waist level of approximately three to four feet AGL, but will still operate if held higher or set down on a surface. The optional ATC high gain external antenna is intended to be mounted outdoors on a building, typically around 30 feet AGL.

A-6: Interference Protection

Globalstar described its method for protecting the RAS and radio-navigation services in an Exhibit to its March 2005 application.[6/] Except for the expansion of authorized ATC frequencies, and except as modified below, there are no substantive changes to that description, which is incorporated herein by reference. At present Globalstar does not intend to deploy base stations that cover RAS protection zones. This will ensure that MSS/ATC METs do not transmit inside of the zones.

6.1 Protection of Other MSS Systems in the Same or Adjacent Bands for FDD ATC

For each FDD technology deployed, Globalstar will protect the other MSS systems in the same or adjacent bands by certifying equipment compliance with the applicable Commission Rules governing MSS and ATC. Specifically:

- The MSS mobile terminals described herein will meet an out-of channel EIRP limit per ETSI EN 301 441, Table 5, of -32 dBW/30 kHz at the edge of Globalstar's licensed MSS frequency assignment (at 1618.725 MHz) and -56 dBW/30 kHz more than 2.3 MHz away from the band edge.

- ATC base stations will meet all of the requirements as highlighted in section A-4.

- ATC mobile terminal will meet all of the requirements as highlighted in section A-5.

- ATC mobile terminals will meet an out-of channel EIRP limit of -57.1 dBW/30 kHz at the edge of Globalstar's licensed MSS frequency assignment.

Note that the ATC terminals have more stringent out-of-channel emission limits and should pose no greater interference potential than existing MSS terminals. Each FDD technology (W-CDMA, FDD TD-CDMA and LTE) deployed will have no greater emissions than those for cdma2000 base stations and mobile stations.

6.2 Protection of Other Systems in the Same or Adjacent Bands for TDD WiMAX ATC

This section addresses the potential for interference between ATC Base Station (BS) transmitters using WiMAX technologies and BRS BS receivers using WiMAX technologies

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[6/] Application of Globalstar LLC, File No. SAT-MOD-20050301-00054, filed March 1, 2005, at Exhibit B-5.

where both systems are operating close to 2495 MHz with a worst-case separation of 100 meters. The licensees of the BRS band are believed to be planning to deploy TDD WiMAX technology.

It also addresses the potential for interference between ATC Mobile Stations (MSs) and BRS MSs. If the ATC BS and MS emissions operate at the FCC limits[7/], then RF filters will be required both at the ATC BS and the BRS BS in order to suppress these interference sources.

Alternatively, if the ATC system uses WiMAX TDD technology, and the transmissions are synchronized with those of any nearby BRS systems operating on BRS channel 1, any potential for interference can be entirely eliminated. In such a case, interference to MSs from BSs is no greater than that which occurs between adjacent FDD systems.

Finally, this analysis explains that no additional interference to Broadcast Auxiliary Service (BAS) licensees is created by ATC MSs transmitting in the 2483.5–2495 MHz bands. BAS operates on Channel A10 between 2483.5–2500 MHz and on Channel A9 between 2467 – 2483.5 MHz.

For this analysis, we consider the parameters of the interfering and victim systems, and use an ATC WiMAX with 10 MHz bandwidth. We consider BRS in Channel 1 as WiMAX with 5 MHz bandwidth (4.6 MHz occupied bandwidth). Finally, we consider BAS in Channels A9 and A10 with 16.5 MHz bandwidth or digitized into a 12 MHz bandwidth.

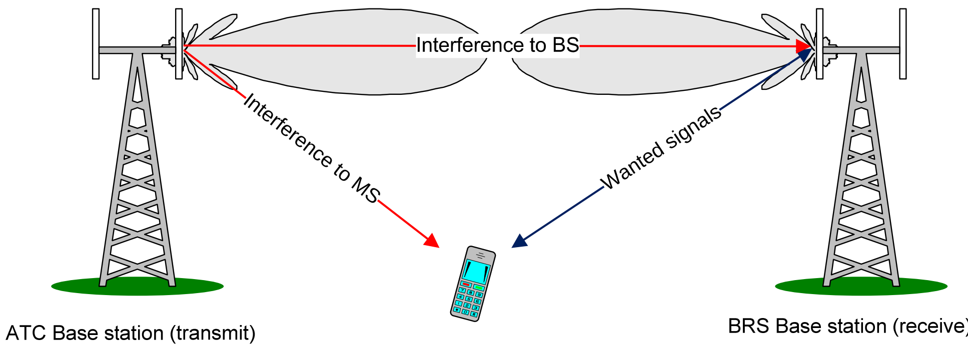
Potential interference scenarios between ATC and BRS include BS-to-BS interference (both directions), BS-to-MS interference, MS-to-BS interference, and MS-to-MS interference. The most serious interference potential is BS-to-BS, since the BSs emit higher EIRP than the MSs, the BS receivers are designed for greater sensitivity to detect low power mobile signals, and all MSs using a particular base station could experience degraded performance due to interference at the BS receiver. The impact of mutual interference depends on both the affected BS receiver characteristics (including receiver sensitivity, low noise amplifier compression point, and input filtering) and the interfering BS transmitter's emissions mask. If the BS transmitter's filtering and resulting emissions mask are not sufficient to meet interference limits, more frequency separation between ATC and BRS BSs and more antenna isolation (greater antenna separation or off-pointing) may be needed to mitigate interference.[8/]

Since BSs are usually sited on towers, with high gain antennas and large transmit powers compared with MSs, the dominant interference paths tend to be between BS transmitters of one system and the BS receivers of the victim system operating in nearby spectrum as shown below. We first consider the ATC carrier operating on the highest frequency in the allocation and BRS WiMAX operating on the lowest carrier.

7/ *See* 47 C.F.R. § 25.254.

8/ This applies to TDD or FDD ATC systems.

Interference paths for BRS as victim



6.2.1 ATC BS – BRS BS Interference Considerations

The WiMAX Forum introduced mobile WiMAX into the International Mobile Telecommunications 2000 (IMT-2000) family of third generation (3G) radio technologies and a considerable amount of information has been published relating to WiMAX operations in the frequency range 2496 – 2690 MHz with bandwidths of 5 and 10 MHz (WiMAX Profile 3A)[9/]. For this analysis we shall assume a BRS-1 carrier with a 5 MHz nominal bandwidth (4.6 MHz occupied bandwidth) and a center frequency of 2499 MHz per current WiMAX profiles, and a BS with the parameters shown in the table below.

[9/] WiMAX Forum, "WiMAX Forum™ Mobile System Profile Release 1.0 Approved Specification", Revision 1.2., 17 November 2006.

Parameters of WiMAX operating in the BRS[10/], [11/]

Parameter	Value	Notes
Base station height	30 m	
Antenna gain	18 dBi	
Transmit power	36 dBm	
1st adjacent channel leakage ratio (ACLR)	45 dB	5 MHz offset
2nd ACLR	55 dB	10 MHz offset
1st adjacent channel selectivity (ACS)	70 dB	5 MHz offset
2nd ACS	70 dB	10 MHz offset
Interference threshold	−110 dBm/5 MHz	Assumes an interference-to-noise-ratio (I/N) of −6 dB and a noise figure of 5 dB.
Receiver bandwidth	4.6 MHz	Assumes the Partial Usage of SubChannels (PUSC) structure for the uplink. Note that the downlink bandwidth is 4.75 MHz for PUSC.
FFT Size	512	
Sampling Rate	5.6 MHz	(28/25) × channel bandwidth
Number of subcarriers used	421 (downlink PUSC) [12/] 409 (uplink PUSC)	Includes DC carrier

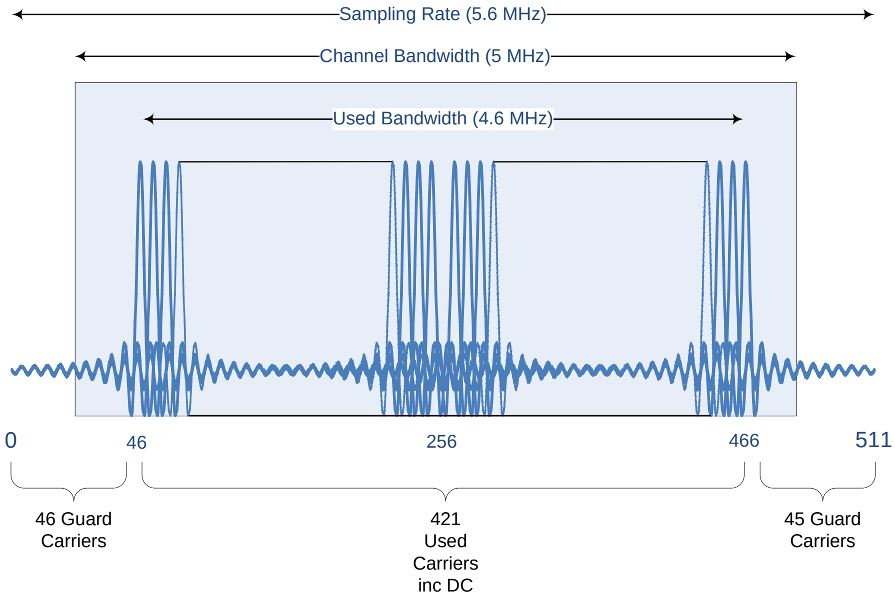
The relationships between the channel bandwidth and the number of subcarriers in the WiMAX signal are shown in the figure below.

10/ *See* ITU-R Report M.2116, "Characteristics of broadband wireless access systems operating in the land mobile service for use in sharing studies," 2007.

11/ *See* IEEE 802.16e-2005, "IEEE Standard for Local and metropolitan area networks Part 16: Air Interface for Fixed and Mobile Broadband Wireless Access Systems Amendment 2: Physical and Medium Access Control Layers for Combined Fixed and Mobile Operation in Licensed Bands and Corrigendum 1," December 2005.

12/ WiMAX includes many different subcarrier allocations, so the parameters of the mandatory PUSC zones are given. Other zones use different values for the number of subcarriers used, e.g., the possibilities for the downlink are 419 subcarriers for the preamble, 427 subcarriers for Full Usage of SubChannels (FUSC), 409 subcarriers for Tile Usage of SubChannels TUSC1 (downlink), and 433 subcarriers for the optional FUSC, optional PUSC and TUSC2 zones. Optional PUSC may be used for the uplink, which uses 433 subcarriers (rather than 409).

Signal bandwidth and number of subcarriers used for downlink with PUSC



The emissions mask defined by the WiMAX Forum is shown in the table below.

Emissions limit for 5 MHz WiMAX[13/]

Offset from center frequency	Level	Measurement bandwidth
2.5-3.5 MHz	−13 dBm	50 kHz
3.5-12.5 MHz	−13 dBm	1 MHz

Beyond 12.5 MHz offset, the ITU Category A limits apply, i.e. -13 dBm/MHz for frequencies above 1 GHz.

The FCC applies special rules for ATC networks, set forth in 47 C.F.R. 25.254, which require that the transmitted EIRP spectral density may not exceed 32 dBW/1.25 MHz and that the EIRP outside the MSS authorized bandwidth may not exceed −44.1 dBW/30 kHz[14/]. This equates to an EIRP spectral density of −14.1 dBm/30 kHz. In addition, the FCC more recently applied to ATC base stations the same Part 27 Section 53 limits pertaining to BRS and EBS base

13/ *See* ITU-R Recommendation M.1580-2, "Generic unwanted emission characteristics of base stations using the terrestrial radio interfaces of IMT-2000," October 2007.

14/ *See* 47 C.F.R. § 254.

stations, which require the power spectral density for a 10 MHz carrier to not exceed -43.0 dBW/100 kHz at the band edge and -43.0 dBW/MHz at 1 MHz from the band edge.

The WiMAX ATC is assumed to operate with a nominal bandwidth of 10 MHz in TDD mode with similar emissions to the 5 MHz WiMAX system described above. For the purposes of interference analysis, the center frequency of operation will be assumed to be 2490 MHz. Note that the depicted carrier center frequencies shown are representative, but may be moved slightly in the licensed band as appropriate to provide best performance in each deployment while still maintaining in-band and out-of band emission requirements. The parameters to be used in the analysis are given in the tables below.

Parameters of WiMAX operating in the ATC

Parameter	Value	Notes
Base station height	30 m	
Antenna gain	18 dBi	
Transmit power	36 dBm	
1st ACLR	45 dB	10 MHz offset
2nd ACLR	55 dB	20 MHz offset
1st ACS	70 dB	
FFT Size	1024	
Sampling Rate	11.2 MHz	
Number of subcarriers used	851 (PUSC)	Includes DC carrier

Emissions limit for 10 MHz WiMAX operating in the ATC

Offset from center frequency	Level	Measurement bandwidth
5-6 MHz	−13 dBm	100 kHz (1% of WiMAX bandwidth)
6-10 MHz	−13 dBm	1 MHz

Beyond 10 MHz offset, the ITU Category A limits apply, i.e., −13 dBm/MHz for frequencies above 1 GHz.

When ATC networks and WiMAX networks operating in the BRS bands are deployed in urban areas, where it is assumed that there will be relatively high BS sites and small cells and that the WiMAX BS receivers are likely to have (without regard to any antenna discrimination) line of sight to ATC BS transmitters, it is necessary to assume that the attenuation between the base stations is no greater than free space path loss. Free-space path loss, L_{FSPL}, is given by[15/]

15/ Parsons D, "The Mobile Radio Propagation Channel", Pentech Press, London, 1992.

$$L_{FSPL} = 20\log d + 20\log f + 32.44 \text{ dB}$$

where *f* is the operating frequency in megahertz and *d* is the distance in kilometers between the transmitting and receiving antennas.

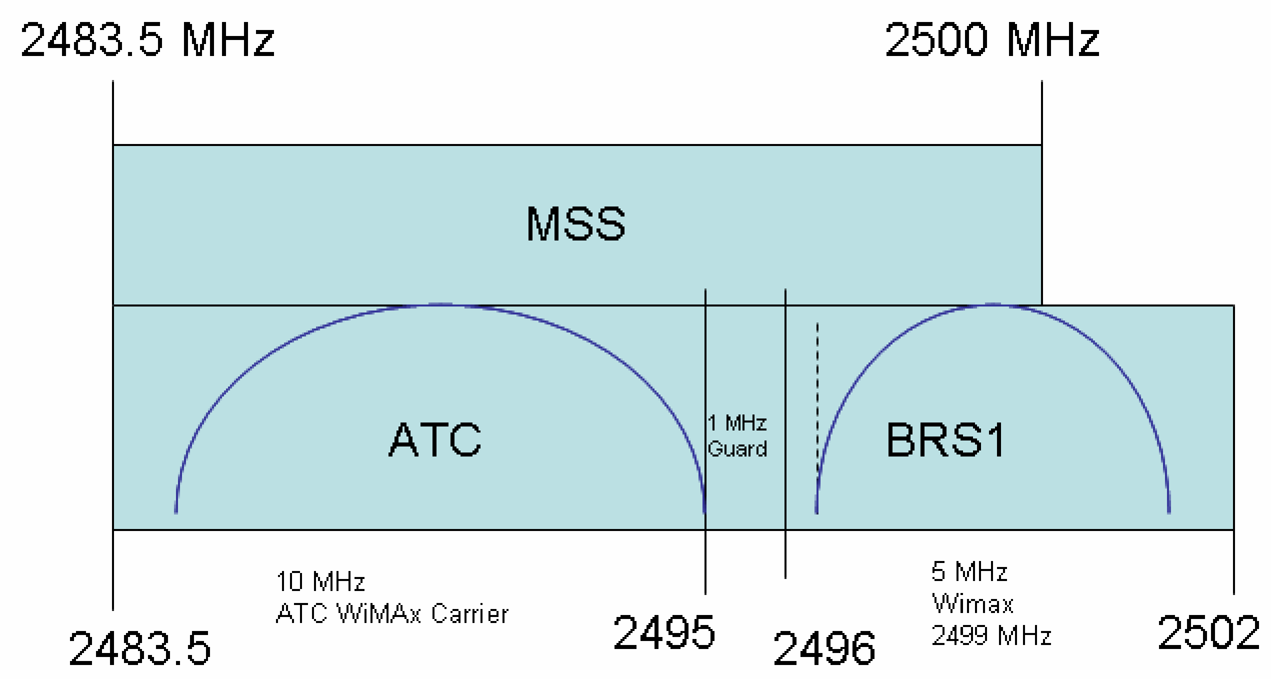
The approach taken is to assume that the antennas are separated by at least 100 m with the antennas pointing directly at each other. This represents a worst-case uncoordinated situation. At less than this distance and for collocated sites, engineering measures will be taken to ensure that sufficient isolation is achieved.

We note that the potential for interference described above is virtually nonexistent when ATC is deployed in rural and remote areas, where a significant geographic distance is likely between ATC and BRS BSs, and where BRS deployment is not anticipated for quite some time (if at all).

When using the FCC ATC out-of-band emission limits, the analyses converge independent of the ATC technology deployed, i.e. the different scenarios outlined below yield the same results. However, the optimal interference mitigation solution may differ based on the deployed technology.

We now calculate the emissions from a WiMAX ATC BS into the WiMAX BRS BS with the band plan shown below. With a WiMAX ATC center frequency of 2490 MHz, and a WiMAX BRS center frequency of 2499 MHz, the frequency offset to the lowest used subcarrier of the WiMAX BRS system is 2.1 MHz. The emissions level throughout this region is specified at −13 dBm/MHz per 47 C.F.R. 27.53(m).

WiMAX ATC carrier and BRS carrier band plan



If the FCC's limit at frequencies above 2496 MHz is applied, then the isolation required is:

ATC OOBE (dBm/MHz) – FSL (dB) + $\text{Gain}_{\text{ant (dBi)}}$

−13 – 80.4 + 18 = −75.4 dBm/MHz or -68.4 dBm/5 MHz receiver bandwidth,

resulting in a 41.6 dB shortfall referenced to the interference threshold of the WiMAX BRS receiver that is taken to be -110 dBm/5 MHz, as given in ITU-R Report M.2116,

Assuming free space path loss, the maximum tolerable interference level would require a separation of approximately 12 km. Once again, this uses worst-case assumptions that are unlikely in practice and losses actually incurred will be greater than free space at this range. Adherence to 47 C.F.R. 27.53(m) and 25.254(d) of the FCC's rules provides additional protection. That rule calls for additional attenuation of OOB, 67+10 log(P) as opposed to 43+10 log(P), resulting in an additional 24 dB of required protection coupled with additional attenuation for stations located less than 1.5 kilometers from each other. The additional attenuation is 23.5 dB for this instance where the base stations are assumed to be 100 meters from each other. The total additional attenuation is then 47.5 dB at a separation distance of 100 m, at the FCC-prescribed 3 MHz from the ATC carrier edge, more than compensating for the 41.6 dB shortfall even if no transmit filtering was added.

The BSs of a WiMAX TDD ATC may suffer interference from the BRS service. However, a filter may be used to contain the ATC emissions thereby also improving the receiver selectivity.

Interference from the WiMAX ATC BSs to the WiMAX BRS MSs will be determined by the selectivity of the mobiles. However, this interference potential is no greater for WiMAX ATC BSs than FDD ATC BSs such as those using cdma2000. This form of interference already exists between BRS and EBS operators and is accepted in adjacent networks because it is intermittent, and the worst case scenario is unlikely. Any interference caused by out-of-band emissions from ATC BSs could be resolved by a variety of mitigation techniques, particularly RF filtering at the ATC BSs. To protect the WiMAX BRS BS receiver from blocking signals (i.e. ATC BS transmissions irrespective of technology), another filter is required at the BS receiver; since WiMAX uses TDD, an RF filter on each antenna can be used to protect the BS receiver from blocking signals and this filter will also provide protection to adjacent services such as ATC BS receivers. The filter attenuation needed to sufficiently improve the selectivity of the BRS BS receiver is not as great as that required to adequately contain the emissions of the ATC BS. Interference to adjacent channel operations can thus be avoided through employing additional filtering at each BS transmitter and receiver, coordinated siting, and antenna pointing of ATC BSs.

If the ATC system uses WiMAX TDD technology, there is a second mitigation approach, namely synchronization. WiMAX systems operating in 10 MHz bandwidth and 5 MHz bandwidths both can use 5 msec frames, and by synchronizing the frames and judicious selection of the downlink/uplink ratio (for example, using 28 downlink symbols for the 10 MHz system and 14 downlink symbols for the 5 MHz system), they can be configured such that neither BS is transmitting while the other needs to receive. In this manner, BS-to-BS interference can be virtually eliminated, without any guard band at all. Many WiMAX systems plan to use such synchronization techniques to avoid interference to adjacent channels without the need for any guard band.

6.2.2 ATC MS – BRS MS Interference Considerations

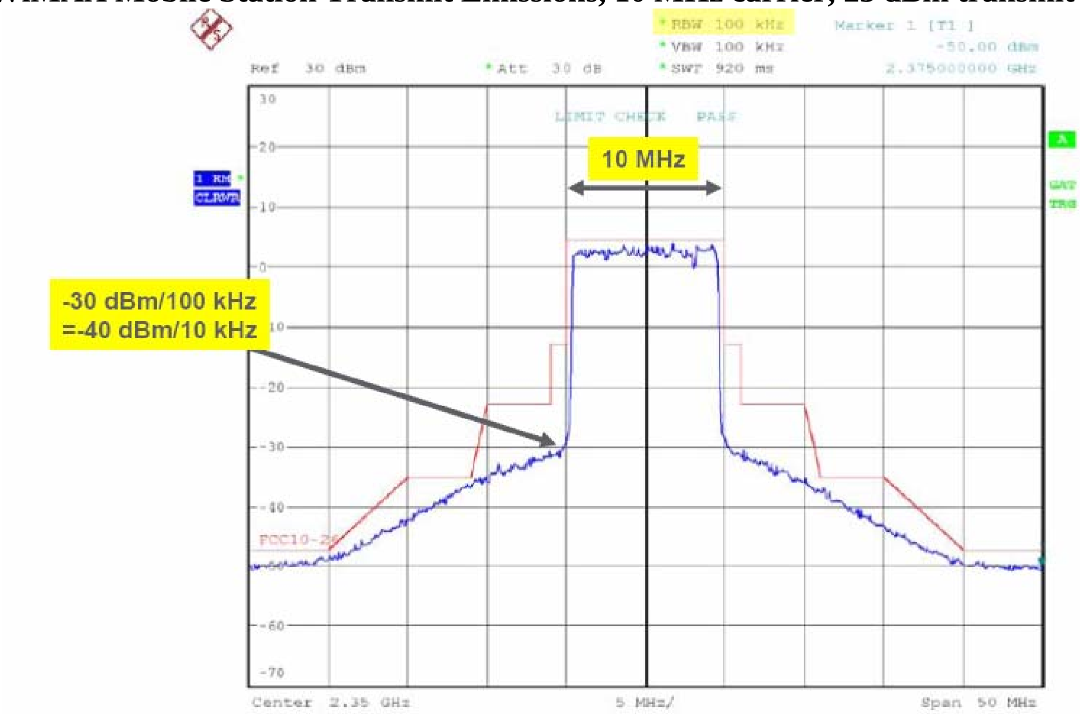
If the ATC and BRS WiMAX systems are not synchronized, then MS interference can occur in three ways:

- When the BSs of both systems are transmitting at the same time, the interference is small unless a MS is far from its system's BS and close to the other system's BS. This might result in a small amount of adjacent channel interference, which could be greatly reduced by collocating BSs of both systems. The inter-system guard bands and out-of-band emission requirements limit this type of interference.

- When the MSs of both systems are transmitting at the same time, the BS of one system may be desensitized by many mobiles of the other system operating close to the BS. Sufficient filtering at the BS receiver is required to reduce this problem. BS receive filters are available that can help mitigate this problem if it exists.

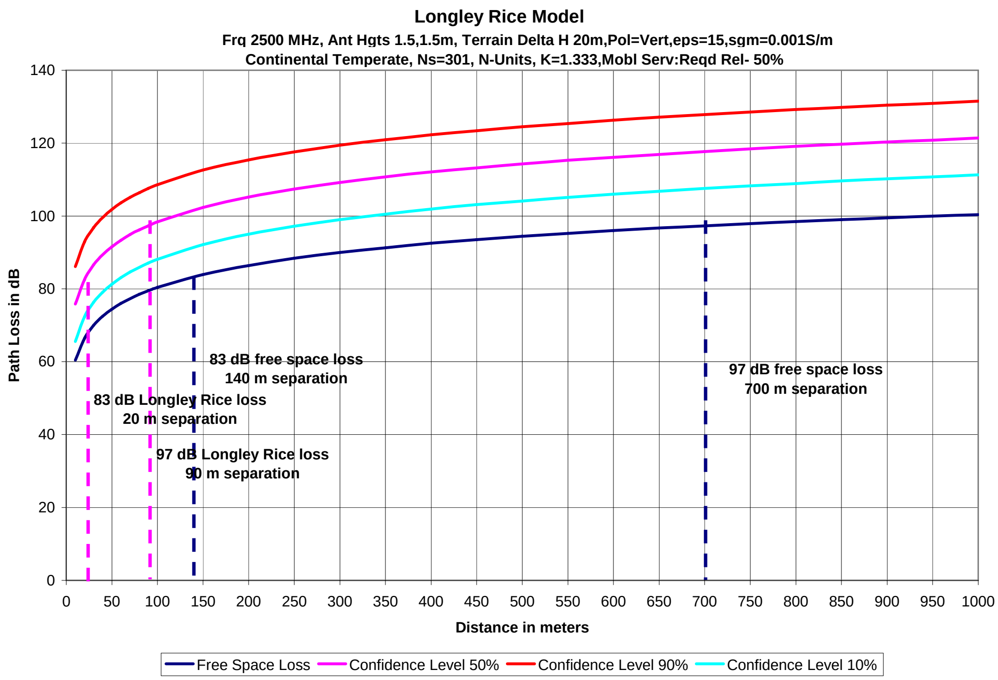
- When the MS of one system is transmitting when the MS of the other system is nearby and receiving, the transmitting MS desensitizes the receiving MS. This is generally a problem only when the two MSs are both far from their respective BSs and relatively close to each other. One MS may be transmitting at higher power than usual and the other MS may be receiving a weak signal. Synchronization of networks alleviates this issue since the mobiles in close proximity would transmit in the same windows.

WiMAX Mobile Station Transmit Emissions, 10 MHz carrier, 23 dBm transmit power



When looking at the case of MS-MS interference, we assume the worst case that the ATC and BRS operators are not synchronized. The MS received out-of-band emissions need to be about -137 dBm/10 kHz (-110 dB//5 MHz) to have negligible impact on its sensitivity. The above figure shows the typical MS emissions from a 10 MHz carrier as -30 dBm/100 kHz or -40dBm/10 kHz. This would require about 97 dB of loss due to separation of the terminals (or 700 meters separation for free space propagation). Ten meters of separation results in 60 dB of free space propagation loss and a 30 dB increase in the MS noise floor. If the ATC MS transmits at 23 dBm/10 MHz, the adjacent channel rejection of a typical BRS MS receiver would result in desensitization at -60 dBm. This requires 83 dB of path loss (or 140 meters separation for free space propagation).

In most situations, terminals distant from the BSs using two different systems on adjacent frequencies are unlikely to be operating within 140 m of one another with no blockage from buildings or terrain. For example using Longley-Rice propagation model as shown below, for 20 m terrain variations, 83 dB loss would occur with a separation of 20 m while 97 dB loss would occur with a separation of 90 m. If such situations are projected or occur in a particular geography, the problem could be mitigated by collocating BSs, adequately scheduling MS transmissions, or synchronizing transmissions which is readily achieved between WiMAX systems.



When looking at the case of multiple MS-BS interference, we assume the worst case that the ATC and BRS operators are not synchronized. The required emission level for a BS receiver with negligible sensitivity impact is -137 dBm/10 kHz (-110 dBm/5 MHz) as shown in WiMAX parameters table for the BRS receivers above. Since, the typical mobile out of band emission is -40 dBm/10 kHz, the required path loss will increase with N as shown in the following equation:

$$-137 + 40 + 10\log N = 97 + 10\log N \text{ dB},$$

with N representing the number of mobiles operating away from the serving ATC BS and close to the BRS BS, where 97 dB is the minimum loss for single MS and BS. Since in an urban and rural environment, the BS and MSs are not normally located within clear line of sight, the COST-231 HATA model is representative of the path loss experienced by mobiles in a cellular environment. The basic equation for path loss using COST-231 HATA model in dB is:

$$PL = 46.3 + 33.9 \log(f) - 13.82 \log(hb) - ahm + (44.9 - 6.55 \log(hb)) \log d + cm,$$

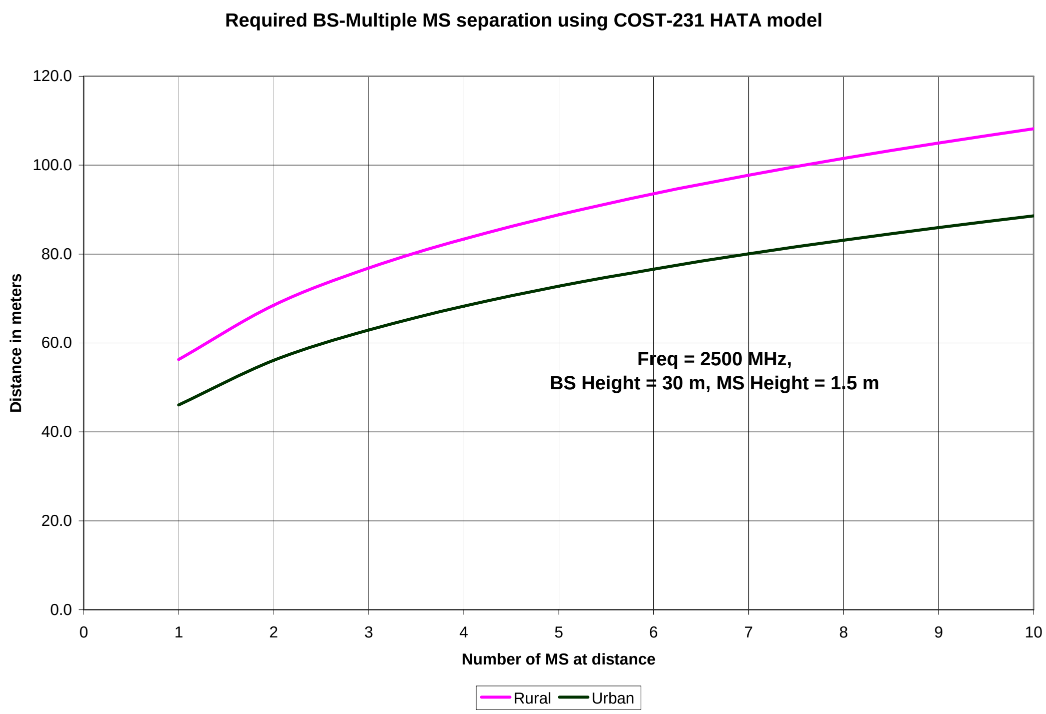
where f is the frequency in MHz, d is the distance between BS and MS antennas in km, and hb is the BS antenna height above ground level in meters. The parameter cm is defined as 0 dB for suburban or open environments and 3 dB for urban environments. The parameter ahm is defined for urban environments as:

$$ahm = 3.20(\log(11.75hr))2-4.97, \text{ for } f > 400 \text{ MHz}.$$

and for suburban or rural (flat) environments as:

$ahm = (1.1 \log f - 0.7)hr - (1.56 \log f - 0.8)$ (9),

where, *hr* is the CPE antenna height above ground level. The required distance based on the COST-231 HATA model and number of mobiles in vicinity in rural and urban environment is given below for reference.



Additional isolation can be achieved by employing sufficient filtering the BRS receiver for the adjacent band.

6.3 ATC MS – BAS Interference Considerations

The FCC repeatedly has acknowledged that ATC and BAS operations can successfully operate in the same band through coordination. BAS operations in Channel A10 overlap the entire 2483.5 – 2500 MHz MSS allocation. Allowing ATC MSs to transmit in the 2483.5–2495 MHz portion of this band along with the ATC BSs, albeit at lower power, would not result in any additional interference to BAS operations than already occurs from the existing unlicensed users in the band. Moreover, as the FCC has acknowledged,[16/] the number of active BAS licensees

[16/] As the FCC has recognized, in 2005 there were only 77 BAS licensees authorized to operate on channel A10. *See* Flexibility for Delivery of Communications by Mobile Satellite Service Providers in the 2 GHz Band, the L-Band, and the 1.6/2.4 GHz Bands, *Memorandum Opinion and Order and Second Order on Reconsideration*, 20 FCC Rcd 4616 (2005) at ¶ 93.

using Channel A10 is relatively small and should not increase since no new licenses will be issued, making the need for coordination small and diminishing.

For BAS operating in Channel A9 (2467 - 2483.5 MHz), Globalstar's ATC operations must meet the FCC required out of band EIRP of −44.1 dBW/30 kHz for all frequency offsets from the edge of the licensed assignment. In addition, if the BAS licensee were to deploy digitized equipment (which is more and more likely to be the case going forward), then only 12 MHz of bandwidth would be required for that channel, effectively creating 2.25 MHz of guard band.

6.4 Conclusion

ATC and BRS base stations can operate in adjacent spectrum separated by no more than the existing 1 MHz guard band between 2495-2496 MHz free of harmful interference without coordination or synchronization if the ATC/BRS BS separation is 12 km or more. For base stations in closer proximity to one another, additional antenna isolation, such as titling or sectorization, or RF filters with sharp roll-off may be used at both the ATC network BS and the BRS BS in order to enable both systems to operate with higher spectrum efficiency. Such filters would need to attenuate the out-of-band emissions on the order of 40 dB in the receive band of the victim BS if the systems are operating at worst-case parameters, no additional path loss beyond free space exists, and no additional antenna isolation can be implemented. By using improved filtering at the ATC BS transmitter, the necessary emission limits can be met, and ATC operations will be possible up to 2495 MHz, without the need for additional antenna isolation.[17/] In addition, to the extent that both the ATC and BRS systems use WiMAX technologies, any threatened interference can be virtually eliminated through synchronization. If the adjacent ATC and BRS systems operated as synchronized TDD systems, no guard band would be required and BS-to-BS interference would be eliminated. Finally, U.S. wireless broadband operators using or planning to deploy WiMAX are currently working through operating agreements sponsored by an industry organization that will help ensure coordinated, interference-free operations for their customers.

Allowing ATC MSs to transmit in the 2483.5–2495 MHz band along with the ATC BSs would not result in any additional interference to BAS in Channel A10. BAS in Channel A9 will be afforded the same protection from ATC MSs transmitting above 2483.5 MHz as from ATC BS emissions because ATC systems must meet the FCC required out of band EIRP of −44.1 dBW/30 kHz for all frequency offsets from its licensed band edge.

[17/] *See* UK WP8F WP(04)026 contribution: 60 dB of antenna isolation can be met by sharing the same antenna tower with appropriate vertical separation.

Engineering Certification

I hereby certify under penalty of perjury that I am the technically qualified person responsible for preparation of the engineering information contained in the foregoing "Technical Exhibit"; that I am familiar with the relevant sections of the FCC's rules and the information contained in the Technical Exhibit; and that the information in the Technical Exhibit is true and correct to the best of my knowledge and belief.

Signed this 16th day of May, 2008

/s/ Paul A. Monte

____

Paul A. Monte,
Vice President, Engineering & Product Development
Globalstar, Inc.