Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Comprehensive Review of Licensing and Operating Rules for Satellite Services	)	IB Docket No. 12-267
	)	
	)	

INITIAL COMMENTS OF COMTECH EF DATA CORPORATION

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January 14, 2013

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SUMMARY

Comtech EF Data Corporation ("Comtech EF Data") applauds the Commission for undertaking a comprehensive review of its satellite rules with the objectives of promoting more efficient operations, reducing administrative burden, and enhancing spectrum management, including interference protection and resolution.

Satellites are susceptible to interference from earth station transmissions in a variety of circumstances. Approximately 80% of interference events result from unauthorized carriers or from incorrect cross/co-polarization. The frequency of interference from uplink transmissions, the costs resulting from such interference, and the level of efforts to resolve such interference events have motivated several industry-wide groups to explore improved and more cost effective methods to identify and resolve interference from uplink transmissions.

Comtech EF Data has been active in such industry efforts and at the forefront of developing a spread spectrum-based solution to carrier identification ("Carrier ID"). The Digital Video Broadcasting Project ("DVB"), an industry-led consortium of over 200 broadcasters, manufacturers, network operators, software developers, regulatory bodies and others from over thirty-five countries, commenced a standardization process for spread spectrum Carrier ID in December 2011. Comtech EF Data anticipates the standard will be adopted at DVB's Technical Module in Geneva next month. The technology is commercially available now.

Comtech EF data supports the Commission's proposal to update its Automatic Transmitter Identification System ("ATIS") rules, codified in Section 25.281 of its Rules. Comtech EF Data urges the Commission to specify in the rule that spread spectrum Carrier ID consistent with the anticipated DVB standard is one of the means by which operators of transmit (or transmit/receive) earth stations may identify uplink transmissions. Comtech EF Data

believes the proposed rule revisions represent a good start and, with the modifications described in these Comments, should be adopted. In brief:

- Spread spectrum carrier ID should be an option for both analog video uplink transmissions as well as all fixed and mobile digitally modulated non-bursting fixed frequency uplink transmissions with a symbol rate of 128,000 symbols per second or greater. The spread spectrum solution works not just with fixed digital video feeder links, but equally well with analog video links and all non-bursting digital transmissions.

- Certain specifications for the spread spectrum option in the proposed rule – the forward error correction, packet size requirement, and chip rate – should be modified to be consistent with the standard Comtech EF data expects the DVB to adopt in January.

- The spread spectrum Carrier ID signal should be offset +220Hz at the output of the modulator when the modulator is configured to not introduce a spectrum inversion in the host carrier signal, and the spread spectrum Carrier ID signal should be offset -220Hz at the output of the modulator when the modulator is configured to introduce a spectrum inversion in the host carrier signal.

- The format of an ATIS signal using spread spectrum carrier ID (or using a Network Identification Table approach on a digitally-modulated signal) should be the MAC address, a two-character operator ID assigned by either the Satellite Interference Reduction Group ("sIRG") or the Space Data Association ("SDA"), and a 96-byte open field, consistent with the anticipated DVB standard.

- The Commission should provide a transition for operators using digitally modulated uplink transitions. Specifically, on and after January 1, 2014, all digital transmit (or transmit/receive) earth station equipment (enabling fixed or mobile non-bursting fixed frequency uplink transmissions) that is manufactured in the United States, imported, or certificated should have an embedded ATIS solution consistent with the rule. On and after January 1, 2015, all new installations (including upgrades and replacements) of digitally-modulating transmit (or transmit/receive) earth station equipment should have a complaint, embedded ATIS solution. As of that same date, previously installed digitally-modulating transmit (or transmit/receive) earth station equipment must have either an embedded, complaint ATIS solution or an external modulator that transmits an ATIS message that complies with the rules (except that it may not meet the requirement that the ATIS solution cannot be easily defeated). As of January 1, 2019, all digitally-modulating transmit (or transmit/receive) earth station equipment must have an embedded, complaint ATIS solution.

Comtech EF Data submits that adoption of the proposed rule with these modifications will maximize the benefits from the ATIS solutions currently or imminently available in the marketplace.

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INITIAL COMMENTS OF COMTECH EF DATA CORPORATION

Comtech EF Data Corporation ("Comtech EF Data"), by its attorneys, hereby submits these comments in response to the Commission's Notice of Proposed Rulemaking in the above-referenced docket.[1] Comtech EF Data applauds the Commission for undertaking a comprehensive review of its satellite rules with the objectives of promoting more efficient operations, reducing administrative burden, and enhancing spectrum management, through methods including improved interference protection. In particular, by these Comments, Comtech EF Data urges the Commission to adopt a rule facilitating the rapid identification of satellite uplink transmissions to allow efficient and expedited resolution of interference events. Comtech EF Data believes the proposed rule revisions to Section 25.281 set forth in the NPRM represent a good start and, with the modifications described herein, should be adopted.

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1 *Comprehensive Review of Licensing and Operating Rules for Satellite Services,* Notice of Proposed Rulemaking, IB Docket No. 12-267, 27 FCC Rcd 11619 (rel. Sep. 28, 2012) ("NPRM"). On December 19, 2012, the International Bureau issued an Order extending the deadline for comments to January 14, 2013. DA *Comprehensive Review of Licensing and Operating Rules for Satellite Services,* Notice of Proposed Rulemaking, IB Docket No. 12-267, DA 12-2046 (rel. Dec. 19, 2012).

I. DESCRIPTION OF COMTECH EF DATA AND ITS INTEREST IN THE PROCEEDING

Comtech EF Data designs, develops, and markets a wide range of satellite communication products for commercial and government customers internationally.[2] Comtech EF Data's products are deployed in numerous applications by a variety of entities, including satellite operators, cellular service providers, broadcast and satellite news gathering organizations with satellite bandwidth requirements, government agencies, educational institutions, maritime and offshore oil and gas enterprises. Comtech EF Data was incorporated in 2000 and is based in Tempe, Arizona. Comtech EF Data operates as a subsidiary of Comtech Telecommunications Corp., which, through its various subsidiaries, provides a variety of communications products, services, systems, and equipment to commercial and government customers supporting their terrestrial, marine, and satellite communications requirements.

Comtech EF Data has been at the forefront of developing methods by which a spread spectrum signal is superimposed on an uplink satellite transmission to provide a means for rapid identification of the signal in case it is misdirected and either poses an interference threat or, in fact, causes harmful interference. As such, Comtech EF Data is interested in the proposal in the NPRM to adopt a rule expanding the scope of requirements for uplink transmitter identification. As detailed below, the Commission's proposal should be adopted with certain modifications.

II. THE NATURE AND COSTS OF THE INTERFERENCE THREAT FROM SATELLITE UPLINK TRANSMISSIONS AND INDUSTRY RESPONSE

Satellites are susceptible to interference from a variety of causes, both long- and short-term. Common sources of long-term interference, when it occurs, are adjacent satellites (which

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[2] Comtech EF Data's product lines include satellite modems and accessories; performance enhancement proxies; satellite network gateway, bandwidth and capacity management; encapsulators and receivers, converters, transceivers, amplifiers, terminals, block up converters, antenna systems, trunking modems, and legacy products.

would be due to either lack of coordination between users, outdated or poorly designed equipment, or small mobile antennas) or interference from terrestrial sources, such as microwave links or radar.[3]

Short-term interference, on the other hand, typically results from earth station transmissions, such as incorrect cross polarization, transmission on the wrong frequency, or pointing to the wrong satellite. Such interference may also be caused by equipment malfunctions or incorrect back-up configurations. Approximately 80% of short-term interference events result from unauthorized carriers or from incorrect cross/co-polarization.[4]

When there is interference on a transponder, revenue is often lost due to the reduction of available bandwidth and power capacity. To protect against and eliminate short-term interference, significant capital and operational expenses may be required, ranging from the purchase of interference monitoring or geolocation equipment (high value tools such as those from Integral Systems, Glowlink, Zodiac or Siemens AG), or dedicating personnel to interference mitigation. Geolocation systems may be purchased, with costs upwards of $500,000 per system, and a monthly recurring fee on the order of $15,000. There are per-use arrangements for geolocation priced in the range of $20 to $30,000 per year per satellite.[5] There is also lost opportunity cost when partial or whole transponders not available for use by the satellite operator.

By 2009, satellite interference had become such an acute problem that satellite industry-wide groups commenced more serious efforts to address it, looking for more efficient and less costly means. These efforts include those of the World Broadcast Union/International Satellite

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3 *See* Technical Appendix, prepared by Fred Morris, Vice President of Sales Engineering, Comtech EF Data, appended hereto, at 2.

4 *Id.*

5 *Id.* at 2-3.

Operators Group ("WBU-ISOG") whose members are primarily video broadcasters, the Radio Frequency Interference End User Initiative ("RFI-EUI") whose members are video broadcasters, satellite operators and equipment manufacturers, and the Satellite Interference Reduction Group ("sIRG") whose members include satellite operators, service providers, video broadcasters, and equipment manufacturers. Comtech EF Data participates in all three of these groups.

In 2010 three working groups were formed within the sIRG to address the interference issue for different segments of the satellite industry. These working groups, the Broadcast, VSAT, and Data groups, pursue approaches to mitigate interference that are unique to their segments of the market. Comtech EF Data participates in the Data and Broadcast groups.

To aid in identification of carriers (both uplink and downlink) in an interference environment ("Carrier ID"), in 2009 the sIRG started promoting the concept of an improved Carrier ID technology. The sIRG created a few rules for the implementation of this improved Carrier ID with which Comtech EF Data agrees. These rules are:

- The identification must be read in the clear, by a properly configured Carrier ID receiver, even if the referenced carrier is encrypted.
- The Carrier ID must be transmitted in an industry accepted format, so as to minimize the number of types of Carrier ID receivers and boost effectiveness
- The Carrier ID insertion must have a minimal effect on the data carrier overhead, efficiency, Es/No, phase noise and other carrier quality measurements.[6]

Realizing that the above requirements could be met by superimposing a dedicated, separate spread spectrum carrier for the Carrier ID on the traffic carrier, Comtech EF Data performed work to accomplish this in the first quarter of 2010 and by the end of that same year was ready to trial the technology with satellite operators.[7]

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6 *Id.* at 3.

7 In connection with its development of spread spectrum Carrier ID technology, Comtech EF Data has applied for several patents relevant to the solutions it has developed. *See id.* at 4, n. 1.

As discussed in the attached Technical Appendix, the first field demonstration of Comtech EF Data's spread spectrum Carrier ID technology was at the Intelsat Ellenwood (Georgia) teleport in December 2010. These tests proved successful and were immediately followed by tests conducted at the SES Woodbine (Maryland) teleport in January 2011, at the Satellite 2011 conference in Washington DC in March 2011 to over twenty (20) satellite operators and broadcasters, at the Atlanta teleport of Turner Communications, and a longer term demonstration during the month of August 2011 on the CBS national feed. Each of these demonstrations showed that the technology was robust and reliable. In addition, in each of these demonstrations, except one where it was not attempted, the technology proved able to resolve the Carrier ID, even during exposure to severe interference introduced for purposes of the demonstration. Understandably, CBS was not willing to deliberately inject interference on their national carrier to demonstrate the capabilities of the technology.[8]

More recently, at and for the duration of the 2012 London Olympics, Comtech EF Data, in conjunction tested the superimposition of the Carrier ID signal on video uplink transmissions. Eutelsat, Intelsat and SES placed both the spread spectrum and NIT-based Carrier ID signals on video carriers carrying content from the Olympic Games. There were no reported interference incidents during the Olympics. As explained in the Technical Appendix, there was no reported perceptible degradation in the video uplink signals during the Olympics as a result of the inclusion of the Carrier ID information.

The Digital Video Broadcasting Project ("DVB") started the standardization process for spread spectrum Carrier ID in December 2011. DVB is an industry-led consortium of over 200 broadcasters, manufacturers, network operators, software developers, regulatory bodies and

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8 *Id.* at 10-11.

others in over thirty-five countries. This standardizations process has two steps: the first is a Commercial Module, which is meant to capture the commercial requirements of the technology. The Commercial Module is followed by the Technical Module, which determines the appropriate technical design to meet the Commercial Modules requirements. The Commercial Module convened in December 2011 and concluded in March 2012 with recommendations to the Technical Module. Comtech EF Data expects the Technical Module will recommend adoption of the spread spectrum Carrier ID specifications consistent with the technology developed and demonstrated by Comtech EF Data as a standard (currently defined as TM-S20108) at its joint Technical Module meeting in mid-January 2013. Comtech EF Data also anticipates that the specifications of the technology will be included in the DVB-S2 enhanced next generation standard when that effort is concluded.

Carrier ID technology is now available and the spread spectrum Carrier ID firmware can be embedded today in most current commercial satellite modulators, in Comtech EF Data's as well as those of other vendors in the industry.

III. THE COMMISSION SHOULD ADOPT PROPOSED REVISED SECTION 25.281 WITH CERTAIN ADDITIONAL MODIFICATIONS

In the NPRM, the Commission proposes to modify Section 25.281 which currently requires all satellite uplink transmissions carrying broadband video information to include a subcarrier signal, known as the Automatic Transmitter Identification System ("ATIS") signal that identifies the call sign of the transmitting earth station and includes contact information.[9] Recognizing that Section 25.281 was adopted two decades ago when operators transmitted video signals with analog modulation techniques, the Commission proposes to modernize the rule and prescribe appropriate methods of ATIS message transmission for stations transmitting video

[9] NPRM, paras. 149-153.

signals with digital techniques. The Commission's proposal is timely, especially in light of the work of both technology developers like Comtech EF Data but also the efforts of industry groups like sIRG and DVB, as described above. Comtech EF Data agrees that the rule should be modified to provide solutions suited to uplink transmissions using digital techniques.

The Commission proposes to require operators using digital techniques to choose from a limited number of techniques to meet their ATIS obligations.[10] For effective interference management, satellite operators will have to be equipped to detect the satellite uplink transmitter identification regardless of which method is utilized. By specifying the methods that can be used in the rule, Comtech EF Data agrees that the Commission will provide certainty and also minimize the burden on satellite operators to maintain numerous systems. Like the Commission, Comtech EF Data is aware of only two methods available today by which ATIS information could be included in such digitally modulated video uplinks: the spread spectrum carrier ID method which Comtech EF Data has been at the forefront of developing and the insertion of the ATIS information into the Network Information Table ("NIT") of an MPEG transport stream.

The adoption of a rule providing users with more than one specific option will allow earth station operators to choose the solution that works for them from those that are commercially available. Comtech EF Data takes no position on the inclusion of the NIT approach in the rule in particular. However, Comtech EF Data does believe that the spread spectrum Carrier ID approach is superior, particularly in an interference environment. As to which of the specified methods becomes more widely deployed and proves most effective, the marketplace and experience should decide.

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[10] *Id.*, ¶151.

Although Comtech EF Data takes no position on including the NIT approach, the spread spectrum Carrier ID method should definitely be specified as an acceptable approach in the rules. This alternative is not only robust, but it is also universally adaptable to both analog and non-bursting digital uplink transmissions.[11] The spread spectrum Carrier ID method significantly reduces the time to identify interference sources and clear transponders of interference when it arises and should substantially reduce the capital and operational expense to protect against and resolve interference events. Consequently, the use of the spread spectrum solution will raise the quality level of communications in the satellite industry.

Comtech EF Data submits that the revisions to Section 25.281 proposed in the NPRM relative to an ATIS using the spread spectrum approach should be modified in several particulars. These are specifically embodied in the language changes reflected in redline to the proposed rule contained in the Rules Exhibit appended hereto. Each of these changes is described below.

1. Types of Uplink Transmissions Requiring ATIS: The NPRM seeks comment on what types of uplink transmissions signals should carry ATIS information.[12] Comtech EF Data submits that proposed Section 25.251(b) should be revised to make an ATIS requirement applicable not just to fixed broadcast video transmissions using digital modulation, but all digital satellite uplinks using non-bursting fixed frequency transmissions, both fixed and mobile. This would include single channel per carrier ("SCPC") uplinks in addition to digital video transmissions. As discussed in the Technical Appendix, SCPC transmission is used in a variety of applications, including oil and gas exploration, mobile telephony backhaul, IP trunking, and

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11 Technical Appendix at 11.

12 NPRM, ¶153.

disaster recovery.[13] SCPC transmissions are just as likely to result in man-made interference events as are video broadcast transmissions and for the same reasons.

This requirement would maximize the potential for reducing interference promised by spread spectrum carrier ID techniques. Spread spectrum carrier ID technology is just as suitable for non-video, *i.e.*, data, fixed frequency transmissions as broadcast video transmissions. As the Commission observed in the NPRM: "The method we are proposing for transmitting ATIS data on digitally-modulated uplinks with a spread spectrum signal could be applied to any continuous digitally-modulated uplink transmission with a symbol rate of at least 128,000 symbols per second."[14] Comtech EF Data concurs. The rule should be modified to bring within its scope all digital satellite uplinks using non-bursting fixed frequency transmissions with a symbol rate of 128,000 sps, or greater.[15]

2. Making the Technical Specifications Consistent with Developing Standards: The specifications set forth in proposed Section 25.281(c) should be adjusted to reflect the parameters being considered, and which Comtech EF Data expects will be adopted in January of 2013, by the DVB. By and large, the rule proposed by the FCC is consistent with the standard (TM-S20108). Three adjustments are necessary in that regard: (i) the forward error correction requirement should be a (127,85) BCH code shortened by 16 bits to (111,69) rather than (112,70) BCH as proposed, (ii) packet size, including forward error correction bits, should be 244 bits,

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13 Technical Appendix at 11.

14 NPRM, ¶153.

15 In the NPRM, the Commission inquires whether DBS and 17/24 GHz BSS feeder-link transmissions should be excluded from any ATIS requirement for digital transmissions. NPRM, ¶150. Comtech recognizes that operators of such earth stations employ skilled technical personnel, changes to the pointing of these earth stations are infrequently made, and that typically do not cause interference. Comtech has no objection to exclude these types of earth station uplinks from the ATIS requirement.

rather than 122 bits; and (iii) a chip rate of 112,000 chips per second should be permitted for all symbol rates of digitally-modulated signals below 512,000 sps. As explained in the Technical Appendix, these changes to the proposed rule will serve to lower the potential self-interference effect of adding the spread spectrum Carrier ID to the uplink transmission being identified.[16]

3. Offset of Carrier ID Signal: In proposed Section 25.281(b)(2), the Commission proposes that "the ATIS message must be modulated onto a direct sequence spread spectrum signal that has the same center frequency as the digitally-modulated broadband video signal."[17] In Comtech EF Data's experience, when the superimposed spread spectrum Carrier ID signal is centered on the underlying video or SCPC carrier, there will be cause cross talk or a Direct Current (DC) offset when the carrier leaks.[18] To avoid suppression of the center of the carrier being identified, Comtech EF Data submits that the spread spectrum Carrier ID signal should be offset. Comtech EF data recommends that, when the modulator is configured not to introduce a spectrum inversion in the host carrier signal, the Carrier ID signal be sent at +220Hz offset at the output of the modulator. Conversely, when the modulator is configured to introduce a spectrum inversion in the host carrier signal, the Carrier ID signal should be sent at -220Hz offset at the output of the modulator.

4. The Content of the ATIS Message: The NPRM proposes that a message transmitted by an ATIS, whether using the NIT or spread spectrum Carrier ID method, include the call sign of the transmitter, a contact telephone number, and a unique serial number of ten or more digits programmed so that cannot be readily changed by the operator on duty.[19] Comtech

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16 Technical Appendix at 12.

17 NPRM at 77.

18 Technical Appendix at 12.

19 NPRM at 77 (proposed Sections 25.281(c)(1)-(4)).

EF Data respectfully submits that, at least where the spread spectrum Carrier ID approach is used, for the sake of efficiency, the *required* content may be limited to the unique serial number of ten or more digits programmed into the ATIS message, specifically the Media Access Control ("MAC") address. As the Commission proposes, that serial number should be embedded in a permanent manner such that it cannot be readily changed by the operator on duty. As explained in the Technical Appendix, the MAC address should be sufficient because satellite operators are very likely to have their own databases that relate a MAC address to a carrier operator. Moreover, Comtech understands that there will be a database administered by the sIRG to support resolution of interference events suffered by satellite operators from the errant signals of customers of another satellite operator.[20] Additional information, including geographic location, should be optional, because satellite operators will be able to use the MAC address to uniquely identify the equipment and, using a database, rapidly locate the operator to address any interference event. To be consistent with the DVB standard Comtech anticipates will be adopted, the format of the ATIS signal should be the MAC address, a two-character operator ID, and a 96-byte open field.[21] The two-character operator IDs are assigned by either the sIRG or the Space Data Association.

5. Frequency of Transmission of the ATIS Information. The proposed rule is silent as to how frequently the ATIS information should be transmitted by digitally modulated uplinks. Comtech EF Data proposes that the ATIS message, at least when using the spread spectrum Carrier ID method, should be transmitted continuously from the beginning of any uplink transmission until the transmission ends. Because tests have demonstrated that the impact on the underlying uplink from the superimposition of a spread spectrum ATIS signal is not detectable in

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20 *See* Technical Appendix at 12.

21 *See id.*

terms of signal quality, continuous transmission of the ATIS signal should not present any adverse consequences.[22]

6. Effective Date of Rules and Transition: The NPRM inquires about what grace or transition period should apply before all digitally-modulated uplink transmissions subject to Section 25.281 must include ATIS information, including in connection with already-installed equipment.[23] The NIT method is available today. Further, the DVB standard for the spread spectrum carrier ID method should be adopted before the pleading cycle in this proceeding is complete. Even without the adoption of the DVB standard, the technology to deploy the spread spectrum Carrier ID is, for all practical purposes, already commercially available both in the form of external modulators and of embedded modulators or modems within earth station equipment. Unlike the embedded approach, external modulators do not offer the same level of protection from user manipulation. So while external modulators can play an important role in bringing the interference management benefits of spread spectrum carrier ID into the field now, they do not present an equivalent level of security from manipulation by users. Nevertheless, requiring their use as a transitional measure would promote better interference resolution in the short term.

Consequently, Comtech EF Data proposes a multi-step transition period similar to the approach taken by the Commission in implementing its narrow banding requirements in the 150-174 MHz or 421-512 MHz bands.[24] Specifically, taking in to account the considerable investment in existing earth station equipment and the advanced stage of development of the

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22 *See* id. at 3-4, 10-11.

23 NPRM, ¶151.

24 *See* Public Notice, *Licensees, Frequency Coordinators, And Equipment Manufacturers Reminded of Narrowband Migration Deadlines in the 150-174 MHz and 421-512 MHz Bands*, DA 09-2589 (rel. Dec. 11, 2009).

relevant Carrier ID technology,[25] Comtech EF Data proposes the following timetable for implementation of an ATIS requirement for digitally modulated earth station equipment:

- Beginning January 1, 2014, (or six months after the Commission adopts the rule) the manufacture, importation, or certification of any digitally-modulated transmitting earth station equipment using non-bursting fixed frequency signals that will be offered for sale or marketing in the United States will be prohibited unless it has embedded in it, in a manner that cannot be easily defeated by a user, a capability that will transmit the ATIS information consistent with the FCC's rules.

- Beginning January 1, 2015, (or eighteen months after the Commission adopts the rule) no new applications will be accepted for digital transmit earth stations using non-bursting fixed frequency signals unless the applicant certifies that it will use transmission equipment with an embedded capability (that cannot be easily defeated by a user) to transmit the ATIS information in accordance with the rule.

- Beginning January 1, 2015, (or eighteen months after the Commission adopts the rule) no new digital transmit earth stations capable of using non-bursting fixed frequency signals may be deployed that does not deploy transmission equipment with an embedded capability (that cannot be easily defeated by a user) to transmit the ATIS information in accordance with the rule.

- Beginning January 1, 2015, (or eighteen months after the Commission adopts the rule) all digital transmit earth stations using non-bursting fixed frequency signals that do not utilize transmission equipment with an embedded capability (that cannot be easily defeated by a user) to transmit the ATIS information must deploy and operate external modulators that comply with the technical specifications in Section 25.281(b)(2).[26] Whenever such transmitting equipment is replaced, it must include an embedded capability (that cannot be easily defeated by a user) to transmit the ATIS information in accordance with the rule.

- Beginning January 1, 2019, (or sixty-six months after the Commission adopts the rule) all transmitting earth station equipment in use must have an embedded capability (that cannot be easily defeated by a user) to transmit the ATIS information in accordance with the rule.

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25 As noted in the Technical Appendix, implementation of either NIT or spread spectrum Carrier ID solutions and manufacturing of compatible equipment can readily be achieved by January 1, 2014. *See* Technical Appendix at 5, 12-13.

26 The Commission should encourage earth station operators to deploy password protection or other security measures where they use external modulators to minimize the chance that the ATIS capability will be defeated by users.

A five year-transition period for already-deployed earth stations is more than ample time for operators to bring that equipment into compliance with an embedded solution. This additional five-year period should provide for a normal pace of replacement and upgrade of equipment in the industry for virtually all affected existing equipment, which Comtech believes may exceed one hundred thousand modems and modulators.[27] Comtech submits that, in comparison to other wireless technologies this is a sufficiently long period to give satellite equipment operators the opportunity to upgrade to equipment that supports digital ATIS.

IV. CONCLUSION

The Commission's proposal to require digitally modulated satellite uplinks to deploy ATIS capabilities is very timely. Adoption of such a rule will ensure a robust tool to combat satellite interference is deployed. Much effort has gone into the development and industry testing of the spread spectrum Carrier ID solution. Efforts by the DVB organization to standardize the technology are well advanced, and the standard should be finalized later in January 2013.

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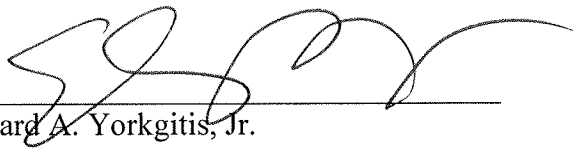
[27] *See* Technical Appendix at 13.

For the foregoing reasons, Comtech EF Data submits that the Commission should modify Section 25.281 in the manner described herein and as set forth in the Rules Exhibit appended hereto. Comtech EF Data also urges the Commission to adopt the implementation timetable set forth herein.

Respectfully submitted,

COMTECH EF DATA CORPORATION



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Rules Exhibit

Comtech EF Data's Suggested Revisions to Proposed Rule Section 25.281[1]

§ 25.281 Transmitter identification requirements for satellite video transmissions from fixed earth stations.

(a) Fixed earth station transmissions carrying broadband video information with analog frequency modulation must be identified through use of an Automatic Transmitter Identification System (ATIS) employing either an analog identifier or a direct sequence spread spectrum signal as follows:

(1) The ATIS message may be identified with an analog identifier meeting the following specifications;

(i) The ATIS signal must be a separate subcarrier that is automatically activated whenever any radio frequency emissions occur.

(ii) The ATIS message must continuously repeat.

(iii) The ATIS subcarrier signal must be generated at a frequency of 7.1 MHz ±25 kHz and modulate the uplink radio frequency carrier at a level no less than −26 dB (referenced to the unmodulated carrier).

(iv) ATIS subcarrier deviation must not exceed 25 kHz.

(v) The ATIS message protocol must be International Morse Code keyed by a 1200 Hz ±800 Hz tone representing a mark and a message rate of 15 to 25 words per minute. The tone must frequency-modulate the subcarrier signal with the ATIS message.

(2) Should the ATIS message be identified with the direct sequence spread spectrum signal, it must comply with the specification set forth in paragraph (b)(2) of this section.

(b) Fixed and mobile earth station transmissions carrying digital information using non-bursting fixed frequency transmissions with a symbol rate of 128,000/s or greater must be identified through use of an ATIS with the following specifications.

(1) Either the ATIS message must be injected into the Network Information Table of the MPEG data stream, or

(2) the ATIS message must be modulated onto a direct sequence spread spectrum signal whose center is offset 220 Hz from the center of the digitally-modulated earth station signal **per subsection (b)(2)(vii)**, is transmitted along with the earth station signal at a level that can be received by a compatible ATIS message receiver using the same antenna and downlink receiver chain as the earth station signal, and has the following characteristics:

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[1] Comtech EF Data's intent is to reflect the DVB standard. This document reflects Comtech EF Data's understanding of the draft DVB standard as of the date of its Comments. Comtech EF Data will provide the Commission with an updated Rules Exhibit in an *ex parte* filing should the standard finally adopted differ from what is presented here.

(i) binary phase-shift keying modulation;

(ii) spreading ratio of 4096;

(iii) a chip rate of 112,000 chips per second for symbol rates of the digitally-modulated broadband video signal below 512,000 symbols per second, or 224,000 chips per second for symbol rates of the digitally-modulated broadband video signal at or above 512,000 symbols per second;

(iv) forward error correction with a (127,85) BCH code shortened by 16 bits to a (111,69) BCH code;

(v) packet size, including forward error correction bits, of 244 bits; and

(vi) maximum message size of 32 packets.

(vii) when the modulator is configured not to introduce a spectrum inversion in the host carrier signal, the Carrier ID signal is sent at +220Hz offset at the output of the modulator; when the modulator is configured to introduce a spectrum inversion in the host carrier signal, the Carrier ID signal is sent at -220Hz offset at the output of the modulator.

(c) Each message transmitted by an ATIS required by paragraph (a)(1) or (b)(1) above must be transmitted in an unencrypted ASCII text format that can be displayed using readily-available computer terminal emulation software and must include the following:

(1) the FCC-assigned call sign of the transmitting earth station;

(2) a telephone number providing immediate access to personnel capable of resolving ongoing interference or coordination problems with the station; and

(3) a unique serial number of ten or more digits programmed into the ATIS message in a permanent manner such that it cannot be readily changed by the operator on duty.

(4) Additional information may be included in the ATIS data stream provided the total ATIS message length does not exceed 30 seconds.

(d) Each message transmitted by an ATIS required by paragraph (a)(2) or (b)(2) above must be transmitted in an unencrypted ASCII text format that can be displayed using readily-available computer terminal emulation software in the following format: the Medium Access Control address, a unique two-character operator ID assigned by the Satellite Interference Reduction Group or the Space Data Association, and a 96-byte open field which may be used for additional information

(e) Each message transmitted by an ATIS required by paragraphs (b) shall be repeated continuously commencing with the beginning of the earth station transmission to be identified until that transmission ends.

(f) The ATIS equipment must be integrated into the uplink transmitter chain with a method that cannot easily be defeated, except to the extent set forth in paragraph (g)(4) below.

(g) The obligations pertaining to paragraph (b) will be phased in as follows:

(1) Beginning January 1, 2014, (or six months after the Commission adopts paragraph (b), whichever is later) the manufacture, importation, or certification of any digitally-modulated transmitting earth station equipment using non-bursting fixed frequency signals that will be

offered for sale or marketing in the United States will be prohibited unless it has embedded in it a capability that will transmit the ATIS information.

(2) Beginning January 1, 2015, (or eighteen months after the Commission adopts paragraph (b), whichever is later) no new applications will be accepted for digital transmit earth stations using non-bursting fixed frequency signals unless the applicant certifies that it will use transmission equipment with an embedded capability to transmit the ATIS information in accordance with the rule.

(3) Beginning January 1, 2015, (or eighteen months after the Commission adopts paragraph (b), whichever is later) no new digital transmit earth stations capable of using non-bursting fixed frequency signals may be deployed that does not deploy transmission equipment with an embedded capability to transmit the ATIS information in accordance with the rule.

(4) Beginning January 1, 2015, (or eighteen months after the Commission adopts paragraph (b), whichever is earlier) all digital transmit earth stations using non-bursting fixed frequency signals that do not utilize transmission equipment with an embedded capability (that cannot be easily defeated by a user) to transmit the ATIS information must deploy and operate external modulators that comply with the technical specifications in Section 25.281(b)(2). Operators employing external modulators pursuant to this subparagraph are encourage to incorporate password identifiers or similar measures to control access to the modulator and minimize the opportunity for users to defeat the transmission of ATIS information. Whenever equipment subject to this subparagraph is replaced, it must include an embedded capability (that cannot be easily defeated by a user) to transmit the ATIS information in accordance with the rule.

(5) Beginning January 1, 2019, (or sixty-six months after the Commission adopts paragraph (b), whichever is earlier) all transmitting earth station equipment in use must have an embedded capability to transmit the ATIS information in accordance with the rule.

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Technical Appendix to FCC Part 25 Comments in IB Docket No. 12-267

January 14, 2013

This Technical Appendix has been prepared by the undersigned in support of Comtech EF Data Corporation's (Comtech EF Data's) Comments in the Federal Communications Commission's (FCC's) comprehensive review of its Part 25 satellite services rules, IB Docket No. 12-267. Comtech EF Data's Comments focus on and support, with certain changes, the Commission's proposal to adopt a requirement that digital video uplink transmissions include an Automatic Transmitter Identification System (ATIS) signal.

Comtech EF Data supports the Commission's proposal to provide for the use of spread spectrum carrier identification (spread spectrum Carrier ID) as one option for earth station operators to comply with an ATIS requirement. As explained herein, for digital uplinks, the ATIS requirement should extend to all fixed and mobile earth stations making non-bursting fixed frequency transmissions with a symbol rate of 128,000 ksps (kilo symbols per second) or greater. Moreover, the spread spectrum Carrier ID option should be an option to comply with the ATIS requirement for analog fixed earth station transmissions carrying video information with analog frequency modulation, as it can work just as well in that environment.

The Causes and Costs of Satellite Interference

Satellite operators and service providers spend a considerable amount of time on their attempts to reduce interference. There are both capital and operational expenses incurred for this effort. Capital expense elements include investment in high value tools such as those from Integral Systems, Glowlink, or Crystal Systems. Operational expenses can include subscription-based plans from Integral Systems and Glowlink. In addition, there are personnel dedicated to identifying and reducing sources of interference. There is also the lost opportunity cost; partial or whole transponders not available for use by the satellite operator.

There are long- and short-term causes of interference. Long-term interference may be from adjacent satellites, which often is due to either lack of coordination between users, outdated or poorly designed equipment, or small mobile antennas. In addition to these reasons, there may be interference from terrestrial sources, such as microwave links or radar, among other causes.

Short-term sources of interference may be caused by users, such as cross- or co-polarization, or transmission on the wrong frequency or to the incorrect satellite (i.e., unauthorized carriers). Short-term interference may also be caused by equipment malfunctions or incorrect back-up configurations.

Short-term interference is predominantly categorized by satellite operators as unauthorized carriers or from incorrect cross/co-polarization. Approximately 80% of interference events fall into these two categories as reported by the operators.

Interference has a financial impact as well to satellite operators and users. When there is interference on a transponder, revenue may be lost due to the effective reduction of available bandwidth and power capacity. Expenses are increased, ranging from the purchase of interference monitoring or geolocation equipment, or dedicating personnel to interference mitigation. Geolocation systems may be purchased to attempt to address the problem, with costs upwards of $500,000 per system, and a monthly recurring fee of $15,000. There are per use arrangements for geolocation. These arrangements are priced in the

range of $20,000 to $30,000 per year per satellite. These solutions are not available today in all frequency bands in all regions.

Recent Industry Developments to Combat Interference Caused by Unauthorized Carriers

Satellite interference has become such an acute problem that a satellite industry-wide group was created to address it. The Satellite Interference Reduction Group (sIRG) members include satellite operators, service providers, broadcasters, and equipment manufacturers. Recently, three working groups were formed within the sIRG to address different segments of the satellite industry. The Broadcast, VSAT, and Data groups are pursuing approaches to mitigate interference that are unique to their segments of the market.

To aid in identification of carriers in an interference environment, the sIRG is promoting the Carrier ID concept. To be most effective, Carrier ID would be on every carrier transmitted to the satellite. It is a small identification that could include the Media Access Control (MAC) address of the earth station's modulator alone, or the MAC combined with the latitude and longitude of the transmitting station, the operator name, and the contact's telephone number, to name several possibilities.

There are a few rules that have been created for the implementation of Carrier ID. These are:

- The ID must be read in the clear, by a properly configured Carrier ID receiver, even if the referenced carrier is encrypted.
- The Carrier ID must be transmitted in an industry accepted format, so that the number and type of Carrier ID receivers are kept to a minimum.
- The Carrier ID insertion must have a minimal effect on the data carrier overhead, efficiency, Es/No, phase noise and other carrier quality measurements.

The sIRG has suggested that by January 1, 2015, all newly installed or updated equipment that transmits a satellite carrier will have Carrier ID capability. The Broadcast group within the sIRG has agreed to implement a procedure for injection of the Carrier ID. Their proposal is that the ID will be injected in the Network Info Table (NIT) frame on the video encoder for MPEG transport streams. There is an issue with this approach, namely that when a carrier with the NIT ID enabled is experiencing interference, the NIT can no longer able be read. The sIRG is searching for techniques to address installed legacy equipment for VSAT and data modems. The challenge here is implementing a solution compatible with the multitude of different products from different manufacturers already in operation.

Comtech EF Data has developed a technology called MetaCarrier™ that is used to embed and detect Carrier ID on video and data satellite carriers. The Meta prefix is used in its meaning of a carrier used to describe another carrier. In this case, MetaCarrier means that we have a separate carrier that contains information, which is used to describe another single carrier, a group of carriers, or a relay, such as a satellite transponder, or terrestrial wireless relay. What is unique is that the MetaCarrier is

embedded using spread spectrum techniques within the carrier(s) or relay, without adding appreciable noise to the carrier(s) or relay.[1]

The MetaCarrier technology overlays the very low data rate Carrier ID data, in a spread spectrum carrier, onto the carrier that it is referencing, Figure 1.[2]

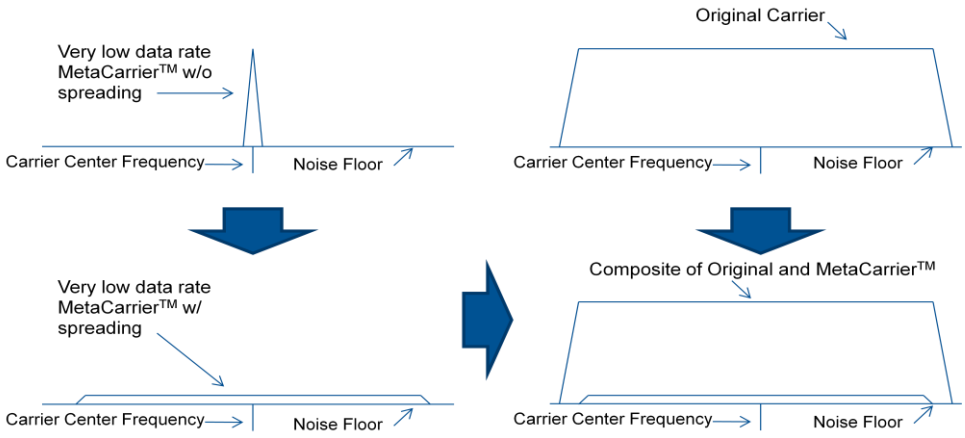

Figure 1, MetaCarrier Overlay

The MetaCarrier technology meets sIRG's Carrier ID requirements:

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[1] In the course of its development of spread spectrum Carrier ID solutions, Comtech EF Data has applied for several patents. Some examples of the technology relevant to spread spectrum Carrier ID solutions developed by Comtech EF Data may be found in the following published patent applications: U.S. Application Publication Nos. 20110249706 (filed Feb. 10, 2011), 20120002701 (filed Feb. 10, 2011), 20120082185 (filed Mar. 9, 2011), 20110176603 (filed Mar. 31, 2011), 20110193684 (filed Apr. 18, 2011), 20110269396 (filed Jun. 16, 2011), 20120219038 (filed Aug. 26, 2011), 20120156986 (filed Feb. 28, 2012), and 20120195347 (filed Apr. 12, 2012). Some of these pending applications also have Patent Cooperation Treaty counterparts.

[2] The Metacarrier would be offset from the center frequency of the underlying video or communications carrier being identified. At the output of the modulator the carrier ID signal is sent at +220Hz offset when the modulator is configured not to introduce a spectrum inversion in the host carrier signal. At the output of the modulator the carrier ID signal is sent at -220Hz offset when the modulator is configured to introduce a spectrum inversion in the host carrier signal. Consequently at RF frequencies, the offset can be +/-220Hz, but it will be deterministic +220Hz at any point in the RF chain where the host carrier signal has no spectrum inversion.

The ID is a small string of bytes that include lat/long, operator name, contact telephone number, etc.	√
The Carrier ID must be read in the clear, by a properly configured Carrier ID receiver, even if the referenced carrier is encrypted.	√
The Carrier ID must be transmitted in an industry accepted format, so that the number and type of Carrier ID receivers are kept to a minimum.	√ (Proposed to DVB)
The Carrier ID insertion must have a minimal effect on the data carrier overhead, efficiency, Es/No, phase noise and other carrier quality measurements.	√

Comtech EF Data's spread spectrum Carrier ID technology has been developed and tested in the field, as discussed later. Products resulting from this technology are available today. The Digital Video Broadcasting Project ("DVB") started a standardization process for spread spectrum Carrier ID in December 2011. DVB is an industry-led consortium of over 200 broadcasters, manufacturers, network operators, software developers, regulatory bodies and others in over thirty-five countries. The DVB standard for Carrier ID will be considered for adaption at the DVB general meeting in Geneva in mid-January 2013. There are slight modifications that Comtech EF Data will likely need to make to its products as a result of the DVB standardization effort. Products with these changes will be available from Comtech EF Data starting approximately three months from the adaptation of the DVB standard. Accordingly, products should become available during the second calendar quarter of 2013.

Spread spectrum Carrier ID technology provides the ability to significantly reduce the time to identify and clear transponders of interference sources. It will raise the level of communications quality in the industry and will help to reduce the capital and operational expense now attributed to interference.

Comtech EF Data has expanded on the implementation requirements for Carrier ID (for the embedding of the Carrier ID signal and the detection of the Carrier ID by the satellite) using its MetaCarrier technology. For the earth station sites that have a MetaCarrier embedder, the embedder must automatically:

- Detect the center frequency and bandwidth of the user's carrier
- Require no user configuration
- Select the optimum spreading for the modulated Carrier ID signal

For the sites with spread spectrum Carrier ID decoders, the decoder must be able to scan a full transponder under the control of an external system (such as Glowlink, Monics, Siemens, etc.). The spread spectrum Carrier ID decoder must be able to:

- Accept a center frequency and bandwidth, either from an external system or a manual, local entry

- Acquire the Carrier ID
- De-spread and demodulate the Carrier ID signal to output the Carrier ID information.

A decoded Carrier ID may be in the format of Figure 2.

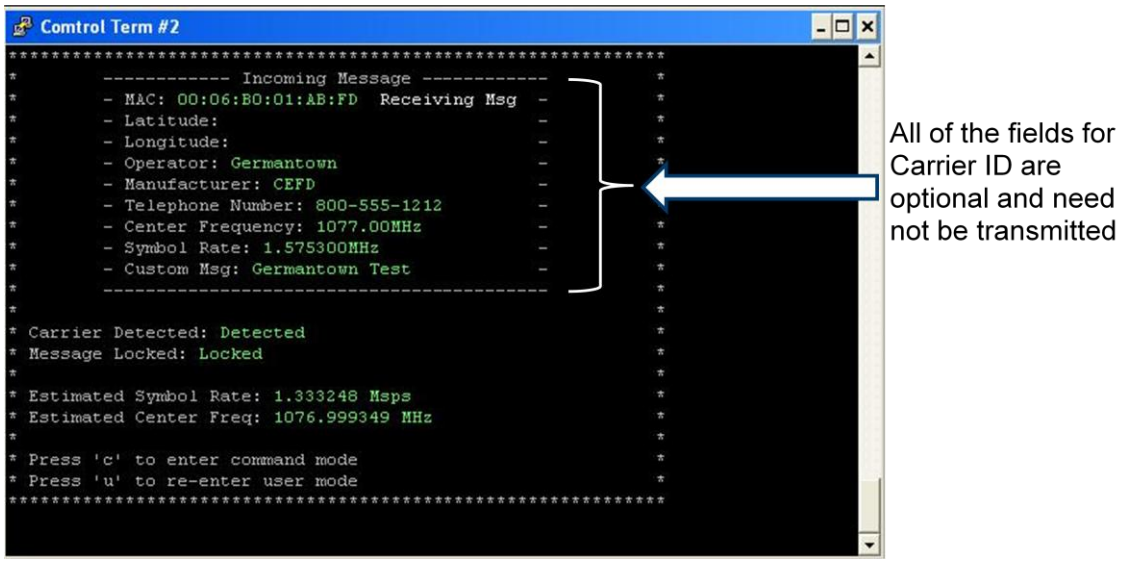

Figure 2, Decoded Carrier ID Format

The implementation of Carrier ID using Comtech EF data's solution is illustrated in Figures 3 and 4. In Figure 3, showing an Single Carrier per Channel (SCPC) network, the Carrier ID embedders are in line with the modem, connected between the IF port of the modem and the RF terminal. The site receiving and processing the Carrier IDs via MetaCarrier does not have to be the site receiving traffic.

Similarly, in an implementation of Carrier ID in a Satellite News Gathering (SNG) application, as shown in Figure 4, the Carrier ID embedder could be an external device or firmware enabled on the modulator.

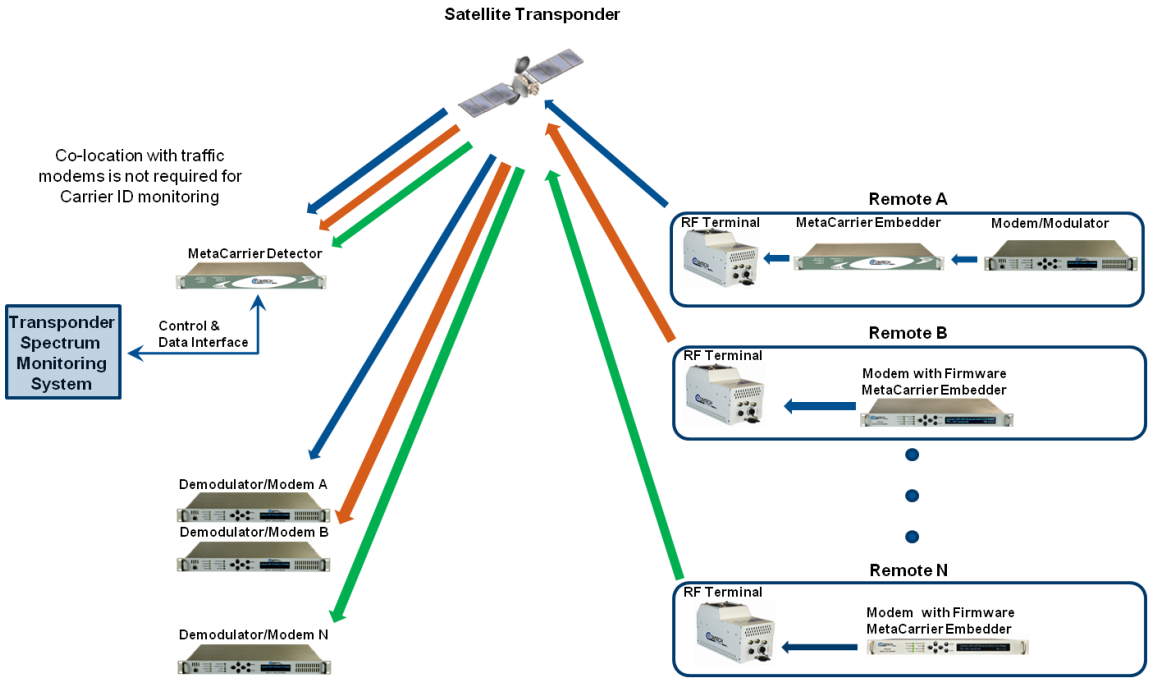

Figure 3, Carrier ID Implementation Topology – SCPC Network

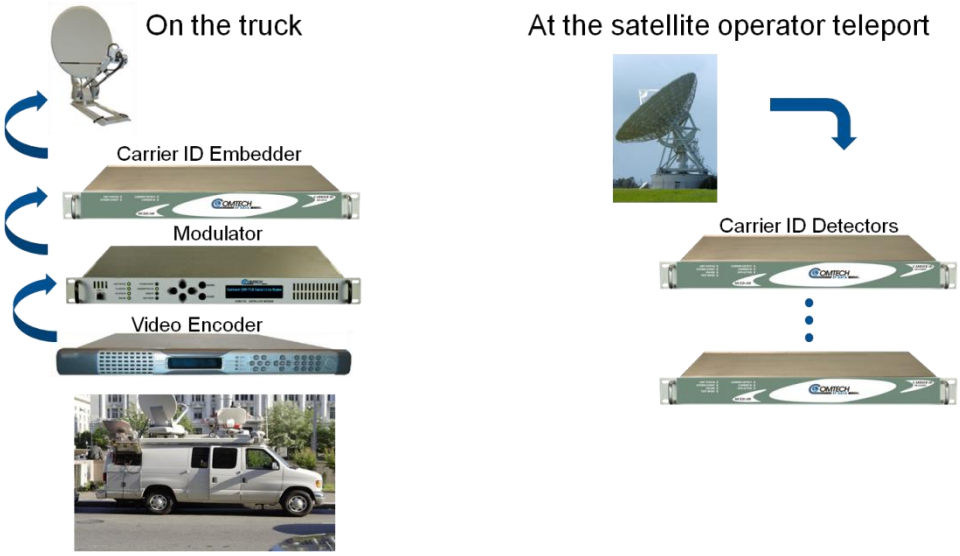

Figure 4, Carrier ID Implementation Topology – SNG Video

The Comtech EF Data approach to Carrier ID has a minimal, almost insignificant impact on the carrier that it references. It uses power from the referenced carrier and its impact is more pronounced with small symbol rate carriers. However, with a 224 ksps (kilo symbol per second) referenced carrier, the degradation of the referenced carrier due to the Carrier ID signal is a tenth of a dB. Figure 5 shows the calculation at this symbol rate.

Carrier ID Configuration

Carrier ID Chip Factor	4,096	
CID Carrier Chip Rate	224.000	Kcps
CID Power Ratio	-22.000	dB
CID C/N	0.1	dB
Scaling Ratio	43.75%	
Power Ratio Original Data Carrier to CID Carrier	0.002760	
Noise Power including CID	0.102760	
Difference between Original Data Carrier and CID Carrier	9.9	dB
Spread Attenuation	-36.123599	dB
Spread Ratio	-3.590219	dB
Spread Correction	-39.713819	dB
Degraded C/N	9.99536371	dB

User Input Required

Degradation Output

Input C/N	10.0000	dB
Degradation due to CID Power Attenuation	0.0120	dB
Degradation due to CID Carrier as Noise	0.1183	dB
Output C/N	9.8937	dB
Output Eb/No	12.8801	dB
Total Degradation	0.1302	dB

Figure 5, Carrier ID Power Spectral Density Reduction Calculator

Certainly the greatest utility of Carrier ID is when two traffic carriers are in severe interference. In this situation the goal is to resolve the Carrier ID from both the carrier of interest and the interfering carrier. The spread spectrum Carrier ID approach is robust enough to extract the Carrier ID from both carriers. The image on the spectrum analyzer in Figure 6 shows two carriers each with a MetaCarrier, and not interfering with each other. In the equipment rack are two modems; one with an external Comtech EF Data Carrier ID embedder, the other with an internal, firmware based Comtech EF Data Carrier ID embedder. The external embedder has one red LED indicating that a GPS source is not present. One can see that the demodulator LEDs are lit green, indicating that traffic is passing. On the top of the rack is a MetaCarrier Carrier ID detector that is locked on the MetaCarrier. Below the spectrum analyzer is a PC that is connected to the MetaCarrier Carrier ID detector and displaying the Carrier ID from the modem with the firmware embedder.

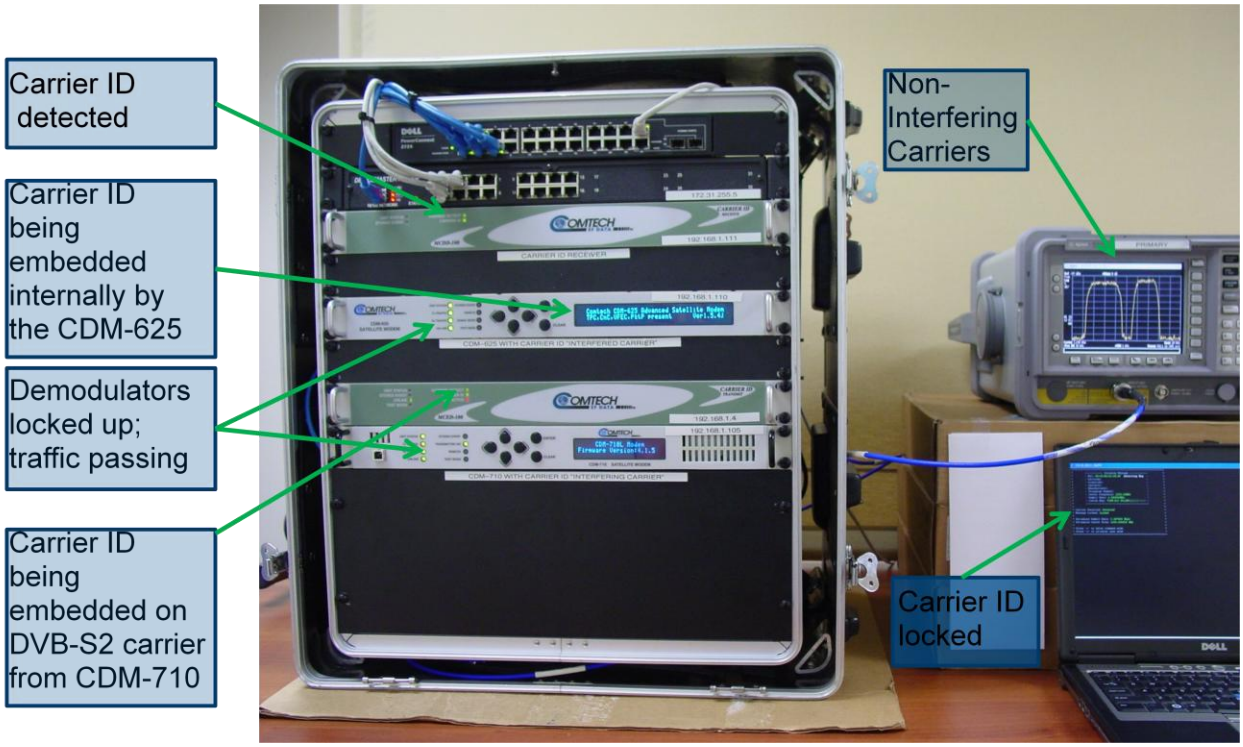

Figure 6, Non-Interfering Carriers with Carrier ID Signals

Figure 7 shows the situation when the non-interfering carriers are closer to each other in frequency such that they almost completely overlap. One can see on the spectrum analyzer that the carriers are interfering with each other to the point that the demodulators are not locked on the modems, as indicated by the red LEDs. However, the Carrier ID from the modem with the firmware version of the embedder is detected, locked, and displayed.

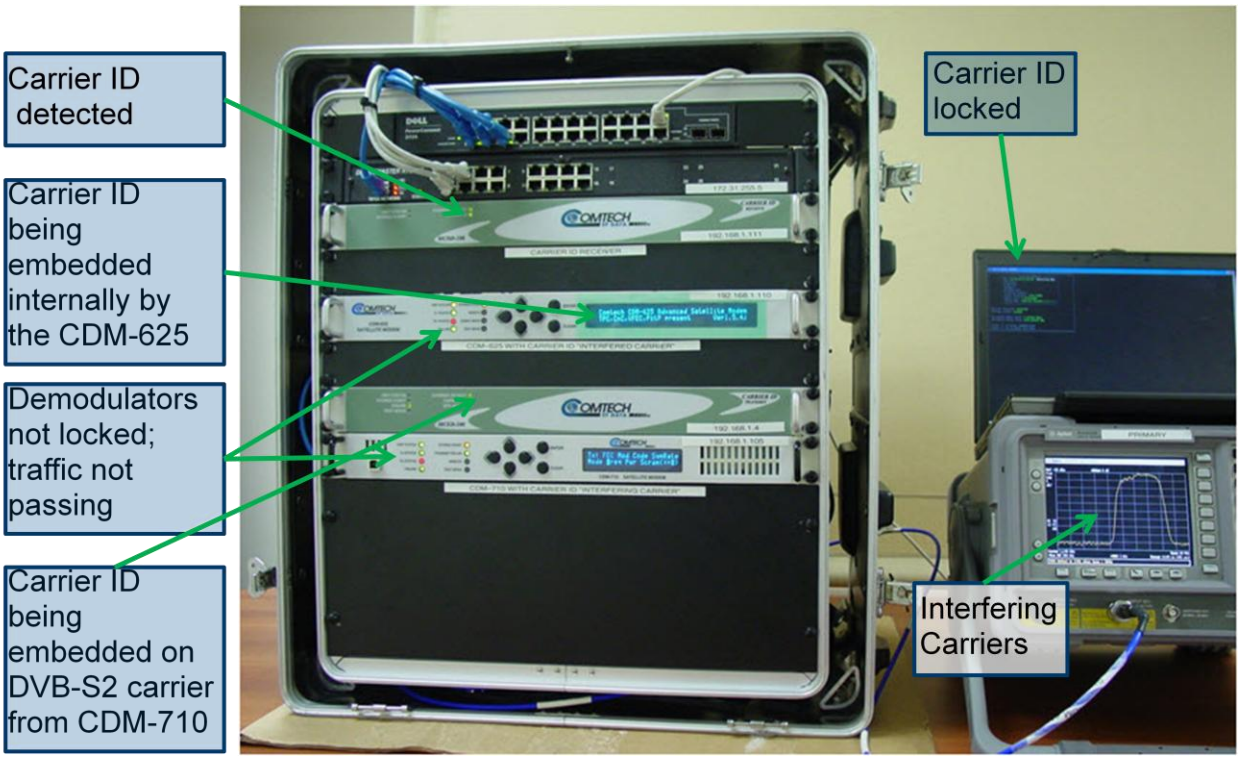

Figure 7, Interfering Carriers with Carrier ID Signals

Although it is surprising that even now, in a 50-year old satellite industry, there is no provision for a universal identification of carriers on a satellite, the ability to do so for video and SCPC carriers – indeed all fixed and mobile digitally modulated uplink non-bursting fixed frequency earth station transmissions – is at hand with the spread spectrum Carrier ID approach. Notably, the spread spectrum Carrier ID solution would work just as effectively for analog video feeder links.

Testing of the Spread Spectrum Carrier ID Solution

Spread spectrum Carrier ID has been demonstrated by a number of representatives from satellite operators and is ready for industry adaptation. There have been field demonstrations of the technology both at operator teleports, at trade shows, and at Comtech EF Data facilities.

The first Comtech EF Data field demonstration of spread spectrum Carrier ID was at the Intelsat Ellenwood (Georgia) teleport in December 2010. Comtech EF Data provided the spread spectrum Carrier ID external embedder and detector, and two modems, a CDM-710 to act as the desired video carrier, and a CDM-625 to act as the interferer. We connected the Carrier ID external embedder to the IF of the CDM-625. The CDM-710 was then set up to transmit a carrier, and the CDM-625 carrier was gradually walked into the CDM-710 carrier to simulate an interferer. In these tests, the Carrier ID was able to be resolved, even when the demodulator for the desired carriers could no longer lock on the carrier because of the test arrangement's deliberate interference. Various combinations of carrier bandwidth and severity of interference situations were tested. Intelsat reported to Comtech EF Data that the tests demonstrated successfully the efficacy of the Carrier ID technology.

Comtech EF Data immediately followed the Ellenwood tests with tests in January 2011 conducted at the SES Woodbine teleport in Maryland. Tests similar to those conducted at Intelsat were performed, and in addition, SES tested the signal loss resulting from the spread spectrum Carrier ID at various carrier bandwidths. SES reported to Comtech EF Data considered these tests to be successful.

Comtech EF Data, in March 2011, demonstrated the technology at the Satellite 2011 conference in Washington DC to over twenty (20) satellite operators and broadcasters. This technology was well received by the industry.

Comtech EF Data continued field tests during 2011. In May 2011 we demonstrated the technology to Turner Communications at their Atlanta teleport. These were tests similar to the previous ones at Intelsat and SES. In addition to the signal loss tests at SES, Turner was interested in observing any video loss resulting from superimposition of the Carrier ID signal on the video signal. Turner Communications reported to Comtech EF Data that they did not observe any video loss.

The foregoing tests were followed by a longer term demonstration during the month of August 2011 on the backup CBS national feed. The equipment was installed at the Encompass teleport in New Jersey, which is the primary uplink for CBS.

More recently the superimposition of the spread spectrum Carrier ID signal was tested on video uplink transmissions at and for the duration of the London Olympics last summer. Eutelsat, Intelsat and SES placed both the spread spectrum and NIT-based Carrier ID signals on video carriers carrying content from the Olympic Games. There were no reported interference incidents during the Olympics nor any perceptible degradation in the video signals resulting from inclusion of the Carrier ID information.

All of these demonstrations showed that the technology was robust and reliable. In addition, in all of these demonstrations, except for the CBS and Olympics demonstrations, the technology was able to resolve the Carrier ID, even during severe interference. During the Games there were no interference events and understandably, CBS was not willing to deliberately inject interference on their national carrier to demonstrate the interference performance capabilities of the Carrier ID technology.

Incorporating Spread Spectrum Carrier ID As a Permissible ATIS Alternative

Comtech EF Data supports the FCC's proposed rule to include spread spectrum Carrier ID as a permitted method for earth station operators to comply with an ATIS obligation. We believe that ATIS requirements should extend to all fixed and mobile digitally modulated non-bursting fixed frequency transmissions with a symbol rate of 128,00 ksps or greater. The spread spectrum Carrier ID solution will work equally well with this entire set of transmissions, including SCPC transmissions, not simply digitally modulated video transmissions. This method would also work effectively with analog video earth station transmissions, and should be permitted as an option for those transmissions. SCPC transmission is used in the oil and gas exploration, mobile telephony backhaul, IP trunking and disaster recovery markets, and there are as many man-made interference events with SCPC in these markets as there are in video broadcast. Because of this interference, and that the spread spectrum Carrier ID technology can be applied to both video and SCPC, the FCC should use this opportunity to extend the regulation from covering only broadband video to include SCPC transmissions as well.

Certain additional changes to the FCC's proposed rule would be appropriate, however. To lower the potential self-interference effect of adding the spread spectrum Carrier ID to the uplink transmission being identified, three minor adjustments to the specifications of an ATIS signal using spread spectrum techniques are appropriate: one, the forward error correction requirement should be a (127,85) BCH code shortened by 16 bits to (111,69) rather than (112,70) BCH as proposed; two, packet size, including forward error correction bits, should be 244 bits, rather than 122 bits; and, three, a chip rate of 112,000 chips per second should be permitted for all symbol rates of digitally-modulated signals below 512,000 sps. . These modifications to the proposed rule would better bring the rule into harmony with the current draft DVB standard that Comtech EF Data expects will be finalized in January 2013. We also recommend monitoring of the DVB Technical Module DVB-S2 for any changes to the standard, which may make future rule modifications prudent. In addition, Comtech EF Data has found that placing the superimposed spread spectrum Carrier ID signal in the center of the underlying carrier will cause cross talk or a Direct Current (DC) offset when the carrier leaks. To avoid suppression of the center of the carrier, the spread spectrum Carrier ID signal should be offset. Comtech EF data recommends that, when the modulator is configured ***not*** to introduce a spectrum inversion in the host carrier signal, the Carrier ID signal be sent at +220Hz offset at the output of the modulator. When the modulator is configured to introduce a spectrum inversion in the host carrier signal, the Carrier ID signal should be sent at -220Hz offset at the output of the modulator. Consequently at RF frequencies the offset can be +/-220Hz, but it will be deterministic +220Hz at any point in the RF chain where the host carrier signal has no spectrum inversion.

To ensure further consistency with the anticipated DVB standard, the format of the ATIS signal should be the MAC address of the earth station modulator, a two character operator ID (provided by either the sIRG or the Space Data Association), and a 96-byte open field which could be used in a variety of ways within the discretion of operators. As a result of databases to be administered by the sIRG, transmission of the MAC address will be sufficient to use the Carrier ID information to address the source of any interference event.

Finally, Comtech EF Data believes that certain transition periods are appropriate to implement ATIS requirements for digitally modulated earth station equipment using a spread spectrum Carrier ID solution or any other solution the FCC allows:

Comtech EF Data proposes the following timetable for implementation of an ATIS requirement for digitally modulated earth station equipment:

- Beginning January 1, 2014, the manufacture, importation, or certification of any digitally-modulated transmitting earth station equipment using non-bursting fixed frequency signals should be prohibited unless it has embedded in it a capability that will transmit the ATIS information.

- Beginning January 1, 2015,

    - no new applications should be accepted for digitally transmitting earth stations using non-bursting fixed frequency signals unless the applicant certifies that it will use

transmission equipment with an embedded capability to transmit the ATIS information in accordance with the rule;

- no new digital transmit earth stations capable of using non-bursting fixed frequency signals should be deployed that do not use transmission equipment with an embedded capability to transmit the ATIS information in accordance with the rule.

- all digital transmit earth stations using non-bursting fixed frequency signals that are not otherwise required to utilize transmission equipment with an embedded capability to transmit the ATIS information must deploy and operate external modulators that comply with the technical specifications of the rule. While such external equipment cannot meet the proposed standard that the ATIS equipment may not be easily defeated, the operator can adopt password requirements and deny access to those that do not provide the proper identification. Whenever such transmitting equipment is replaced, it must include an embedded capability to transmit the ATIS information in accordance with the rule.

- Beginning January 1, 2019, all transmitting earth station equipment in use must have an embedded capability to transmit the ATIS information in accordance with the rule.

The five year-transition period described above for existing earth stations is more than ample time for operators to bring that equipment into compliance with an embedded solution through normal cycles of replacement and upgrade of equipment in the industry. Comtech EF Data estimates that the number of affected modems and modulators may exceed 100,000. In comparison to other wireless technologies, this transition would be sufficiently long to give satellite equipment operators the opportunity to upgrade to equipment that supports digital ATIS on an embedded basis.

Conclusion

Comtech EF Data believes that most in the industry that are familiar with and concerned about the issue of interference agree that spread spectrum Carrier ID will not address all interference situations. However, there has never before been a Carrier ID technology soon ready for production that can be used with both SCPC and video carriers, and that addresses virtual all operational and technical concerns. The time is ripe for the implementation of Carrier ID solutions by the satellite industry and adoption of spread spectrum Carrier ID as one of the permitted means of complying with the Federal Communications Commission's ATIS obligations would be appropriate.

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January 14, 2013