

Skybridge Spectrum Foundation  
Telesaurus Holdings GB LLC  
Environmental LLC  
Verde Systems LLC  
ATLIS Wireless LLC  
Intelligent Transportation & Monitoring Wireless LLC

2649 Benvenue Ave, Berkeley CA 94704  
2509 Stuart St, Berkeley CA 94705

510.841.2220 - phone  
510.740.3412 - fax

Warren C. Havens  
President

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Ex parte presentation

April 12, 2010

*Filed via ECFS under WT Docket No. 06-49*

Marlene H. Dortch  
Federal Communications Commission  
Office of the Secretary  
445 12<sup>th</sup> Street, SW  
Washington, DC 20054

*Wireless Telecommunications Bureau:*

Paul D'Ari: paul.dari@fcc.gov  
Jim Schlichting: jim.schlichting@fcc.gov  
Paul Murray: paul.murray@fcc.gov  
Nese Guendelsberger: nese.guendelsberger@fcc.gov

*Office of Engineering and Technology:*

Julius Knapp: julius.knapp@fcc.gov  
Ira Keltz: ira.keltz@fcc.gov  
Alan Stillwell: alan.stillwell@fcc.gov  
Ronald Repasi: ronald.repasi@fcc.gov  
Bruce Romano: bruce.romano@fcc.gov

Re: WT 06-49: the *LMS-M ITS Radio Service NPRM*.

The following summary and separately uploaded exhibits support, with major additional proof, the past filing in this docket by the entities listed above.

These are provided here to further demonstrate the need *to make no changes in the M-LMS rules, except the minor relief we have previously proposed.*

Telesaurus Holdings GB LLC and Skybridge Spectrum Foundation are M-LMS licensees.<sup>1</sup>

They have submitted various pleadings in this docket 06-49 as to why the M-LMS rules, properly established in the public interest as the one wide-area Intelligent Transportation System radio service under Subpart M of Part 90 of the FCC rules, should not be changed (other than as they proposed, if the FCC finds that modest-change reasonable).<sup>2</sup>

In sum, as reflected in the exhibits hereto:

GPS<sup>3</sup> by itself is unquestionably, as all experts find, insufficient for major Intelligent Transportation System (“ITS”) purposes since it is not accurate and consistent enough to track and guide vehicles along and across lanes and otherwise for safe and efficient travel. This applies to roadway as well as railway and maritime vehicles.

GPS must be augmented including by wireless wide-area systems to deliver a constant flow of correction of GPS errors, and also to carry back and forth location based data. M-LMS is ideal for this in the major urban areas, and in time as can be expanded to more rural areas and corridors. *Network RTK (commonly called “N-RTK”) is the primary means for this augmentation, and N-RTK wide-area systems are now being built worldwide--* some nationwide systems and many large regional ones including in the United States. Costs of enduser devices are dramatically dropping making wide adoption possible. M-LMS can and should be the basis of nationwide N-RTK for ITS.

GPS, even augmented by N-RTK (or similar correction augmentation), is still subject to major inaccuracy and unreliability in area of substantial radio multipath, including most urban areas with good-sized buildings and areas with substantial hill, mountains, and valleys, and multi-lane vehicle corridors with large vehicles passing others. In these area of substantial radio multipath, terrestrial wide-area multilateration (commonly called “WMLAT”) and other local or on-board techniques are required to augment GPS (itself a form of multilateration). *WMLAT is now being implemented substantially worldwide* at airports to supplement radar and aircraft-GPS to track and guide aircraft *and to track and guide road vehicles on airport premises.*

Formal economic-projection studies project that nationwide high-accuracy-location wireless-systems as summarized above (and demonstrated below) will be one of the major, required intelligent infrastructures, *adding to the economy a significant percent increase in GDP, apart from the immense benefits that will be provided by reduction in fuel consumption, pollution and adverse health and environmental effects, and overall improvement to quality of life.* First, see

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<sup>1</sup> In some exhibits, they are together called “Sky-Tel.” They hold M-LMS A-block licenses in over 80% of the nation (and one C-block license). They are affiliated with the following LLCs that hold AMTS and 220 MHz (together, in 217-222 MHz) licenses also in over 80% of the nation (and with the noted M-LMS licenses, over 90% of the nation): Environmental LLC, Verde Systems LLC, and Intelligent Transportation & Monitoring Wireless LLC. These M-LMS and 200 MHz licenses comprise the *largest* aggregation of spectrum in the nation for wide-area ITS and the other complementary applications described herein. They also are the *only* entity or affiliated group in the nation seriously pursuing these essential applications.

<sup>2</sup> They proposed certain minor rules changes to allow certain *ancillary* use flexibility in the direction other M-LMS licensees appeared to seek but without injury to the ITS application requirements (including no reduction in the currently permitted power and full time of use) and without wholesale diversion of the spectrum from its intended and much needed ITS focus.

<sup>3</sup> Herein, by “GPS” we include other GNSS as well.

the Australian study in the Exhibits hereto. Also, see the Exhibit with outline of the “Cooperative High Accuracy Location (C-HALO) Cost Benefit Study,” funded by charitable gifts from our companies, by the University of California, Berkeley Institute for Transportation Studies. (This follows preceding years of collaboration between our companies and the UC Berkeley professors and staff involved in this study.) This study will be published, probably in early 2011. A copy will be provided to FCC staff involved with this docket. Already, there is no question of the major benefits to be provided as the other Exhibit hereto demonstrate.

Exhibits: A summary list is provided in the Attachment below.<sup>4</sup>

While the exhibits uploaded with this filing are substantial, we provide them to demonstrate the great promise and practicality of M-LMS for ITS.

There is no fundamental technical or economic impediment or breakthrough needed, rather, the exhibits demonstrate every aspect of the above summary--

Technology (including wireless devices, including in lower 900 MHz), systems, implementations, economic justification, and other fundamental issues are covered in the exhibits.

Note that Exhibit [7] is from the latest U.S. *Federal Radionavigation Plan*: excerpts that fully support the need for M-LMS for ITS as described herein.

In addition, a paper from a leading international expert in GPS and GPS augmentation systems, suitable for educated lay persons, had been drafted and will soon be completed and submitted in this docket by our companies. It addresses in more summary fashion major components addressed in the exhibits hereto, in sum, the means and justification for nationwide high-accuracy-location wireless systems and applications, founded on ITS.

In closing:

M-LMS was properly and wisely dedicated to ITS both to augment GPS (the Commission described this at some length in the rulemaking that lead to current M-LMS rules) and to carry back and forth location-based messages.

*There is no more seriously needed new form of wireless in the nation or the world.* Experts in these areas are in agreement on the need, and on the fundamental means.

The FCC should take no adverse action to damage M-LMS for its intended ITS purposes, including no reduction in the authorized power or time of use, and no allowance for M-LMS to be used for general commercial wireless.

M-LMS used as intended for ITS is also, as we have often wrote in this docket, compatible with responsible, lawful use of the band for Part 15 devices, especially for industrial purposes such as telemetry and telecommand by utility operations. There is clear substantial

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<sup>4</sup> While published online for only several months (the average length of time, as shown in each), these online publications submitted and annotated by our companies, specifically on the topics of the filing--high accuracy location wireless for ITS and compatible purposes-- have already been accessed or read approximately 7,000 times. The counts are shown in the link provided.

separation of peak-hour use in space and time, etc. (see our past comments) and in developing the M-LMS rules, the FCC recognized and wrote of this. The FCC also heard and disposed of all of the same arguments Progeny brought up in this docket, with no change in the market but *far greater* not lesser need for M-LMS.

Our nonprofit foundation and commercial companies, listed above, have undertaken and continue with major due diligence and investments to enable M-LMS to be used for these critical, FCC-intended purposes, and to defend these in this docket.

We also plan in-person presentations on these matters to FCC staff

Respectfully,

*/s/*

Warren Havens  
President  
Skybridge Spectrum Foundation (M-LMS licensee)  
Telesaurus Holdings GB LLC (M-LMS licensee)  
And associated LLCs indicated above<sup>5</sup>

Attachment: List and summary of Exhibits

Exhibits: Separately uploaded on ECFS

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<sup>5</sup> Skybridge Spectrum Foundation is an IRS-recognized tax-exempt 501(c)(3) organization. These other LLCs hold FCC licenses in lower 200 MHz and MAS 900 MHz. All of the captioned LLCs are managed by Warren Havens, who is also Director (and trustee in the public interest) of Skybridge Spectrum Foundation. The Foundation (on a nonprofit basis) and these LLCs (on a combined profit and supportive charitable basis) have cooperative plans to use their respective FCC licenses for public-interest wireless, principally, “intelligent” or “smart” transportation, energy, and environment radio systems nationwide.

## Attachment

### List of Exhibits

The following exhibits are separately uploaded on ECFS.

In addition, our companies listed above regularly publish additional materials on matters described in this FCC filing, accessible at the following link:

[http://www.scribd.com/document\\_collections/2340784](http://www.scribd.com/document_collections/2340784)

*Click blue titles links to go to the publication online.*

[1]

[\(Sky-Tel\) Proposed US High Accuracy Location Infrastructure: Cost-Benefit Study Outline, UC Berkeley](#)

A 2010 University of California-Berkeley group cost-benefit study on Cooperative High Accuracy Location (C-HALO) with tightly integrated dedicated wireless communications, for nationwide smart transportation systems in the United States, with extensions to other domains: A next generation nationwide location infrastructure. The study is sponsored as public-interest research by unrestricted grants and grant pledges from Skybridge Spectrum Foundation and related LLCs that hold FCC licenses for nationwide smart transport, energy, and environment, including free core services (those most needed for safety and transport efficiency). The study follows on past work by the same University group and Skybridge in these areas.

[2]

[\(Sky-Tel\) Nov 2008. 20-Year Projection of Economic Benefits of High Resolution Positioning Services, For Australia. Allen Group](#)

(Sky-Tel republished and noted)\* 2008 study of the economic benefits of high accuracy location or positioning in Australia, projections through year 2030, assuming the implementation of planned, or 'organic' widespread nationwide GNSS augmented systems, such as by use of N-RTK. The benefits are estimated for only three economic sectors: agriculture, mining, and civil engineering and construction. Those benefits estimated to be in the range of .1.1 to 1.2% of GDP by 2030. Based on this study, Sky-Tel roughly estimates that if C-HALO (very wide area, cooperative high accuracy location for transportation and all other sectors)\* is implemented, the GDP increase would be in the range of 10%, and certainly a substantial multiple of 1.1 to 2.1 %, and that should apply to the US as well as Australia. This would equate to about \$14 trillion in increase over that time period, for reasons indicated in margin notes in this study. - - - - \* This document is noted and republished on Scribd by Skybridge Spectrum Foundation and Telesaurus LLCs (Sky-Tel). They hold 200 and 900 MHz FCC licenses nationwide in the US for Smart Transport, Energy and Environment Radio (STEER) systems including its component Cooperative High Accuracy Location (C-HALO). See other Scribd articles on Sky-Tel STEER and C-HALO (e.g., Google "Skybridge C-HALO STEER"). STEER and C-HALO core wireless location and communication services for public safety, traffic flow, and environmental monitoring and protection, and related smart energy, will be at no cost to end users.

[3]

[\(Sky-Tel\) Skybridge - Telesaurus Plan: Nationwide High Accuracy Location Based Intelligent Transportation \(2008\)](#)

2008 Summary of the Telesaurus LLCs- Skybridge Spectrum Foundation plan for nationwide Intelligent Transportation Systems based upon high accuracy (sub-meter) location (HALO) and guidance of vehicles, along and across lances, using terrestrial and space (GPS-GNSS) multilateration and other forms of location determination, along with tightly integrated dedicated two-way and one-way radio communications, and dynamic GIS, as from ESRI. The plan was submitted at the 2007 ITS World Congress in Beijing, the FCC, NTIA and other entities and fora. The core safety and efficiency services will be at no cost to government agencies and the general public. Telesaurus and Skybridge are developing the technical components and deployment concepts with assistance of transportation-, wireless-, and other experts at the University of California, Berkeley, and other entities. More recent work includes support of smart transportation as integrated with smart or intelligent transportation, as in V2G (vehicle to grid) enabled by said HALO+tight

wireless. Smart transportation and energy systems will in large part merge, and they each and especially together need the planned dedicated radio location and communication networks.

[4]

[\(Sky-Tel\) High Accuracy Location \(HALO\) for Intelligent Transport & Infrastructure, and GPS backup](#)

2009 presentation regarding planned nationwide High Accuracy Location (for vehicles, etc.) to augment and backup GPS, to the US Office of Position Navigation & Timing (that coordinates GPS among Federal agencies and is liaison with private sector) by W. Havens of Skybridge Spectrum Foundation (that holds FCC mLMS licenses with Telesaurus Holdings) and Prof. Raja Sengupta of University of California Berkeley, also with Prof. Kannan Ramchandran. The same presentation was made to other public agencies, and associations involving wireless communication and public safety.

[5]

[\(Sky-Tel\) Skybridge-Telesaurus 2009 Overview of High Accuracy Location- HALO- to US DOT RITA](#)

2009 presentation to US DOT RITA by Warren Havens for Skybridge Spectrum Foundation (with support by Telesaurus LLCs, and in association with Prof. Raja Sengupta at University of California Berkeley, of nationwide High Accuracy Location (HALO) as the foundation for advanced Intelligent Transportation Systems, provide sub-meter accuracy guidance of vehicles along and across lanes to greatly reduce accidents, congestion, pollution, etc.

[6]

[\(Sky-Tel\) Smart Transport, Energy & Environment Radio - STEER, presentation to Caltrans, 2009](#)

2009 presentation of STEER- Smart Transport, Energy & Environment Radio systems by Warren Havens of Skybridge Spectrum Foundation (with support of Telesaurus LLCs, and Prof. Raja Sengupta and others of University of California Berkeley) to Caltrans. STEER is a proposed nationwide dedicated radio service for purposes noted above. It includes HALO- High Accuracy Location, and core services at no cost to end users (like GPS).

[7]

[\(Sky-Tel\) C-HALO Justified in 2008 Federal Radio Navigation Plan- Excerpts](#)

Excerpts from the US 2008 Federal Radionavigation Plan, selected and annotated to show its support of Sky-Tel's planned C-HALO. Sky-Tel is Skybridge Spectrum Foundation and Telesaurus LLCs. They hold 200 and 900 MHz FCC licenses nationwide in the US for Smart Transport, Energy and Environment Radio (STEER) systems including its component Cooperative High Accuracy Location (C-HALO). See other Scribd articles on Sky-Tel STEER and C-HALO (e.g., Google "Skybridge C-HALO STEER"). STEER and C-HALO core wireless location and communication services for public safety, traffic flow, and environmental monitoring and protection, and related smart energy, will be at no cost to end users.

[8]

[\(Sky-Tel\) Re Existing & Planned N-RTK Networks US & Worldwide](#)

Dec 2009 compilation by Sky-Tel\* of extensive materials describing major existing and planned Network RTK (N-RTK) networks in the US, Europe, Japan, New Zealand and Dubai (as examples). N-RTK provides high accuracy location over very wide areas, cost effectively. It's growth worldwide is dramatic, but it is not yet used for wide-area Intelligent Transport since N-RTK GNSS augmentation must be further augmented to provide needed accuracy and reliability in area of GNSS satellite blockage and RF multipath. Sky-Tel plans "C-HALO" for that. / Sky-Tel is Skybridge Spectrum Foundation and the Telesaurus LLCs of Berkeley California. They hold 200 and 900 MHz FCC licenses nationwide in the US for Smart Transport, Energy and Environment Radio (STEER) systems including its component Cooperative High Accuracy Location (C-HALO). / Google other Scribd articles on Sky-Tel STEER and C-HALO. STEER and C-HALO core wireless location and communication services for public safety, traffic flow, and environmental monitoring and protection, and related smart energy, will be at no cost to end users.

[9]

[\(Sky-Tel\) US Leader in GNSS- PNT, International Comparisons](#)

Nov-Dec 2009 survey in GNSS showing US still the leader in international GNSS and PNT (position, navigation and timing). Comments by Sky-Tel on why C-HALO in the US will help maintain that lead. /

Sky-Tel is Skybridge Spectrum Foundation and Telesaurus LLCs of Berkeley, California. They hold 200 and 900 MHz FCC licenses nationwide in the US for Smart Transport, Energy and Environment Radio (STEER) systems including its component Cooperative High Accuracy Location (C-HALO). See other Scribd articles on Sky-Tel STEER and C-HALO (e.g., Google "Skybridge C-HALO STEER"). / STEER and C-HALO core wireless location and communication services for public safety, traffic flow, and environmental monitoring and protection, and related smart energy, will be at no cost to end users.

[10]

[\(Sky-Tel\) Smart Railroads- 200 Wide Band+ High Accuracy Location, By Federal Railroad Admin, 2008](#)

2008 presentation by the Federal Railroad Administration of developments for smart or intelligent railroads based in large part on advanced wireless communications using 200 MHz radio spectrum, additional spectrum for wider band wireless, high accuracy location by enhanced GPS, etc. This parallels similar developments in intelligent or smart highways, electric grid, airports, and other core infrastructure, and for smart environment (wide scale environmental monitoring and protection). Skybridge Spectrum Foundation, Telesaurus and related LLCs focus on wireless for these Smart Transport, Energy, and Environment Radio systems, with core service to be free to government agencies and the general public.

[11]

[\(Sky-Tel\) Daimler Benz- Precise Mapping & Location for Smart Transport, Lane-based ITS, Etc.](#)

"The Potential of Precision Maps in Intelligent Vehicles," by Christopher K. H. Wilson, Seth Rogers, Shawn Weisenburger, of Daimler Benz research. Apparently published in late 1990s or 200\* early. Discussed the value, some methods, and high probability of near-future high-accuracy road digital mapping and maps, and vehicle positioning on the maps, for critical roadway safety and a convenience applications. Discusses vehicle-to-vehicle methods, and vehicle-to-roadside methods as well, to supplement GPS and INS. One of a small number of research papers on high-accuracy location and mapping for public road transportation applications. Important that Daimler Benz, the world's leading high-end automobile maker, did this research, since as the article reflects, the high-end vehicle market segment (along with some government, trucking and other vehicle segments) will logically be first adopters. This document is noted and republished on Scribd by Skybridge Spectrum Foundation and Telesaurus LLCs (Sky-Tel). They hold 200 and 900 MHz FCC licenses nationwide in the US for Smart Transport, Energy and Environment Radio (STEER) systems including its component Cooperative High Accuracy Location (C-HALO).

[12]

[\(Sky-Tel\) Trimble-APCO Request for RTK Spectrum in US in VHF Range for Critical Government and Private Uses](#)

[Sky-Tel]\* 2001 request by Trimble and APCO (American Association of Public Safety Communications Officials) to the FCC to allocate approx. 1/2 MHz of spectrum in high band VHF range for RTK (real time kinematic GPS- GNSS augmentation), and describing governmental and private sector safety-of-life and other critical applications of RTK. Since 2001, RTK has evolved to Network RTK (N-RTK) for increased coverage, accuracy, and cost effectiveness, and RTK and N-RTK have grown by some order of magnitude. / Sky-Tel plans to provide the needed 200 MHz VHF and 900 MHz UHF spectrum for N-RTK nationwide in the US. / \* This document is noted and republished on Scribd by Skybridge Spectrum Foundation and Telesaurus LLCs (Sky-Tel). They hold 200 and 900 MHz FCC licenses nationwide in the US for Smart Transport, Energy and Environment Radio (STEER) systems including its component Cooperative High Accuracy Location (C-HALO). Google other Scribd articles on Sky-Tel STEER and C-HALO. STEER and C-HALO core wireless location and communication services for public safety, traffic flow, and environmental monitoring and protection, and related smart energy, will be at no cost to end users.

[13]

[\[Sky-Tel\] RTK Extend. Navcom Starfire Satcom GNSS Augmentation Extends RTK When Lacks Coverage](#)

[Sky-Tel]\* 2007 Navcom (J. Deere) white paper on use of its "StarFire" satellite based [GNSS] augmentation system (SBAS), with decimeter accuracy, noted for its topic of extending Network RTK accuracy (or close to its accuracy) temporarily in periods and places of no RTK wireless coverage. Also, StarFire maintains its accuracy for about 20 minutes if its satcom coverage is interrupted. These functions are important for Sky-Tel planned nationwide high accuracy location infrastructure and service. (Somewhat similar functions may be achieved using other SBAS. The differences will be separately discussed.) \* This

document is noted and republished on Scribd by Skybridge Spectrum Foundation and Telesaurus LLCs (Sky-Tel). They hold 200 and 900 MHz FCC licenses nationwide in the US for Smart Transport, Energy and Environment Radio (STEER) systems including its component Cooperative High Accuracy Location (C-HALO).

[14]

[\(Sky-Tel\) 2009.Importance of N-RTK, Wireless for Location Services, And Radio Location Augmentation of GNSS- by Trimble CEO](#)

(Sky-Tel)\* 2009, Trimble CEO on the growth and importance of N-RTK, wireless for location services, and radio location (e.g., multilateration pseudolites) for GNSS augmentation in the International GNSS-based location industry. - - - - \* This document is noted and republished on Scribd by Skybridge Spectrum Foundation and Telesaurus LLCs (Sky-Tel). They hold 200 and 900 MHz FCC licenses nationwide in the US for Smart Transport, Energy and Environment Radio (STEER) systems including its component Cooperative High Accuracy Location (C-HALO). See other Scribd articles on Sky-Tel STEER and C-HALO (e.g., Google "Skybridge C-HALO STEER"). STEER and C-HALO core wireless location and communication services for public safety, traffic flow, and environmental monitoring and protection, and related smart energy, will be at no cost to end users.

[15]

[\(Sky-Tel\) 2006 mRTK Research by Nokia-- Mass-market Mobile RTK, With Sky-Tel Cover Memo](#)

(Sky-Tel).\* 2006 article by Nokia researchers on mobile RTK or mRTK, a form of network- or N- RTK. One value of this article is to indicate the importance of upcoming high-accuracy location in the broader wireless industry. Sky-Tel believes that a better idea than mRTK, which uses compromises deemed needed for commercial wireless, is the N-RTK-based C-HALO that Sky-Tel plans, which will be available for commercial (and some private) wireless operators and terminal makers without charge, for the defined critical functions. C-HALO will commence with mission-critical grade N-RTK, and expand from there as indicated in other Sky-Tel publications on Scribd. \* This article is noted and republished on Scribd by Skybridge Spectrum Foundation and Telesaurus LLCs (Sky-Tel). They hold 200 and 900 MHz FCC licenses nationwide in the US for Smart Transport, Energy and Environment Radio (STEER) systems including its component Cooperative High Accuracy Location (C-HALO). See other Scribd articles on Sky-Tel STEER and C-HALO (e.g., Google "Skybridge C-HALO STEER"). STEER and C-HALO core wireless location and communication services for public safety, traffic flow, and environmental monitoring and protection, and related smart energy, will be at no cost to end users.

[16]

[\(Sky-Tel\) Introduction to Network RTK.6-2008](#)

(Sky-Tel)\* 2008 Introduction to Network RTK (N-RTK) by IAG Working Group 4.5.1: Network RTK (2003-2007). \*This article is noted and republished on Scribd by Skybridge Spectrum Foundation and Telesaurus LLCs (Sky-Tel). They hold 200 and 900 MHz FCC licenses nationwide in the US for Smart Transport, Energy and Environment Radio (STEER) systems including its component Cooperative High Accuracy Location (C-HALO). See other Scribd articles on Sky-Tel STEER and C-HALO (e.g., Google "Skybridge C-HALO STEER"). STEER and C-HALO core wireless location and communication services for public safety, traffic flow, and environmental monitoring and protection, and related smart energy, will be at no cost to end users. Note: Scribd does not display highlights and other emphases added by Sky-Tel, and to partly compensate, they instead use margin text notes and arrows.

[17]

[\(Sky-Tel\) N-RTK GNSS- Global Amenity for High Accuracy Location](#)

(Sky-Tel)\* 2005 Article on N-RTK GNSS, as the new Global Amenity for High Accuracy Location.\* This well-presented case in this article is even more compelling today. It explains the growth in N-RTK and the need for it to become a global amenity, as the principal needed augmentation of GNSS for increased accuracy and reliability. It also explains how N-RTK is founded on wireless communication recent-years advances, and why N-RTK needs wider wireless coverage than provided by commercial wireless, as Sky-Tel plans. \*This article is noted and republished on Scribd by Skybridge Spectrum Foundation and Telesaurus LLCs (Sky-Tel). They hold 200 and 900 MHz FCC licenses nationwide in the US for Smart Transport, Energy and Environment Radio (STEER) systems including its component Cooperative High

Accuracy Location (C-HALO). See other Scribd articles on Sky-Tel STEER and C-HALO (e.g., Google "Skybridge C-HALO STEER"). Note: Scribd does not display highlights and other emphases added by Sky-Tel, and to partly compensate, they instead use margin notes and arrows.

[18]

[\(Sky-Tel\) Chip Scale Atomic Clocks, For GNSS Augmentation, C-HALO](#)

Dec 2009 complied. Chip Scale Atomic Clocks (CSACs) with tightly integrated MEMS inertial measurement unit and SDR GPS-GNSS, for high accuracy PNT: position, navigation and timing. Compilation for by Skybridge Spectrum Foundation and Telesaurus LLCs (Sky-Tel). Sky-Tel holds 200 and 900 MHz FCC licenses (CMRS and PMRS) nationwide in the US for C-HALO (Cooperative High Accuracy Location) and tightly integrated communications for Smart Transport, Energy, and Environment Radio (STEER) systems, with no-charge core services for highway safety and flow, better energy systems, and environmental monitoring and protection. Sky-Tel C-HALO will use GPS-GNSS with N-RTK as a first phase, followed by augmentation using multilateration pseudolites, INS, and other mobile location techniques. These materials based on CSACs show important advances being pursued in such augmentation.

[19]

[\(Sky-Tel\) Multilateration- Aircraft & Ground Vehicles, Compilation, For C-HALO](#)

Dec 2009 complied. Multilateration tracking for aircraft & ground vehicles. Compilation for by Skybridge Spectrum Foundation and Telesaurus LLCs (Sky-Tel). Sky-Tel holds 200 and 900 MHz FCC licenses (CMRS and PMRS) nationwide in the US for C-HALO (Cooperative High Accuracy Location) and tightly integrated communications for Smart Transport, Energy, and Environment Radio (STEER) systems, with no-charge core services for highway safety and flow, better energy systems, and environmental monitoring and protection. Sky-Tel C-HALO will use GPS-GNSS with N-RTK as a first phase, followed by multilateration pseudolites, INS, and other mobile location techniques).

[20]

[\(Sky-Tel\) Intuicom RTK Bridge Radio, 902-928 MHz, 2.4, CDMA-GSM, w Sky-Tel Cover Notes](#)

December 2009. This Intuicom product brochure is noted and republished by Skybridge Spectrum Foundation and Telesaurus LLCs (Sky-Tel) (Berkeley, California) (Sky-Tel). Sky-Tel holds 200 and 900 MHz FCC licenses (CMRS and PMRS) nationwide in the US for C-HALO (Cooperative High Accuracy Location) and tightly integrated communications for Smart Transport, Energy, and Environment Radio (STEER) systems, with no-charge core services for highway safety and flow, better energy systems, and environmental monitoring and protection. Sky-Tel C-HALO will use GPS-GNSS with N-RTK (and eventually also multilateration pseudolites, INS, and other mobile location techniques). The following Intuicom product (by Freewave) is an example of a Phase-1 of G1 product for use in Sky-Tel C-HALO: Under FCC rules Sky-Tel under its M-LMS 900 MHz licenses can use Part-90 power up to 30W ERP in PMRS M-LMS type-approved equipment, and can also use "unlicensed" equipment certified under Part 15 that operates in 902-928 MHz, both in its M-LMS subbands (904-909.75 MHz and 927.75-928 MHz) with no height restriction, and in the rest of 902-928 MHz on a Part-15 basis and under the "safe harbor" in FCC rule sec. 90.361. Thus, in existing radios such as this one from Intuicom (other vendors make somewhat similar radios), Sky-Tel may (1) use it as-is for a 1G radio for C-HALO: it comes with (a) 2-band unlicensed-band functionality: 900 MHz and 2.4 GHz, and (b) licensed-band CDMA/GSM functionality, or (2) use it with 'a' but swap out the 'b' for (c): a similar-power or higher-power PMRS licensed radio operating in its M-LMS subbands, or (3) use it with 'a' and 'b' and add 'c'.

[21]

[\(Sky-Tel\) RTKLIB Open-Source Low-Cost RTK Receiver, Toyko Uni Maritime..](#)

"RTKLIB." 2009 Summary. From Tokyo University of Marine Science and Technology. This is marked and republished by Skybridge Spectrum Foundation and Telesaurus LLCs (Berkeley, California) which hold 200 and 900 MHz FCC licenses nationwide in the US for C-HALO (Cooperative High Accuracy Location) and tightly integrated communications for Smart Transport, Energy, and Environment Radio (STEER) systems, with no-charge core services for for highway safety and flow, better energy systems, and environmental monitoring and protection. Japan has a nationwide N-RTK network. In the US, many States have existing or planned statewide or regional N-RTK networks. N-RTK receiver cost is an issue in more wide spread use, moving beyond surveying and other high-end, low-volume use, to more mass-market use

such as in Intelligent Transport. The below development is thus important for the wider uses of N-RTK. In addition, Nokia and others are working on low-cost SDR based N-RTK for commercial smart phones. \$30 to \$300 / receiver price range given herein. In higher volumes, and given Moore's law, probably in lower end of that in reasonable time.

[22]

[\(Sky-Tel\) Ubiquitous High Accuracy Location GNSS+ N-RTK+ Multilateration Pseudolites+ INS+ RFID, Etc.](#)

2007 Article on Ubiquitous Positioning (UbiPos) or Cooperative High Accuracy Location (C-HALO) in GPS World, via integrated use of GNSS, N-RTK, Pseudolites, INS, RFI, etc. Discusses RTK Test Bed at the University of Nottingham, UK. Concludes: "Mobility, continuity, flexibility, and scalability are other important parameters for UbiPos and these can be achieved through the construction of next generation NRTK GNSS positioning infrastructure and wireless communications." Marked and presented by Skybridge Spectrum Foundation and Telesaurus LLCs (Berkeley, California) which hold 200 and 900 MHz FCC licenses nationwide in the US for C-HALO (Cooperative High Accuracy Location) and tightly integrated communications for Smart Transport, Energy, and Environment Radio (STEER) systems, with no-charge core services for for highway safety and flow, better energy systems, and environmental monitoring and protection. Part of Sky-Tel C-HALO online library being created.

[23]

[\(Sky-Tel\) Wireless Communication for N-RTK IAG-WG](#)

2008 summary of wireless broadcast and two-way communications to support network RTK for mobile high accuracy location from IAG (International Association of Geodesy). Marked by Skybridge Spectrum Foundation and Telesaurus LLCs (Berkeley, California) which hold 200 and 900 MHz FCC licenses nationwide in the US for C-HALO (Cooperative High Accuracy Location) and tightly integrated communications for Smart Transport, Energy, and Environment Radio (STEER) systems, with no-charge core services for for highway safety and flow, better energy systems, and environmental monitoring and protection. Part of Sky-Tel C-HALO online library being created.

[24]

[\(Sky-Tel\) Dangers & Shortfalls in Unaided GPS-GNSS--Wireless N-RTK Solutions of This for Intelligent Transport.](#)

Feb 2009 Coordinates magazine, 2 articles, with comments by Skybridge- Telesaurus: (1) Dangers and shortfalls of unaided GPS, especially for high accuracy location and navigation, including for Intelligent Transportation Systems, and (2) Solution by N-RTK augmentation, for which mission-critical grade secure, private, dedicated, wide-area wireless is the foundation, as Skybridge Telesaurus plan with their 200 and 900 MHz FCC licenses nationwide in the US. See other articles on the above by Skybridge and Warren Havens on Scribd, including the University of California's 2010 "C-HALO" cost benefit study, for a nationwide cooperative high accuracy location infrastructure in the US.