Not All Bands Are Created Equal
A Closer Look at Ka & Ku High Throughput Satellites
INTRODUCTION

The advent of high-throughput satellites (HTS) enables network service providers to offer a new generation of communications solutions. HTS systems combine the exceptional spectrum efficiency and performance of spot-beam antennas with ultra-wideband transponders to enable unprecedented levels of bandwidth and throughput. Each spot beam reuses frequencies in multiple carriers so that a single HTS spacecraft can provide five to ten times the capacity of traditional satellites. For the customer, this provides the potential to dramatically increase data rates, upwards of 100Mbps to a single site, and improve application performance compared to traditional satellite based communications.

Despite this tremendous potential, there is a great deal of misperception and lack of understanding about these new technologies among both customers and the industry at large. This is compounded by marketing exuberance from some satellite fleet operators with their own specific and often proprietary flavors of these emerging technologies. Customers and satellite network service providers alike need an unbiased engineering perspective on the features, benefits and trade-offs of emerging HTS technologies.

ENGINEERING ANALYSIS OF HTS SYSTEMS

In order to better understand the real potential and practical application of this new generation of HTS spacecraft, Harris CapRock Communications, conducted an in-depth engineering analysis of several HTS systems. Actual systems that are either currently in orbit or in production for launch within the next 12 to 36 months were examined. We used data available from the satellite manufacturers and satellite fleet operators themselves, combined with our 30+ years experience to compile an analysis that enables a clearer view of HTS capabilities considering beam coverage, power consumption, frequency band, link availability and actual cost per bit of transponded capacity.

Harris CapRock does not own or operate any satellites directly. However, it is the world’s largest single commercial buyer of space segment. We currently provide end-to-end managed satellite communications solutions to thousands of remote sites worldwide utilizing over 4GHz of capacity across 60+ different satellites in C, Ku, Ka, L, X and UHF bands. We land that traffic in one of our 12 self-owned and operated teleport facilities and connect directly to our customers’ networks through a global terrestrial backbone network with 83 points-of-presence across 23 countries. Our approach is to tailor the right technology for our customer’s unique application environment. We are technology and frequency band agnostic, focused solely on designing a solution for its performance and operational efficiency.

Therefore we are uniquely positioned to provide unbiased perspective on the real potential of HTS systems. It is important to note that Harris CapRock clients operate exclusively in remote and harsh environments including the energy, mining, maritime and government markets. As such, the perspective of this analysis focuses on satellite network services that operate in truly mission critical and remote operations, where network reliability, actual user throughput, and application performance are the highest priority. This white paper is not intended to draw any conclusions as to the applicability of HTS for mass markets or consumer-grade services where lowest possible price may be a higher consideration.
OVERVIEW OF HIGH THROUGHPUT SATELLITES

Originally most HTS systems were designed for mass markets and to operate in Ka-band where small antenna aperture antennas can provide narrow spot beams. However, satellite operators are now applying HTS technology and spot-beam antennas to new Ku-band spacecraft. As these HTS systems proliferate, operators of VSAT networks will have new technology choices when implementing solutions tailored to the application environment of their clients. HTS systems and capabilities can be leveraged in a variety of ways to extend the portfolio of satcom service offerings available on the market.

This whitepaper compares several key aspects of Ka-band and Ku-band HTS systems in the context of the VSAT network services. As part of our in-depth engineering analysis, Harris CapRock compared the designs, technical capabilities, and operational trade-offs of eight current and planned HTS Ka and Ku band systems, including two of the most widely discussed within the industry, Inmarsat Global Xpress and Intelsat EPIC.

For the purposes of this paper, an HTS system is defined as a satellite system that uses a large number of small spot beams distributed over its service area. These spot beams provide high signal strength and signal gain (EIRP and G/T), which allows the satellite to close links to small aperture earth stations at high data rates with positive rain-fade margin to provide good overall link availability. A typical HTS has a significant number of ultra-wideband transponders distributed among the beams, each with a bandwidth well over 100 MHz.

HTS spot beams generally have 3dB beamwidths between 0.5 and 1.5 degrees. Spacecraft have been built or proposed with antennas ranging from a dozen to more than a hundred spot beams. HTS payloads commonly have 5 to 10 GHz of transponder bandwidth but channel frequencies are reused numerous times in geographically isolated spots so that the spectrum needs of the system are constrained within available satellite bands. Spot beams may be steered or fixed relative to the satellite. Since the spot beams have limited geographic coverage, HTSs generally have special gateway beams and transponders specifically to support connections with teleports.

The narrow beamwidths associated with spot beam antennas are created by employing relatively large antenna structures that focus downlink energy and have large areas for collecting uplink energy. Consequently, these antennas greatly improve link performance, providing high data rates at much better availability than traditional regional and hemispherical beams. However, since these antennas accomplish their link improvements by focusing the radio signals into small spots on the earth’s surface, these improvements come at the price of geographic coverage.

The developers of HTS systems must balance their geographic coverage needs against the superior link performance that small-spot beams can provide. The coverage/performance trade off is particularly important for Ka-band HTS systems, where the links are especially susceptible to propagation impairments due to rain and other atmospheric disturbances. Antennas size scales inversely with the square of the frequency. Therefore, using very narrow spot beams to mitigate these propagation impairments is particularly attractive in Ka-band. On the other hand, the number of transponders, the payload complexity, and the spacecraft power requirements all scale directly with the number of beams on the satellite, so very small beams also limit the available service area of the HTS.
The natural contention between coverage and link performance has tended to divide Ka-band HTS systems into two classes: those optimized primarily to achieve high availability links and those optimized primarily for large area coverage. The first class is characterized by fractional-degree antenna beam widths, whereas the second class sacrifices link performance to use larger spot beams. Of course, a great many considerations and tradeoffs go into the development of satellite communications systems, so this classification is a simplification of a much more complex situation. Nevertheless, Harris CapRock has found this coverage/link performance dichotomy useful when comparing Ka-band HTS.

At lower frequencies (such as Ku-band) where the links require smaller margins to overcome propagation impairments, HTS systems have tended to use only wider spot beams, and the small-spot/large-spot classification is less useful. The remainder of this white paper will compare three classes of HTS systems: Ka-band small spot beam systems, Ka-band large spot beam systems and Ku-band spot beam systems. Like most modern satellite systems, HTSs are often multi-purpose designs. HTS antennas may provide large regional and hemispherical beams as well as spot beams. HTS payloads may include transponders for several different satellite bands. This paper will focus exclusively on spot beam services in the fixed satellite service bands in Ku-band and Ka-band.

The HTS spacecraft analyzed in this paper are in geosynchronous earth orbit. There have been promising proposals for Ka-band HTS systems in low earth orbit and medium earth orbit as well, and at least one such system has announced launch plans in 2013. Harris CapRock is following these developments with interest. However, this white paper does not address systems outside the geosynchronous arc.

Ka frequencies are almost twice the frequency used by Ku. The higher the frequency, the more a signal is susceptible to rain fade. Ka-band has a large availability disadvantage:
Downlink: Rain dissipates 3 to 10 times more energy at Ka-band than at Ku-band (11 GHz vs. 20 GHz)
Uplink: Rain dissipates 63 to 400 times more energy at Ka-band than at Ku-band (14 GHz vs. 30 GHz)
HIGH THROUGHPUT SATELLITE SYSTEMS COMPARED

We have evaluated many existing and proposed Ka and Ku-band HTS systems from our perspective as a VSAT network service provider and have reached some general conclusions about their potential use for customers in remote or harsh operating environments, who generally place a higher priority on network reliability, user throughput, and application performance. The evaluation considered technical issues such as link performance and availability, as well as commercial issues such as bandwidth costs, the ability to respond to different customer demands, and the ability to support new services and emerging applications. Since existing and proposed HTS systems are currently targeted for Ka-band and Ku-band, our evaluation was limited to comparing the merits of HTS systems in those two bands.

Table 1 is a qualitative summary of our conclusions regarding the relative strengths of Ku-band and Ka-band spot beam HTS systems. The table also includes a column for traditional Ku-band satellites with regional and/or hemispherical beams. The well-understood capabilities of these satellites provide a valuable basis for comparing the network service improvements that can be realized with the spot beam systems.

Table 1. Summary Comparison of Ka-Band and Ku-Band HTS Systems

<table>
<thead>
<tr>
<th>Item</th>
<th>Ku Hemi</th>
<th>Ku Spot</th>
<th>Ka Small Spot</th>
<th>Ka Large Spot</th>
<th>Ka Spot w. Backup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost per Hz</td>
<td></td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bps/Hz</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coverage</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flexibility (More Ku available, H/W &amp; BW)</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BW Portability</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ability to Recover from Satellite Disaster</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td>✔️</td>
<td></td>
</tr>
<tr>
<td>VSAT Cost</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Spectrum Availability (Grow)</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Synergy Savings (Pre-Launch)</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No Conversion Cost (Ku to Ka)</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Availability (Link performance - Tropics)</td>
<td>✔️</td>
<td>✔️</td>
<td>✔️</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Check-marks represent where a particular space segment option provides the best value. HTS Ku-band technologies outperform Ka-band in high rain zone environments.

The factors compared in Table 1 represent the most crucial aspects of the space segment for a VSAT network service provider. The check-marks represent where a particular space segment option provides the best value for the service provider and ultimately the end customer. When multiple columns are checked for a given factor, it indicates that those options are judged to be equally valuable for the service provider. This does not mean the options have the same or even similar characteristics in that area, rather it means that even if the systems have quite different characteristics, their overall value propositions in the context of the factor in question are of roughly equal value for a VSAT network. The next few paragraphs briefly discuss the factors listed in the table.
Cost per Hz and Bps/Hz

The use of spot beams allows both the Ku-band and Ka-band systems to achieve high spectrum efficiencies. Further, HTS systems in both bands use ultra-wideband transponders and frequency reuse. These features create an economy of scale that allows satellite operators to offer bandwidth at attractive and comparable prices. However, this advantage is eroded when a Ka-band system sacrifices link performance in favor of coverage by using larger spot beams. This approach is currently being utilized by a to-be-launched global maritime based service. These factors are not discriminators between the Ku-band spot and Ka-band small spot systems, but Ka-band large spot systems do not fare as well from this perspective. As a result HTS Ku spot systems actually tend to demonstrate a cost per bits per second that is more favorable than Ka, when compared at the same link availability design requirement and larger spot beam sizes.

Coverage

Spot beam systems are by their nature limited in coverage. Each spot beam generally covers at most a few thousand square kilometers. However, some HTS systems provide large fields of spot beams that collectively create continental and even global coverage, whereas others offer only a relatively small number of fixed or steerable spots in targeted areas. Ku-band spot beams and Ka-band large spots beams are similar in beamwidth and so are generally comparable in system coverage. Ka-band small spot beams, however generally cover only about 10% or 15% of the area covered by a large spot beam and these spacecraft tend to offer less total spot beam coverage.

Flexibility and Bandwidth Portability

The commitment to the development of an HTS system represents a substantial and long term investment of resources, not just for the satellite operator but also for network providers and customers as well. The anticipated lifetime of these systems is greater than a decade, and yet their target marketplace is dynamic. Over the long term, the energy, maritime and government sectors are subject to transformation or disruption by factors such as new mineralogical discoveries, changes in shipping patterns, or international crises. Thus it is advantageous to be able to relocate services and capacity to respond to major changes in the marketplace. Multiple satellite systems with near global coverage such as some of the Ku-band and Ka-band large spot systems can respond to these changes more readily than the small spot Ka-band HTS systems. Ku-band HTS systems and Ka-band systems with other frequency backup have the additional benefit that their VSAT links can, if necessary, be reallocated to traditional systems, albeit in some cases at a loss of service performance if the back-up service operates in significantly longer wavelength such as L or UHF bands.

Ability to Recover from Satellite Failure

A great deal of Ku-band satellite service provided by traditional spacecraft is available virtually everywhere in the world. On the other hand, Ka-band service is relatively sparse. Many Ka based systems are also proprietary or closed networks that require specific satellite modem technology or configurations that are not available from other providers. Thus, in the event of a failure on an HTS spacecraft resulting in loss of service to a spot beam or beams, it is possible to mitigate the service impact by migrating customers in the affected area to an alternate Ku-band satellite. This back-up capability is less likely to be available at Ka-band. A similar back-up service could be provided adding a backup service for Ka-band in Ku-band or some other satellite band, but that would require additional ground terminal hardware and on-site electronics.
VSAT and Equipment Costs

Ka-band VSAT systems are less common in the marketplace and therefore can be more expensive than Ku-band systems of similar performance. While “mass market” systems designed primarily for direct-to-home users are becoming more available at low price points. These systems are generally not suitable for industrial environments in terms of both performance and hardware reliability. In addition as discussed below, the realities of RF propagation drive performance requirements for larger Ka-band earth terminals. This means that sub-meter sized consumer grade terminals cannot deliver the speed or link availability typically required by industrial installations. Larger Ka-based terminals of 1.2M or greater are not yet produced in meaningful quantities and therefore remain more expensive than Ku-band terminals.

<table>
<thead>
<tr>
<th>Component</th>
<th>Ku band price</th>
<th>Ka Band price</th>
</tr>
</thead>
<tbody>
<tr>
<td>PLL type LNB</td>
<td>$200-$250</td>
<td>$1,500</td>
</tr>
<tr>
<td>BUC</td>
<td>$4,000 (8 watt)</td>
<td>$6,000 (4 watt)</td>
</tr>
<tr>
<td>Teleport Earth Station* (9m) w/o civil works</td>
<td>$600,000</td>
<td>$1,300,000</td>
</tr>
</tbody>
</table>

- Remote site equipment prices are significantly higher for Ka-band.
- *Ka Band teleport earth stations require high accuracy tracking and high accuracy reflector.

Pricing based on data from satcomresources.com during August 2012.

Conversion Cost

Harris CapRock currently manages over 4,000 VSAT terminals located around the world. Transitioning any significant fraction of these customers to Ka-band would represent a substantial investment. On-the-other-hand, Ku-band terminals can be transitioned from their current satellite to a new spot beam satellite simply by repositioning the antenna.

New Spectrum Availability

One of the chief selling points for Ka-band satellite services is that the spectrum is relatively unused, while the lower frequency satellite bands are all heavily subscribed. The use of spot beams at any of these frequencies allows a much higher frequency reuse which greatly multiplies the data throughput that can be achieved in the available bands. Spot beam designs in HTS spacecraft offer a way to extract much more efficiency and coverage out of currently available Ku space segment spectrum.

Service Reliability

The much smaller wavelength and higher frequency of Ka-band makes its links far more susceptible to disruption from weather and other atmospheric disturbances than Ku-band links. The use of spot beams improves Ka-band performance, but links with Ku-band spot beams remain much more reliable. Obtaining the same level of link availability (say 99%+) in a Ka spot beam, would require exponentially more transponder power than a comparable link and antenna size in Ku-band. It is therefore much more difficult and expensive to provide high availability and reliable services in Ka-band than in Ku-band – particularly in regions where heavy rainfall is common.
**Customer Market Perception**

Ka-band satellite services have gained general customer acceptance and Ka-band is widely viewed as “the wave of the future” for SATCOM. Ku-band SATCOM is generally viewed as business as usual and it does not excite the imagination of VSAT customers. This perception has been in part created by marketing hype over Ka, promoted by fleet operators in the consumer or maritime mass markets. However, this perception is overstated and does not fit all application environments. A similar phenomenon was observed in the 1980’s when Ku-band systems first appeared. Many industry pundits speculated that C-band would all but disappear from use in VSAT applications. Quite the contrary, C-band continues to grow as an important band in industrial, military, and especially maritime applications where atmospheric interference is particularly acute. This perception may change as the capabilities of Ku-band HTS systems become more widely known, but at this time Ka-band has a somewhat inflated advantage in market perception. In general, all frequency bands have their place in satellite communications. It is the application environment that tends to determine the appropriate band, rather than a satellite fleet operator's band of choice on a particular satellite constellation.

**TRUE RELATIVE COSTS OF KU- VS. KA-BAND SERVICES**

Customers who operate in remote and harsh environments use satellite services for time sensitive, mission critical communications. These customers demand high availability, reliable communications links. A substantial part of the evaluation effort in this study went to determining the real relative cost of providing these highly reliable communications services using Ku-band and Ka-band HTS systems. Ku-band is often promoted in marketing presentations as substantially cheaper to operate than Ku-band. However a pragmatic analysis shows this is not the case for high availability networks.

Our approach was to determine the cost to provide a unit of constant bit rate (CBR), user capacity, as a function of the service availability. In performing this analysis, we considered a number of existing and proposed HTS systems and VSATs located in various regions where we have or expect to have a substantial customer community.

Figure 1 below shows the relative cost of providing a CBR service as a function of service availability, under different climatic conditions for the three classes of HTS systems considered in this whitepaper. Relative performance characteristics are provided for 1.2m VSATs located in temperate, tropical and arid regions. The analysis isolated the effects of satellite technology and frequency band by using similar VSAT to satellite look angles in the various regions, as well as common gateway locations. To the extent possible, given the different frequency bands, common earth terminal characteristics were used. Further, teleport locations and gateway terminal performance parameters were selected such that the VSAT to satellite links dominated the availability. The results shown in the figure are for the outbound (i.e. GW-SV-VSAT) link which is the most difficult to manage in these VSAT systems due to the need to manage satellite power resources as well as satellite bandwidth. One often sees Ka-band VSATs designed with larger antennas in heavy rain regions, but that represents a serious drawback for many VSAT customers and if allowed, could be equally advantageous at Ku-band. Larger VSAT antennas were not considered in this study. The HTS cost data used to construct these curves are based on the lowest cost proposals that have been provided to Harris CapRock for these types of systems.
KU-BAND HIGH AVAILABILITY ADVANTAGE

The data in Figure 1 below indicates that the cost of providing a high availability service is always lowest with a Ku-band HTS system. The cost difference between a small spot Ka-band HTS and a Ku-band HTS narrows as the availability of the service is reduced and in many locations the Ka-band small spot system is at near parity with the Ku-band system for availabilities less than around 98% to 99%. The Ku-band HTS has a significant and distinct advantage for customers who demand very high service reliability and as the availability increase from 99.5%, the Ku-band cost advantage grows rapidly.

The large spot Ka-band HTS systems do not appear to be cost competitive for providing CBR services of this type in any of the regions considered. Its costs were around 2X to 3X the costs for the other systems regardless of the service availability.

Ka-band radio signals are more severely impacted by rain and other transient propagation conditions than lower frequency signals, like Ku-band. Consequently, Ka-band links require higher fade margins for a given service availability than lower frequency links, and Ka-band HTS spacecraft are designed to provide these margins. As noted above, this can result in a cost penalty for the Ka-band systems when customers demand high service reliability. However, this disadvantage can in some cases be turned to the advantage of Ka-band services, for customers whose service needs can tolerate lower availability – such as mass market or consumer clients.

Figure 1. Relative Cost of Constant Bit Rate (CBR) Service

Cost vs. Availability Curves – Temperate

Temperate Region
1.2 m VSAT

- Ku-band Spot provides best cost performance
- Ka-band Small Spot does well below 99.5% availability
• Small spot Ka HTS systems suffer a severe cost disadvantage in harsh climate regions, even for moderate availability services.

• In the tropical region, the Ka small spot system remained 2x the cost of providing the same service quality with Ku HTS for as low as 98% availability.

- Ka is not competitive in tropical rain regions without backup
- Ku-band spot provides best cost performance

• Ka-band Small Spot does well at lower availabilities

• Small spot Ka HTS systems suffer a severe cost disadvantage in harsh climate regions, even for moderate availability services.

• In the tropical region, the Ka small spot system remained 2x the cost of providing the same service quality with Ku HTS for as low as 98% availability.
The small spot Ka-band HTS systems suffer a severe cost disadvantage in harsh climate regions, even for moderate availability services. In the tropical region the Ka-band small spot system remained around 2X the cost of providing the same service quality with a Ku-band HTS for as low as 98% availability. In this region it was difficult to provide a service availability at 99% or higher at any reasonable cost when using Ka-band. This cost disadvantage is largely due to the power penalty incurred by the Ka-band systems in order to provide the large rain margins necessary for even moderate link availability at Ka-band in areas of frequent heavy rainfall. While small spot beams are helpful in this situation, they cannot completely overcome these propagation issues and provide a practical high availability service unless they are coupled with large earth terminals. This solution has its own cost issues and falls outside of the VSAT business area addressed by this paper.

KA-BAND CLEAR SKY ADVANTAGE

The advantage that their large fade margin capability brings to Ka-band HTS systems can be seen by recognizing that the links seldom actually use the power and bandwidth resources represented by the link margin. The propagation impairments that the link margins are designed to mitigate are by definition rare occurrences. If, for example, a link is designed with link margins to provide 99% availability, that means that the link has enough power and bandwidth that it will fail to achieve its minimum operating data rate and error criterion no more than 1% of the time. Normally, links have more power and bandwidth than they need to meet these criteria, and Ka-band links have a great deal more.

When not needed to combat propagation impairments, the power and bandwidth resources available for the link margin can be exploited to operate the link at a higher data rate. This is accomplished by adapting some combination of the power, modulation and forward error correction coding used on the link. While link margins may be exploited that way at any frequency, the exceptionally large link margins used at Ka-band make this an especially effective strategy. Downlink data rates can be increased by factors of up to ten depending on the regions and availabilities in question and hundred-fold increases in uplink data rates are not out of question.

The high data rates that can be achieved by adapting the link parameters in real-time to exploit unused link margin are of course only obtainable at lower availability than the link minimum data rate. However, since typically only a small fraction of VSATs will be operating under impaired conditions at a given time, the total VSAT network throughput can be greatly enhanced by this technique. It is particularly effective for variable bit rate (VBR) and best effort services. The technique of averaging the data rates of large quantities of VSAT sites across multiple regions, including arid climates, is used by Ka providers in order to calculate higher averaged network data rates. By heavily leveraging the high rates available during clear sky conditions, Ka operators boost average transmission data rates. Of course, the data rates and availability in the heavy rain regions suffer in comparison to the high data rates boasted.

Mitigation techniques can help compensate for fades, but provide only a partial solution.

With Adaptive Power Control, the transmit power is adjusted to achieve better availability. While increasing transmit power provides more protection against signal fade, it also leads to significant cost increases.

Dynamic power fluctuation may also affect the life and reliability of the satellite (battery life, power supply).
CONCLUSION

Customers with “industrial-grade” operations in remote and harsh locations, like energy exploration and production, mining, commercial maritime, and government demand highly reliable communications services and have ever increasing bandwidth requirements. For these kinds of clients, our in-depth analysis shows that Ku-band HTS systems have a distinct advantage over Ka-band HTS systems, as well as traditional regional and hemispheric beam systems. While Ka-band HTS can be quite competitive for customer services that do not require particularly high reliability, such as consumer broadband access, they generally do not enable the bandwidth or link availability required by industrial customers, without an excessive, and therefore costly use of spacecraft power and resources.

As a global satellite network service provider, Harris CapRock continually evaluates emerging communications technologies for applications in our client solutions. High Throughput Satellites in both Ku and Ka-band frequencies show great promise to provide customers with a variety of next generation communications solutions.

- Next generation High Throughput Satellites include both Ku and Ka.
- There are many different variations of technologies using the Ka-band frequencies.
- Ka is an appropriate technology for mass markets and non-industrial markets.
- Side-by-side technical and cost comparison of Ka and Ku HTS solutions shows significant technical and cost challenges with most Ka solutions for customers with high reliability and availability needs.
- HTS Ku platforms offer the best overall performance and value for operations for mission critical, maximum uptime networks.

Harris CapRock’s mission is to evaluate & offer the best solution to meet customer requirements. For more information on our analysis of next generation Ka and Ku-band High Throughput Satellites, please contact your account executive or use the information provided below.

HCinfo@harris.com | 1.800.343.8334

Read our August 2012 article published in the Harris CapRock Source customer newsletter:

A Closer Look at High Throughput Satellites, Separating the Hype from the Real Benefits