

**MPH**<sup>™</sup>

Mobile DTV for ATSC Broadcasters



## Digital TV To-Go

Wouldn't it be nice to take digital TV everywhere? Viewers could tune in to the latest news, traffic information, weather, sporting events or entertainment programs in the car, at the beach — virtually anywhere. Now, with MPH™ technology, viewers can use a variety of mobile and video devices to take TV out of the living room and into the outside world.

### MPH™ — What is it?

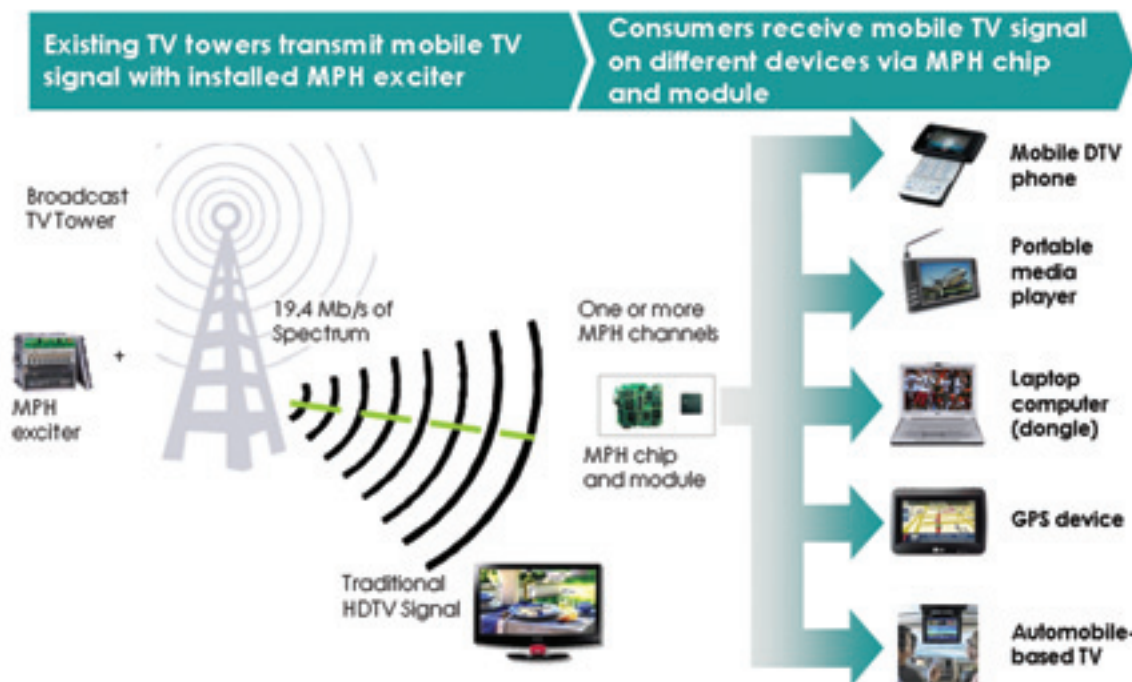
MPH™ (Mobile-Pedestrian-Handheld) in-band mobile digital television is a technology jointly developed by Harris Corporation, LG Electronics, Inc. and its U.S. research subsidiary, Zenith Electronics. The MPH system capitalizes on the powerful combination of Harris Corporation's expertise in digital broadcast systems — including transmitters, exciters, encoders and software — and the systems development, integrated circuit design and vast consumer electronics experience of LG Electronics and Zenith.

The MPH platform allows local TV stations to deliver digital, ATSC-compatible content to mobile and video devices such as mobile phones, portable media players, laptop computers, personal navigation devices and automobile-based "infotainment systems." The service is called "in-band" because local broadcasters are providing mobile TV services as part of their terrestrial transmission within the same, existing 6 MHz channel they use for their ATSC DTV programming.

With the installation of an MPH exciter and signal encoding equipment, existing TV transmission systems can transmit a robust, digital mobile TV signal, and consumers can receive that signal on various "MPH-ready"

devices. The MPH system allows the splitting of the 6 MHz, 19.4 Mb/s of spectrum into a slice for a traditional DTV signal and a slice for MPH use (see figure below). The MPH technology allows each digital TV station to serve all types of users with only its regular DTV channel.

The flexibility of the MPH in-band mobile DTV system facilitates implementation of an end-to-end solution for broadcasters, building on industry-wide approaches and ATSC standards efforts in areas such as digital rights management and conditional access systems. In fact, the MPH system's IP-based transport approach has already responded to the emerging ATSC direction in this technology.



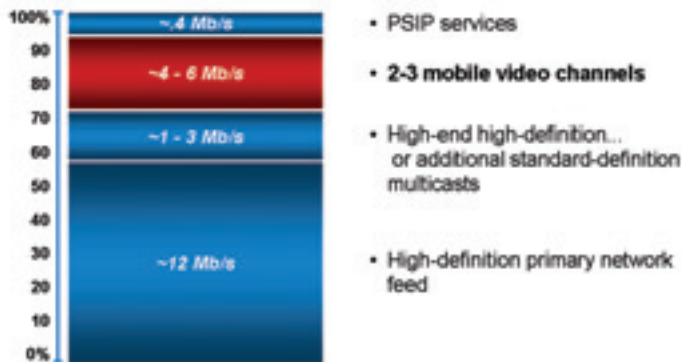
*Splitting the Spectrum for Mobile Digital Transmission*

The following illustrations show two different scenarios of spectrum splitting and channel usage for MPH operations. MPH flexibility provides a number of possibilities for dividing bandwidth and distributing different program streams and services.

### Possible MPH Channel/Spectrum Usage Scenarios

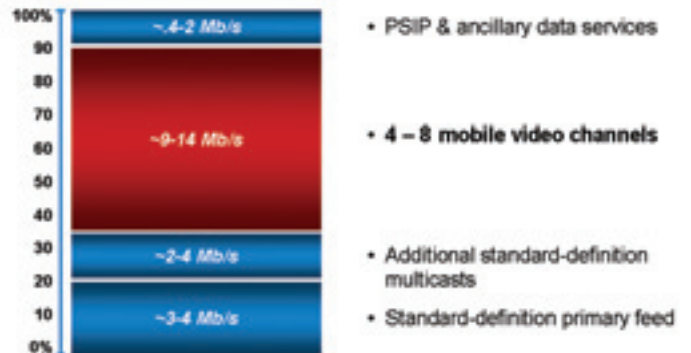
#### DTV Spectrum Allocation Flexibility: Non-Network Affiliate

19.4 Mb/s DTV Spectrum per Station



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19.4 Mb/s DTV Spectrum per Station



## MPH Performance — What are the Technical Criteria?

In order to gain acceptance and meet the operational requirements of today's broadcasters, MPH™ delivers state-of-the-art performance across a range of critical technical criteria, including the following:

- **Video quality** — Delivering one or more compelling, high-quality mobile/handheld videos that provide excellent viewing experiences (resolution up to 480p) using H.264 base profile video encoding.
- **Mobile reception** — Clear, consistent reception tested at speeds greater than 100 miles per hour. The system processes the mobile program stream(s) with additional forward error correction and data redundancy to help ensure successful reception.
- **Efficient/flexible use of spectrum** — More bits of programming delivered with MPH™ compared to other technologies. Spectrum flexibility is evident in the number of audio/video services, data rates and signal robustness provided, coordinated with main ATSC data requirements.
- **Backward compatibility** — 100 percent backward compatibility with all existing/deployed ATSC consumer equipment/receivers. Compatibility eliminates the risk of DTV signal disruption and reduces additional equipment cost for broadcasters.
- **Device/UI parameters** — With only a single receiving antenna required, design options are maximized, and ease of use is enhanced. Convenience features (e.g., programming guide, time-shifting and storage) are part of the system architecture. Significant mobile/handheld receiver power savings result from bursted transmission that maximizes receiver battery life.

## Integrating MPH™ with ATSC Broadcast

The process of integrating MPH transmission with an existing ATSC broadcast plant is neither difficult nor expensive. To add the capability, four basic devices are required:

1. An H.264 A/V encoder for each added program stream
2. An IP encapsulator to encapsulate all program streams and non-real-time files into the appropriate transport protocol
3. A service multiplexer to multiplex the conventional ATSC stream with MPH data
4. An MPH-enabled exciter to replace the existing exciter in the ATSC transmitter

Also, services such as an electronic service guide, non-real-time file delivery and conditional access will require additional

server and software systems. Harris is developing an MPH transmission kit that makes it easy to implement the service. Once the systems are available, Harris will also offer MPH™ as an option with all new transmitter purchases.

The MPH system architecture provides full compatibility with all industry-standard ATSC equipment. MPH™ is already field-proven with Harris, Acrodyne, Axcera and Thomson transmitters, as well as Harmonic, NDS, Tandberg and Harris ATSC encoding systems. Additionally, the system is compatible with all current microwave and fiber STL systems.

### Benefits to Broadcasters

When an MPH system is implemented, broadcasters can expect the following operational and financial benefits:

- Leveraged investment in ATSC transmission
- Delivery of robust DTV signals to Mobile-Pedestrian-Handheld receiving devices
- Extension of local branding to mobile users
- The ability to redirect LOCAL news, weather, sports and traffic information to “consumers on the go”
- Addition of one to eight programs (streams) of mobile content per station
- New revenue stream opportunities based on subscription, advertising and sell-through transactions

## What about the Mobile/Handheld Devices?

A key factor to achieving success in mobile TV broadcast is the proliferation of video-capable, end-user devices such as mobile phones, portable media players, laptop computers, personal navigation devices and automobile-based “infotainment” equipment.

### Potential MPH Mobile DTV Receiving Devices



#### Mobile Phone

Largest volume of new devices per annum. Estimated 164 million new units produced in 2007 with a compound annual growth rate (CAGR) of five percent.\*



#### Portable Media Player

De facto way to watch “cache and carry” video today. Projected to be second largest volume of new devices per annum. Estimated 47 million new units produced in 2007 with a CAGR of five percent.\*



#### Laptop Computer

Larger screen size is ideal for mobile video viewing. Strong consumer interest (73 percent of those surveyed) in watching mobile TV on laptops. Estimated 32 million new units produced in 2007 with a CAGR of 19 percent.\*



#### Navigation Device

Excellent portable form factor for viewing, with links to in-auto usage. Estimated 1 million new units produced in 2007 with a CAGR of 18 percent.\*



#### Automobile-based

Natural enhancement of auto “infotainment” systems with existing monitors. Estimated 6 million new units produced in 2007 with a CAGR of 14 percent.\*

\* 2046 cell-phone owner respondents interested in mobile TV, but do not currently watch it.

Source: Firm mobile TV consumer survey, Aug. 2007, IDC; Euromonitor; iSuppli; IMS; Strategy Analytics; Yankee Group; Gartner Dataquest.

## Who Will Watch and What Will They Watch?

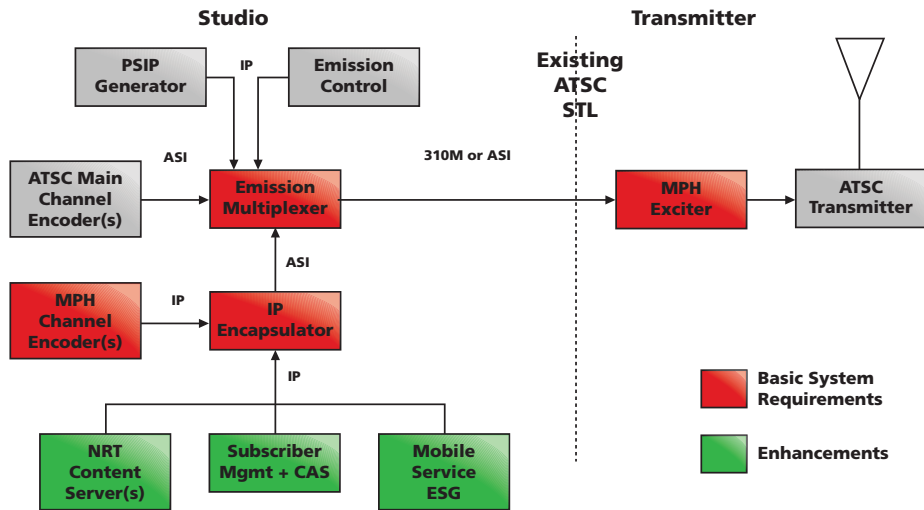
Mobile broadcast TV is well-suited for time-sensitive content with mass appeal. Consumers are interested in watching a mix of local and national content on portable devices. In a recent mobile TV consumer survey conducted in August 2007, viewers were especially interested in receiving local news, weather, traffic information, sports, dramas, comedies, national news and national sports.

Since it is a digital transmission system, MPH™ inherently supports subscription and conditional-access broadcasting business models. Other broadcasters might elect to implement totally free-to-air

systems and rely on advertisers for support. Still others could offer both types of services.

With MPH™, local broadcasters can easily add a mobile service, drawing either on their core traditional programming sources or on new sources of mobile content. As more devices become available with MPH™ and dedicated mobile TV channels, local viewers can watch the programs they want to watch, wherever they are. Viewers will be able to choose from a variety of programs — just as they do when using cable, satellite or IPTV services at home.

### ATSC System Architecture with Full-Service MPH™



## Business Model Possibilities

### New Channels, Expanded Audiences, New Opportunities for Advertising

Research conducted by market research firm In-Stat shows that consumers are increasingly willing to view ads as part of a mobile media experience, highlighting the potential for a smooth transition of local broadcasting's free-to-air value proposition to mobile. The potential for subscription-based services also is strong, as markets around the world demonstrate.

With the availability of these new programs for "consumers on the go," broadcasters can develop new formats for their marketplace, or augment their existing

format by adding a mobile version of their main channel. This offers advertisers new opportunities to reach mobile consumers. Additionally, news brands can be leveraged by offering 24-hour news, traffic and weather feeds for mobile users. Broadcasters are local community stakeholders, and the sky is the limit for what they can offer to viewers, such as expanded sports programming for rabid high school and college fans, or a music-based or children's channel for backseat viewers in the family minivan. MPH mobile TV can reignite and excite audiences — plus the added channels

can translate into additional revenue with an expanded product available for sale.

If a station does not have extensive local programming or production capabilities, there are a large number of program providers who can offer high-quality content services that can be easily automated for playback and minimize a station's operational requirements. Stations can also benefit from leasing out bandwidth and providing a delivery "pipe" for content providers.

## Datacasting Applications

It has long been a goal of broadcasters to use an ATSC signal to cost-effectively deliver data to a large number of users. However, the limitations on reception in a mobile environment can reduce the number of opportunities. MPH™ changes the game for data delivery applications — imagine realizing new revenue streams by using an ATSC station to deliver digital signage content to taxicabs, buses or trains “on the move.” In addition to commercial applications, a large amount of critical content (Amber Alerts, for instance) can be delivered to law enforcement and other first responders on the go. Private data channels can be enabled and dedicated for government and public safety applications. The opportunities presented by this efficient mobile platform are limitless.

MPH mobile TV provides a competitive edge, with a powerful combination of mobile, local and free content to attract and retain viewers in an aggressive media market.

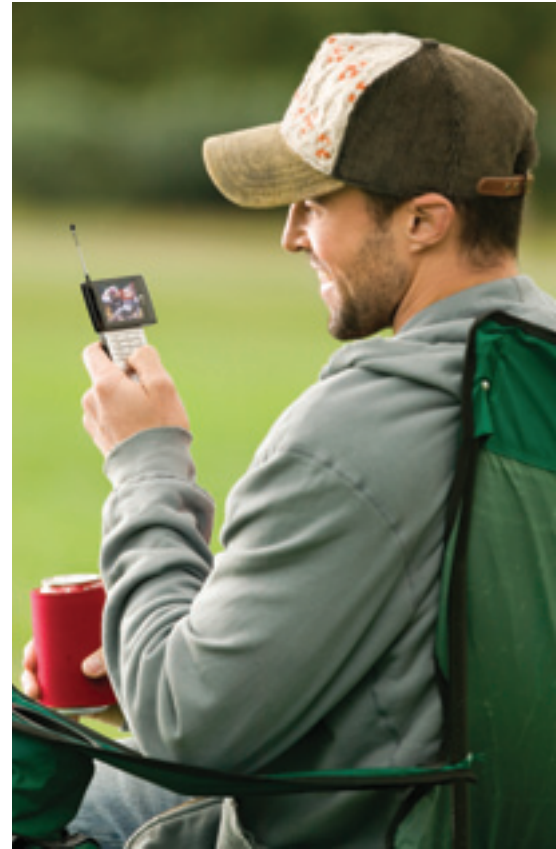
## MPH Partners

For the transmission of television or video content to mobile devices, the terms “mobile video” and “mobile TV” are often used interchangeably. However, typically one would use “mobile video” to define the delivery of video content via cellular systems and “mobile TV” to describe specialized broadcast overlay networks that use technologies such as DVB-H, T-DMB, MPH™, ISDB-Tb and FLO™. The MPH team has created a mobile TV ecosystem with best-in-class partners to provide complete end-to-end mobile TV solutions that deliver more value and open new revenue streams.



To help drive the market for mobile DTV, MPH system co-developer LG Electronics has developed a series of exciting mobile-pedestrian-handheld products that incorporate new circuitry for receiving the robust ATSC-compatible signals. Personal DTVs — built around LG’s popular portable navigation device with a 4-inch widescreen display — are optimized for pedestrian and mobile applications, whether you’re watching a sports broadcast while at the stadium, checking the local weather report on the commuter train, or watching the local news in the car. LG has incorporated MPH technology into two mobile phone platforms: a CDMA handset with a unique twist screen and a GSM touchscreen mobile phone. Both employ a simple whip antenna for VHF/UHF DTV reception. (The MPH capability in these mobile phones can complement other mobile video services such as MediaFIO.) For laptop PCs, LG has developed an add-on USB MPH digital TV receiver. A range of MPH consumer products from LG and other consumer electronics manufacturers is expected to be available to support broadcasters’ launch of MPH DTV services in 2009.

[www.lge.com](http://www.lge.com)



LG MPH Enabled Personal Media Player



LG MPH Enabled Mobile Phone



Triveni Digital is a leader in IP encapsulation and datacasting technology for the ATSC digital television standard. They have joined with the MPH™ team to provide IP encapsulation of both real-time and non real-time encoded MPH to a wide variety of MPH-enabled receiving devices. IP based MPH transmission simplifies content format compatibility across both the source of content and the many different types of receiving and viewing devices found in our increasingly multimedia world.

Triveni Digital's SkyScraper™ point-to-multipoint content distribution system enables delivery of real-time encoded H.264 audio/video program streams by using RTP/RTCP protocol. In addition, SkyScraper™ supports the encapsulation of file based, non real-time content which is encapsulated using the FLUTE protocol.

New business models for MPH broadcasters are also enabled by the Triveni Digital SkyScraper™ Ensignia digital signage solution, which will enable the display of video and still graphics complemented by a live ticker to provide a continually updated digital signage panel. By combining this Triveni technology with MPH™ as a delivery system, broadcasters can reach mobile audiences in buses, taxi cabs, light rail and other methods of public transportation.

For broadcasters, MPH technology opens the door to new revenue streams, supporting exciting mobile applications without compromising continued HDTV, SDTV and datacasting services. Consumers benefit through access to their favorite programs, even when they're on the road or using a handheld video device away from home.

[www.trivenidigital.com](http://www.trivenidigital.com)



Envivio is the world's leading supplier of professional-grade video compression systems for both broadcast and streaming mobile TV services. The Envivio Mobile Series product family, featuring the 4Caster M2 and M4 encoders, powers hundreds of commercial mobile TV deployments all around the world. Five years of experience in this new and exciting market has clearly demonstrated that delivering the highest possible Quality of Experience (QOE) to the end user is the most effective way to guarantee success. Envivio is bringing this extensive mobile TV compression experience to the MPH broadcasting system to ensure that subscribers enjoy the highest possible service quality. Envivio achieves this by delivering:

- High-quality video and audio playback optimized for mobile devices
- Stable and reliable service delivery
- Proven end-to-end system interoperability
- Handset playback on the widest range of devices

[www.envivio.com](http://www.envivio.com)



The use of a broadcast infrastructure to complement mobile networks opens up a new range of revenue-generating services for mobile operators, including TV. The use of these existing broadcast networks ensures that investment remains limited and rollout is accelerated. UDcast is heavily involved in this market. To address a number of issues related to the use of ATSC networks, such as handheld power consumption and mobile and indoor reception, the new mobile broadcast standards have been developed and are now helping to drive digital TV toward mobile applications.

UDcast ATSC MPH IP Encapsulation Solution:

- MPE IP encapsulation
- Field-proven scalability, compatibility, reliability and redundancy
- IPE Manager ensures automatic network configuration and interoperability with service management platforms

[www.udcast.com](http://www.udcast.com)



Expway's FastESG™ (Electronic Service Guide—ESG—for mobile MPH network) and FastEPG™ (Electronic Program Guide—EPG—for IPTV and broadcast networks) enable broadcasters and operators to grow their revenues by promoting and differentiating their service offerings.

**Features:**

- Standard OMA broadcast server and client ESG engine
- ESG management, including logos, images and related content
- Datacasting services management
- Advertisement management (interstitial, banners, etc.)
- Regionalization (optimal solution for regional services and content delivery)
- Time-accurate and/or contextual interactive services and advertising management
- IPTV and MPH convergence
- Multiple operator with optimized bandwidth
- Interface with content protection solutions from Nagra, Viaccess, NDS, Irdeto and CastLabs
- Standards-compliant with single- and multiple-stream support
- Fast Update technology
- Remote monitoring and control (SNMP)
- Redundancy management

[www.expway.com](http://www.expway.com)



## **ONE Company for Workflow Solutions Throughout the Broadcast Chain**

Harris is the ONE company delivering interoperable workflow solutions across the entire broadcast delivery chain — providing today's broadcaster with a single, integrated approach to capitalize on the benefits of IT and mobile applications. By providing unparalleled interoperability across our product portfolio, Harris is able to offer customers integrated solutions that improve workflows, save money, enable new revenue streams and provide a migration path to emerging media business models. To meet the evolving needs of broadcast, distribution, government agencies and entertainment businesses, Harris is the ONE answer for change.

## **Service And Support**

At Harris, we are committed to customer service excellence. It is our goal to provide the highest level of support by applying a simple rule: We take ownership of helping our customers succeed. Our support teams consist of innovative technical experts who support all situations regarding product performance, integration and operational processing. We are adept at providing proven solutions, making workflows better and ensuring reliability of the product and system. At Harris, our experienced and dedicated teams stand ready to help you meet your goals for premium product performance, 100% up-time and reduced maintenance investment.

## **Warranty**

Because we want to assure you that Harris stands beside its products and system solutions, our products carry a standard set of warranty services, which are competitive with — and in some cases outperform — others in the industry.

## **Service Packages**

We offer value-add services that allow you to customize the level of services you need in meeting mission-critical performance levels. Our service package options offer many ways to upgrade your standard warranty by choosing the All-Inclusive OnePak, or by selecting individual services from our extensive portfolio. Our service and support advisors can assist in the selection of the individual services that best suit your requirements.

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**For more information please visit [www.broadcast.harris.com](http://www.broadcast.harris.com).**

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