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**High Bandwidth Wireless for HD and 3D/HD Digital Video  
Cameras**

*New developments in wireless technology allow uncompressed HD and 3D/HD to be transmitted up to 500 yards with the highest fidelity of signal and resolution*

High speed, high bandwidth wireless is now available that can transmit uncompressed high definition (HD) video signals and even High Def 3D at the performance level required to ensure the highest fidelity of signal and resolution.

This technology, in the hands of camera operators in motion picture, television, sports, and Electronic News Gathering (ENG) organizations is ideal for the placement of digital video cameras in remote locations up to 500 meters from the receiver without wires and without concern for interference.

The breakthrough involves technology that works in the unlicensed 60 GHz “millimeter wave” frequency band. The data bandwidth available at this frequency allows a tremendous amount of digital information to be transmitted wirelessly at high speeds, a feat not possible at the lower frequencies used by most wireless equipment.

## **Explosion in Data Transmission**

The industry has struggled for some time to identify wireless and even physical cabling connections that can keep up with the rapidly increasing bandwidth required for high definition filming.

The escalating demand is being driven not only by higher resolution devices, but also with the upsurge in popularity of 3D/HD motion pictures, televisions, smart phones and gaming monitors.

Because 3D is shot essentially utilizing two cameras that film slightly offset images that are synchronized to create the dimensional effect, two independent HD streams must be transmitted simultaneously. This immediately doubles the data transmission requirement and presents the challenge of doing so through a delivery system – physical or wireless – that has no latency issues.

## **Physical Cabling – Fiber, Coax**

The most obvious solution for high speed transmission of data-intensive content would be to establish a physical connection via fiber optic cabling.

However, digital 3D/HD fiber optic cable has significant latency issues that can affect the synchronization of the two digital streams of data. To compensate, complex and expensive multiplexers are required, which lead to racks of equipment on-site and a completely non-portable solution.

Due to the deficiencies of fiber optic cable, the industry often utilizes a coax cable solution that can be run to a distance of approximately 300 meters. However, the limitations of data transmission often lead to stepping down the resolution and sacrificing quality.

High bandwidth wireless, naturally, would be the ideal solution and eliminate the need for any kind of physical connection. But traditional wireless options are unable to keep up with the bandwidth requirements as well.

Fortunately, a little used portion of the wireless spectrum known as the millimeter wave band has all the bandwidth capability, and more, to ensure the highest fidelity and resolution of signal from source to receiver.

### **Millimeter Wave Band**

Millimeter waves (also known as extremely high frequency or EHF) operate within a frequency range of 30-300 GHz.

What makes this range so attractive to the broadcasting and film industries is the available bandwidth. Standard wireless at lower frequencies can only deliver 2-5 MHz of bandwidth. The lesser used millimeter wave band, on the other hand, can deliver data at speeds of up to 10 GB/s currently, with projections increasing to as much as 40 GB/s by 2014.

Until recently, the military has been the primary user of this spectrum for developing short range wireless communication products. Not only is the technology mature, but with the cost of the all-important Monolithic Microwave Integrated Circuits (MMIC) dramatically decreasing in recent years (a trend that is expected to continue), the technology is now being utilized for commercial applications.

The millimeter band, however, does have some distance limitations. Millimeter wave radio signals in certain frequencies can suffer atmospheric attenuation over long distances. Rain and humidity can also dilute signal strength. As a result, wireless transmission is limited to about 1 mile.

### **Products Emerge**

The first millimeter wave products in the 60 GHz band – a frequency available for unlicensed commercial applications – are now being introduced that specifically target the HD and 3D/HD motion picture, television and broadcast industries.

Renaissance Electronics Corporation (REC) and its wholly owned subsidiary, HXI, for example, have recently introduced a millimeter wave based product specifically designed for high definition and 3D digital filming, the GigaLink HD wireless radio links.

These wireless radio links, which are available as single or dual channel, are the first unlicensed wireless system that transmits uncompressed raw HD/SDI video at 1.485 GB/s.

The dual channel model can transport independent, uncompressed video signals from two HD cameras or alternately High Definition 3D with both 3D/HD input signals transported in perfect synchronization at 2.970 GB/S (combined). This is all without the need for compression or forward error correction, avoiding the associated latency.

The GigaLink Products were developed specifically for use with Sony HDC and HDCU-F950 Digital 4:4:4 CineAlta systems but will interface with any SMPTE 372M or SMPTE 292M compliant production system.

These portable wireless links consist of a transmitter and a receiver that each weighs approximately 11 pounds. Operating range is up to 500 meters in clear air to light rain conditions.

### **New Possibilities in 3D Filming**

With its performance meeting or exceeding fiber optics, this technology has particular value for Electronic News Gathering (ENG), live events (sports, holiday parades, etc.), film, TV and for studio to transmitter links.

Because wireless in the millimeter wave spectrum has a limited range, the applications for HD and 3D/HD video include those that call for portability and/or camera repositioning. These lightweight radio links can be set up and positioned in remote locations without wires visible in the shot and without concern for interference.

Another potential application is for broadcasting live events, such as the Olympics or Holiday Parades, where the installation of physical cables that later have to be removed (or left) is not feasible. Sporting events also benefit from the portability, as cameramen move from location to location at an event.

For more information, contact Renaissance Electronics at phone (978) 772-7774 or on the web at [www.rec-usa.com](http://www.rec-usa.com) / [www.hxi.com.com](http://www.hxi.com.com). They are located at 12 Lancaster County Road, Harvard MA 01451.

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