

## DoubleTalk Carrier-in-Carrier Overview

DoubleTalk Carrier-in-Carrier, based on patented “Adaptive Cancellation” technology, allows transmit and receive carriers of a duplex link to share the same transponder space. DoubleTalk Carrier-in-Carrier is complementary to all advances in modem technology, including advanced FEC and modulation techniques. As these technologies approach theoretical limits of power and bandwidth efficiencies, DoubleTalk Carrier-in-Carrier utilizing advanced signal processing techniques provides a new dimension in bandwidth efficiency.

Figure 1 shows the typical full-duplex satellite link, where the two carriers are adjacent to each other. Figure 2 shows the typical DoubleTalk Carrier-in-Carrier operation, where the two carriers are overlapping, thus sharing the same spectrum.

When observed over a spectrum analyzer, only the Composite is visible. Carrier 1 and Carrier 2 are shown in Figure 2 for reference only.

## A New Dimension in Bandwidth Efficiency

DoubleTalk Carrier-in-Carrier is complementary to all advances in modem technology, including advanced FEC and modulation techniques. As these technologies approach theoretical limits of power and bandwidth efficiencies, DoubleTalk Carrier-in-Carrier (utilizing advanced signal processing techniques) provides a new dimension in bandwidth efficiency.

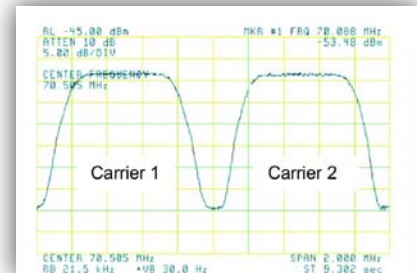


Figure 1:  
Without DoubleTalk Carrier-in-Carrier

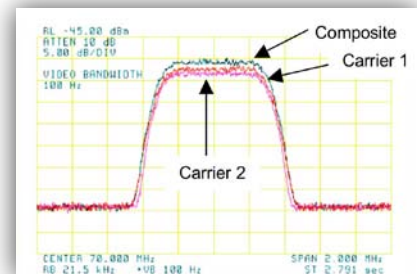


Figure 2:  
With DoubleTalk Carrier-in-Carrier



DoubleTalk Carrier-in-Carrier allows satellite users to achieve spectral efficiencies (i.e. bps/Hz) that cannot be achieved with traditional links. For example, DoubleTalk Carrier-in-Carrier when used with 16-QAM approaches the bandwidth efficiency of 256-QAM (8bps/Hz).

As DoubleTalk Carrier-in-Carrier allows equivalent spectral efficiency using a lower order Modulation and/or FEC Code, it can simultaneously reduce CAPEX by allowing a smaller BUC/HPA and/or antenna.

DoubleTalk Carrier-in-Carrier can be used to save transponder bandwidth and/or transponder power, thereby allowing successful deployment in *bandwidth-limited* as well as *power-limited* scenarios.

## Global Acceptance of DoubleTalk Carrier-in-Carrier

Our revolutionary DoubleTalk Carrier-in-Carrier is a proven technology. Globally accepted, DoubleTalk Carrier-in-Carrier is installed by major operators, service providers, governments and enterprises. Below are announcements that demonstrate the global acceptance of this award-winning technology.



Date	News Release
May 9, 2012	<a href="#">Comtech Telecommunications Corp. Awarded \$2.5 Million SATCOM Equipment Contract to Support Mobile Backhaul &amp; Trunking</a>
May 7, 2012	<a href="#">Comtech Telecommunications Corp. Receives \$1.8 Million Order for Modems with DoubleTalk® Carrier-in-Carrier® to Support Military Network Expansion</a>
January 12, 2012	<a href="#">Comtech Telecommunications Corp. Receives \$1.0 Million Order for SATCOM Equipment to Support Mobile Backhaul</a>
December 20, 2011	<a href="#">Comtech Telecommunications Corp. Awarded \$4.1 Million Contract for SATCOM Equipment to Support Mobile Backhaul</a>
August 24, 2011	<a href="#">Comtech Telecommunications Corp. Receives \$1.3 Million Order for Satellite Earth Station Equipment to Support Network Expansion in Asia</a>
August 24, 2011	<a href="#">Comtech Telecommunications Corp. Awarded \$1.2 Million Order for Satellite Earth Station Equipment to Support Telecommunications Network Expansion in Africa</a>
August 18, 2011	<a href="#">Comtech Telecommunications Corp. Receives \$4.8 Million of Satellite Earth Station Orders From Commercial Customer</a>
June 27, 2011	<a href="#">Comtech Telecommunications Corp. Receives Large Contract From Bharti Airtel for Satellite Cellular Backhaul Equipment</a>
May 10, 2011	<a href="#">Comtech EF Data Receives 2011 NGN Leadership Award from NGN Magazine</a>
April 14, 2011	<a href="#">Comtech Telecommunications Corp. Receives \$1.2 Million Satellite Ground Station Equipment Order</a>
March 3, 2011	<a href="#">WTA Announced Finalists for 2011 Teleport Awards for Excellence</a>
December 14, 2010	<a href="#">Comtech Telecommunications Corp. Wins \$1.3 Million Order for MIL-STD-188-165A Modems</a>
October 27, 2010	<a href="#">Comtech EF Data Receives New Product Innovation of the Year Award by Frost &amp; Sullivan</a>
July 27, 2010	<a href="#">Comtech Telecommunications Corp. Announces \$1.0 Million in Orders for New High-Speed Trunking Modem</a>

July 3, 2010	<a href="#">Receipt of BSNL's Technical Specification Evaluation Certificate for the CDM-625 with DoubleTalk Carrier-in-Carrier</a>
May 3, 2010	<a href="#">Comtech Telecommunications Corp. Awarded \$4.8 Million SATCOM Equipment Order From Telecommunications Service Provider</a>
April 5, 2010	<a href="#">Comtech Telecommunications Corp. Wins \$12.1 Million in SATCOM Equipment Orders for Government Network Expansion</a>
March 23, 2010	<a href="#">Comtech EF Data's CDM-625 Advanced Satellite Modem Wins Teleport Technology of the Year Award</a>
January 14, 2010	<a href="#">Comtech Telecommunications Corp. Awarded \$1.6 Million Order for Satellite Modems for an Asia-Pacific Cellular Operator</a>
January 6, 2010	<a href="#">Comtech Telecommunications Corp. Receives a \$1.3 Million Satellite Modem Order</a>
November 19, 2009	<a href="#">Comtech Telecommunications Corp. Wins Advanced Satellite Modem Order for Asian Cellular Operator</a>
November 10, 2009	<a href="#">Comtech Telecommunications Corp. Receives \$1.2 Million Order for Satellite Modems to Support Cellular Backhaul in Africa</a>
October 1, 2009	<a href="#">Comtech Telecommunications Corp. Receives \$1.1 Million SATCOM Equipment Order from the U.S. Government</a>
April 7, 2009	<a href="#">Comtech Telecommunications Corp. Obtains \$2.2 Million Equipment Order to Support Satcom-Based Cellular Backhaul</a>
March 5, 2009	<a href="#">Comtech Telecommunications Corp. Wins \$1.7 Million in Equipment Orders to Support Satellite-Based Cellular Backhaul</a>
January 7, 2009	<a href="#">Comtech Telecommunications Corp. Receives \$1.4 Million in Equipment Orders to Upgrade a GSM Network in Africa</a>
October 28, 2008	<a href="#">Comtech Telecommunications Corp. Receives \$6.2 Million SatCom Equipment Orders to Support Cellular Backhaul in Asia and Middle East</a>
October 14, 2008	<a href="#">Comtech Telecommunications Corp. Wins \$1.1 Million Equipment Order to Support Satellite-Based Cellular Backhaul</a>
April 24, 2008	<a href="#">Comtech Telecommunications Corp. Receives \$1.1 Million Satellite Communications Equipment Order to Support a Cellular Backhaul Network in Asia</a>
April 21, 2008	<a href="#">Comtech Telecommunications Corp. Receives \$1.3 Million Satellite Communications Equipment Order to Support Cellular Backhaul Networks in Africa and the Middle East</a>
March 13, 2008	<a href="#">Comtech Telecommunications Corp. Receives \$1.3 Million in Satellite Communications Equipment Orders for GSM Backhaul Network in Africa</a>
February 21, 2008	<a href="#">Comtech EF Data and Intelsat Offer Ways to Increase Satellite Efficiency</a>
October 11, 2007	<a href="#">Comtech Telecommunications Corp. Receives \$2.6 Million in Orders to Supply Satcom Equipment for a Cellular Backhaul Network Expansion in Asia</a>

October 2007	<a href="#">ST Teleport Validates the Technical &amp; Business Case for Deploying the Bandwidth-Efficient CDM-Qx with DoubleTalk Carrier-in-Carrier</a>
May 22, 2007	<a href="#">Gateway Communications' Use of the CDM-Qx with DoubleTalk Carrier-in-Carrier</a>
May 2007	<a href="#">Pan-Africa Service Provider Addresses Satellite Capacity Shortage</a>
February 28, 2007	<a href="#">Comtech EF Data Awarded Teleport Technology of the Year by World Teleport Association</a>
November 2006	<a href="#">Premier Communications Provider Doubles Satellite Transponder Throughput</a>

## Selection of Products

DoubleTalk Carrier-in-Carrier is currently available as an option for the following products:

- CDM-750 Advanced High-Speed Trunking Modem
- SLM-5650A Satellite Modem
- DMD2050E Universal Satellite Modem
- DMD2050 Universal Satellite Modem
- CDM-625 Advanced Satellite Modem
- CDM-625-EN Advanced Satellite Modem
- CDM-Qx and CDM-QxL Multi-Channel Satellite Modems
- DMD20 Universal Satellite Modem
- DMD20 LBST L-Band Satellite Modem
- CLO-10 Link Optimizer (modem agnostic)



## Consider DoubleTalk Carrier-in-Carrier for Your Network

Does DoubleTalk Carrier-in-Carrier make sense for your satellite links? An easy way to analyze the possible benefits is to download our Excel-based Link Optimization Tool. We created this tool to highlight the multi-dimensional optimization that can be achieved with our advanced technologies. Explore the value today and download this free tool via <http://www.comtechefdata.com/tools/toolstco>



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