

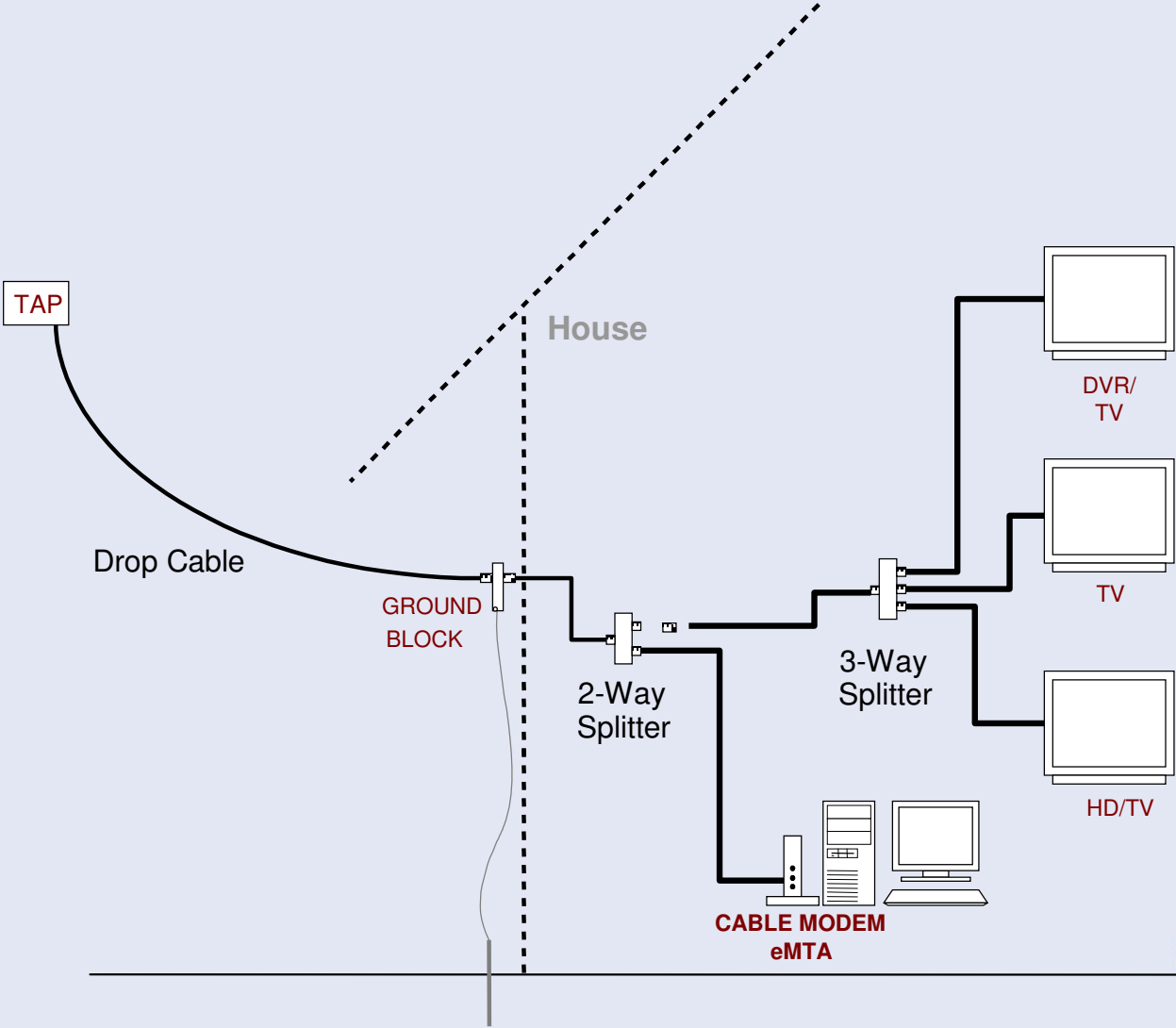
INTRODUCING

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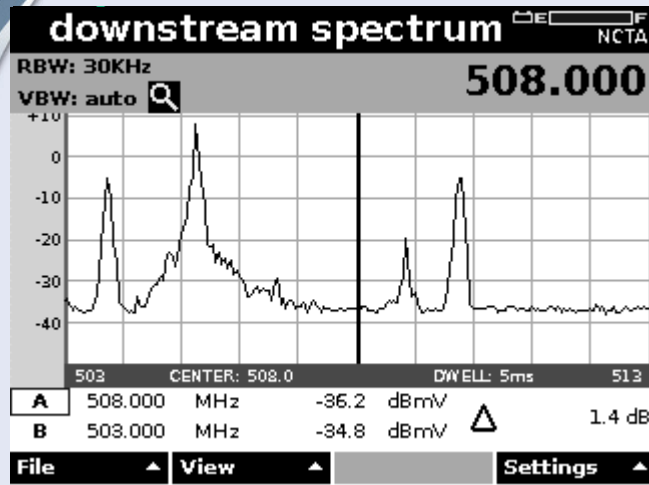
Presented By: Keith Grunberg
Account Executive III
Charter Business
Oregon/Washington

Date: 16 October 2008

A Typical Installation

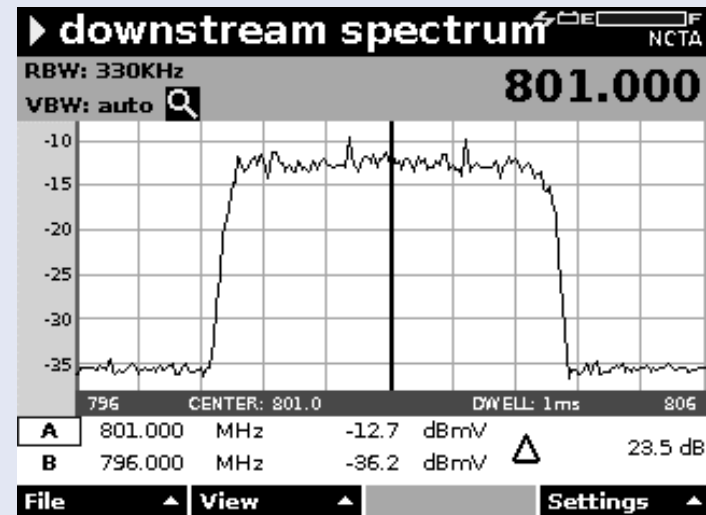


Defining ANALOG Modulation



Analog Content – 6Mhz Analog Carrier

Digital Content – 6Mhz Analog Carrier



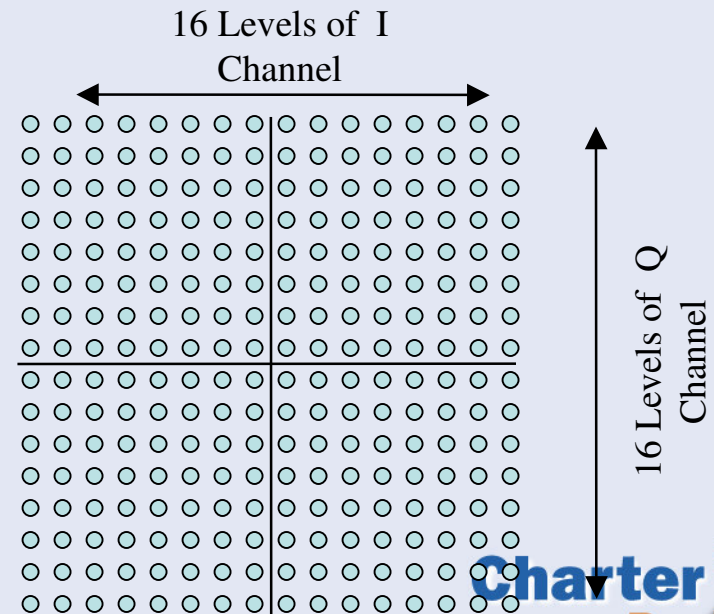
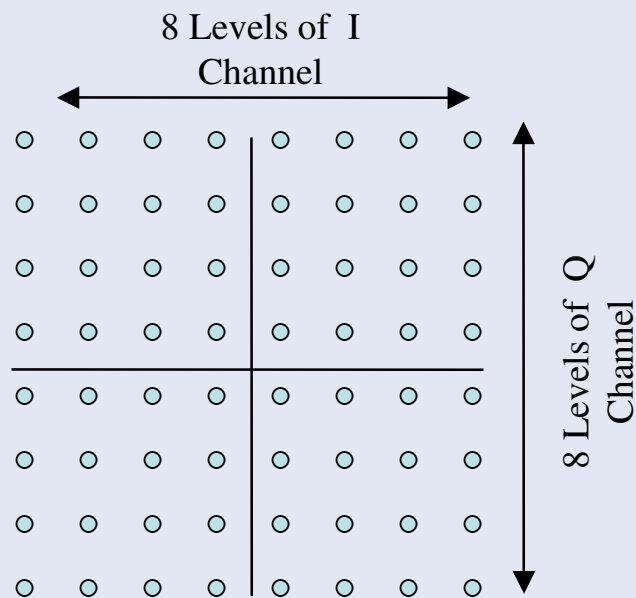
QAM and CATV

QAM - (Quadrature Amplitude Modulation)

- Is a method of combining two amplitude-modulated signals into a single channel, thereby doubling the effective bandwidth (Analog QAM).
- In Digital QAM, the constellation points are usually arranged in a square grid. Since in digital telecommunications the data is usually binary, the number of points in the grid is usually a power of 2 (2,4,8...). Since QAM is usually square, most common forms are 16-QAM, 64-QAM, 128-QAM and 256-QAM.

64 QAM and 256 QAM

- 64 QAM has 8 levels of I and 8 levels of Q making 64 possible locations for the carrier.
- 256 QAM has 16 levels of I and 16 levels of Q making 256 possible locations for the carrier.
- QAM 256 is somewhat less robust vs. QAM 64



DOCSIS is the Standard for data over Cable

- DOCSIS® (Data Over Cable Service Interface Specification), defines interface requirements for cable modems involved in high-speed data distribution over cable television system networks.
- 16 QAM is part of the DOCSIS® 1.0/1.1 **upstream** specifications and 64 QAM is part of the DOCSIS® 2.0 **upstream** specifications
- 64 QAM and 256 QAM is used for both digital video and DOCSIS **downstream**, allowing more digital data transmission using the same 6 MHz bandwidth
 - Transmit equivalent of 6 to 10 (SD) analog channels or 2-3(HD Streams) over one 6 MHz bandwidth channel

DOCSIS® Versions at a Glance

DOCSIS 1.0 (High Speed Internet Access)

- 23 million products shipped worldwide as of YE2002
- 228 CM Certified, 29 CMTS Qualified

DOCSIS 1.1 (Voice, Gaming, Streaming)

- Interoperable and backwards-compatible with DOCSIS 1.0
- “Quality of Service” and dynamic services, a MUST for PacketCable™
- In the field NOW - 64 CM Certified, 22 CMTS Qualified

DOCSIS 2.0 (Capacity for Symmetric Services)

- Interoperable and backwards compatible with DOCSIS 1.x
- More upstream capacity than DOCSIS 1.0 (x6) & DOCSIS 1.1 (x3)
- Improved robustness against interference (A-TDMA and S-CDMA)
- Available NOW – Number of CM & CMTS Qualified growing

DOCSIS 3.0 (Channel Bonding)

- Interoperable and backwards compatible with DOCSIS 1.x & 2.0
- Specification released this year, equipment becoming available

Good Resource Site: www.cablelabs.org

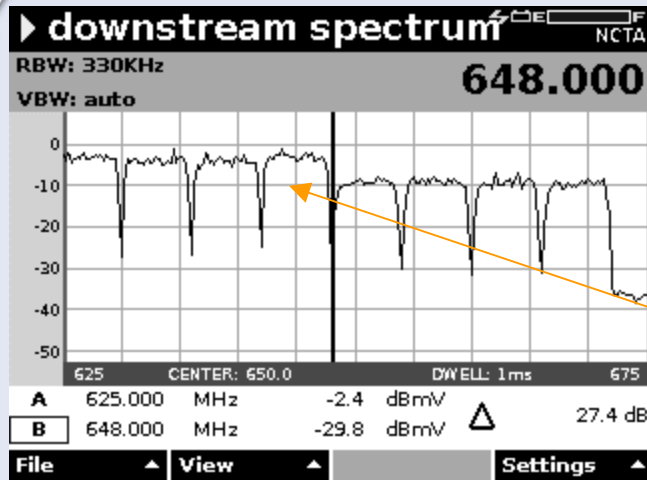


DOCSIS 3.0 Overview

- Specification late last year
 - DOCSIS 3.0 Interface Specifications (Released December 2006)
 - CPE equipment in development stages
- Downstream data rates of 160 Mbps or higher
 - Channel Bonding **256QAM => ~40Mbps**
 - 4 or more channels **4 x 256QAM => ~160 Mbps**
- Upstream data rates of 120 Mbps or higher
 - Channel Bonding **64QAM => ~30Mbps**
 - 4 or more channels **4 x 64QAM => ~120 Mbps**
- Internet Protocol version 6 (IPv6)
 - *Current System (IPv4) is limited to 4.3B numbers*
 - IPv6 greatly expands the number of IP addresses
 - Expands IP address size from 32 bits to 128 bits
 - IPv6 supports 3.4×10^{38} addresses;
 - Colon-Hexadecimal Format
- 100% backward compatible with DOCSIS 1.0/1.1/2.0

4923:2A1C:0DB8:04F3:AEB5:96F0:E08C:FFEC

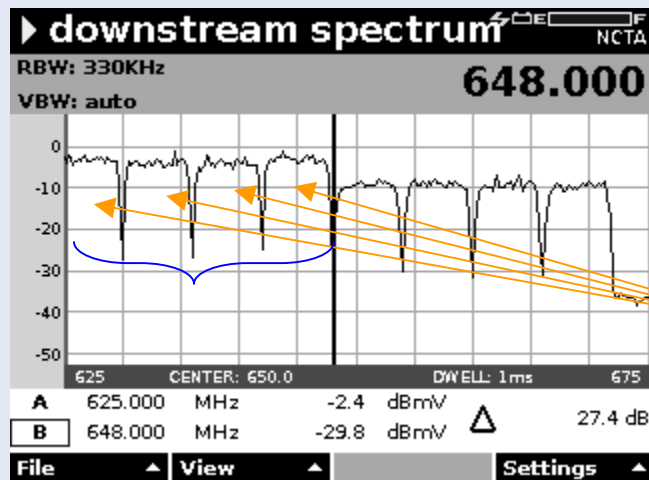
DOCSIS 3.0 – Channel Bonding



Individual QAM 256 DOCSIS channel

Versions 1.0/1.1/2.0 used only one channel for upstream and one channel for downstream communications

256QAM => ~40Mbps



4 Bonded QAM 256 DOCSIS channels

DOCSIS v3.0 Spec requires devices to be able to bond a minimum of 4 upstream channels into one and 4 downstream channels into one for 4 times increased throughput in both directions

The MSO does not have to use all 4 channels, but the devices which are 3.0 compliant must have the ability to bond 4 or more channels in both directions

4 x 256QAM:

4 x 40Mbps = 160 Mbps



Thank You!

Charter 
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