

DM240XR Equalization and Group Delay (AutoEQ™)

White
Paper

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Introduction

Broadcasters – Are you getting what you paid for? Get AutoEQ™ and reclaim your bandwidth! Are you buying 36MHz transponders but limiting your usage to 29 MHz of useable bandwidth.

Obviously there were good reasons why this was the case. Without an “Equalizer”, this is what you will be limited to. Now you can literally “get what you paid for”. The Radyne line of satellite broadcast modulators (DM240XR series) now have the ability to allow you to use virtually all of the transponder bandwidth you paid for. We have engineered a full function automatic setup - Amplitude and Group Delay equalizer into our broadcast modulators! This automatic equalizer (AutoEQ™) offers 10-20% more capacity on your existing transponders.

The Problem

Satellite communications obviously rely on satellites. Satellites use numerous “transponders” for the relay of ground stations to talk to other ground stations. Each transponder is amplified by either a traveling wave tube amplifier (TWTA) or a solid state power amplifier (SSPA). Satellites of this type are very popular for transmitting TV channels to broadcast stations, cable TV systems, and directly to the home.

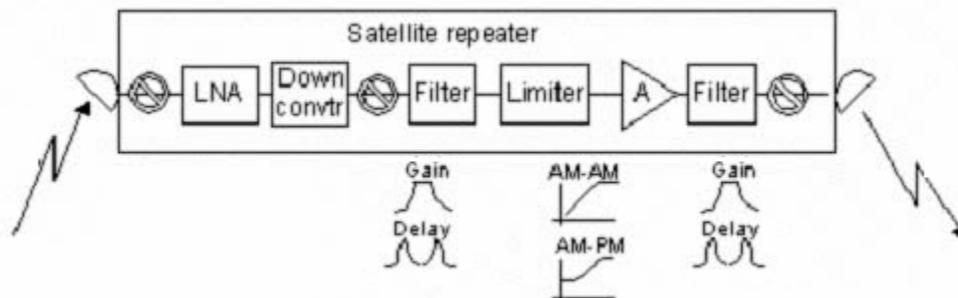


Figure 1. Satellite Repeater

Transponders receive weak signals, amplify the signal strength, translate it to the downlink frequency, filter unwanted sidebands, and amplify it again to send the newly “cleaned and amplified” signal down to the receive site (See Figure 1) . This is exactly what we need to complete a satellite link.

However, some of the steps mentioned above introduce unwanted side effects. Filters and amplifiers also introduce amplitude (AM-AM), phase (PM-PM and AM-PM) distortions / delay. These amplitude and phase delay distortions effectively limit the useable bandwidth on a transponder at its min and max frequencies forcing large carriers to use the “center” of the transponder.

The Solution

The way to fight distortion is to essentially fight fire with fire. When you pre-distort your signal with the opposite phase and amplitude as the known transponder, you can essentially eliminate the negative effects of the amplifier and filter (Figure 2). This is very similar to what is done in common “noise cancelling” headphones.

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What results is a carrier that is free of distortion and defects that can be used at any frequency on the transponder. However, none of this is new. Pre-distortion has been available for many years.

But what is new is the ability to quickly and accurately dial-in the correct pre-distortion to properly oppose the transponder. Historically these devices were hand tuned, required 30min to 3+ hours to properly align, and when you were finally finished you still could only remove a portion of the phase and amplitude distortion.

Furthermore you typically need to use these devices in a 70 or 140MHz environment, for example L-Band, and the price for each of these stand alone devices are close to \$10,000.

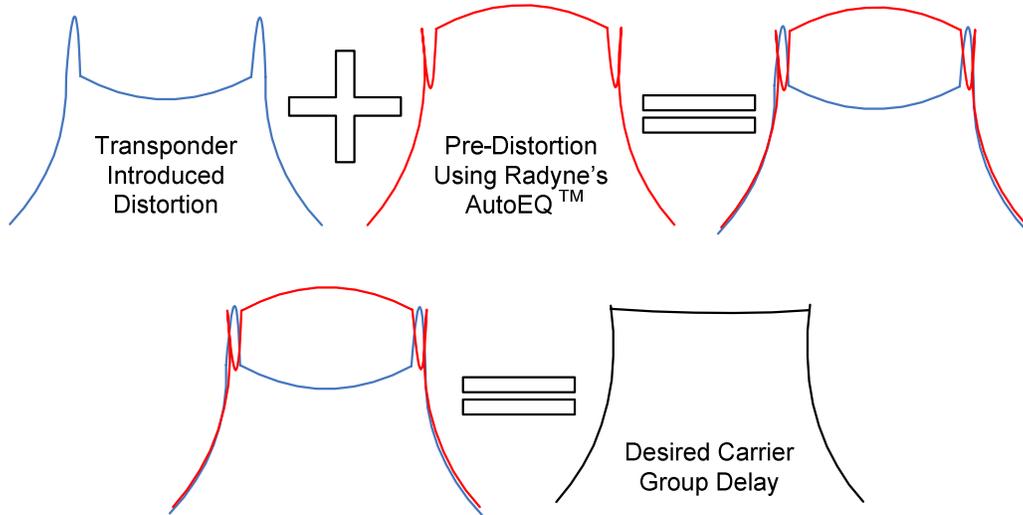


Figure 2.

Today

Radyne's award winning line of broadcast modulators (DM240XR) now come with an available group delay and amplitude delay equalizer with automatic set-up "AutoEQ™".

The DM240XR has an ingenious sample port that can detect and determine the amplitude and group delay response of any transponder and automatically pre-distort the modulated carrier to perfectly compensate for the transponder distortion. Figure 3 illustrates actual performance results using Radyne's AutoEQ™ technology.

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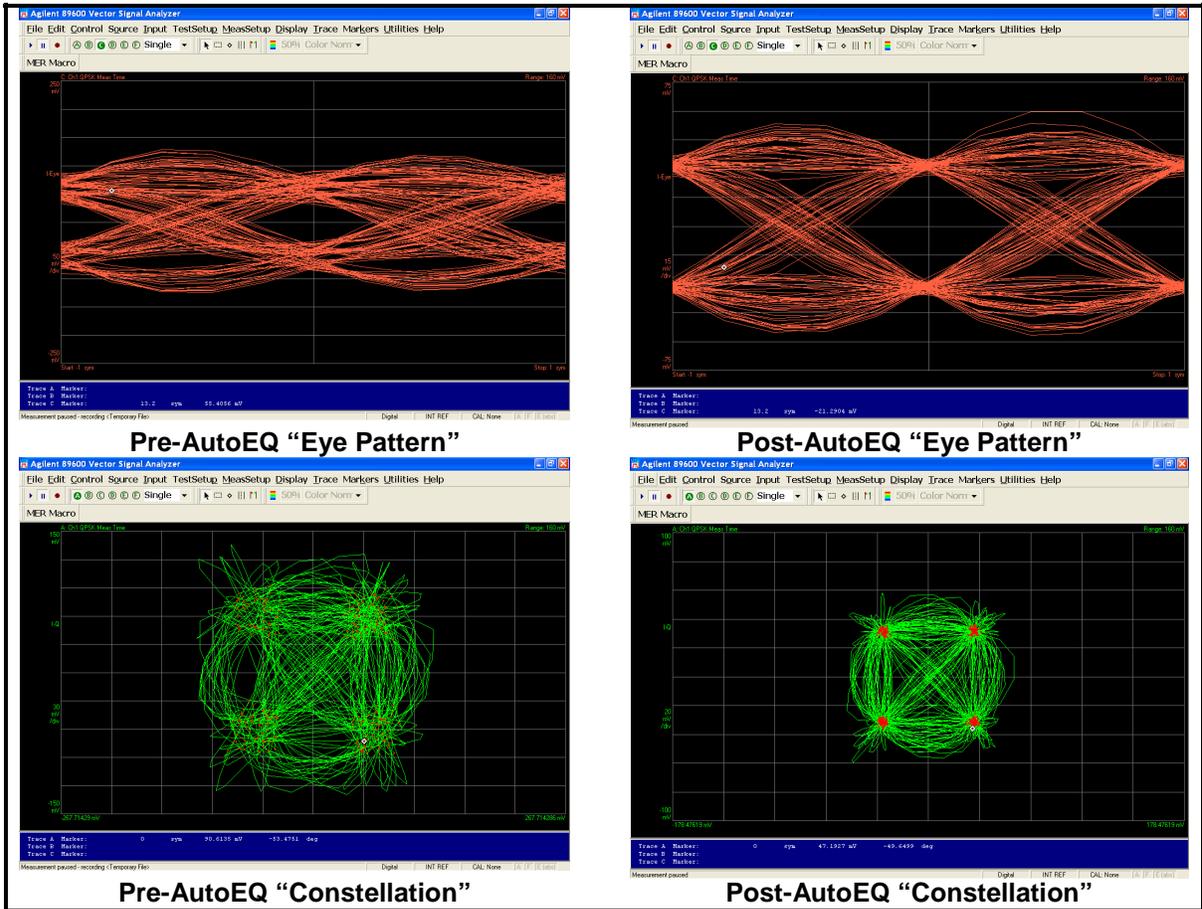


Figure 3. Actual Performance Results

No more manual tuning of the equalizer, pulling units out of racks to twist tuning screws, and no more hours of wasted time. Best of all, AutoEQ™ takes up no room in your uplink facility and works at all Radyne supported IF frequencies (70/140 and L-Band) and COSTS LESS than conventional equalizers. The choice is simple.