



Application Note
AN-8
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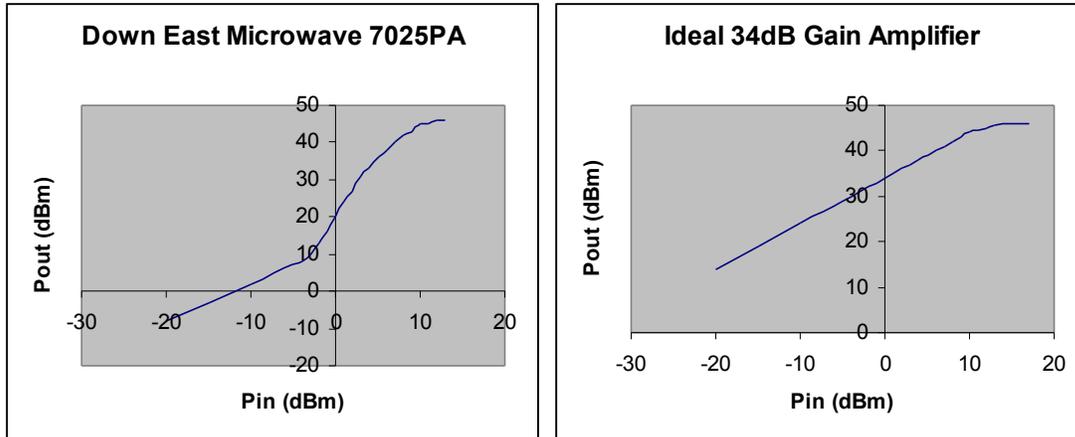
"Linear" Amplifiers - Buyer Beware

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After the Four Mile Canyon fire, in Sept. 2010, I started on a "home brew" project to build an improved 70 cm, VUSB-TV transmitter for BCARES and a couple of other hams. The objective was to have a 25 Watt transmitter. Previously, the highest power TV transmitters we have been using had 10 Watts output. The plan was to follow the same architecture as used in the TV transmitter I described in the Dec. 2007 issue of BARC's Bark. (the KH6HTV VIDEO, model 70-1). This used a VUSB-TV modulator with 0 dBm output followed by a high gain, linear amplifier.

I searched the web and thought I found an ideal linear, high power, 70 cm amplifier. It was the model 7025PA from Down East Microwave.. Per Down East's 7025PA data sheet, they claimed *"The 7025PA is a broadband, linear, power amplifier covering the entire 70cm amateur band. It has a linear power output of 25 Watts minimum with 10 mW of drive or a saturated output of over 40 Watts. This design may be used for AM ATV"*

I ordered the DEM-7025PA kit (\$160) and assembled and tested it. I was impressed by Down East's nice packaging design. However, I was terribly disappointed by the electrical performance of this so-called "*Linear ?*" amplifier. Yes, it put out 25 Watts (+44 dBm) with 10 mW (+10 dBm) drive for a gain of 34 dB as advertised and the saturated output power was 40 Watts (+46 dBm). BUT, at lower drive levels, the amplifier was very non-linear. At low drive levels below -4 dBm, the amplifier's gain was very linear, but only 12 dB. See the Pout vs. Pin plot below.



A gain variation from 12 dB to 34 dB over an input range of only 10 dB will cause extreme distortion of analog signals such as AM, SSB, and TV. Totally unacceptable ! This response will cause severe spectrum broadening and 'splatter' all over the band and out of band.

A truly linear amplifier should have a Pout vs. Pin straight line response similar to the next plot. All amplifiers eventually will saturate at too high input drive levels and this is to be expected. Knowledgeable users will avoid overdriving their amplifiers

I contacted Down East and complained about their very "Non-Linear" linear amplifier and sent them my test data. They then tested one of their 7025PA amps and confirmed my results. I returned my amplifier to Down East and they did refund my money (except for shipping).

Buyer Beware ! --- I should have been more careful in my initial web search. Down East's spec sheet said they used the SAU83L MOSFET hybrid power module. I was able to obtain a Toshiba data sheet for this part from RF Parts (www.rfparts.com). Toshiba's specs. were very minimal. Toshiba makes no linearity claims. They only specified it to give >32 W output with 50 mW drive. They gave no Pout vs. Pin curves.