Report Demonstration Field Test

The device under test:	**G**enesys **R**esonant **A**ctive **T**unable (**GRAT**) antenna
Designer-owner:	GENESYS LTD
Model code name:	GRAT-C-27V3
Device Purpose:	RF Transmitting-Receiving antenna with 27 MHz resonance frequency
Similar devices:	none
When:	December, 2012
Where:	38°51'21.26"N, 77° 4'51.21"W

Introduction

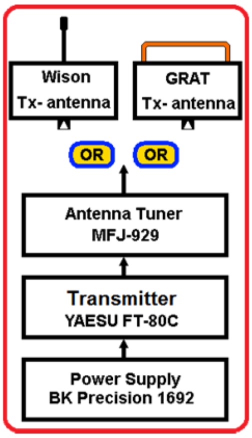
Genesys successfully demonstrated that its device, having a working title GRAT-C-27V3, is functional and effective. The test consisted of a comparison between two identical GRAT antennas and two standard antennas.

Two vehicles were used, one for transmitting an un-modulated carrier AM signal, the transmitter station, and the other for receiving that transmitted signal, the receiver station. The stations on each vehicle were powered solely by the vehicle battery. Each vehicle was equipped with two antennas, one standard antenna and one GRAT antenna. The two antennas on the receiver station were attached to a switch, such that only one antenna can be used at any given time. The two antennas on the transmitter station were manually attached, one at a time, to the antenna tuner. The receiver station was located 20 meters from the transmitter station. All tests were performed on the 11-meter band of Citizen Band Radio at 27 MHz.

The test performed by Genesys was consistent with the previously submitted plan. The results showed full compliance with the claimed antenna characteristics, and those results were registered using standard measurement equipment. The device performed properly and efficiently as promised by Genesys.

Transmitter Station

The transmitter station included the following devices connected as shown in the diagram to the right:



DC/AC converter:	BELKIN F5C400-300W
Power supply*:	BK Precision, model 1692
Transmitter*:	YAESU FT-80C
Automatic Antenna Tuner*:	MFJ-929
Standard Tx-antenna:	Wilson Silver Load FGT
GENESYS Tx-antenna:	GRAT-C-27V3

*Indicators built into the power supply, transmitter, and antenna tuner were used to monitor all presets and data changes during the test.

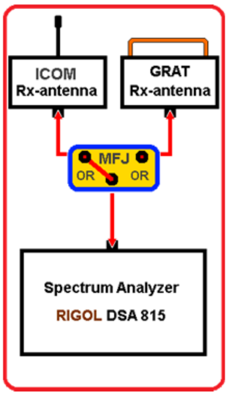
Because of the differing requirements of the two types of antenna, an automatic tuning procedure was run each time the antennas were switched. The tuning was done in order to ensure that each antenna performs at its peak and maintains an ideal transmission line condition with standing wave ratio (SWR) at 1:1 for each tested antenna.

This approach to the setup allows avoiding any unforeseen circumstance in measurements during the test and avoiding potential misinterpretation of the differences in the transmitting-receiving procedure, such as changes in the distance between antennas or the length or placement of the feeder cable. The main goal was to maintain identical conditions on the signal source for both emitting antennas, regardless of each antenna's properties.

Receiver Station

Similar hardware requirements were not necessary for the receiving station. The receiving station only necessitated a spectrum analyzer as a high quality receiver and a mechanical RF switch to change between the two types of antennas by simple reconnecting the input of the spectrum analyzer from one antenna to another. No additional configuration of the spectrum analyzer or receiving antennas was required.

The receiver station included the following devices connected as described in the diagram to the right:



DC/AC converter:	BELKIN F5C400-300W
Spectrum Analyzer:	RIGOL 815-TG
Manual RF switch:	MFJ-2703N "Rhinos ™"
Standard Rx-antenna:	ICOM 3310001920
GENESYS Rx-antenna:	GRAT-C-27V3

Characteristics of the GRAT Antenna

Genesys demonstrated that the physical appearance and dimensions of the GRAT antenna were as described in the preliminary technical documents. The antenna is an entirely new design, with the ability to filter the signal directly on the antenna and greatly increase the efficiency of the signal source. Even though the GRAT antenna is new, the design is simple and the antenna is fully compatible with standard radio communication devices. For the entire test, the GRAT antenna was connected to a standard RF transmitter to provide the signal source, and there were no additional devices used to improve the functionality of the antenna.

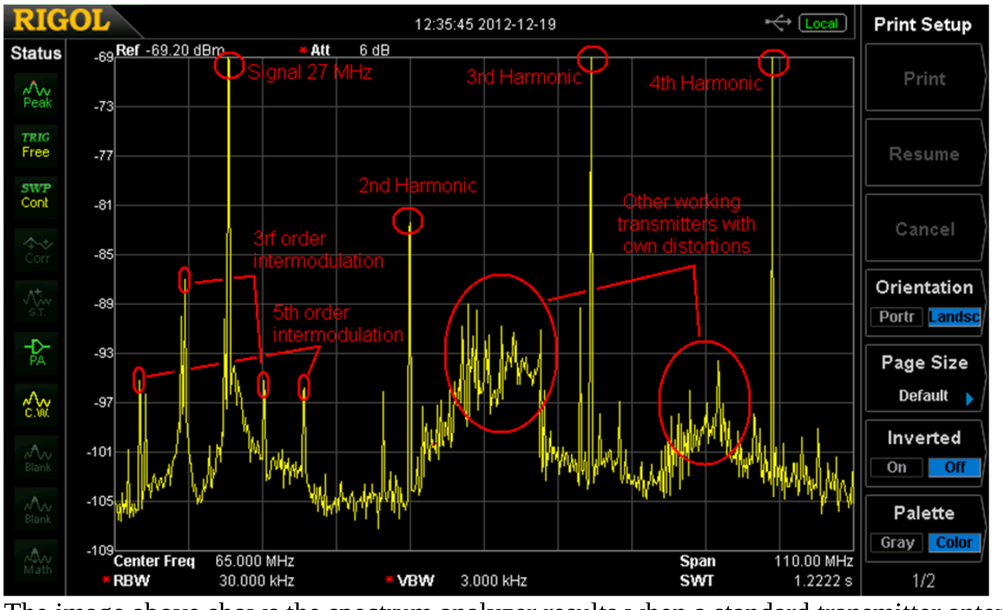
Test 1

The first test showed the selectivity properties of the GRAT antenna in receiving mode.
When using a standard antenna for receiving the signal, the spectrum analyzer showed unwanted, out-of-band emissions and intermodulation distortion caused by the transmitter power amplifier. When switching to the GRAT antenna, none of these unwanted emissions or distortions was present.

The Wilson Silver Load antenna was connected and used for transmitting a carrier signal as a reference antenna. The picture to the right shows the characteristics of that antenna.

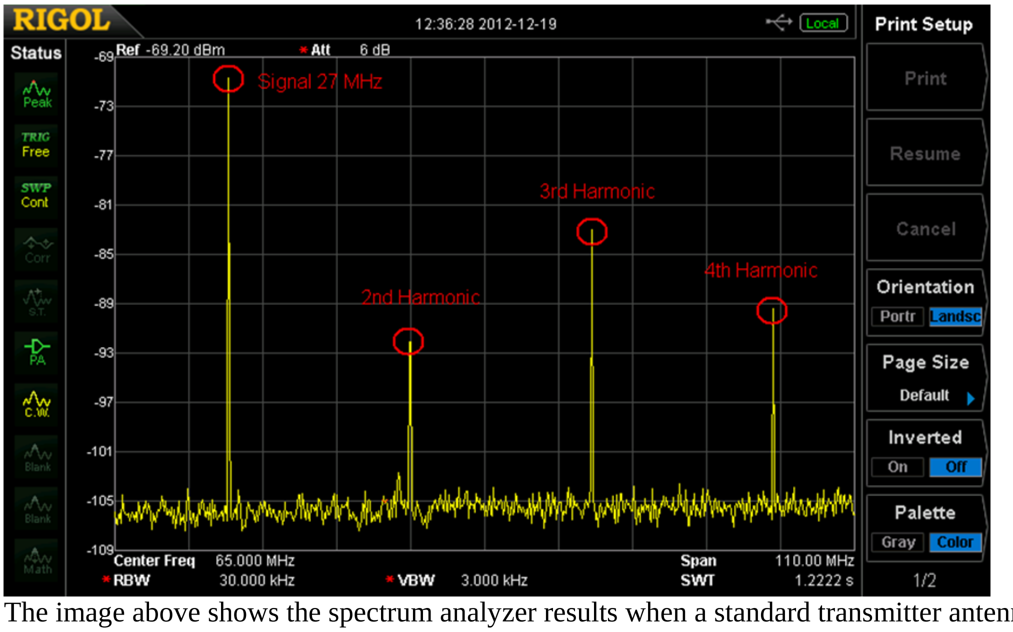
Applied voltage:	+12.5 DC
Total current:	5.5 A
Carrier frequency:	27 MHz
SWR:	1.0
Forward power:	4.2 W
Reflected power:	0.0 W

1A. Standard Transmitter & Standard Receiver



The image above shows the spectrum analyzer results when a standard transmitter antenna and a standard receiver antenna were used. The unwanted emissions consist of the intermodulation product of our transmitted signal own harmonics, as well as signal and intermodulation product from other transmitters in the area.

1B. Standard Transmitter & GRAT Receiver



The image above shows the spectrum analyzer results when a standard transmitter antenna and a GRAT receiver antenna were used. The level of harmonic and level of other noises dropped significantly from when the standard antenna was used.

The results obtained confirm the selectivity properties of the GRAT antenna in focusing on the desired signal, reducing harmonics, and suppressing unwanted emissions. The antenna not only performs its direct function, but also acts as an input filter increasing the selectivity of the receiver radio channel.

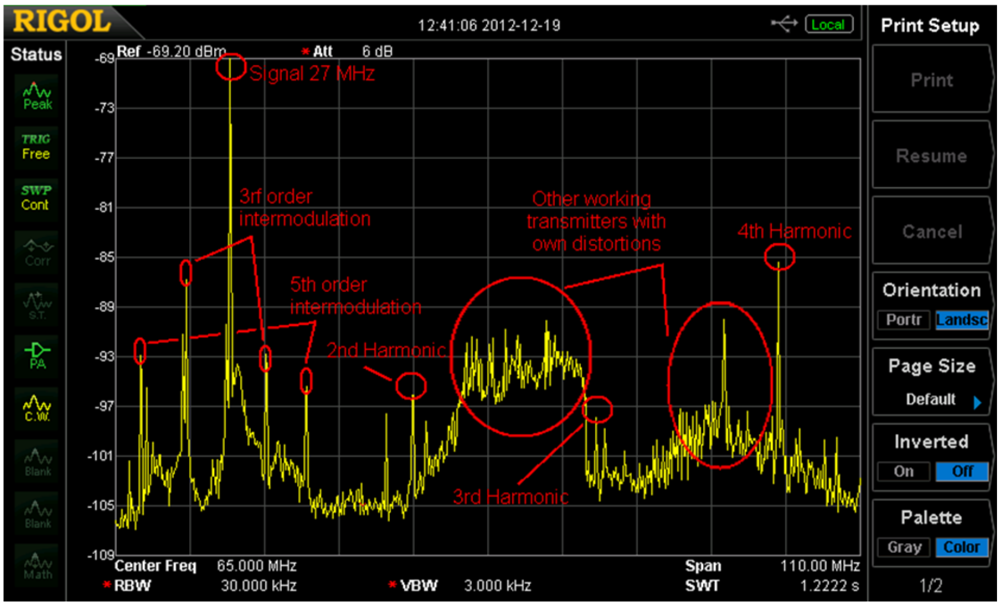
Test 2

The second step of the test is transmitting the carrier signal using the GRAT antenna and comparing the efficiency in signal reception using both the standard antenna and the GRAT antenna for receiving. The Wilson Silver Load antenna was physically disconnected from the transmitter and the GRAT antenna was connected in its place. SWR tuning on the transmitting equipment was performed. The results are visible in the image on the right.

Applied voltage:	+12.5 DC
Total current:	8.1 A
Carrier frequency:	27 MHz
SWR:	1.0
Forward power:	19 W
Reflected power:	0.0 W

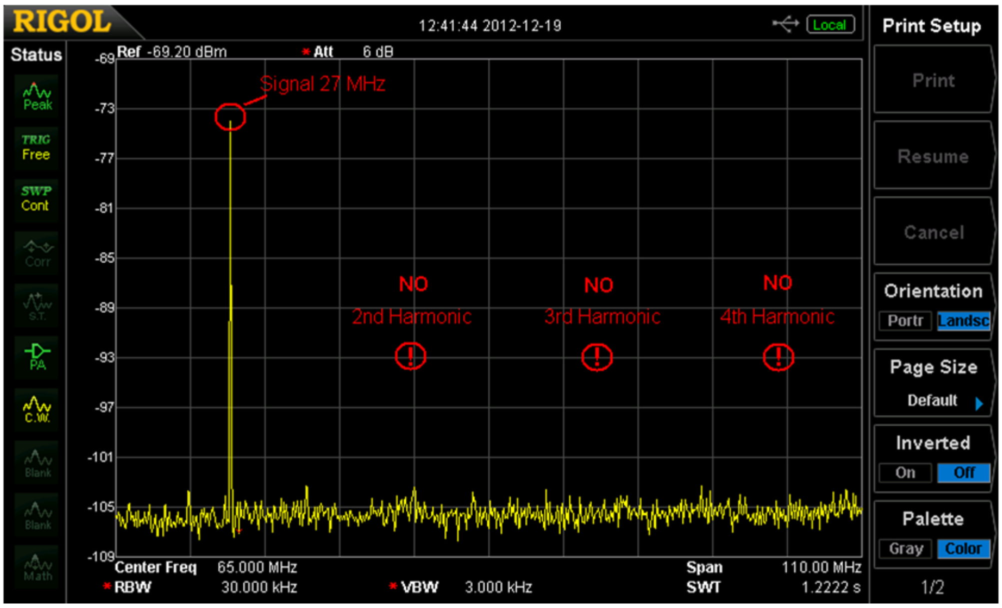
The image shows that there is an increasing forward power with only a minor increase in consumption current when compared to the results of the standard antenna.

2A. GRAT Transmitter & Standard Receiver



The image above shows the spectrum analyzer results when a GRAT transmitter antenna and a standard receiver antenna were connected. There is a stark difference when compared to the results of two standard antennas being used. The harmonics level of the transmitter is suppressed drastically because of the GRAT antenna's selectivity properties. Suppression of intermodulation product around test signal did not happen, as they are in the band or near the receiver antenna bandwidth.

2B. GRAT Transmitter & GRAT Receiver



The image above shows the spectrum analyzer results when a GRAT transmitter antenna and a GRAT receiver antenna were connected. We can see that, although the level of the received signal dropped slightly, there is a complete absence of any out-of-band emissions and other noises. Eliminating distortions entirely was possible when the antennas with GRAT technology are used on the receiving and transmitting end.

Conclusion:

The observed properties of GRAT antenna will:

- simplify the front-end circuit
- increase effectiveness of the signal
- eliminate input circuit overloading due to out-of-band emissions
- increase the signal to noise ratio
- increase power efficiency
- decrease unwanted out-of-band emissions
- simplify the design of multi-frequency transceivers
- harvest unused frequency gaps in the radio spectrum

It should be noted that the selectivity and filtering of the signal that the GRAT antenna can perform, on either the transmitting or receiving end or both, is very important when operating in hostile environments where reliability of the signal is paramount.