

Sarkes Tarzian and His HiFAM Experiment

BY ANDREW MITZ

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Armstrong's wideband VHF FM looked like a success until the FCC shifted the FM band up to 88-108 MHz, when suddenly all the FM receivers to date were useless, and the listeners had to start anew. The new FM receivers were relatively expensive. And then, there was the nagging question asked by engineers: was it the FM feature or the VHF feature that made Armstrong's VHF FM so noise-free? Are these the questions that a fellow named Sarkes Tarzian was trying to address with his grand experiment, High-frequency AM, or HiFAM? [Ed.]

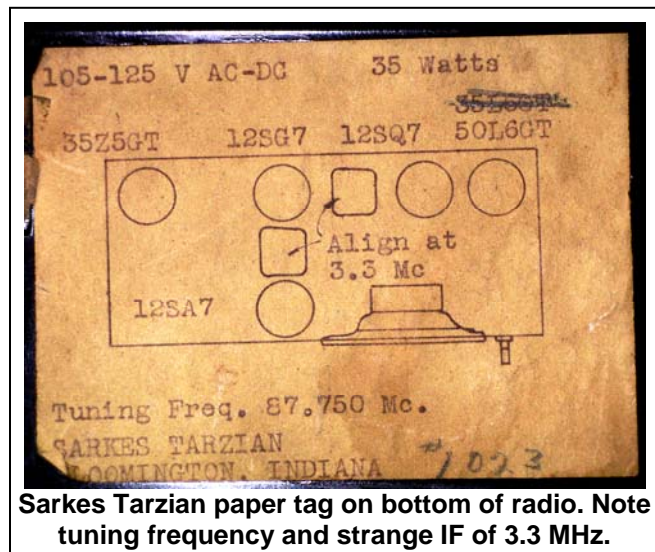
Introduction

Sarkes Tarzian was a bright and motivated engineer responsible for many important designs and patents. He was born in Armenia at the turn of the century and emigrated to the U.S. with his family in 1907. Sarkes Tarzian's top academic placement in the Philadelphia public school system won him a scholarship to University of Pennsylvania. His performance in the Electrical Engineering program was equally outstanding. After graduation in 1924, Tarzian went to work for Atwater Kent. He eventually made his way to RCA and to the Bloomington, Indiana manufacturing plant there, before starting his own consulting firm.

He founded Sarkes Tarzian, Inc. around 1944. The company branched out both as a manufacturing and as a media entity. The manufacturing was at one time an important contributor to the Bloomington economy, producing broadcast equipment, television tuners and semiconductors. You may have seen the Sarkes Tarzian plug-in replacements for the 5U4 and other rectifier tubes. By the 1970s, the manufacturing divisions were sold off in favor of the more profitable media components. Sarkes Tarzian, Inc. still exists today with Tom Tarzian, Sarkes's son, at the helm.

Early in the history of the company, Sarkes Tarzian tried an experiment in broadcasting. In 1945 he received permission from the FCC to establish a high frequency AM broadcast radio station. The motivation behind this scheme, dubbed Hi-FAM, is a little obscure. FM radio had just been moved to the 88-108 Mc frequency band. FM had been moved up in frequency to make room for more stations and avoid the ionospheric skip conditions that plagued medium-frequency AM stations at night (and to please Sarnoff, who thought the old FM band was needed for his grand television scheme).. Perhaps Hi-FAM was seen as a nice way to permit the proliferation of local AM radio stations without the expense of transmitting or decoding FM. Engineers were debating the reasons

why the then-novel FM was so free of static and noise, and one of the arguments claimed that the move to VHF (either the 40-MHz band or the 88-MHz band, both are VHF) alone was enough to eliminate most of the lightning and spark-induced static. Economy was touted a significant benefit of the Sarkes Tarzian experiment. Receiving converters for regular AM radios were built into ice cream cans at a cost of under \$6 each.



Sarkes Tarzian paper tag on bottom of radio. Note tuning frequency and strange IF of 3.3 MHz.

Tarzian's station went on the air in July of 1946 as W9XHZ. This station broadcast everything from NBC recorded materials to local news and poetry. Remote broadcasts included Indiana University and Bloomington High School Football games, special events, and live band music from the local high schools. In addition to 300 or so ice-cream can receiving converters, Sarkes Tarzian built 27 receivers specifically for listening to W9XHZ on 87.75 Mc. A few months ago I won an eBay auction for an unusual Sarkes Tarzian radio. As it turns out, this radio is one of the original 27 receivers built as part of the Hi-FAM experiment.

At the time, I expected this to be an unusual FM radio. Certainly the frequency of 87.75 Mc seemed to

suggest FM, and Sarkes Tarzian produced a large number of FM only radio sets in the 1950s. FM only radios are my collecting specialty (see my web site at www.somerset.net/arm/fm_only.html), and I was convinced this radio was intended for FM. When the radio arrived I carefully removed the chassis and took a close look. To my amazement, the radio appeared to be an "All American Five" AM radio converted over to the FM broadcast band.

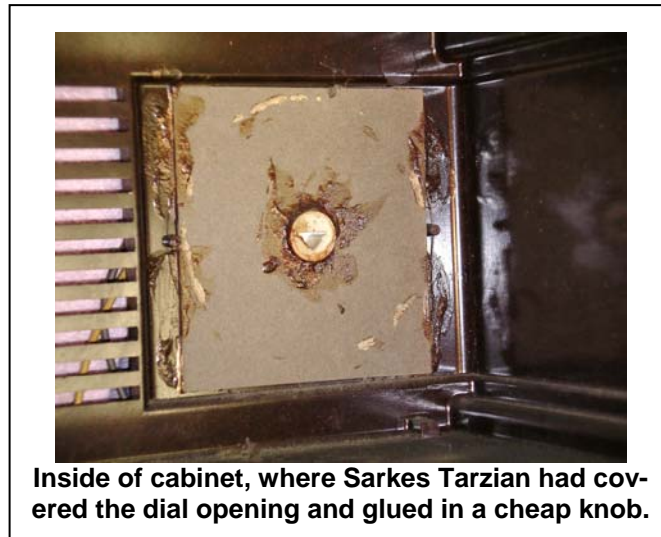
There was much to suggest that the conversion was done on the cheap. For example, the W9XHC printed label covered the original tuning dial hole and it had a white plastic TV knob glued into the center. A vacant spot revealed where a large tuning capacitor had been removed. A dial lamp was mounted just behind the label to make the knob glow when the power went on. All the (octal) tubes had their plastic alignment pins broken off. The broken alignment pins make sense if you posit that Sarkes Tarzian located a source of cheap octal tubes, ones with broken alignment pins. Each tube socket and one of the tubes had carefully painted red dots to mark alignment.

Was this an experiment that failed, or did it actually work? What AM radio was it originally? There were more questions than answers, so I got right to work. I needed to find out about the original AM set. I posted a request on my FM only web site and got a world of information from Carter Cook, a collector in Austin, Texas. At first, he simply identified the radio as a Maguire Model 500. After trading some emails, he provided more detailed information. Apparently, Maguire Industries (owned by Meissner) sold unbranded sets similar to the Model 500. Carter had one of the unbranded sets in reasonable shape, so I quickly offered to buy it. This was great progress. Finding a schematic was next. After a few other leads failed, Bill Robie searched his basement and found the Sams Photofacts folder 466-15 from 1946. (*Thanks, Bob.*)

Description

Perhaps 90% of the Maguire 500 is unchanged in the Sarkes Tarzian set. The Maguire is a marbled plastic radio with a round dial on the left, speaker on the right, and the tuning control above the volume control on the extreme right front. The case has a pleasing curve to the top and accent lines skirt from the front around to the left side of the radio. Electrically, the Maguire is a typical AC/DC five-tube superhet. It uses a 12SA7 pentagrid converter, a 12SK7 IF amplifier, followed by a 12SQ7. One plate of the 12SQ7 operates as the AM detector, a second

plate provides AGC, and the triode section capacitively-couples audio to the beam-powered 50L6GT pentode amplifier. Power rectification is provided by a 35Z5GT, which has a filament tap for the pilot lamp.



Sarkes Tarzian made surprisingly few changes to the original circuit design. The local oscillator coil and tuning capacitor are replaced with a hand-wound coil and fixed capacitors mounted on what appears to be the ceramic mount from a WWII surplus VHF tuning capacitor. An extra tap was added to the coil near the cold end for a small variable capacitor (WWII surplus VHF tuning capacitor?). The variable capacitor shaft provides a front panel frequency adjustment of about ½ MHz. The position of this tuning dial has been swapped with the original volume control; the new tuning control now sits below the volume control so its connection to the local oscillator coil is unobstructed. An 18-inch insulated wire tail out the back of the radio acts an antenna. It is isolated by a capacitor, then couples to the input tank circuit with a 2-turn link winding. The input tuned circuit replaces the original AM loop and 365 pf section of the tuning capacitor. Like the local oscillator circuit, the input circuit is a hand-wound coil with a fixed capacitor. The AGC circuit was removed.

The IF amplifier has been shifted to 3.3 Mc. The transformer cans are still marked "455 kc" and have not been opened. I do not know if the internal coils were rewound or replaced. Converting an AM radio to 88 Mc is an amazing feat and making the conversion with so few changes is even more impressive. Presumably, Sarkes Tarzian was aware that the 12SA7 and its 6-volt brother, the 6SA7 had been used in a number of pre-war FM receiver

designed for 50 Mc. For example, the Stromberg-Carlson 425H and 505H use a 6SA7 converter and a 4.3 Mc IF. Getting the 12SA7 to convert at 88 Mc is a bit more tricky, but obviously doable. The Maguire was probably chosen for a number of reasons. Perhaps one was its similarity to earlier FM designs.



An All-American five lineup, but not an octal base key in the lot. Every tube had the base key broken off, and one tube (and all the sockets) had red dots for insertion guides.



This is the 12SA7 region of the under-chassis. Note the VHF coils, fixed ceramic tuning caps, and the antenna coupling link in the middle of the RF coil (on the right). The oscillator coil (on the left) is mounted on a porcelain insulator from a WW2 surplus variable capacitor.

Performance

A serious hum prompted some recapping. The radio still has hum and the B+ is at 50 volts rather than the expected 110 volts. I have not determined if the converter is intentionally being run at a higher current or if there is a biasing problem somewhere else in the set. Regardless, the radio was able to pick up my signal generator at 88 Mc. I temporarily added a series capacitor to the local oscillator to see if I could receive a strong local FM station at 101.1 Mc. I reasoned that FM slope detection should work with a strong signal. With the antenna wire fully extended in the basement, our local station came through with ease. Careful adjustment of the tuning control made the FM sound quality similar to that of the original AM Maguire set. After almost 60 years, the Sarkes Tarzian was playing again. With no RF amplifier and little front-end selectivity, however, the strong local oscillator radiated 3.3 Mc above the receive frequency and wiped out reception of a nearby radio. Certainly, this arrangement is not for regular use.

Epilog

The original version of this article was written on the completely wrong assumption that the modified Maguire radio was intended for FM. Geoff Vargo of Sarkes Tarzian helped unravel the history of this radio. He sent a few documents and in a kindly written letter he pointed me to Ms. Kari Price, the executive director of the Monroe County Historical Museum. The Historical Museum was the recipient of a box of historical documents some years back. Ms. Price was a delight on the phone and promised to

research radio station W9XHZ. A few weeks later a small packet of photocopies arrived at my door. The information was somewhat sparse, but enough to piece together the unusual history described above.

The radio described here is one of only 27 sets built for receiving the experimental station. From the available accounts, the station did not stay on the air past 1946. The official story is that Sarkes Tarzian decided to pursue television instead. However, the FCC may have decided that the Hi-FAM experiment was over. Regardless, in 1947 there were a few hundred ice cream cans with useless receiving converters floating around Bloomington, Indiana. I wonder if any have survived?



Unbranded Maguire (Model 500) side-by-side with Sarkes Tarzian radio.



Unbranded Maguire (Model 500) chassis side-by-side with Sarkes Tarzian.