FEEDBACK – KT34A M2 Upgrade 15 Meter Issue – Somewhat Improved F/B, Some Clarifications, Questions Remain, Getting On with Life

Here is a follow up and partial conclusions on prior postings on a KT34A M2 upgrade issue for 15 m F/B. This incorporates information from responses and additional testing and thinking including new data from K7HP. No warranty expressed or implied.

Quick Summary:

A. The KT3** antennas are frequently, but not universally, felt to have poorer performance (often in F/B) on 15 than on 10 and 20. Anecdotal stories are common, documentation is rare.

B. If the KT34A M2 upgrade (or the original) 15 m reflector element (taken alone, fed as a dipole) has a resonant frequency above, or maybe too near, the lower band edge, 15 m F/B and SWR will he compromised, at least low in the band. Exactly what the desired resonance frequency should be is not fully clear but values from 20.5 to 20.9+ come up. (Note that the KT34A M2 upgrade does not have exactly the some dimensions as any other KT3** units.) Personal observation: a value of 21.03 is not good, 20.92 seems rather better, going from a poor to nil F/B to a passable one (but < 10 dB) yet still below spec, at least in the CW band.

C. The KT3** scheme for providing 15 m operation appears to be quite unusual and different from any common tribander - and as a result, conventional yagi, even trap, intuition may not be very useful. The method for electrically shortening the elements for 15 involves use of a coaxial tube capacitor and a 4' X 3" tubing loop as inductor which act as (most of) a resonant "tuned decoupling stub." This is a very high Q (~400) circuit that produces quite sharp resonant (said to be series LC) behavior compared to the other two bands. Detailed explanations are not available.

D. The 15 m individual element resonant frequencies, and likely the antenna performance overall, are very sensitive to some antenna components. Probably the most critical is the coaxial capacitor where very small changes in radial dimensions can have a large impact. If either the inner (of the 3/4") or outer (of the 3/8") radius of the capacitor tubes differs from plan by 1 mil, 0.001 inch, the resonant frequency changes by ~ 100 kHz. The polyethylene caps for the capacitor tube, the centering of the 3/8" interior capacitor tube and shorting bar spacing dimensions ( ~ 200 kHz/inch) are also possible issues.

E. Measurements of the single element dipole resonant frequencies are subject to variations and uncertainties (even errors). Resonance from minimum SWR and zero imaginary component of impedance (i.e., jX=0) are not the same (however, this appears only to be a significant issue for 10 m, less so for 15). Height above ground, as well as local structures changes the resonance frequency. Feedline effects on resonance estimates are not so easy to remove without skilled calibration, especially for jX=0. However, 15 m appears to be the least sensitive band for these effects, probably due to

domination by the high Q resonance. Still, measurements of all element resonances for the three bands may provide very good diagnostics for problems, if you have the strength.

F. I believe that the KT3** issues on 15 m are largely traceable to the novel high Q decoupling stubs (some might say traps), requiring rather precise resonance values, formed by components that have very critical dimensions. Some of these dimensions are not fully under the control of the owner. So is it not too surprising that adjustments for performance that is a bit off have been published by KLM. It is likely that some owners could have issues on the low end of the band but don't realize it since they operate ssb where the 15 m F/B may well be better.

G. Assuming the 15 m coaxial tube capacitors are functioning in their resonant circuit with a suitably high Q, it should be possible to get the KT3** to perform in a reasonable way (we leave the definition open here). This may require modest adjustments of the shorting bars for 15 and perhaps 10. Additional hardware for the M2 upgrade may or may not be needed depending on your particular model and whether your particular antenna has excessive deviation from the norm.

H. Killer F/B on 15, CW at least, is not assured (or perhaps even likely over the whole band?).

I. Modeling of the KT3** is problematic. No reliable models have been claimed or published and conventional wisdom is that most modeling software does not handle closely spaced parallel wires or sharp bends well. The KT3** depends on both of these features. Furthermore, at best, the coaxial capacitors must be handled as lumped elements. Yet, a model using MMANA, picking the loading capacitors to match observed resonances (and these capacitor values look physically reasonable) provides a simulation that has demonstrated pretty sensible looking behavior variation for small variation of parameters.

A more detailed write up on these issues, along with assorted other KT3** materials including attempts to determine KT34A and KT34A M2 upgrade target resonant values for both 15 and 10, an MMANA file for a KT34A M2 upgrade model with results, and a tabulation of current and historical KT3** dimensions and resonance measurements, is provided at http://www12.asphost4free.com/wortmanxx/n6mw.htm . Other amusing stuff is there too including using the QSK-5 and 811A Amp Tuning matters. Fun's over. Thanks to N2EA, N7BF, K1KP, N2IC, K5GS, W4EF, K9MUF, K4JRB, K6HJC and K7HP for responses.

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