The DX HUNTER

SEPTEMBER 17

MDXA CLUB INFO

MEETINGS: 2nd SATURDAY OF EACH MONTH 7:30 AM @ GOLDEN CORRAL HWY 49 GULFPORT

MDXA WEBSITE: MDXA.org

Net Frequency: 147.375 Tuesday @ 8:00 PM

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"More than a Club – We are Friends"

CLUB NEWS

This months meeting we will be discussing members Most Wanted Entities and how we might set-up a call/e-mail list to contact members when your needed entity comes on-the-air. Review your log and determine which entities you really need so we can make up a Club Call List.

HOW TO TUNE an AMPLIPHER

By Matt Erickson KK5DR

Introduction

This guide is primarily written for those who are new to HF tube-type amps or anyone who wishes to get the most out a Linear amplifier.

I have found that this procedure works well with all HF amps that I have used, regardless of the type tube used.

First, we must understand why a Linear amplifier must be tuned in this manner.

Plate impedance

The voltage used relates to the "Plate Impedance" and each amp is designed to operate at a given plate impedance. The plate voltage can be reduced or increased but the plate current must be increased or decreased to meet the plate impedance level. A person can think of a tube type RF amplifier much like an antenna tuner, matching the tubes plate impedance to the output impedance which is usually 50 ohms on the output end. The relationship of plate voltage to plate current creates the plate impedance level, which can range anywhere from 500 to 5000 ohms or more, dependent on the voltages used and the plate current needed to reach full power output. Changes in plate voltage can create plate impedance mismatches, which cause output waveform distortions and loss of efficiency. Large swings in plate voltage due to a poorly designed power supply or a power supply that is operating beyond its capacity can also create this same type of distortion. In my judgment, a swing that exceeds 500 volts is enough to cause distortions in the output signal.

To tune an amp at a lower voltage, and then increase the voltage to operate on, creates a mis-match in the plate impedance.

Problem; Many amps can't stand a steady carrier tune up in high voltage mode due to limitations of the power supply design and components.

Solution; Use a reduced "duty cycle" method to tune the amp in high voltage mode.

Hence, the "pulsed" tune method which has a duty cycle of about 50%.

One can use a store bought "pulsar cricket" or a CW keyer.

For using a CW keyer (which is more commonly available), set the keyer to about 40-50wpm, then tune the amp with it.

Step 1. Set the amp in the voltage mode, you intend to use on the air, low or high, it does not matter. For a person wanting to run lower power most of the time, use the lower voltage, it will be more efficient.

Step 2. Set the exciter to whatever level that increases the plate current by double above the idle "zero-signal" current level.

Step 3. Preset the amp, to the manufacturers suggested settings, if available. Set the exciter to CW mode, ready to start transmitting a "string of dits".

Step 4. Begin tuning the amp, by "dipping" the plate current (while transmitting), this resonates the plate circuit.

Step 5. While still transmitting into the amp, tune the load control, for "peak" RF out put. Un-key when this is done.

Step 6. Repeat the tune cycle by again doubling the plate current or until the maximum plate current is reached.

Step 7. Increase the exciters output until maximum plate current is reached. (Note; care must be used not to exceed the amps plate & grid current ratings, if you reach MAX plate current before reaching MAX exciter RF drive level, that is it. You can't drive the amp any farther.) (ie. If your amp has a MAX. plate current rating of 900ma. & 225ma. grid current, do not exceed these ratings, if you do, reduce exciter drive level.)

Step 8. At this point leave all settings where they are and now tune the "load" control to "over-couple" the amp loading, refer to (**"Grid current Rule # 1"**). Heavy loading is known as "over-coupling". This is the final tuning step.

Step 9. Switch the exciter to the mode that you wish to operate on. SSB is usually used on the high voltage setting while low voltage is used for all other modes. (SSB can be used there also.)

Step 10. You can reduce the RF drive power, if you wish to run at lower than full output. Do not change the voltage, unless you retune at that voltage level.

Now that you have tuned up, the amplifier is operating at maximum efficiency and linearity.

Tetrode tuning; A small variation for these amps is that most run a rather high level of idle plate current relative to a triode type amp (typically 20% of the full load current). So, rather than doubling the plate current, one should add drive signal until about 1mA. of grid current is observed or max plate current is reached. Then tune as one would a triode amp with the steps above.

ALC!

Any ham operator that does not use an ALC feedback circuit to control the exciter RF output to the amp, is an **idiot**. It is there for a reason. Most amplifier manufacturers have installed an ALC output on their units. It does not matter if your exciter can put out enough RF to overdrive the amp or not. Drive level is only one item the ALC system controls. Should the amp be loaded into a high SWR, the ALC will reduce the drive level to a safer level. Every ham has had a "lapse" in memory and left the RF drive level too high when using an amp and this can cause unseen damage to the grids of the tube. This is especially true of delicate metal/ceramic tubes. The ALC system will act as a "safety net" should an error be made or a failure in the antenna system happen. It is inconceivable that someone would knowingly do without it.

Most ALC systems can be set in the following manner;

1. Load the amp in the normal manner to full output with full RF drive needed to reach max RF output level.

2. Adjust the ALC threshold (usually a pot on the back of the amp) until the RF output is reduced slightly, then back up the adjustment slightly.

3. You're done. No further adjustment is needed. If the ALC system was designed correctly, the system will operate without re-adjustment on all bands.

Now you can rest easy, knowing that your amp is protected from overdrive or other problems.

Grid current; Rule # 1, Less is better!

Once you have tuned the amp for max output, you can reduce the grid current, by increasing the loading. (Loading is increased by reducing the load capacitor capacitance, this couples the RF to the antenna where it should be). This will reduce the grid current drastically, with a small drop in RF output power. OK, you ask how much of a drop in RF output? The general rule is 10%, (i.e. 1000 watts out, reduced by 100 watts or more). The drop in RF output is well worth the lower grid current which will greatly increase the life of the tube (especially metal/ceramic tubes). The drop in grid current should be somewhere in the area of 30-50% (ie. full drive grid current of 200ma, should be reduced to 150-100ma.) This is for triode type class AB2 amps.

For a tetrode type amps running class AB1, **NO** grid current is the rule. In these amps any level of grid current indicates over drive or a mis-tune condition.

If you turn the load control the "wrong way" the RF output will "peak" and the grid current will remain high, but if you turn the load control the correct direction, the RF output will drop slowly but the grid current will drop quickly. This can vary from one make of amp to another to verify the correct tune direction, look inside the unit to see which direction "un-meshes" the load capacitor, that is the direction of "heavier loading" the "correct" direction.

Care must be taken not to "over-load" the amp, as this will cause as much problems as "under-loading" can. Do not exceed the levels stated above.

A good rule of thumb is; Tune for peak RF output and lowest plate current, then load the amp slightly to lower the grid current slightly.

Peak RF output and minimum plate current should happen at the same tune point (if the amp is designed properly and has no instability problems).

Now that you have tuned up using this procedure, your amp will now operate cooler and with a lower IMD level for a "cleaner" output signal and your tubes will last longer.

The use of the CW keyer puts a lower stress on the tube, power supply, and all RF components. The speed of the pulses gives a good meter indication and makes it easy to tune.

Nearly all HF linear amplifiers can benefit from these methods. Even if your amp has only one voltage setting, you can use the procedures.

A suggestion: Make a "cheat-sheet" or chart with the tuned up settings at a given frequency. In this way, you can set the amp by number and fore-go the tune-up procedure, less tune time, means longer tube life. (not to mention on-air QRM)

With some HF amps, the tune dials are marked 0-100. I found that "setting by number" is fast and works very well, with no noticeable drop in output power. A cheat sheet for high voltage and low voltage are needed, as the settings **WILL** be different.

Caring for your RF power amp tubes.

Why does the plate current dip at the same point the RF power output peaks?

> This is called "energy transfer" due to plate/load "over-coupling". Imagine a round topped hill with a "dimple" in the very top of it. This depression at the top of the hill is where the plate current dip happens. If there were no antenna/load circuit the plate current would peak, like a hill with no "dimple" at the top, but no output would take place since all the energy in the DC current returns as DC back to the B+ side of the PSU. Since all amps have an antenna/loading circuit, the RF energy flows to the load and DC

energy returns to the PSU. DC energy is converted inside the tube to RF energy, then couples to the load/antenna. The EIMAC "Care and feeding-" article goes into much greater detail on this topic. I hope this info helps the understanding.

Neutralization?

This applies only to "grid-driven" power amplifiers. This circuit reduces the stage gain slightly and cancels out any instabilities in the PA. Generally, this circuit is used in grid-driven tetrode amps where the stage gain in grid-driven service can be extremely high and therefore can be unstable. The circuit damps any tendency for the PA to oscillate. The PA must be re-neutralized on each band it is used on, it IS a tuned circuit. Some older PA(s) were neutralized only on the band that was most likely to cause oscillations when used.

None of the currently available tetrode PA(s) are neutralized since they all use cathode-driven passive resistor input networks. This lowers the stage gain and stabilizes the PA. It also means the exciter drives into a 50 ohm resistive load on all bands. This is not really the best way to do it as it provides no harmonic suppression in the input network.

ANNOUNCED DX OPERATIONS

September					
2017 Sep01	2017 Sep04	**South Cook Is**	**E51JHQ**	LotW	By JA0JHQ fm Rarotonga (IOTA OC-013); 80-6m; 200w; micro vertical; QRV for All Asian DX SSB; call sign pending; QSL also OK via JA0JHQ direct or Club Log
2017 Sep01	2017 Sep10	**Algeria**	**7Y94I**	7X2DD	By Radio Club of Djelfa fm Rachgoun I (IOTA AF-094); HF
2017 Sep01	2017 Sep16	**St Lucia**	**J68HZ**	LotW	By K9HZ; QSL also OK via Clug Log or K9HZ direct
2017 Sep02	2017 Sep09	**Market Reef**	**OJ0**	OH2BR	By OH2BR as OJ0/OH2BR; HF, incl 60m; spare time operation; QSL: Kannuskatu 8 F 72, 20880 Turku, Finland
2017 Sep05	2017 Sep22	**Mauritius**	**3B8**	LotW	By PA3HGT as 3B8/PA3HGT fm IOTA AF-049; 40 20 10m; SSB + digital; 100w; end-fed wire; QSL also OK via PA3HGT (Buro or direct)
2017 Sep06	2017 Sep13	**Morocco**	**CN2**	LotW	By TA1HZ TA7AZC as TBD; holiday style operation; QRV for WAE DX SSB Contest; QSL also OK via LZ3HI
2017 Sep06	2017 Oct01	**French Polynesia**	**FO**	DF1YP Buro	By DF1YP as FO/DF1YP fm Moorea I (IOTA OC-046, BH52cm, WWFF FFF-0178); 20-15m; SSB + digital; holiday style operation
2017 Sep07	2017 Sep15	**Botswana**	**A25AL**	Auto Buro	By IW5ELA; mainly CW; vertical; spare time operation
2017 Sep09	2017 Sep15	**Liechtenstein**	**HB0**	LotW	By DL2SBY as HB0/DL2SBY; 80-10m; SSB CW,focus on RTTY; 400w; QSL also OK via Club Log
2017 Sep09	2017 Sep22	**Dodecanese**	**SV5**	LotW	By HB9OAU as SV5/HB9OAU fm Karpathos I (IOTA EU-001); 40-10m; SSB RTTY PSK; QSL also OK via HB9OAU (Buro or direct) or eQSL
2017 Sep12	2017 Sep28	**Cocos & Keeling**	**VK9CGJ**	W7GJ	By W7GJ; 6m; mainly EME, some SSB CW; exact dates uncertain
2017 Sep13	2017 Sep25	**Niue**	**E6AG**	LotW	By VK5GR; 40-6m, perhaps 80m; mainly digital, some SSB; 500w; vertical folded dipole; QSL also OK via M0OXO OQRS, Club Log, eQSL, VK5GR Buro

2017 Sep14	2017 Sep21	Galapagos	HD8M	WB2REM	By WB2REM VK2BXE KG0YL N1MWJ G8OFQ fm Isabela I (IOTA SA-004); 160-6m; CW SSB + digital; QSL also OK via Club Log
2017 Sep15	2017 Sep20	Svalbard	JW	OM6TC Buro	By OM6TC as JW/OM6TC; HF; CW SSB; 100w; wires
2017 Sep15	2017 Sep25	Botswana	A25	Home Call	By RM0F as A25BI, R2AD as A25SP, RC5A as A25BE fm Kasane; 160-6m; CW SSB; QSL OK via Buro or direct; A25BI and A25BE will use LotW
2017 Sep16	2017 Sep28	Mauritania	5T5OK	LotW	By OK1BOA OK1CRM OK6DJ OK1FCJ OK1GK OK2ZA OK2ZI 5T0JL 5T2AI; 160-6m; SSB CW RTTY; 100w; yagis, verticals; QSL also OK via OK6DJ
2017 Sep17	2017 Sep23	St Pierre & Miquelon	FP	Home Call	By M0WUT as FP/M0WUT, M0BLF DK2AB G3ZAY DH5FS G7VJR likewise fm IOTA NA-032; all bands; all modes
2017 Sep20	2017 Sep26	Palau	T88XA	LotW	By JA3KIO fm Koror Island (IOTA OC-009); 160-10m; CW SSB; yagi + dipoles; QSL also OK via JA3KIO (Buro or direct)
2017 Sep27	2017 Oct02	Micronesia	V63	Home Call	By JR1FKR as V63FKR and JH1MLO as V63MLO fm Pohnpei I (IOTA OC-010, QJ96cx); HF
2017 Sep28	2017 Oct30	Burkina Faso	XT2AW	M0OXO	By DF2WO; 40-10m; CW SSB + digital; hex beam, dipole
2017 Sep30	2017 Oct20	Temotu	H40GC	LotW	By LZ1GC; 160-10m; CW SSB RTTY PSK; QSL also OK via LZ1GC or Club Log

CONTESTING NEWS

SEPTEMBER

2- 3 Sat 1300 - Sun 0400	Colorado QSO Party - CW/Digital/Phone
3- 4 Sun 1800 - Mon 0300	Tennessee QSO Party - CW/Digital/Phone
9-10 Sat 0000 - Sun 2359	**Worked All Europe DX-Contest - SSB**
9 Sat 1400 - 2200	Ohio State Parks On the Air - SSB
9-11 Sat 1800 - Mon 0259	**ARRL September VHF Contest - All**
16-17 Sat 1400 - Sun 0200	Iowa QSO Party - CW/Digital/Phone
16-17 Sat 1600 - Sun 0400	New Hampshire QP (1) - CW/Digital/Phone
16-17 Sat 1600 - Sun 0359	New Jersey QSO Party (1) - CW/Phone
16-17 Sat 1600 - Sun 0700	Washington Salmon Run (1) - CW/Digital/Phone
17 Sun 0000 - 0359	**North American Sprint - RTTY**
17 Sun 1400 - 2000	New Jersey QSO Party (2) - CW/Phone
17 Sun 1600 - 2200	New Hampshire QP (2) - CW/Digital/Phone
17 Sun 1600 - 2400	Washington Salmon Run (2) - CW/Digital/Phone
23-24 Sat 0000 - Sun 2359	**CQ WW RTTY DX Contest - RTTY**
23-24 Sat 1200 - Sun 1200	Maine QSO Party - CW/Phone
23-24 Sat 1400 - Sun 0200	Texas QSO Party (1) - CW/Digital/Phone
24 Sun 1400 - 2000	Texas QSO Party (2) - CW/Digital/Phone

If you have info or articles you would like in the Newsletter, e-mail them to me and I will get them published.

K1AR CONTESTING HINT

It may seem obvious, but labeling antennas and amplifier settings is a must for contest stations. In the excitement of Friday afternoon it may be more tempting to work guys than taking that final step towards efficiency. Paying attention to the details of preparation in the long run is what separates successful contest efforts from mediocre ones.