

Hello All,

I just came back from out of state and saw the above post.

>> Recently, I have been seeing standard definitions being altered.

>> I am posting in response to the previous post and simplifying as much as possible to help the newbies who may be reading. Notice I will be using the >> symbol to identify my response.

>> I mean no harm, but still must correct misconceptions. I hate to use my education, academia etc as an argument, but there are major misunderstandings with the above post that I must address.

Hi guys, I haven't posted on here in years, though I lurk and read often. I apologize if I sound uncouth to post out of nowhere with something like this; I just wanted to throw in a clarification concerning operating class, as there are many misconceptions concerning it (especially on guitar amp-specific forums), which then are sometimes repeated by good, well-meaning people.

"Notice, each tube in the Push Pull output stage operates Class A until each output tube just reaches the point of cutoff. That means each output tube conducts the entire musical waveform."

Class AB amplifiers are never Class A at any point or time, instead, they operate in a region with conditions similar to Class A up until a certain output level. Operating class is always determined at an amplifier's full, unclipped output, rather than the quiescent operating point or anywhere in between.

>> If that is the case, then no preamplifier, phono stage, amplifier is operating Class A since none are operating in the optimum center of an optimum load line that you require. Fortunately, such is not the case, whether preamplifier or amplifier, including the output stage.

>> Class A operation only pertains to the entire signal waveform, 360 degrees, being reproduced through a tube(s)/device(s), period. This condition occurs in output stages, driver, input stages, and preamplifier/phono stages. Class A operation occurs anywhere along the load line, as long as the entire waveform, 360 degrees is amplified.

>> I also have a copy of the 4th edition and on page 545 such is stated:

"Limiting Class A push-pull operation is operation such that one valve just reaches plate current cut-off when the other reaches zero bias."

>> Maximum power is not produced, but Class A operation is still in effect.

The next quote from page 572, RCA Radiotron Designers Handbook, 4th edition, written by 26 engineers.

"A very useful operating condition is the borderline case between Class A and Class AB1, that is when the plate current just reaches the point of cut-off--this is called Limiting Class A1 operation."

>> Interestingly, minimum distortion occurs as one sets the idle towards the zero bias operating point (near maximum plate current), not the center point of the load line. So this condition is not Class A? Of course it is. Once again, power output nor center of the loadline has nothing to do with the different Class definitions. This has been taught in the class room for 70+ years.

>> I have also seen confusion, including misrepresenting of Classes on other forums, and YouTube videos.

Also, Class AB never reaches cutoff at any time, else it would instead be Class B. Class AB always conducts for more than 180 degrees of the AC cycle at its full output, but significantly less than 360 degrees. This keeps the output devices' conduction high enough at the peak of the input signal's negative half-cycle to avoid the highly non-linear region of the characteristic curves near cutoff, while also avoiding exceeding their thermal dissipation limit.

>> Another gross misunderstanding. Each tube in push pull (pp) Class AB1 operation does reach cut-off, again by definition. Class AB1 operation allows for the signal waveform to be amplified more than 180 but less than 360 degrees, in each output tube (when past the Class A point of operation). This means each output tube is cut-off, no plate current, for some portion of their respective half of the waveform. That "portion" is determined by the idle bias that is set.

>>Class B means that 180 degrees, or half the waveform is not amplified. It is quite different than AB1 in that Class B usually has a kink and notch in the waveform unless GNF is used. Efficiency is also greater.

Operating class is also independent of output stage topology, whether single ended or push pull, and is also independent of the biasing method used. A common misconception is that cathode biased tube amps are always automatically Class A, and grid biased tube amps are always Class AB. The reality is that a Class A amplifier can be grid biased, and a Class AB amp can be cathode biased. However, a cathode biased Class AB amp is indeed limited to 'high' AB operation, close to Class A. The reason is simple: Ohm's Law.

>> Basically correct except the last sentence. Class AB1 operation can be operated at a variety of idle currents when the cathode resistor is bypassed by a capacitor of suitable size. This keeps the cathode voltage constant with respect to signal ground. As such, only the signal voltage at the grid alters the grid to cathode voltage, similar to typical grid bias operation where the cathode is signal grounded as well.

As the average AB plate current increases correspondingly with output level, the same current increase across the cathode resistor in turn produces a higher bias voltage, thereby counteracting and limiting the maximum plate current excursion. This effectively prevents using cathode bias to achieve the higher efficiency 'low AB' operation (moving closer to Class B condition).

>> Again, that is why a cathode resistor is bypassed with a suitable size capacitor in Class AB1 operation. The bypass capacitor keeps the cathode voltage constant to reference signal ground. The only change in cathode to grid voltage is due to the musical signal, similar to grid bias with the cathode essentially grounded.

>> I hope this has helped you and viewers in understanding the different classes of operation. As I stated at the beginning, I am addressing the newbies out there, so simplified the post as much as possible for clarity.

>> I also mean no harm to anyone, but gross errors I must address. Otherwise confusion reigns.

>> One may also quote my posts to counteract such misrepresentations of classes of operation in other forums and YT videos etc.

All the best.

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