Name That Core

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If you've been active in Amateur Radio for a number of years, perhaps you've accumulated a junk box full of components. These components could be resistors, transistors, tubes (I still have some of these!), capacitors, inductors, knobs, meters, cores, connectors, etc.

Of those components, it's likely that the characteristics of most of them are identified by a color code (resistors, for example), by performing a mathematical calculation (air-wound inductors, for example), by reading labeling (transistors, for example) or by doing a visual inspection (connectors, for example). The one exception seems to be cores – generally ferrite cores have no marking to identify their characteristics (there are iron powder cores that are color coded – more on this later).

A great example of 'no marking' is a box full of half-cores that I have. The idea here is to put a wire or cable in one of these half-cores and then add another half-core to fully encase the wire or cable. But I have no idea what these cores are. One way to answer the 'what are they?' question is to stick a short wire through the core and measure the resulting impedance – its series resistance Rs and its series reactance Xs. You can easily do this with an MFJ-259B (HF/VHF SWR analyzer) or something similar, with one end of the wire to the center conductor of the RF connector and the other end to the ground side of the RF connector.

What you're looking for is the frequency at which the series resistance Rs is equal to the series reactance Xs. Knowing that frequency, you can then go to Figure 1 to estimate the permeability of the core. Also included on the plot is tabular data on various ferrite materials.

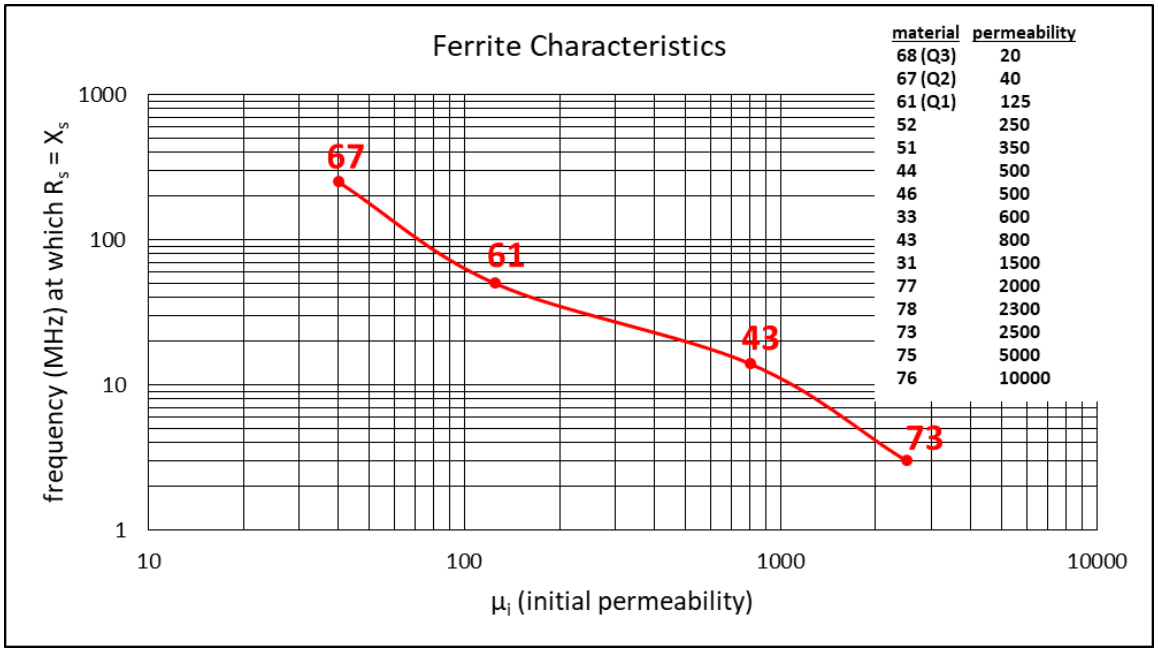

Figure 1

Figure 1 was developed by looking at the data sheets of toroidal ferrite cores of material 67, 61, 43 and 73 and plotting the frequency where Rs = Xs versus the permeability of the core. As can be seen, the higher the permeability, the lower the frequency where Rs = Xs. The permeability does have a tolerance, but this plot should get you into the ballpark of the permeability of the unknown core.

I went through this procedure with my box of half-cores. I started at the lowest frequency of the MFJ-259B, which is about 1.7 MHz. The frequency where Rs = Xs was around 17 MHz. That says these cores are probably ferrite material 33 with a permeability of 600. After learning this, the first thing I did was write ‘material 33’ on the box! I also measured several other cores I have laying around – now I know about what they are in case I need something in the future.

Earlier I mentioned iron powder cores. Iron powder cores have a much lower permeability, and are generally used in high power applications like 4:1 matching transformers at the output of an RF amplifier or at an antenna. I used a big iron powder core in a 4:1 transformer (12.5 ohms to 50 ohms) at the base of a short 80-Meter vertical that I had when we lived in Texas. Table 1 is data from the company Micrometals on their iron powder cores.

mix	permeability	Color code
0	1	tan/tan
12	4	green/white
17	4	blue/yellow
10	6	black/clear
6	8.5	yellow/clear
4	9	blue/white
7	9	white/clear
2	10	red/clear
1	20	blue/clear
15	25	red/white
3	35	gray/clear
8	35	orange/clear
42	40	blue/red

In summary, I hope this helps you sort out some of the stuff in your junk box. It sure has helped me. By the way, this topic came from a question about ferrite cores on the topband reflector.