In order to better comprehend the phenomenon of deflection and the effect "low end mass" has on it I started down a rabbit hole 5 years ago. The accepted science is states the lower the end mass below the tip of a cue - the lower the deflection of the cue ball.

I started with a known material inside a cylinder. Water – mainly because it's a ubiquitous material that pretty much everyone can wrap their heads around even though it's not a ferrule material. We can all imagine the feel of an amount of water in a 13 mm x 13 mm cylinder. I conducted my OWN research to generate data and then to double and triple check that information I ran my questions through Google AI. I put my query in quotes after plugging in the name of each material so that the AI was reading the question as I'd intended. I did this multiple times to corroborate or dispel my findings. Each time I repeated the question my initial findings were verified within .002 of a gram. These were outstanding results. However, I compiled the AI produced results into the charts below so people may try to repeat it for themselves and compare if they so choose.

I used water, brass, titanium, ivory and hard maple as controls by asking: *"What is the mass of water in a hollow cylinder with an inside diameter of 13 mm by 13 mm?"* I chose those dimensions because they are the rough working size of the blank ferrules I install on each of my **Low Deflection CUSTOM Carbon Fiber/Wood Hybrid shafts**. Gone are the days of 1" ivory ferrules or 1-1/4 plastic or "fiber." . **ALL** results are based upon a 13 mm x 13 mm solid cylinder. Into Google AI I then entered the question: "What is the mass of **enter ferrule material here** in a solid cylinder which measures 13 mm by 13 mm?" in order to compile some numerical comparisons. Below are the results sorted by mass:

ALL of the results below are based upon a a constant sample size of **13 mm x 13 mm solid cylinder.**

Material	***MASS expressed in grams***
Control - *Brass*	***≅ 14.45g***
Control - *Titanium*	***≅ 7.77g***
Control - *Ivory*	**≅ 3.1g**
Control - *Water*	***≅ 1.727g***
Control - *Maple (Acer saccharum)*	***≅ 1.192g***

Material	***MASS expressed in grams***
~~Ivorine 4~~	~~4.63g~~ **I could not find the published density of this proprietary material. The mass result may be inaccurate.
Linen Based Micarta (LBM)	**≅ 2.55g**
PVC	**≅ 2.43g**
Atlas MPI UPVC	**≅ 2.42g**

Elforyn (Super-Tusk)	**≅ 2.16g**
Isoplast	**≅ 2.094g**
Hydex-202	**≅ 2.072g**
Elforyn (standard)	**≅ 2.07g**
Nylon	**≅ 1.984g**
ABS	**≅ 1.846g**
Atlas MPI PPR	**≅ 1.56g – 3.62g** (multiple formulations)
Tomahawk	**≅ 1.55**
Aegis-2	**≅ 1.32g**
S-433 (Proprietary to me)	**≅ *.340g***

Findings:

S-433 **≅ 3.8 times less than Aegis-2**

S-433 **≅ 5.4 times less than ABS**

S-433 **≅ 5.7 times less than Nylon**

S-433 **≅ 6.09 times less than Hydex-202**

S-433 **≅ 6.16 times less than Isoplast**

S-433 **≅ 7.14 times less than PVC**

S-433 **≅ 7.5 times less than LBM**

S-433 ***≅5.079 times less than water***

S-433 **≅ 9.11 times less than Ivory**

S-433 **≅ 25.852 times less than Titanium**

S-433 **≅ 42.5 times less than brass**

I think my video evidence coupled with the results above corroborate my contention that my Hybrid CF/Wood shaft coupled with an S-433 ferrule should produce significantly less deflection when striking a cue ball off center.

Disclaimer: I am NOT a mathematician nor an engineer. What I am is an insanely curious pool player who has been trying to get to the bottom of some of the deflection arguments for more years than I care to think about. I am trying to separate science from opinion solely for my own edification.