The following is a test done on the accuracy of the Silver Mountain G2 systems.

Before we go into the results first full disclosure about myself. My name is Shawn Agne, I am a High School Physics teacher. I am the president and Match Director of Central Indiana Highpower Rifle Shooters, an NRA affiliated club which shoots out of Camp Atterbury. I am not an employee or an affiliate of Silver Mountain Targets. I am not an employee or an affiliate of the NRA. I am not an opponent of electronic targets as was stated by a moderator on the National Match forum. I am a strong proponent of electronic targets. We (CIHPRS) currently have 12 Silver Mountain targets. Six of our targets were purchased by 6 individuals for the club by club members, the other 2 were purchased by donations by multiple members, and 4 were purchased by the club itself. We did not receive any special discounts for these targets. As a club the reason we chose Silver Mountain target was because of the price of the system and being something that our club could afford and acquire enough to be able to start running matches. We also chose SMT targets because it has the accuracy that is required for NRA Highpower Rifle matches. I do not have my own company and I do not make any money from this test or any dealings with SMT.

The purpose for this test is as a match director that uses SMT targets I have gotten rather tired of certain tests being touted as the gospel truth. These tests were done by a competitor of SMT with a clear intent to show their product is superior to the SMT targets but also to instill doubt in people using SMT targets. The initial test was done incorrectly and then the second test has been held as Gospel. Prior to this I never found the need to conduct an accuracy test of the SMT targets but after the latest interaction with company H employees online I decided it was necessary. I was called out by the owner for test data and well "You called down the thunder, so I'm a coming and Hell is coming with me." This test prooves what I have been saying in that the accuracy of the SMT targets are fine as they currently stand. There is an update coming which will improve the math used to plot the shots on the SMT S25 8nic algorithm. I was going to wait to publish this data until that came out. However I decided to go ahead and publish with the algorithms people are currently using. When the new update is available I will go and show the updated results.

Chamber systems will be more accurate because of how they work vs. open systems such as the SMT, that is not the question here. The question is are the SMT systems accurate enough for what we as highpower shooters do.

In order to tout the accuracy of an electronic target a manufacturer needs to compare it to a standard. Paper targets are the standard as we can visually see the scoring rings, the hole is put in the scoring rings and we score the shot. However as most of us know paper targets are not perfect. Repair center often do not line up and multi-piece targets often are not lined up straight causing distortions in the scoring rings. Also single piece targets can be soaked in glue and messaged out to become slightly bigger. So the standard of exact printed rings isn't always exact. Electronic targets have the rings stored in a digital file and in the case of the SMT the rings are constant but invisible. The other issue you have with paper targets are humans deciding if a shot is close enough to "give" the shooter that 10 or X. One very accomplished shooter told me at a match that he will generally "give" that shot to people at local club matches. But at nationals he makes them "earn" it. This is something that you don't have with electronic targets as the computer uses the same decision methods all the time. Company H stated in their first test which had extreme amounts of error that they calibrated to the center of the target.

Lets first dispel one of the first myths about SMT targets that the calibration sets the accuracy.

Calibrating the target so the center of the X lines up with the center of the X on the paper target DOES NOT set the accuracy of the target. You can shift the center of the acoustic target anywhere you want (within reason) and the scoring rings will stay the same dimension. For example in fclass midrange we will shift the impact 1 MOA below the center of the paper target so that the X/10 ring remains clean for the shooters since the MR63F gets shot out rather quickly. In their tests this is how accuracy is being measured, how it scores on paper vs. the monitor and this doesn't measure accuracy because you have two sets of rings the paper rings just for aiming purposes and the accousitcal rings used for scoring and they need not line up.

What sets the accuracy of the rings are the accurate measurement mic height and width dimensions. This sets the scaling of the target rings. If the dimension is small, the rings are smaller. If the dimension is larger the rings are larger. Also it is very critical in having a correct value for the temperature probe. Since this is an acoustic setup you need to make sure the probe is accurately measuring the temperature for the speed of sound and you need to make sure it is shaded. Also you need to make sure the sensors are all at right angles and the sensor plane is perpendicular to the shooter. Also for greatest accuracy the shooter needs to be shooting perpendicular or straight into the target. If these conditions aren't met you will have error in your results. These were all things that were not done in the original test published by the SMT competitor. They used the excuse that they followed what was in the manual, and it didn't say they had to do this in the manual. I found this quite humorous because when you purchase a target from SMT, Wayne specifically tells you how to set it up and will even come and show you how to do it. The only reason a SMT target is not setup correctly is if a.) the user does not know how to properly set up it, just because you own one doesn't mean you know how to use it. b.) the person conducting the test doesn't want to make sure it is setup properly. Just because a person owns a SMT system does not mean they know how to operate it correctly. We ourselves were making many mistakes at first because we were not following the instructions.

Setup error and the shooter not shooting straight into the target was a point of contention for the first results published. In the second test the concept of a "perfect" setup was used where lasers were used to make sure everybody was squared up, etc and then the error data was presented. This makes one think that if everything is perfect beyond reproach, these targets are clearly not accurate because what shooter or match director is going to go through all this work. I know as a match director shooting matches on a military range we don't have the time or ability to go out and perfectly lay in every firing point and make adjustments to the berms, etc.

To date there has not been a SMT test done by a competent SMT user that understands how they work, by someone not trying to make money off of showing how their performance works, or under regular match shooting conditions. So for reasons previously stated I decided to go ahead and run an accuracy test.

On Saturday March 10th, 2018 on KD3 at Camp Atterbury the following test was conducted in which to show the accuracy of the SMT targets under match conditions. The wind was a quartering to half wind out of the east at around 10-15mph. This also allows for another issue other companies like to use against SMT targets because of error due to wind. They like to state that the wind will blow the sonic cone to such an amount that shots will be incorrectly marked. Temperature changed over the day from 30 degrees in the morning to about 54 degrees. The test was conducted during a NRA Registered 300-500-600 mid range match. I was the shooter firing a 223 palma rifle shooting 80gr Amax with a MV of around 2,980fps. The reason these yardages were chosen is because this is all I've had to test at. While I intend to test at 800,900, and 1000 to date I haven't had the chance to do so. To measure the

shots I didn't use fancy laser plotters or anything like that I used my calipers and hand measured the shots. If the errors are to be as large as reported by the company H tests it should be clearly visible using this method. Also I'm wanting to keep this simple. I am a shooter, checking something for shooting. I am not a salesman, or owner trying to sell a product and talking about accuracy numbers like internet high masters do about load SD's and ES's for 200yd shortline loads. As a shooter I want to do know, does this system correctly plot my scores and do I get credit for the score that I actually shot.

In various other posts on the NM forum and other places pictures of our frames can be seen. They are welded aluminum with pockets for the sensors. They attach to ten foot uprights which are inserted into the vertical style carriers. The aiming black is centered on 4x4 sheets of chloroplast. While we try to center each center they are not perfectly centered on the chloroplast. Each target face was a clean face where I was the only shooter. This however was not done at 600 because a second shooter had to use the test target due to damage on their target.

The target being shot on was the 8-mic G2 target which we calibrated in before the match so the centers would line up as best as possible. While results for our 5-mic G2 systems were not done for this test the results below mirror what we have seen with experience with our 5-mic systems. To line myself up properly on the target I looked at the target and squared myself up using the number board as any HP shooter would do and then proceeded to fire the match. I am sorry if this is not written like a scientific research paper. I did enough of that in college and I don't care to do that on my day off.

Below is the picture of the actual hits on the MR-63 target, the 20 shots for record are plugged with 80gr Amax bullets.

As shown my score is 196-8X. Below is the screenshot of the same target from the SMT target with the identical score.

From this standpoint as far as the shooter is concerned the target works the score is the same. But let's look deeper at the numbers.

ds

5.9188976 -74.46087

				mean	0.0811024	0.4608664	0	-6.7E-017		
				SD	0.25	0.18	0.25	0.18	**0.31**	0.77
	p-x	p-y	e-x	e-y	dx	dy	dx0	dy0	Err (x+y)	
1	-1.394	-0.425	-1.535	-0.118	-0.142	0.307	-0.223	-0.154	0.271	
2	-0.933	0.271	-1.260	0.630	-0.327	0.359	-0.408	-0.102	0.420	
3	-0.118	1.386	-0.354	1.850	-0.236	0.465	-0.317	0.004	0.317	
4	1.953	0.717	2.047	1.142	0.094	0.425	0.013	-0.036	0.038	
5	2.717	0.673	3.031	1.181	0.315	0.508	0.234	0.047	0.239	
6	-2.673	0.039	-2.717	0.512	-0.043	0.472	-0.124	0.012	0.125	
7	-0.748	3.055	-0.748	3.819	0.000	0.764	-0.081	0.303	0.314	
8	1.488	1.256	1.535	1.850	0.047	0.594	-0.034	0.134	0.138	
9	-1.492	-0.394	-1.575	0.039	-0.083	0.433	-0.164	-0.028	0.166	
10	-1.929	0.394	-1.496	0.827	0.433	0.433	0.352	-0.028	0.353	
11	-0.614	2.012	-0.827	2.795	-0.213	0.783	-0.294	0.323	0.436	
12	3.189	0.244	3.937	0.315	0.748	0.071	0.667	-0.390	0.773	
13	0.343	0.992	0.591	1.457	0.248	0.465	0.167	0.004	0.167	
14	-0.594	1.335	-0.433	1.890	0.161	0.555	0.080	0.094	0.124	
15	0.114	0.327	0.433	0.787	0.319	0.461	0.238	0.000	0.238	
16	-2.409	0.559	-2.480	1.220	-0.071	0.661	-0.152	0.201	0.252	
17	-0.240	0.815	-0.236	1.378	0.004	0.563	-0.077	0.102	0.128	
18	0.657	0.039	0.827	0.394	0.169	0.354	0.088	-0.107	0.138	
19	0.614	-1.465	0.748	-1.339	0.134	0.126	0.053	-0.335	0.339	
20	-3.055	-1.953	-2.992	-1.535	0.063	0.417	-0.018	-0.044	0.047	

Above you will see the value that have been converted into inches for ease of understanding. The first two columns show the locations of the shots on the paper target. The second two columns show the location of the shots on the electronic target. The dx/dy columns are the differences of the paper hits vs. the electronic hits. These columns are used to generate the Aqua box which shows how much the offset of the shots are in the paper to the real target. The orange columns dx0/dy0 are the adjusted hit values. Please note the standard deviation of the error at 300yds is .31" this is the equivalent of .103 MOA well inside what anybody can shoot, or sighting devices can correct for.

So let's go back to the paper target and adjust the shots so that they are where the SMT says they are as per the orange clolumns. In order to do this we will measure and drill where the adjusted value would be and keep the actual holes plugged. I decided to use a 13/64" bit as I originally was going to put the bullet in the newly drilled hole and wanted something that would give enough grip to hold the bullet, but then decided if I just left a white hole it would be just as good. The bullet marks in the chloroplast are not .224" in diameter they are much smaller. In hindsight a 9/64 or 11/64 bit would have probably been a better choice but after drilled two holes I decided to continue with that size for consistency.

All the shots are correct for the values accept shot #5. When I drilled it the bit slipped down a little and as said I should have been using a smaller bit. The hole should be just kissing to outside the 10 line. I didn't have a way to patch this back up so just left it. I did not want to be accused of covering something up. I attribute this error to me drilling the hole the actual hole would have been very close to touching the line if not touching. When I was shooting there was a build coming after shot 4 and it kicked around from a quarter to full value, I didn't see it and it blew me out to the right. I corrected wind dropped off and shot 6 went left. Should it have been a 10? Maybe, BUT the onus is on me because I made it that close. If the plug in the software was set to .30cal it would have been a 10, but since I am shooting .223 my plug was set to .22cal. To me this is no different than those shots where your puller tells you “It was real close so I gave it to you,” or “it was just a tad out maybe I should have gave it to you but I didn't.” This is the same situation referenced above by an accomplished shooter human marking would very depending on the person and/or match. As far as where the system marked it will, if I would have held tighter and made a better wind call, it wouldn’t have been an issue. My fault, not the targets.

As you can see the score maybe would have a been a 197-8X but I'm ok with the 196-8X. However I'm upset about the average error, if I had only weight sorted my brass and bullets..... (sarcasm).

Now if the “Perfect” test results are to be believe we should start to see a linear trend as we get farther away. So lets look a the 500yd results. Below is the actual target.

The shot that is not plugged was a crossfire taken on the test target. If you score the hits as shown its a 198-5X. Below is the SMT plot.

Again in shape both look the same no distortions are weird shots. But the score is a 196-6X. If we look purely at paper plot vs. monitor plot as was done it previous tests, I as a shooter can say "AH HAH the SMT target is junk it screwed me over on points" and here comes the error as you get farther away. Block officer I want to challenge and I'm going to file a complaint with the match director!!!

However lets go back to what I first said 1.) the acoustical center does not have to be or may not be perfectly lined up with the paper center. 2.) We have our aiming blacks centered as best as we can. In this case my niece and brother pasted these on during our club work. I guess I'm going to take away Natalie's birthday present because of this!!!! But before I do this lets look at the numbers

500 yards 5.8172243 -72.89667

				mean	0.1827757	-1.103327	0	1.44E-016		
				SD	0.30	0.31	0.30	0.31	**0.43**	0.91
	p-x	p-y	e-x	e-y	dx	dy	dx0	dy0	Err (x+y)	
1	-2.185	0.720	-1.890	-0.827	0.295	-1.547	0.11	-0.44	0.46	
2	1.894	2.123	1.969	0.787	0.075	-1.335	-0.11	-0.23	0.26	
3	-3.563	-1.665	-3.740	-3.071	-0.177	-1.406	-0.36	-0.30	0.47	
4	-5.134	2.827	-5.197	1.929	-0.063	-0.898	-0.25	0.21	0.32	
5	4.921	-0.689	4.961	-1.732	0.039	-1.043	-0.14	0.06	0.16	
6	2.228	-0.339	2.520	-1.535	0.291	-1.196	0.11	-0.09	0.14	
7	-3.047	-2.209	-3.740	-3.543	-0.693	-1.335	-0.88	-0.23	0.91	
8	4.102	1.744	4.291	1.299	0.189	-0.445	0.01	0.66	0.66	
9	0.780	-3.972	0.709	-5.276	-0.071	-1.303	-0.25	-0.20	0.32	
10	3.626	3.575	4.094	2.677	0.469	-0.898	0.29	0.21	0.35	
11	2.783	1.724	3.228	0.748	0.445	-0.976	0.26	0.13	0.29	
12	-2.551	4.315	-2.126	3.622	0.425	-0.693	0.24	0.41	0.48	
13	0.413	1.622	0.866	0.394	0.453	-1.228	0.27	-0.13	0.30	
14	-2.402	3.015	-2.441	2.008	-0.039	-1.007	-0.22	0.10	0.24	
15	-3.441	0.681	-2.953	-1.024	0.488	-1.705	0.31	-0.60	0.67	
16	5.535	3.087	5.709	2.441	0.173	-0.646	-0.01	0.46	0.46	
17	-1.134	2.114	-0.866	1.142	0.268	-0.972	0.08	0.13	0.16	
18	3.506	1.539	4.094	0.276	0.589	-1.264	0.41	-0.16	0.44	
19	0.689	0.760	1.102	-0.236	0.413	-0.996	0.23	0.11	0.25	
20	-2.528	1.134	-2.441	-0.039	0.087	-1.173	-0.10	-0.07	0.12	

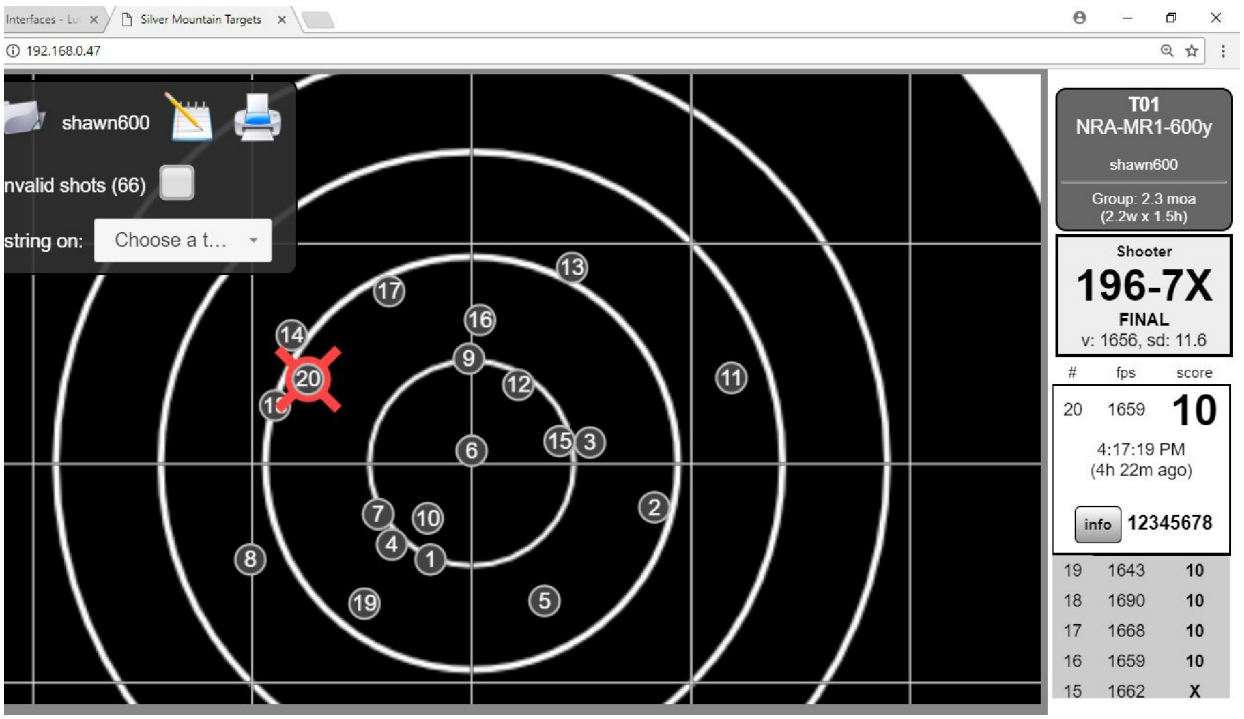
As you can see the SD of the error has increased to 0.43”. Yes the error is increasing, and if you look solely at the linear measurement you are correct. However 0.43” at 500 yards is 0.086 MOA. Wait, you mean the accuracy is actually better at 500 that it was at 300? Yup it is. While the value went up .12” the MOA went down even further to areas of where people can't hold or dope to compensate for it.

But again we are concerned with score in highpower not linear measurements. So if you move the holes and plug them what do you get? (Please note this is a big pain in the hind end to do this. So, I hope you all really appreciate this). The drilled holes are down and right from the bullets.

You guessed it a 196-8X just like the SMT monitor said. Ok Natalie is lucky she gets to keep her birthday present.....

Ok lets finally look at the 600yd target. This is the target that unfortunately a second shooter had to shoot on. I had to make the decision a a match director to either a.) let him shoot on my target or b.) have him wait till another target opened up. Wanting to run an efficient match I chose A. But fortunately for the test, not his score, he didn't hold very tight. Below is the picture of the target with my 20 scoring shots marked and I shot a 198-7X according to the paper.

Looking at the SMT monitor it shows me shooting a 196-7X



CHALLENGE!!!! I hate these things I'd rather pull targets in the heat!!!! Ok remain calm lets look at the values again. Here is the data

600yds 6.6212602 -74.52618

				mean	-0.62126	0.5261814	-0.62126	0.5261814		
				SD	0.32	0.24	0.32	0.24	**0.40**	1.43
	p-x	p-y	e-x	e-y	dx	dy	dx0	dy0	Err (x+y)	
1	-0.236	-2.874	-1.181	-2.756	-0.945	0.118	-0.94	0.12	0.95	
2	5.748	-1.756	5.236	-1.260	-0.512	0.496	-0.51	0.50	0.71	
3	3.543	-0.118	3.386	0.591	-0.157	0.709	-0.16	0.71	0.73	
4	-1.417	-2.520	-2.283	-2.323	-0.866	0.197	-0.87	0.20	0.89	
5	2.697	-4.028	2.087	-3.937	-0.610	0.091	-0.61	0.09	0.62	
6	0.709	-0.315	0.000	0.354	-0.709	0.669	-0.71	0.67	0.97	
7	-1.850	-2.028	-2.677	-1.457	-0.827	0.571	-0.83	0.57	1.00	
8	-5.039	-3.346	-6.339	-2.756	-1.299	0.591	-1.30	0.59	1.43	
9	0.575	2.362	-0.079	2.992	-0.654	0.630	-0.65	0.63	0.91	
10	-0.748	-2.075	-1.260	-1.575	-0.512	0.500	-0.51	0.50	0.72	
11	7.795	1.827	7.441	2.441	-0.354	0.614	-0.35	0.61	0.71	
12	1.654	1.693	1.339	2.244	-0.315	0.551	-0.31	0.55	0.63	
13	3.110	4.803	2.874	5.591	-0.236	0.787	-0.24	0.79	0.82	
14	-4.803	3.035	-5.157	3.661	-0.354	0.626	-0.35	0.63	0.72	
15	2.559	0.000	2.520	0.630	-0.039	0.630	-0.04	0.63	0.63	
16	1.004	3.441	0.236	4.094	-0.768	0.654	-0.77	0.65	1.01	
17	-1.693	3.906	-2.362	4.921	-0.669	1.016	-0.67	1.02	1.22	
18	-5.039	1.535	-5.630	1.654	-0.591	0.118	-0.59	0.12	0.60	
19	-1.969	-4.370	-3.071	-4.016	-1.102	0.354	-1.10	0.35	1.16	
20	-3.780	1.799	-4.685	2.402	-0.906	0.602	-0.91	0.60	1.09	

As you will notice the SD error actually went down 0.03” and the error value of 0.40” is 0.0667 MOA. In this case the targets actually got better at 600 than they were at 500. If we were to go back to 1000yds I surmise the same trend will hold. Given time an opportunity I may test this but I'm not really seeing the need for it.

However let's look at what really matters the score. Get out the drill one more time. Here are the adjusted holes and guess what I shot a 196-6X. Please note the pastors are there because I mistakenly drilled the hole down and right instead of up and left for the correction.

The shot just waterline that is a tight 9 o'clock 9. There is visible black between it and the scoring ring.

Now after doing all of this what can we take from this test.

For all the concern about standards for national records the SMT targets are fine. You do not have scores being shot that are nowhere near what they should be. In other words a 198-8X isn't being scored as a 200-14X. The scores that are recorded are the scores people shoot.

All this talk and fretting over errors is like talking about SD's and ES of loads. The winds we had "should" have produced the worst case scenarios, and if the error we got is the worst case well I'm even happier. Companies will use statistics to sell products. Values of 70mm of error sound scary and make you question it. But when the error is of values of .103 MOA and less in actuallity in the supposed wind that will make stuff inaccurate, who cares. The score is what matters.

Shot #5 at 300yds is questionable but I think it is more due to my method of measurement and drilling than the system. As I said when I shot that 9 it came up what I figured it would. Now it would be nice if the error was less, but it didn't affect the score. Also remember we said about the wind. "IF" the wind makes things bad, then this .31" or error is the "Bad". in more favorable wind conditions it is going to be even better. Also this .3-.4" of error doesn't make them worse as you go back farther it

actually gets better as the targets get larger and the MOA value of the error decreases. The value of . 43" error would be 0.043MOA at 1000yds. Where it plays the biggest issue would be on the 300yd f class target up close. Over the span of 300-600 yards there is no evidence of error incrasing at all, the data doesn't support it. To say there is something magical happening at 800-1000yds and causing the error to increase is just marketing BS.

After getting some numerical measurements I'm now even less concerned about their error than I was before. For all the people stressing about the error you have to realize a couple things. 1.) you can't hold inside the error and your weapon can adjust inside the error that the targets have. 2.) you are complaining about a measurable error (electronic targets) versus something you can't measure the error on (manual targets). 3.) You're trying to push another target system that so far very few people want to buy and you're trying to make the competition sound worse than it really is.

I did not use a "Perfect" setup for this test, I set up like a shooter would for the match. However because I didn't experience all the error that the other tests said I should have experience, well I must have ended up using a "Super Duper Perfect" setup.

The score is what matters and in the test every shot counted. From this limited test here and from what we've observed over the two years of using the SMT targets, they work and you get the score that you should.

If you are really worried about these numerical measurements you can go spend $10,000 per target and get a system that will make you feel better, more warm and fuzzy because you spent more money. However there is a reason most clubs are going with SMT and that is because they work for what HP shooters need. I"m not sure if the extra $6,000 per target is worth the miniscule amount of accuracy you will gain if you do really gain anything, but that is you and/or your clubs decision.

I'm sure there will be people (snowflake types) that get upset with this and will say this test is crap because I didn't use a bunch of fancy pictures and graphs. Because I didn't use lasers to measure stuff. But that is ok they can do this, we as other clubs have targets that we are happy with, and they are just trying to knock down leader in the race so people in the US will buy their targets. Or make their club/range seem better because they spent a lot more money on targets and have to justify this.