NOVRITSCH

Chrono in Joules

To ensure maximum safety on your field, all airsoft replicas should be **measured in joules with the actual BBs used in the game** (=energy of the BB after leaving the muzzle), not FPS with 0.2g BBs. Only the Energy / Joules translates into pain and injury potential.

There is simply too much variation between the guns and ammunition used in these guns to ensure a reliable comparison between them based on FPS and/ or M/s. **Due to various physical effects, the output energy will be different for 0.2g BB and the actual BB used during the game.**

A light BB (e.g. 0.20g) will leave the barrel faster not utilizing the whole potential of the gun. Heavier BBs, on the other hand, are able to absorb more energy from the gun itself resulting in overall higher energy of the projectile after leaving the barrel. **This effect is known as "joule creep".** Therefore, it's always better to measure with the actual BBs the player is using during the game.

Joule Creep Example:

The same sniper rifle shoots 2 different BBs - 0.20g and 0.40g.
0.20g BB leaves the barrel with 141m/s or 463 FPS resulting in 2.00J muzzle energy. 0.40g BB leaves the barrel with 178m/s or 586 FPS resulting in 3.2J muzzle energy. Joule Creep from 0.20g BB to 0.40g BB is therefore 1.2J.

Put simply, with heavier BBs the guns is about 60% more powerful resulting in a higher risk of injury because of a wrong measuring process. **If measured correctly (with the BB the player actually plays) you will prohibit injuries.**

How to measure energy?

Most modern chronographs have the energy calculator built in. Just set the correct BB weight and it will be automatically calculated.
In case your chronograph does not have this function you can easily find the energy charts on page 3 and page 4.

Cheatsheet Chrono

- Do not hold the chronograph in your hands (Dangerous)
- Use a tripod.
- Set your units (Metric/Imperial).
- Ask the player which BB he is using.
- Set the correct BB weight in the menu.
- Shoot through the chronograph 3 times. Wait after each shotl.
- Read the Joules, not the fps / m/s

Setup

- Aligned the barrel perfectly with the chronograph.
- Put it about 1-5 cm away from the entrance.
- Distance and Alignement affect the measurement.

Result

If the gun is within the Joule limit mark the gun appropriately.

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5.95mm BB vs. 6.44mm BB

Now that you measure in Joules, you can easily ensure that all guns and all BB weights are safe for the players. This includes the 0.58g BB which has the advantage of a bigger surface lessening the probability of injury even further.

Chronoing a Full Thrust BB

For example, we take into account that the 0.46g | 5.95mm BB and the 0.58g | 6.44mm BB are shot with the exact same energy of 2 Joules. This results in a velocity of:

0.46g | 5.95mm BB: 306 FPS ≈ 2.0 Joules

0.58g | 6.44mm BB: 273 FPS ≈ 2.0 Joules

Heavier 6.44BB flies slower than the 5.95mm BB resulting in the same muzzle energy but due to the increased diameter, the 6.44BB is less likely to cause an injury. Due to the inceased diameter from 5.95mm to 6.44mm the cross-section of the BBs are as following:

0.46g | 5.95mm BB: 27.8mm2

0.58g | 6.44mm BB: 32.6mm2

The energy per area which causes pain and injury is the total Energy divided by the Area:

0.46g | 5.95mm BB: 2 Joules / 27.8mm2 = 71›940 Joules / m2

0.58g | 6.44mm BB: 2 Joules / 32.6mm2 = 61›350 Joules / m2

Applied to Airsoft

The energy per area is 14,7% lower which results in:

- Less Pain experienced by a hit.
- Less Irritation of the skin and chance to damage the skin.
- Less stress put onto gear and safety equipment.
- Less Skin irritation (page 5)
- Less penetration of ballistic clay (page 5)

Cheatsheet BBs

Dimensions

Diameter: 6.44mm
Weight: 0.58g
Surface: 130mm2
Volume: 140mm3

Compared to 5.95BB

Diameter: 8.2% bigger
Weight: 26% heavier
Surface: 11% bigger
Volume: 26% bigger

Material

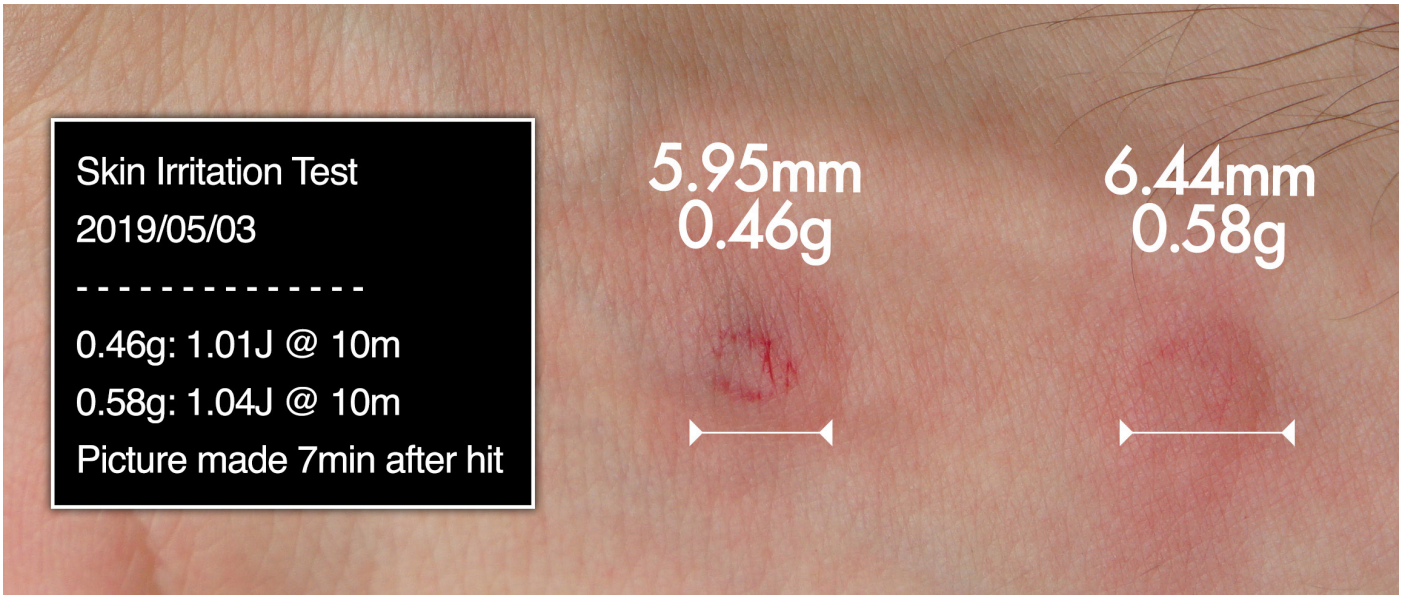
Biodegradable PLA (Same as the 0.46g Bio BB)

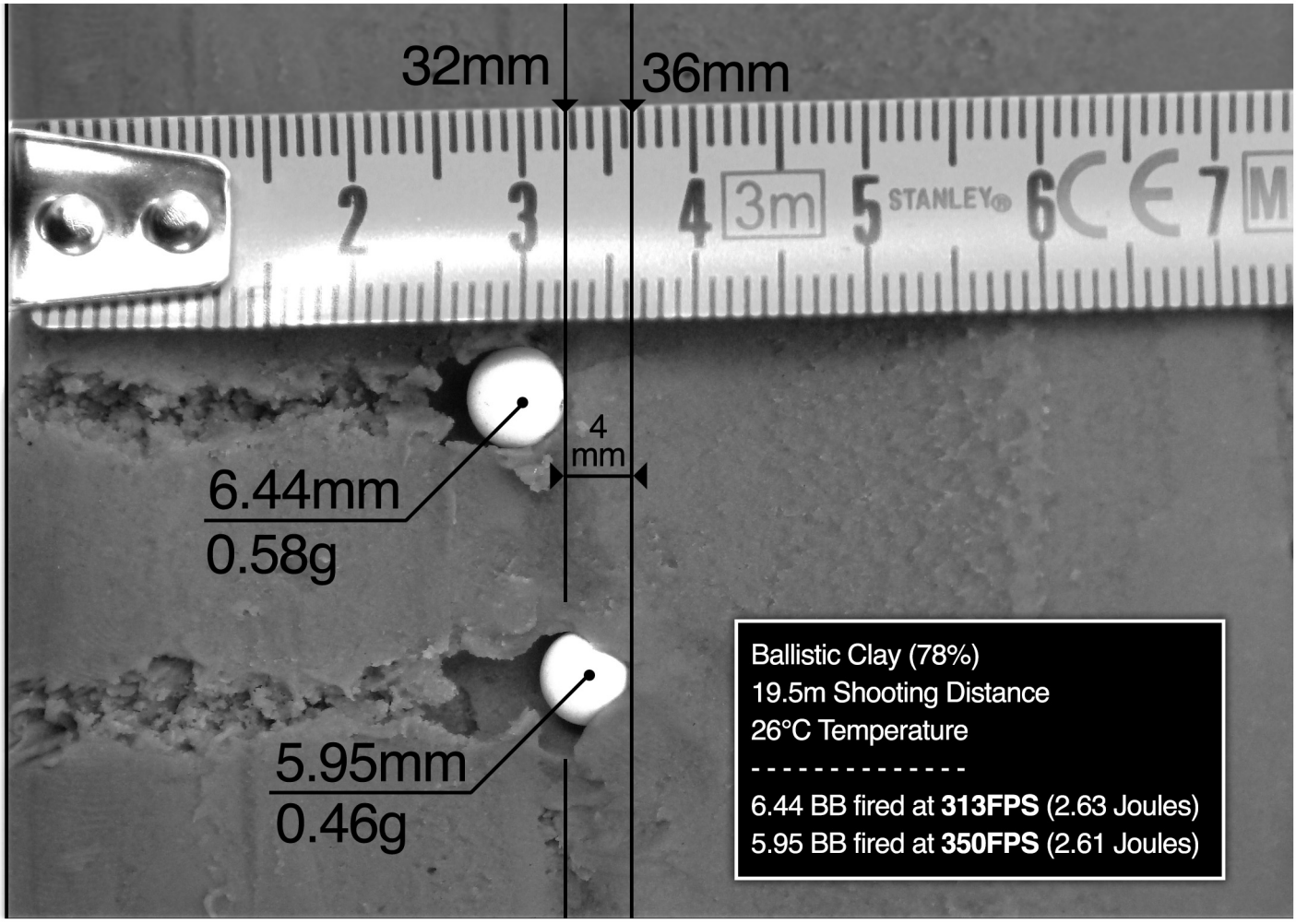
ENERGY CHART 1

NOVRITSCH

FPS	M/s	0.20g	0.23g	0.25g	0.28g	0.30g	0.32g	0.36g	0.40g	0.43g	0.45g	0.46g	0.48g	0.49g	0.58g
180	55	0.30	0.35	0.38	0.42	0.45	0.48	0.54	0.60	0.65	0.68	0.69	0.72	0.74	0.87
190	58	0.34	0.39	0.42	0.47	0.50	0.54	0.60	0.67	0.72	0.75	0.77	0.80	0.82	0.97
200	61	0.37	0.43	0.46	0.52	0.56	0.59	0.67	0.74	0.80	0.84	0.85	0.89	0.91	1.08
210	64	0.41	0.47	0.51	0.57	0.61	0.66	0.74	0.82	0.88	0.92	0.94	0.98	1.00	1.19
220	67	0.45	0.52	0.56	0.63	0.67	0.72	0.81	0.90	0.97	1.01	1.03	1.08	1.10	1.30
230	70	0.49	0.57	0.61	0.69	0.74	0.79	0.88	0.98	1.06	1.11	1.13	1.18	1.20	1.43
240	73	0.54	0.62	0.67	0.75	0.80	0.86	0.96	1.07	1.15	1.20	1.23	1.28	1.31	1.55
250	76	0.58	0.67	0.73	0.81	0.87	0.93	1.05	1.16	1.25	1.31	1.34	1.39	1.42	1.68
260	79	0.63	0.72	0.79	0.88	0.94	1.00	1.13	1.26	1.35	1.41	1.44	1.51	1.54	1.82
270	82	0.68	0.78	0.85	0.95	1.02	1.08	1.22	1.35	1.46	1.52	1.56	1.63	1.66	1.96
280	85	0.73	0.84	0.91	1.02	1.09	1.17	1.31	1.46	1.57	1.64	1.68	1.75	1.78	2.11
290	88	0.78	0.90	0.98	1.09	1.17	1.25	1.41	1.56	1.68	1.76	1.80	1.88	1.91	2.27
300	91	0.84	0.96	1.05	1.17	1.25	1.34	1.51	1.67	1.80	1.88	1.92	2.01	2.05	2.42
310	94	0.89	1.03	1.12	1.25	1.34	1.43	1.61	1.79	1.92	2.01	2.05	2.14	2.19	2.59
320	98	0.95	1.09	1.19	1.33	1.43	1.52	1.71	1.90	2.05	2.14	2.19	2.28	2.33	2.76
330	101	1.01	1.16	1.26	1.42	1.52	1.62	1.82	2.02	2.18	2.28	2.33	2.43	2.48	2.93
340	104	1.07	1.24	1.34	1.50	1.61	1.72	1.93	2.15	2.31	2.42	2.47	2.58	2.63	3.11
350	107	1.14	1.31	1.42	1.59	1.71	1.82	2.05	2.28	2.45	2.56	2.62	2.73	2.79	3.30
360	110	1.20	1.38	1.51	1.69	1.81	1.93	2.17	2.41	2.59	2.71	2.77	2.89	2.95	3.49
370	113	1.27	1.46	1.59	1.78	1.91	2.03	2.29	2.54	2.73	2.86	2.93	3.05	3.12	3.69
380	116	1.34	1.54	1.68	1.88	2.01	2.15	2.41	2.68	2.88	3.02	3.09	3.22	3.29	3.89
390	119	1.41	1.63	1.77	1.98	2.12	2.26	2.54	2.83	3.04	3.18	3.25	3.39	3.46	4.10
400	122	1.49	1.71	1.86	2.08	2.23	2.38	2.68	2.97	3.20	3.34	3.42	3.57	3.64	4.31
410	125	1.56	1.80	1.95	2.19	2.34	2.50	2.81	3.12	3.36	3.51	3.59	3.75	3.83	4.53
420	128	1.64	1.88	2.05	2.29	2.46	2.62	2.95	3.28	3.52	3.69	3.77	3.93	4.02	4.75
430	131	1.72	1.98	2.15	2.40	2.58	2.75	3.09	3.44	3.69	3.86	3.95	4.12	4.21	4.98
440	134	1.80	2.07	2.25	2.52	2.70	2.88	3.24	3.60	3.87	4.05	4.14	4.32	4.41	5.22
450	137	1.88	2.16	2.35	2.63	2.82	3.01	3.39	3.76	4.04	4.23	4.33	4.52	4.61	5.46
460	140	1.97	2.26	2.46	2.75	2.95	3.15	3.54	3.93	4.23	4.42	4.52	4.72	4.82	5.70
470	143	2.05	2.36	2.57	2.87	3.08	3.28	3.69	4.10	4.41	4.62	4.72	4.93	5.03	5.95
480	146	2.14	2.46	2.68	3.00	3.21	3.42	3.85	4.28	4.60	4.82	4.92	5.14	5.24	6.21
490	149	2.23	2.57	2.79	3.12	3.35	3.57	4.02	4.46	4.80	5.02	5.13	5.35	5.46	6.47
500	152	2.32	2.67	2.90	3.25	3.48	3.72	4.18	4.65	4.99	5.23	5.34	5.57	5.69	6.74
510	155	2.42	2.78	3.02	3.38	3.62	3.87	4.35	4.83	5.20	5.44	5.56	5.80	5.92	7.01
520	158	2.51	2.89	3.14	3.52	3.77	4.02	4.52	5.02	5.40	5.65	5.78	6.03	6.15	7.29
530	162	2.61	3.00	3.26	3.65	3.91	4.18	4.70	5.22	5.61	5.87	6.00	6.26	6.39	7.57
540	165	2.71	3.12	3.39	3.79	4.06	4.33	4.88	5.42	5.82	6.10	6.23	6.50	6.64	7.86
550	168	2.81	3.23	3.51	3.93	4.22	4.50	5.06	5.62	6.04	6.32	6.46	6.74	6.89	8.15
560	171	2.91	3.35	3.64	4.08	4.37	4.66	5.24	5.83	6.26	6.56	6.70	6.99	7.14	8.45
570	174	3.02	3.47	3.77	4.23	4.53	4.83	5.43	6.04	6.49	6.79	6.94	7.24	7.40	8.75
580	177	3.13	3.59	3.91	4.38	4.69	5.00	5.63	6.25	6.72	7.03	7.19	7.50	7.66	9.06
590	180	3.23	3.72	4.04	4.53	4.85	5.17	5.82	6.47	6.95	7.28	7.44	7.76	7.92	9.38
600	183	3.34	3.85	4.18	4.68	5.02	5.35	6.02	6.69	7.19	7.53	7.69	8.03	8.19	9.70
610	186	3.46	3.98	4.32	4.84	5.19	5.53	6.22	6.91	7.43	7.78	7.95	8.30	8.47	10.03
620	189	3.57	4.11	4.46	5.00	5.36	5.71	6.43	7.14	7.68	8.04	8.21	8.57	8.75	10.36
630	192	3.69	4.24	4.61	5.16	5.53	5.90	6.64	7.37	7.93	8.30	8.48	8.85	9.03	10.69
640	195	3.81	4.38	4.76	5.33	5.71	6.09	6.85	7.61	8.18	8.56	8.75	9.13	9.32	11.04
650	198	3.93	4.51	4.91	5.50	5.89	6.28	7.07	7.85	8.44	8.83	9.03	9.42	9.62	11.38
660	201	4.05	4.65	5.06	5.67	6.07	6.47	7.28	8.09	8.70	9.11	9.31	9.71	9.91	11.74
670	204	4.17	4.80	5.21	5.84	6.26	6.67	7.51	8.34	8.97	9.38	9.59	10.01	10.22	12.09
680	207	4.30	4.94	5.37	6.01	6.44	6.87	7.73	8.59	9.24	9.67	9.88	10.31	10.52	12.46
690	210	4.42	5.09	5.53	6.19	6.63	7.08	7.96	8.85	9.51	9.95	10.17	10.62	10.84	12.83
700	213	4.55	5.24	5.69	6.37	6.83	7.28	8.19	9.10	9.79	10.24	10.47	10.93	11.15	13.20
710	216	4.68	5.39	5.85	6.56	7.02	7.49	8.43	9.37	10.07	10.54	10.77	11.24	11.47	13.58
720	219	4.82	5.54	6.02	6.74	7.22	7.71	8.67	9.63	10.35	10.84	11.08	11.56	11.80	13.97
730	223	4.95	5.69	6.19	6.93	7.43	7.92	8.91	9.90	10.64	11.14	11.39	11.88	12.13	14.36
740	226	5.09	5.85	6.36	7.12	7.63	8.14	9.16	10.17	10.94	11.45	11.70	12.21	12.46	14.75
750	229	5.23	6.01	6.53	7.32	7.84	8.36	9.41	10.45	11.24	11.76	12.02	12.54	12.80	15.15
760	232	5.37	6.17	6.71	7.51	8.05	8.59	9.66	10.73	11.54	12.07	12.34	12.88	13.15	15.56
770	235	5.51	6.33	6.89	7.71	8.26	8.81	9.91	11.02	11.84	12.39	12.67	13.22	13.50	15.97
780	238	5.65	6.50	7.07	7.91	8.48	9.04	10.17	11.30	12.15	12.72	13.00	13.57	13.85	16.39
790	241	5.80	6.67	7.25	8.12	8.70	9.28	10.44	11.60	12.47	13.05	13.34	13.92	14.21	16.81
800	244	5.95	6.84	7.43	8.32	8.92	9.51	10.70	11.89	12.78	13.38	13.68	14.27	14.57	17.24

FPS 0.20g	M/s 0.20g	Energy in J	FPS 0.58g	M/s 0.58g
300	91	**0.84**	176	54
310	94	**0.89**	182	55
320	98	**0.95**	188	57
330	101	**1.01**	194	59
340	104	**1.07**	200	61
350	107	**1.14**	206	63
360	110	**1.20**	211	64
370	113	**1.27**	217	66
380	116	**1.34**	223	68
390	119	**1.41**	229	70
400	122	**1.49**	235	72
410	125	**1.56**	241	73
420	128	**1.64**	247	75
430	131	**1.72**	253	77
440	134	**1.80**	258	79
450	137	**1.88**	264	81
460	140	**1.97**	270	82
470	143	**2.05**	276	84
480	146	**2.14**	282	86
490	149	**2.23**	288	88
500	152	**2.32**	294	89
510	155	**2.42**	299	91
520	158	**2.51**	305	93
530	162	**2.61**	311	95
540	165	**2.71**	317	97
550	168	**2.81**	323	98
560	171	**2.91**	329	100
570	174	**3.02**	335	102
580	177	**3.13**	341	104
590	180	**3.23**	346	106
600	183	**3.34**	352	107
610	186	**3.46**	358	109
620	189	**3.57**	364	111
630	192	**3.69**	370	113
640	195	**3.81**	376	115
650	198	**3.93**	382	116
660	201	**4.05**	388	118
670	204	**4.17**	393	120
680	207	**4.30**	399	122
690	210	**4.42**	405	123
700	213	**4.55**	411	125
710	216	**4.68**	417	127
720	219	**4.82**	423	129
730	223	**4.95**	429	131
740	226	**5.09**	435	132
750	229	**5.23**	440	134
760	232	**5.37**	446	136
770	235	**5.51**	452	138
780	238	**5.65**	458	140
790	241	**5.80**	464	141
800	244	**5.95**	470	143


Skin Irritation Test
2019/05/03
- - - - - - - - - - - - -
0.46g: 1.01J @ 10m
0.58g: 1.04J @ 10m
Picture made 7min after hit
5.95mm
0.46g
6.44mm
0.58g


32mm
36mm
4
mm
6.44mm
0.58g
5.95mm
0.46g
Ballistic Clay (78%)
19.5m Shooting Distance
26°C Temperature
- - - - - - - - - - - - -
6.44 BB fired at **313FPS** (2.63 Joules)
5.95 BB fired at **350FPS** (2.61 Joules)