GREENHILL ANTIBALLISTICS CORPORATION

Force Disruption Reduces Kinetic Energy

Force Disruption PLATFORM

CAGE: 60VS8
DUNS:962693664
210 Delburg Street
Davidson, NC 28036
T: 704.618.3818
F: 800.662.1198
www.forcedisruption.com
info@greenhillantiballistics.com

Outline

Force Disruption PLATFORM

Executive Team

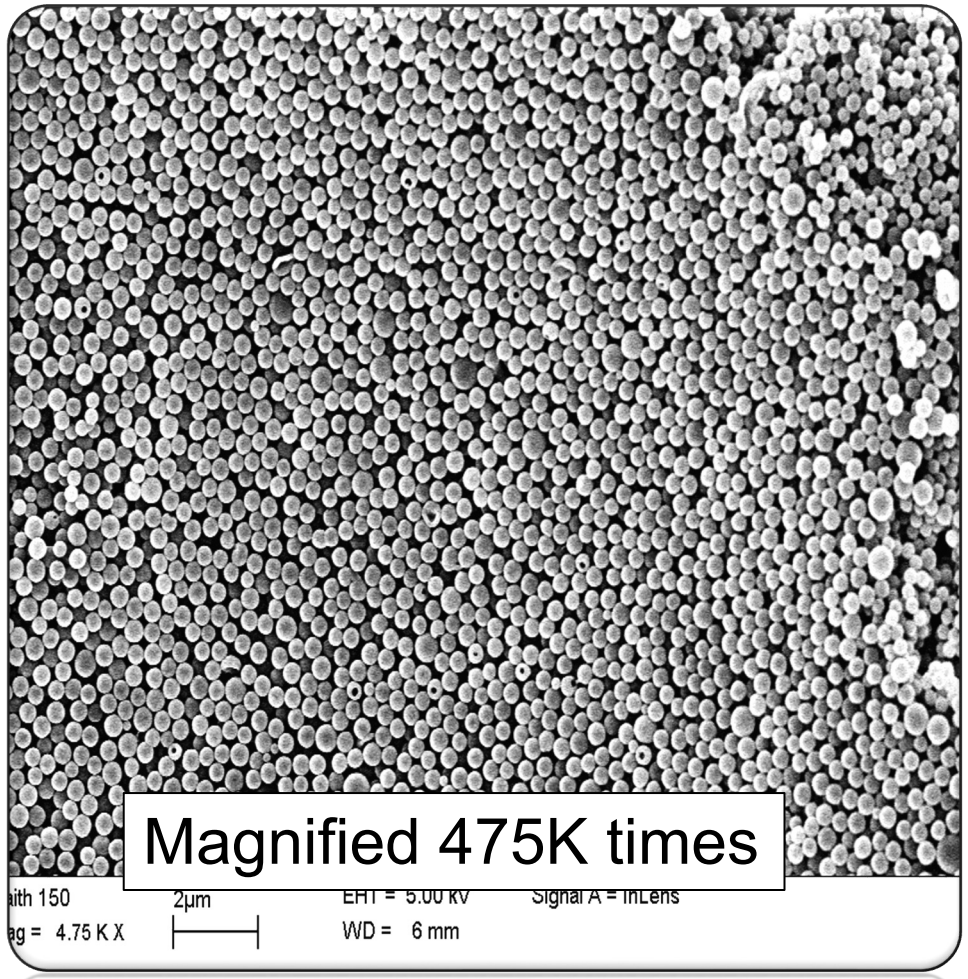
Judy Lee Greenhill, CEO/COO, Co-founder
-19 yrs. IBM – direct $MM projects – Strategy
- Marketing

Joseph J. BelBruno, Ph.D., Chief Scientist
- Nanomaterials - 30 yrs. Dartmouth - 140 peer reviewed papers – 11 patents

Zach Greenhill, Chief Tech., Inventor, Co-founder
- CIA Case Officer - 18 patents - 4th gen service family

Force Disruption PLATFORM

FDP – Force Disruption Platform



Disrupts to Reduce Kinetic Energy

- 50% reduction in 1 mm – 0.24 milliseconds – 87.5% in 3 mm

Turns force against itself
  - Reinforces materials

- Coating, layer, or panel
  - Retrofit
  - No redesign or retooling

Force Disruption PLATFORM

Applications

Curves:

- Blast and blunt force
- Sound: noise, vibration
- Thermal: heat signatures, emissions
- Thin: less bulk, weight
- Flexible: malleable, elastic
- Hardens on impact: reinforces, lightweighting

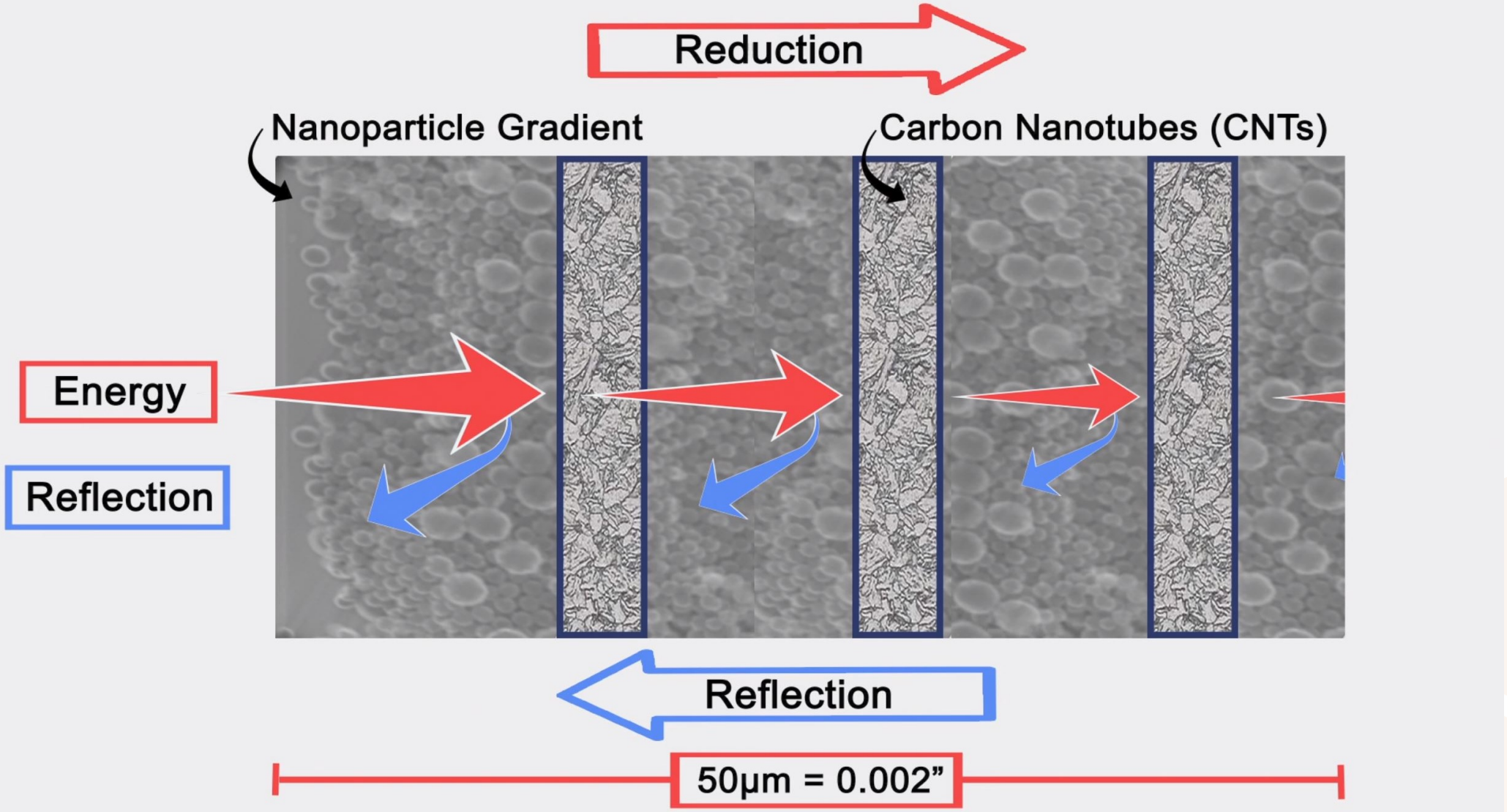
Force Disruption PLATFORM

SWaP-C – 1 Piece of FDP

- *Size:* 1 dime thick x 1 sq. ft.
- *Weight:* 2.42 oz
- *Power:* Kinetic Energy Reduction
    - 50% in 1 mm; 87.5% in 3 mm
    - 0.24 milliseconds
- *Cost:* $32 per piece - *before economies of scale*

Force Disruption PLATFORM

How FDP Works: Disruptive Interference

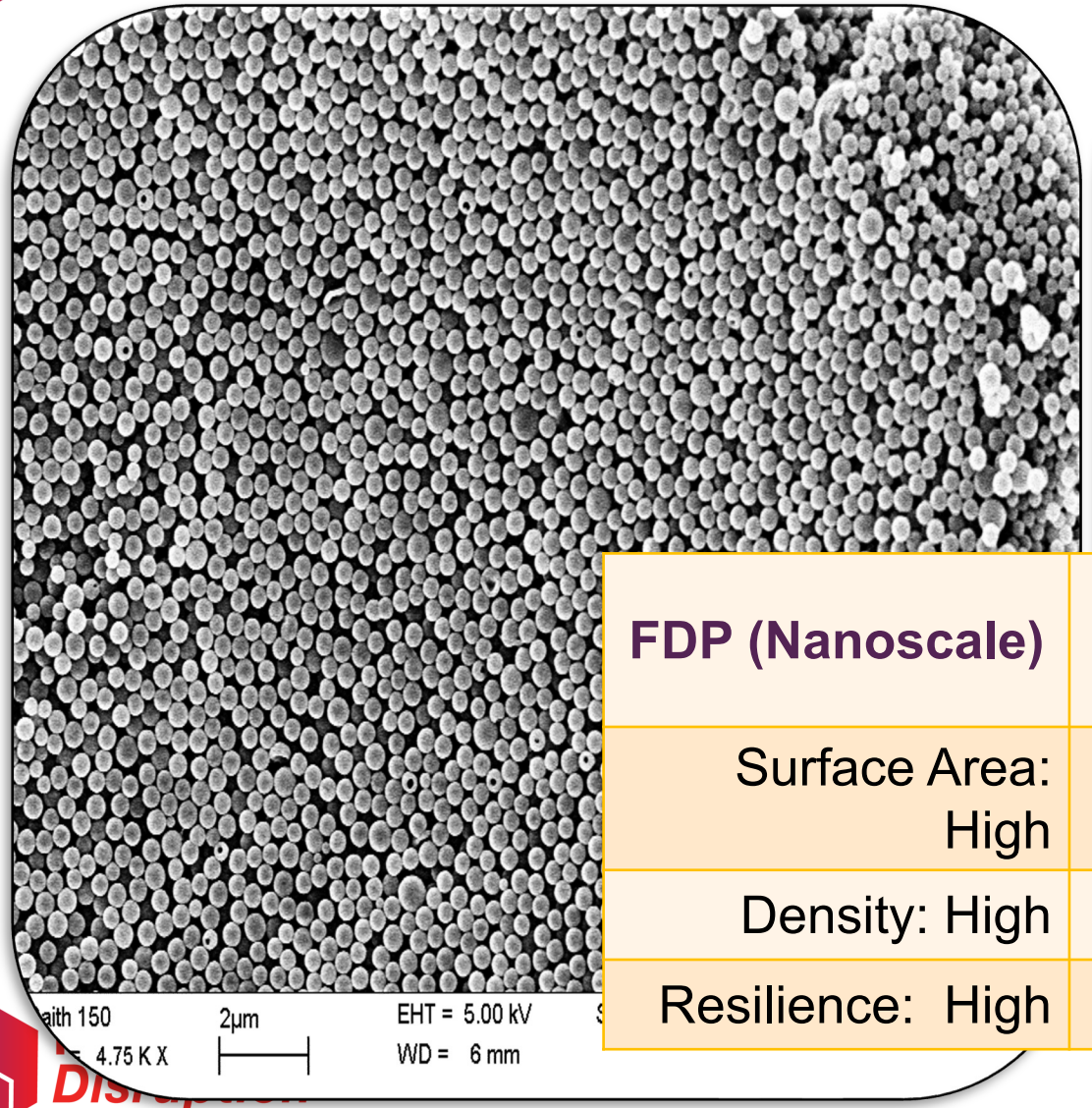


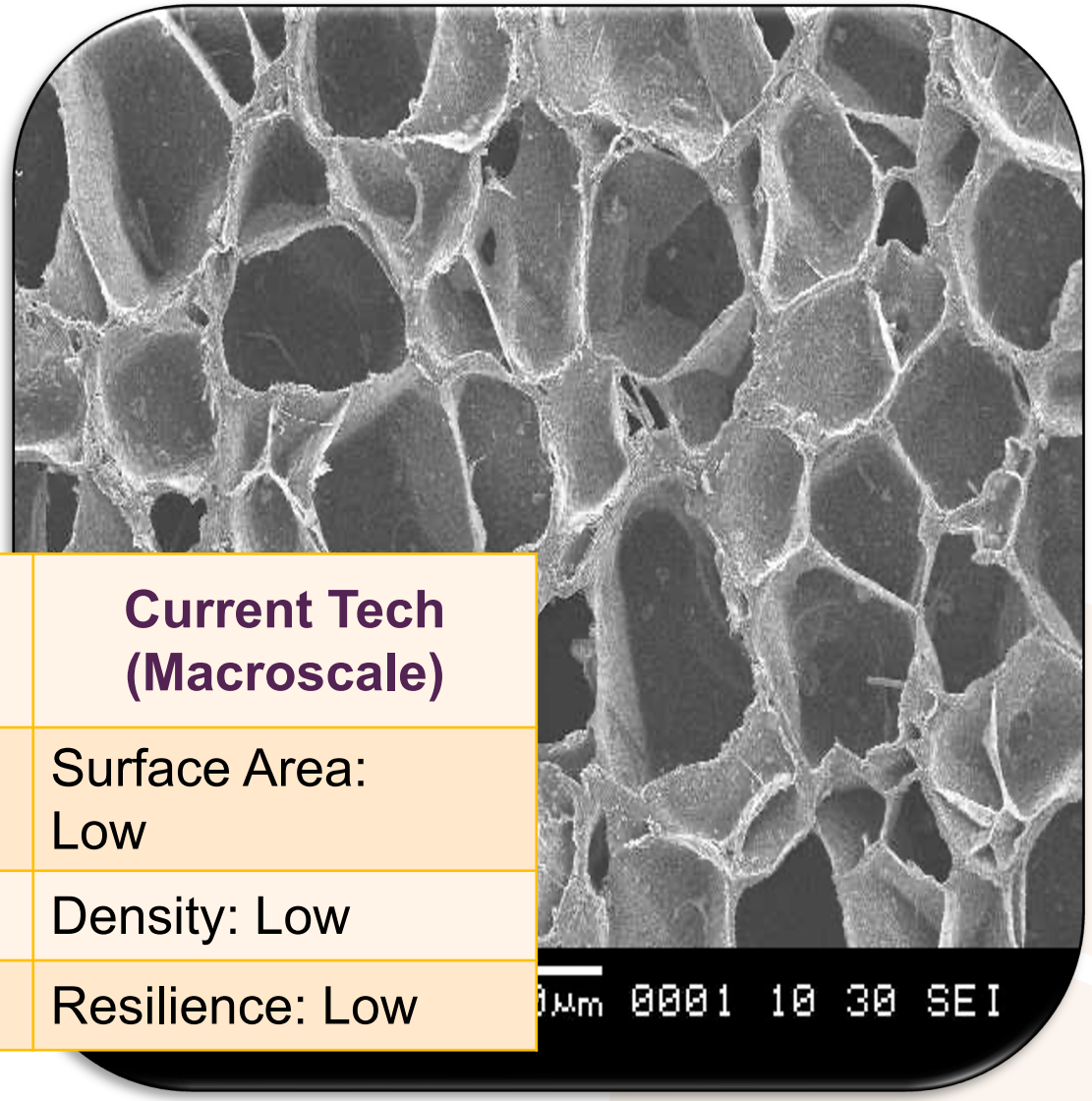
Why FDP is Better

FDP	Current Technology
Nanoscale Technology	Macroscale Technology
Active + passive processes	Passive processes
Uses force against itself	Inert
Reinforces existing protection	Static

Force Disruption PLATFORM

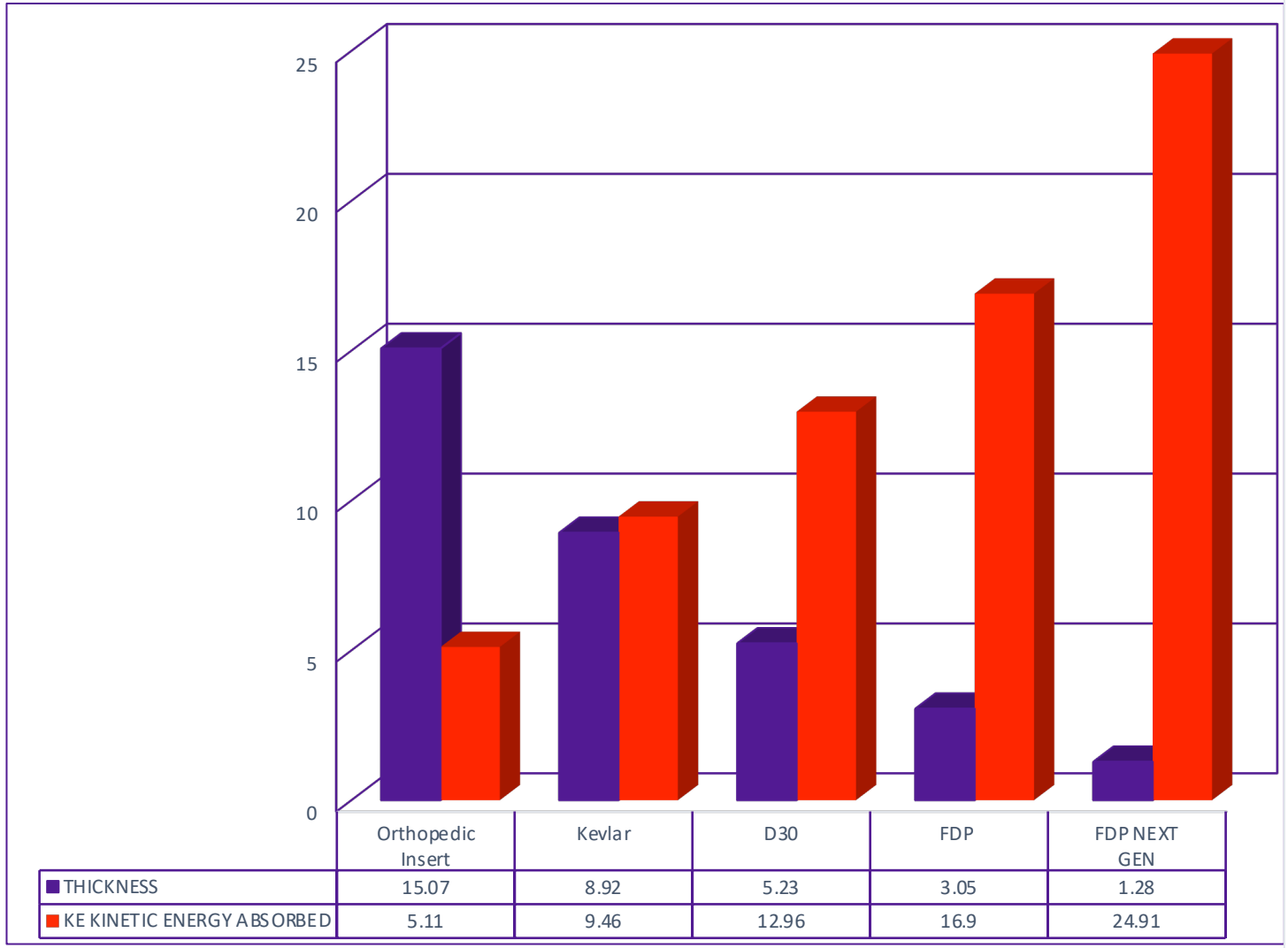
Nanotechnology vs. Macroscale Technology





FDP (Nanoscale)	Current Tech (Macroscale)
Surface Area: High	Surface Area: Low
Density: High	Density: Low
Resilience: High	Resilience: Low

Competitive Benchmarking



	Orthopedic Insert	Kevlar	D30	FDP	FDP NEXT GEN
THICKNESS	15.07	8.92	5.23	3.05	1.28
KE KINETIC ENERGY ABSORBED	5.11	9.46	12.96	16.9	24.91

FDP is the lowest combination of transmitted force and thickness.

"... *performs better than viscoelastic foams and para-aramid fiber."*
-Battelle

* Determined from drop tests at 0.06 J to 0.2 J samples between 0.03 mm to 2.00 mm thick, except orthopedic pads, which were up to 10 mm thick, and D30, which was 6-10 mm thick and tested at 5-10 J.

Force Disruption PLATFORM

THANK YOU

GREENHILL ANTIBALLISTICS CORPORATION

CAGE: 60VS8
DUNS:962693664
210 Delburg Street
Davidson, NC 28036
T: 704.618.3818
F: 800.662.1198
www.forcedisruption.com
yllee@greenhillantiballistics.com

Force Disruption PLATFORM

GREENHILL ANTIBALLISTICS CORPORATION

Appendix One – Test Results

Force Disruption PLATFORM

Test Results

50% Reduction in 0.24 Milliseconds

Table 2. Impact testing results[a] for the coupons[b] described in Table 1.

Coupon	F_{res}, N	%Res vs. Control	$Area_{res}$, N•ms	%Res vs. Control
96-A	872	75	275	75
96-B	783	68	279	76
96-C	623	54	220	60
96-D	712	62	265	72
96-E	578	50	204	56
96-F	712	62	249	68

[a] Definitions: F_{res} = maximum force detected by sensor below the coupon (See, BS EN 397)
$Area_{res}$ = total area of the force vs. time curve at the sensor
[b]Control coupon (polycarbonate) shows F_{res} = 1156 N and $Area_{res}$ = 367 N•ms.

Table 3. Impact testing results for the coupons described in Table 1.

Coupon	Max.Force, N	Width, ms	Delay, ms
Bare Sensor	1334	0.16	0.00
Polycarbonate (2 pcs. 0.031")	1156	0.27	0.10
96-A	872	0.31	0.18
96-B	783	0.30	0.21
96-C	623	0.34	0.22
96-D	712	0.31	0.22
96-E	578	0.34	0.24
96-F	712	0.30	0.21

Force Disruption PLATFORM