Table 1: Model Parameters

Parameter	Description	Value
NC	Total number of grid cells	74
Δx	Grid size	0.0375 cm
$(NC)_{flyer}$	Number of grid cells in flyer plate	8
$(NC)_{target}$	Number of grid cells in target plate	48
$(NC)_{vacuum}$	Number of grid cells in vacuum regions	18 (9 x 2)
Δt	Maximum size of time step	0.01 μs
$\rho(t=0)$	Initial density	8.93 gm cm^{-3}
u_{fp} (t=0)	Initial velocity of flyer plate	0.0645 cm μs^{-1}
Y	Yield stress	0.026 Mbar
G	Shear modulus	0.46 Mbar
Γ	Gruneisen parameter	2.002
s	Shock velocity constant	1.489
c_0	Initial sound speed	0.394 cm μs^{-1}
C_L	Linear artificial viscosity constant	0.2
C_Q	Quadratic artificial viscosity constant	2.0

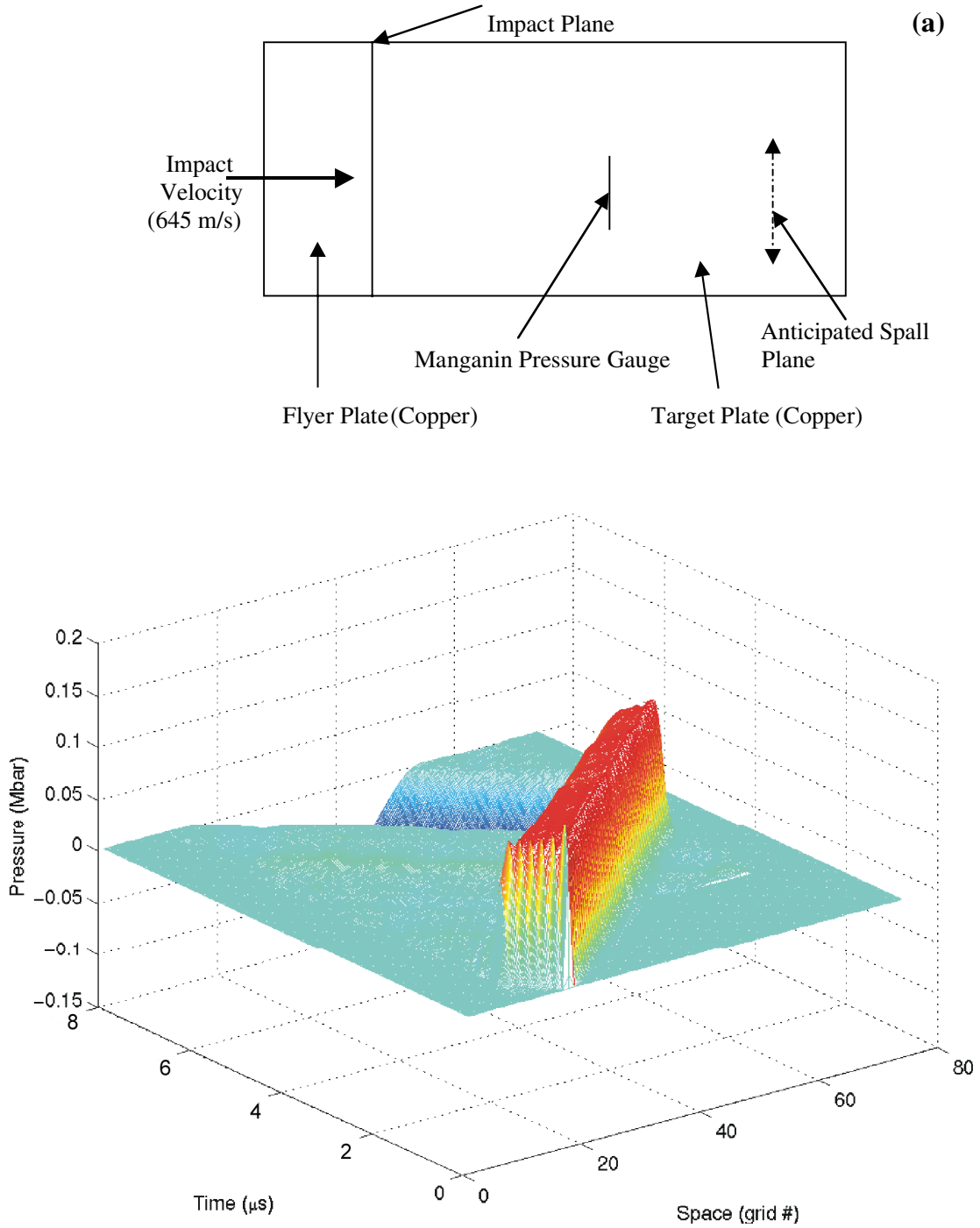
(a)
Impact Plane
Impact
Velocity
(645 m/s)
Manganin Pressure Gauge
Anticipated Spall
Plane
Flyer Plate (Copper)
Target Plate (Copper)
Pressure (Mbar)
0.2
0.15
0.1
0.05
0
−0.05
−0.1
−0.15
Time (μs)
8
6
4
2
0
Space (grid #)
0
20
40
60
80

Fig. 1

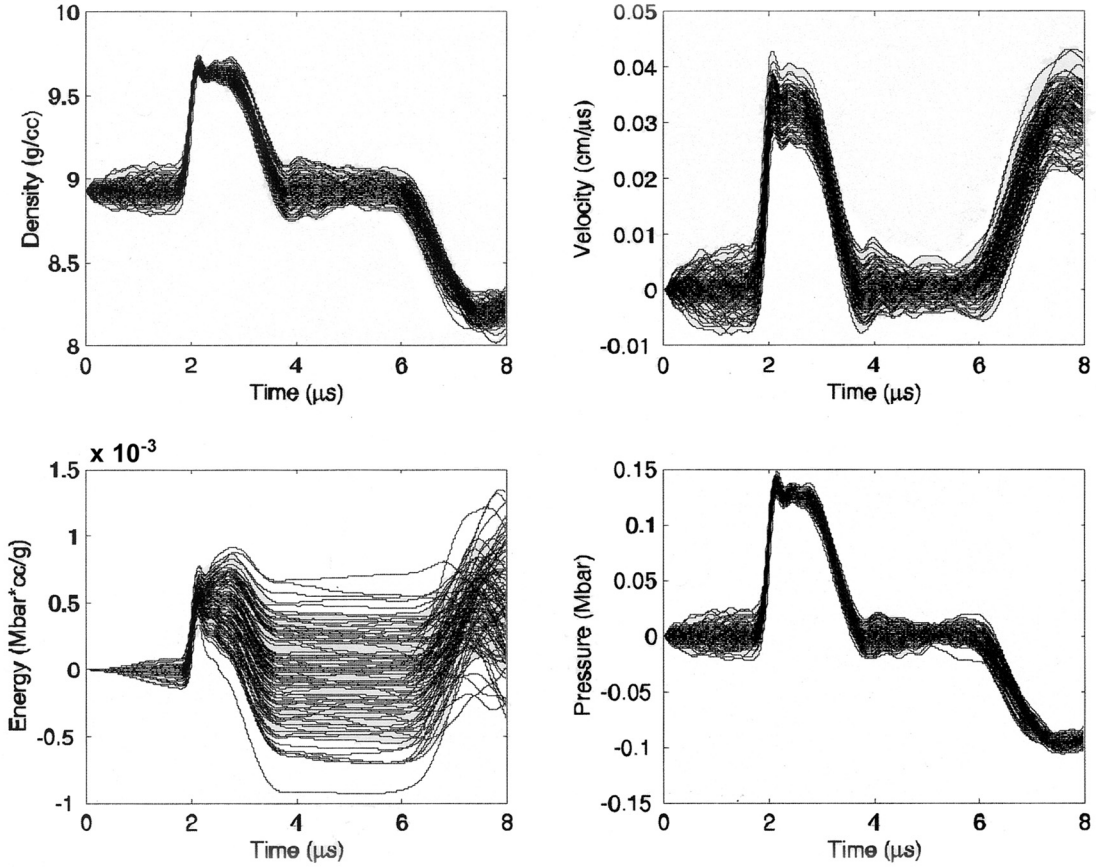
Density (g/cc)
Time (μs)
Velocity (cm/μs)
Time (μs)
x 10^-3
Energy (Mbar*cc/g)
Time (μs)
Pressure (Mbar)
Time (μs)

Fig. 2

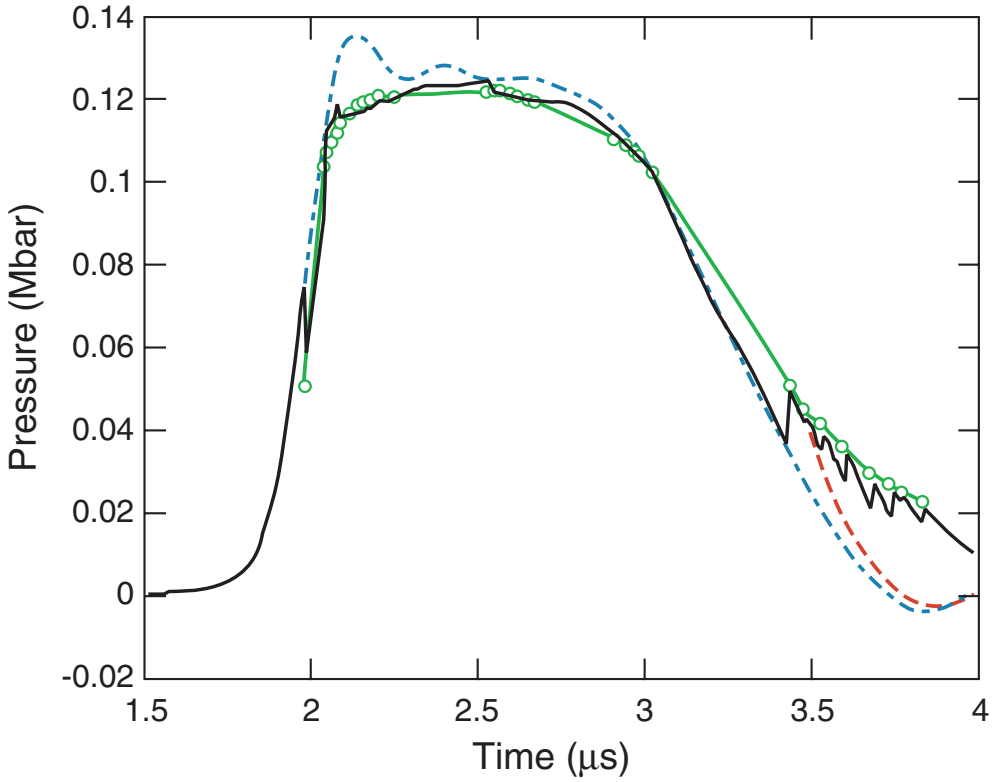
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
Pressure (Mbar)
1.5
2
2.5
3
3.5
4
Time (μs)

Fig. 3

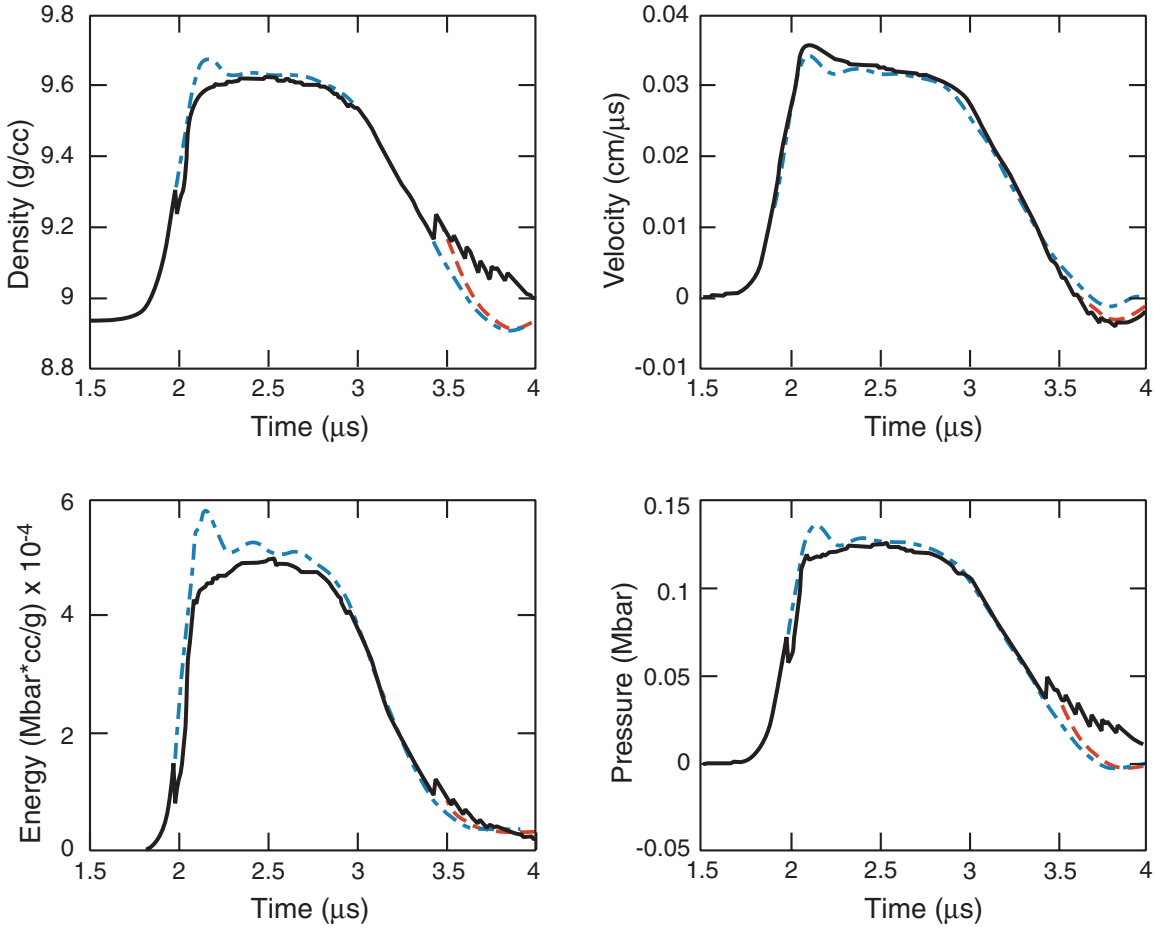
Density (g/cc)
9.8
9.6
9.4
9.2
9
8.8
1.5
2
2.5
3
3.5
4
Time (μs)
Velocity (cm/μs)
0.04
0.03
0.02
0.01
0
-0.01
Time (μs)
Energy (Mbar*cc/g) x 10-4
6
4
2
0
Time (μs)
Pressure (Mbar)
0.15
0.1
0.05
0
-0.05
Time (μs)

Fig. 4

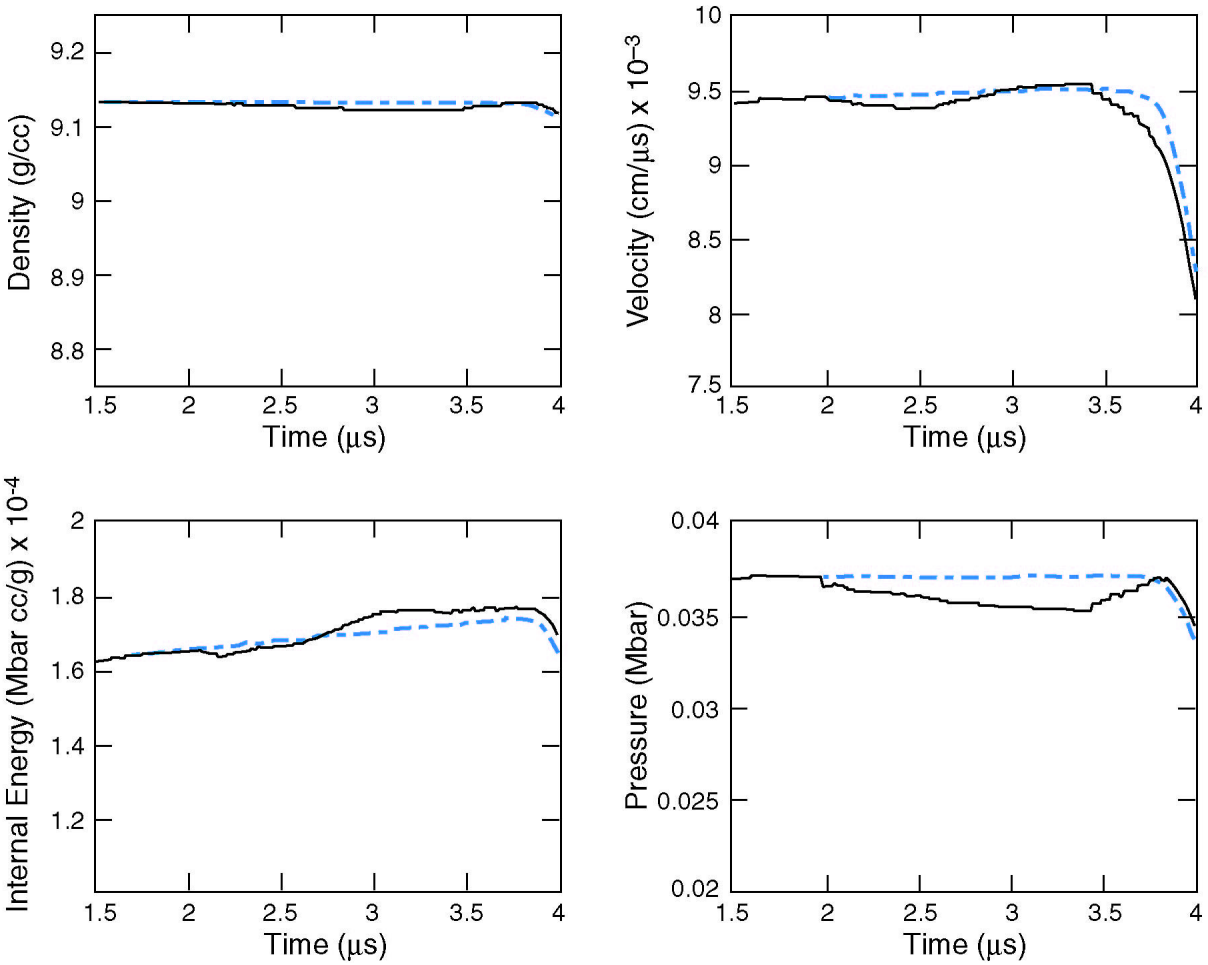
Density (g/cc)
9.2
9.1
9
8.9
8.8
1.5
2
2.5
3
3.5
4
Time (μs)
Velocity (cm/μs) x 10^-3
10
9.5
9
8.5
8
7.5
Time (μs)
Internal Energy (Mbar cc/g) x 10^-4
2
1.8
1.6
1.4
1.2
Time (μs)
Pressure (Mbar)
0.04
0.035
0.03
0.025
0.02
Time (μs)

Fig. 5

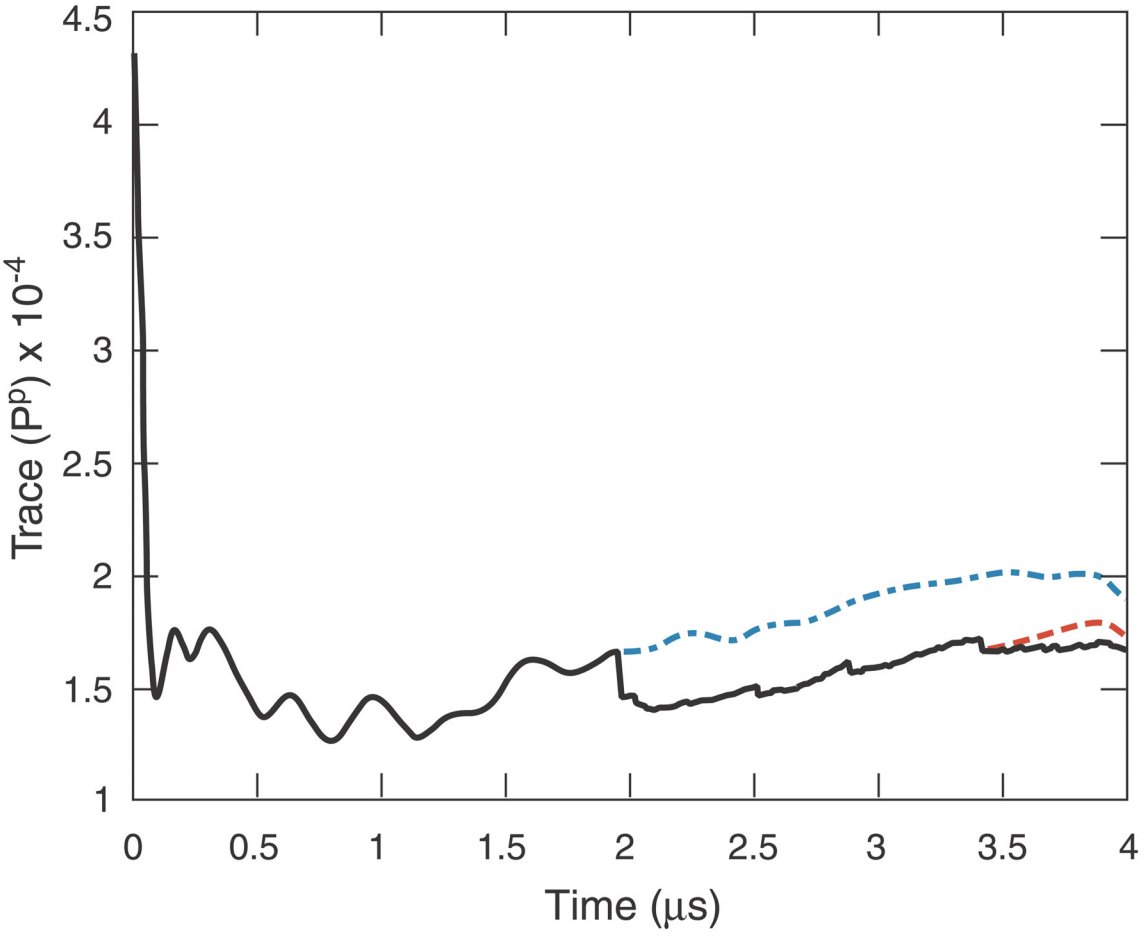

Fig. 6

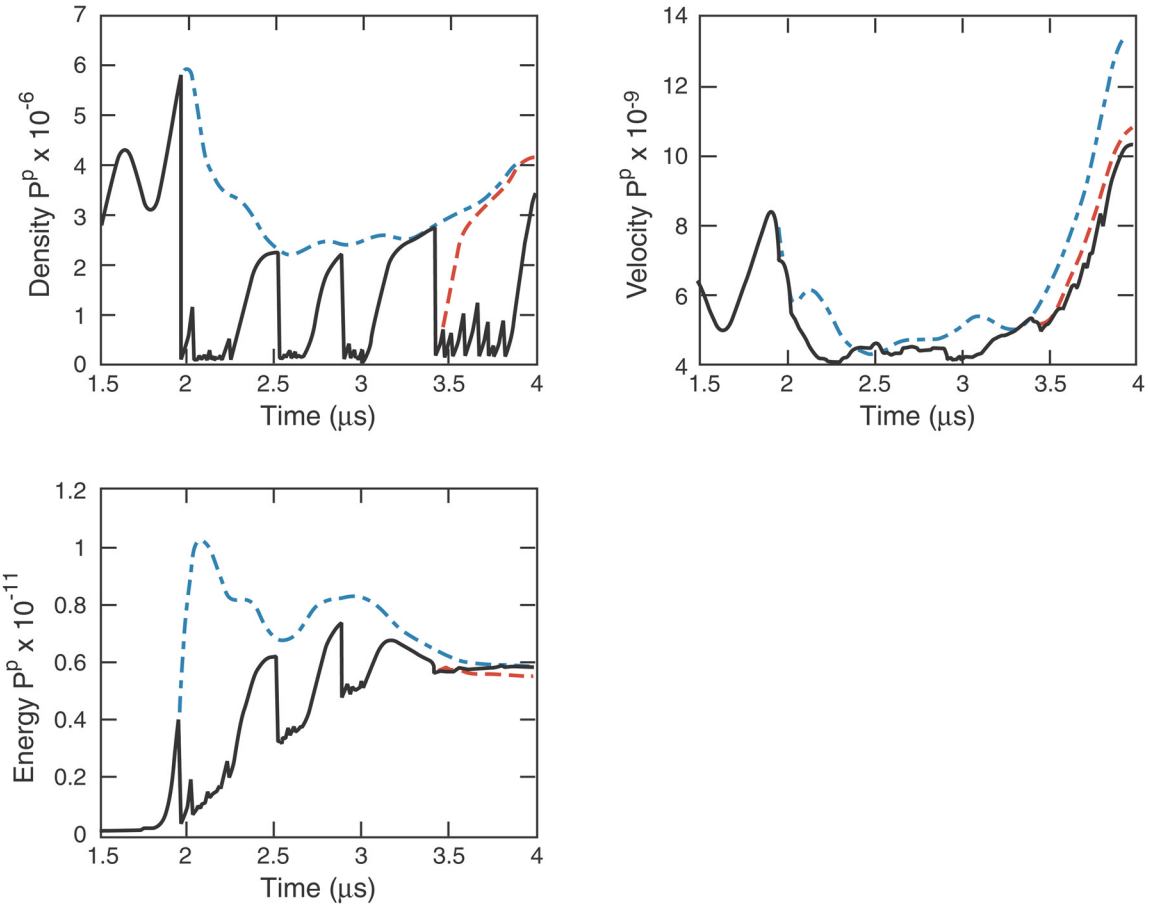
Density P^p x 10^{-6}
Time (μs)
Velocity P^p x 10^{-9}
Time (μs)
Energy P^p x 10^{-11}
Time (μs)

Fig. 7

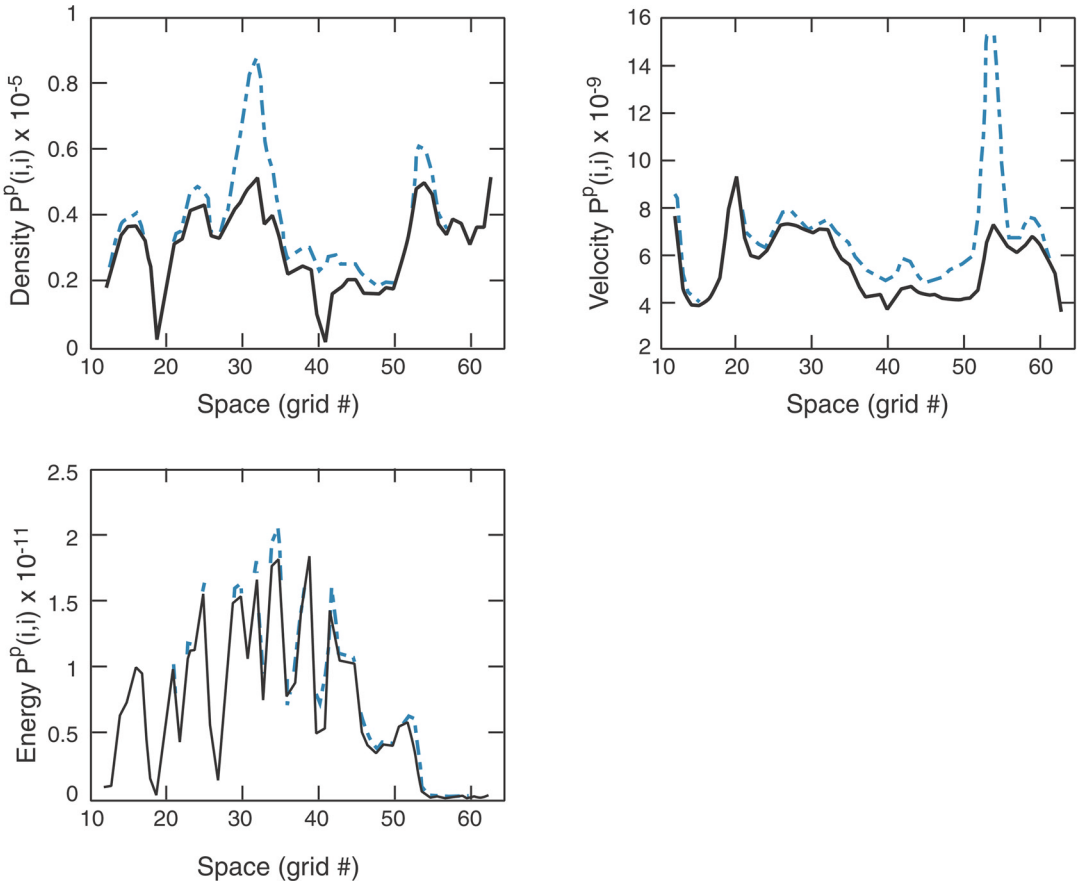
Density $P^p(i,i) \times 10^{-5}$
Space (grid #)
Velocity $P^p(i,i) \times 10^{-9}$
Space (grid #)
Energy $P^p(i,i) \times 10^{-11}$
Space (grid #)

Fig. 8

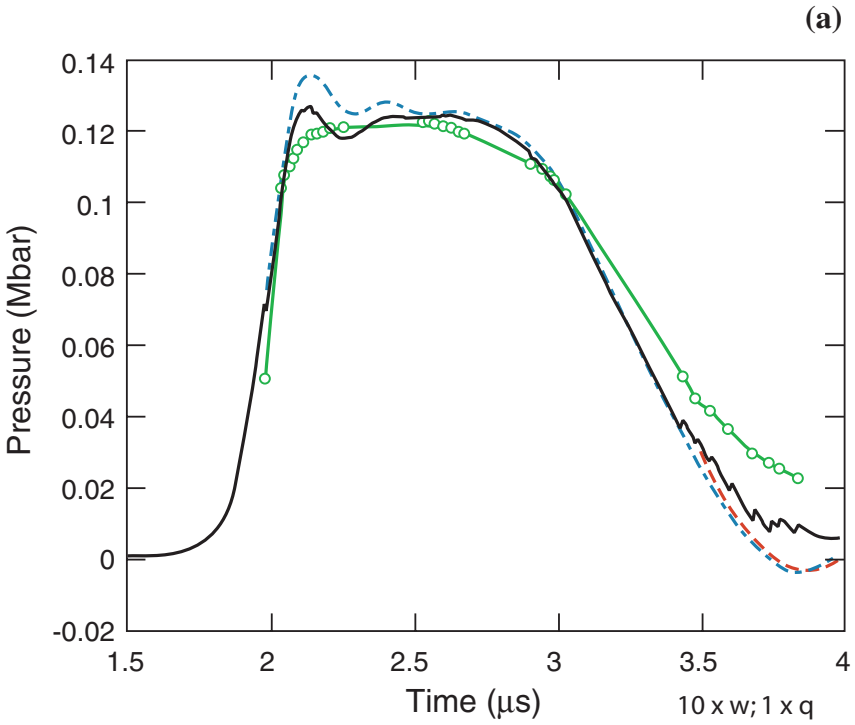
(a)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
Pressure (Mbar)
1.5
2
2.5
3
3.5
4
Time (μs)
10 x w; 1 x q

Fig. 9a

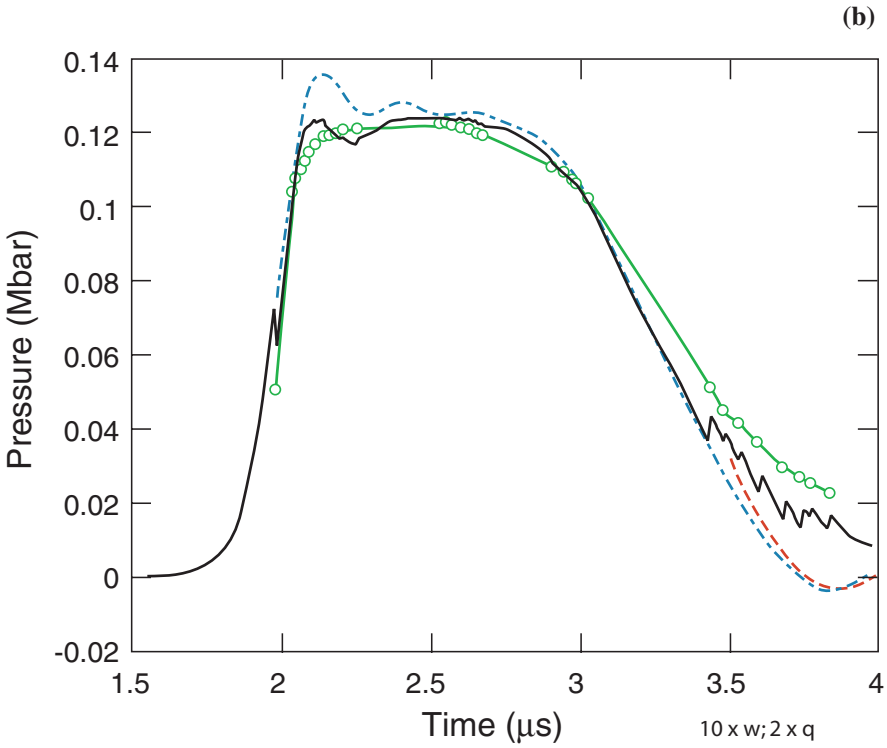
(b)
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
-0.02
Pressure (Mbar)
1.5
2
2.5
3
3.5
4
Time (μs)
10 x w; 2 x q

Fig. 9b

continuation of Figure 9

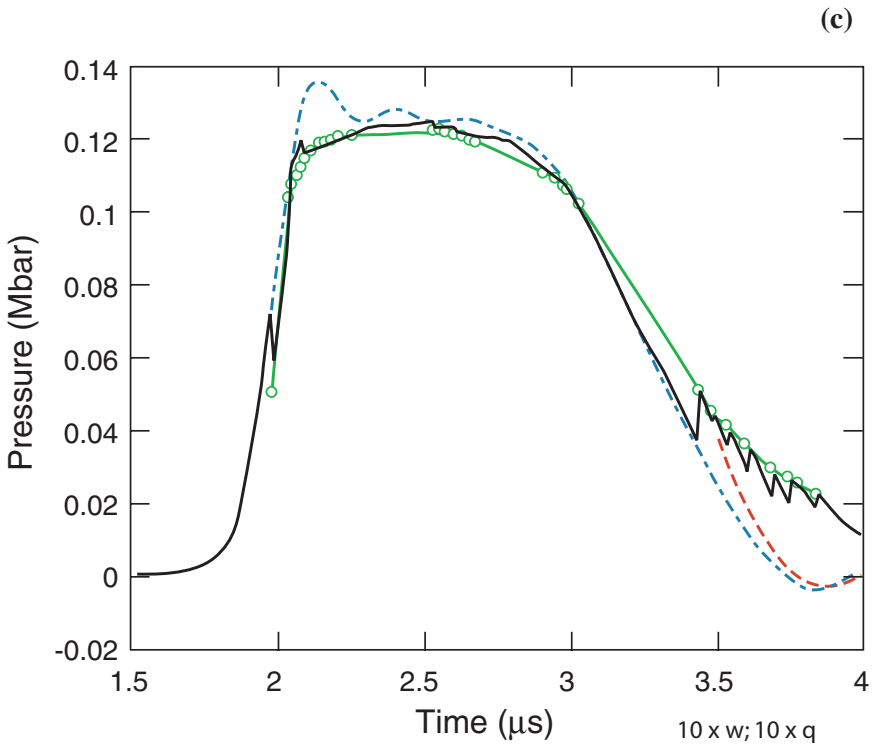

Fig. 9c

Fig. 9

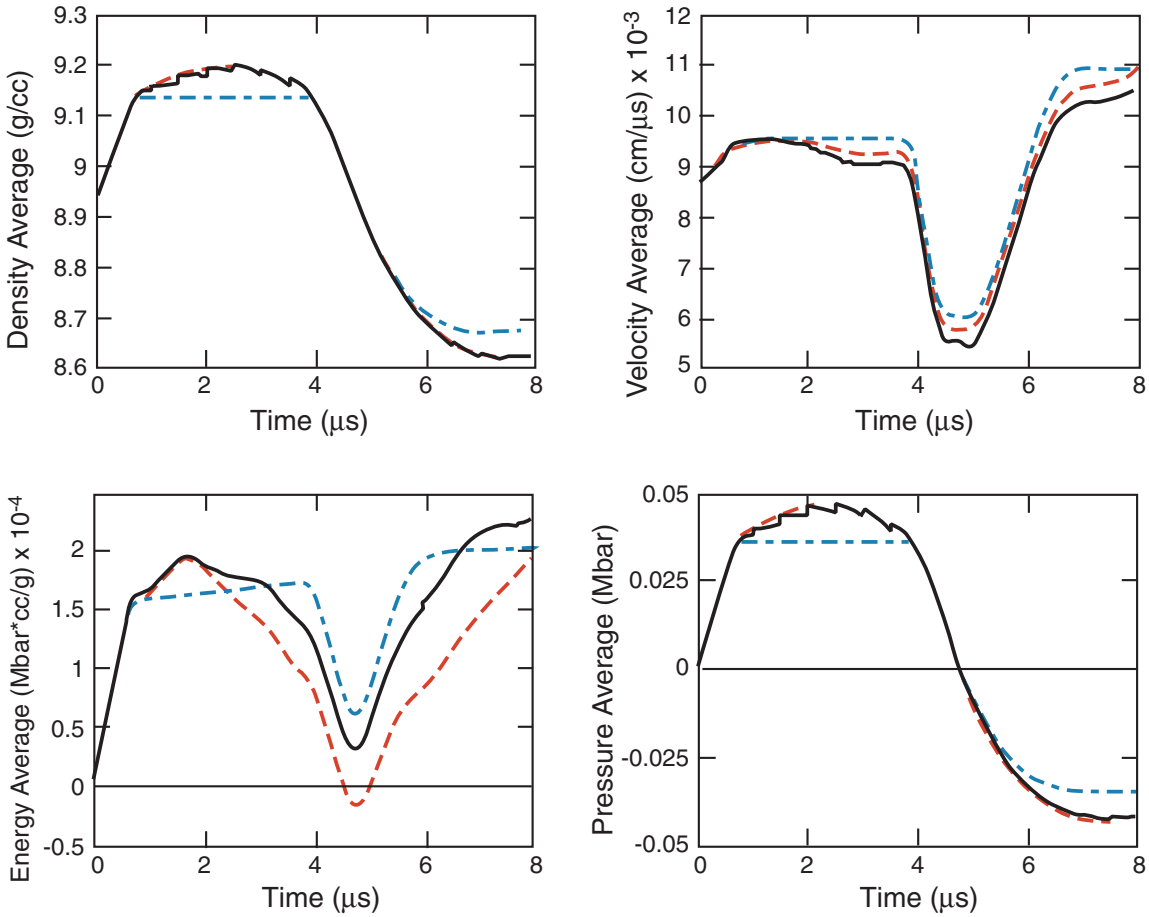
Density Average (g/cc)
9.3
9.2
9.1
9
8.9
8.8
8.7
8.6
0
2
4
6
8
Time (μs)
Velocity Average (cm/μs) x 10-3
12
11
10
9
8
7
6
5
0
2
4
6
8
Time (μs)
Energy Average (Mbar*cc/g) x 10-4
2
1.5
1
0.5
0
-0.5
0
2
4
6
8
Time (μs)
Pressure Average (Mbar)
0.05
0.025
0
-0.025
-0.05
0
2
4
6
8
Time (μs)

Fig. 10

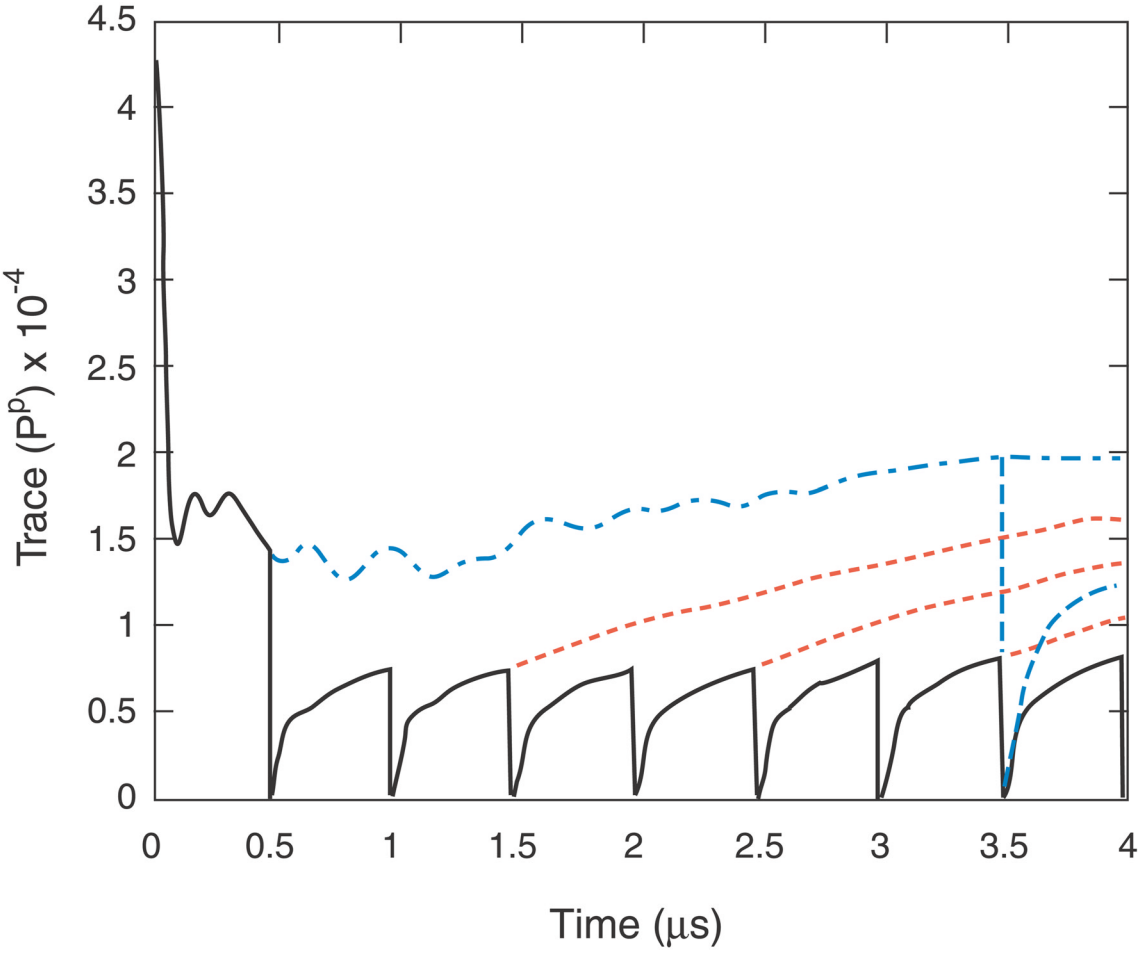

Fig. 11