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REDUCED SENSITIVITY CYCLOTRIMETHYLENE TRINITRAMINE (RDX) EVALUATION *

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* This work was conducted under the auspices of the Insensitive Munitions Technology Transition Program (IMTTP).

Goal

- To ascertain if this material will facilitate a PS□BXN-109 formulation incorporating RDX in passing sympathetic detonation with or without mitigation

Summary of Results

Safety Characterization Assessment and Particle Size Analysis of SME and Dyno Reduced Sensitivity RDX

	Standard RDX (Class 5)	SME IRDX (Class 1)	SME IRDX (Class 5)	Dyno Insensitive RDX (Class 1)	Dyno Improved RDX (Class 5)
Lot number	HOL445-13	0858S00	065S00	DDP02E000E010	DDP02E000E008
Average particle size	N/A	178.28 mm	15.54 mm	175.71 mm	10.67 mm
Impact sensitivity (50% point)	14 cm	13 cm	17 cm	15 cm	21 cm
Friction sensitivity (50% point)	407 lb_f	355 lb_f	427 lb_f	10/10 no-fires at 1000 lb_f	10/10 no-fires at 1000 lb_f
Electrostatic sensitivity	10/10 no-fires at 0.25 J	10/10 no-fires at 0.25 J	10/10 no-fires at 0.25 J	10/10 no-fires at 0.25 J	10/10 no-fires at 0.25 J

N/A = not available.

Summary of SME and Dyno PBXN-109 Processing Properties

	Specification [a]	PBXN–109 Containing OSI CXM-7 [b]	PBXN-109 Containing SME IRDX	PBXN-109 Containing Dyno Insensitive RDX
Composition Analysis				
% RDX	64 ±1.5	64.38	65.21	64.55
% aluminum	20 ±2.0	19.79	19.46	19.74
% binder	16 (by difference)	15.83	15.33	15.71
EOMV, kP		4.75	5.7	6.0
Impact sensitivity (50% point)	25-52 cm	41 cm	42 cm	42 cm
Friction sensitivity (1000 lb_f)	20/20 no-fires at 980 lb_f	10/10 no-fires	10/10 no-fires	10/10 no-fires
Electrostatic sensitivity	20/20 no-fires at 0.25 J	50 % point at 0.1 J [c]	10/10 no-fires at 0.25 J 50% point at 0.03 J [c]	50 % point at 0.16 J [c]

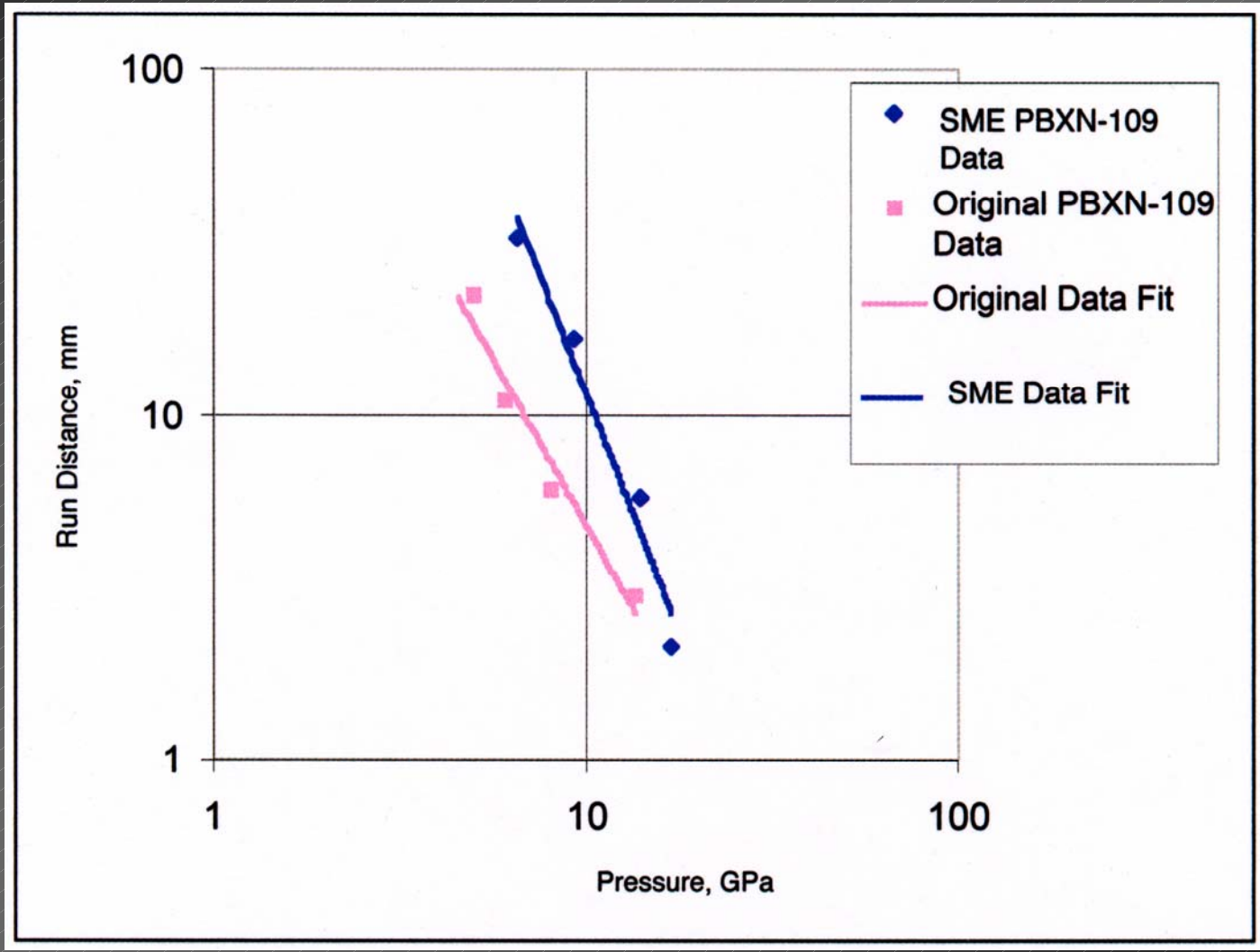
[a] Historical data from SW010-AG-ORD-010; [b] composition prepared from OSI CXM-7, [c] PBXN-109 composition with aluminum from current manufacturer.
EOMV = end-of-mix viscosity.

Summary of NOL Large-scale Gap Test and Detonation Velocity Results for SME and Dyno PBXN-109

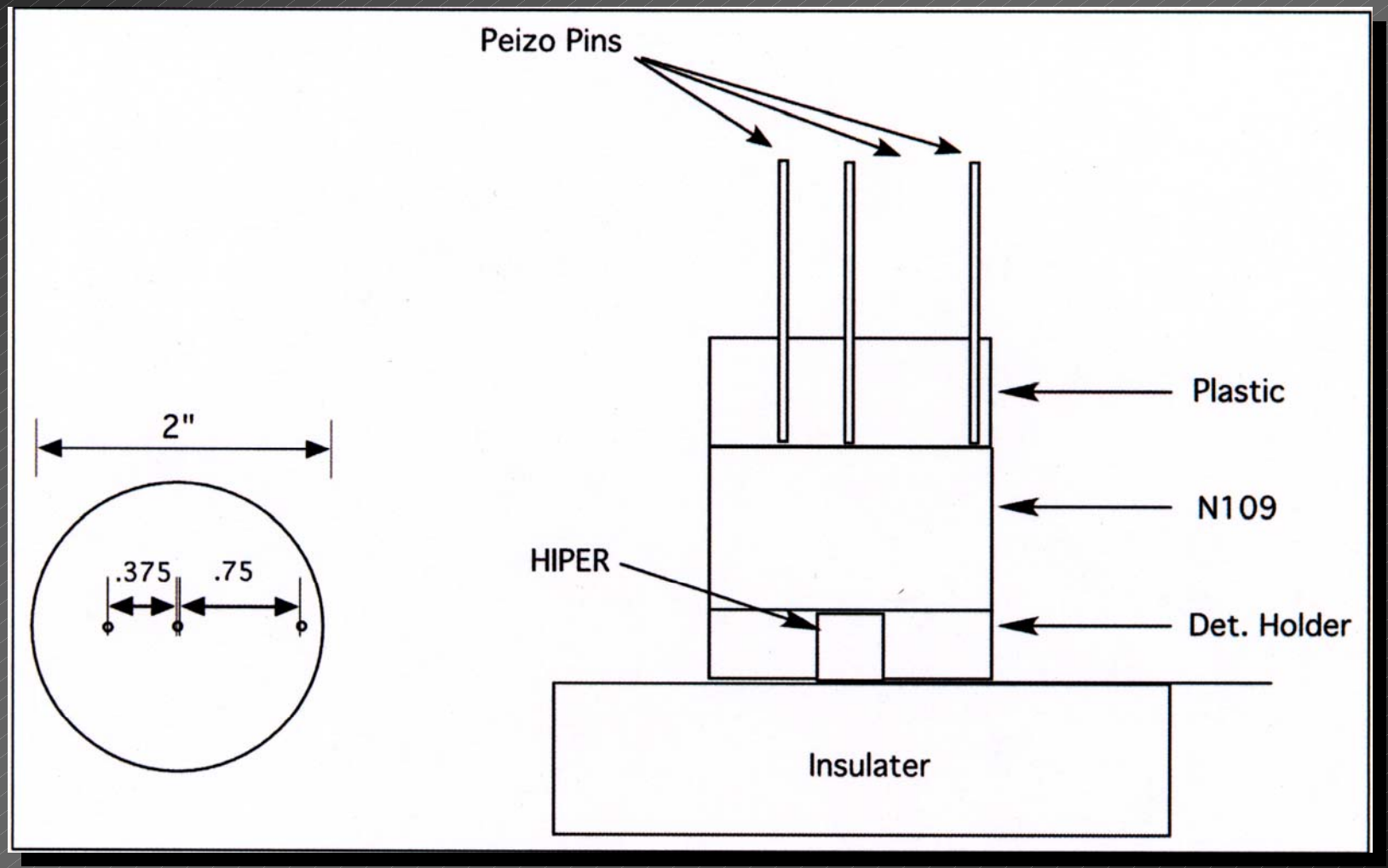
	Historical Data [a]	PBXN-109 Containing OSI CXM-7 [b]	PBXN-109 Containing SME IRDX	PBXN-109 Containing Dyno Insensitive RDX
NOL LSGT				
cards	186 to195	142	113.2	113.9
kbars	~24 to 22	~43	~52	~52
Detonation velocity, mm/ms	7.480	N/A	7.497	N/A

[a] Derived from SW010-AG-ORD-010; [b] composition prepared from OSI CXM-7.
LSGT = large-scale gap test.

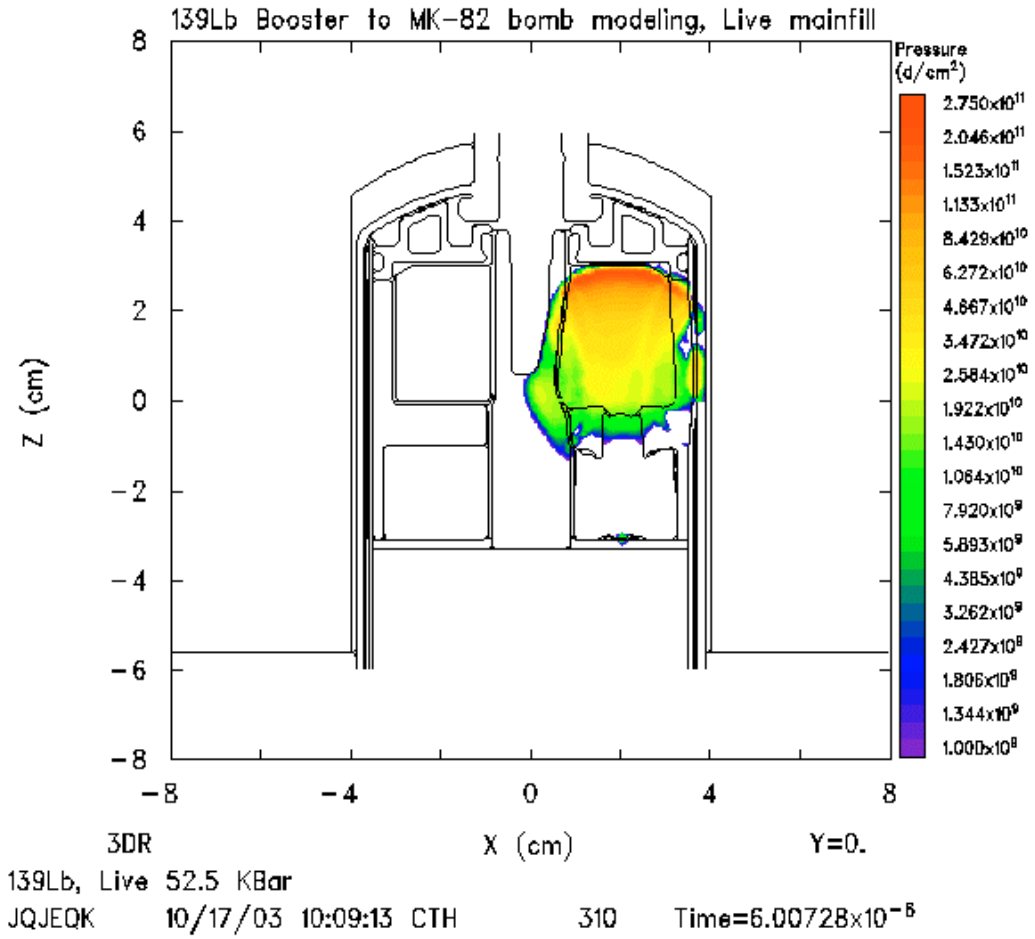
Pop Plot for PBXN-109 Containing Holston and SME Products



Standard HIPER Test Setup



139-lb Booster to Mk 82 Bomb Modeling



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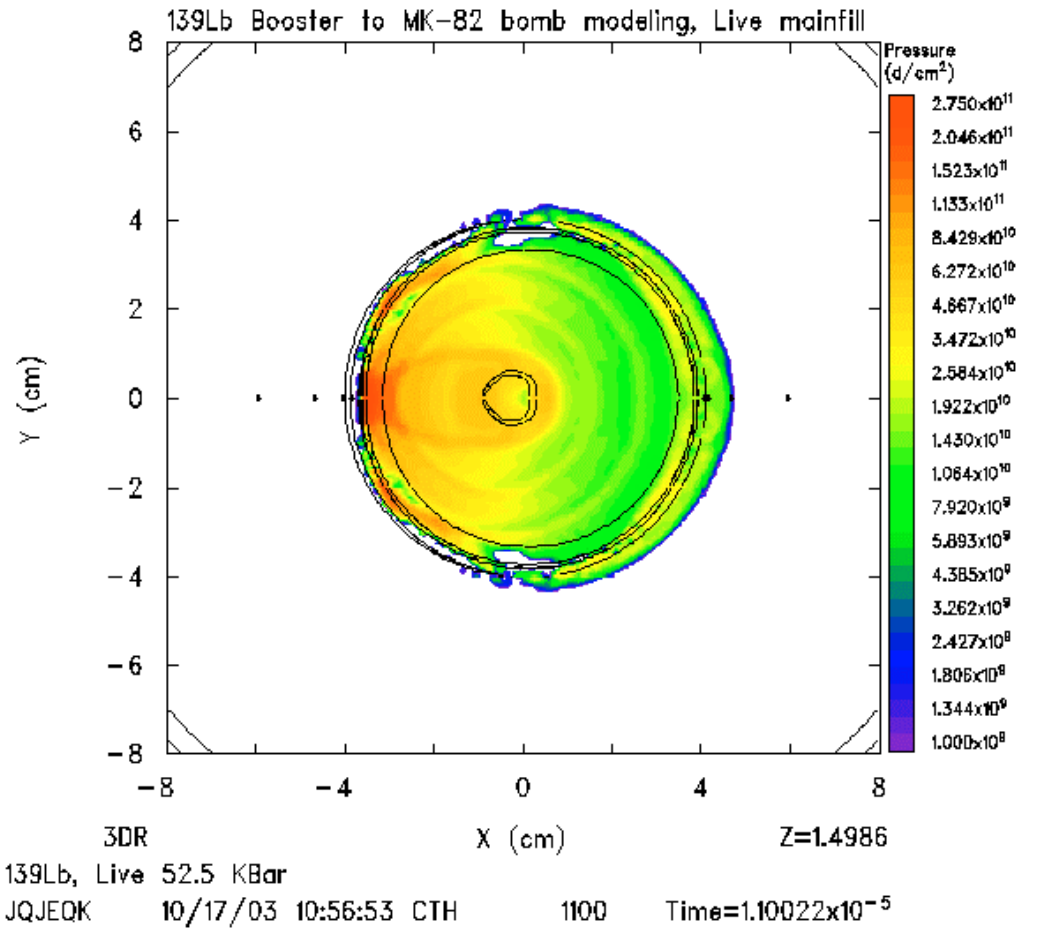
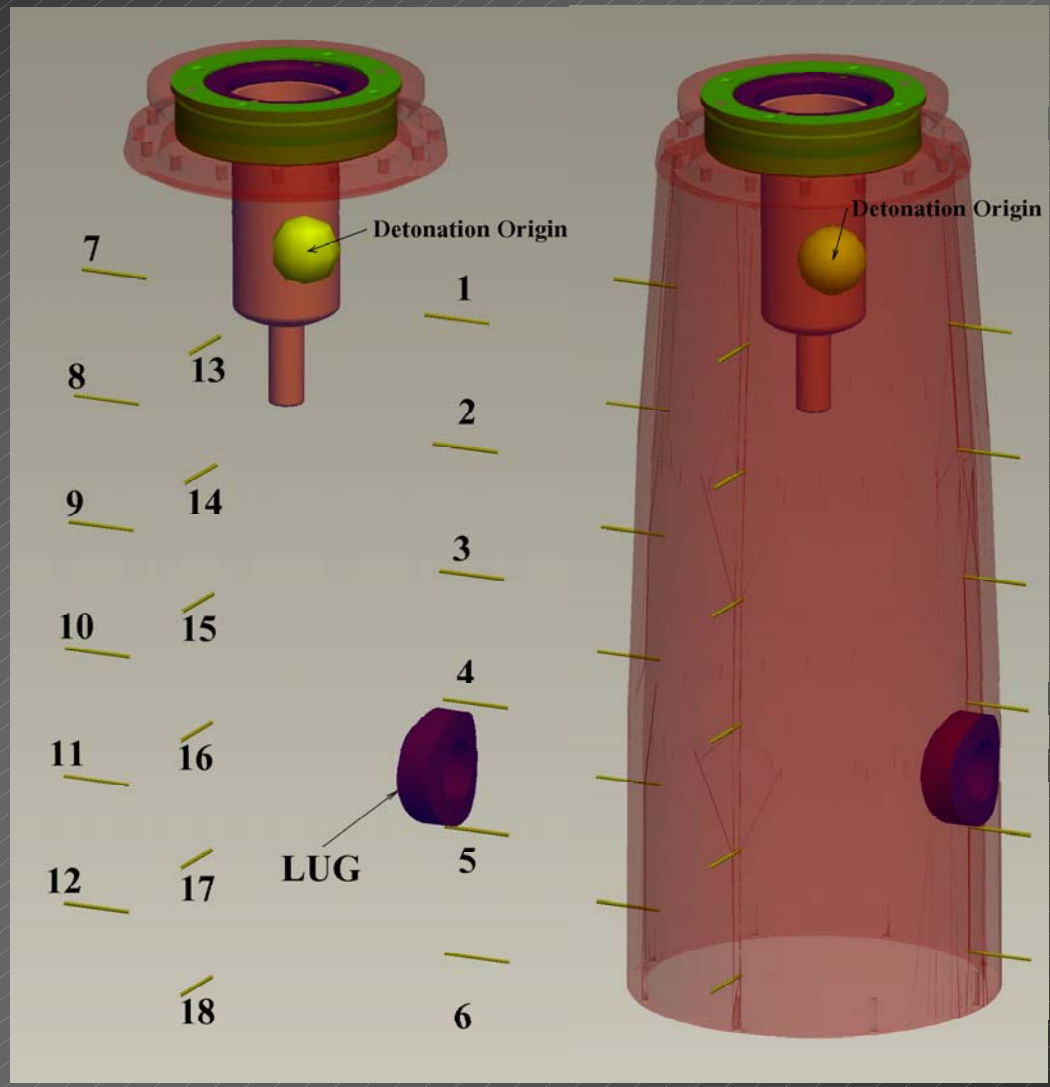
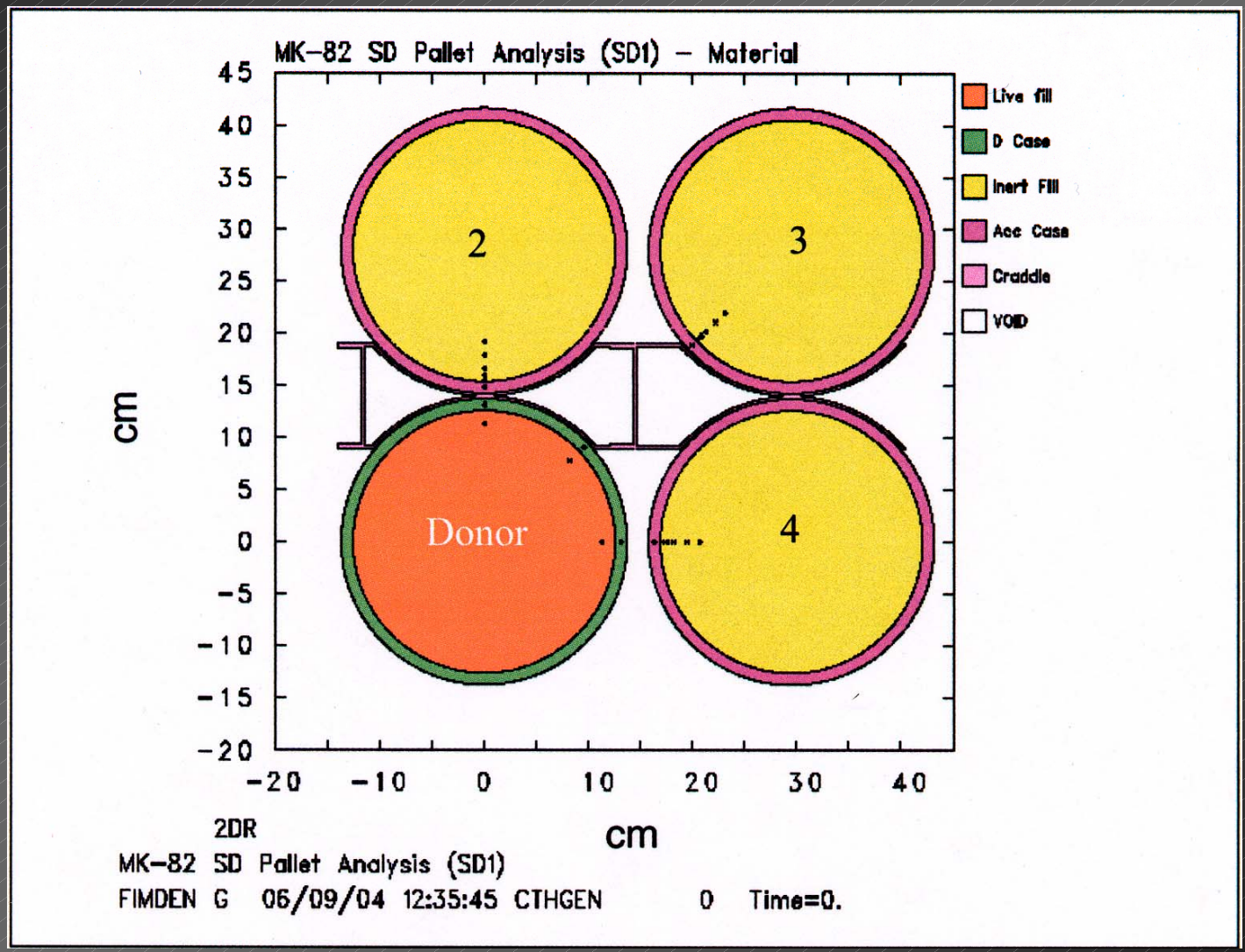


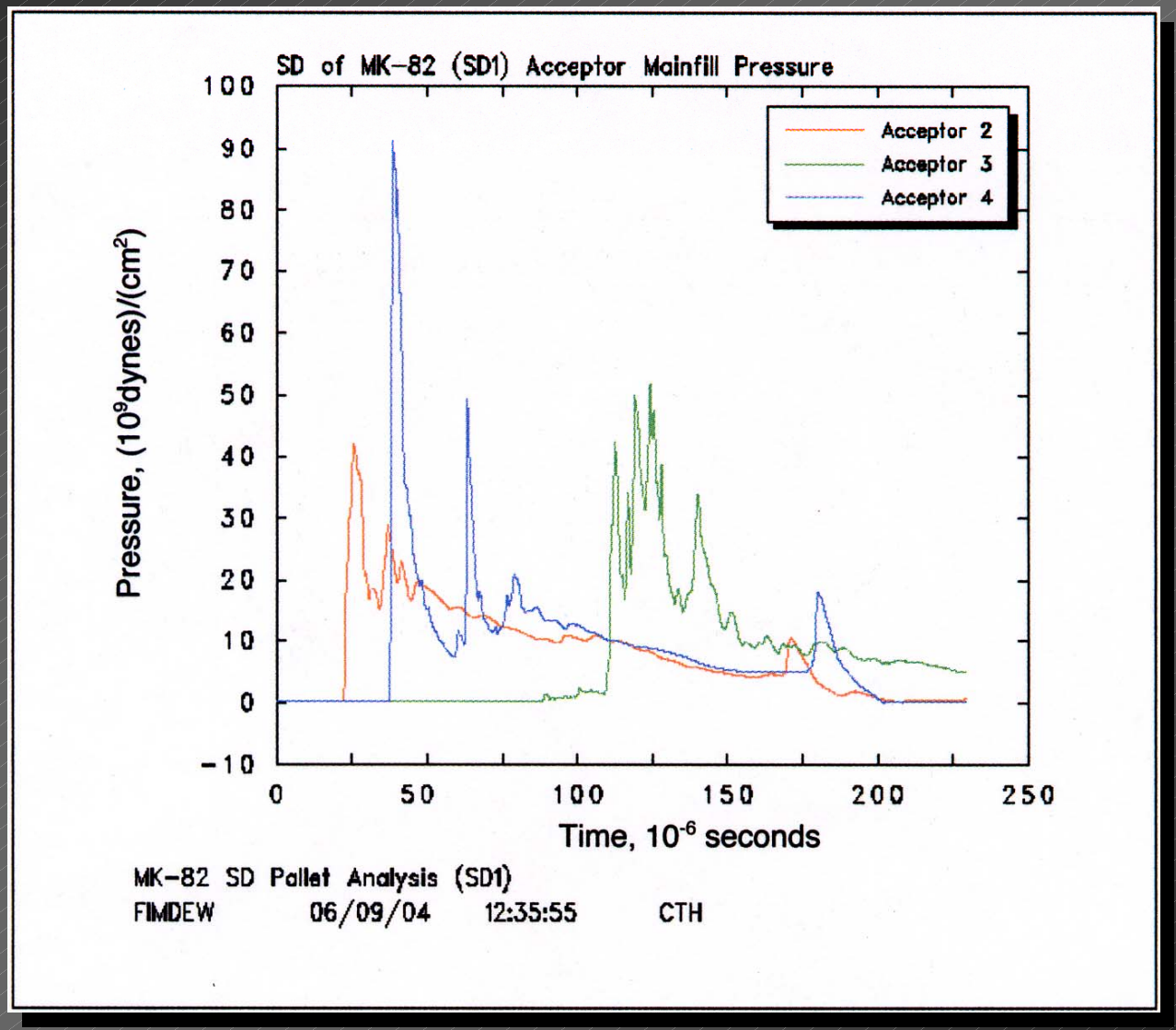
Schematic of Fuze Initiation Test



Baseline Model Configuration for Mk 82 Bombs on Mk 9 Mod 0 Pallets



Sympathetic Detonation of Mk 82



Peak Pressures Results for Models

Model Configuration	Baseline, kbars	Baseline With Pumice, kbars	Baseline With Pumice and Additional Spacing, kbars
Donor explosive	180	183	181
Acceptor 2 bomb case	240	245	225
Acceptor 2 explosive	42	45	59
Acceptor 3 bomb case	226	226	229
Acceptor 3 explosive	53	44	34
Acceptor 4 bomb case	276	240	224
Acceptor 4 explosive	91	67	64

Conclusions and Recommendations

- The Mk 82 bomb filled with PBXN-109 incorporating SME IRDX initiated quickly and successfully in the -65°F environment (with no asphalt liner on the fuzewell) when using a standard FMU-139B/B fuze.

- The pressures determined via hydrocode modeling for Mk 82 acceptor bombs stacked on a Mk 9 Mod 0 pallet are higher than those that resulted from the actual initiation of the mainfill in a half section of that bomb. This outcome was consistent both with and without pumice mitigation.

- The sensitivity of large-size (10-inch-diameter) test items of standard PBXN-109 and that incorporating SME IRDX can be compared by determining the level at which sympathetic detonation occurs when applying increasing intensities of shock wave inputs.