X-rays from z-pinches as relativistic electron beam generators

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applications.

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imploding z-pinches are efficient x-ray producers. Typi

i.e., the explosion of the pinch after the radiation pulse.

[redacted]

ized in Table I by their pulse rise time, the maximum electri-

full power.

[redacted]

		Nominal	Nominal	x-ray	
Double Eagle	PI	8	3	15 (Ne *K*)	Dukart, 1983
[redacted]					
Owl II	PI	1	1		Stallings, 1976

Reference	Pinhole	Soft x-ray spectrum	XUV spectrum	Resolved spectrum
Aranchuk, 1985	W			
Bleach, 1982	Ar		Ne,Ar,Kr,Xe	
Duston, 1981	*t*	Ar	Ar	
Duston, 1984	*t*	Ne,Ar,Kr		
Hammel, 1985		Ar		
Maxon, 1983	*t*		Ar	
Pearlman, 1981		Ar,Kr	Kr	
Stewart, 1987		Ar	Ar	Ar

Z-pinch plasma dynamics

[redacted]

panel (a) and 4.5 keV for panel (b), to 6.45 keV for panel (c). [redacted] could dominate the harder part of the radiation output

[redacted]

compression to a high density.

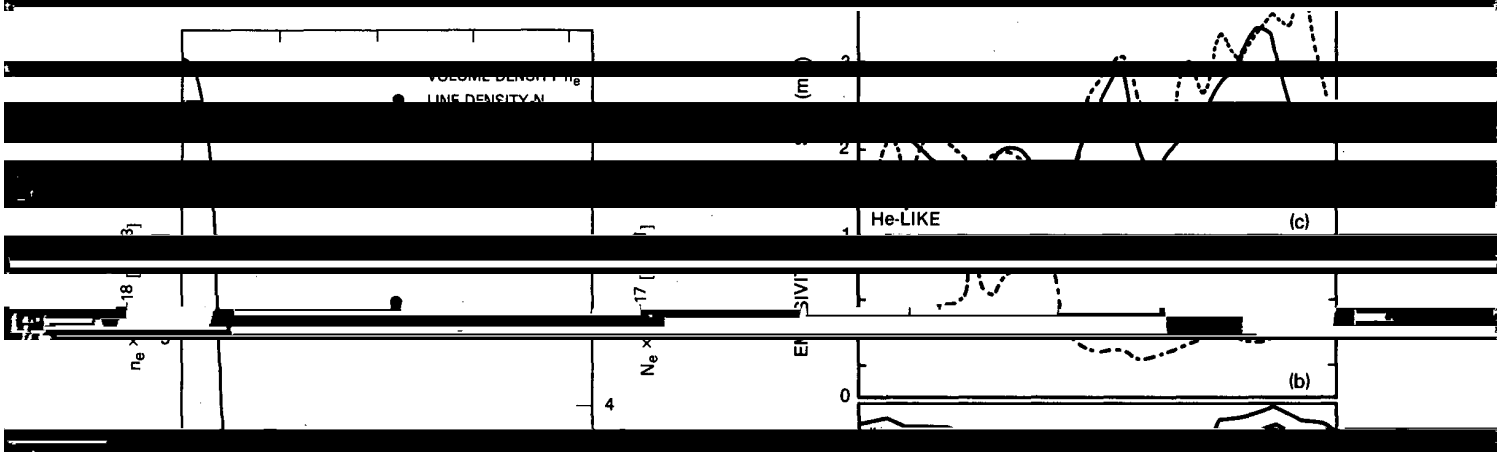
[redacted]

ANODE CATHODE

[redacted]


(a)
0.9
1.0
10
20
40

size of the apparent pinch size in He- and H-like x rays (mid-



the radiation and emitters) applies for the plasma's entire

[redacted]

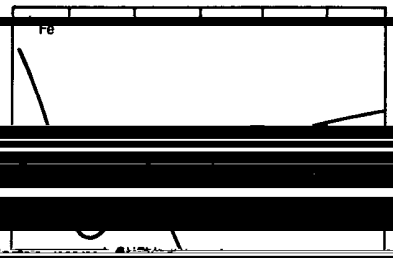
Sec. III C.

1. Snowplow model

[redacted]

$$\frac{\mu_0 I^2}{4\pi} = L = \int dr\, 2\pi r [n_i k(\bar{T}_i + \bar{Z}\bar{T}_e)]$$

$$\sim N_e k\bar{T}_e \times \frac{\int dr\, r n_e k T_e}{N_e k \bar{T}_e},$$



ions are unimportant for the ionization equilibrium because

velocity.

MA, typically ~100 kA.

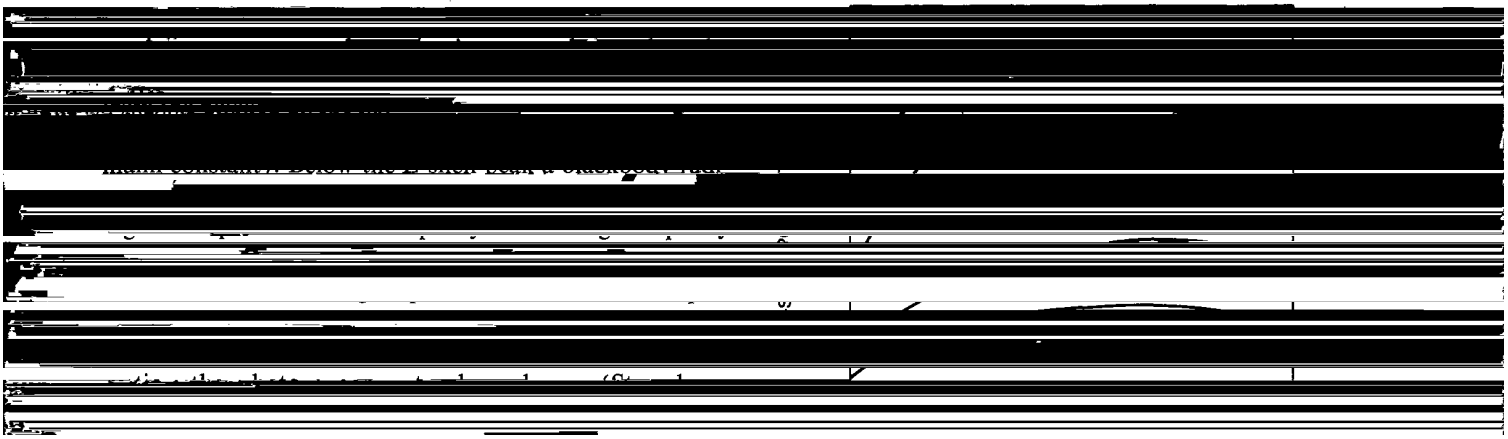
density $n_e(r)$ and current density $j(r)$ are no longer con-

Without violating the Bennett condition or invoking ments generally do not contain data on the electrical part

[redacted]

Current	I		1 MA
Pulse length	τ_p		20 ns
Ions/length[a]	N_i	$\mu \times 2N_A$	10^{18}/cm
[redacted]			
Electron temperature	T		300 eV
[redacted]			
Magnetic field (edge)	B	$\mu_0 I/2\pi r$	200 T
[redacted]			
[redacted]			
Collisionality		$\omega_{pe}\tau_{ee}$	500
[redacted]			
[redacted]		$(T_e/m_e)^{1/2}$	7×10^8 cm/s
Drift velocity	v_D	I/eN_e	10^6 cm/s

[redacted]



D. Outlook

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