P NOTE # 478

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SUBJECT: ARFI FINAL AMP

NAME: R.J. Pasquinelli

DATE: 5/23/88

REVISION DATE:

SYSTEM PARAMETERS

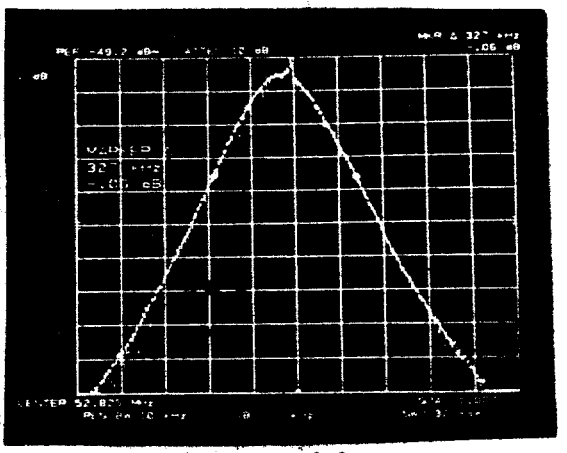
ANODE V = 6.7Kv

ANODE I @ 36Kv$_{DC}$ = 4 AMPS

$$Q_{ARFI-1} = \frac{52.8\,MHz}{.327\,MHz} = 161$$

$$Q_{ARFI-2} = \frac{52.8\,MHz}{.277\,MHz} = 191$$

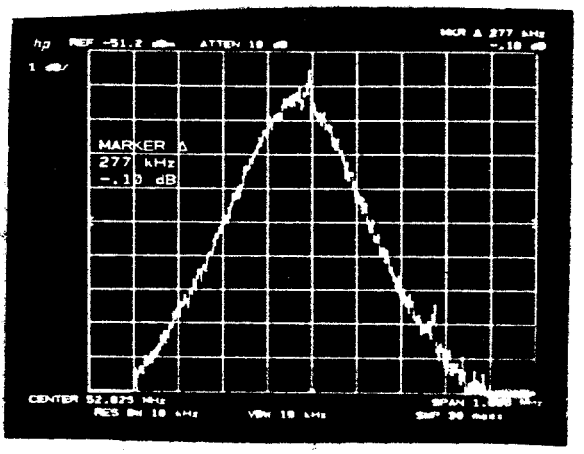
1-1



5/23/88

$$\frac{R_{SHUNT}}{Q} = 164$$ from SUPERFISH CALCULATIONS

1-2



$R_{SHUNT\ 1-1}$ = 26.4 KΩ

$R_{SHUNT\ 1-2}$ 31.3 KΩ

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SUBJECT: ARF1 FINAL AMP ANODE V=6.7KV

NAME: R.J. Pasquinelli

DATE: 5/23/88

REVISION DATE:

PEAK POWER ACROSS GAP

1-1 $= \frac{[36\times10^3 V]^2}{26.4 K\Omega} = 49\ KW_{PK}$

1-2 $= \frac{(36\times10^3)^2}{31.3 K\Omega} = 41.4\ KW_{PK}$

each system has two tubes in push pull mode so they share power equally.

	PEAK		RMS
1-1	24.5 kw pk	→	12.25 kw RMS/TUBE
1-2	20.7 kw pk	→	10.35 kw RMS/TUBE

PLATE SWING $= \frac{P_{RMS}}{I_{RMS}} = \frac{12.25 KW}{4} = 3.06\ KV_{RMS}$ 1-1
$= 4.3\ KV_{PK}$

$= 2.59\ KV_{RMS}$ 1-2
$= 3.66\ KV_{PK}$

$Z_{PLATE} = \frac{V_{RMS}^2}{P_{RMS}} = \frac{(3.06 KV)^2}{12.25 KW} = 764\Omega$ 1-1

$= \frac{(2.59 KV)^2}{10.35 KW} = 648\Omega$ 1-2

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SUBJECT: ARF1 FINAL AMP

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DATE: 5/23/88

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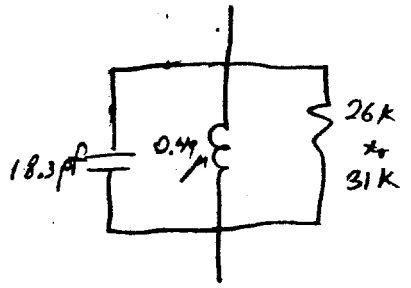
$$Q = \frac{R}{\omega L}$$

@ resonance $\omega L = \frac{1}{\omega C} = \frac{R}{Q} = 164$

$$\frac{1}{\omega C} = 164 \rightarrow C = \frac{1}{\omega 164} = \frac{1}{(2\pi\, 53\times10^6)(164)} = 18.3\,pf$$

$$L = \frac{R}{\omega Q} = \frac{164}{2\pi\, 53\times10^6} = 0.49\,\mu H$$



STORED ENERGY IN CAP ON ½ CYCLE

$$\frac{1}{2}CV_{pk}^2 = \frac{1}{2}(18.3\times10^{-12})(36\times10^3 V)^2$$

$$= 1.18\times10^{-2} \text{ JOULES}$$

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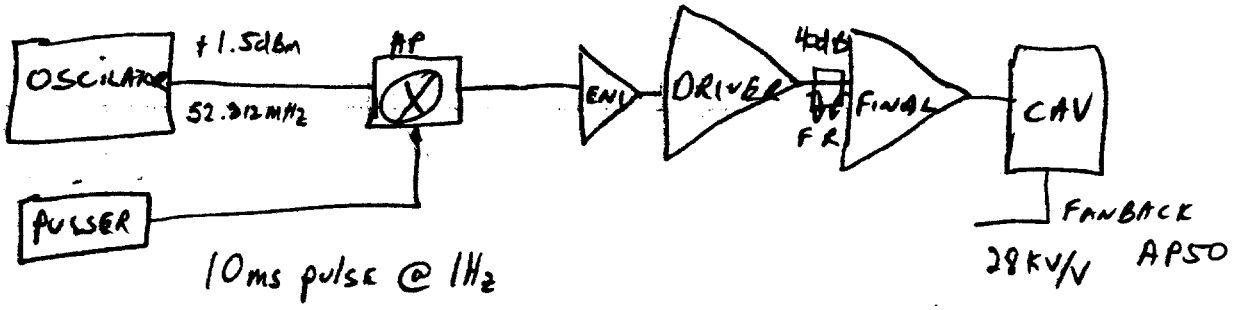
SUBJECT: ARFI FINAL AMP

NAME: R.J. Pasquinelli

DATE: 5/25/88 | REVISION DATE

TEST SET UP



WITH ANODE P.S @ 6.7KV 5/23/88

ARFI-1 → 42 KV$_{op}$
ARFI-2 → 39.2 KV$_{op}$ } AP50 FBS

WITH ANODE PS @ 7.9 kv 5/25/88

ARFI-1 → 49 KV$_{op}$
ARFI-2 → 45 KV$_{op}$ } AP50 FBS

DRIVER Volts 8 KV

	FORWARD		REVERSE	
	VOLTS O-P	RMS	VOLTS O-P	RMS
ARFI-1	390	1521W	75	56W
ARFI-2	325	1056W	72	52W

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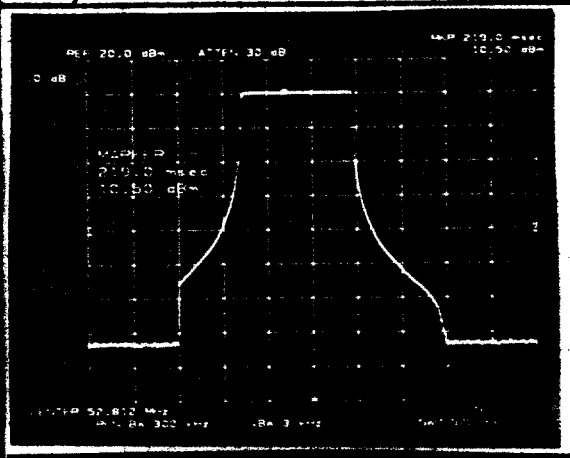
SUBJECT: ARF1 FINAL AMP

NAME: R. J. PASQUINELLI

DATE: 5/27/88

REVISION DATE:



ARF1-1
FANBACK
APIO

$\boxed{46.6\ kV_{op}}$

ARF1 driven with CURVES INPUT

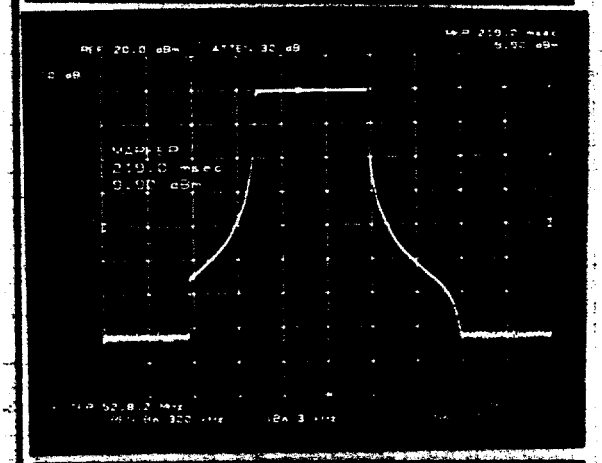
$$dBm = 10\log \frac{\frac{V_{RMS}^2}{50}}{1\times10^{-3}\ ATT}$$

$$V_{RMS} = \sqrt{(50)(1\times10^{-3})\left[10^{\frac{dBm}{10}}\right]}$$

$$V_{op} = V_{RMS} \times \sqrt{2} \times \text{CAL FACTOR}$$

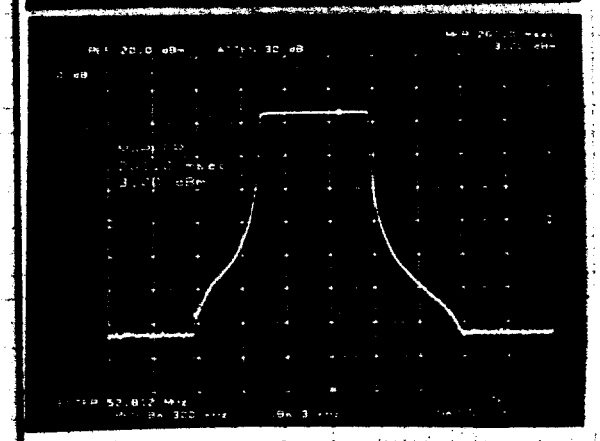
CAL FACTOR APIO
ARF1-1 & ARF1-2
44kV/V

ARF1 SUM
205kV/V



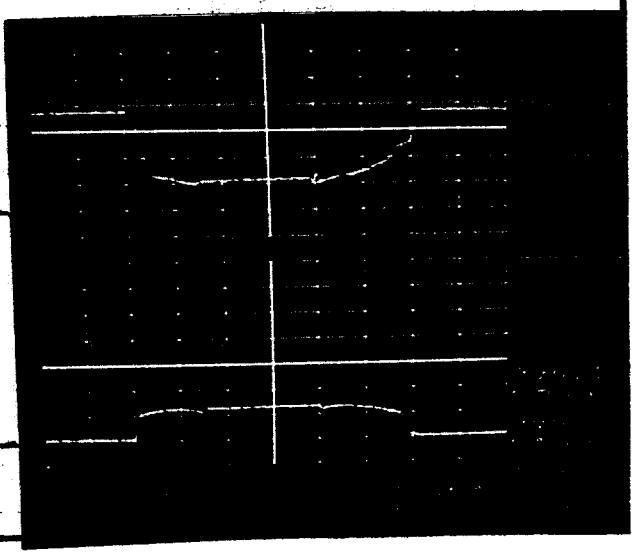
ARF1-2
FANBACK
APIO

$\boxed{43.5\ kV_{op}}$



ARF1-SUM
FANBACK
APIO

$\boxed{91.6\ kV}$



Φ Feedback error voltage during curve

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SUBJECT: ARFI FINAL AMP ANODE V = 7.9kv

NAME: R.J. Pasquinelli

DATE: 5/23/88

REVISION DATE:

PEAK POWER ACROSS GAP2

1-1 $= \frac{(46.6\,kv)^2}{26.4\,K\Omega} = 82.25\,kw_{PK}$

1-2 $\frac{(43.5\,kv)^2}{31.3\,K\Omega} = 60.45\,kw_{PK}$

each system has 2 tubes sharing power

	PEAK	RMS
1-1	41.12 kw	29.08 kw RMS/TUBE
1-2	30.22 kw	21.3 kw RMS/TUBE

PLATE SWING $= \sqrt{\frac{Z_{PLATE}}{Z_{GAP}}} \times V_{GAP}$

1-1 $= \sqrt{\frac{764}{26.4\,K\Omega}} \times 46.6\,kv_{op} = 7.9\,kv$ THIS IS MAX AVAILABLE PLATE SWING

1-2 $= \sqrt{\frac{648}{31.3\,K}} \times 43.5\,kv_{op} = 6.26\,kv$

SUBJECT: ARFI FINAL AMP

NAME: R.S. Pasquinelli

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If calib. is really .75 of what is thought to be due to measurements of synchrotron oscillations

FROM PAGE 2

$$P_{RMS\ gap}\quad 1\text{-}1 = \frac{\left(\frac{.75 \times 36kv}{\sqrt{2}}\right)^2}{26.4k\Omega} = 13.8\ kw_{RMS} = \frac{6.9\ kw_{RMS}}{TUBE}$$

$$1\text{-}2 \quad \frac{\left(\frac{.75 \times 36\ kv}{\sqrt{2}}\right)^2}{31.3k\Omega} = 11.6\ kw_{RMS} = 5.8\ \frac{kw_{RMS}}{TUBE}$$

$$V_{PLATE}\quad 1\text{-}1 = \frac{P_{RMS}}{I_{RMS}} = \frac{6.9\ kw}{4_A} = 1.72\ kv_{RMS}$$

$$1\text{-}2 = \frac{5.8\ kw}{4_A} = 1.45\ kv_{RMS}$$

$$Z_{PLATE}\quad 1\text{-}1 = \frac{V_{RMS}^2}{P_{RMS}} = \frac{1.72\ kv^2}{6.9\ kw} = 431\Omega$$

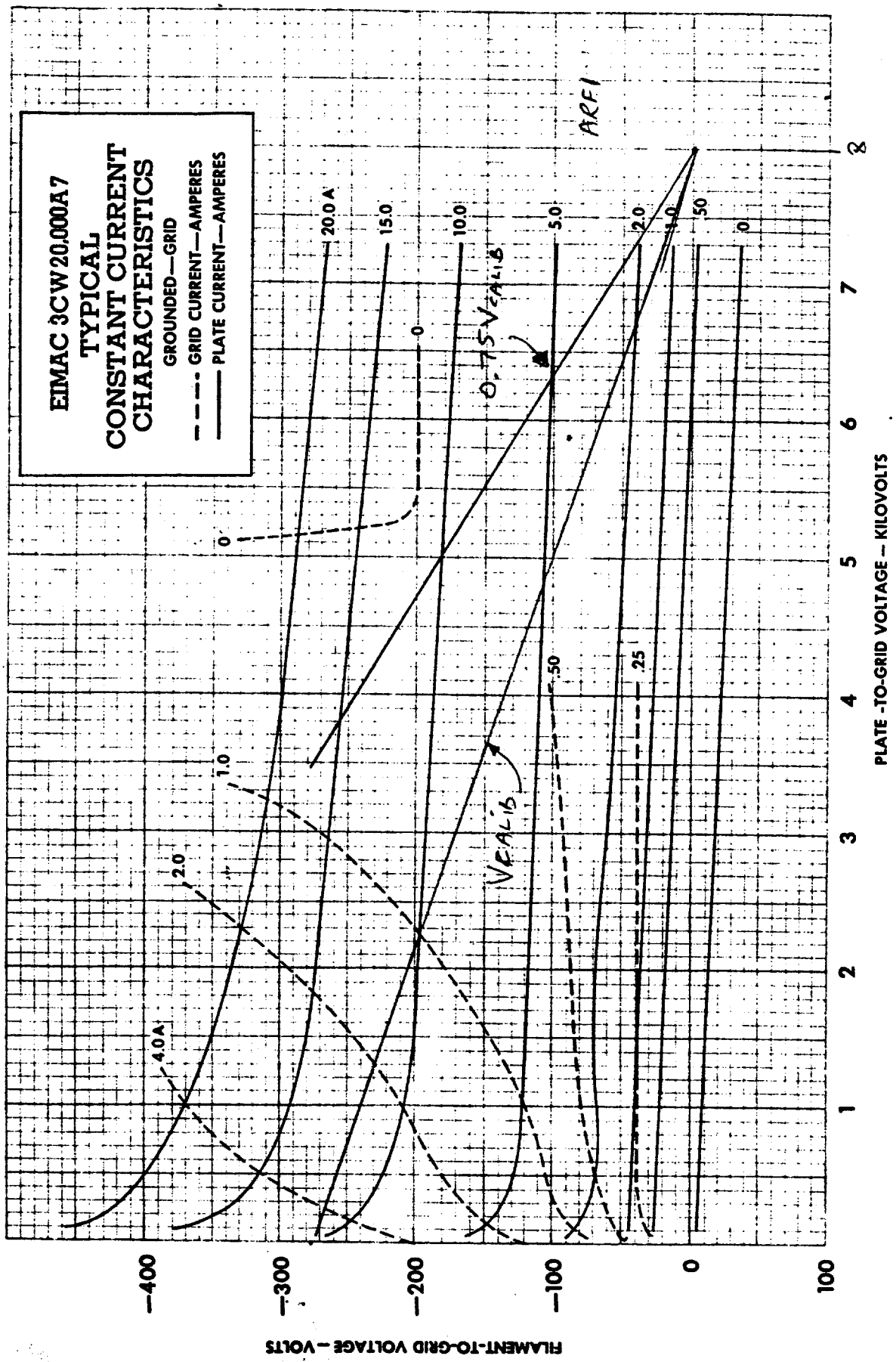
$$1\text{-}2 = \frac{(1.45kv)^2}{5.8\ kw} = 362\Omega$$

@ 8kv ANODE

$$V_{PLATE} = \sqrt{\frac{Z_{PLATE}}{Z_{GAP}}} \times V_{GAP} \times .75$$

$$1\text{-}1 = \sqrt{\frac{431}{26.4k}} \times 46.6k \times .75 = 4.46\ kv$$

$$1\text{-}2 = \sqrt{\frac{362}{31.3k}} \times 43.5kv \times .75 = 3.5\ kv$$



ARF1 LOAD LINE