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Design of Input Circuit

Shunt capacity = ½ of Neutralized 6J6 = 1.4 μμf.

Line Impedance $Z_0 = \frac{2.5}{1.4} \cdot \frac{23.4}{c}$ 372 ohms log ratio and proportion from calculated sample.

Ratio of spacing/radius of conductors = $\log^{-1} \frac{Z_0}{276}$

Effective line capacity = $\frac{33.3\,l}{2 Z_0}$ μμf.

$R_0 = \frac{83.2\sqrt{160}}{a} \times 10^{-6}$ ohms/cm, a = radius in cm.

$L_0 = Z_0/3 \cdot 10^4$ microhenries/cm.

$\omega = 10^9$ radians/sec.

$\theta = 360\,l/187.5 \cdot 57.3$ radians.

$R = \frac{Z_0 (1 - \cos 2\theta)}{k (2\theta + \sin 2\theta)}$ = tuned impedance in ohms,

$Z_2 = \frac{7.5\sqrt{Z_1 Z_3}}{l_2 \text{ (total)}} \frac{BW}{372} \frac{}{10}$ 56.1

BW = 20 MC bandwidth in this case.

$k = (R_0/\omega L_0)\left\{1 + \left[1 + (R_0/\omega L_0)^2\right]^{1/2}\right\}^{-1}$

See Sept 1939 Proc IRE pages 579-584

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Assumed length inches	8	9	10	11	12
Assumed length centimeters	20,3	22,8	25,4	27,9	30,5
Line Impedance Z_0, ohms	765	682	612	557	510
spacing/radius of wires	589	295	166	105	71
Effective line capacity, $\mu\mu f$	.442	.556	.690	.834	.995
Wire diameter for 2" spacing	.0068"	.0136"	.0241"	.0381"	.0564"
Wire Gauge size B&S	33	27	22	18	15
R_0, resistance/cm line, ohms	.122	.061	.034	.022	.015
L_0, inductance/cm line, μh	.0255	.0228	.0204	.0186	.0170
k	.00240	.00134	.00083	.00059	.00044
θ in radians	.680	.765	.851	.935	1.022
2θ in degrees	77.9	87.6	97.5	107.1	117.2
$\cos 2\theta$	.210	.042	-.131	-.294	-.457
$\sin 2\theta$	.978	.999	.991	.956	.889
$(1-\cos 2\theta)/(2\theta+\sin 2\theta)$	.338	.378	.420	.458	.496
R resonant impedance	108,000	192,000	310,000	432,000	575,000

choose 10"

Input resistance of 6J6 grid to grid about 120,000 ohms. $= 2R_g$

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