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LAMPIRAN

Lampiran 1 Alat Dan Bahan

Pesawat Radiografi Umum

Multimeter X-Ray

Phantom Akrilik ketebalan 10 mm

Lampiran 2 Standar Nilai HVL Setiap Tegangan

Tabel 1. Daftar HVL untuk tegangan puncak tabung tertentu [4]

Tegangan puncak tabung (kVp)		HVL minimum (mmAl)
Di bawah 50	30	0,3
	40	0,4
	49	0,5
50 sampai 70	50	1,2
	60	1,3
	70	1,5
Di atas 70	71	2,1
	80	2,3
	90	2,5
	100	2,7
	110	3,0
	120	3,2
	130	3,5
	140	3,8
	150	4,1

Lampiran 3 Analisis Data

Perhitungan HVL secara manual

$$HVL = \frac{t_b \ln(2D_a/D_0) - t_a \ln(2D_b/D_0)}{\ln(D_a/D_b)}$$

Tegangan 60 kV

$$HVL = \frac{t_b \ln(2D_a/D_0) - t_a \ln(2D_b/D_0)}{\ln(D_a/D_b)}$$

$$HVL = \frac{2\ln(1,658) - 0,5\ln(1,018)}{\ln(1,629)}$$

$$HVL = \frac{1,011 - 0,008}{0,487}$$

$$HVL = \frac{1,002}{0,487}$$

$$HVL = 2,057 \; mm$$

Tegangan 63 kV

$$HVL = \frac{t_b \ln(2D_a/D_0) - t_a \ln(2D_b/D_0)}{\ln(D_a/D_b)}$$

$$HVL = \frac{2\ln(1,669) - 0,5\ln(1,041)}{\ln(1,602)}$$

$$HVL = \frac{1,024 - 0,020}{0,471}$$

$$HVL = \frac{1,004}{0,471}$$

$$HVL = 2,131 \; mm$$

Tegangan 66 kV

$$HVL = \frac{t_b \ln(2D_a/D_0) - t_a \ln(2D_b/D_0)}{\ln(D_a/D_b)}$$

$$HVL = \frac{2\ln 1,678 - 0,5\ln(1,061)}{\ln(1,581)}$$

$$HVL = \frac{1,035 - 0,029}{0,458}$$

$$HVL = \frac{1,006}{0,458}$$

$$HVL = 2,196 \; mm$$

Tegangan 70 kV

$$HVL = \frac{t_b \ln(2D_a/D_0) - t_a \ln(2D_b/D_0)}{\ln(D_a/D_b)}$$

$$HVL = \frac{2\ln(1,691) - 0,5\ln(1,091)}{\ln(1,548)}$$

$$HVL = \frac{1,050 - 0,043}{0,436}$$

$$HVL = \frac{1,007}{0,436}$$

$$HVL = 2,309 \; mm$$

Tegangan 73 kV

$$HVL = \frac{t_b \ln(2D_a/D_0) - t_a \ln(2D_b/D_0)}{\ln(D_a/D_b)}$$

$$HVL = \frac{2\ln(1,698) - 0,5\ln(1,112)}{\ln(1,526)}$$

$$HVL = \frac{1,058 - 0,053}{0,422}$$

Perhitungan nilai INAK

$$K_i = Y(d) \cdot P \cdot \left(\frac{d}{d_{SID} - t_p}\right)^2$$

Tegangan 60 kV

$$K_i = Y(d) \cdot P \cdot \left(\frac{d}{d_{SID} - t_p}\right)^2$$
$$K_i = 6.10^{-4}.60^{2,1015} \cdot 1 \cdot \left(\frac{0,98}{1 - 0,01}\right)^2$$
$$K_i = 6.10^{-4}.60^{2,1015} \cdot 1 \cdot (0,989)^2$$
$$K_i = 3,201 \, mGy$$

Tegangan 63 Kv

$$K_i = Y(d) \cdot P \cdot \left(\frac{d}{d_{SID} - t_p}\right)^2$$
$$K_i = 6.10^{-4}.63^{2,1015} \cdot 1 \cdot \left(\frac{0,98}{1 - 0,01}\right)^2$$
$$K_i = 6.10^{-4}.63^{2,1015} \cdot 1 \cdot (0,989)^2$$
$$K_i = 3,546 \, mGy$$

Tegangan 66 kV

$$K_i = Y(d) \cdot P \cdot \left(\frac{d}{d_{SID} - t_p}\right)^2$$
$$K_i = 6.10^{-4}.66^{2,1015} \cdot 1 \cdot \left(\frac{0,98}{1 - 0,01}\right)^2$$
$$K_i = 6.10^{-4}.66^{2,1015} \cdot 1 \cdot (0,989)^2$$
$$K_i = 3,911 \, mGy$$

Tegangan 70 kV

$$K_i = Y(d) \cdot P \cdot \left(\frac{d}{d_{SID} - t_p}\right)^2$$
$$K_i = 6.10^{-4}.70^{2,1015} \cdot 1 \cdot \left(\frac{0,98}{1 - 0,01}\right)^2$$
$$K_i = 6.10^{-4}.70^{2,1015} \cdot 1 \cdot (0,989)^2$$
$$K_i = 4,426 \, mGy$$

Tegangan 73 kV

$$K_i = Y(d) \cdot P \cdot \left(\frac{d}{d_{SID} - t_p}\right)^2$$
$$K_i = 6.10^{-4}.73^{2,1015} \cdot 1 \cdot \left(\frac{0,98}{1 - 0,01}\right)^2$$
$$K_i = 6.10^{-4}.73^{2,1015} \cdot 1 \cdot (0,989)^2$$
$$K_i = 4,834 \, mGy$$

Perhitungan koefisen atenuasi dan HVL

$$\mu = \frac{1}{x} \ln I_0 / I$$

$$HVL = \frac{0,693}{\mu}$$

Tegangan 60 kV

$$\mu = \frac{1}{x}\ln I_0/I$$
$$\mu = \frac{1}{1}\ln 3{,}397/2{,}634$$
$$\mu = \ln 1{,}289$$
$$\mu = 0{,}254 \ mm^{-1}$$
Sehingga,
$$HVL = \frac{0{,}693}{\mu}$$

$$HVL = \frac{0{,}693}{0{,}254}$$
$$HVL = 2{,}728 \ mm$$

Tegangan 66 kV

$$\mu = \frac{1}{x}\ln I_0/I$$
$$\mu = \frac{1}{1}\ln 4{,}164/3{,}260$$
$$\mu = \ln 1{,}277$$
$$\mu = 0{,}244 \ mm^{-1}$$
Sehingga,
$$HVL = \frac{0{,}693}{\mu}$$

$$HVL = \frac{0{,}693}{0{,}244}$$
$$HVL = 2{,}840 \ mm$$

Tegangan 73 kV

$$\mu = \frac{1}{x}\ln I_0/I$$
$$\mu = \frac{1}{1}\ln 5{,}133/4{,}056$$
$$\mu = \ln 1{,}265$$
$$\mu = 0{,}235 \ mm^{-1}$$
Sehingga,
$$HVL = \frac{0{,}693}{\mu}$$

$$HVL = \frac{0{,}693}{}$$

Tegangan 63 kV

$$\mu = \frac{1}{x}\ln I_0/I$$
$$\mu = \frac{1}{1}\ln 3{,}776/2{,}949$$
$$\mu = \ln 1{,}280$$
$$\mu = 0{,}246 \ mm^{-1}$$
Sehingga,
$$HVL = \frac{0{,}693}{\mu}$$

$$HVL = \frac{0{,}693}{0{,}246}$$
$$HVL = 2{,}817 \ mm$$

Tegangan 70 kV

$$\mu = \frac{1}{x}\ln I_0/I$$
$$\mu = \frac{1}{1}\ln 4{,}706/3{,}712$$
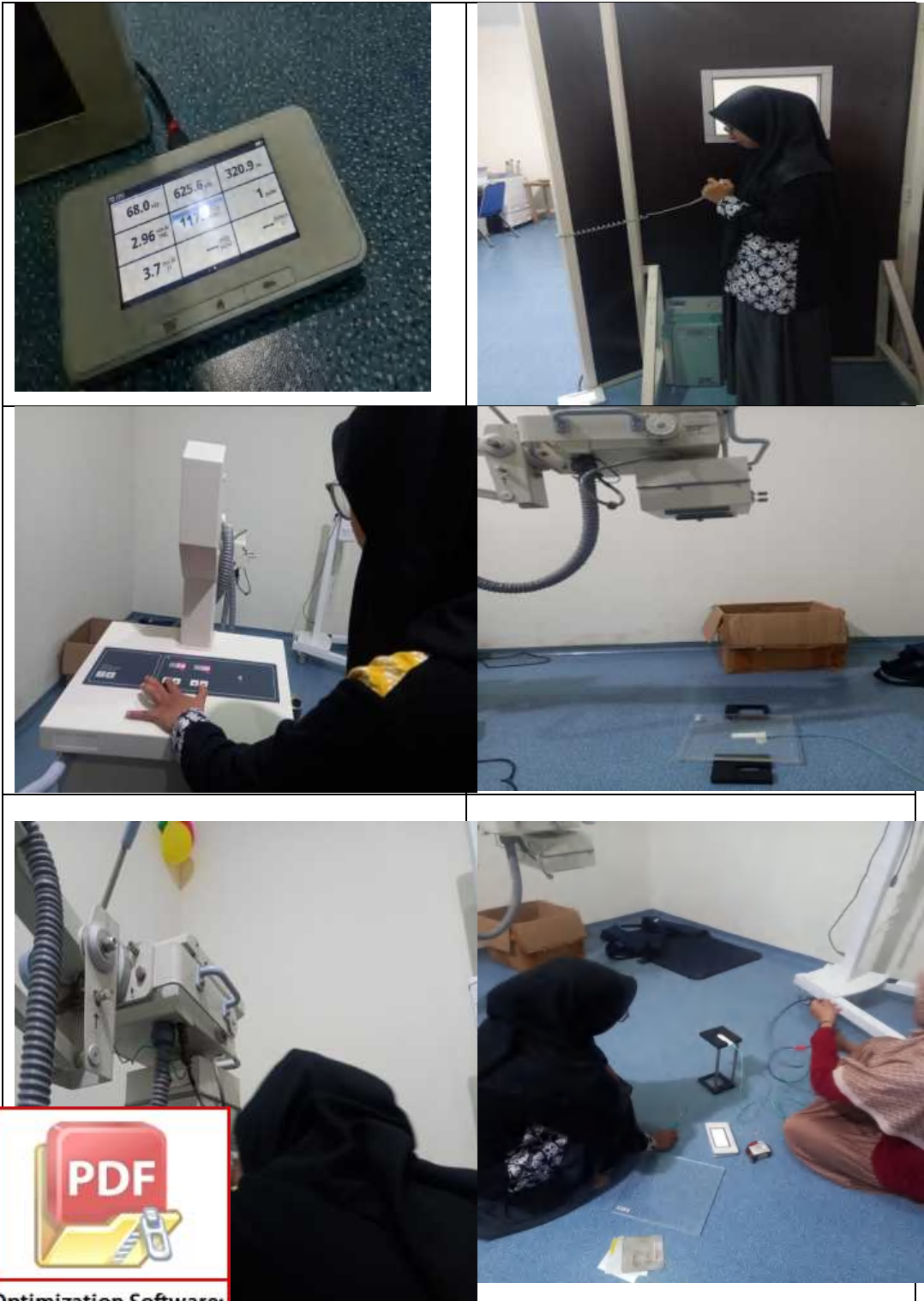$$\mu = \ln 1{,}267$$
$$\mu = 0{,}237 \ mm^{-1}$$
Sehingga,
$$HVL = \frac{0{,}693}{\mu}$$

$$HVL = \frac{0{,}693}{0{,}236}$$
$$HVL = 2{,}924 \ mm$$

Lampiran 4. Dokumentasi Penelitian