

LAMPIRAN A

PERHITUNGAN PANJANG GELOMBANG LASER He - Ne

Rumus yang digunakan

$$\Delta m = \frac{2}{\lambda} \Delta d$$

$$y = b x + a$$

Dari hasil pengukuran jumlah pergeseran Δd dan jumlah intensitas maksimum atau minimum yang terhitung Δm .

i	Δd_i (mm) (x)	Δm_i (y)	Δd_i^2	$\Delta d_i \Delta m_i$	Δm_i^2	Δ_i
1	0,01	30	0,0001	0,3	900	0,369
2	0,02	60	0,0004	1,2	3600	1,148
3	0,03	92	0,0009	2,76	8464	0,215
4	0,04	124	0,0016	4,96	15376	3,999
5	0,05	153	0,0025	7,65	23409	0,287
6	0,06	183	0,0036	10,98	33489	0,005
7	0,07	212	0,0049	14,84	44944	1,941
Σ	0,28	854	0,014	42,69	130182	7,964

$$\begin{aligned} \Delta &= N \sum \Delta d_i^2 - (\sum \Delta d_i)^2 \\ &= 7 (0,0140) - (0,28)^2 \\ &= 0,143 \end{aligned}$$

$$\begin{aligned}
 a &= \frac{\sum \Delta d_i^2 \sum \Delta m_i - \sum \Delta d_i \sum \Delta d_i \Delta m_i}{\Delta} \\
 &= \frac{0,0140 (854) - 0,28 (42,69)}{0,0196} \\
 &= 0,143
 \end{aligned}$$

$$\begin{aligned}
 b &= \frac{N \sum \Delta d_i \Delta m_i - \sum \Delta d_i \sum \Delta m_i}{\Delta} \\
 &= \frac{7 (42,69) - 0,28 (854)}{0,0196} \\
 &= 3046,429
 \end{aligned}$$

$$\begin{aligned}
 S^2 &= \frac{1}{N - 2} \sum (\Delta m_i - a - b \Delta d_i)^2 \\
 &= \frac{1}{N - 2} \sum \Delta d_i^2 \\
 &= \frac{1}{5} 7,964 \\
 &= 1,5928
 \end{aligned}$$

$$\begin{aligned}
 \sigma_a^2 &= \frac{S^2 \sum \Delta d_i^2}{\Delta} \\
 &= \frac{1,5928 \cdot 0,014}{0,0196}
 \end{aligned}$$

$$= 1,138$$

$$\sigma_a = 1,067$$

$$\begin{aligned}
 \sigma_b^2 &= \frac{N S^2}{\Delta} \\
 &= \frac{7 (1,5928)}{0,0196} \\
 &= 568,857
 \end{aligned}$$

$$\sigma_b = 23,851$$

$$\lambda = \frac{2}{b}$$

$$= \frac{2}{3046,429}$$

$$= 6,565064 \cdot 10^{-4} \text{ mm}$$

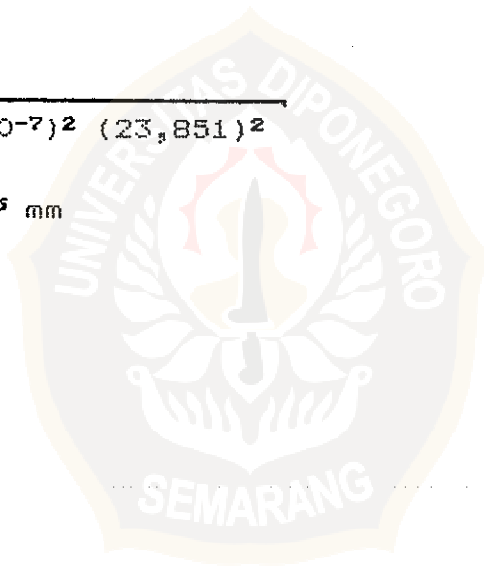
$$= 6565,064 \text{ \AA}$$

$$\sigma_\lambda = \sqrt{\left(\frac{\partial \lambda}{\partial b}\right)^2 \sigma_b^2}$$

$$= \sqrt{(2,555 \cdot 10^{-7})^2 (23,851)^2}$$

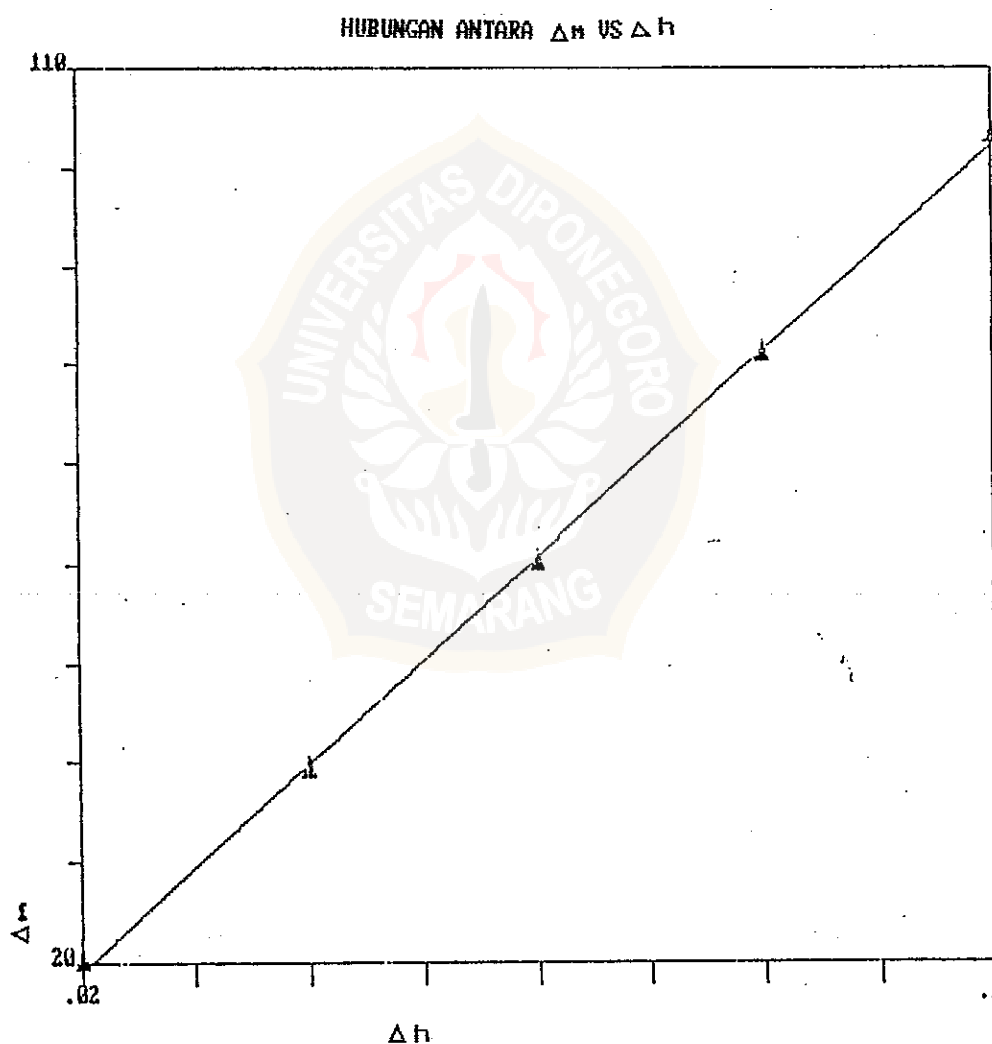
$$= 5,1399 \cdot 10^{-6} \text{ mm}$$

$$= 51,399 \text{ \AA}$$

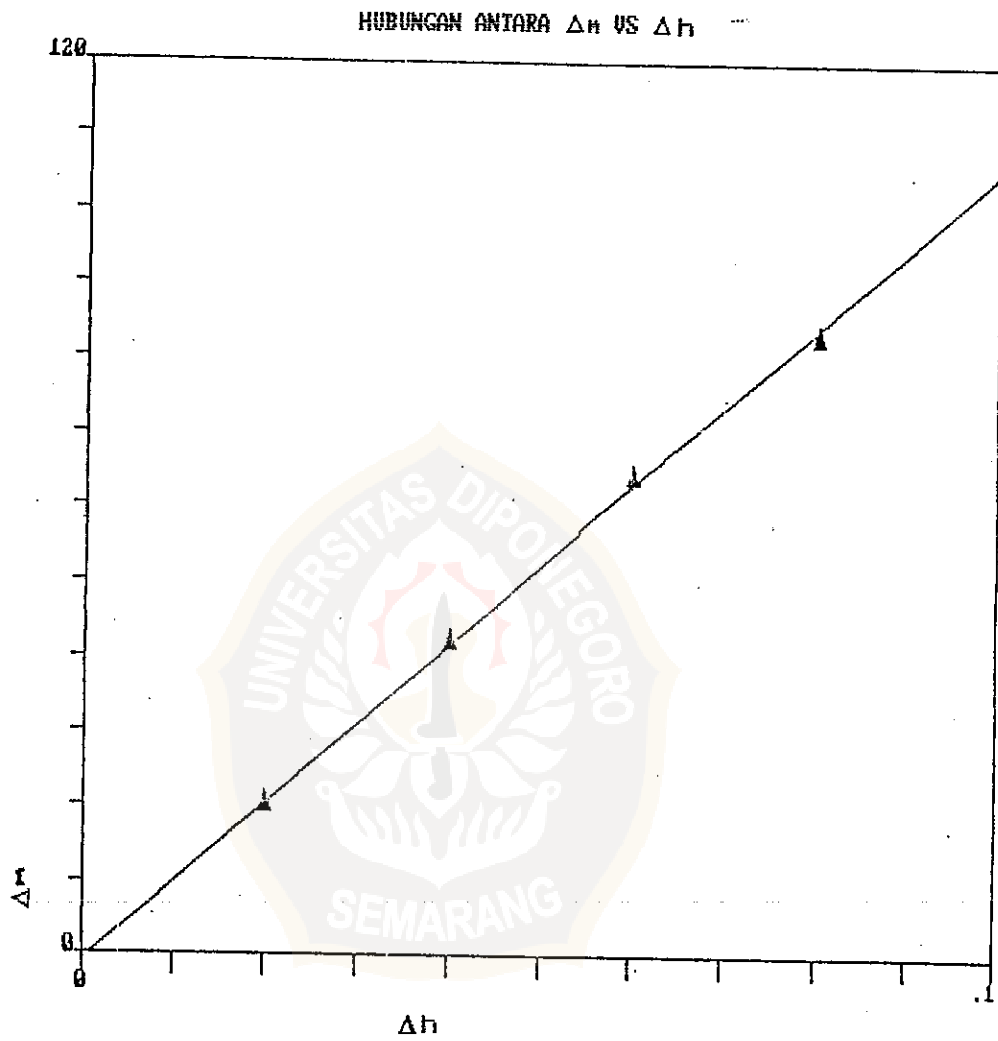


LAMPIRAN B
GRAFIK HUBUNGAN ANTARA Δm VERSUS Δh
UNTUK LARUTAN GULA DAN LARUTAN GARAM
BERBAGAI KONSENTRASI

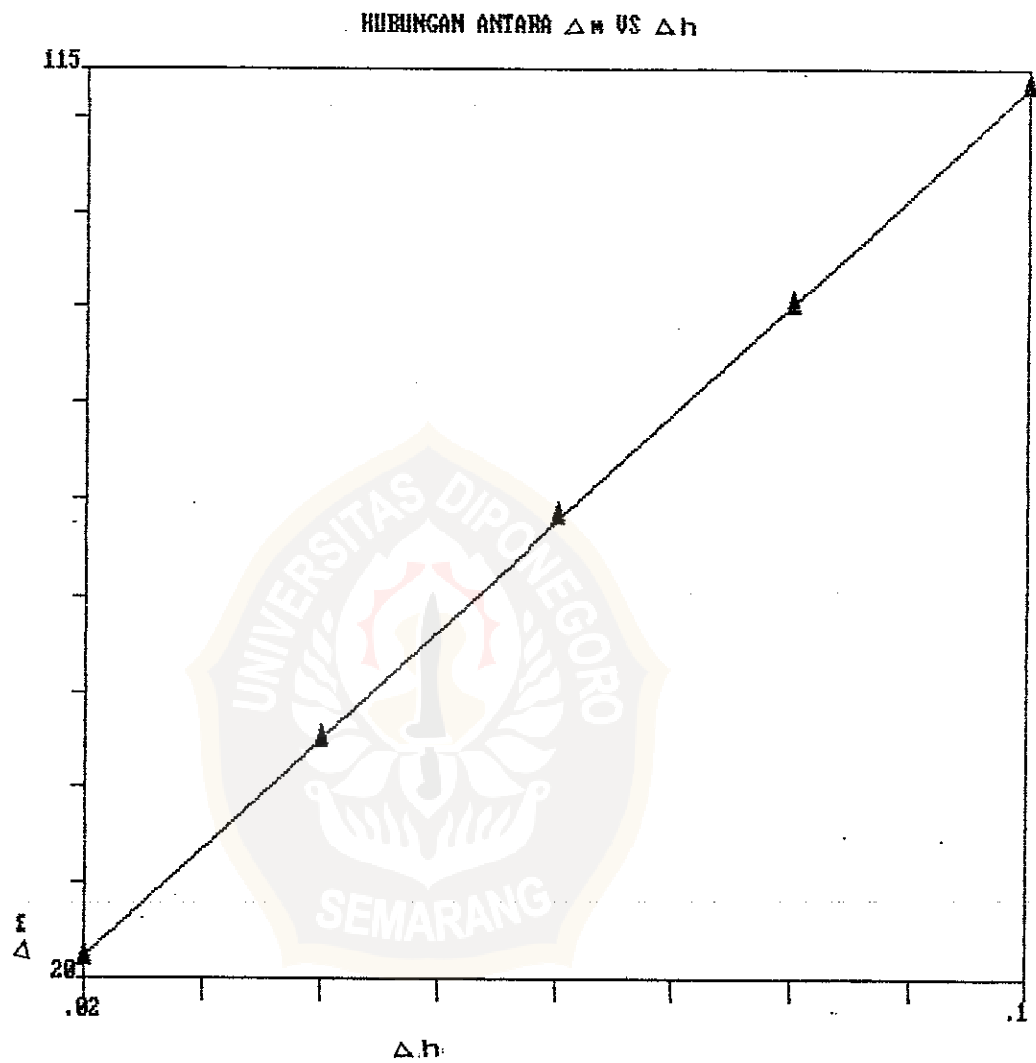
1. larutan gula 5 %



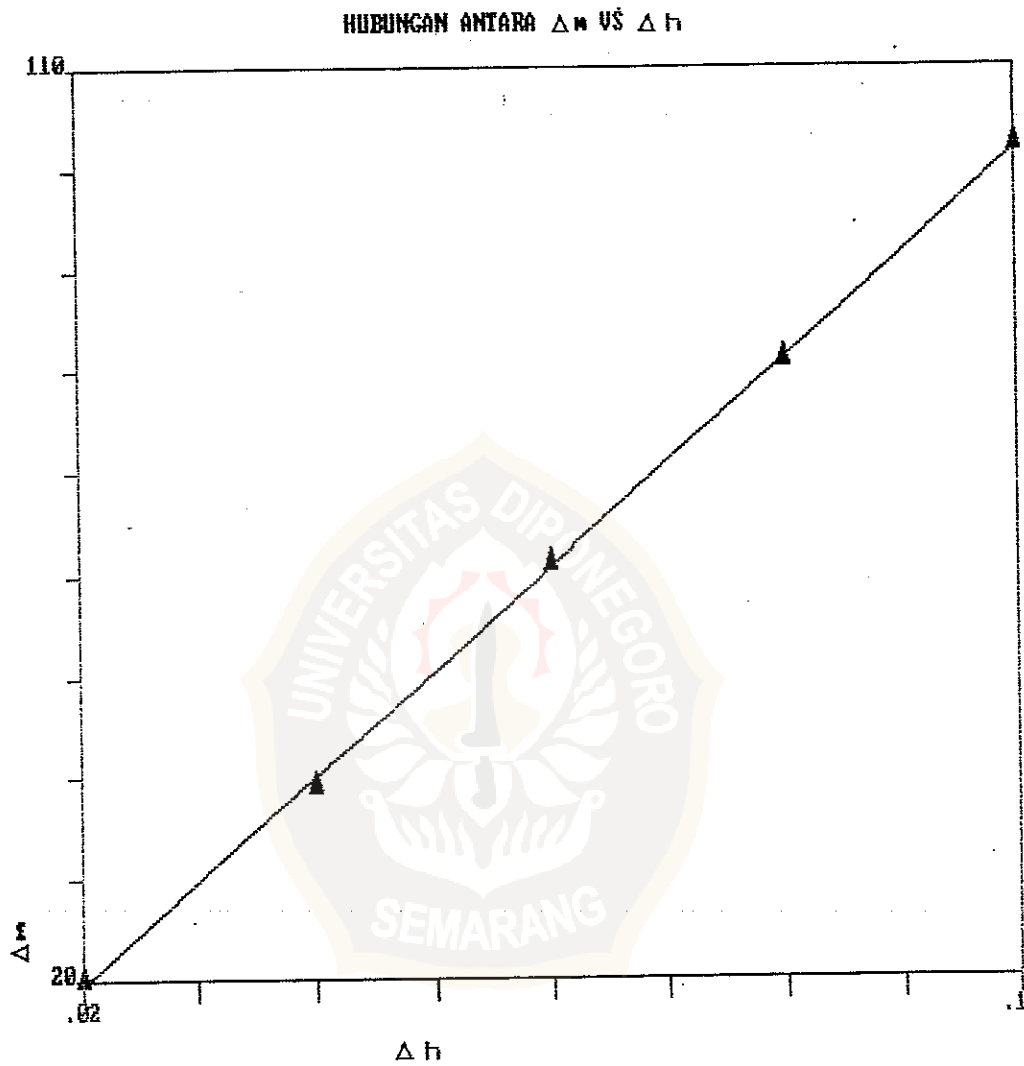
2. Larutan gula 10 %



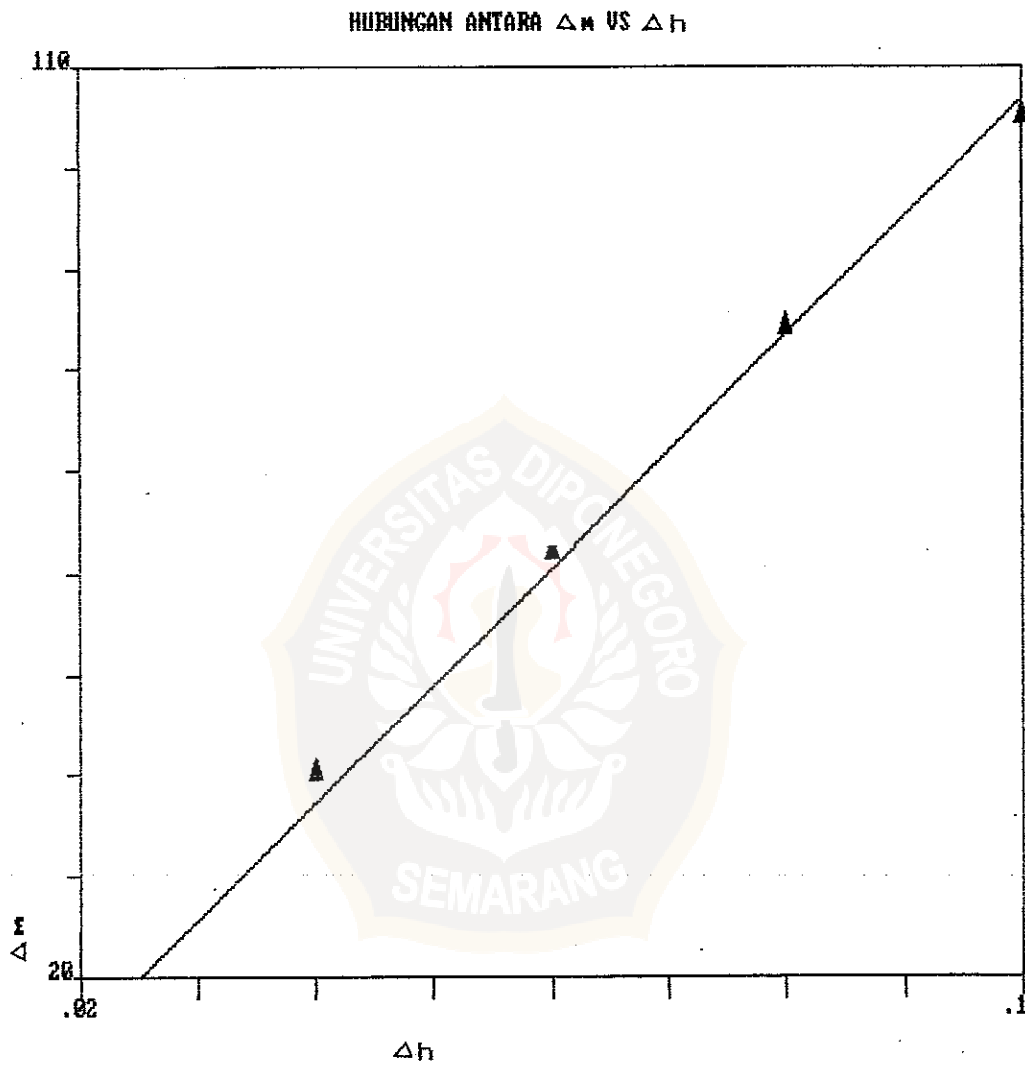
3. Larutan gula 25 %



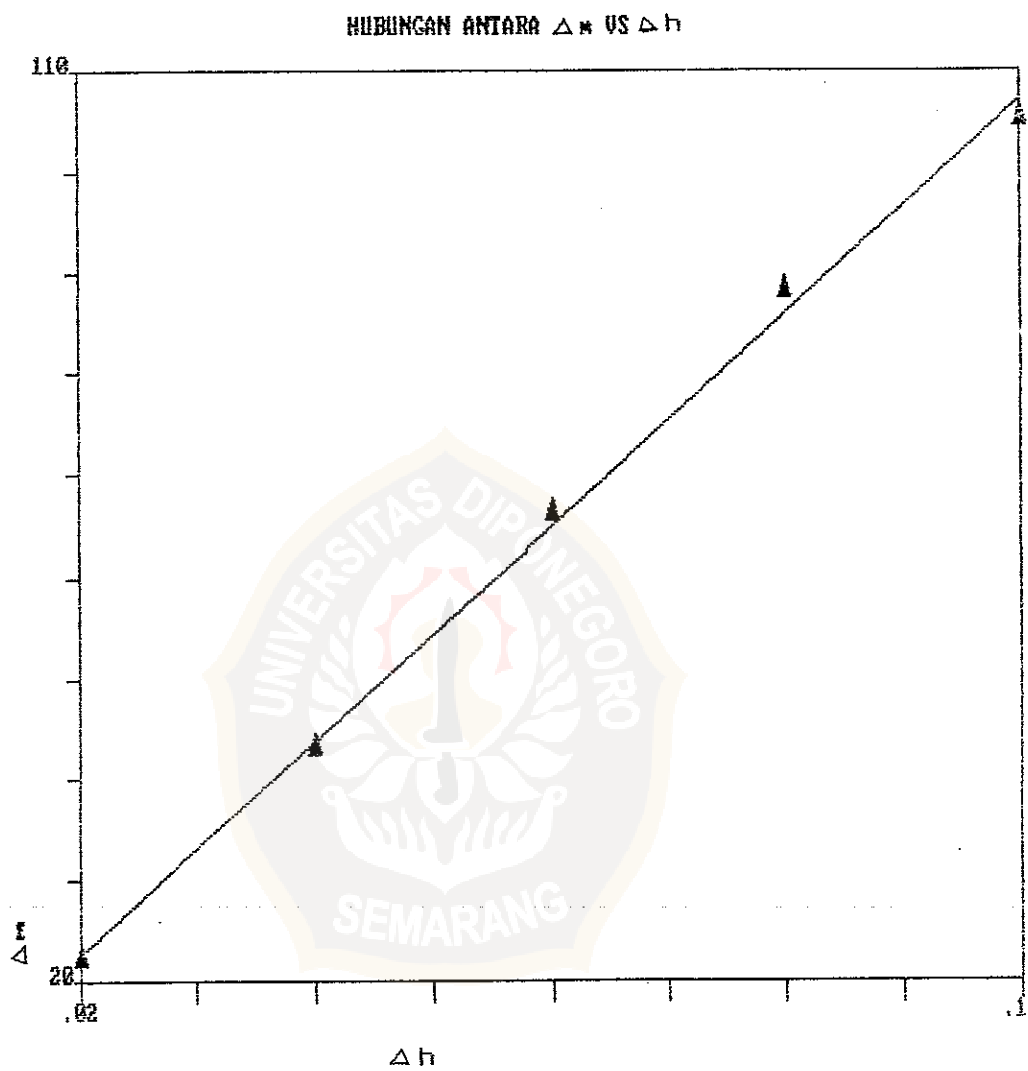
4. Larutan garam 5 %



5. Larutan garam 10 %



6. Larutan garam 25 %



LAMPIRAN C

PERHITUNGAN INDEKS BIAS CAIRAN

C.1. AIR

Rumus yang digunakan

$$n = 1 + \frac{\Delta m \lambda}{2 \Delta h}$$

Dari hasil pengukuran jumlah perubahan intensitas maksimum atau minimum yang terhitung setiap $2 \cdot 10^{-2}$ mm

No	1	2	3	4	5
$\Delta h/2 \cdot 10^{-2}$ mm	20	19	20	20	22

Untuk $\Delta m = 20$

$$n = 1 + \frac{20 \cdot 6328 \cdot 10^{-10}}{2 \cdot 2 \cdot 10^{-5}}$$

$$= 1 + 0,32825$$

$$= 1,328$$

Untuk $\Delta m = 19$

$$n = 1 + \frac{19 \cdot 6328 \cdot 10^{-10}}{2 \cdot 2 \cdot 10^{-5}}$$

$$= 1 + 0,31184$$

$$= 1,312$$

Untuk $\Delta m = 22$

$$n = 1 + \frac{22 \ 6328 \ 10^{-10}}{2 \ 2 \ 10^{-5}}$$

$$= 1 + 0,36108$$

$$= 1,361$$

$$\bar{n} = \frac{(1,328 + 1,312 + 1,328 + 1,361)}{5}$$

$$= 1,331$$

$$\sigma_n = \sqrt{\left[\frac{\partial n}{\partial \Delta m}\right]^2 (\sigma_{\Delta m})^2 + \left[\frac{\partial n}{\partial \lambda}\right]^2 (\sigma_{\lambda})^2 + \left[\frac{\partial n}{\partial \Delta h}\right]^2 (\sigma_{\Delta h})^2}$$

$$\frac{\partial n}{\partial \Delta m} = \frac{\lambda}{2 \ \Delta h}$$

$$= \frac{6328 \ 10^{-10}}{2 \ 2 \ 10^{-5}}$$

$$= 0,0164$$

$$\frac{\partial n}{\partial \lambda} = \frac{\Delta m}{2 \ \Delta h}$$

$$= \frac{20,2}{2 \ 2 \ 10^{-5}}$$

$$= 5,05 \ 10^5$$

$$\frac{\partial n}{\partial \Delta d} = \frac{\Delta m \ \lambda}{2 \ (\Delta d)^2} = \frac{20,2 \ (6328 \ 10^{-10})}{2 \ 4 \ 10^{-7}} = 16,577$$

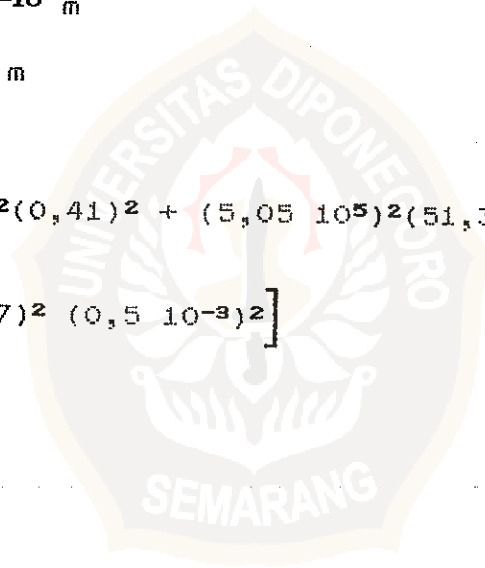
$$\begin{aligned} \sigma_{\Delta m} &= \sqrt{\sum_{k=1}^5 \frac{(\Delta m - \bar{\Delta m})^2}{k(k-1)}} \\ &= \left[\frac{(20 - 20,2)^2 + (19 - 20,2)^2 + (20 - 20,2)^2}{5(4)} \right]^{1/2} \\ &\quad + \left[\frac{(20 - 20,2)^2 + (22 - 20,2)^2}{5(4)} \right]^{1/2} \\ &= 0,41 \end{aligned}$$

$$\sigma_{\lambda} = 51,399 \cdot 10^{-10} \text{ m}$$

$$\sigma_{\Delta h} = 0,5 \cdot 10^{-3} \text{ m}$$

maka :

$$\begin{aligned} \sigma_n &= \left[(0,0164)^2 (0,41)^2 + (5,05 \cdot 10^5)^2 (51,399 \cdot 10^{-10})^2 \right]^{1/2} \\ &\quad + \left[(16,577)^2 (0,5 \cdot 10^{-3})^2 \right] \\ &= 0.012 \end{aligned}$$



LAMPIRAN D
PENENTUAN KONSTANTA α DAN β
UNTUK LARUTAN GULA

Rumus yang digunakan

$$n = \alpha (C + 1)^\beta$$

$$\log n = \log \alpha + \beta \log (C + 1)$$

$$Y = a + b X$$

$\log (C + 1)$	$\log n$	n	n'
0	0,124	1,331	1,329
0,021	0,126	1,338	1,339
0,041	0,130	1,348	1,348
0,061	0,132	1,355	1,355
0,079	0,135	1,364	1,364
0,097	0,137	1,371	1,371
0,114	0,141	1,384	1,384

$$a = 0,124 \longrightarrow \alpha = 1,329$$

$$b = 0,146 \longrightarrow \beta = 0,146$$

$$\Delta = 7 (0,034) - (0,413)^2$$

$$= 0,067$$

$$S^2 = \frac{1}{5} 4 \cdot 10^{-6} = 8 \cdot 10^{-7}$$

$$\sigma_a^2 = \frac{8 \cdot 10^{-7} (0,034)}{0,067} = \frac{0,272 \cdot 10^{-7}}{0,067} = 4,06 \cdot 10^{-7}$$

$$\sigma_a = 6,372 \cdot 10^{-4}$$

$$\sigma_b^2 = \frac{7 (8 \cdot 10^{-7})}{0,067} = 8,358 \cdot 10^{-5}$$

$$\alpha_b = 9,142 \cdot 10^{-3}$$

Hasil dari rumus $n = \alpha (C + 1)^\beta$

$n (X_i)$	$n' (Y_i)$	$a + b X_i$	Δi^2
1,331	1,329	1,331	$4 \cdot 10^{-6}$
1,338	1,339	1,338	$1 \cdot 10^{-6}$
1,348	1,348	1,348	0
1,355	1,356	1,355	$1 \cdot 10^{-6}$
1,364	1,365	1,364	$1 \cdot 10^{-6}$
1,371	1,373	1,371	$4 \cdot 10^{-6}$
1,384	1,381	1,384	$9 \cdot 10^{-6}$

$$a = 9,746 \cdot 10^{-3}$$

$$b = 0,993$$

$$S^2 = \frac{1}{5} \cdot 2 \cdot 10^{-5}$$

$$= 4 \cdot 10^{-6}$$

$$\Delta = N \sum X_i^2 - (\sum X_i)^2$$

$$= 7 (12,871) - (9,491)^2$$

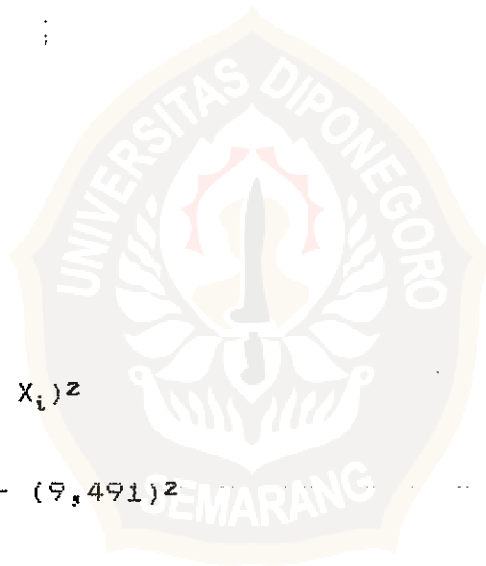
$$= 0,015$$

$$\sigma_a^2 = \frac{S^2 \sum X_i^2}{\Delta}$$

$$= \frac{4 \cdot 10^{-6} (12,871)}{0,015}$$

$$= 3.432 \cdot 10^{-3}$$

$$\sigma_a = 0,059$$



$$\begin{aligned}\sigma_b^2 &= \frac{N S^2}{\Delta} \\ &= \frac{7,4 \cdot 10^{-6}}{0,015} \\ &= 1,967 \cdot 10^{-4}\end{aligned}$$

$$\sigma_b = 0,043$$



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LAMPIRAN E

DATA DAN FOTO PERCOBAAN

1. Pengukuran Perubahan Konsentrasi Terhadap Pola interferensi Larutan Gula dan Larutan Garam

1.1. Larutan Gula

C (% b/v)	Δm					$\bar{\Delta m}$
	1	2	3	4	5	
0	20	19	20	20	22	20.2
5	20	19	21	21	22	20.6
10	20	22	22	19	23	21.2
15	21	22	22	21	22	21.6
20	22	21	23	22	23	22.2
25	22	23	23	22	23	22.6
30	24	23	22	24	24	23.4

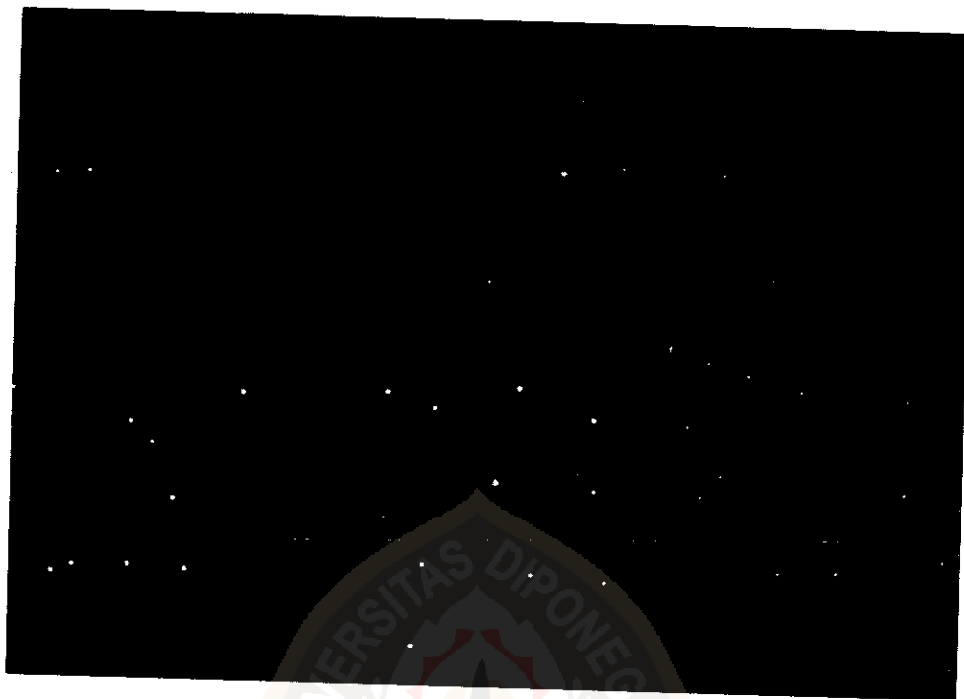
1.2. Larutan Garam

C (% b/v)	Δm					$\bar{\Delta m}$
	1	2	3	4	5	
0	20	19	20	20	22	20.2
5	20	19	22	20	21	20.4
10	19	21	22	22	21	21.0
15	21	23	21	20	22	21.4
20	22	21	23	22	22	22.0
25	22	21	23	23	23	22.4
30	23	22	24	23	23	23.0

2. Pengukuran Perubahan Tinggi Larutan Terhadap Pola Interferensi

C (% b/v)	Δd (mm)	Δm	
		Larutan gula	Larutan garam
0	0,02	20	20
	0,04	39	39
	0,06	59	59
	0,08	79	79
	0,1	101	101
5	0,02	20	20
	0,04	39	39
	0,06	60	61
	0,08	81	81
	0,1	103	102
10	0,02	20	19
	0,04	42	40
	0,06	64	62
	0,08	83	84
	0,1	106	105
15	0,02	21	21
	0,04	43	44
	0,06	65	65
	0,08	86	85
	0,1	108	107
20	0,02	22	22
	0,04	43	43
	0,06	66	66
	0,08	88	88
	0,1	111	110
25	0,02	22	22
	0,04	45	43
	0,06	68	66
	0,08	90	89
	0,1	113	112
30	0,02	24	23
	0,04	47	45
	0,06	69	69
	0,08	93	92
	0,1	117	115

3. Foto Hasil Percobaan



LAMPIRAN F
FOTO SUSUNAN PERALATAN

