

# LAMPIRAN

**Lampiran 1. Hasil Determinasi Kulit Pisang Kepok**



KEMENTERIAN RISET TEKNOLOGI DAN PENDIDIKAN TINGGI  
UNIVERSITAS DIPONEGORO  
FAKULTAS SAINS DAN MATEMATIKA  
LABORATORIUM EKOLOGI DAN BIOSISTEMATIK JURUSAN BIOLOGI  
Jl. Prof. H. Soedarto SH Tembalang Semarang, 024 7474754. 024 76480923

### SURAT KETERANGAN

Yang bertanda tangan dibawah ini, menyatakan bahwa mahasiswa sbb :

Nama : Budiatty Dwi Wulandari  
NIM : 145010150  
Fakultas / Prodi : Farmasi  
Perguruan Tinggi : UNIVERSITAS WAHID HASYIM SEMARANG  
Judul Penelitian : Pembuatan dan Karakterisasi Nanopartikel  
Ekstrak Etanol Kulit Pisang Kepok (*Musa balbisiana*)  
Pada Berbagai Variasi Komposisi Kitosan  
Pembimbing : -

Telah melakukan determinasi / identifikasi sampel tumbuhan (satu jenis) di Laboratorium  
Ekologi dan Biosistematik Departemen Biologi Fakultas Sains dan Matematika UNDIP.  
Hasil determinasi / identifikasi terlampir.

Demikian Surat Keterangan ini dibuat untuk dapat digunakan seperlunya.

Semarang, Maret 2017

Laboratorium Ekologi Dan Biosistematik

Kepala,



Dr. Mochamad Hadi, M.Si.

NIP. 196001081987031002



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### HASIL DETERMINASI / IDENTIFIKASI

#### KLASIFIKASI

Kingdom : Plantae  
Subkingdom : Tracheobionta (Tumbuhan berpembuluh)  
Super Divisi : Spermatophyta (Menghasilkan biji)  
Divisi : Magnoliophyta (Tumbuhan berbunga)  
Kelas : Liliopsida / Monocotyledoneae (berkeping satu)  
Sub Kelas : -  
Ordo : Musales  
Famili : Musaceae  
Genus : *Musa*  
Spesies : *Musa balbisiana* (Pisang kepok)

#### DETERMINASI

1b, 2b, 3b, 4b, 6b, 7b, 9b, 10b, 11a, ..... Golongan 5 : Tanaman Monocotyledoneae, .....  
67b, 69b, 70b, 71b, 72b, 73b, 76b, 77b, 79b, 81b, 82b, 83c, ..... Famili 31 : Musaceae,  
..... Genus : *Musa* ..... Spesies : *Musa balbisiana*.

#### DESKRIPSI

Pisang adalah tanaman buah berupa herba yang berasal dari kawasan Asia Tenggara (termasuk Indonesia), Afrika (Madagaskar), Amerika Selatan dan Tengah. Rasanya yang manis membuat banyak yang senang mengonsumsi buah ini.

Bentuk buah pisang kepok agak gepeng dan bersegi. Karena bentuknya gepeng, ada yang menyebutnya pisang gepeng. Ukuran buahnya kecil, panjangnya 10-12 cm dan beratnya 80-120 g. Kulit buahnya sangat tebal dengan warna kuning kehijauan dan kadang bernoda coklat. Ada dua jenis pisang kepok, yaitu pisang kepok kuning dan pisang kepok putih. Secara kasat mata dari luar bentuk pisangnya hampir sama. Daging buah kepok kuning berwarna kekuningan, sedangkan kepok putih lebih pucat. Rasa kepok kuning lebih manis, sedangkan yang kepok putih lebih asam.

Pisang kepok enak dikonsumsi setelah diolah. Daging buahnya manis. Bahkan buahnya yang masih mengkel, belum terlalu masak, sudah enak kalau dikukus. Hidangan yang memanfaatkan pisang kepok juga beragam, dari pisang goreng, kolak pisang, gethuk pisang, dll. Dunia industri membudidayakan pisang kepok ini untuk tepung, kripik, cuka, bir, dan puree. Selain buahnya, pohon pisangnya sendiri punya banyak manfaat. Daun dan batang pisang sangat berperan untuk upacara-upacara adat. Daunnya dimanfaatkan juga untuk pembungkusan hidangan. Serat pelepah pisangnya bahkan dapat dijadikan kain dan bahan kerajinan. Dan hati pohon pisang, yaitu bagian tengah batang



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pisang, bagus buat pakan ternak. Daun pisang yang muda, yang warnanya masih hijau pupus dan tergulung itu digunakan sebagai obat sakit dada dan sebagai tapal dingin untuk kulit yang bengkak atau lecet. Air yang keluar dari pangkal batang yang ditusuk digunakan untuk disuntikkan ke dalam saluran kencing untuk mengobati penyakit raja singa, disentri, dan diare; air ini juga digunakan untuk menyetop rontoknya rambut dan merangsang pertumbuhan rambut. Cairan yang keluar dari akar bersifat anti-demam dan memiliki daya pemulihan kembali. Buah yang belum terlalu matang bagus untuk diet penderita penyakit batuk darah (haemoptysis) dan kencing manis. Dalam keadaan kering, pisang bersifat antisariawan usus. Buah yang matang sempurna merupakan makanan mewah jika dimakan pagi-pagi sekali karena kandungan gizinya. Tepung yang dibuat dari pisang digunakan untuk gangguan pencernaan yang disertai perut kembung dan kelebihan asam.

**PUSTAKA :**

Backer, CA, RCB Van Den Brink, 1963. Flora of Java. Volume I (III). NV. Noordhoff, Groningen, The Netherlands.  
Van Steenis, C.G.G.J. 1981. Flora, Untuk Sekolah Indonesia. P.T. Pradnya Paramita, Jakarta.



## Lampiran 2. Perhitungan Jumlah Bahan

Berdasarkan variasi komposisi Kitosan dan NaTPP pada Tabel 3 dapat dihitung jumlah bahan yang diperlukan.

- a. Larutan stok EEKP

80 mg EEKPK dalam 10 ml etanol 96%

- b. Larutan asam asetat glasial 1%

$$1/100 \times 100\text{ml} = 1 \text{ g} / 100\text{ml}$$

- c. Larutan stok kitosan 0,5% sebanyak 30ml

$$0,5 \text{ g} / 100 \text{ ml} = x / 30 \text{ ml}$$

$$x = 0,15 \text{ g dalam } 30 \text{ ml asam asetat glasial } 1\%$$

1. Kitosan 0,1 %

$$C1 \times V1 = C2 \times V2$$

$$0,1 \times 20 \text{ ml} = 0,5 \times X$$

$$X = 4 \text{ ml ad asam asetat glasial } 1\% \text{ } 20 \text{ ml}$$

(3 kali pengulangan)

2. Kitisan 0,2 %

$$C1 \times V1 = C2 \times V2$$

$$0,2 \times 20 \text{ ml} = 0,5 \times X$$

$$X = 8 \text{ ml ad asam asetat glasial } 1\% \text{ } 20 \text{ ml}$$

(3 kali pengulangan)

3. Kitosan 0,3 %

$$C_1 \times V_1 = C_2 \times V_2$$

$$0,3 \times 20 \text{ ml} = 0,5 \times X$$

$$X = 12 \text{ ml ad asam asetat glasial 1\% 20 ml}$$

(3 kali pengulangan)

d. NaTPP 0,1 % sebanyak 10 ml

$$0,1 \text{ g} / 100 \times 10 \text{ ml} = 0,01 \text{ g}$$

### Lampiran 3. Perhitungan Nilai Rf Kromatografi Lapis Tipis

Secara sistematis perhitungan Rf menggunakan rumus :

$$R_f : \frac{l}{h}$$

dengan, l = jarak noda dari titik awal ke titik akhir setelah proses pengembangan (cm) h = jarak eluen dari titik awal ke batas akhir eluen (cm). Berdasarkan rumus perhitungan nilai Rf, didapatkan hasil sebagai berikut :

Berdasarkan rumus perhitungan nilai Rf, didapatkan hasil sebagai berikut :

a. Ekstrak Etanol Kulit Pisang Kepok (EEKPK)

1.  $R_f \text{ EEKPK} = 3,1\text{cm} / 8 \text{ cm} = 0,3$

2.  $R_f \text{ Quarsetin} = 3,3 \text{ cm} / 8 \text{ cm} = 0,4$

b. Nanopartikel Ekstrak Etanol Kulit Pisang Kepok (NP EEKPK)

1. FI

$$R_f \text{ Quarsetin} = 3,4 \text{ cm} / 8 \text{ cm} = 0,4$$

$$R_f \text{ NP EEKPK} = 3,2 \text{ cm} / 8\text{cm} = 0,4$$

2. FII

$$R_f \text{ Quarsetin} = 3\text{cm} / 8 \text{ cm} = 0,37$$

$$R_f \text{ NP EEKPK} = 2,9 \text{ cm} / 8 \text{ cm} = 0,36$$

3. FIII

$$R_f \text{ Quarsetin} = 2,8 \text{ cm} / 8 \text{ cm} = 0,35$$

$$R_f \text{ NP EEKPK} = 2,5 \text{ cm} / 8 \text{ cm} = 0,3$$

#### Lampiran 4. Perhitungan Randemen Simplisia dan Ekstrak Kental

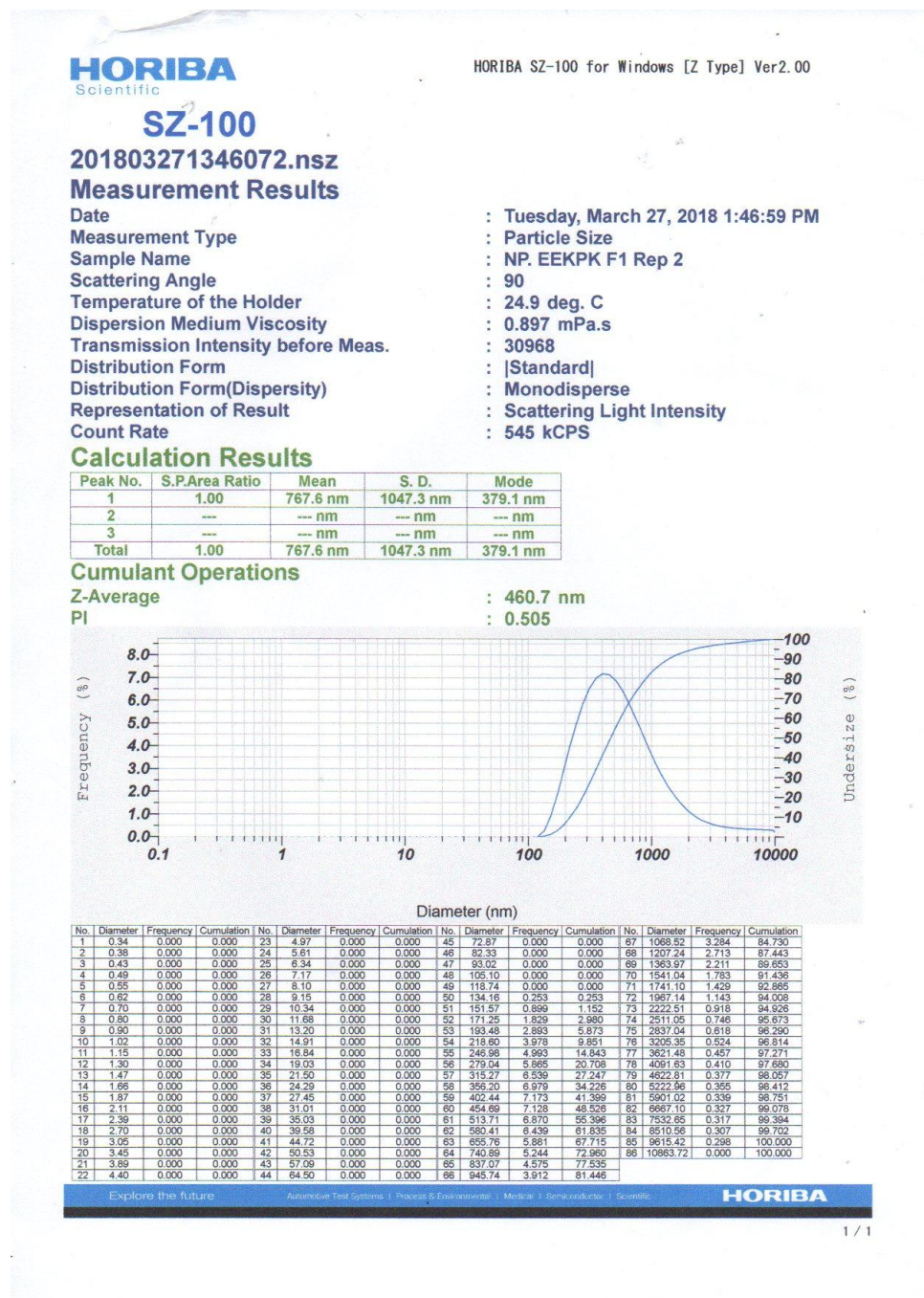
$$\begin{aligned}\text{randemen serbuk (\%)} &= \frac{\text{bobot serbuk simplisia}}{\text{bobot kulit}} \times 100 \% \\ &= \frac{2600 \text{ gram}}{15700 \text{ gram}} \times 100 \% \\ &= 16,56\%\end{aligned}$$

$$\begin{aligned}\text{Randemen ekstrak (\%)} &= \frac{\text{bobot ekstrak kental}}{\text{bobot serbuk simplisia}} \times 100 \% \\ &= \frac{384,59 \text{ gram}}{2400 \text{ gram}} \times 100 \% \\ &= 16,06\%\end{aligned}$$

## LAMPIRAN 5

### A .Hasil PSA dan PI NP EEKPK

#### 1. FI Replikasi 1



## 2. FI Replikasi 2

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HORIBA SZ-100 for Windows [Z Type] Ver2.00

### SZ-100

#### NP. EEKPK F1 Rep 3.nsz Measurement Results

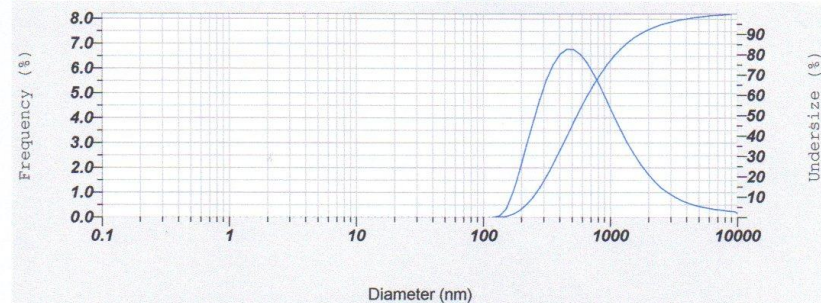
Date : Tuesday, March 27, 2018 1:37:59 PM  
Measurement Type : Particle Size  
Sample Name : NP. EEKPK F1 Rep 3  
Scattering Angle : 90  
Temperature of the Holder : 25.0 deg. C  
Dispersion Medium Viscosity : 0.896 mPa.s  
Transmission Intensity before Meas. : 33431  
Distribution Form : [Standard]  
Distribution Form(Dispersity) : Monodisperse  
Representation of Result : Scattering Light Intensity  
Count Rate : 290 kCPS

#### Calculation Results

| Peak No. | S.P.Area Ratio | Mean     | S. D.     | Mode     |
|----------|----------------|----------|-----------|----------|
| 1        | 1.00           | 873.3 nm | 1049.4 nm | 428.5 nm |
| 2        | ---            | --- nm   | --- nm    | --- nm   |
| 3        | ---            | --- nm   | --- nm    | --- nm   |
| Total    | 1.00           | 873.3 nm | 1049.4 nm | 428.5 nm |

#### Cumulant Operations

Z-Average : 516.0 nm  
PI : 0.474



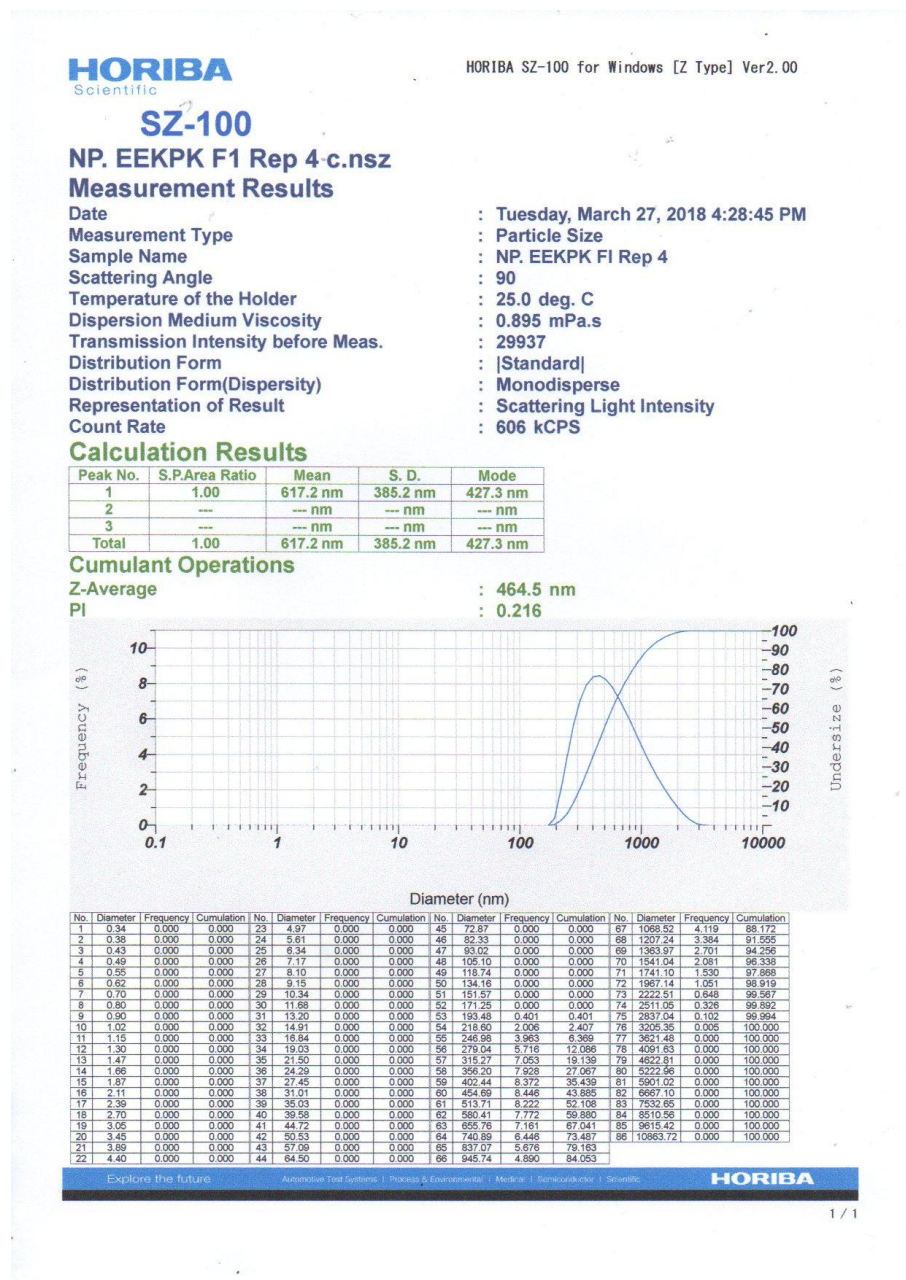
| No. | Diameter | Frequency | Cumulation | No. | Diameter | Frequency | Cumulation | No. | Diameter | Frequency | Cumulation | No. | Diameter | Frequency | Cumulation |
|-----|----------|-----------|------------|-----|----------|-----------|------------|-----|----------|-----------|------------|-----|----------|-----------|------------|
| 1   | 0.34     | 0.000     | 0.000      | 23  | 4.97     | 0.000     | 0.000      | 45  | 72.87    | 0.000     | 0.000      | 67  | 1068.52  | 4.073     | 76.105     |
| 2   | 0.38     | 0.000     | 0.000      | 24  | 5.81     | 0.000     | 0.000      | 46  | 82.33    | 0.000     | 0.000      | 68  | 1207.24  | 3.512     | 82.617     |
| 3   | 0.43     | 0.000     | 0.000      | 25  | 6.34     | 0.000     | 0.000      | 47  | 93.02    | 0.000     | 0.000      | 69  | 1363.97  | 2.960     | 85.607     |
| 4   | 0.49     | 0.000     | 0.000      | 26  | 7.17     | 0.000     | 0.000      | 48  | 105.10   | 0.000     | 0.000      | 70  | 1541.04  | 2.518     | 88.126     |
| 5   | 0.55     | 0.000     | 0.000      | 27  | 8.10     | 0.000     | 0.000      | 49  | 118.74   | 0.000     | 0.000      | 71  | 1741.10  | 2.102     | 90.228     |
| 6   | 0.62     | 0.000     | 0.000      | 28  | 9.15     | 0.000     | 0.000      | 50  | 134.16   | 0.000     | 0.000      | 72  | 1967.14  | 1.744     | 91.971     |
| 7   | 0.70     | 0.000     | 0.000      | 29  | 10.34    | 0.000     | 0.000      | 51  | 151.57   | 0.364     | 0.416      | 73  | 2222.51  | 1.441     | 93.412     |
| 8   | 0.80     | 0.000     | 0.000      | 30  | 11.68    | 0.000     | 0.000      | 52  | 171.25   | 1.023     | 1.439      | 74  | 2511.05  | 1.188     | 94.600     |
| 9   | 0.90     | 0.000     | 0.000      | 31  | 13.20    | 0.000     | 0.000      | 53  | 193.48   | 1.893     | 3.333      | 75  | 2837.04  | 0.981     | 95.582     |
| 10  | 1.02     | 0.000     | 0.000      | 32  | 14.91    | 0.000     | 0.000      | 54  | 218.60   | 2.961     | 6.194      | 76  | 3205.35  | 0.814     | 96.395     |
| 11  | 1.15     | 0.000     | 0.000      | 33  | 16.84    | 0.000     | 0.000      | 55  | 246.98   | 3.839     | 10.032     | 77  | 3621.48  | 0.679     | 97.074     |
| 12  | 1.30     | 0.000     | 0.000      | 34  | 19.03    | 0.000     | 0.000      | 56  | 279.04   | 4.752     | 14.784     | 78  | 4081.63  | 0.571     | 97.645     |
| 13  | 1.47     | 0.000     | 0.000      | 35  | 21.50    | 0.000     | 0.000      | 57  | 315.27   | 5.540     | 20.325     | 79  | 4622.91  | 0.485     | 98.130     |
| 14  | 1.66     | 0.000     | 0.000      | 36  | 24.29    | 0.000     | 0.000      | 58  | 356.20   | 6.156     | 26.481     | 80  | 5222.96  | 0.417     | 98.548     |
| 15  | 1.87     | 0.000     | 0.000      | 37  | 27.45    | 0.000     | 0.000      | 59  | 402.44   | 6.570     | 33.051     | 81  | 5901.02  | 0.363     | 98.911     |
| 16  | 2.11     | 0.000     | 0.000      | 38  | 31.01    | 0.000     | 0.000      | 60  | 454.89   | 6.771     | 39.822     | 82  | 6667.10  | 0.320     | 99.230     |
| 17  | 2.39     | 0.000     | 0.000      | 39  | 35.03    | 0.000     | 0.000      | 61  | 513.71   | 6.764     | 46.587     | 83  | 7532.65  | 0.284     | 99.515     |
| 18  | 2.70     | 0.000     | 0.000      | 40  | 39.58    | 0.000     | 0.000      | 62  | 580.41   | 6.572     | 53.159     | 84  | 8510.56  | 0.255     | 99.770     |
| 19  | 3.05     | 0.000     | 0.000      | 41  | 44.72    | 0.000     | 0.000      | 63  | 655.76   | 6.226     | 59.385     | 85  | 9615.42  | 0.231     | 100.000    |
| 20  | 3.45     | 0.000     | 0.000      | 42  | 50.53    | 0.000     | 0.000      | 64  | 740.89   | 5.765     | 65.150     | 86  | 10853.72 | 0.000     | 100.000    |
| 21  | 3.89     | 0.000     | 0.000      | 43  | 57.09    | 0.000     | 0.000      | 65  | 837.07   | 5.228     | 70.378     |     |          |           |            |
| 22  | 4.40     | 0.000     | 0.000      | 44  | 64.50    | 0.000     | 0.000      | 66  | 945.74   | 4.654     | 75.031     |     |          |           |            |

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### 3. FI Replikasi 3



## 4. F II Replikasi 1

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HORIBA SZ-100 for Windows [Z Type] Ver2.00

### SZ-100

NP. EEKPK F2 R1.nsz

### Measurement Results

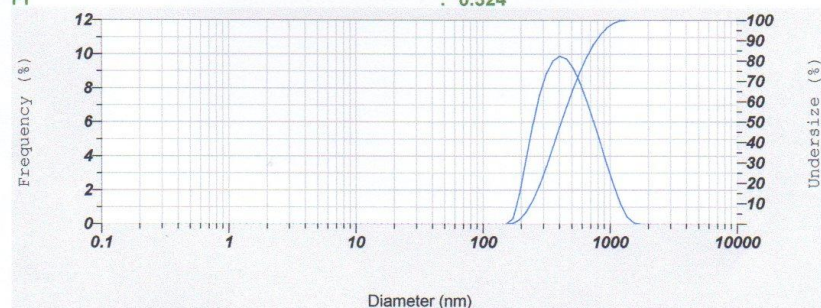
Date : Monday, March 26, 2018 3:37:33 PM  
Measurement Type : Particle Size  
Sample Name : NP. EEKPK F2 Rep 1  
Scattering Angle : 90  
Temperature of the Holder : 25.0 deg. C  
Dispersion Medium Viscosity : 0.896 mPa.s  
Transmission Intensity before Meas. : 29647  
Distribution Form : [Standard]  
Distribution Form(Dispersity) : Monodisperse  
Representation of Result : Scattering Light Intensity  
Count Rate : 1173 kCPS

### Calculation Results

| Peak No. | S.P.Area Ratio | Mean     | S. D.    | Mode     |
|----------|----------------|----------|----------|----------|
| 1        | 1.00           | 468.4 nm | 217.3 nm | 378.8 nm |
| 2        | ---            | --- nm   | --- nm   | --- nm   |
| 3        | ---            | --- nm   | --- nm   | --- nm   |
| Total    | 1.00           | 468.4 nm | 217.3 nm | 378.8 nm |

### Cumulant Operations

Z-Average : 345.7 nm  
PI : 0.324



| No. | Diameter | Frequency | Cumulation | No. | Diameter | Frequency | Cumulation | No. | Diameter | Frequency | Cumulation | No. | Diameter | Frequency | Cumulation |
|-----|----------|-----------|------------|-----|----------|-----------|------------|-----|----------|-----------|------------|-----|----------|-----------|------------|
| 1   | 0.34     | 0.000     | 0.000      | 23  | 4.97     | 0.000     | 0.000      | 45  | 72.87    | 0.000     | 0.000      | 67  | 1068.52  | 2.255     | 98.357     |
| 2   | 0.38     | 0.000     | 0.000      | 24  | 5.61     | 0.000     | 0.000      | 46  | 82.33    | 0.000     | 0.000      | 68  | 1207.24  | 1.193     | 99.550     |
| 3   | 0.43     | 0.000     | 0.000      | 25  | 6.34     | 0.000     | 0.000      | 47  | 93.02    | 0.000     | 0.000      | 69  | 1363.97  | 0.401     | 99.950     |
| 4   | 0.49     | 0.000     | 0.000      | 26  | 7.17     | 0.000     | 0.000      | 48  | 105.10   | 0.000     | 0.000      | 70  | 1541.04  | 0.050     | 100.000    |
| 5   | 0.55     | 0.000     | 0.000      | 27  | 8.10     | 0.000     | 0.000      | 49  | 118.74   | 0.000     | 0.000      | 71  | 1741.10  | 0.000     | 100.000    |
| 6   | 0.62     | 0.000     | 0.000      | 28  | 9.15     | 0.000     | 0.000      | 50  | 134.16   | 0.000     | 0.000      | 72  | 1967.14  | 0.000     | 100.000    |
| 7   | 0.70     | 0.000     | 0.000      | 29  | 10.34    | 0.000     | 0.000      | 51  | 151.57   | 0.000     | 0.000      | 73  | 2222.51  | 0.000     | 100.000    |
| 8   | 0.80     | 0.000     | 0.000      | 30  | 11.68    | 0.000     | 0.000      | 52  | 171.25   | 0.282     | 0.282      | 74  | 2511.05  | 0.000     | 100.000    |
| 9   | 0.90     | 0.000     | 0.000      | 31  | 13.20    | 0.000     | 0.000      | 53  | 193.48   | 1.722     | 2.004      | 75  | 2837.04  | 0.000     | 100.000    |
| 10  | 1.02     | 0.000     | 0.000      | 32  | 14.91    | 0.000     | 0.000      | 54  | 218.60   | 3.783     | 5.787      | 76  | 3205.35  | 0.000     | 100.000    |
| 11  | 1.15     | 0.000     | 0.000      | 33  | 16.84    | 0.000     | 0.000      | 55  | 246.98   | 5.838     | 11.625     | 77  | 3621.48  | 0.000     | 100.000    |
| 12  | 1.30     | 0.000     | 0.000      | 34  | 19.03    | 0.000     | 0.000      | 56  | 279.04   | 7.568     | 19.193     | 78  | 4091.63  | 0.000     | 100.000    |
| 13  | 1.47     | 0.000     | 0.000      | 35  | 21.50    | 0.000     | 0.000      | 57  | 315.27   | 8.835     | 28.028     | 79  | 4622.81  | 0.000     | 100.000    |
| 14  | 1.66     | 0.000     | 0.000      | 36  | 24.29    | 0.000     | 0.000      | 58  | 366.20   | 9.697     | 37.625     | 80  | 5222.96  | 0.000     | 100.000    |
| 15  | 1.87     | 0.000     | 0.000      | 37  | 27.45    | 0.000     | 0.000      | 59  | 402.44   | 9.869     | 47.493     | 81  | 5901.02  | 0.000     | 100.000    |
| 16  | 2.11     | 0.000     | 0.000      | 38  | 31.01    | 0.000     | 0.000      | 60  | 454.69   | 9.697     | 57.190     | 82  | 6667.10  | 0.000     | 100.000    |
| 17  | 2.39     | 0.000     | 0.000      | 39  | 35.03    | 0.000     | 0.000      | 61  | 513.71   | 9.148     | 66.338     | 83  | 7532.65  | 0.000     | 100.000    |
| 18  | 2.70     | 0.000     | 0.000      | 40  | 39.58    | 0.000     | 0.000      | 62  | 580.41   | 8.300     | 74.638     | 84  | 8510.56  | 0.000     | 100.000    |
| 19  | 3.05     | 0.000     | 0.000      | 41  | 44.72    | 0.000     | 0.000      | 63  | 655.76   | 7.232     | 81.870     | 85  | 9615.42  | 0.000     | 100.000    |
| 20  | 3.45     | 0.000     | 0.000      | 42  | 50.53    | 0.000     | 0.000      | 64  | 740.89   | 6.022     | 87.892     | 86  | 10863.72 | 0.000     | 100.000    |
| 21  | 3.89     | 0.000     | 0.000      | 43  | 57.09    | 0.000     | 0.000      | 65  | 837.07   | 4.744     | 92.636     |     |          |           |            |
| 22  | 4.40     | 0.000     | 0.000      | 44  | 64.50    | 0.000     | 0.000      | 66  | 945.74   | 3.466     | 96.102     |     |          |           |            |

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## 5. F II Replikasi 2

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### SZ-100

201803271619230.nsz

#### Measurement Results

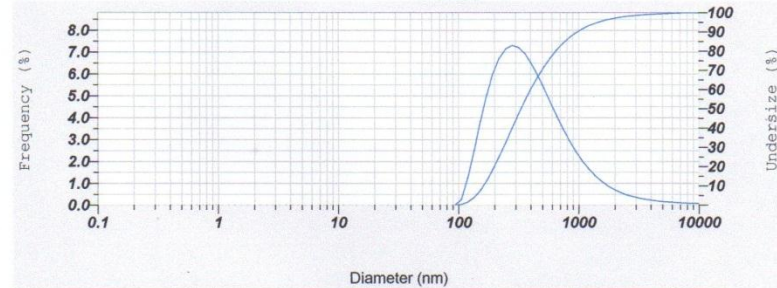
Date : Tuesday, March 27, 2018 4:19:20 PM  
Measurement Type : Particle Size  
Sample Name : NP. EEKPK Fil Rep 2  
Scattering Angle : 90  
Temperature of the Holder : 24.9 deg. C  
Dispersion Medium Viscosity : 0.897 mPa.s  
Transmission Intensity before Meas. : 30460  
Distribution Form : [Standard]  
Distribution Form(Dispersity) : Monodisperse  
Representation of Result : Scattering Light Intensity  
Count Rate : 657 kCPS

#### Calculation Results

| Peak No. | S.P.Area Ratio | Mean     | S. D.    | Mode     |
|----------|----------------|----------|----------|----------|
| 1        | 1.00           | 525.0 nm | 691.5 nm | 262.7 nm |
| 2        | ---            | --- nm   | --- nm   | --- nm   |
| 3        | ---            | --- nm   | --- nm   | --- nm   |
| Total    | 1.00           | 525.0 nm | 691.5 nm | 262.7 nm |

#### Cumulant Operations

Z-Average : 303.5 nm  
PI : 0.453



| No. | Diameter | Frequency | Cumulation | No. | Diameter | Frequency | Cumulation | No. | Diameter | Frequency | Cumulation | No. | Diameter | Frequency | Cumulation |
|-----|----------|-----------|------------|-----|----------|-----------|------------|-----|----------|-----------|------------|-----|----------|-----------|------------|
| 1   | 0.34     | 0.000     | 0.000      | 23  | 4.97     | 0.000     | 0.000      | 45  | 72.87    | 0.000     | 0.000      | 67  | 1068.52  | 2.014     | 91.344     |
| 2   | 0.38     | 0.000     | 0.000      | 24  | 5.61     | 0.000     | 0.000      | 46  | 82.33    | 0.000     | 0.000      | 68  | 1207.24  | 2.650     | 92.995     |
| 3   | 0.43     | 0.000     | 0.000      | 25  | 6.34     | 0.000     | 0.000      | 47  | 93.02    | 0.000     | 0.000      | 69  | 1363.97  | 1.344     | 94.339     |
| 4   | 0.49     | 0.000     | 0.000      | 26  | 7.17     | 0.000     | 0.000      | 48  | 106.10   | 0.234     | 0.234      | 70  | 1541.04  | 1.089     | 95.427     |
| 5   | 0.55     | 0.000     | 0.000      | 27  | 8.10     | 0.000     | 0.000      | 49  | 119.74   | 1.300     | 1.534      | 71  | 1741.10  | 0.880     | 96.307     |
| 6   | 0.62     | 0.000     | 0.000      | 28  | 9.15     | 0.000     | 0.000      | 50  | 134.16   | 2.487     | 3.920      | 72  | 1967.14  | 0.710     | 97.017     |
| 7   | 0.70     | 0.000     | 0.000      | 29  | 10.34    | 0.000     | 0.000      | 51  | 151.57   | 3.809     | 7.730      | 73  | 2222.51  | 0.573     | 97.590     |
| 8   | 0.80     | 0.000     | 0.000      | 30  | 11.68    | 0.000     | 0.000      | 52  | 171.25   | 5.005     | 12.736     | 74  | 2511.05  | 0.454     | 98.044     |
| 9   | 0.90     | 0.000     | 0.000      | 31  | 13.20    | 0.000     | 0.000      | 53  | 193.48   | 5.985     | 18.722     | 75  | 2837.04  | 0.376     | 98.431     |
| 10  | 1.02     | 0.000     | 0.000      | 32  | 14.91    | 0.000     | 0.000      | 54  | 218.60   | 6.701     | 25.423     | 76  | 3205.35  | 0.307     | 98.738     |
| 11  | 1.15     | 0.000     | 0.000      | 33  | 16.84    | 0.000     | 0.000      | 55  | 246.98   | 7.135     | 32.558     | 77  | 3611.48  | 0.253     | 98.991     |
| 12  | 1.30     | 0.000     | 0.000      | 34  | 19.03    | 0.000     | 0.000      | 56  | 279.04   | 7.299     | 39.859     | 78  | 4081.83  | 0.209     | 99.200     |
| 13  | 1.47     | 0.000     | 0.000      | 35  | 21.50    | 0.000     | 0.000      | 57  | 315.27   | 7.217     | 47.076     | 79  | 4622.81  | 0.175     | 99.375     |
| 14  | 1.66     | 0.000     | 0.000      | 36  | 24.25    | 0.000     | 0.000      | 58  | 355.20   | 6.951     | 54.027     | 80  | 5222.86  | 0.147     | 99.522     |
| 15  | 1.87     | 0.000     | 0.000      | 37  | 27.45    | 0.000     | 0.000      | 59  | 402.44   | 6.488     | 60.484     | 81  | 5901.02  | 0.125     | 99.647     |
| 16  | 2.11     | 0.000     | 0.000      | 38  | 31.01    | 0.000     | 0.000      | 60  | 454.69   | 5.936     | 66.431     | 82  | 6667.10  | 0.108     | 99.755     |
| 17  | 2.39     | 0.000     | 0.000      | 39  | 35.03    | 0.000     | 0.000      | 61  | 513.71   | 5.323     | 71.754     | 83  | 7532.65  | 0.093     | 99.848     |
| 18  | 2.70     | 0.000     | 0.000      | 40  | 39.58    | 0.000     | 0.000      | 62  | 580.41   | 4.687     | 76.441     | 84  | 8510.56  | 0.081     | 99.929     |
| 19  | 3.05     | 0.000     | 0.000      | 41  | 44.72    | 0.000     | 0.000      | 63  | 655.76   | 4.061     | 80.501     | 85  | 9615.42  | 0.071     | 100.000    |
| 20  | 3.45     | 0.000     | 0.000      | 42  | 50.53    | 0.000     | 0.000      | 64  | 740.69   | 3.468     | 83.969     | 86  | 10863.72 | 0.000     | 100.000    |
| 21  | 3.89     | 0.000     | 0.000      | 43  | 57.09    | 0.000     | 0.000      | 65  | 837.07   | 2.824     | 86.893     |     |          |           |            |
| 22  | 4.40     | 0.000     | 0.000      | 44  | 64.50    | 0.000     | 0.000      | 66  | 945.74   | 2.435     | 89.331     |     |          |           |            |

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## 6. F II Replikasi 3

**HORIBA**  
Scientific

HORIBA SZ-100 for Windows [Z Type] Ver2.00

### SZ-100

201803271608215.nsz

#### Measurement Results

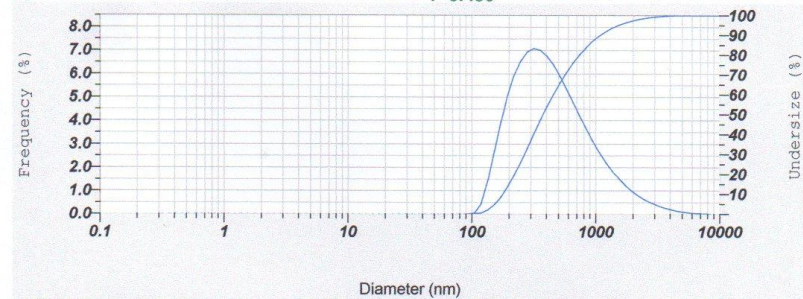
Date : Tuesday, March 27, 2018 4:08:17 PM  
Measurement Type : Particle Size  
Sample Name : NP. EEKPK FII Rep 3  
Scattering Angle : 90  
Temperature of the Holder : 24.8 deg. C  
Dispersion Medium Viscosity : 0.898 mPa.s  
Transmission Intensity before Meas. : 31668  
Distribution Form : |Standard|  
Distribution Form(Dispersity) : Monodisperse  
Representation of Result : Scattering Light Intensity  
Count Rate : 1337 KCPS

#### Calculation Results

| Peak No. | S.P.Area Ratio | Mean     | S. D.    | Mode     |
|----------|----------------|----------|----------|----------|
| 1        | 1.00           | 549.5 nm | 534.5 nm | 296.8 nm |
| 2        | ---            | --- nm   | --- nm   | --- nm   |
| 3        | ---            | --- nm   | --- nm   | --- nm   |
| Total    | 1.00           | 549.5 nm | 534.5 nm | 296.8 nm |

#### Cumulant Operations

Z-Average : 301.3 nm  
PI : 0.450



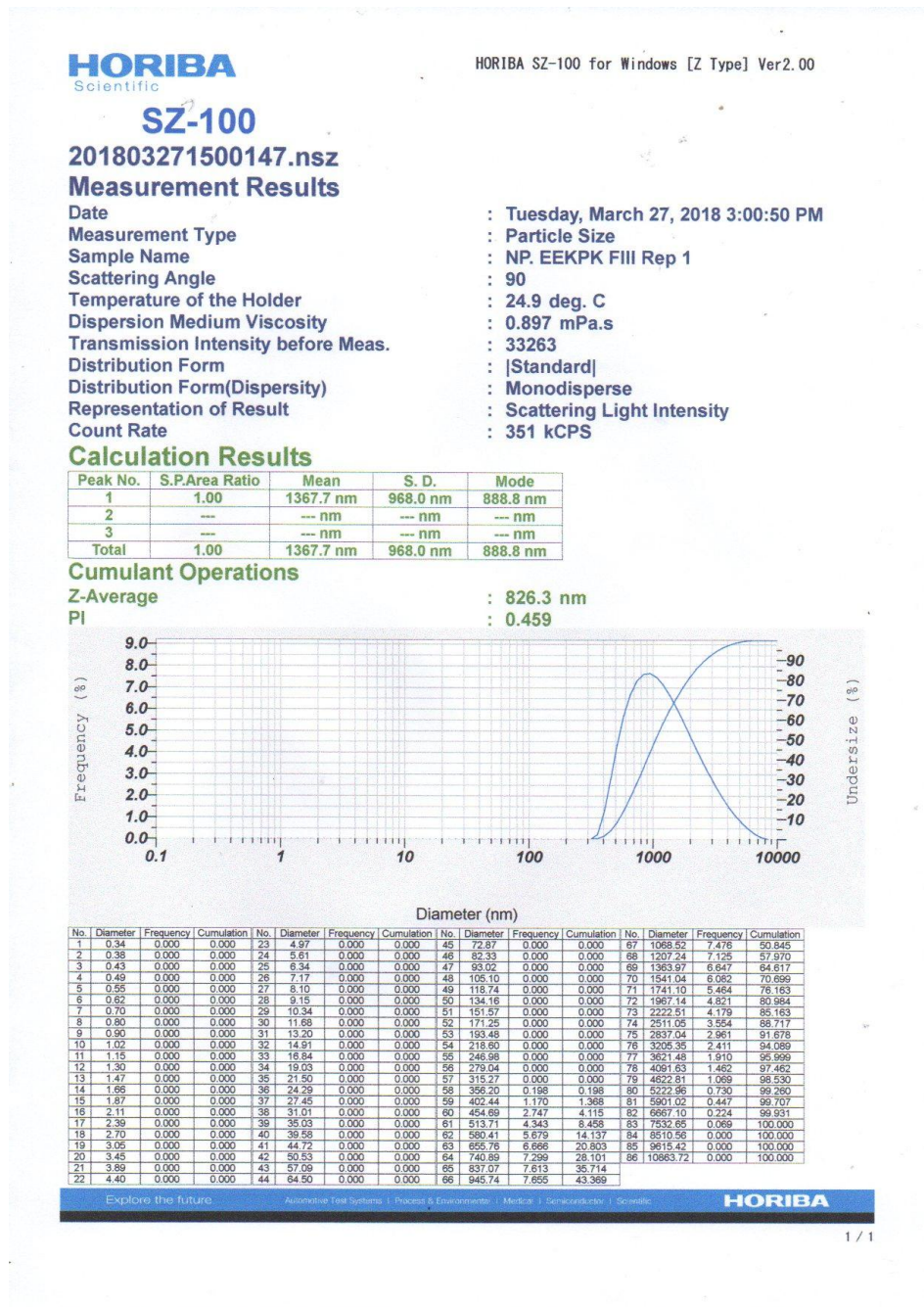
| No. | Diameter | Frequency | Cumulation | No. | Diameter | Frequency | Cumulation | No. | Diameter | Frequency | Cumulation | No. | Diameter | Frequency | Cumulation |
|-----|----------|-----------|------------|-----|----------|-----------|------------|-----|----------|-----------|------------|-----|----------|-----------|------------|
| 1   | 0.34     | 0.000     | 0.000      | 23  | 4.97     | 0.000     | 0.000      | 45  | 72.87    | 0.000     | 0.000      | 67  | 1068.52  | 2.626     | 89.510     |
| 2   | 0.38     | 0.000     | 0.000      | 24  | 5.61     | 0.000     | 0.000      | 46  | 82.33    | 0.000     | 0.000      | 68  | 1207.24  | 5.187     | 91.707     |
| 3   | 0.43     | 0.000     | 0.000      | 25  | 6.34     | 0.000     | 0.000      | 47  | 93.02    | 0.000     | 0.000      | 69  | 1363.97  | 1.818     | 93.525     |
| 4   | 0.49     | 0.000     | 0.000      | 26  | 7.17     | 0.000     | 0.000      | 48  | 105.10   | 0.037     | 0.037      | 70  | 1541.04  | 1.489     | 95.014     |
| 5   | 0.55     | 0.000     | 0.000      | 27  | 8.10     | 0.000     | 0.000      | 49  | 118.74   | 0.423     | 0.460      | 71  | 1741.10  | 1.206     | 96.219     |
| 6   | 0.62     | 0.000     | 0.000      | 28  | 9.15     | 0.000     | 0.000      | 50  | 134.16   | 1.424     | 1.884      | 72  | 1967.14  | 0.965     | 97.184     |
| 7   | 0.70     | 0.000     | 0.000      | 29  | 10.34    | 0.000     | 0.000      | 51  | 151.57   | 2.666     | 4.549      | 73  | 2222.51  | 0.763     | 97.947     |
| 8   | 0.80     | 0.000     | 0.000      | 30  | 11.68    | 0.000     | 0.000      | 52  | 171.25   | 3.903     | 8.453      | 74  | 2511.05  | 0.584     | 98.541     |
| 9   | 0.90     | 0.000     | 0.000      | 31  | 13.20    | 0.000     | 0.000      | 53  | 193.48   | 5.002     | 13.455     | 75  | 2837.04  | 0.455     | 98.996     |
| 10  | 1.02     | 0.000     | 0.000      | 32  | 14.91    | 0.000     | 0.000      | 54  | 218.60   | 5.891     | 19.345     | 76  | 3205.35  | 0.341     | 99.338     |
| 11  | 1.15     | 0.000     | 0.000      | 33  | 16.84    | 0.000     | 0.000      | 55  | 246.98   | 6.534     | 25.879     | 77  | 3621.48  | 0.249     | 99.587     |
| 12  | 1.30     | 0.000     | 0.000      | 34  | 19.03    | 0.000     | 0.000      | 56  | 279.04   | 6.924     | 32.803     | 78  | 4061.63  | 0.175     | 99.762     |
| 13  | 1.47     | 0.000     | 0.000      | 35  | 21.50    | 0.000     | 0.000      | 57  | 315.27   | 7.072     | 39.874     | 79  | 4622.81  | 0.116     | 99.878     |
| 14  | 1.66     | 0.000     | 0.000      | 36  | 24.29    | 0.000     | 0.000      | 58  | 356.20   | 7.004     | 46.878     | 80  | 5222.96  | 0.070     | 99.948     |
| 15  | 1.87     | 0.000     | 0.000      | 37  | 27.46    | 0.000     | 0.000      | 59  | 402.44   | 6.766     | 53.634     | 81  | 5891.02  | 0.036     | 99.985     |
| 16  | 2.11     | 0.000     | 0.000      | 38  | 31.01    | 0.000     | 0.000      | 60  | 454.69   | 6.368     | 60.002     | 82  | 6667.10  | 0.013     | 99.998     |
| 17  | 2.39     | 0.000     | 0.000      | 39  | 35.03    | 0.000     | 0.000      | 61  | 513.71   | 5.881     | 65.883     | 83  | 7532.65  | 0.002     | 100.000    |
| 18  | 2.70     | 0.000     | 0.000      | 40  | 39.56    | 0.000     | 0.000      | 62  | 580.41   | 5.333     | 71.217     | 84  | 8510.36  | 0.000     | 100.000    |
| 19  | 3.05     | 0.000     | 0.000      | 41  | 44.72    | 0.000     | 0.000      | 63  | 655.76   | 4.758     | 75.975     | 85  | 9615.42  | 0.000     | 100.000    |
| 20  | 3.45     | 0.000     | 0.000      | 42  | 50.53    | 0.000     | 0.000      | 64  | 740.89   | 4.181     | 80.156     | 86  | 10863.72 | 0.000     | 100.000    |
| 21  | 3.89     | 0.000     | 0.000      | 43  | 57.09    | 0.000     | 0.000      | 65  | 837.07   | 3.525     | 83.781     |     |          |           |            |
| 22  | 4.40     | 0.000     | 0.000      | 44  | 64.50    | 0.000     | 0.000      | 66  | 945.74   | 3.103     | 86.885     |     |          |           |            |

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## 7. FIII Replikasi 1



## 8. F III Replikasi 2

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Scientific

HORIBA SZ-100 for Windows [Z Type] Ver2.00

### SZ-100

201803271525172.nsz

#### Measurement Results

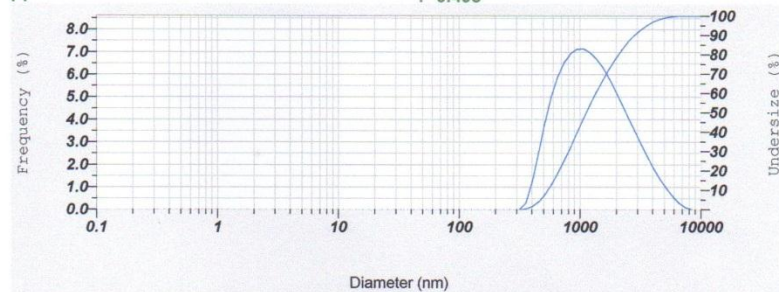
Date : Tuesday, March 27, 2018 3:25:16 PM  
Measurement Type : Particle Size  
Sample Name : NP. EEKPK FIII Rep 2  
Scattering Angle : 90  
Temperature of the Holder : 24.8 deg. C  
Dispersion Medium Viscosity : 0.898 mPa.s  
Transmission Intensity before Meas. : 32205  
Distribution Form : [Standard]  
Distribution Form(Dispersity) : Monodisperse  
Representation of Result : Scattering Light Intensity  
Count Rate : 361 kCPS

#### Calculation Results

| Peak No. | S.P.Area Ratio | Mean      | S. D.     | Mode      |
|----------|----------------|-----------|-----------|-----------|
| 1        | 1.00           | 1460.2 nm | 1024.4 nm | 1004.1 nm |
| 2        | ---            | --- nm    | --- nm    | --- nm    |
| 3        | ---            | --- nm    | --- nm    | --- nm    |
| Total    | 1.00           | 1460.2 nm | 1024.4 nm | 1004.1 nm |

#### Cumulant Operations

Z-Average : 785.2 nm  
PI : 0.498



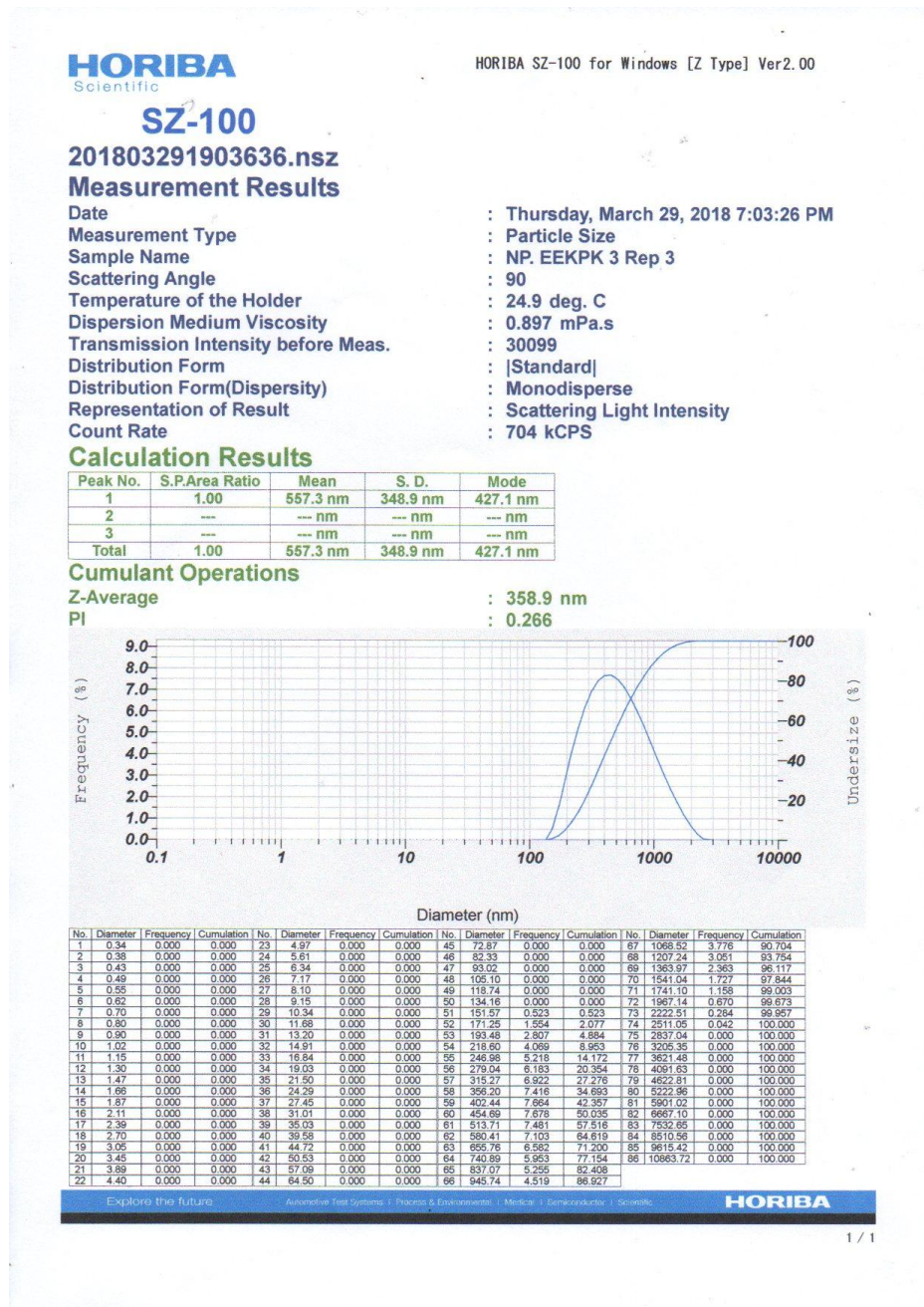
| No. | Diameter | Frequency | Cumulation | No. | Diameter | Frequency | Cumulation | No. | Diameter | Frequency | Cumulation | No. | Diameter | Frequency | Cumulation |
|-----|----------|-----------|------------|-----|----------|-----------|------------|-----|----------|-----------|------------|-----|----------|-----------|------------|
| 1   | 0.34     | 0.000     | 0.000      | 23  | 4.97     | 0.000     | 0.000      | 45  | 72.87    | 0.000     | 0.000      | 67  | 1068.52  | 7.129     | 46.565     |
| 2   | 0.38     | 0.000     | 0.000      | 24  | 5.81     | 0.000     | 0.000      | 46  | 82.33    | 0.000     | 0.000      | 68  | 1207.24  | 6.980     | 53.545     |
| 3   | 0.43     | 0.000     | 0.000      | 25  | 6.34     | 0.000     | 0.000      | 47  | 93.02    | 0.000     | 0.000      | 69  | 1363.97  | 6.697     | 60.242     |
| 4   | 0.49     | 0.000     | 0.000      | 26  | 7.17     | 0.000     | 0.000      | 48  | 105.10   | 0.000     | 0.000      | 70  | 1541.04  | 6.303     | 66.544     |
| 5   | 0.55     | 0.000     | 0.000      | 27  | 8.10     | 0.000     | 0.000      | 49  | 118.74   | 0.000     | 0.000      | 71  | 1741.10  | 5.821     | 72.366     |
| 6   | 0.62     | 0.000     | 0.000      | 28  | 9.15     | 0.000     | 0.000      | 50  | 134.16   | 0.000     | 0.000      | 72  | 1967.14  | 5.278     | 77.644     |
| 7   | 0.70     | 0.000     | 0.000      | 29  | 10.34    | 0.000     | 0.000      | 51  | 151.57   | 0.000     | 0.000      | 73  | 2222.51  | 4.669     | 82.313     |
| 8   | 0.80     | 0.000     | 0.000      | 30  | 11.88    | 0.000     | 0.000      | 52  | 171.25   | 0.000     | 0.000      | 74  | 2511.05  | 4.082     | 86.413     |
| 9   | 0.90     | 0.000     | 0.000      | 31  | 13.20    | 0.000     | 0.000      | 53  | 193.48   | 0.000     | 0.000      | 75  | 2837.04  | 3.475     | 89.888     |
| 10  | 1.02     | 0.000     | 0.000      | 32  | 14.61    | 0.000     | 0.000      | 54  | 218.80   | 0.000     | 0.000      | 76  | 3205.35  | 2.883     | 92.771     |
| 11  | 1.15     | 0.000     | 0.000      | 33  | 16.84    | 0.000     | 0.000      | 55  | 246.88   | 0.000     | 0.000      | 77  | 3611.48  | 2.320     | 95.091     |
| 12  | 1.30     | 0.000     | 0.000      | 34  | 19.03    | 0.000     | 0.000      | 56  | 279.04   | 0.000     | 0.000      | 78  | 4061.63  | 1.798     | 96.889     |
| 13  | 1.47     | 0.000     | 0.000      | 35  | 21.50    | 0.000     | 0.000      | 57  | 315.27   | 0.000     | 0.000      | 79  | 4522.81  | 1.324     | 98.213     |
| 14  | 1.66     | 0.000     | 0.000      | 36  | 24.39    | 0.000     | 0.000      | 58  | 355.20   | 0.286     | 0.286      | 80  | 5022.96  | 0.905     | 99.118     |
| 15  | 1.87     | 0.000     | 0.000      | 37  | 27.45    | 0.000     | 0.000      | 59  | 402.44   | 1.220     | 1.507      | 81  | 5590.02  | 0.547     | 99.665     |
| 16  | 2.11     | 0.000     | 0.000      | 38  | 31.01    | 0.000     | 0.000      | 60  | 454.69   | 2.554     | 4.061      | 82  | 6266.70  | 0.283     | 99.928     |
| 17  | 2.39     | 0.000     | 0.000      | 39  | 35.03    | 0.000     | 0.000      | 61  | 513.71   | 3.981     | 7.942      | 83  | 7032.85  | 0.072     | 100.000    |
| 18  | 2.70     | 0.000     | 0.000      | 40  | 39.58    | 0.000     | 0.000      | 62  | 580.41   | 5.015     | 12.956     | 84  | 8010.56  | 0.000     | 100.000    |
| 19  | 3.05     | 0.000     | 0.000      | 41  | 44.72    | 0.000     | 0.000      | 63  | 655.76   | 5.888     | 18.825     | 85  | 9615.42  | 0.000     | 100.000    |
| 20  | 3.45     | 0.000     | 0.000      | 42  | 50.53    | 0.000     | 0.000      | 64  | 740.89   | 6.530     | 25.385     | 86  | 10863.72 | 0.000     | 100.000    |
| 21  | 3.89     | 0.000     | 0.000      | 43  | 57.09    | 0.000     | 0.000      | 65  | 837.07   | 6.929     | 32.315     |     |          |           |            |
| 22  | 4.40     | 0.000     | 0.000      | 44  | 64.50    | 0.000     | 0.000      | 66  | 945.74   | 7.121     | 39.435     |     |          |           |            |

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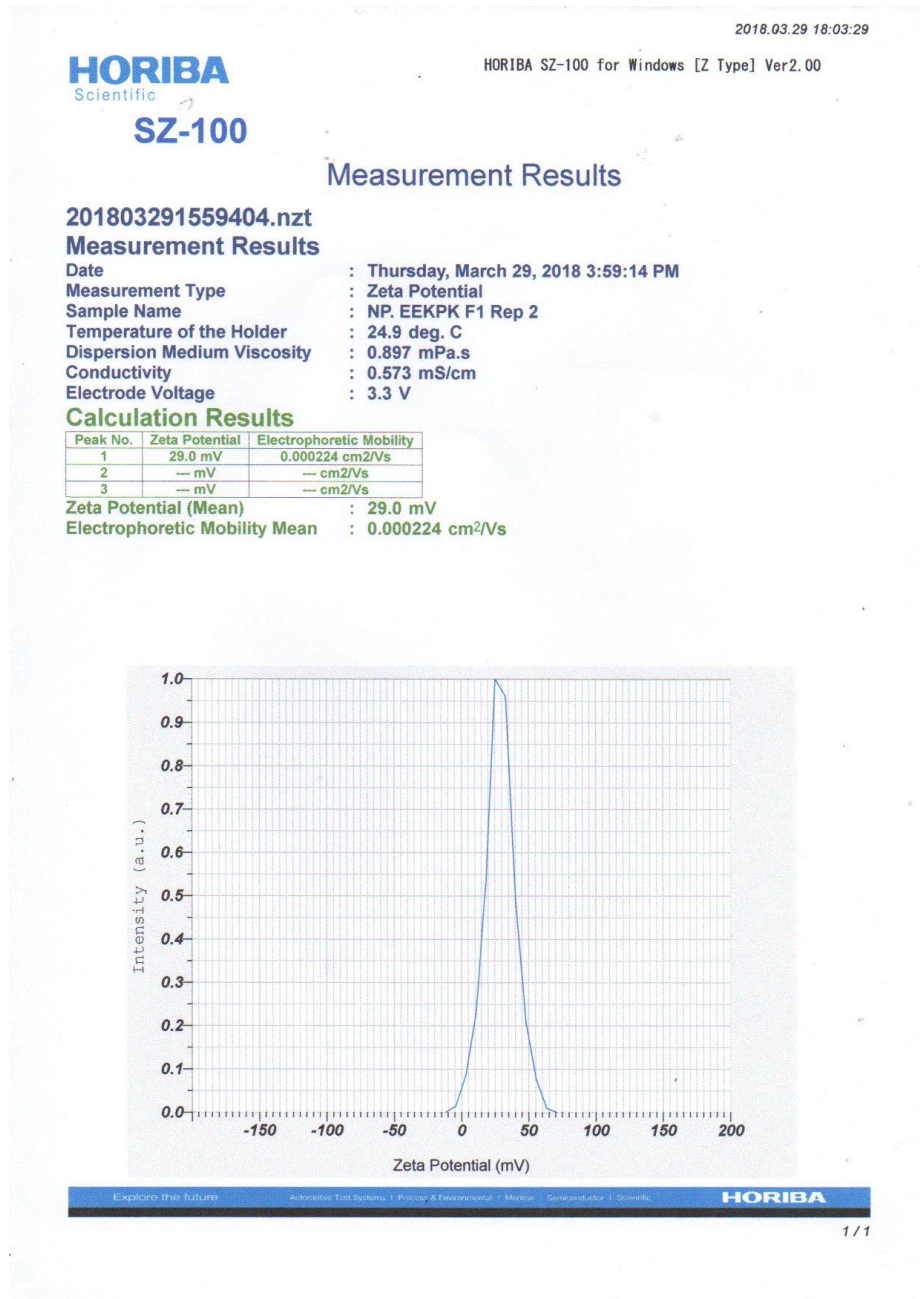
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## 9. F III Replikasi 3

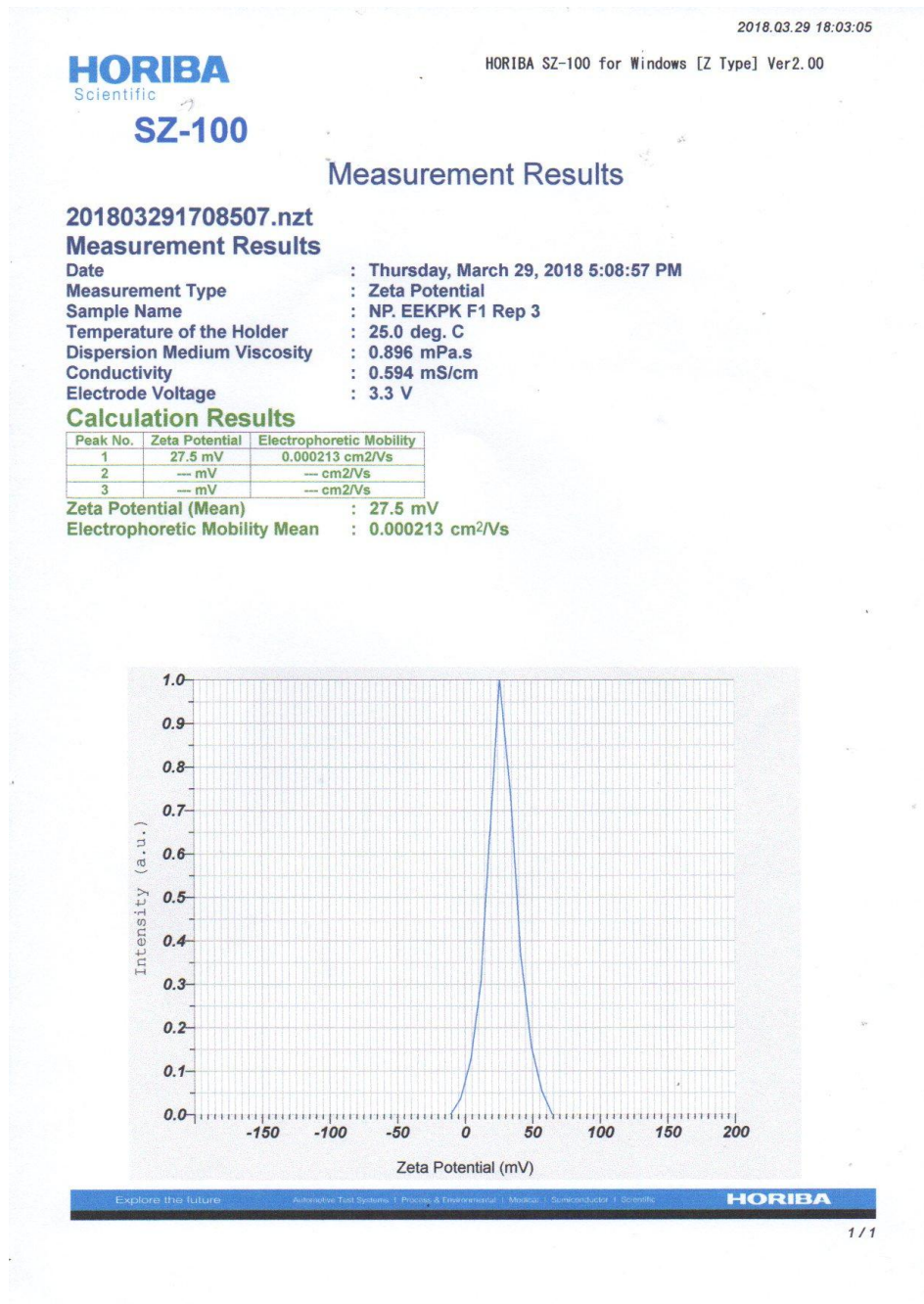


## A. HASIL Potensial Zeta NP EEKPK

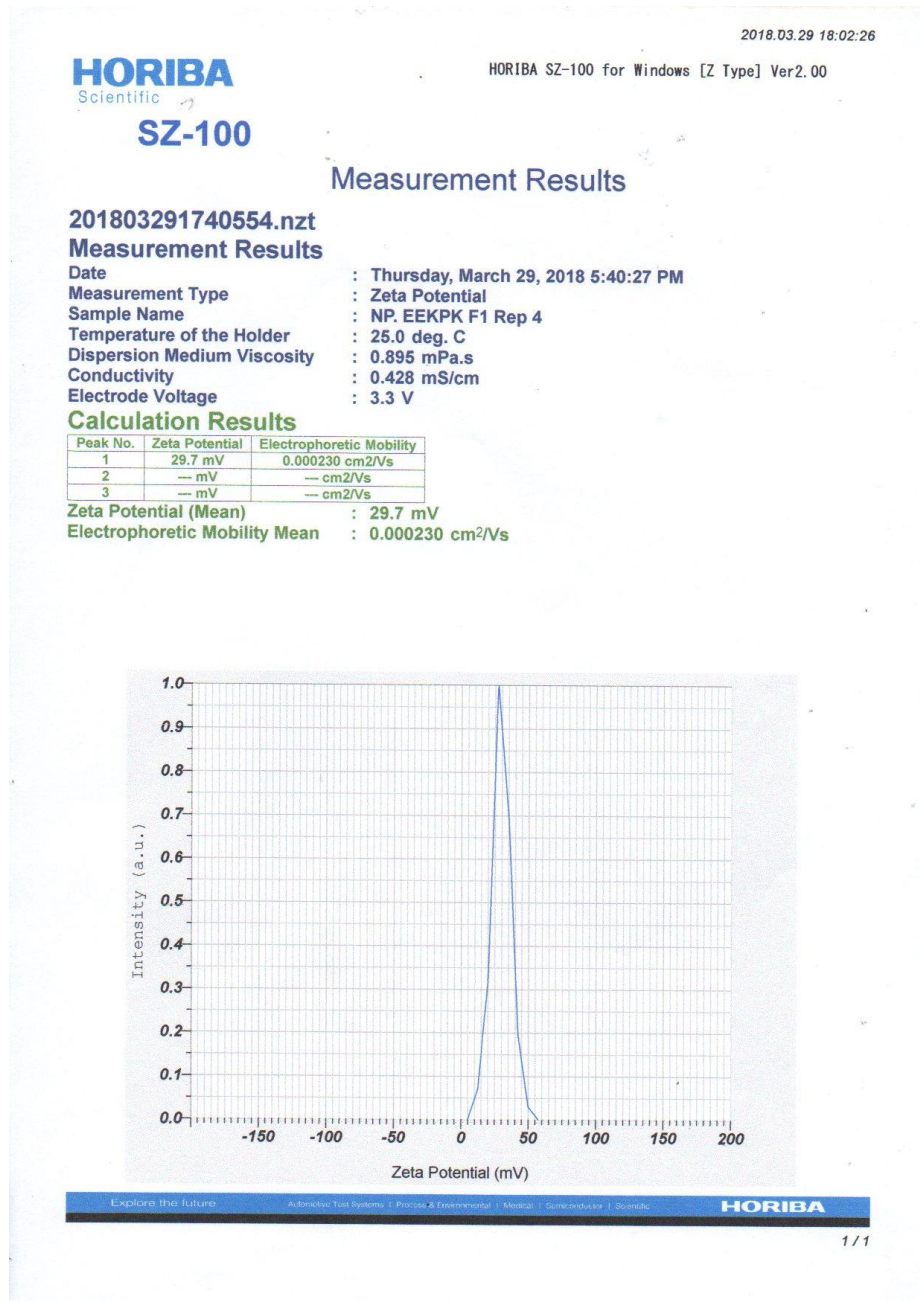
### 1. FI Replikasi 1



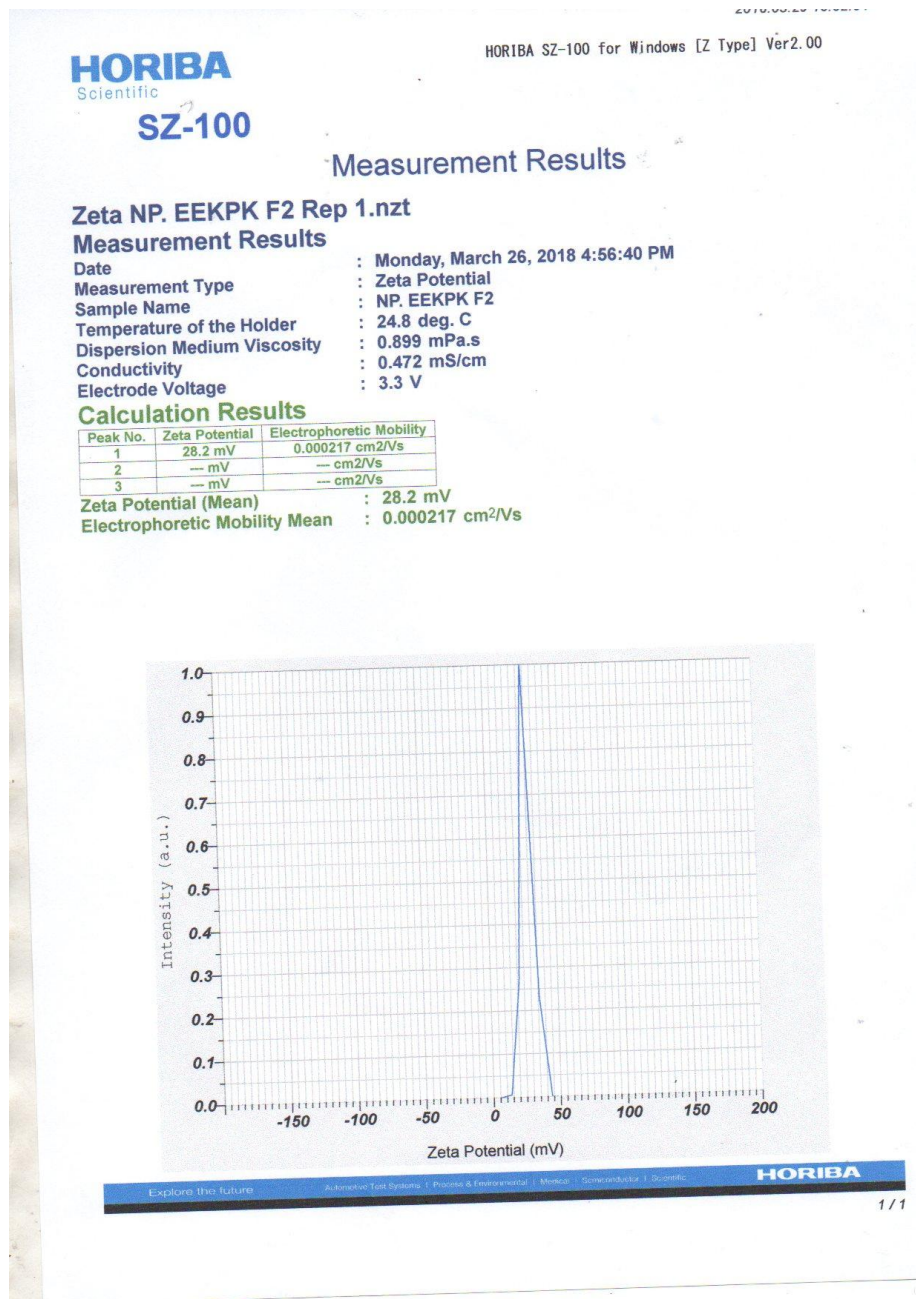
## 2. FI Replikasi 2



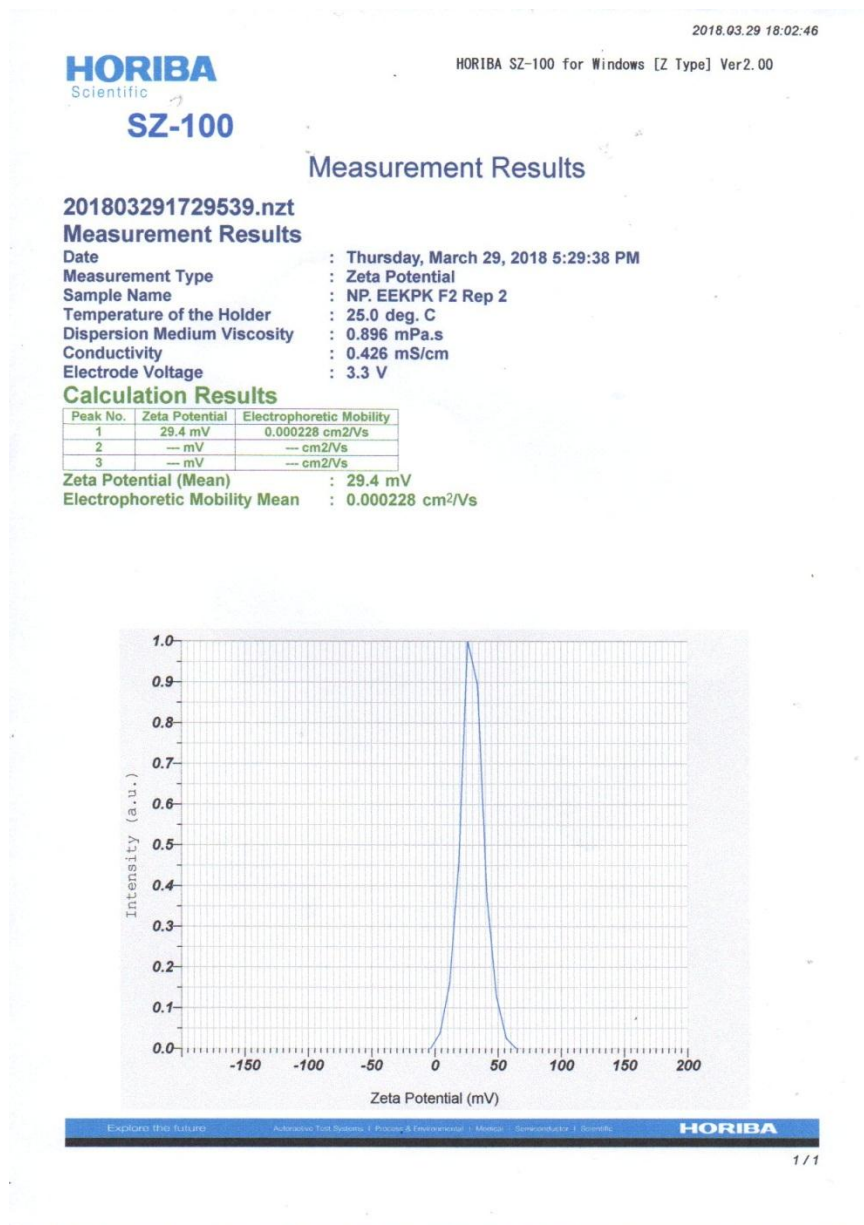
### 3. FI Replikasi 3



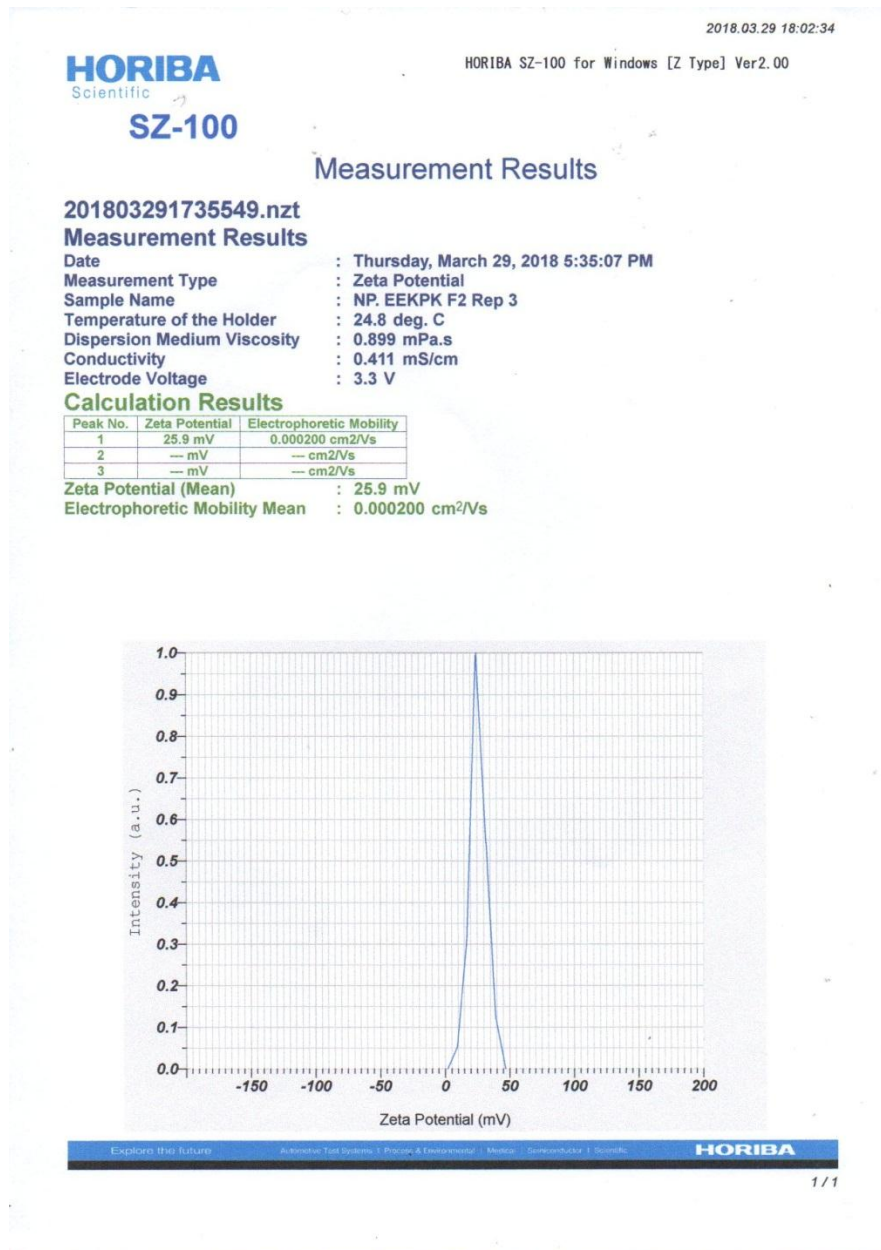
#### 4. FII Replikasi 1



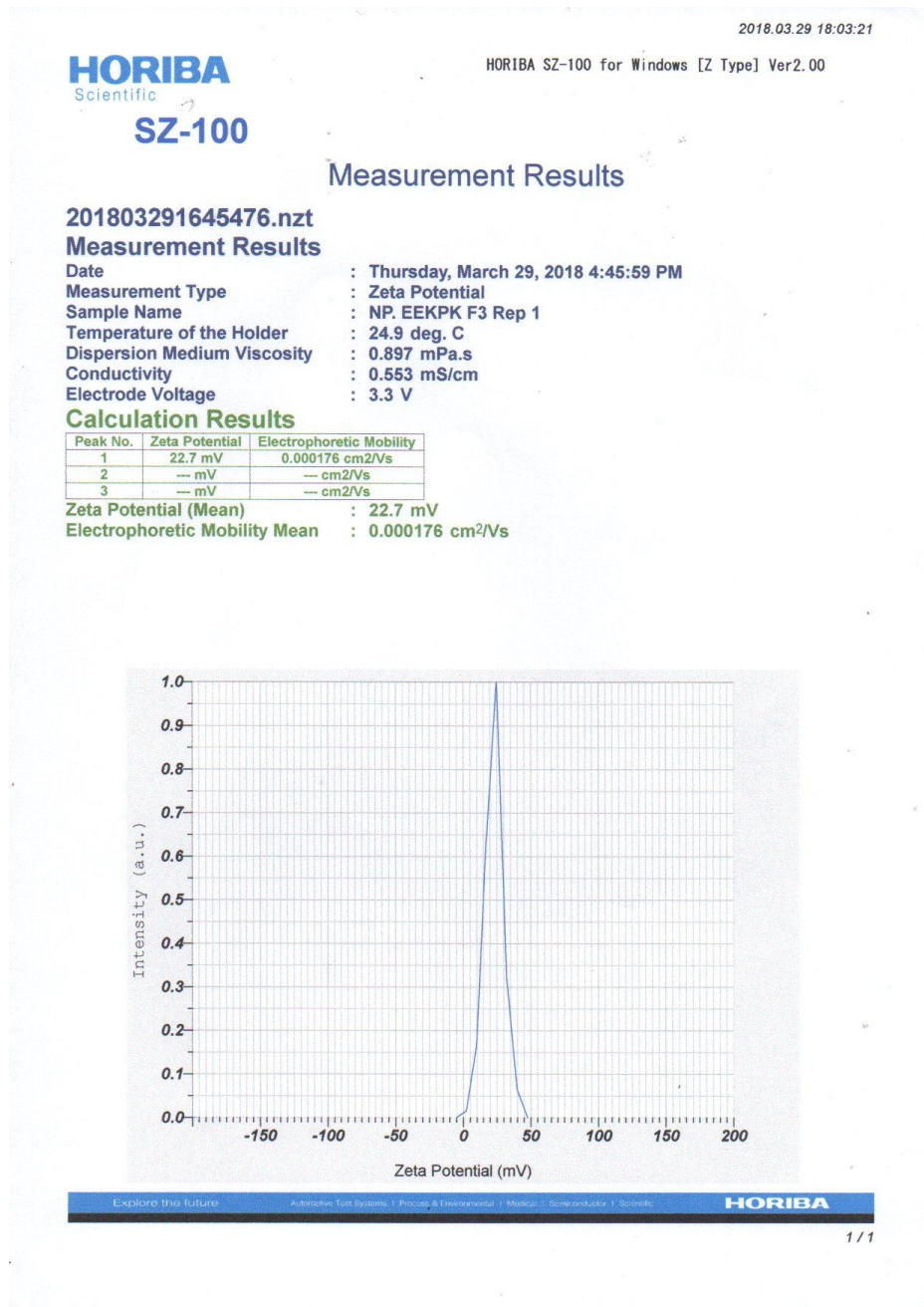
## 5. F II Replikasi 2



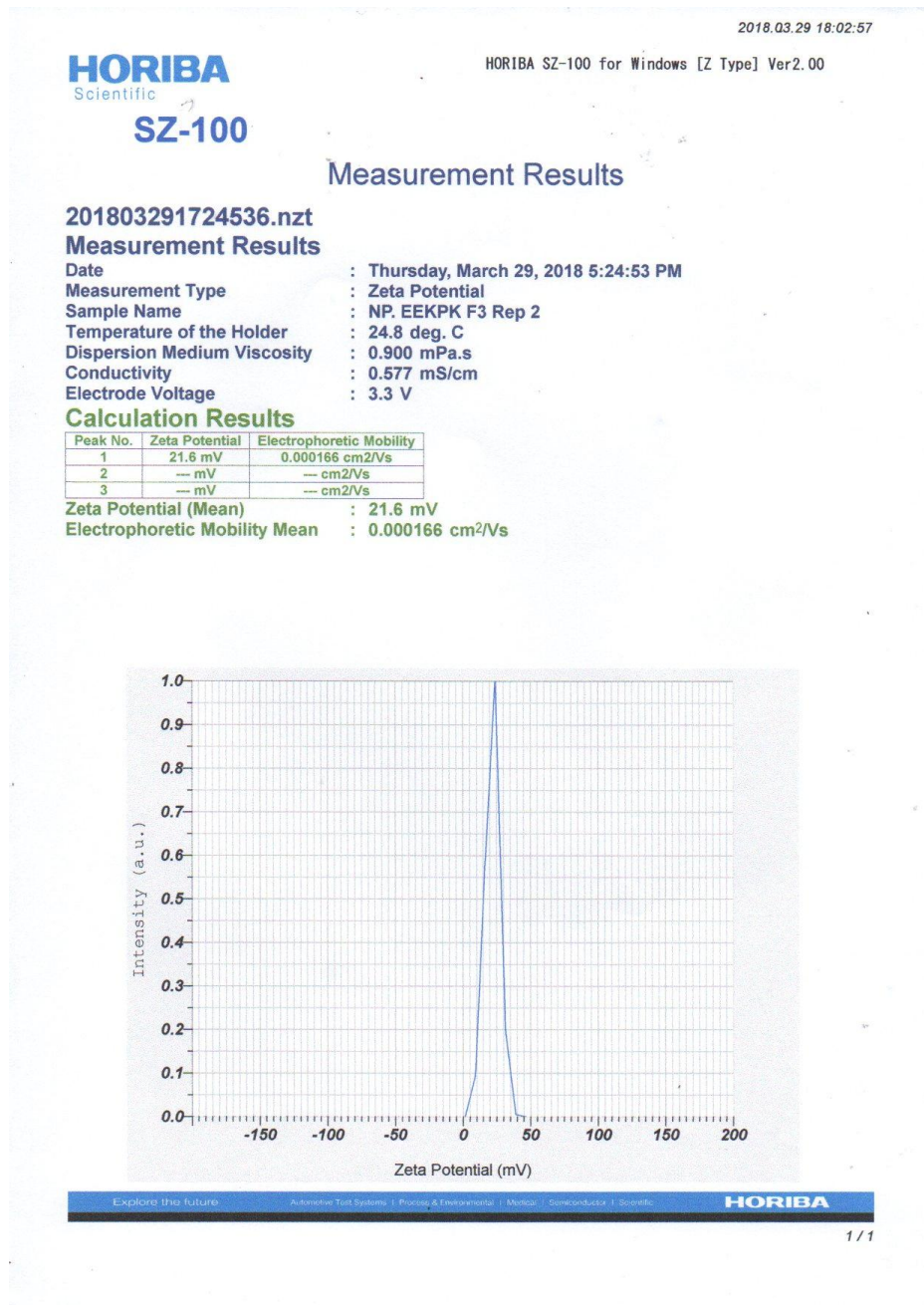
## 6. FII Replikasi 3



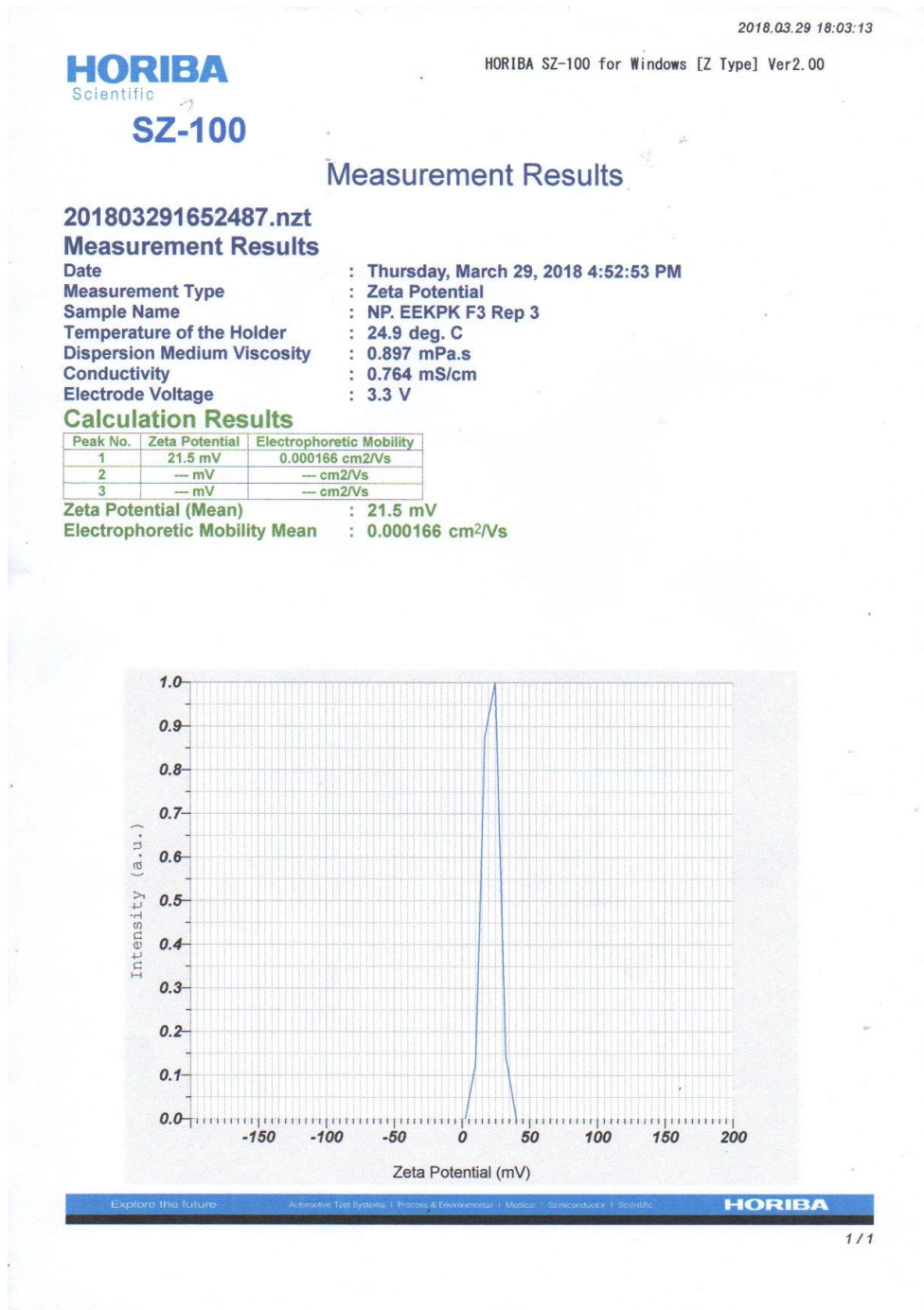
## 7. F III Replikasi 1



## 8. F III Replikasi 2



## 9. F III Replikasi 3



**Lampiran 6. Surat Keterangan Telah Melakukan Penelitian di  
Laboratorium Teknologi Farmasi dan Biologi Farmasi Universitas Islam  
Yogyakarta**



**UNIVERSITAS ISLAM INDONESIA**  
**FAKULTAS MATEMATIKA DAN ILMU PENGETAHUAN ALAM**  
Kampus UII Terpadu Jl. Kaliurang Km. 14,5 Yogyakarta 55584 Kotak Pos 75

**SURAT KETERANGAN**  
No: 053/Korlab/20/LabFar/V/2018

*Assalamu'alaikum Wr.Wb.*

Yang bertanda tangan dibawah ini atas nama Koordinator Laboratorium Farmasi Program Studi Farmasi Universitas Islam Indonesia menerangkan dengan sesungguhnya bahwa:

Nama : Budiaty Dwi Wulandari  
NIM : 145010150  
Jurusan : Farmasi

Menyatakan bahwa mahasiswa tersebut telah melakukan penelitian di Laboratorium Biologi dan Teknologi Farmasi Fakultas MIPA Universitas Islam Indonesia, dengan judul penelitian :

Pembuatan Dan Karakterisasi Nanopartikel Ekstrak Etanol Kulit Pisang Kepok (*Musa balbisiana*) Pada Berbagai Variasi Komposisi Kitosan

Demikian surat keterangan ini dibuat agar dapat dipergunakan sebagaimana mestinya.

*Wassalamu'alaikum Wr.Wb.*

Yogyakarta, 25 Mei 2018  
Koordinator Laboratorium Farmasi

Bambang Hernawan N., M.Sc., Apt.

**Lampiran 7. Surat Keterangan Telah Melakukan Penelitian di  
Laboratorium Biologi Farmasi Universitas Wahid Hasyim Semarang**



**UNIVERSITAS WAHID HASYIM  
FAKULTAS FARMASI  
BAGIAN BIOLOGI FARMASI**

Jl. Menoreh Tengah X / 22 Sampangan – Semarang 50236 Telp. (024) 8505680 – 8505681 fax. (024) 8505680

**SURAT KETERANGAN**

No.134/Lab. Biologi Farmasi/C.05/UWH/VII/2018

Assalamu'alaikum Wr. Wb.

Yang bertandatangan di bawah ini, Kepala Bagian Biologi Farmasi Universitas Wahid Hasyim Semarang menerangkan bahwa:

Nama : Budiaty Dwi Wulandari  
NIM : 145010150  
Fakultas : Farmasi

Telah melakukan ekstraksi kulit pisang kepok dalam rangka penelitian dengan judul:  
"Pembuatan dan Karakteristik Nanopartikel Ekstrak Etanol Kulit Pisang Kepok (*Musa balbisiana*)  
Pada Berbagai Variasi Komposisi Kitosan"

Demikian surat keterangan ini dibuat untuk dipergunakan semestinya.

Wassalamu'alaikum Wr. Wb.



Dewi Andini K.M., M.Farm., Apt.

## Lampiran 8. Certificate of Analysis Chitosan

**SIGMA-ALDRICH®**

[sigma-aldrich.com](http://sigma-aldrich.com)

3050 Spruce Street, Saint Louis, MO 63103, USA

Website: [www.sigmaaldrich.com](http://www.sigmaaldrich.com)

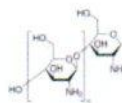
Email USA: [techserv@sial.com](mailto:techserv@sial.com)

Outside USA: [eurtechserv@sial.com](mailto:eurtechserv@sial.com)

### Product Specification

Product Name:  
Chitosan - low molecular weight

Product Number: **448869**  
CAS Number: 9012-76-4  
MDL: MFCD00161512



#### TEST

#### Specification

|                          |                          |
|--------------------------|--------------------------|
| Appearance (Color)       | Faint Beige to Beige     |
| Appearance (Form)        | Conforms to Requirements |
| Powder and/or Chips      |                          |
| Assay                    | > 75 %                   |
| Deacetylation            | —                        |
| Viscosity                | 20 - 300 cps             |
| c = 1% in 1% Acetic Acid |                          |

Specification: PRD.2.ZQ5.10000020770

Sigma-Aldrich warrants, that at the time of the quality release or subsequent retest date this product conformed to the information contained in this publication. The current Specification sheet may be available at [Sigma-Aldrich.com](http://Sigma-Aldrich.com). For further inquiries, please contact Technical Service. Purchaser must determine the suitability of the product for its particular use. See reverse side of invoice or packing slip for additional terms and conditions of sale.

## Lampiran 9. Dokumentasi Penelitian

| Alat-alat yang digunakan                                                            |                                                                                      |                                                                                       |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
|    |    |    |
| Uji kadar air                                                                       | Magnetic stirrer                                                                     | Chamber                                                                               |
|  |  |  |
| Particle siz analyzer (PSA)                                                         | Kuvet uji ukuran partikel                                                            | Kuvet uji zeta potensial                                                              |