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ORTA DOĐU TEKNİK ÜNİVERSİTESİ ELEKTRİK VE ELEKTRONİK MÜHENDİSLİĐİ BÖL.
MIDDLE EAST TECHNICAL UNIVERSITY ELECTRICAL AND ELECTRONICS ENG. DEPT.

No: 11-03-01-506-F

DAMEKS İç Dış Ticaret ve San. A.Ş.

Lightning Conductor Impulse Voltage Streamer Time Lag. Gain Measurements

TEST REPORT

14.03.2013

CONTENTS

- General 3
- Test Standards 3
- Applications of the Tests 3
- **FIGURE.1A** Test System Circuit Diagram 4
- **FIGURE.1B** Test System Scheme 4
- **FIGURE.1C** Test System 5
- Technical Drawing of the Tested ESE Unit 6
- **Table 1** 7
- **Figure.2A** Impulse Test Voltage , $V_{min} = - 988$ kV 7
- **Figure.2B** Impulse Test Voltage ,SR Rod 7
- **Figure.2C** Impulse Test Voltage ,ESE Sample 8
- Evaluation of the Test Results 8
- **Figure.3** Streamer Time gain determination 8
for the ESE Sample
- Result 9

1. GENERAL

Firm Applied for the Test : DAMEKS İç Dış Ticaret ve San. A.Ş.
1201/4 Sokak No:1A Ege Ticaret Merkezi
35170 Yenışehir İZMİR

Tests Requested : Lightning Conductor Impulse Voltage Streamer Time Lag.
Gain Measurements

Date of the Test : 21.02.2013

Test Laboratory : Middle East Technical University
High Voltage Laboratory , Ankara

Environmental Conditions : 18 °C , 687 mmHg , % 60 Relative Humidity
(these values were observed not to change appreciably during the test.)

Equipment Tested : COSMOS Brand ,(E.S.E.) Lightning Conductor

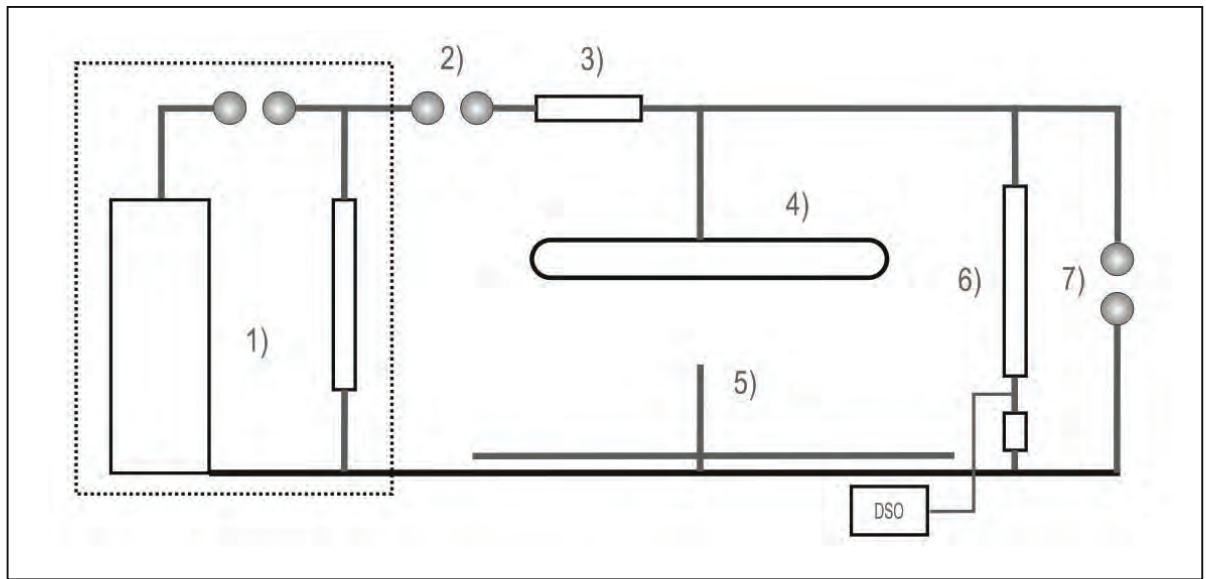
Model : C60 **Year** : 2011 **Serial Number** : 6EGP11180016
Dimensions : **Length** : 510 mm **Maximum Dia.** : 140 mm

2. TEST STANDARDS

NFC17-102 (Appendix C) French Standard

3. APPLICATIONS OF THE TESTS

Tests were carried out using a high voltage electrode prepared according to the criteria mentioned in the related standart with dimensions ; edge radius $R = 20$ cm , diameter $\Phi = 300$ cm and as the ground electrode , in the first case a simple catching rod and in the second case the sample active catching device (ESE) head. In each case 100 negative impulses of approximately 200 / 2000 μ S (Rise time = 170 μ S) waveform were applied and the streamer initiation time lags were recorded by DSO. The spacing between the cathing rod or device and the High Voltage plane electrode was set to 100 cm , the test impulse voltages were applied by means of a 1.2 MV , 20 kJoule impulse generator. The tests were applied using the ESE device under the test and a simple cathing rod of the same tip geometry and total length . Test set-up is shown in Figure.1 A,B and the results are given in Table.1 and Figures.2-3 . The magnitude of the impulse current observed during the tests was not less than 100 kA



- | | | |
|--------------------------------------------------|-------------------------------|-------------------------------------------------------|
| 1) HV. Impulse Generator | 4) HV electrode | 7) Parallel protective gap
(\varnothing 500 mm) |
| 2) Series protective gap (\varnothing 250 mm) | 5) Sample ESE | |
| 3) External front resistor | 6) Capacitive voltage divider | |

FIGURE.1A Test System Circuit Diagram

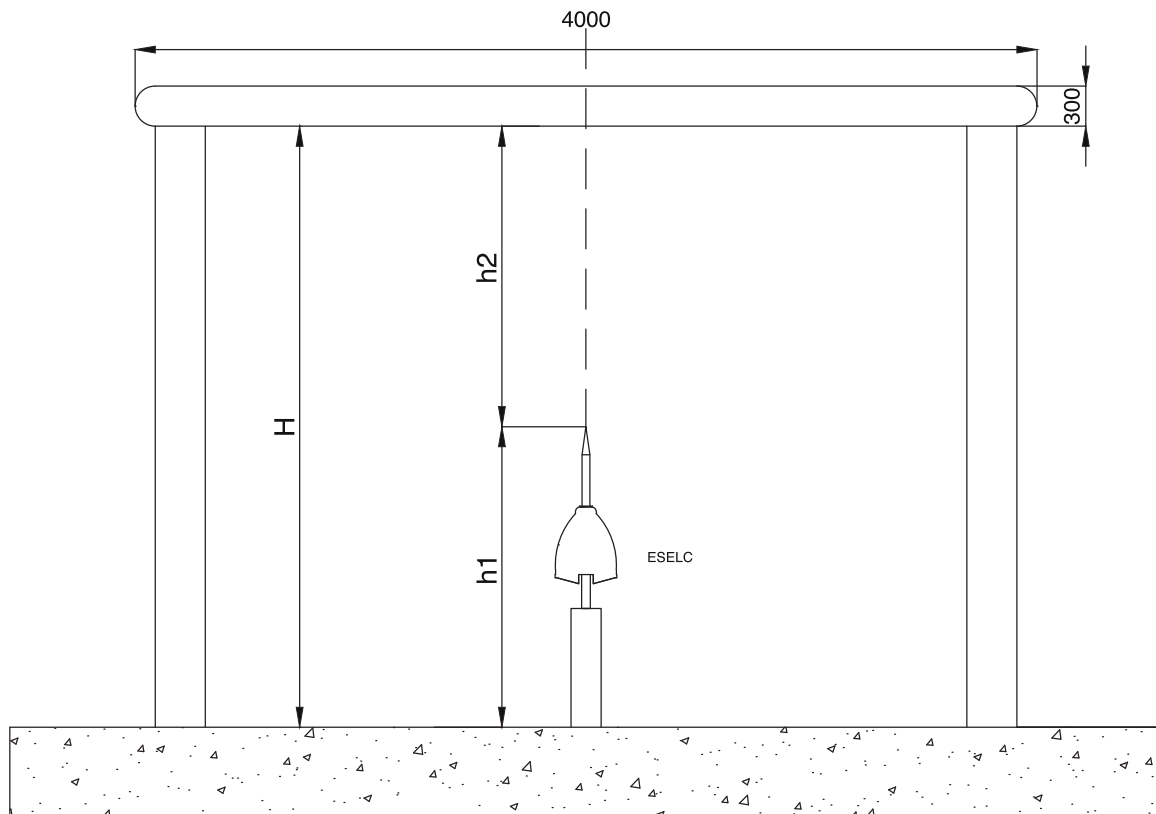


FIGURE.1B Test System Scheme



FIGURE.1C Test System

4. TECHNICAL DRAWING OF THE TESTED ESE UNIT

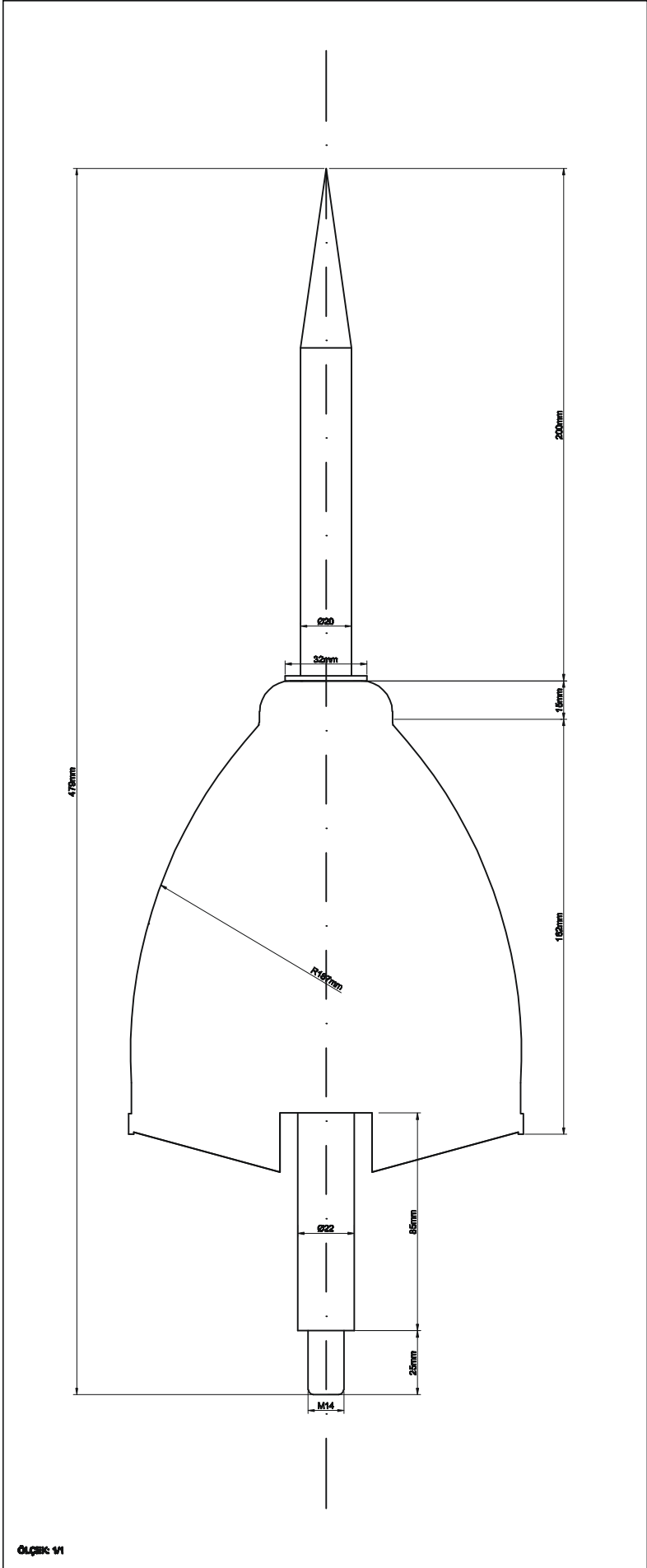


TABLE.1			
Catching Device	Time lag (μS)		
	Min.	Max.	Average
SR	124	450	247
ESE Numune	121	260	174

Test Voltage oscillograms are given in Figures .1-3

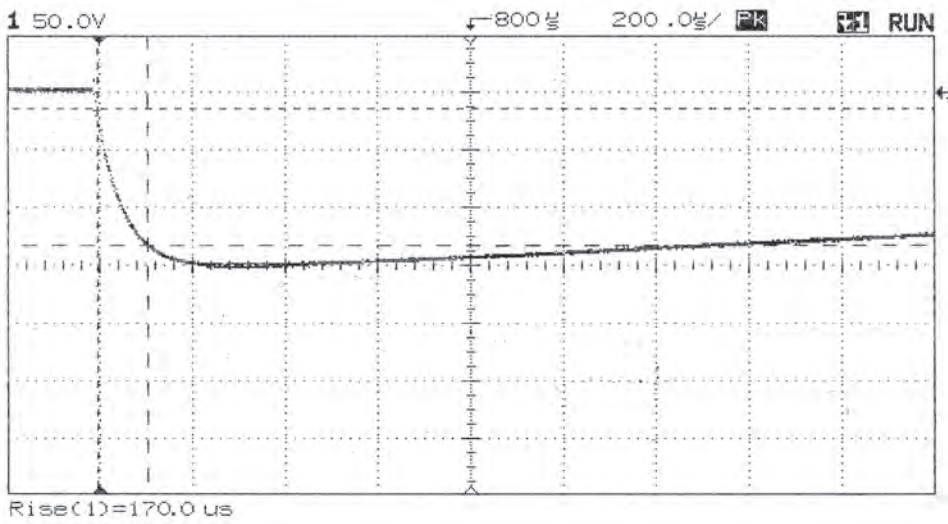


Figure.2A Impulse Test Voltage , $V_{min} = - 988$ kV

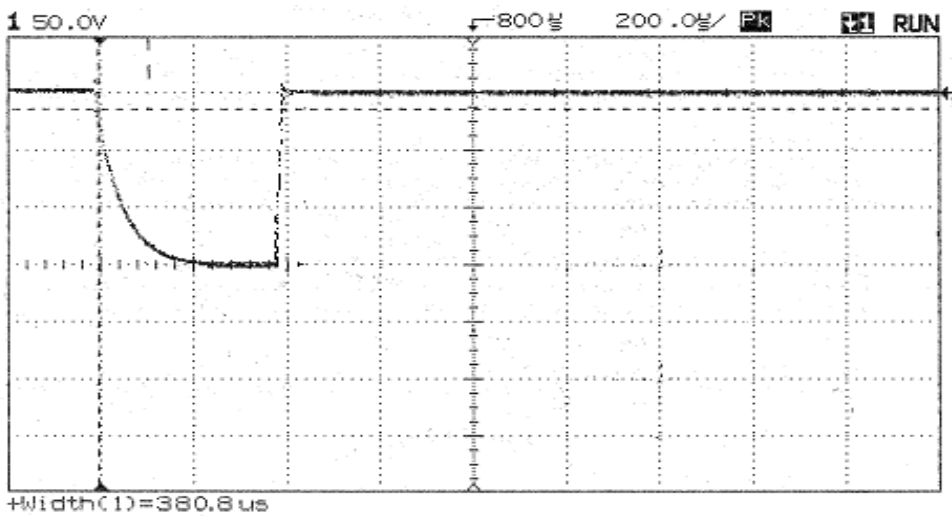


Figure.2B Impulse Test Voltage , SR Rod

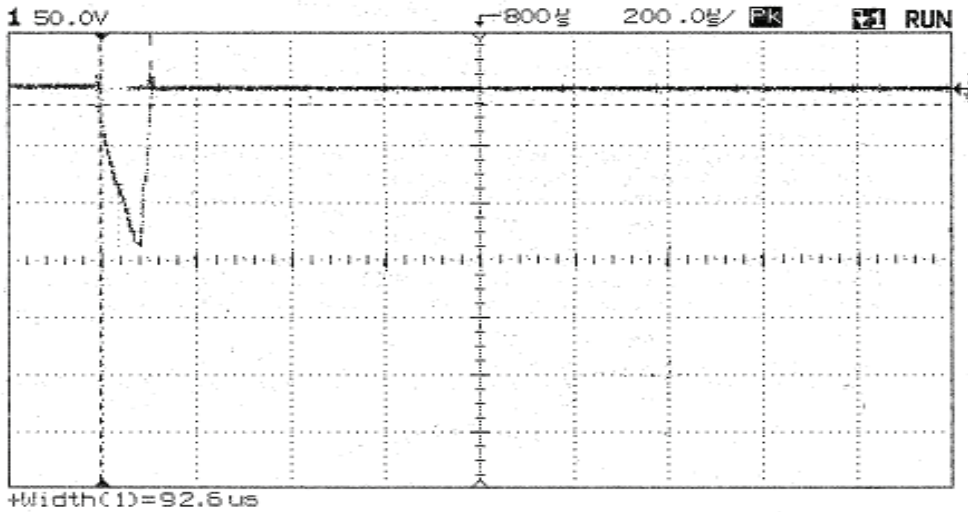


Figure.2C Impulse Test Voltage , ESE Sample

5. EVALUATION OF THE TEST RESULTS

As described in NFC17-102 (Appendix C) , the average time lags are applied to the reference curve and the test curve and the difference between the corresponding values are obtained as the time lag gain for the ESE sample $\Delta T = 98.5 \mu\text{S}$.

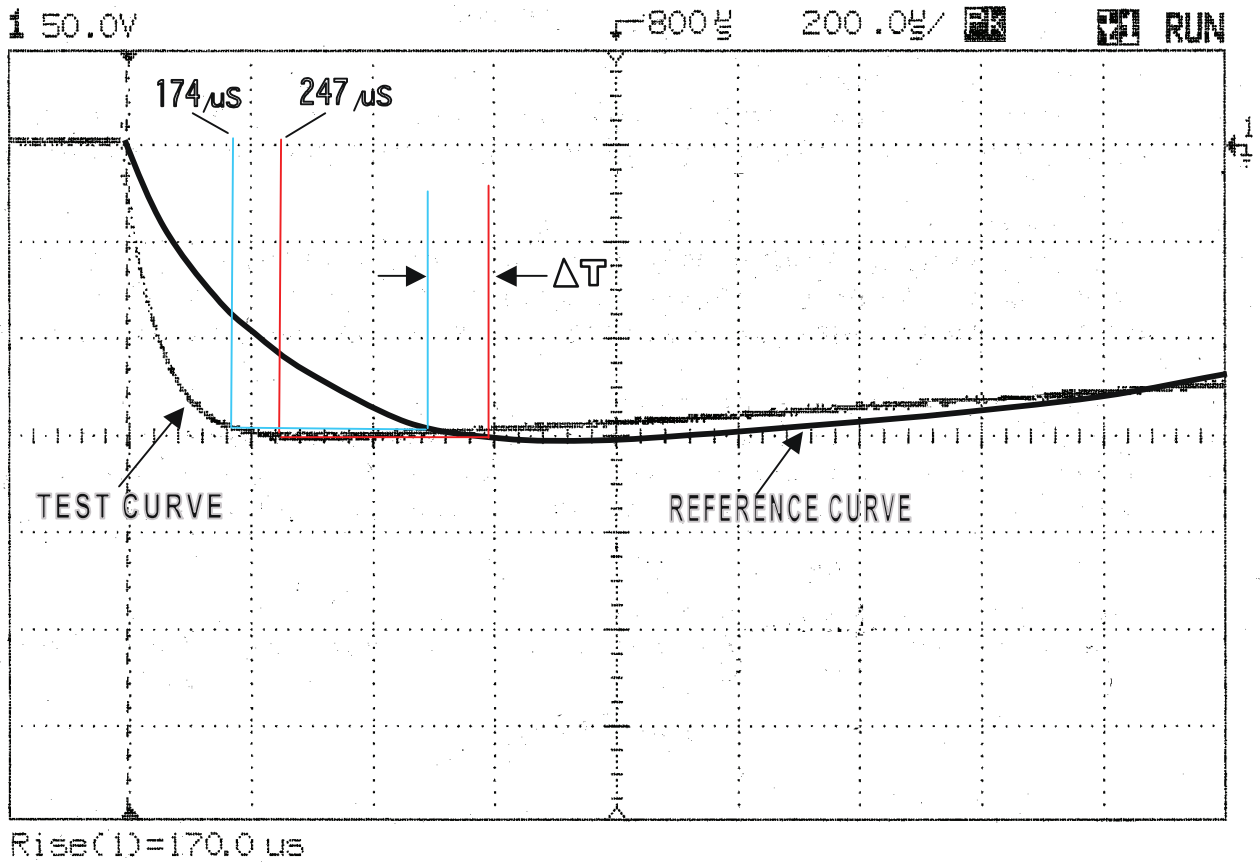


Figure.3 Streamer Time gain determination for the ESE Sample ($\Delta t = 98.5 \mu\text{S}$)

6. RESULT

In context of the tests described above , it was determined that the ESE Sample has provided a certain time gain against the SR catching rod and therefore can be termed as ESE Lightning Conductor according to the criteria described in **NFC17-102 (Appendix C)** .

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