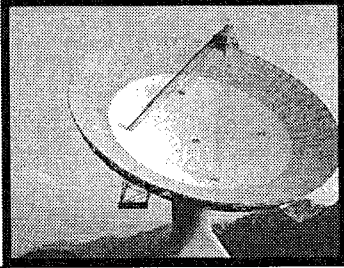


Session 3: 접지시스템 설계 및 시공 방법



정보통신설비 접지시스템 성능평가

기초전력연구원 엄 주 홍

정보통신설비 접지시스템의 성능평가

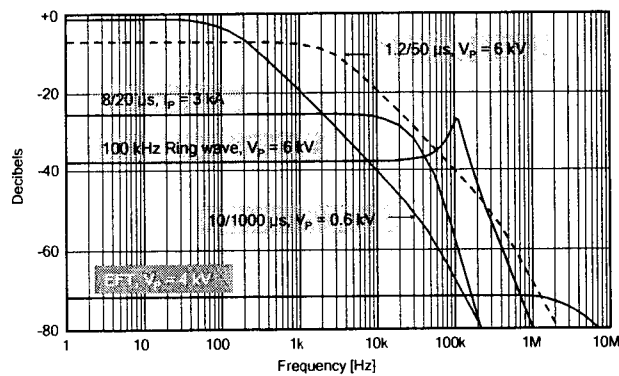
[Performance Evaluation of the Ground System for
Telecommunication Facilities]

발표자 : 엄 주 흥

소 속 : 기초전력연구원

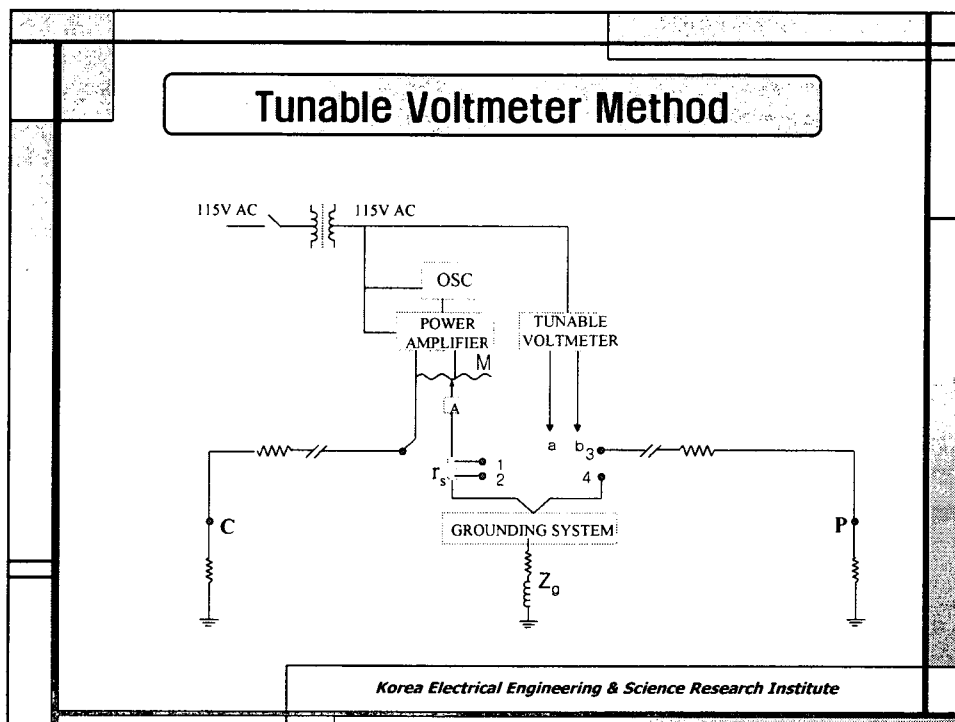
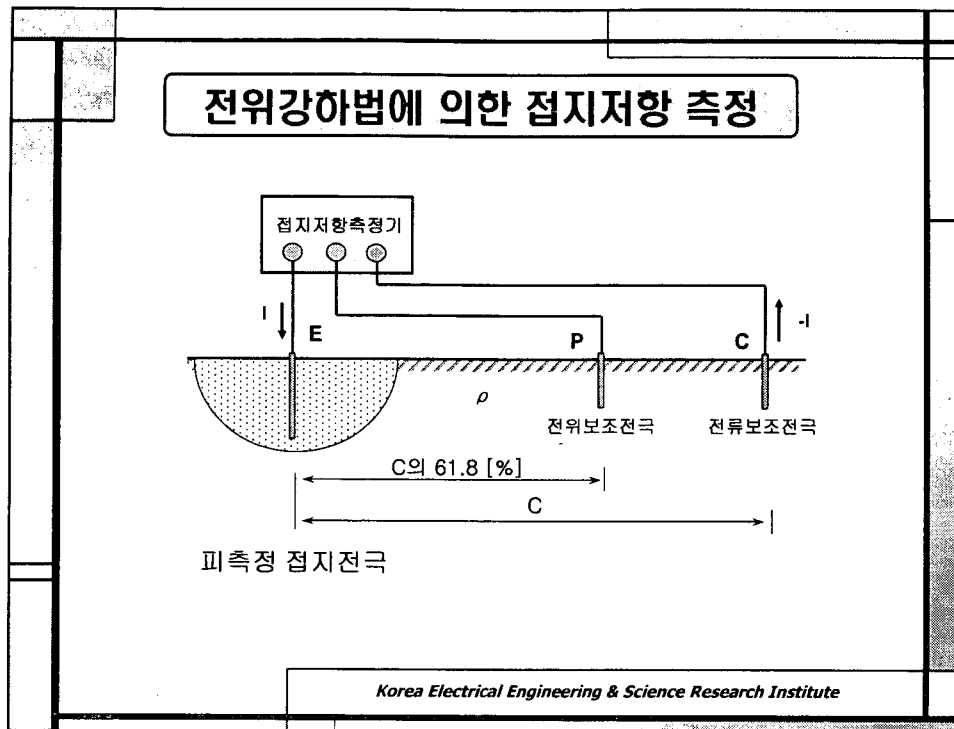
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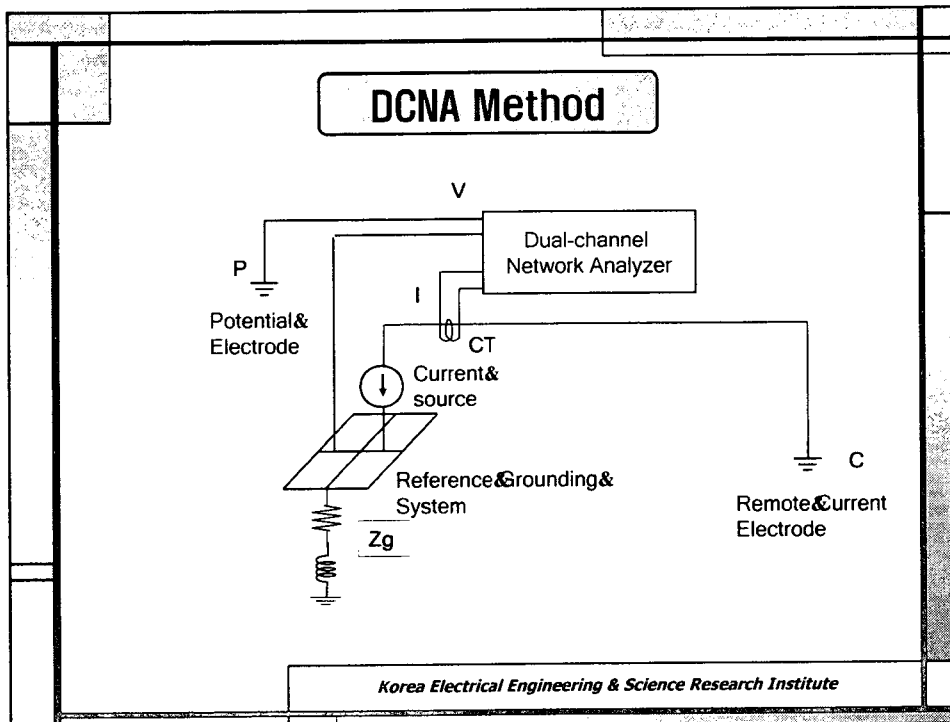
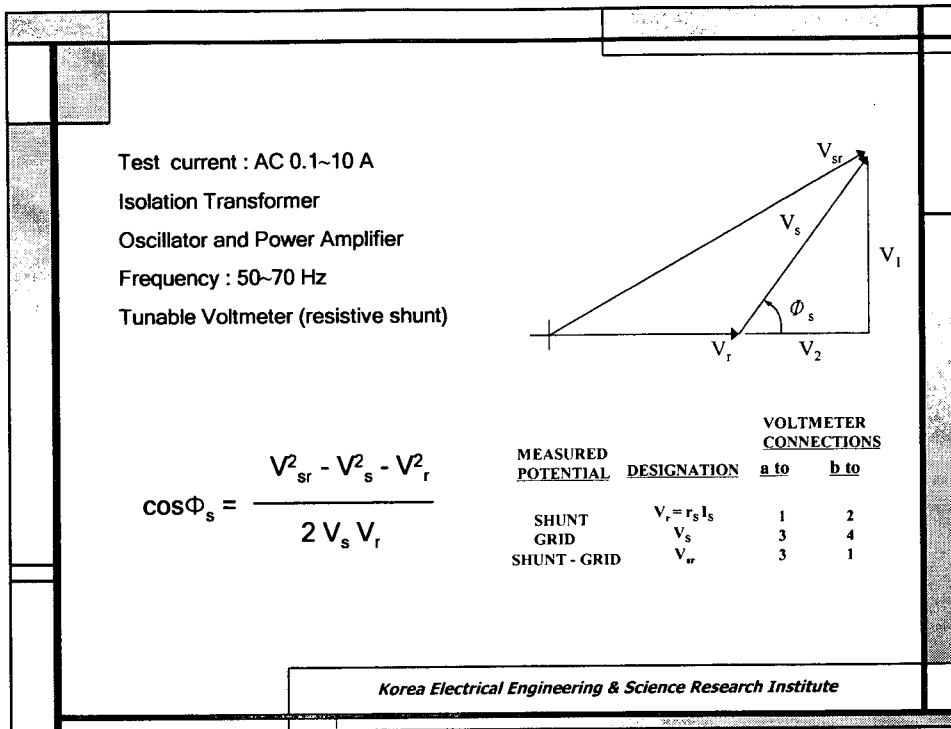
뇌서지의 주파수 대역



Source: Standier, R. B., Protection of Electronic Circuits for Over-voltages, New York: John & Wiley & Sons, 1989.

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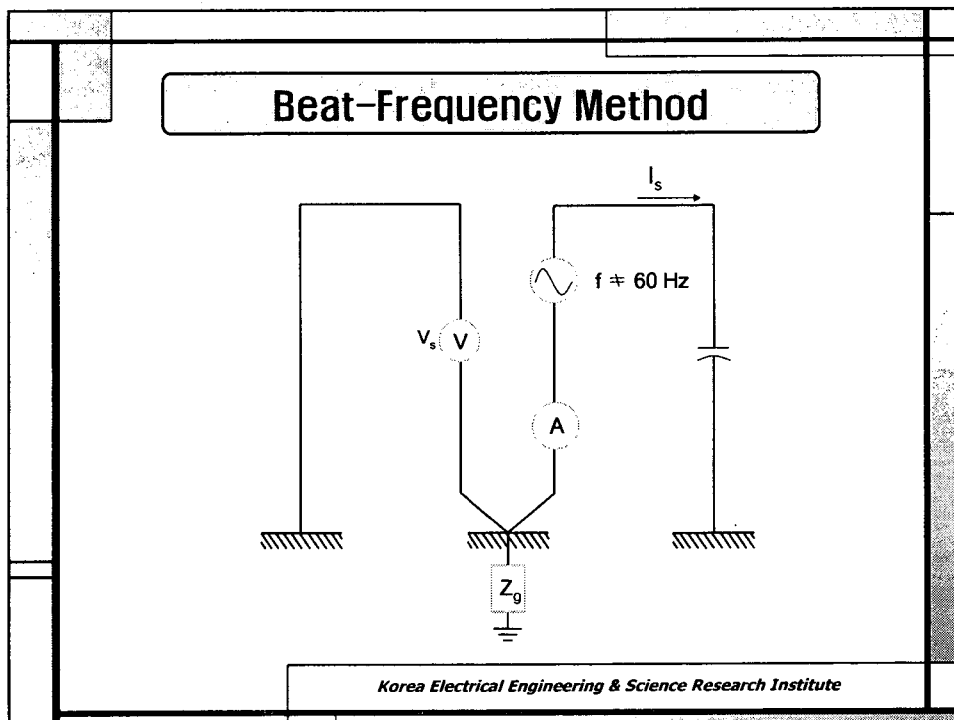


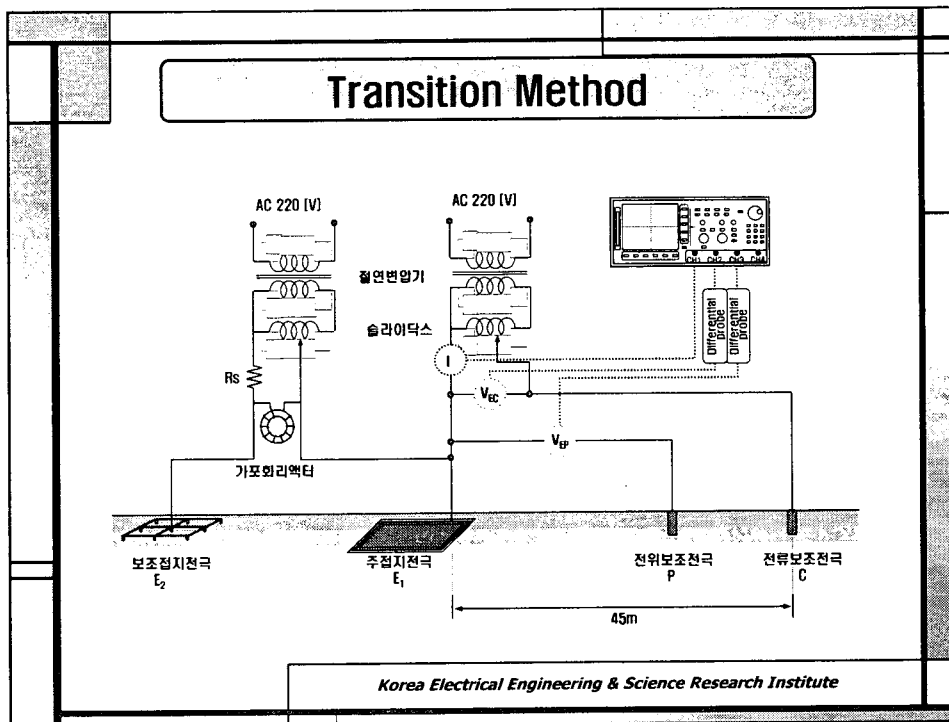
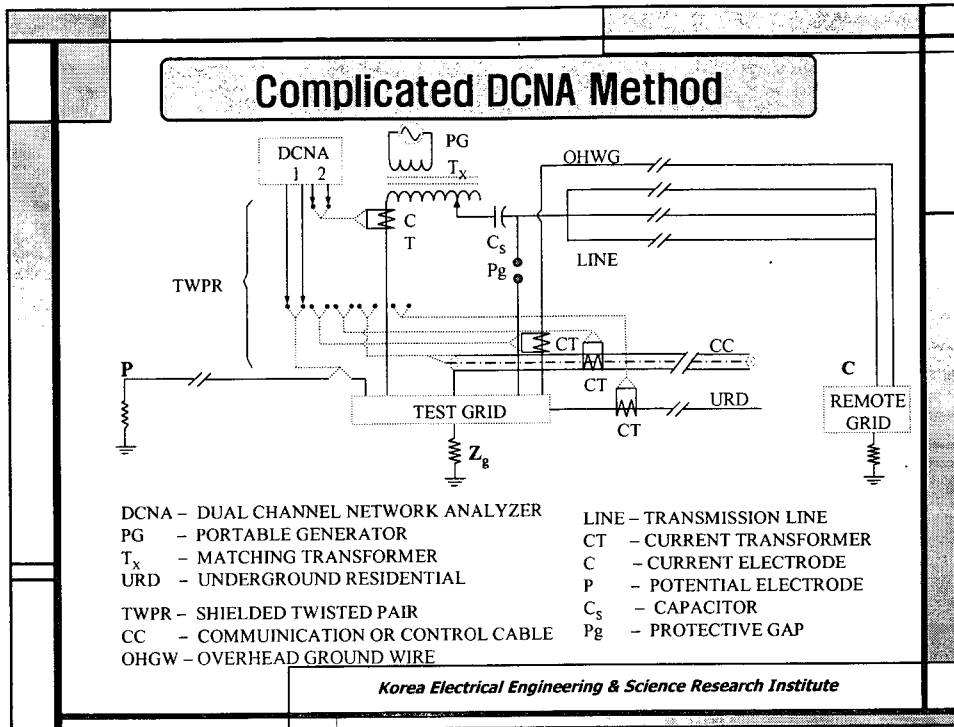
Test current : Transient Current or Switching Current
Dual Channel Network Analyzer : FFT (V/I Waveform)
Random Signal Generator
Frequency : ~ MHz
Noise Filter : 0 ~ 400 Hz (전력주파수의 노이즈를 제거하기 위해 사용)

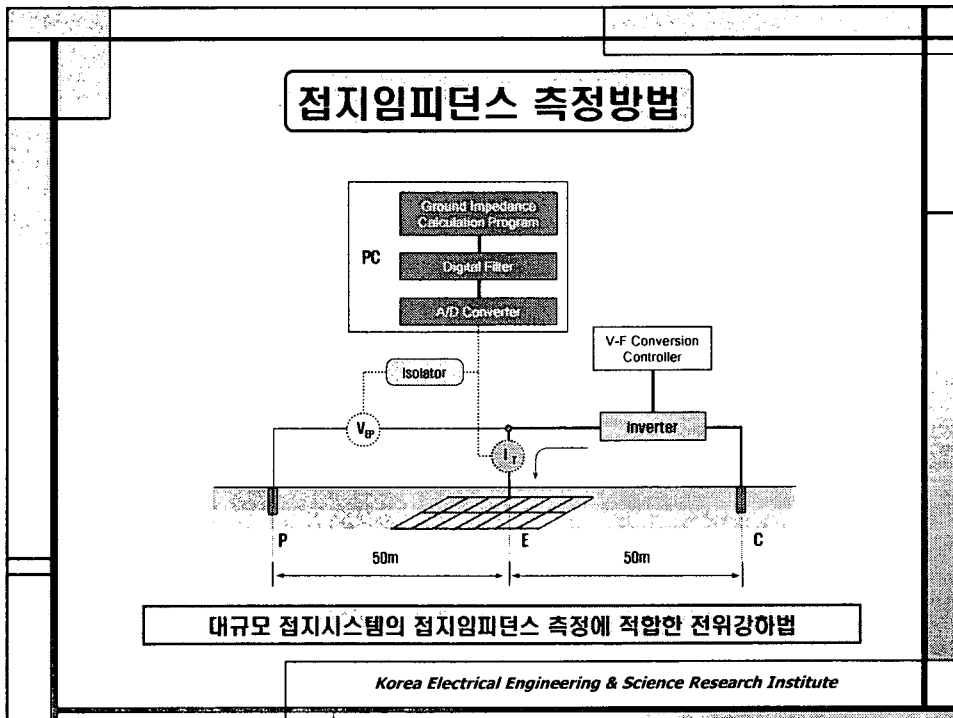
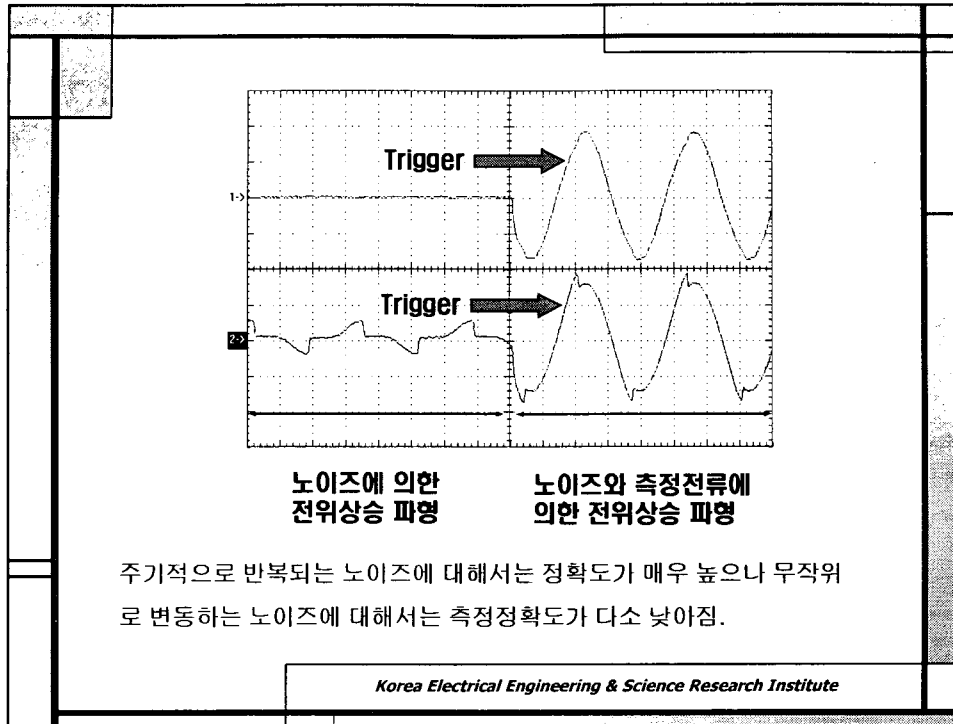
$Z = R + jX$

일정주기로 반복되는 측정전류가 아닌 과도적인 영역에서의 FFT결과를 이용하기 때문에 오차발생이 나타나며, 각각의 주파수에서 접지임피던스를 계산하는 과정을 반복하여야 하므로 시간이 오래 걸린다.

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가변주파수 인버터

인버터의 구성

인버터의 사진

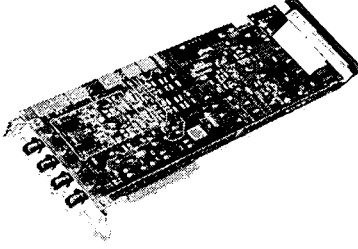
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V-F (전압-주파수) 변환기

- 1) $f_{out} = \frac{E_t}{10 R_t C_t}$
- 2) $E_t=1$ [V]일 때 풀 스케일로 동작
- 3) 최대발전주파수 : 500 [kHz]

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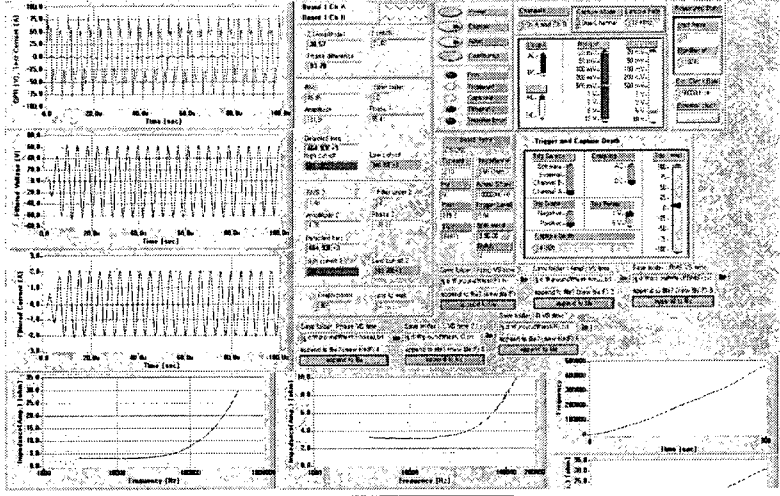
A/D 변환기



- 1) 12 Bit Resolution
- 2) 50 MS/s Sampling
- 3) 25 MHz Bandwidth
- 4) Software Development Kits for LabVIEW under Windows 2000

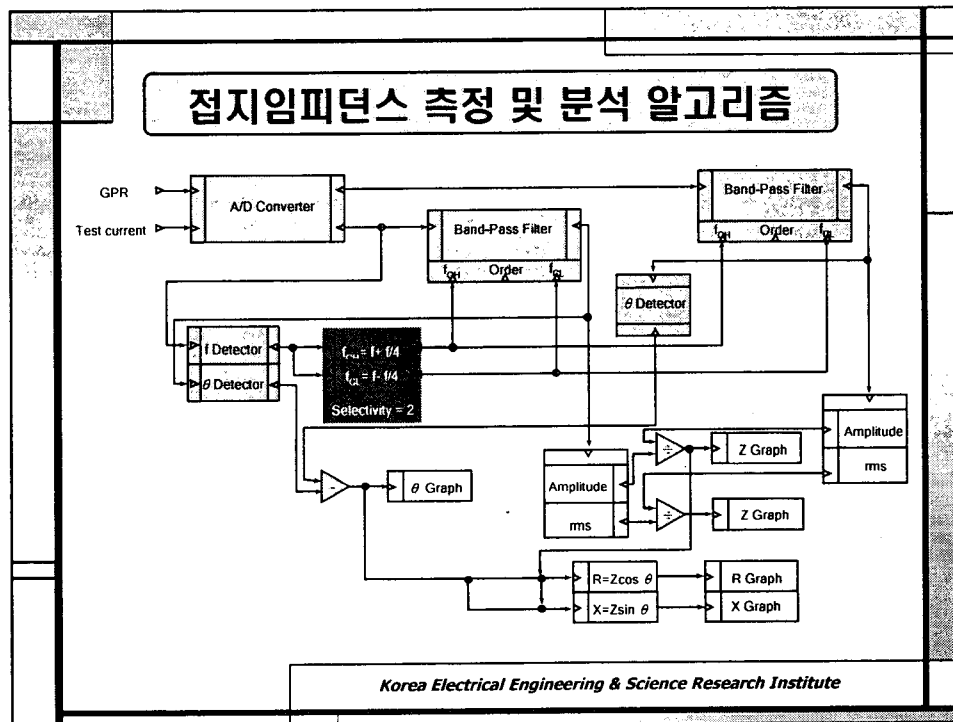
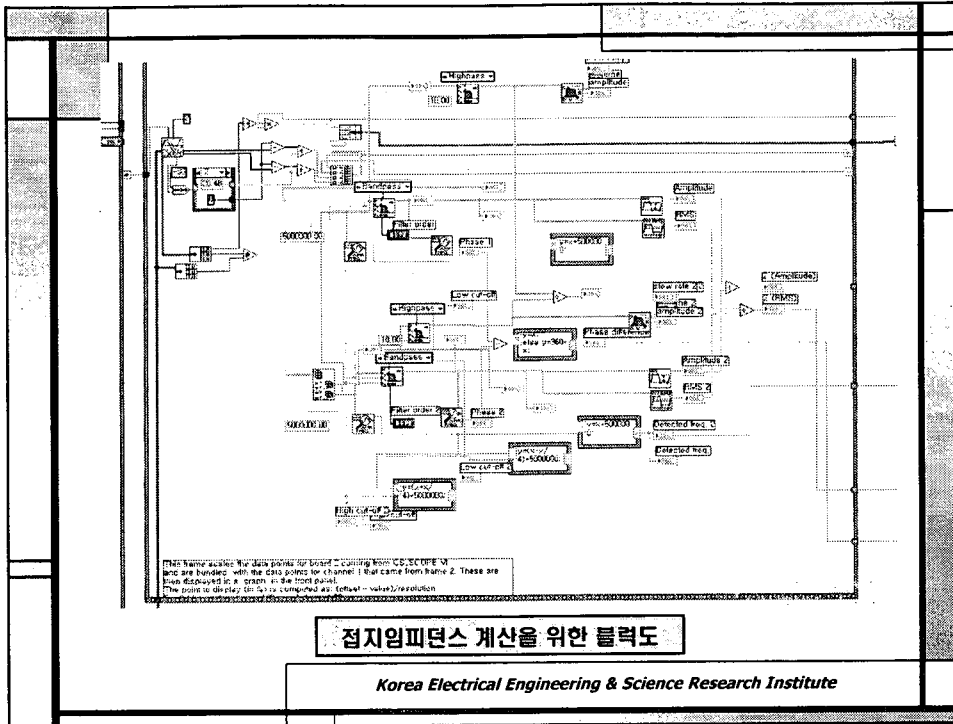
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접지임피던스 계산 프로그램(Labview 기반)

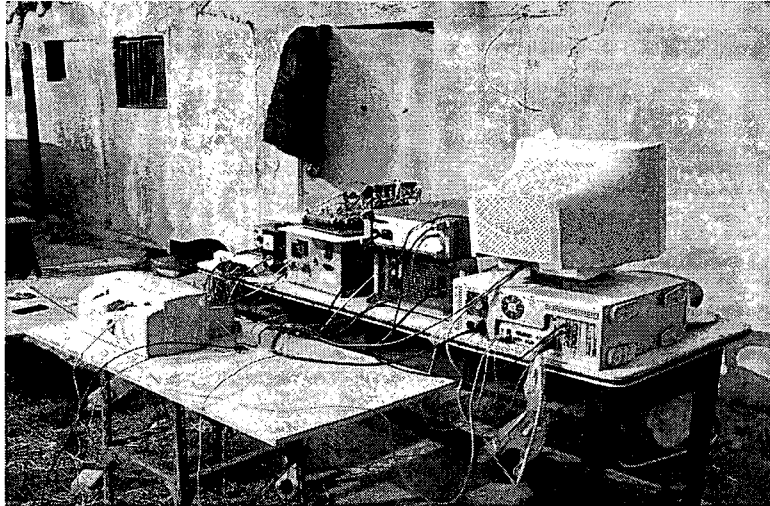


측정관련 변수 조절부

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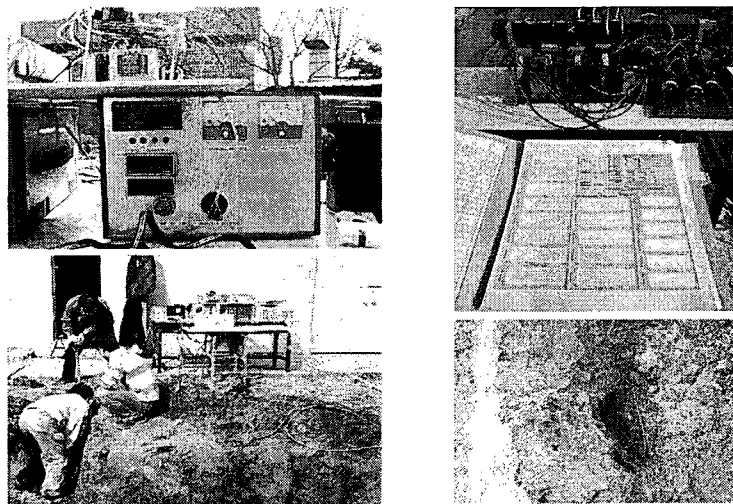


접지임피던스 측정시스템 사진

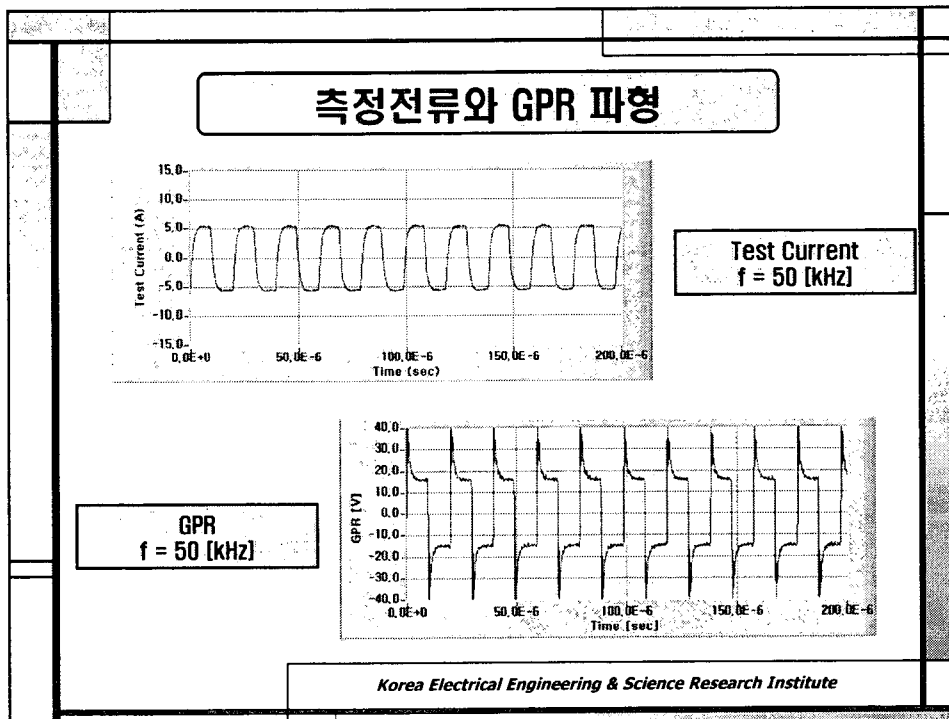
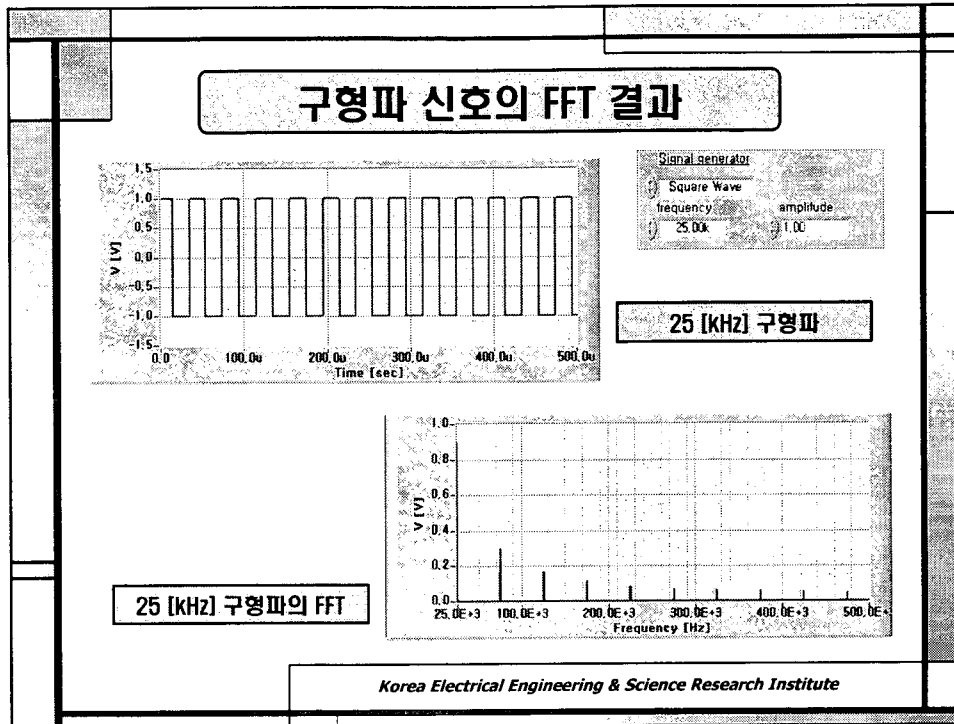


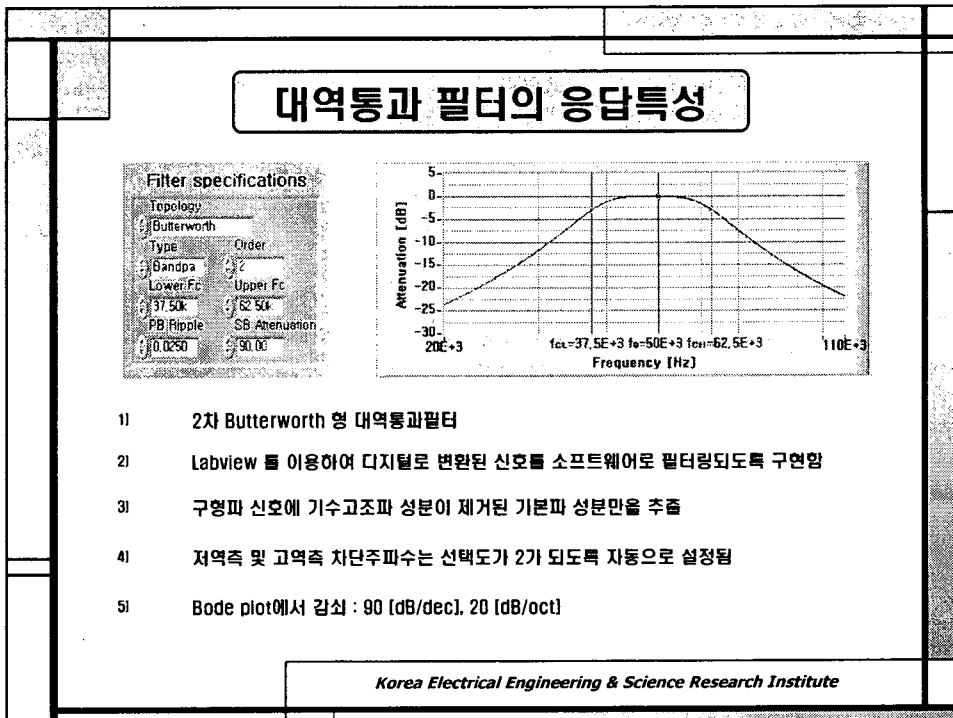
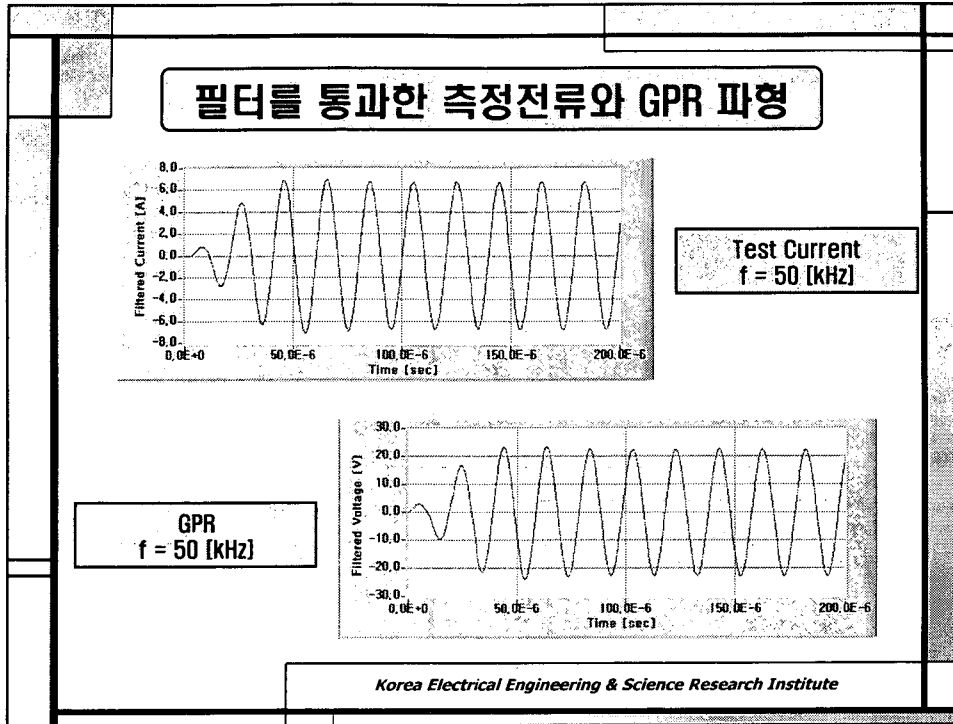
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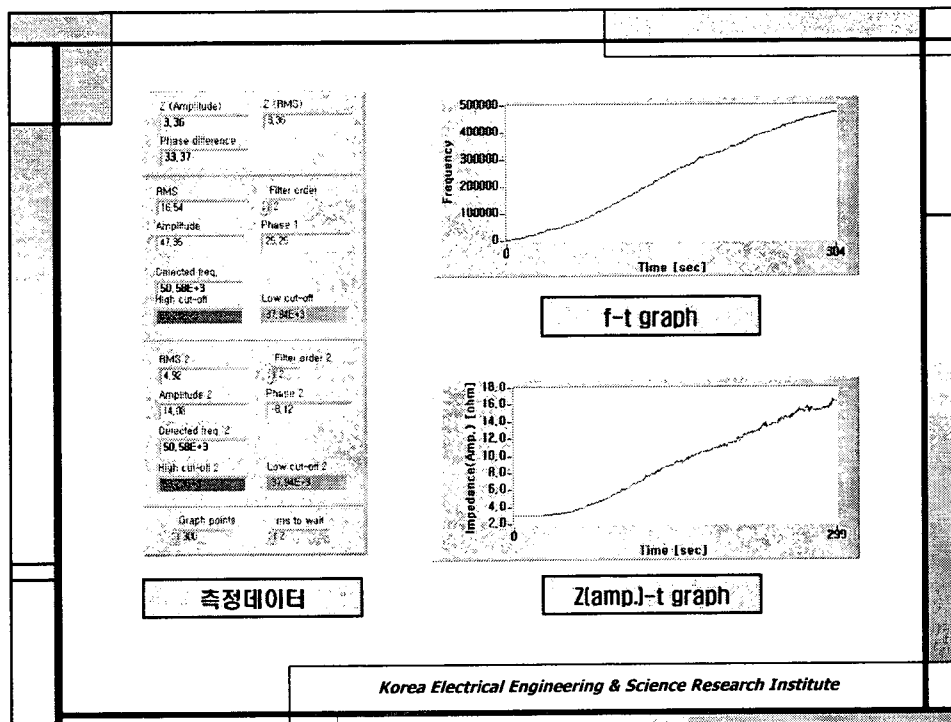
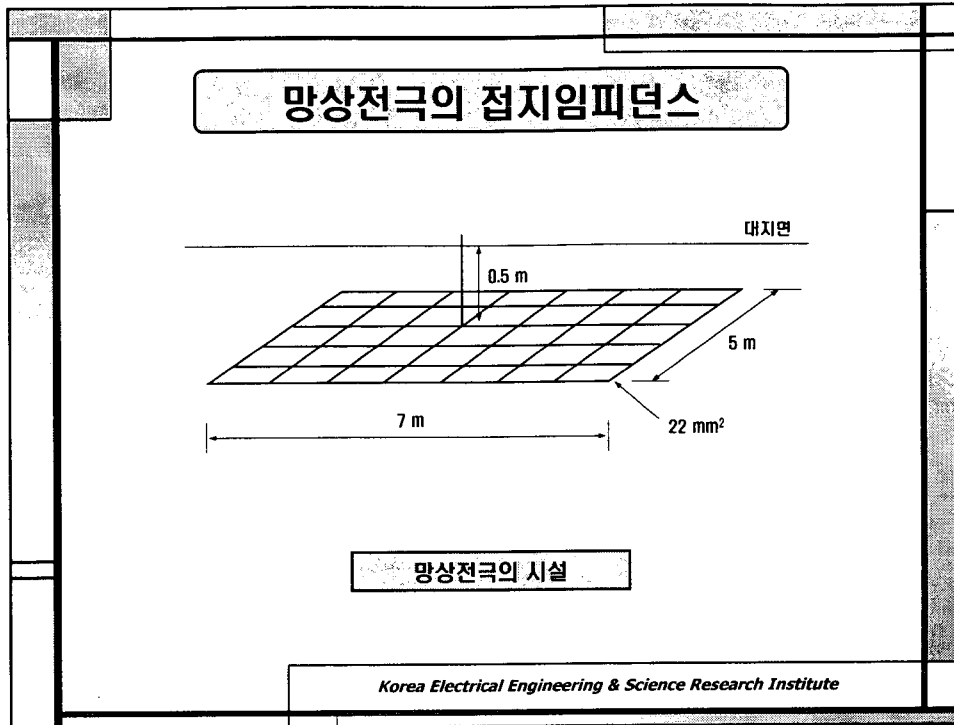
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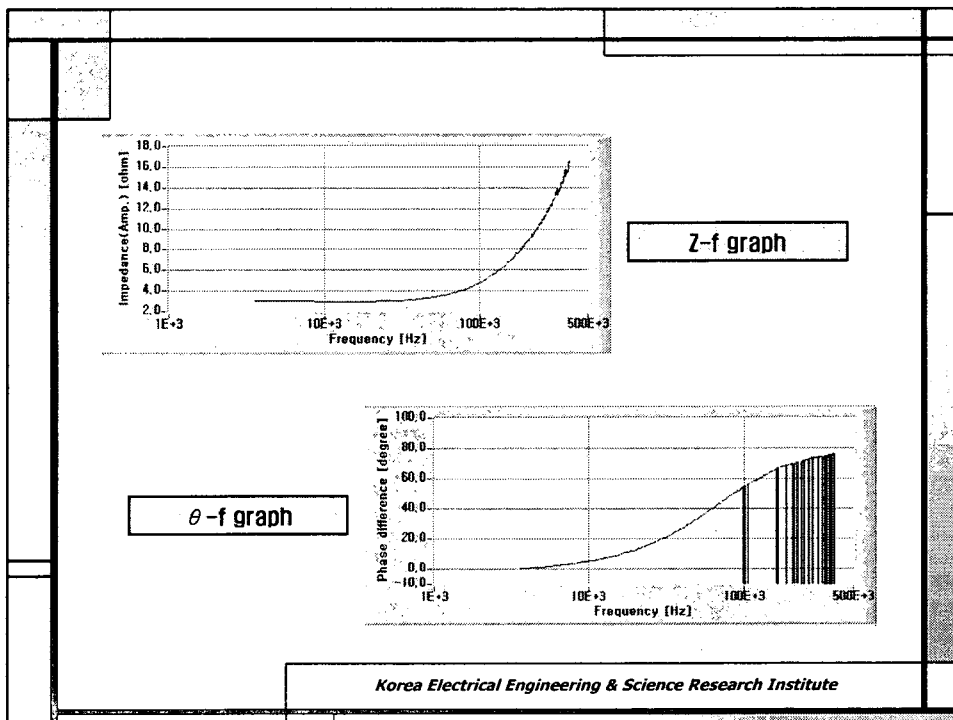
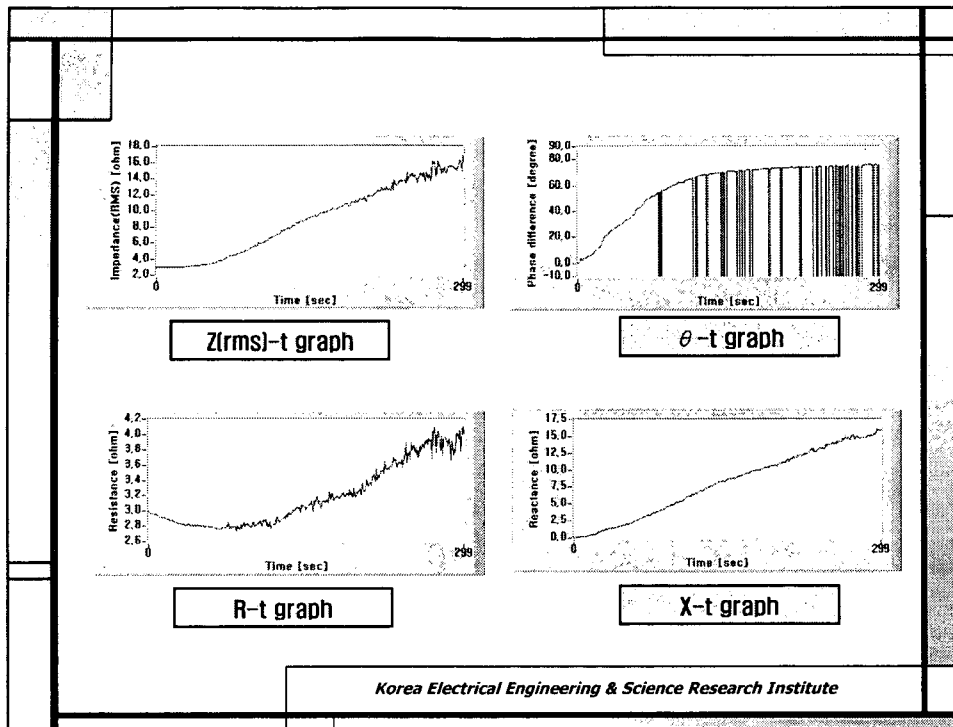


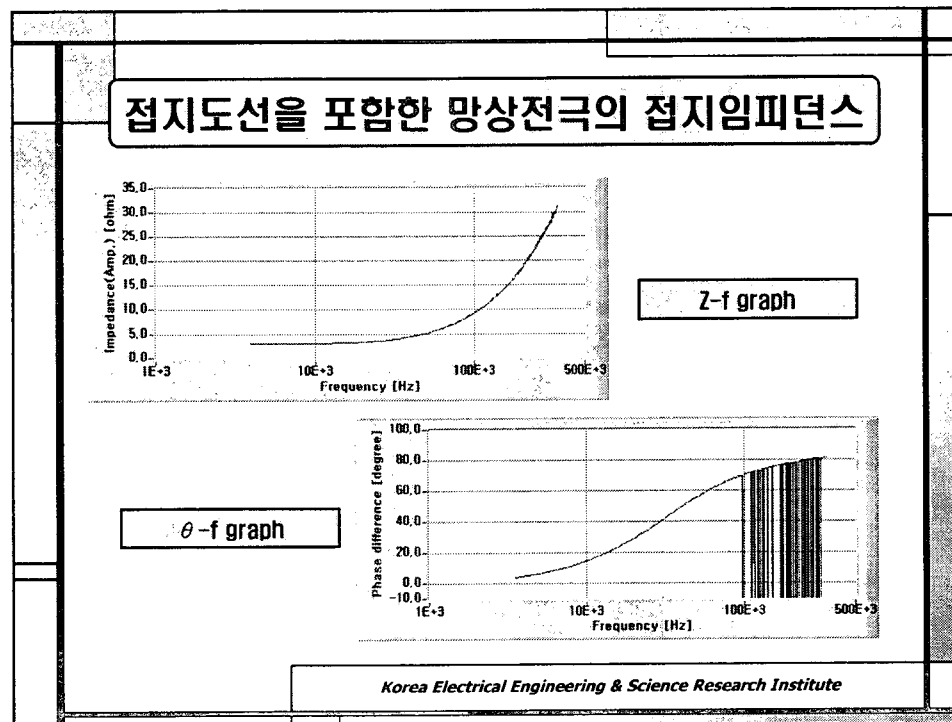
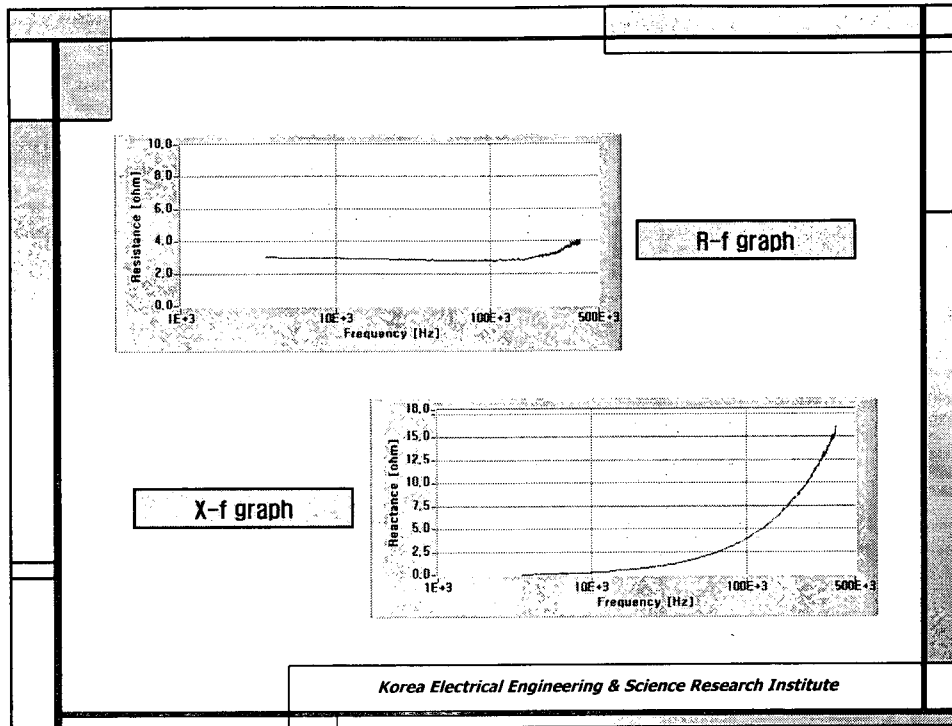
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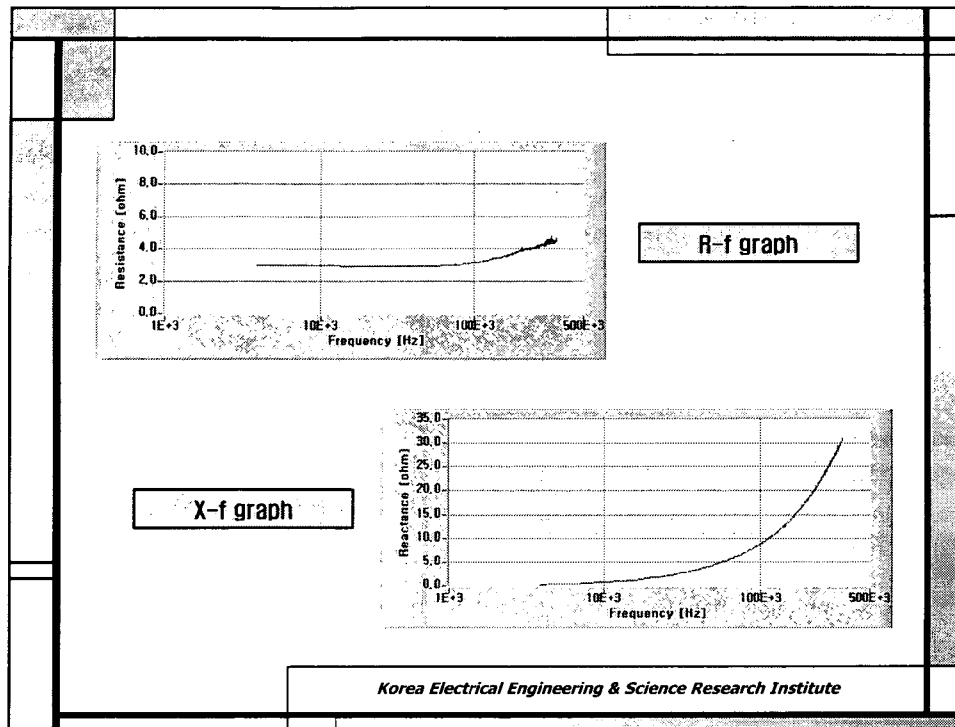












접지도선의 영향

Ground electrode		Frequency			60 [Hz]			10 [kHz]			50 [kHz]			100 [kHz]			200 [kHz]		
		Z	R	X	Z	R	X	Z	R	X	Z	R	X	Z	R	X			
Elec-trode	Ground conductor	[Ω]																	
	No conductor	3.0	3.0	0.0	3.0	2.9	0.3	3.4	2.8	1.8	4.8	2.8	4.0	8.7	3.0	8.3			
Grid	Single GV	3.0	3.0	0.0	3.0	2.9	1.0	5.1	2.9	4.3	9.7	3.2	9.0	18.6	3.9	18.0			

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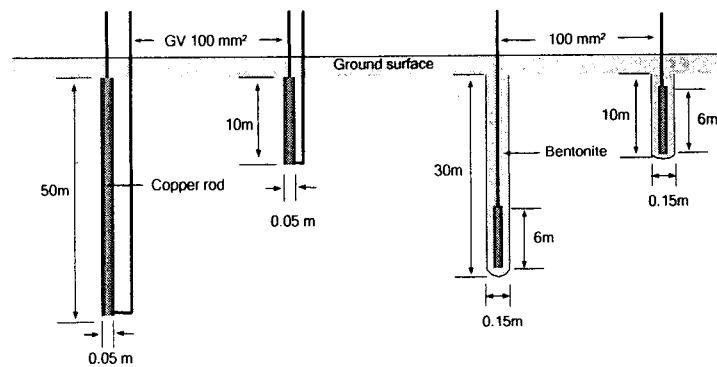
대형 봉상 접지전극의 접지임피던스 특성

Case I : 직경 40 [mm] 동봉 접지전극의 길이에 따른 특성
길이 10, 50 [m] 동봉 사용

Case II : TGO 사의 접지전극
길이 6 [m]의 동봉을 포함한 접지전극 길이 10, 30 [m]
접지저감제 사용 (San Earth)

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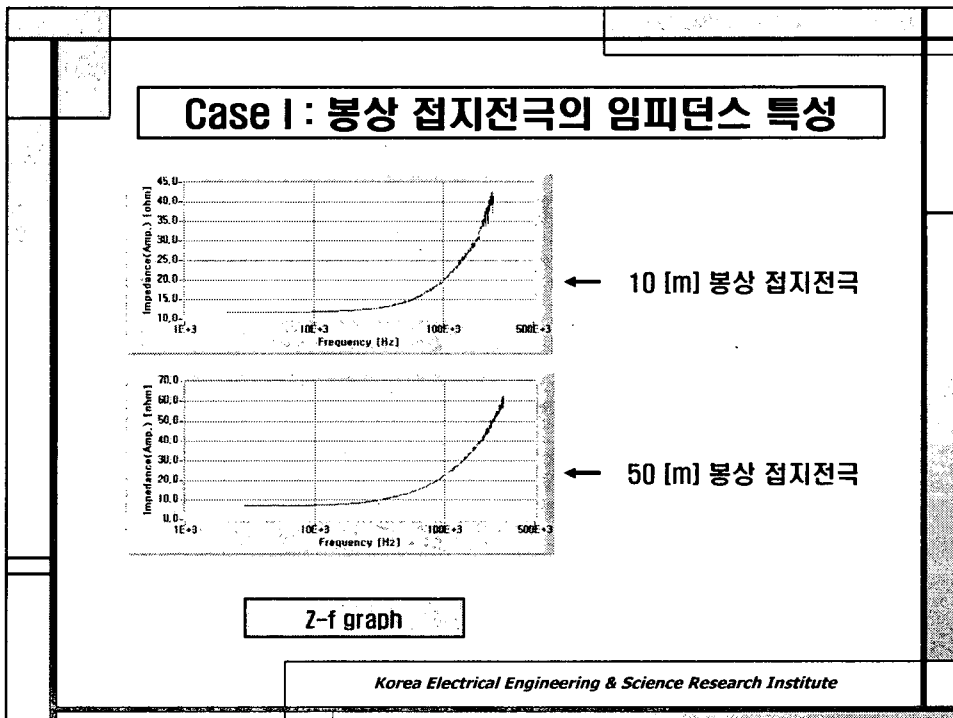
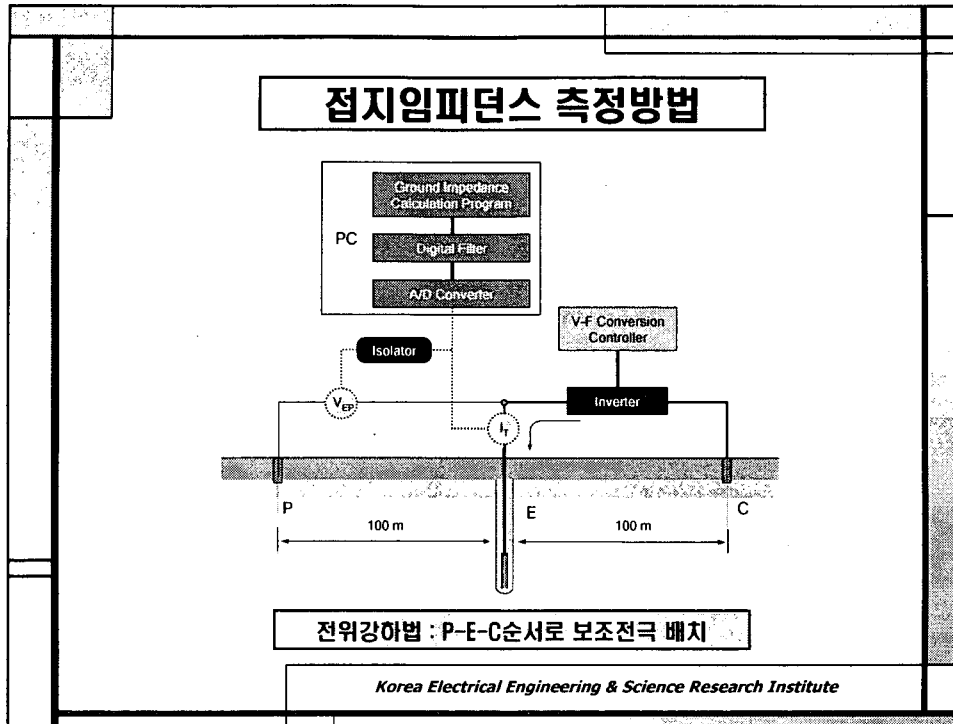
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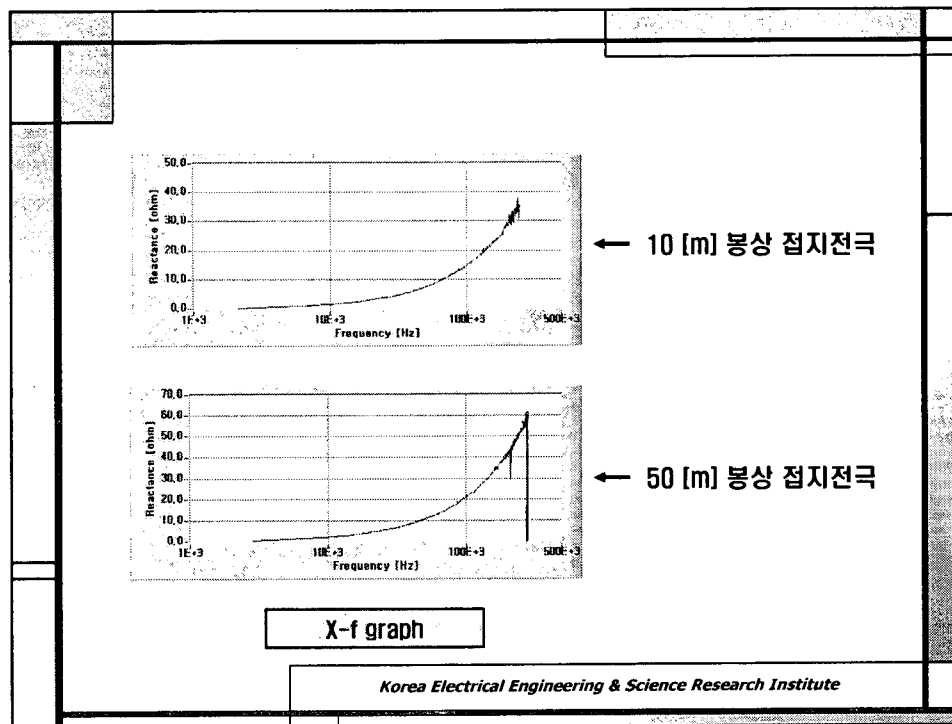
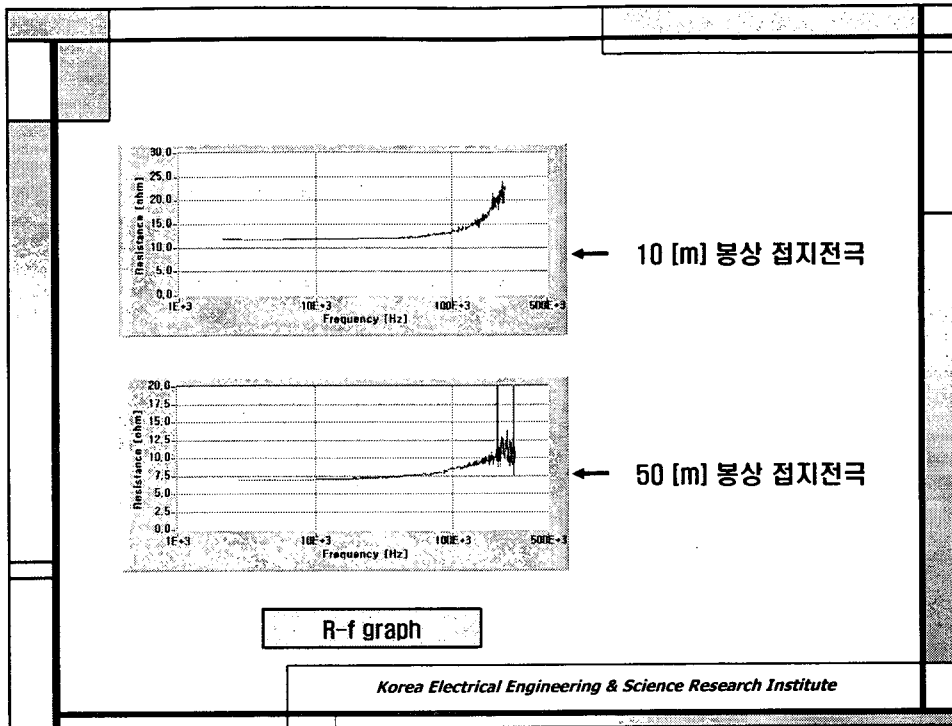


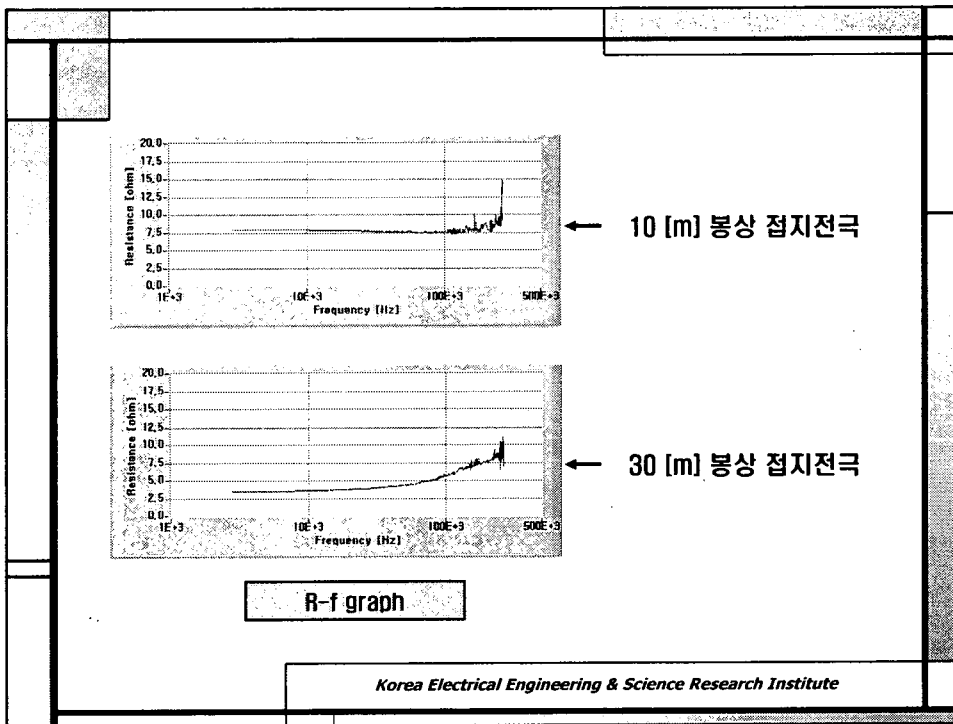
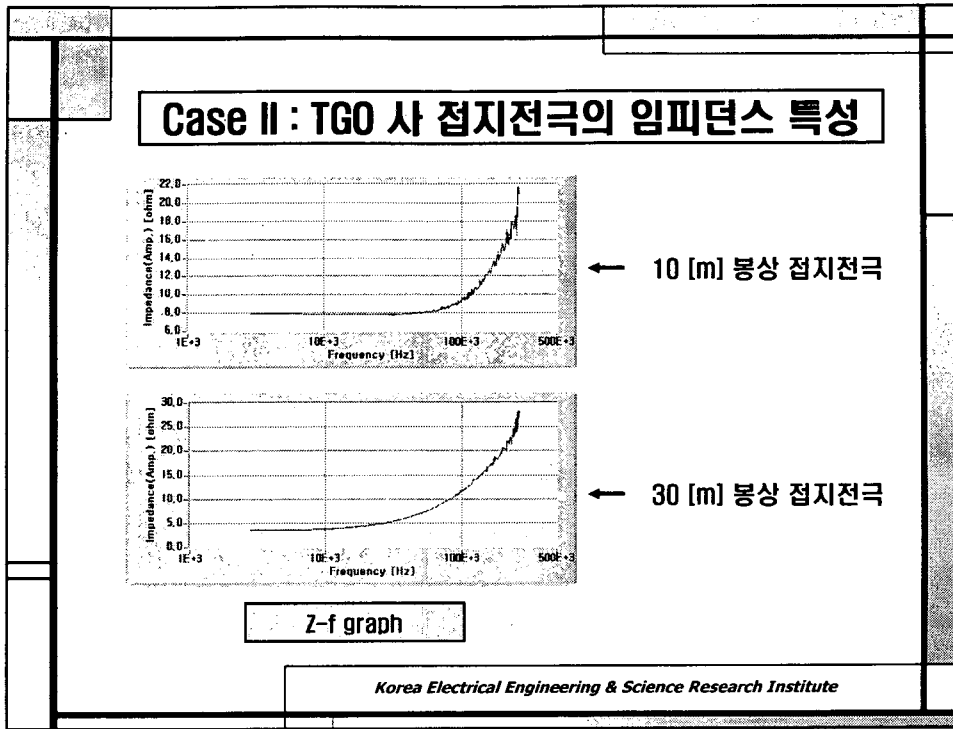
일반 봉상 접지전극

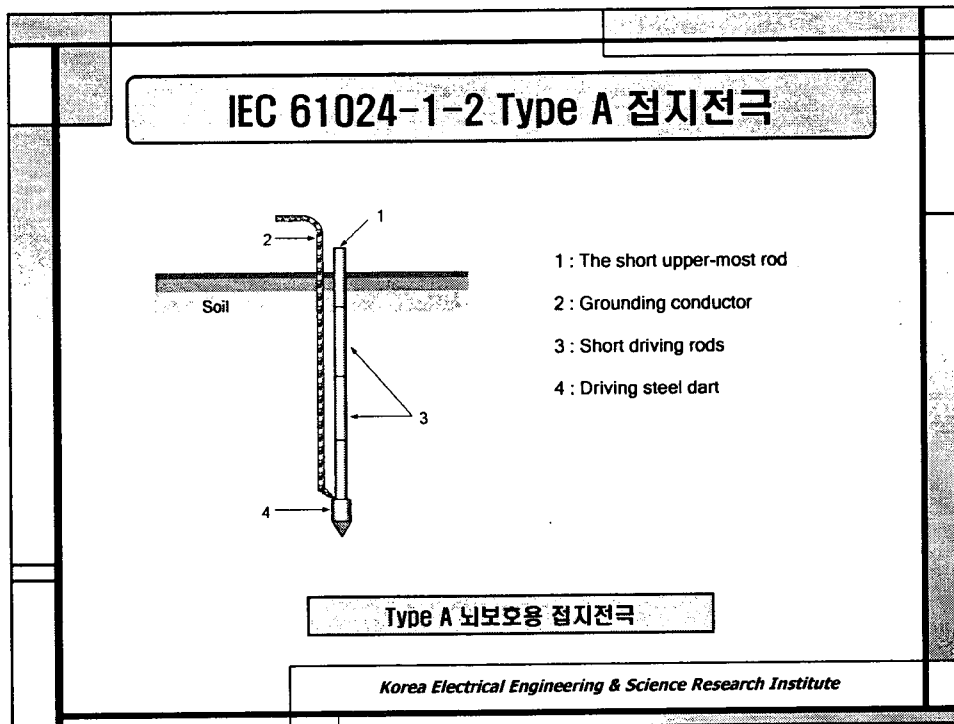
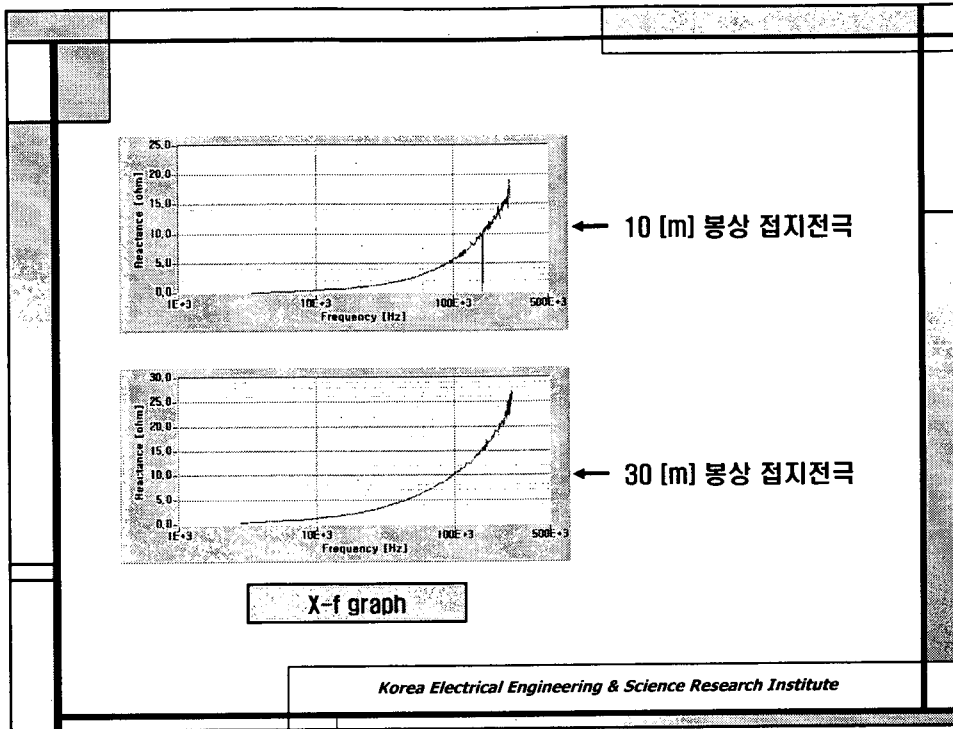
TGO사의 봉상 접지전극

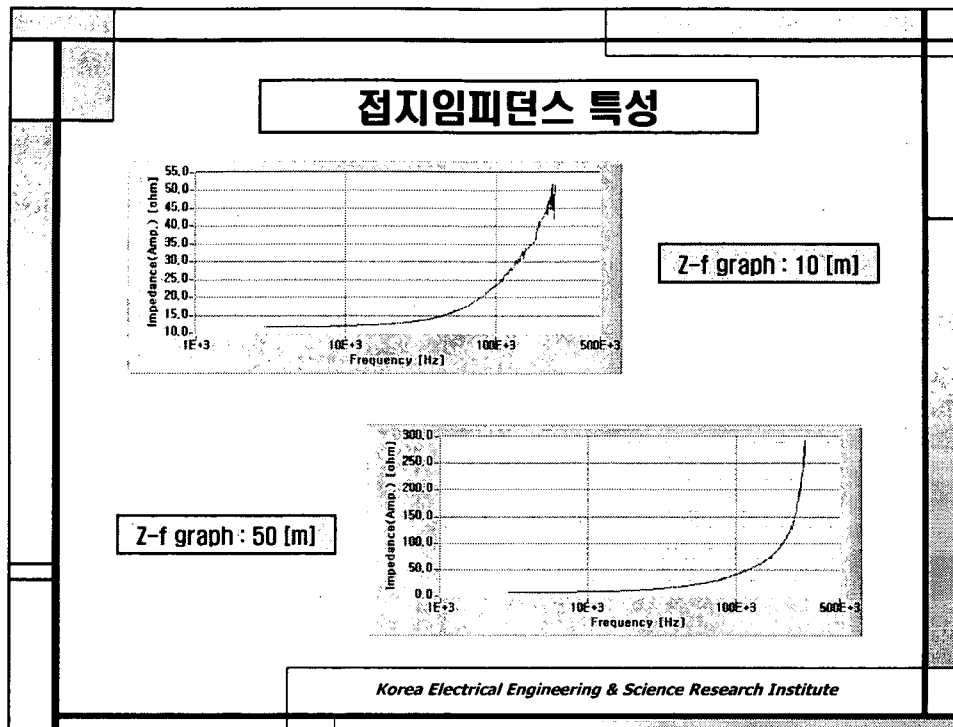
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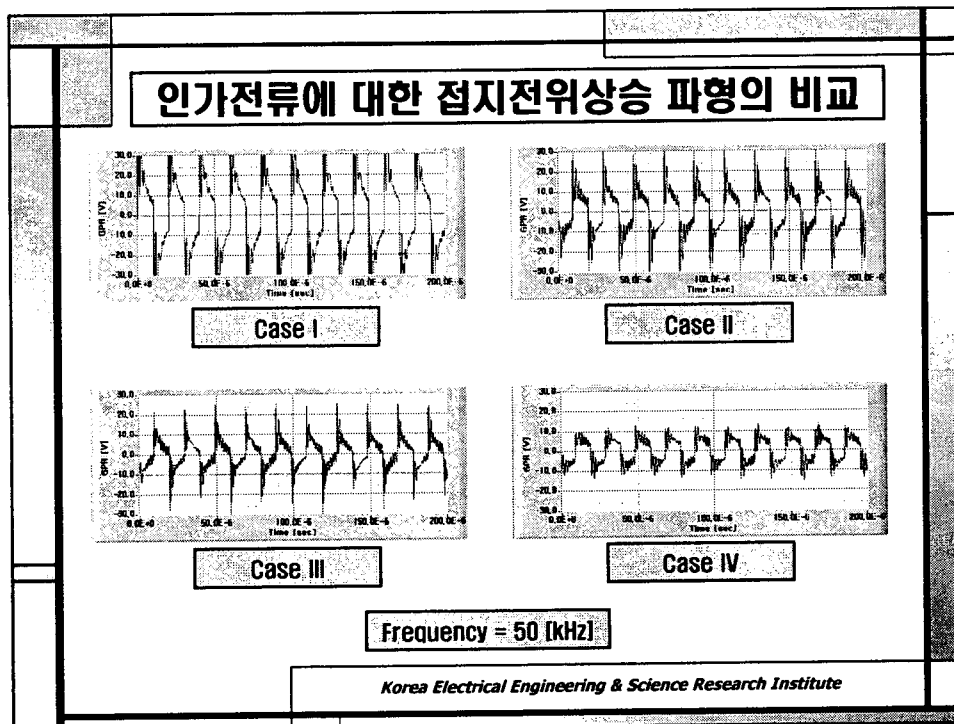
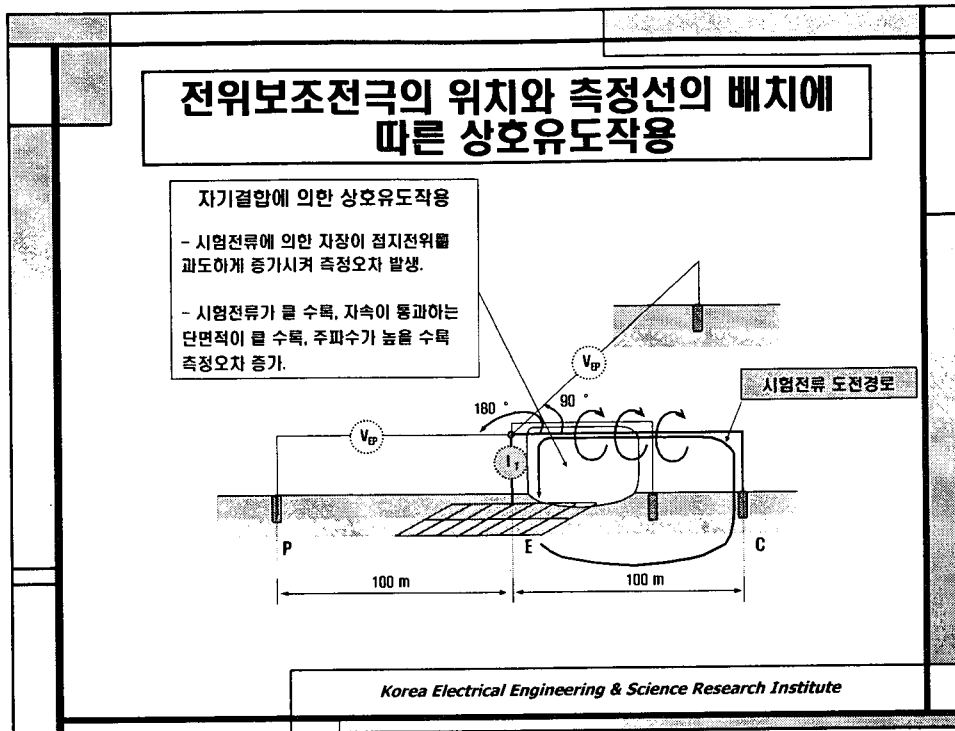
봉상전극의 접지임피던스 양상분석

I : 수 [kHz] 이하에서 접지임피던스는 대부분 저항성

II : 수 [kHz]를 넘어서면서 용량성 리액턴스가 나타나기도 하는데 이러한 특성은 접지전극의 형상, 시공방법, 대지저항률에 따라 다름

III : 수십 [kHz]를 넘어서면서 접지전극의 형상과 길이에 따라 차이가 있지만 자기인덕턴스에 의해 유도성 경향이 지배적으로 나타남

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