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THIS IS UNEVALUATED INFORMATION

1. a 16-page publication in English entitled "Special Measuring Instruments Supplied with the Microwave Link Type GTT 4000/600." This was published by the Telecommunication Research Institute (TKI), Budapest, Hungary. The publication contains one page of description and brief specifications for each of the following instruments: 50X1-HUM

a) UHF Sweep Generator type 111,
b) Amplitude Indicator type 211,
c) Linearity Meter type 302,
d) Crystal Calibrator type 121,
e) Deviation Meter type 132,
f) Video Spectrum Analyzer type 162,
g) Visometer type 82,
h) White Noise Test Set type 141,
i) Differential Measurement Set type 362,
j) Narrow-Band Channel Level Meter type 411,
k) Intermediate Frequency Spectrum Analyzer type 191,
l) Reflectometer type 272,
m) Intermediate Frequency Modulator type 181,
n) Intermediate Frequency Amplitude and Group Delay Measurement Set type 242 50X1-HUM
o) Video Transmission Meter.

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GROUP 1
Excluded from automatic downgrading and declassification

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50X1-HUM

SPECIAL MEASURING INSTRUMENTS

supplied with the microwave link

type [illegible]/400

[illegible] Institute

T. K. I.

BUDAPEST

Contents

1967

UHF Sweep Generator

TKI type 111

The UHF Sweep Generator is intended for measuring the frequency response of wide-band amplifiers by displaying the characteristic on an oscilloscope. Frequency modulation is realized by varying at a 50 cycles rate the inductance of the oscillator coil wound on a ferrit core. The nearly 10:1 frequency range is covered without heterodyning, thus dispensing with annoying harmonic frequencies. Evaluation of the response is facilitated by a tunable frequency marker and a possibility of displaying a zero-line on the screen. It is recommended to use the UHF sweep generator in conjunction with the amplitude indicator type 211.

Brief Specifications

Frequency range	12 to 100 kc/s
Scanning rate	50 c/s
Frequency deviation	continuously adjustable; 0 to ±20 % of the mean frequency in the range of 12 to [illegible] kc/s, 0 to ±[illegible] % of the mean frequency in the range of [illegible] to 100 kc/s
Output voltage	100 microvolts [illegible]
Output impedance	75 ohms
Frequency marker	continuously adjustable in the complete frequency range covered

Amplitude Indicator

TKI type 211

The Amplitude Indicator /abbreviated Amplitude Ind. / is used in conjunction with a sweep generator and an oscilloscope to determine from the scope-display the actual values of the frequency response. The instrument is essentially an attenuator; when connected between the amplifier to be measured and the scope, a double response trace appears because on alternate sweeps the attenuation varies between zero and a known decibel value. It is recommended to use the Amplitude Indicator in conjunction with the UHF sweep generator type 111.

Brief Specifications

Trace distance on scope screen	switch selected, 0-0,3-1-3-6 db
Measurement range	0,1 to 12 db
Type of input signal	a-c, 1 to 100 Mc/s d-c, positive or negative
Input impedance	with a-c input, 75 ohms with d-c input, appr. 50 kohms
Output voltage for vertical deflection of scope	appr. 2 volts/db
Output impedance	appr. 50 kohms

Linearity meter

The linearity meter is [illegible] measuring the linearity of microwave link circuits between terminals. In case the microwave system is modulator and if the heterodyne klystron is capable [illegible] 50 c/s scanning rate, the set is also adaptable [illegible] separately the linearity of modulator only or demodu[illegible]

The generator and indicator parts of the set are [illegible] a common case. The generator supplies a low-amplitude measurement signal superimposed on a high-amplitude 50 cycles scanning signal; frequency of the measurement signal is 10 or 1200 kc/s. This composite signal is given on the input of the circuit to be measured, the output signal feeding the indicator part of the instrument, this includes an amplifier, an envelope detector and a gated attenuator. The output voltages of the indicator when connected to a scope are suitable to display the linearity characteristics of the system. Calibration is possible with [illegible] trace-distance-meter. The set is also adapted for the calibration display of [illegible] envelope characteristics.

The [illegible] meter is recommended for laboratory and factory measurements, for [illegible] on microwave links, the Differential Measurement Set type [illegible] is recommended.

Brief Specifications

Measurement range	0,2 to 60 %
Measurement frequency	switch selected, 10 or [illegible]
Scanning frequency	50 c/s
Generator output impedance and indicator input impedance	75 ohms
Input measurement voltage required for indicator	min. 10 mV p-p
Trace distance on scope	switch selected, 0-1-3-10-30 %
Output voltage to scope [illegible] amplifier	[illegible]

Crystal calibrator

TKI type 171

The crystal calibrator is an instrument designed to fulfill for use with the microwave system type GTT 4000/600. It supplies crystal controlled frequencies necessary for adjustment of the AFC-system /5 Mc/s/, the sound subcarrier-part /8 Mc/s/, the narrow band i-f amplifier /40 Mc/s/, the wide-band i-f amplifier /70 Mc/s/ and the shift frequency oscillator /213 Mc/s/ of the GTT 4000/600 microwave system.

Brief Specifications

Crystal controlled frequencies	switch selected, 5-8-40-70-213 Mc/s
Accuracy	$\pm 2,5.10^{-5}$
Output voltage:	
5-8-40-70 Mc/s	adjustable in 10 steps, 0 to appr. 1 volt r.m.s.
213 Mc/s	fixed, appr. 1 volt r.m.s.

Deviation Meter

TKI type 132

The Deviation Meter is an instrument especially designed for use with the microwave system type GTT 4000/60[illegible] and is intended for frequency deviation measurement of frequency modulated signals. It is designed for use in the range of the wide-band i-f circuits /60 to 80 Mc/s/, the narrow band i-f circuits /39 to 41 Mc/s/ and the sound subcarrier circuits /7,5 to 8,5 Mc/s/. Principle of measurement is deriving the difference frequency of the FM-signal to be measured and of a tunable CW-signal supplied by the instrument. The zero-beats of the difference frequency signal are displayed on a scope screen, and the two limits of the deviation are read seperately from a calibrated scale.

Brief Specifications

Frequency ranges	range 1, [illegible] to [illegible] Mc/s range 2, 60 to 80 Mc/s range 3, [illegible] range 4, 7,5 to [illegible] Mc/s
Lowest deviation measurable	range 1, appr. [illegible] kc/s range 2, appr. [illegible] range 3, appr. [illegible] range 4, [illegible]
Input signal requirement for giving an output signal of 1 volt p-p to scope vertical amplifier	appr. [illegible]

Video Spectrum Analyser

TKI type 162

This instrument is essentially a panoramic receiver giving a display of the spectrum ranging from 0,1 to 10 Mc/s. When connected to the base-band output terminal of a microwave link not being modulated, the noise spectrum of the link can be investigated on a scope screen. Evaluation of the display is facilitated by a tunable frequency marker and an internal calibrating voltage source.

Brief Specifications

Sweep width and band center	continuously adjustable to cover the range 0,1 to 10 Mc/s
Panoramic receiver 3-db band-width	appr. 50 kc/s
Input impedance	75 ohms
Input voltage range	30 microvolts to 300 millivolts
Output voltage to scope vertical amplifier	appr. 1 volt p-p can be adjusted by means of an input attenuator within the input voltage range specified
Scanning rate	50 c/s
Internal calibration	1 Mc/s, 1 millivolt
Frequency marker	continuously adjustable, 0,1 to 10 Mc/s

R. 1530

Visometer

TKI type 82

The Visometer is a high sensitivity vide[illegible] voltmeter operating in the 10 kc/s to 10 Mc/s frequency [illegible] and having a voltage range of 30 microvolts to 1 volt. A special [illegible] detector incorporated in the Visometer makes it especially suitable for the measurement of the r.m.s. value of noise voltages. Either flat or visometric frequency response may be selected by means of a front panel response-switch, thus making possible unweighted and visometric noise measurements. Main uses are the measurement of the visometric signal-to-noise ratio at the base-band terminal of microwave links and TV studio equipment, and the measurement of the base-band loading level of multichannel telephony apparatus or white noise test equipment, up to 1920 channels.

Brief Specifications

Input impedance	75 ohms
Frequency response:	
1. In case of flat response, 6 Mc selected by means of [illegible]	10 kc/s to 6 Mc/s, ±0,5 db 6 Mc/s to 10 Mc/s, ±1 db
2. In case of flat response, 6 Mc selected by means of [illegible]	10 kc/s to 6 Mc/s, ±0,5 db 7 Mc/s to 10 Mc/s, min. -20 db
3. In case of weighted [illegible] response	in the range of 10 kc/s to 6 Mc/s departure from the response of the visometric filter having a 0,33 microsecond time constant is less than ±1 db
Low frequency attenuation in all cases	at 30 and 100 cycles, more than 30 db
Measurement range	30 microvolts to 1 volt r.m.s. /to 10 volts with external 20 db attenuator supplied/
Maximum signal-to-noise ratio measurable with respect to 0,7 volts p-p	appr. 57 decibels
Indicator:	
characteristic	quadratic
meter scale	calibrated in [illegible] within ±0,15 db
time constant	appr. 0,[illegible]

[illegible]

T. M. [illegible]

White Noise Test Set

TKI type 141

This set is intended for noise and intermodulation distortion measurements in multichannel base-band equipment of radio links. The set comprises two parts, the noise generator and the noise receiver. The noise generator produces random white noise, and switched filters allow the selection of band-widths corresponding to 120, 300 or 600 channel operation. Band-stop filters give a slot in the noise spectrum at any one of four frequencies. This noise is given on the equipment to be measured, the output of which feeds the noise receiver switch-tuned to the centre frequency of any of the four slots. The intermodulation distortion and noise due to the equipment to be measured is indicated by the noise power ratio read directly from the attenuator scale of the noise receiver.

Brief Specification

Noise bands	switch selected, [illegible]
Measurement frequencies	[illegible]
Generator output noise level	[illegible]
Receiver sensitivity	[illegible]
Back-to-back noise power ratio	[illegible]
Output impedance of generator Input impedance of receiver	75 ohms

Differential Measurement Set

TVI type 562

The measurement set is intended for measuring [illegible] and group delay distortion between [illegible] microwave links. It is especially adapted for [illegible] between distant terminals, owing to the special [illegible] not requiring a reference signal. One microwave [illegible] are required at the two terminals, making possible measurements in both directions; one set is sufficient for [illegible] factory work.

A low-frequency scope has to be connected to the set, displaying the linearity or group delay characteristics. A special feature of the set is the possibility of a simultaneous display of both characteristics. Both axes of the screen are calibrated: the vertical axis in terms of per cent or nanosecond /by using the double-trace method/, and the horizontal axis in terms of megacycles /by using intensity modulation markers/.

Brief Specifications

Measurement range:	
linearity	0,2 to 60 per cent
group delay	0,6 to 200 nanoseconds
Calibrating trace distance:	
linearity	adjustable in 5 steps, 0-1-3-10-30 per cent
group delay	adjustable in 5 steps, 0-3-10-30-100 nanoseconds
Scanning frequency	50 cycles
Measurement frequency	250 kc/s; different frequencies can be used with auxiliary units
Generator output voltage:	
50 c/s component	0 to appr. 9 volts r-r
2,0 kc/s component	0 to appr. 0,5 volts r-r
[illegible] current voltage [illegible] for indicator	0,2 to [illegible] volts r-r
[illegible] output impedance and [illegible] input impedance	75 ohms
[illegible] to scope [illegible] amplifier	[illegible]
[illegible]	[illegible]

Narrow-Band Channel Level Meter

TRI type 411

The Narrow-Band Channel Level Meter is an instrument designed especially for use with the microwave system GTT 4000/600. It is intended for facilitating the level adjustment of the narrow-band channels. The Level Meter comprises essentially a band-pass filter tuned to 13 kc/s and an indicator using a transistor, and is battery operated. When a 13 kc/s input signal is given on the link at the terminal station, the Level Indicator is adaptable to adjust during operation the levels of the narrow-band transmitters and receivers at any relay station.

Brief Specifications

Measurement frequency	13 kc/s
3-db band-width	±400 c/s
Input impedance	600 ohms
Input voltage range	-12 to -8 dbm

R. 1530.

Intermediate Frequency Spectrum Analyser

TKI type 191

This instrument is essentially a panoramic receiver [illegible] a display of the spectrum ranging from 55 to 90 Mc/s. [illegible] connected to the i-f output terminal of a microwave link not modulated, the noise spectrum of the link can be investigated on a scope screen. Evaluation of the display is facilitated by a tunable frequency marker. A special feature of the i-f spectrum analyser is the "side-band" operation used for precisely comparing the side-bands and the carrier in the spectrum of modulated waves. In this mode of operation, the frequency axis is folded back at the point of the carrier, and the two side-bands are displayed to cover each other; the carrier spectrum line is blanked for eliminating distortion. The instrument is capable of measuring AM-to-FM conversion and AM-compression of i-f circuits in conjunction with the Intermediate Frequency Modulator type [illegible].

[illegible] Specifications

Band center [illegible]

Sweep width [illegible]

[illegible]

[illegible]

[illegible] receiver [illegible]

[illegible] marker

Reflectometer

TMI type 172

The reflectometer is used to measure the ref
/5-ohms intermediate frequency and video frequency
Accessories of the instrument are an i-f video
bridge, and an external generator oper
is required for the measurement. It is possible to
circuits both with the point-to-point method and
sweep method; in the latter case, the reflection
characteristic can be displayed on the screen of
connected to the reflectometer. For sweep measurements,
WMF Sweep Generator type 111 is recommended as
The value of return loss is read directly from
calibrated in decibels.

Brief Specifications

Frequency range	i-f, 25 to 80 Mc/s video, 0,1 to 10 Mc/s
Measurement range	return loss, 40 to 0 db, reflection factor, 1 to 100 %
Accuracy of measurement in the 40 to 10 db range	5 % /referred to 0dB-value/
Voltage required from external generator	i-f, 0,1 to 0,3 volts video, 1 volt

Intermediate Frequency Modulator[x]

TKI type 181

The Intermediate Frequency Modulator is intended for measuring AM-to-PM conversion and AM-compression of i-f circuits in conjunction with the Intermediate Frequency Spectrum Analyzer type 191. It comprises a 70 Mc/s oscillator, followed by a wide-band amplifier and attenuator, and a modulating oscillator switch-tuned to 7 video frequencies. The 70 Mc oscillator can be modulated both in amplitude and phase, and the phase difference between the two modulations is continuously adjustable. When using the side-band method, the AM-to-PM conversion of the circuit measured can be read directly from two meters, calibrated in degrees and decibels, showing the phase-modulation and the amplitude-modulation of the 70 Mc/s oscillator. The AM-compression is read off the input attenuator dial on a linear scale of the i-f Spectrum Analyzer used in conjunction with the i-f Modulator.

Main Specifications

Frequency	70 Mc/s
Output voltage	1 V ± 10 %, adjustable
Output impedance	50 Ω
Modulation:	
amplitude modulation	adjustable, 0 to 50 %
phase modulation	adjustable, 0 to 1.5 radians
phase difference between the two modulations	adjustable, 0 to 360 degrees
frequency	switch selected, 1, 2, 4, 7, 14, 28, 56 kc/s

[x] Presently not supplied with the ITT 900 line.

R. 15301

Intermediate Frequency

[illegible] and Group Delay Measurement Set*

TXI type 242

The measurement set is intended for measuring the frequency characteristics of IF amplifiers and circuits used in microwave links. The generator and indicator parts are housed in separate cases. The generator output signal has double frequency [illegible] sweeping signal gives high deviation, [illegible] deviation. This FM-signal [illegible] the output of which is [illegible]. The indicator comprises two detectors, [illegible] detector for obtaining the amplitude-frequency response, and a phase detector for obtaining the group delay-frequency response. The back-to-back error of the measurement set is considerably reduced by the compensation system used in both detector circuits.

A two-frequency scope has to be connected to the set, displaying the amplitude and group delay characteristics. A special feature of the set is the possibility of a simultaneous display of both characteristics. Both axes of the screen are calibrated, the vertical axis in terms of decibel or [illegible] /by using the double-trace method/, and the horizontal axis in terms of megacycles /by using intensity modulation/.

Brief Specifications

Measurement range:	
amplitude	0,1 to [illegible]
group delay	0, [illegible]
Calibrating trace distance:	
amplitude	[illegible]
group delay	[illegible]
frequency	70 Mc/s
sweep width	adjustable [illegible]
Sweeping frequency	[illegible]
Measurement frequency	[illegible]
Generator output voltage and indicator input voltage	0,[illegible]
Generator output impedance and indicator input impedance	75 ohms
Frequency markers	simultaneously at 62, 70 and [illegible]

* Presently not supplied with the STT 4000/600 system

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Video Transmission Meter

TKI type 401

The Video Transmission Meter is intended for measuring the frequency response of microwave systems between baseband terminals, but can also be used for measuring TV studio equipment and TV transmitters. The instrument is transistorized, and comprises two parts, the generator and indicator, housed in a common cabinet. The generator-part consists of an oscillator switch-tuned for 7 frequencies, and the indicator-part comprises a wide-band level meter.

Brief Specifications

Generator-part:

[redacted]: adjustable in 7 steps, 0,2-1-2-3-4-5-6 Mc/s

[redacted]: adjustable in 10 steps, 1 decibel each, up to 100 millivolts r.m.s.

[redacted]: 20 db required to 100 millivolts

[redacted]: calibrated in decibels, +3 to -10 db

Generator [redacted] and indicator input impedance 75 ohms