3. Maintenance

The mechanical construction of Type SMDA is such that no maintenance is necessary. In case any mechanical defects develop, we recommend that the signal generator be sent to the local R & S agency or to the R & S factory. This is absolutely necessary if a scale, oscillator or attenuator drive is defective. The mechanical work (cleaning, disassembling) involved in the maintenance of the signal generator is described in section 3.3.

3.1 Measuring Instruments and Auxiliary Equipment Required

The following table lists all measuring instruments and auxiliary equipment required for checking.

Designation and specifications	Type	Ident No.	Uses Section
UHF-DC Millivoltmeter AC voltage 2 mV to 300 V Frequency range 1 kHz to 1.6 GHz Error of voltage indication ±8 % of f.s.d. DC voltage 1 mV to 1000 V Error of voltage indication ±8 % of f.s.d. with probe (above 300 MHz to be used as indicator only – appreciable error)	URV	100.0130.02	3.2.1.2 3.2.4
Millivoltmeter Frequency range 10 Hz to 1 MHz Voltage range 0.1 mV to 300 V, – 80 to +52 dB Error of voltage indication ±2 % of f.s.d. Input resistance 1 MΩ, shunted by 30 pF.	UVN	100.0160.02	3.2.2.2 3.2.2.3 3.2.3.12
Digital Multimeter AC voltage 100 µV to 700 V_{rms} Frequency range 20 Hz to 20 kHz DC voltage 100 µV to 1000 V Resistance range 1 to 15 MΩ	UGWD	100.0218.02	3.2.8
Power and Standard Signal Generator Frequency range 30 kHz to 31 MHz Output voltage EMF 0 to 10 V into 60 Ω	SMAR	100.4513.02	3.2.3.5 3.2.3.6
VHF Signal Generator Frequency range 22.5 to 480 MHz Output voltage EMF 0 to 3.5 V into 60 Ω	SLSV	100.4188.02	3.2.1.6 3.2.3.5 3.2.3.6
Stereo Signal Generator Frequency range I 10.2 to 11.2 MHz II 87 to 108 MHz Output voltage EMF I 0.1 mV to 1 mV II 0.1 mV to 1 V	SMSF	100.4571 ..	3.2.1.6
Field-Strength Meter Frequency range 0.1 to 30 MHz Voltage range 0 to 120 dB above 0.1 µV (0.1 µV to 0.1 V)	HFH	100.1014.02	3.2.1.3 3.2.1.4 3.2.1.6

Designation and specifications	Type	Ident No.	Uses Section
VHF-UHF Monitoring Receiver with the 4 RF Plug-in Units 100.1189.02 at 25 to 230 MHz 100.1195.02 at 160 to 470 MHz 100.1208.02 at 460 to 900 MHz 100.1214.02 at 850 to 1300 MHz Input voltage for all RF Plug-in Units 0 to 120 dB above 1 µV (1 µV to 1 V)	ESU	100.1143.02	3.2.1.3 3.2.1.4 3.2.7.1 3.2.7.2
Frequency Deviation Meter Frequency range 20 to 300 MHz Deviation range 0 to 150 kHz	FMV [1]	100.5932.02	3.2.1.5 3.2.3.5 3.2.3.6 3.2.3.7 3.2.6
Direct-Reading Distortion Meter Measurement range 0.2 to 30 % Frequencies 0.04/1/5/15 kHz	FTZ	100.6100.02	3.2.3.4 3.2.3.7
Wave Analyzer Frequency range 5 Hz to 20 kHz Voltage range 1 µV to 300 V	FAT 1	100.8683 . .	3.2.2.4 3.2.3.4
Frequency Indicator Frequency range 10 Hz to 500 kHz Error ±1 %	FKM [1]	100.5955.02	3.2.1.6
800-MHz Counter with 800-MHz Plug-in 100.6080.02 Frequency range 10 to 800 MHz Error limits $\pm 10^{-10}$	FET 2 [1]	100.6039.02	3.2.1.1 3.2.1.6 3.2.2.1
Frequency Counter Frequency range 10 kHz to 350 MHz Error limits $\pm 5 \times 10^{-10}$/°C	FET 3 [1]	104.0235 . .	3.2.1.1 3.2.1.6
Interference Meter Type U 2033 or J 78 of Siemens with weighting filter according to CCIF 0.3 to 3 kHz			3.2.1.5
Demodulator Type Narda, Model 501 BR			3.2.3.4
SHF Termination	RMC	100.2940.50	3.2.4

Battery (2 ea) 24 V, I_{max} = 0.5 A

Adapter (Z = 50 Ω)

N connector system	⟷	Dezifix B [2])
Dezifix B [2])	⟷	Subminax socket
Dezifix B [2])	⟷	Subminax plug

Cable (Z = 50 Ω)

Dezifix B [2])	⟷	Subminax plug
Dezifix B [2])	⟷	Subminax socket
N connector system	⟷	Dezifix B [2])
Dezifix B [2])	⟷	Dezifix B [2])
BNC	⟷	4/13 [2])

[1]) Can be replaced by the Frequenzkontroller 100.4542
[2]) These connectors apply to R&S instruments only

3.2 Performance Check

3.2.1 RF Output

3.2.1.1 Frequency

Test setup

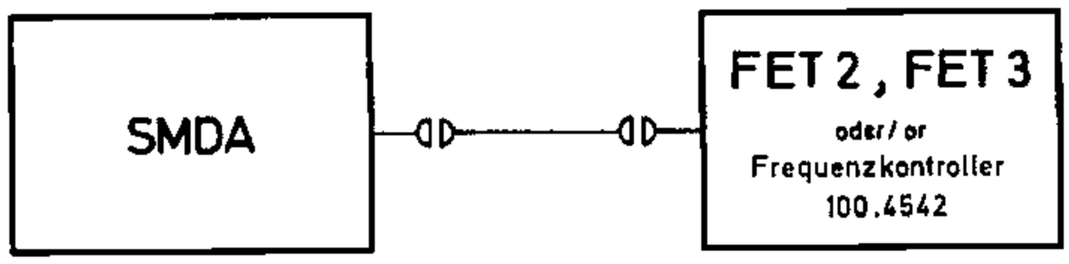


Fig. 3-1 Test setup for frequency measurement at the RF output

Measurement: Check the frequency at three points in each range (upper limit, centre and lower limit). Prior to checking in range I, calibrate the frequency scale (zero beat adjustment). Allow a warm-up period of 5 minutes after switching on and after range switching.

Permissible errors: of measured frequency relative to the frequency setting of the SMDA: Range I (0.4 to 48 MHz) $< \pm(1.5\,\% + 100\,\text{kHz})$, Ranges II to VII $< \pm 0.5\,\%$

Adjustment: If all departures are in the same direction, correct with the adjustment screws provided in the frequency-range buttons. If the directions of the departures vary, adjust the oscillator concerned according to section 5.4.2.

3.2.1.2 Checking the Output Voltage or Output Power

Test setup

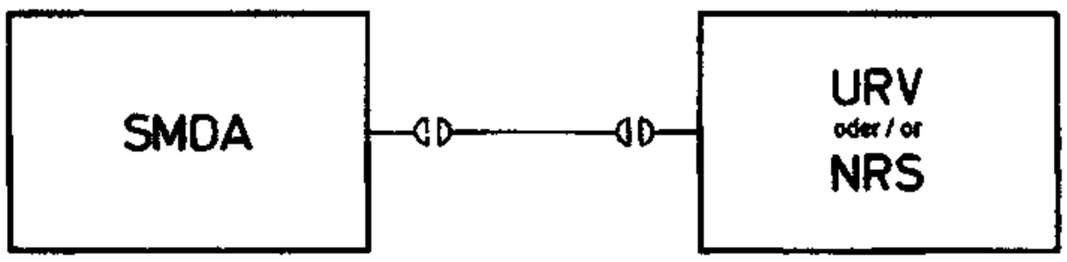


Fig. 3-2 Measurement of output voltage or output power at the RF output

Measurement: Measure the output voltage (or output power) in the lower third and at the upper limit of each frequency range with the output attenuator of the SMDA set to 0 dBV.

Permissible errors: of measured voltage or power relative to the setting of the SMDA $< \pm 0.6$ dB. (This error includes the amplitude/frequency response in the whole frequency range.)

Adjustment: If all departures are in the same direction, correct with potentiometer R273 in the AGC amplifier (see section 5.4.4 and Fig. 4-1). If the directions of the departures vary (amplitude/frequency response), there is probably a defect in the coupling head (GI260 in 41314 S Bl.2) of the attenuator (see section 5.3.11).

3.2.1.3 Measuring the Non-harmonic Spurious Waves

Test setup

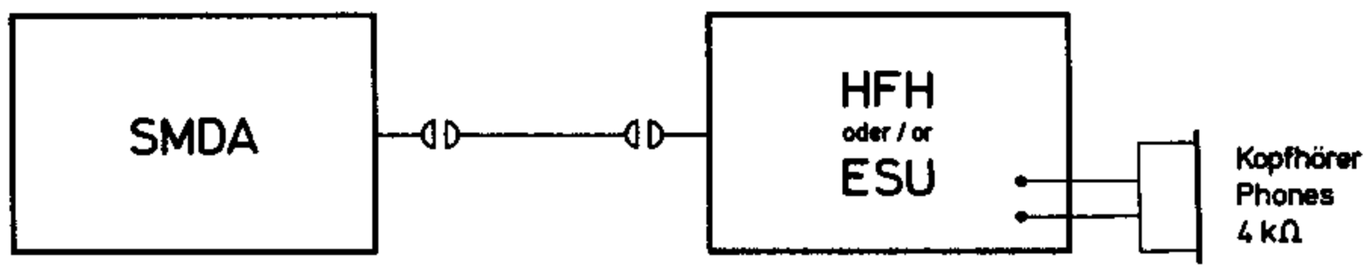


Fig. 3–3 Test setup for measurement of non-harmonic spurious waves

Measurement: Slowly tune the test receiver through its range at three frequencies of range I (upper limit, centre, lower limit) of the SMDA and measure the voltages whenever beats occur. The SMDA must be set for maximum output power. No non-harmonic spurious waves occur in the ranges II to VII; these ranges need not be measured.

Non-harmonic spurious waves: down from useful signal level 0.4 to 48 MHz $>$ 70 dB; 35 to 48 MHz $>$ 50 dB.

Adjustment: No adjustment is provided.

3.2.1.4 Measuring the Harmonics

Test setup

Fig. 3–4 Test setup for harmonics measurement

Measurement: Measure the amplitude of the first and second harmonics at two frequencies of each range (in the lower and the upper third of the range). The SMDA must be set for maximum output power.

Harmonics: (down from useful signal level, for output levels $<$ 200 mV_{EMK}) 0.4 to 50 MHz $>$ 26 dB, typical value $>$ 30 dB; 50 to 484 MHz $>$ 30 dB.

Adjustment: If harmonics appear in ranges II to VII, check the filter characteristic according to section 5.3.10.

3.2.1.5 Measuring the Residual FM (Deviation without modulation)

Test setup

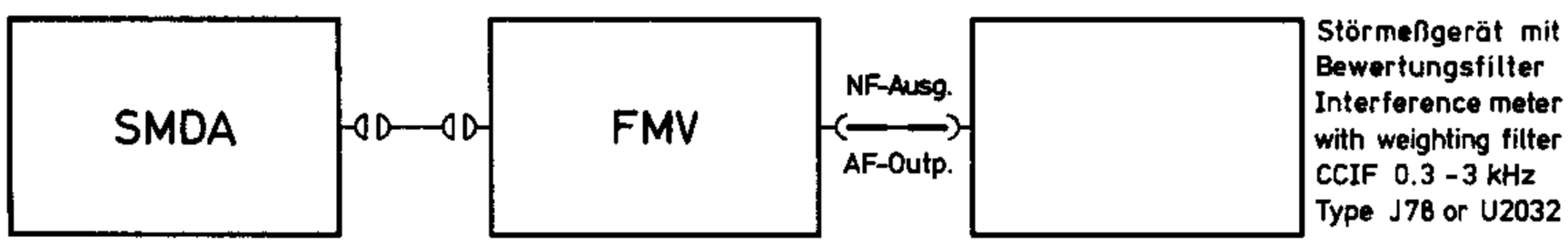


Fig. 3–5 Test setup for measurement of spurious FM

Measurement: Measure the residual FM at a medium frequency in each frequency range. The SMDA must be set for maximum output voltage. Measuring method: Tune the FMV to the frequency of the SMDA. Apply the AF voltage of the test output to the Interference Meter Type U2033 or Type J78 (with weighting filter according to CCIF 0.3 to 3 kHz). The test setup can be calibrated by means of the FM of the SMDA: deviation = 10 kHz, f_{mod} = 1 kHz. 10 Hz residual FM corresponds to 10 : 10,000 = 0.0001 times the reading obtained with 10 kHz (ratio 60 dB). Take care to avoid changing the tuning indication or frequency deviation range of the FMV after calibration of the setup. The RF voltage check of the FMV must give a reading in the green range.

Permissible residual FM (weighted) $<$ 10 Hz.

Adjustment: No adjustment is provided for residual FM. Range I is identical to range IV and need not be measured. (Check from 20 to 48 MHz.)

3.2.1.6 Measuring the Noise Voltage

Test setup

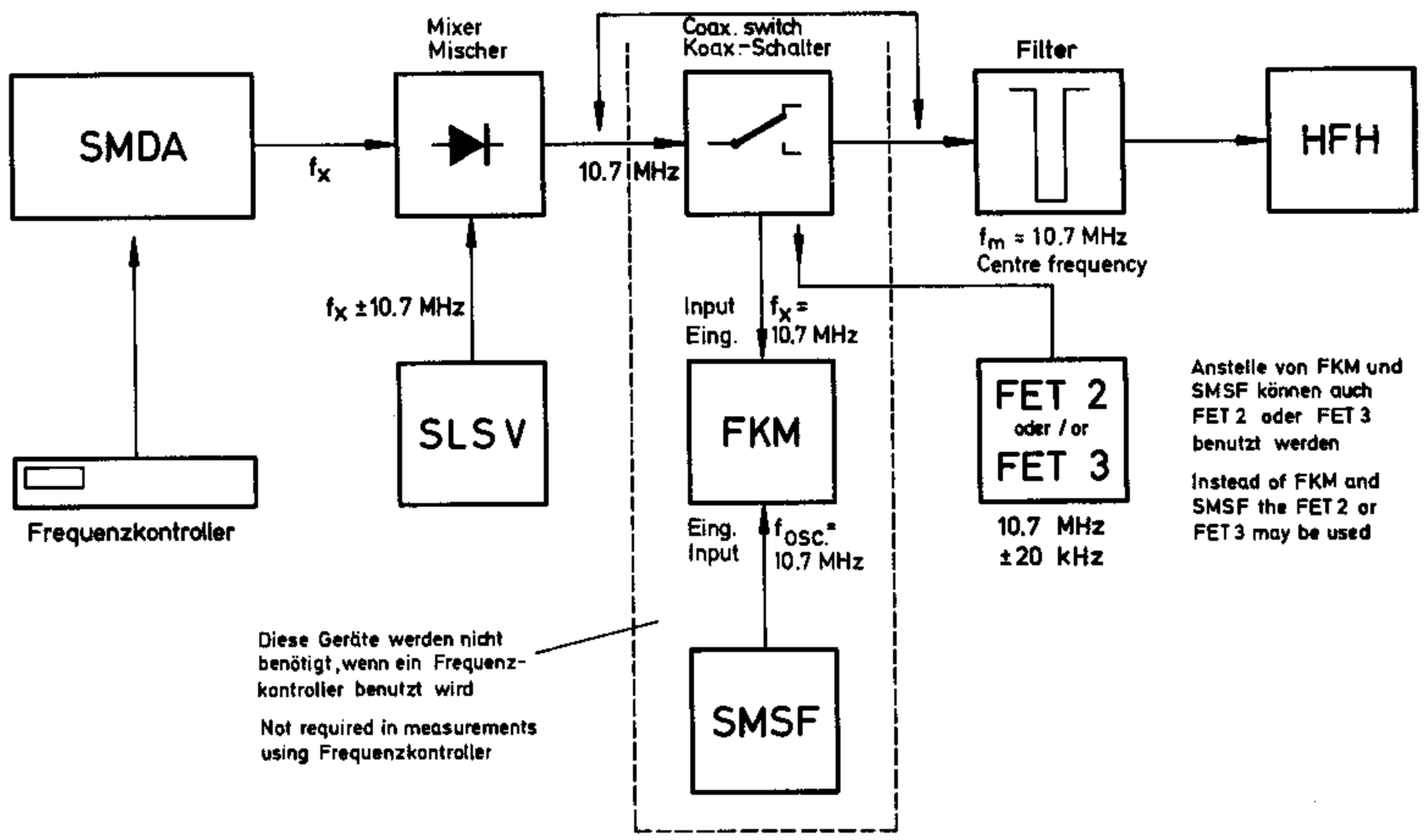


Fig. 3–6 Test setup for noise voltage measurement

Performance specifications of the equipment:

Mixer: Use a diode mixer with a very low noise level.

Signal source: S/N ratio must be at least 140 dB/Hz at 20 kHz from the carrier. The RF source must feature very good stability and low noise (it necessary, fed from AC supply stabilizer).

The VHF Signal Generator Type SLSV meets these requirements.

Coaxial switch: Cross-talk attenuation must be $>$ 100 dB (disconnect FKM, if necessary).

Filter: Type F 2107-01 Marconi Manufacturing Company with matching network Z = 60 Ω.

Bandwidth ± 6 kHz at midband frequency = 10.7 MHz (for channel spacing $>$ 20 kHz). Attenuation $>$ 110 dB at ± 12 kHz.

Test receiver (HFH): Frequency range depending on filter midband frequency (10.7 MHz for the above filter). Test bandwidth $<$ 10 kHz. Sensitivity 0.1 µV. Attenuator 100 dB.

Frequenzkontroller: The coaxial switch, the frequency indicator and the generator are not required when the Frequenzkontroller is used.

Measurement using Frequenzkontroller for tuning indication

a) Set Field-Strength Meter Type HFH to 10.7 MHz.

b) Adjust the VHF Signal Generator Type SLSV and the SMDA so that the mixture frequency is 10.7 MHz. Detune the SMDA and the HFH until the HFH reads maximum voltage. Adjust the level of the HFH to +120 dB referred to 0.1 µV.

c) Detune the SMDA by ± 10 kHz (indication on Frequenzkontroller). Check the deflection of the HFH. Correct the centre frequency on the SMDA according to b) until the deflection of the HFH is symmetrical to within ± 5 dB.

d) Detune the SMDA by ± 20 kHz (indication on Frequenzkontroller). With a level adjustment according to b), the deflection of the HFH must not exceed 39 dB.

Using Frequency Indicator Type FKM and Stereo Signal Generator Type SMSF for tuning indication

a) Adjust the Stereo Signal Generator Type SMSF and the Field-Strength Meter Type HFH to 10.7 MHz.

b) Select the 500-kHz range on the Frequency Indicator Type FKM.

c) Set the Coaxial Switch to FKM. Adjust the test frequency and maximum output voltage on the SMDA. Tune the SLSV so that the meter deflection of the FKM goes back to 0. Now set the coaxial switch to FILTER. Adjust the incremental tuning control of the SMDA and of the HFH for maximum indication on the HFH. Adjust the level to +120 dB referred to 0.1 µV.

d) Set the coaxial switch to FKM and adjust the SMSF for 0 deflection on the FKM.

e) Change the coaxial switchover to FILTER and detune the SMDA by ± 10 kHz (indication on FKM); check deflection of HFH. Correct the centre frequency of the SMDA according to c) until the deflection of the HFH is symmetrical to within ± 5 dB.

f) Set the coaxial switch to FILTER. Detune the SMDA by ± 20 kHz (indication on FKM). The meter deflection of the HFH must not exceed 39 dB if the level has been adjusted according to c).

The 100-MHz Counter Type FET 2 or the Frequency Counter Type FET 3, on which the IF and detuning by ± 20 kHz can be read, may be used in place of Types FKM and SMSF.

Calculation of noise/Hz bandwidth

Signal Level	120 dB
Noise level at 20 kHz from signal level . .	39 dB
Difference	81 dB
Conversion factor/Hz bandwidth	39 dB
at 8 kHz bandwidth [1])	
S/N ratio	120 dB/Hz

[1]) At other bandwidths: conversion factor/Hz = 10 log bandwidth

Minimum permissible S/N ratio: At 20 kHz from carrier 120 dB/Hz bandwidth.

Adjustment: Check performance of RF stages according to sections 5.3.4, 5.3.8 and 5.3.9.

3.2.2 Modulation Generator

3.2.2.1 Measuring the Frequency

Test setup

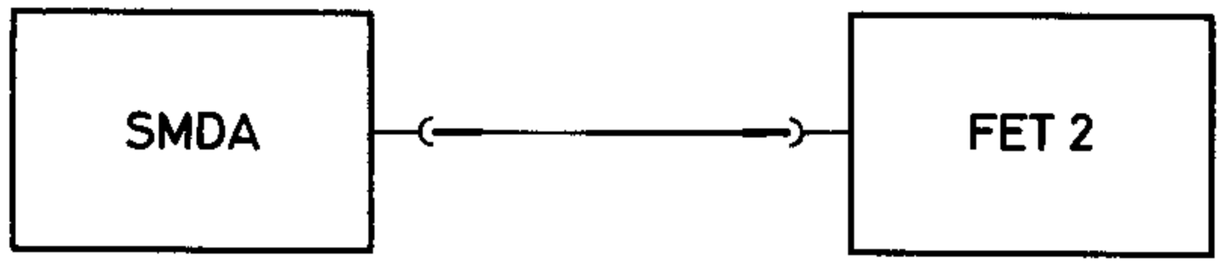


Fig. 3-7 Measurement of modulation-generator frequency

Measurement: Measure all fixed frequencies that can be selected with switch **8**. In position "0.3 kHz", check the fine tuning adjustable with knob **10**.

Permissible error: Fixed frequencies $\leqq \pm 1.5\,\%$; Fine tuning $\pm(5\,\% + 5$ Hz).

Adjustment: At uniform percentage deviations of the fixed frequencies adjust C3 on the modulation generator board 413141-6. If the adjustment range of C3 is insufficient, C4 (factory-adjusted) must be changed (see section 5.4.8). If deviations occur at the low generator frequencies (0.3 kHz and 0.4 kHz), adjust R141. A fine tuning error at – 30 Hz can be corrected for by means of R144.

3.2.2.2 Measuring the Output Voltage

Test setup

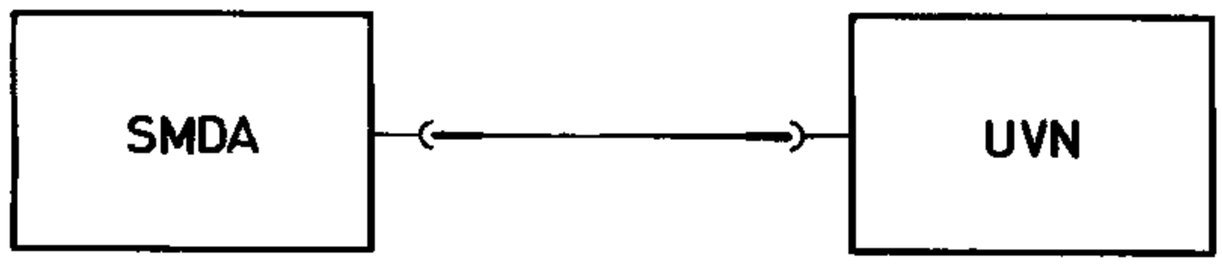


Fig. 3-8 Measurement of modulation-generator output voltage

Measurement: Measure the output voltage into 200 Ω at all selectable modulation frequencies.

Permissible error: see section 3.2.2.3. Adjustable in the range $<$ 0.5 mV to 1 V.

Adjustment: No adjustment is provided.

3.2.2.3 Checking the Output-voltage Indication

For the **test setup** see section 3.2.2.2 Fig. 3-8. Set INDICATION switch to MOD. GEN.

Measurement: Compare the indication of meter **5** in the modulation unit with the indication of the Millivoltmeter Type UVN. Take measurements at the lowest and at the highest modulation frequency and in each range of indication (full-scale deflection).

Permissible error $< \pm (2\,\% + 1.5\,\%$ of FS)

Adjustment: Adjust R36 on the meter circuit board 413141-7 in the modulation unit to the nominal value (see section 5.4.8).

3.2.2.4 Measuring the AF Distortion Factor

Test setup

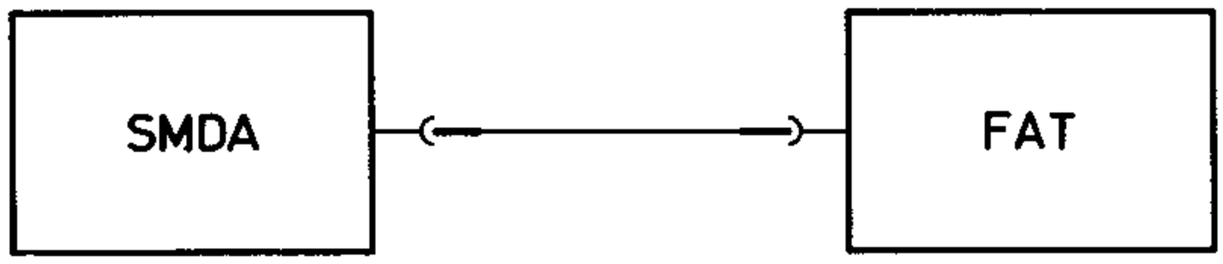


Fig. 3–9 Measurement of modulation-generator distortion

Measurements: Measure the maximum output voltage and its first, second and third harmonics into 200 Ω at all modulation frequencies.

Evaluation: Amplitude of modulation frequency a, Amplitude of 1st harmonic a_1, Amplitude of 2nd harmonic a_2, Amplitude of 3rd harmonic a_3.

$$\text{Distortion factor } d \approx \frac{\sqrt{a_1^2 + a_2^2 + a_3^2}}{a}\ 100\ (\%)$$

Permissible error $< 1\,\%$

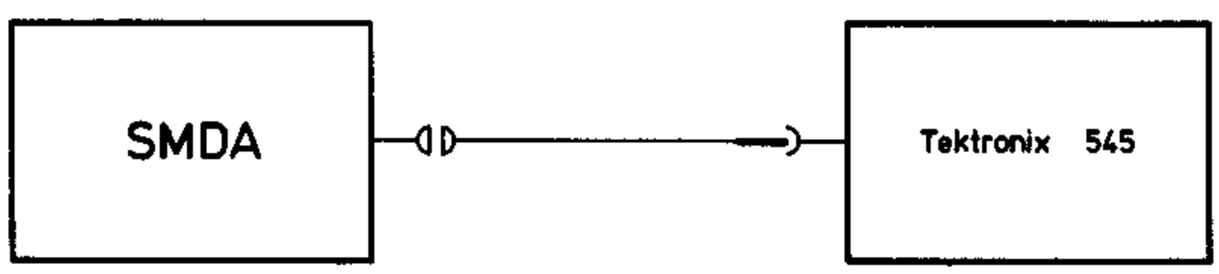
Adjustment: see section 5.3.8.

3.2.3 Modulation

3.2.3.1 Checking the Internal Amplitude Modulation

Test setup

a)



b)

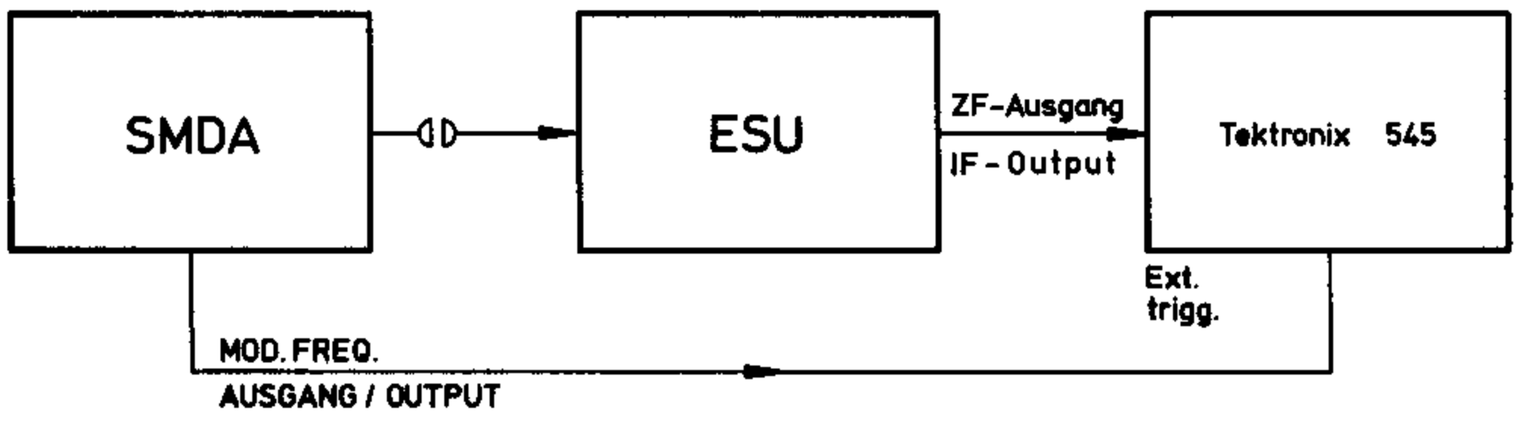


Fig. 3–10 Measurement of amplitude modulation
a). up to 20 MHz, b) above 20 MHz

Measurement: Measure the modulation depth according to the following pattern:

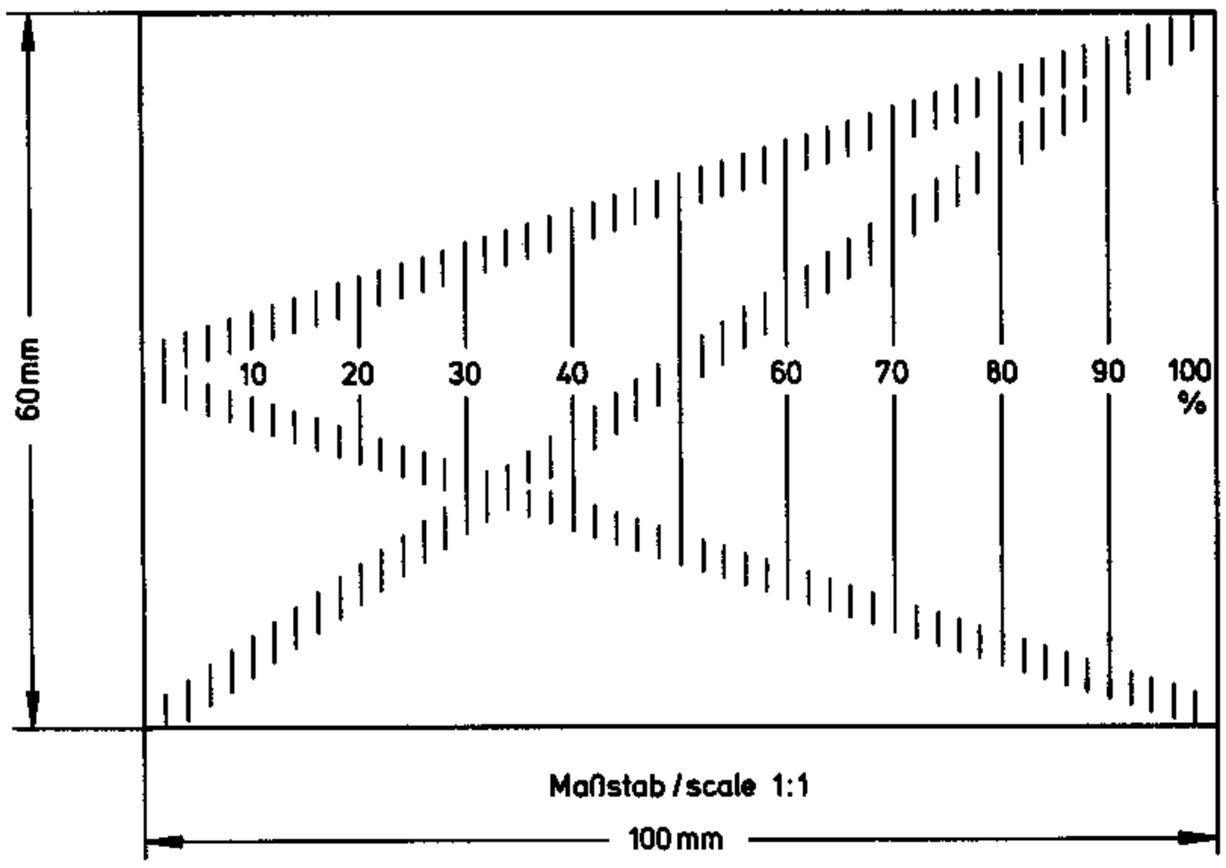


Fig. 3–11 Modulation depth read

Evaluation

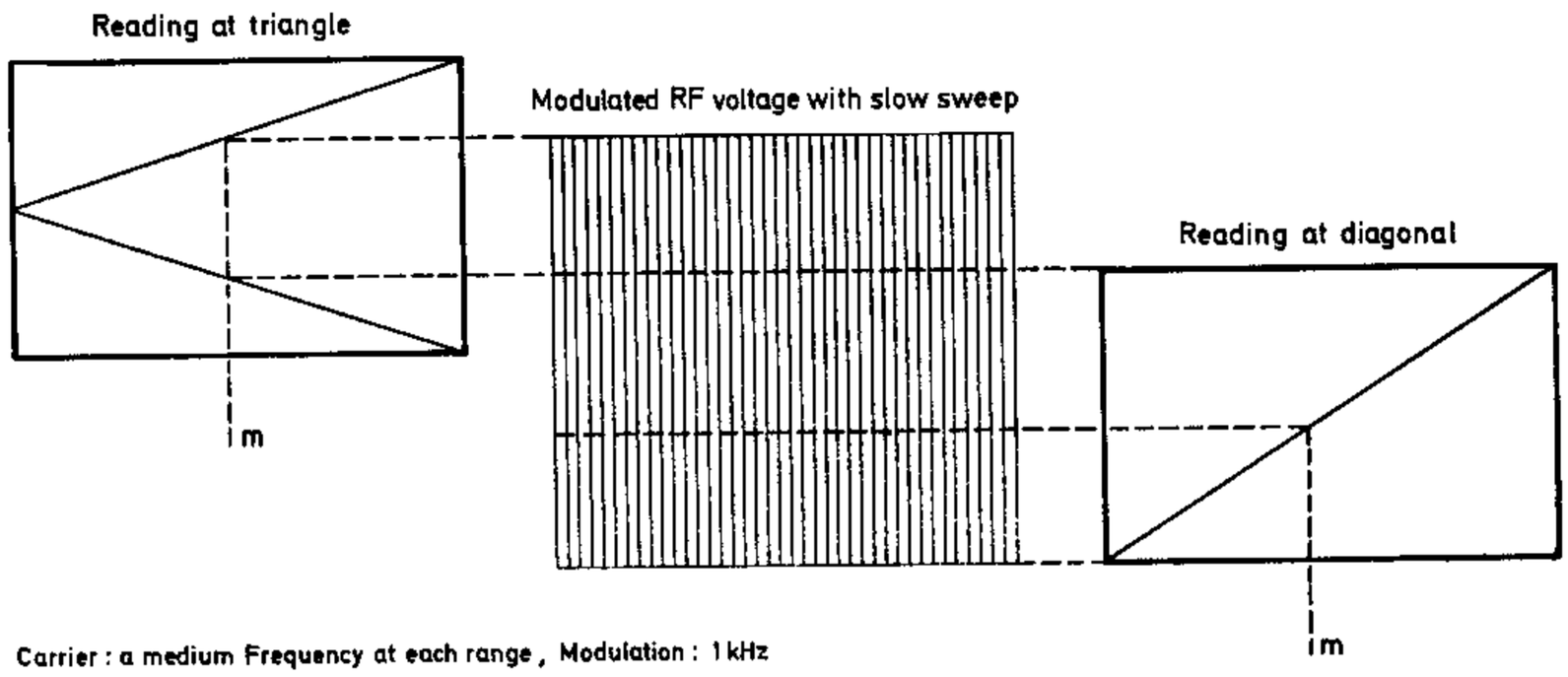


Fig. 3–12 Determination of the modulation depth

Permissible error: Permissible departure of modulation depth read on the pattern from the value adjusted on meter **5** ±(3 %+1.5 % of f.s.d.) valid up to < 90 %.

Example: 50 % modulation; range of indication 100 %;

$$\text{permissible error } \frac{50 \times 3}{100} + \frac{100 \times 1.5}{100} = 3\ \% \text{ modulation depth}$$

The indication may therefore vary between a modulation depth of 47 and 53 %.

Adjustment: see section 5.4.9.

3.2.3.2 Checking the External Amplitude Modulation

For the **test setup** see Fig. 3-10 section 3.2.3.1. Set the switch of the modulation unit to AM EXT., feed an AF voltage of 0 to 1.5 V_{rms}, 1 kHz, to the AM EXT. socket.

Measurement: As described in section 3.2.3.1 for internal amplitude modulation, using modulation frequencies between 40 Hz and 4 kHz, 80 % modulation.

Permissible error: Voltage requirement for external modulation approx. 15 mV/% mod. Error of indication as in section 3.2.3.1.

Adjustment: No adjustment is provided.

3.2.3.3 Measuring the Spurious AM with Frequency Modulation

For the **test setup** see Fig. 3-10 section 3.2.3.1.

Measurement: As described in section 3.2.3.1. Adjust for a frequency deviation of 10 kHz with a modulation frequency of 1 kHz.

Permissible spurious AM $< 1\ \%$

Adjustment: No adjustment is provided.

3.2.3.4 Measuring the Modulation Distortion with AM

Test setup

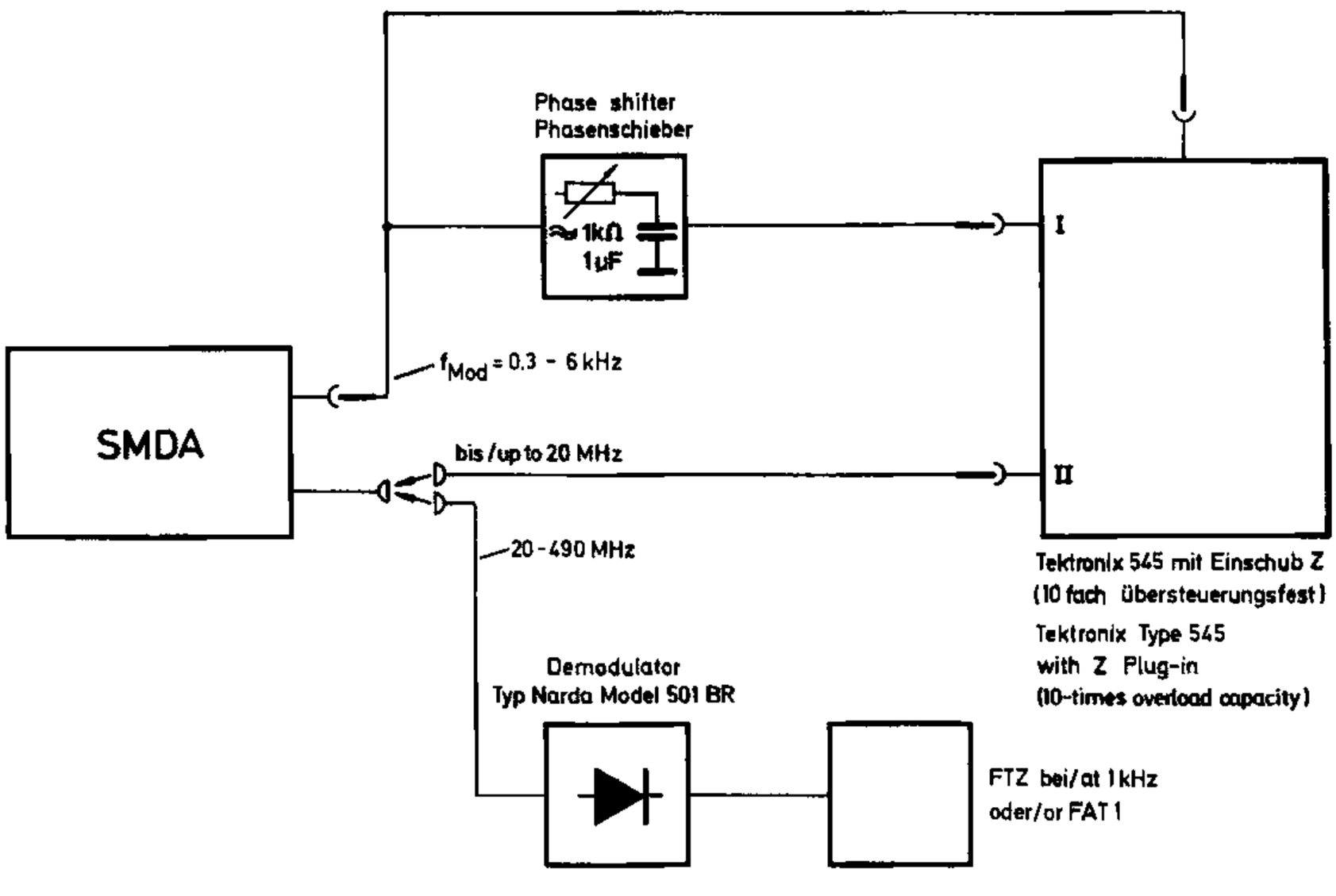
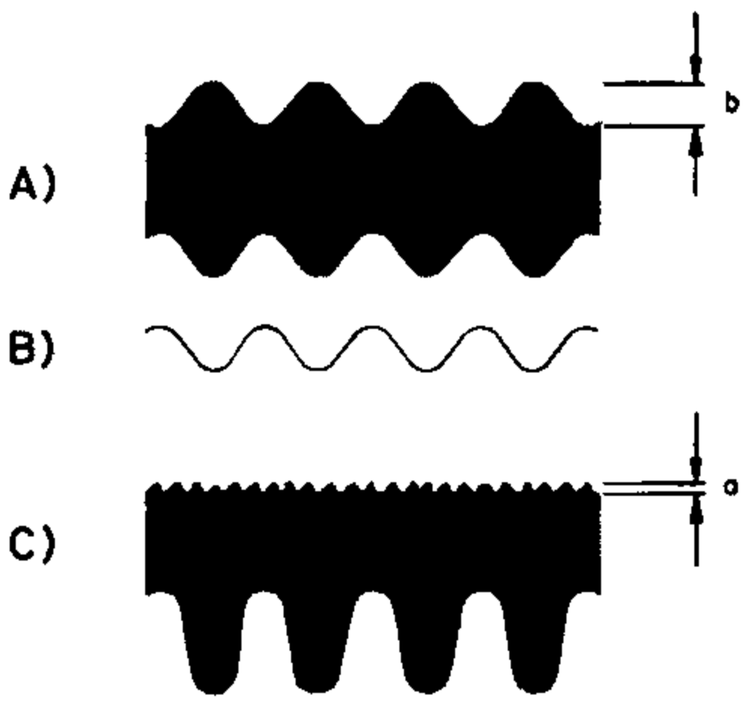


Fig. 3–13 Measurement of modulation distortion with AM

Measurement: Range I (0.4 to 20 MHz): Use an oscilloscope; no demodulator is required. Adjust the AF voltage and the phase so that the envelope of the carrier voltage is compensated for as far as possible.



Evaluation: $d_m = \frac{a\,[V_{pp}]}{b\,[V_{pp}]}\,100\,\%$

Fig. 3-14 Oscillograms

A) Carrier voltage at oscilloscope input II
B) AF voltage at oscilloscope input I
C) Difference voltage = AF voltage carrier voltage
a = residual ripple
b = envelope

Adjust the carrier voltage of the envelope b and the AF voltage separately to about the same value. Form the difference of the voltages at inputs I and II. Adjust the AF amplitude for minimum residual ripple, correct the symmetry with the phase shifter, if necessary overmodulate the amplitudes by accurately known amounts.

Ranges I to VII (20 to 484 MHz): Tune the demodulator to the carrier signal, connect the Distortion Meter Type FTZ or the AF Wave Analyzer Type FTA to the AF output. Read distortion factor or harmonics.

Permissible distortion factor at 80 % modulation (40 Hz to 4 kHz) < 5 % (typical value 3 %).

Adjustment: see section 5.3.8.

3.2.3.5 Checking the Internal Frequency Modulation

Test setup (f = 20 to 484 MHz)

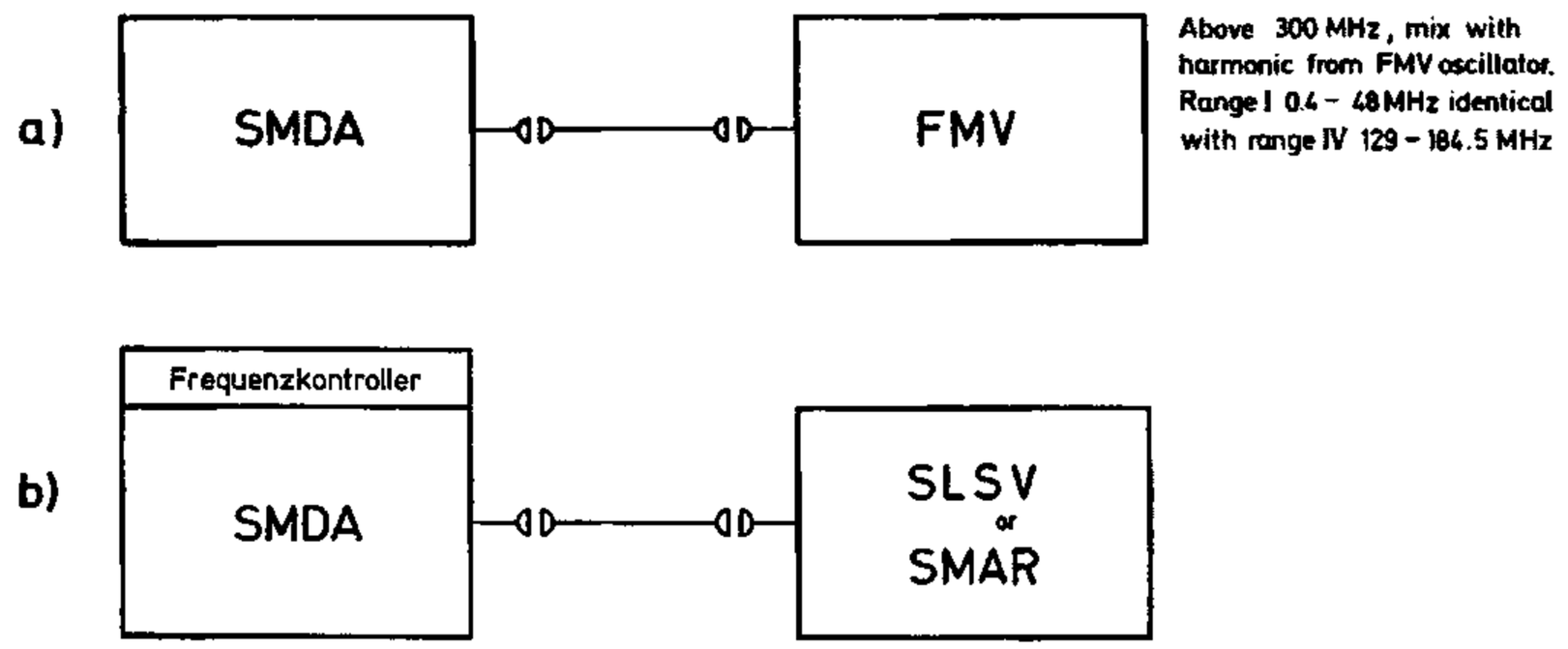


Fig. 3-15 Checking of internal FM und φM

a) using frequency deviation meter, b) using Frequenzkontroller
$f_{rec} = f_{gen} + f_{mix}$ = conversion to a frequency suitable for the frequency deviation meter

Measurement: According to Fig. 3-15 a):

Tune the frequency deviation meter and read the frequency deviation on the panel meter.
According to Fig. 3-15 b): Adjust the following controls:

SMDA: Output attenuator to < 1 W
Frequency deviation as for Fig. 3-15 a)
NOTE: Distortion measurement is possible only at 2 kHz modulation frequency.

Frequenzkontroller: Operation "+" or "–", adjust frequency deviation, range of frequency deviation indication 20 kHz.

SLSV: Adjust trequency to frequency of SMDA.

SMAR: Adjust level to 1.5 V into 50 Ω.

Take all measurements at least at 3 points of each frequency range (upper limit, centre and lower limit). Modulation frequency: preferably 1 kHz.

Permissible error: Permissible departure of measured frequency deviation from setting on meter **5** < ±(5 %+1.5 % of FS) [1])

Adjustment: If the departures vary in the direction (see section 5.4.8), adjust with R35 (in 413141-7 S). If the departures differ adjust the oscillator according to section 5.4.2. In case of uniform departures in one or several frequency ranges adjust the deviation network according to section 5.4.3.

3.2.3.6 Checking the External Frequency Modulation

For the **test setup** see Fig. 3-15 section 3.2.3.5.

Measurement: Take the measurement as described in section 3.2.3.5 but set the FM switch of the SMDA to EXT. and feed a modulation voltage to the FM EXT. socket. Voltage requirement for ext. modulation approx. 30 mV/kHz frequency deviation.

Permissible error: The permissible error of indication is the same as in section 3.2.3.5.

3.2.3.7 Measuring the Modulation Distortion with FM

Fig. 3-16 Measurement of modulation distortion with FM and φM

Take measurements in the frequency ranges above 20 MHz. The values for the frequency range 129 to 184.5 MHz are valid also for the range 0.4 to 48 MHz. (Check in the range 20 to 48 MHz).

Measurement: Tune the Frequency Deviation Meter Type FMV to the frequency set on the SMDA; then the distortion can be read directly on the Distortion Meter Type FTZ. Take all measurements at the medium frequencies of each range. The frequency deviation is 4 kHz or 25 kHz at a modulation frequency of 1 kHz.

Permissible modulation distortion: at 4 kHz frequency deviation < 1 %, at 25 kHz frequency deviation < 5 %, at 75 kHz frequency deviation < 10 %.

Adjustment: No adjustment is provided.

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[1]) Approx. 15 % from 401–420 MHz and from 470–484 MHz.

3.2.3.8 Checking the Phase Modulation

For checking the phase modulation proceed as for checking the frequency modulation (see sections 3.2.3.5 and 3.2.3.6) according to Fig. 3-15 at a modulation frequency of 1 kHz with $\Delta f/f_{mod}$ corresponding to the frequency deviation. Set switch φM-FM to position φM and the type-of-indication selector to φM [$\Delta f/f_{MOD}$].

3.2.3.9 Checking the Level Adjustment Frequency of the Pase Modulation

Measurement: Modulate the SMDA with a frequency of 1 kHz. Set switch φM-FM to position φM. Read the frequency deviation on meter **5**.

Permissible error: $< 3\,\%$.

Adjustment: No adjustment is provided.

3.2.3.10 Checking the AF Response with Phase Modulation

The built-in modulation generator may be used for checking.

Measurement: Select the modulation frequency 0.3 kHz with switch **8**. Set switch φM-FM to position φM and the type-of-indication selector to FM [kHz]. Adjust for a frequency deviation of 1 kHz and increase the modulation frequency with switch **8**. The frequency deviation must increase with the frequency.

Permissible errors: up to 3 kHz – 3 %, up to 5 kHz – 6 %, up to 10 kHz – 30 %.

Adjustment: No adjustment is provided.

3.2.3.11 Measuring the Modulation Distortion with φM

For the **test setup** see Fig. 3-16 section 3.2.3.7. Proceed as for FM, described in section 3.2.3.7.

Permissible modulation distortion: at 4 kHz frequency deviation $< 1\,\%$, at 25 kHz frequency deviation $< 5\,\%$, at 75 kHz frequency deviation $< 10\,\%$.

Adjustment: No adjustment is provided.

3.2.3.12 Checking the Response Threshold of the Maximum Frequency Deviation Indication

Measurement: Set switch φM-FM to position FM- or φM-INT., the type-of-indication selector to position FM [kHz] and switch **3** to position 100. Adjust for a modulation frequency of 1 kHz (switch **8**). Increase the frequency deviation using knob **18** until lamp **21** lights up (78 kHz). The phase and the frequency modulation should have been checked beforehand. If this is not the case, the AF Millivoltmeter Type UVN may be used to measure the AF voltage (2.5 V_{rms}) at the socket Bu3.30 (413141-5 S).

Permissible errors: when measuring the frequency deviation +4 kHz; when measuring the AF voltage +0.2 V.

Adjustment: No adjustment is provided.

3.2.3.13 Checking the Automatic IF Generation

For the **test setup** see section 3.2.1.1. Feed a voltage of +14 V into the socket Bu7R on the rear wall of the SMDA via a 82-kΩ resistance.

Measurement: Vary the signal generator frequency at the beginning, in the middle and at the end of each frequency range by cutting the DC voltage present at socket Bu7R into circuit and out of circuit. The frequency difference should be approximately 110 kHz.

Permissible error: ±12 kHz.

Adjustment: In the case of one-sided deviations, adjust with R150 (in 413141-5 S).

3.2.4 Measuring the Voltage at RF Output II

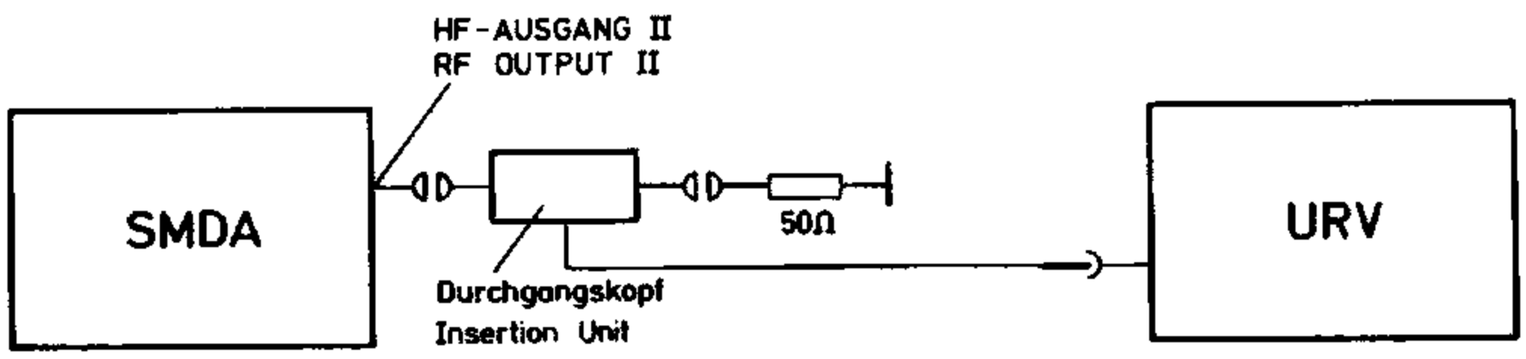

Fig. 3-17 Voltage measurement at RF OUTPUT II

Measurement: Measure at one point in each frequency range. Output voltage 15 to 75 mV_{rms}.
Adjustment: see section 5.3.7.

3.2.5 Measuring the RF Distortion Factor

The RF distortion factor must be measured with a sampling oscilloscope (Tektronix Type 1S1) at RF output II.

Permissible distortion factor: ≦ 10 %. In particular, no additional zero passages must occur.

3.2.6 Measuring the Frequency Deviation in Sweep Operation

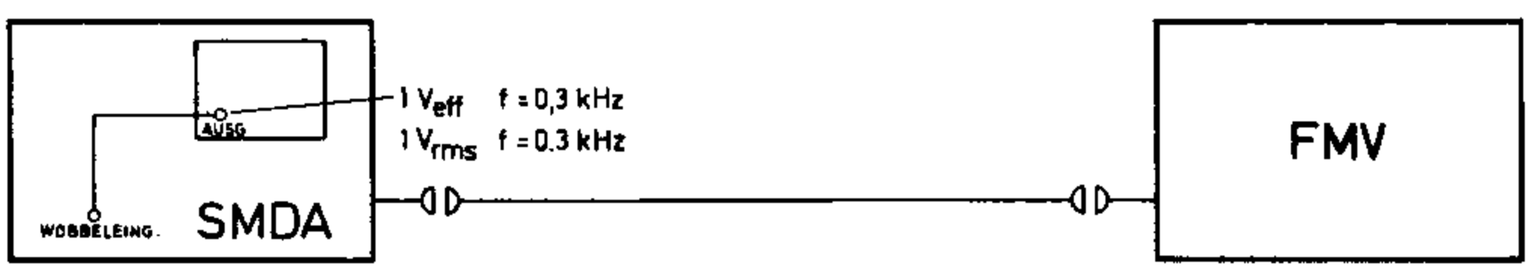

Fig. 3-18 Frequency-deviation measurement in swept-frequency operation

Measurement: Measure at one point in each frequency range.

Range	Frequency deviation at 1 V_{rms}	
I	4.8 kHz	±15 %
II	19 kHz	
III	38 kHz	
IV	38 kHz	
V	76 kHz	
VI	76 kHz	
VII	79 kHz	

Table 3 Measuring the frequency deviation in sweep operation

Adjustment: See section 5.4.2 Deviation (with DC) measured via synchronization input.

3.2.7. Measuring the RF Leakage

The RF leakage of the SMDA has been minimized to such an extent that at a distance of approximately 0.5 m the field strength is less than 1 µV. Since the field strength decreases with the third power of the distance, signals can, however, be received with a selective antenna at 5 cm from the instrument. For the measurement, a receiver for 400 MHz with a sensitivity of $> 1\ \mu V_{EMF}$ is required for 6 dB signal-to-noise ratio.

3.2.7.1 Determination of the Receiver Sensitivity

Test setup

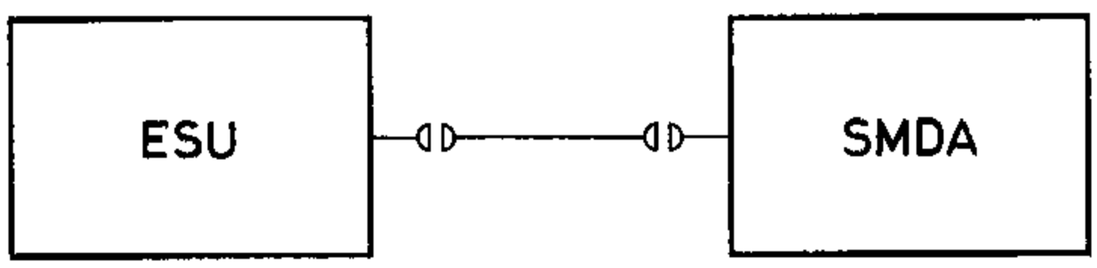

Fig. 3–19 Measuring of the Receiver Sensitivity

Measurement: In all measurements make sure that the cables exhibit no RF leakage and that the contact resistances are kept to a minimum.

Adjust the following controls on the SMDA: Attenuator to – 130 dBV, Switch FM to INT., Switch **3** to 4 kHz frequency deviation, Switch **8** to f_{mod} = 1 kHz and Switch AM to UNMOD. Adjust the receiver as follows: Select maximum sensitivity, Turn the control CALIBRATION II fully clockwise, select a bandwidth of 12.5 kHz, use average-responsive indication, operate without AFC and note noise deflection.

Advance the attenuator control on the SMDA until the deflection on the receiver has increased by 6 dB. The 6-dB value must be below 1 μV_{EMF}. Then advance the attenuator control on the SMDA further until 1 μV_{EMF} is reached. The corresponding indication on the receiver serves as a point of reference for all other measurements and should be noted down.

3.2.7.2 Measuring the RF Leakage

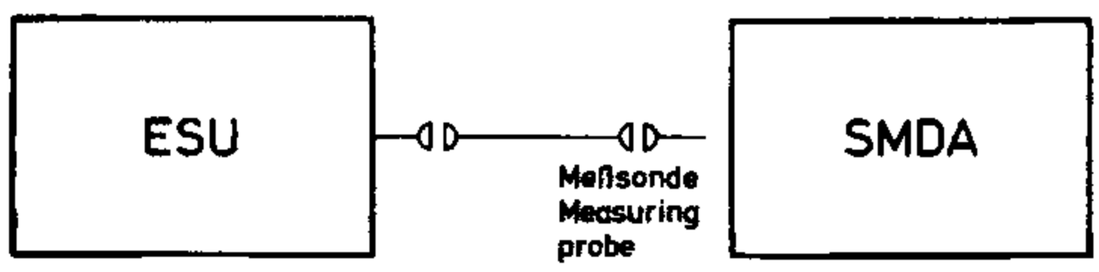

Fig. 3–20 Measuring of RF Leakage

Measurement: Test frequency: 450–470 MHz. The measuring probe should be 16 cm long (length of copper wire at the end of a cable). Allow the receiver and the SMDA to warm up. Make the adjustments according to section 3.2.7.1. Connect the measuring probe and tune the receiver to the frequency of the signal generator. For this purpose, the antenna should be placed near the output socket of the SMDA and the attenuator of the SMDA be set to approximately 1 V_{EMF}. Then short-circuit the RF OUTPUT II of the SMDA and set the attenuator of the SMDA to – 130 dBV. At the attenuator setting 1 V_{EMF}, greater unwanted radiation occurs but this is of no consequence in practical applications since high protection against leakage is required only when adjusting very small output voltages. Now find the maximum field strength at a distance of approximately 5 cm from the SMDA, using the measuring probe.

Test result: A deflection of 8 dB above the reference value is permissible. If a higher level is measured (from approximately 6 dB above the nominal level), first check the connecting cables for leakage. Particular attention should be paid to the cables K8 and K9. If all cables are properly assembled and connected to chassis and there is still leakage, remove the cable K1 from the amplifier and shield the cable end. If this does not stop leakage either, unscrew the cover of the oscillator and clean it. Then check the neoprene padding for sufficient pressure and thickness (minimum thickness 2 mm with foil). If necessary, replace the cover (41314-2.40). Clean the cover and the casing prior to reassembly with trichlorethylene or alcohol. If the oscillator is RF tight, replace the cable K1, loosen cable K8 and provide socket Bu19 with an earthed shield. If the SMDA still exhibits leakage, unscrew the two amplifier covers. The foils must not be damaged. New covers can be ordered under the Stock Nos. 41314-5.7 and 41314-5.8. The covers and the edges of the amplifier chassis must be cleaned with trichlorethylene or alcohol. If necessary, a second washer may be used with the screws. Check the cables K8, K9 and K10 for proper connection to chassis and screw down tightly.

3.2.8 Checking the Output Voltage on the VOR-ILS Unit

Measurement: With the VOR-ILS Unit connected, connect the Multimeter UGWD between chassis and contact 1 of socket 31 VOR-ILS ADAPTER. Set output attenuator 13 to -10 dB. The output voltage at Bu31/1 should be 0 V at 115 MHz.

Permissible error: ±20 mV

Adjustment: The voltage can be adjusted to 0 V using R276 in the AGC amplifier 41314-3.10.7; see also 5.4.4.

3.3 Mechanical Maintenance

3.3.1 Cleaning

Cabinet: Wipe the cabinet with a dry non-fuzzy cloth.

Front panel: Remove the panel controls (see section 4.19.1) and clean the front panel with a cloth moistened with alcohol. Do not use polish or any solvents. Do not disengage the tuning drive.

Interior: Withdraw the chassis from the cabinet according to section 3.3.2 and clean with compressed air and a soft brush.

3.3.2 Withdrawing the Chassis from the Cabinet

Loosen the four Phillips-type screws which are accessible through the bore holes in the carrying handles. Then the chassis can be withdrawn from the cabinet. NOTE: Pull out the power plug before withdrawing the chassis from the cabinet. If the SMDA is operated without its cabinet, parts carrying AC supply voltage are accessible. The safety rules regarding work on live equipment must be observed.