Sub-part
2.983(e): TEST AND MEASUREMENT DATA

All tests and measurement data shown were performed in accordance with FCC Rules and Regulations, Volume II; Part 2, Sub-part J, Sections 2.981, 2.983, 2.985, 2.987, 2.989, 2.991, 2.993, 2.995, 2.997, 2.999 and the following individual Parts:

___ 21 - Domestic Public Fixed Radio Services
___ 22 - Public Mobile Services
_x_ 22 Subpart H - Cellular Radiotelephone Service
_X_ 22.901(d) - Alternative technologies and auxiliary services
___ 23 - International Fixed Public Radiocommunication services
___ 24 - Personal Communications Services
___ 74 Subpart H - Low Power Auxiliary Stations
___ 80 - Stations in the Maritime Services
___ 80 Subpart E - General Technical Standards
___ 80 Subpart F - Equipment Authorization for Compulsory Ships
___ 80 Subpart K - Private Coast Stations and Marine Utility Stations
___ 80 Subpart S - Compulsory Radiotelephone Installations for Small Passenger Boats
___ 80 Subpart T - Radiotelephone Installation Required for Vessels on the Great Lakes
___ 80 Subpart U - Radiotelephone Installations Required by the Bridge-to-Bridge Act
___ 80 Subpart V - Emergency Position Indicating Radiobeacons (EPIRB'S)
___ 80 Subpart W - Global Maritime Distress and Safety System (GMDSS)
___ 80 Subpart X - Voluntary Radio Installations
___ 87 - Aviation Services
___ 90 - Private Land Mobile Radio Services
___ 94 - Private Operational-Fixed Microwave Service
___ 95 Subpart A - General Mobile Radio Service (GMRS)
___ 95 Subpart C - Radio Control (R/C) Radio Service
___ 95 Subpart D - Citizens Band (CB) Radio Service
___ 95 Subpart E - Family Radio Service
___ 95 Subpart F - Interactive Video and Data Service (IVDS)

GENERAL INFORMATION

1. Prior to testing, the deviation for audio modulation and each of the respective SAT + ST tones were set as close to possible to the required limit.

2. Except for audio modulation, which was applied externally, Wideband Data, SAT, ST and all other tones and operational modes were provided by a test control unit incorporating appropriate software. Worst case repetition rate for Wideband Data was 10 kb/s.

3. Spurious radiation was measured at three (3) meters.

4. The two cellular frequency bands are available to the user automatically. Please refer to the manual contained in the documentation.

5. The normal modes of modulation are:

(a)	VOICE	x
(b)	WIDEBAND DATA	x
(c)	SAT	x
(d)	ST	x
(e)	SAT + VOICE	x
(f)	SAT + DTMF	x
(g)	CDMA	
(h)	TDMA	
(i)	NAMPS VOICE	x
(j)	NAMPS DSAT	x
(k)	NAMPS ST	x
(l)	NAMPS VOICE + DSAT	

STANDARD TEST CONDITIONS and ENGINEERING PRACTICES

Except as noted herein, the following conditions and procedures were observed during the testing:

ROOM TEMPERATURE	= 25±5°C
ROOM HUMIDITY	= 20-50%
D.C. SUPPLY VOLTAGE, Vdc	= 3.6
A.C. SUPPLY VOLTAGE, Vac	= N/A
A.C. SUPPLY FREQUENCY, Hz	= N/A

Prior to testing, the E.U.T. was tuned up in accordance with the manufacturer's alignment procedures. All external gain controls were maintained at the position of maximum and/or optimum gain throughout the testing.

Measurement results, unless otherwise noted, are worst case measurements.

NAME OF TEST: R. F. POWER OUTPUT (CONDUCTED)

PARAGRAPH: 47 CFR 2.985 (a)

GUIDE: TIA/EIA STANDARD IS-19-B

TEST CONDITIONS: STANDARD TEMPERATURE & HUMIDITY

TEST EQUIPMENT: AS PER ATTACHED PAGE

MEASUREMENT PROCEDURE

1. The E.U.T. was connected to a resistive coaxial attenuator of normal load impedance, and the unmodulated output power was measured by means of an R. F. Power Meter.

2. Measurement accuracy is ±3%.

MEASUREMENT RESULTS

NOMINAL, MHz	CHANNEL	R.F. POWER OUTPUT, WATTS Lo	Hi
✓ AMPS MODE:			
824.040	991	0.006	0.5
836.400	380	0.006	0.5
848.970	799	0.006	0.5
CDMA/TDMA/✓NAMPS (AS APPROPRIATE) MODE:			
825.290		0.006	0.5
836.400		0.006	0.5
847.720		0.006	0.5

SUPERVISED BY: MORTON FLOM, P. Eng.

NAME OF TEST: R. F. POWER OUTPUT (RADIATED)

PARAGRAPH: 47 CFR 2.985 (a)

GUIDE: TIA/EIA STANDARD IS-19-B

TEST CONDITIONS: STANDARD TEMPERATURE & HUMIDITY

TEST EQUIPMENT: AS PER ATTACHED PAGE

MEASUREMENT PROCEDURE

1. The E.U.T. was placed on an open-field site and its radiated field strength at a known distance was measured by means of a spectrum analyzer. Equivalent loading was calculated from the equation $P_t=((E \times R)^2/49.2)$ Watts, where R = 3m.
2. Measurement accuracy is ±1.5 dB.

MEASUREMENT RESULTS

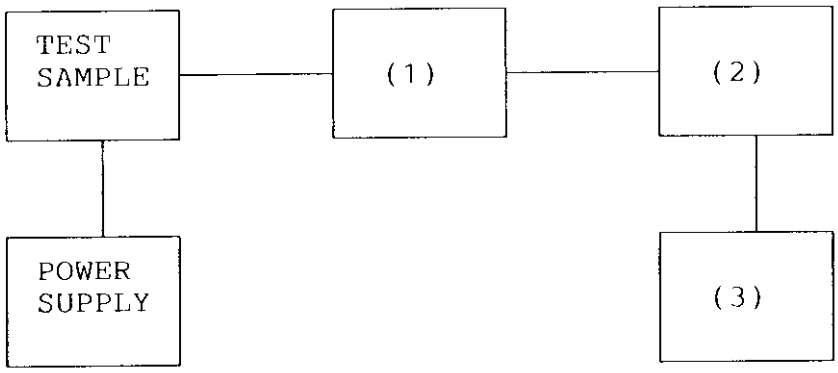
NOMINAL, MHz	CHANNEL	R.F. POWER OUTPUT, WATTS ERP		
		Lo	Hi	
AMPS MODE:				
		0.005	0.389	
		0.007	0.593	+2
		0.006	0.502	
NAMPS MODE:				
	991	0.0095	0.631	-.52
	380	0.010	0.741	
	799	0.0085	0.707	

SUPERVISED BY: M. Flom P. Eng.

MORTON FLOM, P. Eng.

R.F. POWER OUTPUT (A.M. OR F.M.)

TEST 1: R. F. POWER OUTPUT
TEST 2: FREQUENCY STABILITY



(1) COAXIAL ATTENUATOR

NARDA 766-10	x
SIERRA 661A-30	
BIRD 8329 (30 dB)	
_____	

(2) POWER METERS

HP 435A	
HP 436A	x
HP 8901A	x
_____	

(3) FREQUENCY COUNTER

HP 5383A	
HP 5334B	x
HP 8901A FREQUENCY MODE	x
_____	

NAME OF TEST: MODULATION CHARACTERISTICS - FREQUENCY RESPONSE OF AUDIO MODULATING CIRCUIT

PARAGRAPH: 47 CFR 2.987 (a)

GUIDE: TIA/EIA STANDARD IS-19-B

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: AS PER ATTACHED PAGE

MEASUREMENT PROCEDURE

1. The E.U.T. and test equipment were set up as shown on the following page.

2. The audio signal generator was connected to the audio input circuit/microphone of the E.U.T.

3. The audio signal input was adjusted to obtain 20% modulation at 1 kHz, and this point was taken as the 0 dB reference level.

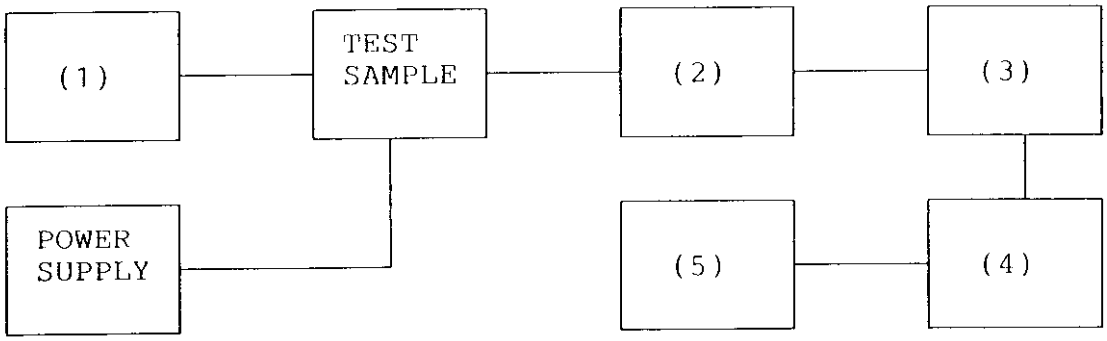
4. With input levels held constant and below limiting at all frequencies, the audio signal generator was varied from 100 Hz to 50 kHz.

5. The response in dB relative to 1 kHz was then measured, using the HP 8901A Modulation Analyzer.

6. MEASUREMENT RESULTS: ATTACHED

TRANSMITTER TEST SET-UP

TEST A. MODULATION CAPABILITY/DISTORTION
TEST B. AUDIO FREQUENCY RESPONSE
TEST C. HUM AND NOISE LEVEL
TEST D. RESPONSE OF LOW PASS FILTER
TEST E. MODULATION LIMITING



(1) AUDIO OSCILLATOR/GENERATOR

HP 204D	___
HP 8903A	x
_____	___

(2) COAXIAL ATTENUATOR

NARDA 766-10	___
SIERRA 661A-30	x
BIRD 8329 (30 dB)	___
_____	___

(3) MODULATION ANALYZER

HP 8901A	x
_____	___

(4) AUDIO ANALYZER

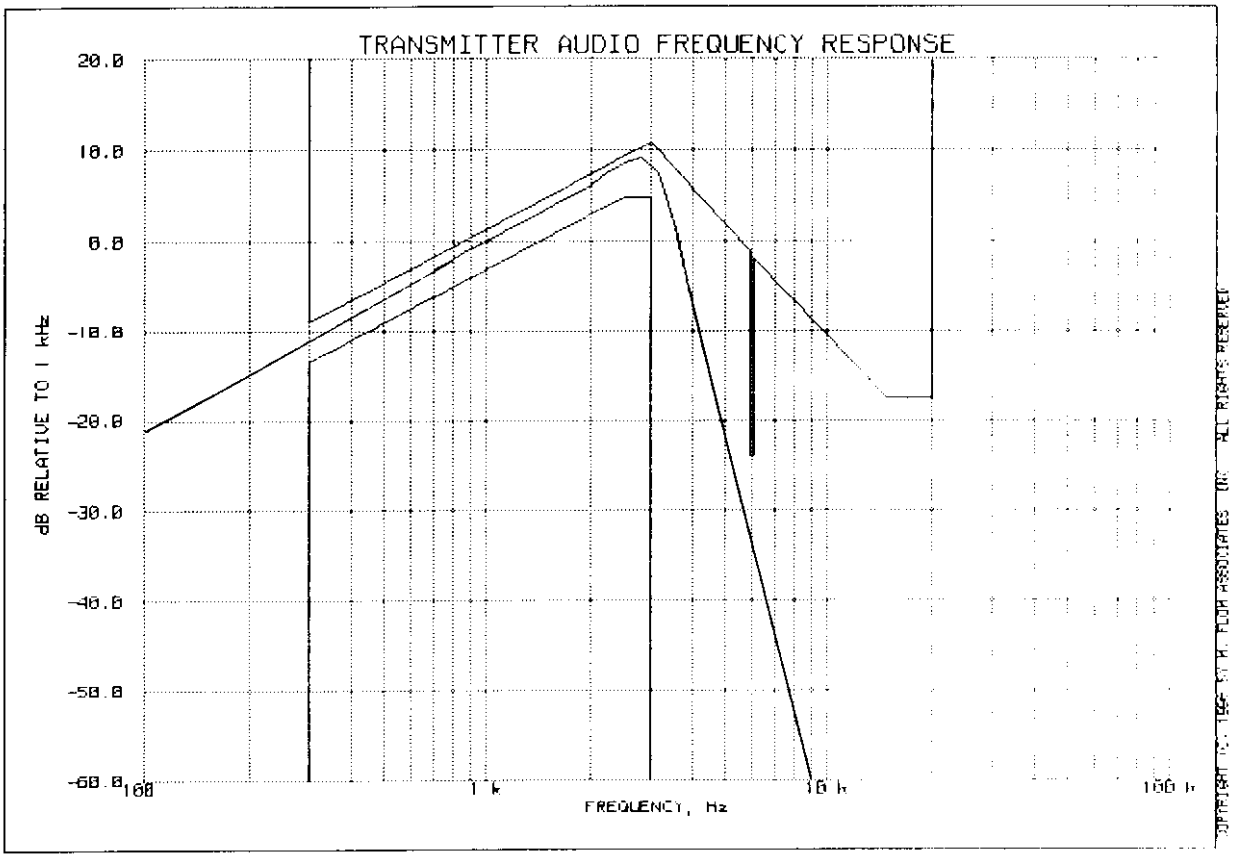
HP 8903A	x
_____	___

(5) SCOPE

HP 54502A	___
_____	___

GML NHA-9S

TRANSMITTER AUDIO FREQUENCY RESPONSE
NOKIA, 282N, NHA-9SA AMPS
1 JUL 1998, 11:30



PEAK AUDIO FREQUENCY, Hz: 2820

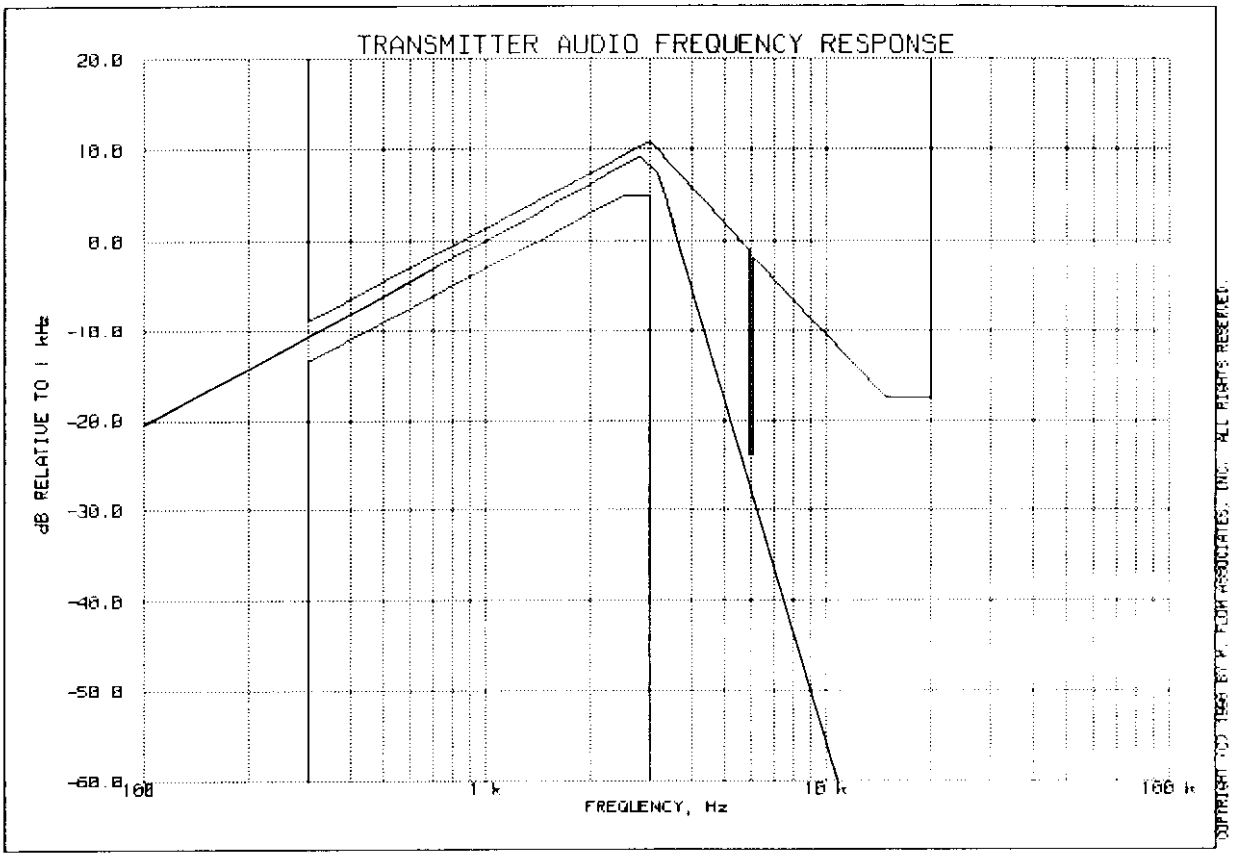
TABLE VALUES:

FREQUENCY, Hz	LEVEL, dB	FREQUENCY, Hz	LEVEL, dB	FREQUENCY, Hz	LEVEL, dB
300	-9.1	30000	-12.5		
20000	-12.7	50000	-12.5		

SUPERVISED BY: MORTON FLOM, P. Eng.

GML NHA-9S

TRANSMITTER AUDIO FREQUENCY RESPONSE
NOKIA, 282N, NHA-9SA NAMPS
1 JUL 1998, 08:45



PEAK AUDIO FREQUENCY, Hz: 2820

TABLE VALUES:

FREQUENCY, Hz	LEVEL, dB	FREQUENCY, Hz	LEVEL, dB	FREQUENCY, Hz	LEVEL, dB
300	-8.5	30000	-11.7		
20000	-11.6	50000	-11.6		

SUPERVISED BY: MORTON FLOM, P. Eng.

NAME OF TEST: MODULATION CHARACTERISTICS - FREQUENCY RESPONSE OF AUDIO LOW PASS FILTER

PARAGRAPH: 47 CFR 2.987 (a)

GUIDE: TIA/EIA STANDARD IS-19-B

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: AS PER PREVIOUS PAGE

MEASUREMENT PROCEDURE

1. The E.U.T. and test equipment were set up such that the audio input was connected at the input to the modulation limiter, and the modulated stage.

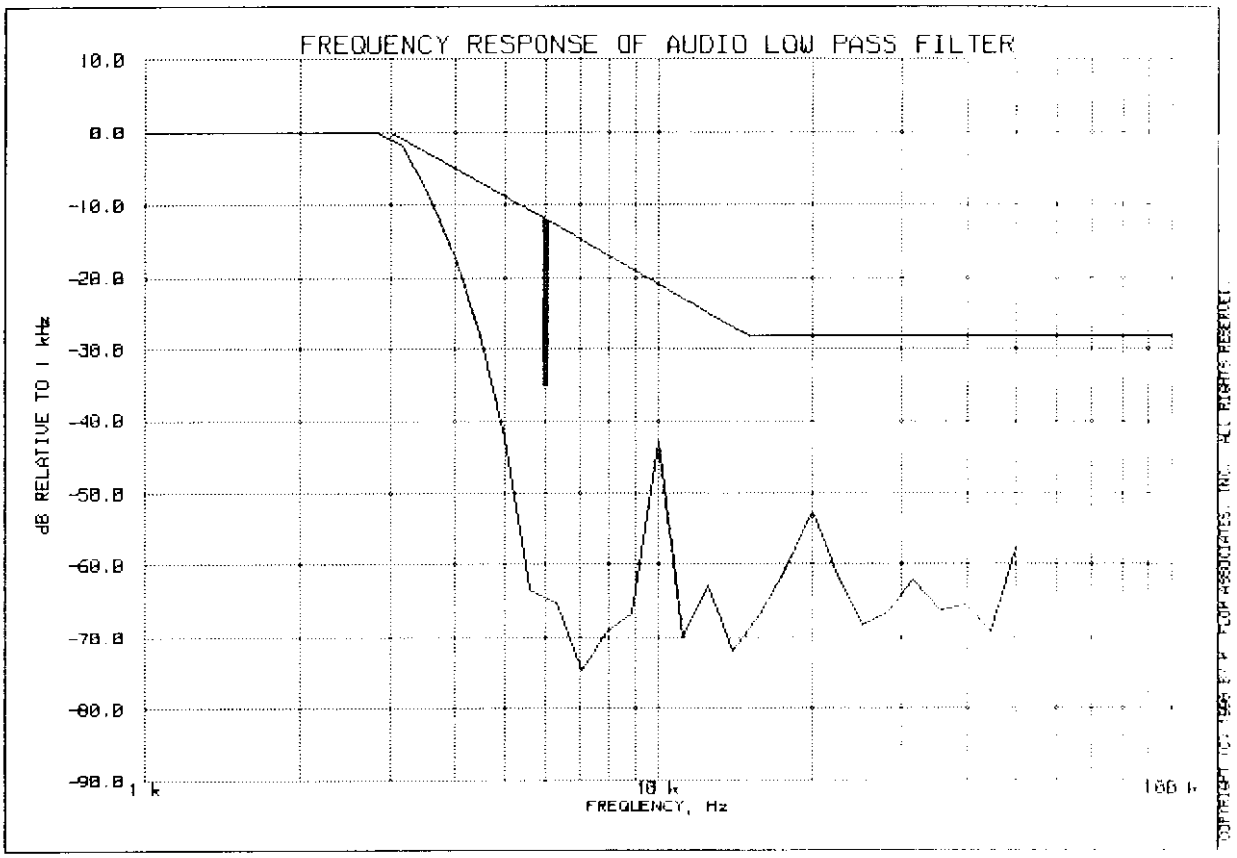
2. The audio output was connected at the output to the modulated stage.

3. MEASUREMENT RESULTS: ATTACHED

PAGE 13.1.

GML NHA-9S

FREQUENCY RESPONSE OF AUDIO LOW PASS FILTER
NOKIA, 282N, NHA-9SA AMPS
1 JUL 1998, 11:34



PEAK AUDIO FREQUENCY, Hz: 2820

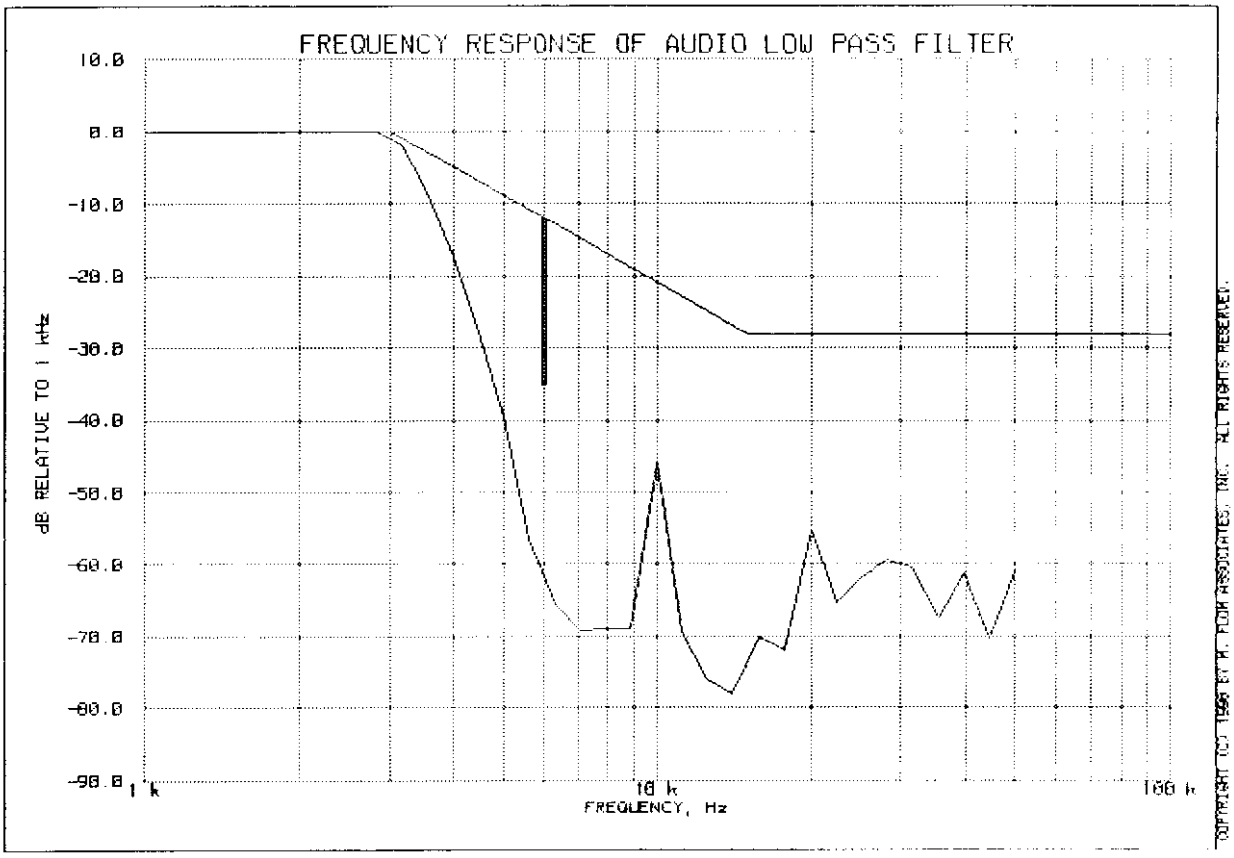
SUPERVISED BY:

MORTON FLOM, P. Eng.

PAGE 13.2.

GML NHA-9S

FREQUENCY RESPONSE OF AUDIO LOW PASS FILTER
NOKIA, 282N, NHA-9SA NAMPS
1 JUL 1998, 08:48



PEAK AUDIO FREQUENCY, Hz: 2820

SUPERVISED BY:

MORTON FLOM, P. Eng.

NAME OF TEST: MODULATION CHARACTERISTICS - MODULATION LIMITING

PARAGRAPH: 47 CFR 2.987 (b)

GUIDE: TIA/EIA STANDARD IS-19-B

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: AS PER PREVIOUS PAGE

MEASUREMENT PROCEDURE

1. The audio signal generator was connected to the audio input circuit/microphone of the E.U.T. as for "Frequency Response of the Audio Modulating Circuit."

2. The modulation response was measured for each of three tones (one of which was the frequency of maximum response), and the input voltage was varied and was observed on an HP 8901A Modulation Analyzer.

3. The audio input level was varied from 30% modulation (±3.6 kHz deviation) to at least 20 dB higher than the saturation point.

4. Measurements were performed for both negative and positive modulation and the respective results were recorded.

5. MEASUREMENT RESULTS: ATTACHED FOR

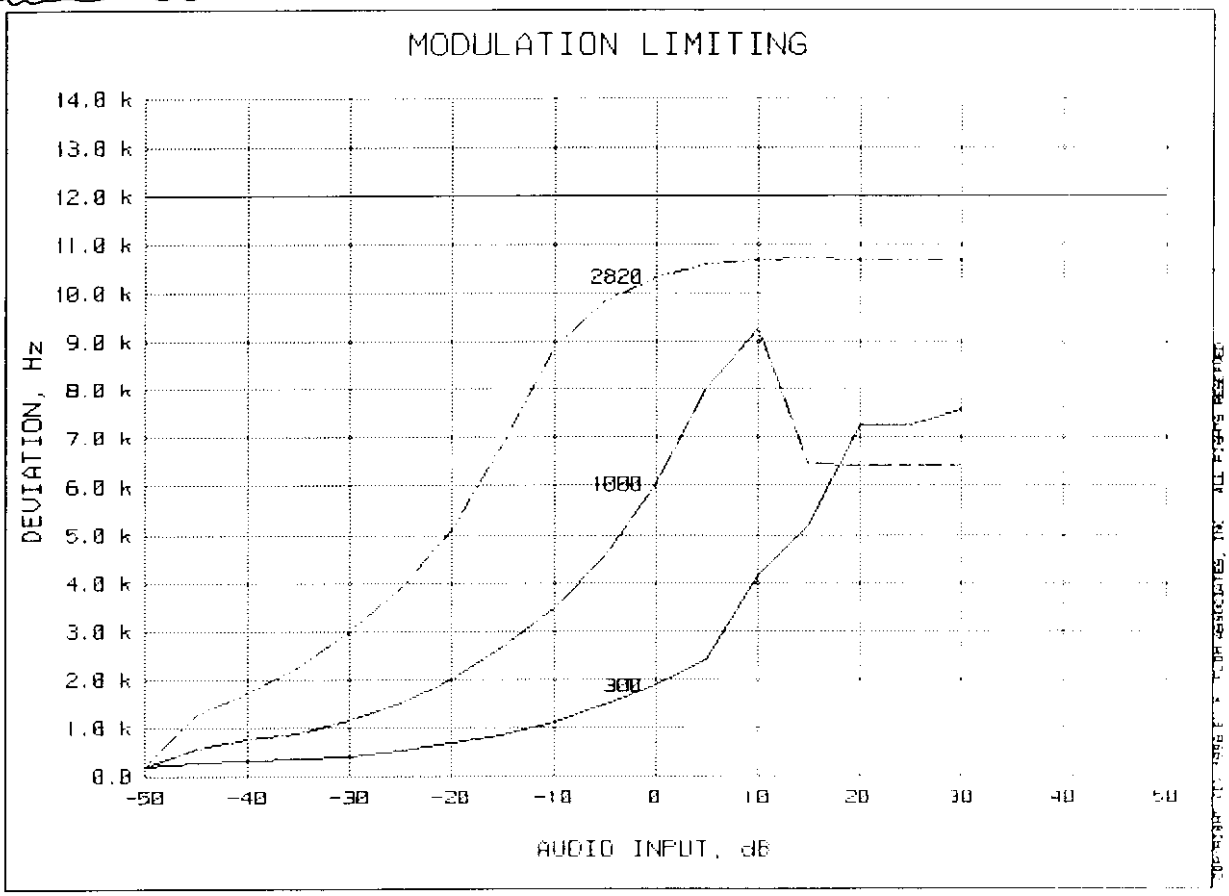
COMPANDOR ON:

1. VOICE x
2. VOICE + SAT x

PAGE 15.1.
MODULATION LIMITING
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 11:38

GML NHA-9S

VOICE ONLY



REFERENCE DEVIATION, kHz = 6

REFERENCE MODULATION, Hz = 1000

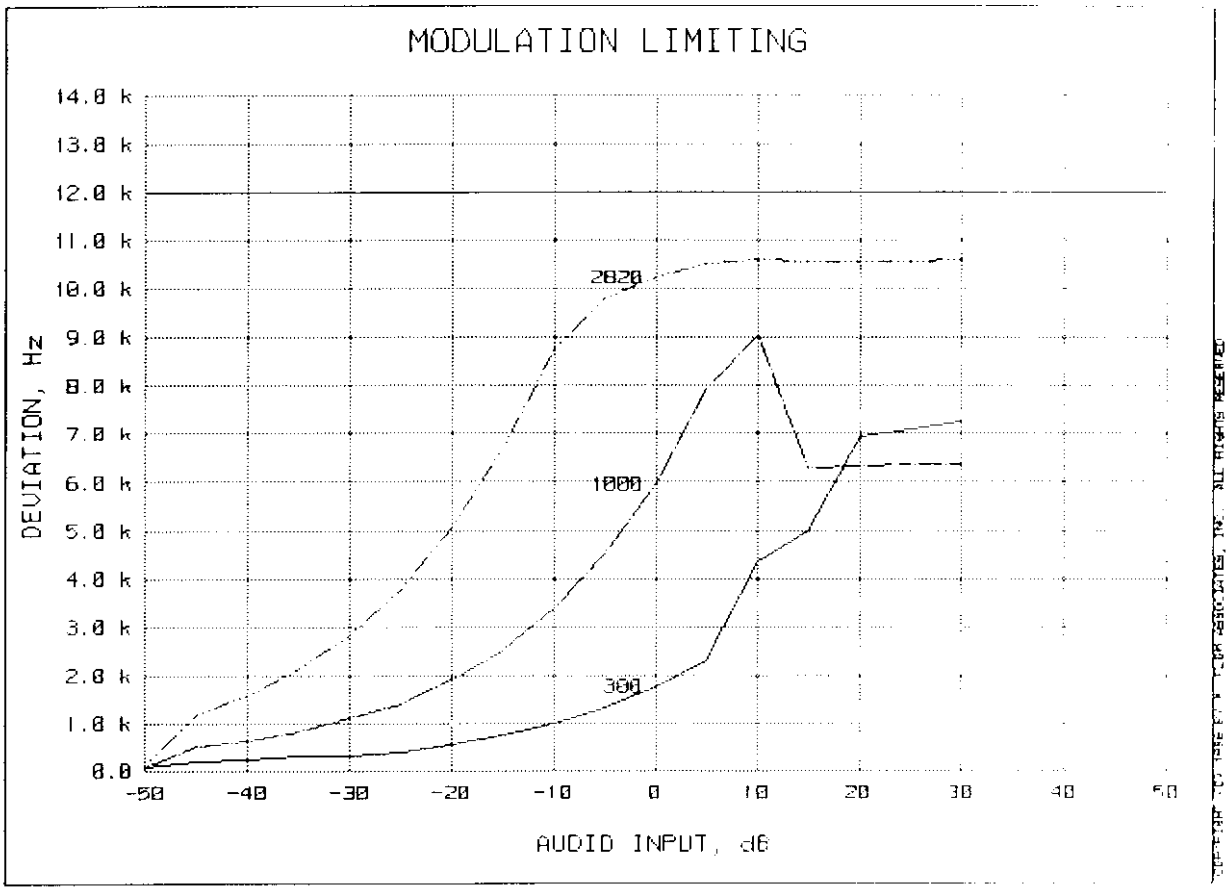
PEAKS = POSITIVE

AUDIO AMPLITUDE, mV = 158.15

SUPERVISED BY: MORTON FLOM, P. Eng.

PAGE 15.2.
MODULATION LIMITING
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 11:38

VOICE ONLY



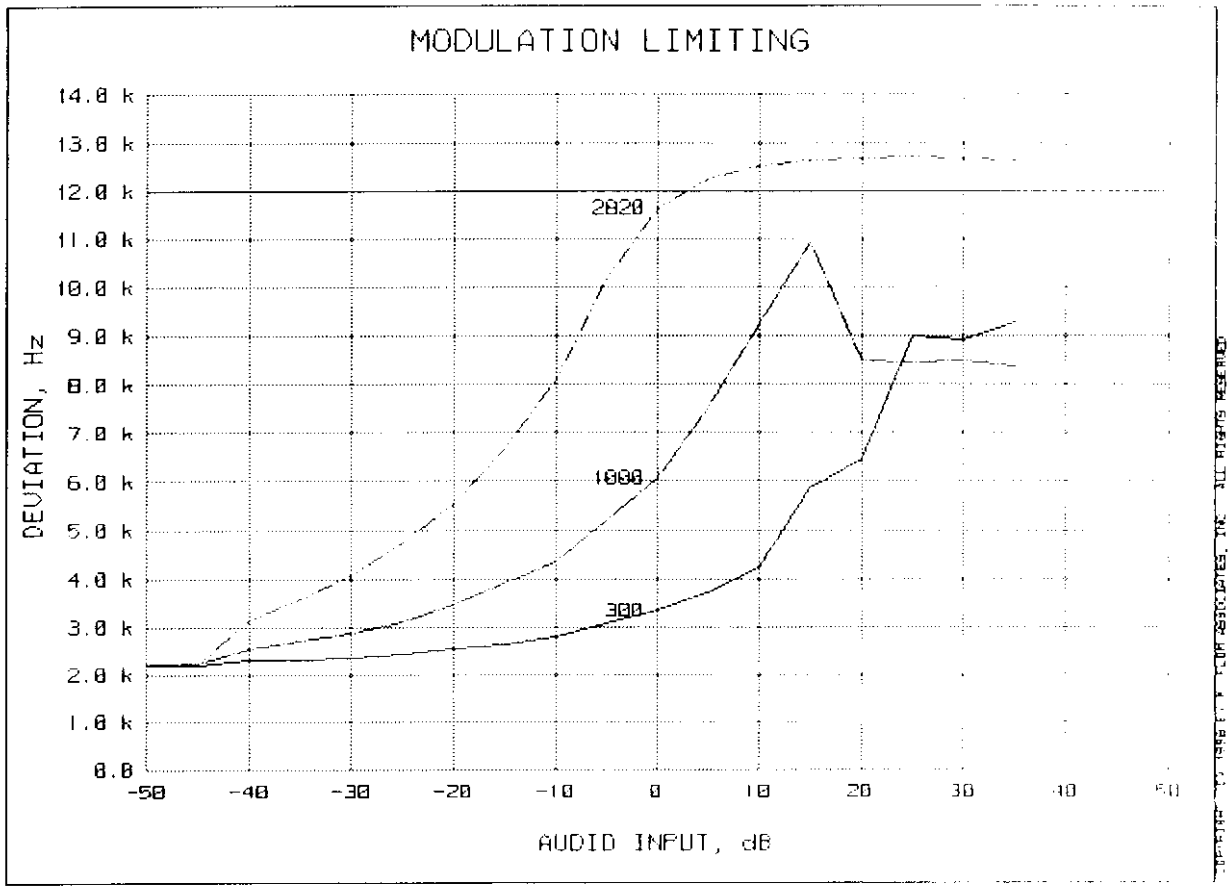
REFERENCE DEVIATION, kHz	= 6
REFERENCE MODULATION, Hz	= 1000
PEAKS	= NEGATIVE
AUDIO AMPLITUDE, mV	= 158.15

SUPERVISED BY: MORTON FLOM, P. Eng.

PAGE 15.3.
MODULATION LIMITING
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 11:42

GML NHA-9S

VOICE + SAT



REFERENCE DEVIATION, kHz = 6

REFERENCE MODULATION, Hz = 1000

PEAKS = POSITIVE

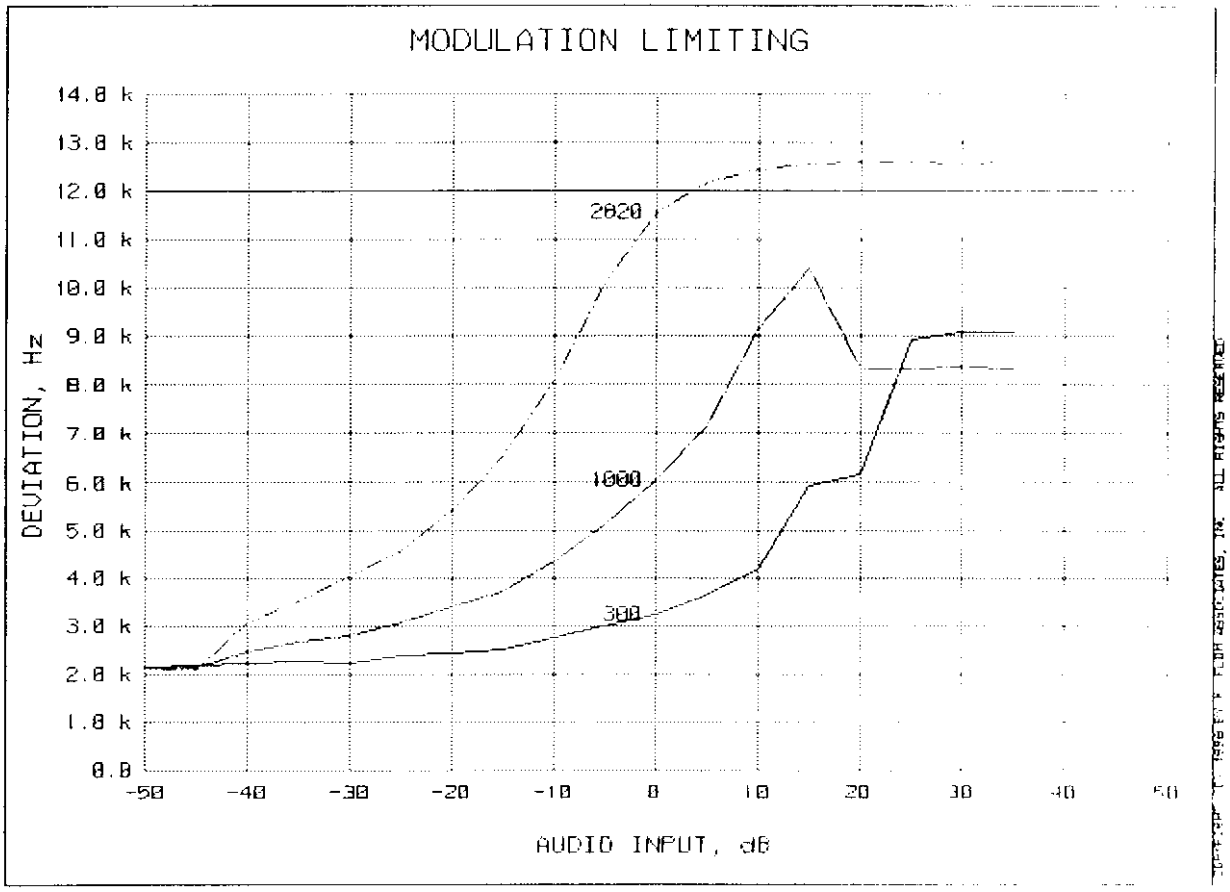
AUDIO AMPLITUDE, mV = 73.13

SUPERVISED BY: MORTON FLOM, P. Eng.

PAGE 15.4.
MODULATION LIMITING
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 11:42

GML NHA-9S

VOICE + SAT



REFERENCE DEVIATION, kHz = 6

REFERENCE MODULATION, Hz = 1000

PEAKS = NEGATIVE

AUDIO AMPLITUDE, mV = 73.13

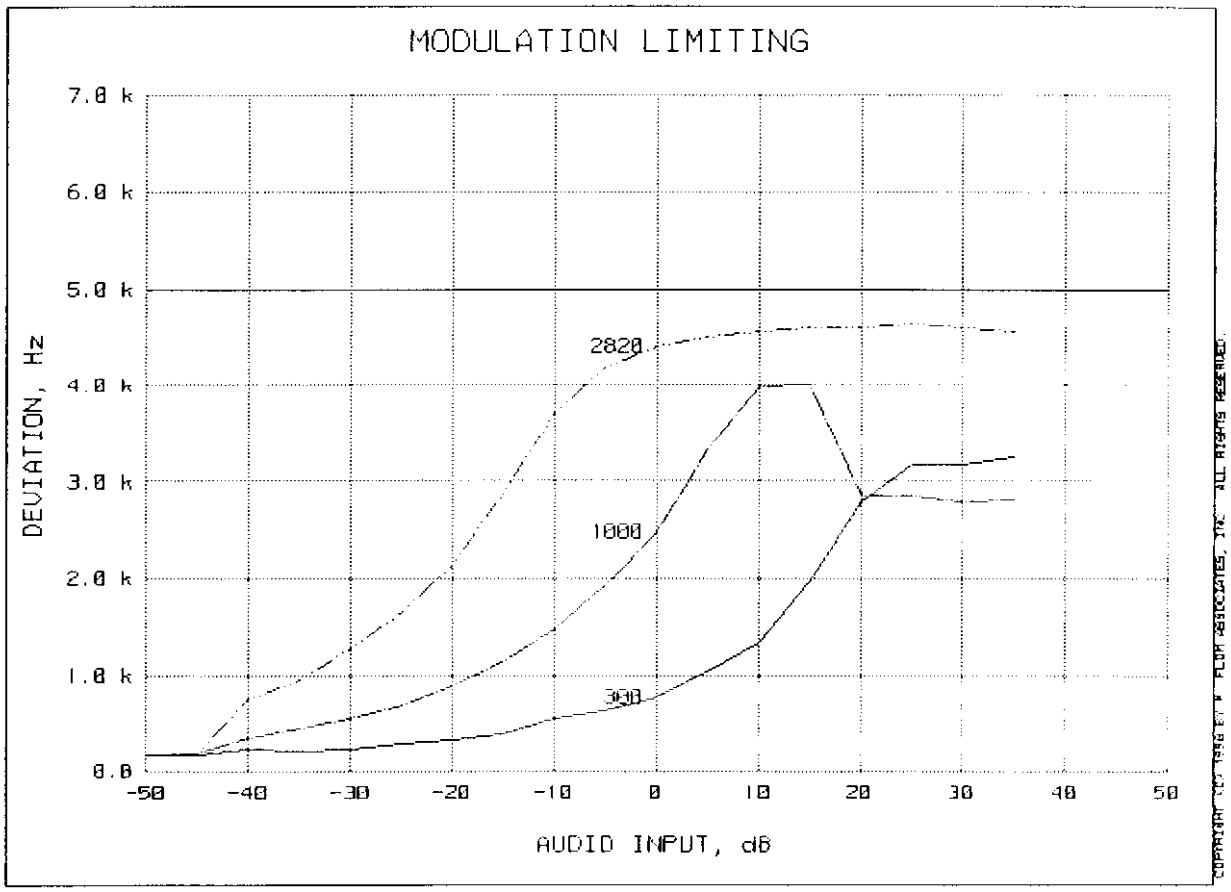
SUPERVISED BY: MORTON FLOM, P. Eng.

GML NHA-9S

MODULATION LIMITING
NOKIA, 282N, NHA-9SA
1998-JUL-01, 09:03

NAMPS

VOICE ONLY



REFERENCE DEVIATION, kHz	= 2.5
REFERENCE MODULATION, Hz	= 1000
PEAKS	= POSITIVE
AUDIO AMPLITUDE, mV	= 94.21

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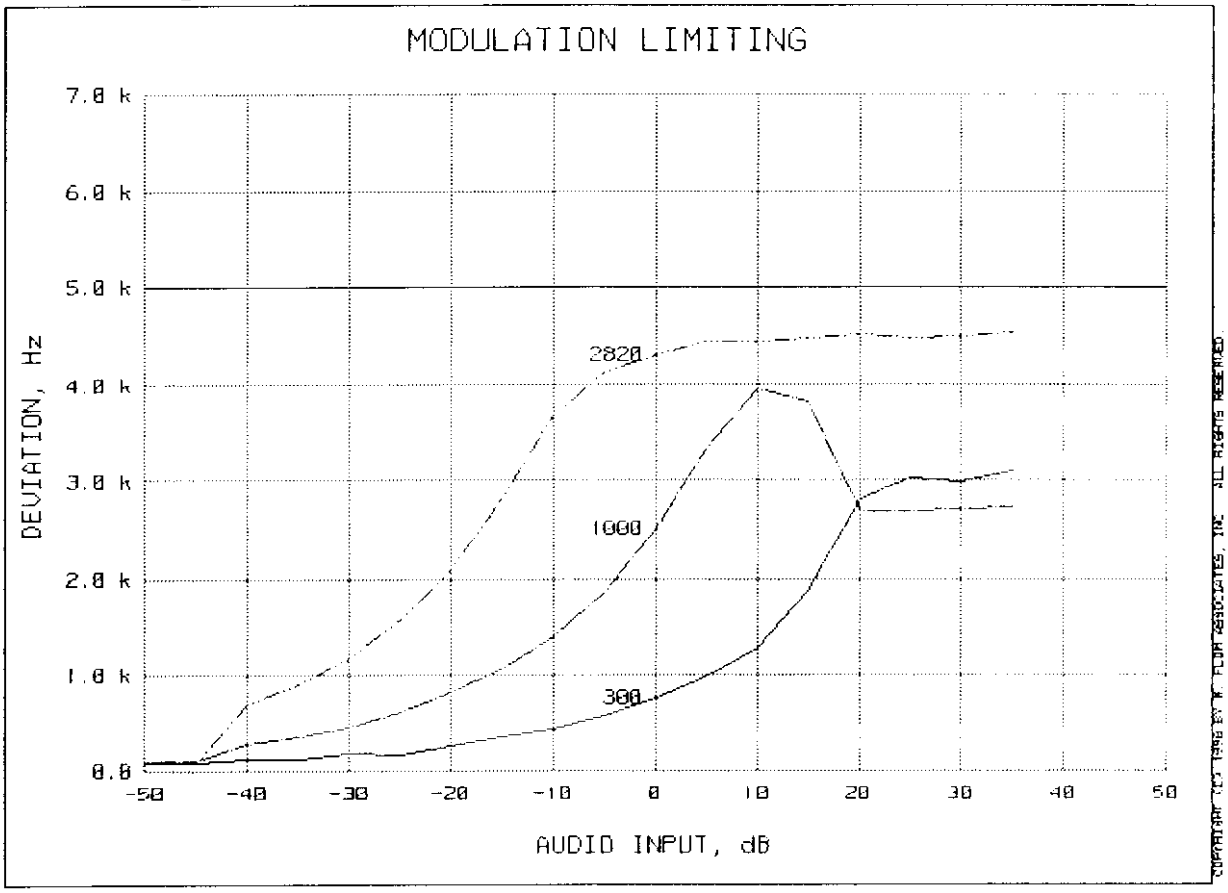
GML NHA-9S

MODULATION LIMITING
NOKIA, 282N, NHA-9SA NAMPS
1998-JUL-01, 09:03

VOICE ONLY



REFERENCE DEVIATION, kHz	= 2.5
REFERENCE MODULATION, Hz	= 1000
PEAKS	= NEGATIVE
AUDIO AMPLITUDE, mV	= 100.94

SUPERVISED BY: MORTON FLOM, P. Eng.

NAME OF TEST: OSCILLOSCOPE PRESENTATION OF TONES
MEASUREMENT OF MAXIMUM DEVIATION

PARAGRAPH:

GUIDE: TIA/EIA STANDARD IS-19-B

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: AS PER ATTACHED PAGE

MEASUREMENT PROCEDURE

1. The presentation of tones was obtained by attaching the HP 54502A Oscilloscope to the modulation output of the HP 8901 Modulation Analyzer.

2. The E.U.T. was modulated by an HP 8903 Audio Analyzer and/or internally generated signals.

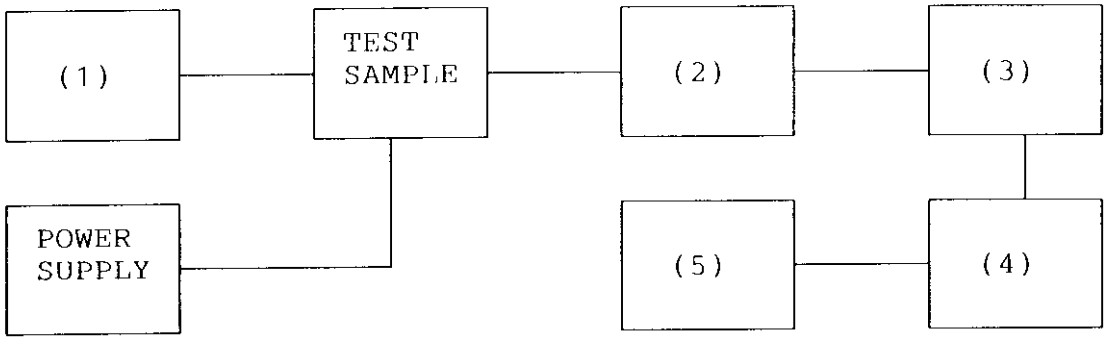
3. Oscillographic presentations and maximum deviation measurements were recorded for the various configurations.

4. MEASUREMENT RESULTS: ATTACHED SUMMARY FOR DEVIATION

5. MEASUREMENT RESULTS: ATTACHED PLOTS FOR TONES

TRANSMITTER SPURIOUS EMISSION

TEST A. OCCUPIED BANDWIDTH (IN-BAND SPURIOUS)
TEST B. OUT-OF-BAND SPURIOUS



(1) AUDIO OSCILLATOR/GENERATOR

HP 204D	___
HP 8903A	x
_____	___

(2) COAXIAL ATTENUATOR

NARDA 766-10	x
SIERRA 661A-30	___
_____	___

(3) FILTERS; NOTCH, HP, LP, BP

CIRQTEL FHT	___
EAGLE TNF-1	x
PHELPS DODGE PD-495-8	___
_____	___

(4) SPECTRUM ANALYZER

HP 8566B	x
HP 8563E	___
_____	___

(5) SCOPE

HP 54502A	x
_____	___

MEASUREMENT SUMMARY: OSCILLOSCOPE PRESENTATION OF TONES
MEASUREMENT OF MAXIMUM DEVIATION

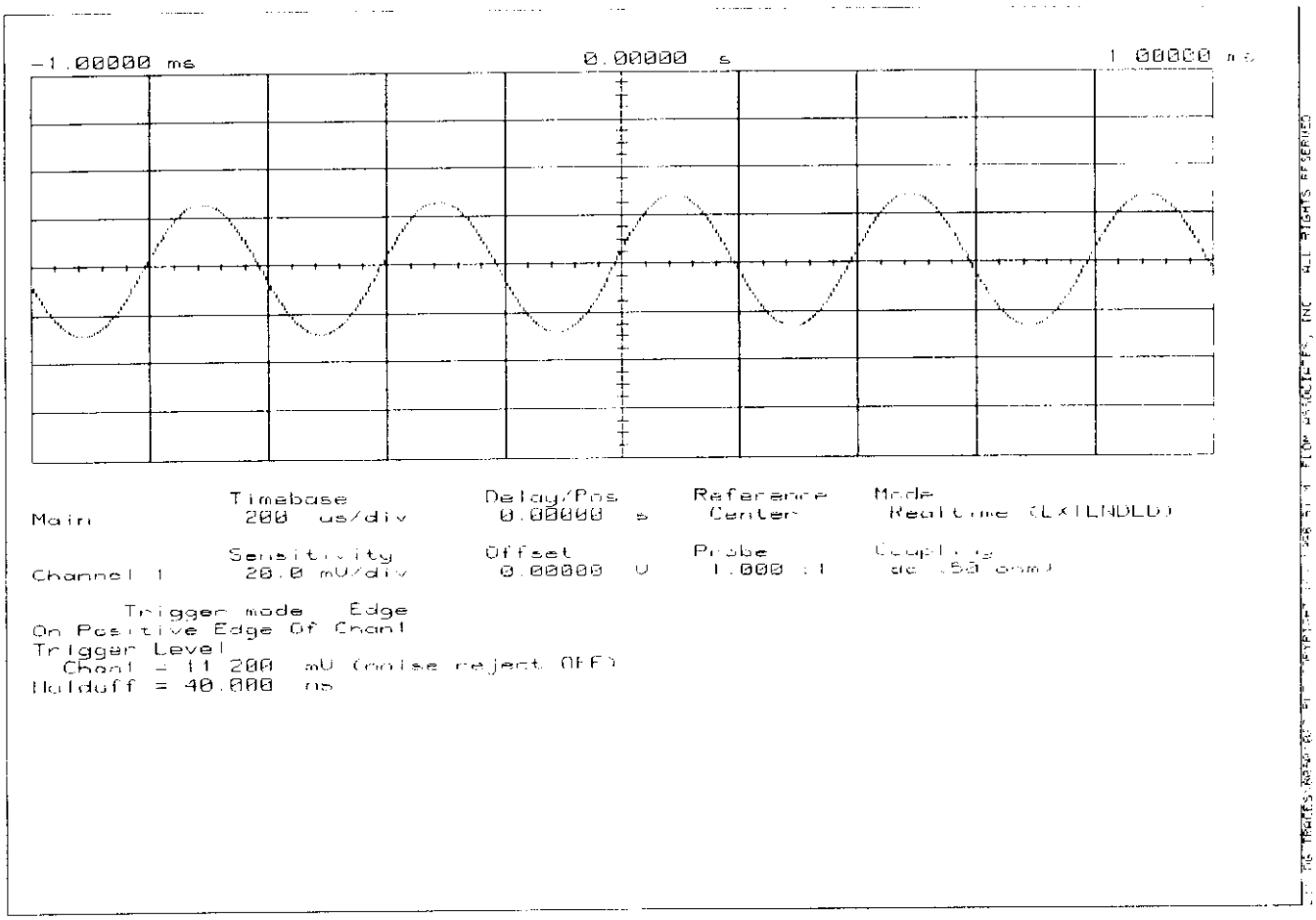
MODULATION	DEVIATION, ±kHz
(a) VOICE	10.7
(b) WIDEBAND DATA	9.0
(c) SAT	2.1
(d) ST	8.0
(e) SAT + VOICE	12.5
(f) SAT + DTMF	12.5
(g) CDMA	N/A
(h) TDMA	N/A
(i) NAMPS VOICE	N/A
(j) NAMPS DSAT	N/A
(k) NAMPS ST	N/A
(l) NAMPS VOICE	N/A

SUPERVISED BY:

MORTON FLOM, P. Eng.

PAGE 19.1.
OSCILLOSCOPE PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 09:35, WED

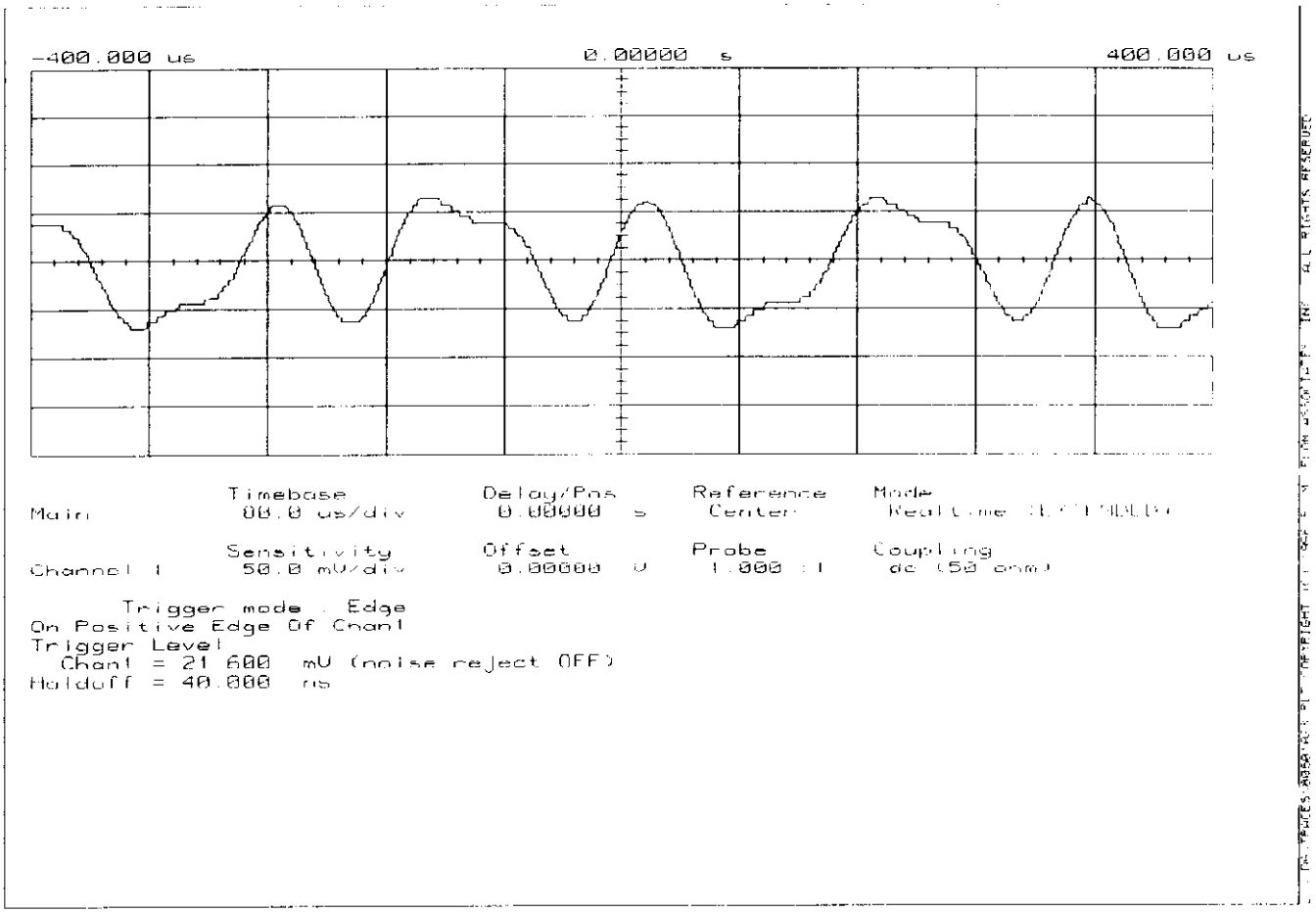
MODULATION: VOICE (AMPS)



GML NHA-9S

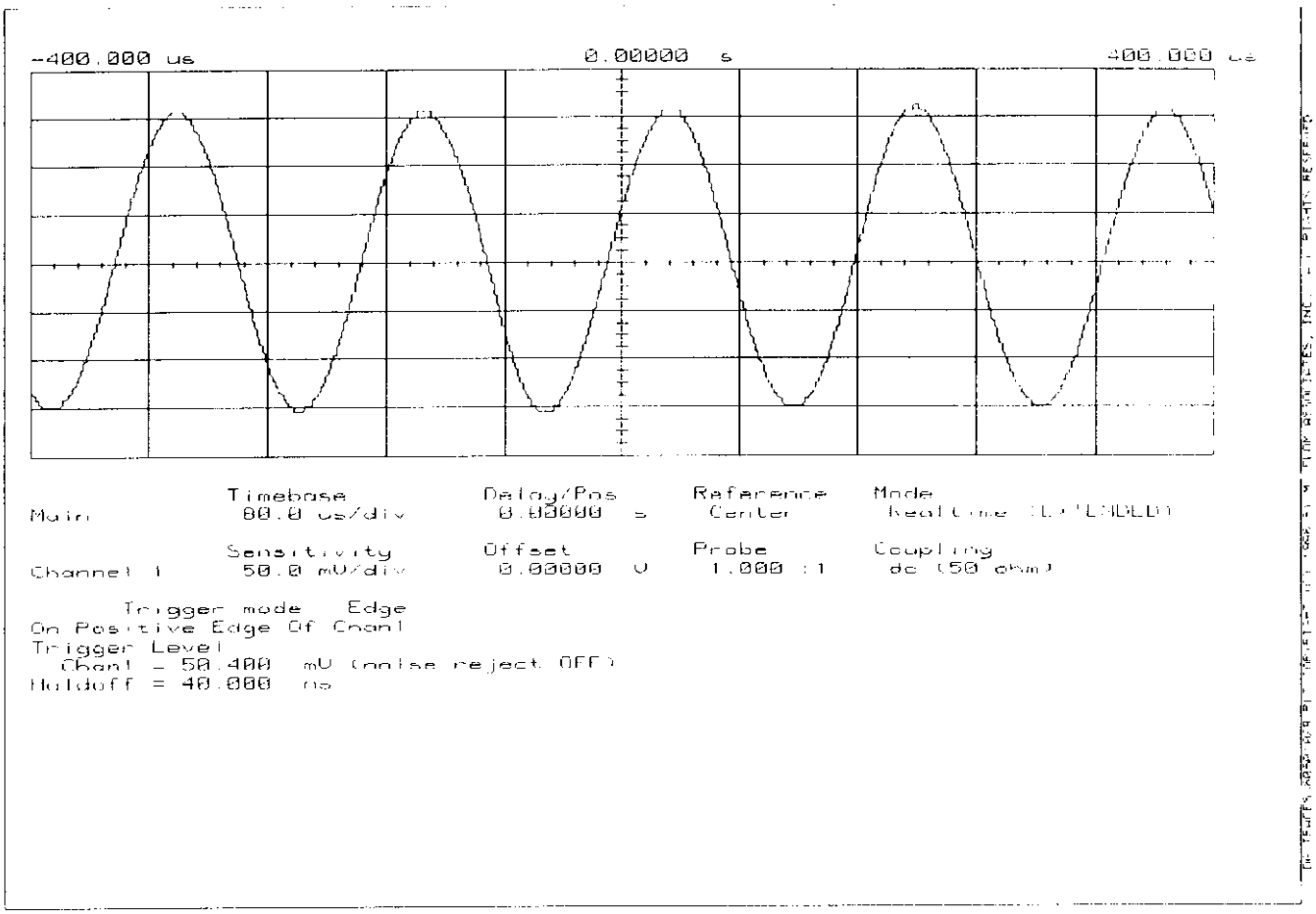
OSCILLOSCOPE PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 09:38, WED

MODULATION: WBD (AMPS)



OSCILLOSCOPE PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 09:40, WED

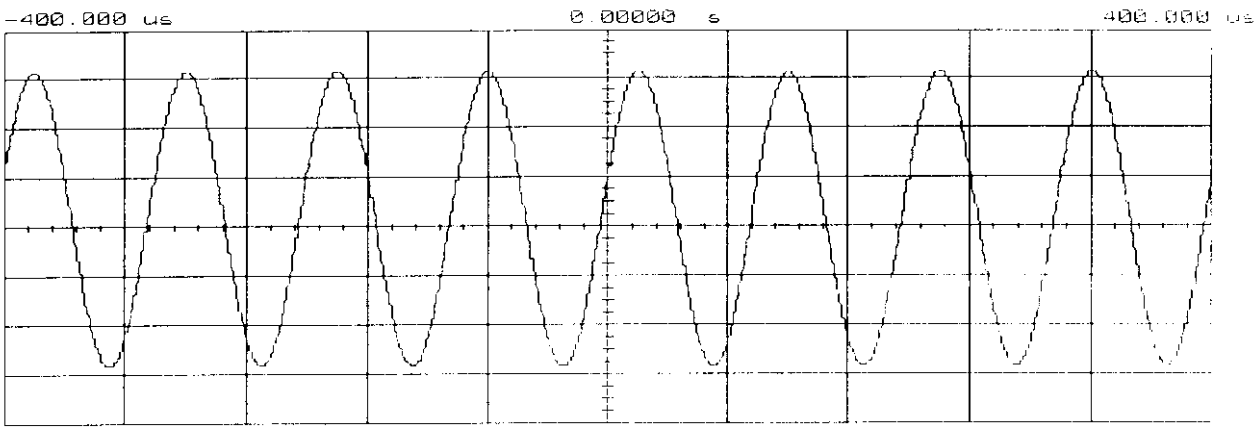
MODULATION: SAT (AMPS)



GML NHA-9S

OSCILLOSCOPE PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 09:41, WED

MODULATION: ST (AMPS)



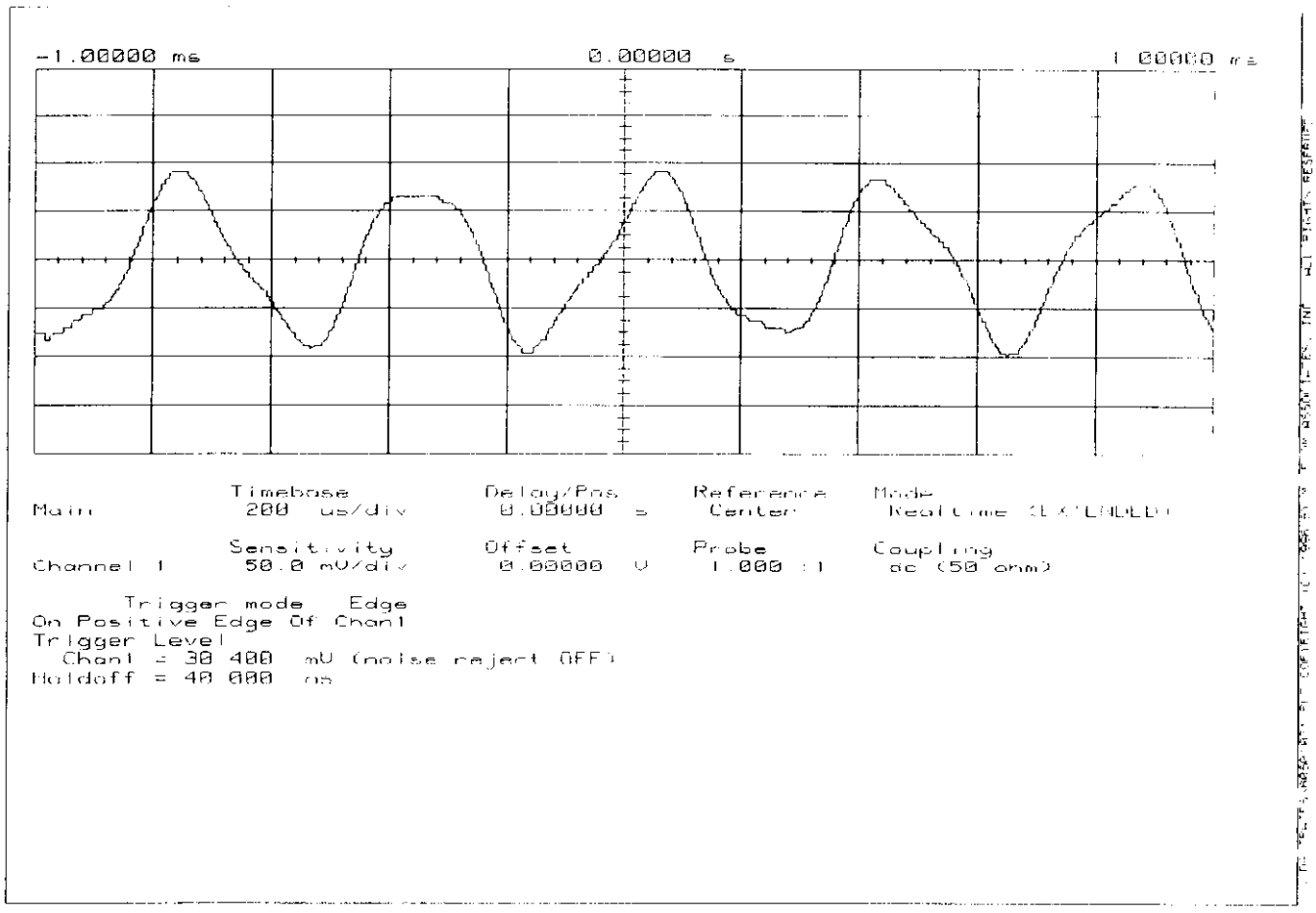
	Timebase	Delay/Pos	Reference	Mode
Main	80.0 us/div	0.00000 s	Center	Real-time (L/LHOLD)
	Sensitivity	**Offset**	**Probe**	**Coupling**
Channel 1	20.0 mV/div	-2.500 mV	1.000 : 1	dc (50 ohm)

Trigger mode Edge
On Positive Edge Of Chan1
Trigger Level
Chan1 = 15.900 mV (noise reject OFF)
Holdoff = 40.000 ns

OSCILLOSCOPE PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 09:43, WED

GML NHA-9S

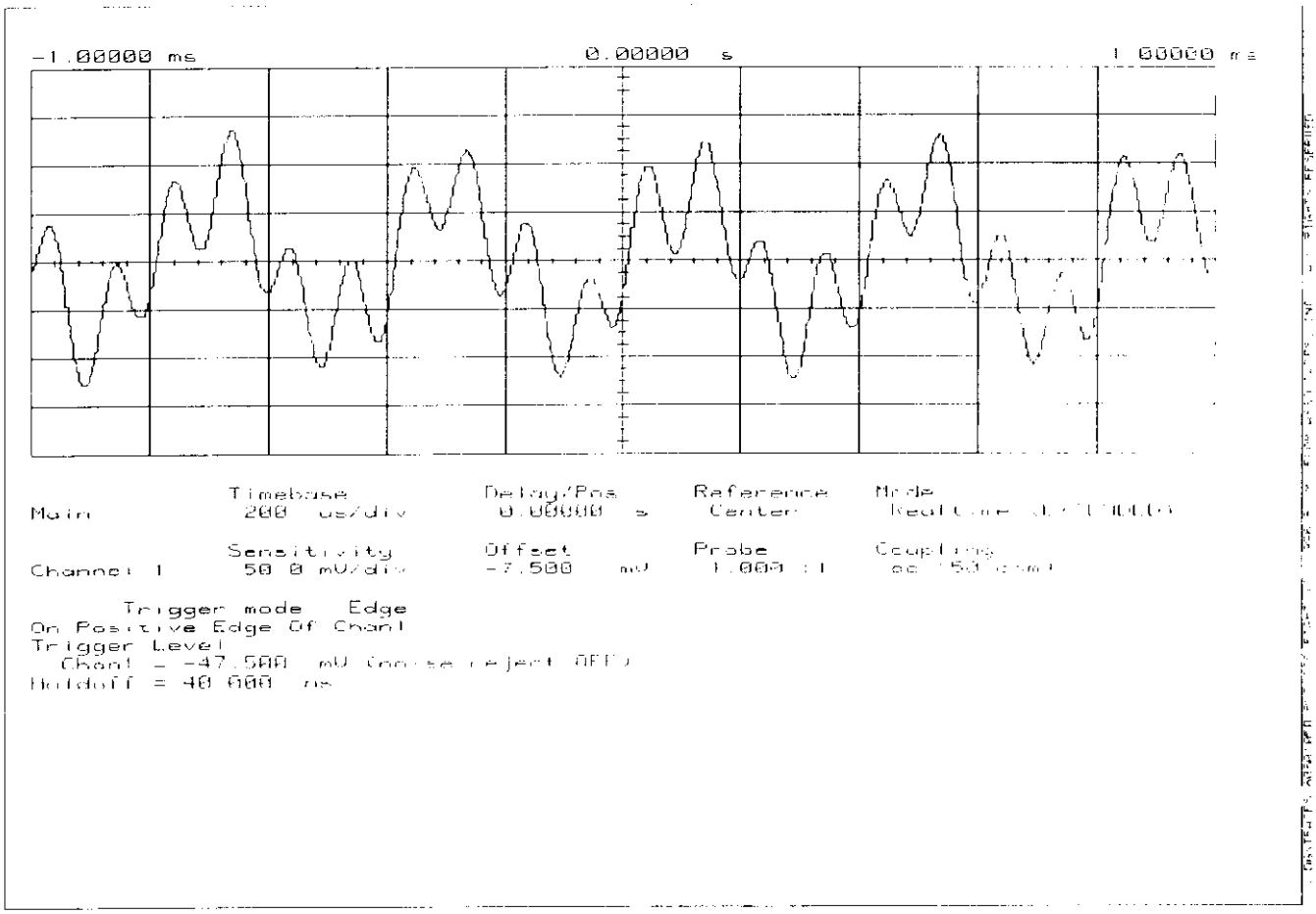
MODULATION: SAT+VOICE (AMPS)



OSCILLOSCOPE PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 10:39, WED

GML NHA-9S

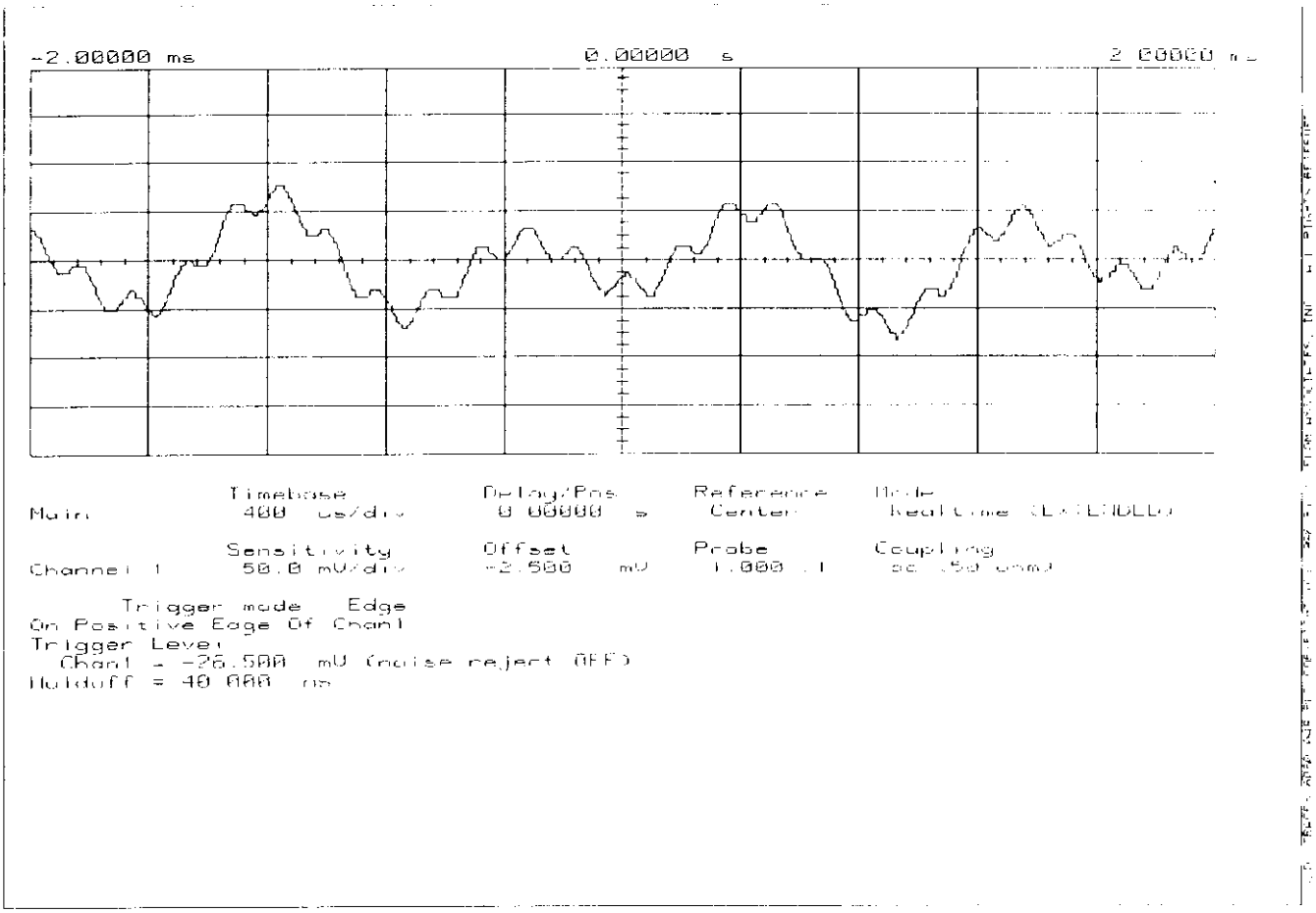
MODULATION: SAT + ST (AMPS)



OSCILLOSCOPE PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 10:37, WED

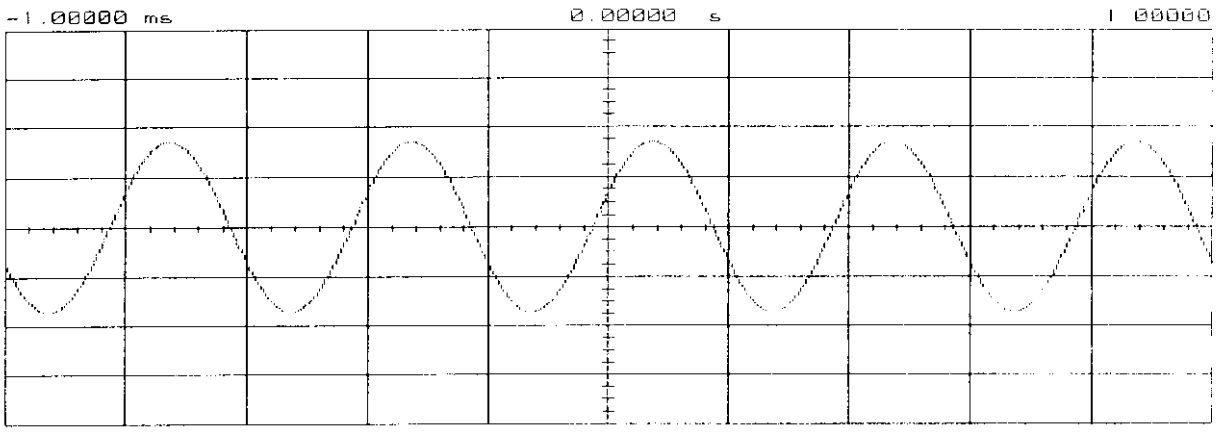
GML NHA-9S

MODULATION: SAT+DTMF (AMPS)



OSCILLOSCOPE PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 09:28, WED

MODULATION: VOICE NAMPS



	Timebase	Delay/Pos	Reference	Mode
Main	200 us/div	0.00000 s	Center	Real time (EXTENDED)
	Sensitivity	**Offset**	**Probe**	**Coupling**
Channel 1	20.0 mV/div	0.00000 V	1.000 :1	dc (50 ohm)

Trigger mode Edge
On Positive Edge Of Chan1
Trigger Level
Chan1 = 11.200 mV (noise reject Off)
Holdoff = 40.000 ns

NAME OF TEST: OCCUPIED BANDWIDTH

PARAGRAPH: 47 CFR 2.989 (c)(1)

GUIDE: TIA/EIA STANDARD IS-19-B

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: AS PER PREVIOUS PAGE

MEASUREMENT PROCEDURE

1. The E.U.T. and test equipment were set up as shown on the previous page, with the Spectrum Analyzer connected.

2. For voice modulated equipment, the audio signal generator was adjusted to the frequency of maximum response and with output level set for ±6 kHz deviation (or 50% modulation).

3. With level constant, the frequency was set at 6 kHz, then the signal level was increased 16 dB.

4. The Occupied Bandwidth was measured with the Spectrum Analyzer controls set as shown on the test results.

5. All other modulations for this equipment as available from appropriate interface devices.

6. MEASUREMENT RESULTS: ATTACHED

MEASUREMENT SUMMARY: OCCUPIED BANDWIDTH

MODULATION	MEASURED DEVIATION ±kHz (HP 8901A)	LIMIT ±kHz	B/W @ -26 dB PLOTS, kHz
NONE	0.0	0	0
VOICE	10.7	12	-32
WIDEBAND DATA	9.0	8	-22
SAT + VOICE		N/A	-32
SAT + DTMF		N/A	-22
CDMA	N/A	N/A	N/A
TDMA	N/A	N/A	N/A
NAMPS	N/A	N/A	-17

FOR ALL OCCUPIED BANDWIDTH PLOTS:

1. 0 dB REFERENCE LEVEL = TOP
2. HORIZONTAL = AS INDICATED
3. VERTICAL = AS INDICATED
4. I.F. BANDWIDTH = AS INDICATED
5. VIDEO FILTER = OFF
6. POWER OUTPUT = AS PER PAGE 2.
7. WORST CHANNEL = 380
8. WORST CASE = VOICE + SAT

SUPERVISED BY:

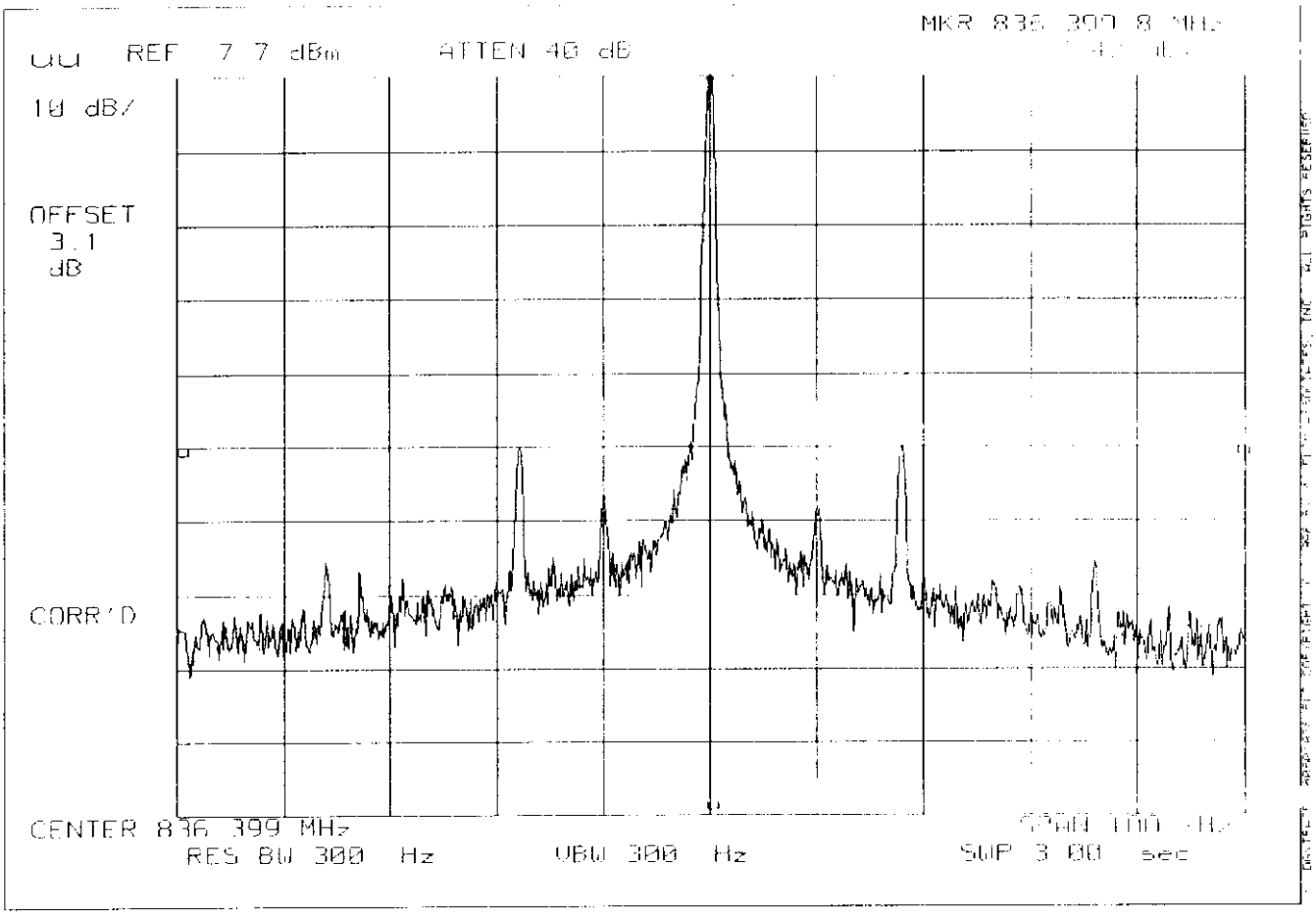
MORTON FLOM, P. Eng.

PAGE 22.1.

GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 10:16, WED

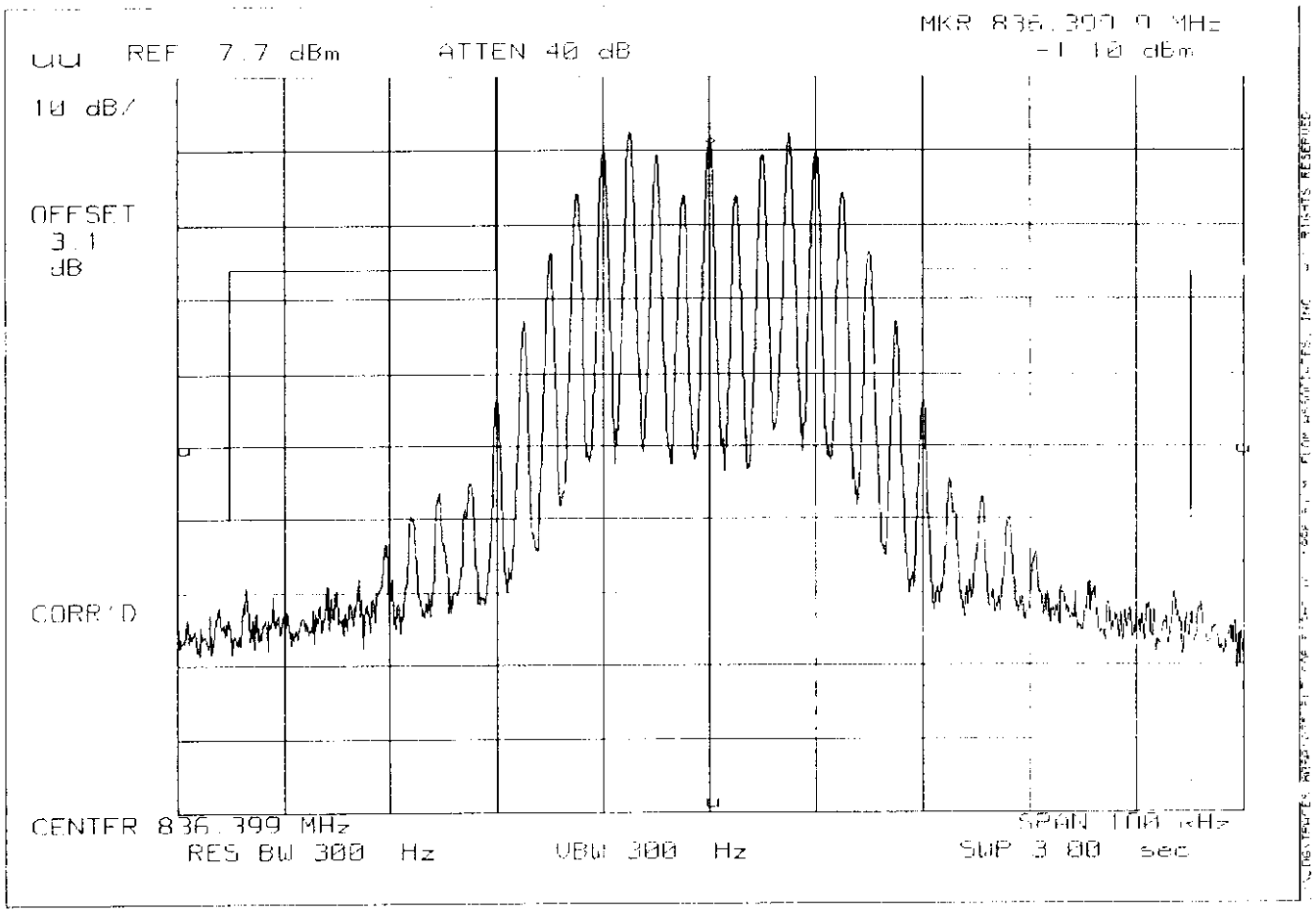
POWER: LOW
MODULATION: NONE



PAGE 22.2.
SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 10:10, WED

GML NHA-9S

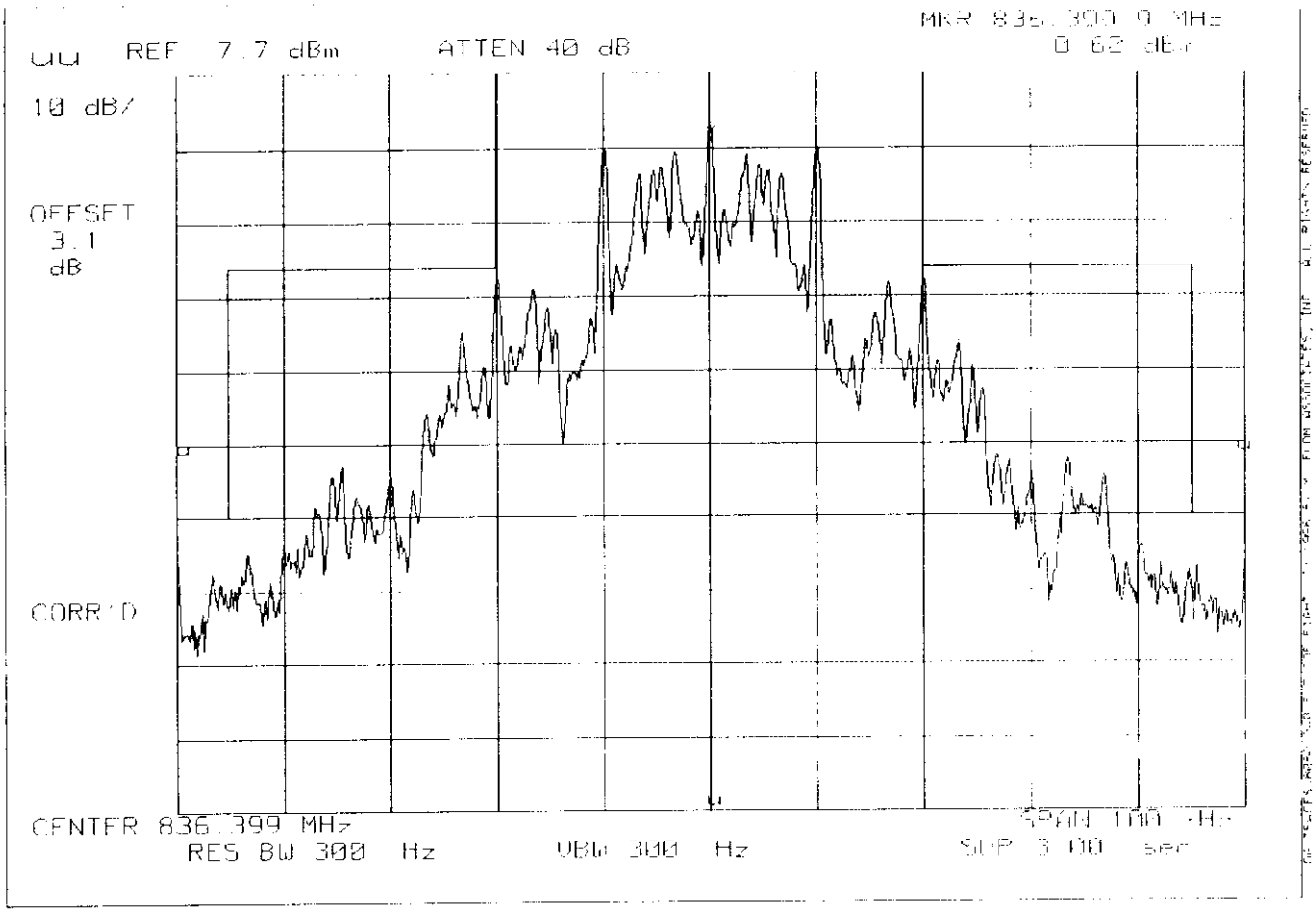
POWER: LOW
MODULATION: VOICE: 2500 Hz SINE WAVE
MASK: AMPS CELLULAR, F3E/F3D w/LPF



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 10:18, WED

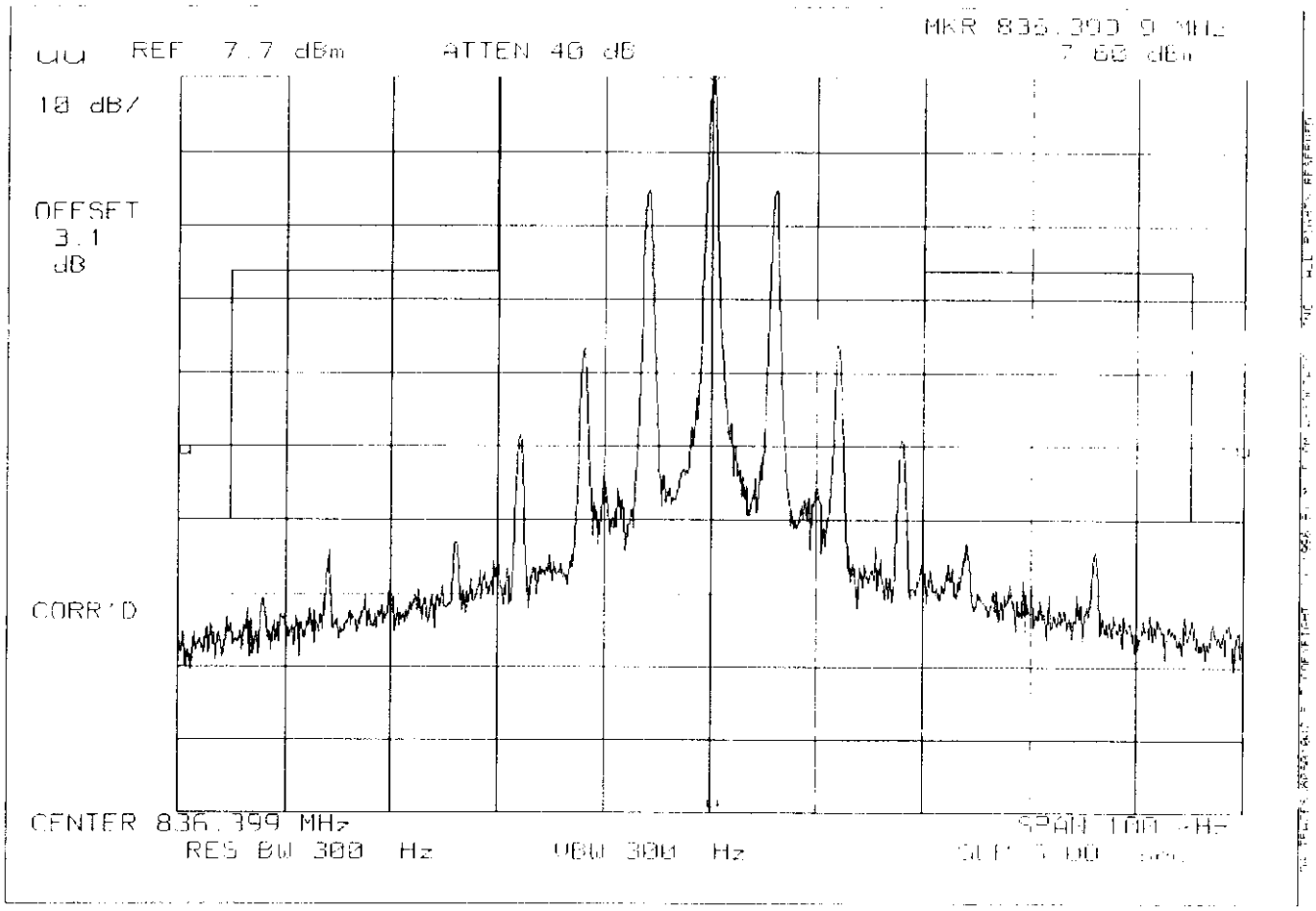
POWER: LOW
MODULATION: WBD
MASK: AMPS CELLULAR, F3E/F3D w/LPF



PAGE 22.4.
SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 10:21, WED

GML NHA-9S

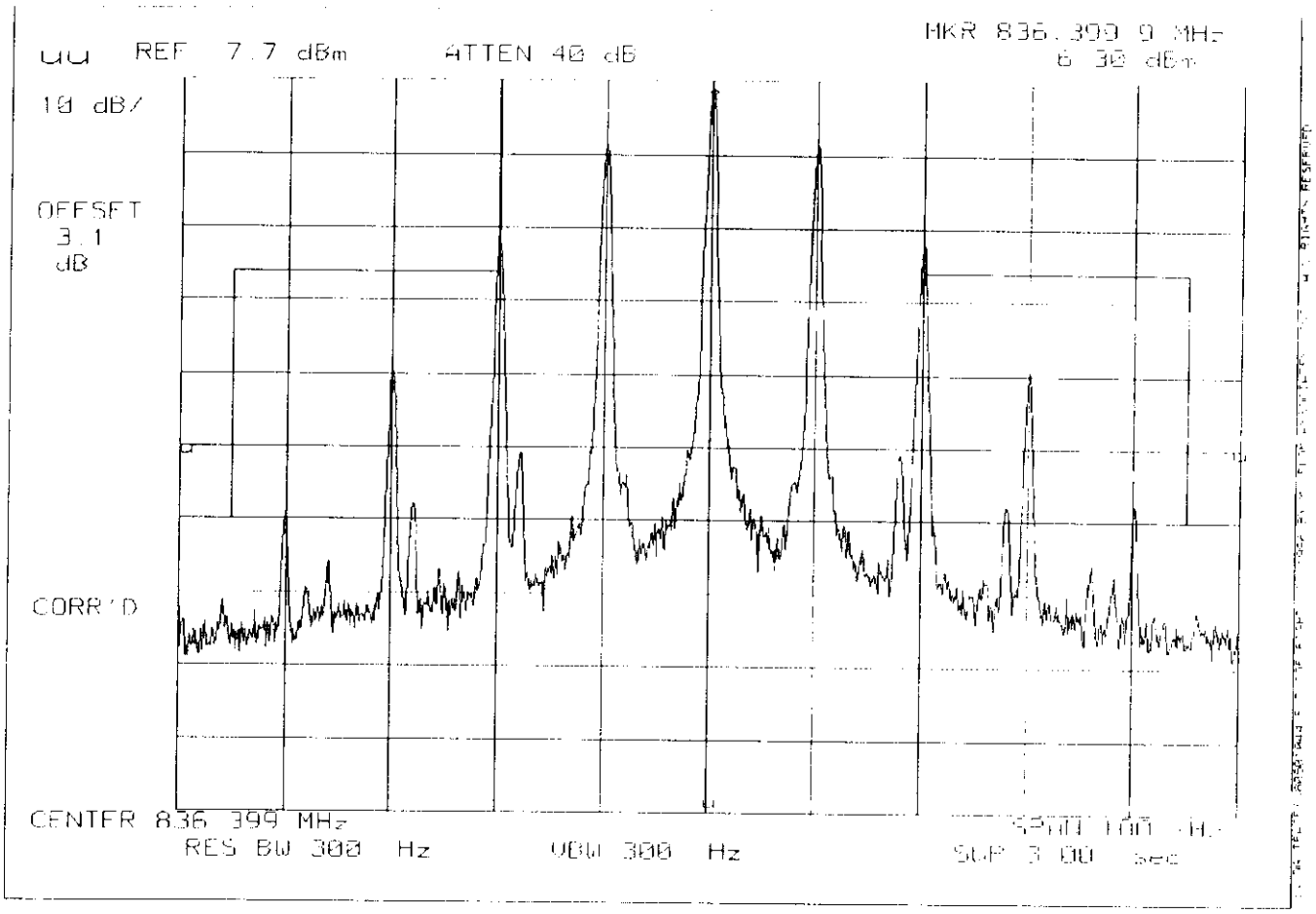
POWER: LOW
MODULATION: SAT
MASK: AMPS CELLULAR, F3E/F3D w/LPF



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 10:23, WED

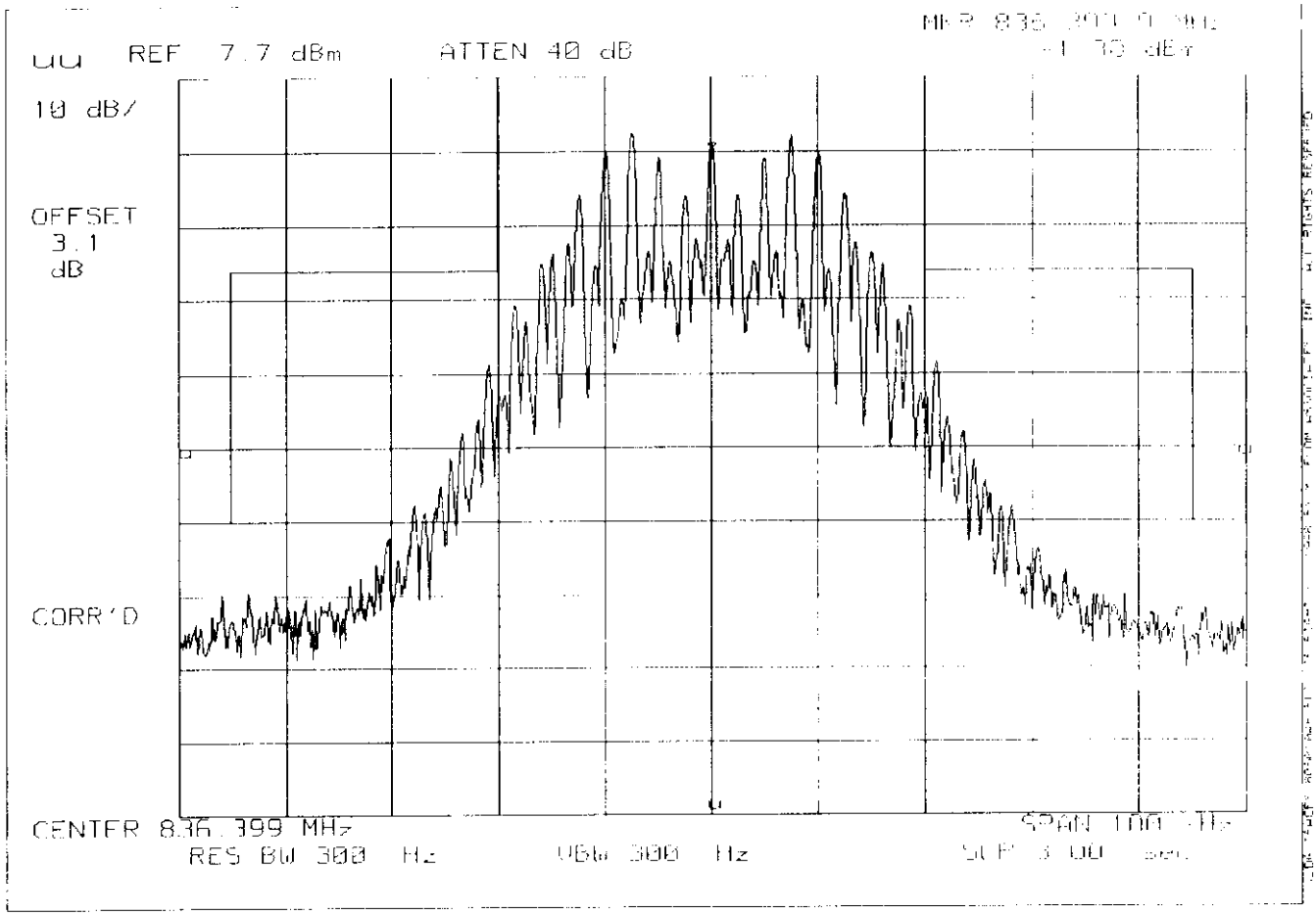
POWER: LOW
MODULATION: ST
MASK: AMPS CELLULAR, F3E/F3D w/LPF



SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 10:26, WED

GML NHA-9S

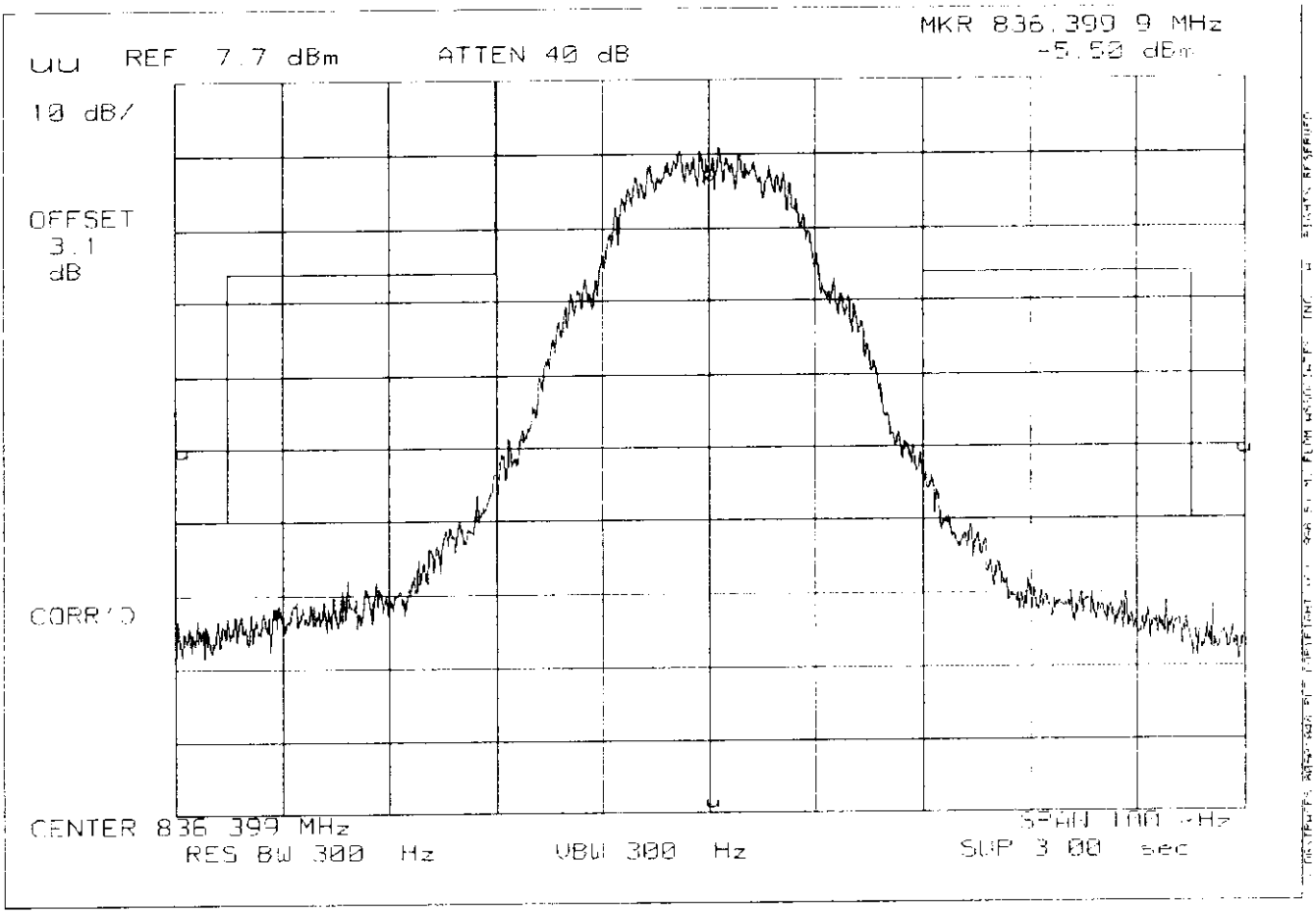
POWER: LOW
MODULATION: SAT+VOICE
MASK: AMPS CELLULAR, F3E/F3D w/LPF



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 10:29, WED

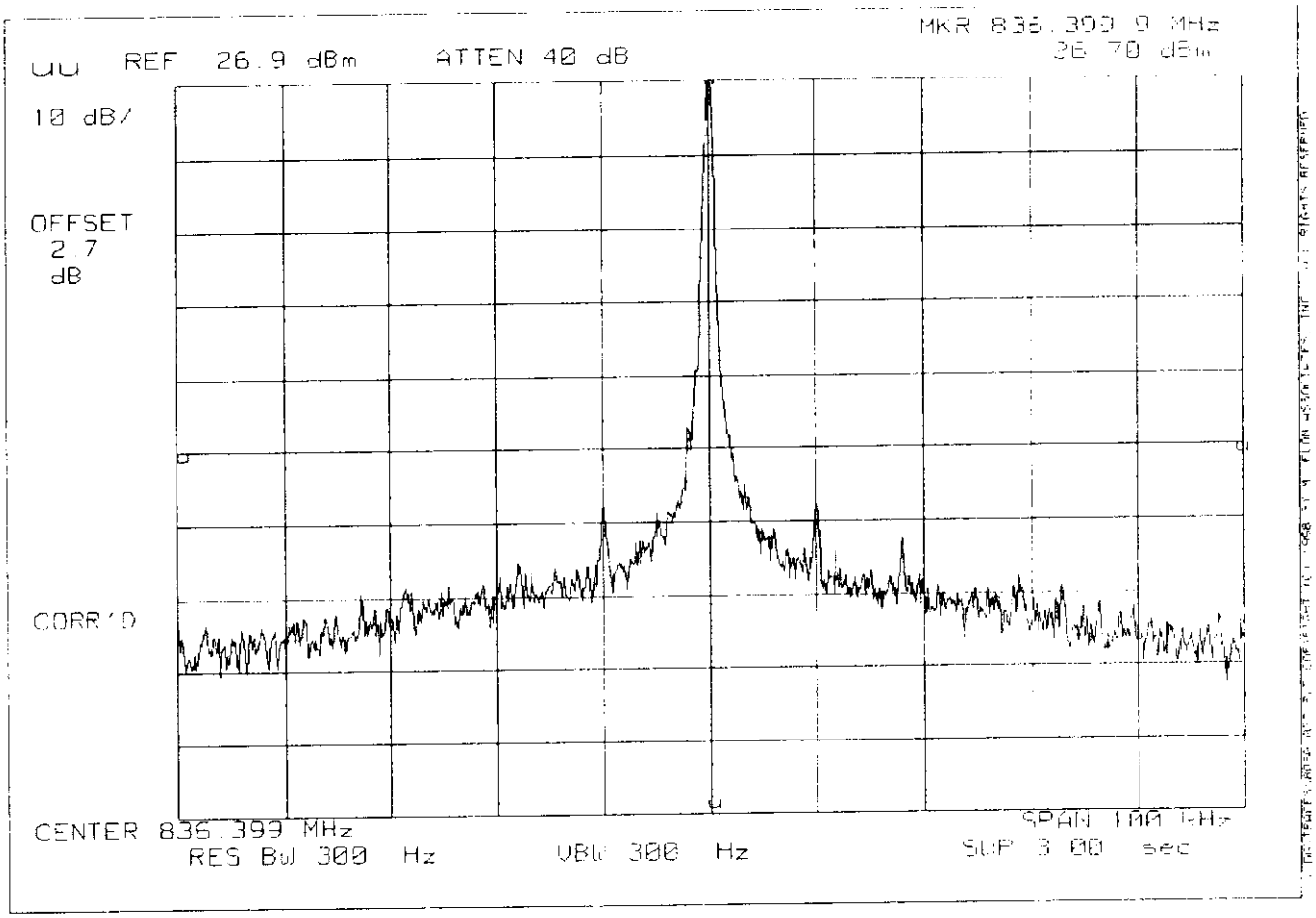
POWER: LOW
MODULATION: SAT+DTMF
MASK: AMPS CELLULAR, F3E/F3D w/LPF



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 10:12, WED

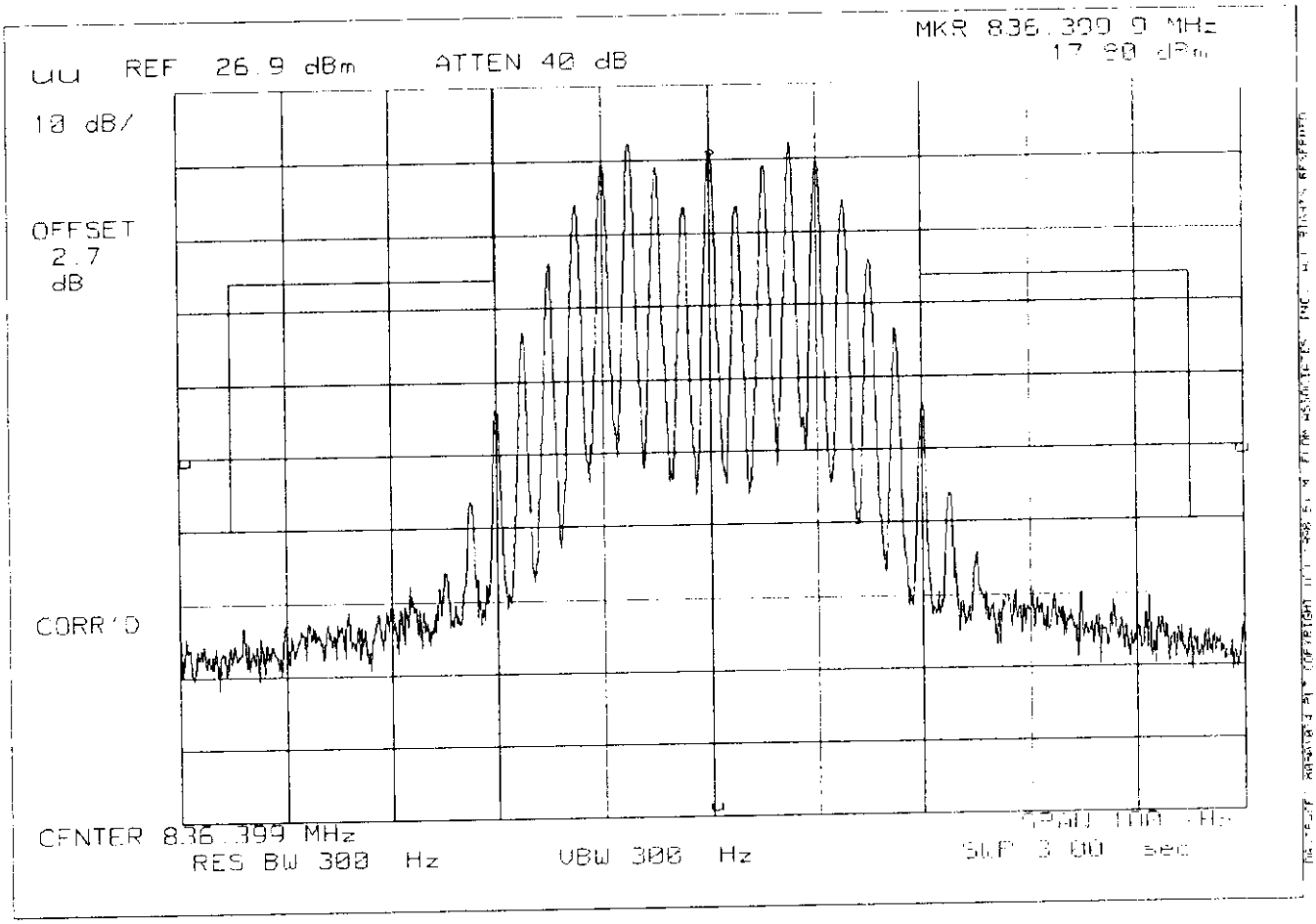
POWER: HIGH
MODULATION: NONE



SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 10:09, WED

GML NHA-9S

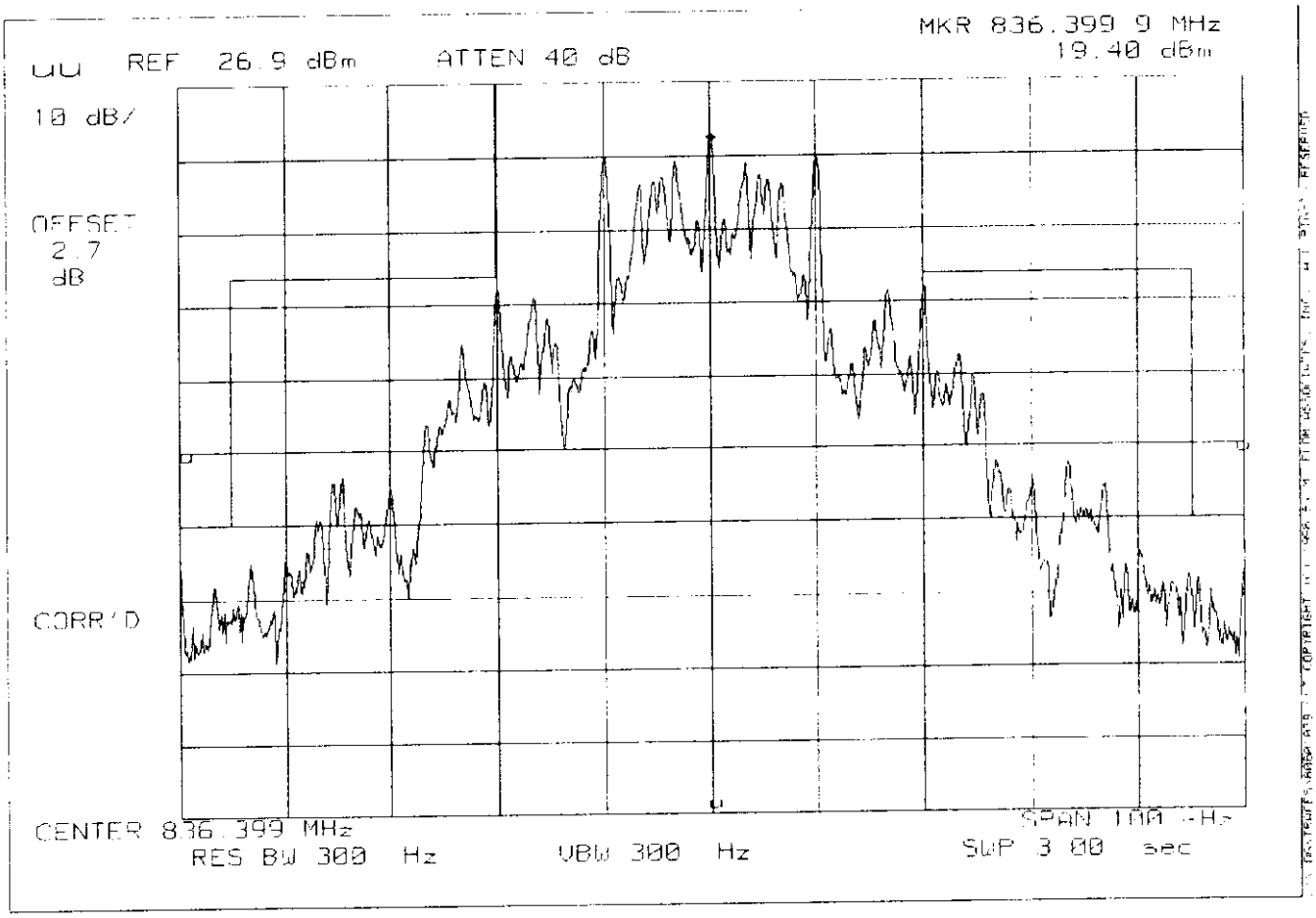
POWER: HIGH
MODULATION: VOICE: 2500 Hz SINE WAVE
MASK: AMPS CELLULAR, F3E/F3D w/LPF



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 10:18, WED

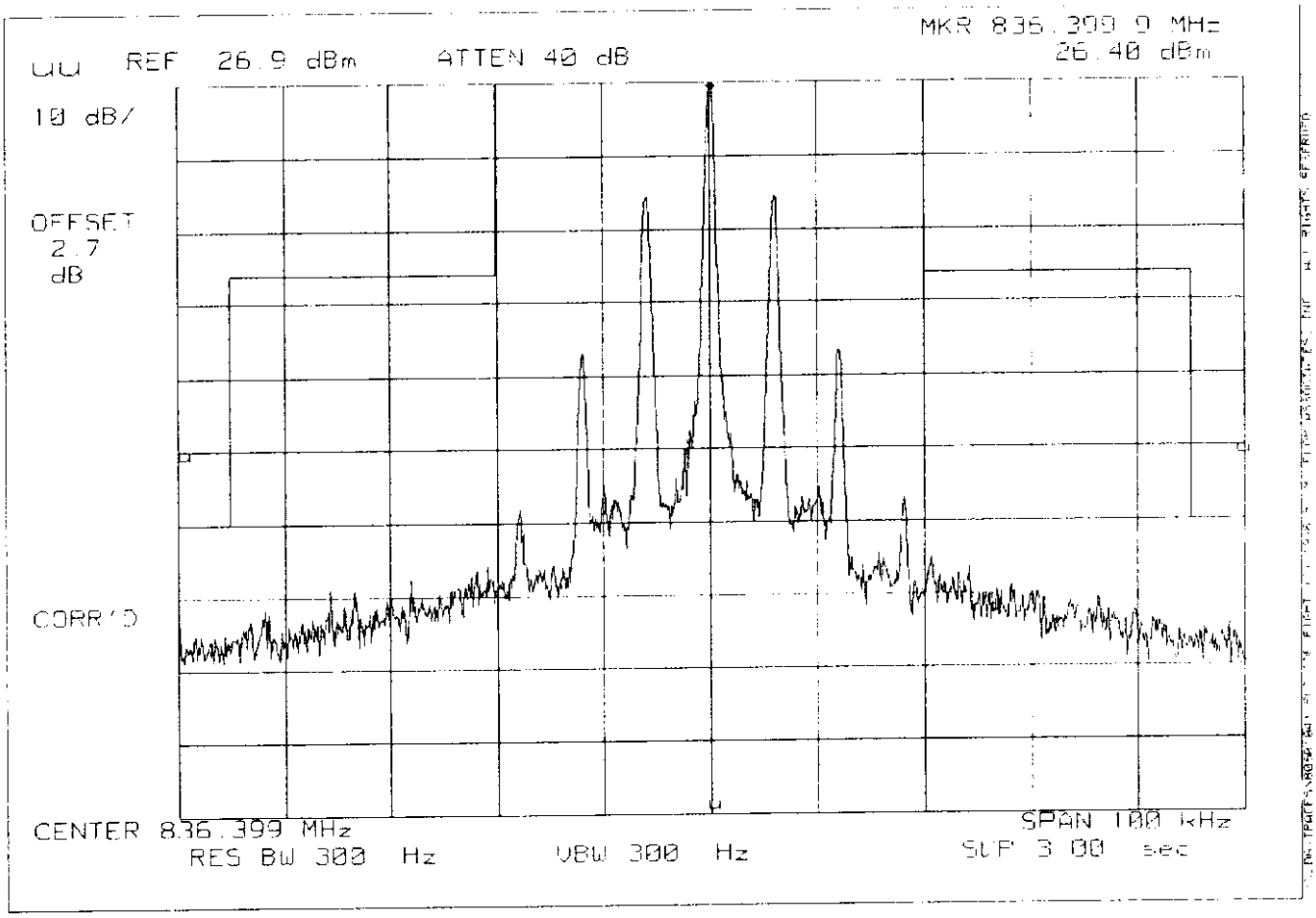
POWER: HIGH
MODULATION: WBD
MASK: AMPS CELLULAR, F3E/F3D w/LPF



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 10:20, WED

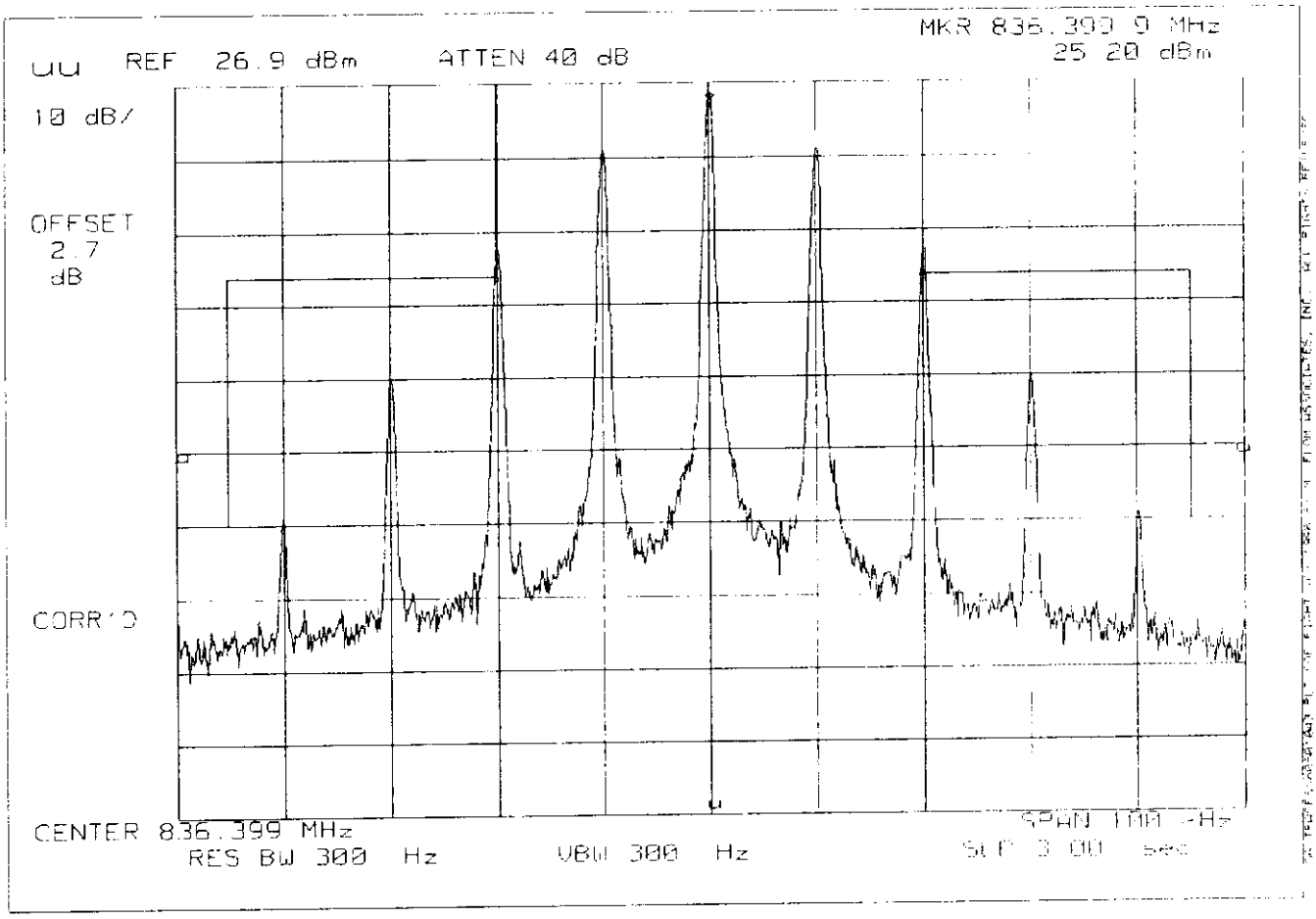
POWER: HIGH
MODULATION: SAT
MASK: AMPS CELLULAR, F3E/F3D w/LPF



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 10:23, WED

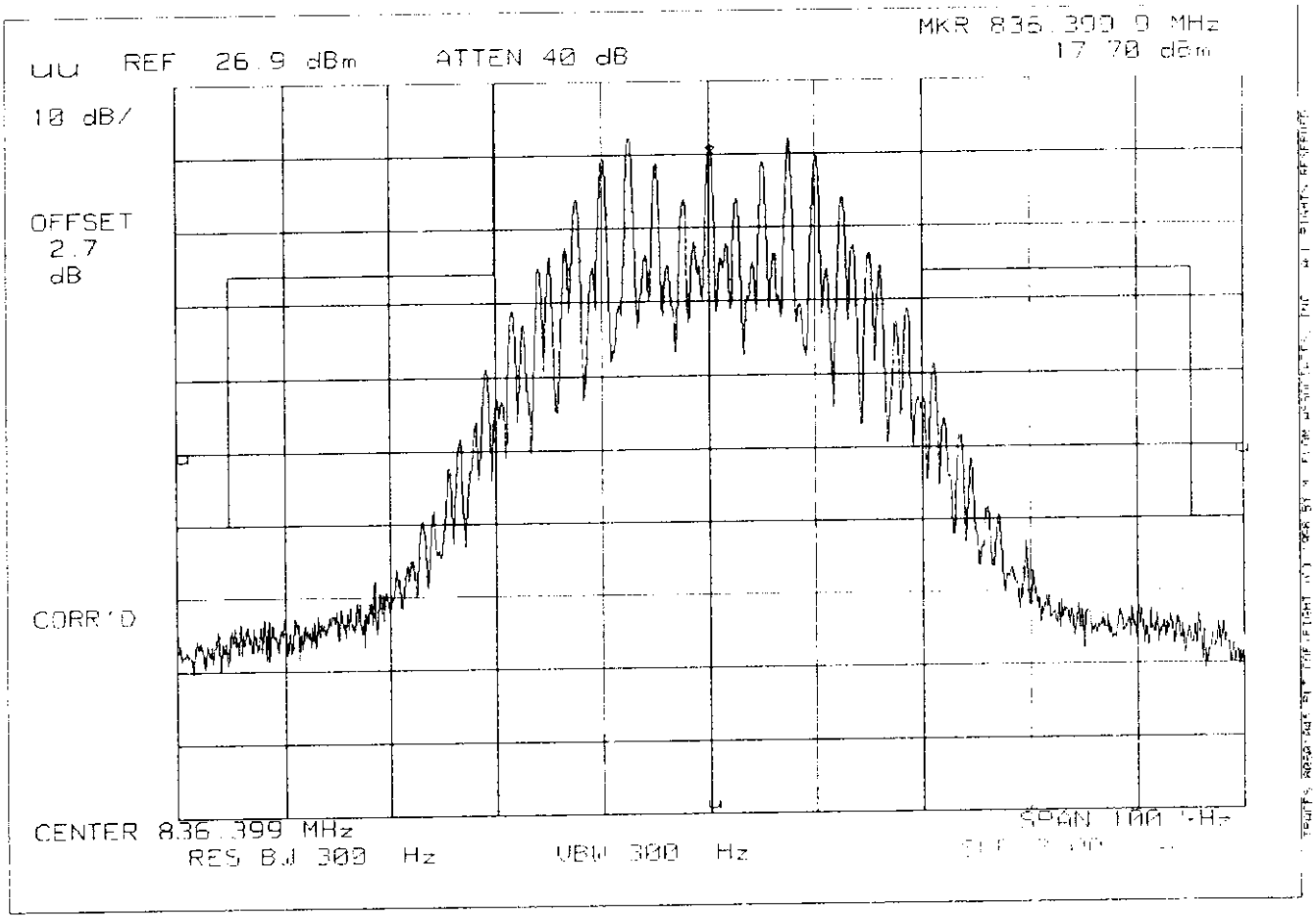
POWER: HIGH
MODULATION: ST
MASK: AMPS CELLULAR, F3E/F3D w/LPF



SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 10:25, WED

GML NHA-9S

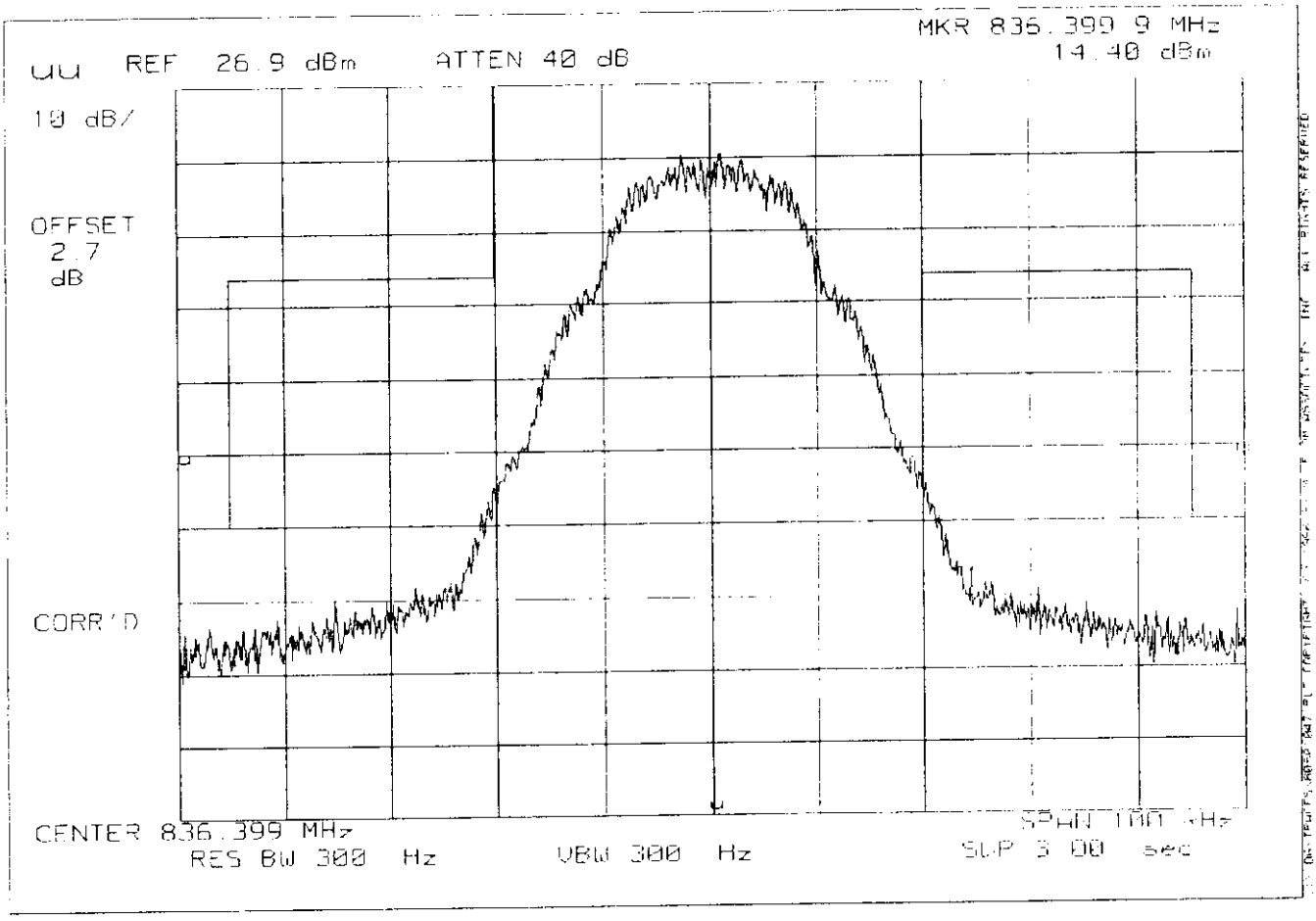
POWER: HIGH
MODULATION: SAT+VOICE
MASK: AMPS CELLULAR, F3E/F3D w/LPF



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA AMPS
1998-JUL-01, 10:28, WED

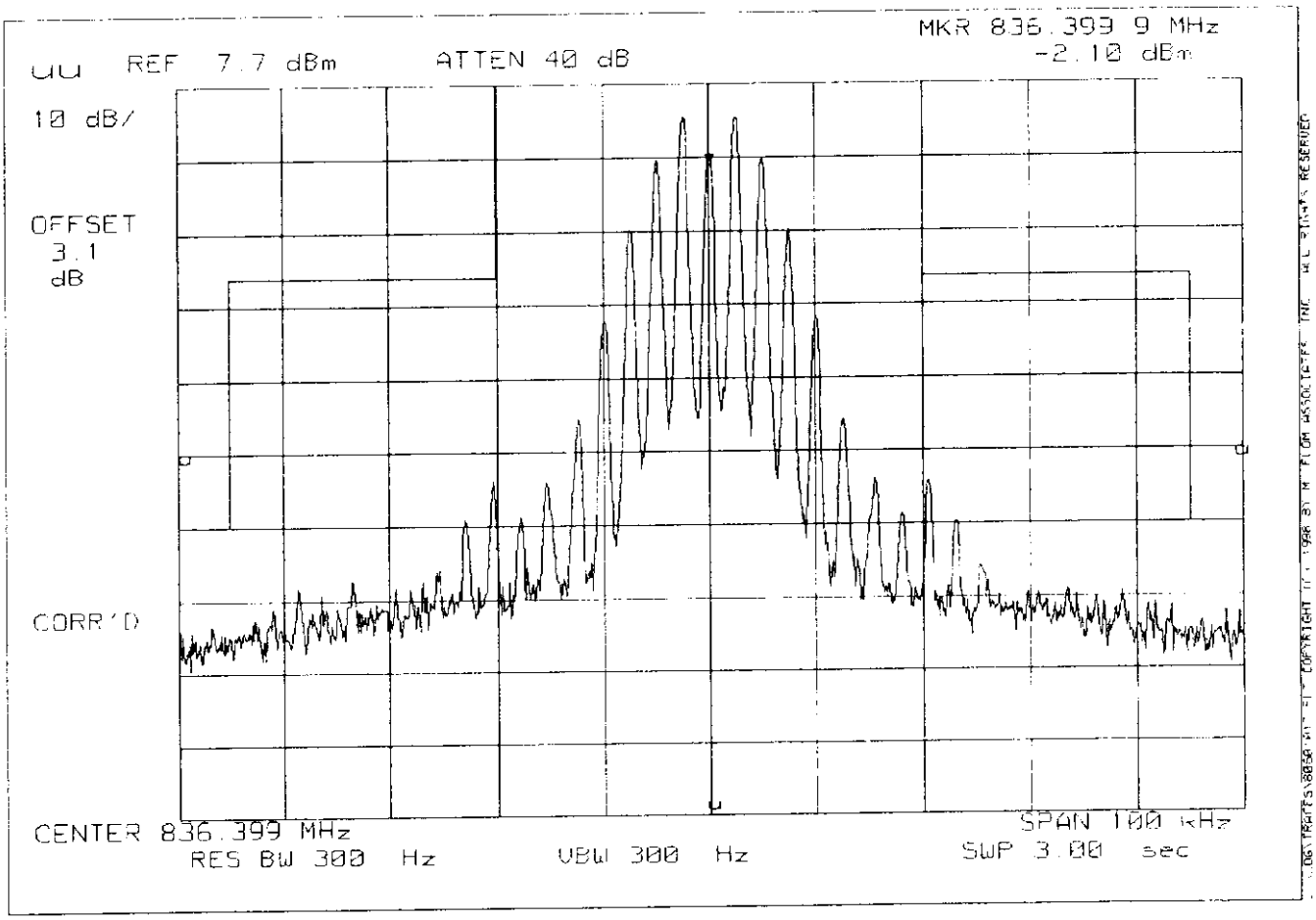
POWER: HIGH
MODULATION: SAT+DTMF
MASK: AMPS CELLULAR, F3E/F3D w/LPF



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 08:15, WED

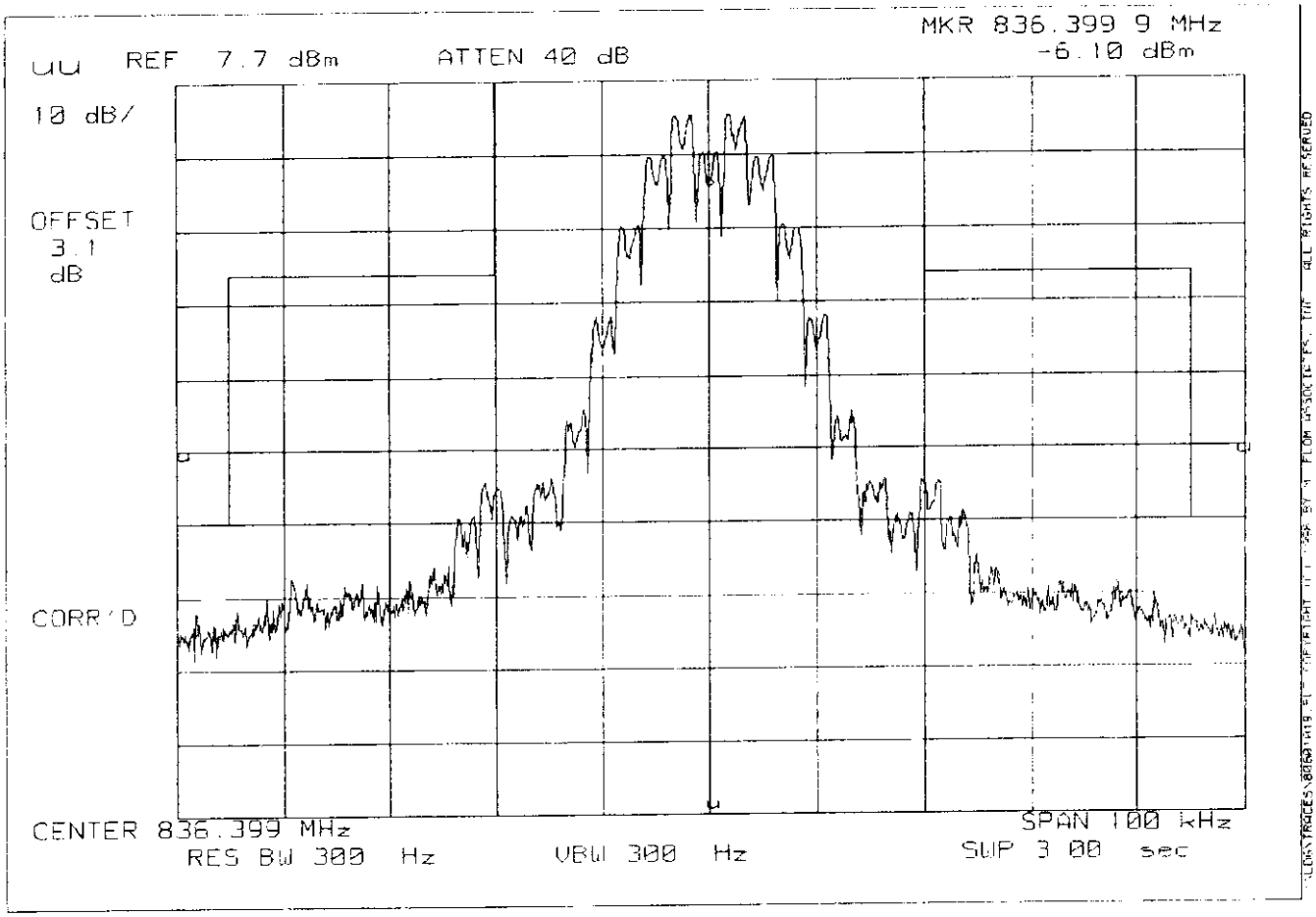
POWER: LOW
MODULATION: NAMPS VOICE
MASK: AMPS CELLULAR, F3E/F3D w/LPF



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 08:18, WED

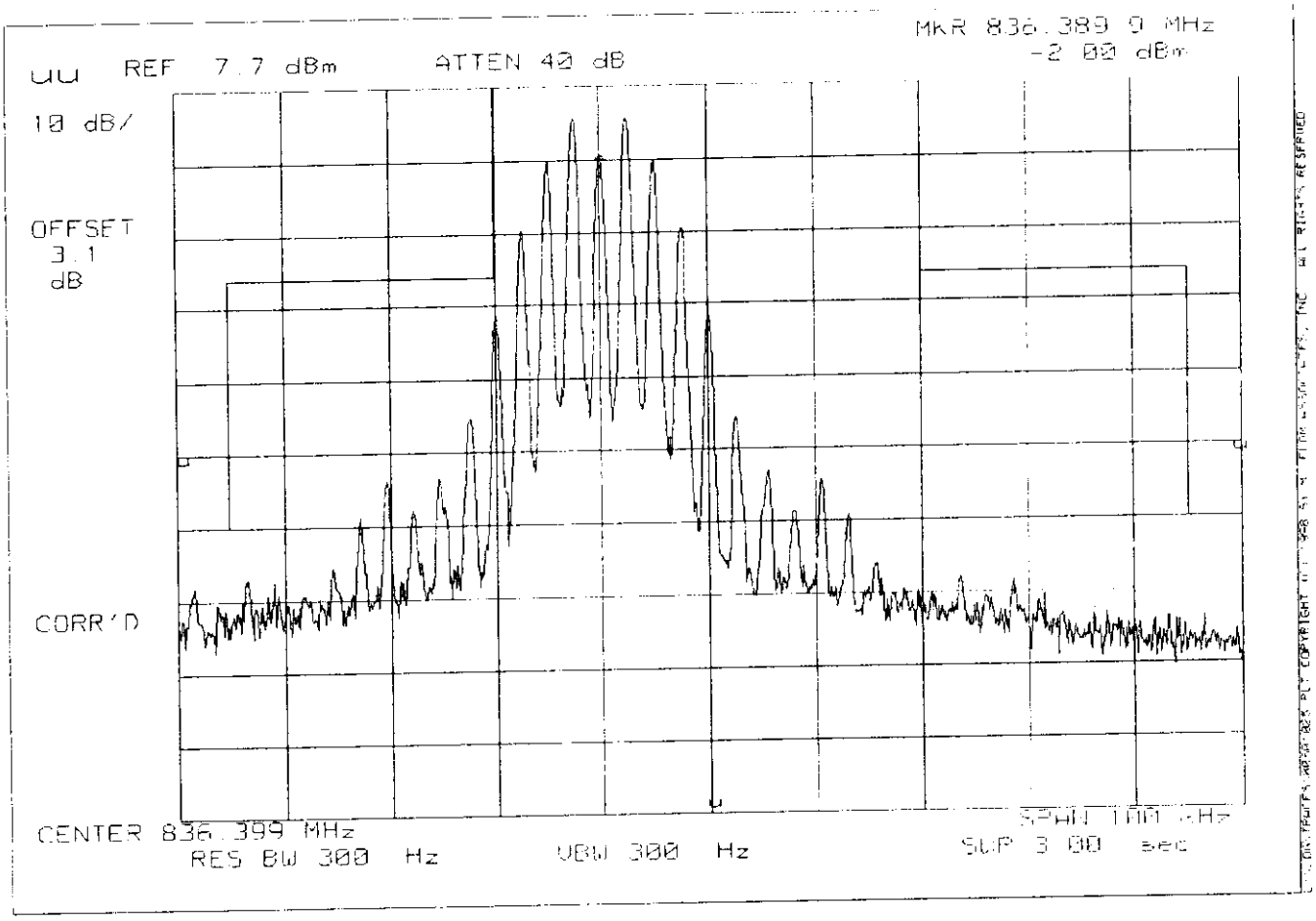
POWER: LOW
MODULATION: NAMPS VOICE + D-SAT
MASK: AMPS CELLULAR, F3E/F3D w/LPF



PAGE 22.17.

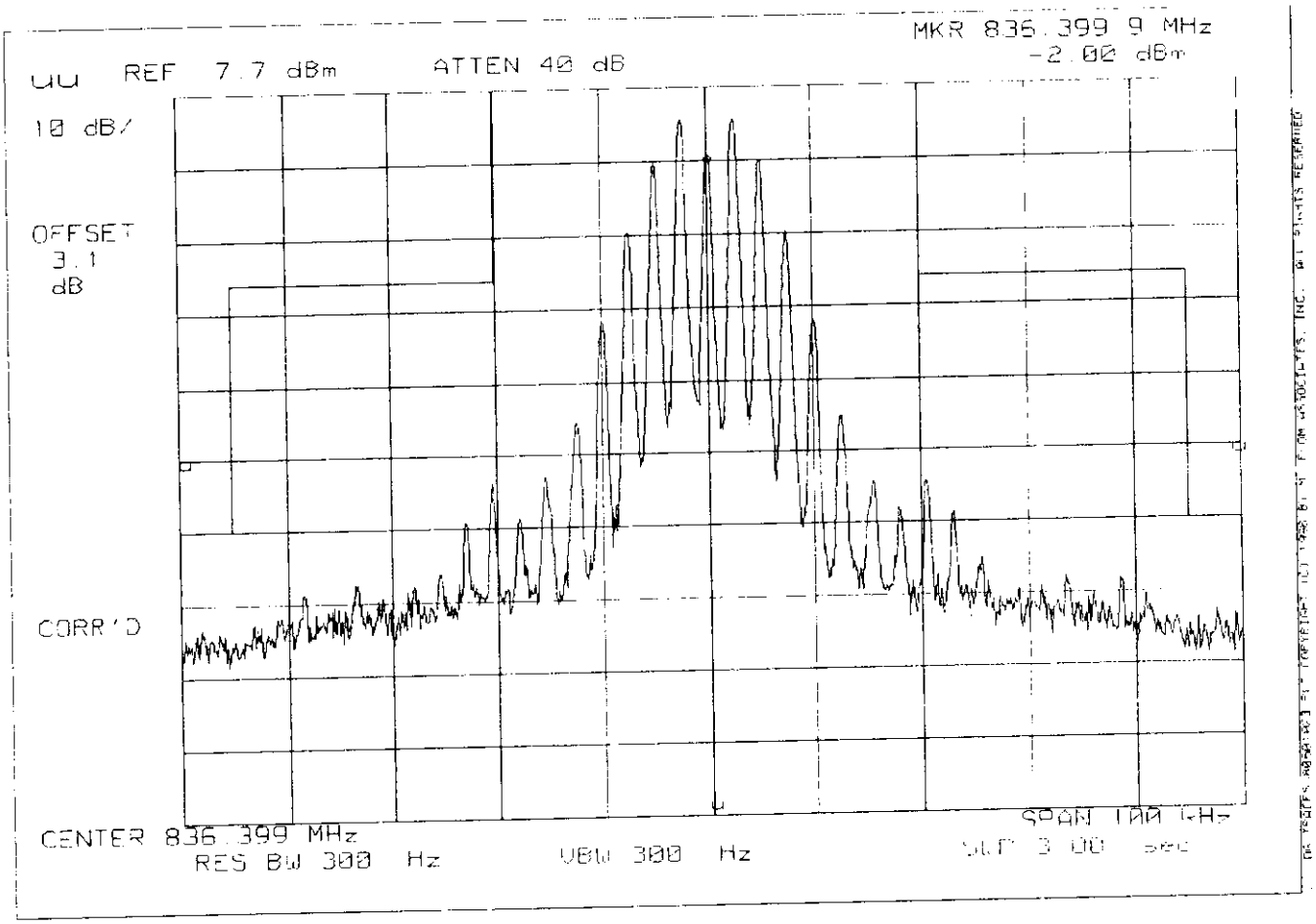
SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 08:33, WED

POWER: LOW
MODULATION: NAMPS VOICE (LOW CH)
MASK: AMPS CELLULAR, F3E/F3D w/LPF



SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 08:30, WED

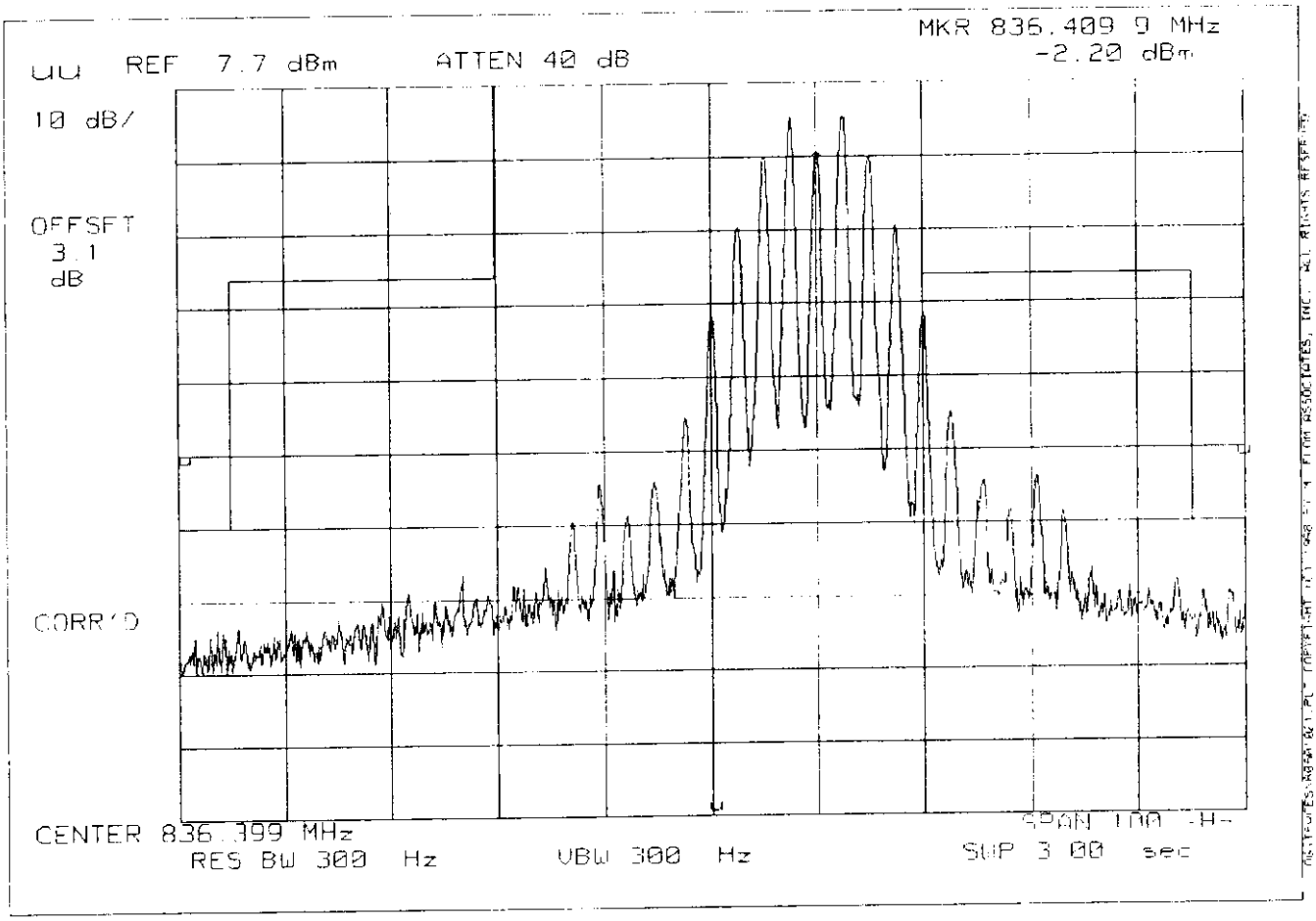
POWER: LOW
MODULATION: NAMPS VOICE (MID CH)
MASK: AMPS CELLULAR, F3E/F3D w/LPF



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 08:26, WED

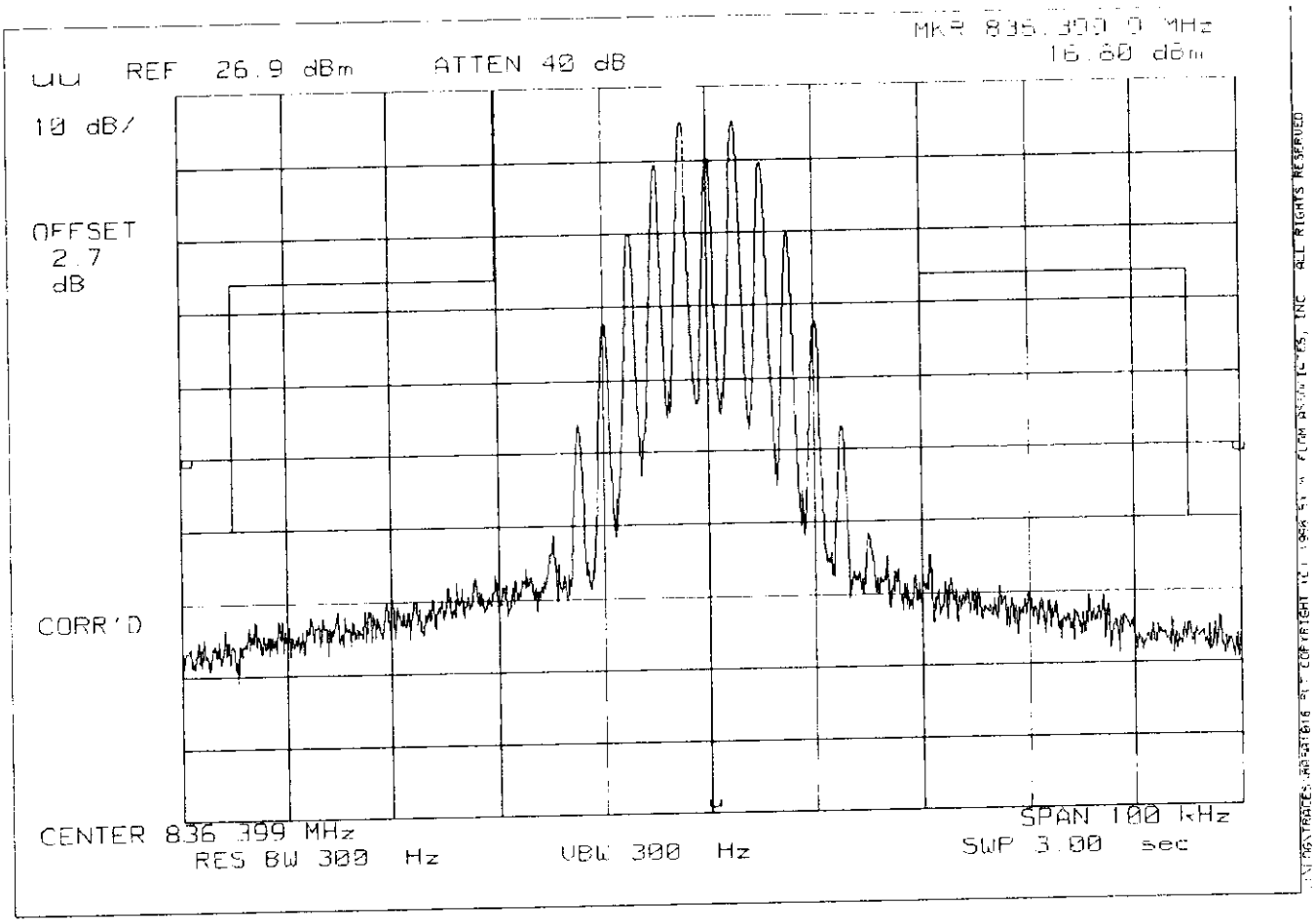
POWER: LOW
MODULATION: NAMPS VOICE (HIGH CH)
MASK: AMPS CELLULAR, F3E/F3D w/LPF



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 08:14, WED

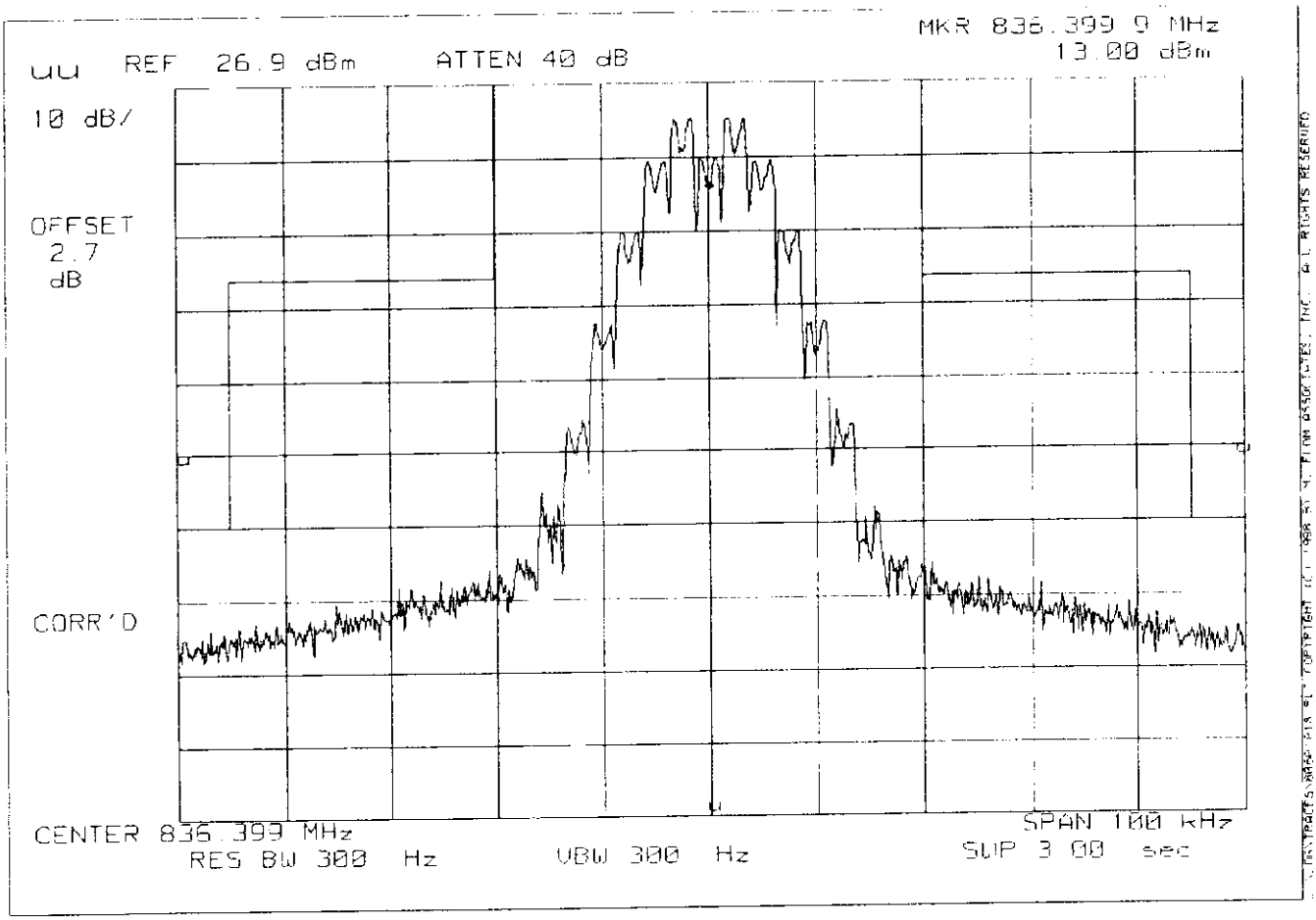
POWER: HIGH
MODULATION: NAMPS VOICE
MASK: AMPS CELLULAR, F3E/F3D w/LPF



SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 08:17, WED

GML NHA-9S

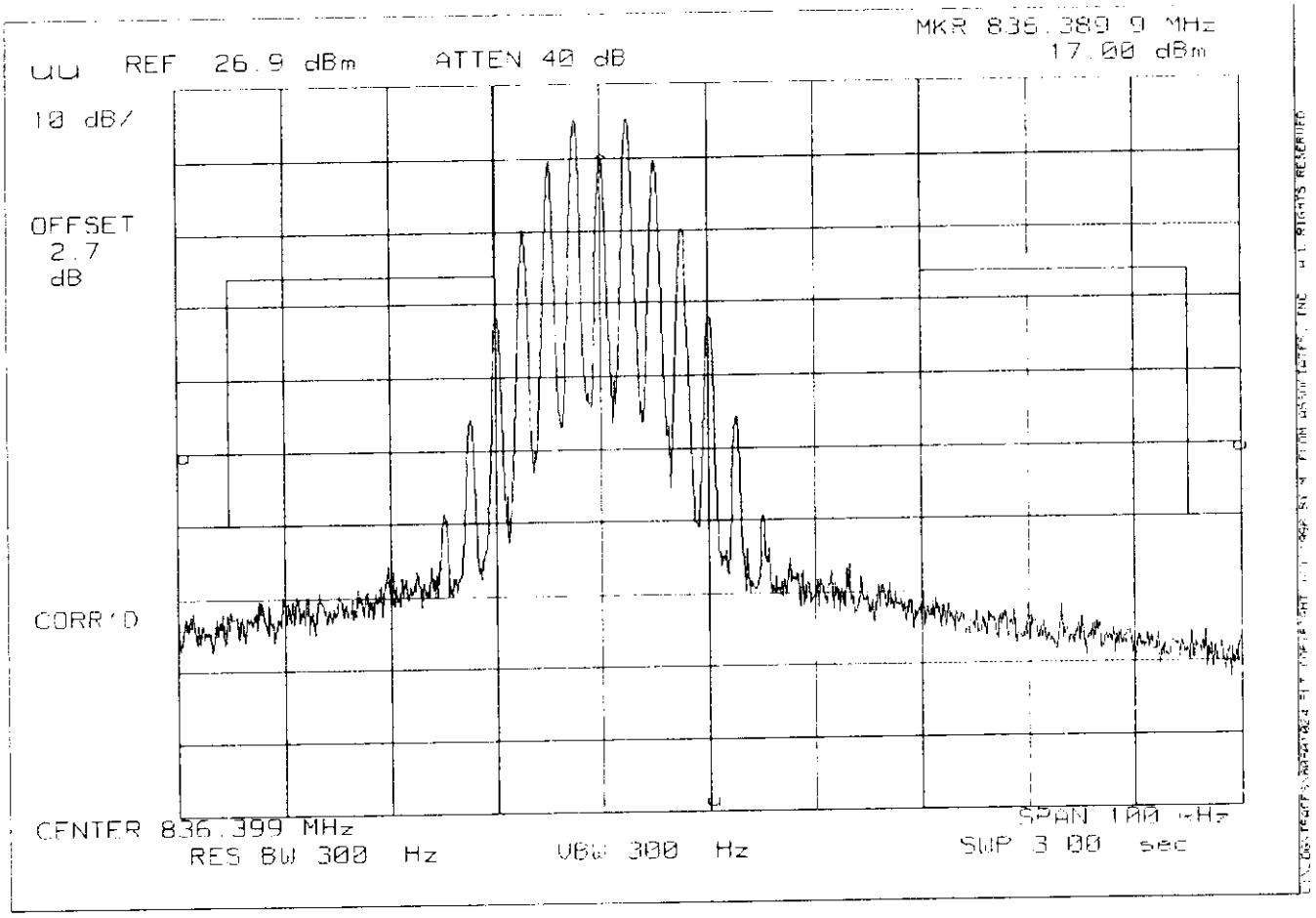
POWER: HIGH
MODULATION: NAMPS VOICE + D-SAT
MASK: AMPS CELLULAR, F3E/F3D w/LPF



GML NHA-9S

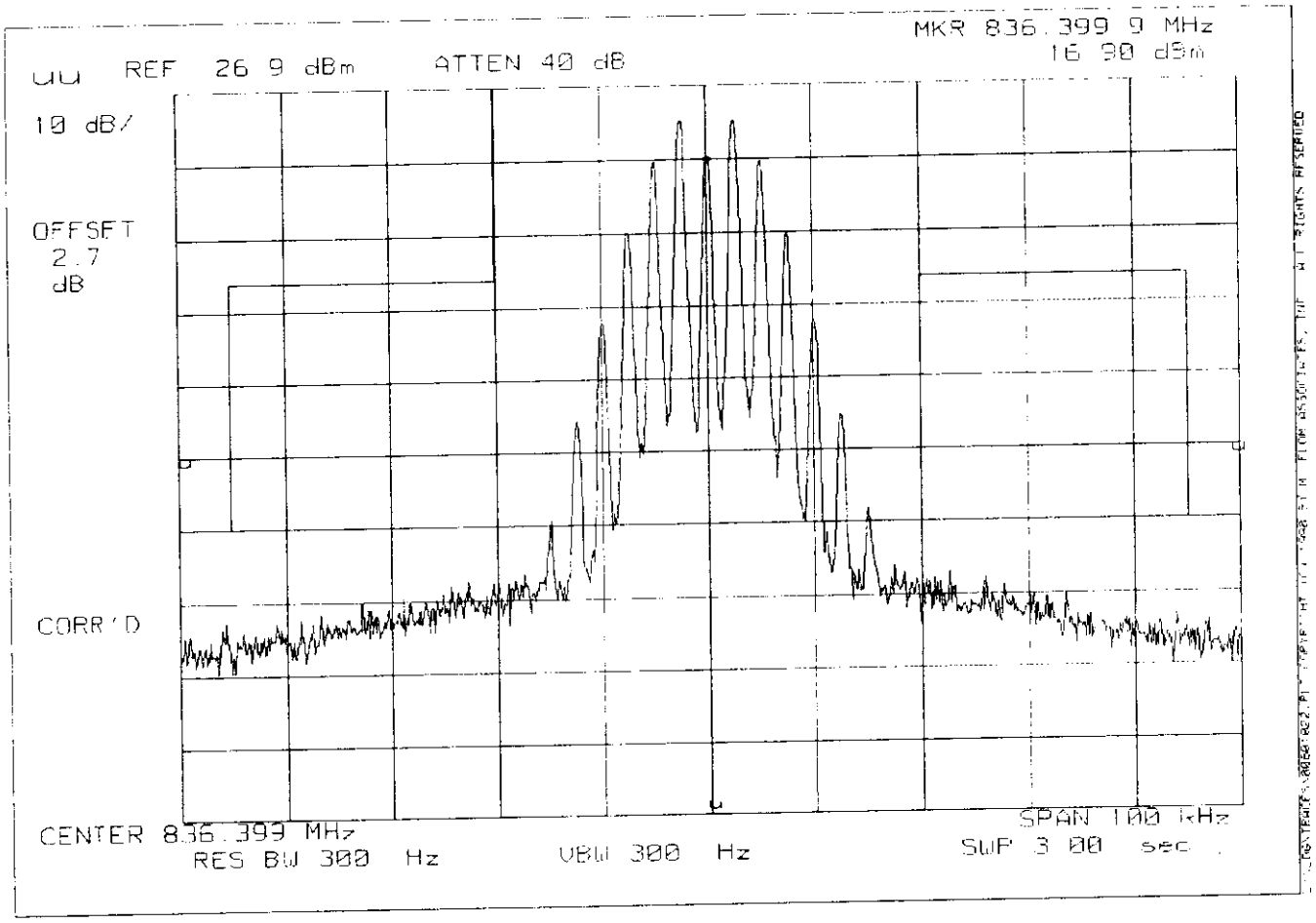
SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 08:32, WED

POWER: HIGH
MODULATION: NAMPS VOICE (LOW CH)
MASK: AMPS CELLULAR, F3E/F3D w/LPF



SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 08:29, WED

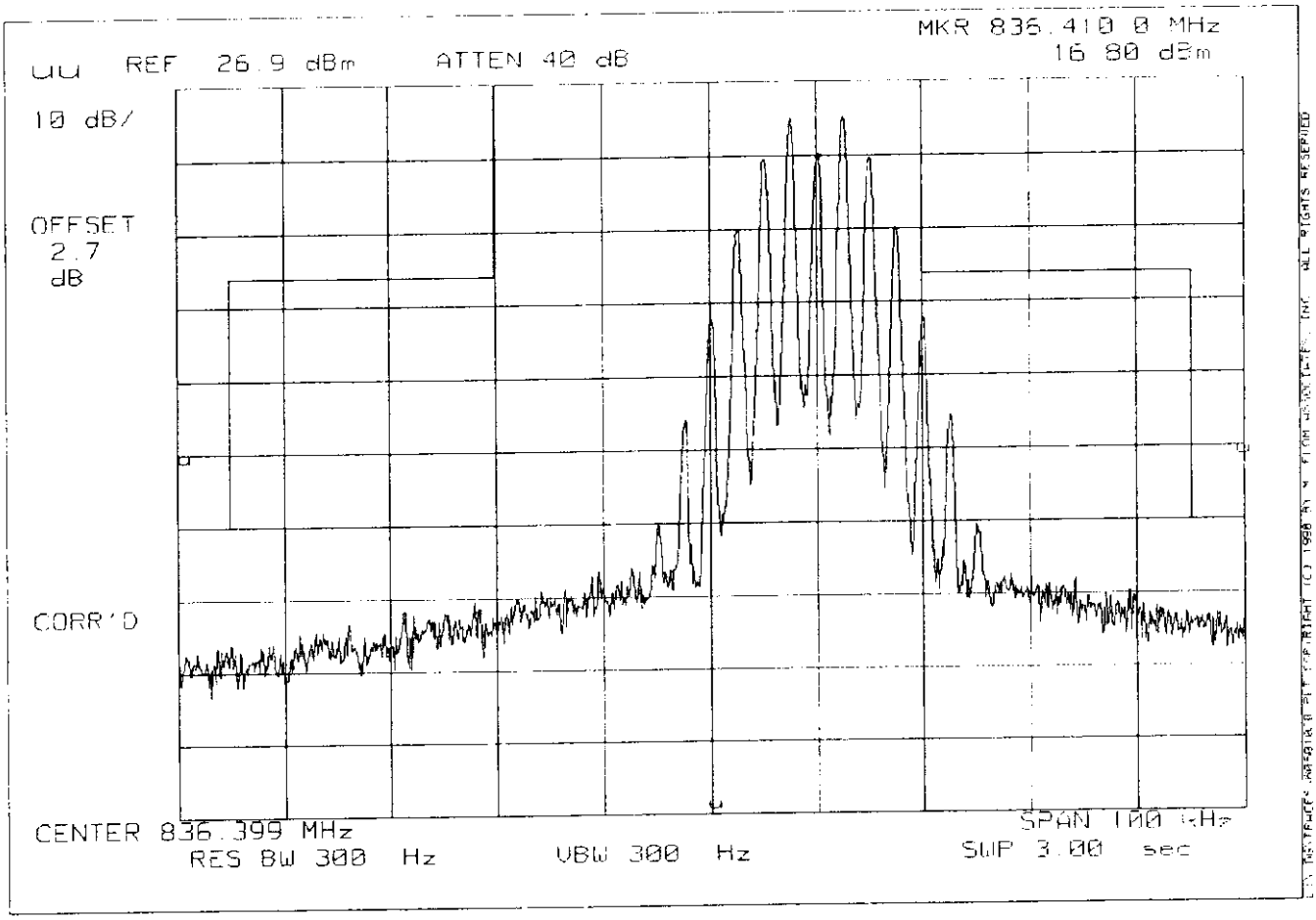
POWER: HIGH
MODULATION: NAMPS VOICE (MID CH)
MASK: AMPS CELLULAR, F3E/F3D w/LPF



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 08:25, WED

POWER: HIGH
MODULATION: NAMPS VOICE (HIGH CH)
MASK: AMPS CELLULAR, F3E/F3D w/LPF



NAME OF TEST: EMISSION REQUIREMENTS - WORST CASE MODULATION & WIDEBAND DATA

PARAGRAPH: 47 CFR 22.917

GUIDE: TIA/EIA STANDARD IS-19-B

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: AS PER PREVIOUS PAGE

MEASUREMENT PROCEDURE

1. The E.U.T. was connected to a coaxial attenuator and then to a spectrum analyzer. The unmodulated carrier was set for 0 dB reference level.

2. A notch filter was introduced to reduce or eliminate any spectrum analyzer internally generated spurious for measurements of the harmonics and the carrier level.

3. Spectrum analyzer bandwidth was set to section 22.917(h) as applicable.

4. Measurements were made on channels 380, 799 and 991. The equipment was first modulated for the Worst Case Modulation, then for Wideband Data (F8W, F1D).

5. All other spurious emissions over the range of 0 to beyond the 10th harmonic (10 GHz) were 20 dB or more below the limit.

6. The data presented here is for the worst case.

7. MEASUREMENT RESULTS: ATTACHED

MEASUREMENT SUMMARY: EMISSION REQUIREMENTS - WORST CASE MODULATION

WORST CASE MODULATION = VOICE + SAT

EMISSION, MHz/HARM.	LIMIT, dBc	SPURIOUS EMISSIONS, dBc	
		Lo	Hi
Fo + (Fo + 20 kHz) to Fo + 45 kHz	≤-26	<-45	<-47
Fo + (Fo + 45 kHz) to Fo + 90 kHz	≤-45 (≤-13 dBm)	<-74	<-77
2nd to 10th	≤-51 (≤-13 dBm)	<-91	<-92

MEASUREMENT RESULTS = ATTACHED OFFSET PLOTS

EMISSIONS IN THE RECEIVER CRITICAL BAND

EMISSION, MHz/HARM.	LIMIT, dBm	SPURIOUS EMISSIONS, dBm	
		Lo	Hi
869 to 894	≤-80	<-91	<-91

MEASUREMENT RESULTS = ATTACHED PLOTS

SUPERVISED BY:

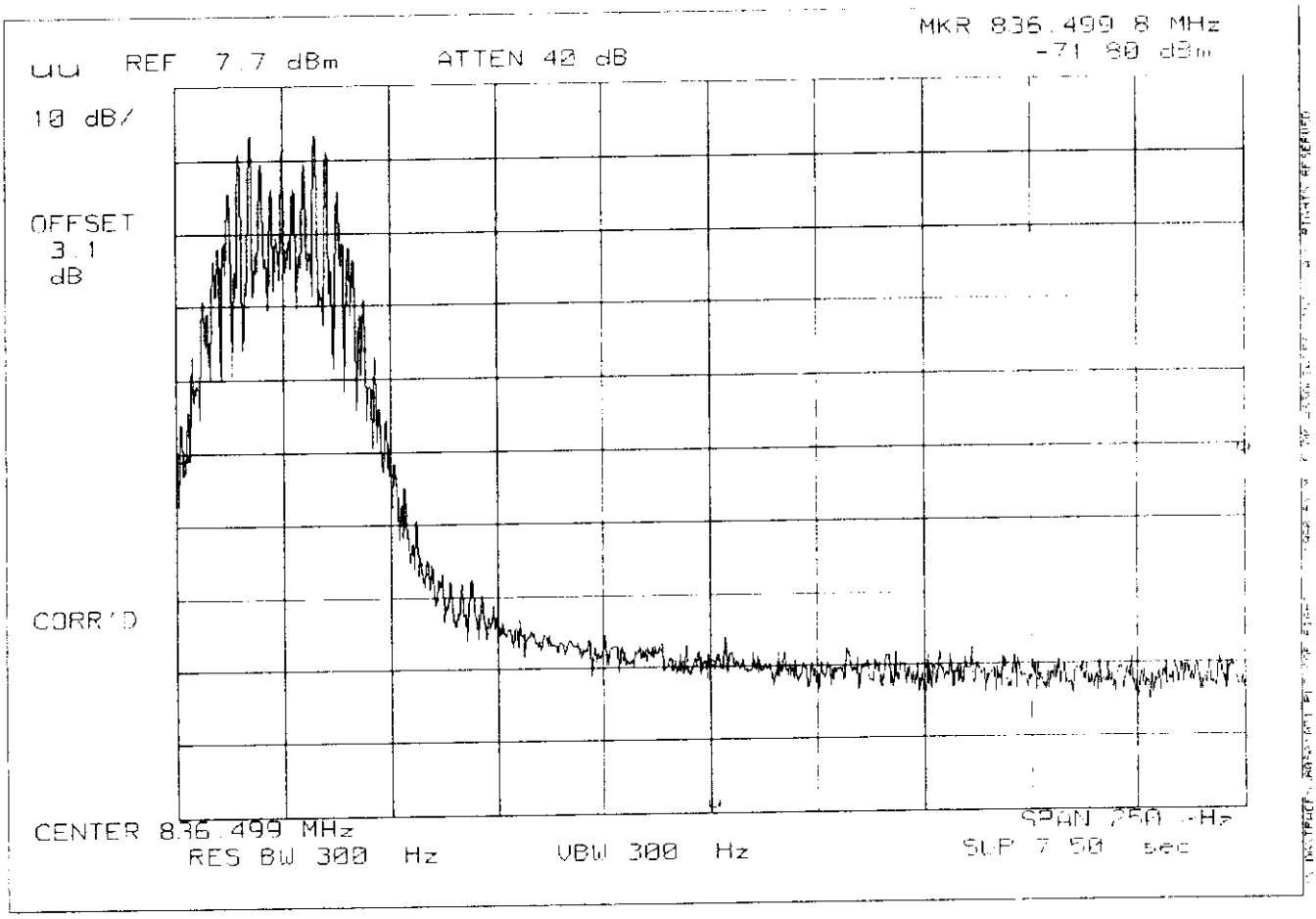
MORTON FLOM, P. Eng.

PAGE 25.1.

GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 14:12, WED

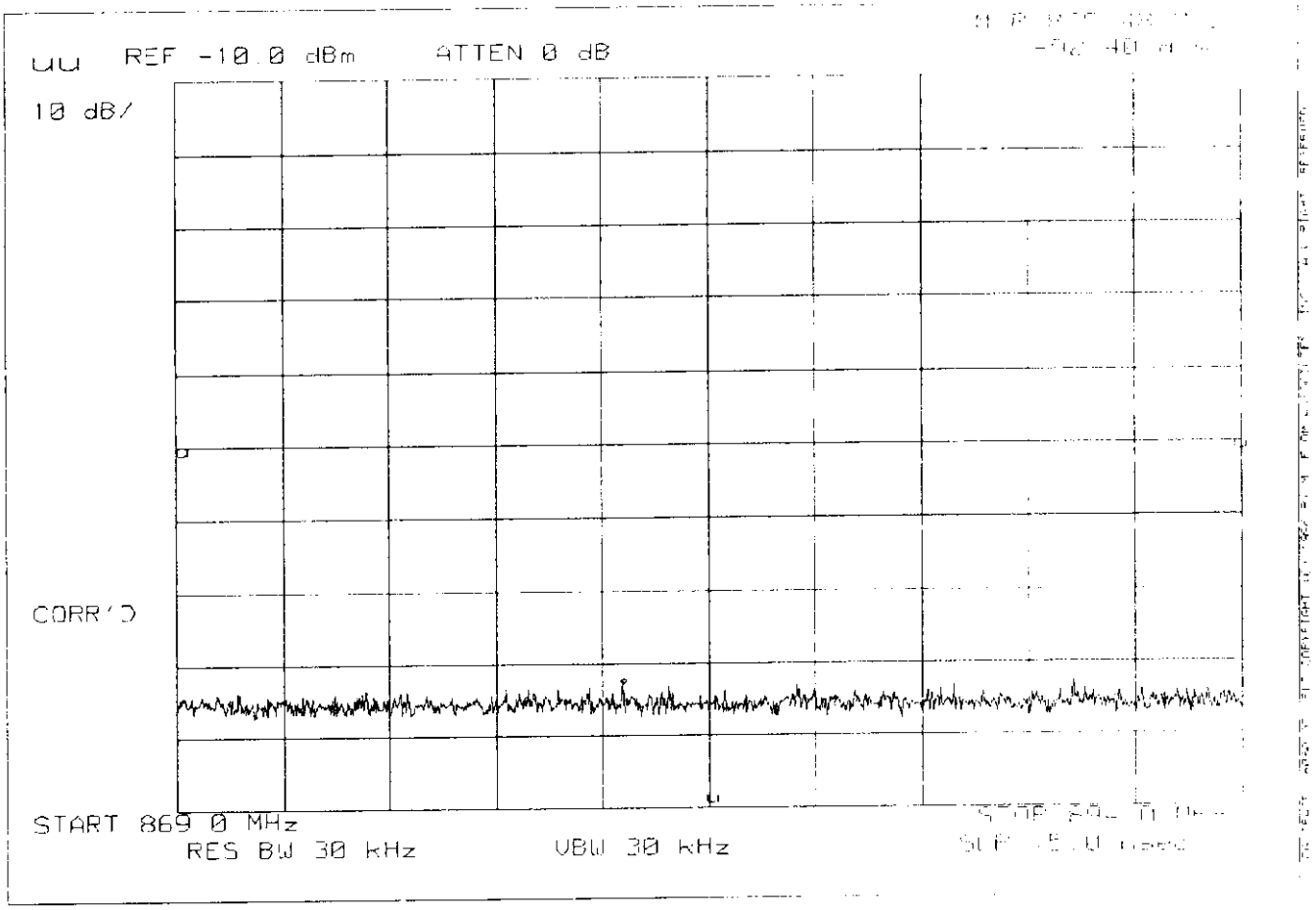
POWER: LOW
MODULATION: OFFSET VOICE + SAT



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 14:14, WED

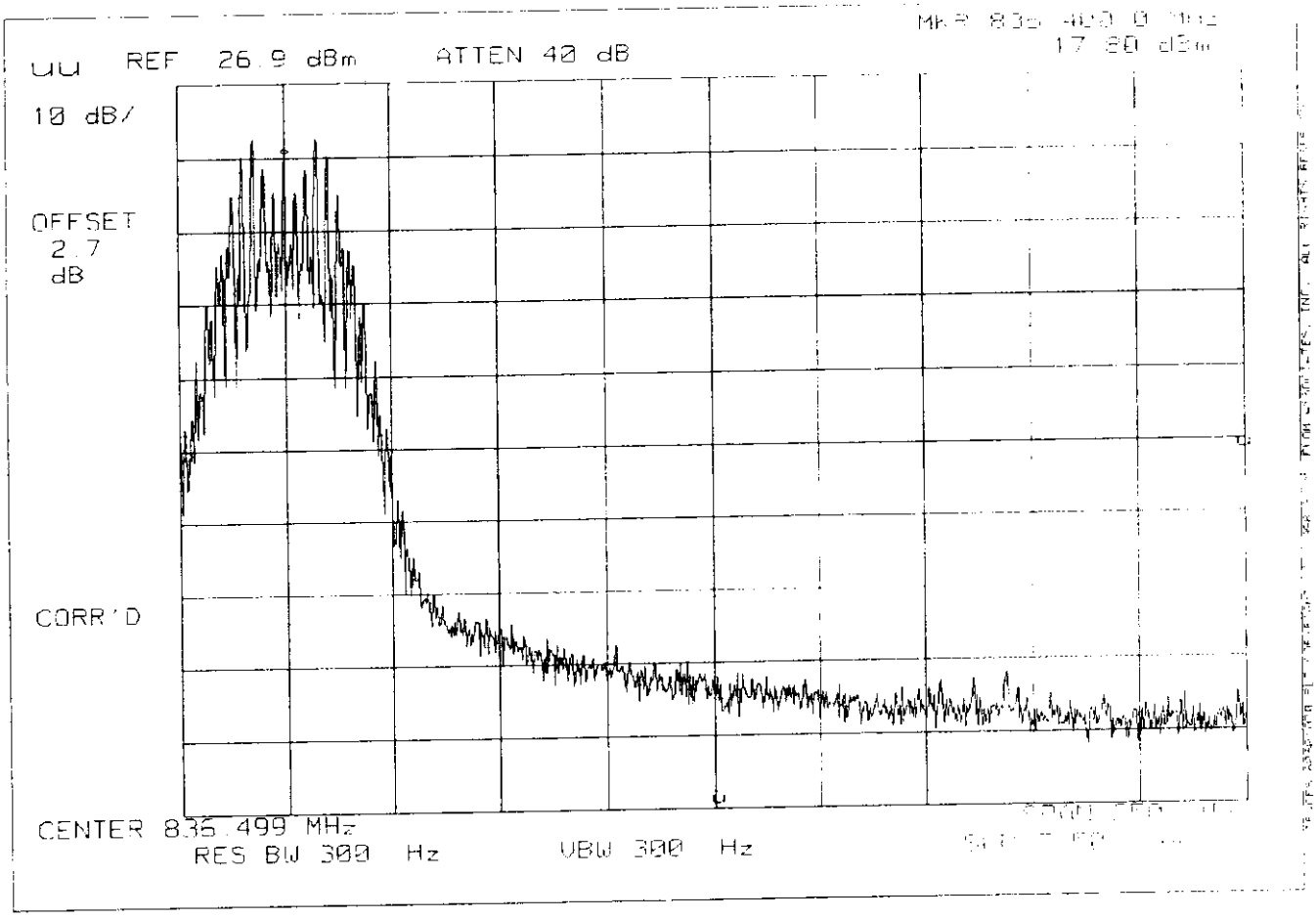
POWER: LOW POWER
MODULATION: CH 380 991, 799
REMARK: RECEIVER CRITICAL BAND



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 14:09, WED

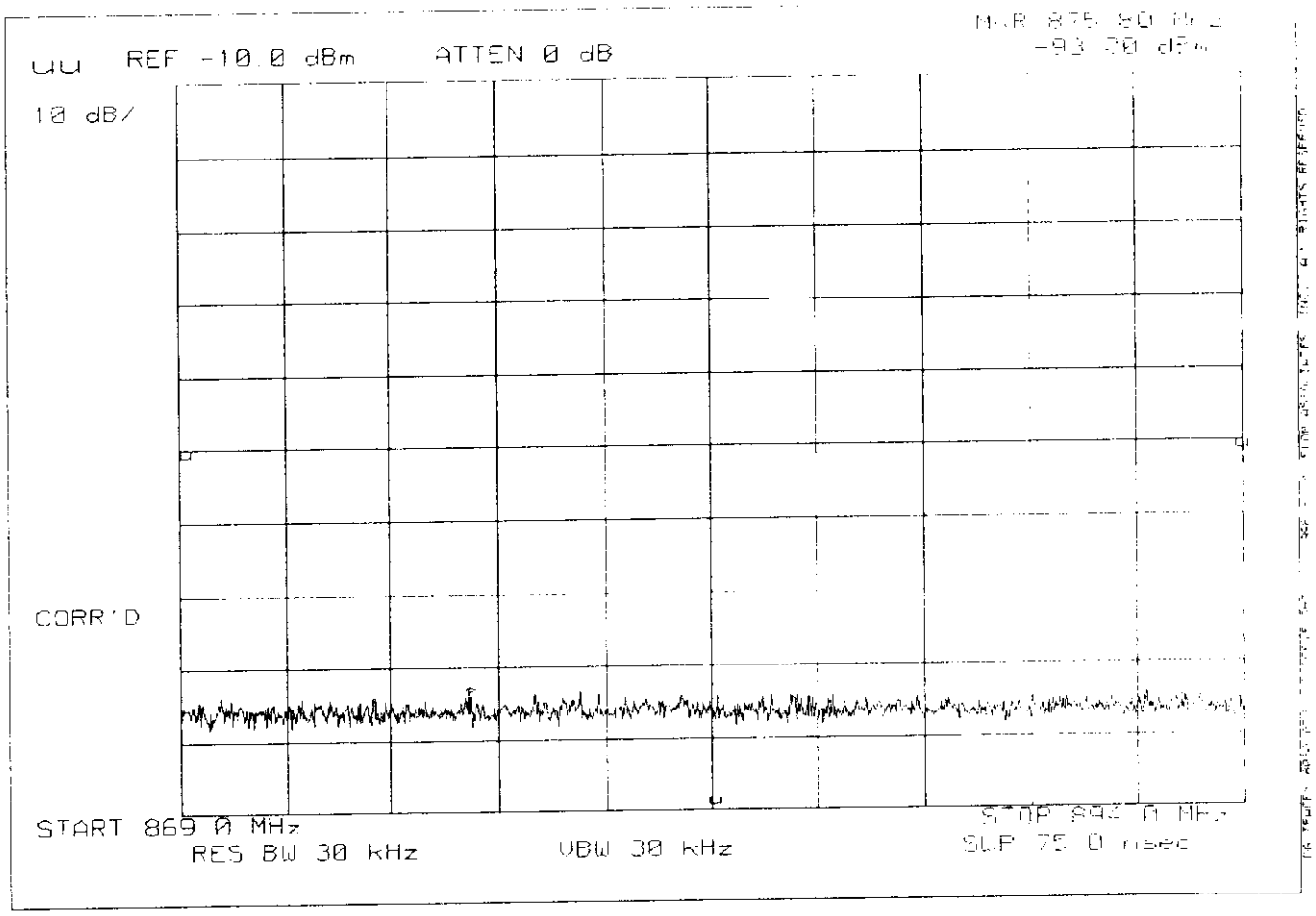
POWER: HIGH
MODULATION: OFFSET VOICE + SAT



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 14:15, WED

POWER: HIGH POWER
MODULATION: CH 380 991, 799
REMARK: RECEIVER CRITICAL BAND



MEASUREMENT SUMMARY: EMISSION REQUIREMENTS - WIDEBAND DATA (F9D, 10 kb/s)

MEASURED CHANNELS = 380, 799, 991

EMISSION, MHz/HARM.	LIMIT, dBc	SPURIOUS EMISSIONS, dBc Lo	Hi
Fo + (Fo + 20 kHz) to Fo + 45 kHz	≤-26	<-35	<-37
Fo + (Fo + 45 kHz) to Fo + 90 kHz	≤-45	<-64	<-63
Fo + (Fo + 90 kHz) to 2nd Harmonic	≤-60 (≤-13 dBm)	<-77	<-83
2nd to 10th	≤-51 (≤-13 dBm)	<-91	<-92

MEASUREMENT RESULTS = ATTACHED OFFSET PLOTS

EMISSIONS IN THE RECEIVER CRITICAL BAND

EMISSION, MHz/HARM.	LIMIT, dBm	SPURIOUS EMISSIONS, dBm Lo	Hi
869 to 894	≤-80	<-91	<-91

MEASUREMENT RESULTS = ATTACHED PLOTS

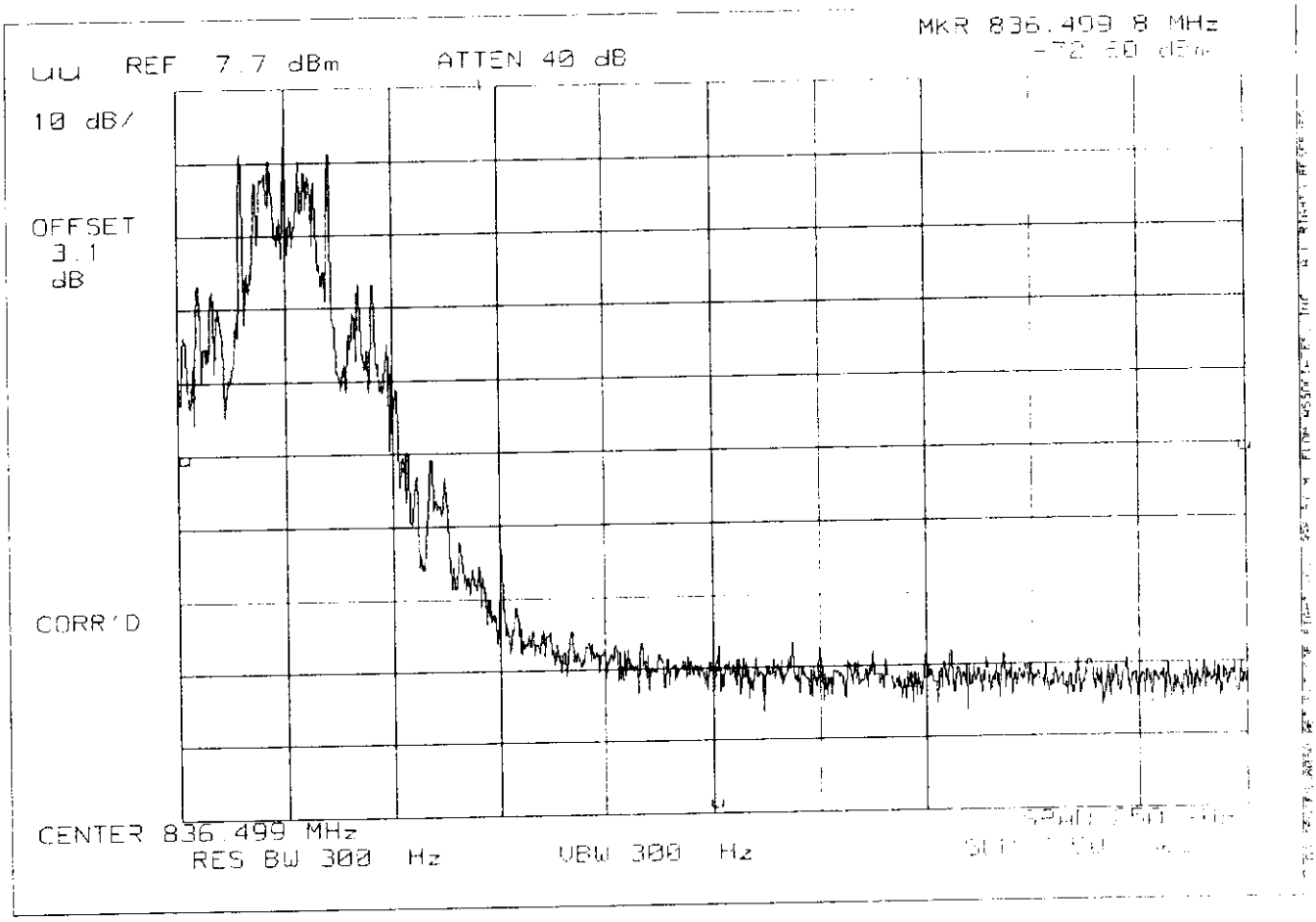
SUPERVISED BY:

MORTON FLOM, P. Eng.

GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 14:00, WED

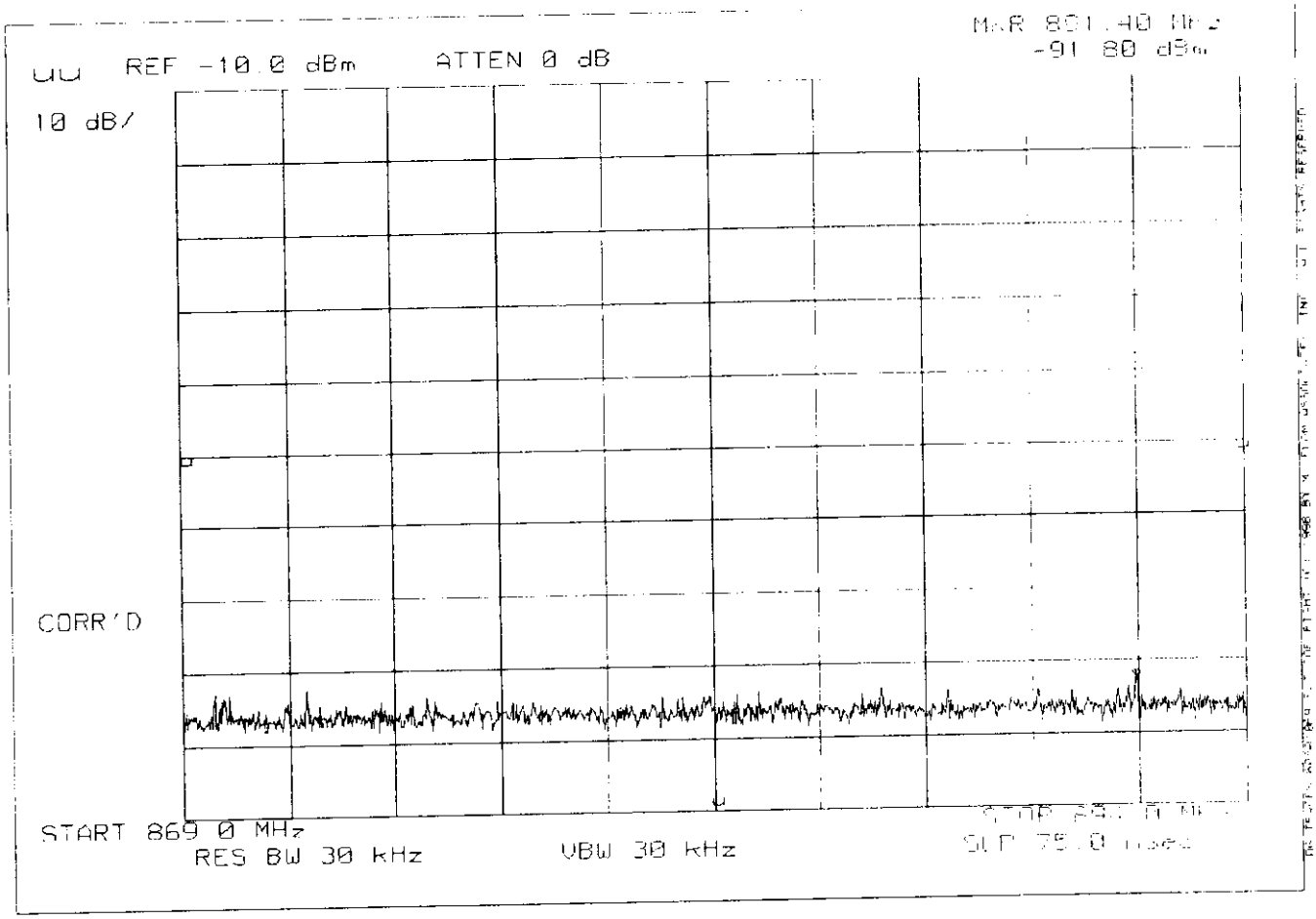
POWER: LOW
MODULATION: OFFSET WIDEBAND DATA



GML NHA-9S

SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 14:05, WED

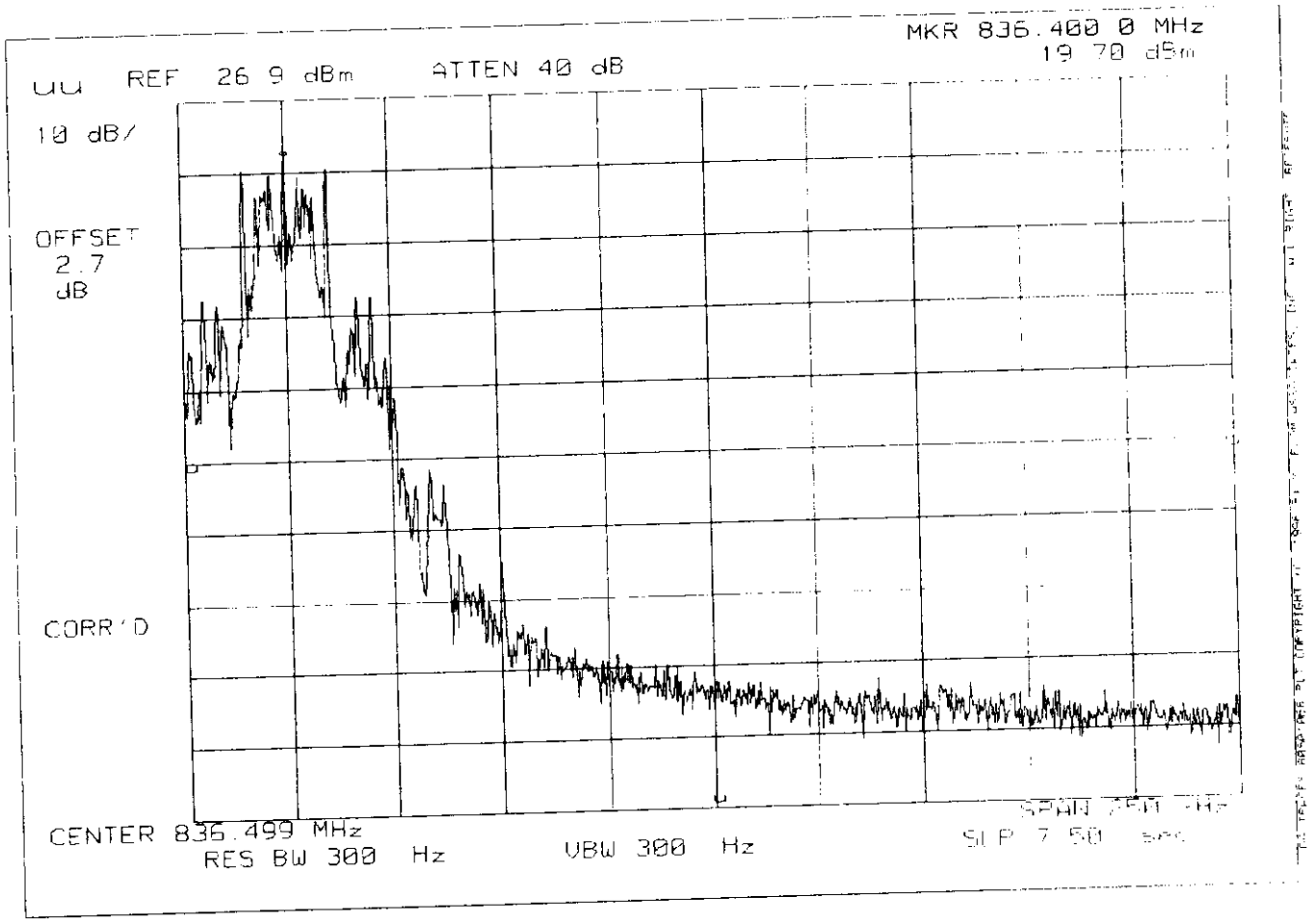
POWER: LOW POWER
MODULATION: CH 380, 991, 799
REMARK: RECEIVER CRITICAL BAND



GML NHA-9S

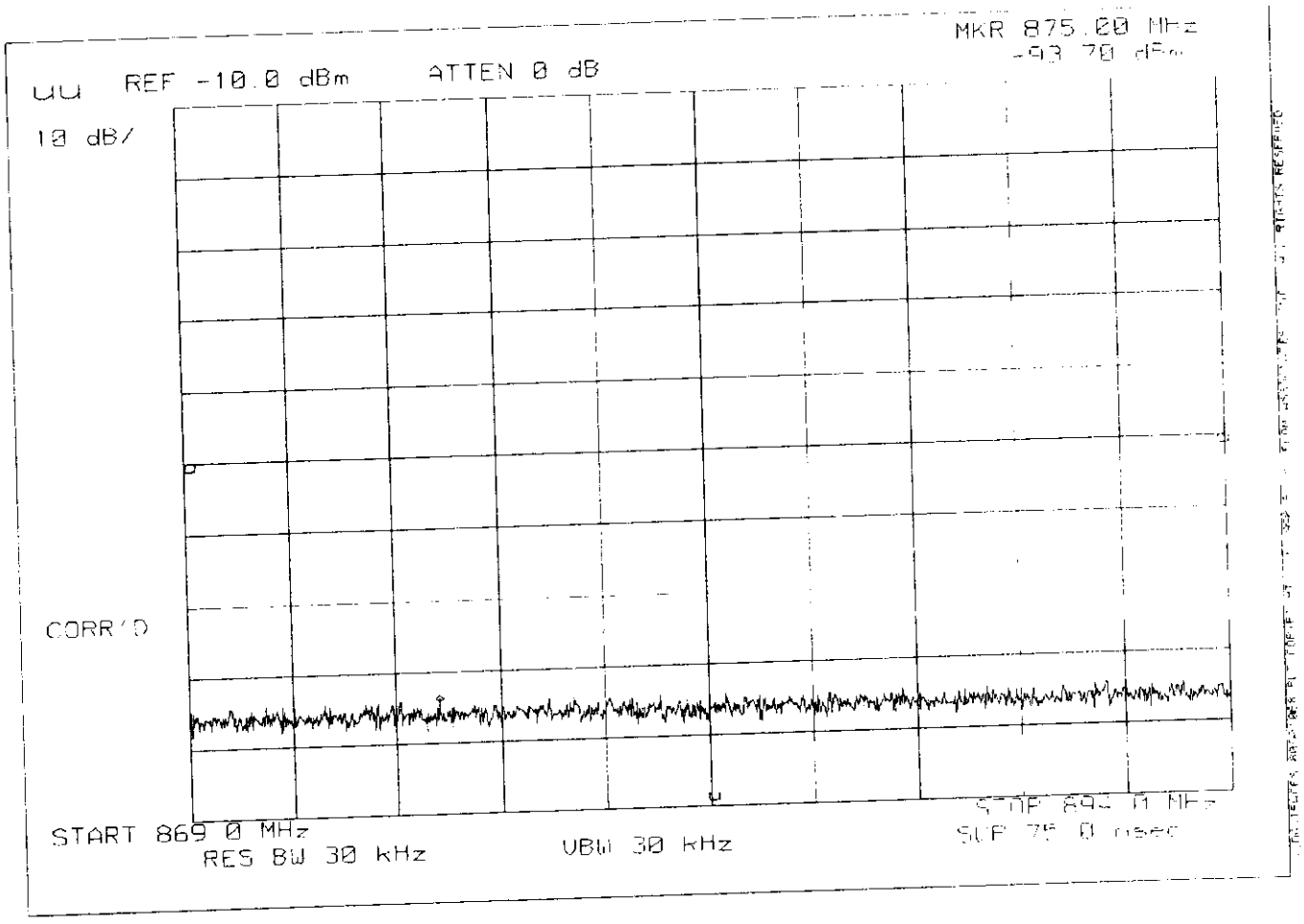
SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 13:59, WED

POWER: HIGH
MODULATION: OFFSET WIDEBAND DATA



PAGE 27.4.
SPECTRUM ANALYZER PRESENTATION
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1998-JUL-01, 14:04, WED

POWER: HIGH POWER
MODULATION: CH 380, 991, 799
REMARK: RECEIVER CRITICAL BAND



NAME OF TEST: SPURIOUS EMISSIONS AT ANTENNA TERMINALS

PARAGRAPH: 47 CFR 2.991, 22.917

GUIDE: TIA/EIA STANDARD IS-19-B

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: AS PER ATTACHED PAGE

MEASUREMENT PROCEDURE

1. The E.U.T. was connected to a coaxial attenuator and then to a Spectrum Analyzer.

2. A notch filter was introduced to reduce or eliminate spurious emissions which could be generated internally in the spectrum analyzer.

3. Measurements were made over the range from 45 kHz to 10 GHz for the worst case modulation at both the highest and lowest R.F. power settings.

4. All other emissions were 20 dB or more below the limit.

5. Spectrum analyzer bandwidth was set to section 22.917(h) as applicable.

6. MEASUREMENT RESULTS: ATTACHED

G871003

TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED)

POWER: LOW

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	LEVEL, dBm	LEVEL, dBc	LEVEL, µW
836.400	1672.795	-48.4	-56.1	0
836.400	2508.724	-52.1	-59.8	0
836.400	3346.013	-52.8	-60.5	0
836.400	4182.027	-53.2	-60.9	0
836.400	5017.967	-53.1	-60.8	0
836.400	5854.938	-46.2	-53.9	0
836.400	6690.935	-47.1	-54.8	0
836.400	7527.714	-46.6	-54.3	0
836.400	8364.449	-46.3	-54.0	0
836.400	9200.114	-46.4	-54.1	0
836.400	10036.768	-46.0	-53.7	0
836.400	10872.894	-46.0	-53.7	0
836.400	11709.245	-45.1	-52.8	0
836.400	12546.257	-41.2	-48.9	0

G871004
TRANSMITTER SPURIOUS EMISSIONS (CONDUCTED)
POWER: HIGH

FREQUENCY TUNED, MHz	FREQUENCY EMISSION, MHz	LEVEL, dBm	LEVEL, dBc	LEVEL, µW
836.400	1672.810	-40.7	-67.6	0
836.400	2509.220	-45.8	-72.7	0
836.400	3345.622	-53.5	-80.4	0
836.400	4182.308	-52.5	-79.4	0
836.400	5018.332	-53.3	-80.2	0
836.400	5855.055	-47.6	-74.5	0
836.400	6691.325	-47.2	-74.1	0
836.400	7527.848	-46.1	-73.0	0
836.400	8363.564	-47.2	-74.1	0
836.400	9200.528	-47.7	-74.6	0
836.400	10037.149	-47.2	-74.1	0
836.400	10873.543	-47.2	-74.1	0
836.400	11709.418	-45.0	-71.9	0
836.400	12546.154	-42.5	-69.4	0

NAME OF TEST: FIELD STRENGTH OF SPURIOUS RADIATION

PARAGRAPH: 47 CFR 2.993 (a)

GUIDE: SEE MEASUREMENT PROCEDURE BELOW

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: AS PER ATTACHED PAGE

MEASUREMENT PROCEDURE

1. A description of the measurement facilities was filed with the FCC and was found to be in compliance with the requirements of Section 15.38, by letter from the FCC dated March 3, 1997, FILE 31040/SIT. All pertinent changes will be reported to the Commission by up-date prior to March 2000.

2. At first, in order to locate all spurious frequencies and approximate amplitudes, and to determine proper equipment functioning, the test sample was set up at a distance of three meters from the test instrument. Valid spurious signals were determined by switching the power on and off.

3. In the field, the test sample was placed on a wooden turntable above ground at three (or thirty) meters away from the search antenna. The test sample was connected to an R.F. Wattmeter and a 50 ohm dummy load, and adjusted to its rated output.

   In order to obtain the maximum response at each spurious frequency, the turntable was rotated. Also, the Search Antennas were raised and lowered vertically, and all cables were oriented. Excess power lead was coiled near the power supply.

4. A signal generator, connected with a non-radiating cable to a vertically polarized half-wave antenna (for each frequency involved) was substituted for the transmitter. The Search Antenna was raised and lowered to obtain maximum indicated.

5. The signal generator output was adjusted until a signal level indication equal to that from the transmitter was obtained.

6. Steps 4 and 5 were repeated, using a horizontally polarized half-wave antenna. The higher of the two observations was noted.

7. Power into the half-wave antenna was calculated from the characteristic impedance of the line, and the voltage output from the signal generator.

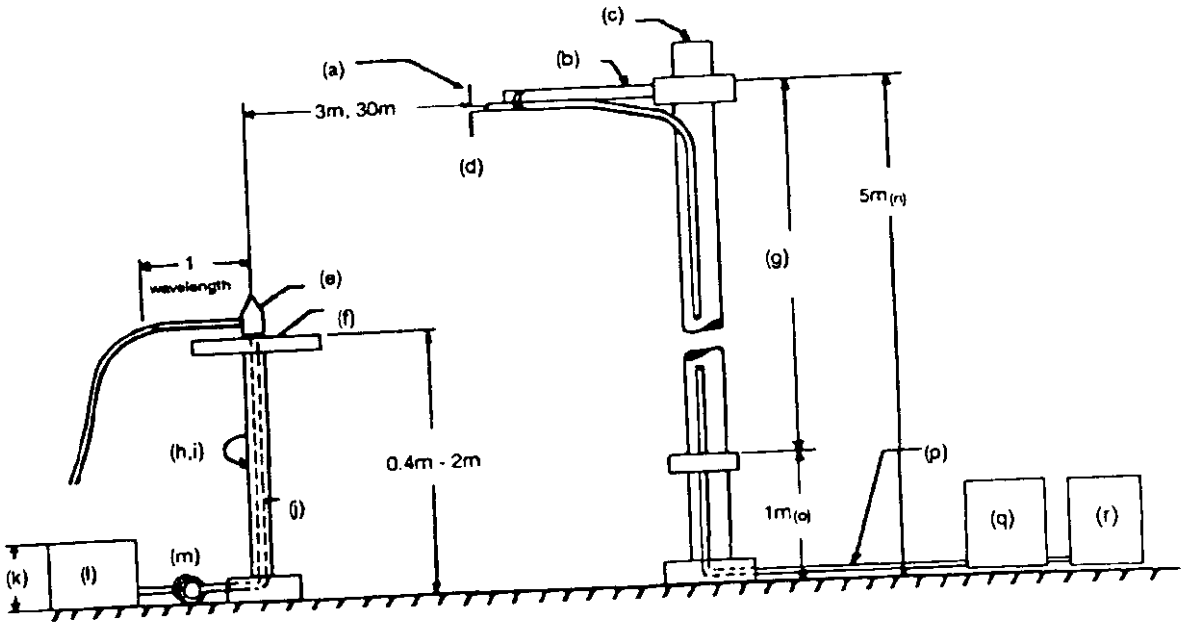
8. The level of each spurious radiation with reference to the transmitter power in dB, was calculated from:

$$\text{SPURIOUS LEVEL, dB} = 10 \text{ LOG } \frac{\text{(Calculated Spurious Power [from Para. 7].}}{\text{Tx Power (Wattmeter)}}$$

9. The worst case for all channels is shown.

10. MEASUREMENT RESULTS: ATTACHED

RADIATED TEST SETUP



NOTES:

(a) Search Antenna - Rotatable on boom.
(b) Non-metallic boom.
(c) Non-metallic mast.
(d) Adjustable horizontally.
(e) Equipment Under Test.
(f) Turntable.
(g) Boom adjustable in height.
(h) External control cables routed horizontally at least one wavelength.
(i) Rotatable.
(j) Cables routed through hollow turntable center.
(k) 30 cm or less.
(l) External power source.
(m) 10 cm diameter coil of excess cable.
(n) 25 cm (V), 1 m-7 m (V, H).
(o) 25 cm from bottom end of 'V', 1 m normally.
(p) Calibrated Cable at least 10 m in length.
(q) Amplifier (optional).
(r) Spectrum Analyzer.

GML NHA-9S

RADIATED EMISSIONS (TX2), LOW POWER
1998-JUN-30, 13:03, TUE

TUNED, MHz	EMISSION, MHz	METER, dBuV	C.F., dB	ERP, dBm
824.040	1648.08	29.3	33.5	-32.4
836.400	1672.79	29.7	33.6	-31.9
848.970	1697.94	29.3	33.8	-32.1
824.040	2472.12	40.8	5.8	-48.6
836.400	2509.19	40.2	6.0	-49.1
848.970	2546.91	39.2	6.2	-49.9
824.040	3296.16	40.0	9.3	-45.9
836.400	3345.58	39.7	9.5	-46.1
848.970	3395.88	42.0	9.7	-43.6
824.040	4120.20	42.0	11.3	-41.9
824.040	4120.20	41.3	11.3	-42.6
836.400	4181.98	38.8	11.3	-45.1
848.970	4244.85	39.0	11.3	-44.9
824.040	4944.24	40.0	13.2	-42.1
836.400	5018.38	40.0	13.5	-41.8
848.970	5093.82	39.3	13.7	-42.2
824.040	5768.27	36.8	15.6	-42.8
836.400	5854.77	38.8	15.7	-40.7
848.970	5942.79	37.7	15.9	-41.7
824.040	6592.31	36.7	16.8	-41.8
836.400	6691.17	37.0	17.1	-41.2
848.970	6791.76	37.3	17.4	-40.5
824.040	7416.35	36.3	19.2	-39.7
836.400	7527.57	40.5	19.5	-35.2
848.970	7640.73	39.0	19.7	-36.6
824.040	8240.39	36.5	20.6	-38.1
836.400	8363.96	40.0	20.8	-34.4
848.970	8489.70	37.3	21.0	-36.9

GML NHA-9S

RADIATED EMISSIONS (TX1), HIGH POWER
1998-JUN-30, 11:51, TUE

TUNED, MHz	EMISSION, MHz	METER, dBuV	C.F., dB	ERP, dBm
824.040	1648.08	43.5	33.5	-18.3
824.040	1648.08	44.3	33.5	-17.4
836.400	1672.80	42.7	33.6	-18.9
836.400	1672.80	43.8	33.6	-17.8
848.970	1697.94	40.5	33.8	-20.9
848.970	1697.94	42.0	33.8	-19.4
824.040	2472.12	41.0	5.8	-48.4
836.400	2509.20	56.5	6.0	-32.7
848.970	2546.92	50.5	6.2	-38.5
824.040	3296.16	43.7	9.3	-42.2
836.400	3345.60	50.0	9.5	-35.7
848.970	3395.89	45.3	9.7	-40.2
824.040	4120.20	46.3	11.3	-37.6
836.400	4181.99	43.7	11.3	-40.2
848.970	4245.26	40.3	11.3	-43.6
824.040	4944.24	43.8	13.2	-38.2
836.400	5018.39	46.8	13.5	-34.9
848.970	5094.23	46.2	13.7	-35.3
824.040	5768.28	42.3	15.6	-37.3
836.400	5854.79	40.0	15.7	-39.5
848.970	5943.21	39.3	15.9	-40.0
824.040	6592.32	40.2	16.8	-38.3
836.400	6691.19	42.0	17.1	-36.2
848.970	6792.18	39.7	17.4	-38.2
824.040	7416.36	40.2	19.2	-35.8
836.400	7527.59	42.3	19.5	-33.4
848.970	7641.15	43.0	19.7	-32.6
824.040	8240.40	41.8	20.6	-32.8
836.400	8363.99	39.8	20.8	-34.6
848.970	8490.12	40.5	21.0	-33.7

NAME OF TEST: FREQUENCY STABILITY - TEMPERATURE VARIATION

PARAGRAPH: 47 CFR 2.995 (a)(1)

GUIDE: TIA/EIA STANDARD IS-19-B

TEST CONDITIONS: AS INDICATED

TEST EQUIPMENT: AS PER ATTACHED PAGE

MEASUREMENT PROCEDURE

1. The E.U.T. and test equipment were set up as shown on the following page.

2. With all power removed, the temperature was decreased to -30°C and permitted to stabilize for three hours. Power was applied and the maximum change in frequency was noted within one minute.

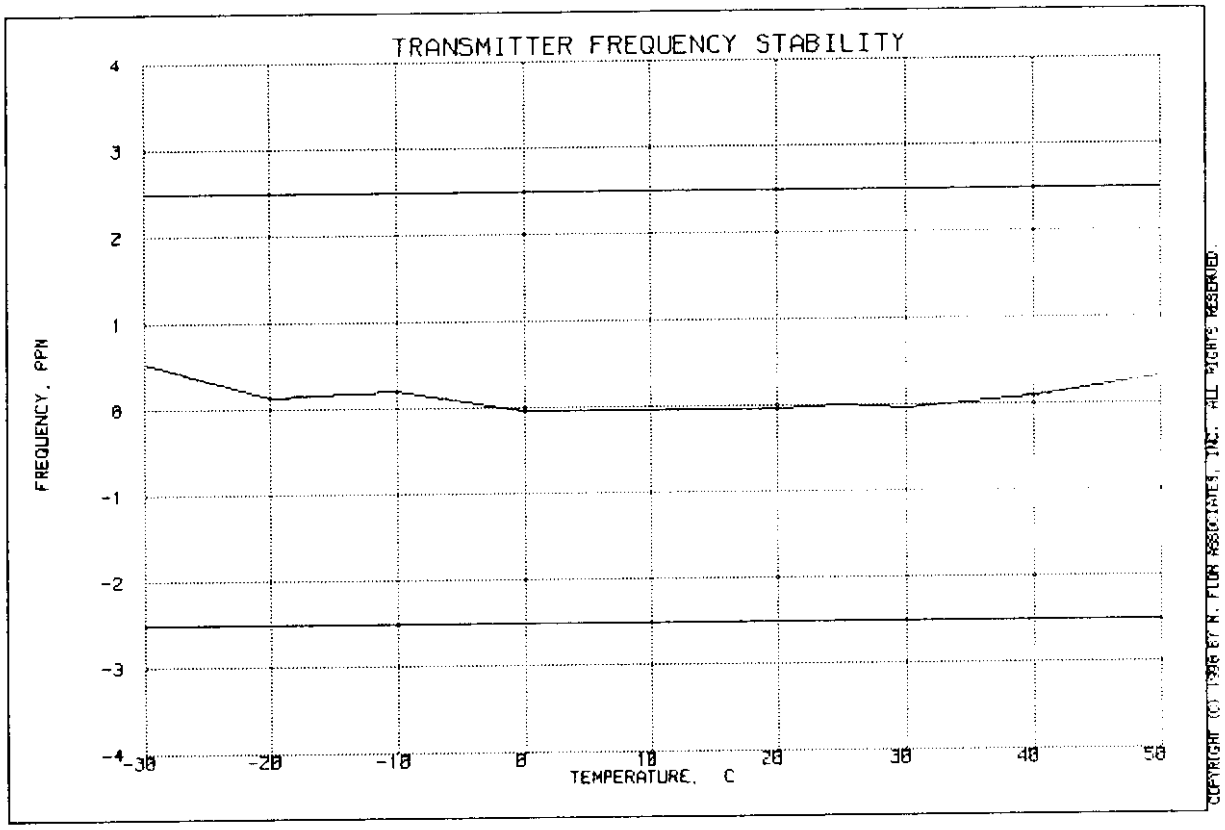
3. With power OFF, the temperature was raised in 10°C steps. The sample was permitted to stabilize at each step for at least one-half hour. Power was applied and the maximum frequency change was noted within one minute.

4. The temperature tests were performed for the worst case.

5. MEASUREMENT RESULTS: ATTACHED

GML NHA-9S

TRANSMITTER FREQUENCY STABILITY
NOKIA, 282N, NHA-9SA (AMPS/NAMPS)
1 JUL 1998, 16:28



FREQUENCY OF CARRIER, MHz = 836.39984

LIMIT, ppm = 2.5

LIMIT, Hz = 2091

SUPERVISED BY:

MORTON FLOM, P. Eng.

NAME OF TEST: FREQUENCY STABILITY - VOLTAGE VARIATION

PARAGRAPH: 47 CFR 2.995 (b)(1)

GUIDE: SEE MEASUREMENT PROCEDURE BELOW

TEST CONDITIONS: S. T. & H.

TEST EQUIPMENT: AS PER PREVIOUS PAGE

MEASUREMENT PROCEDURE

1. The E.U.T. was placed in a temperature chamber at 25±5°C and connected as for "Frequency Stability - Temperature Variation" test.

2. The power supply voltage to the E.U.T. was varied from 85% to 115% of the nominal value measured at the input to the E.U.T.

3. The variation in frequency was measured for the worst case.

MEASUREMENT RESULTS

LIMIT, ppm = 2.5
LIMIT, Hz = 2091

STV, %	Vdc	CHANGE IN FREQUENCY, Hz	
85	3.1	836400020	20
100	3.6	836400000	0
115	4.1	836400000	0
BATTERY END POINT:	3.1	836400020	20

SUPERVISED BY: MORTON FLOM, P. Eng.

TESTIMONIAL
AND
STATEMENTOF CERTIFICATION

GML NHA-9S

THIS IS TO CERTIFY:

1. THAT the application was prepared either by, or under the direct supervision of, the undersigned.

2. THAT the technical data supplied with the application was taken under my direction and supervision.

3. THAT the data was obtained on representative units, randomly selected.

4. THAT, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.

CERTIFYING ENGINEER:

M. Flom P. Eng.

MORTON FLOM, P. Eng.

F.C.C. HAS RULED SAR REPORT

CAN BE KEPT CONFIDENTIAL

ATTACHED IS SAR DATA EXTRACTED RESULTS

5.5 Results of SAR for 1g.

Appendix: 10

The plots in Appendix 10 are a graphical representation of the SAR values over the whole area being scanned.

Appendix 10, page 7 (Nr:7), has sketch of the phone added on the plot for clarifying the position of the phone with respect to the measured SAR values.

The size of the area being scanned is sufficiently large to ensure that all possible regions of peak SAR are measured. This is indicated by the fact that the position of peak SAR is in the measured area, and the value of SAR reduces asymptotically in the x- and y- directions as the probe is moved towards the border of the measured area.

meas nr:	Phone position	Frequency MHz / channel	Power [dBm]	Whip in (1g) [mW/g]	Whip up (1g) [mW/g]
1, 2	90°	824.0 / 991	25.6	0.31	0.53
3, 4	90°	836.0 / 384	26.9	0.31	0.66
5, 6	90°	849.0 / 799	26.1	0.23	0.64
FCC ID: GML NHA-9S MEASURED: 17.07.1997 / NMP		FCC limit		~~1.60~~ [mW/g] (ANSI/IEEE)	1.60 [mW/g] (ANSI/IEEE)

Sorry

24 July 1998.

~~This~~ See SAR plots, data is 1.60 is for GML-NHA-9 not -9S

max SAR is 0.778 W/kg