



Monitoring System

DK2OM - Wolfgang Hadel -

Co-ordinator IARUMS Region 1

Latest update: January 2006

Region 1 Monitoring Manual

The German tips are from the desk of DJ9KR. Please observe these tips, if you send us your mail! Use the added template!

The classification of emissions is important, if you send reports to your national coordinator. The explanations from PA0GRU are helpful, too.

The following sonagrams and FFTs will give you some assistance on your first steps with digital or other intruders (German and English).

Most of them are taken with Wavecom equipment.

If you prefer a cheap solution, use Gram50 (freeware) for sonagrams and WAV-files.

[73s and a successful work!](#)

[The following pages are written in German and English!](#)

Part 1: Monitoring tips from (DJ9KR) – German part

Part 2: Monitoring template (DK2OM)

Part 3: Explanations and abbreviations (PA0GRU)

Part 4: Classification of emissions – IARU Region 1

Part 5: Measuring frequencies (VE3OAT)

Part 6: ITU-country abbreviations – Map of the ITU-Regions

Part 7: Prefixes and countries (source: RSGB)

Part 8: Screenshots with Wavecom and Gram50 (DK2OM)

Part 1: Tips from DJ9KR (Vice Co-ordinator IARUMS R1)

Hören, notieren, melden!

So berichten Sie an die Bandwacht!

Ist es Ihnen nicht auch schon passiert, dass Ihre Funkverbindung durch einen plötzlich auf Ihrer QRG auftauchenden Rundfunksender, einen kommerziellen Fernschreiber oder durch private Funkpiraten im 10-m-Band in die Brüche ging?

Der erste Gedanke, der Ihnen da wohl durch den Kopf geht, ist: „Jetzt störe ich aber den Störer auch mit meiner Funkstation!“ Das mag vielleicht die Dauer Ihres Adrenalin-Ausstoßes verkürzen und Ihnen kurzfristige seelische Linderung verschaffen; doch: ist Stören wirklich sinnvoll?

1. Lieber zuhören als stören – hören, notieren, melden!

Es genügt nicht, einen Bandeindringling zu stören, und meist bringt es auch keinen Erfolg. Bei einem Rundfunksender hat es sowieso keinen Sinn, denn ein Funkamateurl mit seinen maximal 700 Watt Hochfrequenz kann gegen einen Rundfunksender mit 500 oder 1000 Kilowatt nicht „anstinken“. Andererseits ist eine solche Aktion bei einem privaten Funkpiraten (Schwarzfunker) zum Beispiel im 10-m-Band, für den Augenblick eher von Erfolg gekrönt. Doch der Bandeindringling wird wieder kommen, wenn nicht auf der alten, dann auf einer neuen Frequenz. Deshalb muss man versuchen, ihn mit Hilfe seiner Fernmeldeverwaltung aus dem Verkehr zu ziehen. Und da kann absichtliches Stören eher schädlich sein; denn ein Mitarbeiter der Bandwacht oder der Regulierungsbehörde, der zufällig auf der Frequenz ist, bekommt dann weder das Phantasierufzeichen noch die Adresse des Piraten mit, noch kann er ordentlich peilen.

2. So stellen Sie Bandeindringlinge fest, notieren und melden sie an die Bandwacht

Viele Amateurfunkverbände haben Bandwachten eingerichtet. Sie stehen per Internet oder Brief in engem Kontakt zueinander. Die Bandwachten haben international ein Raster mit sieben Spalten für Meldungen an die Leiter der nationalen Bandwachten aufgestellt. Es umfasst

1. **Frequenz** in Kilohertz (kHz)
2. **Betriebsart** (Mode)
3. **Zeit** in UTC
4. **Tag**
5. **Rufzeichen** des Störers, so bekannt
6. **Land**, so bekannt
7. **Bemerkungen**, z. B. Inhalt der Aussendung, Programmsprache des Rundfunksenders

Am meisten zu empfehlen ist eine Meldung per Email: Sie ist schnell und kann, wenn notwendig, sofort an die Regulierungsbehörde per Mausklick weitergegeben werden. Doch: Noch nicht jeder Funkamateurl hat einen PC mit Internetanschluss. So tut es natürlich auch die gute alte Snail Mail (Schneckenpost) in Form eines Briefes oder einer Postkarte.

3. Eine deutliche Schrift ist wichtig!

Meine Bitte: Schreiben Sie jeweils die Beobachtungen für einen Monat auf einen Bogen Papier. Die Ziffer „1“ kann leicht mit den Buchstaben „L“ oder „I“ verwechselt werden, deshalb deutlich schreiben. Ziffer Null nur als durchgestrichenes „O“; U und V, U und K; b, G und die Ziffer „6“ sind in manchen Handschriften schwer zu unterscheiden. Schließen Sie den Funkverkehr einer Station, den Sie zitieren, in „...“ ein, um ihn eindeutig vom Kommentar des Beobachters zu unterscheiden. Eine Genauigkeit der Frequenzangabe auf 100 Hz ist im allgemeinen völlig ausreichend, zum Beispiel für die Frequenz eines Rundfunksenders. Die genaue Frequenz des Rundfunksenders stellen

Sie am besten in Stellung „SSB“ fest und ziehen dann den Empfänger-VFO auf Schwebungs-Null. Erst dann lesen Sie ab. In Stellung „AM“ ist nämlich der Null-Durchgang schwierig zu bestimmen.

Shifts von Fernschreibstationen bitte, so bekannt (und möglich) auf 10 Hz genau. Peilangaben von Beobachtern, deren Peilungen nach eigener Erfahrung halbwegs genau sind, sind erwünscht. Mit einem 3-Element-Beam kann man von Deutschland aus durchaus feststellen, ob sich eine angepeilte Station im Nahen Osten, in Zentral- oder in Westafrika befindet.

4.1 Rundfunksender in Amplitudenmodulation (A3E) und ihre Harmonische („Oberwellen“)

Im 40-m-Band der Funkamateure sendet schon seit Jahren auf 7100 kHz die **Stimme der Breiten Massen** aus Eritrea. Auch die **Stimme Koreas** (Nordkorea, Pyongyang) hat sich seit Ende des Jahres 2004 diese Frequenz ausgesucht. Um bei einem Rundfunksender die Stationsansage mitzubekommen, empfiehlt es sich, zur vollen Stunde auf der Frequenz zu hören. Rundfunksender erscheinen entweder auf der Grundwelle in einem Amateurband (siehe Frequenz 7100 kHz) oder mit ihren Oberwellen (Harmonischen) in Amateurbändern. Diese Oberwellen sind immer ganzzahlige Vielfache der Grundfrequenz. So war über Jahre hinweg **Radio France Inter** mit seiner Relaisstation **Moyabi** in Gabun auf der 20-m-Band-Frequenz 14320 kHz zu hören. Seine Grundfrequenz (gleich Arbeitsfrequenz) war im 41-m-Rundfunkband auf 7160 kHz.

Wenn man glaubt, eine Oberwelle (Harmonische) entdeckt zu haben, kann man auf der Grundwelle versuchen, das gleiche Programm zu finden. Meist scheiden schon einige Frequenzen infolge bekannter Frequenzzuweisungen aus. Trotzdem beweist die Tatsache, dass eine vermeintliche Grundwelle nicht zu hören ist, noch lange nicht, dass sie vielleicht doch vorhanden ist: Die Ausbreitungsbedingungen der Grundwellenfrequenzen sind ganz anders als die der Oberwellenfrequenzen.

4.2 Rundfunksender und ihre Intermodulationsprodukte

Defekte oder schlecht abgestimmte Sender strahlen Intermodulationsprodukte, sogenannte „Nebenwellen“ aus, die manchmal sogar die Stärke des Nutzsignales erreichen können. Häufig gehen die kommerziellen Sendeanstalten auch mit zwei „benachbarten“ Frequenzen gleichzeitig auf die gleiche Sendeantenne. Und dort mischen sich dann die beiden. Die Rechenformel dieser Intermodulationsprodukte ist immer dieselbe und soll an einem Beispiel gezeigt werden:

Immer wieder wird der **Saudi Arabian Broadcasting Service** (SABS) Riadh auf der 15-m-Band-Frequenz 21285 kHz mit gleichzeitig zwei Programmen in arabischer Sprache gehört. Durch gezieltes Suchen wurde das eine Programm auf 21495 kHz, das andere auf 21705 kHz gefunden.

Rechenformel: $(21495 \text{ kHz} \times 2) - 21705 \text{ kHz} = 21285 \text{ kHz}$.

Wie gesagt: Die Mischung entsteht in diesem Fall bereits beim Rundfunksender und nicht im (Amateur-) Empfänger.

5. Einseitenband-Sender (Single Sideband = SSB), Betriebsart J3E

Bei SSB-Aussendungen bitte das Seitenband angeben (USB = Upper Sideband = oberes Seitenband, LSB = Lower Sideband, unteres Seitenband) sowie die direkt ablesbare Sendefrequenz, also die Frequenz des (gedachten) Trägers.

Da kommerzielle Funkstationen und private Funkpiraten die Bandpläne der Funkamateure nicht kennen, erscheinen sie häufig im „falschen“ Seitenband: Man findet sie in USB auf 40 m und in LSB auf 20, 15 und 10 m. Im 40-m-Band sind diese Funkpiraten häufig spanische und marokkanische Fischer, Militär aus Somalia, Safariveranstalter und Missionsstationen aus Zentralafrika. Im 10-m-Band sind es Taxis aus den GUS-Staaten und Gasflaschen-Versorgungsunternehmen mit Leitzentralen (häufig eine Frau am Mike) und Einsatzfahrzeugen (schwächeres Signal, Mann am Mike).

6. Funkfernschreiben (RTTY), Betriebsart F1B

Amateurfunkfernschreiben wird in unseren Exklusivbändern weltweit in der Regel nur in den folgenden Bereichen abgewickelt:

**7035 – 7045 kHz, 14070 – 14099 kHz,
21080 – 21120 kHz, 28050 – 28150 kHz.**

Fernschreibsender außerhalb dieser Bereiche sind in den meisten Fällen Eindringlinge. Bitte die ungefähre Mittenfrequenz des Fernschreibsignals angeben, wenn Sie keine Fernschreibeinrichtung haben. Dazu zieht man die beiden Signale eines Fernschreibsenders, die ja aus zwei abwechselnd getasteten Tönen bestehen, einzeln auf Schwebungsnull und berechnet daraus die Mittenfrequenz (Mark-Signal plus Space-Signal geteilt durch 2). Übliche Shifts bei Kommerziellen sind 170, 500 und 1000 Hz. Es gibt jedoch auch „krumme“ Shifts, die irgendwo dazwischen oder über 1000 Hz liegen.

„Breite“ Betriebsarten wie Multiplex- und Mehrkanalsysteme

Wenn Sie keinen Fernschreibdekoder haben, dann geben Sie auch hier die ungefähre Mittenfrequenz an. Das ist zugegebenermaßen schwierig. Manche solcher Stationen lassen in Stellung „schmal“ des CW-Filters beim langsamen Drehen durch das Breitbandsignal hindurch viele Einzelträger (= Kanäle) feststellen. Anzahl, Lage, Frequenz und eventuell der Abstand dieser Kanäle können ermittelt werden, wenn man das richtige „Equipment“ dafür hat. Fachmann für solche Systeme ist Wolf Hadel, DK2OM.

7. Tipps und Kniffe

Es empfiehlt sich, während des Hörens ein Tonbandgerät (Kassettenrekorder) mitlaufen zu lassen. PC-Nutzer verfügen vielleicht auch über eine geeignete Soundkartensoftware, die Mitschnitte auf der Frequenz anfertigt. So kann man sich einen Eindringling, zum Beispiel die Stationsansage bei einem Rundfunksender oder die Anschrift bei einem privaten Funkpiraten, mehrere Male anhören, bis man ganz sicher ist.

Überzeugen Sie sich, dass Sie den Eichpunktgeber und die Störfilter (Noiseblanker) Ihres Empfängers oder Transceivers ausgeschaltet haben. Diese können Geistersignale erzeugen. Misstrauen Sie grundsätzlich Ihrem Empfänger, wenn Sie ungewöhnliche Signale auf ungewöhnlichen Frequenzen feststellen! Schalten Sie den Abschwächer oder eine Behelfsantenne ein! Manchmal verschwindet dann ein Signal abrupt: Es wurde als Geistersignal in Ihrem Empfänger erzeugt. Verwenden Sie einen zweiten Empfänger (so vorhanden) mit unterschiedlicher (zum ersten Empfänger) Frequenzaufbereitung.

8. Was soll man melden – und was nicht

Bitte melden Sie der Bandwacht keine Funkamateure, die gegen Bandpläne der IARU verstoßen haben und beispielsweise in SSB im CW-Bereich funken. Senden Sie bitte auch keine Berichte über geheimnisvolle Knackgeräusche, die aus der Heizung des Nachbarn oder vom elektrischen Weidezaun der benachbarten Schafweide stammen. Auch für Störungen durch den Sonderkanal S6 ist die Bandwacht nicht zuständig.

Wenn Sie nun also eine oder mehrere Nicht-Amateurfunkstationen festgestellt haben, dann notieren Sie bitte nach obigem Muster den Sachverhalt. Und vergessen Sie dann auch bitte nicht, die Meldung an die Bandwacht abzuschicken (bis zum achten Tag des darauffolgenden Monats).

Der Leiter der Bandwacht des Deutschen Amateur-Radio-Clubs e. V.

Vize Koordinator des IARUMS Region 1

Ulrich Bihlmayer, DJ9KR

Eichhaldenstraße 35, 72074 Tübingen

Email: bandwacht@darc.de

Homepage: www.darc.de/referate/hf/bandwacht/

Nützliche URLs: www.intervalsignals.net/

Stand: September 2005

Part 2: Monitoring template

Benutzen sie bitte diese Vorlage für ihre Berichte!

Please use this template for your reports!

[illegible]

SOC = national Radio Club or Society

kHz = frequency

UTC = universal time coordinated (GMT)

DD = date (day of month)

MM = month

ITU = ITU-abbreviation (3 letters)

IDENT = ident, call, selcall

MODE = like J3E , A3E, F3E, F1B, G7B, J7D

BD = baud

SH = shift

DETAILS = observed details

Part 3: Explanations (PA0GRU)



VERON IARU MONITORING SYSTEM

National Coordinator for VERON:

Dick van Empelen (**PA0GRU**)



Explanations / Administrations / Area's

Adm	- Administration	Asia	- Asia
Approx	- Approximately	CHN	- China
BC	- Broadcast	CIS	- Commonwealth of Independent States
BEAR	- Bearing	E	- Spain
Dly	- Daily	E.Eu	- East Europe
**	- Multiple dates	I	- Italy
Em	- Class of Emission	M.Ea	- Middle East
FC	- Coast station	ROU	- Roumania
HSM	- High speed morse	RUS	- Russia
Pbl	- Preamble		
Proc's	- Procedures		
Ptr	- Printer		
Revs	- Reversals		
Tfc	- Traffic		
Tgm	- Telegram		
Ui	- Unidentified		
UiBC	- Unidentified broadcast station		
UiBUZ	- Unidentified audio frequency buzzer		
UiCAR	- Unidentified carrier		
UiCW	- Unidentified Morse transmission		
UiDIPLO	- Unidentified Diplomatic Radio transmission		
UiFAX	- Unidentified facsimile transmission		
UiILL	- Unidentified non-amateur voice transmission		
UiJAM	- Unidentified jamming transmission		
UiMIL	- Unidentified military transmission		
UiMOD	- Unrecognised Modulation		
UiMUX	- Unidentified multi-channel digital transmission		
UiOTHR	- Unidentified over the horizon radar transmission		
UiPIC	- Unidentified piccolo transmission		
UiPTR	- Unidentified printer		
UiPSK	- Unidentified phase shift keying		
UiVFT	- Unidentified single channel digital transmission		
2f/3f/9f	- Second/third/ninth harmonic		
4F/5F	- 4-figure groups/5-figure groups		
5BL	- 5-letter groups with accented letters (Cyrillic morse)		
5L	- 5-letter groups		
MIL	- military		
MOI	- Ministry of Interior		
MOD	- Ministry of Defense		

Part 4: Classification of emissions (IARU-R1)

The Monitoring System of The International Amateur Radio Union Region I

Classification of Emissions

The following short list of classifications of emissions is for those modes most frequently used by non-amateur stations operating in the Amateur Bands and is for your guidance only. While the list is not complete it covers the Minimum format to be used when submitting reports. For your further information the paper contains an extract of the ITU classifications of emission for those who wish to report the full details of signals heard.

Some examples of symbols for the most common classes of emission.

Telephony:

Single side band, suppressed carrier (SSB)	J3E
Frequency modulation (FM)	F3E
Phase modulation (PM)	G3E
Amplitude modulation (AM)	A3E

RTTY & SITOR:

Direct frequency shift keying of the carrier	F1B
Frequency shift keyed audio tone (FM)	F2A
Frequency shift keyed audio tone (SSB)	J2B

Morse:

On/off keying of carrier (hand sending)	A1A
On/off keying of carrier for automatic reception	A1B
On/off keying of the Audio tone (FM transmitter)	F2A

Extract from the Radio Regulations of Article 2, Nomenclature.

Section III. Designation of Emissions

- S2.2 Emissions shall be designated according to their necessary bandwidth and their classification in accordance with the method described in Appendix 1.

Extract from the Radio Regulations of Appendix 1

APPENDIX S1

Classification of Emissions and Necessary Bandwidths

(see Article 2)

Section II. Classification

- § 3. The class of emission is a set of characteristics conforming to § 4 below.
- § 4. Emissions shall be classified and symbolised according to their basic characteristics as given in Sub-Section IIA and any optional additional characteristics as provided for in Sub-Section IIB.

§ 5. The basic characteristics (see Sub-Section IIA) are;

- (1) first symbol - type of modulation of the main carrier;
- (2) second symbol - nature of signal(s) modulating the main carrier;
- (3) third symbol - type of information to be transmitted.

Modulation used only for short periods and for incidental purposes (such as, in many cases, for identification or calling) may be ignored provided that the necessary bandwidth as indicated is not thereby increased.

Sub-Section IIA. Basic Characteristics

§ 6. (1) First symbol - type of modulation of the main carrier

- | | |
|---|---|
| (1.1) Emission of an unmodulated carrier | N |
| (1.2) Emission in which the main carrier is amplitude-modulated (including cases where sub-carriers are angle-modulated) | |
| (1.2.1) Double-sideband | A |
| (1.2.2) Single-sideband, full carrier | H |
| (1.2.3) Single-sideband, reduced or variable level carrier | R |
| (1.2.4) Single-sideband, suppressed carrier | J |
| (1.2.5) Independent sidebands | B |
| (1.2.6) Vestigial sidebands | C |
| (1.3) Emission in which the main carrier is angle-modulated | |
| (1.3.1) Frequency modulation | F |
| (1.3.2) Phase Modulation | G |
| (1.4) Emission in which the main carrier is amplitude - and angle-modulated either simultaneously or in a pre-established sequence | D |
| (1.5) Emission of pulses ² | |
| (1.5.1) Sequence of unmodulated pulses | P |
| (1.5.2) A sequence of pulses | |
| (1.5.2.1) modulated in amplitude | F |
| (1.5.2.2) modulated in width/duration | L |
| (1.5.2.3) modulated in position/phase | M |
| (1.5.2.4) in which the carrier is angle modulated during the angle-period of the pulse | Q |
| (1.5.2.5) which is a combination of the forgoing or is produced by other means | V |
| (1.6) Cases not covered above, in which an emission consists of the main carrier modulated, either simultaneously or in a pre-established sequence, in a combination of two or more of the following modes; amplitude, angle, pulse | W |
| (1.7) Cases not otherwise covered | X |

²Emissions where the main carrier is directly modulated by a signal which has been coded into quantized form (e.g. pulse code modulation) should be designated under (1.2) or (1.3)

§ 6. (2) Second symbol - nature of signals(s) modulating the main carrier

- | | |
|---|---|
| (2.1) No modulating signal | 0 |
| (2.2) A single channel containing quantized or digital information without the use of a modulating sub-carrier ³ | 1 |

(2.3) A single channel containing quantized or digital information with the use of a modulating sub-carrier ³	2
(2.4) A single channel containing analogue information	3
(2.5) Two or more channels containing quantized or digital information	7
(2.5) Two or more channels containing analogue information	8
(2.7) Composite system with one or more channels containing quantized or digital information, together with one or more channels containing analogue information	9
(2.8) Cases not otherwise covered	X

³ This excludes time-division multiplex.

§ 6. (3) Third Symbol - type of information to be transmitted	
(3.1) No information transmitted	N
(3.2) Telegraphy - for aural reception	A
(3.3) Telegraphy - for automatic reception	B
(3.4) Facsimile	C
(3.5) Data transmission, telemetry, telecommand	D
(3.6) Telephony (including sound broadcasting)	E
(3.7) Television (video)	F
(3.8) Combination of above	W
(3.9) Cases not otherwise covered	X

⁴ In this context the word 'information' does not include information of a constant, unvarying nature such as is provided by standard frequency emissions, continuous wave and pulse radar. etc.

Sub-Section IIB. Optional Characteristics for the Classification of Emissions

§ 7. Two optional characteristic should be added for a more complete description of an emission. These are (see also Recommendation 62)

Fourth symbol - Details of signal(s)

Fifth symbol - Nature of multiplexing

Where the fourth or fifth symbol is used it shall be as indicated below.

Where the fourth or fifth symbol is not used this should be indicated by a dash where each symbol would otherwise appear

§ 7. (1) <i>Fourth symbol</i> - Details of signal(s)	
(1.1) Two-condition code with elements of differing numbers and/or durations	A
(1.2) Two-condition code with elements of the same number and duration without error correction	B
(1.3) Two-condition code with elements of the same number and duration with error correction	C
(1.4) Four-condition code in which each condition represents a signal element (of one or more bits)	D
(1.5) Multi-condition code in which each condition represents a signal element (or one or more bits)	E
(1.6) Multi-condition code in which each condition or combination of conditions represents a character	F
(1.7) Sound of broadcasting quality (monophonic)	G

	(1.8)	Sound of broadcasting quality (stereophonic or quadraphonic)	H
	(1.9)	Sound of commercial quality (excluding categories given in sub-paragraphs 1.10 and 1.11)	J
	(1.10)	Sound of commercial quality with the use of frequency inversion or band splitting	K
	(1.11)	Sound of commercial quality with separate frequency- modulated signals to control the level of demodulated signal	L
	(1.12)	Monochrome	M
	(1.13)	Colour	N
	(1.14)	Combination of the above	W
	(1.15)	Cases not otherwise covered	X
§ 7.	(2)	<i>Fifth symbol</i> - Nature of Multiplexing	
	(2.1)	None	N
	(2.2)	Code-division multiplex ⁵	C
	(2.3)	Frequency-division multiplex	F
	(2.4)	Time-division multiplex	T
	(2.5)	Combination of frequency-division multiplex and time-division multiplex	W
	(2.6)	Other types of multiplexing	X

⁵ This includes bandwidth expansion techniques

Part 5: Measuring frequencies

IARU Region 2 Monitoring System

MEASURING RADIO FREQUENCIES

Using an Analog Receiver

If you have a receiver with an analog dial, you really do need a calibrator, either internal or external, to accurately measure radio frequencies. Many analog receivers have such a calibrator, and one can easily be added if necessary. The key is that the calibrator itself must have been recently checked and adjusted against an accurate frequency source. Even with a calibrator, you will quickly learn a few tricks which are necessary to get the best performance for measuring frequencies, like making use of parallax (varying the angle between your eye, the dial pointer, and the dial markings), and always tuning through the zero-beat point of a signal in the same direction (to avoid the mechanical equivalent of magnetic hysteresis in your receiver's dial mechanism).

Using a Digital Receiver

With a receiver having a digital frequency read-out many of the uncertainties are removed from the measurement process, but only if you can be confident of the readings provided by your receiver. In other words, check your receiver by measuring a few accurately known frequencies first, like WWV, WWVH, LOL, or CHU, or even shortwave broadcasts from any of the "big" broadcasters (VOA, BBC, DW, etc). You might be surprised to find that your receiver is not as accurate as you thought. But knowledge is power, so do not be dismayed if your receiver's dial is "off" by 15 or 100 hertz. The important thing is to know how big the error is and its direction.

The following three general methods for frequency measurement were sent to me by Wolfgang Hadel, DK2OM, a senior Bandwacht monitor with the Deutscher Amateur-Radio-Club (DARC) of Germany. These methods are specifically intended for measuring the frequency of an unknown carrier wave, such as found in unmodulated carriers (N0N), analog AM (A3E) signals, and FM voice or music (F3E, during pauses in the modulation) using any receiver with digital frequency read-out, but of course they can be adapted to measuring the frequency components of some other signals as well.

Method 1 - Split the Difference

This simple method is particularly suited to receivers which can be switched between upper and lower sideband modes but which do not have variable passband tuning or IF shift.

1. Listen to the carrier in USB mode, then tune slowly up in frequency until the carrier just disappears. (At this point, the receiver was getting close to zero-beat with the carrier but the carrier has passed outside the bandpass of the receiver.)
2. Make a note of this frequency.
3. Switch to LSB mode and continue tuning slowly up in frequency until the tone of the carrier reappears (if it hasn't already).
4. Now tune DOWN a little in frequency until the carrier just disappears again (this condition similar to the end of step 3).
5. Make a note of this frequency.
6. Find the difference between the two frequencies. Take HALF of the difference and add it to the USB reading frequency.

Example -

USB reading freq =	14001.20 kHz
LSB reading freq =	14001.80
Difference =	0.60 kHz
Then unknown carrier freq =	$14001.20 + 0.30 = 14001.50 \text{ kHz}$

Of course, this method assumes that the dial of the receiver is accurate and that the USB and LSB passbands are tuned symmetrically about the carrier. This method can also be adapted to find the bandwidth and center frequency of complex modulations which have no distinct carrier, such as frequency-shift-keyed printer signals, VFTs, wideband pulse signals, etc., by finding the upper and lower frequency limits of the signal.

Method 2 - Help from a Frequency Counter

To use this method you need only have a receiver with an accurate dial and an inexpensive electronic counter for audio frequencies. In practice it is also helpful (but not necessary) if the unknown carrier is relatively strong and free from interference in your receiver's passband.

1. Connect the frequency counter to the audio output of your receiver.
2. Using USB mode, tune in the unknown carrier signal and adjust your bandwidth for best reception of the audio tone from the carrier.
3. Note the receiver's frequency.
4. Note the average reading of the tone frequency on the counter.
5. Add the two readings.

Example -

Receiver dial frequency =	14000.850 kHz
Counter frequency =	650 hertz tone
Then the carrier frequency =	$14000.85 + 0.65 \text{ kHz} = 14001.50 \text{ kHz}$

Wolf points out that you can also use LSB mode on your receiver for this procedure but then you must remember to SUBTRACT the counter (tone) frequency from the receiver dial frequency.

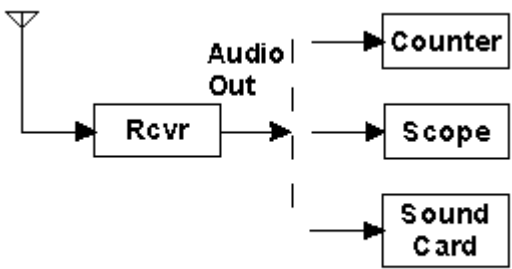


Figure 1. Block diagram of setup for Methods 2 and 3. Use the counter for Method 2 and the scope or soundcard for Method 3.

Method 3 - Directly Measuring at Zero-Beat

This method is the most accurate of the three here, but it requires that you carefully check the accuracy of your receiver's dial, and that you have either an oscilloscope or an audio connection to your computer's sound card and a "software oscilloscope" like Winscope. (Winscope was written by Konstantin Zeldovitch.)

1. Connect your receiver's audio output to either a simple audio oscilloscope or to your computer's soundcard (and start the Winscope or similar program).
2. Tune in the unknown carrier.
3. Set your receiver to USB mode and adjust the bandpass tuning down so that you will be able to hear signals at zero-beat.

4. Near zero-beat you will see the audio beat note on the oscilloscope display, as shown in Figure 2. Continue tuning the receiver until the beat note becomes zero hertz, as shown by the nearly straight line in Figure 3. You can check for zero-beat by rocking the receiver tuning back and forth and you will hear and see the audio beat note rise from zero on either side of the zero-beat point on the dial.
5. Tune the receiver for zero beat with the carrier and read the receiver dial. This is the frequency of the carrier, plus or minus any correction from your receiver calibration test.

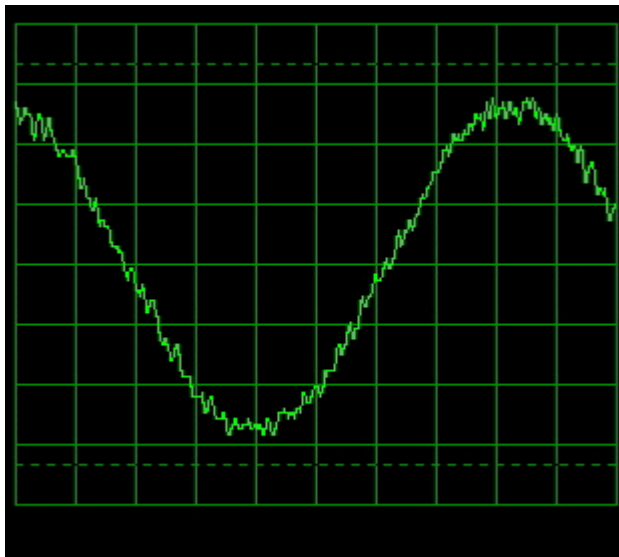


Figure 2. Winscope display of receiver audio output with a low beat note from the unknown carrier. (Image courtesy of DK2OM.)

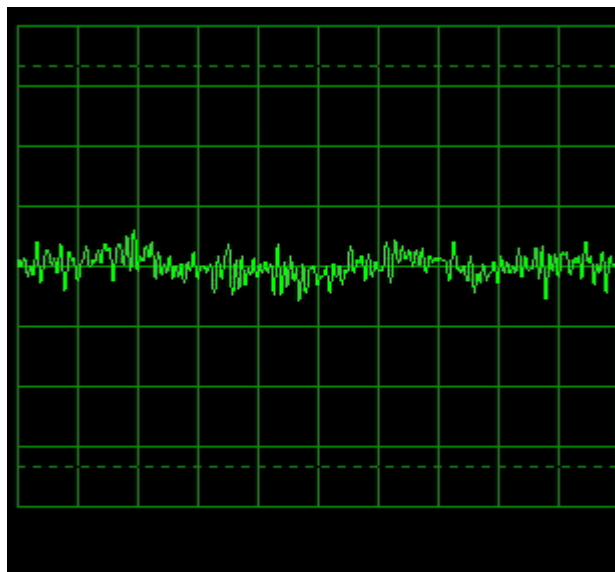


Figure 3. Winscope display of audio output when receiver is zero beat with the unknown carrier. At this point, the frequency on the receiver dial is the carrier's frequency, $\pm$ any dial error. Residual signals in the display are noise and interference in the receiver passband which have not been completely masked by the carrier signal. (Image courtesy of DK2OM.)

Wolf adds that if you have a serial interface and computer to control your receiver, you can often read the frequency with a resolution of 1 hertz, depending on the software you use. Don't forget to calibrate your dial, otherwise all that extra "accuracy" will be wasted and you will be misled by the dial reading.

Your success with this method will also depend somewhat on how well your receiver delivers very low audio frequencies at the audio output (you will find there is a dead zone for a few tens of hertz on either side of zero-beat). In fact, if the receiver's audio is good at these low audio frequencies and you have a good ear, you may be able to use the method without an oscilloscope, or Winscope on your computer. Just watch for a regular motion on the signal strength meter corresponding to the beat note, maybe one or two hertz. Sometimes you can also hear this beat note as a rhythmic variation in background noise.

I hope the above descriptions will help you to determine radio frequencies more accurately. With a little care and knowledge and perhaps some inexpensive equipment, you can make very accurate measurements of frequency with confidence and reliability. It is a good skill for an Amateur to have.

Written by VE3OAT (Martin) Ex-Coordinator of IARUMS Region 2.

Published with kind permission of VE3OAT, Martin Potter.

Part 6: ITU-country abbreviations and Regions

The Monitoring System of The International Amateur Radio Union

Region I

ITU Country Symbols for use in Monitoring Reports

With the geopolitical changes that have occurred over the last few years the list of countries shown in the IARU Monitoring System Manual requires to be brought up to date. The following list has been extracted from a recent edition of the ITU Directory should be used by to designate countries in IARUMS reports.

Afghanistan to Fiji

Afghanistan	AFG
Albania	ALB
Algeria	ALG
American Samoa	SMA
Angola	AGL
Anguilla	AIA
Antigua & Barbuda	ATG
Antilles (Netherlands)	ATN
Argentina	ARG
Armenia	ARM
Aruba	ABW
Ascension Island	ASC
Australia	AUS
Austria	AUT
Azerbaijan	AZE
Bahamas	BAH
Bahrain	BHR
Bengladesh	BGD
Barbados	BRB
Belgium	BEL
Belize	BLZ
Belarus	BLR
Benin	BEN
Bermuda	BER
Bhutan	BTN
Bolivia	BOL
Boznia Herzegovena	BIH
Botswana	BOT
Brasil	B
British Virgin Islands	VRG
Brunei Darussalam	BRU
Bulgaria	BUL

Burkina Faso	BFA
Burundi	BDI
Cambodia	CBG
Cameroon	CME
Canada	CAN
Cape Verde	CPV
Cayman Islands	CYM
Central African Republic	CAF
Chad	TCD
Chile	CHL
China	CHN
Columbia	CLM
Comoros	COM
Congo	COG
Cook Islands	CKH
Costa Rica	CTR
Cote d'Ivoire	CTI
Croatia	HRV
Cuba	CUB
Cyprus	CYP
Czech Republic	CZE
Denmark	DNK
Djibouti	DJI
Dominica	DMA
Dominican Republic	DOM
Ecuador	EQA
Egypt	EGY
El Salvador	SLV
Estonia	EST
Ethiopia	ETH
Falkland Islands	FLK
Fiji	FJ

Finland to Slovenia

Finland	FNL
France	F
French Polynesia	OCE
Gabon	GAB
Gambia	GMB
Georgia	GEO
Germany	D
Ghana	GHA
Gibraltar	GIB
Granada	GRD
Greece	GRC
Guam	GUM
Guatamala	GTM
Guinea-Bissau	GNB
Guinea Equatorial	GNE
Guinea (Republic of)	GUI
Guyana	GUY
Haiti	HTI
Honduras	HND
Hongkong	HKG
Hungary	HUN
Iceland	ISL
India	IND
Indonesia	INS
Iran	IRN
Iraq	IRQ
Ireland	IRL
Israel	ISR
Italy	I
Jamaica	JMC
Japan	J
Jordan	JOR
Kazakhstan	KAZ
Kirghizia	KGZ
Kenya	KEN
Kiribata	KIR
Korea (Republic of)	KOR
Korea (Peoples Rep. of)	KRE
Kuwait	KWT
Laos (Peoples Rep. of)	LAO
Latvia	LVA
Lebanon	LBN
Lesotho	LSO
Liberia	LIB
Libya	LBY
Liechtenstein	LIE
Lithuania	LTA
Luxembourg	LUX
Macao	MAC
Macedonia	MKD
Madagascar	MDG
Malawi	MWI
Malaysia	MLA

Maldives	MLD
Mali	MLI
Malta	MLT
Marshal Islands	MRL
Mauritania	MTN
Mauritius	MAU
Mexico	MEX
Moldavia	MDA
Monaco	MCO
Mongolia	MNG
Montserrat	MSR
Morocco	MRC
Mozambique	MOZ
Myanmar	BRM
Namibia	NMB
Nauru	NRU
Nepal	NPL
Netherlands Antilles	ATN
Netherlands	HOL
New Caledonia	NCL
New Zealand	NZL
Nicaragua	NCG
Nigeria	NIG
Niger	NGR
Niue	NIU
Norway	NOR
Oman	OMA
Pakistan	PAK
Panama	PAN
Paraguay	PRG
Peru	PRU
Philippines	PHL
Poland	POL
Portugal	POR
Puerto Rico	PTR
Qatar	QAT
Rumania	ROU
Russian Federation	RUS
Rwanda	RRW
Saint Helena	SHN
Saint Kitts & Nevis	SCN
Saint Lucia	LCA
St. Vincent/Grenadines	VCT
Samoa Occidental	SMO
San Marino	SMR
Sao Tome & Principe	STP
Saudi Arabia	ARS
Senegal	SEN
Seychelles	SEY
Sierra Leone	SRL
Singapore	SNG
Slovak Republic	SVK
Slovenia	SVN

Solomon Islands to Zimbabwe

Solomon Islands	SLM
Somalia	SOM
South Africa	AFS
Spain	E
Sri Lanka	CLN
Sudan	SDN
Suriname	SUR
Swaziland	SWZ
Sweden	S
Switzerland	SUI
Syria	SYR
Tajikistan	TJK
Tanzania	TZA
Thailand	THA
Togo	TGO
Tokelau	TKL
Tonga	TON
Trinidad & Tobago	TRD
Tunisia	TUN
Turkey	TUR
Turkmenistan	TKM

Turks & Caicos Islands	TCA
Tuvalu	TUV
Uganda	UGA
Ukraine	UKR
United Arab Emirates	UAE
United Kingdom	G
United States of America	USA
US Virgin Islands	VIR
Uruguay	URG
Uzbekistan	UZB
Vanuatu	VUT
Vatican City State	CVA
Venezuela	VEN
Viet Nam	VTN
Wallis & Fortuna Islands	WAL
Western Samoa	SMO
Yemen	YEM
Yugoslavia	YUG
Zaire	ZAI
Zambia	ZMB
Zimbabwe	ZWE

Although not ITU practice if a positive ID based on previous knowledge, content of the transmission or characteristics cannot be made but an approximate locality can be established by bearing or language, the following symbols may be used.

Africa Central	C.Af
Africa East	E.Af
Africa North	N.Af
Africa West	W.Af
America Central	C.Am
America South	S.Am
Asia	ASA

Europe Central	C.Eu
Europe North	N.Eu
Europe South	S.Eu
Europe West	W.Eu
Far East	F.Ea
Middle East	M.Ea
Oceania	OCN

The ITU-Regions 1, 2 and 3



source: ITU Homepage

Part 7: Prefixes and countries (RSGB)

Prefix & Country	Prefix & Country
A2 Botswana	A3 Tonga
A4 Sultanate of Oman	A5 Bhutan
A6 United Arab Emirates	A7 Qatar
A8 Liberia EL	A9 Bahrain
AA - AG USA W	AH1 - AH0 USA Pacific Islands KH1 - KH0
AI - AK USA W	AL Alaska KL
AM - AO Spain including overseas Territories and Islands EA 6 8 9	AP AR Pakistan
AT India VU	AX Australia and Islands
AY - AZ Argentina LU	BO Quemoy Matsu BV
BS Scarborough Reef	BV Taiwan
BV9P Pratas I.	BV9S Spratly Archipelago 9M0
BY China BA BD BG BT BZ	C2 Nauru
C3 Andorra	C4 Cyprus 5B
C5 Gambia	C6 Bahamas
C9 Mozambique	CE Chile
CE0 Easter I.	CE0 San Felix and San Ambrosio Is
CE0 Juan Fernandez Is	CF - CK Canada VE
CL CM Cuba CO	CN Morocco
CO Cuba	CP Bolivia
CT1CQ-CT2 4-8 0 Portugal	CT3 CQ-CS3 CT9 Madeira Is
CU Azores	CX CV CW Uruguay
CY CZ Canada VE	CY9 St Paul Is
CY0 Sable I.	D2 D3 Angola
D4 Cape Verde	D6 Comoros
D7 Korea (Republic of) HL	DL DA-DD DF-DH Federal Republic
DJ DK DP of Germany	DS Korea (Republic of) HL
DU DV-DZ Philippines	DU Spratly Archipelago 9M0
E2 Thailand HS	E3 Eritrea
E4 Palestine	EA EB-EH1-5 7 0 Spain
EA6 EB6-EH6 Balearic Is	EA8 EB8-EH8 Canary Is
EA9 EB9-EH9 Ceuta and Melilla	EI EJ Republic of Ireland
EK Armenia	EL Liberia
EM EN EO Ukraine UR	EP Iran
ER Moldova	ES Estonia
ET Ethiopia	EU EV EW Belarus
EX Kyrgyzstan	EY Tajikistan
EZ Turkmenistan	F France
FG Guadeloupe	FH Mayotte
FJ St Barthelemy (French St Martin) FS	FK New Caledonia
FK----/C Chesterfield Is	FM Martinique
FO Austral Is	FO French Polynesia
FO Marquesas Is	FO8X Clipperton I.
FP St Pierre and Miquelon	FR Reunion I.
FR——/E Europa I. FR——/J	FR——/G Glorioso Is
FR——/J Juan de Nova	FR——/T Tromelin I.
FS French St Martin	FTnW Crozet Is
FTnX Kerguelen Is	FTnZ Amsterdam I. and St Paul I.
FW Wallis and Futuna Is	FY French Guiana
G GX England	GB United Kingdom G GD GI GJ GM GU GW
GD GT Isle of Man	GI GN Northern Ireland
GJ GH Jersey	GM GS Scotland
GU GP Guernsey and Dependencies	GW GC Wales
H2 Cyprus 5B	H3 Panama HP
H4 Solomon Is	H40 Temotu Province
H5 Bophuthatswana ZS	H6 H7 Nicaragua YN
H8 H9 Panama HP	HA Hungary
HB Switzerland	HB0 Liechtenstein
HC,HD Ecuador	HC8,HD8 Galapagos Is
HE Switzerland HB	HF Poland SP
HG Hungary HA	HH Haiti

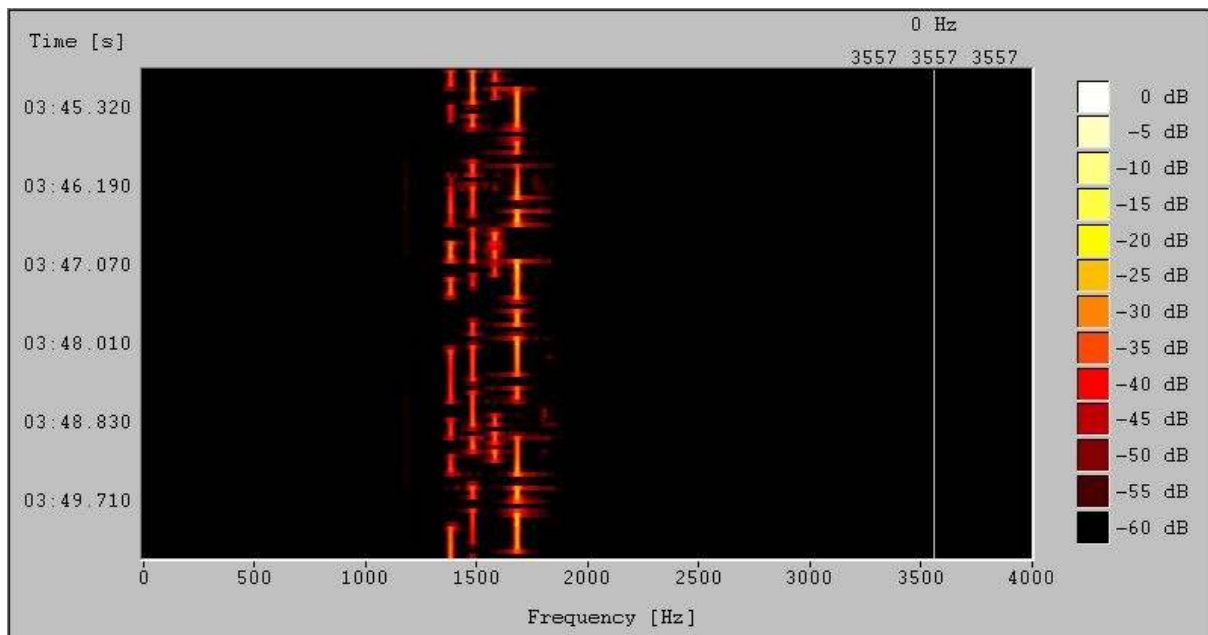
Prefix & Country	Prefix & Country
HI Dominican Republic	HK HJ Colombia
HK0 Malpelo I.	HK0 HJ0 San Andres and Providencia
HL Korea (Republic of)	HP HO Panama
HR HQ Honduras	HS Thailand
HT Nicaragua YN	HU El Salvador YS
HV Vatican City	HZ Saudi Arabia
I IA-IH IK IL IN IP Italy	IR IT IV-IX
IS0 IM0 Sardinia	J2 Djibouti
J3 Grenada	J4 Greece SV
J5 Guinea-Bissau	J6 St Lucia
J7 Dominica	J8 St Vincent and the Grenadines
JA JE-JS Japan	JD 7J Minami Torishima
JD 7J Ogasawara Is	JT JU JV Mongolia
JW Svalbard	JX Jan Mayen
JY Jordan	K KA-KZ USA and US Islands W KC6xx KG4xx KH1-0 KP1-5
KC6 x x Republic of Palau	KG4 x x Guantanamo Bay
KG6 x x Guam	KH1 Baker I. and Howland I.
KH2 (KG6) Guam	KH3 Johnston I.
KH4 Midway Is.	KH5 Palmyra I.
KH5J Jarvis I. KH5	KH5K Kingman Reef
	KH6 7 Hawaiian Is
KH7K Kure I.	KH8 American Samoa
KH9 Wake I.	KH0 North Mariana
KL Alaska	KP1 Navassa I.
KP2 US Virgin Is	KP3 4 Puerto Rico
KP5 Desecheo I.	L2-L9 Argentina LU
LA LB LC LG LI Norway	LJ LN
LU LO-LT LV LW Argentina	LX Luxembourg
LY Lithuania	LZ Bulgaria
M MX England G	MD MT Isle of Man GD
MI MN Northern Ireland GI	MJ MH Jersey GJ
MM MS Scotland GM	MU MP Guernsey and Dependencies GU
MW MC Wales GW	N NA-NG NI-NK USA W
NM-NO NQ-NZ	NH1-NH0 US Pacific islands KH1-KH0
NL Alaska KL	NP1-NP5 US Caribbean Islands KP1-KP5
OA OB OC Peru	OD Lebanon
OE Austria	OH OF OG OI Finland
OH0 OF0 OG0 Aland Is	OJ0 OF0M OH0M Market Reef
OK OL Czech Republic	OM Slovak Republic
ON OO-OT Belgium	OX Greenland
OY Faroe Is	OZ Denmark
P2 Papua New Guinea	P3 Cyprus 5B
P4 Aruba	P5 Korea (Dem Peoples Rep of)
PA PB PD PE PI Netherlands	PJ1 PJ2 4 9 Netherlands Antilles
PJ5 PJ6 7 8 Sint Maarten, Saba and St Eustatius	PY PP-PX Brazil
PY0F Fernando de Noronha Archipelago	PY0M Martim Vaz I. PU0T
PY0R Atol das Rocas PY0F	PY0S St Peter and St Paul Rocks
PY0T Trindade I.	PZ Suriname
R1A Antarctica	R1F Franz Josef Land
R1M Malyj Vysotskij I.	R RA RK RN RU-RZ European Russia UA
R RA RK RN RU-RZ Asiatic Russia UA9	R2 RA2 RK2 RN2 Kaliningradsk UA2
RY2	S2 Bangladesh
S4 Ciskei ZS	S5 Slovenia
S6 Singapore 9V	S7 Republic of Seychelles
S8 Transkei ZS	S9 Sao Tome and Principe
S0 Western Sahara	SM SH-SL Sweden
SP SN-SR Poland	ST Republic of the Sudan
SU Egypt	SV SX-SZ Greece
SV—/A Mount Athos	SV5 Dodecanese Is
SV9 Crete	SV0 Non-nationals in Greece or on Greek Is SV SV5 SV9
	T2 Tuvalu
T30 West Kiribati	T31 Central Kiribati

Prefix & Country	Prefix & Country
T32 East Kiribati	T33 Banaba
T4 Cuba CO	T5 Somalia
T6 Afghanistan YA	T7 San Marino
T9 Bosnia-Herzegovina	TA Turkey
TD Guatemala TG	TE Costa Rica TI
TF Iceland	TG Guatemala
TI Costa Rica	TI9 Cocos I.
TJ Cameroon	TK Corsica
TL Central African Republic	TM France including overseas Territories and Departments F
TN Congo	TO France including overseas Territories and Departments FG FJ FM FP FR FS FY
TP Council of Europe - Strasbourg F	TR Gabon
TT Chad	TU Cote d'Ivoire
TX France including overseas Territories and Departments FK FO FW	TY Benin
TZ Mali	UA U UA UE 1 3 4 6 European Russia
UA2 U UA UE 2 Kaliningrad	UA9 U UA UE 8-0 Asiatic Russia
UK U8 UJ UK7-9 UM Uzbekistan	UN UN1-0 UP UQ Kazakhstan
UR US-UZ Ukraine	V2 Antigua and Barbuda
V3 Belize	V4 Federation of St Kitts and Nevis
V5 Namibia	V6 Micronesia
V7 Marshall Is	V8 Brunei Darussalam
V9 Vendaland ZS	VE VA-VG Canada
VE0 Canadian /MM Stations	VK VI Australia
VK9C Cocos Keeling Is	VK9L Lord Howe I.
VK9M Mellish Reef	VK9N Norfolk I.
VK9W Willis Is	VK9X Christmas I.
VK0 Heard I.	VK0 Macquarie I.
VO1 VO3 5 7 9 Newfoundland VE	VO2 VO4 6 8 0 Labrador VE
VP2E Anguilla	VP2M Montserrat
VP2V British Virgin Is	VP5 Turks and Caicos Is
VP6 Pitcairn Is	VP8 Antarctica
VP8 Falkland Is	VP8 South Georgia
VP8 AZ1 5 ED0 L South Orkney Is	UnZx
VP8 South Sandwich Is	VP8 CE9 CX0 ED0 South Shetland Is
HF0 HL5 LUnZx South Shetland Is cont.	ZX0 4K1
VP9 Bermuda	VQ9 Chagos Is
VR2 Special Administrative Region of Hong Kong	VU India
VU Lakshadweep	VU Andaman Is and Nicobar Is
VX VY Canada VE	VY1 Yukon Territory VE
VY2 Prince Edward I. VE	W WA-WG WI-WK USA
WM-WO WQ-WZ	WH1-WH0 US Pacific Islands KH1 - KH0
WL Alaska KL	WP1-WP5 US Caribbean Islands KP1 - KP5
XE XB-XH Mexico	XF4 Revilla Gigedo Is
XJ-XO Canada VE	XQ XR Chile and Islands CE CE9 CE0
XT Burkina Faso	XU Cambodia
XV Vietnam 3W	XW Lao Peoples Democratic Republic
XX3 Madeira Is CT3	XX9 Macao
XZ XY Myanmar	XZ5 XZ9 Karen State XZ
YA Republic of Afghanistan	YBYC YE-YH Indonesia
YI Iraq	YJ Vanuatu
YK Syria	YL Latvia
YM TurkeyTA	YN Nicaragua
YO YP-YR Romania	YS El Salvador
YU YT Yugoslavia	YV YW-YY Venezuela
YV0 Aves I.	YZ Yugoslavia YU
Z2 Zimbabwe	Z3 Macedonia
ZA Albania	ZB ZG Gibraltar
ZC UK Sovereign Bases on Cyprus - Akrotiri and Dhekelia	ZD7 St Helena
ZD8 Ascension I.	ZD9 Tristan da Cunha and Gough I.
ZF Cayman Islands	ZK1 South Cook Is
ZK1 Northern Cook Is	ZK2 ZK9 Niue

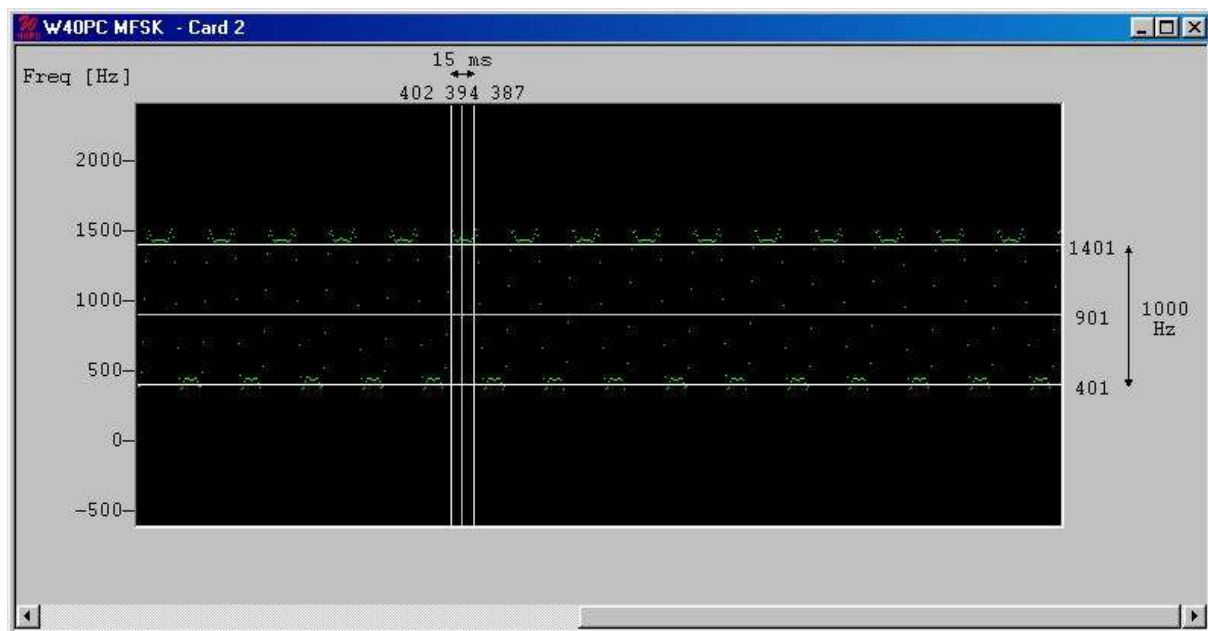
Prefix & Country	Prefix & Country
	ZK3 Tokelau Is
ZL New Zealand	ZL7 Chatham Is
ZL8 Kermadec Is	ZL9 Auckland I. and Campbell I.
ZM New Zealand and Islands ZL ZL7 ZL8 ZL9	ZP Paraguay
ZS ZR ZU Republic of South Africa	ZS8 Prince Edward I. and Marion I.
ZV-ZZ Brazil and Islands PY PY0	1A0 Sovereign Military Order of Malta (Rome, Italy)
1B Turkish area of North Cyprus	1C Chechnya Rep. (Russian Federation)
1P Seborga Principato (Italy)	1S Spratly Archipelago 9M0
1Z Karen State (Myanmar)	2D Isle of Man GD
2E England G	2I Northern Ireland GI
2J Jersey GJ	2M Scotland GM
2U Guernsey and Dependencies GU	2W Wales GW
3A Monaco	3B6 Agalega Is
3B7 Cargados Carajos (St Brandon) 3B6	3B8 Mauritius
3B9 Rodriguez I.	3C Equatorial Guinea
3C0 Annobon I.	3D2 Republic of Fiji
3D2 Conway Reef	3D2 Rotuma I.
3DA0 Swaziland	3E-3F Panama HP
3G Chile and Islands CE CE9 CE0	3V Tunisia
3W XV Vietnam	3X Republic of Guinea
3Y Bouvet I.	3Y Peter I Island
3Z Poland SP	4A-4C Mexico and Islands XE XF4
4D-4I Philippines DU	4J 4K Azerbaijan
4L Georgia	4M Venezuela and Islands YV YV0
4N1 6-0 Yugoslavia YU	4S Sri Lanka
4T Peru OA	4U United Nations Organization
4U1ITU 4UnITU United Nations Geneva	4U1SCO UNESCO, Paris F
4U1UN 4UnUN United Nations New York	4U1VIC United Nations Vienna OE
4U1WB World Bank Washington D.C. W	4V Haiti HH
4W East Timor	4X 4Z Israel
5A Libya	5B Cyprus
5C Morocco CN	5H Tanzania
5J 5K Colombia and Islands HK HK0	5L Liberia EL
5N Nigeria	5P Denmark OZ
5R Madagascar	5T Mauritania
5U Niger	5V Togo
5W Western Samoa	5X Uganda
5Z 5Y Kenya	6C Syria YK
6D-6J Mexico and Islands XE-XF4	6K 6L Republic of Korea HL
6O Somalia T5	6P Pakistan AP
6T 6U Sudan and Southern Sudan ST ST0	6W 6V Senegal
6Y Jamaica	7J-7N Japan JA
7O Republic of Yemen	7P Lesotho
7Q Malawi	7S Sweden SM
7X 7W Algeria	7Z Saudi Arabia HZ
8A 8B 8E 8I Indonesia YB	8J Japan JA
8O Botswana A2	8P Barbados
8Q Maldives	8R Guyana
8S Sweden SM	9A Croatia
9G Ghana	9H Malta
9J 9I Zambia	9K Kuwait
9L Sierra Leone	9M2 Malaya (Malaysia)
9M6 Sabah (Malaysia) 9M8	9M8 Sarawak (Malaysia)
9M0 BV9S 1S DU Spratly Archipelago	9N Nepal
9Q 9R Democratic Republic of Congo	9U Burundi
9V Singapore	9W Malaysia (including Sabah & Sarawak) 9M2 8
9X Rwanda	9Y 9Z Trinidad and Tobago

Part 8: Screenshots (DK2OM)

A1A (CW) Intruder:

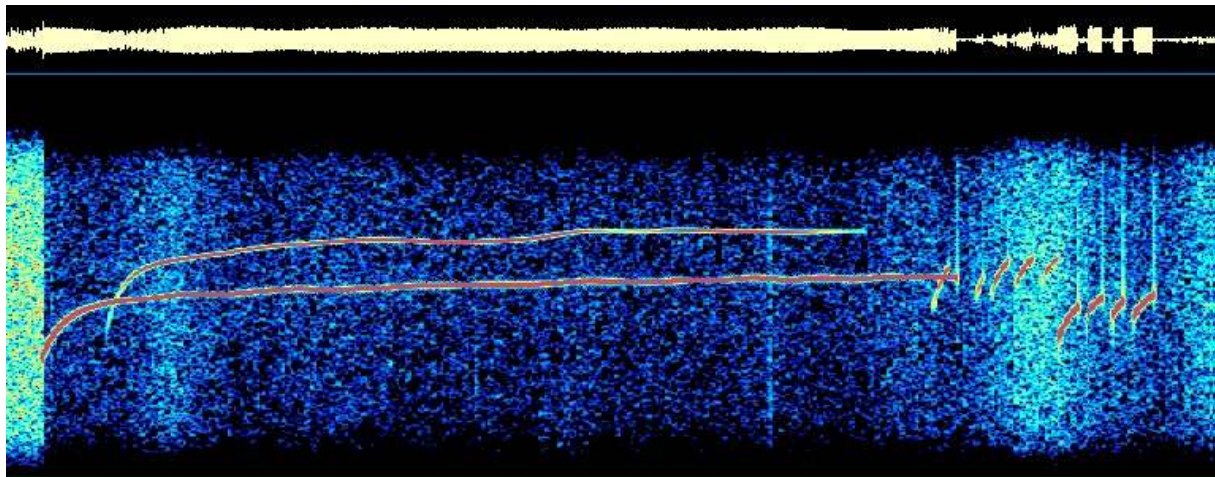


Clusterbaken ([clusterbeacons](#)) „D“ „P“ „S“ „C“ März 2005
„D“ (Odessa, Ukraine) „P“ „S“ „C“ (Russia)
[7038.0 - 7039.1 kHz](#) [March 2005](#)

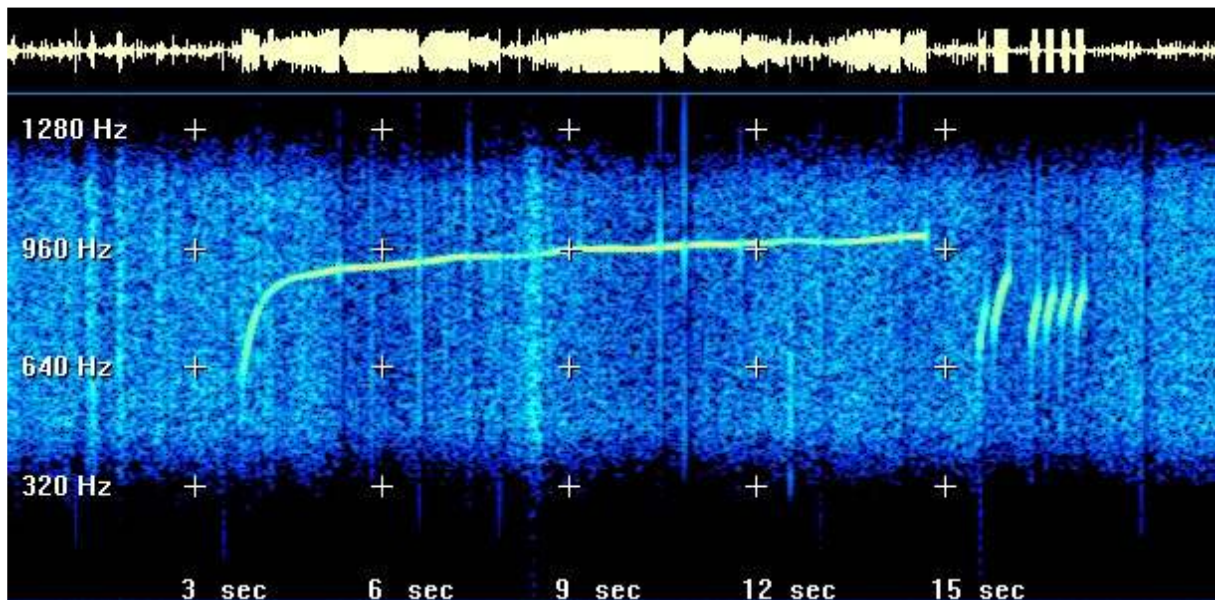


7018.0 CW (F1B/A1AAN) – Airforce Moscow
ident „REA4“

Treibnetz-Fischereibojen auf 28.000 – 28.500 MHz
Driftnet-fishery buoys on 28.000 – 28.500 MHz



Ansteigender Ton, dann die CW-Kennung.
Rising tone, followed by the CW-ident.



Sonagramm der Boje „AH“ – östliches Mittelmeer
Sonagram of the buoy „AH“ – Eastern Mediterranean Sea

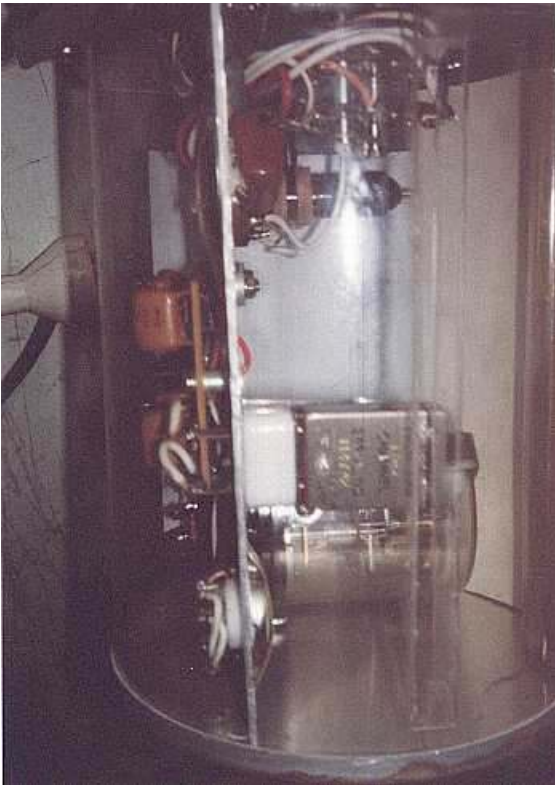
Treibnetzbojen arbeiten mit 0,050 - 8 Watt und einer Peitschenantenne.
Wir haben Beobachtungen und Peilungen aus dem Mittelmeer, dem Atlantik und dem Pazifik. Empfang in SSB oder CW.

Driftnetbuoys are working with 0.050 W - 8 Watts and a simple whip antenna.
We have bearings from buoys in the Mediterranean Sea, the Atlantic and the Pacific.
Reception in SSB or CW.

Screenshots: Taken with Gram50 (freeware for soundcards)

Please read the summaries of DJ7KG (Georg), our beacon expert!
<http://www.IARUMS-R1.org> - Homepage of IARU-MS Region 1

Treibnetz-Fischerei-bojen auf 28.000 – 28.500 MHz
Driftnet-fishery buoys on 28.000 – 28.500 MHz



Eine Treibnetzboje mit einem primitiven elektromechanischen Signalgeber zur Erzeugung der Bojenkennung

A fishery buoy with rather primitive electric and electronic components

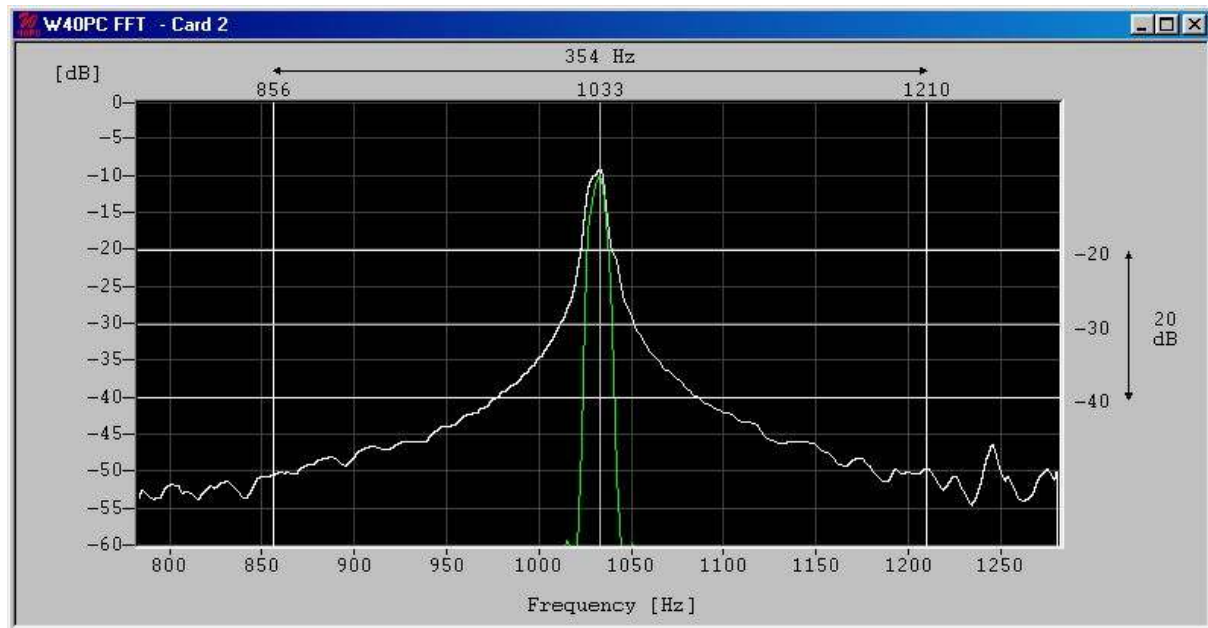


Das Oberteil einer Boje mit Antennenfuß

The upper part of a buoy including the antenna base

Photos from the courtesy of DJ9KR

Unmodulierte Träger Unmodulated carriers



Unmodulierte, sehr stabile Träger werden vom US-Militär von Zeit zu Zeit zu Versuchszwecken abgestrahlt. Hier: Unmodulierter Träger auf 14001,33 MHz. Sie werden ausgesendet von: Sizilien, Diego Garcia, Island oder Schiffstationen.

Unmodulated and very stable carriers are transmitted by US-MIL bases on Sicily, Diego Garcia, Iceland or from ships from time to time.

Bitte beachten:

Militärstationen dürfen auf allen Bereichen senden, mit Ausnahme von Flugfunkfrequenzen und Notfrequenzen! Sie verursachen oft erhebliche Störungen auf unseren exklusiven Bändern.

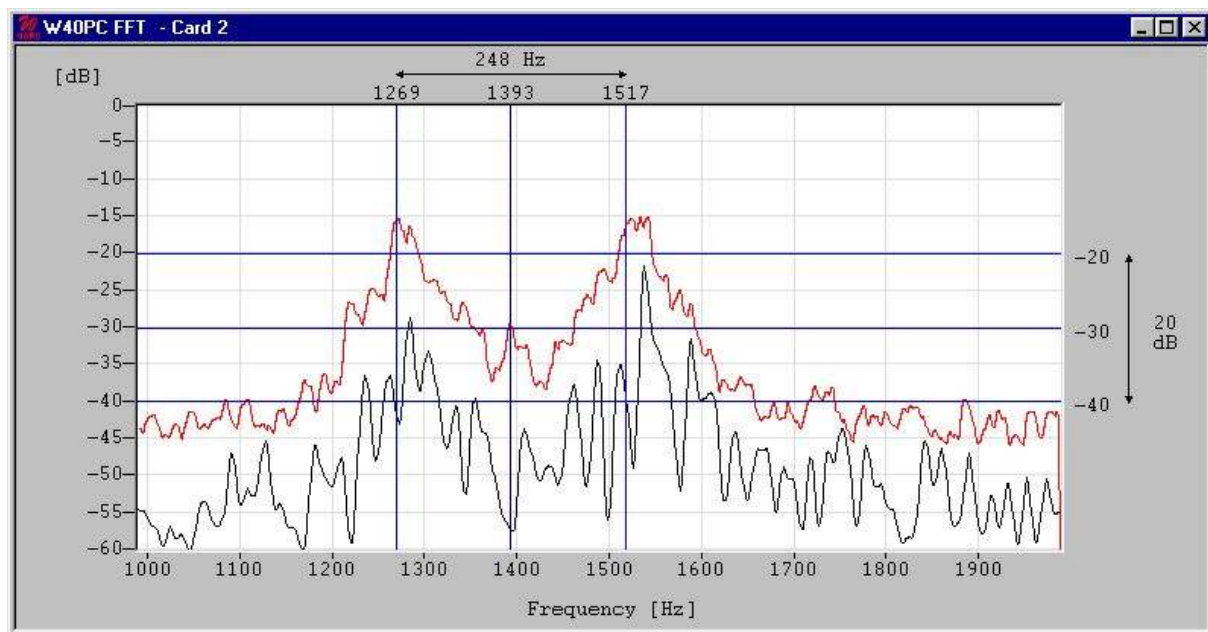
Die Bandwacht des DARC versucht diese Störungen mit Hilfe der BNetzA zu reduzieren. Das ist schon einige Male gelungen.

Please notice:

MIL stations are allowed to transmit everywhere but not on flight- or emergency frequencies! They often cause severe problems on our exclusive bands. The German Monitoring System is trying to reduce these interferences assisted by the German PTT (BNetzA). This has been successful for several times.

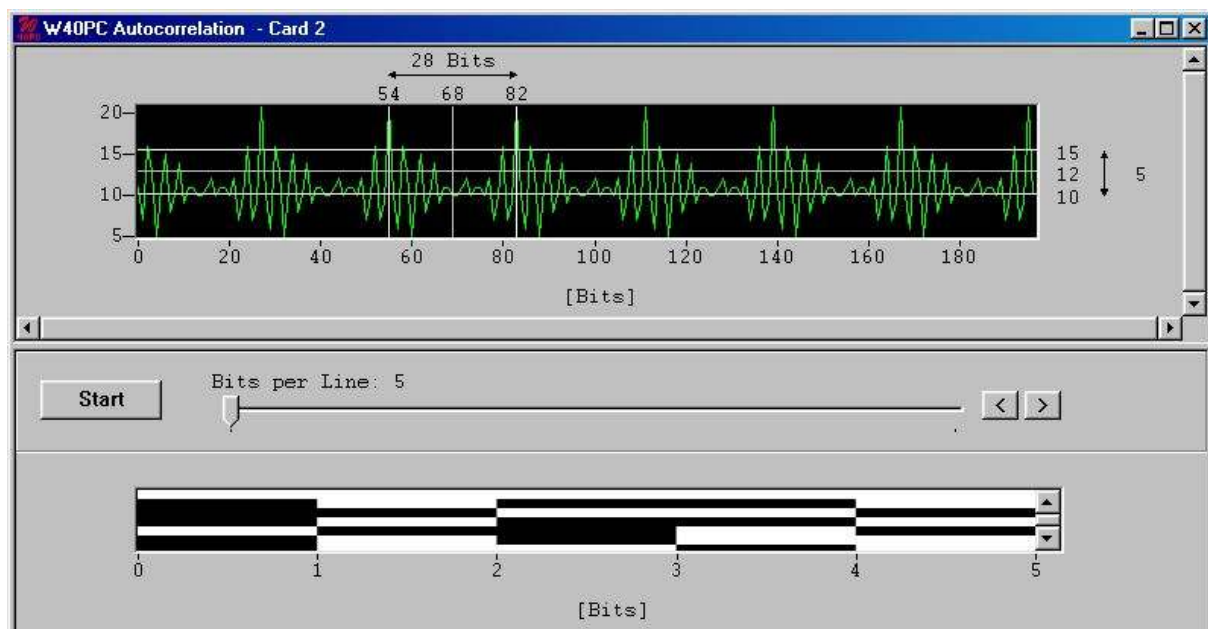
Fernschreibsysteme – FSK - Frequenzumtastung (F1B)

Teleprinting systems – FSK - Frequency shift keying (F1B)



Russischer Armeesender im 20 m – Band. Schlechte Filterung und simpler Aufbau verursachen Splatter und Oberwellen. Baudraten: 50, 75 und 81 Bd.

Russian military transmitter on 20 m. Bad filters and simple technology are causing spurious and harmonic radiations. Baudrates: 50, 75 and 81 Bd.

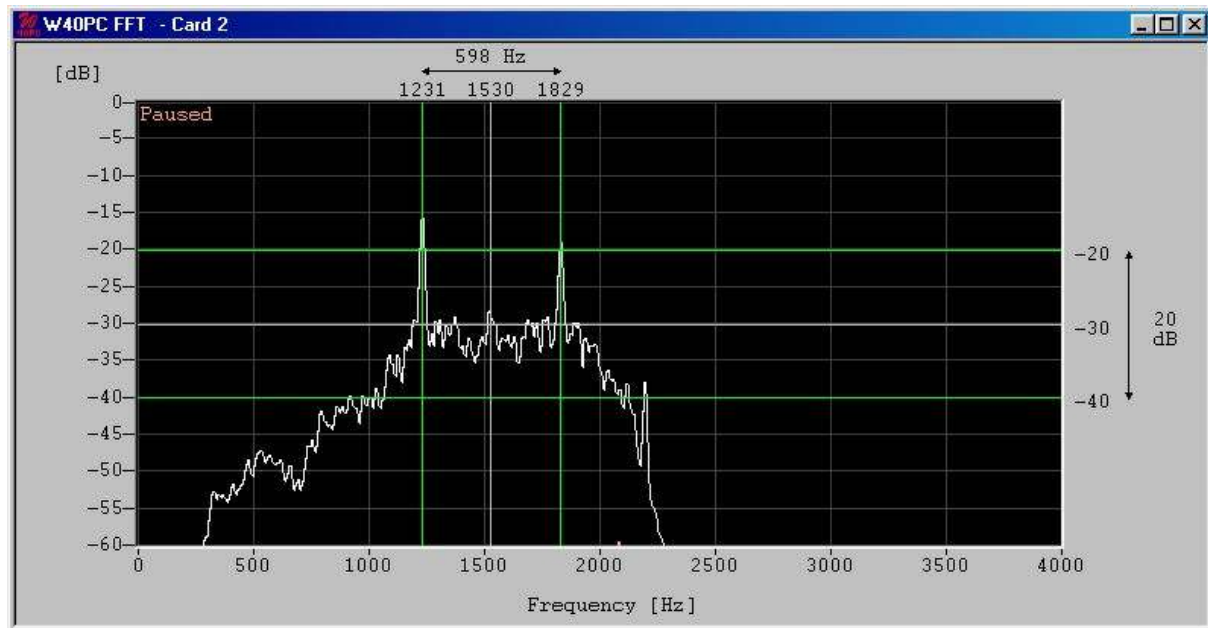


Beurteilung von F1B-Signalen durch **Auto-Korrelationsmessung** (hier: ARQ-E). Bei Onlineverschlüsselung ist diese Messung nicht möglich.

Classification of F1B transmissions by **autocorrelation-measurement** (in this case: ARQ-E). This measurement is not possible, if the traffic is online encrypted.

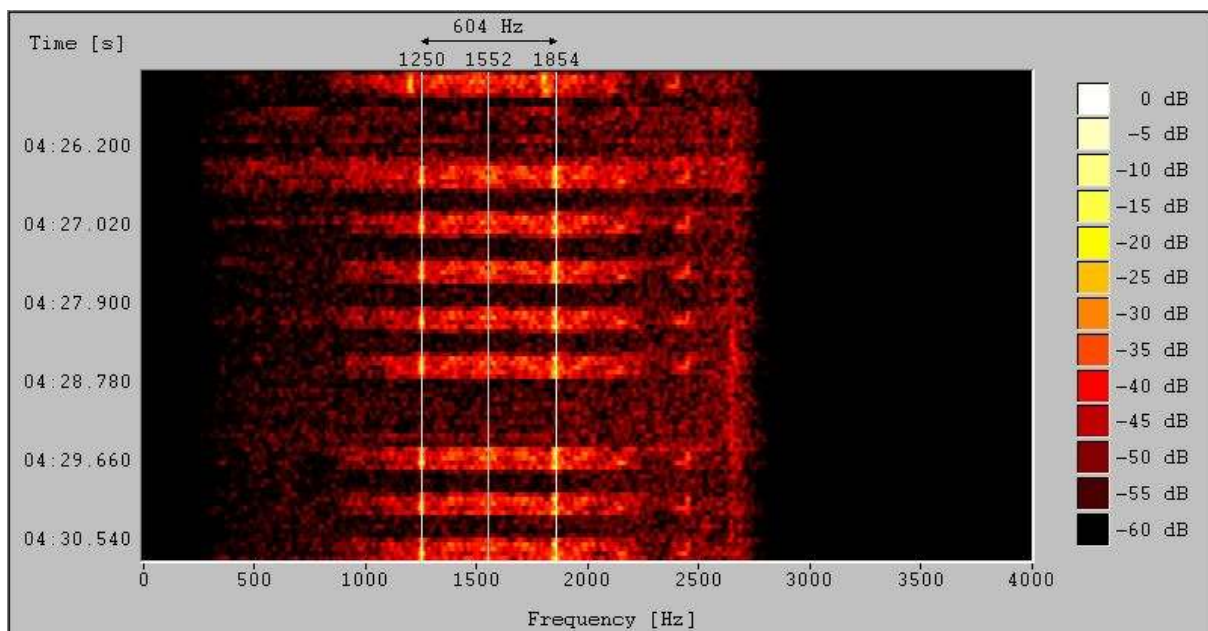
Fernschreibsysteme – FSK - Frequenzumtastung (F1B)

Teleprinting systems – FSK - Frequency shift keying (F1B)



Nordkoreanisches Fernschreibsystem DPRK FSK-600 – 600 Bd – 600 Hz Shift für
Diplomatenfunk

North Korean teletyper DPRK FSK-600 with 600 Bd and 600 Hz shift for diplo traffic

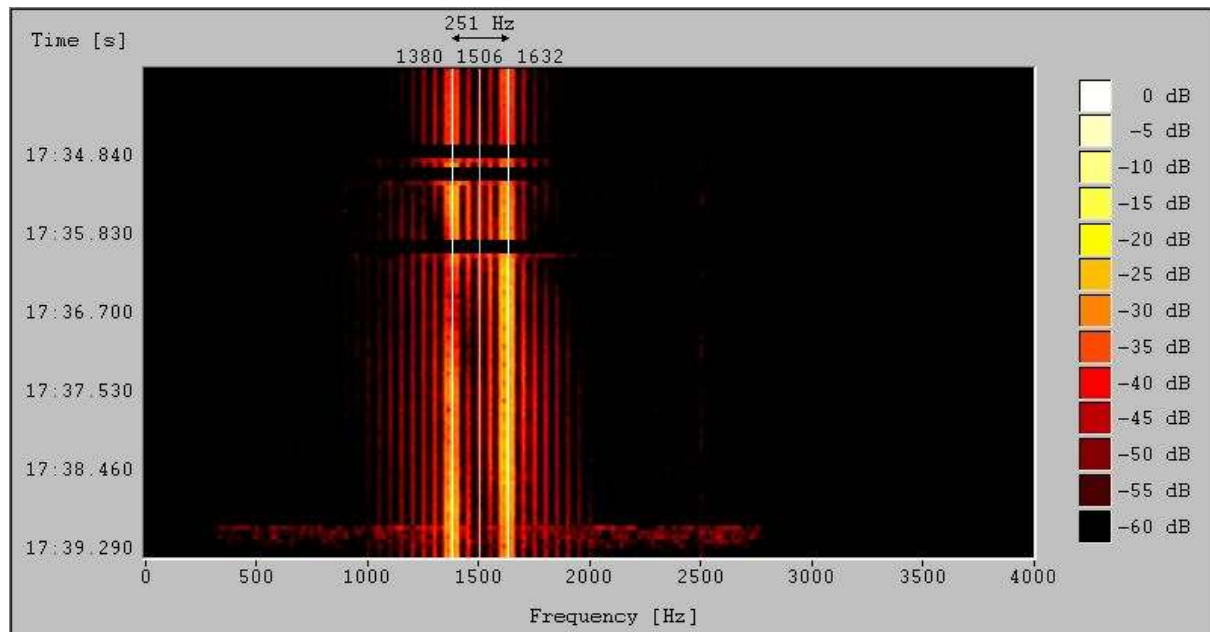


Nordkoreanisches Fernschreibsystem DPRK FSK-600 – 600 Bd – 600 Hz Shift für
Diplomatenfunk

North Korean teletyper DPRK FSK-600 with 600 Bd and 600 Hz shift for diplo traffic
DPRK = Democratic People Republic Of Korea

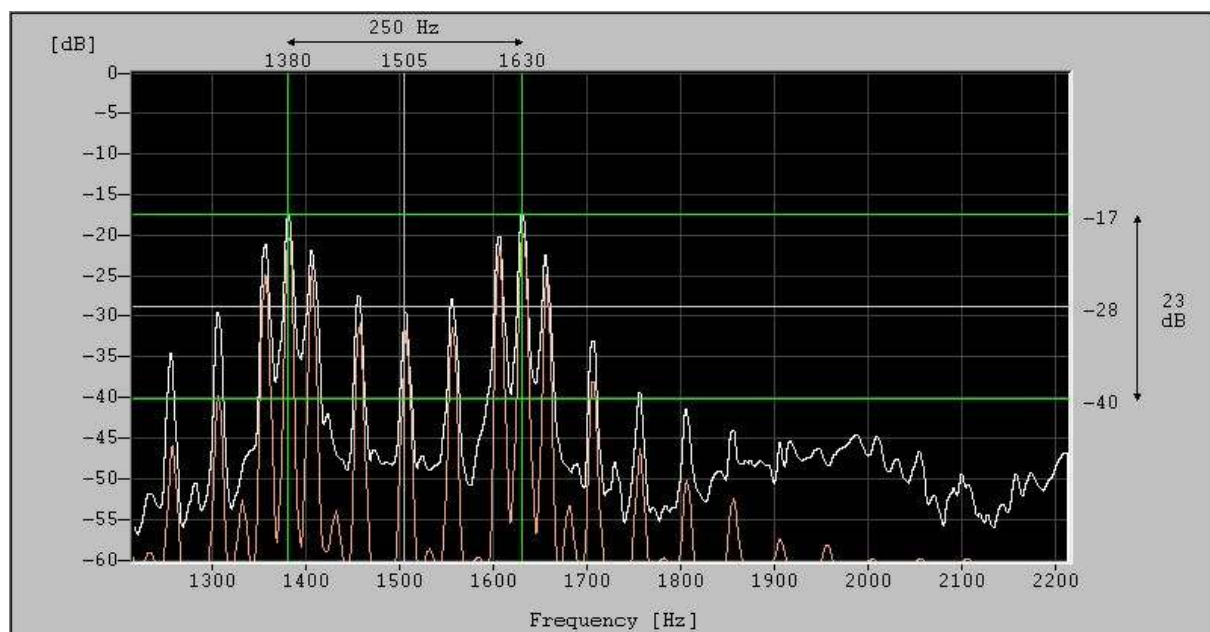
Fernschreibsysteme – FSK - Frequenzumtastung (F1B)

Teleprinting systems – FSK - Frequency shift keying (F1B)



CIS50-50 - Russischer Fernschreiber (Militärsystem CIS50-50) auf 7054 kHz. (Leerlauf 50 Bd, Datenübertragung 50 Bd, online verschlüsselt) – Unsauberes Signal durch eine primitive Endstufe mit schlechter Filterung.

CIS50-50 - Russian MIL printer CIS50-50 on 7054 kHz (Idling 50 Bd, traffic 50 Bd, online encrypted). Bad signals and spurious emissions caused by bad filtering.

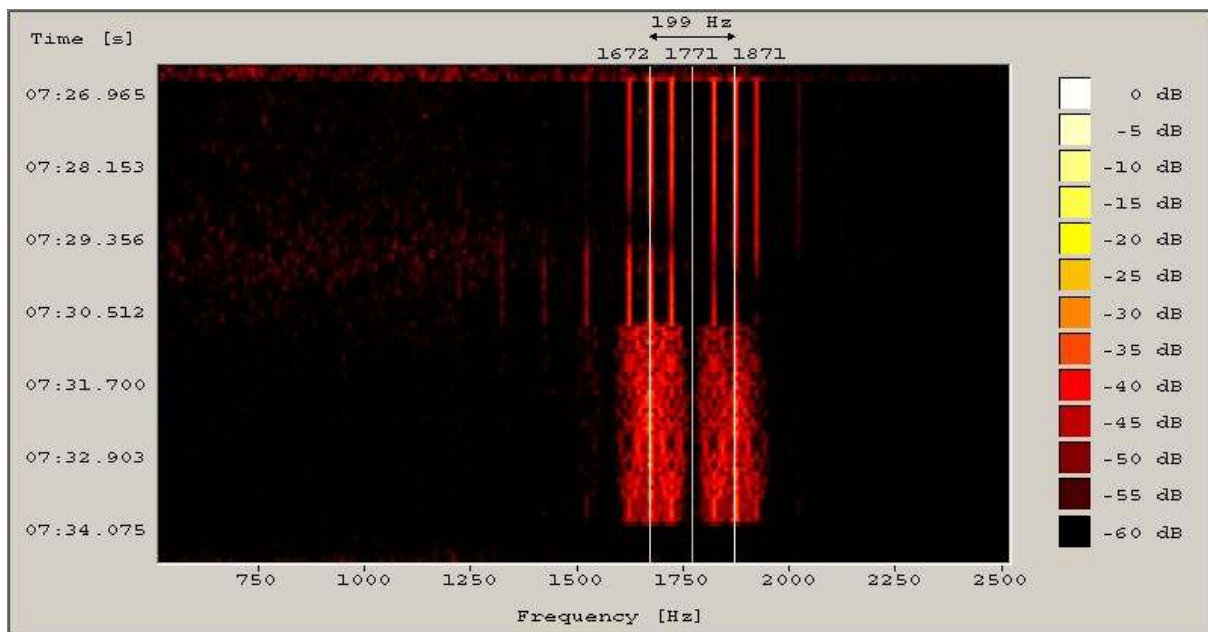


Im FFT-Spektrum erkennt man die problematische Aussendung noch besser.

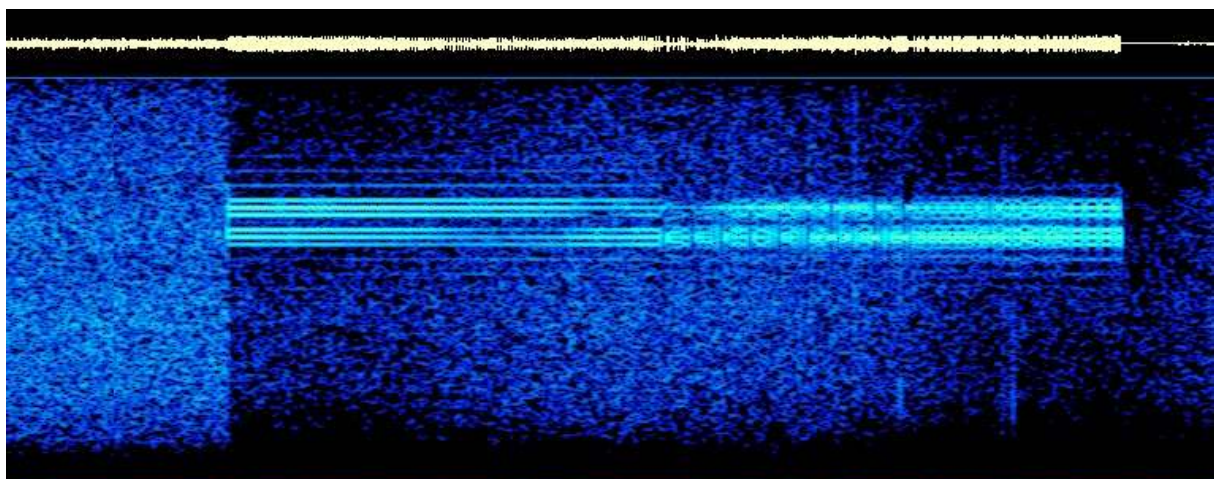
The FFT spektrum display is showing the bad emission much better.

Fernschreibsysteme – FSK - Frequenzumtastung (F1B)

Teleprinting systems – FSK - Frequency shift keying (F1B)



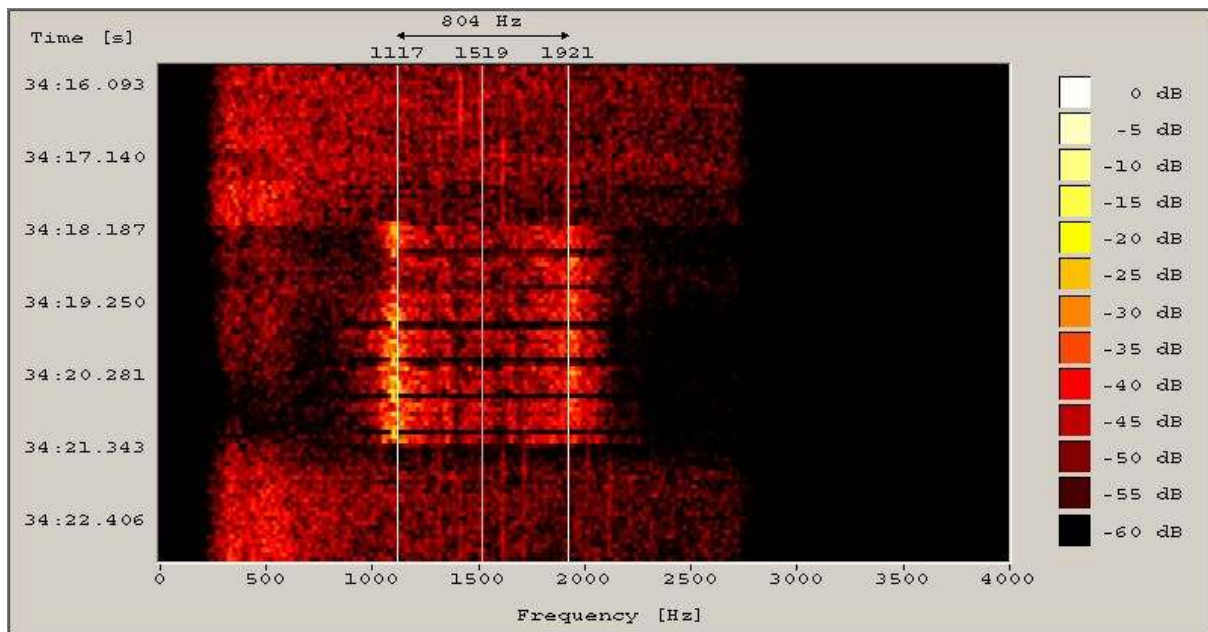
Codan Selektivruf 100 Bd (200 Hz Shift) auf 14108 kHz empfangen in Region 3.
Codan selective call 100 Bd (200 Hz shift) on 14108 kHz heard in Region 3.



Das gleiche System aufgezeichnet mit Gram50.
The same system on a Gram50 screenshot.

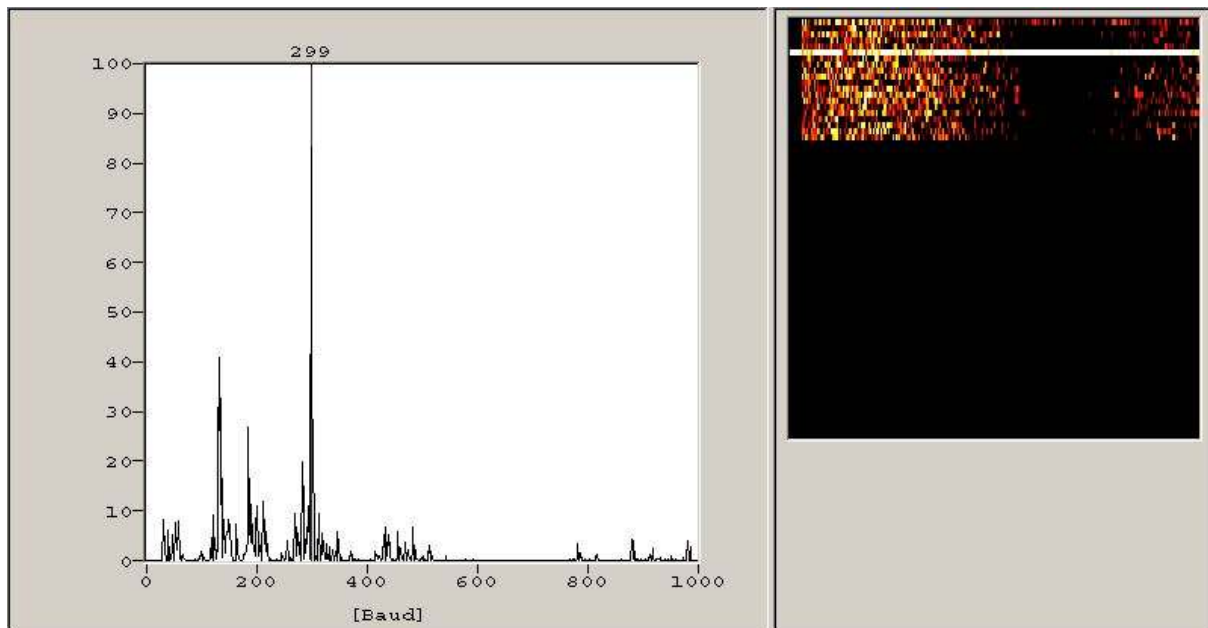
Fernschreibsysteme – FSK - Frequenzumtastung (F1B)

Teleprinting systems – FSK - Frequency shift keying (F1B)



Ägyptisches burst system – F1B - 300 Bd – 850 Hz Shift – täglich auf 14000 kHz – verschiedene Zeiten - Telemetriedaten, maximal 3 Sekunden

Burst system from Egypt – F1B - 300 Bd -850 Hz shift – daily on 14000 kHz, various times – short messages (telemetry), no longer than 3 seconds

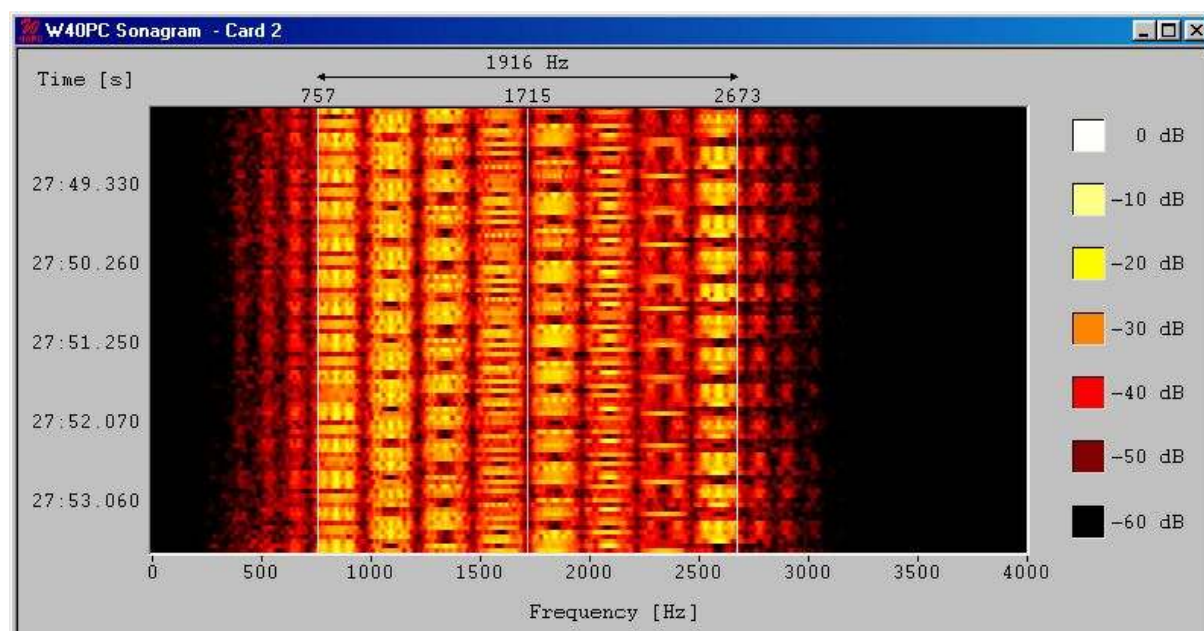


Telemetry bursts – hier Baudratenmessung mit einem Wavecom-Decoder

Telemetry bursts – Baudrate measurement by a Wavecom-decoder

Phasenmodulierte Systeme, serielle und parallele Modems, Frequenz-Multiplex-Systeme (FDM)

Phase modulated systems, serial and parallel modems, frequency division multiplex systems (FDM)

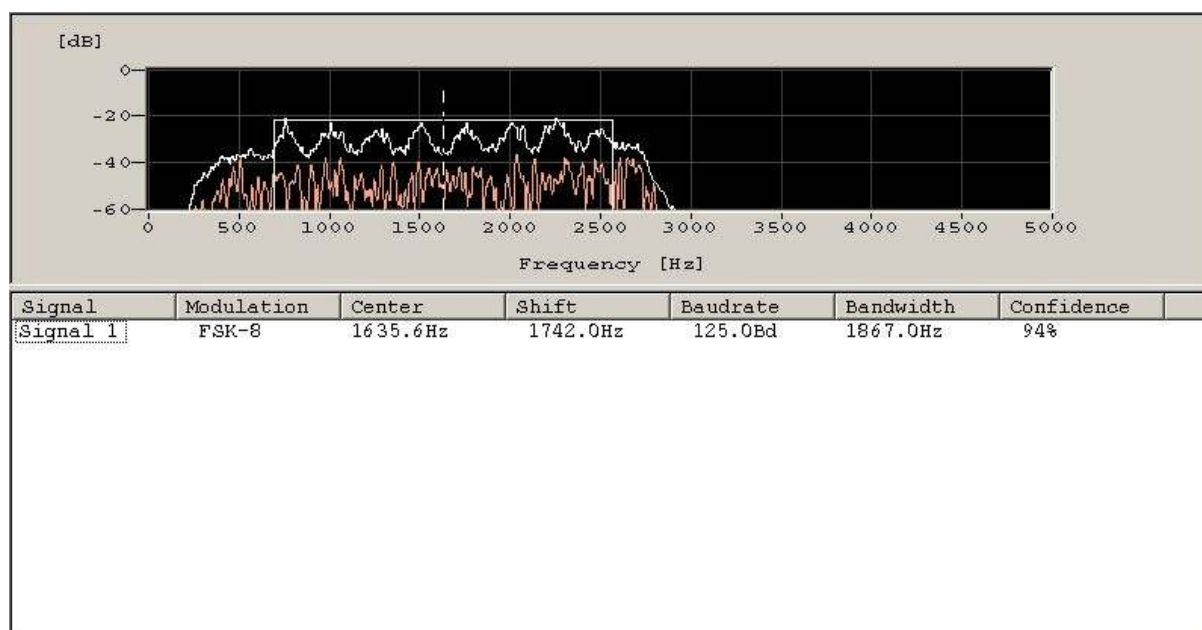


ALE = automatic link setup (auch bekannt als **MIL-STD-188-141A**), entwickelt vom amerikanischen Verteidigungsministerium. 8 Kanäle FSK - 125 Bd.

Täglich auf 7, 10, 14, 21 und 28 MHz hörbar, weltweit sehr verbreitet. Klingt wie ein Würfelbecher.

ALE-system (known as MIL-STD-188-141A), developed by the US Ministry of Defense. 8 channels - FSK - 125 Bd. Daily audible on 7, 10, 14, 21 and 28 MHz.

Worldwide often used. It is sounding like an ice-shaker.

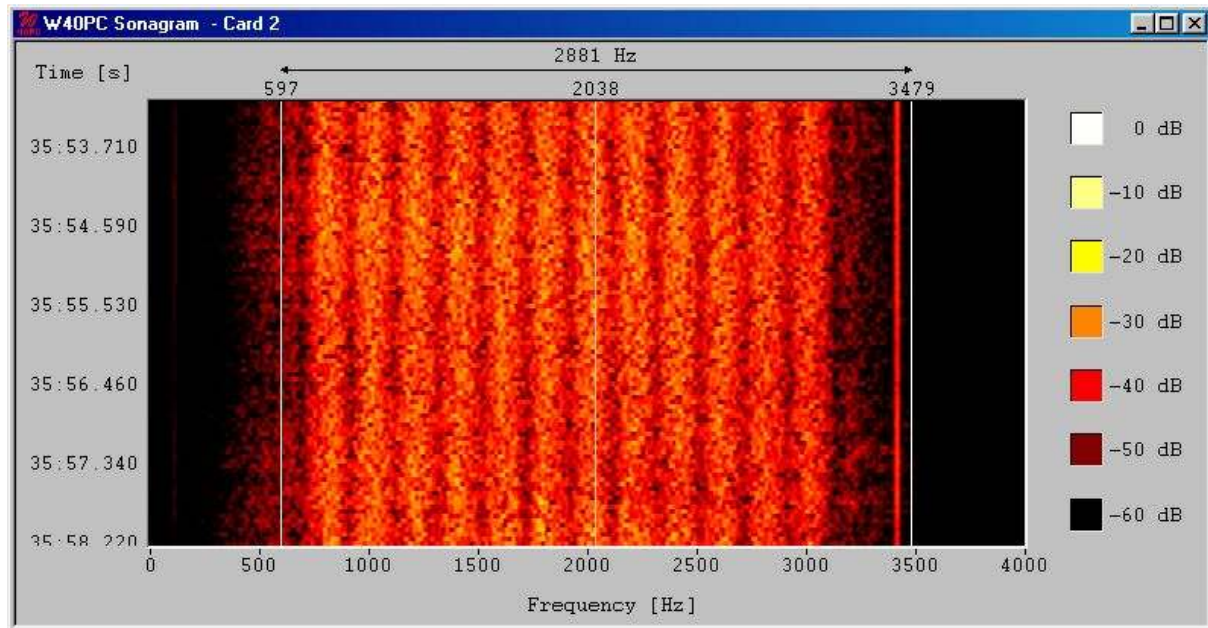


ALE auf 21 MHz analysiert mit dem Wavecom Classifier. In weniger als 1 Sekunde sind alle Parameter bestimmt.

ALE analyzed by the new Wavecom Classifier. Less than 1 second is needed to show all parameters.

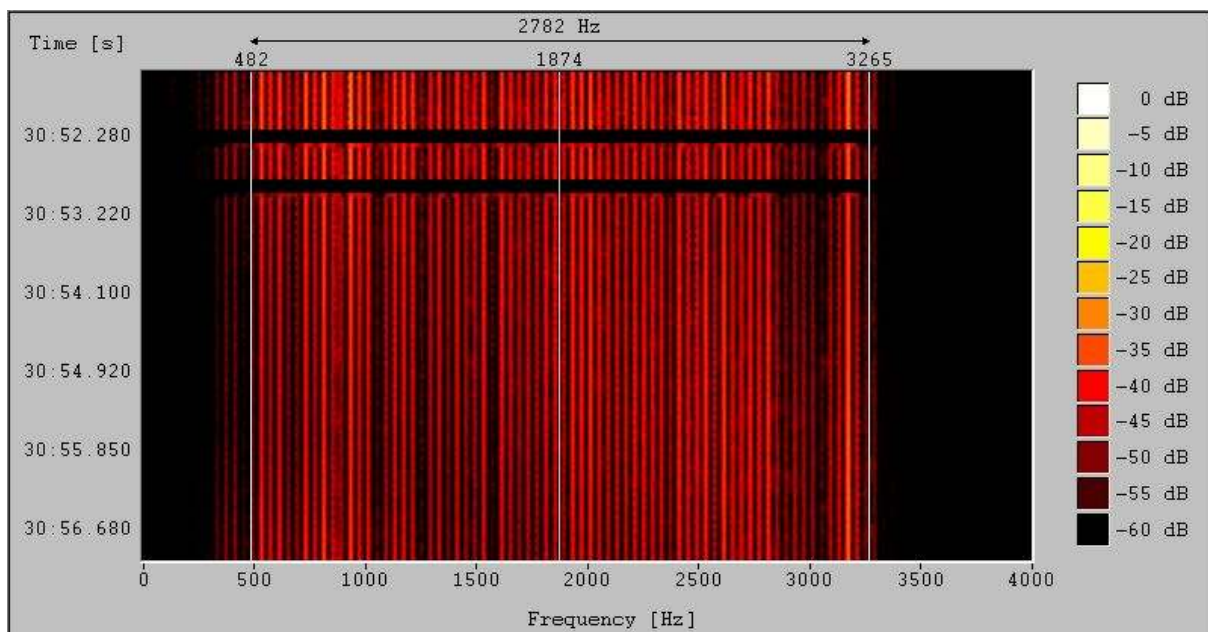
Phasenmodulierte Systeme, serielle und parallele Modems, Frequenz-Multiplex-Systeme (FDM)

Phase modulated systems, serial and parallel modems, frequency division multiplex system (FDM)



MS 5 - CIS-Militär, 12 Ton (FDM) BPSK oder QPSK, 120 Bd pro Kanal, rechts der Pilotton, oft hörbar auf 7, 14 und 21 MHz.

**MS 5 - CIS-MIL 12-tone FDM-system, often audible on 7, 14 and 21 MHz.
12 channels BPSK or QPSK, 120 bd each channel, right the pilottone.**

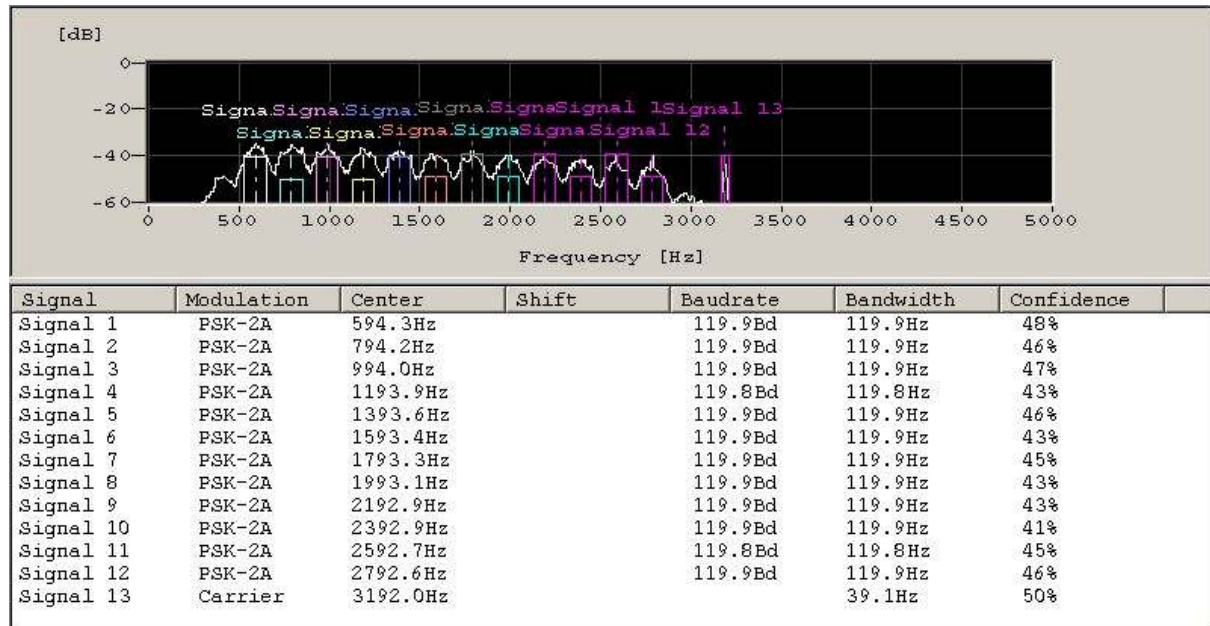


Das gleiche System im Leerlauf (Idling), rechts der Pilotton.

The same system in idling condition, the pilottone above 3000 Hz.

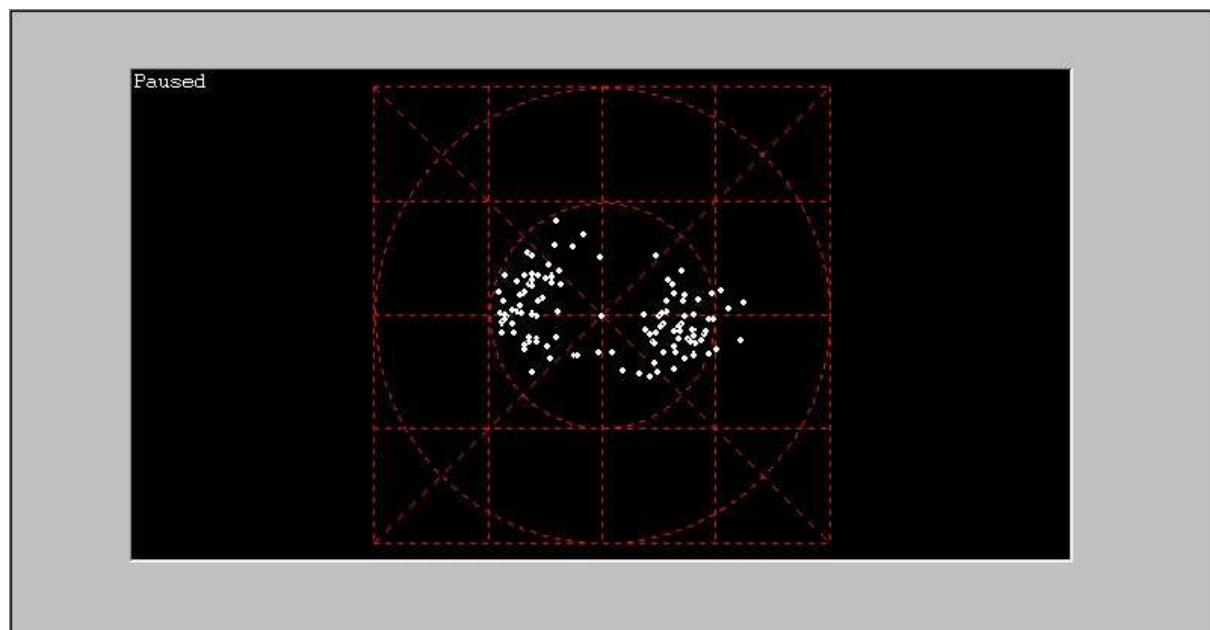
Phasenmodulierte Systeme, serielle und parallele Modems, Frequenz-Multiplex-Systeme (FDM)

Phase modulated systems, serial and parallel modems, frequency division multiplex systems (FDM)



MS 5 - CIS-Militär, 12-Ton System BPSK oder QPSK, 120 Bd pro Kanal. Analyse mit dem Wavecom Classifier.

MS 5 - CIS-MIL 12-tone system, 12 channels BPSK or QPSK. Analyzed by the Wavecom Classifier.

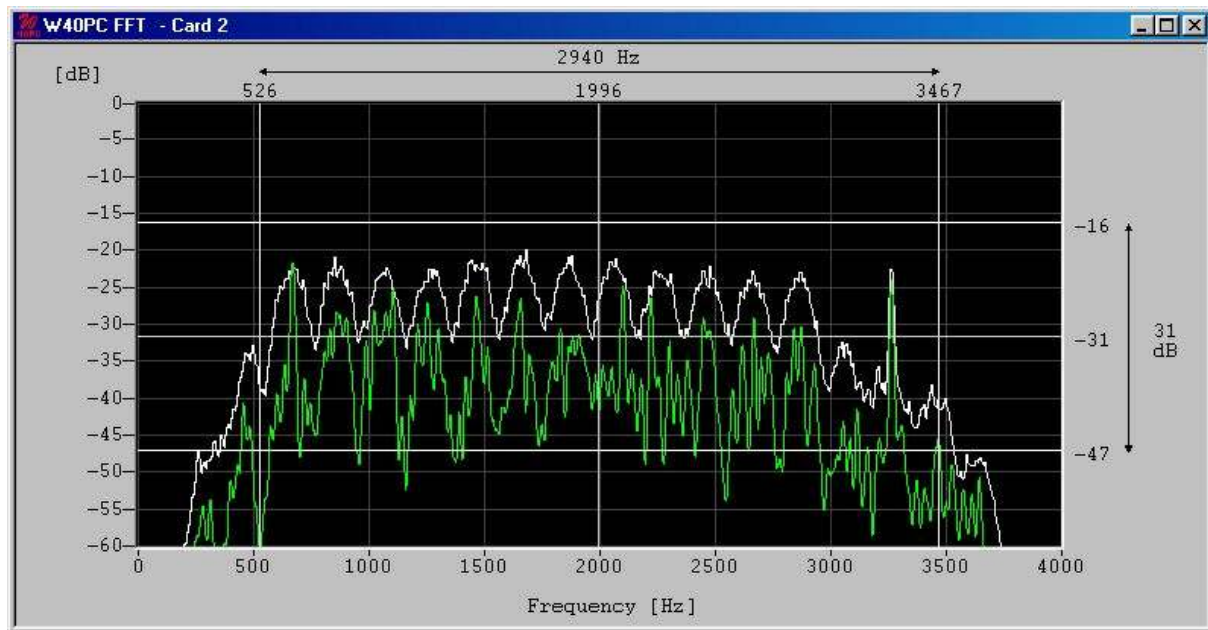


MS 5 -12 Ton-System, wie oben, Phasenlage eines Kanals (BPSK).

MS 5 - 12 tone system, like above, phaseplane of one channel (BPSK).

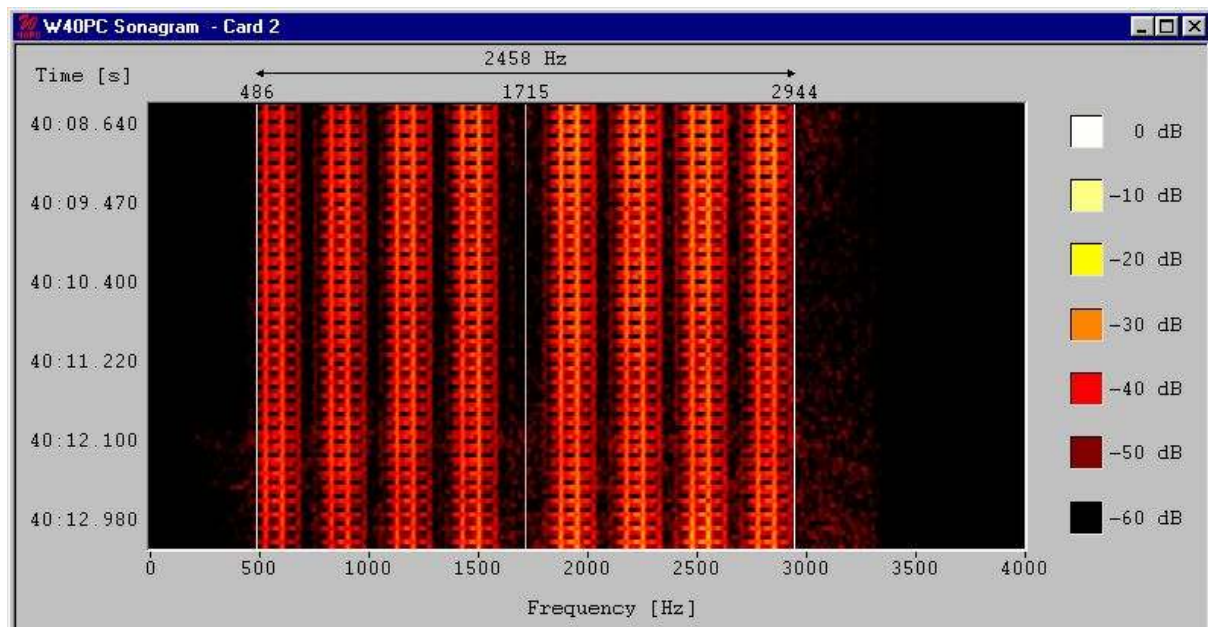
Phasenmodulierte Systeme, serielle und parallele Modems, Frequenz-Multiplex-Systeme (FDM)

Phase modulated systems, serial and parallel modems, frequency division multiplex systems (FDM)



MS 5 – wie oben, hier im FFT-Display (Pilotton rechts bei 3250 Hz).

MS 5 – like above, now FFT-Display, right the pilottone at 3250 Hz.

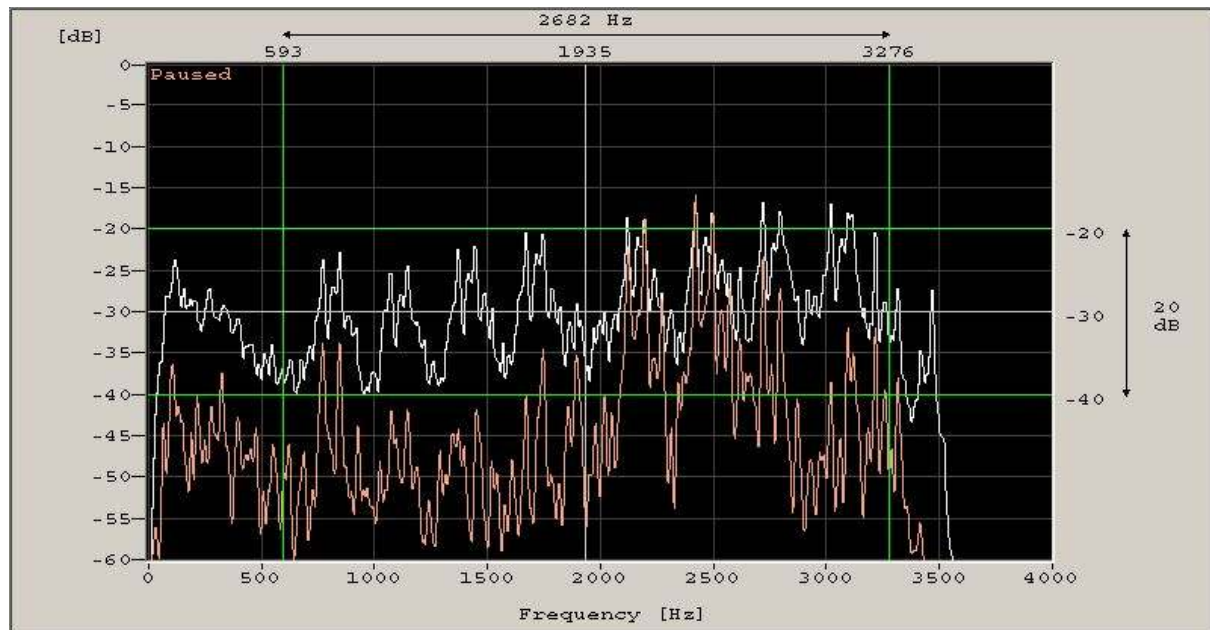


PRC4+4 – Chinesisches-Militärsystem on 20 m, 8 Kanäle a 75 Bd, QPSK – traffic –
Leerlauf: 8 x 150 Bd, FSK-8

PRC4+4 – Chinese-MIL system on 20 m, 8 channels, 8 x 75 Bd, QPSK – traffic –
Idling: 8 x 150 Bd, FSK-8

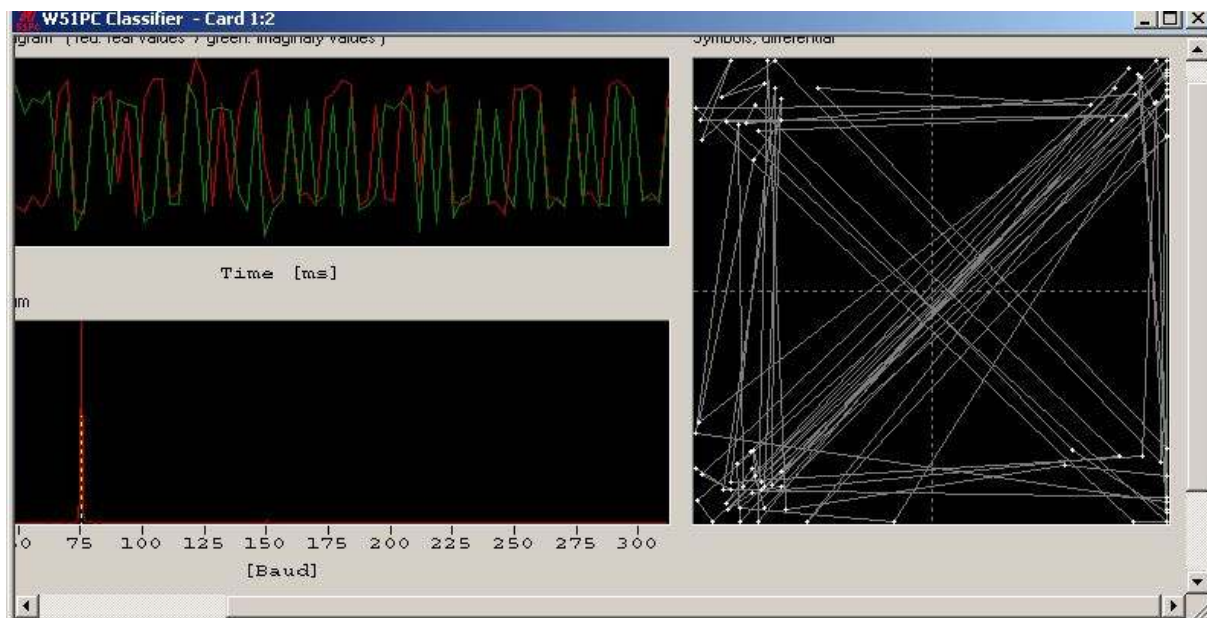
Phasenmodulierte Systeme, serielle und parallele Modems, Frequenz-Multiplex-Systeme (FDM)

Phase modulated systems, serial and parallel modems, frequency division multiplex systems (FDM)



PRC4+4 – Chinesisches-Militärsystem on 20 m, 8 Kanäle a 75 Bd, QPSK – traffic –
Leerlauf: 8 x 150 Bd, FSK-8

PRC4+4 – Chinese-MIL system on 20 m, 8 channels, 8 x 75 Bd, QPSK – traffic –
Idling: 8 x 150 Bd, FSK-8

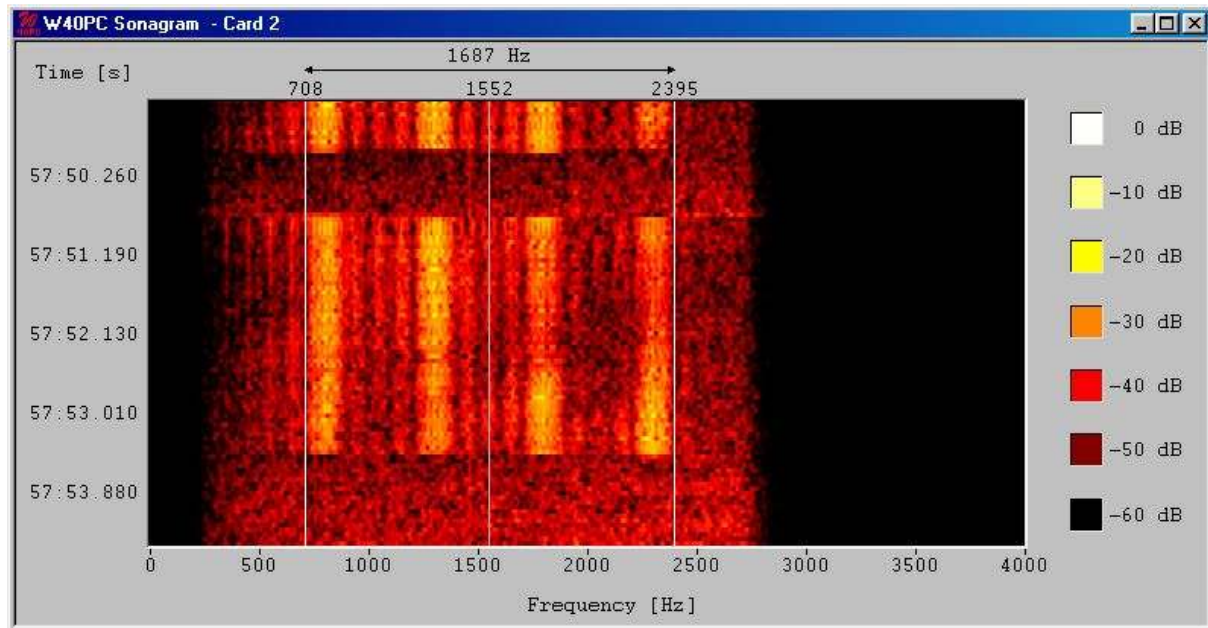


PRC4+4 – Chinesisches-Militärsystem on 20 m, 8 Kanäle a 75 Bd, QPSK –traffic –
Leerlauf: 8 x 150 Bd, FSK-8 – hier: mit dem Wavecom Classifier

PRC4+4 – Chinese-MIL system on 20 m, 8 channels, 8 x 75 Bd, QPSK – traffic –
Idling: 8 x 150 Bd, FSK-8 – shown by the Wavecom Classifier

Phasenmodulierte Systeme, serielle und parallele Modems, Frequenz-Multiplex-Systeme (FDM)

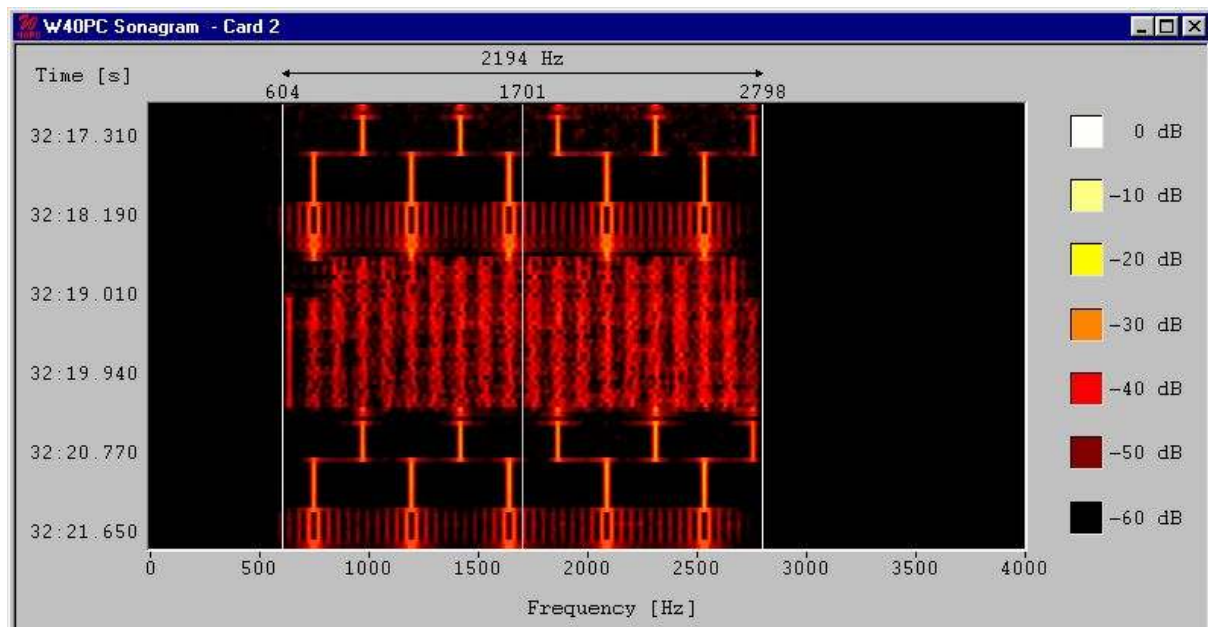
Phase modulated systems, serial and parallel modems, frequency division multiplex systems (FDM)



PRC 4 FSK – Chinesisches 4 Kanal-System (Militär) auf 14.004 MHz. 4 x 100 Bd.

PRC 4 FSK – Chinese MIL 4-channels on 14.004 MHz. 4 x 100 Bd.

PRC = People Republic of China

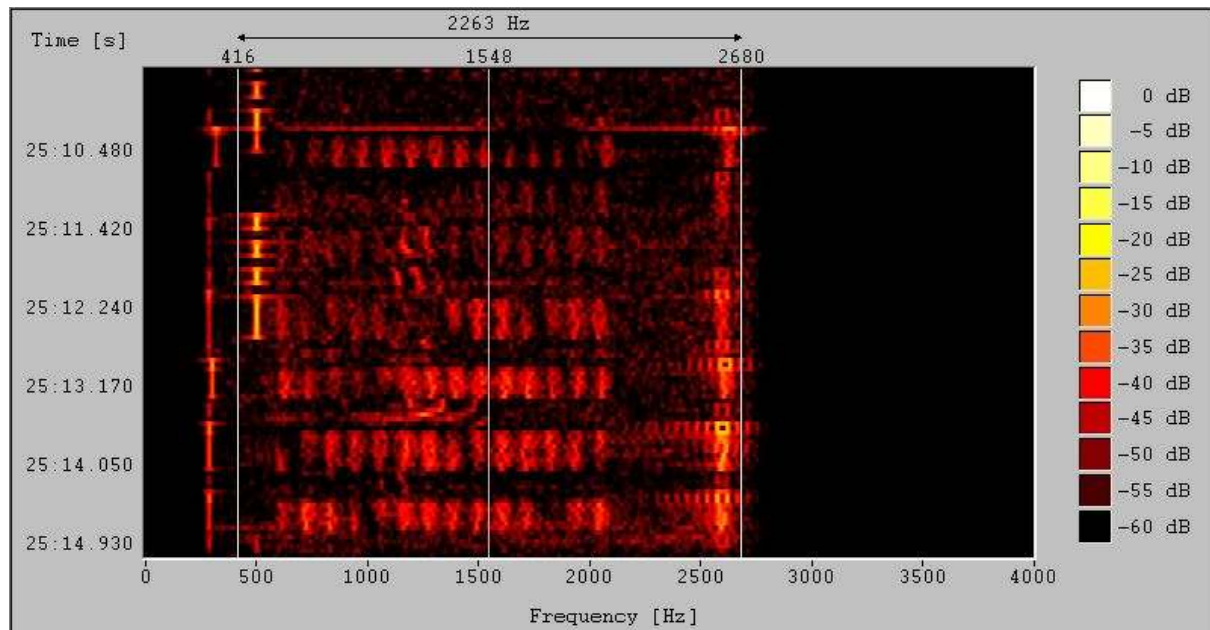


Chinesisches 18 Ton - FDM Militärsystem auf 21,257 MHz. (18 Kanäle x 90 Bd, DPSK)

Chinese 18 tone - FDM MIL-system on 21.257 MHz. (18 channels x 90 Bd, DPSK)

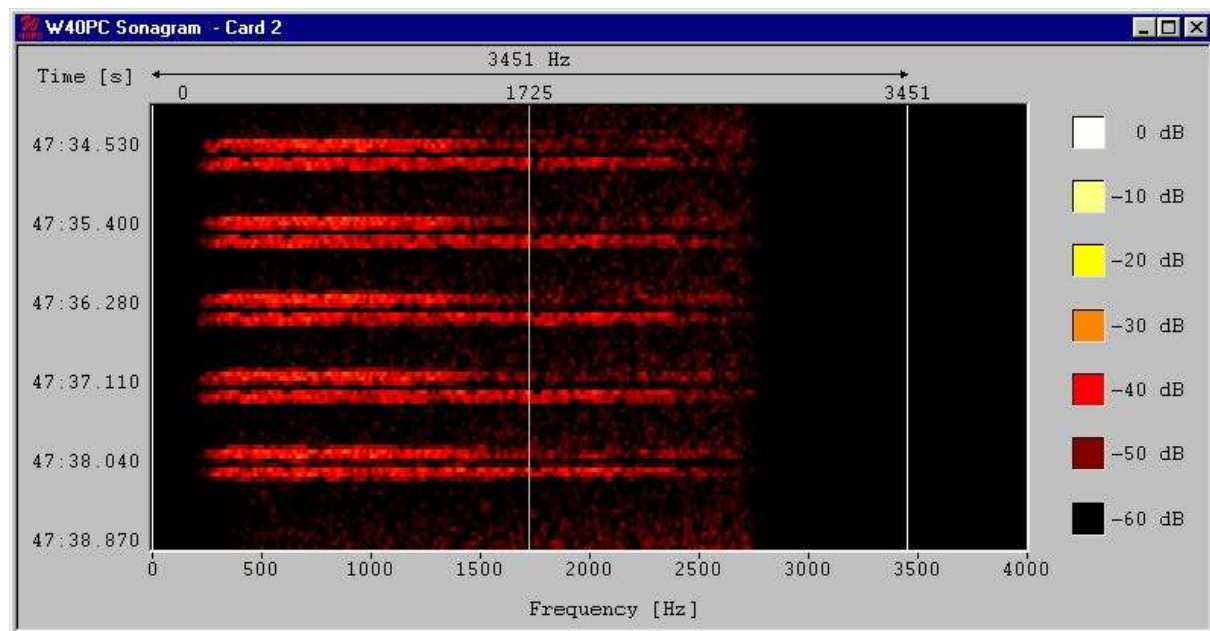
Phasenmodulierte Systeme, serielle und parallele Modems, Frequenz-Multiplex-Systeme (FDM)

Phase modulated systems, serial and parallel modems, frequency division multiplex systems (FDM)



NATO-System LINK11 – hier auf 7 MHz.

NATO-system LINK11 on 7 MHz.

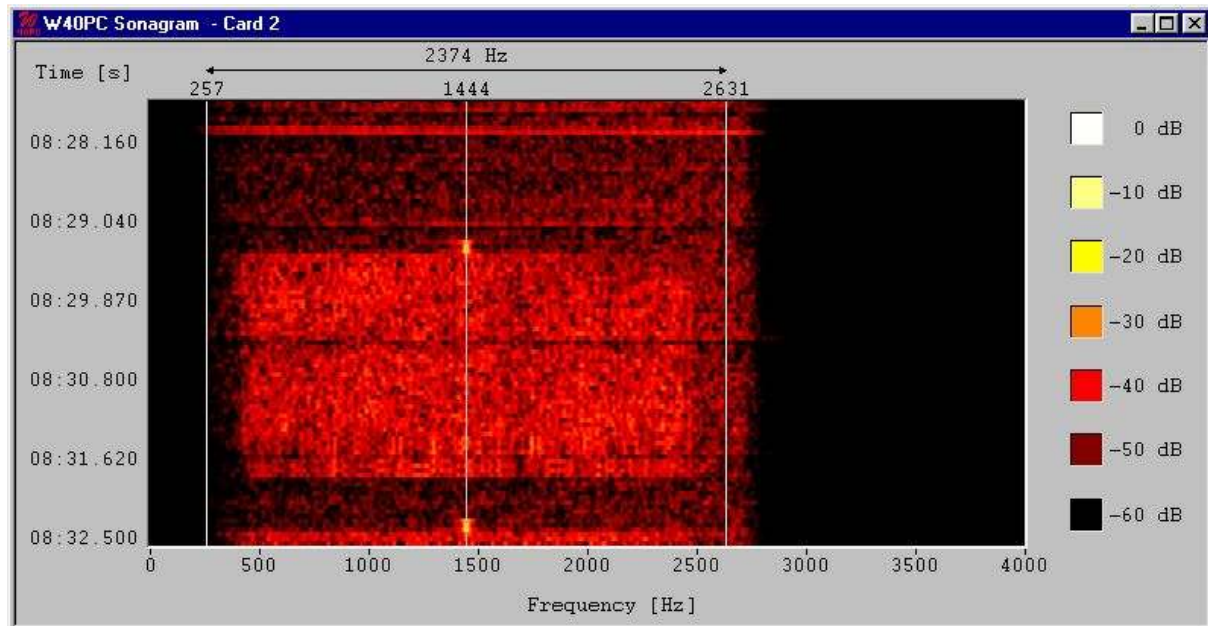


Frequenz Hüpfer – verschiedene Systeme mit Burst-Signalen auf 7, 14 und 21 MHz.

Frequency hoppers – different systems with burst signals on 7, 14 and 21 MHz.

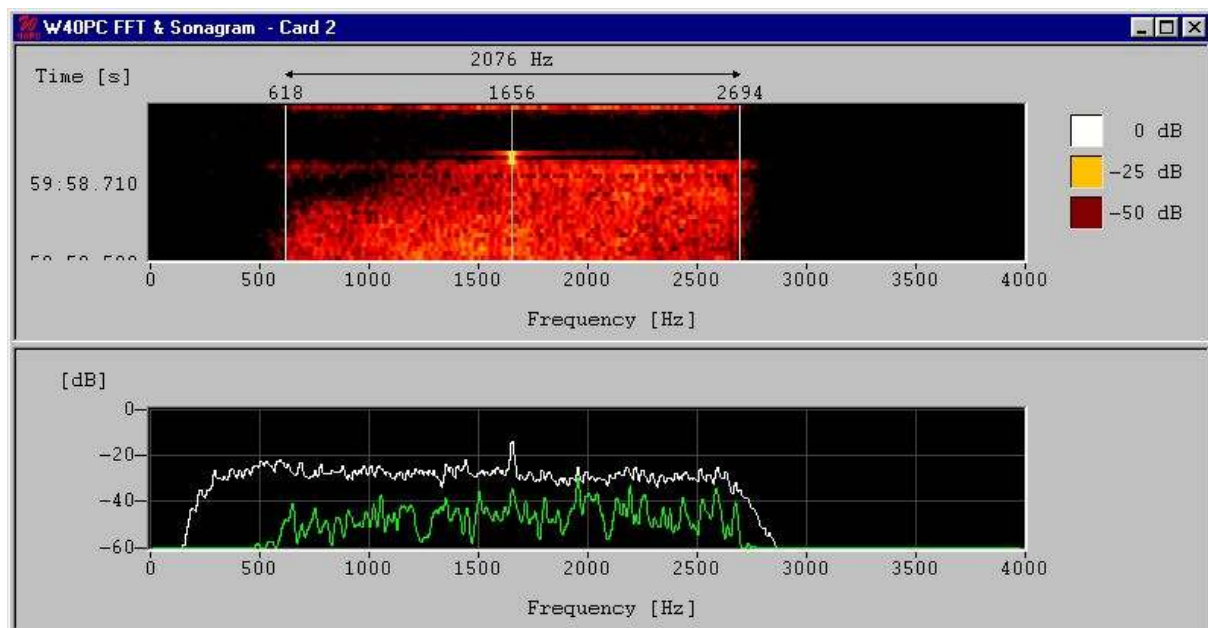
Phasenmodulierte Systeme, serielle und parallele Modems, Frequenz-Multiplex-Systeme (FDM)

Phase modulated systems, serial and parallel modems, frequency division multiplex systems (FDM)



HF-Acars auf 18117 kHz, 1800 Bd. Traffic zwischen Flugzeugen und Fluggesellschaften. Dieses System wurde 2004 von der spanischen PTT abgeschaltet.

HF-Acars on 18117 kHz, 1800 Bd. Traffic between planes and airlines. This system was disabled by the Spanish PTT in 2004.

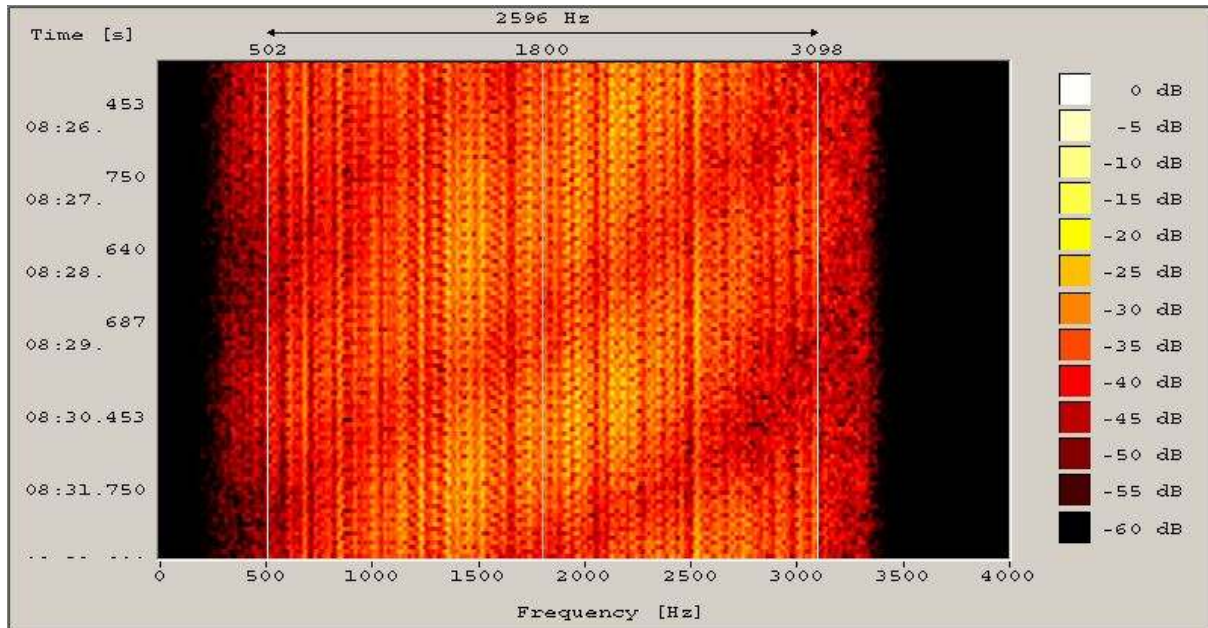


Das gleiche System mit dem "prekeytone" in der Mitte.

The same system with the centered prekeytone.

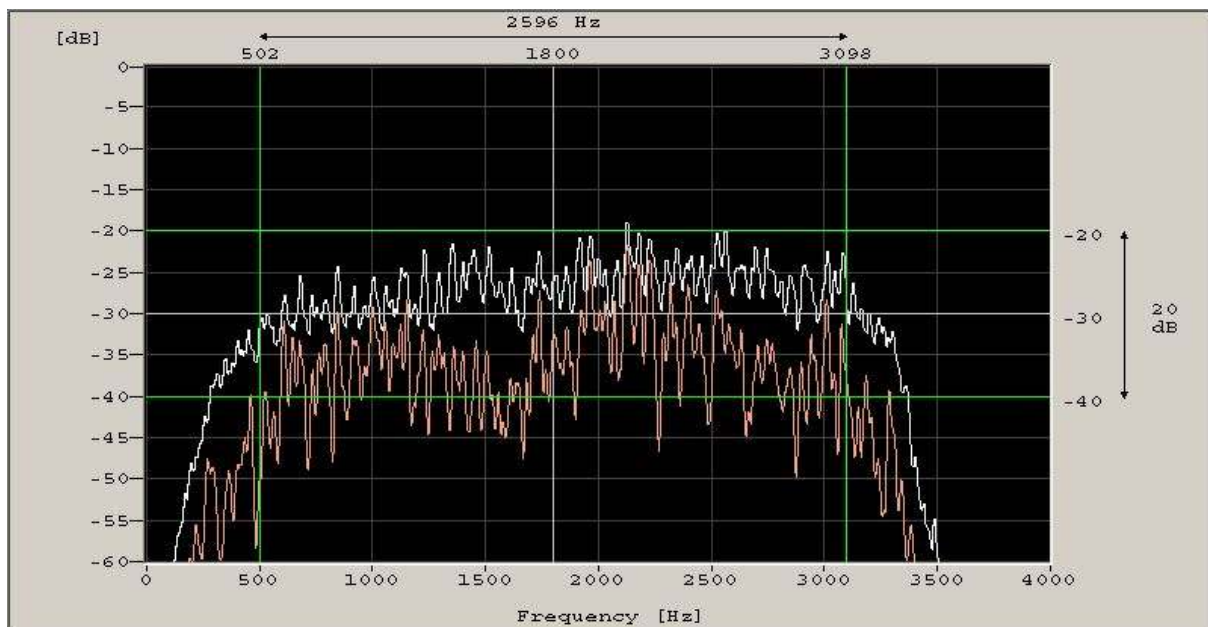
Phasenmodulierte Systeme, serielle und parallele Modems, Frequenz-Multiplex-Systeme (FDM)

Phase modulated systems, serial and parallel modems, frequency division multiplex systems(FDM)



Stanag 4285 – 2k4 Baud – D8PSK auf 10112.0 kHz – täglich, permanent -
serielles MIL-Modem aus der Türkei, legal

Stanag 4285 - 2k4 Baud – D8PSK on 10112.0 kHz, daily, continuous -
serial MIL-modem from Turkey, legal operation

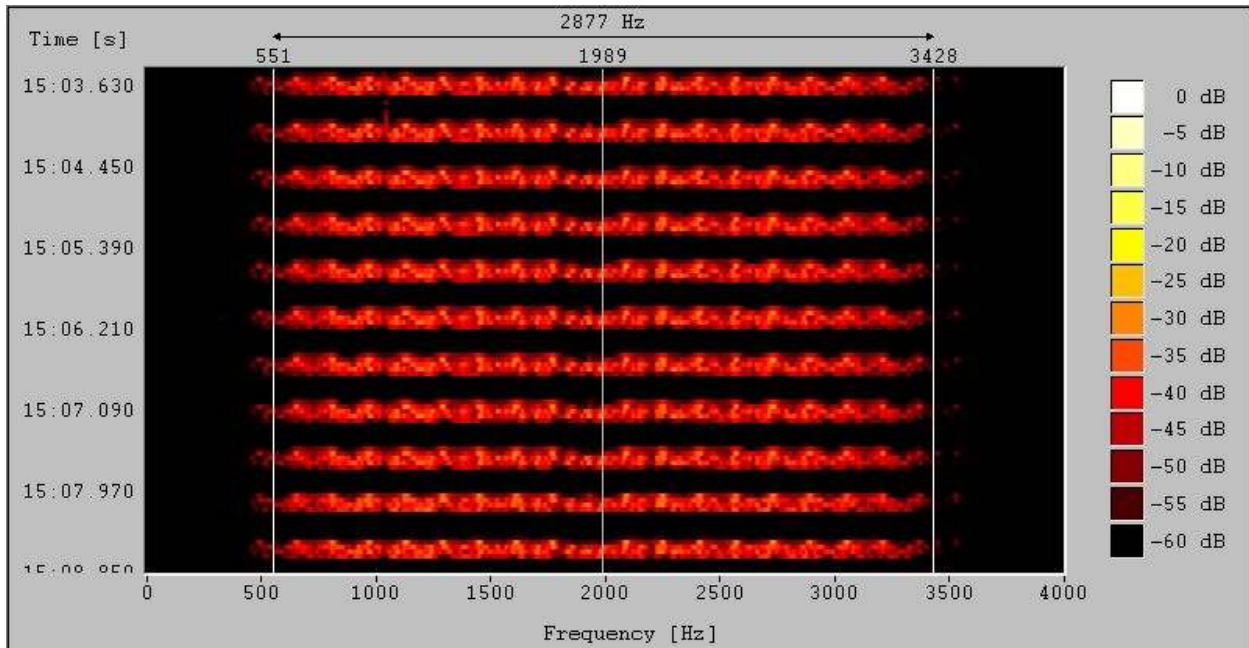


Das selbe System – hier spektrale Verteilung im FFT-Display

The same system – FFT-spectrum

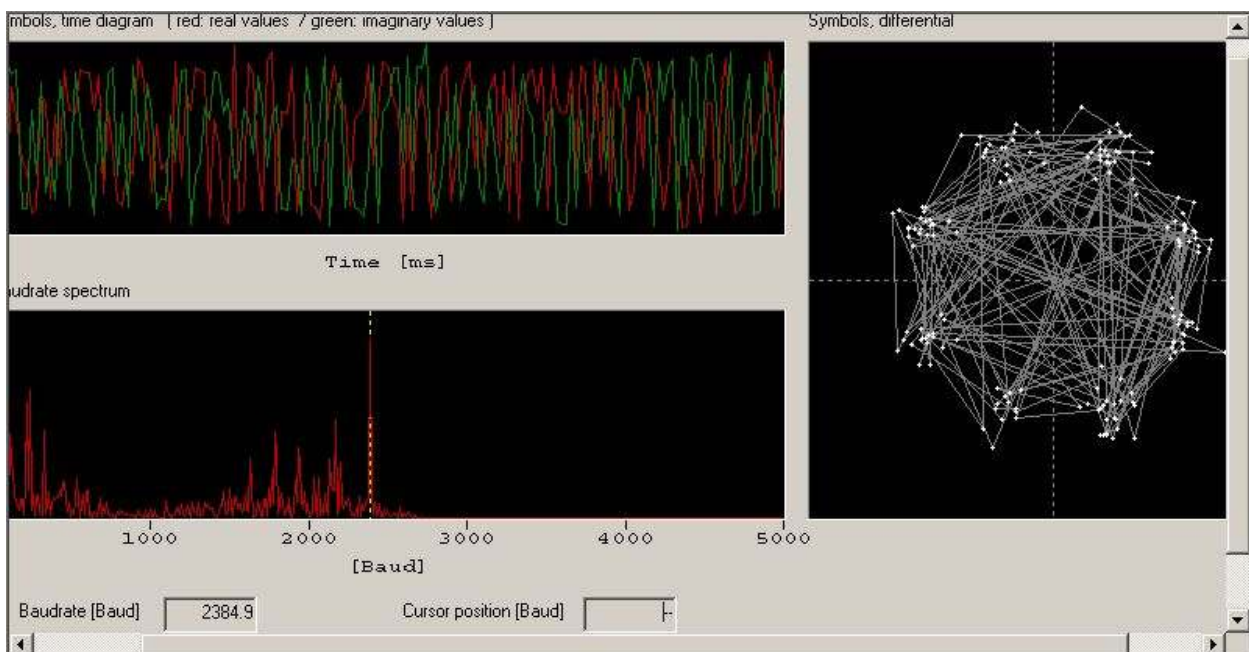
Phasenmodulierte Systeme, serielle und parallele Modems, Frequenz-Multiplex-Systeme (FDM)

Phase modulated systems, serial and parallel modems, frequency division multiplex systems(FDM)



Arcotel MAHRS/EADS – serielles MIL-Modem – 2400 Bd – D8PSK auf 3507,2 kHz
hier: Bursts

Arcotel MAHRS/EADS – serial MIL-modem – 2400 Bd – D8PSK on 3507.2 kHz
with bursts

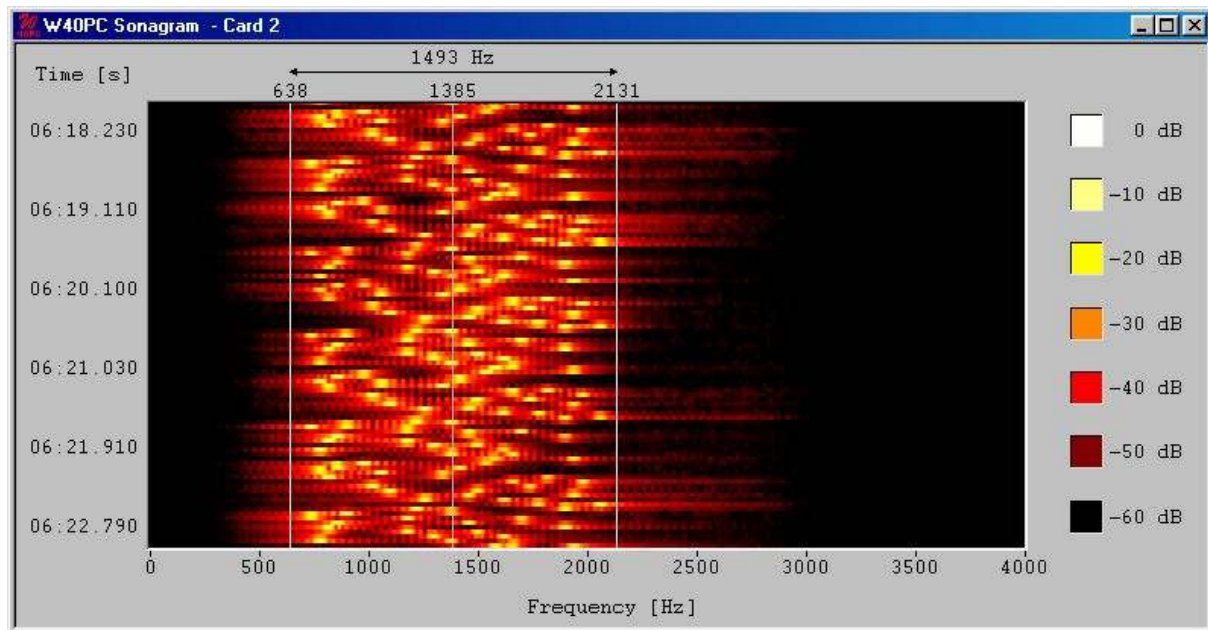


Arcotel MAHRS/EADS – hier Analyse mit dem Wavecom Classifier

Arcotel MAHRS/EADS – analyzed by the Wavecom Classifier

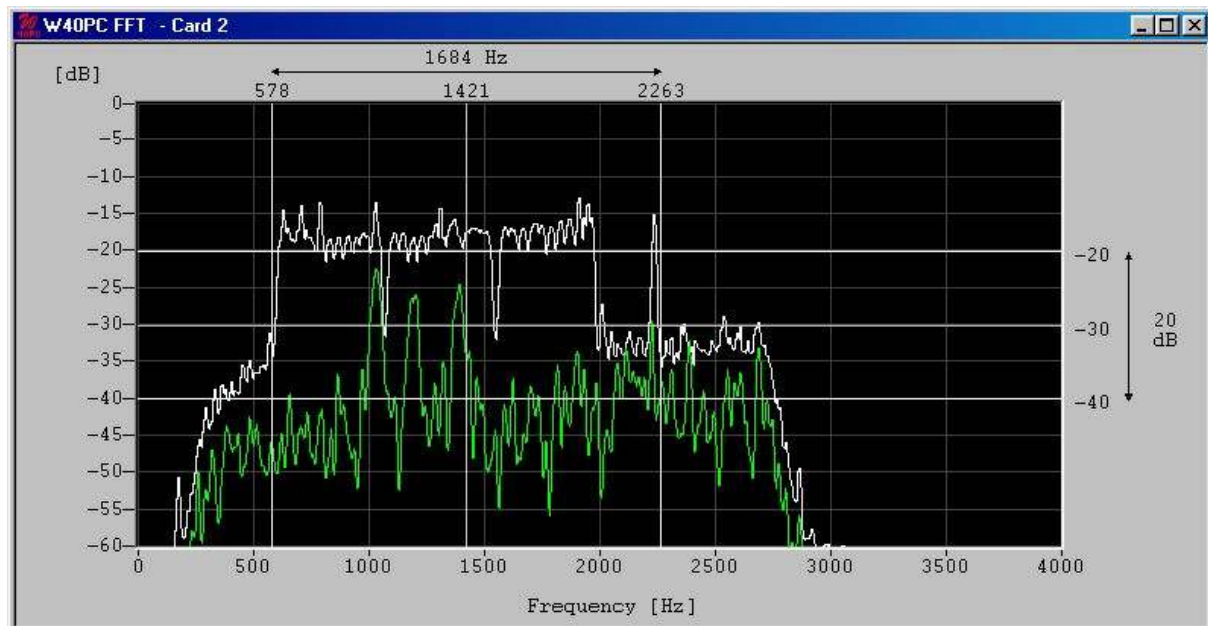
Multitonsysteme

Multitone systems



CIS 36 (Crowd 36) - CIS-Multi-Tonsystem, 36 Töne, selten auf unseren Bändern.

CIS 38 (Crowd 36) - CIS-Multi-tonesystem with 36 tones, rare on our bands.

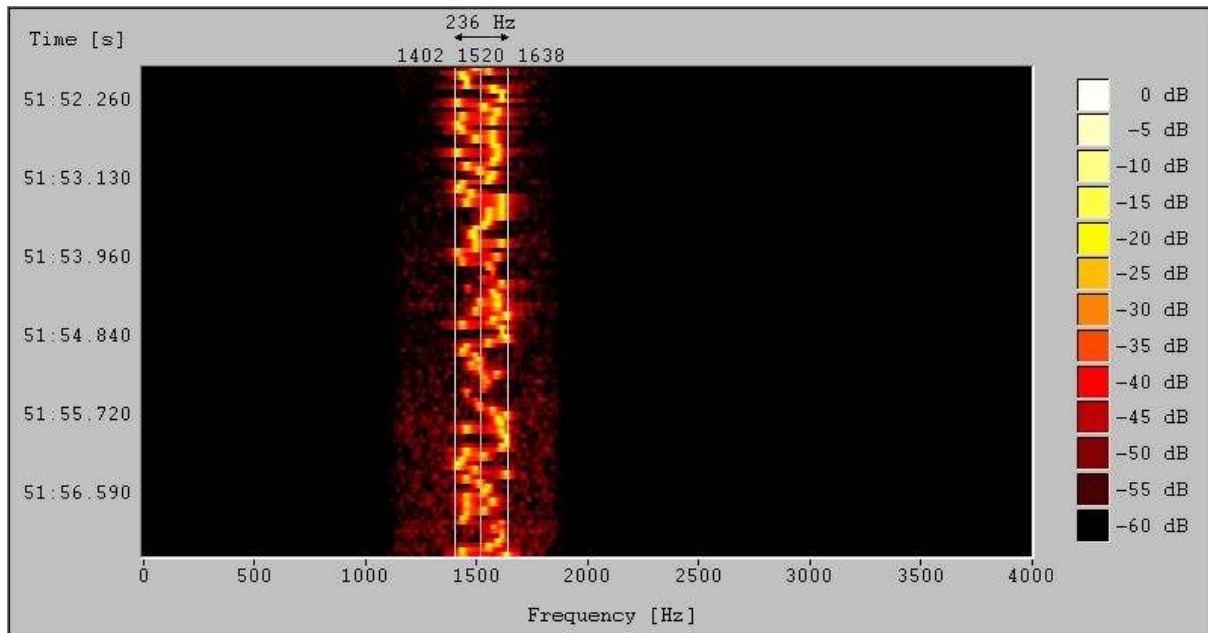


Das gleiche System im FFT-Display. Die 36 Töne sind scheinbar in 3 Gruppen unterteilt, weil die Töne in den beiden Lücken sehr wenig gesendet werden. Rechts der Pilotton.

The same system as above on the FFT-display. The 36 tones seem to be divided into 3 groups. The tones in the gaps are really existing, but rare. On the right side the pilot tone.

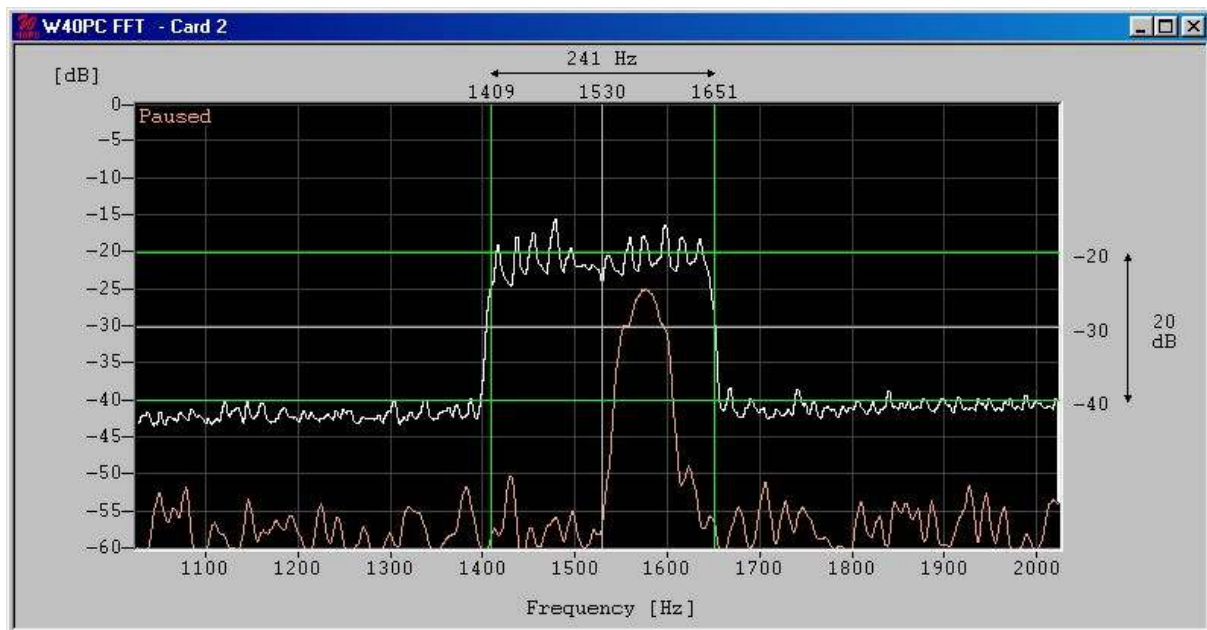
Multitonsysteme

Multitonesystems



Piccolo MK12 auf 21389,5 kHz – 12 Töne – Tonlänge 50 msec – shift 220 Hz

Piccolo MK12 on 21389.5 kHz – 12 tones – tone duration 50 msec – shift 220 Hz

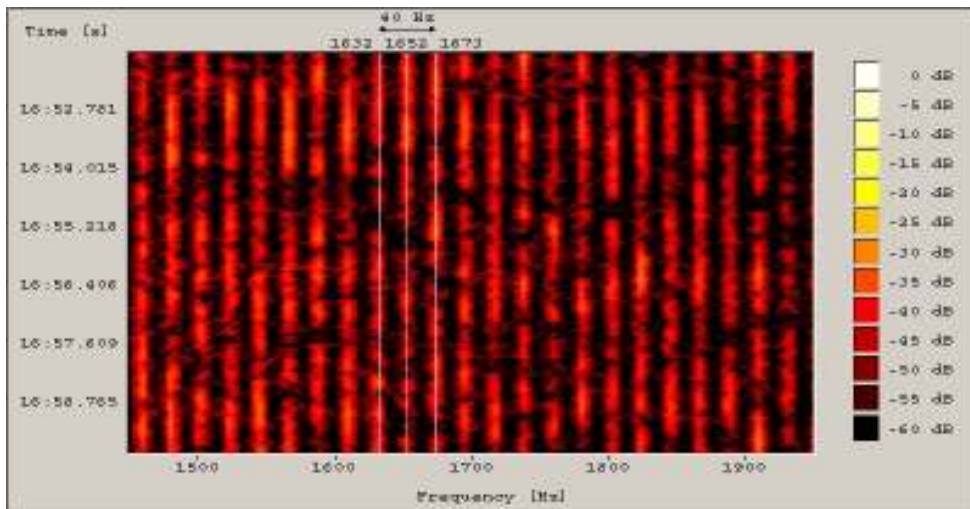


Piccolo MK12 – spektrale Verteilung der 12 Töne – Bandbreite 220 Hz

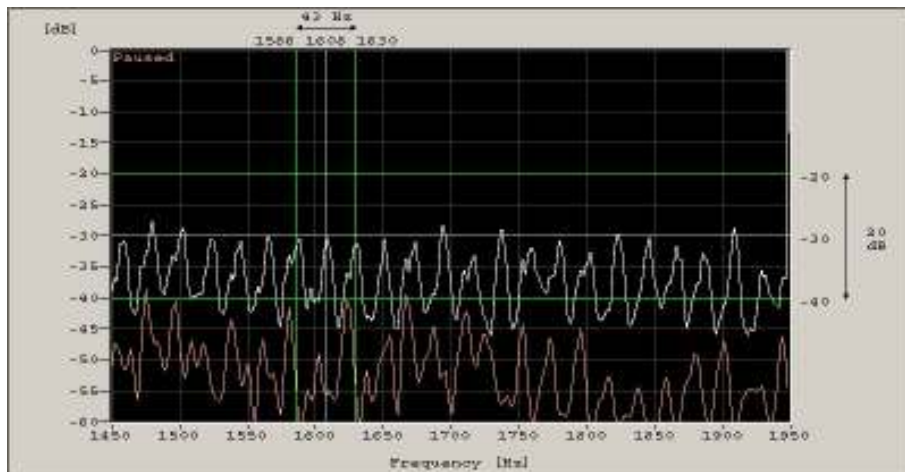
Piccolo MK12 – spectrum of the 12 tones – spreading over 220 Hz

Radarsysteme auf 3,5 und 7 MHz

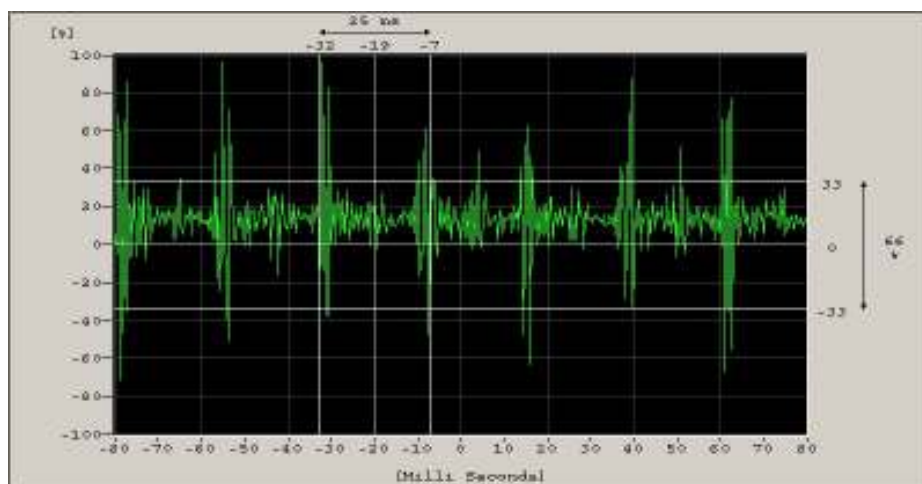
Radar systems on 3.5 and 7 MHz



OTH Radar in Region 3 – Sonagramm, 40 Pulse/sec – oft auf 3,5 und 7 MHz
 OTH Radar in Region 3 – Sonagramm, 40 pulses/sec – very active on 3.5 and 7 MHz
 Often heard in Australia and New Zealand.



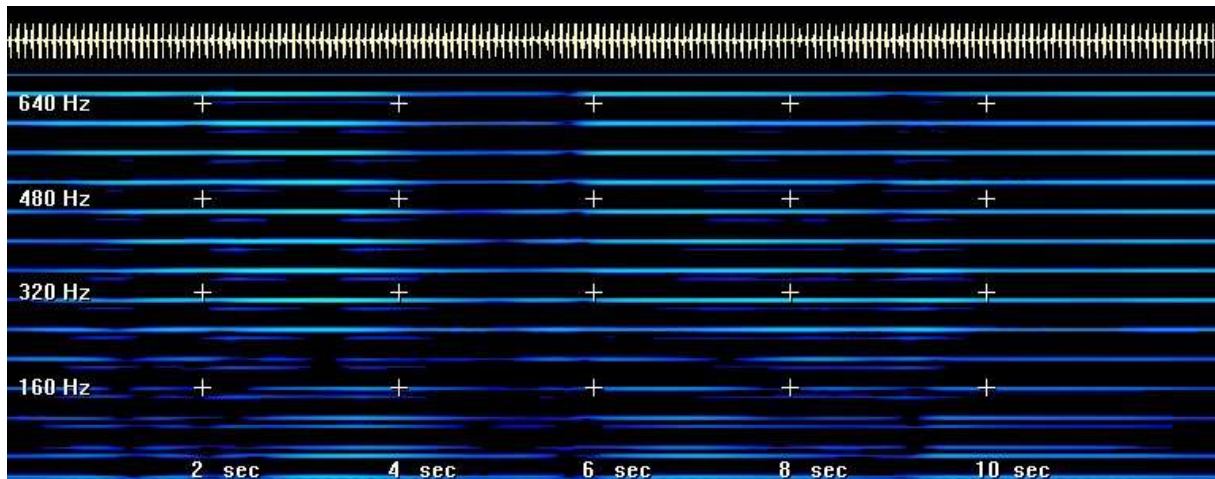
Das selbe System im FFT-Display
 The same system shown on the FFT-display



Das selbe System - Systemtaktabstand 25 ms (40 Takte/Sekunde)
 The same system, pulse difference 25 ms (40 pulses/second)

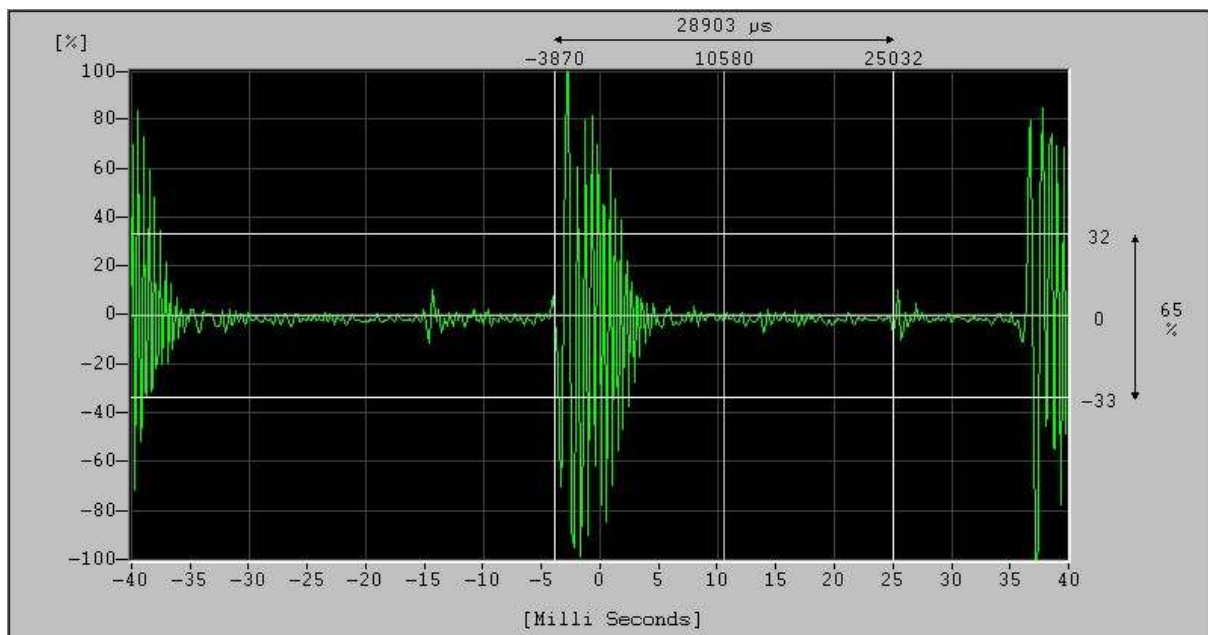
Radarsysteme auf 10, 14, 21 und 28 MHz

Radar systems on 10, 14, 21 and 28 MHz



Überhorizontradar Zypern (10 – 29 MHz), ca. 30 kHz breit. (Gram50)

Over The Horizon radar Cyprus (10 – 29 MHz), spreading over 30 kHz. (Gram50)

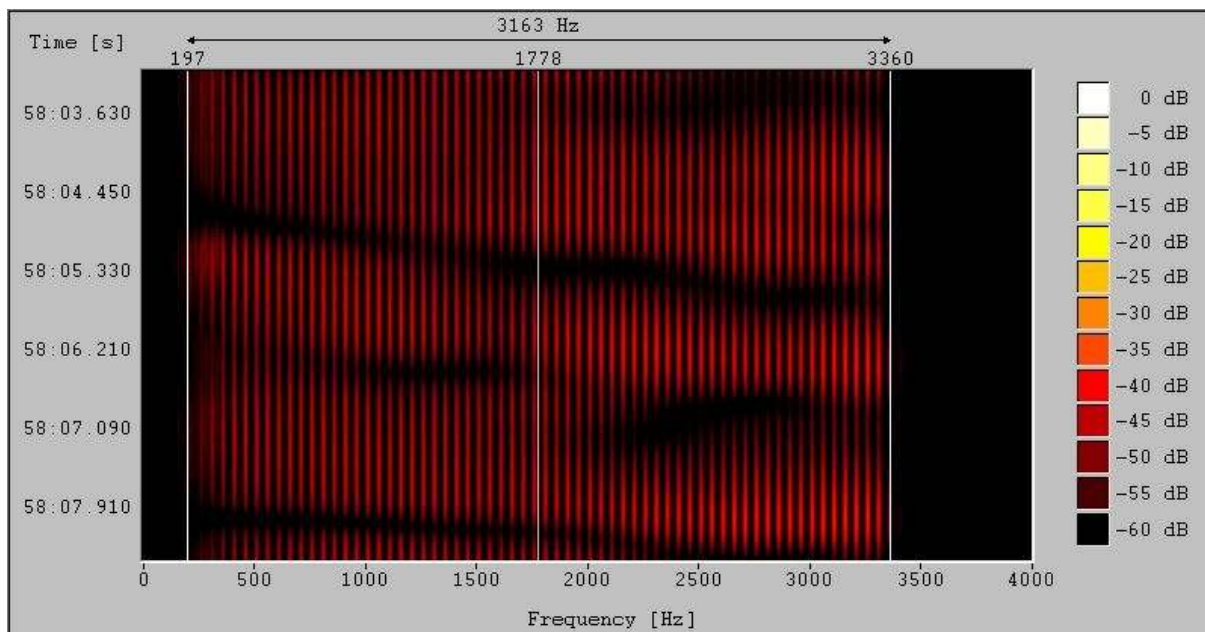


Überhorizontradar Zypern – hier: Reflexionen in den Sendepausen nach 29 msec.

OTH Cyprus – reflections in the breaks after 29 msec.

Radarsysteme auf 10, 14, 21 und 28 MHz

Radar systems on 10, 14, 21 and 28 MHz

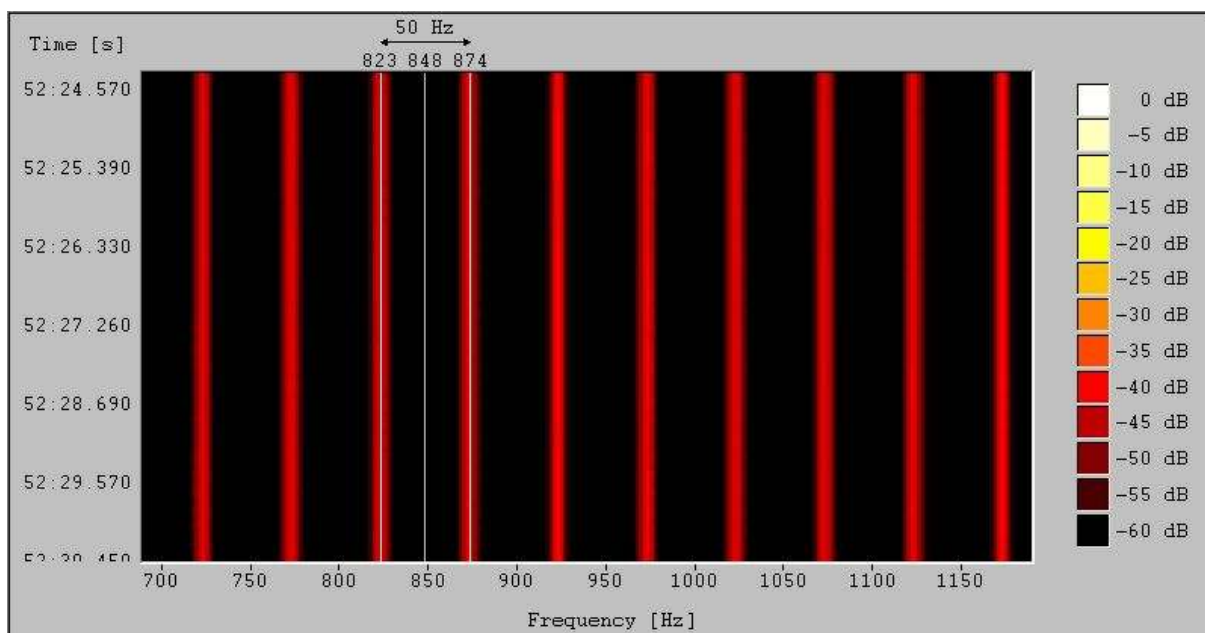


Zypern Radar auf 14290 kHz, Abstand zwischen den „Latten“ 50 Hz.

Selektives Fading ist gut sichtbar an den dunklen „Wolken“.

Cyprus Radar on 14290 kHz, 50 Hz spacing between the „pales“.

The selective fading is visible (dark cloud layers).

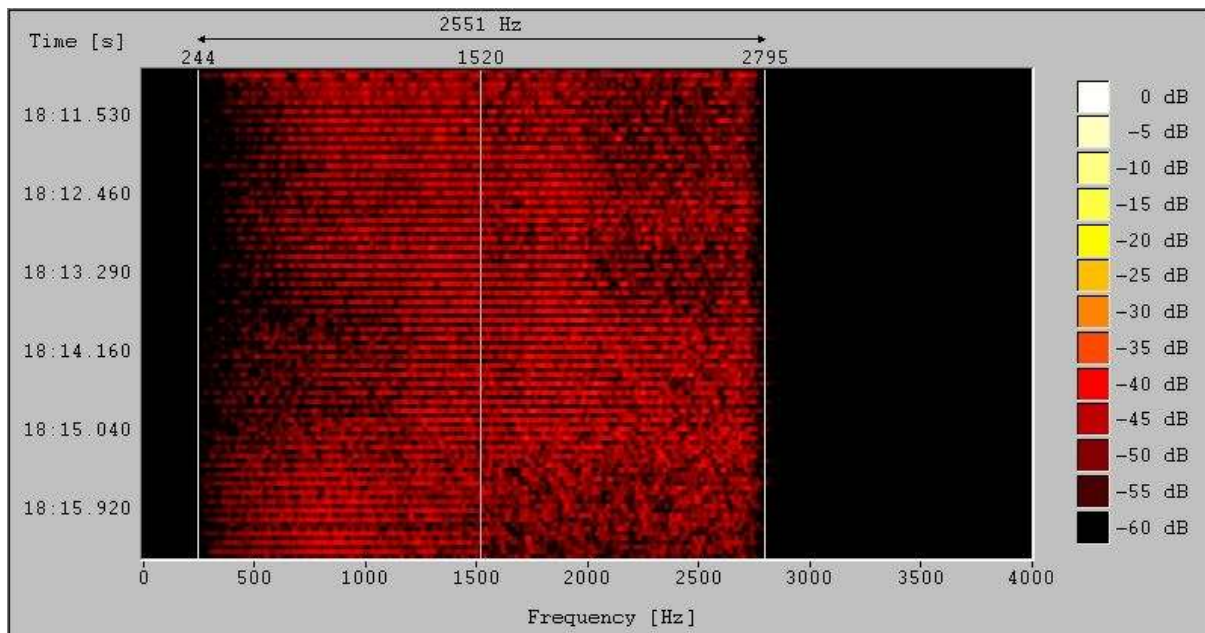


Russisches Überhorizontradar ABM-2 (im Raum Novgorod), beobachtet auf 14190 kHz im März 2005.

Russian Over The Horizon Radar type ABM-2, area of Novgorod, heard on 14190 kHz, on March 2005.

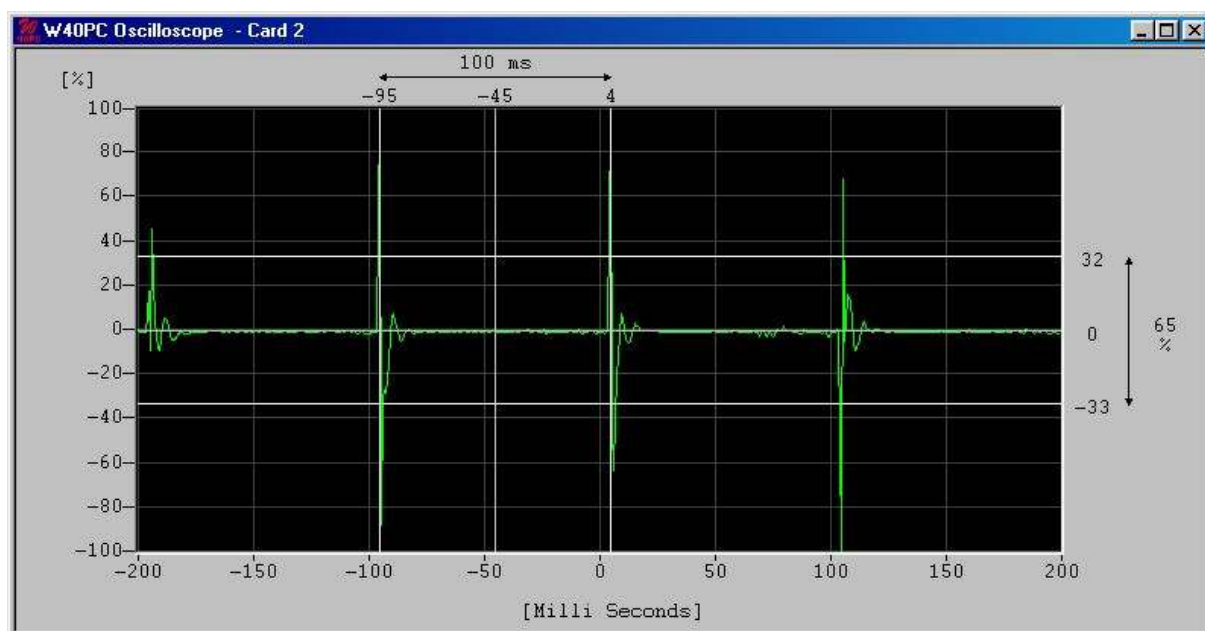
Radarsysteme auf 10, 14, 21 und 28 MHz

Radar systems on 10, 14, 21 and 28 MHz



Russisches Überhorizonradar ABM-2 (im Raum Novgorod), beobachtet auf 14190 kHz
im März 2005.

Russian Over The Horizon Radar type ABM-2, area of Novgorod, heard on 14190 kHz,
on March 2005.

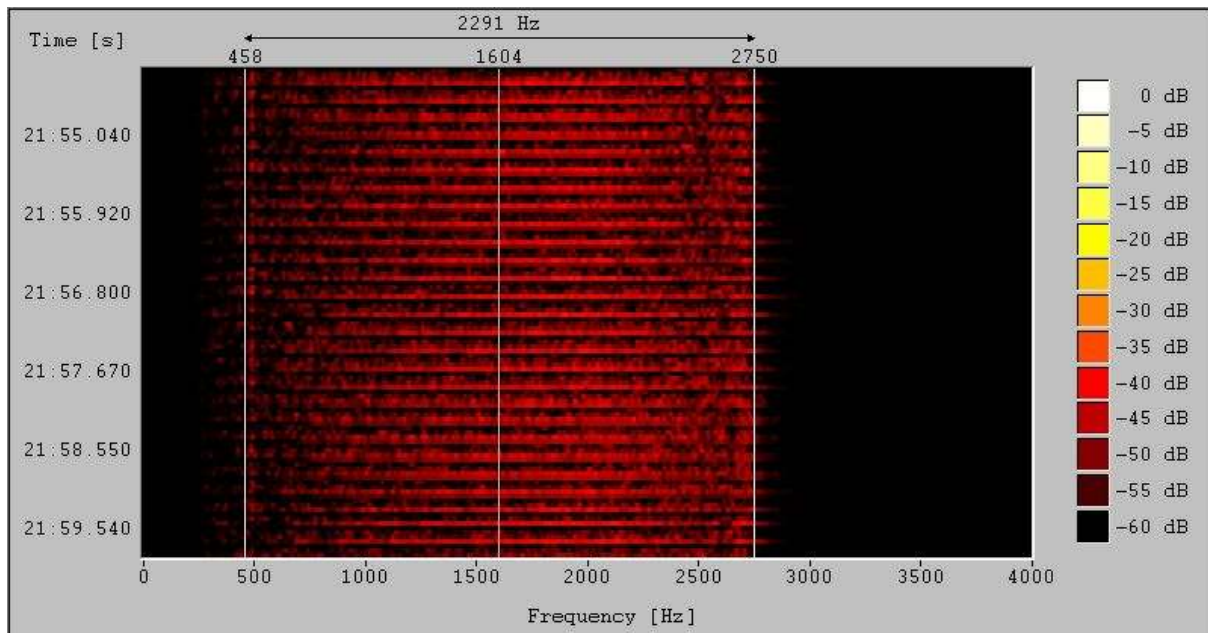


Russisches Überhorizonradar ABM-2 im Raum Novgorod, beobachtet auf 14190 kHz
im März 2005. Systempuls: 10 Pulse/sec

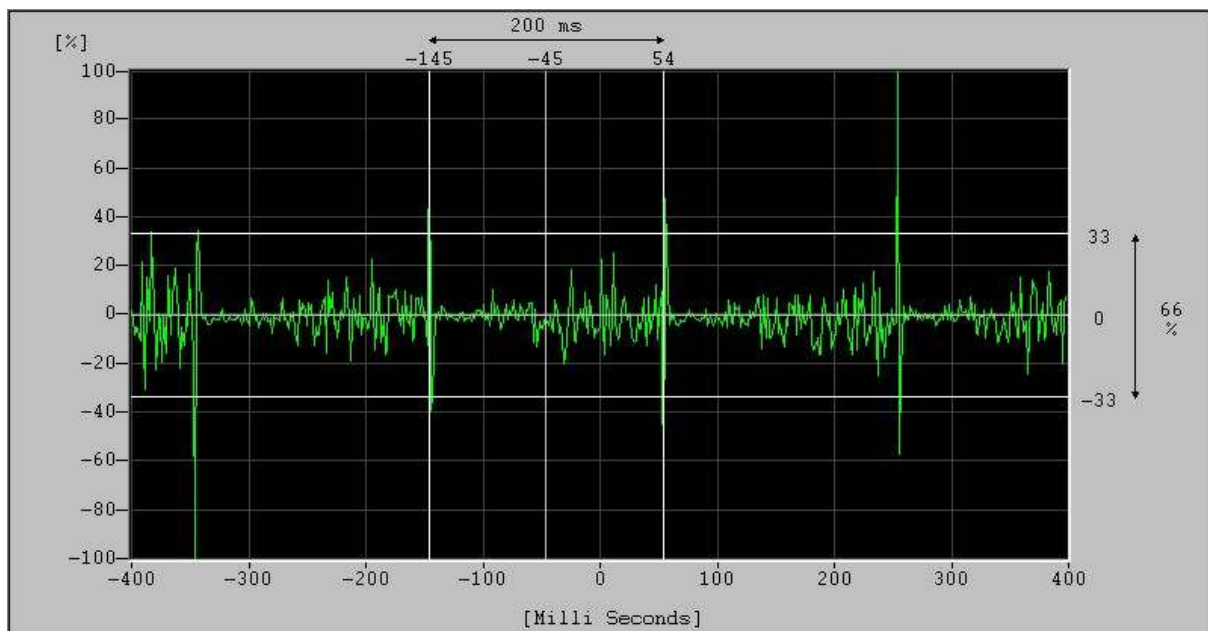
Russian The Over Horizon Radar type ABM-2, area of Novgorod, heard on 14190 kHz,
on March 2005. System pulse: 10 pulses/sec

Radarsysteme auf 10, 14, 21 und 28 MHz

Radar systems on 10, 14, 21 and 28 MHz



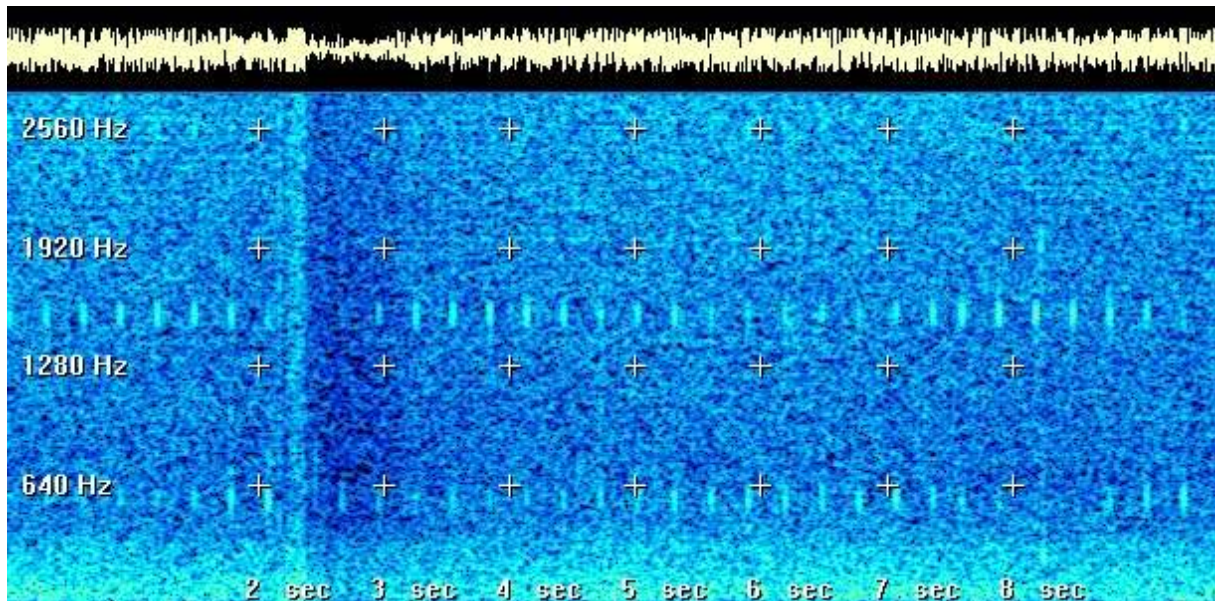
Russisches OTH-Radar auf 14190 kHz - hier die Systemtaktung, 5 Pulse/sec.
[Russian OTH-Radar on 14190 kHz – system pulse rate 5/sec.](#)



Russisches OTH-Radar auf 14190 kHz - hier die Systemtaktung: 5 Pulse/sec.
[Russian OTH-Radar on 14190 kHz – system pulse rate: 5 pulses/sec.](#)

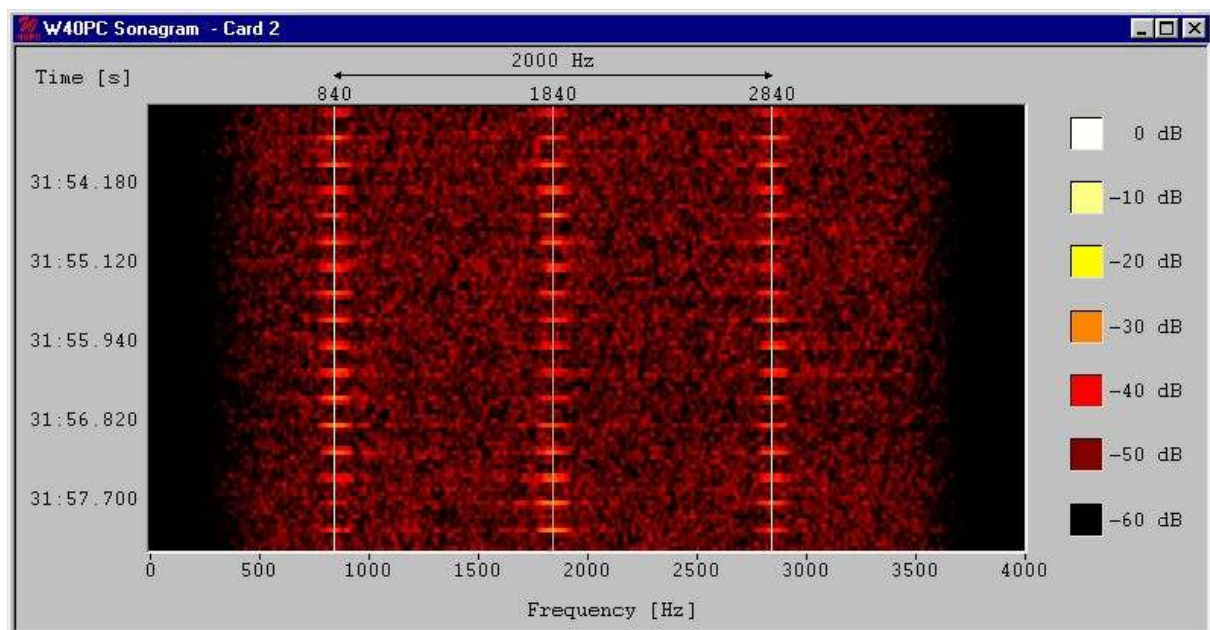
Radarsysteme auf 10, 14, 21 und 28 MHz

Radar systems on 10, 14, 21 and 28 MHz



Iranisches Radarsystem auf 14000.0 kHz – 12 kHz Breite – hört sich an wie eine schnell tickende Uhr – 4 Impulse/sec. (Gram50 screenshot / 2004)

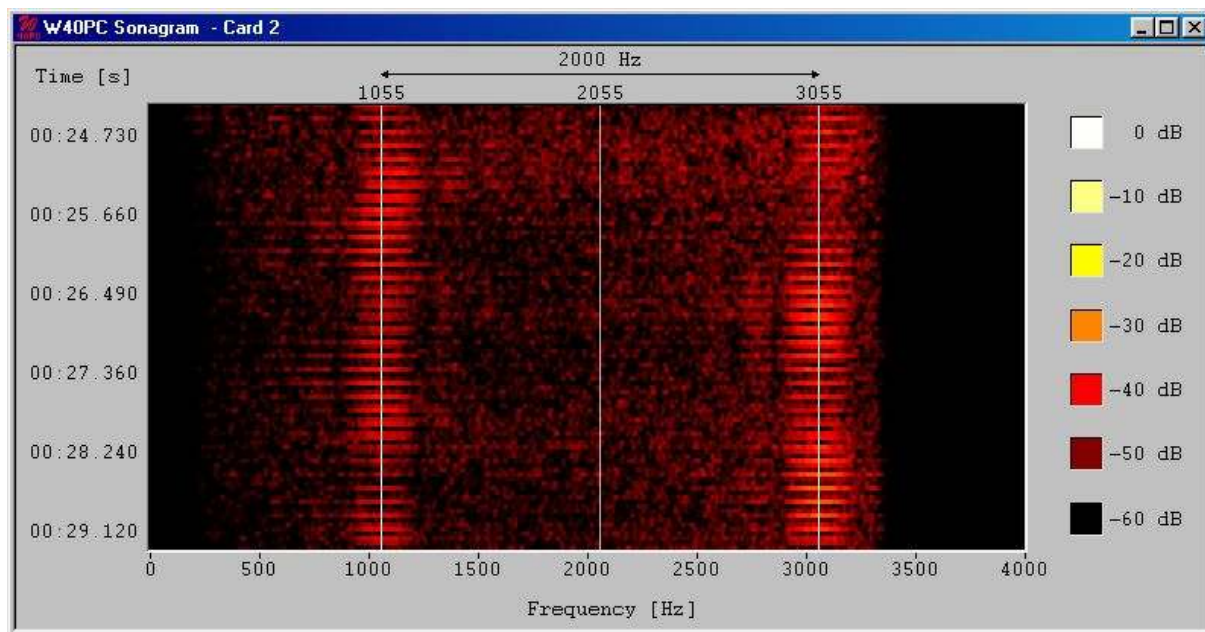
Radar from Iran on 14000.0 kHz – spreading over 12 kHz – sounding like a tin clockwork – 4 pulses/sec. (Gram50 screenshot / 2004)



Das selbe System mit Wavecom-Analyse.
The same system analyzed by Wavecom equipment.

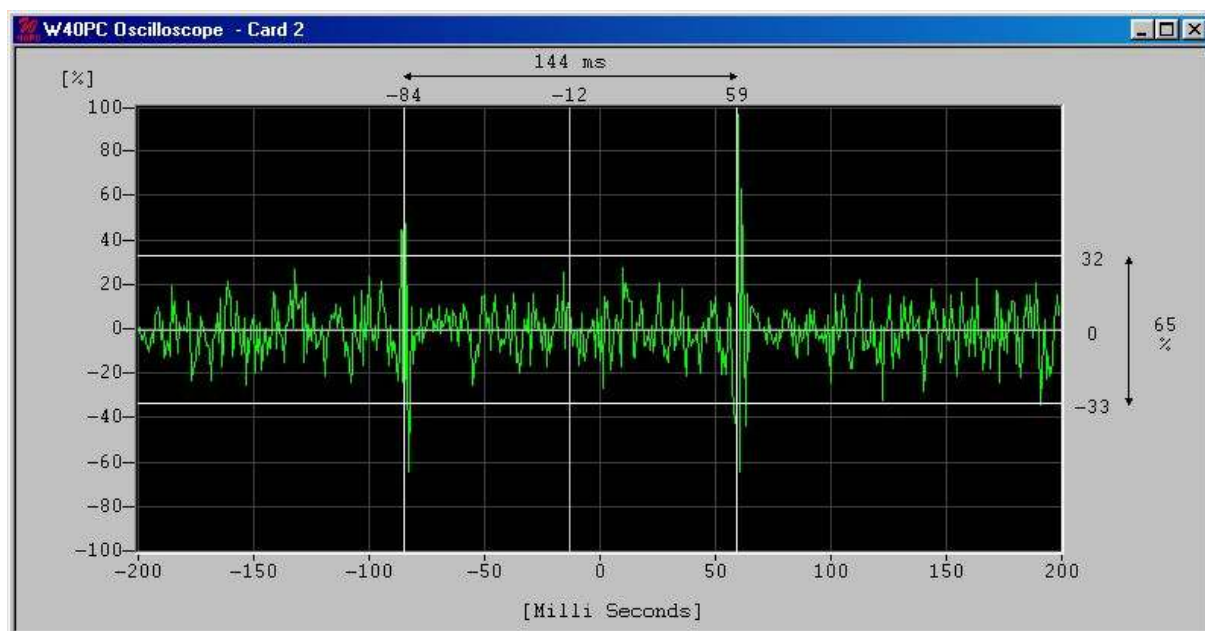
Radarsysteme auf 10, 14, 21 und 28 MHz

Radar systems on 10, 14, 21 and 28 MHz



Iranisches Überhorizontradar auf 21000 kHz im Februar 2005, 7 Pulse/sec, Bandbreite 24 kHz.

Iranian OTH Radar with 7 pulses/sec on February 2005.
Spreading over 24 kHz (21000 +/- 12 kHz).

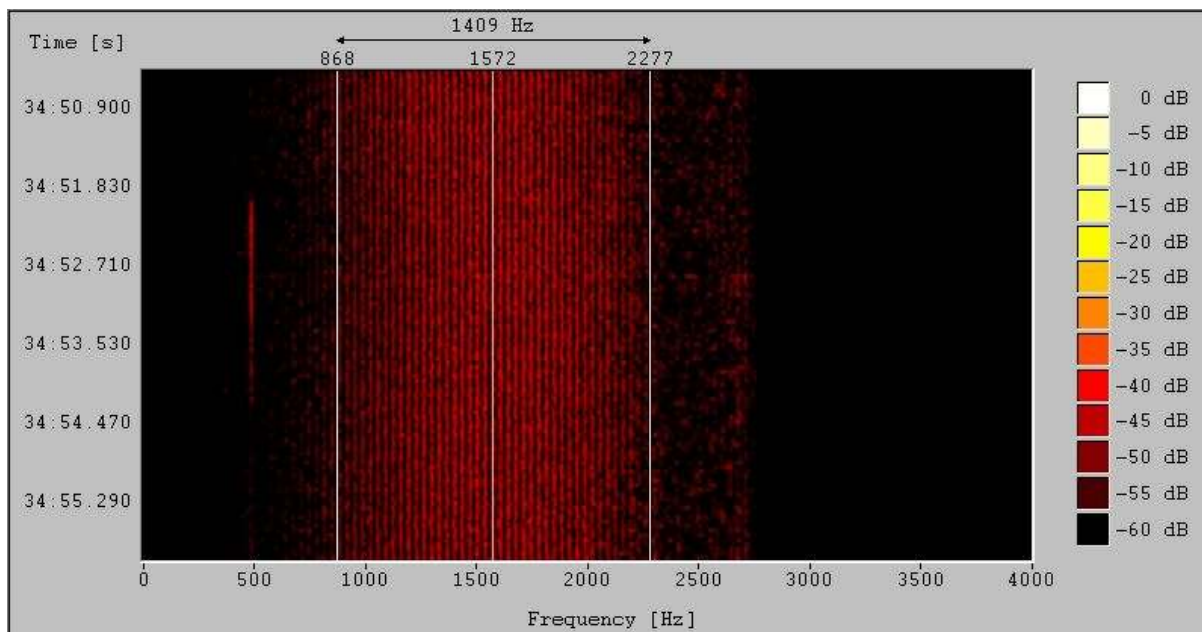


Iranisches Überhorizontradar auf 21000 kHz im Februar 2005. Pausen zwischen den Impulsen = 144 msec. $1000 \text{ msec} / 144 \text{ msec} = 7 \text{ Pulse/sec}$.

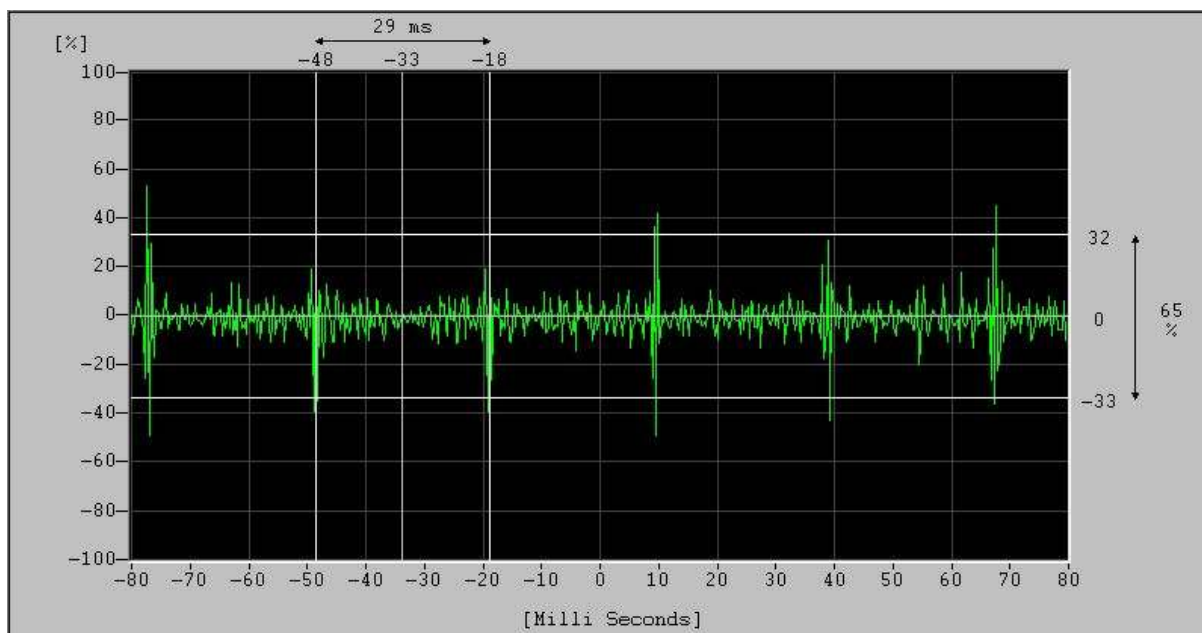
OTH Radar from Iran on 21000 kHz on February 2005. Length of the breaks between the pulses: 144 msec. Calculation: $1000 \text{ msec} / 144 \text{ msec} = 7 \text{ pulses/sec}$.

Radarsysteme auf 10, 14, 21 und 28 MHz

Radar systems on 10, 14, 21 and 28 MHz



Neue iranische OTH Radarversion auf 14000 und 21000 kHz am 23. August 2005.
 New Iran OTH Radar on 14000 and 21000 kHz on August 23rd 2005.

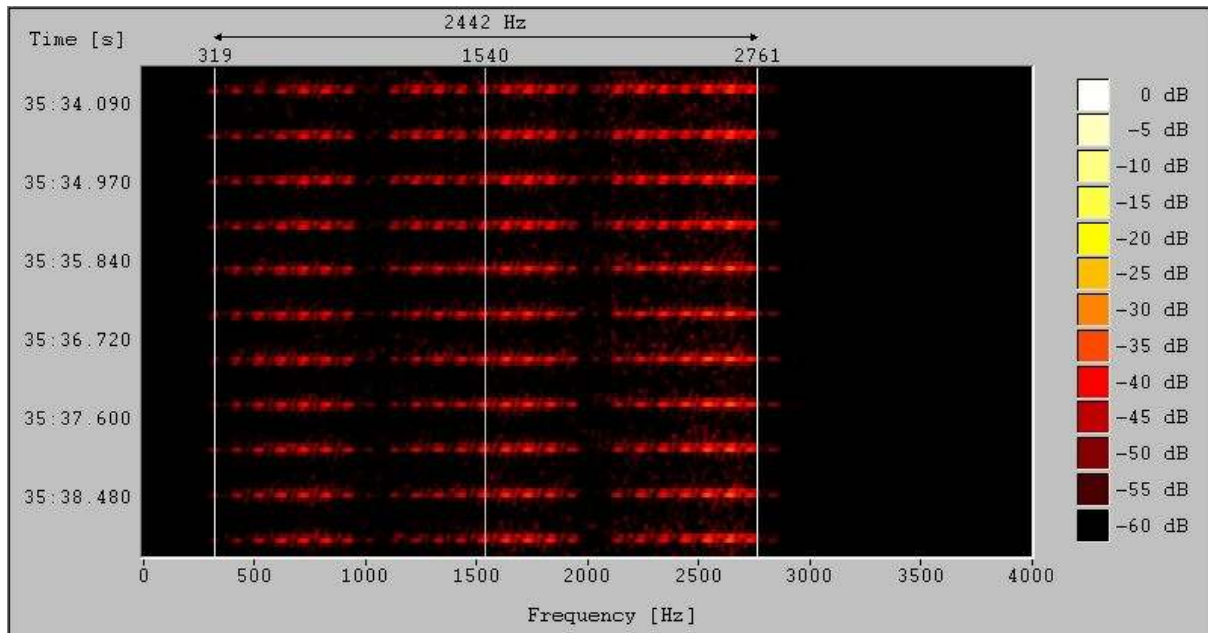


Neue iranische OTH Radarversion auf 14000 und 21000 kHz am 23. August 2005.
 Pulsrate: ca. 30 Pulse pro Sekunde

New Iran OTH Radar on 14000 and 21000 kHz on August 23rd 2005. Systempulse: 30 pulses per second

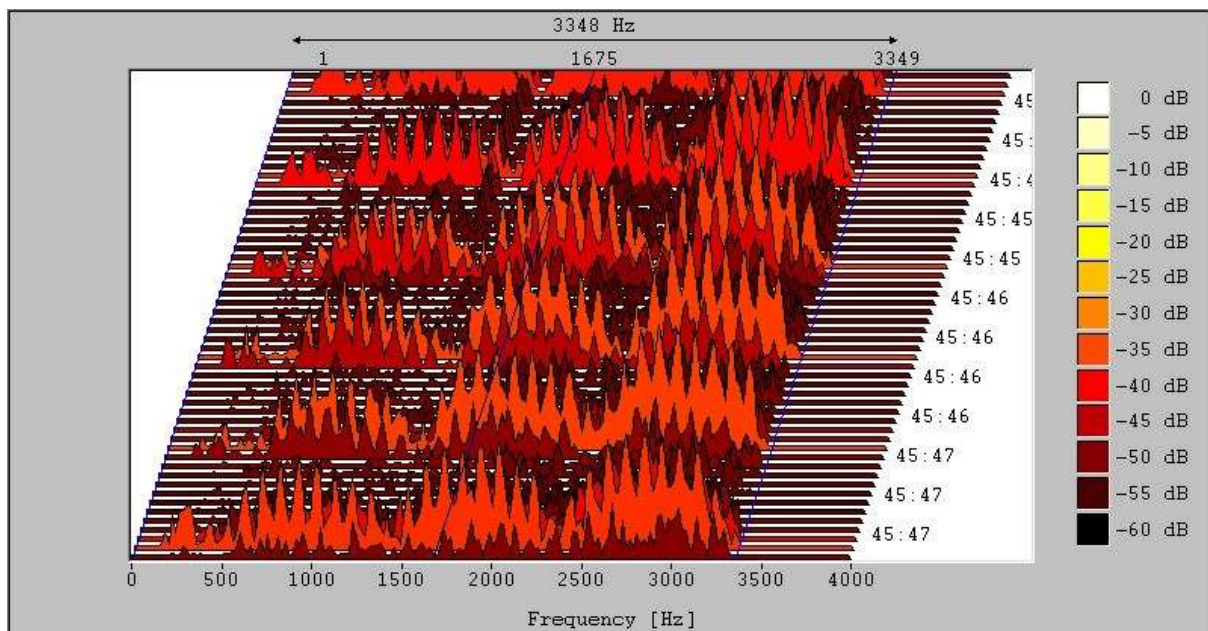
Andere Radarsysteme

Other Radarsystems



Codar-HF Radar zur Beobachtung Meereswellen – normal 13300 zwischen 13800 kHz
– am 02.04.2005 auch auf 14000 kHz mit schwachen Splattern hörbar

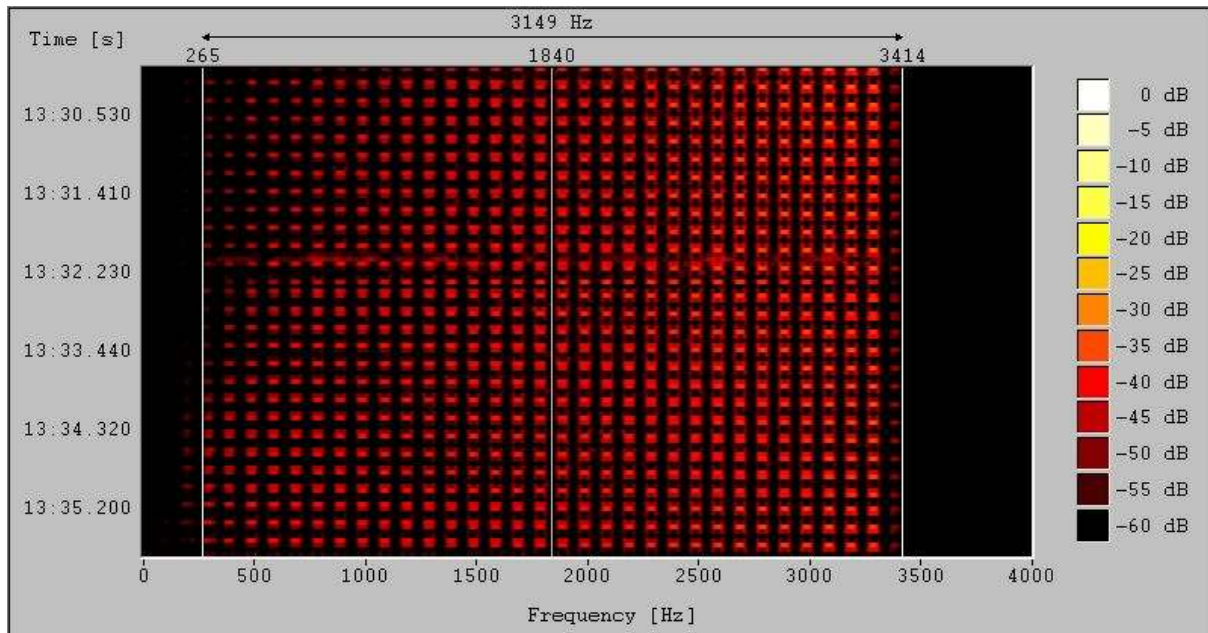
Codar-HF Radar is used to analyze ocean surface waves – normal operating between
13300 and 13800 kHz – on April 2nd 2005 even audible on 14000 kHz with weak
splatters



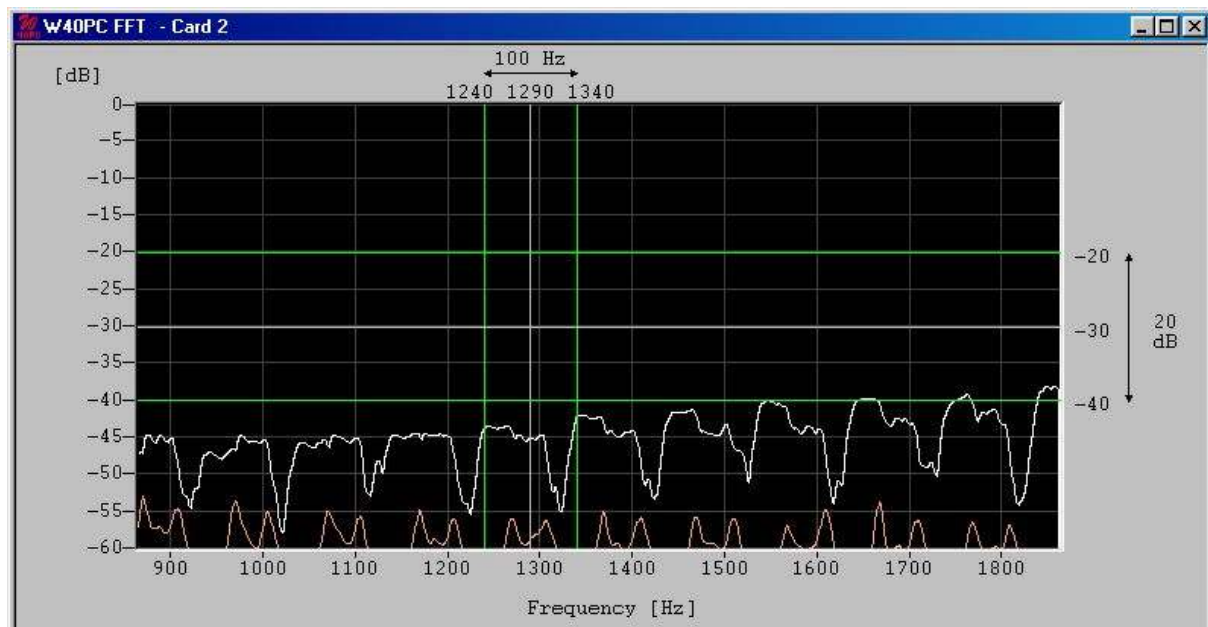
Codar-HF Radar im Echtzeitwasserfall
Codar-HF Radar on the Realtime-Waterfall

Andere Radarsysteme

Other Radarsystems



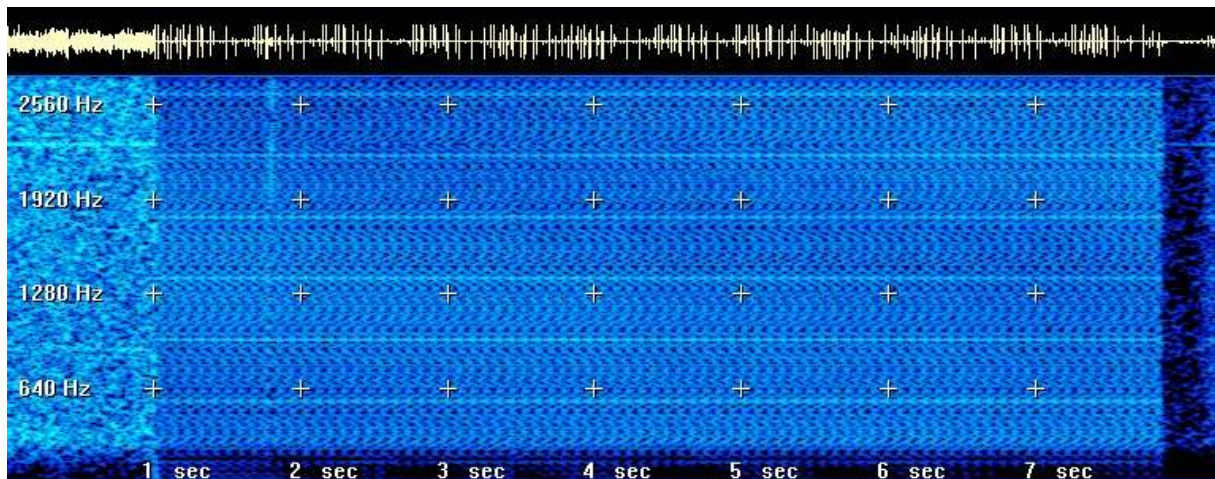
Französisches Radar zur Beobachtung von Meereswellen
French Ocean Surface Radar



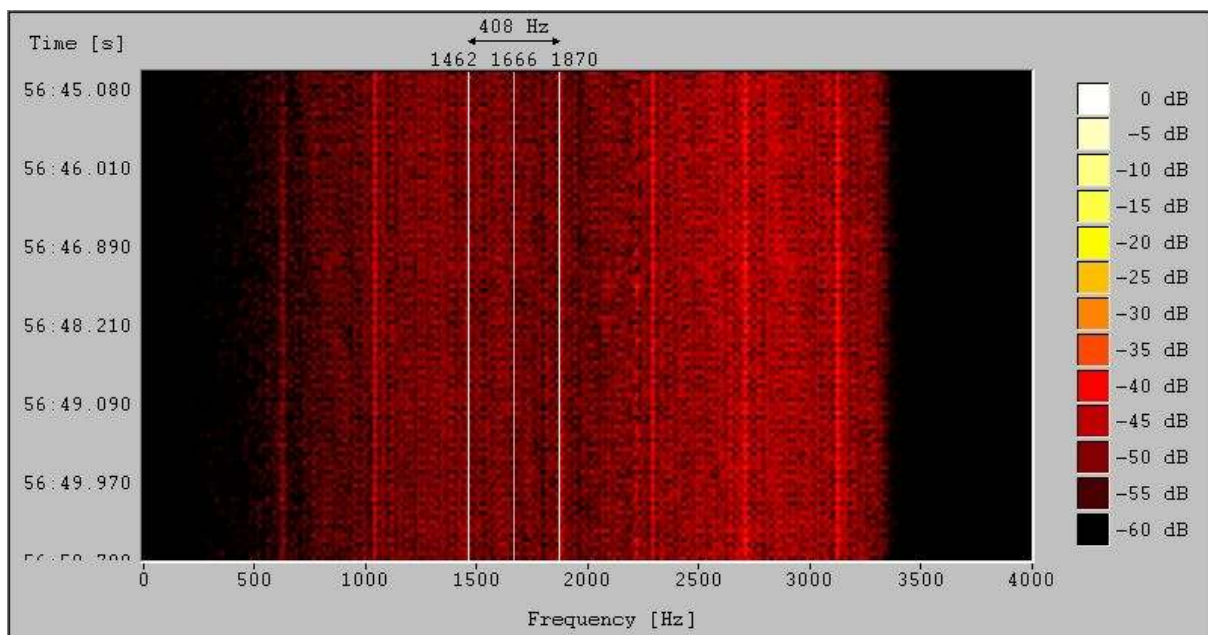
Das gleiche Radar auf dem Oszilloskop
The same Radar showed on the oscilloscope screen

Andere Radarsysteme

Other Radarsystems



Superdarn-Radar, 8 Sekunden Laufzeit pro Sendeblock.
Superdarn-Radar, duration of one transmission period 8 seconds.



Superdarn-Radar, 8 Sekunden Laufzeit pro Sendeblock.
Superdarn-Radar, duration of one transmission period 8 seconds.

Important or interesting links:

Region 1:

<http://www.ral.org.lb/>

<http://www.qsl.net/arsk/>

<http://www.darc.de/referate/hf/>

<http://www.darc.de/>

<http://www.mrasz.hu/engver/mraszen.html>

<http://www.sral.fi/indexeng.html>

<http://www.uska.ch/>

<http://www.rsgb.org/>

<http://www.veron.nl/maine.htm>

<http://www.iaru.org/>

<http://www.iarums-r1.org>

Region 2:

<http://www.storm.ca/~iarumr2/>

(Homepage of IARUMS-Monitoring-System Region 2)

Region 3:

<http://www.jarl.or.jp/iaru-r3/ms/r3msnl.htm>

(Homepage of IARUMS-Monitoring-System Region 3)

Hardware, Software, Databases, Decodersystems, Infos:

<http://home.luna.nl/~ary>

<http://www.wunclub.com/>

<http://www.wavecom.ch/>

<http://www.klingenfuss.org/>

<http://www.monteria.com/>

<http://www.hoka.com/>

<http://www.medav.com/>

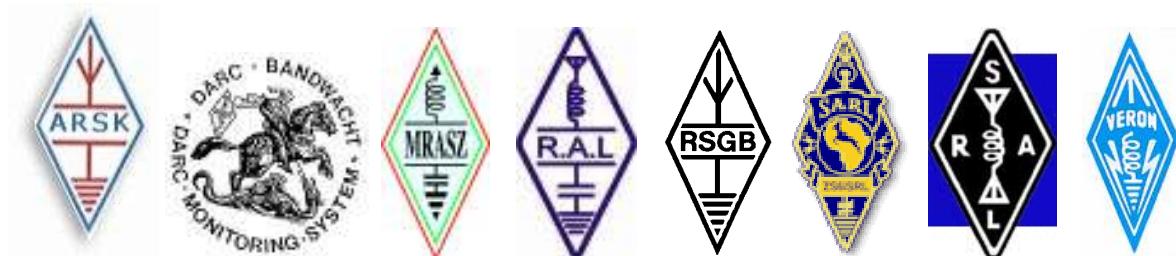
<http://www.muenster.de/~welp/sb.htm>

<http://www.geocities.com/iz8bly/>

http://rover.wiesbaden.netsurf.de/~signals/DIG_intro.htm

<http://www.weaksignals.com/>

The members of the IARUMS Region 1 monitoring team:



**Mehr Informationen bekommt man hier:
More infos here:**

<http://www.iarums-r1.org>

DK2OM

Co-ordinator of IARU Monitoring System Region 1