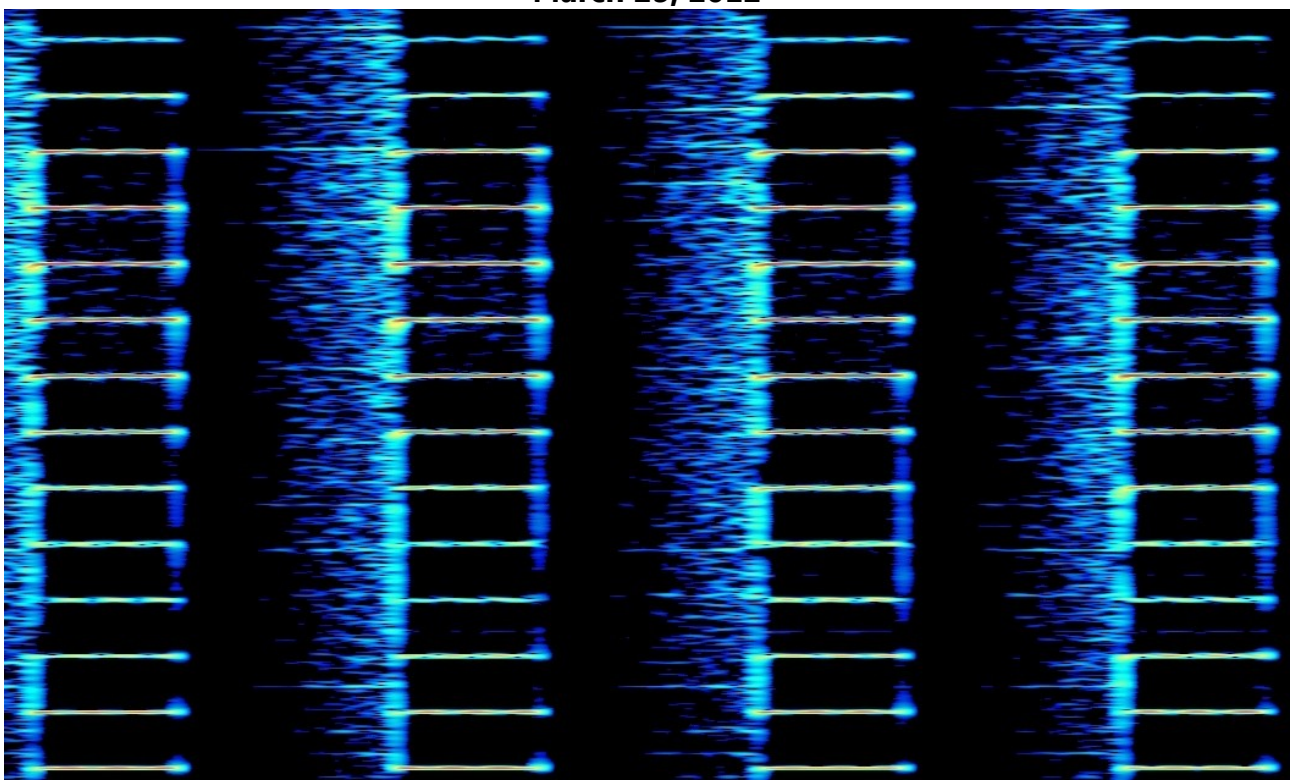
The Buzzer Primer

March 25, 2012



Above: Spectrogram view of the Buzzer

This document is meant as an overview on the Buzzer as it is impossible to list every little thing about it in here. Please consider this as a stepping stone to further studies and not as a definitive guide.

Definition

Russian military station possibly located in the Western Military District. Operates around the clock on 4625 kHz broadcasting a sound reminiscent of a buzzer or a foghorn as a channel marker approximately 20 times a minute. Sends short, apparently unscheduled, voice messages in Russian. Reports of first activity range from 1976 to 1982, at this time station used different channel marker tone and changed to current sound around 1990.

Modulation usually AM with suppressed lower sideband, but varies, station uses multiple transmitters. Transmission quality is often poor with common parasitics on 4585, 4666, 4712, 4753 kHz and occasional harmonic on 9250 kHz. Transmitter stoppages and overdriven transmissions occur frequently. Despite ENIGMA (The European Numbers Information Gathering & Monitoring Association) giving it the designator of S28 it is not a numbers station.

This station is commonly known as UVB-76, UZB-76, MDZhB, S28, the Buzzer and in Russian as жужжалка.

History

Internet is full of Buzzer folklore so I will only present the well-known facts in here, most of which I can back up with a recording as to avoid spreading false rumours.

Reports of the station's emergence vary from 1976 to 1982. It is possible that it operated without a channel marker in it's early days, but definitely had one by 1982 as the sample below illustrates.

S28 4625 kHz AM January, 1982, recording by Ary Boender
http://priyom.org/media/57390/s28-jan-1982-am.ogg

The channel marker sound has changed multiple times, below is a sample of slower paced marker with noticeably higher pitch.

S28 4625 kHz January 15, 1989 2025z, recording by Ary Boender
http://priyom.org/media/57357/s28-old-marker-1989-01-15-2025utc-4625khz.mp3

First logged voice message (no doubt there has been earlier ones of which no record exists) from the Buzzer was in December 24, 1997 at 2158z which read “УЗБ-76 180 08 БРОМАЛ 74 27 99 14”, a format almost identical to the one used today, only difference being in the “180 08” group which is currently organized in 2fg 3fg format.

S28 4625 kHz 2158z December 24, 1997, recording provided by Jan Michalski
http://soundcloud.com/lafleurvk/4625-uzb76-bromal

New millenium

On November 3, 2001 the microphone was mistakenly left open and the following conversation was accidentally transmitted: “Я — 143. Не получаю генератор.”, “Идёт такая работа от аппаратной.”, translated to English: “I am 143. Not receiving the generator (oscillator).”, “That stuff comes from hardware room.”.

The Buzzer got international media attention in 2010 when shortwave listeners reported it's increased activity and soon after this an Internet repeater was established.
It is questionable how legitimate the reports of increased activity were; the current activity varies from up to 18 messages a day to only one message in a few weeks and without a dedicated receiver monitoring it constantly these messages could easily be missed and the current good monitoring results might be misinterpreted as increased activity.

Despite this, 2010 was a busy year for the Buzzer in it's publicly known history. It seems likely that the transmitter site was moved from Povarovo to currently unknown location and new transmitter installation caused many outages and tests heard on the air. Buzzer outages, test counts and other little oddities are too numerous to list but the most notable events are mentioned below.

In June 2010 after a maintenance outage the 1-minute long two-tone buzzer that was played at the top of the hour was disabled and after this the station hasn't sent any type of time signals. Below is an example of the time signal as heard in 1991.

S28 4625 kHz June 20, 1991 2059z, recording by Ary Boender
http://priyom.org/media/57724/s28-1991-06-20-2059utc-4625khz.mp3

On September 2, 2010 during maintenance the transmitter was tested by transmitting “Swan Lake” and phone patch -type communications were heard between the 9th and 11th.

S28 4625 kHz USB September 2, 2010 2225z, recording by Laid
http://www.opendrive.com/files/7036250_6GPdL_e43b/Swans_Lake_September_1_22.25UTC.mp3

UVB-76 - No buzzer but voice
http://uvb-76.net/2010/09/uvb-76-no-buzzer-but-voice.html

On November 11, 2010 at 1400z a mistake was made and half an hour long phone conversation was accidentally transmitted.

S28 4625 kHz USB November 11, 2010 1400z, recording by danix111
http://soundcloud.com/danix111/uvb-76-2010-11-11-14-00-utc

After this followed a period where no events of great significance were heard, but April 2011 offered couple instances of accidentally transmitted voice and also a transmitter harmonic on 9250 kHz was widely reported. Unfortunately only one of the recordings of the accidental transmissions survive, link below.

S28 4625 kHz USB April 19, 2011 1330z, recording by Avare
http://priyom.org/media/1694/S28-4625USB-20110419-1330z-odd-ByAvare.ogg

Call signs and messages

Evolution of the call signs

It is believed that the early messages (of which no recordings exist) were misheard and transcribed as UVB-76 (УВБ-76) while the correct call sign is UZB-76 (УЗБ-76). The UZB-76 has been verified to be correct by native russian speakers on instances where recordings exist. Call sign UZB-76 fell into disuse after September 10, 2010 when one message was sent. A new call sign MDZhB (МДЖБ) came up on the 7th of September and 4 messages were sent before the farewell message with the call sign UZB-76.

Only MDZhB was active the rest of 2010 and up to February 14, 2011 when new call signs KZJT LNR4 (КЗЙТ ЛНР4) were used in one message. Another message with two call signs was heard on 24th of February with the first call sign being used only 10 days earlier, KZJT MBYShch (КЗЙТ МБЫЩ). Further 7 new call signs were heard between March and October of 2011, all with 1-3 messages before disappearing. Rest of the year and up to mid-March of 2012 was dominated by MDZhB call sign.
On March 13, 2012 a total of 18 messages were sent. A call sign OYeUN (ОЕУН) from August 2011 made a return with one message and three new call signs 'B2M HN87 (ЬБ2М ХН87) and 2BYP (2БЫП) sent one message each. The 'B2M HN87 – 2BYP messages were especially noteworthy since it was the second ever observed instance where the ID group numbers match. Another first on that day was a MDZhB message with two ID groups, a feature that has previously been reserved for “rare” call signs only.

Call sign types and message structure

Messages sent by Buzzer can vary in their formatting but can be classified under few different subtypes. Below are diagrams to illustrate the types. Complete text including call sign repeats are shown, all letters are pronounced phonetically. Messages are repeated once with identical content. With one exception all messages so far consist of one or two call signs followed by one or more number sets of varying length and finally a group or groups consisting of a code word and four 2-number sets. The exceptional message contains 5 call signs and is classified as type 4-3.
Please refer to appendix A for transmission types in a table format.

Legend	
Call sign	
Second call sign	
Irregular ID group	
ID group	
Message group	

Type 1

Most common messages consisting of two repeats of a single call sign, followed by 2fg 3fg ID group and 1-4 message groups.

Type 1-1, one message group

МДЖБ	МДЖБ	93 343	АВТОКОД 03 09 36 91

S28 4625 kHz USB March 11, 2012 1431z, recording by Avare
http://priyom.org/media/57500/s28-4625usb-20120311-1431z-msg-byavare.ogg

Type 1-2, two message groups

МДЖБ	МДЖБ	02 097	АВТОНОМИСТ 07 53 90 30	АВТОНОМНЫЙ 64 61 81 01

S28 4625 kHz USB March 12, 2012 1430z, recording by Avare
http://priyom.org/media/57497/s28-4625usb-20120312-1430z-msg-byavare.ogg

Type 1-3, three message groups

МДЖБ	МДЖБ	03 144	АКУШЕРСКИЙ 79 17 00 47	СКУТОЗАВР 81 72 80 08	ЛИСОХВОСТ 98 59 36 63

S28 4625 kHz USB March 13, 2012 0637z, recording by Avare
http://priyom.org/media/12823/s28_4625usb_20110407_1113z_m.mp3

Type 1-4, four message groups

МДЖБ	МДЖБ	48 713	БРЯНТА 48 93 69 91	ОРТОЛАН 74 63 11 98	ПРОКЛИЗА 69 10 45 66	ХРОМАТИЗМ 59 54 01 94

S28 4625 kHz USB October 18, 2010 1524z, recording by danix111
http://danix111.cba.pl/archives/USB-Stream/UVB-76_2010-10-18_15.24_UTC.mp3

Type 2

Uncommon messages consisting of two repeats of a single call sign, followed by two 2fg 3fg ID groups and 1, 2 or 4 message groups.

Type 2-1, two ID groups, one message group

ИА6Н	ИА6Н	13 137	38 473	ВИНКАТОН 43 65 32 76

S28 4625 kHz USB August 19, 2011 1527z, recording by Webweasel
http://priyom.org/media/34438/s28-4625usb-20110819-1527z-msg-bywebweasel.ogg

Type 2-2, two ID groups, two message groups

В6БЫ	В6БЫ	60 582	37 817	ГЛАДІРЙ 30 53 41 11	ГЛАДАК 41 10 19 56

S28 4625 kHz USB February 24, 2011 1214z
http://priyom.org/media/1191/UVB-76-24-02-2011-1214UTC.ogg

Type 2-4, two ID groups, four message groups

ОЕУН	ОЕУН	67 234	10 324	СИМВОЛИКА 06 50 32 02	ЦИМБИДИУМ 85 03 58 40	ГИЛЬДИН 52 14 46 54	ДИЛЬДРИН 37 46 77 11

S28 4625 kHz USB August 22, 2011 1120z, recording by Webweasel
http://priyom.org/media/33950/s28-4625usb-20110822-1120z-msg-bywebweasel.ogg

Type 3

Messages addressed to two call signs, very rare.
It is very likely that these are two separate call signs and not a single one consisting of two words because the call signs are read and repeated separately, for example “ЬБ2М ЬБ2М ХН87 ХН87”. Other Russian military stations which use 2-word call signs announce them by reading the whole call sign before repeating it, for example in the case of the Squeaky Wheel the callup is read as “Альфа 45 Альфа 45”.
Furthermore the call sign KZJT (КЗЙТ) has been used in conjunction with two other call signs in two different messages. Also, the call sign OYeUN (ОЕУН) has appeared both as the sole recipient of a message and in a double call sign message with the most active call sign MDZhB (МДЖБ).

Two distinct types of messages emerge when examining the type 3 transmissions. Messages where the second call sign is read only once always contain a 2fg 2fg irregular ID group, while messages where both call signs are repeated twice do not contain this group.
In common radio tradecraft the call signs are usually repeated twice and the lack of this repetition does not look like an accident. The whole message is repeated after the first reading and in this the call sign is also only read once. Also the additional 2fg 2fg irregular ID group is seen in these messages and yet it is absent in the messages where both call signs get repeated twice, making a strong case that the reading is done like this in purpose and there is something in the message design that dictates this action.
Taking this assumption, the second call sign can't be the intended recipient but would turn into part of the message itself, so station MDZhB would receive a message regarding station OYeUN with extra instructions of “47 05”, followed by a regular message format with an ID group and message group.

The latter message type where both call signs are read twice contain two regular ID groups and a reasonable assumption can be made that the same message is intended for both recipients but unique ID groups might be given for each of the stations.

Type 3-2-1-1-1-1, two call signs, first repeated twice, second repeated once, one irregular ID group, one regular ID group, one message group

МДЖБ	МДЖБ	ОЕУН	47 05	26 605	ВОЛЕМИТОЛ 94 88 59 75

S28 4625 kHz USB March 13, 2012 0637z, recording by Avare
http://priyom.org/media/57706/s28-4625usb-20120313-0637z-msg-byavare.ogg

Type 3-2-1-1-2-1, two call signs, first repeated twice, second repeated once, one irregular ID group, two regular ID groups, one message group

МДЖБ	МДЖБ	ОЕУН	02 86	19 836	59 557	ВОРОНЬЕ 44 96 76 71

S28 4625 kHz USB March 13, 2012 0642z, recording by Avare
http://priyom.org/media/57709/s28-4625usb-20120313-0642z-msg-byavare.ogg

Type 3-2-2-0-2-1, two call signs, both repeated twice, no irregular ID groups, two regular ID groups, one message group

ЬБ2М	ЬБ2М	ХН87	ХН87	42 356	07 458	ПОДКОС 68 20 72 58

S28 4625 kHz USB March 13, 2012 0749z, recording by Avare
http://priyom.org/media/57712/s28-4625usb-20120313-0749z-msg-byavare.ogg

Type 3-2-2-0-2-2, two call signs, both repeated twice, no irregular ID groups, two regular ID groups, two message groups

КЗЙТ	КЗЙТ	МБІЩ	МБІЩ	60 582	37 817	ГЛАДІРЙ 30 53 41 11	ГЛАДАК 41 10 19 56

S28 4625 kHz USB February 24, 2011 1207z
http://priyom.org/media/1190/UVB-76-24-02-2011-1207UTC.ogg

Type 4

One-off message formats.

Type 4-1, ID group 3fg 2fg, opposite of current 2fg 3fg

УЗБ-76	УЗБ-76	180 08	БРОМАЛ 74 27 99 14

S28 4625 kHz 2158z December 24, 1997, recording provided by Jan Michalski
http://soundcloud.com/lafleurvk/4625-uzb76-bromal

Type 4-2, ID group 2fg 2fg

МДЖБ	МДЖБ	63 05	АРЦЕДА 39 86 82 47

S28 4625 kHz USB December 8, 2010 1548z, recording by danix111
http://danix111.cba.pl/archives/USB-Stream/UVB-76-08-12-2010-1548UTC.wav

Type 4-3, five call signs, five regular ID groups, one message group

КЗЙТ	КЗЙТ	МБЫЩ	МБЫЩ	8ЖСМ	8ЖСМ	1СГ5	1СГ5	6Е4Н	6Е4Н	70 617	99 919	63 819	24 832	05 598	СПЛАВЩИЦА 13 48 33 24

For purpose of practicality differing call signs in this message are illustrated by alternating colour.

S28 4625 kHz August 24, 2011 0357z, recording by Gwraspe
http://priyom.org/media/57727/s28-4625usb-20110824-0357z-msg-bygwraspe.ogg

Messages with call signs other than UZB-76 or MDZhB

Only a handful of messages with call signs other then UZB-76 or MDZhB have been sent during the known history of the station. Why other call signs are sometimes used is debated, but one plausible possibility is that the call signs address the recipient, not the station identifying itself. Messages that contain two call signs are especially problematic to explain away if it is thought to be the transmitting station call sign.

Call signs assigned to a unit, area or function are not uncommon in military communications and this would explain why the overwhelming majority of messages are addressed to MDZhB, the Buzzer being the local communications link to it with only occasional needs to contact anyone else. This might also explain why the old call sign UZB-76, active at least since 1997 was phased out in September 2010, shortly after the Buzzer changed it's transmitter location.

List of messages sent to call signs other than UZB-76 and MDZhB

Date	Time	Call sign	Message
February 14, 2011	1448z	KZJT LNR4 КЗЙТ ЛНР4	35 993 44 723 ILYeK 72 11 21 19 35 993 44 723 ИЛЕК 72 11 21 19
February 24, 2011	1207z	KZJT MBYShch КЗЙТ МБЫЩ	60 582 37 817 GLADYRJ 30 53 41 11 GLADAK 41 10 19 56 60 582 37 817 ГЛАДІРЙ 30 53 41 11 ГЛАДАК 41 10 19 56
February 24, 2011	1213z	V6BY В6БЫ	60 582 37 817 GLADYRJ 30 53 41 11 GLADAK 41 10 19 56 60 582 37 817 ГЛАДІРЙ 30 53 41 11 ГЛАДАК 41 10 19 56
March 05, 2011	1233z	V6BY В6БЫ	93 988 07 374 GLOKT 27 56 14 43 93 988 07 374 ГЛОКТ 27 56 14 43
April 07, 2011	1250z	V6BY В6БЫ	21 943 SKOSOK 95 77 57 66 21 943 СКОСОК 95 77 57 66
April 07, 2011	1345z	V6BY В6БЫ	00 262 21 943 SKOSOK 95 77 57 66 00 262 21 943 СКОСОК 95 77 57 66
August 19, 2011	1527z	IA6N ИА6Н	13 137 38 473 VINKATON 43 65 32 76 13 137 38 473 ВИНКАТОН 43 65 32 76
August 22, 2011	1120z	OYeUN ОЕУН	67 234 10 324 SIMVOLIKA 06 50 32 02 CIMBIDIUM 85 03 58 40 GIL'DIN 52 14 46 54 DIL'DRIN 37 46 77 11 67 234 10 324 СИМВОЛИКА 06 50 32 02 ЦИМБИДИУМ 85 03 58 40 ГИЛЬДИН 52 14 46 54 ДИЛЬДРИН 37 46 77 11
August 22, 2011	1135z	IA6N ИА6Н	67 234 10 324 SIMVOLIKA 06 50 32 02 CIMBIDIUM 85 03 58 40 GIL'DIN 52 14 46 54 DIL'DRIN 37 46 77 11 67 234 10 324 СИМВОЛИКА 06 50 32 02 ЦИМБИДИУМ 85 03 58 40 ГИЛЬДИН 52 14 46 54 ДИЛЬДРИН 37 46 77 11
September 09, 2011	1130z	94ZhT 94ЖТ	44 729 SIZAL' 79 84 36 62 SIDNOKARB 41 72 92 04 44 729 СИЗАЛЬ 79 84 36 62 СИДНОКАРБ 41 72 92 04
September 17, 2011	0243z	CLIM ЦЛИМ	20 573 YIKROJKA 07 02 21 81 MARKBUZIP 91 08 20 67 20 573 ВЫКРОЙКА 07 02 21 81 МАРКБУЗИР 91 08 20 67

September 17, 2011	0245z	C38M Ц38М	51 893 FENOKSILEN 06 55 70 92 51 893 ФЕНОКСИЛЕН 06 55 70 92
September 24, 2011	1845z	'BOM ЬБОМ	23 697 DIASPOR 96 16 63 83 23 697 ДИАСПОР 96 16 63 83
September 29, 2011	1228z	'BOM ЬБОМ	00 194 MOROZ 21 61 45 67 00 194 МОРОЗ 21 61 45 67
September 30, 2011	1440z	94ZhT 94ЖТ	62 216 TORSAN 22 34 78 21 62 216 ТОРСАН 22 34 78 21
October 05, 2011	1137z	94ZhT 94ЖТ	78 663 NOKSIRON 49 85 41 36 VYEMOChNYJ 33 51 58 30 78 663 НОКСИРОН 49 85 41 36 ВЫЕМОЧНЫЙ 33 51 58 30
March 13, 2012	0637z	OYeUN ОЕУН	47 05 26 605 VOLYeMITOL 94 88 59 75 47 05 26 605 ВОЛЕМИТОЛ 94 88 59 75
March 13, 2012	0642z	MDZhB OYeUN МДЖБ ОЕУН	02 86 19 836 59 557 VORON'Ye 44 96 76 71 02 86 19 836 59 557 ВОРОНЬЕ 44 96 76 71
March 13, 2012	0732z	OYeUN ОЕУН	32 077 21 576 MOROZhYeNICA 88 38 70 63 32 077 21 576 МОРОЖЕНИЦА 88 38 70 63
March 13, 2012	0749z	'B2M HN87 ЬБ2М ХН87	42 356 07 458 PODKOS 68 20 72 58 42 356 07 458 ПОДКОС 68 20 72 58
March 13, 2012	0803z	2BYP 2БЫП	42 356 14 033 SOKOLYeC 12 39 08 63 42 356 14 033 СОКОЛЕЦ 12 39 08 63

First line in latin, second in cyrillic.

March 13, 2012 was the exception to this list with call sign MDZhB used, however used in conjunction with OYeUN, rare call sign rightly belonging to this list.

Duplicated messages

One common feature with Buzzer messages are a high rate of duplicates, repeated up to 4 times, sometimes years later.
Typically the code word and related 4 number groups are repeated, not the ID itself. In some cases message with only one code word is later repeated in another message that has two code words. Repeats also span multiple call signs so basically every possible permutation has occurred.

Examples of different types of duplicates

Split repeat, 2-group message sent in January repeated in two separate transmissions in May.

Date	Time	Call sign	ID	Group 1	Group 2
January 26, 2011	1458z	MDZhB МДЖБ	19 553	ILOTICIN 36 19 69 46 ИЛОТИЦИН 36 19 69 46	HLORAPATIT 80 80 29 83 ХЛОРАПАТИТ 80 80 29 83
May 11, 2011	1305z	MDZhB МДЖБ	35 990	ILOTICIN 36 19 69 46 ИЛОТИЦИН 36 19 69 46	
May 11, 2011	1405z	MDZhB МДЖБ	22 806	HLORAPATIT 80 80 29 83 ХЛОРАПАТИТ 80 80 29 83	

Repeat with different call signs. The TREKATOR group also got repeated 2 more times, those times with MDZhB call sign.

Date	Time	Call sign	ID	Group 1	Group 2
September 10, 2010	1516z	UZB-76 УЗБ-76	27 416	TREKATOR 52 50 10 95 ТРЕКАТОР 52 50 10 95	AREOGRAFIYa 18 05 35 23 АРЕОГРАФИЯ 18 05 35 23
December 28, 2010	1350z	MDZhB МДЖБ	69 922	AREOGRAFIYa 18 05 35 23 АРЕОГРАФИЯ 18 05 35 23	

A rare example of the ID repeating after 7 years. It might be a coincidence but likelihood of that in 5 number string is low.

Date	Time	Call sign	ID	Group 1	Group 2
January 21, 2003	0650z	UZB-76 УЗБ-76	80 516	ГАНОМАТИТ 21 23 86 25 GANOMATIT 21 23 86 25	
November 04, 2010	1450z	MDZhB МДЖБ	80 516	ARGONAVT 01 13 48 72 АРГОНАВТ 01 13 48 72	TRESKUN 65 92 21 24 ТРЕСКУН 65 92 21 24

3 and 4 group repeats spanning 3 months.

Date	Time	Call sign	ID	Group 1	Group 2
September 22, 2010	0700z	MDZhB МДЖБ	71 442	APLANATIZM 44 34 58 31 АПЛАНАТИЗМ 44 34 58 31	
October 17, 2010	1423z	MDZhB МДЖБ	60 382	APLANATIZM 44 34 58 31 АПЛАНАТИЗМ 44 34 58 31	TROPOSFERA 02 39 53 68 ТРОПОСФЕРА 02 39 53 68
October 17, 2010	1442z	MDZhB МДЖБ	24 727	APLANATIZM 44 34 58 31 АПЛАНАТИЗМ 44 34 58 31	TROPOSFERA 02 39 53 68 ТРОПОСФЕРА 02 39 53 68
November 23, 2010	1345z	MDZhB МДЖБ	25 646	APLANATIZM 44 34 58 31 АПЛАНАТИЗМ 44 34 58 31	TROPOSFERA 02 39 53 68 ТРОПОСФЕРА 02 39 53 68

Station operation

Frequency

Buzzer transmits always on 4625 kHz with no day/night or seasonal changes. Due to the military nature of this station the operators have without question done calculations to ensure that the link quality is high during all situations. Choosing a relatively low frequency and not changing it depending on the time of the day would suggest a fairly local operation (few hundred kilometers) where a low frequency is reliable even during the day.

Transmitters and transmission mode

It is believed that the Buzzer uses at least two transmitters. Two different strength sources that send the ”buzz” slightly out of sync have been observed on many occasions as well as one transmitter sending the carrier and another transmitting the buzzing sound. This theory has been verified by comparing signal strengths as well as seeing secondary transmitters being turned on and off and also by observing the frequency drift of secondary transmitters that have just been turned on and that haven't yet settled on the correct frequency.

Modulation of the main transmitter in Povarovo has been reported as A3E (full carrier two-sideband AM). During daily maintenance the main transmitter was turned off and transmission resumed from a backup transmitter in an unknown location using R3E (suppressed LSB, reduced carrier, full USB) emission type. The backup transmitter was reported to have transmitted harmonics on 9250 and 13875 kHz. After the Povarovo transmitter site was abandoned it is believed that the R3E transmitter is the main source of Buzzer emissions.

It is also possible that there is a third transmitter that is responsible for transmitting the carrier while the other two alternate on transmitting the buzz. So far the Buzzer has been seen operating in many different modes, transmitting the channel marker on H3E (USB + carrier) and R3E (suppressed LSB, reduced carrier, full USB) and sending messages on J3E (USB) and some on R3E (suppressed LSB, reduced carrier, full USB) respectively.

The correct emission mode is difficult to determine, and it is even possible that the Buzzer uses a J3E transmitter that is incorrectly adjusted or overmodulated. Due to the Buzzer having multiple transmitters, all of them very error-prone, it is impossible to attribute one "standard" mode for it's operation.

Priyom – 2 buzzers
http://priyom.org/blog/2-buzzers.aspx

Buzzing device

Curiously the device that generates the signature sound of the station appears to be a mechanical device of some sort. It has failed multiple times and by examining the recordings it doesn't sound like a tape player breaking or MP3 player crashing and it is possible that the pitch and tempo changes in the transmitted sound are due to a mechanical device somehow "winding down" and ending up out of tune before failing to sound entirely.

S28 4625 kHz USB April 9, 2011 Approx. 0300z, recording by Webweasel
http://priyom.org/media/1659/S28-4625USB-2011-04-09-0300UTCApprox-BuzzerFailer-ByWebweasel.ogg

Remote operation

On April 19, 2011 a mistake was made and voices were broadcast over the Buzzer through what sounded like a PBX telephone switch before the Buzzer was turned off and an actual message was sent. It is possible that the transmitter complex is some distance away from the actual headquarters and transmissions are sent through a dedicated phone line.
A man who claims to have been professionally involved with the Pip told me that that station is also operated remotely with only a skeleton crew of engineers handling the actual transmitter complex and actual transmissions were sent through a dedicated phone line.

This is possible with the Buzzer too, but it is as likely that the station is manned whilst still retaining the possibility of patching in calls from outside.

S28 4625 kHz USB April 19, 2011 1330z, recording by Avare
http://priyom.org/media/1694/S28-4625USB-20110419-1330z-odd-ByAvare.ogg

Purpose of the Buzzer

It is thought that the Buzzer, Pip and Squeaky Wheel are all parts of a centralized command and control system (централизованное боевое управление (ЦБУ)) for different military regions.

Buzzer, being strong in Europe and triangulation results showing it near the Estonian border would suggest it to be serving the Western Military District (Западный военный округ), while Pip being in Rostov-on-Don would serve the Southern Military District (Южный военный округ).
The Squeaky Wheel is said to be in St. Petersburg which places it in the Western Military District but due to it's low signal strength in the west it might be that it is using directional antennas beamed towards the east to serve the Central Military District (Центральный военный округ) or being a filler station for the western one.

According to multiple sources these messages are general circular announcements (оповещение) meant for military commissariats (военкоматы) in their respective military districts. At least in the case of Pip and Squeaky Wheel these stations are expecting multiple recipients as heard in their propagation test Dlya-messages, in Pip's case over 80 stations in total are called. In the case of circular announcements it would not be unreasonable to postulate that such announcements would be relayed to different districts by different C2 stations.

It is worth noting that all messages are sent in AM-compatible modulation meaning that even a very simple receiver is suitable for the reception. For the same reason messages are sent in voice, allowing unskilled operators to successfully handle radio traffic. This is in stark contrast to very high priority strategic flash messages that are usually sent in Morse code or digital modes such as the CIS 36-50 which require skilled operators and receivers with specialized decoders.
A photograph showing a plaque supposedly taken in a military commissariat in Moscow lends further credibility to this theory.

http://upload.wikimedia.org/wikipedia/ru/b/b5/Табличка_в_одном_из_Военкоматов_4625кгц.jpg

The plaque reads

Russian	**English**
Р/ПРИЕМНИК т."Ишим-003" Р/СЕТЬ № 43 Рабочая частота - 4625 кГц Работает: КРУГЛОСУТОЧНО	RECEIVER: "Ishim-003" RADIO NETWORK № 43 Operating frequency - 4625 kHz Working time: Around the clock

Receiver mentioned and pictured is a common longwave to low VHF (with gaps) receiver made in the Soviet Union, more specifically Kazakhstan, in the mid-1980's. It is capable of receiving AM and FM modulated signals which goes a long way in explaining why the Buzzer uses a carrier in it's transmissions.

Information about the receiver
http://www.msevm.com/md/703/03/

Dead Hand

Dead Hand refers to a system that automatically triggers the launch of nuclear weapons in a case of a devastating strike by the enemy eliminating the Russian leadership who would normally authorize the counterstrike. It is likely that such a system has been built and might still be in operation today but it is not the Buzzer.

Proponents of this theory claim that a Buzzer stoppage would cause the system to automatically launch nuclear weapons – not to mention the absolute irresponsibility of building such a system, the station itself has proven this theory wrong many times over. Outages are common due to equipment failures as well as planned stoppages when voice messages are sent, so this theory is simply false.

Why the buzz?

It takes a lot of power to transmit a signal constantly and it occupies human and equipment resources to keep a transmitter(s) running 24/7 so logically there has been a lot of speculation on why the sound is so important that it warrants such investment.

Few obvious reasons are that the Buzzer is there to keep the frequency occupied – during a military emergency you don't want to find your frequency in use by drunken pirates. Another user convenience feature is the simplicity of monitoring a frequency with a constant tone, a lack of it is much easier to notice during bad propagation conditions than listening to plain static and trying to hear a possible voice message. Lastly, the buzzing is a signal that the transmitter is functioning properly and the receiver has a ”connection” and has the assurance that communications are possible to receive.

Many have looked at the sound itself, trying to find whether it carries some well-hidden information. This doesn't seem to be the case and the sound has been reproduced by regular software sound generators. Another proposition is that the receiver has a detector notifying the user when the buzzer stops and message is imminent, this indeed is possible in radio communications with high signal-to-noise ratio but might be a tall order for the temperamental shortwave propagation – and it's cheaper to have a conscript to sit at the radio.
Lastly, with the Pip and Squeaky Wheel and a bunch of letter beacons the Buzzer is not a unique example of constant transmitting, it is just the most publicized.

Ionospheric research

Russian research article published on April 17, 2008 titled “Information-measuring complex and database of mid-latitude Borok Geophysical Observatory” details data gathering and logging systems used by said institution. In the section regarding geophysical observations the Buzzer frequency of 4.625 MHz is mentioned, below is a quote from the article detailing the methodology:

Doppler Radio Sounding of the Ionosphere
[31] High-frequency Doppler method for ionosphere researches is based on observation of frequency variations of the radio wave reflected from ionosphere inhomogeneities, changing in time and in space. Thus changes of an ionosphere state can be caused by solar geophysical factors as well as by atmosphere and seismic events from natural and artificial origins. Propagation of the radio wave is accompanied by frequency deviation caused by changes in physical properties of media and in the geometric trajectory or an altitude of reflection.

[32] The high-frequency Doppler method consists in comparison between the frequency of the continuous radio signal, reflected by the ionosphere, and the frequency of the stable basic generator. Usage of the basic source enables to apply the device both for vertical and inclined sounding. The basic generator frequency is shifted on some hertz from the transmitter frequency to detect Doppler shift.

[33] The equipment resolution, or its sensitivity, depends on the frequency stability of the heterodyne receiver and carrier wave of the radio transmitter. The highly stable broadcasting radio station working in a short wave range is used as radio transmitter. The radio receiver basic generator is the quartz generator with proportional thermostat system of the resonator, providing the frequency stability about 10^{-8}. So the resolution of the measuring complex on frequencies about 10 MHz is provided at 0.1 Hz level. With decreasing of a radio frequency this value decreases proportionally. Main parameters of the measuring are

carrier wave frequency 4.625 MHz;
receiver resolution ~0.1 Hz.

Source: Anisimov, S. V., A. Chulliat, and E. M. Dmitriev (2008), Information-measuring complex and database of mid-latitude Borok Geophysical Observatory, Russ. J. Earth Sci., 10, ES3007, doi:10.2205/2007ES000227.

So what can be taken from this document is that ionospheric sounding has been done using a referenced transmitter with high frequency stability emitting a carrier wave on the Buzzer frequency of 4.625 MHz. This emission is then monitored with scientific-grade receivers to obtain the research data.

It is obvious that the Buzzer is used for military purposes but to learn whether it could double as a scientific reference transmitter we must examine the affiliations of the research institutions, locations of these facilities, and the quality of instrumentation required for such research to see whether the Buzzer can meet these demands.

Observatory

The Borok Geophysical Observatory was established by the Schmidt's Institute of Physics of the Earth of the Russian Academy of Sciences in 1957 and in 2004 it joined the international INTERMAGNET network of geomagnetic observatories which disseminates research data to scientists worldwide. The founding institute, Russian Academy of Sciences, is a Russian national academy which functions autonomously from the government with civilian leadership. Nothing in the observatory or the founding institute would suggest military affiliation and it's openness and international data sharing infers that the data extracted doesn't lend tactical advantages to foreign nations since it is readily shared. Whether the military would cooperate with a civilian research project depends on the culture and local regulations and no definitive answer to that can be given at this time.

Location

Borok is located in Yaroslavl region north of Moscow. It is roughly 590 kilometers from Pskov which is one candidate for Buzzer's current location and 230 km from Povarovo where the old transmitter site was located in 2008 when this research supposedly was taking place. Reliable shortwave listener sources tell that a A3E (AM) transmitter was used as a primary transmitter around this time during the operations in Povarovo.

The signal has to propagate reliably from the transmitter site to the receiver. With the approximate distance of 230 km and frequency of 4.625 MHz the link reliability is good and it is likely that the recipients of Buzzer voice messages are within similar distance from the transmitter. With this consideration antennas with high takeoff angle that suit the local voice communications are also effective for ionospheric sounding.

Technical requirements

Doppler measurements are done from the carrier frequency which has to be stable using the methodology which is specified in the research paper. It is unlikely that a normal military grade AM/SSB transmitter designed for voice communications is fitted with a frequency standard as that level of stability is not necessary for it's normal function. However it it possible to retrofit an external standard and such addition doesn't affect the reliability of the transmitter and retuning is possible by simply bypassing the source. Thus there doesn't seem to be any reasons why the military would not allow the installation of a frequency standard if they were to choose to cooperate with civilian researchers.

From a scientific point of view the content in the sidebands is irrelevant in Doppler shift measurements where frequency deviations are in the order of few hertz and the regular sideband transmission is located further away from the carrier frequency. Considering that the carrier is always present during normal transmitter operation despite the transmission content there are no reasons why it could not have been done.

Results

With these requirements fulfilled and using the specified frequency of 4.625 MHz with ~0.1 Hz resolution the accuracy that can be achieved is ±3.25 m/s, or detection of radial velocities greater than 11.7 km/h. This resolution is low in modern terms but the research paper does not go into great detail on when these experiments were done and what the purpose of them was – perhaps greater resolution was not necessary.

Was it done?

If the scientific experiment was conducted independently on the same frequency as the Buzzer it must have suffered from severe interference due to their close proximity. The Borok Geophysical Observatory website details the instrumentation used with a short mention of "multi-frequency Doppler sounding" capability without any further information. The research paper published in 2008 details a single-frequency system so it is possible that a single experiment was conducted and canceled due to interference – or then the Buzzer was used and the capabilities are now extended to utilize other transmitters in other frequencies as well.

But in the end there is no way to know for sure whether the Buzzer was involved in this research with the information currently publicly available. The Borok Geophysical Observatory doesn't have an email address and making a phone call is not possible for me so this theory shall go unverified 'til someone else picks up the phone and asks them.

Borok Geophysical Observatory website
http://wwwbrk.adm.yar.ru/

Information-measuring complex and database of mid-latitude Borok Geophysical Observatory
http://elpub.wdcb.ru/journals/rjes/v10/2007ES000227/

Location of the Buzzer

Current location of the Buzzer transmitter site is unknown and any speculation would be based on anonymous Internet "experts" or skywave direction finding results so the only sure answer for now is that it's in European Russia.

Some triangulation results
http://uvb-76.net/p/triangulation.html
http://priyom.org/media/53392/4625_peleng28102011_1_.jpg

The old Buzzer transmitter site, however, is well known and has even been visited by urban explorers who brought back some transmission logs.

Expedition pictures
http://bydunai.livejournal.com/749.html

Analysis in English
http://www.numbersoddities.nl/N&O-169.pdf
The ledgers are marked as practice material but the content has been written with different pens and handwritings with some dirt only on certain pages, all which would suggest that it has been used for a while and not written at once as fictitious practice material. There are over a hundred pages of repetitive transmission logs and it seems likely that the operators took an old, filled up ledger and stamped it as practice material to show the new conscripts how to fill the logs in, instead of writing a purpose-made practice log.

Similar stations

Despite Buzzer being the most famous it is not the only station of Russian origin that transmit a tone constantly. Similar stations are the Pip and the Squeaky Wheel which hold ENIGMA designations of S30 and S32 respectively.

Differences

- Both Pip and Squeaky Wheel send Dlya (Для) propagation test messages where a number of station call signs are read and presumably the recipients contact these stations to give their signal reports.
- Both of these stations change the frequency depending on the time of the day to optimize signal propagation to their recipients, Pip also changes the time it changes the frequencies seasonally – it is not known at this time if the Squeaky Wheel does this.
- Pip and Squeaky Wheel are considerably weaker than the Buzzer in Europe, Pip being stronger than Squeaky Wheel which is usually inaudible in western Europe.
- There is a strong link between Pip and Squeaky Wheel, when Pip sends a message Squeaky Wheel usually sends one only few minutes later. This following message has different content but a similar format suggesting that it might work as a relaying service. It is worth noting that Squeaky Wheel also sends messages by itself but the Pip relay connection is so common that it can't be a coincidence.
- These stations use only one call sign each while the Buzzer uses many. Pip uses 8S1Shch (8С1Щ) and Squeaky Wheel uses Al'fa45 (Альфа45), however it is possible that other call signs are used very rarely and have been missed because these stations have not been monitored 24/7 for very long periods of time at once.

As was mentioned in the Purpose of the Buzzer section, it is likely that these stations all belong in the same C2 system and are just incarnations for different regions, perhaps partially overlapping now when military regions have been cut from 7 to 4. Not surprisingly these stations all send messages in similar formats.

Station	Date	Time	Call sign	Message
S28 Buzzer	March 12, 2012	1518z	MDZhB МДЖБ	38 466 DVOROVYJ 24 45 94 38 38 466 ДВОРОВЫЙ 24 45 94 38
S30 Pip	March 12, 2012	1508z	8S1Shch 8С1Щ	89 859 RYeNTNYJ 38 18 55 80 89 859 РЕНТНЫЙ 38 18 55 80
S32 Squeaky Wheel	March 12, 2012	1511z	Al'fa45 Альфа45	85 876 NABORNYJ 72 68 48 29 85 876 НАБОРНЫЙ 72 68 48 29

First line in latin, second in cyrillic.

Note that these messages are all on the same day and were sent in short succession suggesting a possible connection. This is very common to Pip and Squeaky Wheel but the Buzzer is not as involved in this relaying system.
For more information about Dlya messages, Pip and the connection between Pip and Squeaky Wheel please refer to the ”Pip Dossier”.

Pip Dossier
http://priyom.org/media/56944/the_pip_dossier.pdf

Personal notes

I did not include footnotes in this document so I will give a general introduction of my sources in here.
I have used logs available at Priyom.org as a basis of my analysis as well as general information from Numbers & Oddities and ENIGMA 2000 newsletters, blog posts in the UVB-76 Internet Repeater and discussions on the Priyom IRC channel. T! taught me a great deal about ionospheric sounding and Doppler measurements. Gwraspe told me about all things Russian, provided ideas, theories and feedback and was a great proofreader. TROJAN719 helped with translations and danix111 found me some recordings thought lost and gave me gems of information. And last but not least, Webweasel read over this document and kindly continues to host good stuff at Priyom.org.

Recordings came from Ary Boender, Avare, danix111, Gwraspe, Laid, Jan Michalski and Webweasel. Many thanks to you all!

And finally a reader tip. There is an enormous amount of false information about the Buzzer online so I would like to recommend the following places for reliable information:

Priyom
http://priyom.org/

Numbers & Oddities
http://www.numbersoddities.nl/

ENIGMA 2000
http://www.brogers.dsl.pipex.com/enigma2000/

UVB-76 Temporary Internet Repeater
http://uvb-76.net/

Tucana
tucana@priyom.org

Appendix A - Message types table

Examples of different message types. Message classifications for types 1 and 2 are very rough, designed for ease of use because the overwhelming majority of messages readily fit in these types. Type 3 covers all possible combinations for messages with 2 call signs and the classification number is correspondingly long and complex. Type 4 covers one-off messages. Type 4-3 has it's own definition table in Appendix B.

Type	Call sign	Call sign	Second call sign	Second call sign	Irregular ID group	ID group	ID group	Message group 1	Message group 2	Message group 3	Message group 4
1-1	МДЖБ	МДЖБ				93 343		АВТОКОД 03 09 36 91			
1-2	МДЖБ	МДЖБ				02 097		АВТОНОМИСТ 07 53 90 30	АВТОНОМНЫЙ 64 61 81 01		
1-3	МДЖБ	МДЖБ				03 144		АКУШЕРСКИЙ 79 17 00 47	СКУТОЗАВР 81 72 80 08	ЛИСОХВОСТ 98 59 36 63	
2-1	ИА6Н	ИА6Н				13 137	38 473	ВИНКАТОН 43 65 32 76			
2-2	В6БЫ	В6БЫ				60 582	37 817	ГЛАДІРЙ 30 53 41 11	ГЛАДАК 41 10 19 56		
2-4	ОЕУН	ОЕУН				67 234	10 324	СИМВОЛИКА 06 50 32 02	ЦИМБИДИУМ 85 03 58 40	ГИЛЬДИН 52 14 46 54	ДИЛЬДРИН 37 46 77 11
3-2-1-1-1-1	МДЖБ	МДЖБ	ОЕУН		47 05	26 605		ВОЛЕМИТОЛ 94 88 59 75			
3-2-1-1-2-1	МДЖБ	МДЖБ	ОЕУН		02 86	19 836	59 557	ВОРОНЬЕ 44 96 76 71			
3-2-2-0-2-1	ЬБ2М	ЬБ2М	ХН87	ХН87		42 356	07 458	ПОДКОС 68 20 72 58			
3-2-2-0-2-2	КЗЙТ	КЗЙТ	МБІЩ	МБІЩ		60 582	37 817	ГЛАДІРЙ 30 53 41 11	ГЛАДАК 41 10 19 56		
4-1	УЗБ-76	УЗБ-76			180 08			БРОМАЛ 74 27 99 14			
4-2	МДЖБ	МДЖБ			63 05			АРЦЕДА 39 86 82 47			

Appendix B – Type 3 message classification scheme and type 4-3 specification

Message type 3 has a complex naming scheme due to high level of variation with the currently known messages meaning that every possible combination has to have it's own numerical code. Below is a sample message and explanation on how it is classified.

Type 3-2-2-0-2-2, two call signs, both repeated twice, no irregular ID groups, two regular ID groups, two message groups

```
KZJT KZJT MBYShch MBYShch 60 582 37 817 GLADYRJ 30 53 41 11 GLADAK 41 10 19 56
КЗЙТ КЗЙТ МБІЩ МБІЩ 60 582 37 817 ГЛАДІРЙ 30 53 41 11 ГЛАДАК 41 10 19 56
```

Number	Meaning
3	Type 3 message indicator
2	Number of repeats of the first call sign
2	Number of repeats of the second call sign
0	Number of irregular ID groups
2	Number of regular ID groups (2fg 3fg)
2	Number of message groups (CODEWORD 2fg 2fg 2fg 2fg)

Type 4-3 specification

5 call signs, all repeated, no irregular ID groups, 5 ID groups, 1 message group.

Type	Call sign 1	Call sign 1	Call sign 2	Call sign 2	Call sign 3	Call sign 3	Call sign 4	Call sign 4	Call sign 5	Call sign 5	ID group	ID group	ID group	ID group	ID group	Message group
4-3	КЗЙТ	КЗЙТ	МБЫЩ	МБЫЩ	8ЖСМ	8ЖСМ	1СГ5	1СГ5	6Е4Н	6Е4Н	70 617	99 919	63 819	24 832	05 598	СПЛАВЩИЦА 13 48 33 24