

Annex A Test equipment

A.1 Test equipment summary

#	description	type	identification
1	VDL analyser / Generator	Attingimus UAIS Test unit	S/N 001 BSH PC5593 SW AISterm V1.0rev47 AISmain V1.47011120R
2	Target simulator	Simutech	BSH PC3007 SW BSHSIM7T
3	Presentation Interface Monitor	BSH	BSH PC 3481 BSH PC 3544 SW NewMoni V2.1
4	DSC Testbox	DEBEG 3817 DEBEG 6348	S/N 475533
	Auxiliaries:		
5	Digital Multimeter	Voltcraft	S/N 1010365036
6	Fluke Scopemeter	123	BSH 101275/2001
7	5 Converters RS 422 to RS 232		
8	1 fixed voltage power supply (24 V/10A)		
9	3 adjustable power supplies (30 V/5 A)		
10	active retransmitting GPS antenna		

for a description of pos. 1-4 see below

A.1.1 VDL analyser / generator

The VDL analyser/generator:

- receives the radio data telegrams transmitted by the AIS under test, slotwise evaluates their radio parameters (field strength, SNR, etc.) and provides a transparent display of the decoded radio data telegrams (VDL messages).
- transmits radio data telegrams which have been entered/edited via a control panel. The AIS under test receives these messages and either passes the received data to its presentation interface and/or responds as appropriate.
- records all data contained in the received radio telegrams and radio parameters in a data base for offline evaluation and documentation purposes.
- simulates AIS targets by transmitting position reports of virtual targets up to the maximum channel capacity.

A.1.2 Target simulator

The target simulator consists of a standard PC with

- special Radar and Target Simulator software
- extension boards for generation of Radar signals and RS422 serial output signals

Connection of AIS Test system

For tests of AIS transponders the data of 60 moving targets defined in the Radar Simulator are transferred to the VDL Generator and transmitted on VHF. Thus the AIS VHF data link is loaded with simulated AIS targets.

Connection of display systems

Radar systems as well as ECDIS systems will have the ability to receive, process and display AIS information in the near future. In order to test this feature the data of moving targets defined in the Radar Simulator are transferred to the RADAR (together with video, sensor data etc. as known).

Connection of AIS under Test

The AIS under test can be connected to the own ship sensor outputs in order to provide full control over own ship's dynamic data (for tests of reporting rates, channel management...).

A.1.3 Presentation Interface Monitor

The Presentation Interface Monitor is a PC software running on two standard PCs. It is used to

- simulate Sensor inputs
- analyse the AIS high speed input / output
- analyse the AIS long range function
- generate DSC calls for the DSC test box and to display, log and evaluate the received DSC calls from EUT.

For that purpose it includes the functions:

- coding / decoding of NMEA 6-bit data fields
- online AIS message filtering
- online AIS message editing
- load and transmit predefined sequences
- online modification of transmitted sequences

A.1.4 DSC Testbox

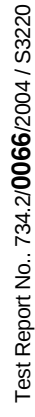
The DSC test box includes:

- A standard VHF DSC controller DEBEG 3817 with open interface
- A standard VHF radiotelephone DEBEG 6348

The software modification of the DSC controller comprises a remote control input/output facility

- to transmit DSC calls according to ITU 825-3 generated in an external device on DSC channel 70 and
- to output received DSC calls from the EUT to the external device.

The Presentation Interface Monitor is used to generate the DSC calls and to display, log and evaluate the received DSC calls.



Annex B Test sentences

B.1 IEC 61162 test sentences

Many of the test sentences are modified manually during the test according to the requirements of the actual test items.

Mainly the MMSI in all addressed sentences are adapted to the actual MMSI of the EUT or of the unit the EUT communicates with.

In addition the files containing these sentences contain also some control information used by the monitor program like:

<UTC> is replaced by the actual UTC time at time of output

<WAIT EVENT> waiting for user action before next output

<WAIT xxxx> waiting xxx ms before next output

This control information is not shown in the following sentence examples because it is not sent to the EUT.

B.1.1 Sensor input

Sensor input sentences	
File name	Description
Sentences	
AIS01_gll_vtg_hdt_rot.sst	Standard sensor input sentences
\$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A \$GPVTG,350.0,T,,M,10.0,N,,K,A \$TIHDT,359.9,T \$TIROT,0.0,A	
AIS01d_dtm_gll_vtg_hdt_rot.sst	Standard sensor input with DTM
Similar files with an additional DTM sentence are also available for the other position sentence sets and not listed explicitly	
\$GPDTM,w84,,,,,,,,P90 \$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A \$GPVTG,350.0,T,,M,10.0,N,,K,A \$TIHDT,359.9,T \$TIROT,0.0,A	
AIS01g_gll_vtg_gbs_hdt_rot.sst	Standard sensor input with GBS sentence
\$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A \$GPVTG,350.0,T,,M,10.0,N,,K,A \$GPGBS,141800.00,2.6,2.8,4.2,,,, \$TIHDT,359.9,T \$TIROT,0.0,A	
AIS01x_gll_vtg_hdt_rot_180.sst	Standard sensor input at Longitude of 180°

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\$GPGLL,0001.00,N,17959.00,W,141800.00,A,A \$GPVTG,350.0,T,,M,10.0,N,,K,A \$TIHDT,359.9,T \$TIROT,0.0,A	
AIS02 gga vtg hdt rot.sst	Sensor Input set with GGA position
\$GPGGA,092854,5330.1234,N,01001.2345,E,1,3,1.2,65.2,M,45.1,M,, \$GPVTG,350.0,T,,M,10.0,N,,K,A \$TIHDT,359.9,T \$TIROT,0.0,A	
AIS02d dtm gga vtg hdt rot.sst	Sensor Input set with GGA position and DTM
\$GPDTM,999,,,,,,,,P90 \$GPGGA,092854,5330.1234,N,01001.2345,E,1,3,1.2,65.2,M,45.1,M,, \$GPVTG,350.0,T,,M,10.0,N,,K,A \$TIHDT,359.9,T \$TIROT,0.0,A	
AIS03 gns vtg hdt rot.sst	Sensor input set with GNS position
\$GNGNS,122500.00,5330.1234,N,01001.2345,E,AA,5,1.2,35.5,41.1,, \$GNVTG,350.0,T,,M,10.0,N,,K,A \$TIHDT,359.9,T \$TIROT,0.0,A	
AIS04 rmc hdt rot.sst	Sensor input set with RMC position and speed
\$GPRMC,122500.00,A,5330.1234,N,01001.2345,E,11.2,352.2,120202,2.0,E,A \$TIHDT,359.9,T \$TIROT,0.0,A	
AIS06 gll vtg vbw hdt rot.sst	Sensor input set with speed by VBW and VTG
\$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A \$GPVTG,350.0,T,,M,10.0,N,,K,A \$VDVBW,11.00,01.00,A,12.00,02.00,A,,V,,V \$TIHDT,359.9,T \$TIROT,0.0,A	
AIS07 osd.sst	Single OSD sentence
\$INOSD,359.9,A,5.2,B,12.6,B,150.0,1.2,N	
AIS08 gll vbw hdt rot.sst	Standard sensor input with VBW instead of VTG
\$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A \$VDVBW,11.00,01.00,A,12.00,02.00,A,,V,,V \$TIHDT,359.9,T \$TIROT,0.0,A	
AIS09 gll osd.sst	Sensor input set with GLL and OSD
\$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A \$INOSD,359.9,A,5.2,B,12.6,B,150.0,1.2,N	
AIS10 gll vtg.sst	GPS receiver sentences (GLL and VTG)
\$GPGLL,5330.1234,N,01001.2345,E,141800.00,A,A \$GPVTG,350.0,T,,M,10.0,N,,K,A	
AIS11 vbw.sst	Log sentence VBW
\$VDVBW,11.00,01.00,A,12.00,02.00,A,,V,,V	
AIS12 hdt rot.sst	Gyro sentences (HDT and ROT)
\$TIHDT,359.9,T \$TIROT,0.0,A	

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B.1.2 Settings (VSD,SSD)

Settings (VSD,SSD)	
File name	Description
Sentences	
AISSD_transpondertype.sst	Settings of static data, specific set for each transponder type
\$AISSD,callsign,name,100,20,15,10,1,GP	
AIVSD_Hamburg.sst	Settings of voyage related data
\$AIVSD,51,11.5,26,HAMBURG,131020,20,05,0,0	

B.1.3 Messages (ABM,BBM)

The addressed messages include a MMSI number which is changed according to the actual MMSI number of the EUT

Messages (ABM,BBM)	
File name	Description
Sentences	
AIABM_bin.sst	Standard addressed binary message
!AIABM,1,1,2,000001005,1,6,06P0test,0	
AIABM_safety.sst	Standard addressed safety related message
!AIABM,1,1,2,000001005,1,12,D5CD,0	
AIABM_4_bin.sst	Set of 4 addressed binary messages
!AIABM,1,1,3,000008001,1,6,06P0test,0 !AIABM,1,1,0,000008001,2,6,06P0test,0 !AIABM,1,1,1,000008001,1,6,06P0test,0 !AIABM,1,1,2,000008001,2,6,06P0test,0	
AIABM_4_safety.sst	Set of 4 addressed safety related messages
!AIABM,1,1,0,000001005,1,12,D5CD,0 !AIABM,1,1,1,000001005,1,12,D5CD,0 !AIABM,1,1,2,000001005,1,12,D5CD,0 !AIABM,1,1,3,000001005,1,12,D5CD,0	
AIBBM_bin.sst	Standard binary broadcast message
!AIBBM,1,1,6,1,8,06P0test,0	
AIBBM_safety.sst	Standard safety related broadcast message
!AIBBM,1,1,6,1,14,D5CD,0	
AIBBM_5_bin.sst	Set of 5 binary broadcast messages

!AIBBM,1,1,7,0,8,06P0test1,0 !AIBBM,1,1,8,0,8,06P0test2,0 !AIBBM,1,1,9,0,8,06P0test3,0 !AIBBM,1,1,0,0,8,06P0test4,0 !AIBBM,1,1,1,0,8,06P0test5,0	
AIBBM_5_safety.sst	Set of 5 safety related broadcast messages
!AIBBM,1,1,6,0,14,D5CDi,0 !AIBBM,1,1,7,0,14,D5CDj,0 !AIBBM,1,1,8,0,14,D5CDk,0 !AIBBM,1,1,9,0,14,D5CDl,0 !AIBBM,1,1,0,0,14,D5CDm,0	
AIBBM_bin_stuffing.sst	Special message for bit stuffing test
!AIBBM,1,1,6,1,8,06Qv>khvOP,4	
AIBBM_multi_bin.sst	Long 5 slot binary broadcast message
!AIBBM,4,1,6,2,8,06P0456789012345678901234567890123456789,0 !AIBBM,4,2,6,2,8,0123456789012345678901234567890123456789,0 !AIBBM,4,3,6,2,8,0123456789012345678901234567890123456789,0 !AIBBM,4,4,6,2,8,012345678901234567890123456789012345678901,4	
AIBBM_multi_safety.sst	Long 5 slot safety related broadcast message
!AIBBM,4,1,6,2,14,0123456789012345678901234567890123456789,0 !AIBBM,4,2,6,2,14,0123456789012345678901234567890123456789,0 !AIBBM,4,3,6,2,14,0123456789012345678901234567890123456789,0 !AIBBM,4,4,6,2,14,0123456789012345678901234567890123456789,0	
AIBBM_multi_bin_1.sst	Longer than 5 slots binary broadcast message, all bits 1
!AIBBM,4,1,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0 !AIBBM,4,2,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0 !AIBBM,4,3,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0 !AIBBM,4,4,1,1,8,wwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwwww,0	
AIBBM_ABM_17_5.sst	Set of 2 long messages 8 and 12 for message priority test
!AIBBM,4,1,6,2,8,06P0456789012345678901234567890123456789,0 !AIBBM,4,2,6,2,8,0123456789012345678901234567890123456789,0 !AIBBM,4,3,6,2,8,0123456789012345678901234567890123456789,0 !AIBBM,4,4,6,2,8,0123456789012345678901234567890123456789,0 !AIABM,4,1,2,000001005,1,12,0123456789012345678901234567890123456789,0 !AIABM,4,2,2,000001005,1,12,0123456789012345678901234567890123456789,0 !AIABM,4,3,2,000001005,1,12,0123456789012345678901234567890123456789,0 !AIABM,4,4,2,000001005,1,12,0123456789012345678901234567890123456789,0	
AIBBM_25.sst	25 broadcast message to check 20 slots per frame rule

!AIBBM,1,1,6,1,8,06P0test1,0	
!AIBBM,1,1,6,1,14,D5CD1,0	
!AIBBM,1,1,7,1,8,06P0test2,0	
!AIBBM,1,1,7,1,14,D5CD2,0	
!AIBBM,1,1,8,1,8,06P0test3,0	
!AIBBM,1,1,8,1,14,D5CD3,0	
!AIBBM,1,1,9,1,8,06P0test4,0	
!AIBBM,1,1,9,1,14,D5CD4,0	
!AIBBM,1,1,0,1,8,06P0test5,0	
!AIBBM,1,1,0,1,14,D5CD5,0	
!AIBBM,1,1,1,1,8,06P0test6,0	
!AIBBM,1,1,1,1,14,D5CD6,0	
!AIBBM,1,1,2,1,8,06P0test7,0	
!AIBBM,1,1,2,1,14,D5CD7,0	
!AIBBM,1,1,3,1,8,06P0test8,0	
!AIBBM,1,1,3,1,14,D5CD8,0	
!AIBBM,1,1,4,1,8,06P0test9,0	
!AIBBM,1,1,4,1,14,D5CD9,0	
!AIBBM,1,1,5,1,8,06P0test10,0	
!AIBBM,1,1,5,1,14,D5CD10,0	
!AIBBM,1,1,6,1,8,06P0test11,0	
!AIBBM,1,1,6,1,14,D5CD11,0	
!AIBBM,1,1,7,1,8,06P0test12,0	
!AIBBM,1,1,7,1,14,D5CD12,0	
!AIBBM,1,1,7,1,8,06P0test13,0	
AIAIR_5.sst	Simple interrogation for msg 5
\$AIAIR,000001005,5,,,,,	
AIAIR_35_5.sst	Interrogation of msg 3 and 5 from ID1 and msg 5 from ID2
\$AIAIR,000005002,3,,5,,000007001,5,,	
AIS_DSI.sst	Test that EUT ignores command to send a DSC msg
\$AIDSI,1,1,2210393930,,,,03,,11,,	

B.1.4 Regional operational settings (ACA)

Regional operational settings (ACA)	
File name	Description
Sentences	
AIACA_Region_in_ch86.SST	Region around standard position with test channels
\$ECACA,2,5400.0,N,01030.0,E,5300.0,N,00930.0,E,4,2086,0,1086,0,0,1,, ,	
AIACA_Region_out_ch74_76.SST	Region not including standard position with channels 74 and 76
\$ECACA,2,5500.0,N,00900.0,E,5400.0,N,00800.0,E,4,0074,0,0076,0,0,1,, ,	
AIACA_Region_17_3_SW.SST	2 adjacent regions in SW quadrant. for test 17.3

\$ECACA,2,3000.00,S,01200.00,W,3100.00,S,01300.00,E,1,2081,0,1081,0,0,1,, , \$ECACA,2,3000.00,S,01100.00,W,3100.00,S,01200.00,E,1,2082,0,1082,0,0,1,, ,	
AIACA_8_Regions_17_7_1.SST	8 different regions to fill quickly the complete list, for test 17.7.1
\$ECACA, ,5400.00,N,01030.00,E,5300.00,N,00930.00,E,2,72,0,74,0,0,1,, , \$ECACA, ,5200.00,N,00700.00,E,5100.00,N,00600.00,E,2,2060,0,1060,0,0,1,, , \$ECACA, ,5200.00,N,00900.00,E,5100.00,N,00800.00,E,2,2061,0,1061,0,0,1,, , \$ECACA, ,5200.00,N,01100.00,E,5100.00,N,01000.00,E,2,2062,0,1062,0,0,1,, , \$ECACA, ,5200.00,N,01300.00,E,5100.00,N,01200.00,E,2,2063,0,1063,0,0,1,, , \$ECACA, ,5200.00,N,01500.00,E,5100.00,N,01400.00,E,2,2064,0,1064,0,0,1,, , \$ECACA, ,5100.00,N,00800.00,E,5000.00,N,00700.00,E,2,2065,0,1065,0,0,1,, , \$ECACA, ,5100.00,N,01000.00,E,5000.00,N,00900.00,E,2,2066,0,1066,0,0,1,, ,	
AIACA Region 17_7_2 c.SST	Region for test 17.7.2 c
\$ECACA,2,5430.00,N,01200.00,E,5300.00,N,01100.00,E,4,2083,0,1083,0,0,1,, ,	
AIACA Region 17_7_2 f.SST	Region for test 17.7.2 f
\$ECACA,2,5300.00,N,01320.00,E,5200.00,N,01200.00,E,4,2081,0,1081,0,0,1,, ,	
AIACA Region 17_7_4.SST	4 adjacent regions for test 17.7.2 f
\$ECACA,2,5800.00,N,00800.00,E,5700.00,N,00700.00,E,4,2081,0,1081,0,0,1,, , \$ECACA,2,5800.00,N,00900.00,E,5700.00,N,00800.00,E,4,2082,0,1082,0,0,1,, , \$ECACA,2,5700.00,N,00800.00,E,5600.00,N,00700.00,E,4,2083,0,1083,0,0,1,, , \$ECACA,2,5700.00,N,00900.00,E,5600.00,N,00800.00,E,4,2084,0,1084,0,0,1,, ,	
AIACA Region lon180.SST	Special region at longitude = 180°
\$ECACA,2,0100.00,N,17900.00,W,0100.00,S,17900.00,E,2,0074,0,0076,0,0,1,, ,	
AIACA Set channel.SST	Set channel command, without area co-ordinates
\$ECACA, ,N, ,W, ,N, ,W,2,2074,0,2076,0,0,1,, ,	
Request_ACA.SST	Request of ACA sentences from EUT
\$ECAIQ,ACA	

B.1.5 Long range requests

The of long range requests include a MMSI number which is changed according to the actual MMSI number the EUT

Long Range (LRI, LRF)

File name	Description
Sentences	
LRI_LRF_MMSI_all.sst	Request of all data addressed by MMSI
\$LRLRI,5,0,211003000,000002002,,,,,,,,, \$LRLRF,5,211003000,VTS,ABCEFIOPUW,	
LRI_LRF_area_CEF.sst	Request of some data addressed by area
\$LRLRI,6,1,211003000,,6000.0,N,2000.0,E,4000.0,N,0500.0,E \$LRLRF,6,211003000,VTS,CEF,	
LRI_LRF_out_area_CEF.sst	Request of some data addressed by area, standard position not in area
\$LRLRI,6,1,211003000,,6000.0,N,1500.0,E,5500.0,N,0800.0,E \$LRLRF,6,211003000,VTS,CEF,	
LRI_LRF_area_at_180_CEF.sst	Request of some data addressed by area, area around longitude of 180° and latitude of 0°
\$LRLRI,6,1,211003000,,0500.0,N,17500.0,W,0500.0,S,17500.0,E \$LRLRF,6,211003000,VTS,CEF,	
LRF_ack_all.sst	For external confirmation of request
\$LRLRF,5,211003000,VTS,ABCEFIOPUW,	

B.2 DSC sentences

The sentences are listed as they are applied to the DSC Testbox for transmission of DSC test calls. There is a special format used based on an earlier definition of NMEA private sentences.

The frame for transmitting a DSC call is:

\$PDEBT,CCDSC,T,00014600<call content>FF

The <call content> has to be entered in Hex code, 2 hex numbers for each 7 bit DSC symbol, without spaces, beginning with the format specifiere which included only ones. The DSC coding and addition of redundance (3 bit symbol redundance and symbol repetition) are done by the test box. The content description of the calls is available on request.

The DSC sentences include MMSI number which is changed according to the actual MMSI number the EUT

DSC Sentences	
File name	Description
Sentences	

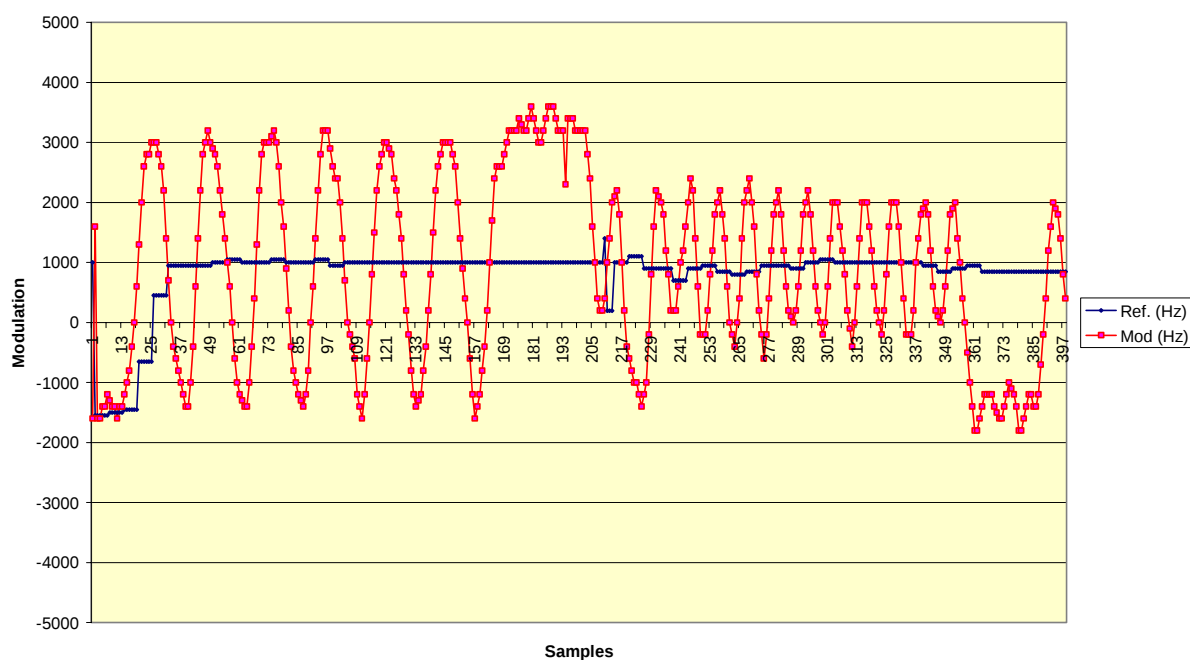
BUNDESAMT FÜR
SEESCHIFFFAHRT
UND
HYDROGRAPHIE

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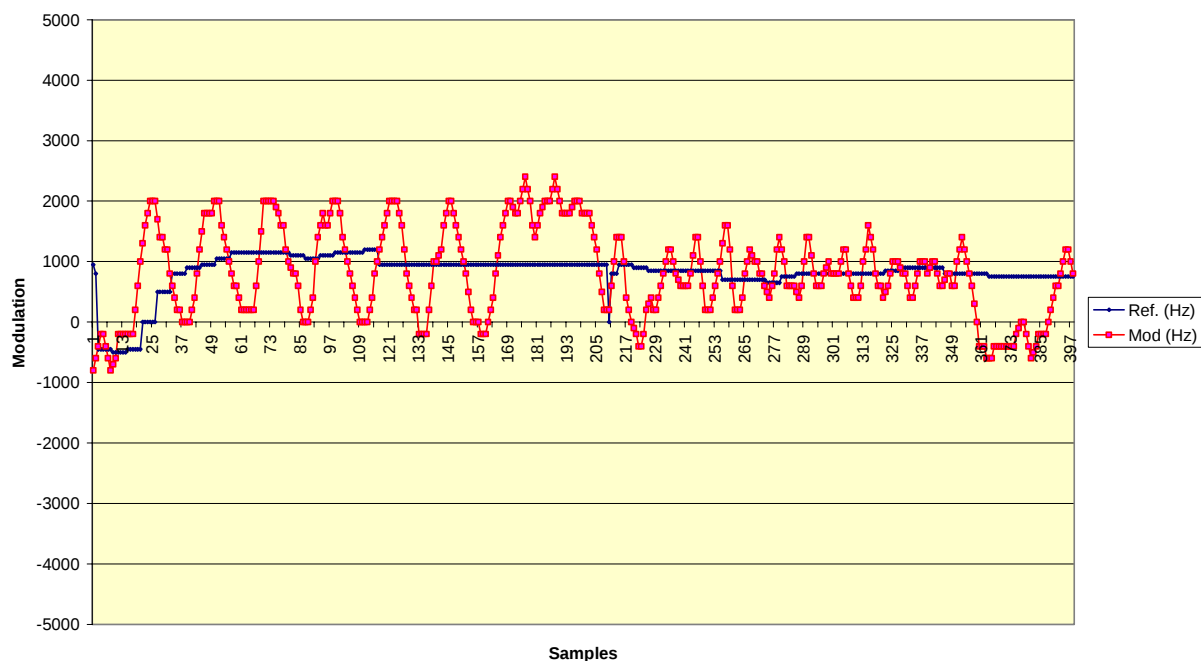
Annex C test diagrams

C.1 GMSK modulation 12.5 and 25 kHz bandwidth

15.12.04 Ba - McMurdo M-2, 25 kHz, RX A, ch 2084

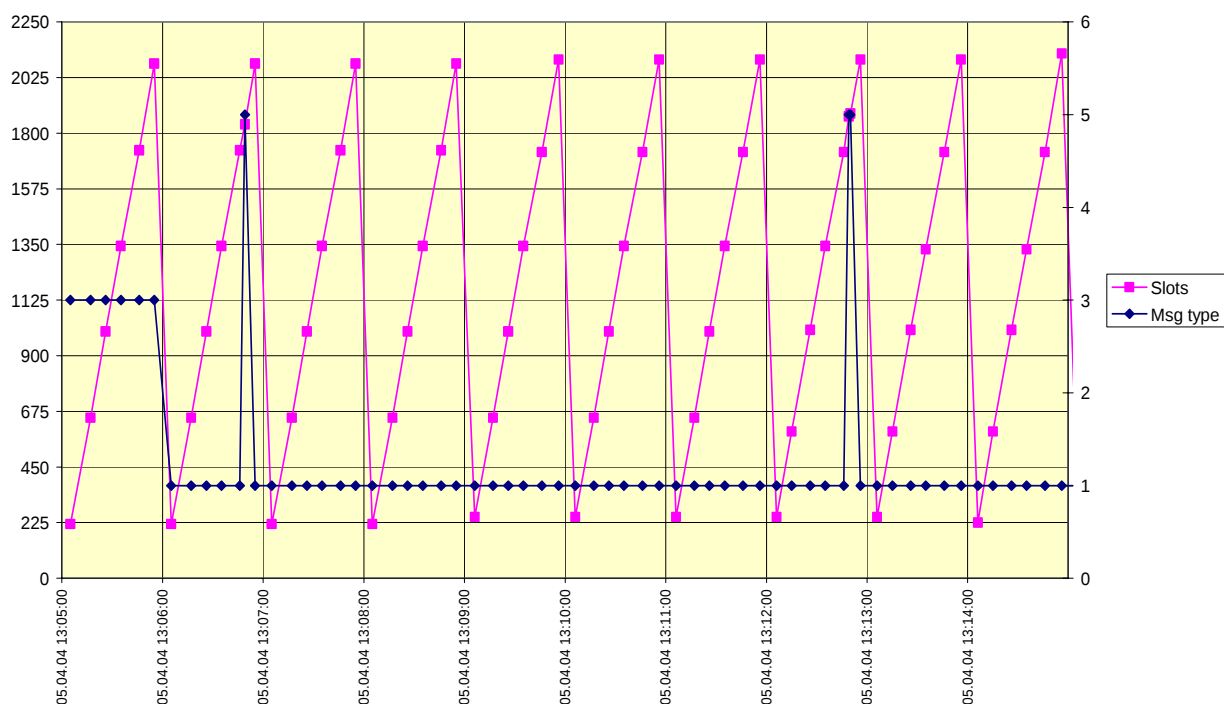


15.12.04 Ba - McMurdo M-2, 12.5 kHz, RX A, ch 2084

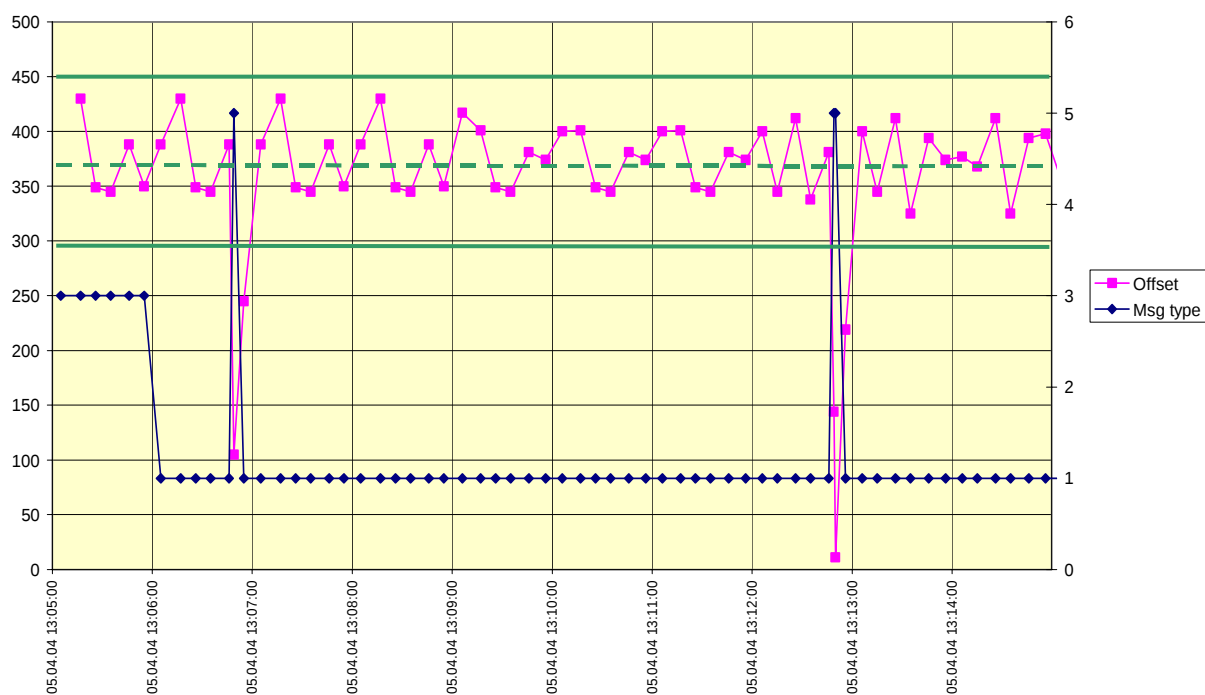


C.2 Network entry phase

05.04.04 - McMurdo M-2 - 16.6.1 - Slot allocation at Network entry

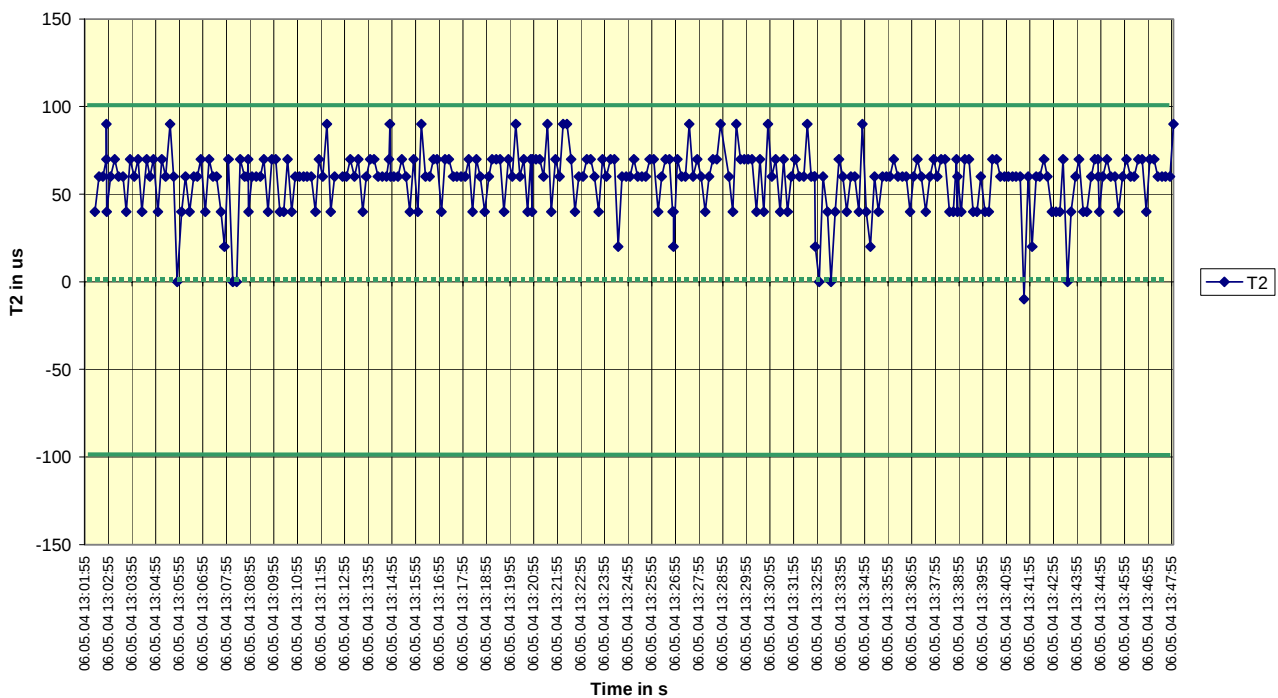


05.04.04 - McMurdo M-2 - 16.6.1 - Slot offsets at Network entry

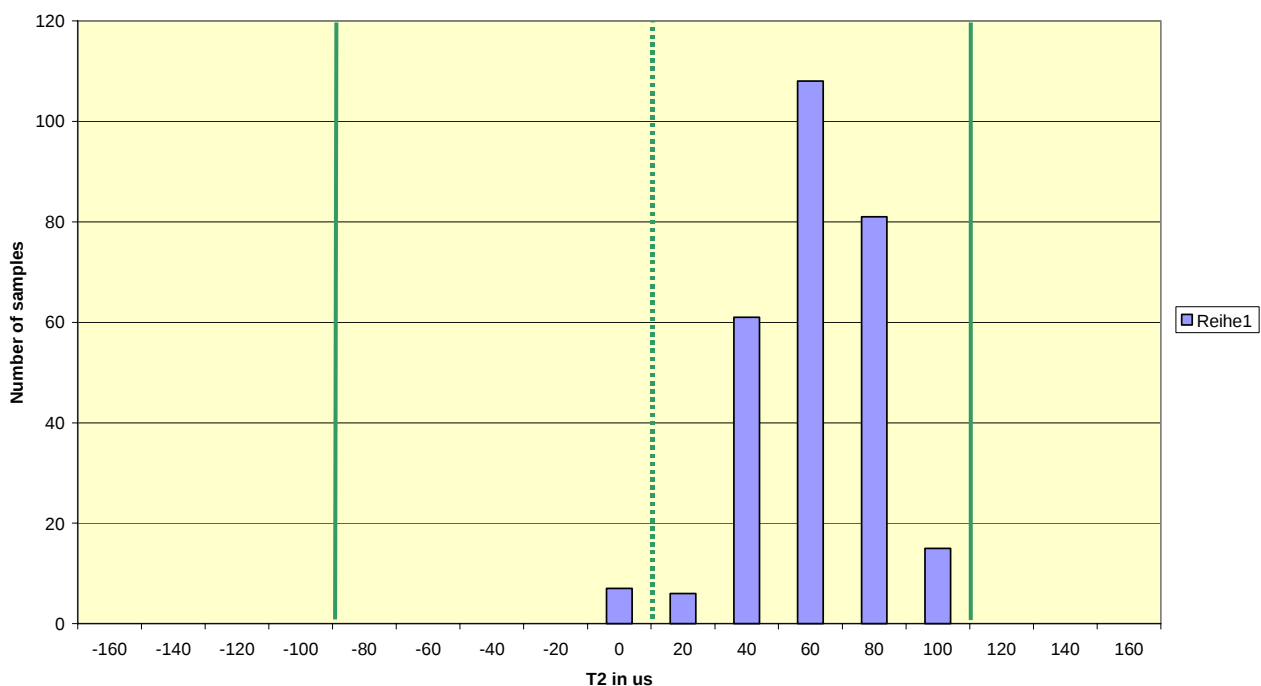


C.3 Sync Jitter

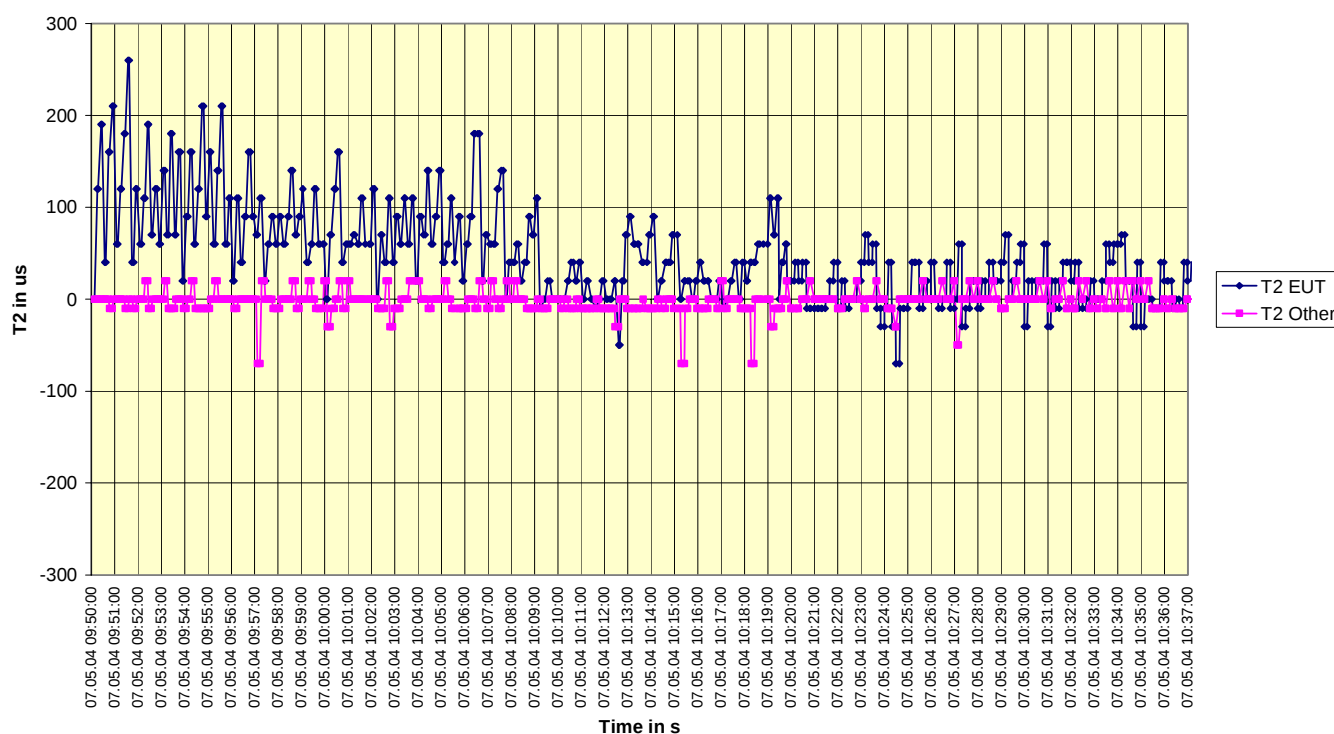
07.05.04 - McMurdo M-2 - 16.3 - Sync jitter deviation vs. time in sync mode 0



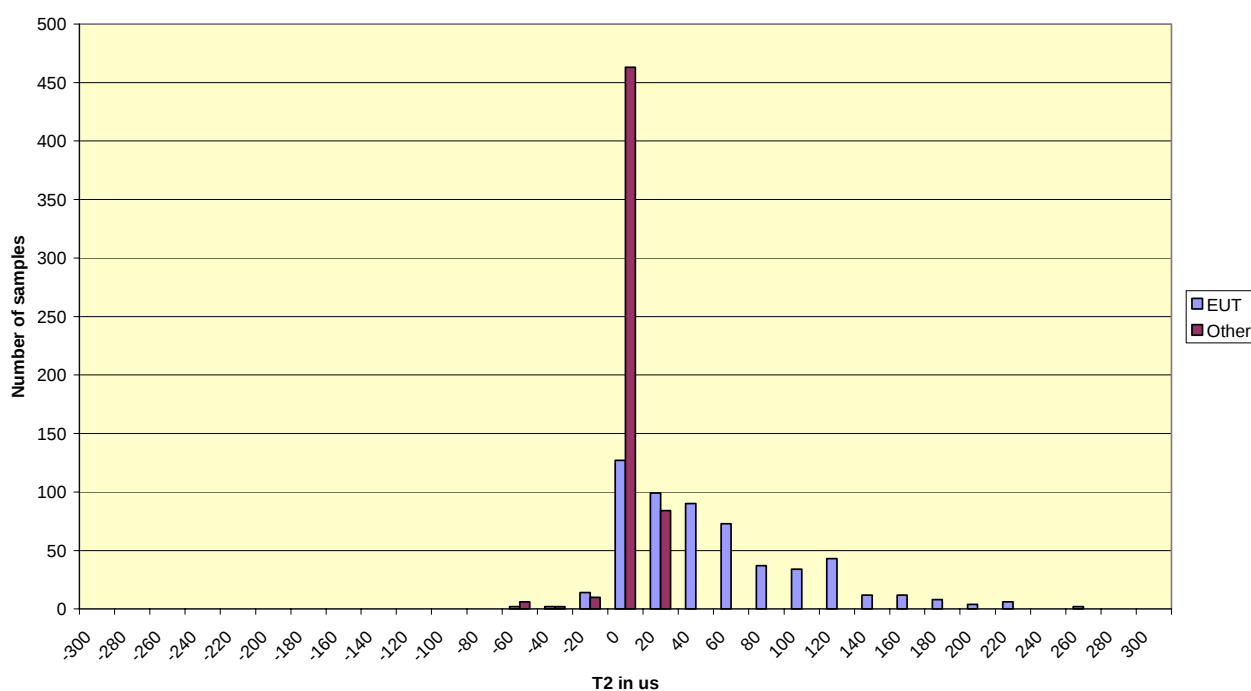
07.05.04 - McMurdo M-2 - 16.3 - Sync jitter deviation histogram in sync mode 0



07.05.04 - McMurdo M-2 - 16.3 - Sync jitter deviation vs. time in sync mode 1

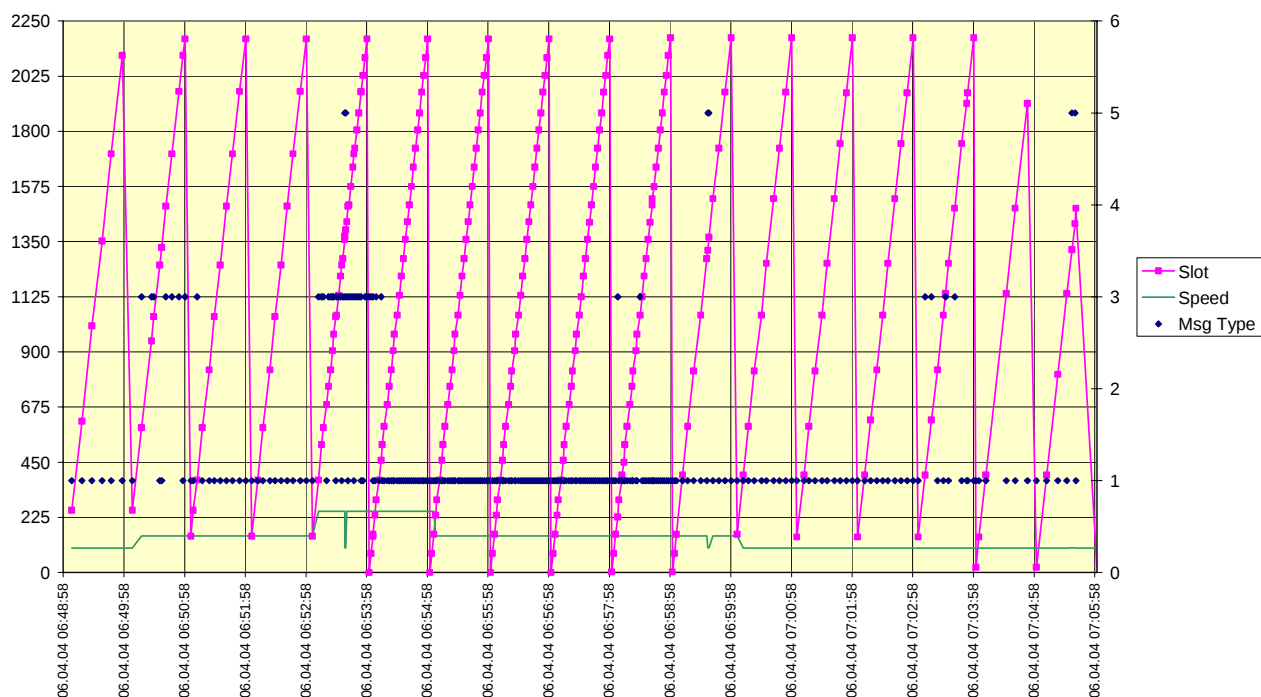


07.05.04 - McMurdo M-2 - 16.3 - Sync jitter deviation histogram in sync mode 1



C.4 Reporting rate by speed

06.04.04 - McMurdo M-2 - 14.4.1 - Reporting rate by speed - Slots

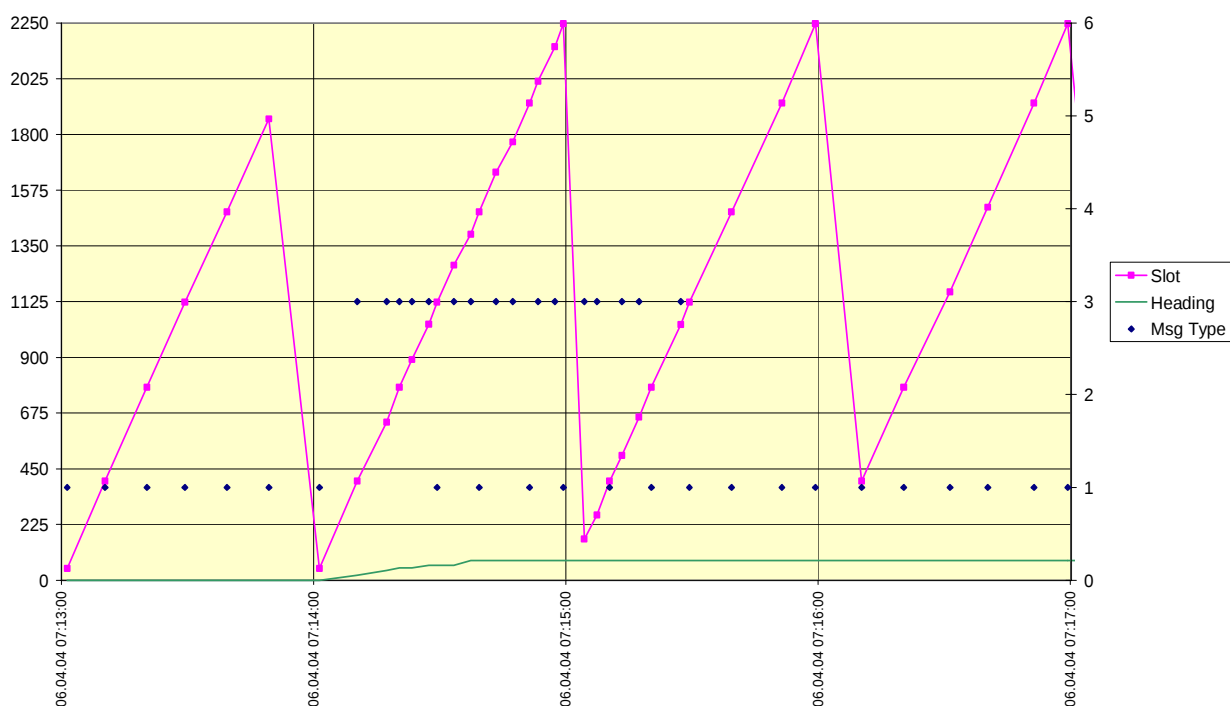


06.04.04 - McMurdo M-2 - 14.4.1 - Reporting rate by speed - Slot offset

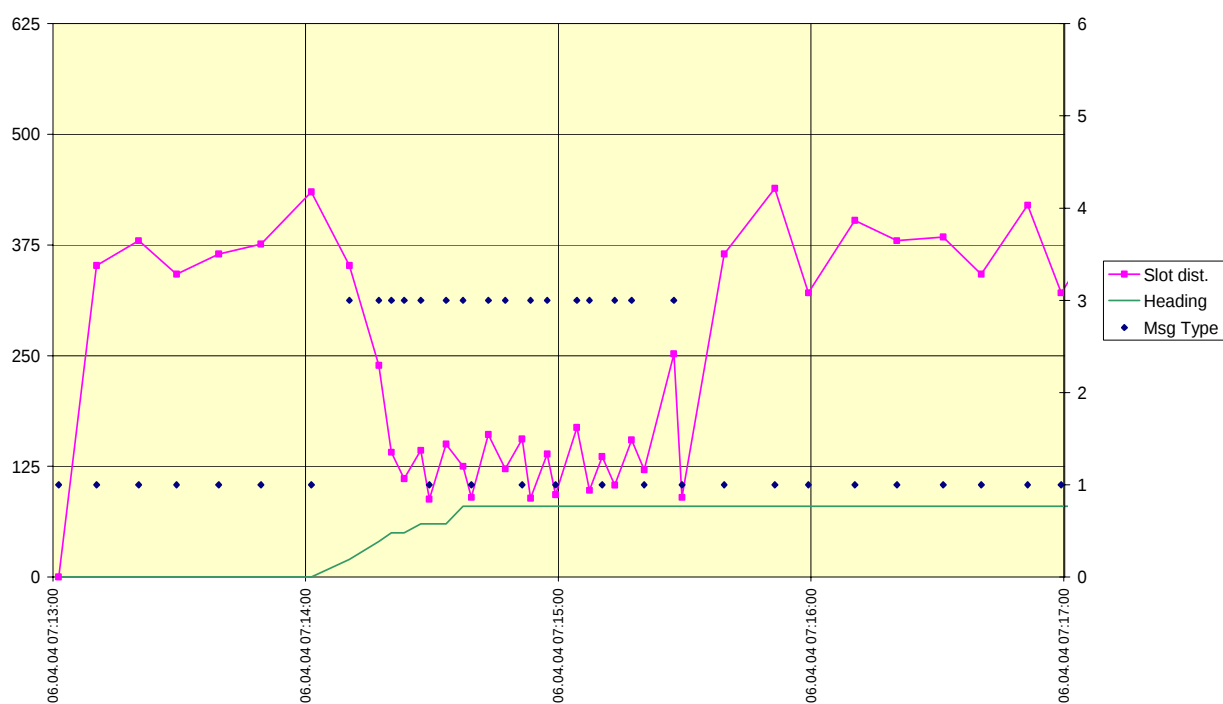


C.5 Report rate by heading

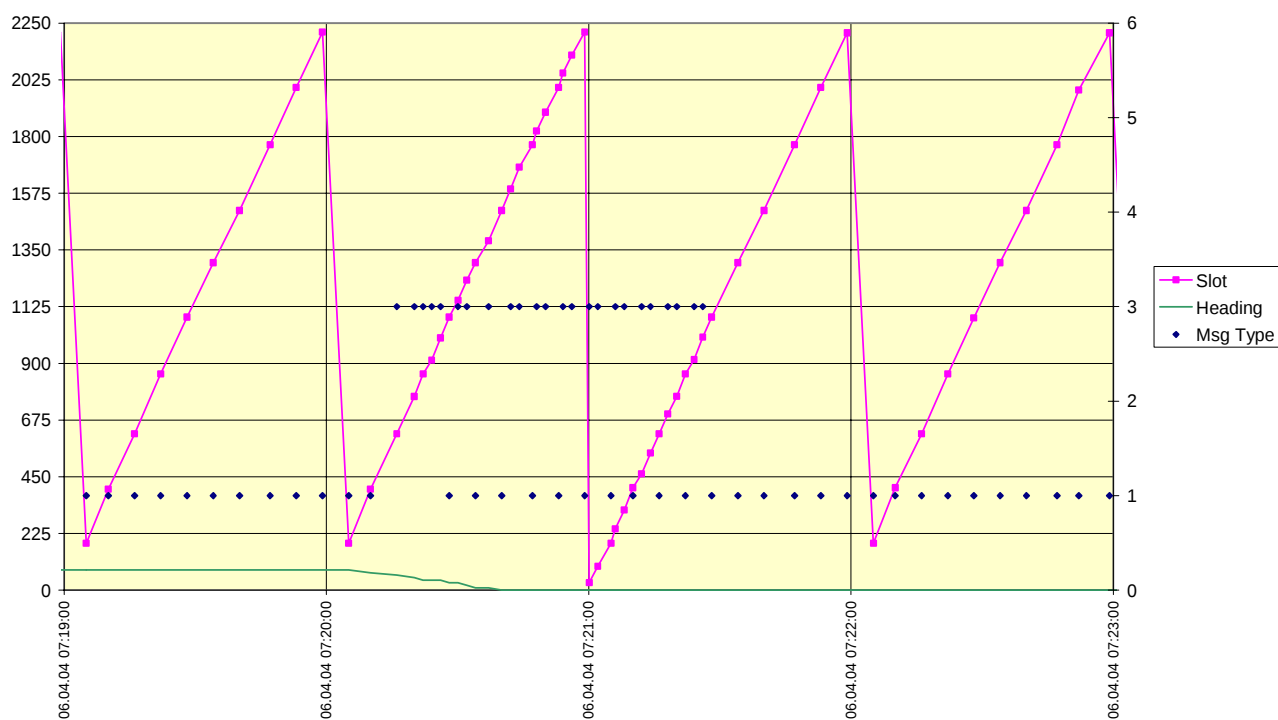
17.02.04 - McMurdo M-2 - 14.4.1 - Reporting rate change by heading at 10 kn - Slots



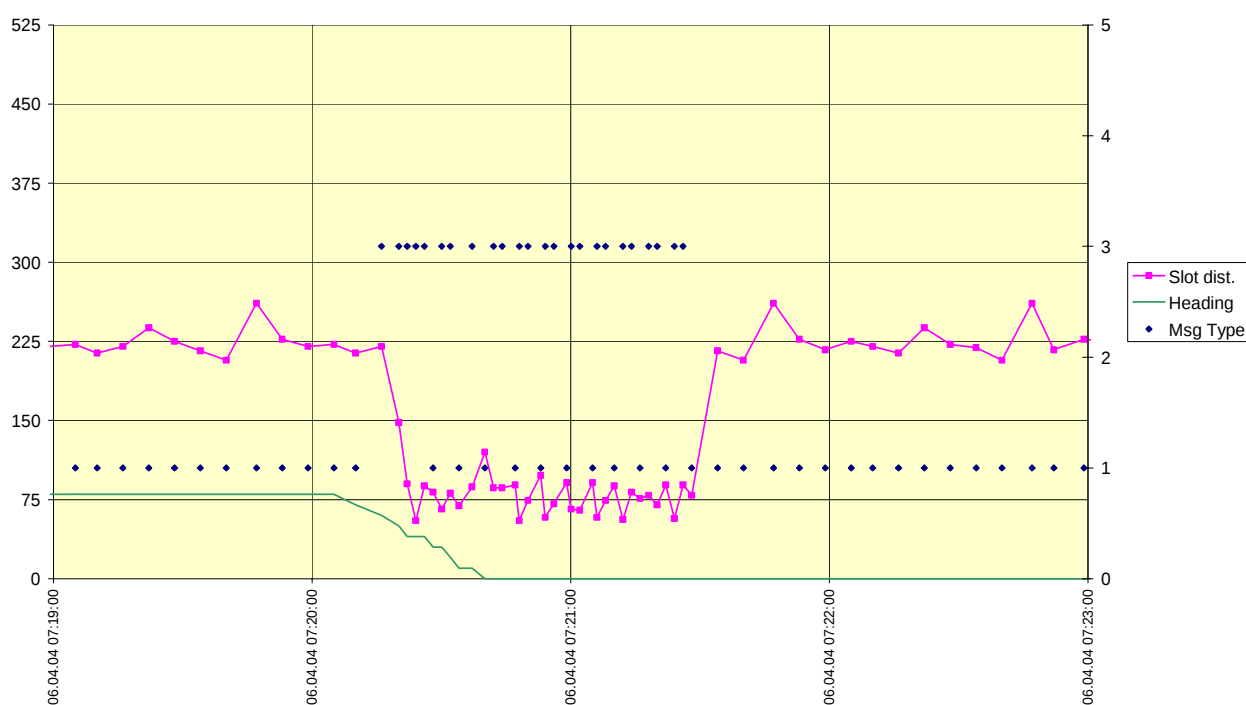
17.02.04 - McMurdo M-2 - 14.4.1 - Reporting rate change by heading at 10 kn - Slot offset



17.02.04 - McMurdo M-2 - 14.4.1 - Reporting rate change by heading at 15 kn - Slots

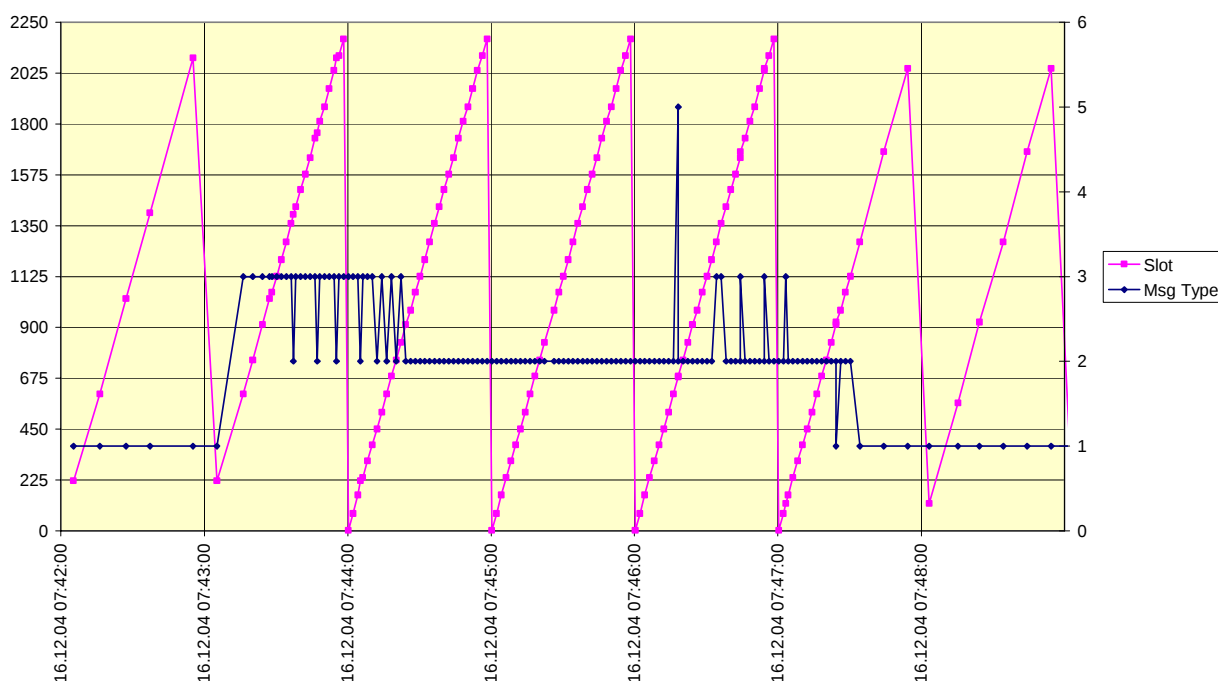


17.02.04 - McMurdo M-2 - 14.4.1 - Reporting rate change by heading at 15 kn - Slot offset

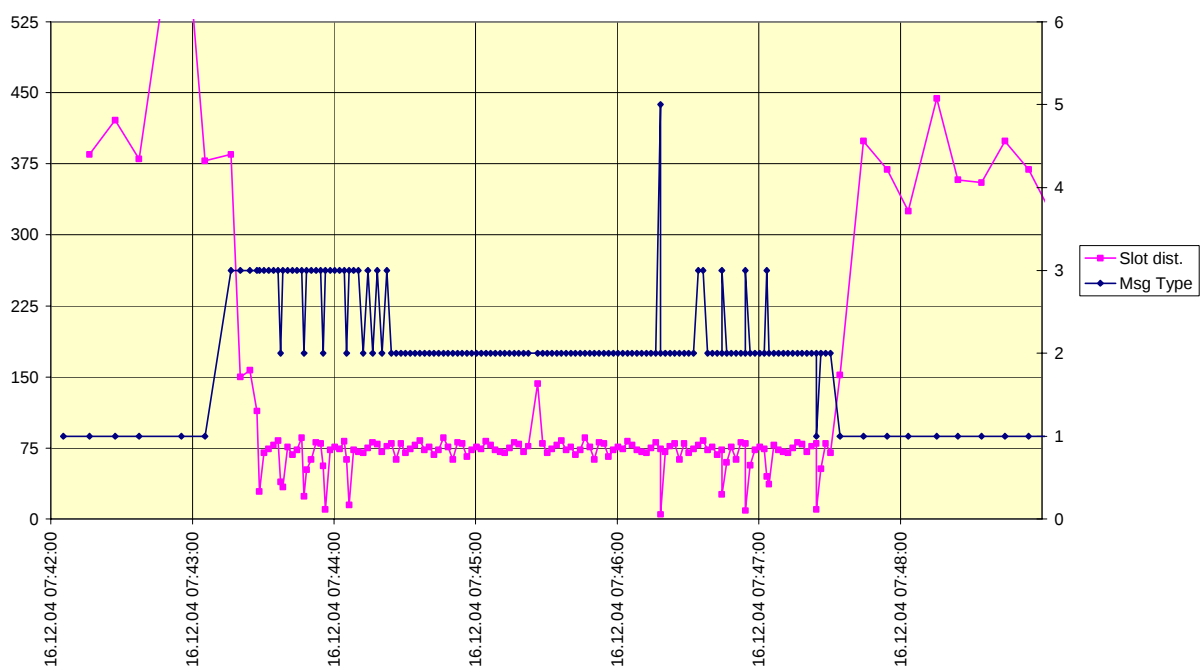


C.6 Assigned mode / rate assignment

16.12.04 - McMurdo M-2 - 16.6.4.2 - Rate assignment - Slots

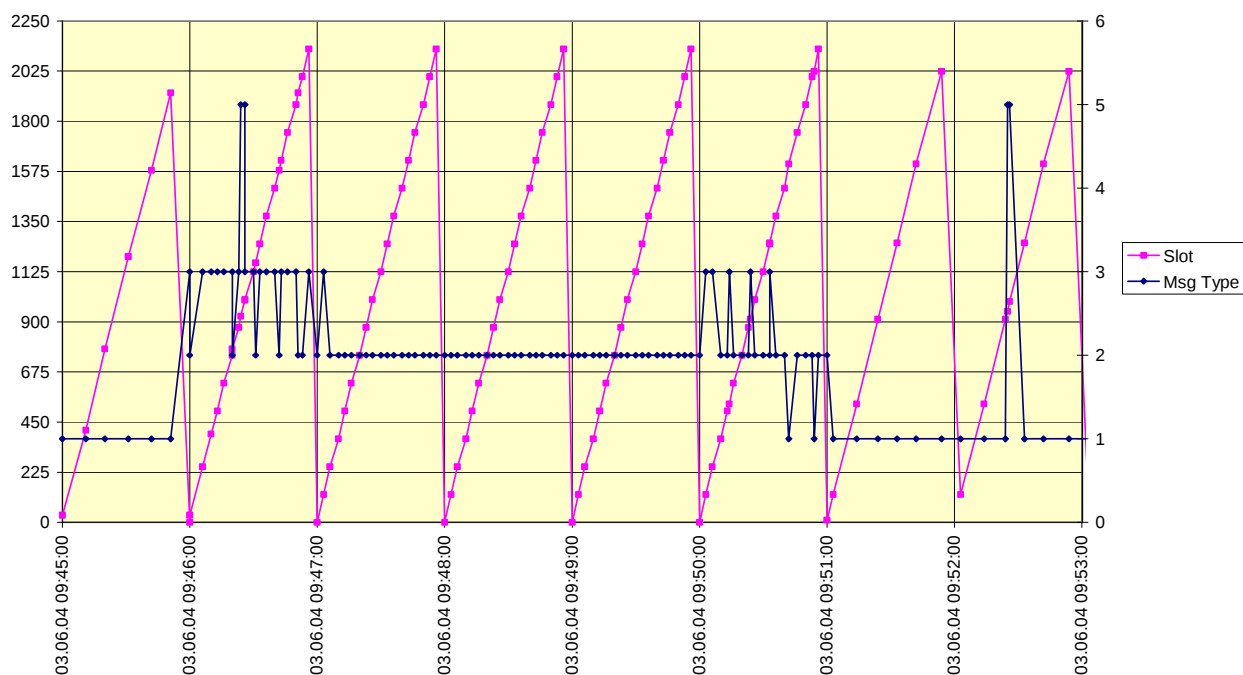


16.12.04 - McMurdo M-2 - 16.6.4.2 - Rate assignment - Slot offset

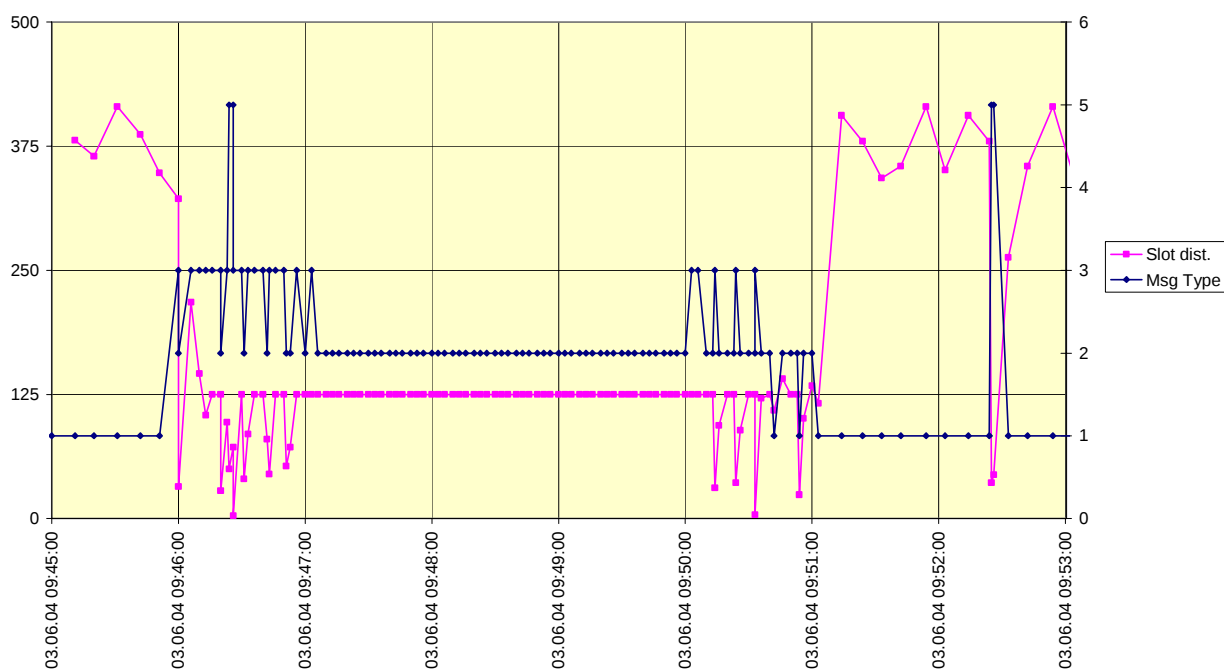


C.7 Assigned mode / slot assignment

03.06.04 - McMurdo M-2 - 16.6.4.2 - Slot assignment - Slots

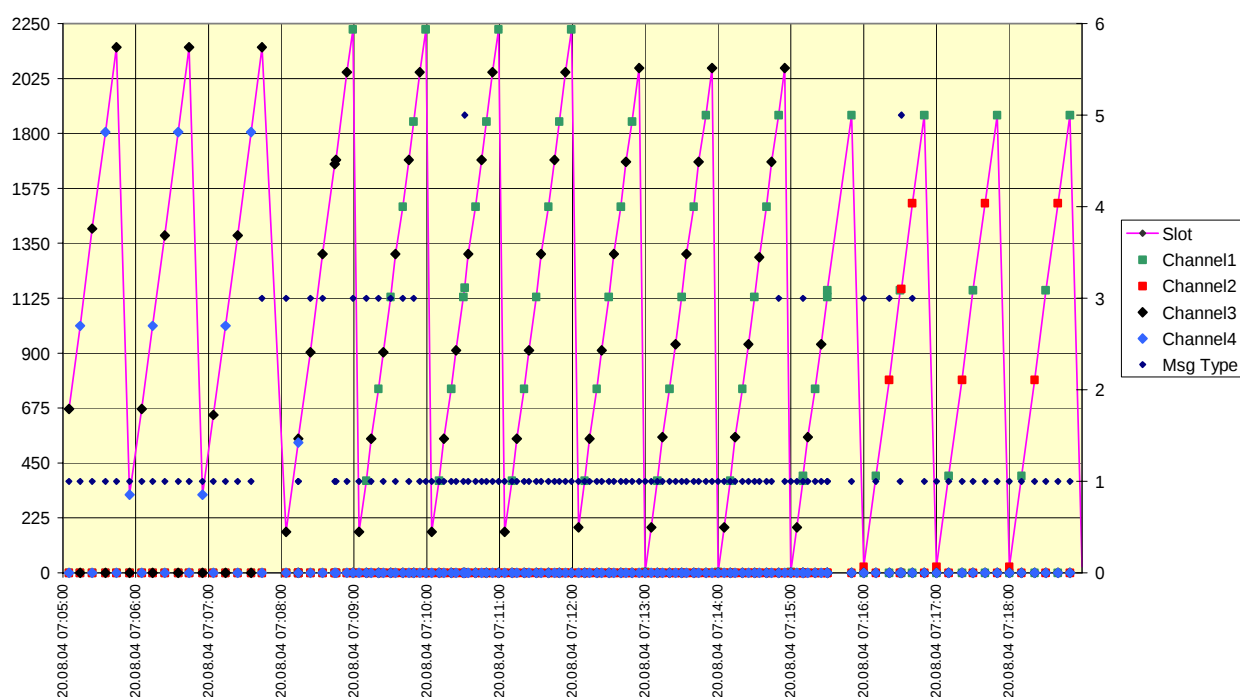


03.06.04 - McMurdo M-2 - 16.6.4.2 - Slot assignment - Slot offset

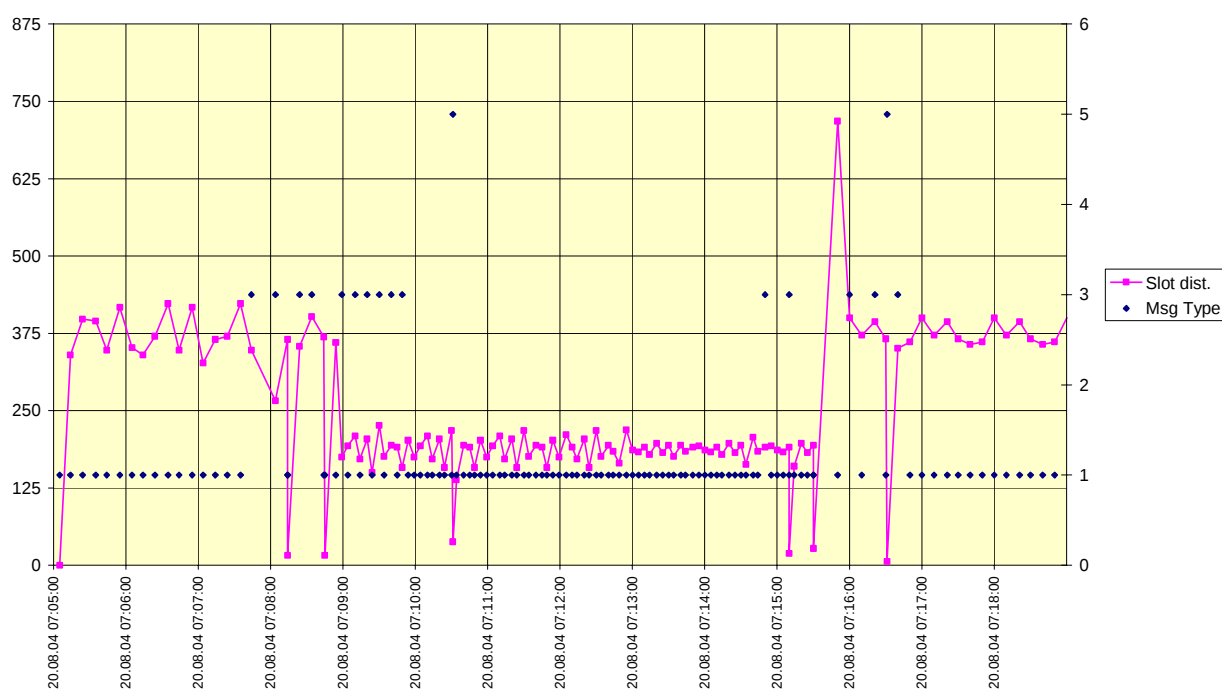


C.8 Area entry through transitional zone

20.08.04 - McMurdo M-2 - 17.2 - Area Entry - Slots



20.08.04 - McMurdo M-2 - 17.2 - Area Entry - Slot offset

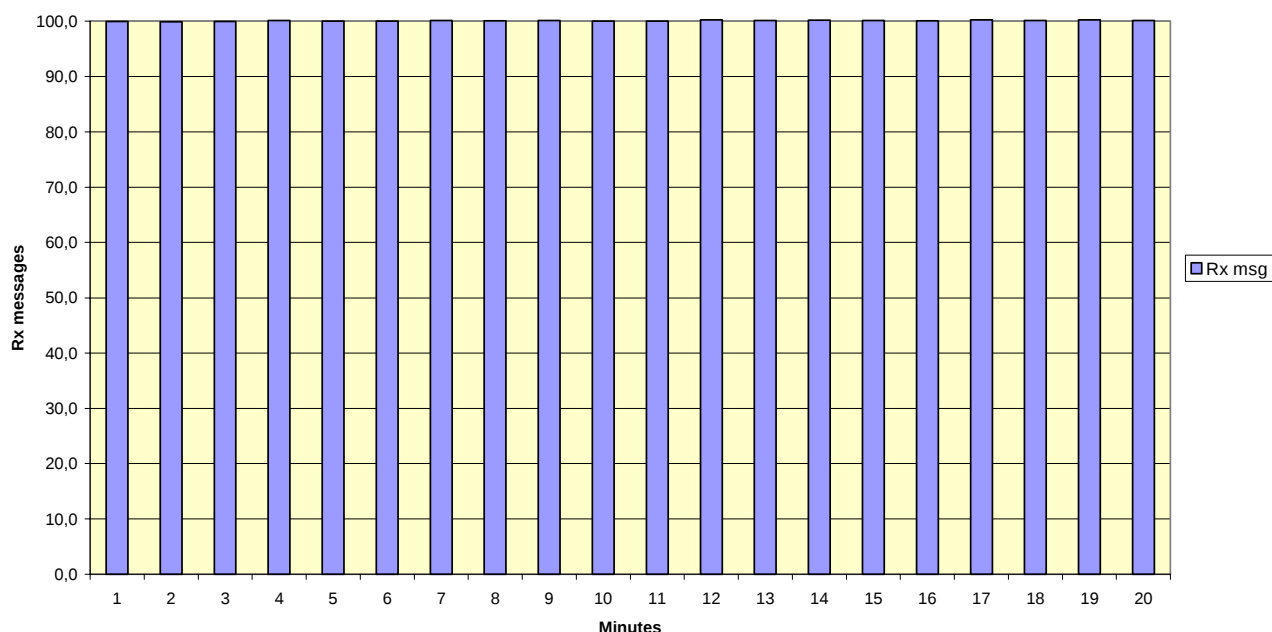


C.9 High speed output performance

18.06.04 - McMurdo M2 - 19.7 PI output performance

Result: Average = 100%

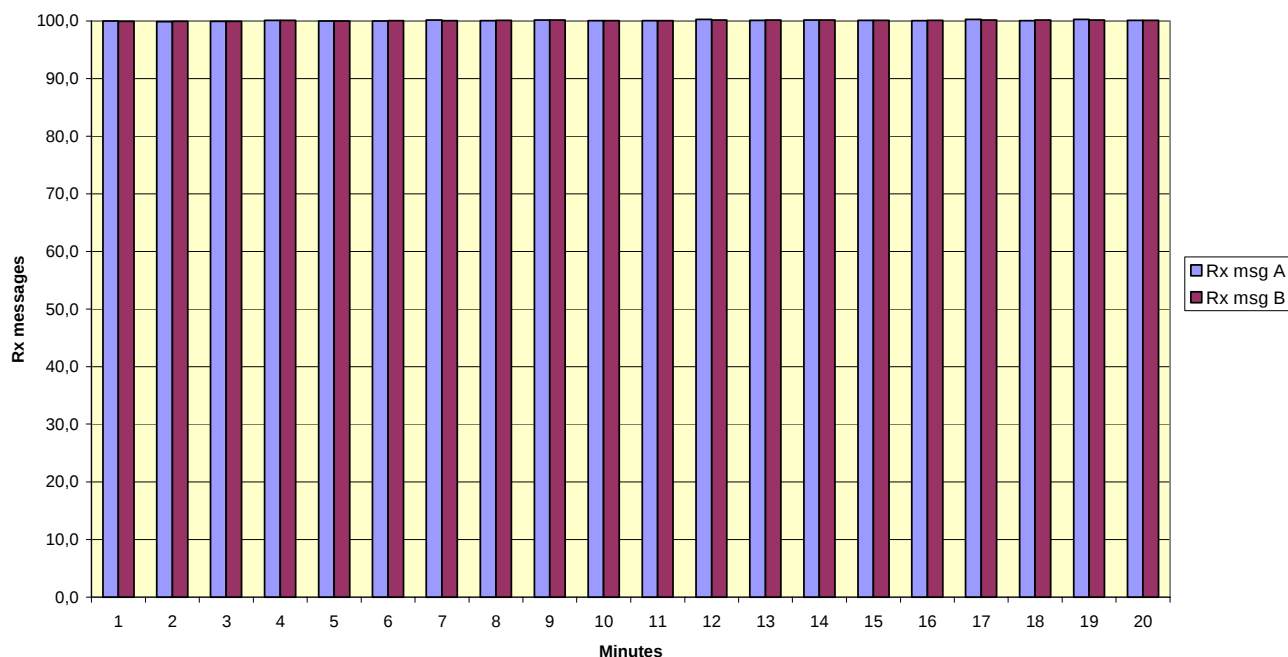
Ch A: 2084 Ch B: 2086



18.06.04 - McMurdo M2 - 19.7 PI output performance

Result: Average = A= 100%, B=100%

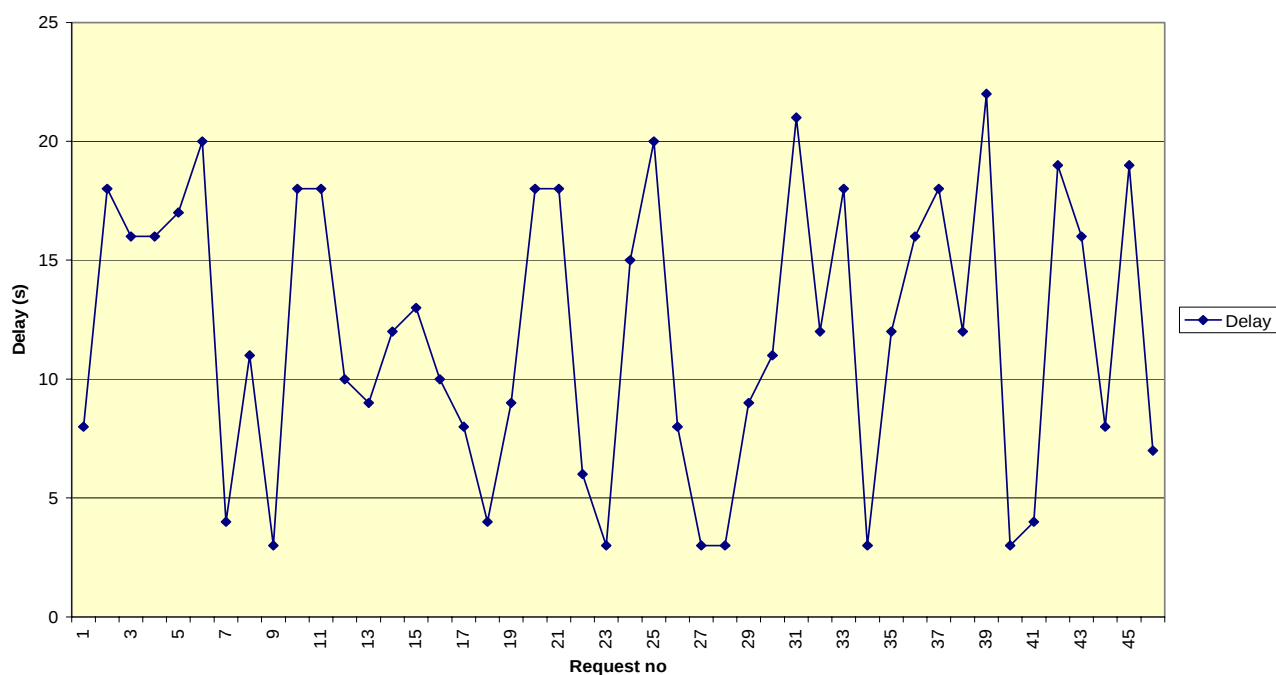
Ch A: 2084 Ch B: 2086



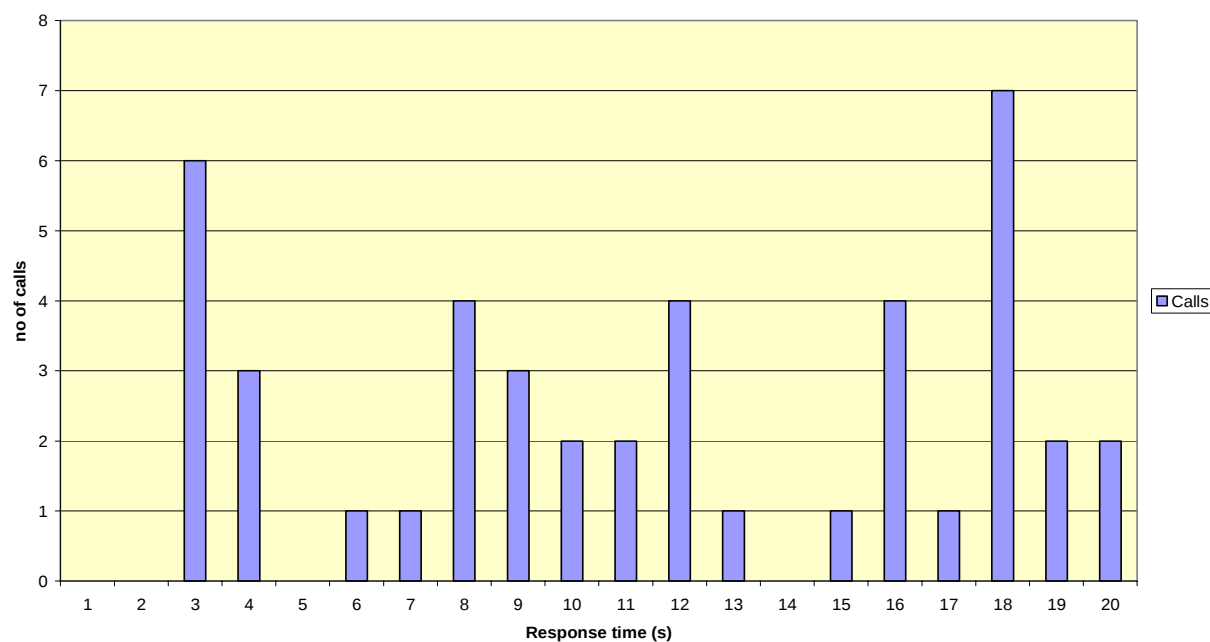
C.10DSC response time

see test clause 8.4

18.06.04 - McMurdo M2 - Area call response delay time



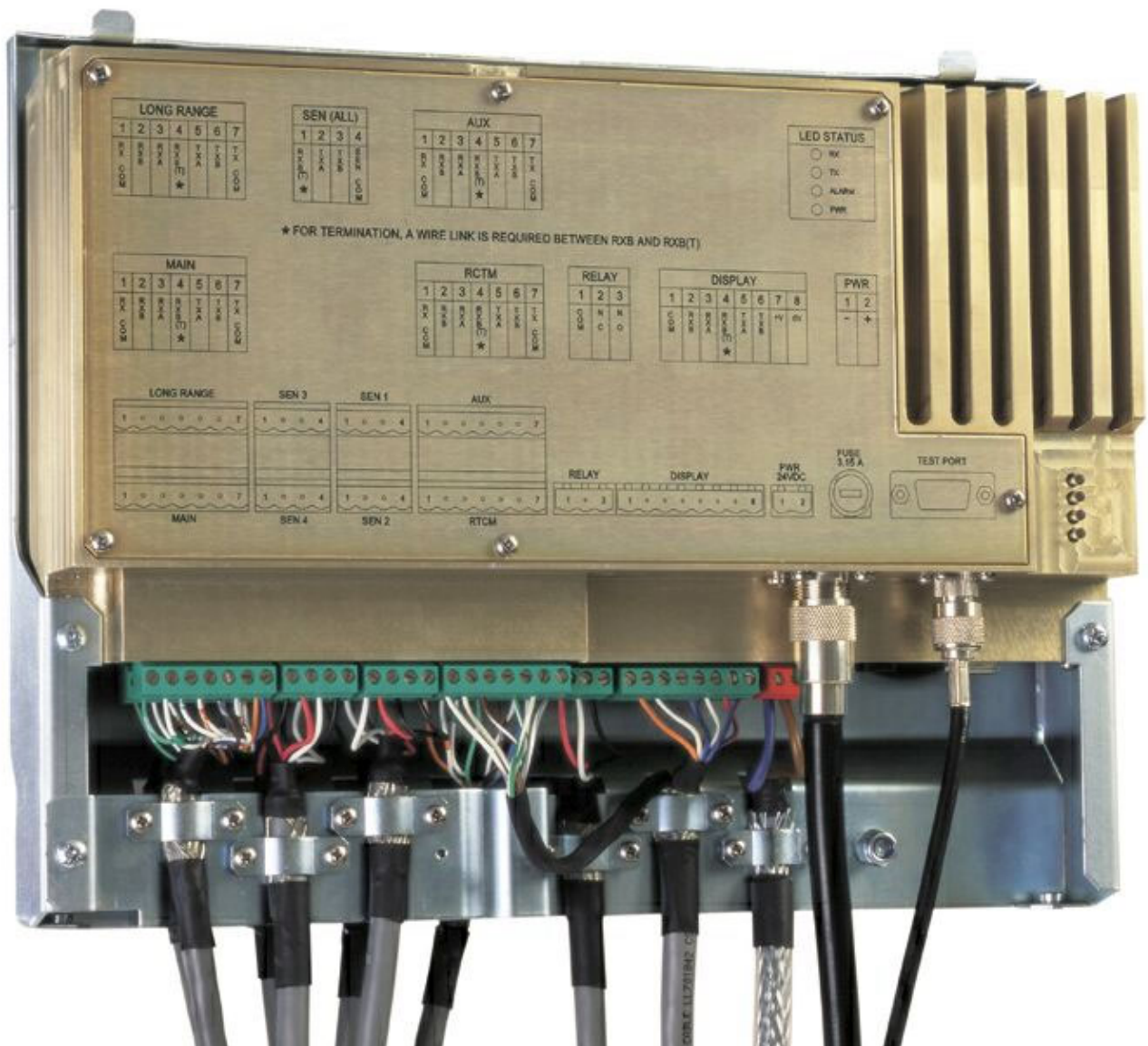
18.06.04 - McMurdo M2 - Area call response time

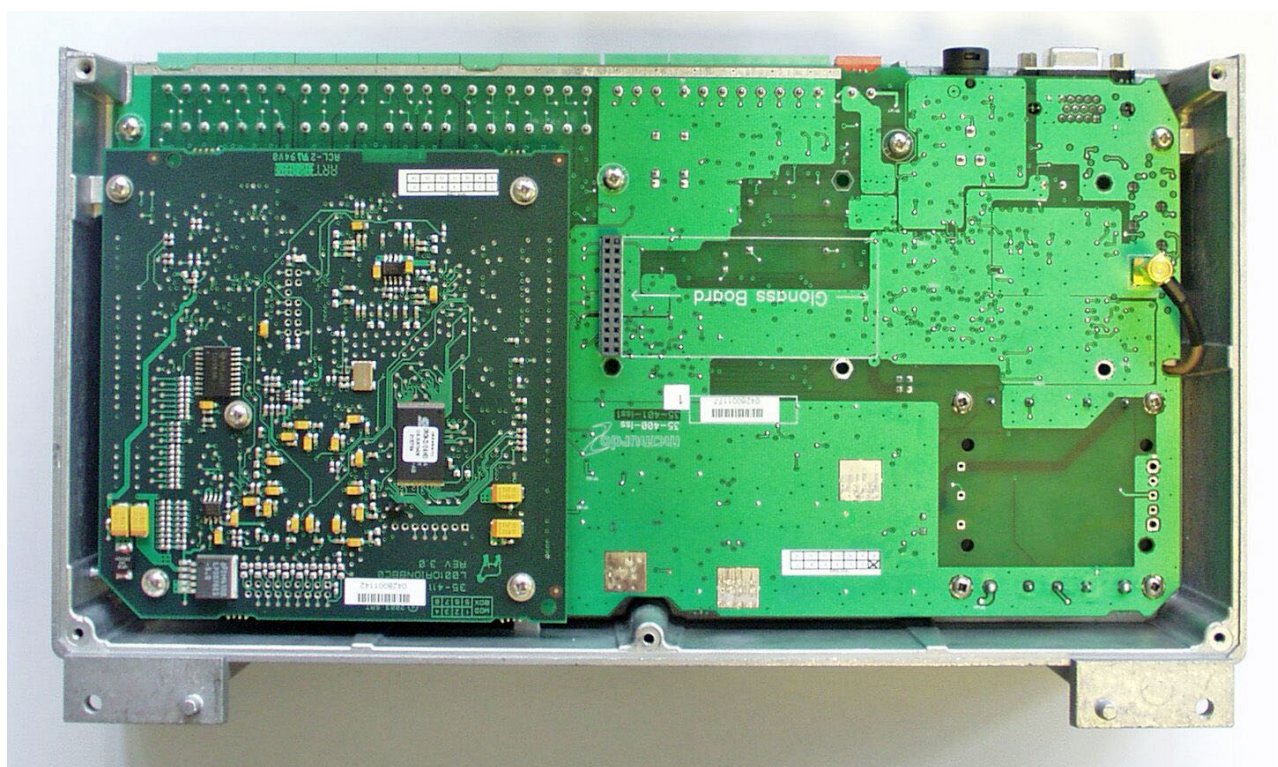
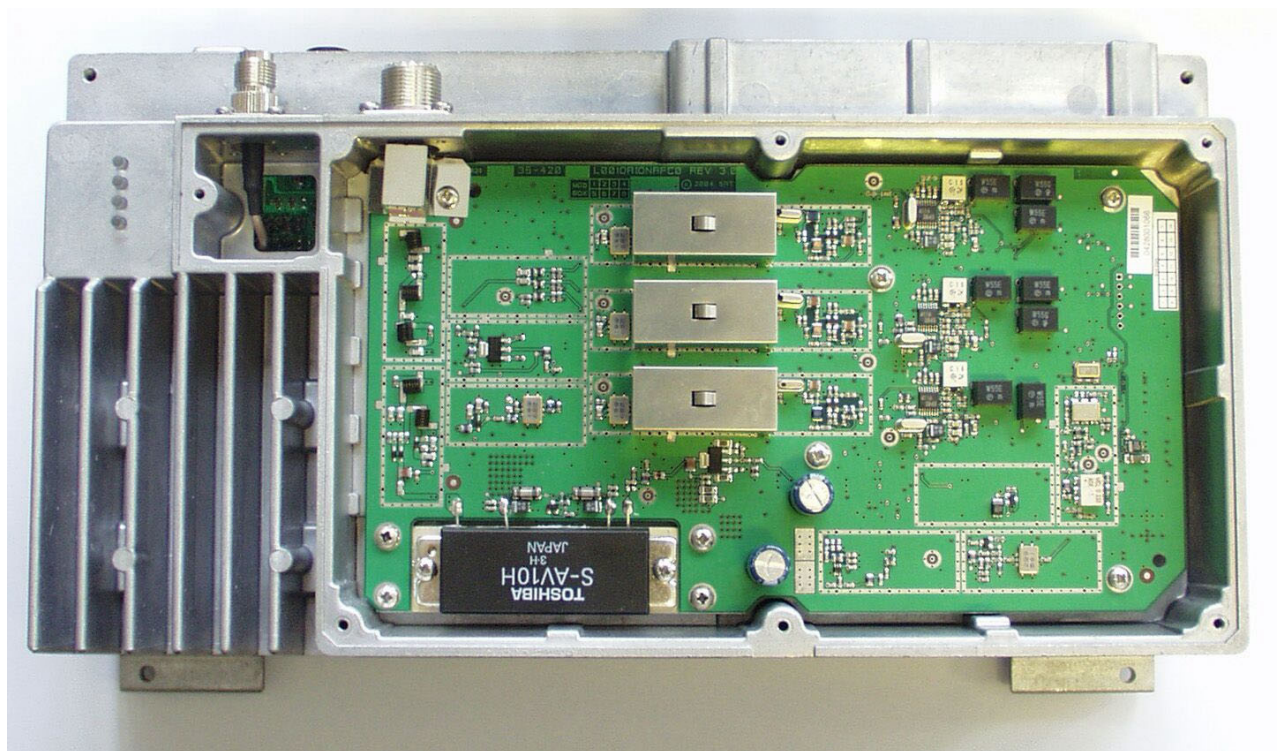


Annex D Photos of equipment under test

D.1 Transponder Unit

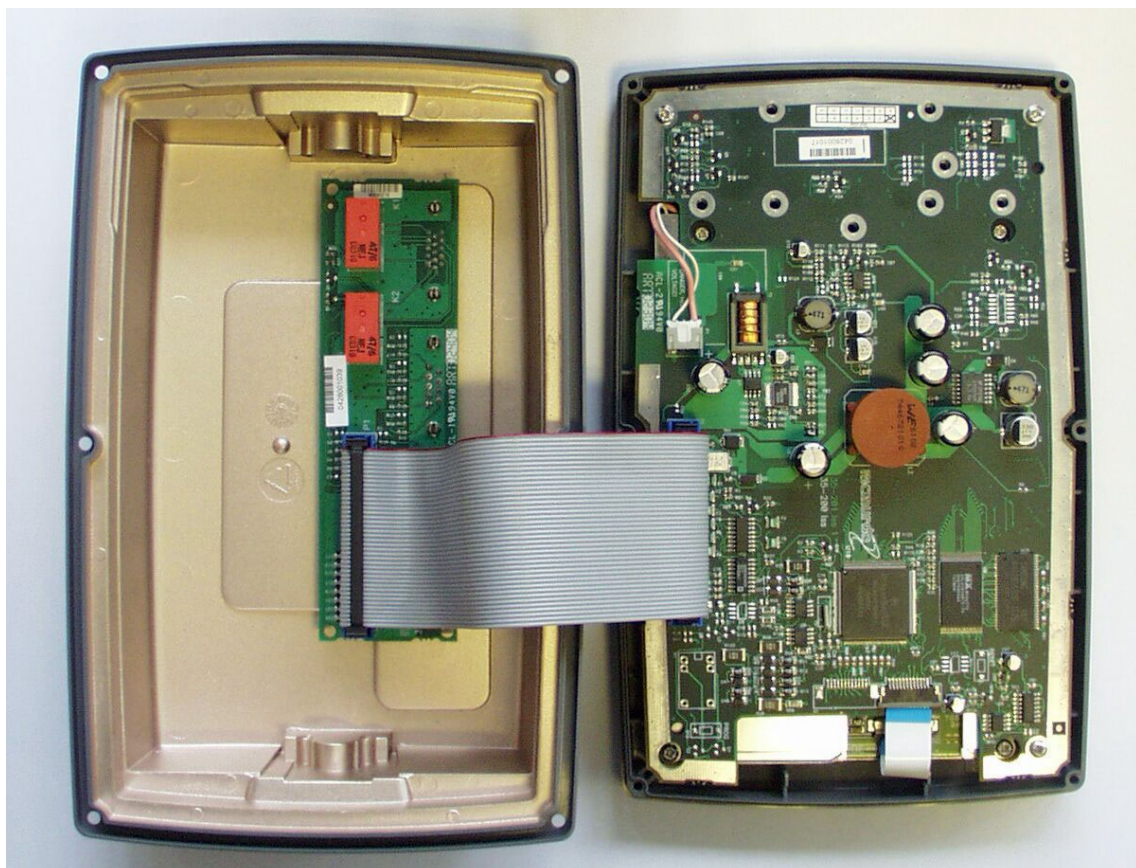






D.2 MKD unit





D.3 GPS antenna

