# **DAB-XPlorer**

A set of tools to analyze DAB data streams



- Key features
  - Modular system consisting of hard- and software tools
  - Hardware ETI interface and receiver hardware available
  - Analysis of DAB multiplex on ETI, EDI and RDI signal
  - Measuring of synchronism in SFNs
  - Recording of ETI files from on-air signals via RDI

## Range of applications

- ETI analysis for broadcasters
- Transmitter setup
- Coverage measuring
- SFN test
- Test of transmitter components
- Receiver test

Ingenieurbüro Mulka

## Description

For historical reasons the term DAB-XPlorer stands for two things a) the DAB-XPlorer software suite providing a collection of software tools to analyze DAB data streams and b) for the DAB-XPlorer hardware providing an ETI/RDI-to-USB interface. Originally, both the software and the hardware have been one product, the DAB-XPlorer, developed and manufactured by Ingenieurbüro Mulka. In the course of the evolution of this product, the software was modified and extended to support additional hardware products from other vendors. At this time the DAB-XPlorer software suite supports and can be delivered with

- the ETI/RDI-to-USB converter DAB-XPlorer from Ingenieurbüro Mulka,
- the DAB test receiver and modulator DABRF from Ingenieurbüro Mulka,
- all Ethernet interfaces that can be used to receive EDI data streams,
- the DAB test receiver UEB400-DXP provided under the trademark VAD, and
- the products of VDL's DABSTOR family.

The DAB-XPlorer software application is modular. The following tools are available:

- Ensemble Viewer
- ETI-XPlorer
- FIC-XPlorer
- FIC-XTractor
- PRBS-Analyzer
- Message Viewer
- Recorder / Player / Timeshift Buffer
- RDI-ETI-Converter
- GPS-Campaign-Converter
- Triggered Recorder

Together with the various hardware options, the software modules can be combined to support a great variety of use cases by broadcasters, transmitter network operators and manufacturers.



Figure 1: Overview of the hard- and software modules of the DAB-XPlorer family

## **Screenshots**

DAB-XPlorer	- D 🗙
Elle Yew Tools Help	
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Player Panel	X Decoder Panel X
Status: Reyback is numming           Pile:         0P4/N05/21087/00055-001.bin           Statt:         Current End         Total           Fammes:         0.1661         1005           Time:         00:00:00         00:04:39	Statut:         Decoder is numing         SPOUR         ROL           Year         Current:         Dn03         Tel03           Fineme:         0         1003         1003           Time:         13/28/54         13/94/06         0000
System Panel X	Messages
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6.703 TOCD TOLE TOL ROL AIS SHES	Local CIF Source Class Message
G 703 Property Value Deta	✓ 15:33:38 16:110 Analyzer MCI Sub-Channel #0 - SSTC is error free. (SAD 0, CU 140, 192kbps)
External 0.0.dB	✓ 15:33:38 16:110 Analyzer MCI Sub-Channel #2 - SSTC is error free. (SAD 280, CU 140, 1929bps)
Status Code 0x02 0x00	<ul> <li>V 15:33:30 16:110 Analyzer SubCH Sub-Chamel #0 - MPCG Audio Layer II present. (1926pps)</li> <li>J 15:29:29 16:110 Analyzer SUBCH Sub-Chamel #2 - MDEC Audio Layer II present. (1926pps)</li> </ul>
PRBS/BPolar Counter 12475 0	15:33:36 16:112 Analyzer MCL Strawn Characterization in ETLic changed
	✓ 15:33:38 16:112 Analyzer MCI Sub-Channel #0 - SSTC is error free, (SAD 0, OJ 140, 192kbos)
	✓ 15:33:38 16:112 Analyzer MCI Sub-Channel #1 - SSTC is error free. (SAD 140, CU 140, 1928bps)
SPIDIF PIL BIDH PAR CONF CORC QCRC AES3	✓ 15:33:38 16:112 Analyzer MCL Sub-Channel #2 - SSTC is error free. (SAD 280, CU 140, 1928bps)
	✓ 15:33:38 16:112 Analyzer SUBCH Sub-Channel #0 - MPEG Audio Layer II present. (192kbps)
SPDIF Property Value Delta	15:33:38 16:112 Analyzer SUBCH Sub-Channel #1 - Audio SCF-CRC errors detected. (SCF F)
Sample Rate 48.0 kHz 0.0 kHz	✓ 15:33:38 16:112 Analyzer SUBCH Sub-Channel #2 - MPEG Audio Layer II present. (192kbps)
Status Code 0x00 0x00	✓ 15:33:38 16:113 Analyzer SUBCH Sub-Channel #1 - MPEG Audio Layer II present. (192kbps)
Corp research and P	15:33:55 Applica G.703: BPolar Violations (12475) detected.
	🔒 15:33:55 Applica G.703: A15 alarm detected.
	✓ 15:33:55 Applca G.703: A15 alarm deared.
	🖌 15:33:55 Applica G.703: Receive Carrier Loss error deared.

## DAB-XPlorer

- System Panel
- Recorder / Replayer
- Decoder / Time shift
- Message list with results of analyses

ETI-XPlorer											-	. 🗆 🗙
ETI-X	Plor	er										Clear
Overview			Timing				CU Usaç	je				
Property Value			Property Value				-	-	C MARGINA DA			
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Error Counter			Subc	h Organiza	tion							
Error Type		Errors		Subch ID	Туре	Level	Bitrate	SAD	Size	Errors		
Synchronization		0	0	Subch 8	LIEP	1	128 kbps	0 CU	140 CU	0		
G.704		0	0	Subch 10	UEP	3	192 kbps	140 CU	140 CU	0		
ETI(NA, G.704	)	0		Subch 6	EEP	2-A	16 kbps	280 CU	16 CU	0		
ETI(NI, G.703)		0		Subch 7	EEP	3-A	16 kbps	296 CU	12 CU	0		
E Frame	4	3		Subch 12	EEP	3-A	48 kbps	308 CU	36 CU	0		
FCT Counter	4	1		Subch 14	EEP	2-A	8 kbps	344 CU	8 CU	0		
FP Phase		0	0,	Subch 1	LEP	3	128 kbps	352 CU	96 CU	0		
FL Length		0	0,	Subch 2	LEP	3	128 kbps	448 CU	96 CU	0		
TIST NA	4	1	9	Subch 3	LIEP	3	160 kbps	544 CU	116 CU	0		
TIST LI	4	1	0,	Subch 4	LEP	3	64 kbps	660 CU	48 CU	0		
E CRC	a.	1		Subch 9	EEP	3-A	16 ktps	708 CU	12 CU	0		
Reed Solomon	4	1	0.1	Subch 5	LEP	3	128 kbps	722 CU	96 CU	1		
Header		0	0,	Subch 11	UEP	4	64 kbps	818 CU	42 CU	0		
Main Stream		0										
I FIC		0										
Subch Organisatio	n 🥼	1										
CU Size		0										
Content	1	1										

## ETI-XPlorer

- Overview
- Error status, error counters
- Timing of TIST-NA/LI
- Sub-Channel list
- Graphical overview of CU allocation

FIC-XPlorer		
FIC-XPlorer		FIC 🚥 FIC Time: 21.06.2007, 6:55:49.008 81 🔹 📁
Overview	Sub-Channel	Service Component
December           PEC context           PEC context           PEC context           SADD 1           SADD 1           SADD 1           SADD 1           SADD 1           SADD 10           SADD 10           SADD 10           SADD 10           SADD 10           SADD 112           SADD 10           SADD 112           SADD 112           SADD 112           SADD 112           SADD 110           SADD 1100           SADD 1100	Sub-Charted         Descent         F.Level	Forrise Component           Proje< School PDCSI PADOR SCHI CA. CACOP
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FI	C-	XF	loi	rer

- MCI overview
- FIC overview
- Ensemble Information
- Various views on MCI:
  - Sub-Channel View
  - Service View
  - Component View

## Overview of deliverable hard- and software components

#### Hardware components

## DABXP-CM

USB dongle CodeMeter

#### DABXP-HWU

#### DAB-XPlorer hardware

- G.703/SPDIF to USB converter box
- USB 2.0 A/B cable

### **DABRF-HWU**

 $\mathsf{DAB}(\texttt{+})/\mathsf{DMB}$  test receiver and modulator with GPS receiver

- DAB receiver and modulator
- antenna for VHF band III and L-band
- active GPS antenna
- wall power supply 230V AC to 12 V DC
- Ethernet Cat 6 cable

# **DABRF** - specific software options

#### DABRF-RX

DAB receiver firmware and DABXP-BASIC PC software with recorder, player and configuration

- configuration, tuning, scanning, receiver status, FIC-BER, MSC-BER, RSSI level
- recording as EDIX, IQX or IQ
- local playback of EDIX and IQX
- measurement of the SFN, MER, constellation, inband spectrum

## DABRF-TX

DAB modulator firmware

- Playing of IQ, IQX, EDIX, EDI, ETI files and output as DAB signal on DABRF
- Up to 4 Ensembles parallel
- Input streaming via EDI (ETI over IP)

## Software options

### DABXP-BASIC

Option Recorder, Player, ETI-XPlorer, and FIC-XPlorer

- configuration, hardware status
- recording of ETI and RDI
- playback of ETI and local playback of RDI and EFCO
- service, sub-channel and SC list
- decoding of the selected audio subchannel (MUSICAM)
- RDI, ETI Decoder/Analyzer
- ETI-XPlorer, FIC-XPlorer, and Messages-Viewer

## DABXP-OCO

Option RDI/EFCO/ETI Converter. Converter of RDI, EFCO, IQX, EDIX, EDI, ETI-NI, ETI-NA, ETI-LI files with off-line analysis, replacement and post- processing

- converting to EDI, ETI-NI or ETI-NA
- offline analysis of the data stream, analyzing results may be exported as XML file
- optional extracting of the FIC or sub-channel content
- changing of DAB transmission mode
- replacement of labels and sub-channel con- tent by file content
- replacement of sub-channel content by PRBS
- insertion of bit or frame errors

#### DABXP-OPL

Option DAB+/FEC/Streaming. DAB+ audio decoder, analysis of FEC, sub-channel streaming, EDI decoder

- DAB+ audio decoder incl. VIA license
- Analyzing errors within the DAB+ Fire-Code, RS-Code or AU-CRC (requires ETI-XPlorer)

- analyzing errors within the DMB RS-Code (requires ETI-XPlorer)
- sub-channel streaming to external decoders via UDP/TCP
- decoding, recording, playback of EDI streams
- analyzing errors within the Enhanced Packet Mode RS-Code or Packet-CRC (requires ETI-XPlorer)

#### DABXP-OPR

Option PRBS Analyzer. Real-time PRBS analyzer

- displays the signal level over the time
- displays the Viterbi-BER and RS-BER over the time
- displays the error position (error bitmap) within the sub-channel over the time

### DABXP-OXT

Option FIC-XTractor. Analyzer of the Fast Information Channel on bit-stream level like a protocol analyzer

- frame oriented list of received FIGs
- FIG list sorted by type or extension
- database oriented list of received FIGs, all doublets are removed from the view, gets statistic of the FIGs
- tree view of the decoded FIG

## DABXP-OCC

Option GPS Campaign Converter. Converter of EFCO, EDIX and IQX to KML and CSV

 displays the measured data on the map of Google Earth

### DABXP-OTR

Option Triggered Recorder

 ETI, EDI, EDIX, EFCO recording triggered by an external event

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