Coverage Measurement Solutions

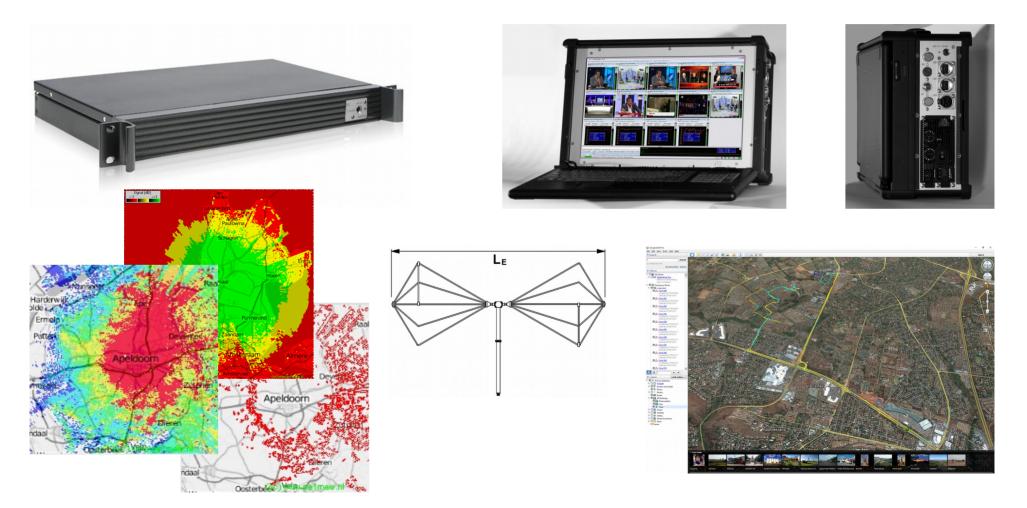
based on the Advanced Broadcast Components Ltd.

4T2 Portable or 4T2 Rack instrument platforms

Advanced Broadcast Components Frankfurterstrasse 21 64720 Michelstadt www.4T2.eu

4T2 Coverage Measurement Solutions presentation @2019 Advanced Broadcast Components slide 1 of 28

Coverage Measurement Solutions



Coverage Measurement Solutions

- Integrated systems, Hardware and Software from world renowned supplier
- More than 10 Years experience in Coverage Measurement Instruments
- Multi-channel coverage on map display with key performance parameter analysis
- Integrated GPS receiver communication module
- Antenna-Factor database for accurate field-strength evaluation
- Software application for map-retrieval for offline usage
- KML, KMZ export for post-processing of measurement data
- Transport Stream analysis available on all channels

4T2 Portable



- Windows[™] 64bit measurement platform
- robust aluminium housing
- portable 7.7 kg
- compact 40 x 30 x 15 cm
- six-core coffee lake CPU
- m.2 solid state drive
- high resolution 15.4" monitor
- full size keyboard
- 4k HDMI output
- stereo speakers

4T2 Portable

- 2 Gbit-LAN interfaces
 - UDP/RTP transport stream input
 - SNMP remote interface, instrument remote control
- DVB-T/T2
 - RF coverage measurements & Content Analysis
- 4 USB-3 interfaces
 - GPS Receiver (Navilock supplied)



4T2 Rack

- compact 19" x 1U x 250mm
- Windows[™] 64bit system platform
- six-core coffee lake CPU
- m.2 solid state drive
- 4k HDMI output



 Same interface configuration as 4T2-Portable instruments

4T2 Portable and Rack capabilities

- Multiple channel coverage analyser
- Integrated spectrum analyser
- DVB-T/T2 RF analyser with
 - Level, MER, EVM, bit errors
 - Constellation display, Impulse Response display
- Transport Stream analyser with Multi-Viewer
 - SI-Tree, SI-table repetition, TR.101.290 1st, 2nd, 3rd priorities, Services & PIDs display, Data-rates display & graph, PCR-rate & Jitter, Black/Freeze detector, Audio mute, triggered capture, log-file
- H.262 SD/HD, H.264 SD/HD and H.265 Ultra HD decoder on internal display and with 4k capable hdmi output
- DVB-T2 MI analyser on ASI and on IP input

DVB-T2 specific RF measurements

Constellations L1 post and Data-PLP, Impulse-Response, Spectrum displays

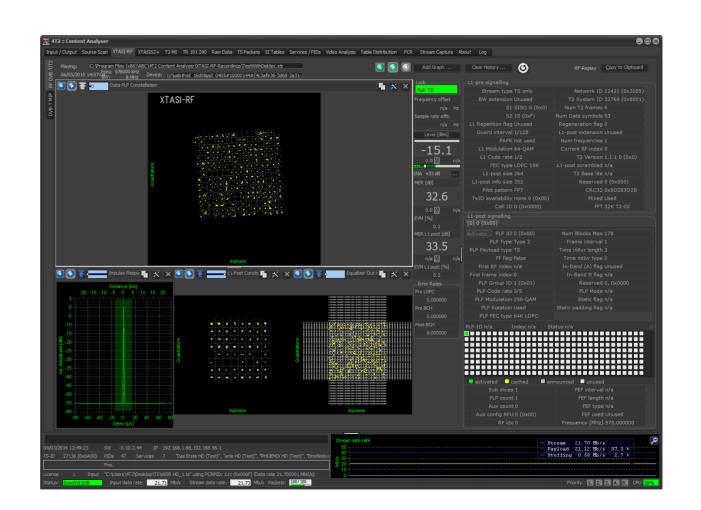
Level, MER, EVM,

BER before LDCP, and BCH

L1-pre, and L1-post decoded information

data logging and export

>42dB MER performance



Up to four simultaneous channels supported

Fully integrated GPS reception (Garmin, or Navilock devices)

Multiple Map format including OpenStreetMap

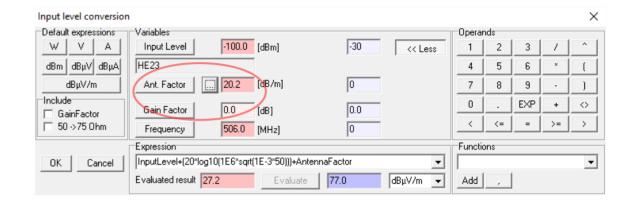
Level conversion with antenna factor entry

Comprehensive printing, and file-export features

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Level conversion with antenna factor entry

Database of calibrated measurement antennas on file



Antenna Factor				×
Component RE	5 4590			
Frequency [MHz]	Factor [df	3/m]	^	
350.000000	27.5300			
355.000000	27.8700			
360.000000	27.5200			Delete all
365.000000	27.0600			D CICKO GILL
370.000000	26.7600			Delete line
375.000000	26.6100			
380.000000	26.6600			Insert line
385.000000	26.6200			[
390.000000	26.8200			Load
395.000000	26.7300			Save
400.000000	26.2700			Jave
405.000000	26.0000			Save As
410.000000	25.8300			
415.000000	26.2100			
420.000000	26.6000			
425.000000	26.2500		~	
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		Cancel		Ok

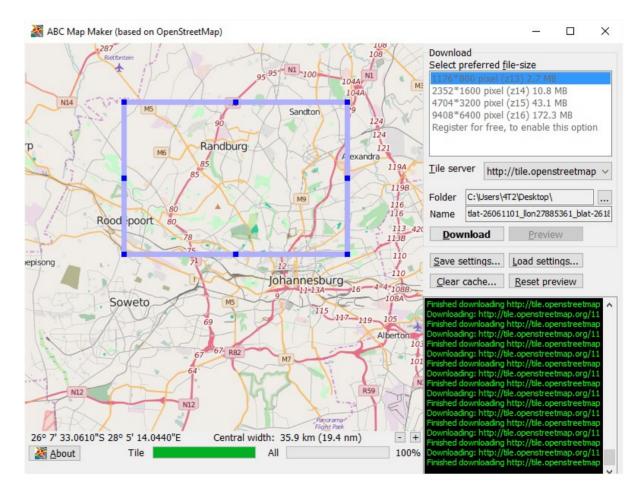
Antenna Factor			×
Component HL	40		
Frequency [MHz]	Factor [dB/m]	^	
350.000000	26.7700		
355.000000	27.1100		
360.000000	26.7500		Delete all
365.000000	26.2900		
370.000000	25.9800		Delete line
375.000000	25.8200		
380.000000	25.8700		Insert line
385.000000	25.8200		
390.000000	26.0200		Load
395.000000	25.9200		
400.000000	25.4600		Save
405.000000	25.1800		Save As
410.000000	25.0100		
415.000000	25.3800		
420.000000	25.7600		
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Modified HL_040)_s_kabel.ini		
	Ca	incel	Ok

Component H	L 023 A1	
Frequency [MHz] Factor [dB/m]	
100.000000	6.7000	
150.000000	10.1900	
200.000000	12.8800	Delete all
300.000000	16.6500	
400.000000	19.6300	Delete line
500.000000	21.800	
600.000000	23.4600	Insert line
700.000000	25.300	
800.000000	26.3900	Load
900.000000	27.650	Save
1000.000000	28.910	Save
1100.000000	30.180	Save As
1200.000000	31.2400	
1300.000000	32.2000	
HL02	3A1.INI	
	Cancel	

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Multiple Map formats including OpenStreetMap

Application to retrieve map-data for offline coverage visualisation provided (ABC Map Maker)



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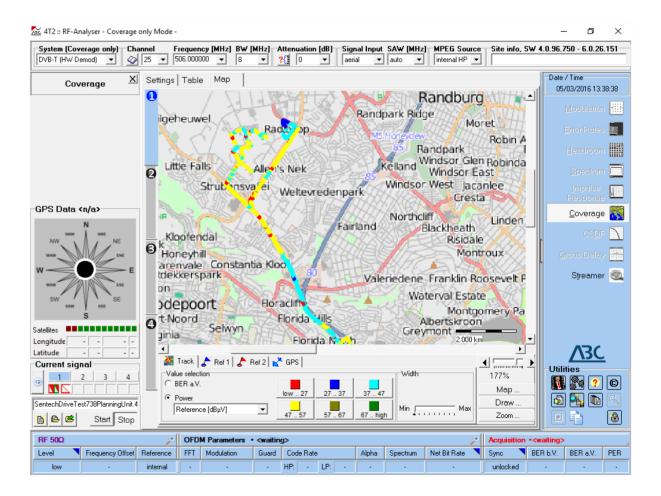
Up to four simultaneous channels supported

Fully integrated GPS reception (Garmin, or Navilock devices)

Multiple Map format including OpenStreetMap

Level conversion with antenna factor entry

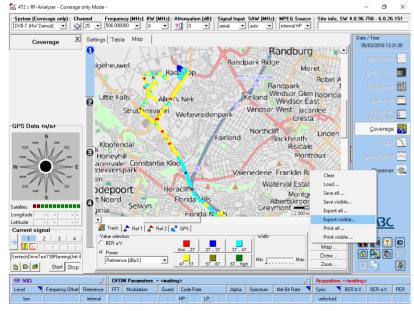
Comprehensive printing, and file-export features

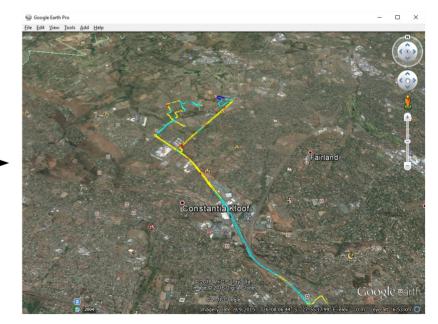


Multiple Map format including OpenStreetMap

Comprehensive printing, and file-export features

KML, KMZ export for post-processing of measurement data





Each received channel writes its own full GPSreferenced parameter set

Values include Level (fieldstrength), MER, bit errors

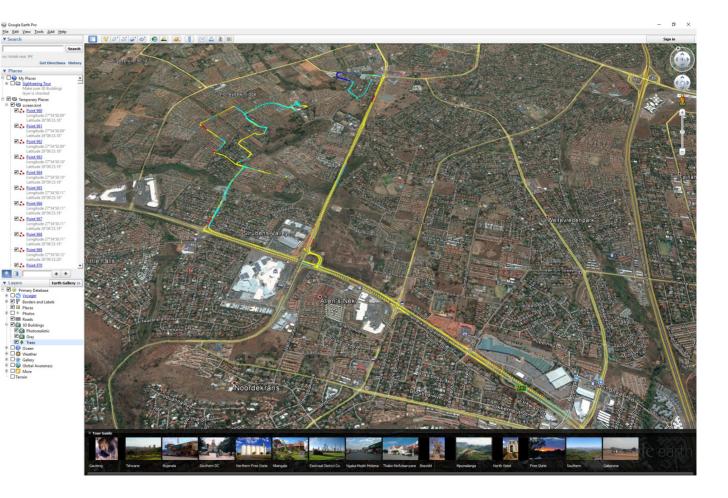
The comma separated file format exports seamlessly into Excel or OpenOffice

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n/a	ő	0 n/a	0 0 n/a	-1		39.6	-67.4 locked n/a	0 locked	22.4	22.4 n/a	n/a	n/a	13:10:44-3
ı/a	Ö	0 n/a	0 0 n/a	-1	-1 None	39.6	-67.4 locked n/a	0 locked	22.4	22.4 n/a	n/a	n/a	13:10:45-2
n/a	0	0 n/a	0 0 n/a	-1		39.6	-67.4 locked n/a	0 locked	2.8	2.8 n/a	n/a	n/a	13:10:46-2
ı/a	0	0 n/a	0 0 n/a	-1		40.6	-66.4 locked n/a	0 locked	14.9	14.9 n/a	n/a	n/a	13:10:47-2
ı/a	0	0 n/a	0 0 n/a	-1		40.6	-66.4 locked n/a	0 locked	19.8	19.8 n/a	n/a	n/a	13:10:48-2
1/a	0	0 n/a	0 0 n/a	-1		40.8	-66.2 locked n/a	0 locked	21.7	21.7 n/a	n/a	n/a	13:10:49-2
1/a 1/a	0	0 n/a 0 n/a	0 0 n/a 0 0 n/a	-1		39.1 39.5	-67.9 locked n/a -67.5 locked n/a	0 locked 0 locked	22.5	22.5 n/a 22.8 n/a	n/a	n/a	13:10:50-2 13:10:51-1
1/a 1/a	0	0 n/a 0 n/a	0 0 n/a	-1		39.5	-68 locked n/a	0 locked	18.1	18.1 n/a	n/a n/a	n/a n/a	13:10:52-1
/a /a	0	0 n/a	0 0 n/a	-1		35.6	-71.4 locked n/a	0 locked	20.3	20.3 n/a	n/a	n/a	13:10:53-1
n/a	0	0 n/a	0 0 n/a	-1		37.7	-69.3 locked n/a	0 locked	20.5	21.5 n/a	n/a	n/a	13:10:54-1
1/a	0	0 n/a	0 0 n/a	-1		37.6	-69.4 locked n/a	0 locked	22.5	22.5 n/a	n/a	n/a	13:10:55-1
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n/a	0	0 n/a	0 0 n/a	-1	-1 None	39	-68 locked n/a	0 locked	22.9	22.9 n/a	n/a	n/a	13:10:57-0
n/a	0	0 n/a	0 0 n/a	-1		39.8	-67.2 locked n/a	0 locked	23.7	23.7 n/a	n/a	n/a	13:10:58-0
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1/a	0	0 n/a	0 0 n/a 0 0 n/a	-1		41.7 40.8	-65.3 locked n/a	0 locked	24.1	24.1 n/a	n/a	n/a	13:11:03-9
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n/a	0	0 n/a	0 0 n/a	-1		41.6	-65.4 locked n/a	0 locked	24.1	24.1 n/a	n/a	n/a	13:11:07-9
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ı/a	0	0 n/a	0 0 n/a	-1	-1 None	40.5	-66.5 locked n/a	0 locked	23.9	23.9 n/a	n/a	n/a	13:11:11-8
n/a	0	0 n/a	0 0 n/a	-1	-1 None	40	-67 locked n/a	0 locked	23.3	23.3 n/a	n/a	n/a	13:11:12-8
n/a	0	0 n/a	0 0 n/a	-1		39.1	-67.9 locked n/a	0 locked	23.2	23.2 n/a	n/a	n/a	13:11:13-8
ı/a	0	0 n/a	0 0 n/a	-1		38.6	-68.4 locked n/a	0 locked	23	23 n/a	n/a	n/a	13:11:14-7
n/a	0	0 n/a	0 0 n/a	-1		37.9	-69.1 locked n/a	0 locked	23.2	23.2 n/a	n/a	n/a	13:11:15-7
1/a	0	0 n/a	0 0 n/a	-1		39	-68 locked n/a	0 locked	23.4	23.4 n/a	n/a	n/a	13:11:16-7
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n/a	Ő	0 n/a	0 0 n/a	-1		37.9	-69.1 locked n/a	0 locked	23.2	23.2 n/a	n/a	n/a	13:11:23-6
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n/a	0	0 n/a	0 0 n/a	-1		36.8	-70.2 locked n/a	0 locked	13	13 n/a	n/a	n/a	13:11:26-5
ı/a	0	0 n/a	0 0 n/a	-1		37.6	-69.4 locked n/a	0 locked	19.1	19.1 n/a	n/a	n/a	13:11:27-5
n/a	0	0 n/a	0 0 n/a	-1		38.9	-68.1 locked n/a	0 locked	21.2	21.2 n/a	n/a	n/a	13:11:28-5
n/a	0	0 n/a	0 0 n/a	-1		38.5	-68.5 locked n/a	0 locked	22.3	22.3 n/a	n/a	n/a	13:11:29-5
n/a	0	0 n/a	0 0 n/a	-1		37.9	-69.1 locked n/a	0 locked	22.4	22.4 n/a	n/a	n/a	13:11:30-5
n/a	0	0 n/a	0 0 n/a	-1		37.4	-69.6 locked n/a	0 locked	22.7	22.7 n/a	n/a	n/a	13:11:31-4
n/a	0	0 n/a	0 0 n/a	-1	-1 None	37.8	-69.2 locked n/a	0 locked	22.9	22.9 n/a	n/a	n/a	13:11:32-4 ~
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Comprehensive printing, and file-export features include KML/KMZ output

Coverage results can be overlapped using readily available tools, such as Google maps

The range of data to be exported is selected graphically in the Coverage-Analyser interface



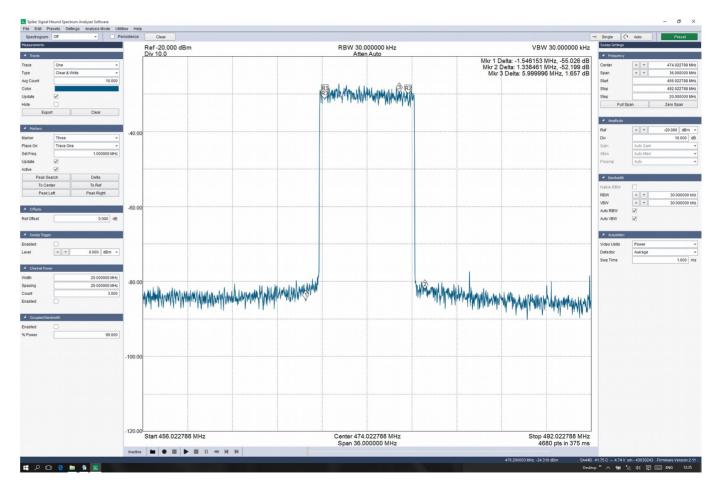
4T2 Portable and Rack Spectrum Analysis

The Spectrum Analyser sub-system provides stateof-the-art signal analysis, available independantly from the Coverage Analysis

Frequency range spans 100 kHz to 4.4 GHz

Average noise level is better than -158 dBm in typical applications

A typical dynamic range of 80 dB is achieved

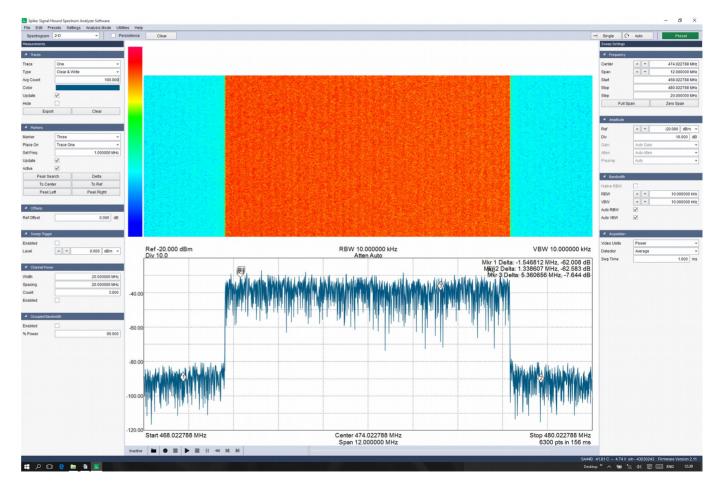


4T2 Portable and Rack Spectrum Analysis

Span can be adjusted for higher resolution and/or faster update rate.

2D spectrogram function is recommended for spurious pickup.

Shoulder distance and tilt linearity measurements available through deltamarker feature



4T2 Portable and Rack additional features

The following additional features are provided through the use of the

4T2 Content Analyser application

and are part of the standard feature set provided by

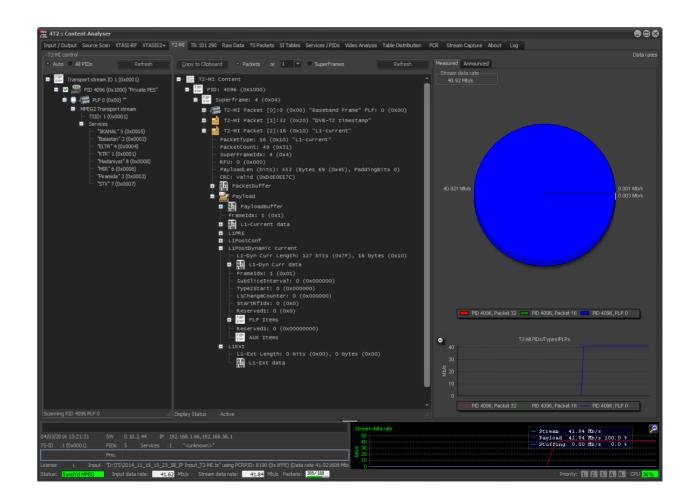
Advanced Broadcast Components

T2-MI (ASI, IP inputs)

T2-Modulator interface real-time analyser

De-capsulation of embedded single-, or multi-program transport streams

Re-routing into Content-Analyser for full visualisation and analysis



SERVICES PIDs (all inputs)

Data-rate displays with virtual and logical channel numbers sorted by services and PIDs

Pie-chart and trend-line displays with relative and absolute data-rates

All components that make up a service are displayed

Data rate logging allows to pick-up statistical multiplexer limitations

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MultiViewer (all inputs)

Video/audio of all services in transport stream (H.262, H.264, and H.265) (AC3, AAC)

Audio bar-graphs with history

Black/freeze detection

Moving video or thumbnails

Industry standard codec interface



TR 101 290 (all inputs)

Evaluation of transport stream following TR 101 290 1st, 2nd, 3rd priority

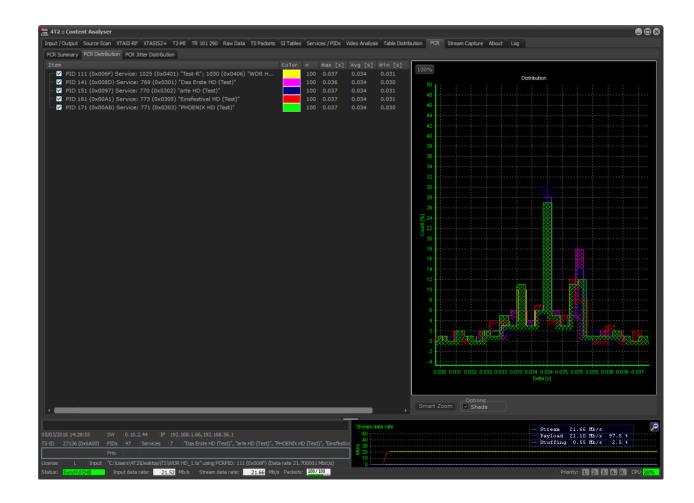
Groups, or individual error measurements can be activated / deactivated

4T2 :: Content Analyser					
Toput / Output Source Scan YT	TAST DE YTASIS24 T2-MT TR 101 290	Daw Data	TS Dackate ST Tablee	Services / PIDs Video Analysis Table Distribution PCR Stream Capture About Log	
			Time of Last E		
		# Errors		Error Message	
	irst priority				
			04/03/2016 13:11:05		
	ync byte error		0 100/2010 10.11.00		
	AT_error_2				
		90	04/03/2016 13:11:11	PID 1410 (0x0582): Incorrect Packet Order Pos 552775460 (expected 9 received 5)	
	MT error 2		0 100/2010 10:11:11		
	ID_error				
	econd priority				
	ransport_error				
	RC error				
		2021	04/03/2016 13:11:24	PID 301 (0x012D): Time interval between two consecutive PCR values more than 40.0 ms (actual 49.7 ms)	
		2003	04/03/2016 13:11:24	PID 301 (0x012D): Time interval between two consecutive PCR values more than 40.0 ms (actual 49.7 ms)	
		18	04/03/2016 13:11:09	PID 101 (0x0065): The difference between two consecutive PCR values (PCRi+1 - PCRi) (actual 880245587448 - 881	868104146) is outside the range of 0100.0 ms (act
		18	04/03/2016 13:11:09	PID 101 (0x0065): PCR accuracy of selected programme is not within ±5E-007 (actual -60.1 s)	
		16	04/03/2016 13:11:22	PID 505 (0x01F9): PTS repetition period more than 0.700 s (actual 0.744 s)	
	AT error				
	hird priority				
	IT error				
	IT actual error				
🗹 💷 3.1.b N	 IT other error				
	I_repetition_error				
	uffer error				
- 🗹 💷 3.4.a U	- Inreferenced PID				
🗹 💷 3.5 SI	 DT error				
- 🗹 💷 3.5.a SI	 DT_actual_error				
🗹 💷 3.5.b SI	DT other error				
- 🗹 💷 3.6 EI	IT_error				
🗹 🛄 3.6.a El					
- 🗹 💷 3.6.b EI	IT_other_error				
🗹 💷 3.6.c EI	IT_PF_error				
🗹 💷 3.7 RS	ST_error				
🗹 💷 3.8 ΤΓ	DT_error				
🗹 💷 3.9 Er	mpty_buffer_error				
🗹 💷 3.10 De	ata_delay_error				
- 🗖 🖬 A.1 🛛 Pa	acket_header_inconsistent				
🖆 🗖 📖 в 🛛 т та	2-MI errors				
🛱 🛄 8.2 Т					
- 🗖 🖬 B.2.1 T	2MI_packet_type_error				
🗖 🖬 B.2.2 T	2MI_packet_payload_error				
- 🗖 🖬 B.2.3 Ti	2MI_packet_count_error				
- 🗖 🛄 B.2.4 Ti	2MI_CRC_error				
- 🔲 🛄 B.2.5 T	2MI_payload_error				
					· ·
				Stream data rate	— Stream 24.14 Mb/s
	0.10.2.44 IP 192.168.1.66,192.1				- Payload 23.24 Mb/s 96.3 % - Stuffing 0.90 Mb/s 3.7 %
	105 Services 22 "BBC ONE", "Bi				- scarring 0.50 mb/s 3.7 %
	2.3.a PID 901 (0x0385): Time interval b			10	
	S\BBC Mux SD Stream 7 9 13 - 1 minute Cap				
Status: Synch'd DVB Inp	out data rate: 24.15 Mb/s Stream	data rate:	24.14 MD/s Packets:	100/100	Priority: 1. 2. 3. A. B. CPU 82%

PCR (all inputs)

Powerful menu for finding PCR related problems from

Jitter, Drift, and Timestamping

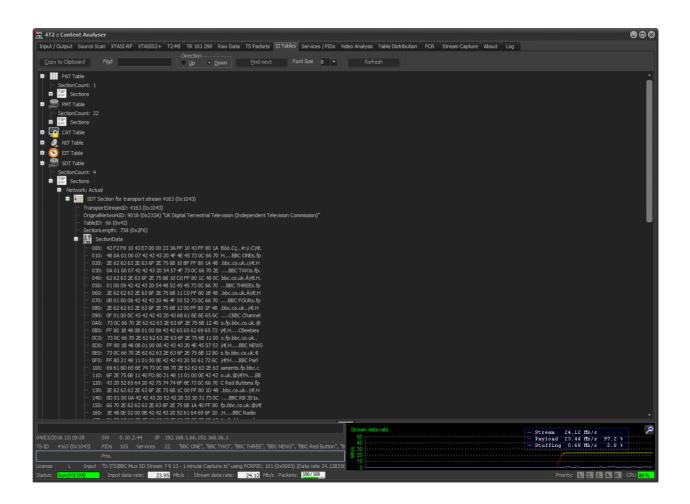


SI tables (all inputs)

Display of the services information with comprehensive interpreter

detailed export functions

find function



TS Packets (all inputs)

3rd generation expert function

Sophisticated packet filtering with multiple triggers and filter expression editor

Unique and powerful tool for finding problems in transmission chains and multiplexers

4T2 :: Content Analyser							
Input / Output Source Scan XTASI-RF XTASIS2+ T2-MI TR 101 290 Raw Data TS Page	kets SI Tables	Services / PIDs	Video Analysis	Table Distribution PCR	Stream Capture About Log		
Copy to Clipboard Find Direction Find	next						
Packet							Trigger control Single Multi Start
∎- merets a. o			16 (0x010)		2016-03-04, 13:12:39-227	â	Packet display
	32531		16 (0x010) 16 (0x010)		2016-03-04, 13:12:39-227		Maximum amount 400
2							
B 3							
	32571 32591	30 20	16 (0x010) 16 (0x010)		2016-03-04, 13:12:39-228 2016-03-04, 13:12:39-228		Trigger setup
6	112783	80192	16 (0x010)		2016-03-04, 13:12:44-224		Name
7							
	112802 112804		16 (0x010) 16 (0x010)		2016-03-04, 13:12:44-224 2016-03-04, 13:12:44-224		PID gate
	112804		16 (0X010) 16 (0X010)		2016-03-04, 13:12:44-224 2016-03-04, 13:12:44-224		Block Pass
11							16 Inv
PacketData							_Smart packet trigger / filter
General							Active Edit
■- Header ■- ■ PayLoad							
							File
- 10: 74 68 7F 25 0A 47 42 52 65 6E 67 47 45 6E 67 6C th							Load Save Save as
20: 61 6E 64 01 85 53 6F 75 74 68 01 0F 8A 53 6F 75 an							guice Bave as
30: 74 68 20 45 61 73 74 01 17 7F 0A 09 47 42 52 FA th							
40: 01 0F FA 01 17 4A 0C 10 43 23 3A 11 40 09 04 00 50: 01 5A 00 4A 0C 10 4C 23 3A 11 40 09 04 00 01 5A .Z							
- 60: 00 4A 0C 40 83 23 3A 44 40 09 04 00 01 5A 00 7F .J							
70: 98 08 FF 65 6E 67 4E 65 74 77 6F 72 6B 20 63 68 >.							
90: 6E 38 20 65 6E 68 61 6E 63 65 64 20 6E 65 74 77 n; A0: 6F 72 6B 20 63 6F 6E 66 69 67 75 72 61 74 69 6F or							
12							
PacketData							
General Berteader							
PayLoad							
- 10: 6F 72 6B 20 63 68 61 6E 67 65 20 6E 6F 74 69 66 or							
- 20: 69 63 61 74 69 6F 6E 3B 20 65 6E 68 61 6E 63 65 1c							
- 60: 01 10 BF 01 10 C0 01 11 C0 01 12 00 01 12 40 01							
- A0: 5A 0B 02 F7 E3 40 1F 81 03 FF FF FF FF 7F 07 09 Z.							
5tart 2016-03-04, 13:12:37-174 Trigger 2016-03-04, 13:12:39-231	192978 Stop	3 2016-03-04, 13:1	16 (0x010)		2016-03-04, 13:12:49-238		
Start 2016-03-04, 13:12:37-174 Trigger 2016-03-04, 13:12:39-231		2016-03-04, 13:1	5:00-100				
L			Stream data				24.01 Mb/s
04/03/2016 13:13:11 SW 0.10.2.44 IP 192.168.1.66,192.168.56.1			50 40				23.05 115/s 96.0 % 4 0.95 115/s 4.0 %
TS-ID 4163 (0x1043) PIDs 105 Services 22 "BBC ONE", "BBC TWO", "BBC THRE						- stuffing	0.55 //////
04/03/2016 13:13:11 Prio. 2.3.a PID 1802 (0x070A): Time interval between two consec			10				
License L Input "D:\TS\BBC Mux SD Stream 7 9 13 - 1 minute Capture.ts" using PCRPI			3336 <u>0 ime</u> r				
Status: Synch'd DVB Input data rate: 24.14 Mb/s Stream data rate: 24.01	mb/s Packets	1007 100					riority: 1. 2. 3. A. B. CPU 81%

Log (all inputs)

Most comprehensive logging system

with integrated find and sorting options

Automated logfile storage with integrated garbage collection

2 :: Content Analys	ser							•
/Output Source So	can XTASI-R	F XTASIS2	+ T2-MI	TR 101 290 Raw Data TS P	ackets SI Tables Service:	s / PIDs Video Ar	alysis Table Distribution PCR Stream Capture About Log	
y to Clipboard				Direction Up • Down Ei	id next 📎	* 🗉 🗉	Explorer: Logfile folder CMD: Logfile folder	
p / Sub-Gr				Date and Time	ClassName	Instance	Message	
				2016-03-04, 13:13:32-824	TTSPESCollector TTSPESCollector	0x15DC00C0	PID 101 (0x0065): Discontinuity detected while collecting PES Packet	
				2016-03-04, 13:13:32-819	TTSPESCollector	0x0A949340	PID 601 (0x0259): Discontinuity detected while collecting PES Packet	
	Warning Warning	Progr Progr		2016-03-04, 13:13:32-811 2016-03-04, 13:13:32-806	TTSPESCollector	0x0DBB17B0 0x0A949100	PID 901 (0x0385): Discontinuity detected while collecting PES Packet PID 501 (0x01F5): Discontinuity detected while collecting PES Packet	
				2016-03-04, 13:13:32-806	TISPESCOLECTOR	0X0A949100	PID SUI (0X01+5): Discontinuity detected while collecting PES Packet	
Error	Error							
Warning	Warning							
Error	Error							
1040			1040					
Message	Message Message		1040	2016-03-04, 13:13:53-050	TTSAnalycer		1.4 Continuity_count_error clear 2 Events suppressed (3 mgs suppres	
	Message		1040	2016-03-04, 13:13:53-009	TTSAnalyser		1.4 Continuity_count_error clear (35 mgs suppressed)	
	Message		1040	2016-03-04, 13:13:52-957	TTSAnalyser	NI	1.4 Continuity_count_error clear 4 Events suppressed (1 mgs suppres	
	Message		1040	2016-03-04, 13:13:33-057	TTSAnalyser	0x0857E460	1.4 Continuity_count_error dear 2 Events suppressed	
	Message		1040	2016-03-04, 13:13:32-989	TTSAnalyser	0x0857E460	1.4 Continuity count error dear	
	Message		1040	2016-03-04, 13:13:32-976	TTSAnalyser	0x0857E460	1.4 Continuity_count_error clear 6 Events suppressed	
	Message		1040	2016-03-04, 13:13:32-947	TTSAnalyser	0x0857E460	1.4 Continuity_count_error dear 4 Events suppressed	
	Message			2016-03-04, 13:13:32-910	TTSAnalyser	0x0857E460	1.4 Continuity count error dear 13 Events suppressed	
Error								
						_		
						Stre	eam data rate	- Stream 23.85 Mb/s
				3.1.66,192.168.56.1			0	- Payload 23.01 Mb/s 96.5 %
4163 (0x1043)				BC ONE", "BBC TWO", "BBC THR		Button", "B	ō	
016 13:14:19				Time interval between two conse		1	0	
						≥ 24.12833€	<u>0</u>	
Synch'd DVB	Toout dat	a rater 1	24.16 Mb/	s Stream data rate: 24.9	8 Mb/s Parkets: 166/166	3		Priority: 1. 2. 3. A. B. CPU

further benefits

- chassis refined over more than one decade with respect to robustness and durability
- based on industry-standard hardware: Mini-itx, ATX, m.2 SSD, DDR-4, USB-3, Gbe
- Windows[™] 64bit system, supporting any standard application software
- all measurements performed simultaneously
- unlimited storage of measurement reports on either SSD, or USB memory stick
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