

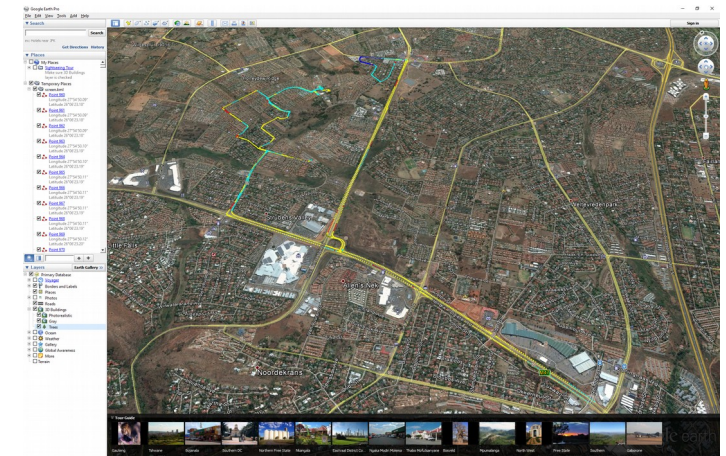
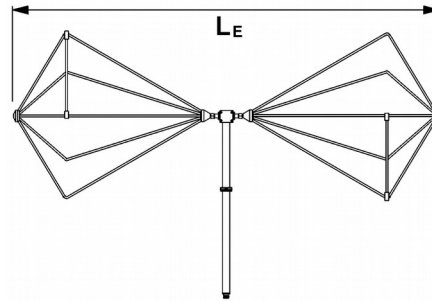
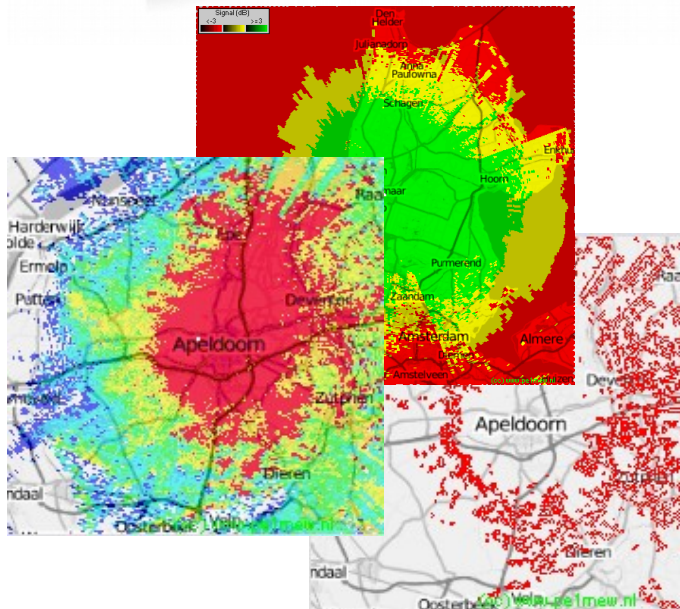
Coverage Measurement Solutions

based on the Advanced Broadcast Components Ltd.

4T2 Portable or 4T2 Rack instrument platforms

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

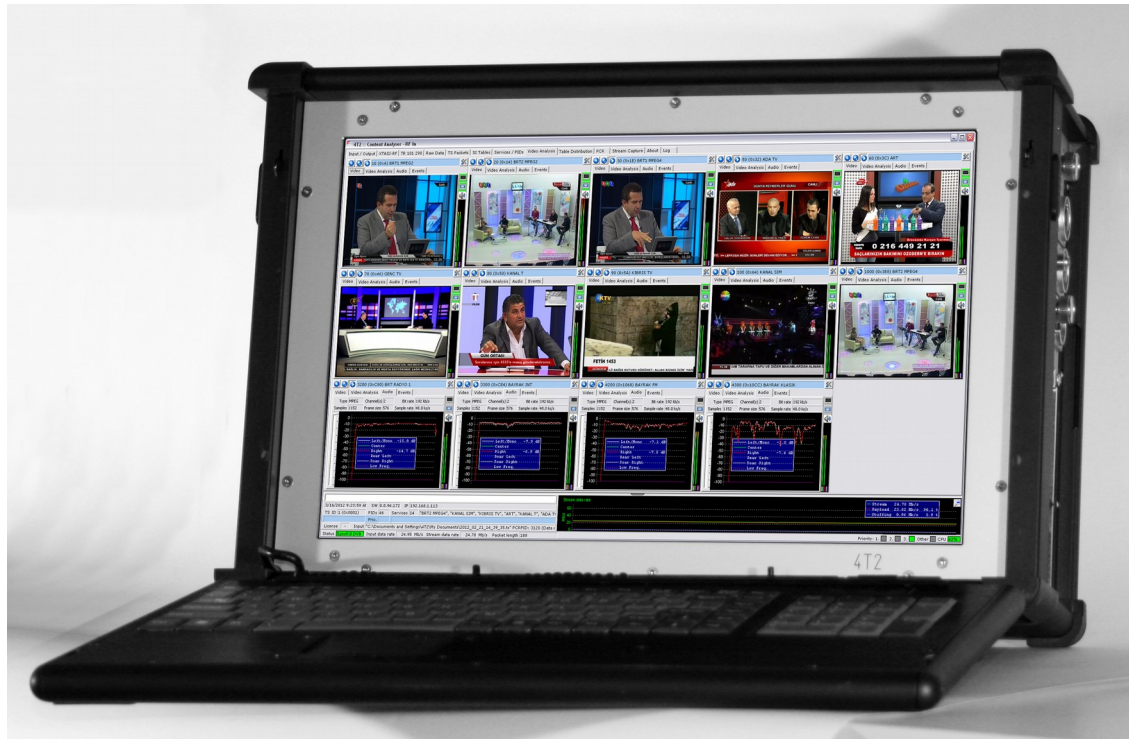
Coverage Measurement Solutions



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



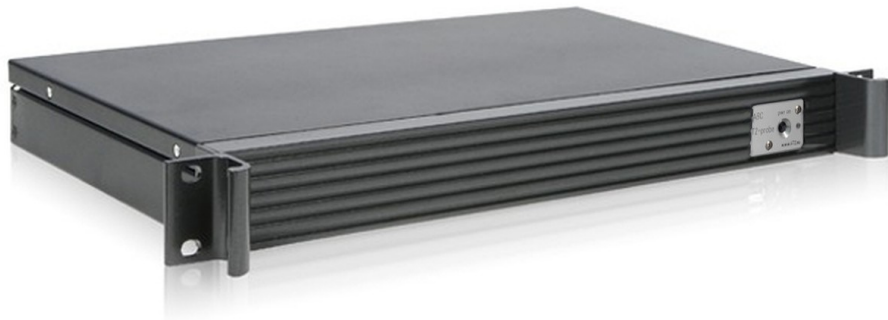
- Windows™ 64bit measurement platform
- robust aluminium housing
- portable 7.7 kg
- compact 40 x 30 x 15 cm
- six-core coffee lake CPU
- m.2 solid state drive
- high resolution 15.4" monitor
- full size keyboard
- 4k HDMI output
- stereo speakers

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

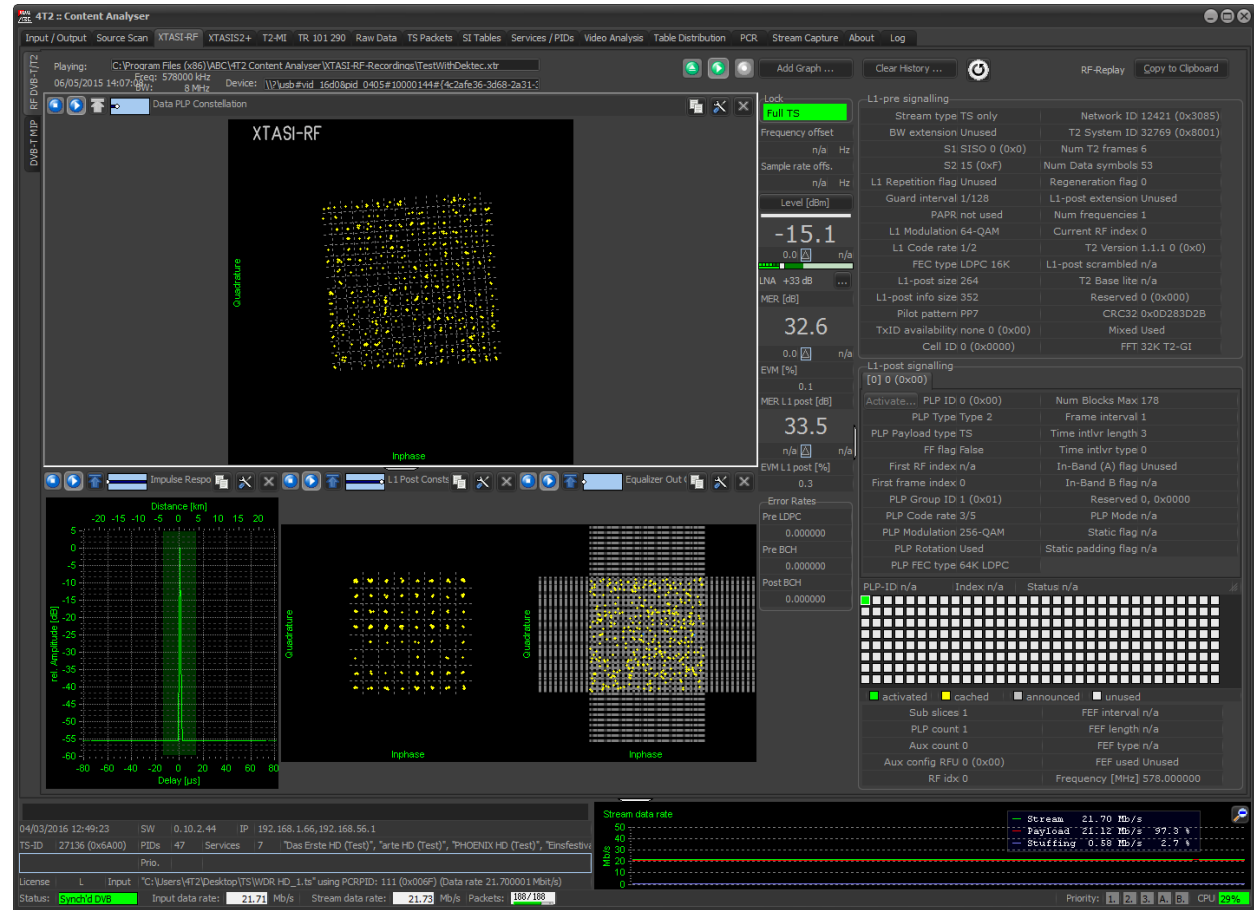
Level, MER, EVM,

BER before LDPC, and BCH

L1-pre, and L1-post
decoded information

data logging and export

>42dB MER performance



DVB-T/T2 4T2 Coverage-Analyser

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

System (Coverage only) Channel Frequency [MHz] BW [MHz] Attenuation [dB] Signal Input SAW [MHz] MPEG Source Site info, SW 4.0.96.750 - 6.0.26.151

DVB-T (Hw Demod) 25 506.000000 8 ? 0 aerial auto internal HP

Coverage X Settings Table Map

1 in use System Channel Frequency [MHz] BW [MHz] Active PLP CSV file name Raw-data snapshots
DVB-T 25 506.000000 8 0.csv Disabled

RF (1/2) TPS (1/2) BER
Level Spectrum SNR FFT Modulation Guard Code Rate Alpha Sync BER b.v. BER a.v. PER
low normal . 2K . 1/32 HP: . LP:

2 in use System Channel Frequency [MHz] BW [MHz] Active PLP CSV file name Cal. / Tune status
DVB-T 54 738.000000 8 1.csv n/a

RF (1/1) TPS (1/2) BER
Level Spectrum SNR FFT Modulation Guard Code Rate Alpha Sync BER b.v. BER a.v. PER
. HP: . LP:

3 in use System Channel Frequency [MHz] BW [MHz] Active PLP CSV file name Cal. / Tune status
DVB-T 58 770.000000 8 2.csv n/a

RF (1/1) TPS (1/2) BER
Level Spectrum SNR FFT Modulation Guard Code Rate Alpha Sync BER b.v. BER a.v. PER
. HP: . LP:

4 in use System Channel Frequency [MHz] BW [MHz] Active PLP CSV file name Cal. / Tune status
DVB-T 58 770.000000 8 3.csv n/a

RF (1/1) TPS (1/2) BER
Level Spectrum SNR FFT Modulation Guard Code Rate Alpha Sync BER b.v. BER a.v. PER
. HP: . LP:

GPS Data <n/a>

Current signal

1 2 3 4

SentechDriveTest738PlanningUnit.4

Start Stop

RF 50Q OFDM Parameters <waiting> Acquisition <waiting>

Level	Frequency Offset	Reference	FFT	Modulation	Guard	Code Rate	Alpha	Spectrum	Net Bit Rate	Sync	BER b.v.	BER a.v.	PER
low	.	internal	.	.	.	HP: . LP:	unlocked	.	.	.

DVB-T/T2 4T2 Coverage-Analyser

Level conversion with antenna factor entry

Database of calibrated measurement antennas on file

Input level conversion

Default expressions: W, V, A, dBm, dBµV, dBµA, dBµV/m

Include: GainFactor, 50 -> 75 Ohm

Variables: Input Level: -100.0 [dBm], HE23, Ant. Factor: 20.2 [dB/m], Gain Factor: 0.0 [dB], Frequency: 506.0 [MHz]

Operands: 1, 2, 3, /, ^, 4, 5, 6, *, (, 7, 8, 9, -,), 0, ., EXP, +, <>, <, <=, =, >=, >

Functions: [Dropdown]

Expression: $\text{InputLevel} + (20 * \log_{10}(1E6 * \sqrt{1E-3 * 50})) + \text{AntennaFactor}$

Evaluated result: 27.2, Evaluate: 77.0 [dBµV/m]

OK, Cancel

Antenna Factor

Component: RE 4590

Frequency [MHz]	Factor [dB/m]
350.000000	27.5300
355.000000	27.8700
360.000000	27.5200
365.000000	27.0600
370.000000	26.7600
375.000000	26.6100
380.000000	26.6600
385.000000	26.6200
390.000000	26.8200
395.000000	26.7300
400.000000	26.2700
405.000000	26.0000
410.000000	25.8300
415.000000	26.2100
420.000000	26.6000
425.000000	26.2500

RE 4590.ini

Cancel, Ok

Antenna Factor

Component: HL40

Frequency [MHz]	Factor [dB/m]
350.000000	26.7700
355.000000	27.1100
360.000000	26.7500
365.000000	26.2900
370.000000	25.9800
375.000000	25.8200
380.000000	25.8700
385.000000	25.8200
390.000000	26.0200
395.000000	25.9200
400.000000	25.4600
405.000000	25.1800
410.000000	25.0100
415.000000	25.3800
420.000000	25.7600
425.000000	25.4100

Modified: HL_040_s_kabel.ini

Cancel, Ok

Antenna Factor

Component: HL 023 A1

Frequency [MHz]	Factor [dB/m]
100.000000	6.7000
150.000000	10.1900
200.000000	12.8800
300.000000	16.6500
400.000000	19.6300
500.000000	21.8000
600.000000	23.4600
700.000000	25.3000
800.000000	26.3900
900.000000	27.6500
1000.000000	28.9100
1100.000000	30.1800
1200.000000	31.2400
1300.000000	32.2000

HL023A1.INI

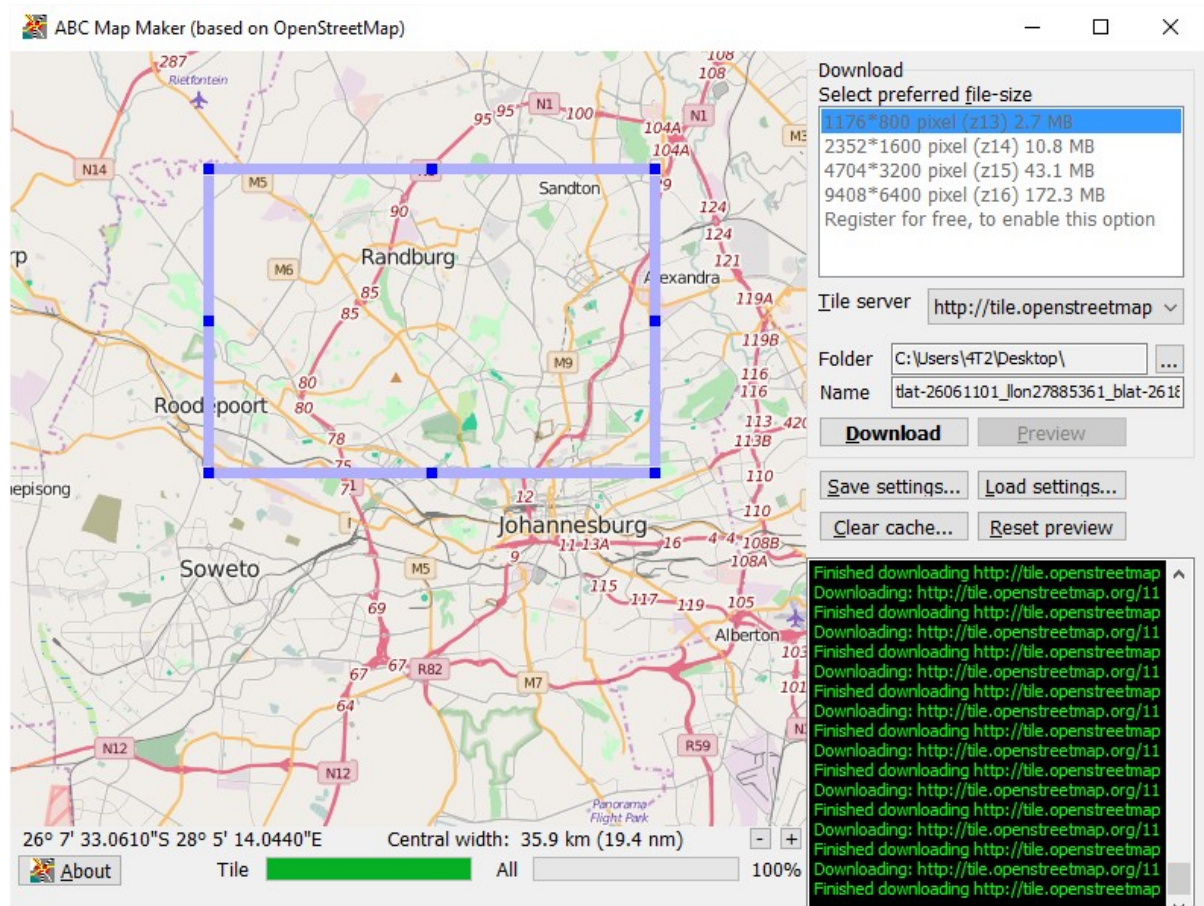
Cancel, Ok



DVB-T/T2 4T2 Coverage-Analyser

Multiple Map formats including
OpenStreetMap

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



DVB-T/T2 4T2 Coverage-Analyser

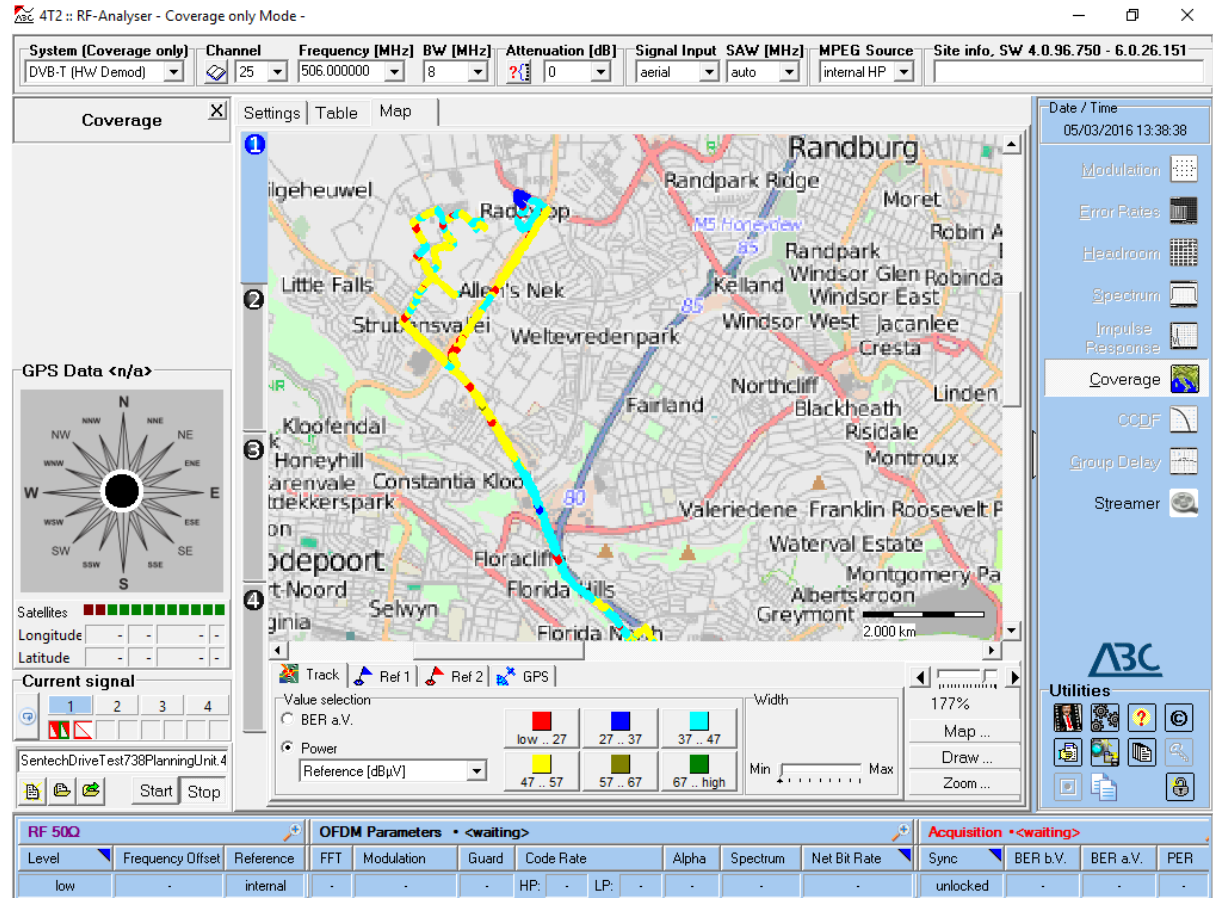
Up to four simultaneous channels supported

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

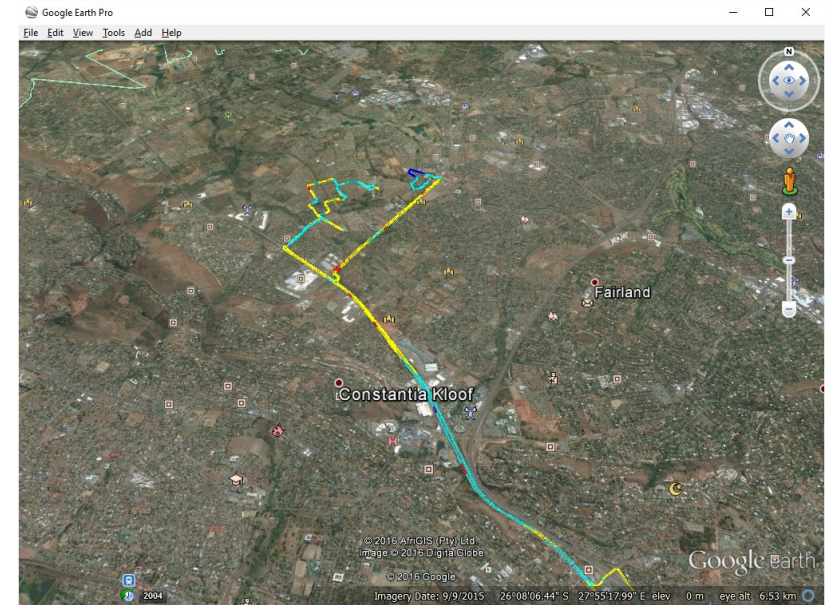
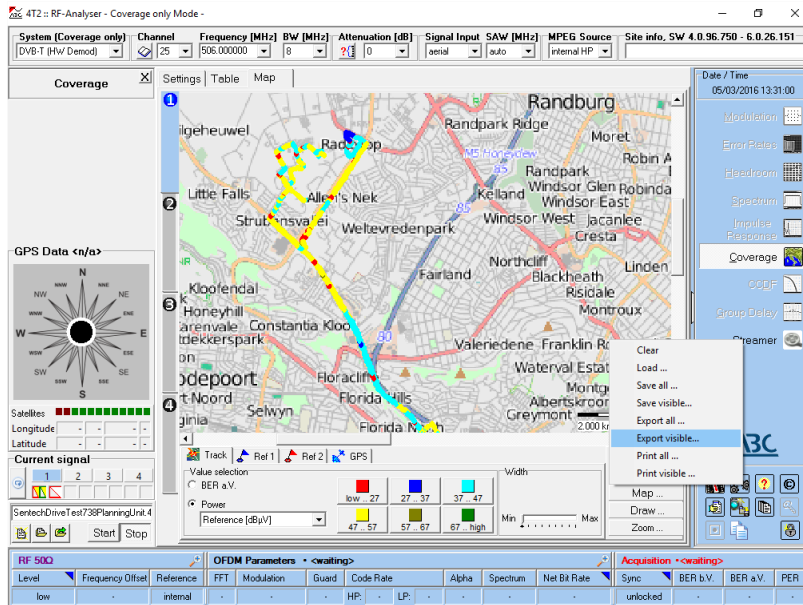


DVB-T/T2 4T2 Coverage-Analyser

Multiple Map format including OpenStreetMap

Comprehensive printing, and file-export features

KML, KMZ export for post-processing of measurement data

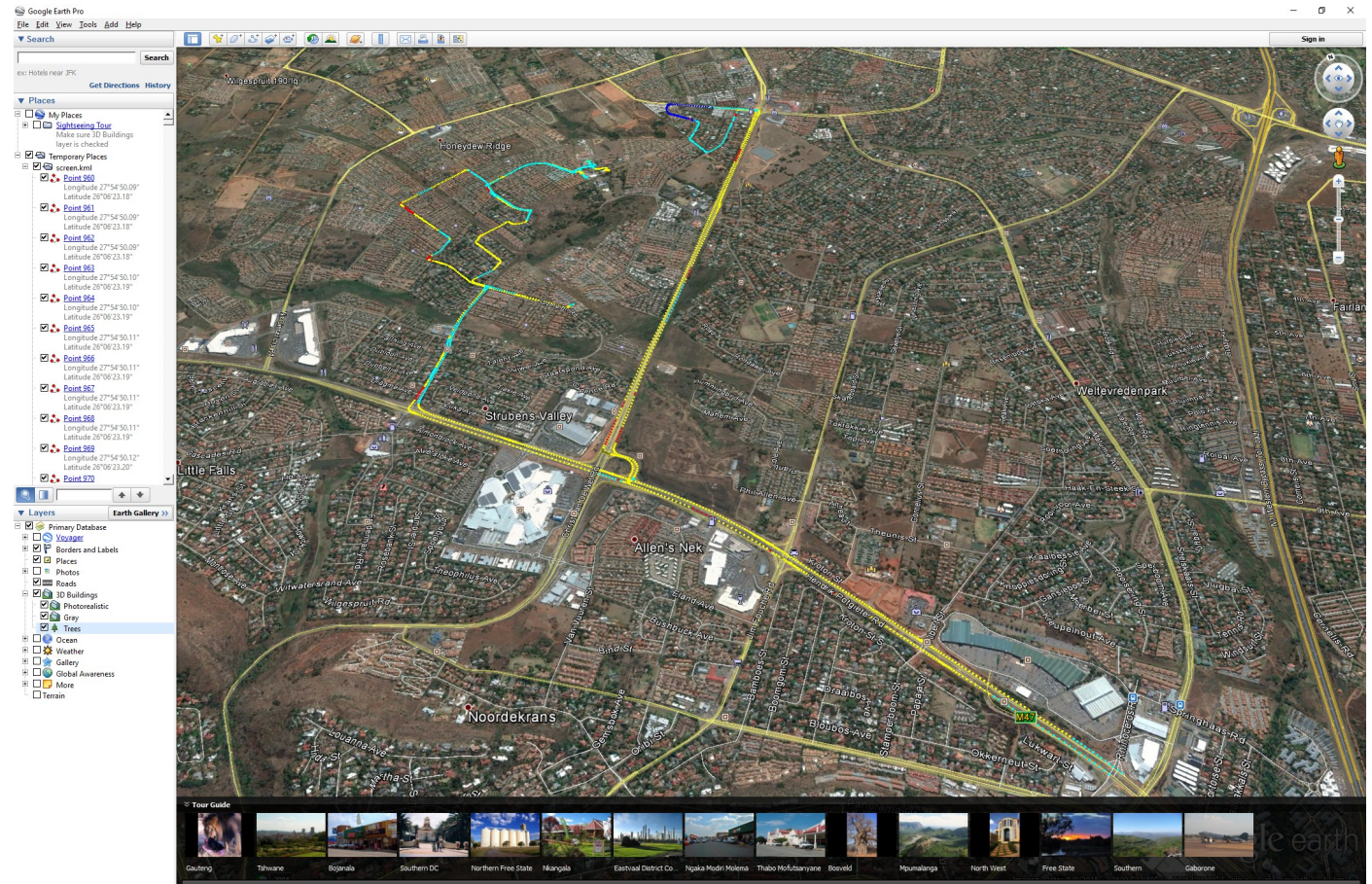


DVB-T/T2 4T2 Coverage-Analyser

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



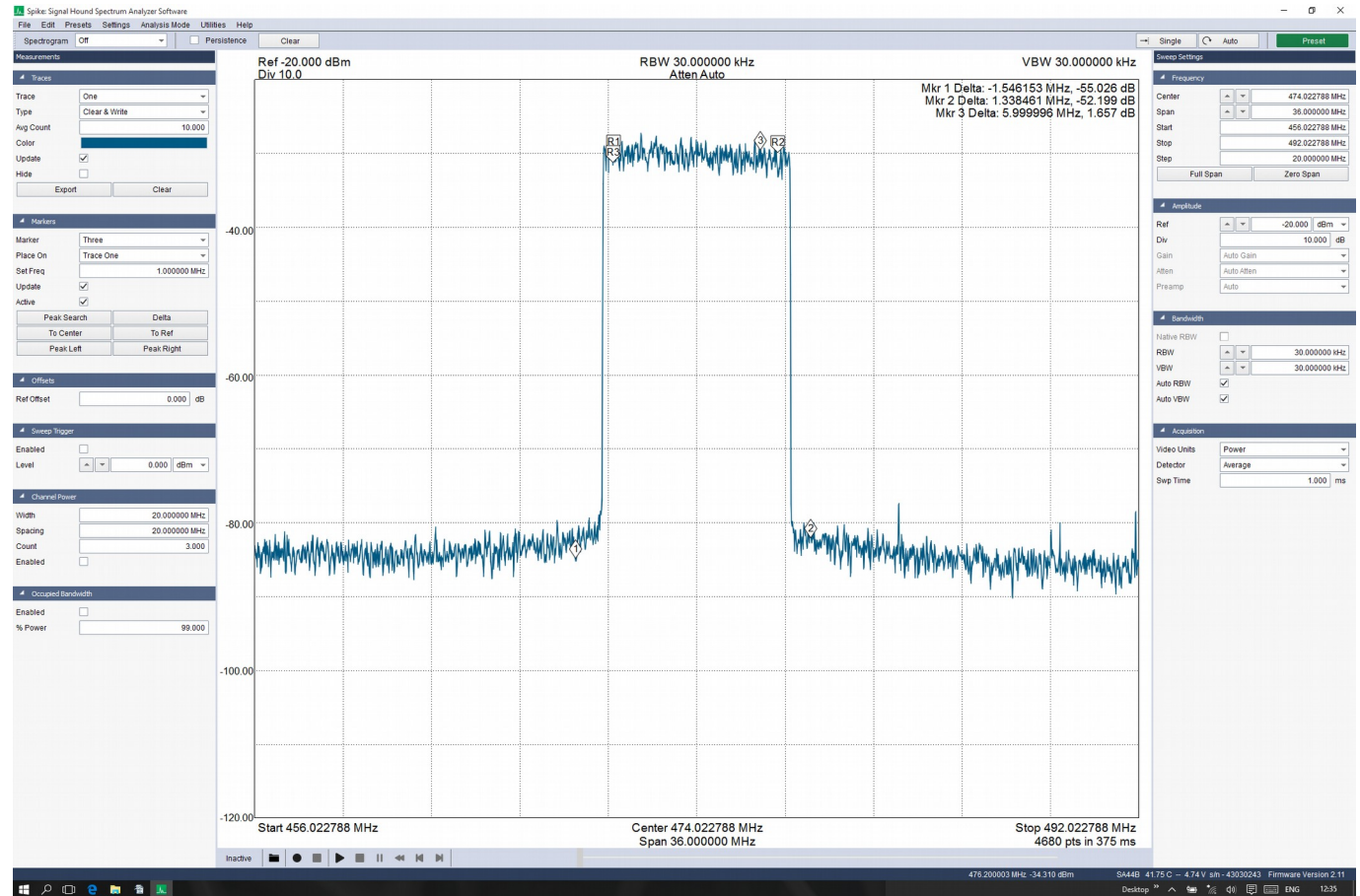
4T2 Portable and Rack Spectrum Analysis

The Spectrum Analyser sub-system provides state-of-the-art signal analysis, available independently 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

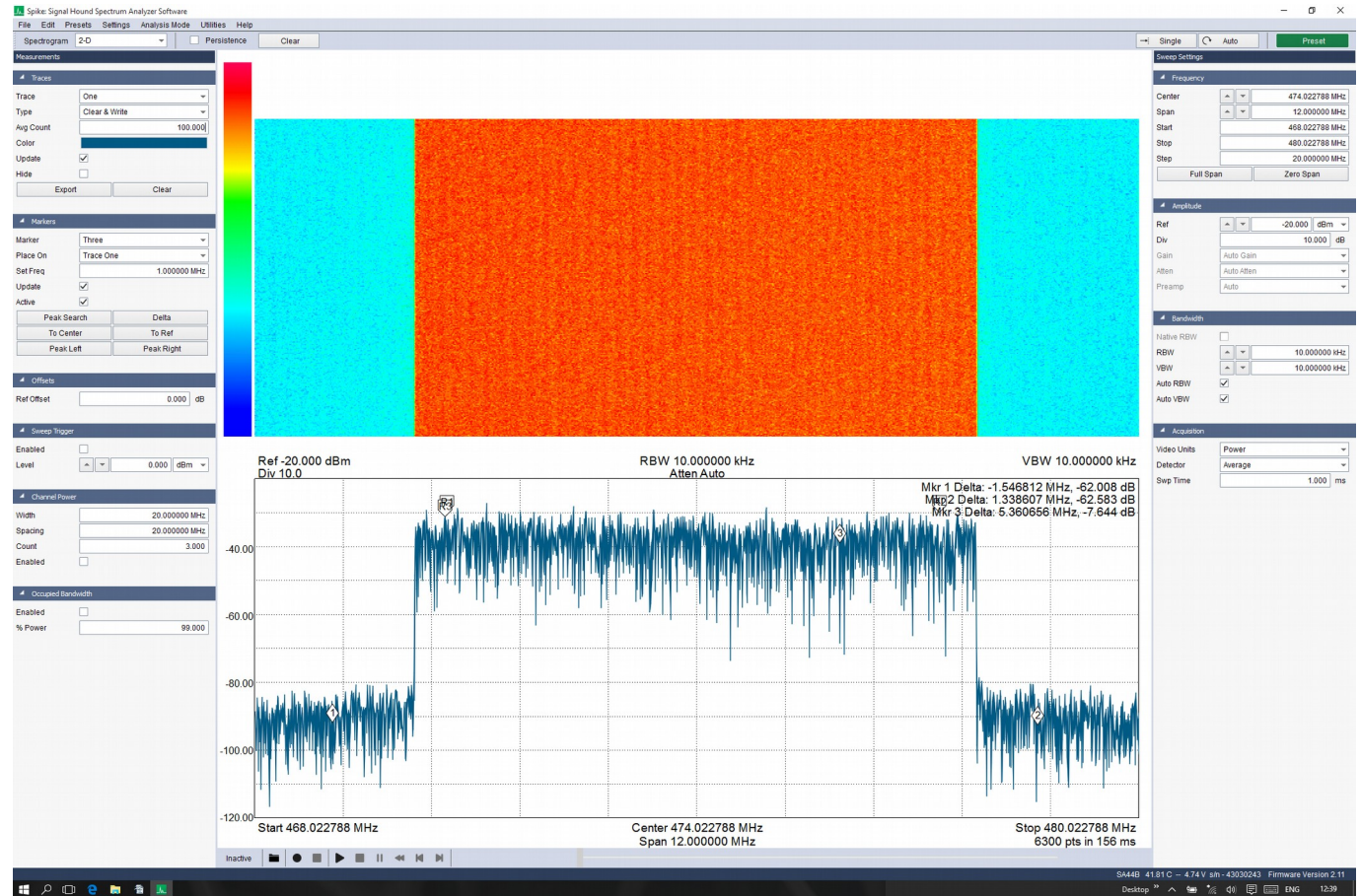


4T2 Portable and Rack Spectrum Analysis

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 delta-marker 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

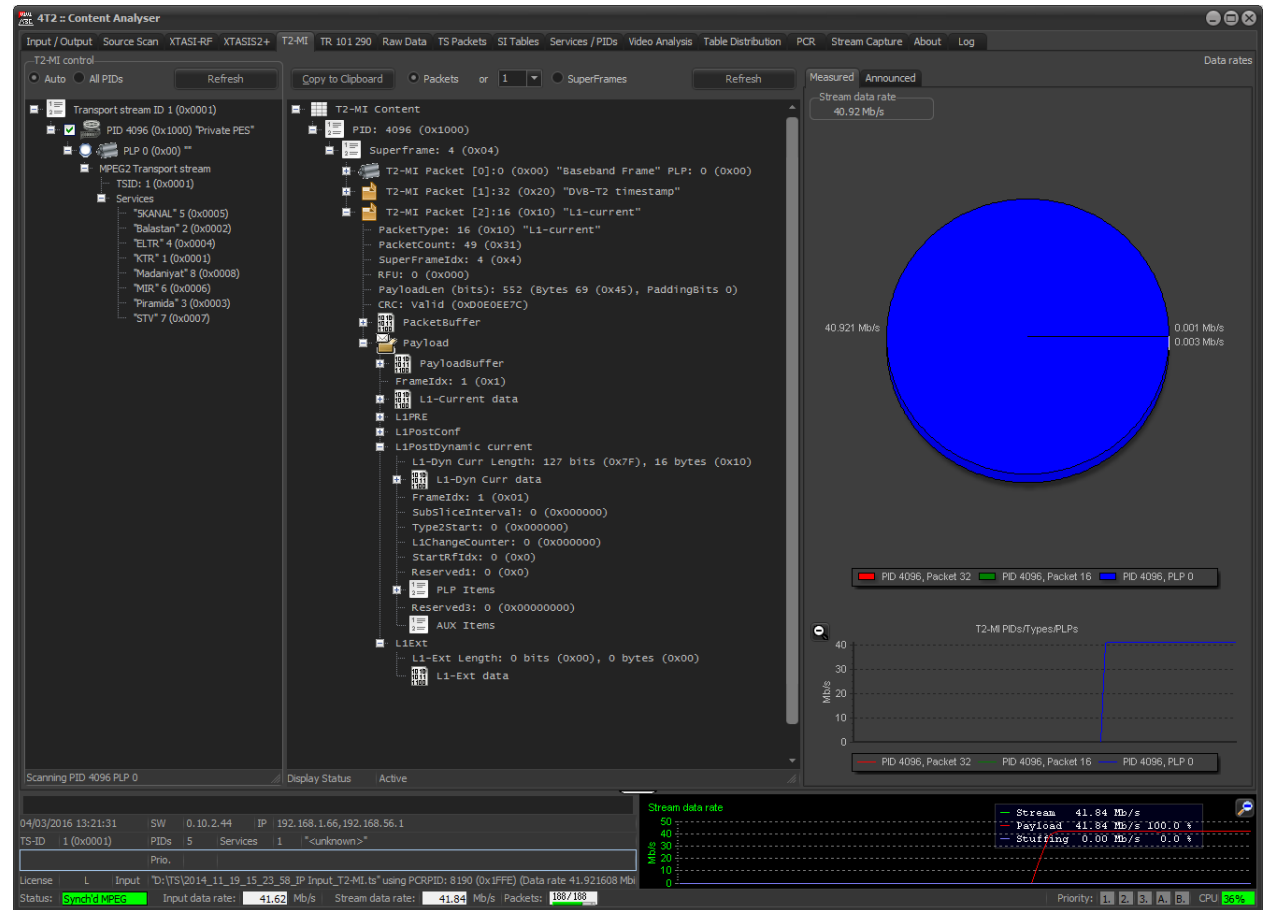
Advanced Broadcast Components

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



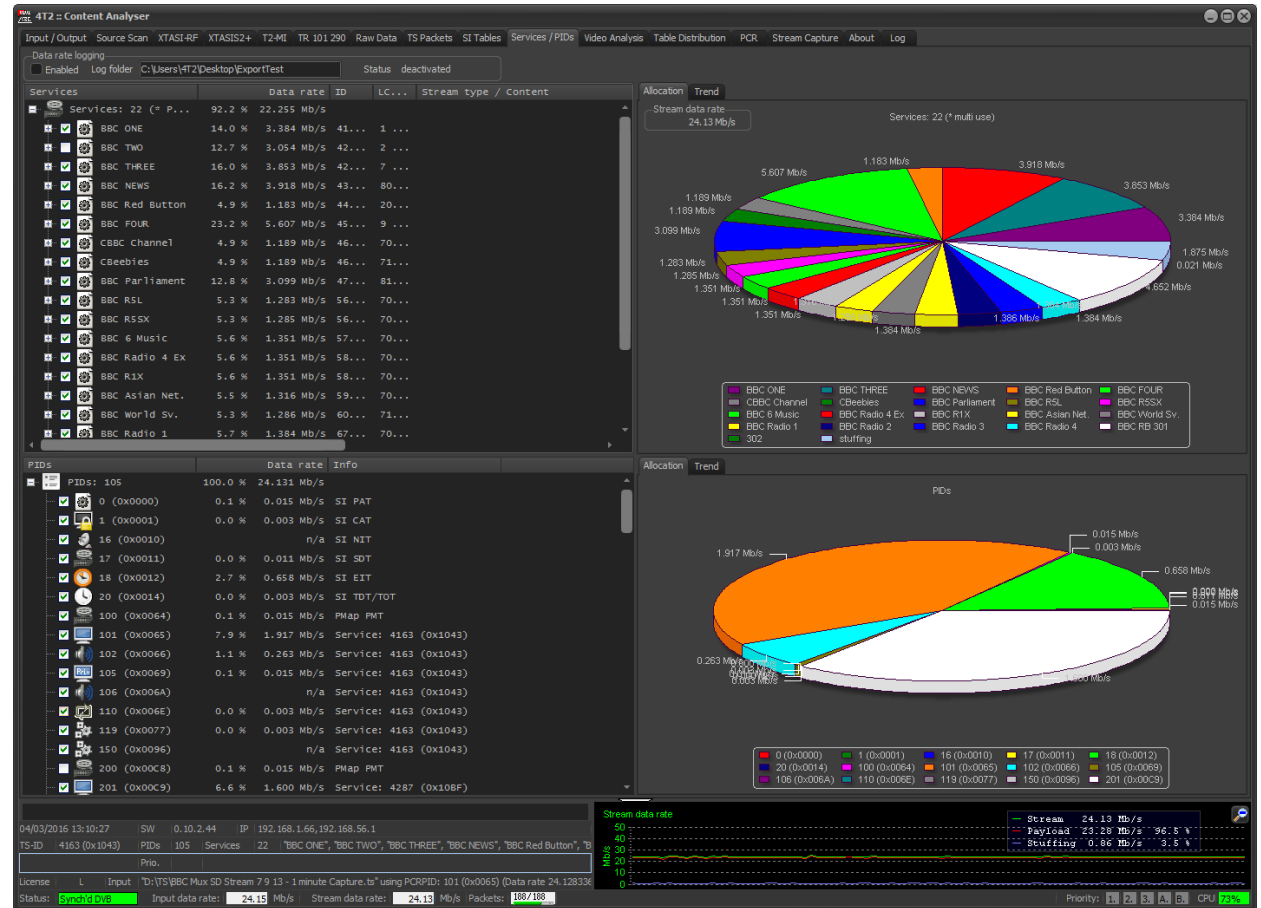
SERVICES PIDs (all inputs)

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



MultiViewer (all inputs)

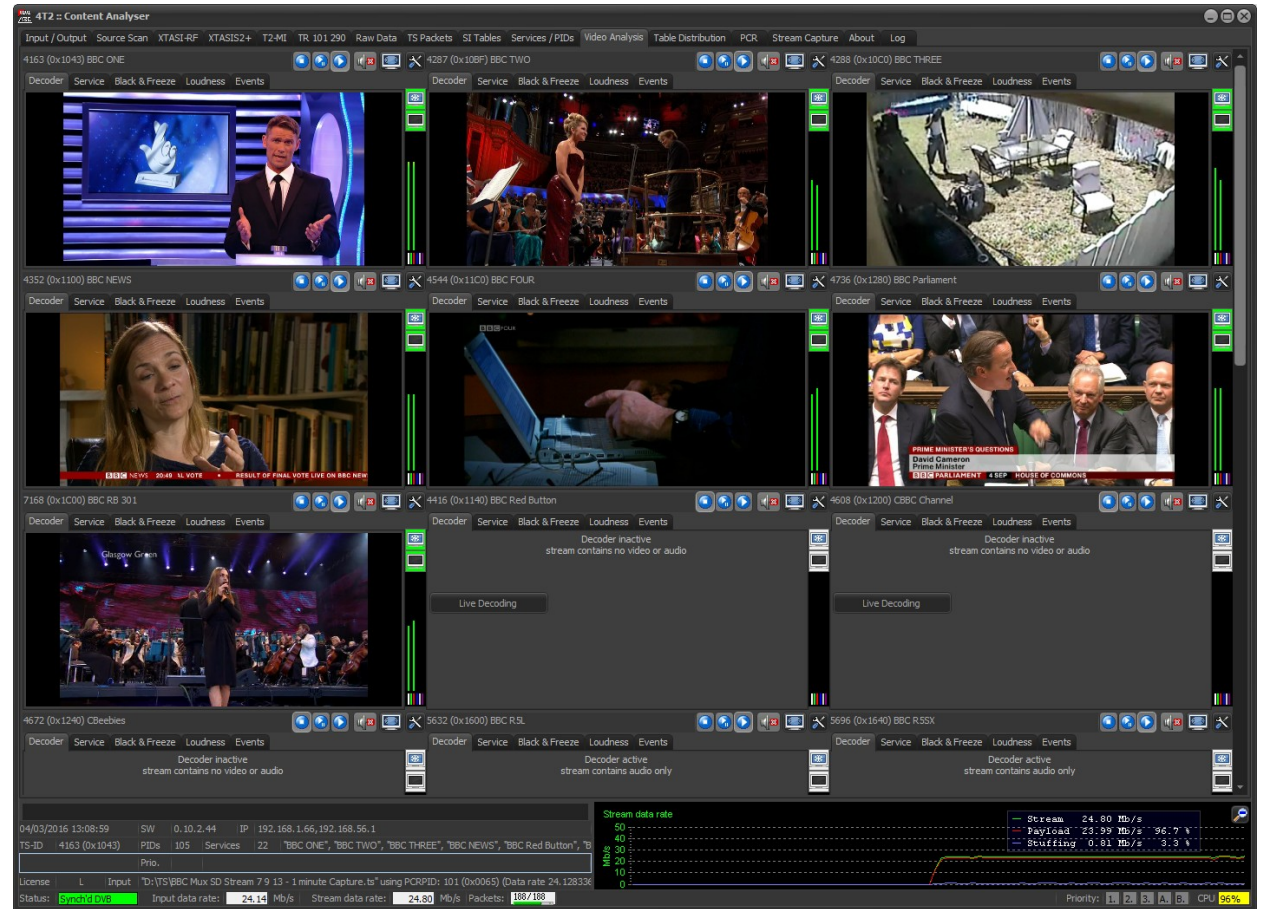
Video/audio of all services
in transport stream
(H.262, H.264, and H.265)
(AC3, AAC)

Audio bar-graphs with
history

Black/freeze detection

Moving video or
thumbnails

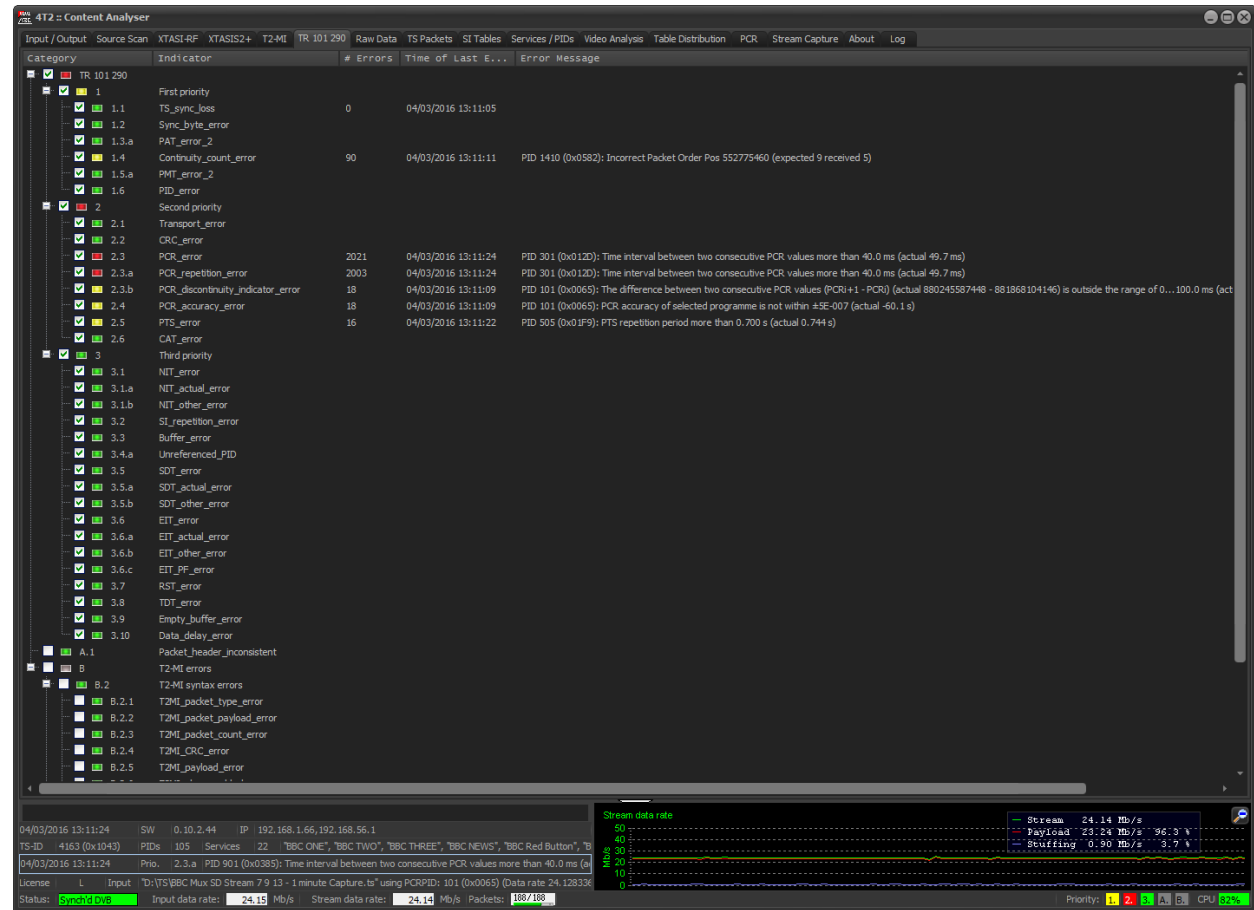
Industry standard codec
interface



TR 101 290 (all inputs)

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

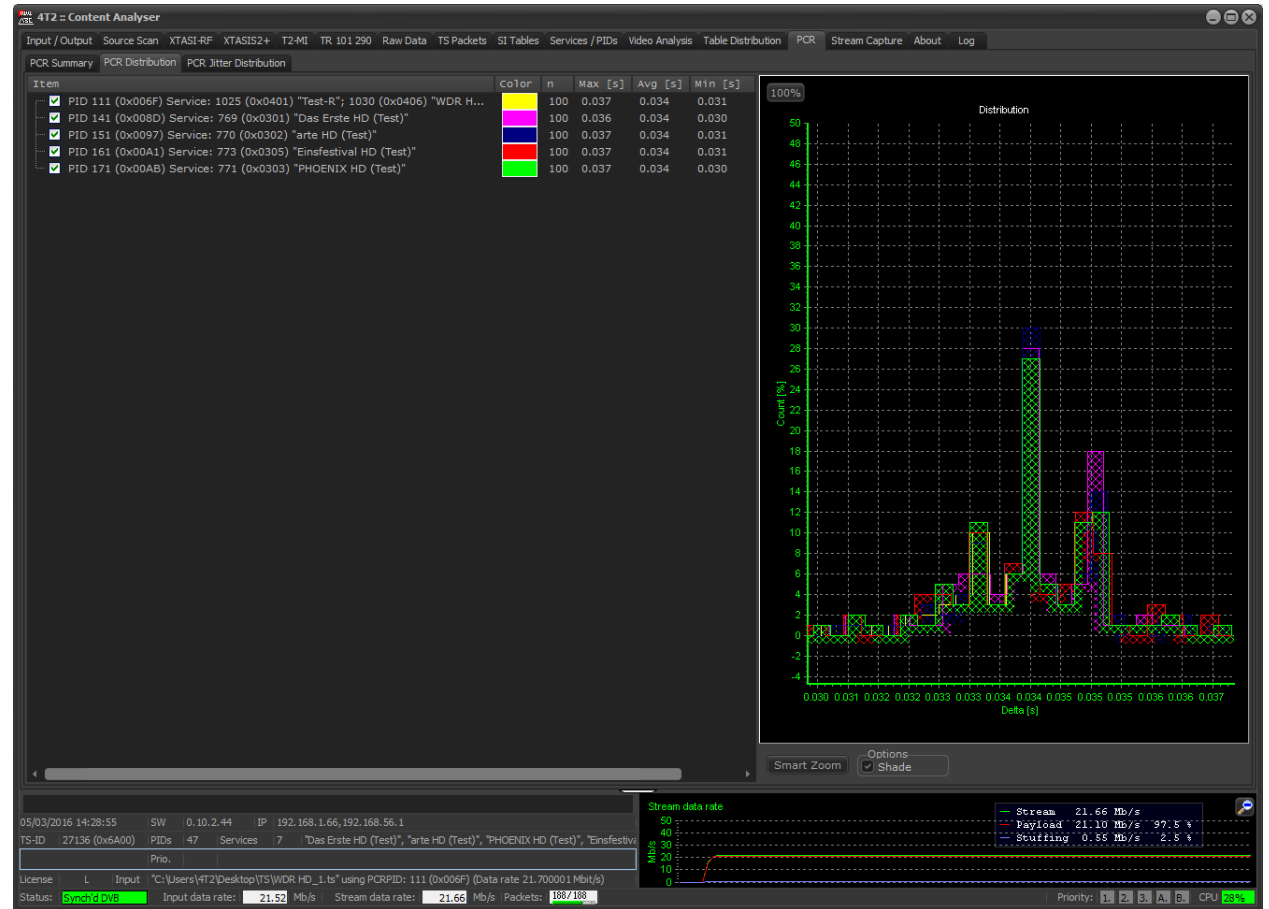
Groups, or individual error measurements can be activated / deactivated



PCR (all inputs)

Powerful menu for finding PCR related problems from

Jitter, Drift, and Time-stamping



SI tables (all inputs)

Display of the services information with comprehensive interpreter

detailed export functions

find function

The screenshot displays the 'Content Analyser' application window. The 'SI Tables' tab is active, showing a tree view of service information. The selected item is an SDT Section for transport stream 4163 (0x1043). The main pane shows the hex and ASCII data for this section, including service names like 'BBC ONEs', 'BBC TWOs', 'BBC THREEs', 'BBC FOURs', and 'BBC NEWS'. The bottom status bar shows the current stream data rate as 24.12 Mb/s and CPU usage at 36%.

Stream	24.12 Mb/s
Payload	23.44 Mb/s 97.2%
Swifling	0.68 Mb/s 2.8%

04/03/2016 13:19:38 SW 0.10.2.44 IP 192.168.1.66,192.168.56.1
TS-ID 4163 (0x1043) PIDs 105 Services 22 "BBC ONE", "BBC TWO", "BBC THREE", "BBC NEWS", "BBC Red Button", "BBC Radio"
License L Input "D:\ITS\BBC Mux SD Stream 7.9.13 - 1 minute Capture.ts" using PCRPID: 101 (0x0065) (Data rate 24.128336)
Status: Sync'd DVB Input data rate: 23.95 Mb/s Stream data rate: 24.12 Mb/s Packets: 188 / 188

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

The screenshot displays the 4T2 Content Analyser interface. The main window shows a list of TS Packets with columns for Packet Number, Delta, PID, Start Indicator, and Arrival. The selected packet (11) is expanded to show its PacketData, including General, Header, and Payload sections. The Payload is displayed in hexadecimal and ASCII format. The bottom status bar shows the current capture settings, including the start and stop times, the trigger expression, and the stream data rate.

Packet	Number	Delta	PID	Start Indicator	Arrival
0	32531	n/a	16 (0x010)	Yes	2016-03-04, 13:12:39-227
1	32532	1	16 (0x010)		2016-03-04, 13:12:39-227
2	32540	8	16 (0x010)		2016-03-04, 13:12:39-228
3	32541	1	16 (0x010)		2016-03-04, 13:12:39-228
4	32571	30	16 (0x010)		2016-03-04, 13:12:39-228
5	32591	20	16 (0x010)		2016-03-04, 13:12:39-228
6	112783	80192	16 (0x010)	Yes	2016-03-04, 13:12:44-224
7	112796	13	16 (0x010)		2016-03-04, 13:12:44-224
8	112802	6	16 (0x010)		2016-03-04, 13:12:44-224
9	112804	2	16 (0x010)		2016-03-04, 13:12:44-224
10	112815	11	16 (0x010)		2016-03-04, 13:12:44-224
11	192961	80146	16 (0x010)	Yes	2016-03-04, 13:12:49-238
12	192975	14	16 (0x010)		2016-03-04, 13:12:49-238
13	192978	3	16 (0x010)		2016-03-04, 13:12:49-238

Stream data rate: Stream 24.01 Mb/s, Payload 23.08 Mb/s (96.0%), Stuffing 0.95 Mb/s (4.0%).

Log (all inputs)

Most comprehensive logging system

with integrated find and sorting options

Automated logfile storage with integrated garbage collection

The screenshot displays the Content Analyser application window. The main area is a log table with columns for Group, Sub-Group, Direction, Date and Time, Class Name, Instance, and Message. The log shows various events, including warnings and errors, such as 'Discontinuity detected while collecting PES Packet' and 'Exception in PacketHandler'. The interface includes a menu bar, a toolbar, and a status bar at the bottom showing stream data and system metrics.

Group	Sub-Gr...	Direction	Date and Time	Class Name	Instance	Message
Warning	Prog...	0	2016-03-04, 13:13:32-824	TTSPECollector	0x150C00C0	PID 101 (0x0065): Discontinuity detected while collecting PES Packet
Warning	Prog...	0	2016-03-04, 13:13:32-819	TTSPECollector	0x0A949340	PID 601 (0x0259): Discontinuity detected while collecting PES Packet
Warning	Prog...	0	2016-03-04, 13:13:32-811	TTSPECollector	0x0DB81780	PID 901 (0x0385): Discontinuity detected while collecting PES Packet
Warning	Prog...	0	2016-03-04, 13:13:32-806	TTSPECollector	0x0A949100	PID 501 (0x01F5): Discontinuity detected while collecting PES Packet
Error	Prog...	0	2016-03-04, 13:14:07-983	TTSAnalyser	0x0857E460	Exception in PacketHandler of pid 102 (0x0066) EOutOfMemory 'Out ...
Error	Prog...	0	2016-03-04, 13:14:07-606	TFormTSAnalyserMan	0x05074B40	Exception in MainTimer: EOutOfMemory 'Out of memory' (10)
Error	Prog...	0	2016-03-04, 13:14:06-528	TFormTSAnalyserMan	0x05074B40	Exception in MainTimer: EOutOfMemory 'Out of memory' (0)
Error	Prog...	0	2016-03-04, 13:14:04-280	TTSAnalyser	0x0857E460	Exception in PacketHandler of pid 101 (0x0065) EOutOfMemory 'Out ...
Error	Prog...	0	2016-03-04, 13:14:04-122	TTSAnalyser	0x0857E460	Exception in PacketHandler of pid 901 (0x0385) EOutOfMemory 'Out ...
Error	Prog...	0	2016-03-04, 13:14:04-084	TTSAnalyser	0x0857E460	Exception in PacketHandler of pid 301 (0x01D0) EOutOfMemory 'Out ...
Error	Prog...	0	2016-03-04, 13:14:04-011	TTSAnalyser	0x0857E460	Exception in PacketHandler of pid 601 (0x0259) EOutOfMemory 'Out ...
Error	Prog...	0	2016-03-04, 13:14:03-982	TTSAnalyser	0x0857E460	Exception in PacketHandler of pid 501 (0x01F5) EOutOfMemory 'Out ...
Error	Prog...	0	2016-03-04, 13:14:04-061	TABCVideoAnalyserFrame	0x05063ED0	Exception in PESPacketVideoCallback: EOutOfMemory 'Out of memory'
Error	Prog...	0	2016-03-04, 13:14:02-753	TTSAnalyser	0x0857E460	Exception in PacketHandler of pid 201 (0x00C9) EOutOfMemory 'Out ...
Error	Prog...	0	2016-03-04, 13:14:02-701	TTSAnalyser	0x0857E460	Exception in PacketHandler of pid 401 (0x0191) EOutOfMemory 'Out ...

Stream data rate: Stream 23.85 Mb/s, Payload 23.01 Mb/s, Stuffing 0.84 Mb/s. Status: Synchronised, Input data rate: 24.16 Mb/s, Stream data rate: 24.93 Mb/s, Packets: 168/188, CPU 72%.

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
- remote control or sharing of the 4T2 equipment in LAN or WAN environments



further information available at
www.4T2.eu

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