

# 4T2 Content-Analyser

RF and MPEG Transport Stream analyser application for the  
Windows operating system

Advanced Broadcast Components  
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# Time-line / history

- 2009 internal project „MPEG Transport Stream analyser“ for ABC 4T2 portable and rack-mount measurement receivers
- 2009 4T2-Rack with 4T2 Content-Analyser delivered with IP, and ASI inputs  
(>100 installations at Italian RAI, main sites, 24/7 monitoring with SNMP remote control)
- 2010 4T2 Content-Analyser to work with XTASI-ASI modules (laptop-use)
- 2010 default configuration for 4T2-Portable 3rd generation
- 2011 4T2 Content-Analyser to work with XTASI-RF modules  
DVB-T/T2 RF-measurements, Constellation, Impulse Response, Level, ...
- 2012 4T2 Content-Analyser to work with XTASI-S2+ modules  
DVB-S/S2x RF-measurements, Constellation, Level, ..., Multi-Stream
- 2013 full compatibility with 64bit Windows operating systems
- 2014 version 1.1 with flexible user interface features
- 2015 latest version 0.10 with streamlined user interface
- 2017 added Teletext, Subtitles, GOP Structure,..
- 2018 added Round Robin analysis through ABC Scheduler application

# Time-line / history



# key functions on transport stream level

- Analysis of MPEG-TS PAT, PMT Program Association, and Map Tables
- Analysis of DVB-specific Service Information (CAT, SDT, EIT, NIT, TOT, TDT)
- Analysis of ATSC-specific Service Information (MGT, STT, TVCT, EIT, ETT)
- Visualisation of SDT Service Description Tables
- Visualisation of NIT Network Information Tables
- Visualisation of MIP Mega-frame Initialisation Packets
- Visualisation of PID Packet Identifiers and associated bit-rates
- Visualisation of bit stuffing
- Visualisation of time repetition intervals of tables defined in TR.101.290
- Analysis and visualisation of first, second and third priority errors according to TR.101.290

# enhanced functions on TS level

- Analysis of DVB T2-MI Modulator Interface
- Measurement of PCR Program Clock Reference Jitter
- Content decoding, based on Software Defined Video SDV,  
including H.262 SD/HD, H.264 SD/HD and H.265 QRes/SD/HD/UHD material
- Monitor-wall feature with audio bar-graphs
- Detection of black and freeze conditions of services in the Transport Stream
- Detection of audio mute condition of services in the Transport Stream
- Teletext and DVB-Subtitles decoding
- GOP structure analysis
- Triggered capture of TS to disk in presence of errors (pre/post trigger time adjustable)

# enhanced functions on TS level (contd.)

- Measurement of multiple Transport Stream sources  
(through multiple instances of the program running at the same time)
- Remote capability with full SNMP support following the DVB MIB, including Traps
- Input support for XTASI-S2 & XTASI-RF & XTASI-ASI, or 4T2 hardware
- Input support for RTP & UDP packet protocol, or files
- Comprehensive logging features with powerful sorting capabilities
- Raw data analysis with smart packet-trigger, and bit dependencies checking
- Smart Packet trigger with expression editor
- Interface to relay alarm contacts with expression debugger
- Forwarding of transport stream to IP, File, or ASI output

# Versatile input and forwarding options

## Inputs

- IP udp /rtp
- File playback
- XTASI ASI input
- XTASI DVB-T/T2 input
- XTASI DVB-S/S2 input

## Outputs

- udp/rtp streaming
- File recording
- XTASI ASI output

The screenshot displays the 4T2 Content Analyser x64 interface. The 'Inputs' section is active, showing a list of input streams. A red arrow points to the 'TS-File' input type. The 'Outputs' section is also active, showing a list of output streams. A red arrow points to the 'UDP/RTP' output type. The interface includes a menu bar, a toolbar, and a status bar at the bottom.

Inputs:

- TS-File [C:\Users\4T2\TS\Romania\Romania\_T2ML\_4t2bmp.ts] using PCRPID: 8191 (0x1FFF) (data rate 20.300000 Mbit/s) (run time 0.00 seconds)
- TS-File XTASI-RF
- TS-File XTASI-S2x
- TS-File XTASI-ASI
- UDP/RTP XTASI-RF #12000100 /DVB-T2 /f 4900000kHz /BW 8MHz /PLPID -1 /LNA auto /HW Gen2
- TS-File [C:\Users\4T2\TS\Germany\Berlin\_CH\_44.ts] using PCRPID: 385 (0x0181) (data rate 14.745190 Mbit/s) (run time 271.28 seconds)
- TS-File [C:\Users\4T2\TS\Germany\DecapsWDR.ts] using PCRPID: 171 (0x00AB) (data rate 21.800007 Mbit/s) (run time 38.35 seconds)
- TS-File [C:\Users\4T2\TS\Malaysia\ch47.ts] using PCRPID: 2052 (0x0804) (data rate 26.900007 Mbit/s) (run time 61.38 seconds)
- TS-File [C:\Users\4T2\TS\UKOther\UK\_VeryBadVideoQuality\_ab7.ts] using PCRPID: 308 (0x0134) (data rate 42.103287 Mbit/s) (run time 709.67 seconds)
- TS-File [C:\Users\4T2\TS\UKOther\Arqiva\_A\_TransportStreamRecording\_000.ts] using PCRPID: 201 (0x00C9) (data rate 29.454578 Mbit/s) (run time 288.51 seconds)
- TS-File [C:\Users\4T2\TS\TransportStreamRecording\_000\_SEMux.ts] using PCRPID: 5169 (0x1431) (data rate 19.694675 Mbit/s) (run time 1002.73 seconds)

Outputs:

- UDP/RTP Proto: UDP IP: 127.0.0.1 NIC: 0.0.0.0 Ports: 1101 TTL: 1
- TS-File Copy of

Status: sync MPEG Input data rate: 20.17 Mb/s Stream data rate: 20.21 Mb/s Packets: 188/188

# TR.101.290 monitoring & stream capture

Evaluation of TS following TR101290 1st, 2nd, 3rd priority (including T2-MI extensions)

- Groups, or individual error measurements
- All errors are logged with date and time of occurrence
- Selection can be used as trigger for Stream Capture
- Pre and post trigger capture
- Adjustable quota for current file and overall storage

The screenshot displays the 4T2 Content Analyser x64 application interface. The main window is titled "4T2 - Content Analyser x64 - app64 // Sky UK Ltd". The interface is divided into several sections:

- Input / Output:** Shows source scan, T2-MI, TR 101 290, Raw Data, TS Packets, SI Tables, Services / PIDs, Sky IEPG, Video Analysis, Table Distribution, PCR, About, and Log.
- TS-Capture on error events:** Includes checkboxes for 1st, 2nd, and 3rd priority, and a Manual checkbox.
- Buffering [seconds]:** Pre (10.0) and Post (10.0) settings with an Apply button.
- Quota [GBytes]:** Per file (1.000) and Folder (2.000) settings with an Apply button.
- Current usage [GBytes]:** File (n/a) and Folder (0.000) settings.
- Explorer: Captured streams:** A button to view captured streams.
- Reset Analyser:** A button to reset the analysis.
- Category:** A tree view showing error categories and indicators. The tree is expanded to show "TR 101 290" with sub-categories: 1 (First priority), 2 (Second priority), 3 (Third priority), A.1 (Packet\_header\_inconsistent), and B (T2-MI errors). Each category has a list of specific error indicators with checkboxes and status icons.
- Status Bar:** Shows "Status: sync OK", "Input data rate: 42.10 Mb/s", "Stream data rate: 41.99 Mb/s", "Packets: 187,188", "TR101290: 1 2 3 A B", "Alarms: R0 R1 R2 R3", and "CPU 42%".



# SI-Table analysis

(all inputs)

Display of the service information tables (SI) with:

- find function
- comprehensive tree exporting options
  - all SI-tree
  - sub-tree
  - individual entries

SI of DVB, ATSC, and ISDB supported

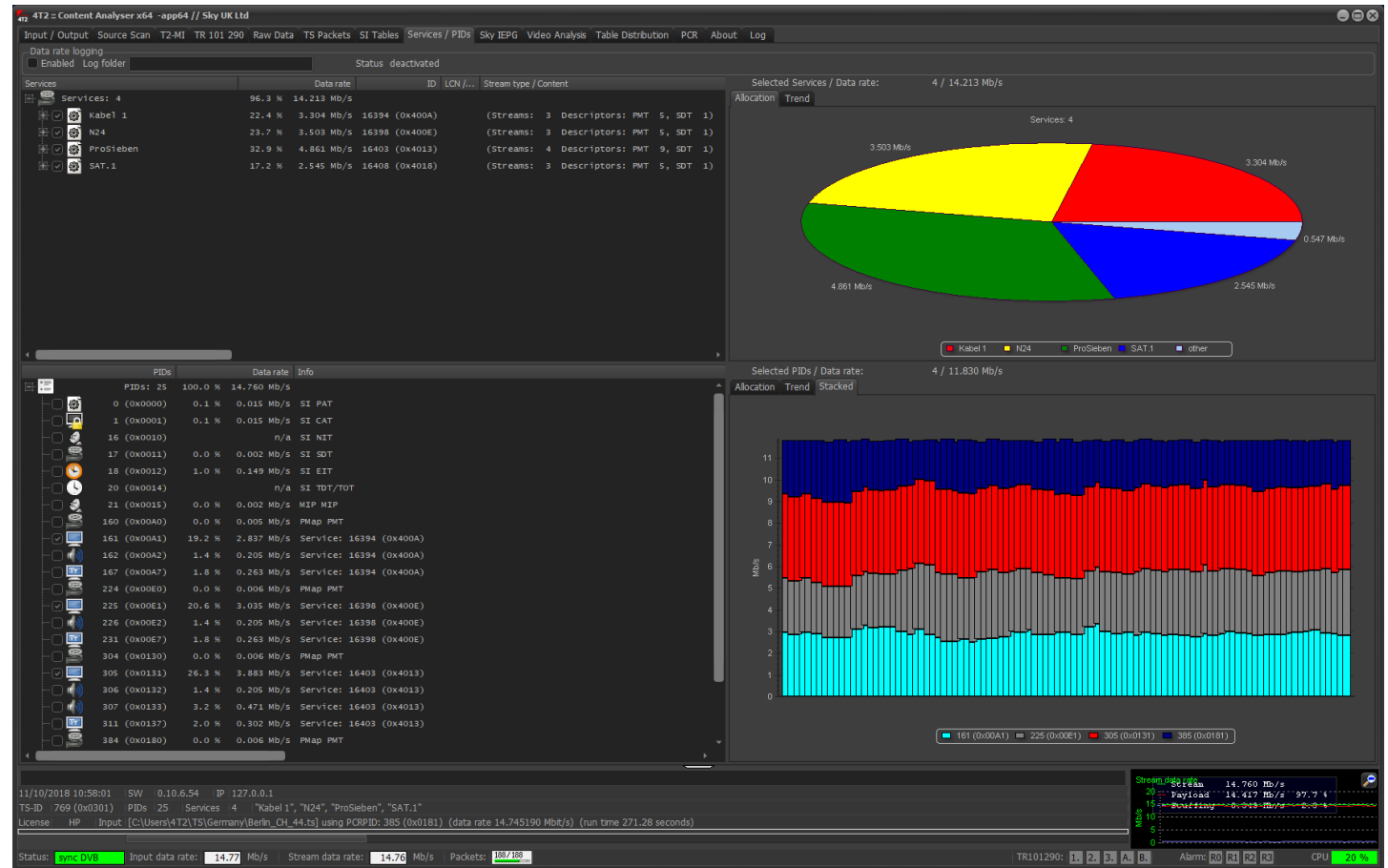
The screenshot displays the 4T2 Content Analyser x64 interface. The main window shows a tree view of service information tables (SI) under the 'Sections' folder. The selected entry is 'Actual Events 78 (0x4E)', which contains a list of programs: 'Kabel 1', 'N24', 'ProSieben', and 'SAT.1'. The 'SAT.1' program is expanded to show its details, including the service ID (16408), transport stream ID (769), and original network ID (8468). The 'SectionData' field is expanded to show a list of service names and their corresponding SI-Table IDs, such as 'N088.0...1..NA', 'MDeu', 'Star Trek - Dee', 'Space Nine', 'Tende-Fiction-Se', 'rie, USA 19935.N', 'y.deu.-.Auf "Dee', 'p Space Nine" do', 'cke ein defektes', 'Raumschiff aus', 'dem Gamma-Quadra', 'nten an, auf dem', 'sich die Mitgll', 'eder des weltgeh', 'end unbekanntem', 'volksstammes der', 'Skreea befinde', 'n. Vor deren unv', 'erstndlicher Sp', 'fache versage so', 'gar der Übersetz', 'ungs-Computer, NY', '.deu.+ und es da', 'uert geraume Zei', 't, bis sich zine', 'ommunikation e', 'rmöglichen läßt.', 'Doch dann stell', 't sich heraus, d', 'als die Skreea v', 'on einem unterdr', 'ücken Planeten'.

The interface also shows a status bar at the bottom with the following information: Status: sync DVB, Input data rate: 14.79 Mb/s, Stream data rate: 14.65 Mb/s, Packets: 187/188, TR101290: 1, 2, 3, A, B, Abmr: R0, R1, R2, R3, CPU: 16%.

# SERVICES PIDs analysis display

(all inputs)

- Data-rate displays with virtual and logical channel numbers sorted by services and PIDs
- Pie-chart allocation or trend of Services
- Service-sorted view displays all PIDs that make up a service
- PID-sorted view with corresponding data-rate display as Pie, Trend or Stacked



# MultiViewer

(all inputs)

decoding of services in  
transport stream

- Black/freeze detection
- Moving video or thumbnails
- Audio bar-graphs and Loudness measurements
- EPG current/next analysis
- GOP Structure Analysis
- DVB-Teletext
- DVB-Subtitling



- H.262, H.264, H.265  
SD, HD and UHD

# DVB-T specific RF measurements

(XTASI-RF)

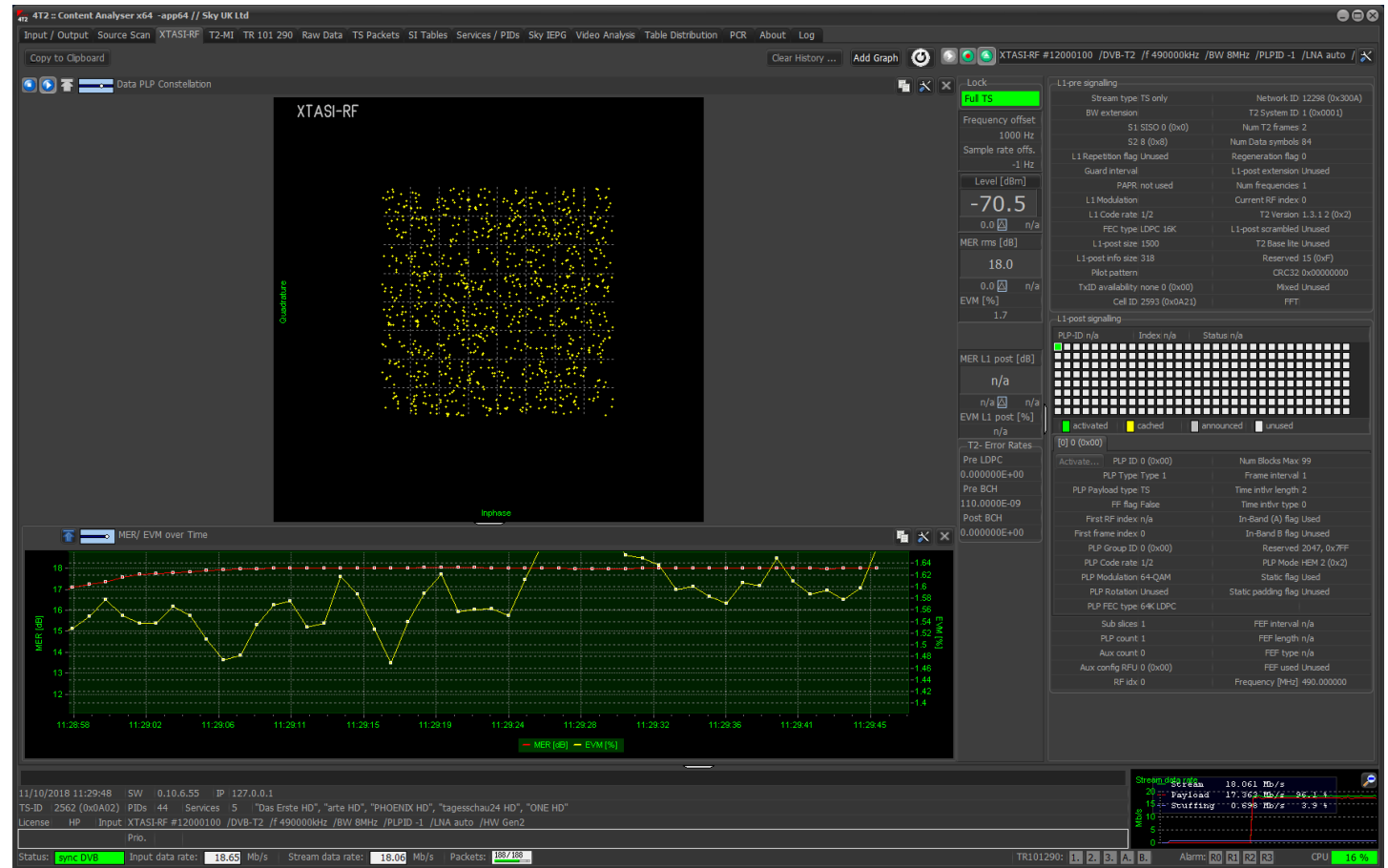
Constellation,  
Impulse-Response,  
Spectrum graphical  
displays

MER/EVM, BER, Level over  
time graphs

Calibrated level,  
field-strength with antenna  
correction factor

MER, EVM, BER before,  
and after Viterbi and Reed-  
Solomon

Decoded TPS information  
>42dB MER performance



# DVB-T2 specific RF measurements

(XTASI-RF)

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

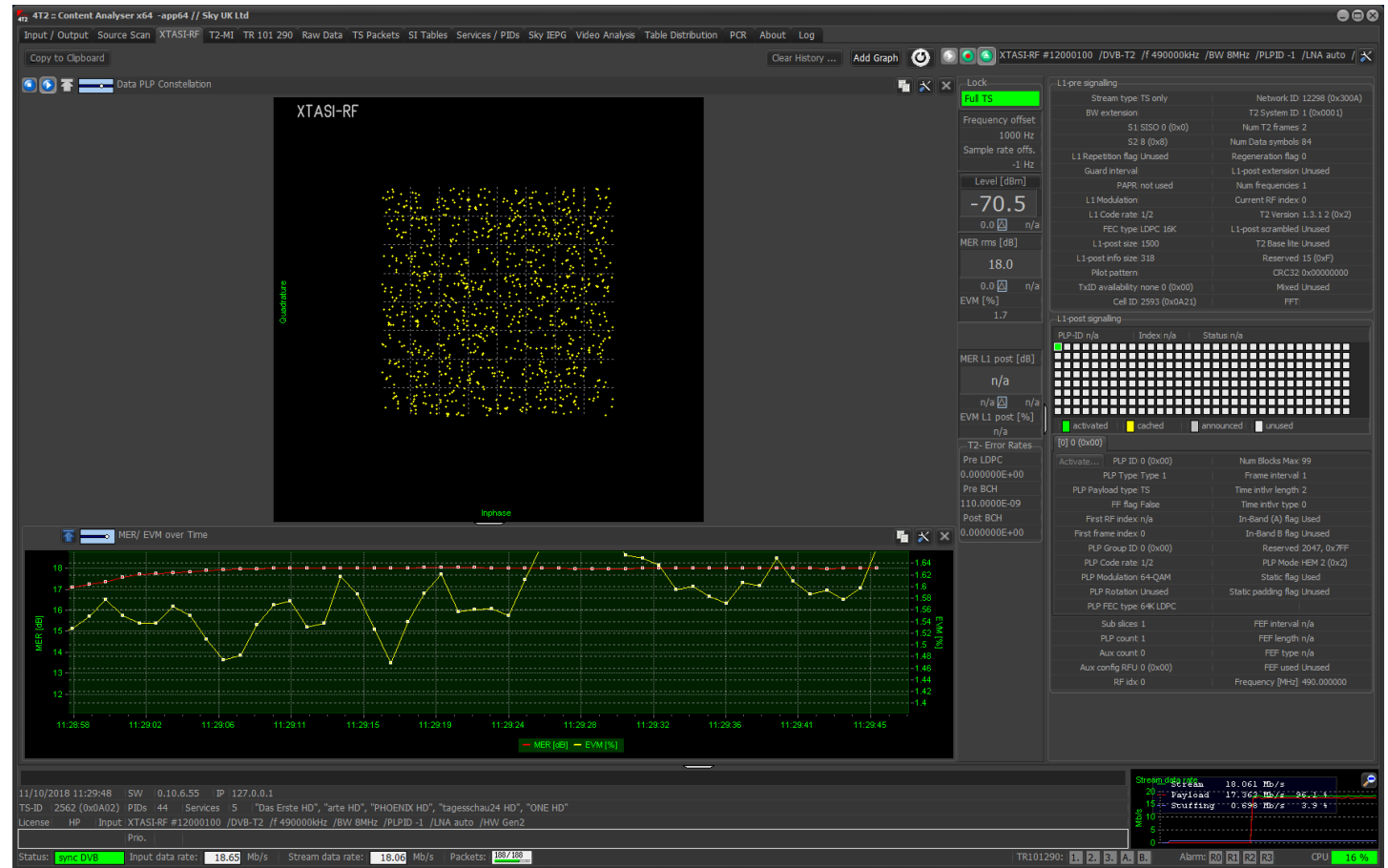
Level, MER, EVM,

BER before LDPC, and BCH

L1-pre, and L1-post  
decoded information

Data logging  
Data export

>42dB MER performance



# DVB-S specific RF measurements

(XTASI-S/S2)

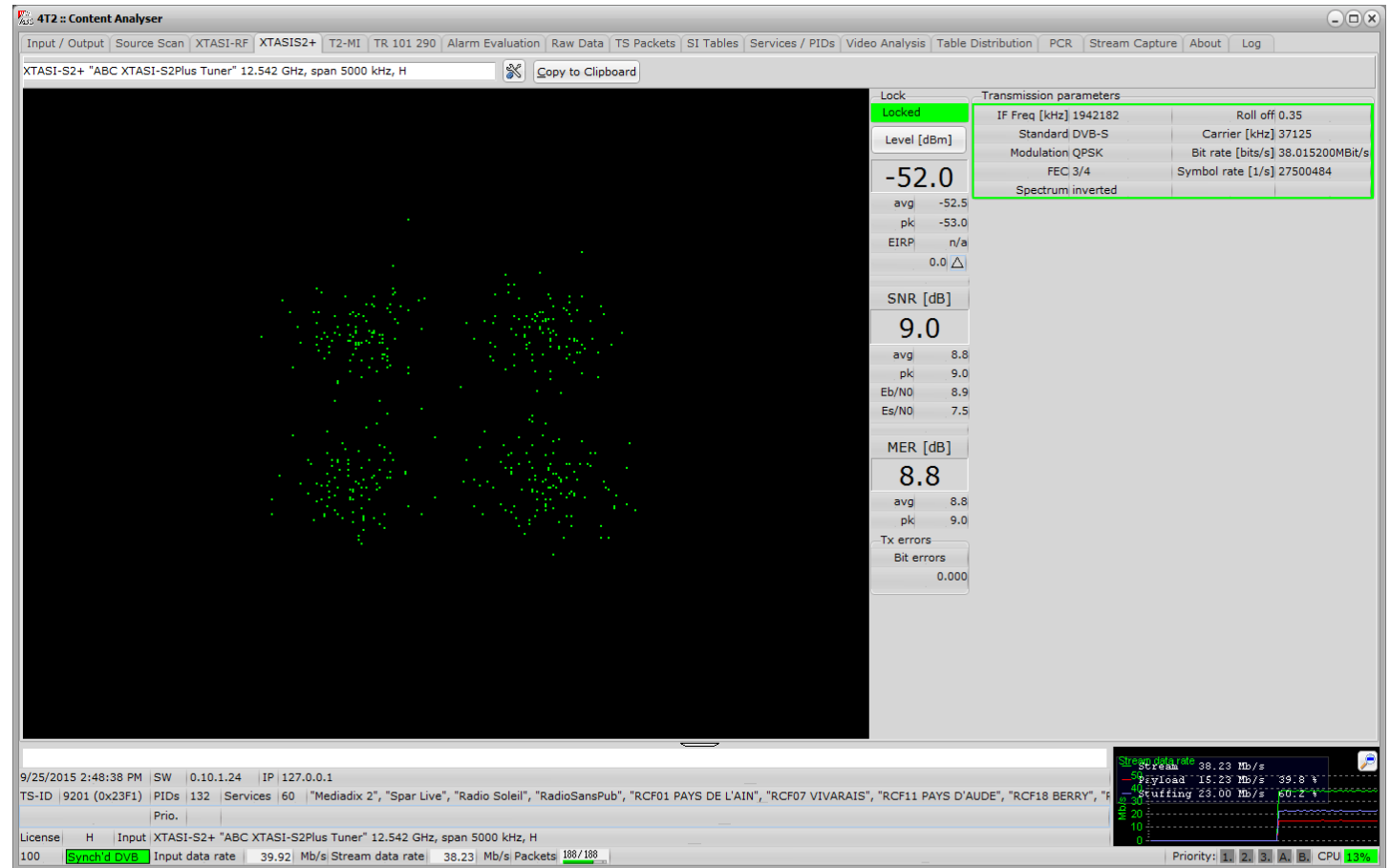
Constellation graphical display  
QPSK

Viterbi and Reed-Solomon  
FEC

Level measurement

SNR, MER, Eb/N0, Es/N0  
measurements

Bit errors





# DVB-S2 specific RF measurements

(XTASI-S/S2)

Constellation graphical display

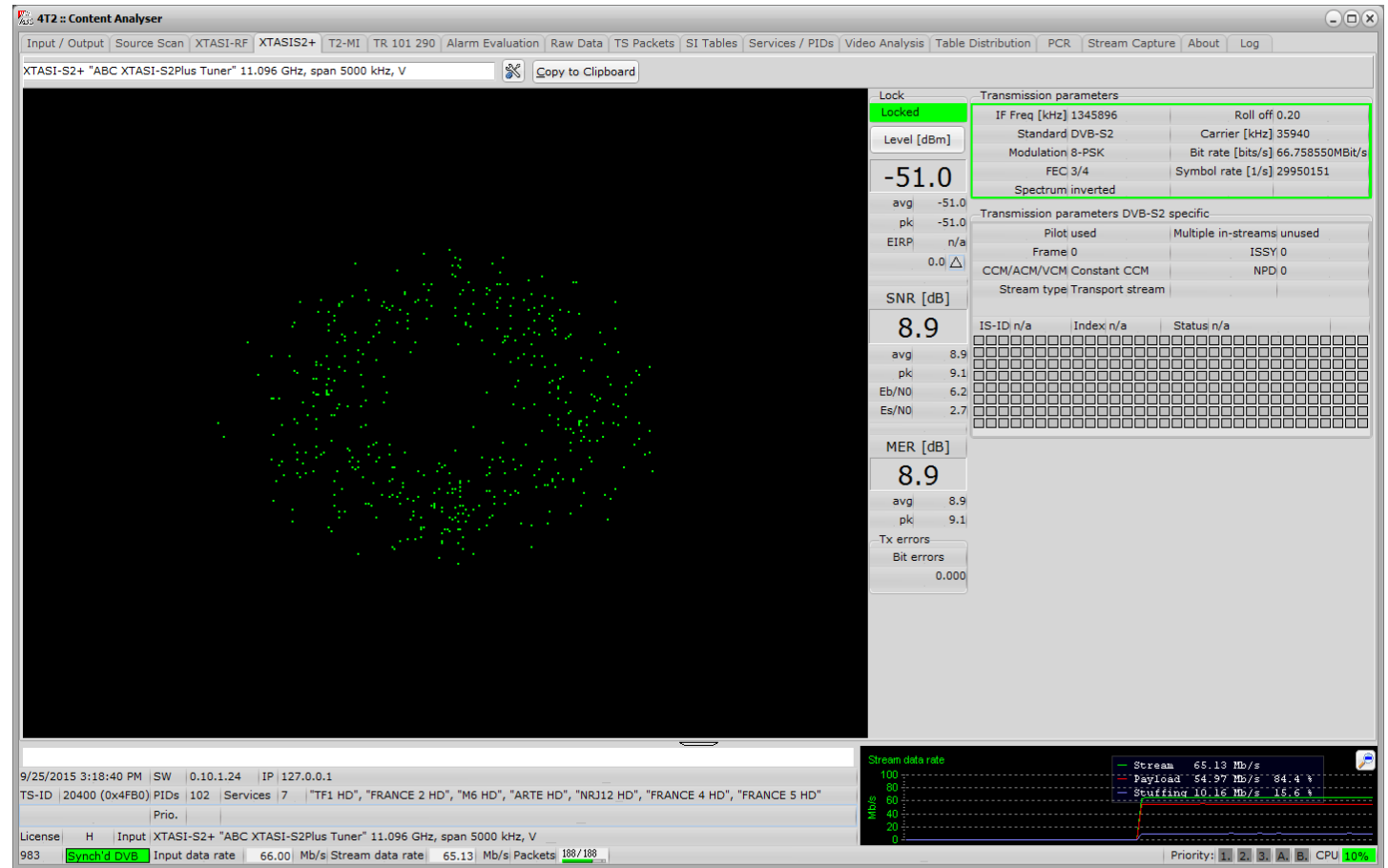
QPSK+, 8 APSK+,  
16 APSK+, 32 APSK+

CCM, ACM, and VCM  
Multi-Stream

LDCP and BCH short and  
normal mode

0.2, 0.25, 0.35 Filter  
Rolloff support  
Level measurement

SNR, MER, Eb/N0, Es/N0  
measurements  
Bit errors



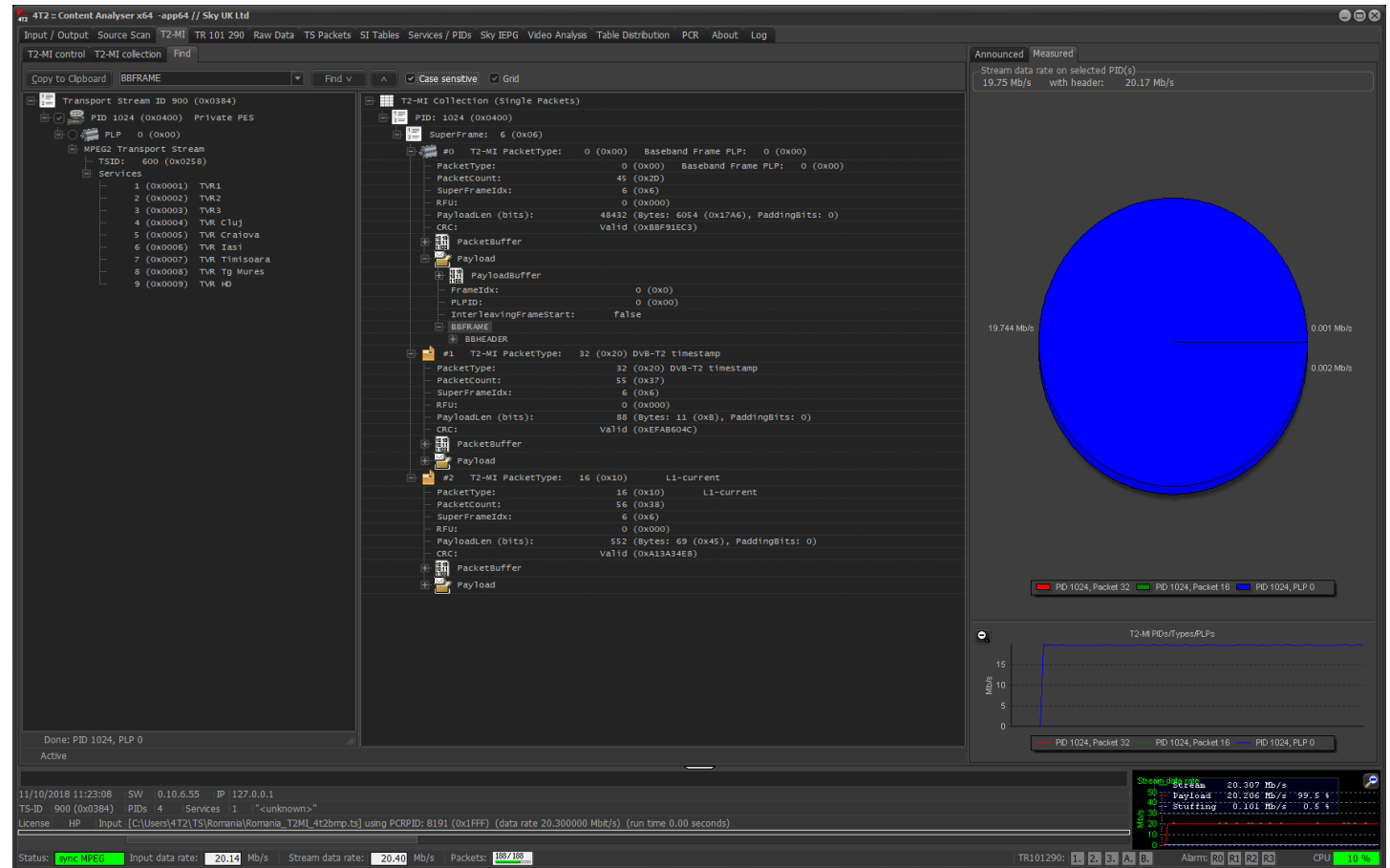
# T2-MI decapsulation and analysis

(DVB-S2, ASI, IP inputs)

Modulator interface real-time analyser

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

Re-routing into Content-Analyser for visualisation and analysis





# TS Packets expert function

(all inputs)

Sophisticated packet filtering with multiple trigger variables and filter expression editor

Unique and powerful tool for finding problems in the transmission chain and in multiplexers

The screenshot shows the 4T2 Content Analyser x64 interface. The main window displays a list of packets with columns for Number, Delta, PID, StartIndicator, and Arrival. The selected packet (Number 87) is expanded to show its payload in hexadecimal and ASCII. The right sidebar contains configuration options for the trigger mode, packet display, and PID gate. The bottom status bar shows input data rate, stream data rate, and packet count.

Packet	Number	Delta	PID	StartIndicator	Arrival
0	87	n/a	161 (0x00A1)	Yes	2018-10-11, 10:59:57-995
1	92	5	161 (0x00A1)		2018-10-11, 10:59:57-995
2	98	6	161 (0x00A1)		2018-10-11, 10:59:57-995
3	103	5	161 (0x00A1)		2018-10-11, 10:59:58-006
4	109	6	161 (0x00A1)		2018-10-11, 10:59:58-006
5	113	4	161 (0x00A1)		2018-10-11, 10:59:58-006
6	116	3	161 (0x00A1)		2018-10-11, 10:59:58-006
7	121	5	161 (0x00A1)		2018-10-11, 10:59:58-006
8	125	4	161 (0x00A1)		2018-10-11, 10:59:58-006
9	128	3	161 (0x00A1)		2018-10-11, 10:59:58-006

Status: sync DVB | Input data rate: 14.62 Mb/s | Stream data rate: 14.74 Mb/s | Packets: 187/188

# PCR

(all inputs)

Powerful menu for finding PCR related problems from jitter, to drift, and time-stamping

The screenshot displays the 'PCR' menu in the 4T2 Content Analyser software. The main window shows a table with the following columns: PCR PID, Service(s), Data rate [Mbit/s], PCR counter value [1/27MHz], and PCR time [hh:mm:ss.ms]. The table lists 37 services, including Miracle TV, CNA, Libya TV, AGHAPY TV, RTV, Alasr TV, Al Omma TV, Al Basira, Horn TV, Light TV, Al Magharia, Dala 3, Yemanyan, MTV, Hodhod TV, SHEBA, Al Eyma, Taqateq, Tiger, Good S..., Zein, Hamas..., Nadi A..., Al Ins..., Mubash..., CTV, Madani..., Noursa..., Libya TV, Aedoon, Nahj, Alhelwa, Tunisi..., El Sha..., Family..., and Family... Each row provides specific data points for these services.

PCR PID	Service(s)	Data rate [Mbit/s]	PCR counter value [1/27MHz]	PCR time [hh:mm:ss.ms]
257 (0x0101)	1 (0x0001) Miracle...	42.000150	2176099919396	22:23:16 293.310963
258 (0x0102)	2 (0x0002) CNA	41.999666	2180849410367	22:26:12 200.383963
259 (0x0103)	3 (0x0003) Libya ...	41.999861	2176075276682	22:23:15 380.617852
260 (0x0104)	4 (0x0004) AGHAPY TV	42.000237	2175662096992	22:23:00 077.666370
261 (0x0105)	5 (0x0005) RTV	41.999899	2176484979480	22:23:30 554.795556
262 (0x0106)	6 (0x0006) Alasr TV	41.999499	2181917645616	22:26:51 764.652444
263 (0x0107)	7 (0x0007) Al Omma...	41.999834	2180364983789	22:25:54 258.658852
264 (0x0108)	8 (0x0008) Al Basira	42.000311	2178228894395	22:24:35 144.236852
265 (0x0109)	9 (0x0009) Horn TV	42.000121	2179367614025	22:25:17 319.037963
273 (0x0111)	11 (0x0008) Light TV	42.000261	1370255601194	14:05:50 207.451630
274 (0x0112)	12 (0x000C) Al Mag...	42.000387	1770286249233	18:12:46 157.379000
275 (0x0113)	13 (0x000D) Dala 3	41.999955	1371539047934	14:06:37 742.516074
277 (0x0115)	15 (0x000F) Yemanyan	42.000320	2175132008099	22:22:40 444.744407
278 (0x0116)	16 (0x0010) MTV	42.000489	2176571952970	22:23:33 776.035926
279 (0x0117)	17 (0x0011) Hodhod TV	42.000085	2179219150882	22:25:11 820.403037
280 (0x0118)	18 (0x0012) SHEBA	42.000220	2175701956399	22:23:01 553.940704
281 (0x0119)	19 (0x0013) Al Eyma	42.000202	351591457866	03:37:01 905.846889
294 (0x0126)	26 (0x001A) Taqateq	42.000308	2178024425628	22:24:27 571.319556
295 (0x0127)	27 (0x0018) Tiger	42.000226	2178316333904	22:24:38 382.737185
296 (0x0128)	28 (0x001C) Good S...	42.000070	2179328597549	22:25:15 873.983296
305 (0x0131)	31 (0x001F) Zein	42.000290	2179414580547	22:25:19 058.538778
306 (0x0132)	32 (0x0020) Hamas...	42.000217	2179759088123	22:25:31 818.078630
307 (0x0133)	33 (0x0021) Nadi A...	42.000354	2178373371354	22:24:40 495.235333
308 (0x0134)	34 (0x0022) Al Ins...	42.000211	1771489075576	18:13:30 706.502815
309 (0x0135)	35 (0x0023) Mubash...	42.000333	2178675556261	22:24:51 687.268926
310 (0x0136)	36 (0x0024) CTV	42.000160	351884781947	03:37:12 769.701741
311 (0x0137)	37 (0x0025) Madani...	42.000162	2177032682609	22:23:50 840.096630
312 (0x0138)	38 (0x0026) Noursa...	42.000111	2177634647420	22:24:13 135.089630
313 (0x0139)	39 (0x0027) Libya ...	42.000228	2174127978315	22:22:03 258.456111
320 (0x0140)	40 (0x0028) Aedoon	42.000389	2173510408463	22:21:40 385.498630
321 (0x0141)	41 (0x0029) Nahj	41.999541	2177231809461	22:23:58 215.165222
322 (0x0142)	42 (0x002A) Alhelwa...	42.000396	2175249178302	22:22:44 784.381556
323 (0x0143)	43 (0x002B) Tunisi...	42.000269	2174712688683	22:22:24 913.654926
324 (0x0144)	44 (0x002C) El Sha...	42.000263	2174089036518	22:22:01 816.167333
544 (0x0220)	20 (0x0014) Family...	45.861924	1584606477213	16:18:09 128.785667
545 (0x0221)	21 (0x0015) Family...	44.113101	1996864100826	20:32:37 929.660222
546 (0x0222)	22 (0x0016) Family...	44.764482	1996864284526	20:32:37 936.463926

At the bottom of the interface, there is a status bar showing: Status: Sync OK, Input data rate: 41.70 Mb/s, Stream data rate: 41.98 Mb/s, Packets: 1887188, TR101290: 1, 2, 3, A, B, Alarm: R0, R1, R2, R3, CPU: 50%.

# Table and PCR Distribution

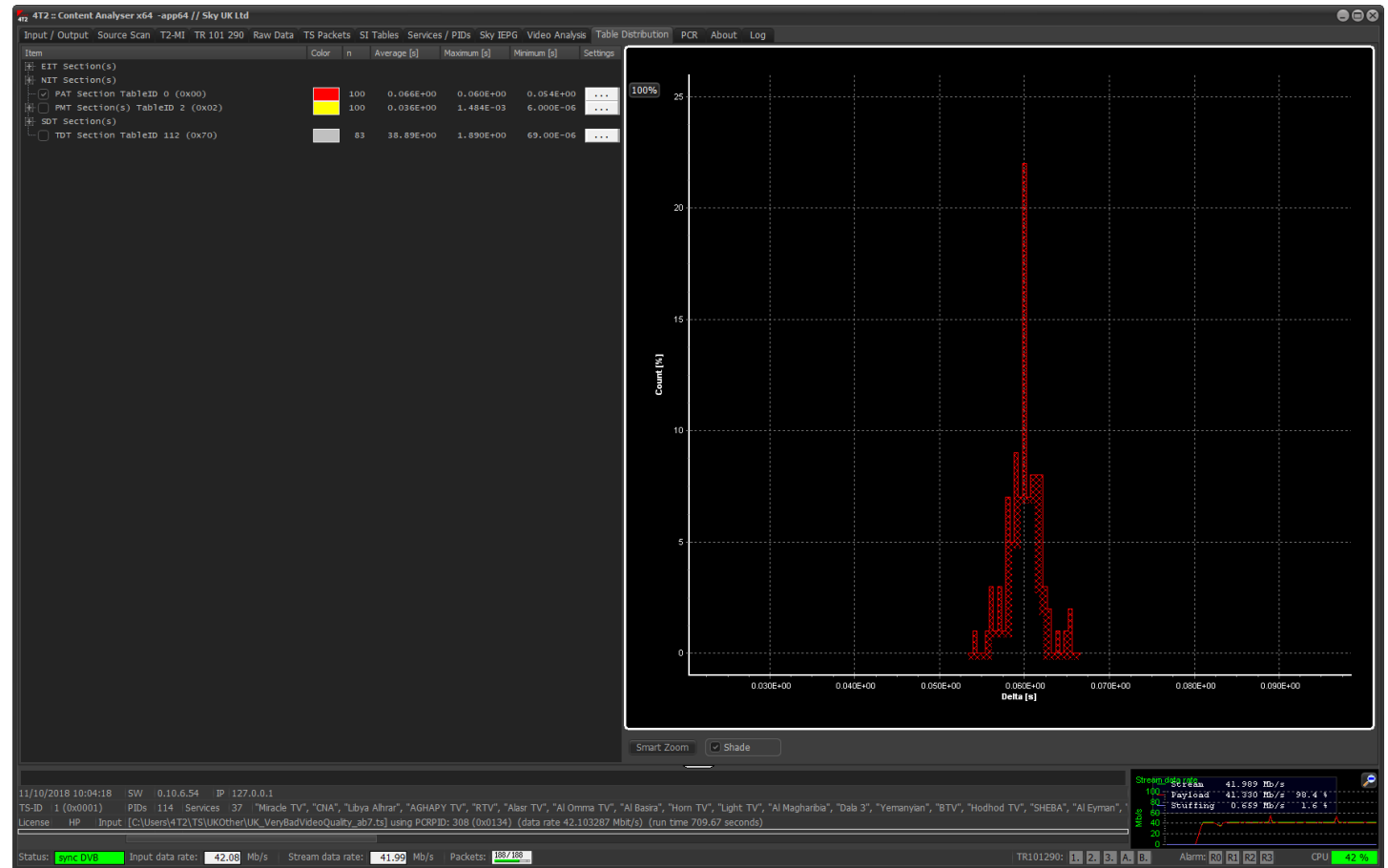
(all inputs)

Distribution of SI-tables in the Transport Stream

Selection is arranged through individual services

Individual tables can be selected and the repetition rates are displayed in form of a histogram

Smart-zoom assists on positioning the histograms



# Log

(all inputs)

Most comprehensive logging system with integrated find and sorting features

Automated logfile storage with integrated garbage collection

Easy logfile post-processing available on-the-fly using Windows tools

The screenshot displays the 4T2 Content Analyser software interface. The main window is titled "4T2 = Content Analyser x64 - app64 // Sky UK Ltd". The interface includes a menu bar with options like "Input / Output", "Source Scan", "T2-MI", "TR 101 290", "Raw Data", "TS Packets", "SI Tables", "Services / PIDs", "Sky IEPG", "Video Analysis", "Table Distribution", "PCR", "About", and "Log". Below the menu bar is a toolbar with icons for "Copy to Clipboard", "BBFRAME", "Find", and "CMD: Logfile folder". The main area is a log window with columns for "Group", "Log-Level", "Group", "SubGroup", "Date and Time", "ClassName", "Instance", and "Message". The log entries show various messages from different components, including "TT2MIPacketCollector", "TTSPEscollector", "TFormTSAnalyserMain", and "TTSF11eReaderThread". The status bar at the bottom provides real-time statistics: "11/10/2018 11:23:58 SW 0.10.6.55 IP 127.0.0.1", "TS-ID 900 (0x0384) PIDs 4 Services 1 'unknowns'", "License HP Input [C:\Users\4T2\TS\Romania\Romania\_T2MI\_4t2bmp.ts] using PCRPID: 8191 (0x1FFF) (data rate 20.300000 Mbit/s) (run time 0.00 seconds)", "Status: Sync MPEG Input data rate: 20.15 Mb/s Stream data rate: 20.31 Mb/s Packets: 188/188 TR101290: 1 2 3 A. B. Alarm: R0 R1 R2 R3 CPU 12 %".

further information available at  
[www.4T2.eu](http://www.4T2.eu)

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