

Configuring the R&S® BTC for ATSC 3.0

Application Note

Products:

- R&S®BTC
- R&S®BTC-K20
- R&S®BTC-K520
- R&S®BTC-PK520

The R&S® Broadcast Test Center BTC supports the new “Next Generation Broadcast Standard ATSC 3.0” with BTC firmware version 2.20 and later.

This application note describes the necessary settings in the user interface of the R&S® Broadcast Test Center BTC.

Note:

Please find the most up-to-date document on our homepage.

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1 Introduction

The R&S® Broadcast Test Center BTC supports the new “Next Generation Broadcast Standard ATSC 3.0” with BTC firmware version 2.20 and later.

Contrary to previous broadcast standards, ATSC 3.0 relies on IP-based methods for transmitting the payload. This circumstance has to be taken into account regarding the infrastructure to be provided, and for the method of feeding the payload content into the modulator.

The ATSC 3.0 modulator implemented in the R&S® Broadcast Test Center BTC supports two different basic operating modes:

- Operating mode “STL Interface = Off”, where the desired IP content (ROUTE/DASH or MMT, respectively) or the transport stream content (188 Byte MPEG-2 transport stream) is directly fed into the modulator
- Operating mode “STL Interface = On”, where the modulator is fed with the STL IP stream produced by a ATSC 3.0 Scheduler / Gateway.

The following sections describe the necessary settings in the user interface of the R&S® Broadcast Test Center BTC for each of the two operating modes.

2 Settings for ATSC 3.0

2.1 Operating mode “STL Interface = Off”

2.1.1 Content Sources

In operating mode “STL Interface = Off”, the R&S® Broadcast Test Center BTC supports the following content sources:

Source = External | MM Generator | Test Signal

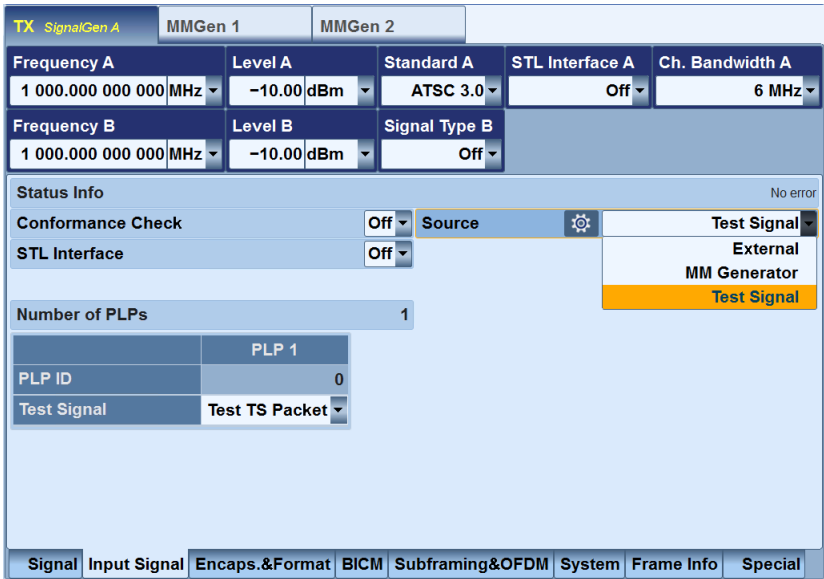


Fig. 2-1: Content sources for STL Interface = Off

2.1.1.1 Source = External

The IP content (ROUTE/DASH or MMT, resp.) or the TS content (TS over IP) is fed into the R&S® Broadcast Test Center BTC via the LAN socket of the host PC.



Fig. 2-2: LAN socket of the host PC

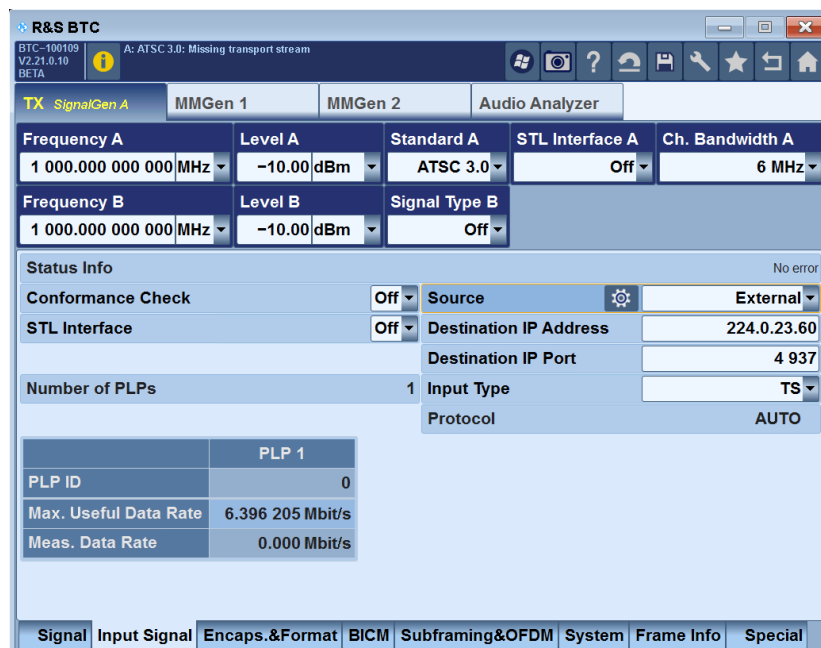


Fig. 2-3: Settings for external source

2.1.1.2 Source = MM Generator

IP content (ROUTE/DASH or MMT, resp.) must be available as **.pcap** file. Player 1 of the MM generator reads the content from the file on the hard disk and streams it internally to the modulator.

TS content is available as **.trp** file. Player 1 of the MM generator reads the content from the file on the hard disk and streams it internally to the modulator.

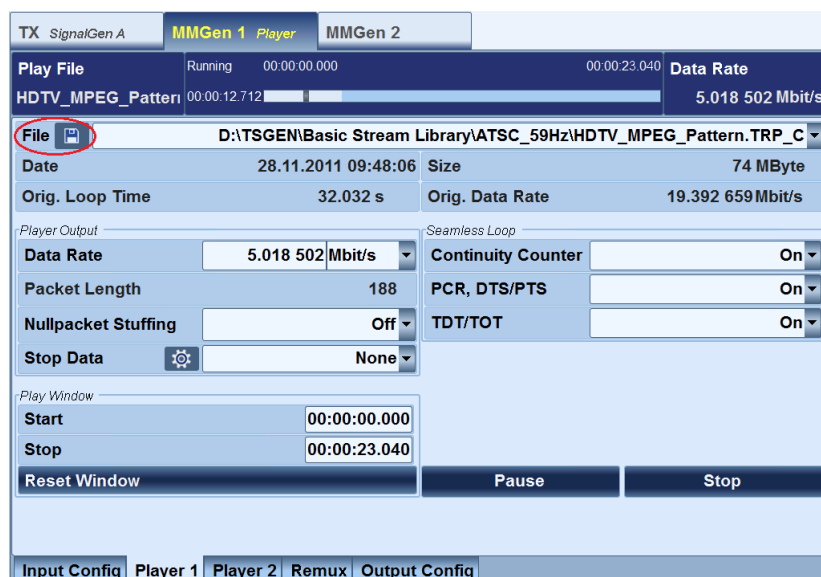


Fig. 2-4: File For TS content

2.1.1.3 Source = Test Signal

Test IP packets or test TS packets are generated internally in the modulator, to be used as content for the transmission.

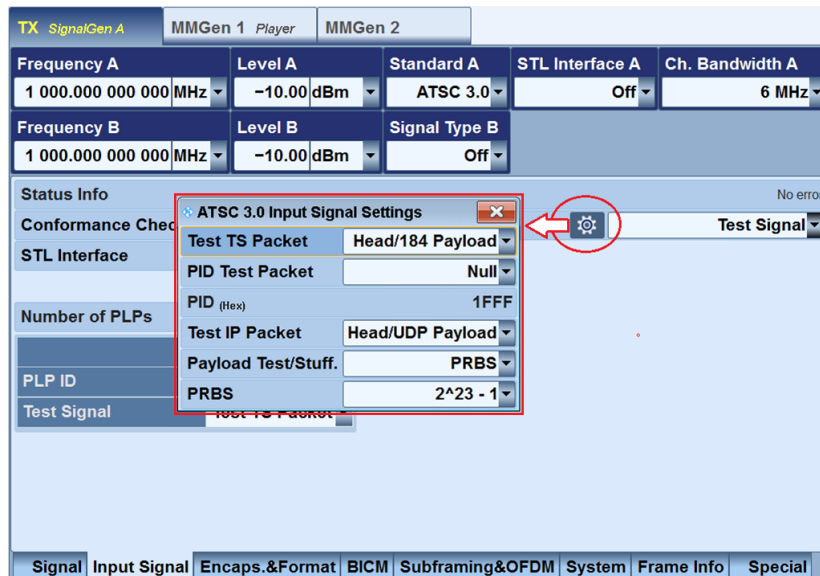


Fig. 2-5: Test signal as source

2.1.2 Configuration of the modulator depending on the content

2.1.2.1 External source with ROUTE/DASH or MMT IP Stream

If "SOURCE" = "External" and the content is a ROUTE/DASH or MMT IP stream, respectively, "Input Type" has to be configured as "IP".

This causes the ALP encapsulation to work in IP mode, and to pack the packets accordingly. The parameters "Destination IP Address" and "Destination IP Port" have to be configured according to the ROUTE/DASH or MMT IP stream, respectively.

The Service List Table (SLT) IP packets contained in the respective IP stream must be comprised in IP address:port (224.0.23.60:4937/udp) according to ATSC 3.0 standard document A/331. IP address and port of the SLT do not have to be additionally configured, as they are stipulated by the ATSC 3.0 standard document A/331.

2.1.2.2 External source with TS over IP content

If "SOURCE" = "External" and the content is TS over IP, "Input Type" has to be configured as "TS".

This causes the ALP encapsulation to work in TS mode, and to pack the TS packets received over IP accordingly.

The parameters "Destination IP Address" and "Destination IP Port" have to be configured such that the IP packets of the TS over IP stream are received.

2.1.2.3 Transport stream from MM generator

If “Source” = “MM Generator” and the content is a 188byte MPEG-2 transport stream, “Input Type” has to be configured as “TS”.

This causes the ALP encapsulation to work in TS mode, and to pack the TS packets accordingly.

The screenshot shows the configuration for MMGen 2. The 'Source' is set to 'MM Generator' and the 'Input Type' is set to 'TS', which is circled in red. Other settings include Frequency A at 1 000.000 000 000 MHz, Level A at -10.00 dBm, Standard A at ATSC 3.0, and STL Interface A at Off. The Destination IP Address is 224.0.23.60 and the Destination IP Port is 4 937. The Number of PLPs is 1, with PLP 1 having a Max. Useful Data Rate of 6.396 205 Mbit/s.

Frequency A	Level A	Standard A	STL Interface A	Ch. Bandwidth A
1 000.000 000 000 MHz	-10.00 dBm	ATSC 3.0	Off	6 MHz

Frequency B	Level B	Signal Type B
1 000.000 000 000 MHz	-10.00 dBm	Off

Status Info: No error

Conformance Check: Off

STL Interface: Off

Source: MM Generator

Destination IP Address: 224.0.23.60

Destination IP Port: 4 937

Number of PLPs: 1

Input Type: TS

PLP 1	
PLP ID	0
Max. Useful Data Rate	6.396 205 Mbit/s

Fig. 2-6: Input type

2.2 Operating mode “STL Interface = On”

In operating mode “STL Interface” = “On” the R&S® Broadcast Test Center BTC supports the STL sources “External” and “MM Generator”.

2.2.1 External source

With “Source” = “External”, the STL IP stream is fed to the R&S® Broadcast Test Center BTC from external via the LAN socket of the host PC.

The screenshot shows the configuration for MMGen 2 with 'STL Interface' set to 'On' and 'Source' set to 'External'. The Destination IP Address is 239.0.0.3 and the Destination IP Port is 30 000. The Number of PLPs is 50, with a Protocol of UDP/RTP. The Useful Data Rate for PLP 1 is 1.053 Mbit/s, and for PLP 2, 3, and 4, it is 0.728 Mbit/s.

Frequency A	Level A	Standard A	STL Interface A	Ch. Bandwidth A
1.000 000 000 000 GHz	-10.00 dBm	ATSC 3.0	On	6 MHz

Status Info: No error

Conformance Check: Off

STL Interface: On

Source: External

Destination IP Address: 239.0.0.3

Destination IP Port: 30 000

Number of PLPs: 50

Protocol: UDP/RTP

PLP ID	PLP 1	PLP 2	PLP 3	PLP 4
0	1	2	3	
Useful Data Rate	1.053 Mbit/s	0.728 Mbit/s	0.728 Mbit/s	0.728 Mbit/s

Fig. 2-7: Settings for “STL Interface = On” and “Source = External”

2.2.2 MM generator

With “Source” = “MM Generator”, the STL IP stream must be available in a pcap file. Player 1 of the MM generator reads the stream from the file and streams it internally from the hard disk to the modulator.

Frequency A	Level A	Standard A	STL Interface A	Ch. Bandwidth A
1.000 000 000 000 GHz	-10.00 dBm	ATSC 3.0	On	6 MHz

Status Info		No error		
Conformance Check	Off	Source	MM Generator	
STL Interface	On	Destination IP Address	239.0.0.3	
Reset Log File		Destination IP Port	30 000	
Number of PLPs	50	Protocol	UDP/RTP	
	PLP 1	PLP 2	PLP 3	PLP 4
PLP ID	0	1	2	3
Useful Data Rate	1.053 Mbit/s	0.728 Mbit/s	0.728 Mbit/s	0.728 Mbit/s

Signal	Input Signal	BICM	Subframing&OFDM	System	Frame Info	Special
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Fig. 2-8: Settings for “STL Interface = On” and “Source = MM Generator”

2.2.3 Configuration of the modulator

The parameters “Destination IP Address” and “Destination IP Port” have to be configured such that the IP packets of the STL IP stream are received.

3 General Hints

Due to the IP-based approach, the ASI sockets TS IN 1, TS IN 2 and TS IN 3A/B of the respective coder board cannot be used for feeding the transport stream to the ATSC 3.0 modulator.

As the software-based ATSC 3.0 encoders are running on the host PC, the data for transmission must be fed to the LAN socket of the host PC. The LAN socket of the respective coder board cannot be used for feeding data to the ATSC 3.0 modulator.

It is possible to simultaneously feed multiple TS over IP streams to the LAN socket of the host PC, in order to transmit them separately on the respective ATSC 3.0 modulators. Alternatively both ATSC 3.0 modulators can be fed with the same TS over IP stream. This also holds true for feeding an STL IP stream. In this case it must be made sure that the different STL IP streams are fed via different IP addresses.

In the case of feeding ROUTE/DASH or MMT IP streams, respectively, it has to be made sure that just one ATSC 3.0 compatible IP stream is fed in, as otherwise the Service Layer Table (SLT) IP packets from different streams, which are all transmitted via the same fix IP address:port (224.0.23.60:4937/udp), interfere with each other.

Furthermore make sure to use only IP addresses and ports which are not yet assigned to Windows OS applications, drivers or services running on the R&S® Broadcast Test Center BTC.

The IP interface of the ATSC 3.0 modulator only supports multicast IPv4 streaming.

Consequently the destination IP addresses of the mentioned IP stream types (MMT, ROUTE/DASH, TSoverIP or STL) must be in the IPv4 multicast address range 224.0.0.0 to 239.255.255.255.

4 Literature

- [1] **Advanced Television Systems Committee** ATSC Standard: Link-Layer Protocol (A/330) // A/330:2016. - Washington, D.C. : Advanced Television Systems Committee, 2016.
- [2] **Advanced Television Systems Committee** ATSC Standard: Signaling, Delivery, Synchronization, and Error Protection // A/331:2017. - Washington, D.C. : Advanced Television Systems Committee, 2017.

5 Ordering Information

Designation	Type	Order No.
Broadcast Test Center	R&S®BTC	2114.3000.02
Multimedia Generation Suite	R&S®BTC-K20	included in base unit
ATSC 3.0 Coder	R&S®BTC-K520	2114.7212.02
ATSC 3.0 Coder Package	R&S®BTC-PK520	2114.7629.02

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