TECHNICAL GUIDELINES

PLAZAMEDIA GMBH

BROADCASTING CENTER

Last update: 01.11.2020

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1. general conditions

These technical guidelines apply to all programme contributions which are produced, transferred and/or broadcast in the PLAZAMEDIA broadcasting center. This also applies in particular to broadcast material not produced by the PLAZAMEDIA broadcasting center.

Insofar as no deviating or supplementary values and data are stated, the recommendations of ITU shall be deemed to be an integral part of these technical guidelines. In order to achieve optimum picture and sound quality of the television programme, the equipment and materials used must comply with broadcast standards.

Both the program preparation and the transmission processing work with automation systems. Compliance with the points listed in Chapter 5 is therefore of particular importance.

It should also be noted that due to the compressed, digital transmission, no material will be transmitted which does not at least correspond to MPEG2 4:2:2, Profile@ML with 15 Mbits/s. The material must not be compressed or compressed.

Files in MPEG2 codec (see 6.) can be used for broadcasting. Please note that the audio tracks 1, 2, 3 and 4 have to be occupied by the transmission sound.

2. Technical Parameters

2.1 Video Signals

2.1.1 Digital Video Signals

The video signals must comply with the ITU-R 601/656 coding parameters for the 625-line system.

Remark:
After D/A conversion, the digitally generated video signals must not have any inadmissible steep edges (10% to 90%), luminance below 100 ns and chrominance below 200 ns (at least 3 samples per edge).

Since the transmission is predominantly in the PAL standard, the component signal must enable standard-compliant PAL coding. Deviations are to be coordinated with the client. At PLAZAMEDIA, the video signals are continuously processed in serial digital component format.

Compliance with the PAL color space (GBR) is monitored with "Quality Advisor". RGB colour space monitoring is possible as an option.

2.1.2 Video Aspect Ratio 4:3 and 16:9

The terms 4:3 (1,33:1) and 16:9 (1,78:1) describe the aspect ratio of an image, i.e. the ratio of width to height.
The resolution of an SD TV picture (Standard Definition TV) in 4:3 format, as well as in 16:9 format, is 720 pixels x 576 lines.

broadcast standard
The broadcast takes place either with an image format of 4:3 or 16:9 full format (anamorphic).
Aspect ratios must not be mixed within an episode/feature.
The signals supplied must not include Wide Screen Signalling (WSS) or Video Index (VI).

16:9 full format

Format specification for a program in SD-TV that is only displayed geometrically correctly in a 16:9 (1.78:1) aspect ratio on a 16:9-capable display.

4:3

Active picture = Line 23-310/336-623 , 702 Pixel (52µs)

Action safe area = line 38-295/351-608 , 632 pixels (46.8 µs)

Title/graphics safe area = Line 45-289/358-601 , 596 Pixel (44 µs)

16:9

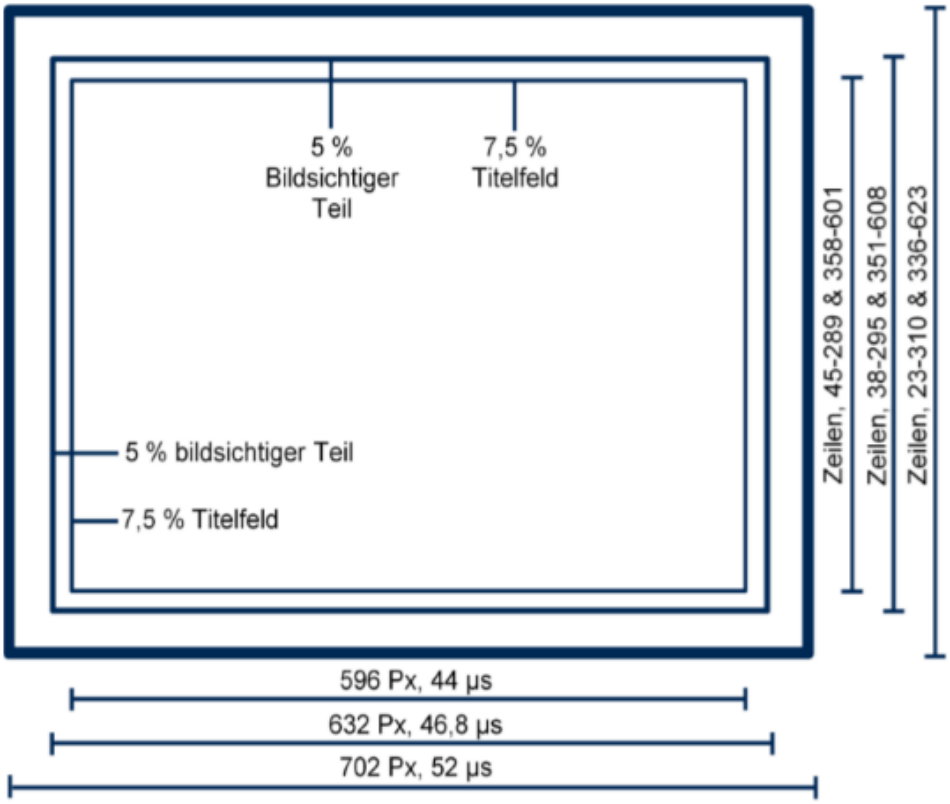
Active picture = Line 23-310/336-623 , 702 Pixel (52µs)

Action safe area = line 33-300/346-613 , 652 pixels (48.4 µs)

Title/graphics safe area = Line 38-295/351-608 , 562 pixels (41.6 µs)

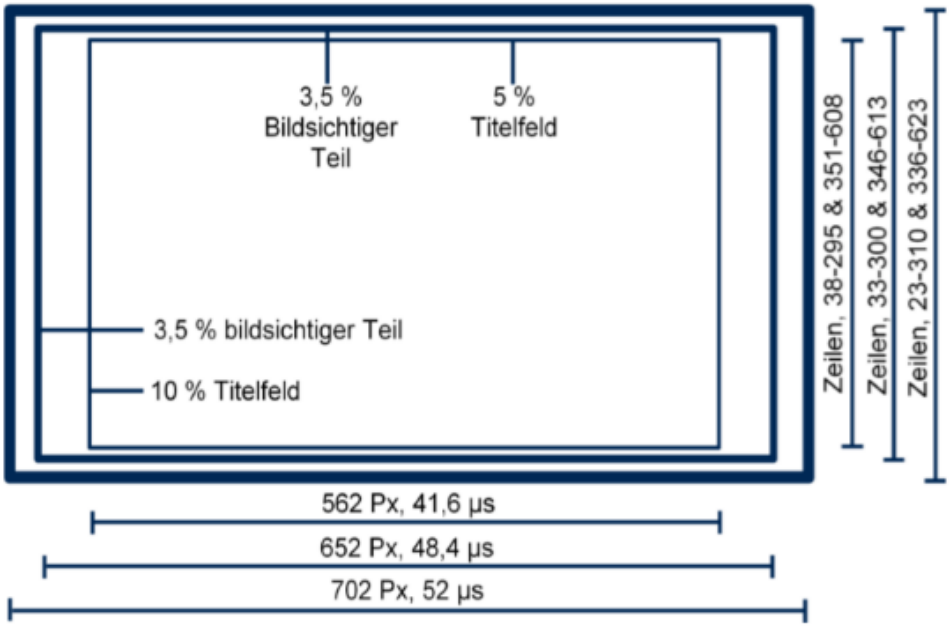
Aufbau des 4:3 Bildes

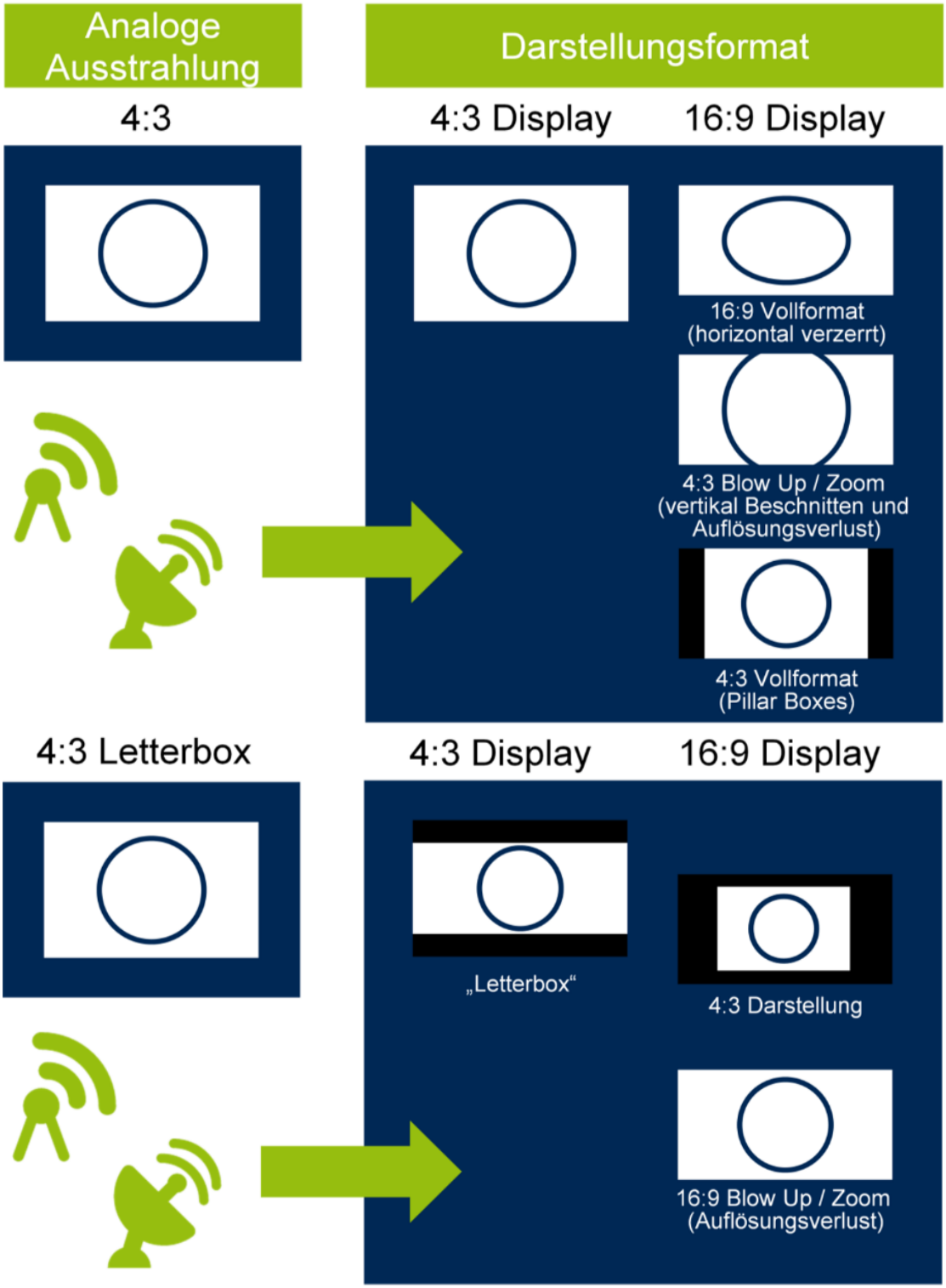
Abbildung 1

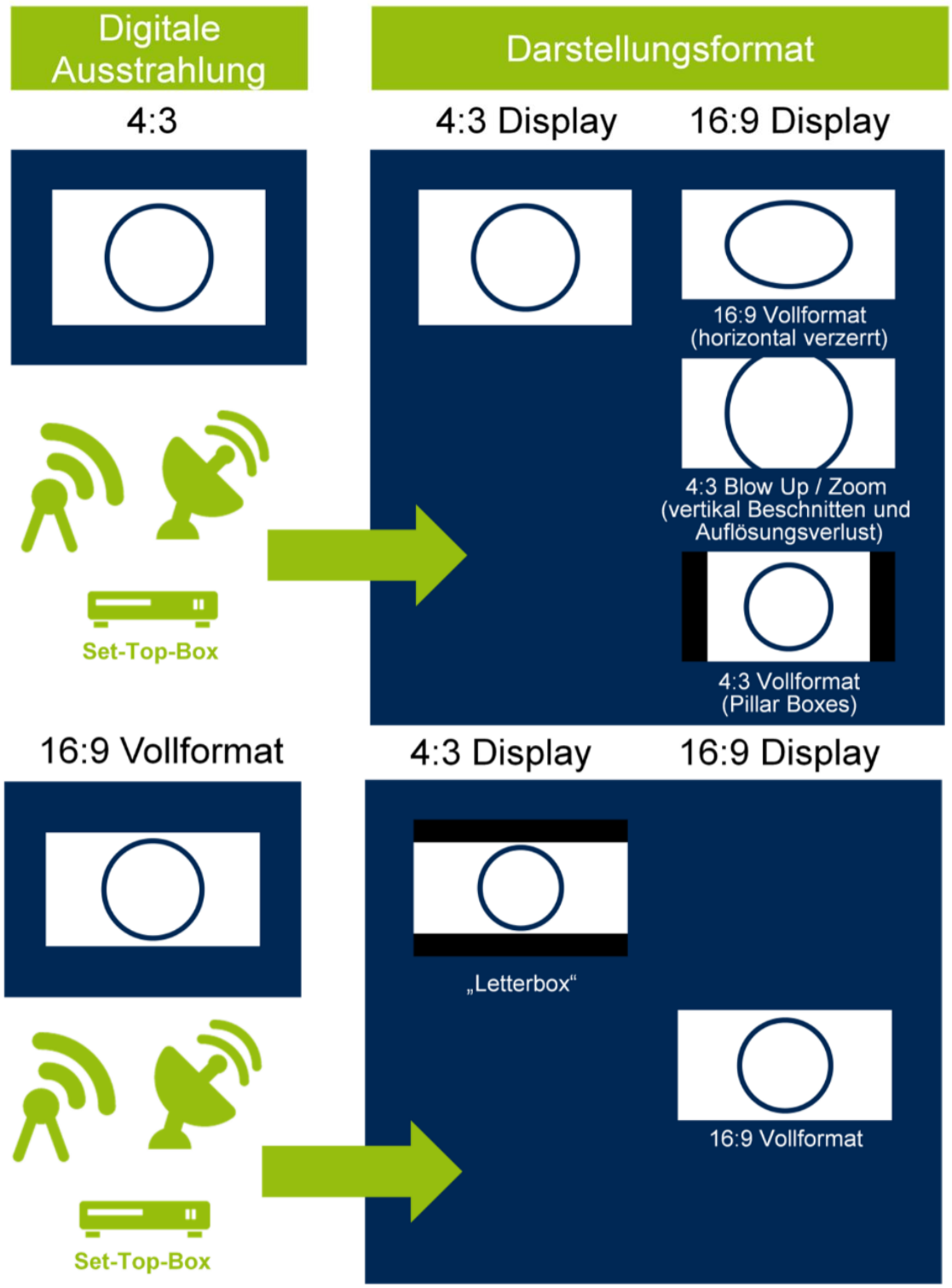


Aufbau des 16:9 Bildes

Abbildung 2




Analoge Ausstrahlung
Darstellungsformat
4:3
4:3 Display
16:9 Display
16:9 Vollformat (horizontal verzerrt)
4:3 Blow Up / Zoom (vertikal Beschnitten und Auflösungsverlust)
4:3 Vollformat (Pillar Boxes)
4:3 Letterbox
4:3 Display
16:9 Display
„Letterbox“
4:3 Darstellung
16:9 Blow Up / Zoom (Auflösungsverlust)


Digitale Ausstrahlung
Darstellungsformat
4:3
4:3 Display
16:9 Display
16:9 Vollformat (horizontal verzerrt)
4:3 Blow Up / Zoom (vertikal Beschnitten und Auflösungsverlust)
4:3 Vollformat (Pillar Boxes)
Set-Top-Box
16:9 Vollformat
4:3 Display
16:9 Display
„Letterbox“
16:9 Vollformat
Set-Top-Box

2.2 Audio Signals

2.2.1 General Parameters

The following audio levels apply at PLAZAMEDIA:

	Analog		Digital	ITU
peak level	0 dB	6 dBu	-9 dBFs (Full scale)	100 %
reference level	-9 dB	-3 dBu	-18 dBFs	35 %

The following sound track assignments apply to PLAZAMEDIA:

	Track 1	Track 2	Track 3	Track 4
stereo	left channel	right channel	IT left channel	IT right channel
	left channel	right channel	left channel	right channel
mono	mono beep	mono beep	IT Mono	IT Mono
	mono beep	mono beep	original mix	IT Mono
	mono beep	mono beep	mono beep	mono beep
dual-channel sound				
Mono / Mono	Mono - Broadcast Sound	original mix	IT Mono	IT Mono
	Mono - Broadcast Sound	original mix	Mono - Broadcast Sound	original mix
Stereo / Stereo	left channel	right channel	O-Mix left channel	O-Mix right channel
	left channel	right channel	IT left channel	IT right channel

Exception:
For recordings that are to be dubbed with commentary etc., live, during the broadcast, tracks 1, 2, 3 and 4 must be contain IT sound.

Stereophonic programme features must be mono-compatible. In accordance with CCIR Rec. 408, the degree of correlation between the left and right channels must be greater than or equal to zero. A good stereo recording has a degree of correlation of 0.7. Any deviations downward from this figure may only occur for brief periods. If mono sound is to be generated from genuine stereo signals, this should be done with a 90° filter. If this guideline is not observed, sound will be lost on mono television receivers.

2.2.2 Analogue Audio Signals

The available maximum transmission dynamic range of 40 dB must be taken into account during production. The analog level meter used must comply with IEC publications 268-10 and DIN 45406.

2.2.3 Digital Audio Signals

Headroom and full modulation

According to the recommendation of ITU-R 777, the coding value for the reference level must be 18 dB below the maximum possible encoding value. This results in a headroom of 9 dB.

The digital level meter used must comply with ITU-R 777 and operate with an integration time of 10 ms. Isolated level peaks must not exceed a value of -6 dBFs.

Implementation of Loudness Directive EBU R 128

The program loudness must be set to the target value of -23LUFS ("Target Level"). The permissible deviation from the target value must not exceed +/- 1 LU. This applies to programs that do not allow exact normalization to the target value, such as Live Programming.

Permissible maximum level

The exact maximum peak level for PCM audio is -3dBTP (dB True Peak).

Loudness Range (Loudness Range)

The permitted loudness range for stereo and 5.1 productions is a maximum of 20LU.

Program loudness for short elements (commercial, trailer and sponsorship)

For short elements such as commercials, trailers and sponsorship credits, the above levels apply, however the following values are permissible:
Momentary Loudness maximum (400ms) -15 LUFS (+8 LU),
Short Term Loudness maximum (3s) -20 LUFS (+3LU).

Sampling Rate

Only digital audio signals with a sampling rate of 48 kHz may be used.

Bit Depth

If a resolution of more than 20 bits is used during production, this must be reduced to 20 bits with a suitable dither algorithm before being transfer to Digital Betacam, as only 20-bit recordings are supported.

Preemphasis

Preemphasis must never be used.

Mixing of transmission contributions

When mixing ready-to-broadcast tapes, care must be taken to ensure that the loudness impression is the same throughout, e.g. music that is already heavily compressed does not have to be dubbed at reference level, so that speech, recorded with less compression, sounds equally loud.

Dolby E / AC3

Dolby E channel configuration 5.1 + 2 (if stereo program is supplied [e.g. for IT or Mix]), otherwise 5.1

AC 3 Metadata

Extended BSI:	on
AC3 metadata:	Enabled
Dialog Norm Level:	-27 dB, with compressed material also above this value
Surround format:	3/2 for 5.1, 2.0 for stereo program
Surround 3dB Att:	off
Surround phase Shift:	off
LFE Enable:	off, if not used (Sport)
Line Mode Compression:	film light
RF overmodulation:	on
Center Downmix:	-3 dB
Surround Downmix:	-3 to -6 dB, depending on surround ratio
Dolby surround:	ON only when surround encoded material is present

DC Filter : on
Low-pass filter: on

The Dolby E encoding delay (40 ms) should be compensated during production.

In general, Atmo and/or effects should be as minimally pre-compressed as possible. Limitation to -9 dBfs is not necessary. Commentary is usually mixed into the center.

However, the downmix parameters (LCR Downmix Level in the Extended BSI) must be set in such a way that the commentary can be understood clearly when listening in stereo or mono (if in doubt, reduce the surround downmix level).

The microphone setup should be chosen so that the listening zone is as large as possible, since most viewers won't be sitting in the sweet spot.

3. Magnetic Tape Recording

3.1 Transmission Formats

The broadcast format for magnetic recording (MAZ) at PLAZAMEDIA is Digital Betacam and HD Cam.
The Digital Betacam tapes must comply with the ITU specifications and the ITU-R 601/656 standards. HD Cam recordings must comply with the ITU-R 709 guidelines. The audio recording must comply with the recommendations of the AES/EBU and IEC 958 as well as the information in the chapter "Audio signals".

3.2 Recording Parameters

3.2.1 Time Code

The time code must be continuous and increasing. LTC and VITC must have identical values.

LTC

The longitudinal 80 bit time code must comply with the specifications of DIN 45484, IEC 461 and EBU 3097. The color framing log flag (bit no. 11) must be set, i.e. the time code must be color carrier-coupled (locked to the colour carrier). The level must correspond to full scale (maximum level).

VITC

The 90 bit time code must comply with the IEC 461 and EBU 3092 specifications. The VITC must be recorded in lines 19 and 21 or 332 and 334.

3.2.2 Technical Leader

In order to enable an optimal adjustment of the replay machine to the material being played back, each recording requires a technical leader, which must be recorded with the program recording recorder. Program content must start at time code 10:00:00:00.

With the file formats the program start is at 00:00:00:00 (see also chapter 6) without technical opening leader and/or closer!

TC	video	audio
09:58:00:00	Colour bar (100/0/75/0) ITU-R 471	level sound analog: 1kHz -9 dB digital: 1kHz -18 dBFs
09:59:30:00	black	mute
10:00:00:00	program content	programcontent
trailer min. 30 sec.	black	mute

The color bar should correspond to the ITU 471, a color bar arranged according to brightness in the upper two thirds of the image and an even red area in the lower third of the image. The video levels should be 100% for white and 75% for colors (100/0/75/0). The synch signal, the control track and the time code must be available continuously from the beginning of the technical leader through to the end of the trailer.

3.2.3 Program Recording

Different versions of the same program feature or different program features on the same tape are not permitted and will not be accepted by PLAZAMEDIA. This also applies in particular to advertising content.
If a production consists of several tape cassettes, the same type and manufacturer for all of the tapes are mandatory.

The recording on Digi Beta must correspond to the PAL 8 sequence. The provision ITU-R 630 point 2.7 applies accordingly.
Recording on HD Cam must comply with the ITU-R 709 Directive.
For the highest possible quality of the broadcast material, the number of copies (generations) should be kept to a minimum.

3.2.4 Error Rate

With digital component recording, it must be ensured that an inadmissibly high error rate does not occur during all recording and playback operations. The "channel condition" display indicates the following operating states:

green Status of the playback channels is good
Errors can be corrected.

yellow Increased error rate
All errors can still be corrected, but it is possible that there is an underlying problem (dirty heads, excessive tape abrasion).

red High error rate
It is no longer possible to correct all errors. Block formation may be visible in the picture and/or sound disturbances may be audible.

The yellow and red status level differ only by a small error rate margin!

Since the recording machine does not record this information during a transfer, special attention must be paid to the "channel condition" during such operations.

3.2.5 VTR Card

A VTR card must be attached to each production and to each tape. The VTR card must contain all the information as on the example VTR card.
Each tape, envelope and VTR card must be labelled in such a way that they can be quickly and reliably identified.

3.2.6 Video Cassettes

Only video cassettes from recognized qualified manufacturers are to be used. PLAZAMEDIA only uses cassettes that are either new or have been deleted and cleaned by the "Tape Check System" (PLAZAMEDIA VTR room) or a comparable system.

A printout is associated with each tape, showing errors and category. For reasons of broadcast security, undeleted or new tapes are not used. Since contamination can spread very quickly from VTR to VTR via cassettes, we ask you to support this procedure at all costs.

4. Remote Broadcasts and Transmission over Dedicated Lines

4.1 Remote Broadcasts

For remote broadcasts, the same general conditions and technical parameters as laid down in Chapters 1 to 3 must be observed.

4.2 Transmissions via Lines and Satellites

In the case of program (features) transfers and live transmissions, the video and audio signals are to be regarded as belonging together. For the transfer or live transmission of productions, the production agent/company must ensure that there is a freely accessible transfer point for each communications service provider.

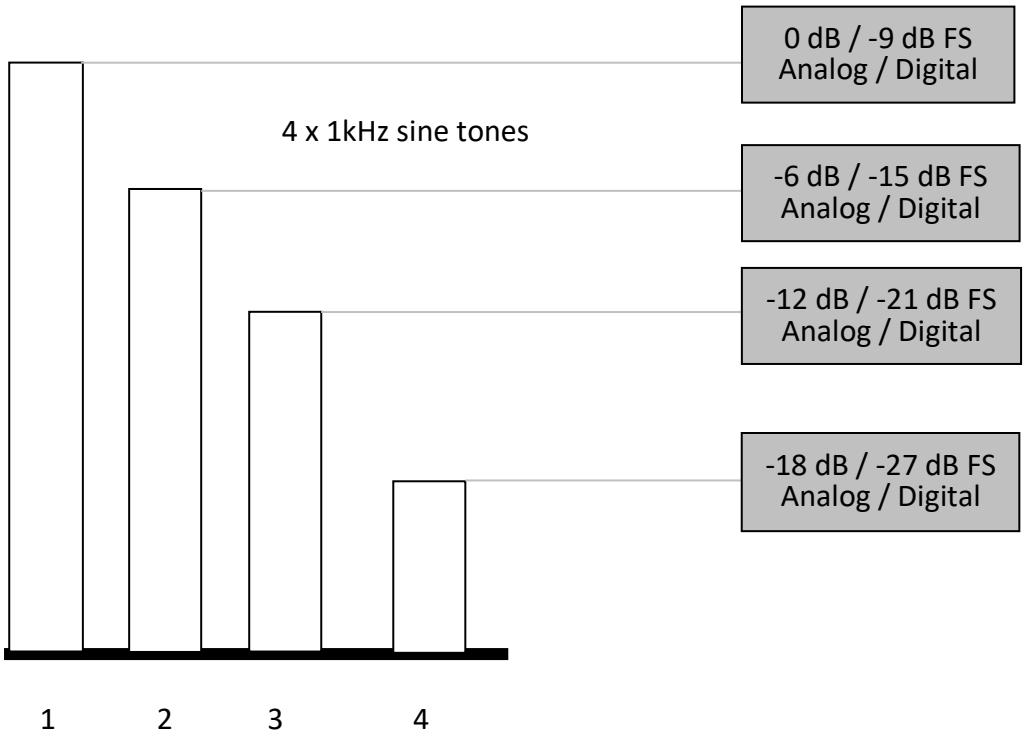
4.2.1 Video Transfer

In the case of program transmissions via dedicatedlines, satellites or line-like networks such as ATM, the FTZ [155 R 157] guideline and section 4.7.1.2 of the "Handbuch Fernsehbetriebstechnik" (Television Operations Manual) must be observed. Program source identification by means of inserting text into the test pattern (test card) is recommended.

4.2.2 Television Audio Transmission

When transferring TV audio via dedicated lines, satellites or line-like networks, the interface conditions of the audio parameters (e.g. the full modulation level, etc.) specified by the transmission medium must be strictly observed.

Here the guidelines [FTZ 154 R 1,4] and [FTZ 154 R 1,5] must be observed. The reference tone is a 1 kHz tone with a reference level of -9 dB (analog) or -18 dBFS (digital) against full scale. If the routing of the audio and video signals are not identical, lip-synchronous matching of image to audio must be maintained. Here a lip-sync tape (running clock with signal tone) is to be used. Confirmation of lip-synchronized video to audio timing and correct audio track assignment must be checked by the lip-sync test, as well as the following cascade, before each and every transfer.



4.2.3 Digital Transfers

In the case of digital transmissions via dedicated lines or line-like networks such as ATM and via satellites, the transfer parameters must be agreed upon in advance with the client. The contact person is the line booking office of the client. The following standards are available and must be agreed and specified in a binding form prior to transfer:

ETSI	G.703	34Mbps
DVB-MPEG2	4:2:0 MP@ML	8 - 15 Mbit/s
DVB-MPEG2	4:2:2 P@ML	15 - 45 Mbit/s

4.2.3.1 Digital Transfer via Land-Based Connections

The provisions under 4.2.1 and 4.2.2 must be observed.

4.2.3.2 Digital Transmission via Satellite

In addition to 4.2.1 and 4.2.2, the following provisions shall be observed:

Each digital satellite transmission shall be carried out in accordance with one of the transmission standards referred to in 4.2.3.

QPSK is generally used as the modulation type.

It must be possible to encrypt the transmission, but in each individual case this must be agreed upon in detail between the booking office and the corresponding reception point.

SCPC (Single Channel per Carrier) is normally used. In special cases, MCPC (Multi Channel per Carrier) can be agreed upon, individually and in advance.

Before each transmission, the following signal parameters must be specified in advance:

- Satellite and orbit position
- satellite transponder used (sub-transponder as necessary)
- Downlink frequency and polarization
- Compatibility of decoder and encoder
- Encoding ETSI G.703; MPEG-2MP@ML; 4:2:P@ML
- Net bit rate 34 Mbit/s; 2 to 15 Mbit/s; 8 to 45 Mbit/s
- FEC
- Line Standard 625-50 / 525-60
- Number and assignment of audio channels
- If necessary, encryption algorithm (e.g. RAS-2, BIZZ etc.)

For digital SNG transmissions (DSNG), MPEG2 is the sole transmission standard permitted by DVB-S (Digital Video Broadcasting for Satellite).

Unless otherwise agreed, DSNG uses MP@ML at a bit rate of 8.448 Mbps, including a 2-channel audio data stream of 256 kbps. This results in a symbol rate of 6.1113 Msym/s with an RS factor of 204/188 and an FEC of ¾ and a bandwidth of 8.25 MHz with QPSK modulation and thus a roll off of 35% and SCPC.

4.2.4 Allowed External Streams Types

When using stream based transfers, the parameters must always be coordinated beforehand. The following streaming standards can be accepted:

TCP push
TCP pull
UDP unicast
UDP multicast
RTMP push
RTMP pull
HLS push
Bifrost protocol - if the transmitter also has an Intinor device.

4.3 Command and Commentary Connections

4.3.1 Command / Commentary using telephone hybrid

To establish a connection via telephone hybrid, the MCR must be called:
+49 (0) 89 996 336 888.
From here the conversation is forwarded to one of our hybrids.

4.3.2 Command / Commentary using SIP via IP Codec

To establish a SIP connection via IP codec, guest access data must be requested in the MCR. After completion of production (or the previously agreed period), the access data must always be completely deleted from the devices used.

The applicable algorithms depend upon objective and terminal devices:

- HQ: MPEG Layer II with up to 256 kBit/s
- LD: G.722, G.711
- HE: AAC, AACv2
- OPUS

HQ with FEC (requires Digigram terminal devices)

5. Automation Systems

At the PLAZAMEDIA broadcasting center, all broadcasting is handled by automation systems.

It is essential to observe this:

File-based delivery/playout:
To ensure a high quality standard, the hardware and software versions of the external service provider must be validated and tested at the beginning of the contract period as well as the compatibility with the respectively valid software or firmware of the playout server in the broadcasting center.
Changes in the production process by the external service provider may only be implemented after consultation with the system administration of PLAZAMEDIA Broadcast Processing and their express release.

6. File formats / Video compression

File formats are defined according to the SMPTE standards 292M (HD) and SMPTE 295M (SD), or, if applicable, ITU-R BT.601.

6.1 HD Video

The video data rate used for HD is 18-85 Mbit/s (MPEG2-Long GOP) or 50-100 Mbit/s (MPEG2-I-FRAME ONLY). And audio is 4 tracks with AES/EBU (resolution 24 bit/sample value at a sampling rate of 48 kHz) or SDI embedded.
The HD video format at PLAZAMEDIA is 1920 x 1080 50i, a format conversion of all common formats is possible.

DOLBY E (see 2.2.3) can be used as the transmission method for 5.1.
The format must be specified ahead of time for a new customer connections.

Metadata should be delivered in XML format (see example). Delivery takes place via FTP, hard disk, SSD or similar.

6.1.1 HD File Format SAW (Playout)

XDCAM HD

Container: MXF OP1A self-contained
XDCamHD 422 in MXF container

The partition status of the header partition must be "closed" and "complete". This ensures that the header metadata is fully available at the beginning of the file.

video

Resolution:	1920 x 1080
Aspect:	16:9
Codec:	MPEG2 LGOP (422P@HL, MPEG HD422)
GOP length:	12 (IBBPBBPBBPBBPBB)
Sub GOP-Length:	3
Frame rate:	25
Sequence header:	on each GOP
Field dominance:	Topfield first
Bit rate:	50 MBit/s
Chroma Subsampling:	4:2:2
IntraDCPrecision:	10 bit

audio

Codec:	PCM
Sample Rate:	48 Khz
Bits/Sample:	24
Max. Channels per file:	8 / 4 stereo pairs

track occupancy

Track 1 - 2:	German Mix
Track 3 - 4:	Original sound, IT or MUTE
Track 5 - 6:	Dolby E - German in 5.1 (L, R, C, LFR, Lx, Rs) + metadata or MUTE
Track 7 - 8:	Dolby E - Original in 5.1 (L, R, C, LFR, Lx, Rs) + metadata or MUTE

time code

- SMPTE 328m Timecode in Picture User Data
- Program start at TC 00:00:00:00

The video data rate for SD is 3-25 Mbit/s (MPEG2-Long GOP) or 25-50 MBit/s (MPEG2-I-FRAME ONLY) and IMX 50.
For the audio signal 4 tracks are used with AES/EBU (resolution 24 bit/sample value at a sampling rate of 48 kHz) or SDI-embedded, the wrapper is the Quicktime container or MXF.

6.2 Metadata

The data format must be specified for each new customer.

Metadata should be delivered as XML (see example below).

Delivery via FTP, hard disk, SSD or similar.

Example XML:

```
  < AXFRoot>
< MAObject type="default" mdclass="MOB">
 < Meta name="MOB_TITLE" format="string" frate=""> </Meta>
 < Meta name="FTP_INGESTID" format="string" frate=""> </Meta>
 < Meta name="XML" format="string" frate=""> </Meta>
 < Meta name="SOURCEFORMAT" format="string" frate=""> mpg</Meta>
 < Meta name="TARGET SYSTEM" format="string" frate=""> SAW</Meta>
 < Meta name="CLIENT" format="string" frate=""> </Meta>
  < Meta name= .
  < Meta name= .
```

7. External network connections (VPN and FTP)

PLAZAMEDIA is redundantly connected with 1 Gbit/s. A bandwidth guarantee is only possible with a QOS.

7.1 VPN accesses

VPN access must always be renegotiated from scratch and technically checked, depending on customer requirements. Only L2TP (Layer 2 Tunneling Protocol) and IPsec (IP Security Protocol) are allowable protocols. With Site-to-Site-VPN it is also necessary that the communication partner has a fixed public IP address, so that authentication using a combination of IP address and a “permanent” password is possible.

7.2 FTP accesses

FTP accesses are specified as follows:

- FTP activation is only possible if a data protection declaration is signed. Passwords for FTP access information is **only** communicated to authorized persons.

- The FTP server is only used as a "data exchange". Data that has been on the server for more than 10 days must be archived or deleted. Archiving takes place after consultation.

- Each FTP account has a defined disk quota.

- The expected file formats must be specified by the customer ahead of time to protect against "executable files".

- Access to the FTP server is only possible from a permanent IP address.

8. Address and Contacts

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85737 Ismaning
GERMANY

E-mail: Plazamedia-BroadcastIT@plazamedia.com

Reception:
Tel: +49 89 99633 - 0
Fax: +49 89 99633 - 6990

Support Helpline:
Phone: +49 89 99633 - 6000

Handbuch Fernsehbetriebstechnik: Available at the Institute for Radio and Television Technology IRT

Radio Technical Guidelines (R&TTE): Available from the Regulatory Authority for Telecommunications and Posts (Regulierungsbehörde für Telekommunikation und Post and the Institute for Radio and Television Technology.

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