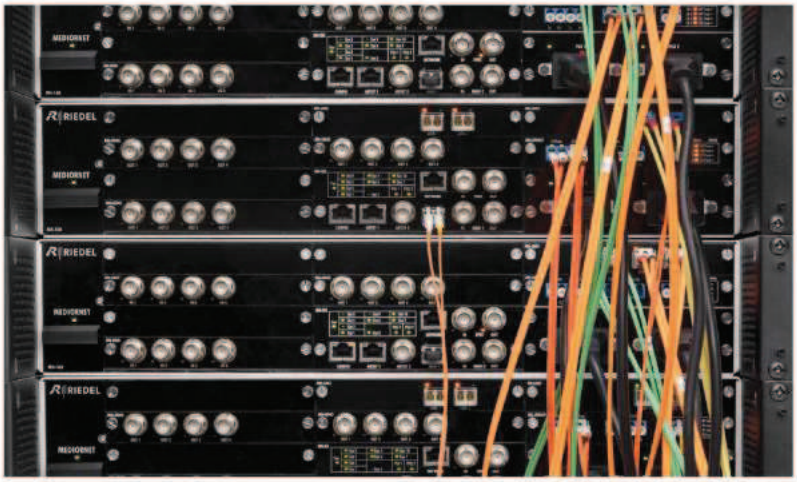
Annexe 1 – Réseau optique temps réel MediorNet.

Une nouvelle conception des réseaux sur fibre optique



Mediornet en bref:

- Transport sur fibre optique de signaux multicanaux vidéo HD/SD, audio, d'intercom, de données
- Compatible avec n'importe quelle combinaison de topologies réseaux
- Multiplexage CWDM intégré
- Distribution et assignation en temps réel de signaux non compressés
- Compatible contrôle routeurs de tierce partie
- Traitement et conversion de signal par voie logicielle
- Le System fournit une Architecture entièrement redondante incl. Re-routage automatique
- Plate-forme évolutive

Riedel Communications, pionnier des solutions d'intercom et de routing audio sur fibre, va aujourd'hui encore plus loin dans la technologie des fibres. Le développement extensif de Riedel dans ce domaine, et l'expérience pratique accumulée depuis plus de 15 ans, notamment sur des événements de classe mondiale tels que les J.O. de Pékin, débouche aujourd'hui sur la naissance d'une nouvelle plate-forme, qui va redéfinir le concept de transport de signal sur fibre optique : MediorNet.

MediorNet libère le vrai potentiel du transport de signal sur fibre optique, et crée une toute nouvelle philosophie dans le domaine du broadcast, de l'événementiel, des installations dans les stades ou sur les campus.
MediorNet allie

- le transport du signal
- son assignation
- son traitement et sa conversion

En une seule solution de réseau temps réel intégrée.

MediorNet n'est pas conçu pour de simples liaisons point à point, mais constitue une vraie solution réseau. Il inclut des fonctions d'assignation, permettant à l'utilisateur d'envoyer n'importe quel signal entrant vers n'importe quelle sortie, ou vers plusieurs sorties, par un simple clic de souris, ou, encore plus pratique, par un système de contrôle de routeur. Chaque mainframe MediorNet constitue un routeur pour 32x32 signaux 120p/1080i, 160x160 signaux SD/SDI, 27.000 x 27.000 signaux AES ou n'importe quelle combinaison de ces signaux.
Mediornet intègre aussi des traitements et des conversions de qualité broadcast. Ces fonctions sont logicielles : elles évolueront donc facilement à l'avenir, sans modifier le hardware. Au final, elles éliminent le recours à des appareils externes. Il en résulte une approche complètement nouvelle des environnements de production, assurant des économies significatives au niveau des investissements d'infrastructure.

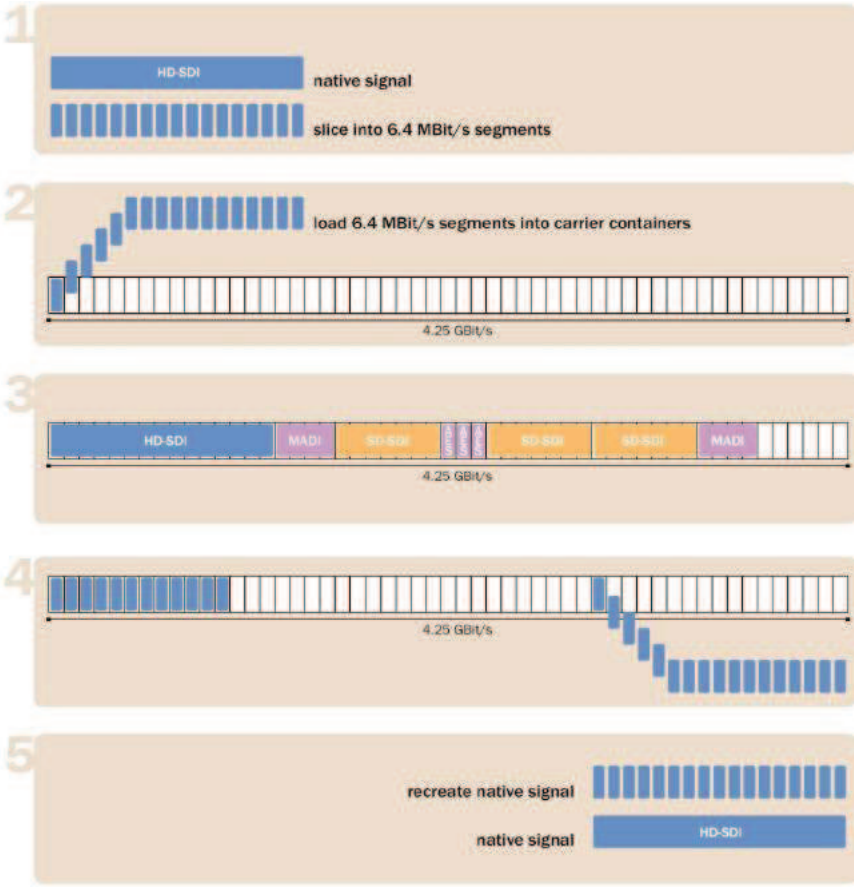
Annexe 2 – Optimisation de la bande passante du réseau MediorNet

Optimisation de la bande passante

Le débit de frame de la porteuse MediorNet est de 4,25 Gbits/s. Cette frame porteuse est ensuite divisée en subframes d'une bande passante de 6,4 Mbits/s, correspondant au plus « petit » signal à transporter : AES3/EBU audio.

Ces subframes peuvent transporter n'importe quel type de données : vidéo, audio, intercom, contrôle... Chaque signal natif est découpé en segments d'un débit de 6,4 Mbits/s. MediorNet transporte ces slices vers une ou plusieurs destinations, puis reconstitue le signal natif.

L'algorithme MediorNet recherche toujours le chemin le plus court pour transporter un signal, et optimise la bande passante sur toutes les liaisons fibre disponibles. Ce qui inclut des sauts par dessus les autres nœuds MediorNet, lorsqu'aucune connexion fibre directe allant de la source à la destination n'est disponible.



Overview of required bandwidth

The required bandwidth is calculated in MediorNet in timeslots (TS).
Each 4.25G link offers 512 timeslots for the data transfer. 10G links have 1536 timeslots.
A "bigger" signal requires more timeslots on a link.

In following table lists the required timeslots for the different signal types.

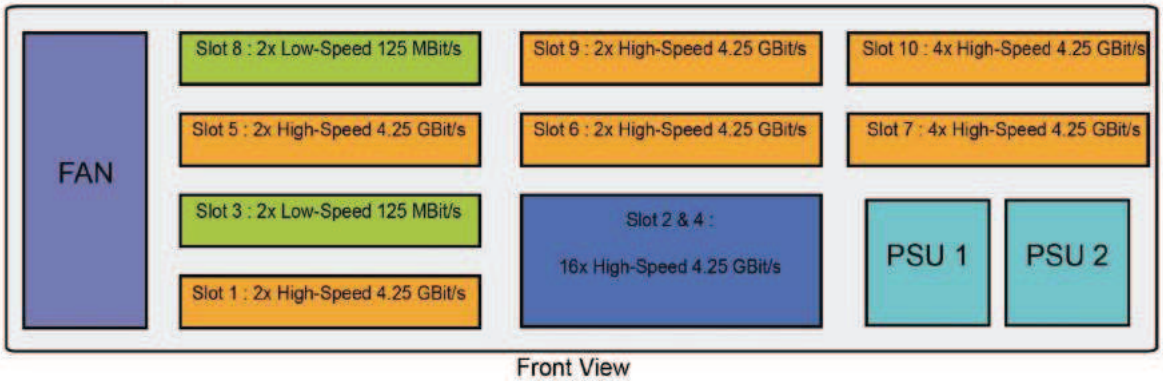
Signal	required TS
Mono Audio @ 48 kHz	1
Mono Audio @ 96 kHz	1
AES 2ch Audio @ 48 kHz	2
AES 2ch Audio @ 96 kHz	2
MADI 64ch @ 48 kHz	64
MADI 32ch @ 96 kHz	32
Alink @ 48 kHz	384
SD	49
HD	239
3G	471
Ethernet 10 Mbit	3
Ethernet 100 Mbit	17
Ethernet 1 Gbit	158
Serial	1
GPI	1

Annexe 3 – Solution modulaire
« Modular mainframe » MN-2RU.

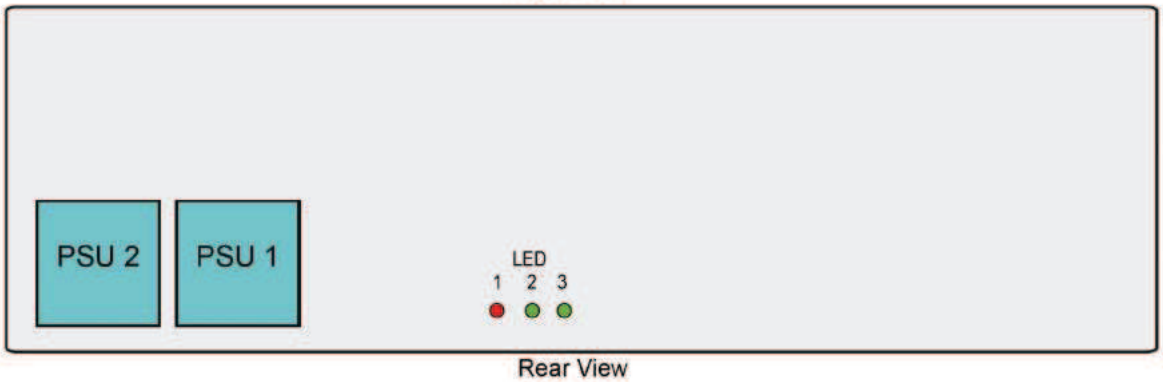
MediorNet MN-2RU

- 19" rack size Modular mainframe with 2 RU dimension
- Slots for two redundant power supplies and fan module
- Rack-mounting in various positions (connectors at the front / connectors on the rear / recessed to allow cabling from the front)
- IEC connectors at the front or on the rear, independently from other cabling
- Support of up to 8 client cards
- Low-Speed slots 3 and 8 for low data rate (Audio and Control signals)
- High-Speed slots 1, 5, 6, 7, 9 and 10 for high data rate (Video signals, Ethernet and fiber network connections)
- High-Speed slots are divided in two groups: slot 1, 5, 6 and 9 are 2x High-Speed slots / slot 7 and 10 are 4x High-Speed slots
- Slot 2/4 is reserved for the Processing Card

Mainframe Drawing



Front View



Rear View

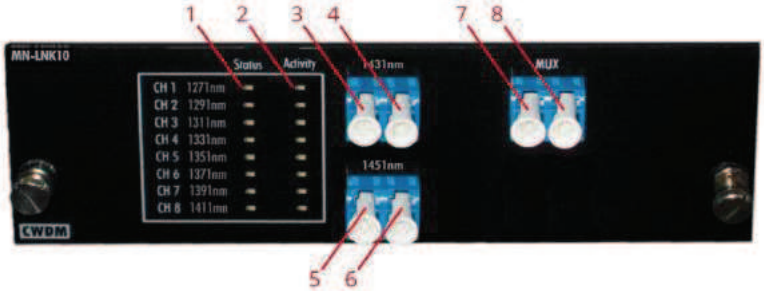
Possible Slot Assignment

Cards	Possible Slots
MN-XSS	2&4
MN-HD4I, MN-HD4O, MN-HDO-4IO, MN-HD(P)6, MN-LNK2, MN-ETH6, MN-ST-AL2	1, 5, 6, 7, 9, 10
MN-LNK4, MN-LNK8-CWDM(80)(-H)	7, 10
MN-LNK10 CWDM, MN-LNK18 CWDM	7&10
MN-RN300, MN-MA2EO, MN-MIO (-E/-T)	3, 8

Annexe 4 – Carte MediorNet MN-LNK-10-CWDM (1/2).

The MN-LNK10-CWDM Link Card allows the interconnection to another MediorNet frame via one bi-directional duplex fiber connection with 10 different CWDM wavelengths.

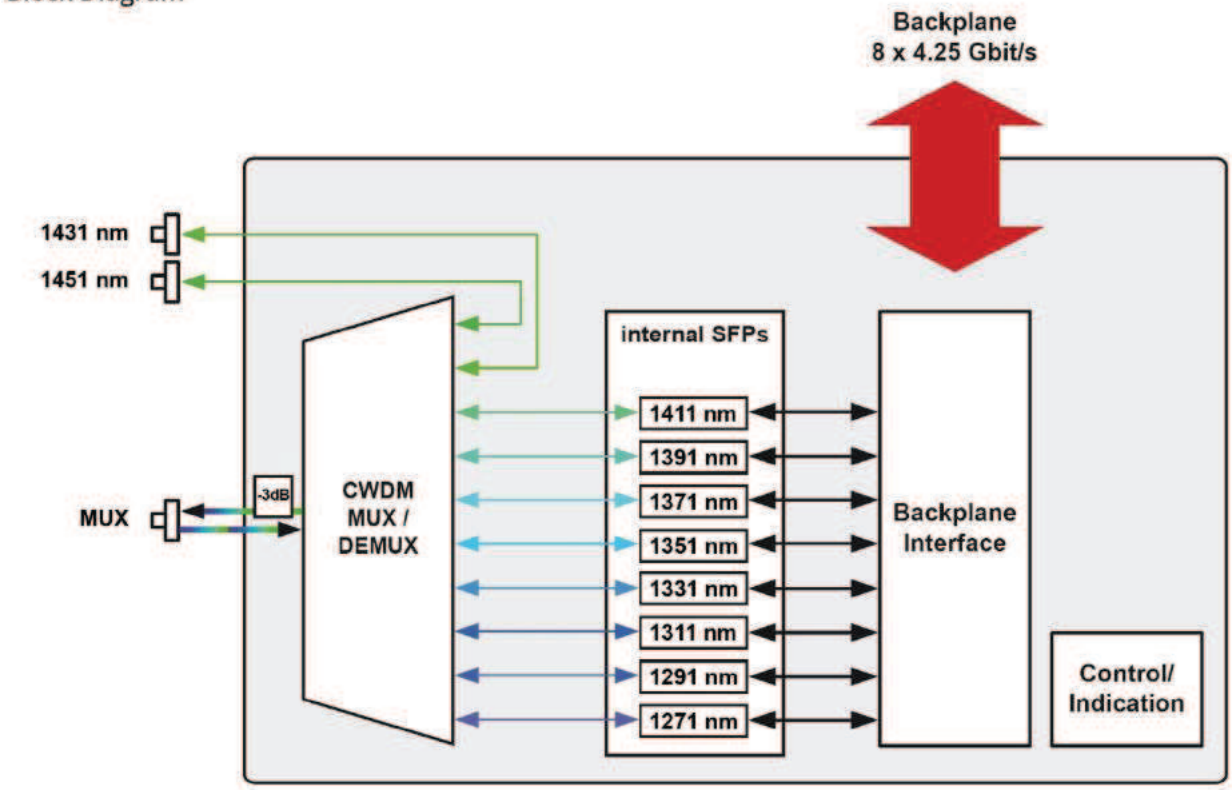
- 8 internal SFP ports that support 4.25 Gigabit/s SFP modules
- 2 external fiber ports via LC connectors
- Integrated CWDM multiplexing / de-multiplexing
- Multiplexing on one single-mode duplex fiber, accessible via LC connector
- Support of single-mode SFP transceivers only
- Different wavelengths are used in the various MediorNet cards.
  The '*MN-LNK10-CWDM MUX*' port must only be connected to a '*MN-LNK10-CWDM MUX*' or '*MN-LNK18-CWDM ADD*' port!
- The external wavelengths are multiplexed passively to the MUX port of the card.
  The frame with the MN-LNK10-CWDM Card is not able to access the external signals.
- A removable 3dB attenuation is placed by default at the MUX output port.
- The MN-LNK10-CWDM Link Card must be fitted into two 4x High-Speed slots and it occupies two slots, so it must be placed in slot 7/10 of the Modular mainframe.



Legend

1) Status LEDs internal channels 1 - 8
2) Activity LEDs internal channels 1 - 8
3) ADD Port 1431 nm TX
4) ADD Port 1431 nm RX
5) ADD Port 1451 nm TX
6) ADD Port 1451 nm RX
7) MUX 1271 - 1451 nm TX Port
8) MUX 1271 - 1451 nm RX Port

Block Diagram



Annexe 5 – Carte MediorNet MN-LNK-10-CWDM (2/2).

Bi-Directional Ports

Mux/Demux Specifications		
Channel Number	10	
Central Wavelength	1271, 1291, 1311, 1331, 1351, 1371, 1391, 1411, 1431, 1451 nm	
Passband	min. λc ±6.5 nm	
Mux Isolation	min. 15 dB	Adjacent Ch.
	min. 15 dB	Non-adjacent Ch.
Demux Isolation	min. 30 dB	Adjacent Ch.
	min. 40 dB	Non-adjacent Ch.
Ripple in Passband	max. 0.3 dB	
Directivity	min. 50 dB	
Polarization Dependent Loss	max. 0.15 dB	
Polarization Mode Dispersion	max. 0.10 ps	
Return Loss	min. 45 dB	
Insertion Loss	max. 1.5 dB	
MUX Port total Input Power*	min/max: -6.5 / +8.5 dBm	
MUX Port total Output Power*	min/typ/max: +5.5 / +8 / +10.5 dBm (including the 3dB opt. attenuation at the MUX output connector)	
ADD Port total Input Power	min/max: 0 / +5 dBm	
ADD Port total Output Power	min/max: -18 / -3 dBm	

SFP Specifications	The specifications of all Riedel recommended SFP modules are listed in the MN-SFP Datasheet
Single SFP Input Power	min/max: -18 / -3 dBm
Single SFP Output Power	min/typ/max: 0 / +2.5 / +5 dBm

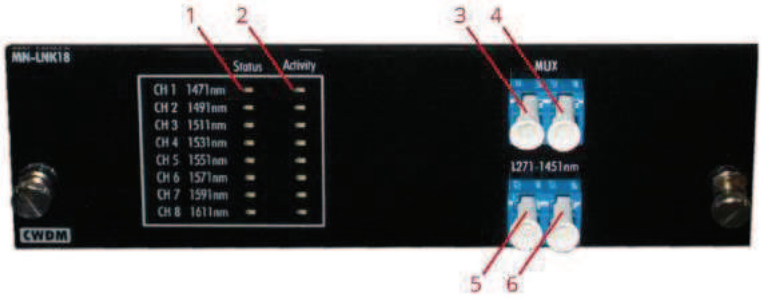
Possible Link Combination	**min. opt. Budget** with/without opt. attenuation at the LNK10 MUX output connector	**min. - max. Fiber length** with/without opt. attenuation at the LNK10 MUX output connector	
LNK10 to LNK10	12 / 15 dB	0 - 48 / 12 - 60 km (with opt. attenuation of 0.25 dB/km)	0 - 34 / 9 - 43 km (with opt. attenuation of 0.35 dB/km)

* all channels in use

Annexe 6 – carte MediorNet MN-LNK-18-CWDM (1/2).

The MN-LNK18-CWDM Link Card allows the interconnection to another MediorNet frame via one bi-directional duplex fiber connection with 18 different CWDM wavelengths.

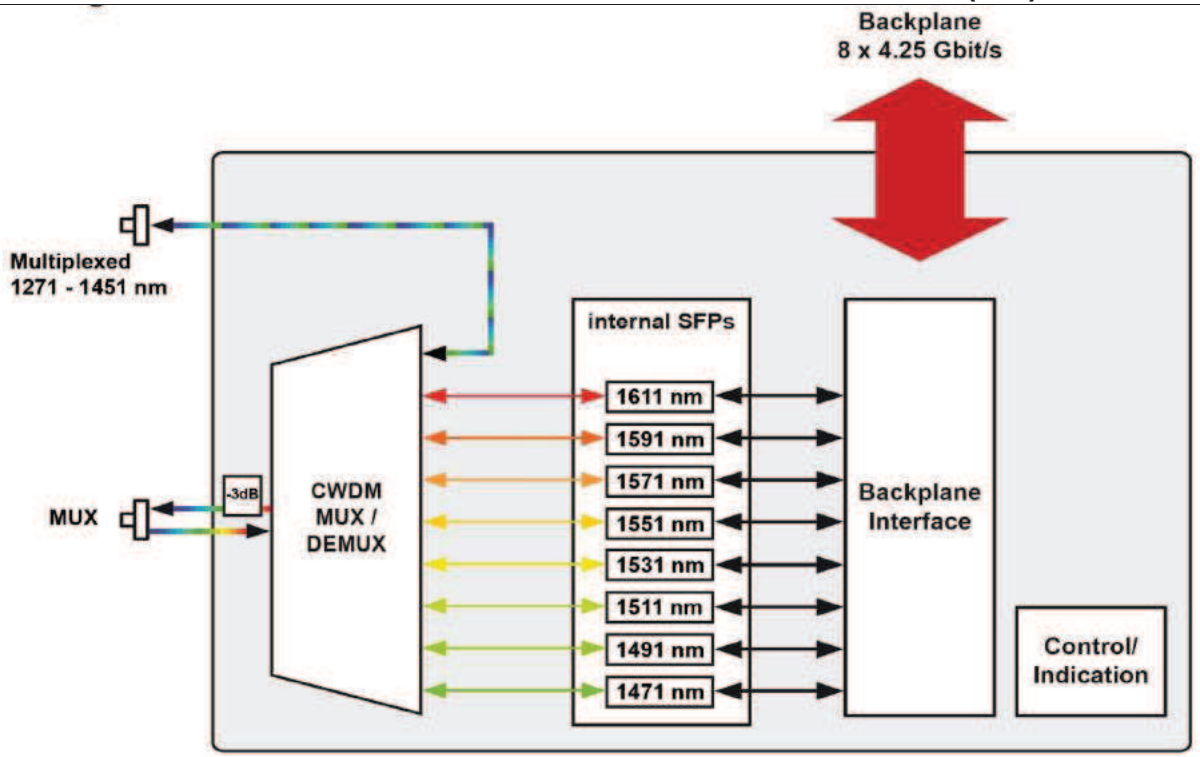
- 8 internal SFP ports that support 4.25 Gigabit/s SFP modules
- 10 external fiber Ports via LC connectors (already multiplexed)
- Integrated CWDM multiplexing / de-multiplexing
- Multiplexing on one single-mode duplex fiber, accessible via LC connector
- Support of single-mode SFP transceivers only
- Different wavelengths are used in the various MediorNet cards.
  The '*MN-LNK18-CWDM MUX*' port must only be connected to a '*MN-LNK18-CWDM MUX*' port!
  The '*MN-LNK18-CWDM ADD*' port must be connected either to a '*MN-LNK10-CWDM MUX*' or to a '*MN-LNK8-CWDM MUX*' port!
- The external channels are multiplexed passively to the MUX port of the card.
  The frame with the MN-LNK18-CWDM Card is not able to access the external signals.
- A removable 3dB attenuation is placed by default at the MUX output port.
- The MN-LNK18-CWDM Link Card must be fitted into two 4x High-Speed slots and it occupies two slots, so it must be placed in the slot 7/10 of the Modular mainframe.



Legend

1) Status LEDs internal channels 1 - 8
2) Activity LEDs internal channels 1 - 8
3) MUX Port 1271 - 1611 nm TX
4) MUX Port 1271 - 1611 nm RX
5) ADD Port 1271 - 1451 nm TX
6) ADD Port 1271 - 1451 nm RX

Annexe 7 – Carte MediorNet MN-LNK-18-CWDM (2/2).



Bi-Directional Ports

Mux/Demux Specifications		
Channel Number	10	
Central Wavelength	1271, 1291, 1311, 1331, 1351, 1371, 1391, 1411, 1431, 1451 nm	
Passband	min. λc ±6.5 nm	
Mux Isolation	min. 15 dB	Adjacent Ch.
	min. 15 dB	Non-adjacent Ch.
Demux Isolation	min. 30 dB	Adjacent Ch.
	min. 40 dB	Non-adjacent Ch.
Ripple in Passband	max. 0.3 dB	
Directivity	min. 50 dB	
Polarization Dependent Loss	max. 0.15 dB	
Polarization Mode Dispersion	max. 0.10 ps	
Return Loss	min. 45 dB	
Insertion Loss	max. 1.8 dB (1.2 dB @ ADD Port)	
MUX Port total Input Power*	min/max: -3.1 / +11.9 dBm (with *LNK10* on ADD Port) / -3.7 / +11.3 dBm (with *LNK8* on ADD Port)	
MUX Port total Output Power*	min/typ/max: +7.3 / +9.8 / +12.3 dBm (with *LNK10* on ADD Port) / +6.8 / +9.3 / +11.8 dBm (with *LNK8* on ADD Port) (including the 3dB opt. attenuation at the MUX output connector)	
ADD Port total Input Power	min/max: +5.5 / +10.5 dBm	
ADD Port total Output Power	min/max: -6.5 / +8.5 dBm	

SFP Specifications	The specifications of all Riedel recommended SFP modules are listed in the MN-SFP Datasheet
Single SFP Input Power	min/max: -18 / -3 dBm
Single SFP Output Power	min/typ/max: 0 / +2.5 / +5 dBm

Possible Link Combination	**min. opt. Budget** with/without opt. attenuation at the LNK18 MUX output connector	**min. - max. Fiber length** with/without opt. attenuation at the LNK18 MUX output connector	
LNK18 with LNK10 on ADD Port to LNK18 with LNK10 on ADD Port	10.4 / 13.4 dB (only without opt. attenuation at the *LNK10* MUX output connector)	0 - 42 / 12 - 54 km (with opt. attenuation of 0.25 dB/km)	0 - 30 / 9 - 38 km (with opt. attenuation of 0.35 dB/km)
LNK18 with LNK8 on ADD Port to LNK18 with LNK8 on ADD Port	10.5 / 13.5 dB (only without opt. attenuation at the *LNK8* MUX output connector)	0 - 42 / 12 - 54 km (with opt. attenuation of 0.25 dB/km)	0 - 30 / 9 - 39 km (with opt. attenuation of 0.35 dB/km)

* all channels in use

4.3.4. Recording Capacities

Disk Storage

The disk storage, on SAS disks, can be as follows, with a total of up to 84 disks:

- internal storage only: 6 or 12 x 300 GB or 900 GB SAS disks
- external storage only: up to 4 arrays with 24 x 300 GB or 900 GB SAS disks, with or without spare disks
- both internal and external storage.

Warning
The sum of internal and external disk storage on an XT3 server cannot exceed 20 TB. This is therefore not possible to have higher recording capacities than the ones described in the following tables.

RAID Level: 3

The video RAID uses striping process across 5 or 6 disk drives. The video and audio data is striped over the first 4 or 5 drives while the parity information is saved on the fifth or sixth drive.

If one drive is damaged, the video RAID can use the parity information to recover the missing information, so that operation can continue seamlessly without bandwidth loss.

Bitrates and Horizontal Resolutions in HD 1080i (50 Hz)

Codec	HD Mjpeg EVS	HD Mjpeg Standard	HD Mpeg-2 Intra	AVC Intra 100	DVCPro HD	XDCAM HD
Bitrate (Mbps)	20-260	20-260	20-260	111	100	50
Default bitrate	100	100	100	111	100	50
Horizontal Resolution	960	960	960	1920	1440	1920
	1152	1152	1152			
	1280	1280	1280			
	1372	1372	1372			
	1440	1440	1440			
	1536	1536	1536			
	1600	1600	1600			
	1920 (default)	1920 (default)	1920 (default)			

Codec	AVID DNxHD 120	AVID DNxHD 185	AVID DNxHD 185x (10b)	Apple ProRes 422 LT	Apple ProRes 422 SQ	Apple ProRes 422 HQ
Bitrate (Mbps)	1-120	121-185	121-185	85	120	185
Default bitrate	120	184	184	85	120	185
Horizontal Resolution	1920	1920	1920	1920	1920	1920

Annexe 9 – Documentations techniques de disques durs.

Disques durs Western Digital RE.

Specifications[1]	2 TB	1.5 TB	1 TB	500 GB	250 GB
Model number	WD2003FYYS	WD1503FYYS	WD1003FBYX	WD5003ABYX	WD2503ABYX
Interface	SATA 3 Gb/s	SATA 3 Gb/s	SATA 3 Gb/s	SATA 3 Gb/s	SATA 3 Gb/s
Formatted capacity	2 TB	1.5 TB	1 TB	500 GB	251 GB
User sectors per drive	3,907,029,168	2,930,277,168	1,953,525,168	976,773,168	490,350,672
Native command queuing	Yes	Yes	Yes	Yes	Yes
Performance					
Data transfer rate (max) Buffer to host Host to/from drive (sustained)	3 Gb/s 138 MB/s	3 Gb/s 138 MB/s	3 Gb/s 128 MB/s	3 Gb/s 128 MB/s	3 Gb/s 128 MB/s
Cache (MB)	64	64	64	64	64
Rotational speed (RPM)	7200	7200	7200	7200	7200

Disques durs Seagate Enterprise Performance 15K.

Spécifications	512 Natif[4]		Émulation 512		Natif 4K	
	600 Go[1]	300 Go[1]	600 Go[1]	300 Go[1]	600 Go[1]	300 Go[1]
Modèle standard	ST600MP0005	ST300MP0005	ST600MP0035	ST300MP0035	ST600MP0065	ST300MP0065
Interface	SAS 12 Gbit/s	SAS 12 Gbits/s	SAS 12 Gbits/s	SAS 12 Gbits/s	SAS 12 Gbits/s	SAS 12 Gbits/s
Performances						
Latence moyenne (ms)	2	2	2	2	2	2
Taux de transfert en continu (du diamètre extérieur au diamètre intérieur) Mio/s	233 à 160	233 à 160	246 à 180	246 à 180	246 à 180	246 à 180
Cache, multisegment (Mo)	128	128	128	128	128	128

Disques durs Western Digital S25.

Specifications[1]	600 GB	450 GB	300 GB	147 GB
Model number	WD6000BKHG	WD4500BKHG	WD3000BKFG	WD1460BKFG
Interface	SAS 6 Gb/s	SAS 6 Gb/s	SAS 6 Gb/s	SAS 6 Gb/s
Formatted capacity	600 GB	450 GB	300 GB	147 GB
User sectors per drive	1,172,123,568	879,097,968	586,072,368	287,186,256
SCSI command queuing	Yes	Yes	Yes	Yes
Performance				
Data transfer rate (max) Buffer to host Host to/from drive (sustained)	6 Gb/s 155 MB/s	6 Gb/s 155 MB/s	6 Gb/s 126 MB/s	6 Gb/s 126 MB/s
Cache (MB)	32	32	16	16
Rotational speed (RPM)	10,000	10,000	10,000	10,000

Disques durs Seagate Enterprise Performance 10K.

Specifications	512 Native[4]		512 Emulation			
	1.2TB[1]	600GB[1]	1.8TB[1]	1.2TB[1]	900GB[1]	600GB[1]
Standard Model	ST1200MM0088	ST600MM0088	ST1800MM0018	ST1200MM0018	ST900MM0018	ST600MM0018
Performance						
Spindle Speed (RPM)	10K	10K	10K	10K	10K	10K
Average Latency (ms)	2.9	2.9	2.9	2.9	2.9	2.9
Sustained Transfer Rate (Outer to Inner Diameter, MB/s)	215 to 108	215 to 108	241 to 117	241 to 117	241 to 117	241 to 117
Cache, Multisegmented (MB)	128	128	128	128	128	128
Configuration/Reliability						
Disks	3	2	4	3	2	2
Heads	6	3	8	6	4	3
Interface	12Gb/s SAS	12Gb/s SAS	12Gb/s SAS	12Gb/s SAS	12Gb/s SAS	12Gb/s SAS

Disques durs Western Digital Velociraptor.

Specifications[1]	600 GB	450 GB	300 GB	150 GB	74 GB
Model number	WD6000HLHX	WD4500HLHX	WD3000HLFS	WD1500HLFS	WD740HLFS
Interface	SATA 6 Gb/s	SATA 6 Gb/s	SATA 3 Gb/s	SATA 3 Gb/s	SATA 3 Gb/s
Formatted capacity	600,127 MB	450,098 MB	300,069 MB	150,039 MB	74,355 MB
User sectors per drive	1,172,123,568	879,097,968	586,072,368	293,046,768	145,226,112
Native command queuing	Yes	Yes	Yes	Yes	Yes
Performance					
Data transfer rate (max) Buffer to host Host to/from drive (sustained)	6 Gb/s 145 MB/s	6 Gb/s 145 MB/s	3 Gb/s 126 MB/s	3 Gb/s 126 MB/s	3 Gb/s 126 MB/s
Cache (MB)	32	32	16	16	16
Rotational speed (RPM)	10,000	10,000	10,000	10,000	10,000

4.5. Video Interpolation

The playing back of smooth slow motion pictures carries specific issues: since some fields must be repeated at regular interval to provide the video at the playback speed required by the operator, parity violation appears regularly on the output video signal. This issue is specific to interlaced formats (525i, 625i and 1080i) and does not concern progressive formats (720p and 1080p).

If O and E represent respectively the odd and even fields of a standard video signal (50/60 Hz), we have:

The original video signal:

- O E O E O E O E O E O E O E

The output video signal at 50% speed:

- O **E** E O **E** E O **E** E O **E** E

The output video signal at 33% speed:

- O **O** O E **E** E O **O** O E **E** E O **O** O E

The output video signal at 25% speed :

- O **O** O **O** **E** E **E** E O **O** O **O** **E** E **E** E

Fields with parity violation are shown in bold, underlined letters. As it appears from the above table, whatever the playback speed (with the exception of the normal 100% playback speed), a number of fields violate the normal parity of the output signal. This parity violation induces a 1-line shift of the field, resulting in a vertical jitter of the picture. The jitter frequency depends upon the chosen playback speed.

To avoid this phenomenon and provide a stable output picture, EVS developed 2 types of line interpolator: 2-line and 4-line interpolators. The interpolation process can be enabled or disabled by the operator on all EVS slow motion systems.

2-Line Interpolator

The 2-line interpolator actually generates a new field, when the original field is in parity violation. Each line of this new field is calculated by a weighted average of the 2 neighboring lines. This process solves the problem of parity violation and vertical jitter, but the drawback is a reduction of the vertical resolution on the interpolated fields, that appear unfocused. Another side effect is the alternation of original fields (perfectly focused) and interpolated fields (unfocused), resulting in a "pumping" video signal.

4-Line Interpolator

The 4-line interpolator uses a more sophisticated calculation based on the 4 neighboring lines. By using suitable coefficients for the weight of each line in the resulting calculation, we apply this interpolation to all fields. The final result is a permanently, slightly unfocused picture. The advantage is a stable output signal with no jitter and no "pumping", but the vertical bandwidth is even more reduced.

5.6. XNet Network

The XNet2 network consists of several EVS video servers or other EVS hardware all connected with a 75-Ohm coaxial cable (BNC).

The data exchange between systems is operated through the SDTI interface at 1485 Mbps (1.5 Gbps) or 2970 Mbps (3 Gbps) , with non-relay connectors. The 2970 Mbps speed for the SDTI network is restricted to EVS servers fitted with H3X boards.

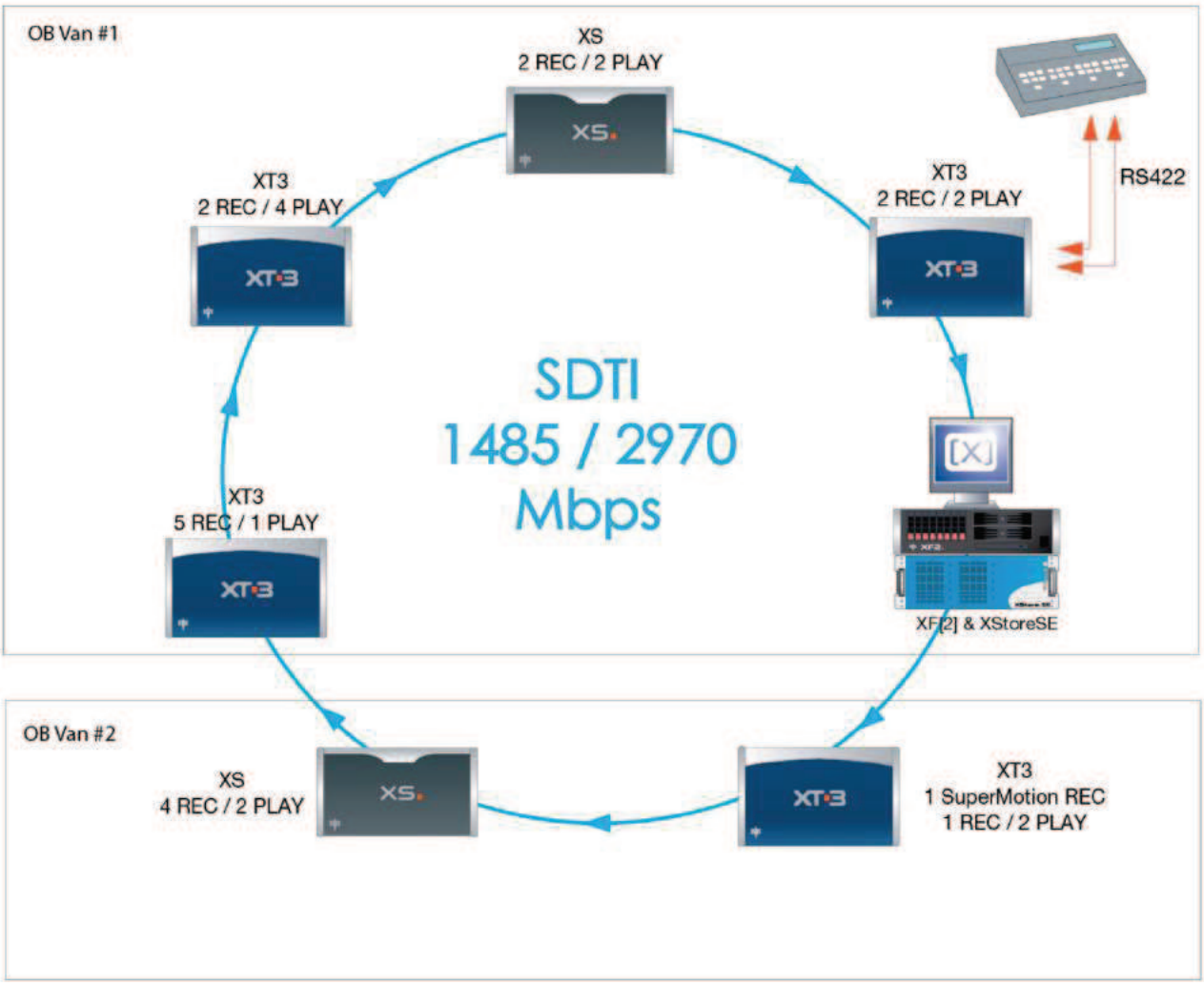
The SDTI loop is closed only when the Multicam software is started. As non-relay connectors are used, it is recommended to use XHub to avoid network interruptions.

The XNet2 requires a network server dedicated to the management of the database shared among all EVS video servers. This is assigned to one of the EVS servers on the network. The EVS server acting as the network server can of course be used for standard server operations.

5.6.2. Network Architectures

To set up an XNet network, EVS servers may be connected directly in a closed loop architecture. Using a dedicated hub, they may be connected in a star architecture as illustrated in the following figure.

Connection Diagram Without EVS XHub SDTI Hub



Annexe 12 – Connexion réseau des serveurs XT3 pour le transfert des clips.

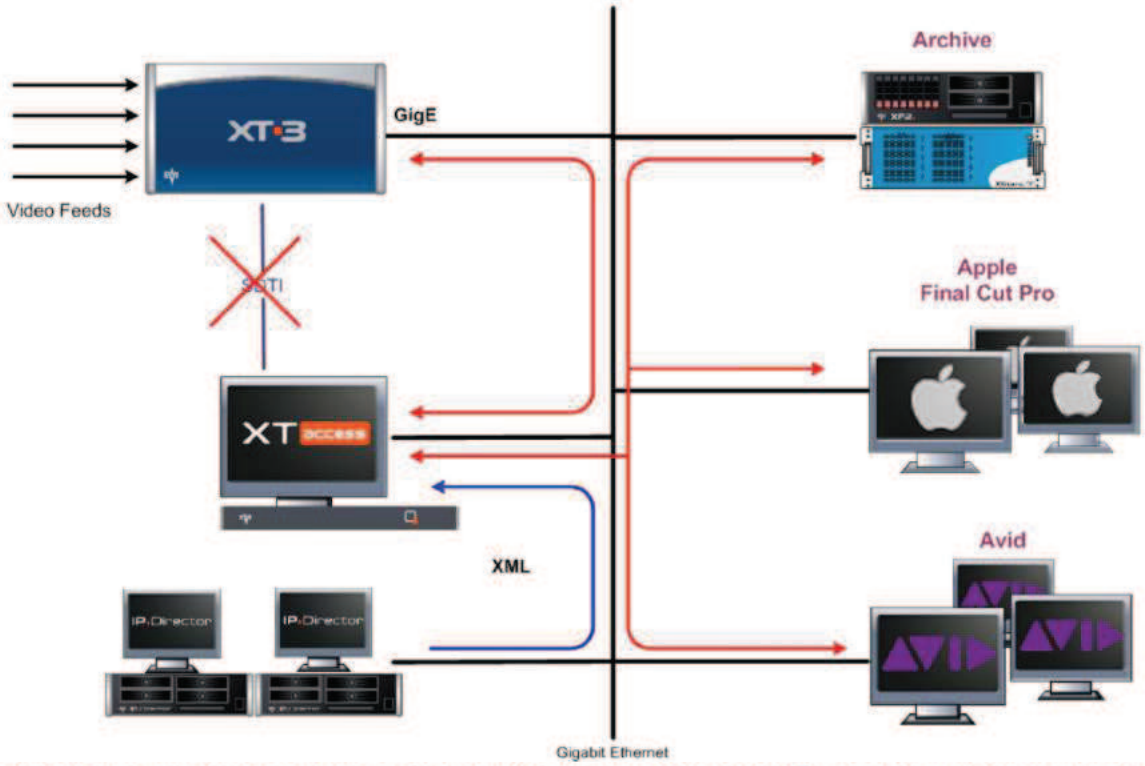
5.7. Gigabit Network

The Gigabit connection makes it possible to transfer video and audio material from your XT3 server to external systems via the TCP/IP network.

The external systems can be the following:

- A storage system or an archiving system, such as XStore or XF.
- A non-linear editing system, such as Xedio, Apple Final Cut Pro, or Avid.

However, the external systems cannot read the raw files coming from a XT3 server. For this reason, XTAccess is used as a "gateway" between your server and the IT world. It takes up the role of gateway used so far by XFile/XStream as it creates file formats compliant with external systems. In this architecture, the Xsquare application plays the role of XTAccess orchestrator on the Gigabit network, communicating via the PC LAN connection.



XTAccess is directly connected to the XT3 server through the Gigabit network via an FTP client. It runs on a Windows workstation and is mainly controlled by the external systems (no user interface) via XML files or other processes.

Cable type	@ 2970 Mbps	@ 1485 Mbps
RG59	30 m / 98 ft	45 m / 148 ft
RG6	70 m / 230 ft	90 m / 295 ft
RG11	85 m / 279 ft	120 m / 394 ft
Fiber	55 km (*)	80 km (*)

(*) 55 km/80 km is the total length of the return path, i.e. the actual distances between the 2 servers connected via the fiber link is half of this value, i.e. 40 km @ 1485 Mbps.

Note
When reclockers are used, the total delay induced by these reclockers between 2 active servers on the network may not exceed 15 µs.

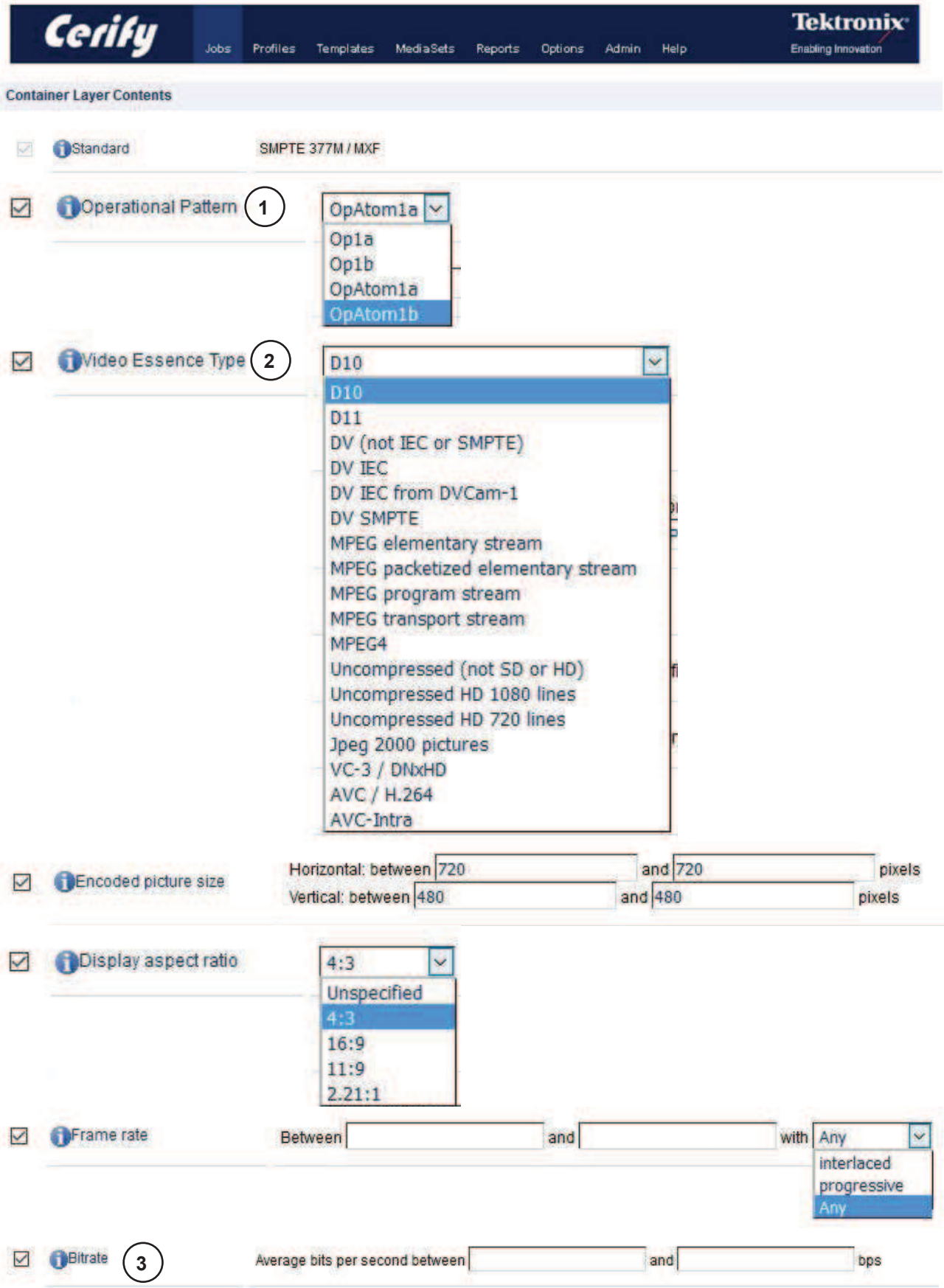
XNet Transfers

The maximum number of real-time channels between EVS servers through the SDTI ports of the XT3 server are summarized in the following table.

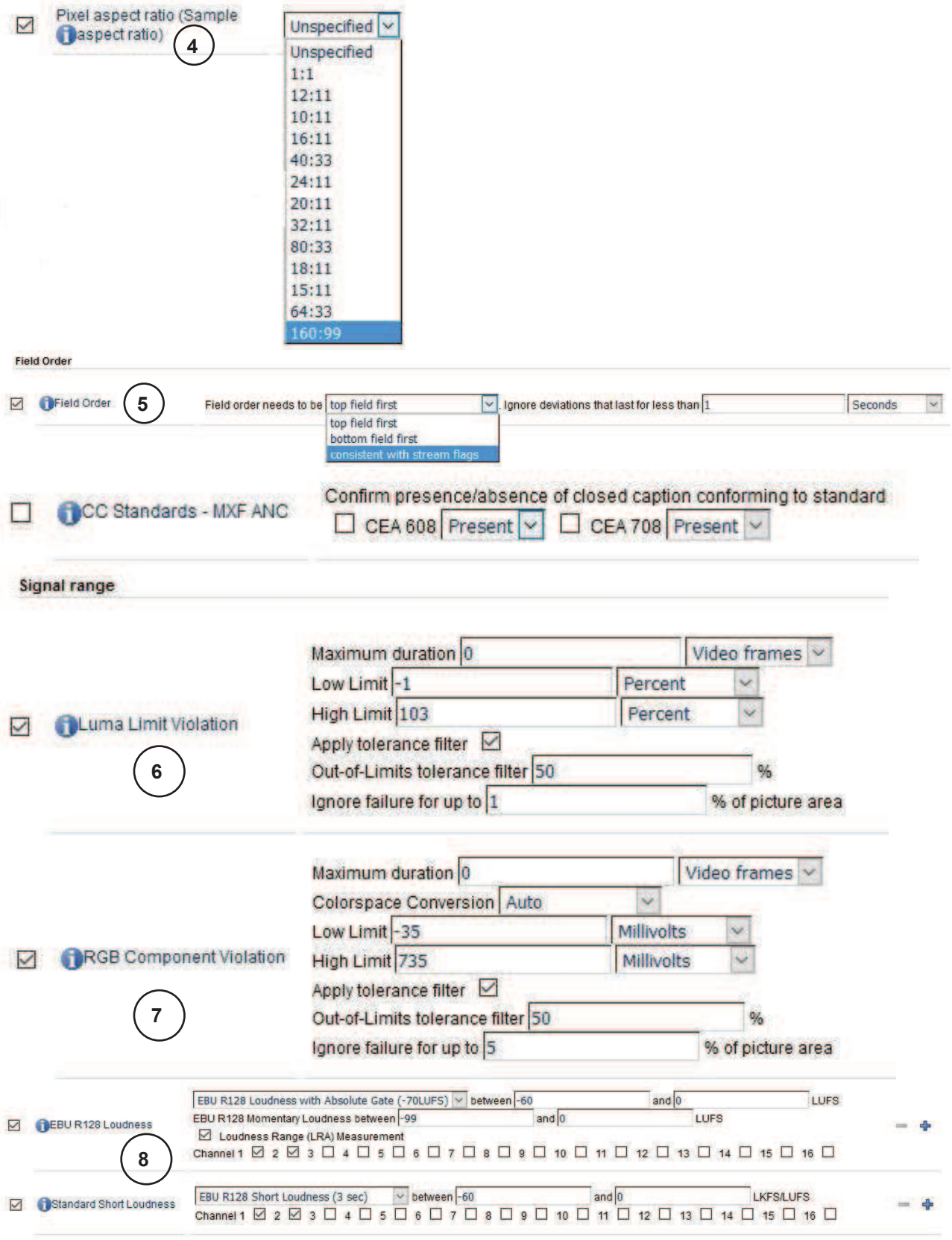
The following tables take into account a field rate of 50.00 Hz, and the resolution 1080i, without SLSM REC, and the following reference bandwidths:

- an SDTI network of 1.5 Gbps, with a maximum bandwidth of 110 MB/s
- an SDTI network of 3 Gbps, with a maximum bandwidth of 200 MB/s.

Annexe 14 – Copies d'écrans du logiciel contrôle qualité Tektonix Cerify (1/2).



Annexe 15 – Copies d'écrans du logiciel contrôle qualité Tektonix Cerify (2/2).



Annexe 16 – Extrait recommandation P.A.D. CST RT017.

A.1.2.3 - Spécifications métrologiques

Le tableau suivant précise les tolérances admises par les Editeurs sur les niveaux électriques des composantes vidéo HD :

Les mesures suivantes sont à effectuer dans les deux espaces colorimétriques (R, V, B et Y, Pr, Pb)

Espace Colorimétrique	*RVB*	*Y_{PrPb} pour la luminance*
Niveau Electrique	700mV	700mV
Niveaux hauts	**+ 3%** *soit 721 mV*	**+ 3%** soit 721 mV
Niveaux bas	**- 1%** soit -7 mV	**- 1%** soit -7 mV
Tolérance spatiale	**1%** Tant que 1% des pixels de l'image active n'est pas au-delà de ces seuils	**1%** Tant que 1% des pixels de l'image active n'est pas au-delà de ces seuils

L'utilisation des différentes compressions numériques vidéo est obligatoirement indiquée sur l'étiquette et sur la fiche d'identification technique, en précisant le type de compression ainsi que le débit.

Annexe 17 – Spécifications techniques de l'émetteur WLL-CX55.

Poids	2 Kg
Type d'antenne	Omnidirectionnelle Impédance 50 Ω Polarisation : verticale
Modulation	16QAM-OFDM, QPSK-OFDM
Alimentation	12 V CC (10,5 V-17 V)
Consommation	1,25 A
Température d'utilisation	-20°C à +40°C
Température de stockage	-20°C à +60°C
Dimensions	132 x 214 x 176 mm
Gamme de fréquences	2402 à 2482 MHz
Espacement entre canaux	12 MHz
Bande passante occupée	8 MHz
Puissance de sortie émetteur (Pe)	4 mW / 40 mW sélectionnables
Gain d'antenne	4,0 dBi

Annexe 18 – Extrait norme E.T.S.I. EN 300 744 (transmission DVB-T).

Table 17: Useful bitrate (Mbit/s) for all combinations of guard interval, constellation and code rate for non-hierarchical systems for 8 MHz channels (irrespective of the transmission modes)

Modulation	Code rate	Guard interval			
		1/4	1/8	1/16	1/32
QPSK	1/2	*4,98*	*5,53*	*5,85*	*6,03*
	2/3	*6,64*	*7,37*	*7,81*	*8,04*
	3/4	*7,46*	*8,29*	*8,78*	*9,05*
	5/6	*8,29*	*9,22*	*9,76*	*10,05*
	7/8	*8,71*	*9,68*	*10,25*	*10,56*
16-QAM	1/2	*9,95*	*11,06*	*11,71*	*12,06*
	2/3	*13,27*	*14,75*	*15,61*	*16,09*
	3/4	*14,93*	*16,59*	*17,56*	*18,10*
	5/6	*16,59*	*18,43*	*19,52*	*20,11*
	7/8	*17,42*	*19,35*	*20,49*	*21,11*
64-QAM	1/2	*14,93*	*16,59*	*17,56*	*18,10*
	2/3	*19,91*	*22,12*	*23,42*	*24,13*
	3/4	*22,39*	*24,88*	*26,35*	*27,14*
	5/6	*24,88*	*27,65*	*29,27*	*30,16*
	7/8	*26,13*	*29,03*	*30,74*	*31,67*

NOTE: Figures in italics are approximate values for 8 MHz channels. Values for 6 MHz and 7 MHz channels are given in annex E. Values for 5 MHz channels are given in annex G.
For the hierarchical schemes the useful bit rates can be obtained from table 17 as follows:
- HP stream: figures from QPSK columns;
- LP stream, 16-QAM: figures from QPSK columns;
- LP stream, 64-QAM: figures from 16-QAM columns.

Annexe 19 – Document Lee Filter.

Tungsten to Daylight

		Kelvin	Mired Shift	Transmission Y%	Absorption abs	Chromaticity Co-ordinates x	y
			(Measured to source C, Correlated Color Temperature of 6774K)				
200 Double CTB	Converts Tungsten to Daylight.	3200K to 26000K approx	-274	16.2	0.79	0.179	0.155
283 One and a Half CTB	Converts Tungsten to Daylight.	3200K to 8888K	-200	24.4	0.61	0.201	0.188
201 Full CTB	Converts Tungsten to Photographic Daylight. Also available as Wide Roll.	3200K to 5700K	-137	34.0	0.47	0.228	0.233
281 Three Quarter CTB	Converts Tungsten to Daylight.	3200K to 5000K	-112	45.5	0.35	0.239	0.258
202 Half CTB	Converts Tungsten to Daylight.	3200K to 4300K	-78	54.9	0.26	0.261	0.273
203 Quarter CTB	Converts Tungsten to Daylight.	3200K to 3600K	-35	69.2	0.16	0.285	0.294
218 Eighth CTB	Converts Tungsten to Daylight.	3200K to 3400K	-18	81.3	0.09	0.299	0.307

Daylight to Tungsten

287 Double CTO	Converts Daylight to Tungsten Light.	6500K to 2147K	+312	40.9	0.39	0.514	0.424
286 One and a Half CTO	Converts Daylight to Tungsten Light.	6500K to 2507K	+245	48.2	0.32	0.478	0.422
204 Full CTO	Converts Daylight to Tungsten Light.	6500K to 3200K	+159	55.4	0.26	0.437	0.392
207 Full CTO + 3ND	Converts Daylight to Tungsten and reduces light 1 Stop.	6500K to 3200K	+159	32.5	0.49	0.435	0.386
208 Full CTO + 6ND	Converts Daylight to Tungsten and reduces light 2 Stops.	6500K to 3200K	+159	15.6	0.81	0.442	0.394
285 Three Quarter CTO	Converts Daylight to Tungsten Light.	6500K to 3600K	+124	61.3	0.21	0.400	0.387
205 Half CTO	Converts Daylight to Tungsten Light.	6500K to 3800K	+109	70.8	0.15	0.374	0.364
206 Quarter CTO	Converts Daylight to Tungsten Light.	6500K to 4600K	+64	79.1	0.10	0.346	0.346

Annexe 20 – Canon Digisuper 80.

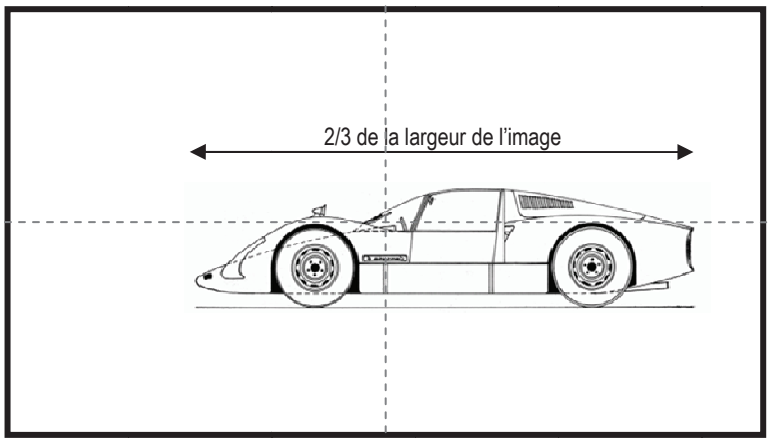
SPECIFICATIONS

DIGISUPER 80	16:9		4:3	
Built-in Extender	1.0x	2.0x	1.0x	2.0x
Zoom Ratio	80x			
Range of Focal Length	8.8~710mm	17.6~1420mm	8.8~710mm	17.6~1420mm
Maximum Relative Aperture	1:1.7 at 8.8~340mm 1:3.55 at 710mm	1:3.4 at 17.6~680mm 1:7.1 at 1420mm	1:1.7 at 8.8~340mm 1:3.55 at 710mm	1:3.4 at 17.6~680mm 1:7.1 at 1420mm
Angular Field of View	57.2°×34.1° at 8.8mm 0.77°×0.44° at 710mm	30.5°×17.4° at 17.6mm 0.39°×0.22° at 1420mm	53.1°×41.1° at 8.8mm 0.71°×0.53° at 710mm	28.1°×21.2° at 17.6mm 0.36°×0.27° at 1420mm
Minimum Object Distance (M.O.D.)	3.0m from front lens vertex			
Object Dimentions at M.O.D.	290.0×163.1cm at 8.8mm 3.7×2.1cm at 710mm	145.0×81.6cm at 17.6mm 1.9×1.1cm at 1420mm	266.8×200.1cm at 8.8mm 3.4×2.6cm at 710mm	133.4×100.1cm at 17.6mm 1.7×1.3cm at 1420mm
Approx. Size	W×H×L=250.6×255.5×610mm			
Approx. Mass	23.2kg (51.1lbs)			

Annexe 21 – Images observées sur le moniteur de contrôle.

L'écran du moniteur de contrôle est représenté avec une largeur de 10 cm pour faciliter les calculs en pourcentage.

Véhicule de profil dans le virage.

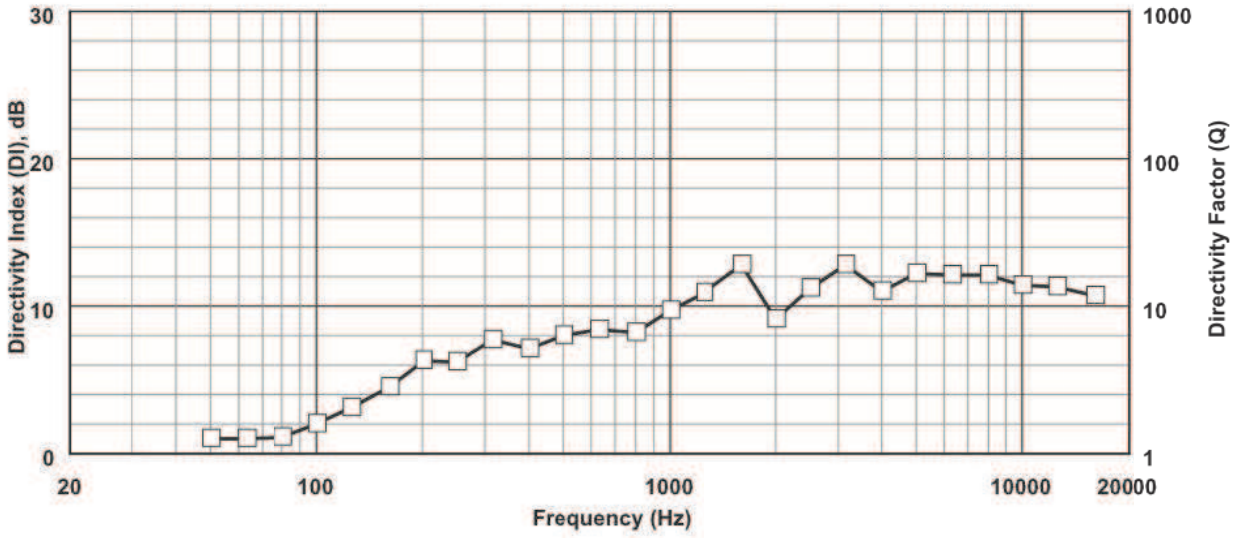


Technical specifications

Freq. Range (-3 dB):	100 Hz–14 kHz
Freq. Range (-10 dB):	70 Hz–16 kHz
Max Calculated SPL[1]:	139 dB
Horizontal Coverage:	65° nominal
Vertical Coverage:	65° nominal
Power Handling[2]:	600 W continuous., 2400 W peak
Sensitivity (SPL 1W / 1m)[1]:	105 dB
Impedance (PI Version Only):	4 Ω nominal, 3.5 Ω minimum
Crossover Frequency:	1.8 kHz, LF/MB Overlap: 200–600 Hz
Recommended Filtering:	90 Hz High-pass Filter, @ Q=1.6
Connectors:	SJO Cable with Gland Nut
Enclosure Material:	High Density Polymer

Electro-Voice

Directivity:



Annexe 23 – Extrait recommandation ITU-R BT.709 (2).

1 Conversion optoélectronique

Point	Paramètre	Système									
		60/P	30/P	30/PsF	60/I	50/P	25/P	25/PsF	50/I	24/P	24/PsF
1.1	Caractéristiques de transfert optoélectronique avant précorrection non linéaire	Supposée linéaire									
1.2	Caractéristiques de transfert optoélectronique globales à la source[1]	$V = 1{,}099\,L^{0{,}45} - 0{,}099$ pour $1 \geq L \geq 0{,}018$ $V = 4{,}500\,L$ pour $0{,}018 > L \geq 0$ où: L : luminance de l'image $0 \leq L \leq 1$ V : signal électrique *correspondant*									
1.3	Coordonnées de chromaticités (CIE, 1931)	x					y				
	Couleur primaire – Rouge (R) – Vert (G) – Bleu (B)	0,640 0,300 0,150					0,330 0,600 0,060				
1.4	Chromaticité supposée pour des signaux primaires égaux (Blanc de référence)	D_{65}									
		x					y				
	$E_R = E_G = E_B$	0,3127					0,3290				