Televes®

LTE READY

Product Guide

Index

Introduction

The path initiated with the deployment of DTT will take a step further with the development of the digital dividend a process which will establish the technical conditions for the allocation of the 800 MHz band (channels 61- 68) in the EU for the introduction of advanced mobile phone services and mobile Internet (**Long Term Evolution - LTE**).

The use of channels 61 to 68 for mobile services responds, on one hand, to an intent to harmonize the use of this band across Europe and, on the other, to reduce the cost of the network infrastructure (less cells required, better penetration and better coverage at these frequencies).

Mobile phone connections will represent 80% of the broadband connection in the year 2014. This spectrum must be harmonized in the 800 MHz band in order to develop the maximum potential of LTE technology and make it available to societies growing demand for services.

The release of the digital dividend must be completed in Europe before the 1st of January 2015. Some governments, like the UK, have already announced that these frequencies will be released during the first half of 2013.

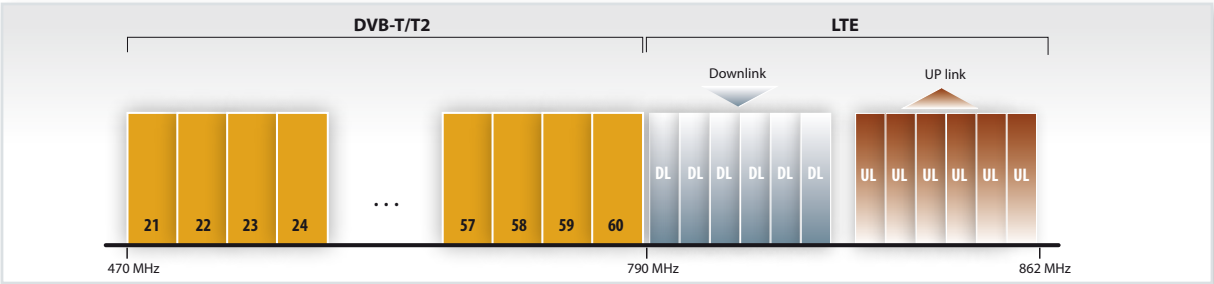
In some countries, the release of the digital dividend could face an added complexity since DTT channels will need to be rellocated to channels between 21 and 60. So during this transition retuning will be required by the end user and maybe adaption of the installation. The planification for the rellocation of frequencies is normally regulated by a government agency and will be part of an on going plan; in the UK the regulator is OFCOM.

For the installers of domestic and commercial TV reception systems, the digital dividend is a challenge. As an industry leader, Televes has worked hard to give the professional installer all the support required, not only with products but also with technical support.

The radioelectric spectrum

UHF-SPECTRUM

The UHF band is currently exclusively used by broadcasted DVB-T/T2 transmissions. However, this will change with the release of the radioelectric spectrum between channels 61 and 68 for the allocation of mobile broadband services, also known as 4G.



LTE SPECTRUM

The frequency spectrum between 790 and 862 MHz will be allocated to the new LTE services.
LTE development reserves only a 1 MHz guard band between LTE and the possible DVB-T/T2 services located at channel 60.

We should be able to differentiate between LTE downlink signals and LTE uplink signals.

LTE downlink signals

These are the download transmissions from the mobile network to the mobile terminal and can be received by DTT aerials.

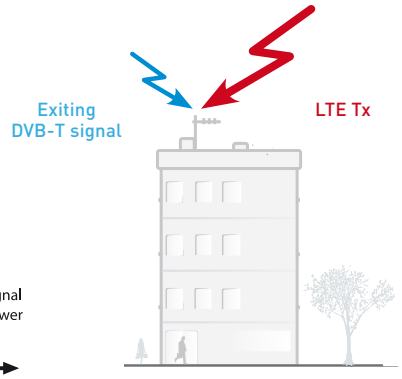
Depending on the amplification system being used in the installation (broadband amplification, programmable amplifiers or single channel amplifiers) a protection ratio can be established for channels 60 and 59 plus the rest of the channels, bearing in mind the small guard interval (1 MHz) between LTE and DTT.

Domestic systems will present similar problems, as they are exposed to LTE downlink signals that can reach the amplification, these will normally be broadband and hence more sensitive to interference.

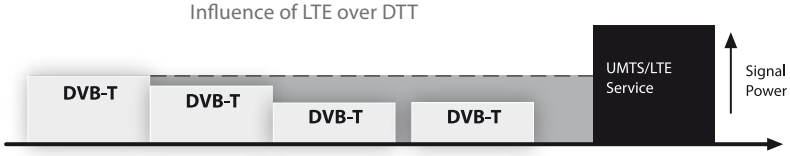
LTE uplink signals

Signals being transmitted from the LTE user terminal that will be received as interfering signals by the receivers integrated in the TV's or the stand alone set top boxes.

Both for domestic and communal system the uplink signals could filter into the distribution system through a poorly screened cable, outlet plate or connector, the interference could even cause pixelization.



Influence of LTE over DTT



790-791	791-796	796-801	801-806	806-811	811-816	816-821	821-832	832-837	837-842	842-847	847-852	852-857	857-862
Guard band	Downlink						Duplex gap	Uplink					
1 MHz	30 MHz (6 blocks of 5 MHz)						11 MHz	30 MHz (6 blocks of 5 MHz)					

The deployment of LTE transmitters will, presumably, be done using the same locations as the current UMTS (3G) and/or GSM networks, so they will be in proximity with TV reception systems, most of these TV systems will have broadband amplification. In this scenario, the TV reception systems will simultaneously receive DTT and LTE transmissions. This will generate intermodulation signals to a greater or lesser extent depending on many different factors (level of the received signals, amplification, DTT channels received, etc.). The intermodulation interference will travel through all the distribution components until it reaches the set top box.

In anticipation to LTE deployment, Televes has participated in trials and has done in depth analysis of the implications that this technology will have on the reception of broadcasted TV.

As the result of the work carried out by our R&D team a company leader in the industry, Televes has developed a **complete range of products specifically designed to minimize the potential of LTE interference** over DTT services. All these products will carry the **LTE Ready** stamp, registered by Televes.

RANGE OF PRODUCTS SPECIFICALLY DESIGNED FOR LTE

FILTERS		
403101	LTE FILTER "F" 470...774MHz (Ch21-58)	
403401	LTE FILTER "F" 5...790MHz (Ch21-60) SELEC.	
404411	BLIST. LTE FILTER "IEC" 470...774MHz (Ch21-58)	
404412	BLIST. LTE FILTER "IEC" 5...790MHz (Ch21-60) SEL.	
405101	LTE FILTER "EasyF" 470...774MHz (Ch21-58) OUTDOORS	
405401	LTE FILTER "EasyF" 5...790MHz (Ch21-60) SELEC. OUTD.	
403301	LTE MICROCAVIT. FILTER "F" 5..790MHz SEL.	
ANTENNAS		
149901	DAT HD BOSS 790 ANT.(Ch21-60) G32dBi BOXED	
149101	V HD 790 TERR.ANT. UHF(Ch21-60) G15dBi BOXED	
130201	IINNOVA BOSS ANT. (Ch21-69 or Ch21-60) G25dBi	
Q-BOSS		
561901	Q-BOSS 790 "EasyF"Ch21-60 G15dB Vo102	
562001	Q-BOSS 774 "EasyF"Ch21-58 G12dB Vo100	
MASTHEAD AMPLIFIERS		
561501	MAST AMP.12..24V 3I/1O B3/U-FMmx-SATmx USOS	
561601	MAST AMP. 12..24V 3I/1O U-Vmix-SATmix USOS	
561701	MAST AMP.12..24V 3I/1O U-U-Vmix	
561801	MAST AMP. 12..24V 3I/1O BIII-U-FMmix USOS	
SETBACK AMPLIFIERS		
562701	DOM.AMP.1O VHF/UHF G13/24dB USOS + DC	
562711	DOM.AMP.1O V/U G13/24dB USOS+DC W/O PSU	
562702	DOM.AMP.2O VHF/UHF G10/21dB USOS + DC	
562712	DOM.AMP.2O V/U G10/21dB USOS +DC W/O PSU	
562703	DOM.AMP.2O+TV VHF/UHF G9/20dB USOS + DC	
562713	DOM.AMP.2O+TV V/U G9/20dB USOS + DC W/O PSU	
LAUNCH AMPLIFIERS		
562301	MINIKOM AMP.5/1"EasyF" FM-V-U-21..35-39..60/69F	
562302	MINIKOM AMP.5/1"EasyF" FM-V-U-21..32-36..60/69	
562401	MINIKOM AMP.MATV 4I/1O "EasyF" FM-V-U-U	
562501	MINIKOM AMP.MATV 3I/1O "EasyF" FM-V-U	
562601	MINIKOM AMP.SMATV 4I/1O "EasyF" FM-V-U-SAT	

PROGRAMMABLE AMPLIFIERS		
532740	AVANT3	
532840	AVANT HD	
SINGLE CHANNEL AMPLIFIERS		
508012	IF BAND AMPLIFIER T12	SAT
508112	BI BAND AMPLIFIER T12	BI
508212	FM BAND AMPLIFIER T12	FM
509912	DAB BAND AMPLIFIER T12	DAB
508312	BIII BAND AMPLIFIER T12	BIII
508712	LOW S BAND AMPLIFIER T12	SB LOW
508812	HIGH S BAND AMPLIFIER T12	SB HIGH
508912	HYPERBAND AMPLIFIER T12	HYPERB.
509812	SELECTIVE SINGLE CHANNEL AMPLIFIER	UHF
508612	SINGLE CHANNEL AMPLIFIER	UHF
549812	SWITCHED PSU T12	
509512	SEL. SINGLE CHANNEL AMP WITH AGC T12	UHF
509712	SINGLE CHANNEL AMP. WITH AGC T12	UHF
OUTLET PLATES		
522610	OUTLET PLATE.47..2150MHz 1-1,5dB+DC	
523110	THROUGH OUTLET PLATE 5...790MHz TV-FM 11-29dB	
SCREENED COAX LEADS		
431001	COAX LEAD "IEC"ELBOW.M-F WHITE 1,5M	
431002	COAX LEAD "IEC"ELBOW.M-F WHITE 2,5M	
SPECTRUM ANALYZER		
5960	H60 ADVANCE (FULL HD + CI+F.O.+EXTENDED SPECTRUM 5...3300 MHz)	
596005	H60 ADVANCE (FULL HD + CI+EXTENDED SPECTRUM 5...3300 MHz+SELECTIVE F.O)	

LTE FILTERS 58 and 60

Televes has designed two types of filters with different rejection and performance depending if there are TV services over channel 58 or not. Once decided the type of filter based on the location of the channels, we will need to choose the format.

PLUG-IN INDOORS (F & IEC)

404411
404412

403101
403401

EASY F OUTDOORS

The most reliable and quick connection

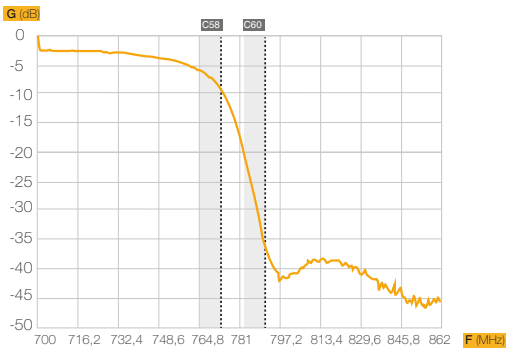
Reduces the installation time by 50%

✓**Built-in system**
You will never require extra connectors

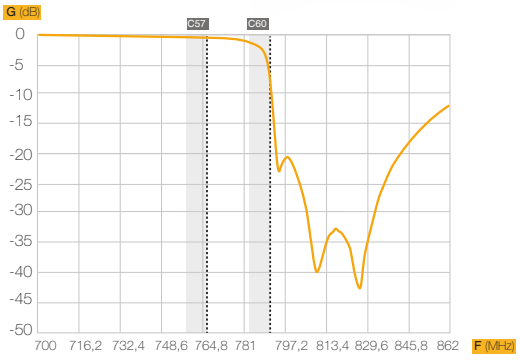
405101
405401

REF	FILTERS	Pass band (MHz)	Rejected band (MHz)	Pass band attenuation (dB)	Rejected band attenuation (dB)
405101	LTE 1I/1O EasyF Ch 21-58	470 - 774	791 - 862	<3 (7@774MHz)	>25
403101	LTE 1I/1O F Ch 21-58				
404411	LTE 1I/1O IEC Ch 21-58				
405401	LTE 1I/1O EasyF Ch 21-60	5 - 790	793 - 821	<1 (5@790MHz)	>20
403401	LTE 1I/1O F Ch 21-60				
404412	LTE 1I/1O IEC Ch 21-60				
403301	CAVITIES 1I/1O F Ch 21-60			<0,5 (2@790MHz)	

The quality in the filter's response can only be appreciated with graphs as the ones below, where the performance of the filter in the high UHF channels can be seen in detail.



C58 LTE filter rejects signals from 774MHz onwards. Specifically recommended for DTT installations with multiplex below channel 58.



C60 LTE filter rejects signals from 782MHz onwards. Specifically recommended for DTT installations with multiplex channels 59 or 60.

The filters for LTE can be designed using different technologies:

LC. Using discrete components (L, C) important rejection to the interference band could be achieved but it will increase the insertion losses in the DTT band. Its use could lead to having to readjust the amplifiers in the system.

Ceramic resonators. The ceramic resonating filters resolve the problems with the insertion losses of the LC filters. If the resonators are not of high quality, variations in temperature will cause variations in the rejection and insertion losses in the DTT channels near LTE (channels 59 and 60).

SAW Filters. The surface wave filtering (SAW) achieves high rejection in small frequency intervals. It generates high insertion losses and why they need to be combined with an amplifier, which complicates its design and increases its cost.

Cavity filters. They are formed by three coupled transmission lines, which are located resonant metal cavities. They achieve optimum rejection characteristics (25-30 dB and even more), whilst maintaining minimum insertion losses (< 1 dB in the DTT band with 2 dB typical in the high UHF channels 59, 60).

PATENTED

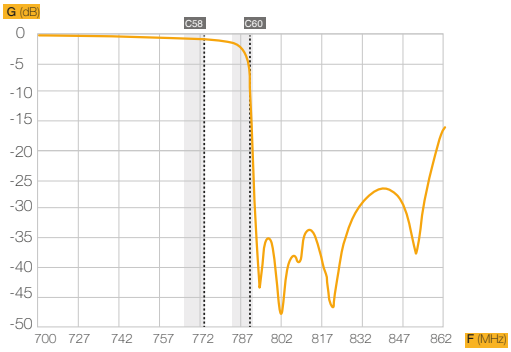
403301

MICROCAVITIES FILTER (F FORMAT)

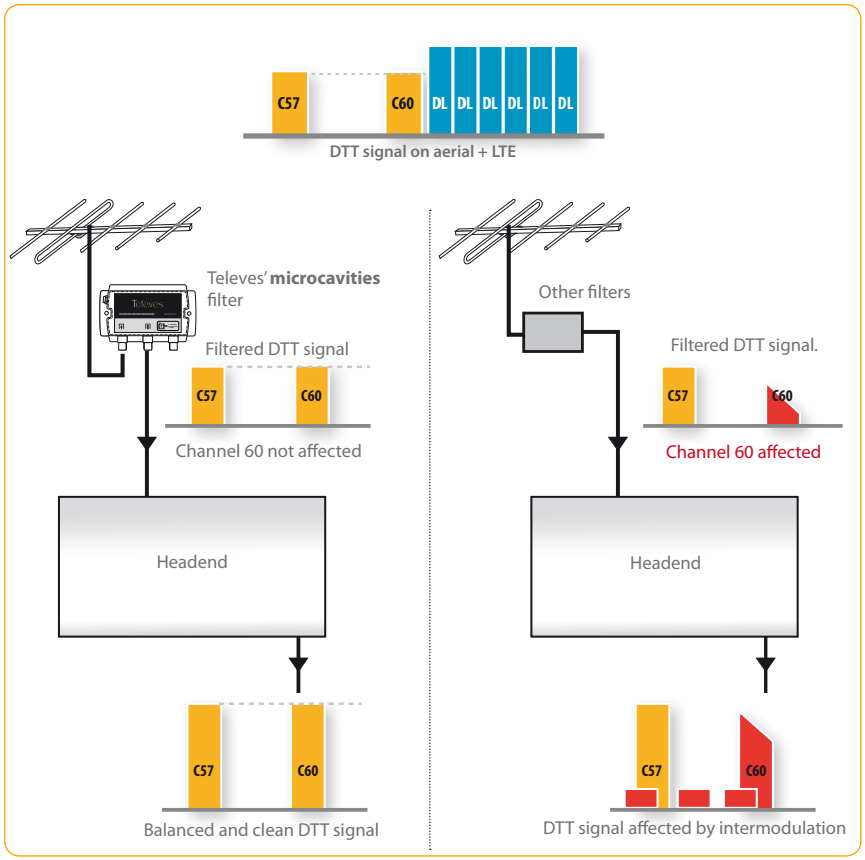
Normally these types of filters are bulky and heavy, hence the reason why they were never used in MATV solutions, restricting their use to broadcasting solutions or very high end MATV headends.

Televes has achieved it with its **microcavities filter** (patented system) and is implementing the technology in a small chassis (10 cm x 5 cm) and with a weight of less than 250 grams, which makes it suitable for internal or external use. In order to achieve this, Televes uses what is called micro-cavities, in which the resonant elements of high quality factor (Q) are allocated.

The **microcavities filter** achieves outstanding performance with temperature variation and its robust construction makes it very resistant to vibration, the ideal component for the rejection of the LTE interference, whilst preserving the reception of DTT. They could be used either as a preventive measure or a mitigation solution.



Microcavities LTE C60 filter
it rejects signals above 782MHz with minimum insertion losses



In the presence of channel 60, depending on the chosen filter, it could be that the headend (amplifier) is unable to equalize the output level of all the available channels.

In the example figure we show channel 60 being received by the aerial and balanced with respect to the rest of the available channels. If the filter used is not a micro-cavities filter ref.403301, it is more likely that the headend will be unable to achieve the same output level for channel 60 as it does for the rest of the channels.

Both for broadband amplifiers or single channel amplifiers, the increase in gain in the amplifier to overcome the losses in the filter could result in the generation of intermodulation products.

Intelligent antennas

Evolution of the species

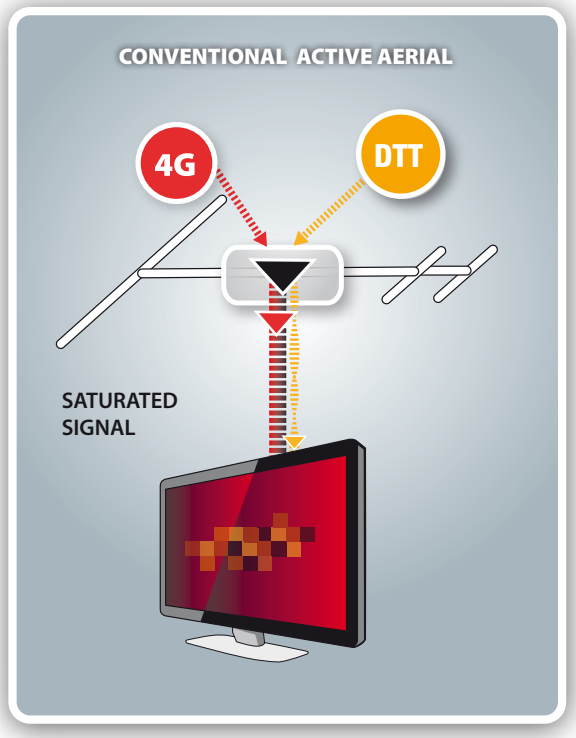
Conventional electronic antennas are nothing more than basic ACTIVE AERIALS, this is an aerial with an amplifier which in many cases has an unacceptable noise figure.

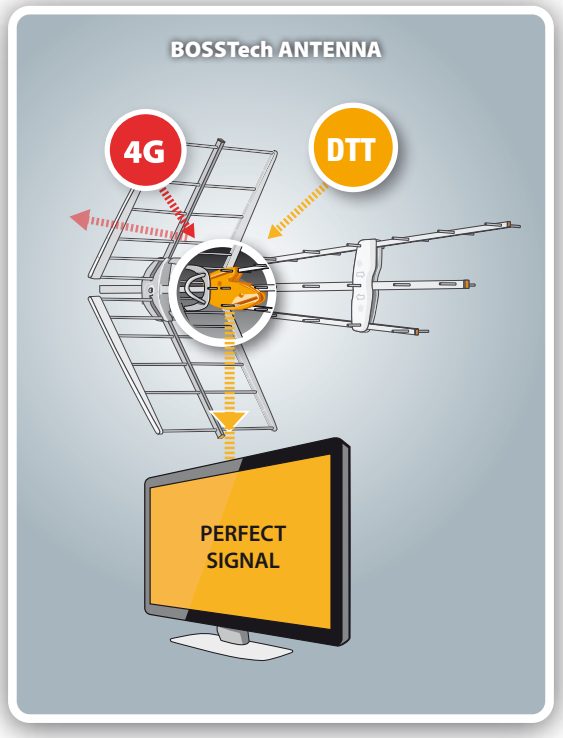
Televes' antennas with BOSSTech are not active aerials. The intelligent device built into the antenna which can be activated or not depending on the requirements of the installation, it automatically regulates the gain to provide the TV with the best signal quality.

ACTIVE aerials could cause problems that render them useless in the current scenario with DTT and in the future for co-existence of DTT with LTE/4G.

Whilst **an active aerial will saturate in the presence of a LTE/4G signal,** the BOSSTech will regulate its gain to avoid saturation, several radiated test where DTT and 4G coadjacent signals were received by a BossTech antenna. The option of blocking the power to the antenna can also be used in extreme cases.

The BOSSTech device allows the installer and the end user to competely forget about the signal level in reception, resolving those problems caused by level adjustment or the signal fluctuation that could occur during the life span of the installation.





Installing a Televes BOSSTech antenna assures the continuity in quality of service and the best possible performance of the system, even with LTE/4G.

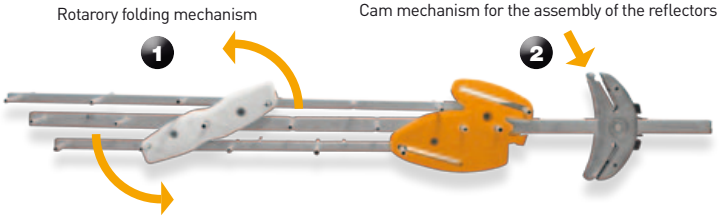
INTELLIGENT ROOF TOP ANTENNA DAT HD BOSS 790

This antenna has been designed to optimize rejection to the LTE band whilst keeping the reception characteristics in the UHF TV band , it is an evolution of the DAT HD BOSS antenna with angular triple array patented by Televes.

The antenna incorporates the BOSSTech device, with improved electronic performance.

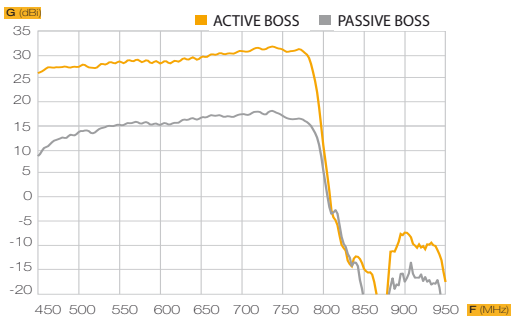
NEW ASSEMBLY SYSTEM

The new DAT incorporates a new **folding mechanism of the directors** and a **cam mechanism in the reflector**



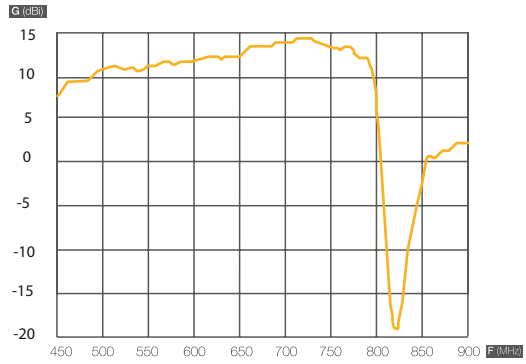
The new folding mechanism of the directors not only simplifies the assembly of the antenna but also optimizes its transport and storage.

REF.149901		SPECIFICATIONS	
Mode		Passive	Active
Bandwidth	MHz	470-790 (Ch 21-60)	
Maximum gain	dBi	17	32 max
Noise figure	dB	-	1.2 typ
Output level		-	Self adjustable
Recommended input level	dBµV	>75	<75
Powering	V	0	12-24
Maximum consumption	mA	0	45 (24V)/35(12V)
Lobe width	º	30	
Wind load	N	120 (130km/h)	165 (150 km/h)



ROOF TOP ANTENNA V HD 790

Antenna specifically designed to optimize the reception of channels 21 to 60 whilst achieving maximum out of band rejection for the 4G/LTE band. Its clever design allows the antenna to achieve high levels of out of band rejection with no built-in filtering.



Made of high grade aluminium and plastics and very easy to assemble, the V790 has been designed to withstand the test of time.

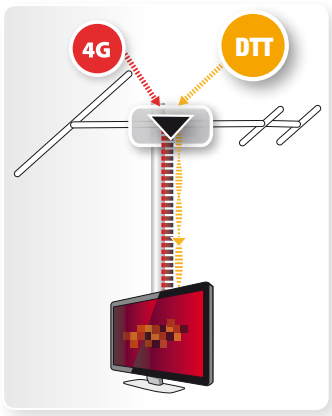
Confederation of Aerial Industries.

REF. 149101		SPECIFICATIONS
Bandwidth	MHz	470 - 790 (Ch 21-60)
Gain	dBi	15
F/B ratio	dB	> 23
Wind load	N	93 (@ 130 km/h) 128 (@ 150 km/h)

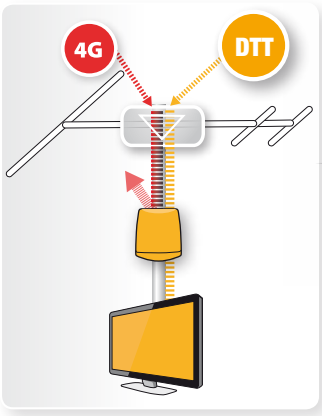
Q-BOSS

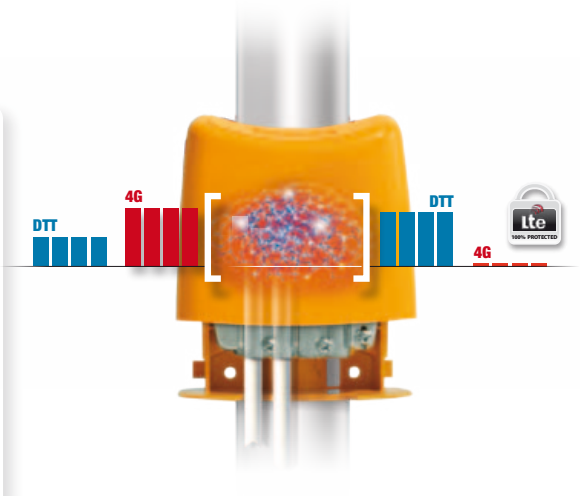
The only device **capable of transforming any aerial into a BOSSTech antenna,** converting your active or passive aerial into an intelligent device.

GENERIC AERIAL WITH NO Q-BOSS



ADAPTED AERIAL





Q-BOSS - EASY F	POWERING (V)	GAIN (dB)	OUTPUT LEVEL (dBuV) DIN45004B
		UHF	UHF
Ref.562001 Q-BOSS 774 Ch21-58	12...24V	12	100
Ref.561901 Q-BOSS 790 Ch21-60		15	102

INTELLIGENT SET TOP ANTENNA INNOVA BOSS

INNOVA BOSS

SPECIFICALLY DESIGNED FOR THE RECEPTION OF DTT INDOORS.

The best possible DTT reception, HD services and 3D TV indoors.

Incorporates the BOSS technology that **automatically regulates the output signal**, which ensures the optimum reception in areas with intermittent reception, whilst eliminating the interferences caused by people moving around the room in which its installed.

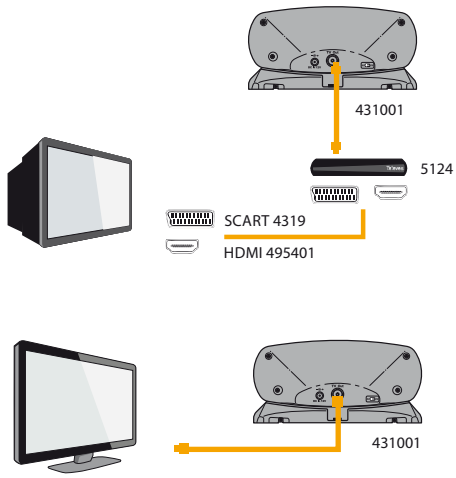
Its exceptional radiation lobe of 360º allows this set top antenna to be installed in any position with no worries about its orientation.

- ✓ **Plug&Play.**
- ✓ No need to be orientated:
- ✓ LTE Ready.

REF. 130201		SPECIFICATIONS
Bandwidth	MHz	**Pos. 60**: 470 - 790 **Pos. 69**: 470 - 862
Maximum gain	dBi	25*
Noise figure (typ.)	dB	3
Maximum consumption (5 ... 12V)	mA	40
Protection index	IP	20
Dimensions	mm	215 x 102 x 105
Weight	gr	350

** Self regulated gain for high input levels.*

Connections depending on type of TV set



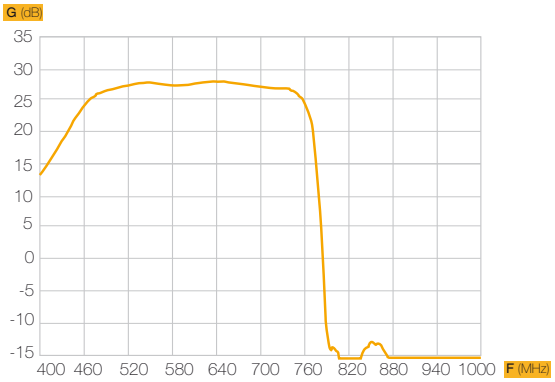
The Innova Boss **incorporates a easy switch ON-OFF** that allows its user to turn ON or OFF the protection against LTE interference as necessary.

MASTHEAD AMPLIFIERS

NanoKom Series

- Optimized for the band between channels 21 and 60.
- Incorporates LTE Switch ON/OFF.
- Incorporates DC pass Switch (ON/OFF).
- Improved noise figure performance (NF).

Once the output level has been adjusted through a potentiometer located on the front, the amplifier will maintain this level by means of an automatic regulation system.



REF.	DESCRIPTION	NOISE FIGURE (dB)		GAIN (dB)		MAX. OUTPUT LEVEL (dBuV)		REMARKS
		UHF	VHF	UHF	VHF	UHF	VHF	
561501	(U+BIII)dc-(FM+BI)mix-FImix	1.5	3.5	31	18	103	103	Auto. indep. Regulation U and BIII. Indep. Reg. Vout U and BIII DC (U+BIII) ON/OFF BIII:174-253 MHz LTE Filter ON/OFF
561601	UHF-VHFmix-FImix	1	-	31	-1	103	-	Auto. Regulation UHF Vout regulation U VHF:47-253 LTE Filter ON/OFF
561701	U1dc-U2-VHFmix	6	-	27	-1	103	-	Indep. Atten. U1 and U2 DC U1 ON/OFF VHF:47-253 LTE Filter ON/OFF
561801	U-BIII-(FM+BI) mix	1	3	31	18	103	103	Auto. Indep. Regulation U and BIII Indep. Reg. Vout U and BIII BIII:174-253 MHz LTE Filter ON/OFF

SETBACK AMPLIFIERS

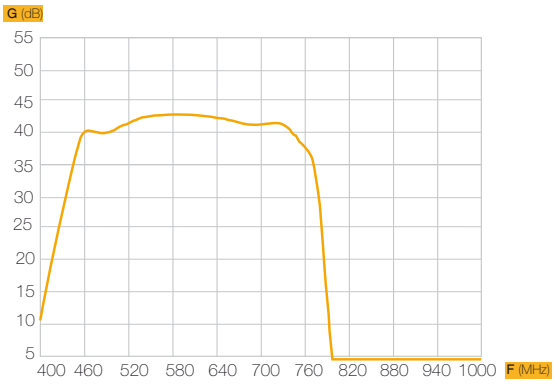
- Optimized for the band between channels 21 and 60.
- Remotely powered through any of its outputs.
- Detachable PSU, allowing flexibility in its location.

Once its output level has been set by means of a potentiometer located on the front, the amplifier will keep this level by means of an automatic gain regulation system.

REF.	DESCRIPTION	GAIN (dB)		MAX. OUTPUT LEVEL (dBuV) DIN45004B		NOTES
		UHF	VHF	UHF	VHF	
562701	AS VHF/UHF 1E/1S	24	13	106	98	Detachable PSU included Common auto. regulation VHF/UHF LTE Filter ON/OFF DC IN ON/OFF
562702	AS VHF/UHF 1E/2S	21	12	103	95	
562703	AS VHF/UHF 1E/2S+TV	20	9	102	94	
562711	AS VHF/UHF 1E/1S	24	13	106	98	Detachable PSU not included Common auto regulation VHF/UHF LTE Filter ON/OFF DC IN ON/OFF
562712	AS VHF/UHF 1E/2S	21	12	103	95	
562713	AS VHF/UHF 1E/2S+TV	20	9	102	94	

LAUNCH AMPLIFIERS

- Optimized for the band between channels 21 and 60.
- New compact design.
- Switch mode PSU, best guarantee of low consumption, and detachable.



REF.	DESCRIPTION	GAIN (dB)			MAX. OUTPUT LEVEL (dBuV)			NOTES
		UHF	VHF	FI	UHF	VHF	FI	
562301	AS FM-VHF-BIV(21-35)-BV(39-60)-UHF	37/27	30/20	-	117	113	-	BI is not amplified VHF: 174-400 MHz. Switchable LTE filter
562302	AS FM-VHF-BIV(21-32)-BV(36-60)-UHF	37/27	30/20	-	117	113	-	
562401	AS FM-VHF-UHF1-UHF2	37/27	30/20	-	117	113	-	
562501	AS FM-VHF-UHF	40/30	33/23	-	117	113	-	
562601	AS FM-VHF-UHF-FI	40/30	30/20	35-42	112	103	121	

PROGRAMMABLE AMPLIFIER AVANT 3

Programmable filtered launch amplifier for domestic or/and communal systems. Incorporates 5 programmable filters with variable bandwidth, and can isolate the DTT signal from LTE interferences.

Main features

- Five or seven channels per filter.
- Self adjustable thanks to an AGC (Automatic Gain Control) in each filter, with an LED to indicate if we have enough input level in UHF.
- VHF input with expanded bandwidth, designed for the combination of services generated from signal processing headend.
- Expandable system; extra Avant3's can be linked.
- Ease of programming by means of handheld programmer and/or software.
- Switch mode PSU with low consumption and high efficiency.

▲ 532740

		INPUTS					OUTPUT
PARAMETERS		UHF1	UHF2	BI / FM	VHF	IN MIX	OUT
Bandwidth	MHz	470 - 790	470 - 790	47-68 / 87 - 108	111-406	47-406 / 470-790	470-790
Filters per input		5 - 0	2 - 3	-	-	-	-
Number of channels per filter		1-5 (21-30) / 1-7(31-69)		-	-	-	-
Gain	dB	52 ± 3		32 ± 2 / 15 ± 2	35 ± 2	3 ± 3 (INMix-OUT)	2 ± 2 (UHF1, UHF2-UHF)
Gain regulation	dB	-		0 - 18	0 - 15	-	-
AGC's margin per filter	dB	0 - 20		-	-	-	-
Ouput level regulation	dB	15		-	-	-	-
Max. Input level	dBµV	95		-	-	-	-
Max. Output level 2 DTT Ch (typ.)	dBµV	113		111	111	111 / 113	-
Output level DIN 45004B (typ.)	dBµV	116		114	114	114 / 116	-
Output level IMD3 (2CH-60dB) (typ.)	dBµV	113		111	111	111 / 113	-
Rejection	dB	20 (± 16MHz)		20 (± 206MHz)	15 (± 40MHz)	-	-
Noise figure (typ.)	dB	7		7	7	-	-
Line power (1) (12Vdc)	mA	50	50	-	-	-	-
Powering	V~	196 - 264					
Maximum current	mA	80					
Maximum power	W	9					
Protection Index		IP20					
Temperature range	ºC	-5 a +45					

(1) Controlled by switch at the back.

PROGRAMMABLE AMPLIFIER AVANT HD

Programmable filtered launch amplifier for large domestic or communal systems, characterised for its selectivity and capacity to balance incoming signals.

Main features

- Easy to install and program.
- High output level and input dynamic margin.
- External programming.
- Very flexible configuration.
- Allows to clone configuration between devices.
- Access to configuration can be blocked via passwor
- Low consumption.

▲ 532840

Inputs		UHF1	UHF2	UHF3	FM	BI	47-790 MHz		IF SAT
Band	MHz	470 - 790			87 - 108	174 - 260	47 - 370	370 - 790	950 - 2150
Gain	dB	Auto (máx. 51 ± 3)			Auto (máx. 41 ± 3)	Auto (máx. 44 ± 3)	Auto (máx. 36 ± 2)	Auto (máx. 39 ± 2)	42 ±2 - 45 ±2
Filter configuration	Nº	10	0	0	-	-	-	-	-
		9	0	1	-	-	-	-	-
		7	2	1	-	-	-	-	-
		6	3	1	-	-	-	-	-
		5	3	2	-	-	-	-	-
Number of channels per filter	Nº	0 - 5 **			-	-	-	-	-
Slope control	dB	0 - 9 **			-	-	-	-	0 - 12
Optimum input margin	dBµV	60 - 105			60 - 85	62 - 87	69 - 73	70 - 74	-
Gain regulation	dB	0 - 20 *			0 - 25 - OFF*	0 - 25 - OFF*	-	-	0 - 24 - OFF*
Manual gain regulation	dB	± 9 (per filter)			± 9	± 9	-	-	-
Output level ***	dBµV	121			115	115	115	121	125
Output level regulation	dBµV	100 - 115			90 - 105	95 - 110	95 - 110	100 - 115	-
Noise figure	dB	9 typ.			10	10	-		9
Rejection	dB	20 (±16 MHz)			20 (±16 MHz)	20 (±16 MHz)	-		40 (a 862MHz)
Line power (automatic) I. max.	V=mA	24			-	24	-	-	13/17 (22KHz)
		60			-	60	-	-	300
Mains voltage/frequency	V~/Hz	196 - 264 / 50-60							
Max. current	mA	255							
Max. power consumption	W	26							
Max. working temperature	ºC	45							
Protection index		IP 20							

* *Automatic adjustment (Depending on the wished level of exit and the signal of entrance).*

** *Programmable adjustment.*

*** *The output level depends on the nº of channels.*

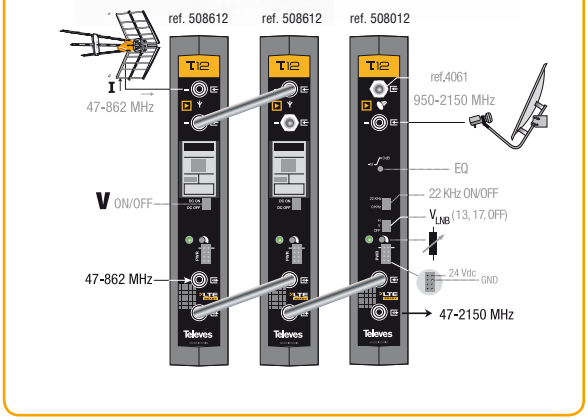
T.12 SINGLE CHANNEL AMPLIFIERS

Televes launches the new T.12 single channel amplifiers, an advanced evolution of a product range, the result of Televes' broad experience accumulated since 1981 when this technology was first introduced.

Main features

- Completely compatible with the previous model (T03) and its PSU.
- Great reliability, thanks to its robotised manufacturing process.
- Improved screening.
- Modular and expandable system.
- Powering of up to 24 modules, from a PSU.
- Line powering of mastheads.

REF.	DESCRIPTION	
508012	IF BAND AMPLIFIER T12	IF
508112	BI BAND AMPLIFIER T12	BI
508212	FM BAND AMPLIFIER T12	FM
509912	DAB BAND AMPLIFIER T12	DAB
508312	BIII BAND AMPLIFIER T12	BIII
508712	LOW S BAND AMPLIFIER T12	LOW SB
508812	HIGH S BAND AMPLIFIER T12	HIGH SB
508912	HYPERBAND AMPLIFIER T12	HYPERB.
509812	SELECTIVE SINGLE CHANNEL AMPLIFIER	UHF
508612	SINGLE CHANNEL/MULTICHANNEL AMP.	UHF
549812	SWITCHED PSU T12	
509512	SELECTIVE SINGLE CH. AMP. W/ AGC T12	UHF
509712	SINGLE CHANNEL AMP. W/ AGC T12	UHF



With the T.12 single channel amplifiers Televes has produced a product that achieves an outstanding performance in the treatment of the signal, with precise and simple frequency adjustments.

The T.12 modules are manufactured in latest generation robotised lines and are subject to the strictest quality control, a guarantee of reliability and stability with no precedents in this industry.

Ready for the upcoming introduction of LTE services, this product carries Televes' LTE Ready stamp.

Televes has put a lot of trust in the T.12 modules, the new reference on single channel amplifiers in the market.

REFERENCES				508112	508212	508312	508712	509912	508812	508912	508612	509812	508012	509712	509512
	f_w	MHz		47 - 88	87.5 - 108	174 - 230	104 - 174	195 - 232	230 - 300	302 - 470	470 - 865		950-2150	470-862	470-862
BW	BW	MHz		7	-	7	7	37	7	8	8➡56	8	950 - 2150	8	8
	G	dB		50	35	45	58	45	58	58	50	55	35➡50	57	57
				35	35	35	35	35	35	35	30	30	20	30	30
	EQ			-	-	-	-	-	-	-	-	-	0➡12	-	-
	Vout	dBµV	A	123*	114*	123*	125*	-	124*	125*	125➡111*	121*	124**	125	121
			D	-	-	-	-	114***	-	-	118➡102*	115*		118	114
	I	mA		100									400	100	100
	V	Vdc		24									13/17	24	24
		KHz		-			-						0/22	-	-
	I_c	mA		70			95						133	90	90
	P	dB		≤ 1	<3	< 3	< 1	< 3	< 1	< 1	< 3	< 2	-	<1	<2
	R_{n+1}	dB		-	-	-	-	-	-	-	> 3	> 18	-	>3	>18
	R_{n+2}			> 40	-	> 30	> 30	> 20	>25	> 30	> 15	> 50	-	>25	>50
	R_{n+3}			-	-	-	-	-	-	-	> 45	-	-	>50	-
Noise figure	NF	dB		< 9								< 11	< 12.5	<9	<11
AGC	AGC	dB		-								30			

* EN 50083-5 ** DIN VDE0855/12 *** di = 50dB (2ch. 4MHz)

Distribution

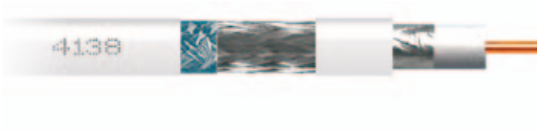
Once 4G services are deployed, there is the possibility that signals will be transmitted from the mobile handset, the so called uplink, these could filter into the coax distribution network.

Televes recommends the use of the EASY-F connection system for installations perfectly prepared for the deployment of LTE/4G.

The passive distribution equipment should be selected with due care and should be correctly screened to avoid the ingress of signals that could interfere with the TV signals. In this scenario the attenuation might not be the most important parameter.

CERTIFIED COAXIAL CABLE

CERTIFIED



Coaxial cable with inner conductor made of 100% copper, high screening attenuation (Class A+) and low losses. Televes' coaxial cable is subject to strict quality controls. Screening attenuation in excess of 85dB in the UHF and 4G bands makes it specially useful against the potential risk of LTE/4G interference.

A requirement to give the installer the satisfaction and peace of mind to guard against LTE/4G signals, has made **Televes certify all the coaxial cable that we supply.**

This is why, **a coaxial cable with the Televes' brand is a certified cable**, and LTE READY cable.

MODEL - REFERENCE			SK2000plus - 4138
Inner conductor - braid composition			Cu
Inner conductor	Ø	mm	1.02 ± 0.016
Dielectric P.E.	Ø	mm	4.60 ± 0.05
Foil			Al + Polyester
Braid	dimensions	G×H×Ø*	24 × 7 × 0.10
	coverage	%	82
Outer sheath	Ø	mm	6.7 ± 0.1 (PVC & LSFH)
Minimum bending radius		mm	33.5
Screening attenuation			Class A+

Attenuation Frequency (MHz)		dB/100m
	5	4.8
	470	14.0
	862	18.7
	950	20.5
	2150	31.2
	3000	35.5

(*) G×H×Ø: strand groups x number of strands x strand's diameter.

NEW CAI RG-6 APPROVED CABLE

With a copper clad steel 1mm inner conductor and aluminium braid it is the perfect cable for single dwelling units.

A screening attenuation of 75dB (Class A) in the UHF and 4G bands it gives this cable an optimum protection against potential harmful interference.

cai Cable Benchmark TYPE RG6-SDU

MODEL - REFERENCE			CXT-1 2127
Inner conductor - braid composition			Cu CLAD STEEL
Inner conductor	Ø	mm	1.00 ± 0.02
Dielectric	Ø	mm	4.7 ± 0.1
Foil			Al + Polyester
Braid	dimensions	G×H×Ø*	16 × 8 × 0.12
	coverage	%	77
Outer sheath	Ø	mm	6.7 ± 0.2 (PVC)
Minimum bending radius		mm	33
Screening attenuation			Class A

Attenuation Frequency (MHz)		dB/100m
	50	5
	200	9.5
	800	20.5
	1000	23
	2050	35
	2300	37

ONLY A CERTIFIED CABLE
GUARANTEES THE QUALITY OF THE INSTALLATION

TELEVES' CABLE CERTIFICATION CENTER

At Televes we consider that the best way to guarantee the performance of a coaxial cable is through the quality control in all the manufacturing processes. In the LTE/4G scenario, only the certified cable will ensure the quality of the signal.

A cable with Televes on it, is a certified cable.

Hence why, Televes, in its cable certification center performs the following tests:

- **Copper quality:** tests of DC performance at high and low frequencies generate parameters that help us evaluate the purity of the copper.
- **Quality of the gas injection (foam):** through the test of dielectric rigidity we can detect alterations in the isolation between the inner conductor and the foil.
- **Copper+Polyester foil:** the continuity tests highlight possible breaks in the foil that could deteriorate the conductivity to ground or the screening against interference.
- **Braid interlacing:** the interlacing is one of the characteristics that can influence more the quality of the shielding. Its effectiveness can be measured by the screening attenuation (Fig.1).
- **Quality of the outer sheath:** a complex tool detects variations in the walls of the outer sheath, which allows us to measure the homogeneity and symmetry of the outer sheath (Fig.2)
- **Attenuation and length:** the attenuation tests measure the uniformity of the impedance, preserving the quality of the signals travelling in the coaxial cable.

In addition to the tests of intrinsic quality, in the coaxial cable certification center we guarantee the length of the cable supplied and the serigraphy and packaging.

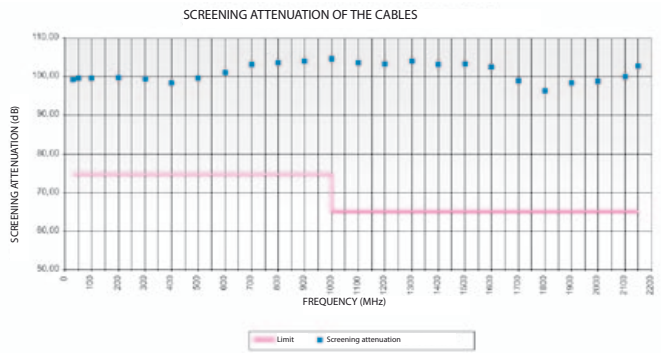


Fig.1 Graph of screening attenuation.

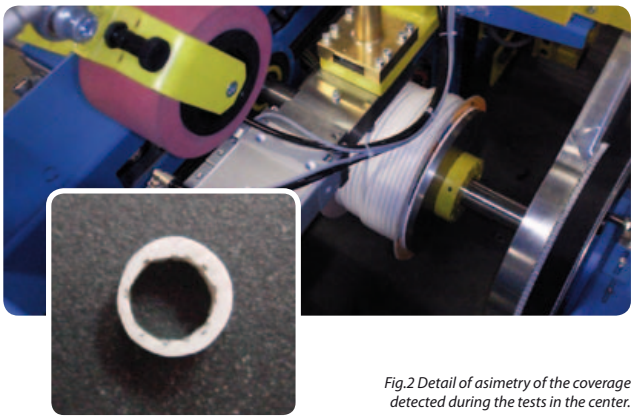
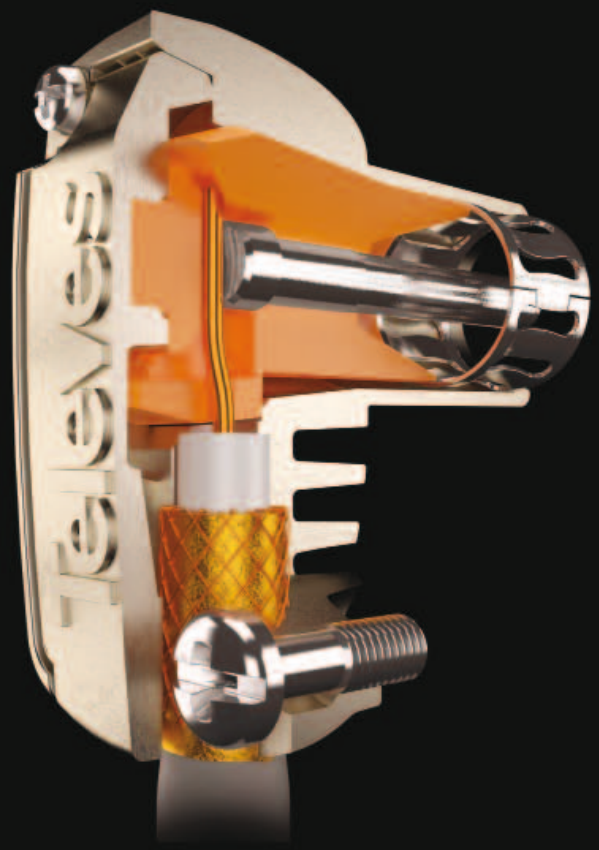


Fig.2 Detail of asimetry of the coverage detected during the tests in the center.

All the information generated during the certification processes, will be stored through a traceability system that allows us to find out all the data of each and every drum produced.

SAFE AND SHIELDED CONNECTION

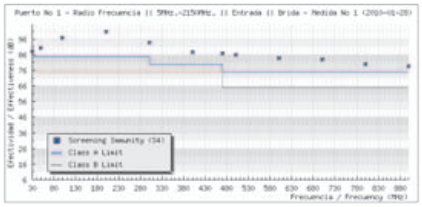
PRO EASY F CONNECTORS



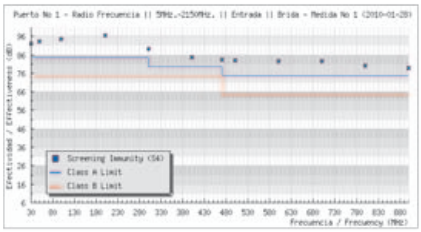
The Pro Easy F connectors ensure the maximum quality in the connection, giving exceptional screening to the TV signals in the installation as its screening efficiency exceeds the requirements of CLASS A.

No push on or detachable components, which simplifies its fitting, eases and assures its connection.

Screening of the male IEC connector ref.413201



Screening of the male IEC connector ref.413201



Safe connection:

- ✓ Save time and cost in the installation.
- ✓ Ensure the reliability of the connection and avoid the need for future call backs.
- ✓ The peace of mind of a job well done.

Electrically perfect:

- ✓ 100% robotised manufacturing is a reasurance of its quality.
- ✓ Completely screened to avoid LTE/4G effects.

Easy and quick to fit:

- ✓ One screw.
- ✓ Connection always visible.
- ✓ No push on pieces.
- ✓ No detachable pieces.

REF.	DESCRIPTION
413201	"PRO EasyF" Connector "IEC" Ø 9,5mm Male elbow screened
413301	"PRO EasyF" Connector "IEC" Ø 9,5mm Female elbow screened
413401	"PRO EasyF" Connector "Quick F" Elbow screened

FLY LEADS

Despite having had the installation adapted to avoid the influence of LTE/4G, **the weakest point will be the leads connecting the outlet plate with the TV.**

The "LTE ready" leads are made with T200 Class A coaxial cable and screened Pro Easy-F connectors.

Both components guarantee the best screening possible.

The quality of these components is now key and would be a mistake to use leads of doubtful quality, many of these don't have screening or foil.

For the measurement of the quality of screening of these leads with IEC connectors we use the following standards EN 60966-2-5 and N 60966-2-4.

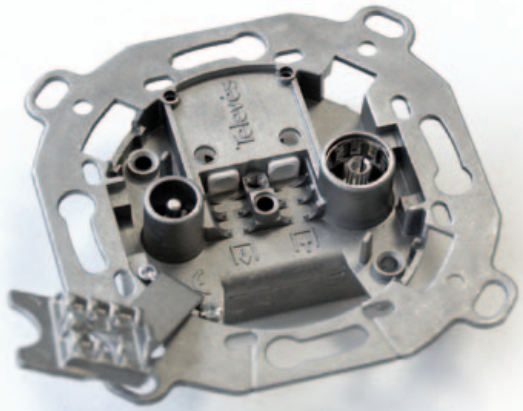
The specifications are reproduced in the table attached. **Theses parameters are not achieved by any other leads currently available in the market.**

REF.	DESCRIPTION
431001	"IEC" coaxial lead Ø 9,5mm Screened elbow Male-Female 1.5m
431002	"IEC" coaxial lead Ø 9,5mm Screened elbow Male-Female 2.5m

TYPE OF LEAD			IEC CONNECTOR
Class A lead	From 30 to 1000MHz	dB	> 85
	From 1 to 3GHz		> 65
Class B lead	From 30 to 1000MHz		>75
	From 1 to 3GHz		> 55

OUTLET PLATES

The special manufacturing process and design of our outlet plates guarantees the protection of the TV and satellite signal.



DOES NOT ALLOW THE DIGITAL QUALITY TO VANISH IN THE CONNECTIONS.

- ☑ Cable connection with easy F
- ☑ Automated production for highest reliability
- ☑ Lateral opening clamp for easy fitting

A manufacturer of outlet plates that offers solutions for every scenario

AUTOMATED MANUFACTURING PROCESS

PRODUCT	SPECIFICATIONS		
	Pass band (MHz)	Attenuation (dB)	
		TV/FM	IF SAT
Ref.522610 TV / SAT DC terminal outlet plate	47-790 / 950-2150	1/1	1,5
Ref.523110 TV - FM through outlet plate	47-790	11 (2 through) / 29 (2 through)	(2,5 through)

SPLITTERS AND TAPS

In the Easy F splitter and tap range special care has been taken in the screening of the circuit, also done with the connection system.

The zamak chassis allows perfect screening across the whole frequency range plus its connection by means of the Easy F system; simplifies the installation with no detriment to the screening efficiency..

DTT Reception

Several studies and test have been carried out in Europe with regards to the influence of pulsed 4G signals over the performance of demodulators built into DTT receivers and adaptors.

These studies concluded that the performance of DTT receivers, TVs and adaptors are subject to interference from LTE/4G, even with optimum screening of the installation.

This is the reason why by design the characteristics of the LTE/4G signals must be taken into account in order to avoid signal break-up or pixelation.

ZAS HD RECEIVER

European manufacturing, with strict quality controls and state of the art electronic design make the zAs HD the ideal receiver to allow the viewing of TV despite changing broadcast scenarios like deployment of LTE/4G.

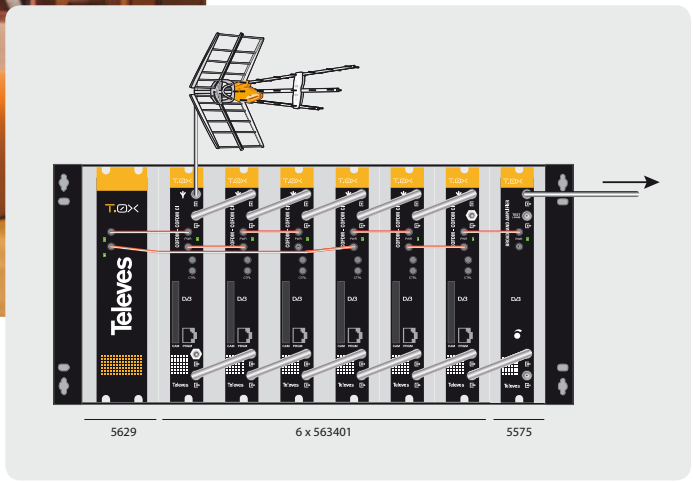
DTT processing

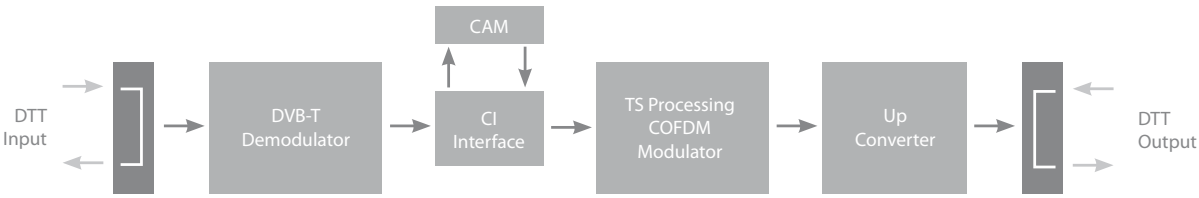
The transmodulator/regenerator is an element that could be used in those instances where standard mitigation techniques (filtering) can't be used or don't achieve the desired results. This alternative allows the re-construction of the original signal, so that the original services are re-modulated at the headend. The regenerator even allows the installer to edit parameters of the multiplexed services. It is the ideal solution to re-establish the quality of the affected signal.

T.0X TRANSMODULATOR / REGENERATOR COFDM / COFDM

The transmodulator COFDM/COFDM CI (Ref.563401) adapts the transport stream to the requirements of the DVB-T transmission through the selective deletion of services from the received DTT MUX, to avoid the reception (and storage) by the DTT receivers and TVs.

By means of its CI interface and the CAM module, those encrypted DTT services could be decrypted and distributed as free to air.





Even more important with the deployment of the 4G telephony network and due to the pulsant nature of this interference signal only a spectrum analyzer capable of capturing up to 20MHz of bandwidth in less than 10 miliseconds will be able to detect it.

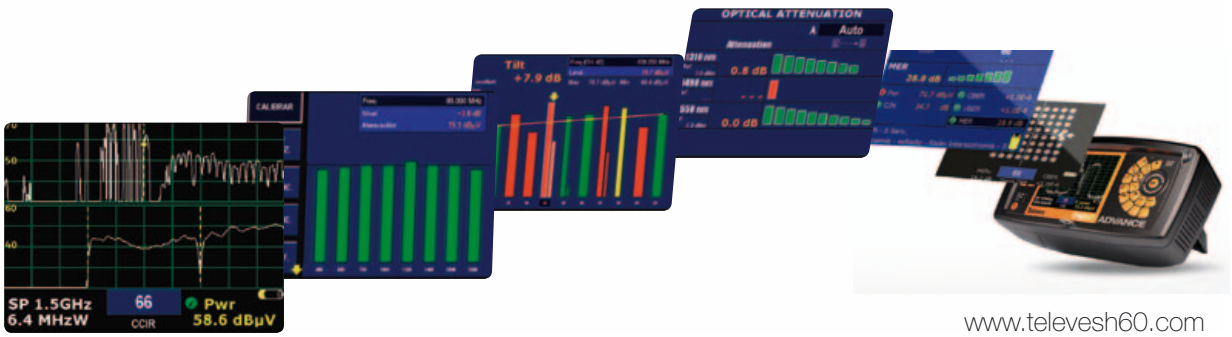
NEW SPECTRUM ANALYZER H60, WITH DIGITAL PROCESSING

Unprecedent speed and mathematical precision in all its measurements...

The spectrum analyzer recommend by Televes to analyze the TV signals in the communal system during 4G deployment.

The Digital Processing allows an uncomparable precision and speed in the analysis.

the choice is **CLEAR**



www.televesh60.com

Spectrum analyzer up to **3.3 GHz**

- ☑ TILT function
- ☑ Network frequency attenuation.
- ☑ MPEG4 with common interface. HD video.
- ☑ HDMI output.
- ☑ Selective optical interface.
- ☑ DVB-T2 demodulation.
- ☑ 5.7" of high resolution.
- ☑ Digital processing.

Remote control of measurements via IP

Ideal for monitoring incoming signals and broadband networks.

Leave your H60 connected to a system and control to it remotely.

Once the job is done, export your results to any PC/laptop by means of the HSuite SW (included).

www.televesh60.com

Televes®

LTE READY

Product Guide

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