tooway™
The new way to broadband

Tooway™ KU-band Satellite Terminal Handbook

Eutelsat Multimedia Department – System Integration Team

Version 4.5 Nov. 2009

www.tooway.net

RELEASE NOTES :

4.3->4.5 (2/11/09)
- add Visiosat antenna (part 7)
- add 3 feed/lnb/buc (part 7.2.1,7.2.2,7.2.3) with photos
- rebuild the summary

4.2⌖4.3
Ajout de "The maximum voltage drop between the modem and antenna is 6.7vdc on both Rx and Tx" page 14
Changement dans l'ordonnancement des photo page 33 et 34

Version 4.2 change compare to version 4.0 : 12/01/09

- page 25-39 picture presentation
- page 43 add procedure 1 description
- page 46 pictures
- page 50 add some precisions
- page 52 add procedure 2 description
- page 82 and folowings, add the 'self activation procedure' document from skylogic

Version 4 : 02/10/08

1 System and service overview

Tooway™ is based on the Surfbeam Product manufactured by ViaSat, which is built on the DOCSIS® standard for broadband cable connections:

Data Over Cable System Interface Standard
Open standard in wide use today, > 70M subscribers worldwide
Continuously being upgraded to add more value added services
Designed for very large networks

Satellite Modem (SM)
Utilise Cable Modem and DTH Set-Top-Box chipsets
Replace cable system physical (PHY) layer with satellite compatible PHY (modulation & coding)

Satellite Modem Termination System (SMTS) (Hub)
Utilise Cable Modem Termination System (CMTS) products
Replace cable system PHY layer with satellite compatible PHY
Add dynamically variable coding and modulation
Add fade mitigation algorithms to maximize throughput
Modified scheduler for use in satellite environment

Skylogic Network operation center Turin SkyPark Network

- > 14 hubs on 8 satellites
- > Connection to Turin/Milan/Paris POP
- > 2 Ka band antennas (W3A Africa and HB6 multiple transponders and spots) 24h/7days service

2 Basic technical data

2.1 Terminal Data

Downstream:

Symbol Rate: 5 to 30 Mbauds
Code Point Options: QPSK ½, 8PSK 2/3

Upstream

Symbol Rate: 160, 320, 640, 1280, 2560 kbps (QPSK ½ and 3/4)

Fade Mitigation

Full upstream & downstream fade mitigation process

SM

FWD and RTN link multi rate

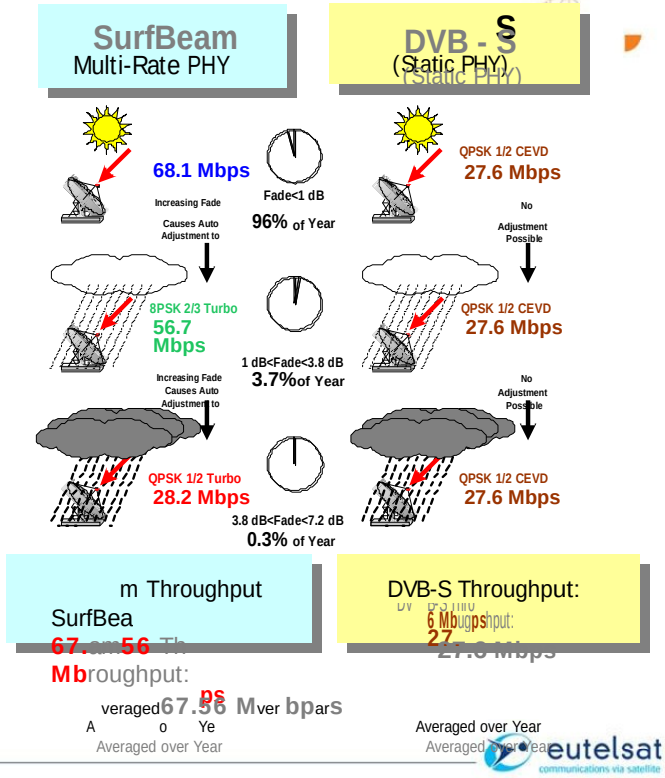
SMTS

Multi-State Upstream Scheduler
Manual Hot Swap Redundancy
FWD and RTN link multi rate
Multicast enabled

2.2 Advantage versus other existing systems

Multi-Rate PHY Advantage

- Terminals in Clear-Sky receive packets at high Information Rate
- Transmissions to terminals experiencing fade are automatically sent at a more robust code point
- Large throughput advantage, since clear sky conditions usually prevail (typ. 95+%)
- Static PHY systems (e.g. DVB-S) must transmit at the more robust code point at all times to achieve desired availability

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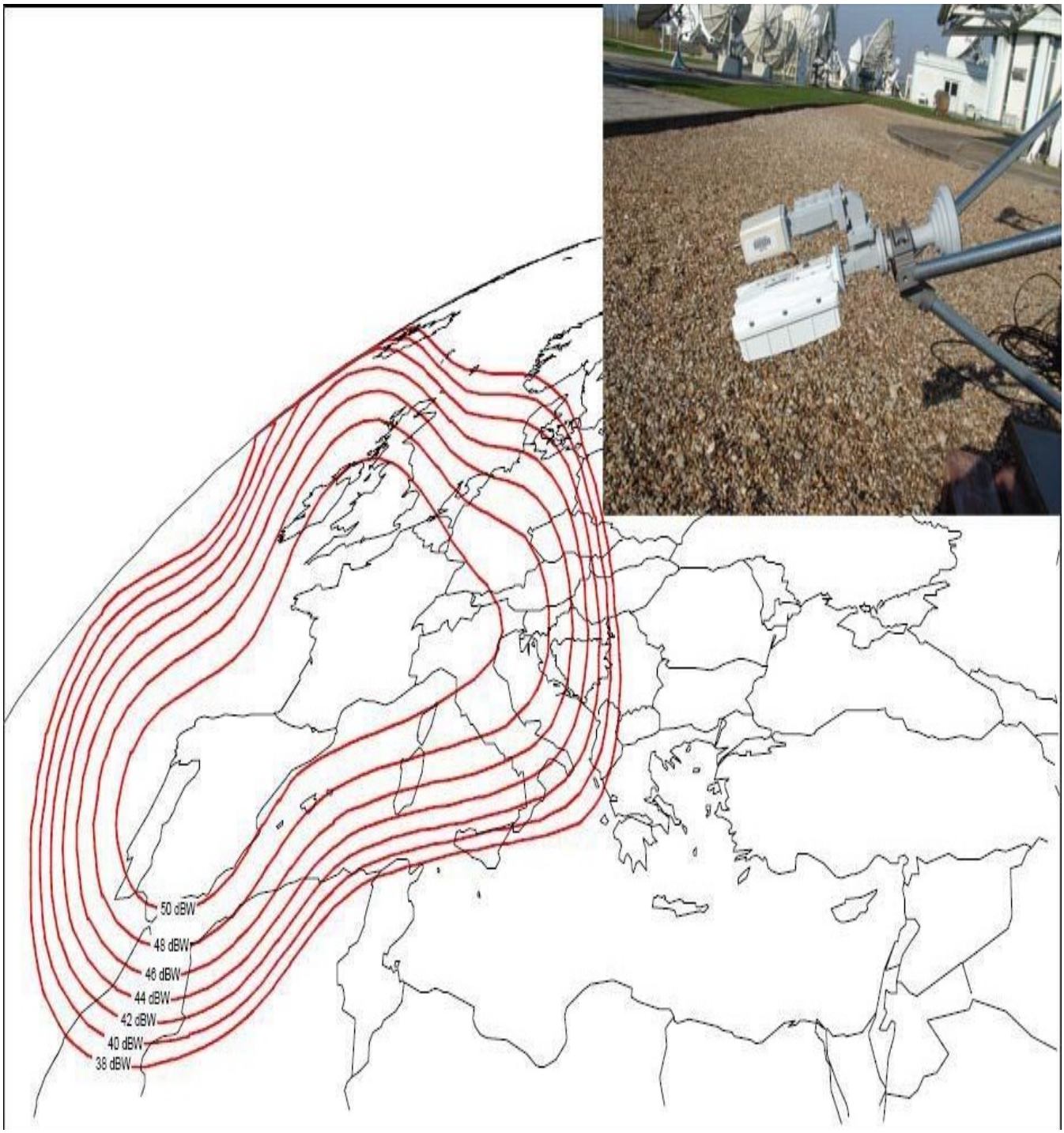
www.europe-satellite.com
www.europe-satellite.com


www.europe-satellite.com
www.europe-satellite.com

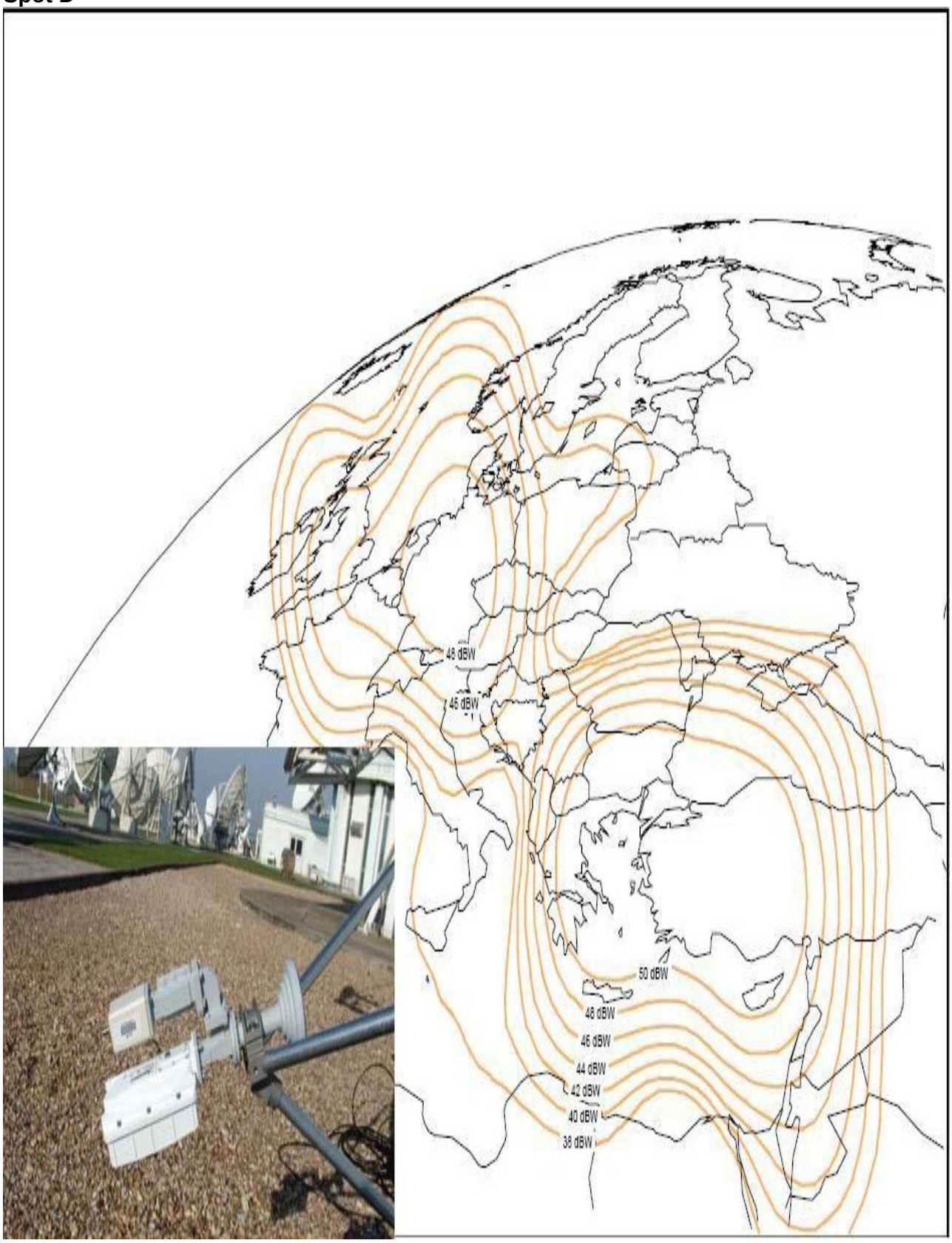

www.europe-satellite.com
Broadband via Satellite
www.europe-satellite.com
www.twowaysat.com

3 The Eurobird 3 satellite at 33° East

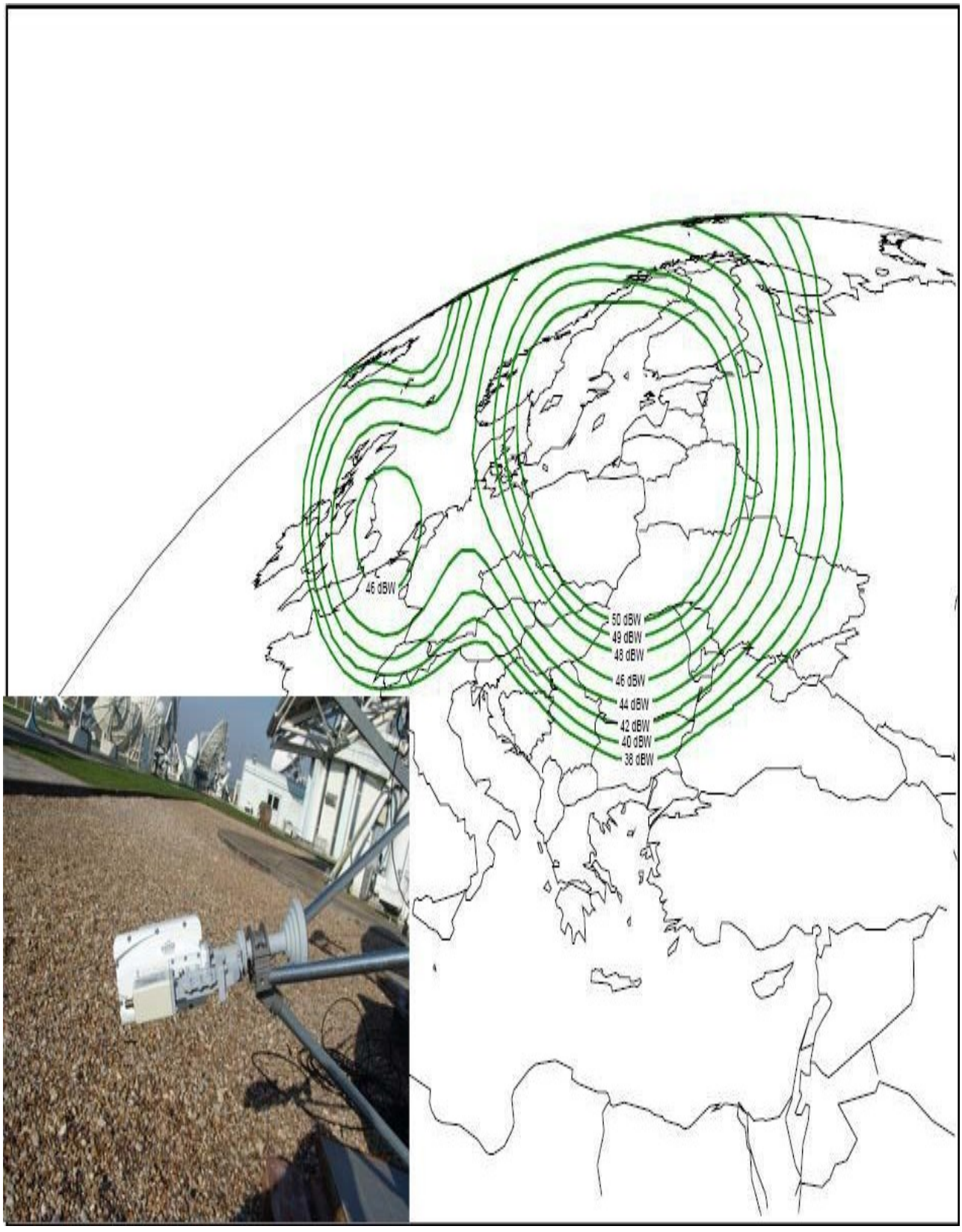
3.1 Ku Band downlink coverage Spot A



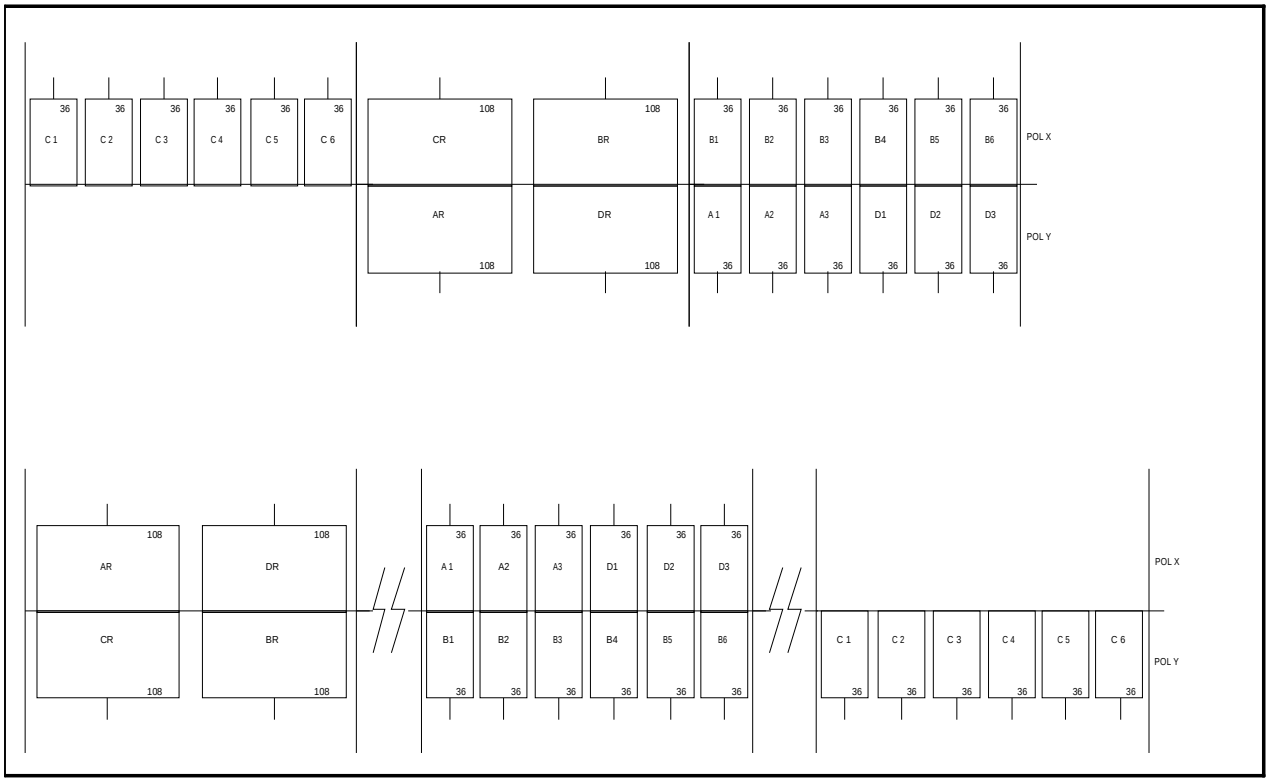
Spot D



3.2 Ku Band downlink coverage Spot C



3.3 Transponders Eurobird 3



4 The Tooway Ku band terminal

4.1 Tooway™ Ku-band Outdoor unit

4.1.1 Satellite Antenna

The antenna is manufactured by

ASC Signal Corporation
620 North Greenfield Parkway
Garner, NC 27529 USA

Telephone: +1-919-329-8700
Fax: +1-919-329-8701

Internet: www.ascsignal.com

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SPECIFICATIONS

Type 100TX 1.0 m RxTx Class I Antenna System

RF Performance

Effective Aperture		1.0 m (40 in)
Operating Frequency	Tx	13.75 - 14.50 GHz
	Rx	10.70 - 12.75 GHz
Polarization		Linear, Orthogonal
Gain (±.2 dBi)	Tx	41.5 dBi @ 14.3 GHz
	Rx	40.2 dBi @ 12.0 GHz
3 dB Beamwidth	Tx	1.5° @ 14.3 GHz
	Rx	1.9° @ 12.0 GHz
Sidelobe Envelope (Tx, Co-Pol dBi)		
	2.5° <Θ< 20°	29 - 25 Log Θ
	20° <Θ< 26.3°	-3.5
	26.3° <Θ< 48°	32 - 25 Log Θ
	48° <Θ< 180°	-10
Antenna Cross-Polarization		30 dB on Axis
Antenna Noise Temperature	10° El	47° K
	20° El	33° K
	30° El	26° K
VSWR	Tx	1.3:1
	Rx	1.5:1
Isolation (Port to Port)	Tx	80 dB
	Rx	35 dB
Feed Interface	Tx	WR75 Flat Flange
	Rx	WR75 Flat Flange

Mechanical Performance

Reflector Material		Glass Fiber Reinforced Polyester
Antenna Optics		One-Piece Offset Feed Prime Focus
Mount Type		Elevation over Azimuth
Elevation Adjustment Range		10° - 90° Continuous Fine Adjustment
Azimuth Adjustment Range		360° Continuous
Mast Pipe Interface		73 - 76 mm (2.88 in - 3.00 in) Diameter
Wind Loading	Operational	80 km/h (50 mph)
	Survival	200 km/h (125 mph)
Temperature		-50°C to 80°C
Humidity		0 to 100% (Condensing)
Atmosphere		Standard Hardware Meets 500 Hour Salt Spray Test Requirements (ASTM B-117)
Solar Radiation		360 BTU/h/ft²
Shock and Vibration		As Encountered During Shipping and Handling

4.1.2 LNB and BUC

2 Watt US Monolithics BUC

Zinwell LNB

Complete ODU electrics with OMT and Transmit reject filter

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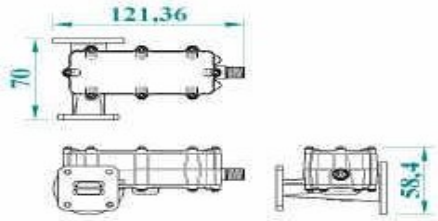
invacom

Dual Oscillator VSAT Integrated LNB,OMT and TX Reject Filter

SPV – 10SM, SPV – 11SM, SPV-20SM & SPV-21SM

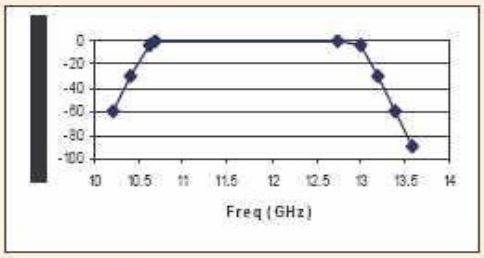
Aug 2007



		SPV-10 & 20SM	SPV-11 & 21SM
1	Input Frequency		
	Low Band	10.7 - 11.7	10.95-12.15 GHz
	High Band	11.7 - 12.75	12.25-12.75 GHz
2	Output Frequency		
	Low Band	950 - 1950	950-2150 MHz
	High Band	1100 - 2150	950-1450 MHz
3	Local Oscillator Frequency		
	LO	9.75GHz	10.0 GHz
	High	10.6GHz	11.30 GHz

4	Noise Figure (measured at circular waveguide port)	0.7 dB typ
5	Gain	57 - 70dB
6	Gain Ripple	
	26 MHz bandwidth	<1dB
	Low Band	<5dB typ
	High Band	<5dB typ
7	Local Oscillator Phase Noise (typ)	
	1kHz	-80 dBc/Hz
	10kHz	-100 dBc/Hz
	100kHz	-115 dBc/Hz
8	Local Oscillator temperature stability	
	-40°C to +70°C	+/-450 KHz
9	OMT Transmit to Receive Isolation, all ports terminated	
	10.7 - 14.5GHz	35 dB
10	OMT Transmit XPD, all ports terminated	
	13.75 – 14.5GHz	35 dB
11	Rejection to transmit signal at F-type from rectangular flange input	140 dB typ
12	Image Rejection	120 dB typ
13	Maximum Tx power level at rectangular flange input	
	14.0 - 14.5GHz	10 Watt
14	Two tone o/p IP3	>15 dBm

15 integrated filter frequency response (typ)



16	Output Connector	F -type
	Return Loss in 75Ω	>10 dB
17	Operating Temp Range	-40°C to +70°C
	Storage Temp Range	-40°C to +70°C
18	PSU (applied to F-type)	8 – 21V
19	Current consumption	110mA typ
20	Band selection – signals applied to F-type	
	SPV-10SM & SPV-11SM	
	High band selection	22kHz tone
	Low band selection	No tone
	SPV-20SM & SPV-21SM	
	Low band Selection	11.5 to 14V
	High band selection	15.5 to 21V

LO/Control	Tone	Voltage
9.75&10.6 GHz	SPV-10SM	SPV-20SM
10.0&11.3 GHz	SPV-11SM	SPV-21SM

21 Waveguide Interfaces
Feed Antenna Port 18.5mm ∅ Waveguide, C120 Flange
Transmitter Port WG17, R120, WR75, UBR120

Patent Pending

ViaSat eutelsat COMMUNICATIONS Skylogic a eutelsat company

4.1.3 The cables

Two factors are important:
Electrical DC resistance (Ohm) for the power support from Satellite Modem to BUC Maximum value (inner connector plus outer braid) = 2.27 Ohms

The maximum voltage drop between the modem and antenna is 6.7vdc on both Rx and Tx.

This results to a maximum cable length between IDU and ODU of

- **30 m using RG59 Cable**
- **50 m using RG 6 Cable**
- **100 m using RG 11 Cable.**

What follows are examples of the cables that meet the required specifications

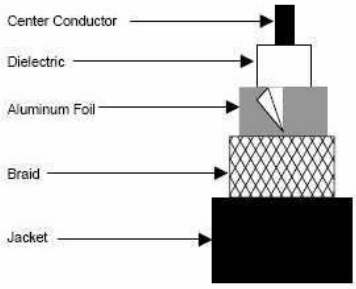
CommScope
1100 CommScope Place SE
PO Box 1729
Hickory, NC 28603-1729
(800) 982-1708
(828) 324-2200
Fax: (828) 328-3400
Int'l Fax: (828) 323-4989
ISO9001 REGISTERED
www.commscope.com

RG-6 2200-MHz
75 Ohm Coaxial Cable
Catalog # 5729
Non-Plenum
NEC/CEC:CM(UL) C(UL) CMG

1 of 1

CABLE CONSTRUCTION:

CENTER CONDUCTOR:
18 AWG Solid Copper
Nom. Diameter: 0.0403"
DIELECTRIC:
Foam Polyethylene
Diameter over Dielectric: 0.180" Nom.
SHIELD:
Foil: Aluminum/Poly Tape
Braid: 34 AWG Aluminum
60% Coverage
Nom. Diameter 0.212"
JACKET:
FR-PVC
Diameter over Jacket: 0.272" +/- 0.008"
Nominal Jacket Thickness: 0.030"
Minimum Spot: 0.024"



ELECTRICAL PROPERTIES:

SPARKER TEST:		4000 VAC
DIELECTRIC STRENGTH:		Conductor to Shield: 2500 VDC
CAPACITANCE:		16.0 pF./FT. Nom.
IMPEDANCE:		75.0 +/- 3.0 Ohms
VELOCITY OF PROPAGATION:		82.0% Nom.
DCR:	Conductor:	6.4 Ohms/1000 Ft. Nom.
	Shield:	8.75 Ohms/1000 Ft. Nom.
SRL:		15 dB (950 thru 2200 MHz) 100% Swept Tested

MECHANICAL PROPERTIES:
MINIMUM BEND RADIUS:
Loaded: 20 Times Cable OD
Unloaded: 10 Times Cable OD
CABLE TEMP. RATING:
Temp: 75°C

ATTENUATION:

DB/100 FT. (NOM.)	@ FREQUENCY MHz
0.25 dB	1 MHz
0.66 dB	10 MHz
1.41 dB	50 MHz
1.92 dB	100 MHz
2.64 dB	200 MHz
3.73 dB	400 MHz
5.05 dB	700 MHz
5.79 dB	900 MHz
6.11 dB	1000 MHz
6.73 dB	1200 MHz
7.49 dB	1450 MHz
8.43 dB	1800 MHz
9.35 dB	2200 MHz

Drawings not to Scale
Specifications subject to change
Revision: 08/27/02

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DESCRIPTION		CODE
Indoor siamese drop coaxial cable - 75 Ohm	**CAVEL**	2 x DG 80

Diam.

0,80	3,50	3,59	3,99	11,00 x 5,00	mm
Cu	PEE	Al/Pet/Al	CuSn	lead free	PVC

A	B	C	D	E

CONSTRUCTION DATA		DIMENSIONS	
A. Inner conductor of plain annealed copper wire .	(Cu) ϕ	0,80 +/- 0.02	mm
B. Dielectric of physical foam Polyethylene .	(PEE) ϕ	3,50 +/- 0.10	mm
Outer conductors :			
C. Alluminium/Polyester/Alluminium tape longitudinally overlapped .	(Al/Pet/Al)	16 x 0,048	mm
D. Braid of tinned copper wires .	(CuSn)	16 x 6 x 0,10	mm
Lay of braid .		50	mm
Coverage (IEC 96-1)		66%	
E . Outer sheath of white lead free PVC printed by ink-jet every 50 cm (only one of both cables):	(PVC) ϕ	11,00 x 5,00 +/- 0.10	mm

CAVEL 2 x DG 80 MADE IN ITALY 75 Ohm EN50117-2-4 ss/aa (ss=settimana , aa=anno)

Weight of copper conductors : 22,8 Kg/Km
Total weight of cable (approx.) 59,0 Kg/Km

Minimum bending radius for single/repeated bending (10 bendings max.) : 25/50 mm

ELECTRICAL PARAMETERS

Characteristic Impedance : 75 ± 3 Ohm
Capacitance : 53 ± 2 pF/m
Velocity ratio : 85%
Attenuation (at 20° C) : dB/100m

Sheath dielectric strength (spark test) : 2,5 kV

Frequenza	Atten.	± 5%	Frequenza	Atten.
5 MHz	1,6		1350 MHz	29,9
50 MHz	5,4		1750 MHz	34,3
200 MHz	11,1		2050 MHz	37,3
470 MHz	17,3		2150 MHz	38,2
862 MHz	23,8		2400 MHz	40,5
1000 MHz	25,7		3000 MHz	45,4

Inner conductor resistance : 35,0 Ohm/Km
Outer conductors resistance : 18,6 Ohm/Km

S.R.L: 30 – 470 MHz > 28 dB
470 – 862 MHz > 26 dB
862 – 2400 MHz > 22 dB

Screening attenuation (As) : 5 – 30 MHz > 75 dB 30 – 1000 MHz > 90 dB 1000 – 2150 MHz > 75 dB

ITALIANA CONDUTTORI s.r.l	DATE	RESPONSIBLE
V.le Zanotti 90 - 27027 Gropello Cairoli (PV)- Italy Tel. 0382-815150 - Fax: 0382-814212	Apr. 22, 2005	P.Piccinini

ViaSat eutelsat COMMUNICATIONS Skylogic a eutelsat company

DESCRIPTION	CAVEL	CODE
Double shielded coaxial cable - 75 Ohm A+ Screening Class		RP61B

Diam.

1,00	4,75	4,97	5,37	6,60 mm
Cu	PEE	Al/Pet/Surlyne	CuSn	PVC

A B C D E

CONSTRUCTIVE DATA — **DIMENSIONS**

A. Inner conductor of plain annealed copper wire. (Cu) ϕ 1,00 ± 0,02 mm

B. Dielectric of physical foam Polyethylene . (PEE) ϕ 4,75 ± 0,10 mm

Outer conductors :

C. Aluminium/Polyester/Surlyne tape (Al/Pet/Surlyne) 18 mm x 50/12/25 µm
longitudinally overlapped and bonded to the dielectric.

D. Braid of tinned copper wires. (CuSn) 16 x 6 x 0,10 mm
Lay of braid . 50 mm
Coverage (IEC 96-1) 53%

E . Outer sheath of white PVC printed by black (PVC) ϕ 6,60 ± 0,10 mm
ink-jet:

CAVEL RP61B MADE IN ITALY 75 Ohm EN50117-2-4 Class A+ ww/yy *meter marking (ww=week; yy=year)*

Weight of copper conductors : 14,1 Kg/Km
Total weight of cable (approx.): 41,1 Kg/Km

Minimum bending radius for single/repeated bending (10 bendings max.) : 35/70 mm

ELECTRICAL PARAMETERS

Characteristic Impedance : 75 ± 3 Ohm
Capacitance : 54 ± 2 pF/m
Velocity ratio : 82%
Sheath dielectric strength (spark test) : 3,0 kV

Nom. attenuation (at 20°C and dB/100m):

Frequency	Atten.		Frequency	Atten.
5 MHz	1,7		862 MHz	19,2
10 MHz	2,3		1000 MHz	20,8
30 MHz	3,5		1350 MHz	24,5
50 MHz	4,5		1750 MHz	28,0
200 MHz	9,0		2150 MHz	31,5
300 MHz	11,0		2400 MHz	33,5
470 MHz	14,0		3000 MHz	38,1

Inner conductor resistance : 22,5 Ohm/Km
Outer conductors resistance : 13,2 Ohm/Km

S.R.L: 5 – 470 MHz > 30 dB
470 – 1000 MHz > 28dB
1000 – 2000 MHz > 26 dB
2000 – 3000 MHz > 22 dB

Screening attenuation (As) : 30--1000 MHz > 95 dB

ITALIANA CONDUTTORI s.r.l	DATE	RESPONSIBLE
V.le Zanotti 90 - 27027 Gropello Cairoli (PV)- Italy Tel. 0382-815150 - Fax: 0382-814212	May 10, 2007	P.Piccinini

CommSpace®

RG 11 Drop Cable

CommSpace Cables

Construction and Dimensions

Item	Standard Shield	Tri-Shield	Quad-Shield
Diameter of Inner conductor(mm)	1.63	1.63	1.63
Diameter of Dielectric(mm)	7.11	7.11	7.11
Diameter of 1st outer conductor ≤ (mm)	7.52	7.52	7.52
Diameter of 2nd outer conductor ≤ (mm)	7.80	7.80	7.80
Diameter of 3rd outer conductor≤ (mm)	/	7.90	7.90
Diameter of 4th outer conductor ≤ (mm)	/	/	8.20
Diameter of Jacket(mm) ≤	10.20	10.30	10.60
Approximate weight(kg/km)	76	78	84
Diameter of messenger steel wire(mm)	1.80	1.80	1.80
Steel wire weight (kg/km)	20	20	20

Annotate: 1)Material of 1st outer conductor and 3rd outer conductor is bonded foil、non-bonded foil, 3rd outer conductor is non-bonded foil.
2)Coverage of 2nd outer conductor and 4th outer conductor is 40%、50%、60%. Other different specification of product can be made upon customer's requirement

Attenuation

Frequency(MHz)	Max value(dB/100m)
5	1.19
50	3.20
55	3.29
200	6.40
211	6.57
300	7.83
400	9.04
450	9.59
500	10.20
550	10.70
600	11.18
750	12.49
800	13.16
860	13.38
1000	14.43
1350	17.10
1750	19.47
2150	21.58

Electricial Performance

DC Resistance of Inner conductor(Ω/km)	40 CCS	8.0 BC
DC Resistance of Outer conductor(Ω /km)	26 AL	13 TC
Impedance(Ω)	75±2.0	
Capacitance(pF/m)	52±3.0	
Wave velocity rate%	85%	
Return loss(≥ dB) VHF 5-300MHz ≥	20dB	
Return loss(≥ dB) UHF 300-960MHz ≥	18dB	

OPTIONS

Packing: wooden spool 305meters(1000Ft)

Printing: ink-engraved-every one meter

DESCRIPTION		CODE
COAXIAL CABLE - 75 Ohm	CAVEL	SAT 50 M

Diam.

A	B	C	D	E	
1,00	4,75	4,81	5,21	6,60	mm
Cu	PEE	Al/Pet	CuSn	PVC	

CONSTRUCTION DATA — **DIMENSIONS**

A. Inner conductor of plain annealed copper wire .	(Cu)	ϕ	1,00 ± 0,02	mm
B. Dielectric of physical foam Polyethylene .	(PEE)	ϕ	4,75 ± 0,10	mm
Outer conductors :				
C. Aluminium/Polyester tape longitudinally overlapped .	(Al/Pet)		18 x 9/19	mm
D. Braid of tinned copper wires.	(CuSn)		16 x 4 x 0,10	mm
Lay of braid .			50	mm
Coverage (IEC 96-1) .			38%	
E. Outer sheath of white PVC printed by ink-jet :	(PVC)	ϕ	6,60 ± 0,10	mm

CAVEL SAT 50 M MADE IN ITALY 75 Ohm EN50117-2-4 ww/yy meter marking (ww=week yy=year)

Weight of copper conductors : 11,4 Kg/Km
Total weight of cable (approx.) : 38,6 Kg/Km

Minimum bending radius indoor/outdoor : 35/70 mm

ELECTRICAL DATA

Characteristic Impedance: 75 +/- 3 ohm
Capacitance : 54 pF/m+/-2
Velocity ratio : 82%
Attenuation (at 20° C) : dB/100m

Frequency	Atten.	+/-5%	Frequency	Atten.
5 MHz	2,0		862 MHz	18,8
10 MHz	2,8		1000 MHz	20,4
30 MHz	3,8		1750 MHz	27,8
50 MHz	4,6		2150 MHz	31,1
200 MHz	8,6		2150 MHz	31,1
300 MHz	10,5		2400 MHz	32,4
470 MHz	13,6		3000 MHz	37,3

Inner conductor resistance : 22,5 Ohm/Km
Outer conductor resistance : 33,0 Ohm/Km

S.R.L: 5 -- 470 MHz > 30 dB
470 -- 1000 MHz > 28 dB
1000 – 2000 MHz > 26 dB
2000 – 3000 MHz > 22 dB

Transfer impedance: 5--30 MHz < 6,0 mOhm/m
Screening Attenuation (As) : 30 – 1000 MHz > 85 dB 1000 -- 2000 MHz > 80 dB 2000 -- 3000 MHz > 70 dB

ITALIANA CONDUTTORI s.r.l	DATE	RESPONSIBLE
V.le Zanotti 90 - 27027 Gropello Cairoli (PV)- Italy Tel. 0382-815150 - Fax: 0382-814212	Jan 31, 2007	P.Piccinini

4.1.4 The Connectors

Ensure connectors are compatible with cable (check with cable suppliers)

You must use compression connectors for any exterior connection. These compression connectors ensure the integrity of the cable.

IF Cables

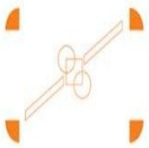
OUTDOOR

RG 6

Cablecon and Stirling compression connectors

connectors

INDOOR



Most crimp connectors

RG 11

Cablecon FM 32 and Cablecon and Stirling compression connectors

F163

FC501SL F male compression connector for outdoor install

Coaxial cables

Cod.

Connectors

FA501

F501

FC501SL

SAT501

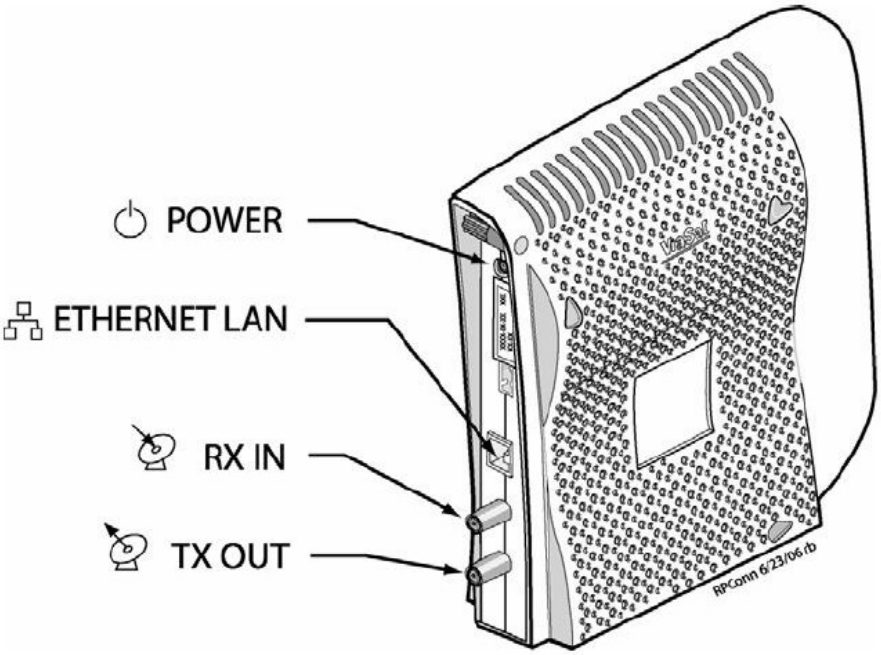
Material Type	nitil-plated brass
Mechanical Dimensions	30,0 mm x 12,0 mm
Insertion Attenuation	5 - 2000 MHz < 0,02 dB
Insertion Attenuation	2000 - 2500 MHz < 0,11
Characteristic impedance	75 +/- 2 Ohm
Operational Frequence	5 - 2500 MHz
Structural Return Loss	5 - 500 MHz > 43 dB
Structural Return Loss	500 - 1000 MHz > 34 dE
Compliance to the Norm	EN50117-2
Stripper Code	CS00
Mounting Tool Code	COT01
Mounting Tool Code	COT02

Cavel - Italiana Conduttori S.r.l. - Viale G.B. Zanotti 90 - 27027 Gropello Cairoli (PV) - Italy - Tel: +39 0382 82

PRODUCTION OF COAXIAL CABLES SINCE 1968

Last update: July 3, 2007

The Satellite Modem



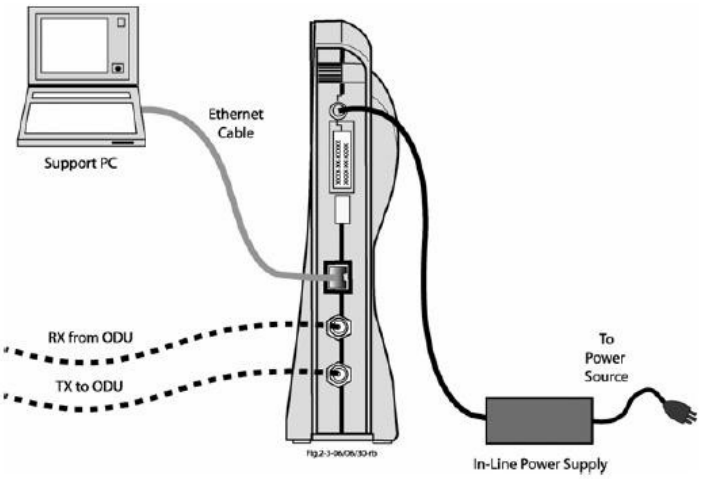
Power: input + 30 V DC from Power Supply

Ethernet LAN: 10/100 base T Ethernet, RF 45 Jack

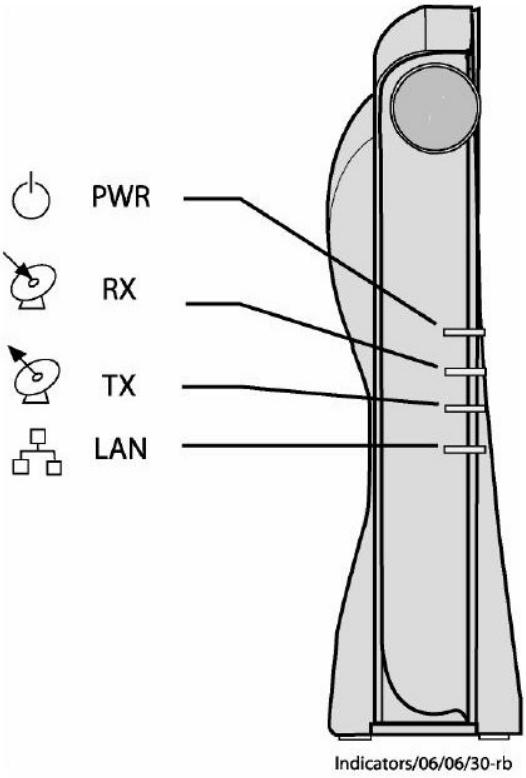
RX In: L Band Input 950 – 1700 MHz Type F 75 Ohm female connector, provides power to LNB 24V 250 mA

TX Out: L Band Output 950 – 1450 MHz Type 75 Ohm female connector, provides DC power to BUC 30 V , 1.78 A

Connection of the Modem



Modem Front panel Indicators



Function	Indicator Conditions			
	PWR	RX	TX	LAN
Power is not applied	Off	Off	Off	Off
Power is applied (startup)	Momentary On	Momentary On	Momentary On	Momentary On
Power is applied (after startup)	On	Off	Off	On - CPE is on and connected to Ethernet Off - CPE is off or not connected to Ethernet Flashes – Data on Ethernet
Downstream acquisition in progress	On	1 Flash	Off	
Upstream ranging in progress	On	2 Flashes	On during upstream traffic	
Registration in progress	On	3 Flashes	On during upstream traffic	
Software download in progress	On	4 Flashes	On during upstream traffic	
SM successfully ranged/registered (normal).	On	On Steady	On during upstream traffic	
Fault as a result of POST	On	Very fast Flashing	N/A	N/A

5 Safety Precautions

Important Safety Precautions and Notices

Warnings.

Before installing the satellite modem, make sure your electrical outlet is properly wired and your computer equipment is properly grounded. Consult with a licensed electrician if you are not sure.

The satellite antenna must be properly grounded for lightening protection. Consult with a licensed electrician and your installer to ensure compliance with local codes.

RF Radiation Hazard. The transmitting equipment is capable of generating RF levels above the maximum permissible uncontrolled exposure level. Do not enter the radiation beam pattern of the transmitter feed horn and / or antenna when the transmitter is on.

Before connecting and cables to the satellite modem, read and understand all safety precautions.

There are no user-serviceable parts inside any of the equipment in your system. There are potentially lethal voltages inside the equipment. It should only be opened by a technician trained and certified to service the product.

Before operating the satellite modem, read and understand all provided instructions.

When the Satellite Modem is powered on, DC voltage is present on the rear panel TX and RX connectors.

To prevent fire or shock hazard, do not expose this appliance to rain or moisture. The apparatus must not be exposed to dripping or splashing and no objects filled with liquids, such as vases, should be placed on the apparatus.

Postpone satellite modem installation until there is no risk of thunderstorm or lightening activity in the area.

To prevent electrical shock, if the unit is provided with a polarized plug, do not connect the plug into an extension cord, receptacle or other outlet unless the plug can be fully inserted with no part of the blades exposed.

The In-Line Power Supply input power cord must be connected to a properly grounded three-prong AC outlet. Do not use adapter plugs, or remove the grounding prong from the plug.

Cautions.

Only use the in-line power supply provided with the SM. Using a different power supply may cause equipment damage.

To ensure regulatory and safety compliance, use only the provided power and interface cables.

Do not open the unit. Do not perform any servicing other than that contained in the installation and troubleshooting instructions. Refer all servicing to qualified service professional.

Avoid damaging the satellite modem with static by first touching the coaxial cable connector when it is attached to the earth grounded coaxial cable wall outlet. Always first touch the coaxial cable connector on the satellite modem when you are disconnecting or re-connecting your Ethernet cable from the satellite modem or your PC.

To prevent overheating, do not block the ventilation holes on the sides of the unit.

Only wipe the unit with a clean, dry cloth. To avoid equipment damage, never use cleaning fluids or similar chemicals. Do not spray cleaners directly on the unit or use forced air to remove dust.

The user should install an AC surge arrestor in the AC outlet to which this device is connected. This is to avoid damaging the equipment by local lightening strikes and other electrical surges.

Notices

This product was qualified under test conditions that included the use of the supplied cable between system components. To be in compliance with regulations, the user must use this cable and install it properly.

Different types of cord sets may be used for connections to the main supply circuit. Use only a main line cord that complies with all applicable product safety requirements of the country of use.

Installation of this product must be in accordance with national wiring codes.

CE *Hereby, ViaSat, Inc., declares that this Satellite Modem is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.*

6 ODU and Antenna Installation for ASC 100 Antenna

Site selection

Important: mark the TX cable on both ends so you do not swap cable between modem and ODU.

- Select the antenna site making sure that you have no obstructions in the line of sight (the line between the antenna and the satellite position). You should ensure that there are no trees or other bushes that could in the future obstruct the line of sight.
- Install the antenna mount (Wall mount or non-penetrating mount) according to local security regulations and the requirements of the local environment. (Condition of walls or ground)
- Try to choose a position that protects the antenna from excess wind or weather (snow) as these could reduce the effectiveness of the antenna
- Make sure the antenna mast or pole which the antenna sits on is vertical. This is necessary when adjusting the elevation
- Place the antenna AZ/EL mount on the antenna pole or mast and fix the antenna so that it can be moved in Azimuth.

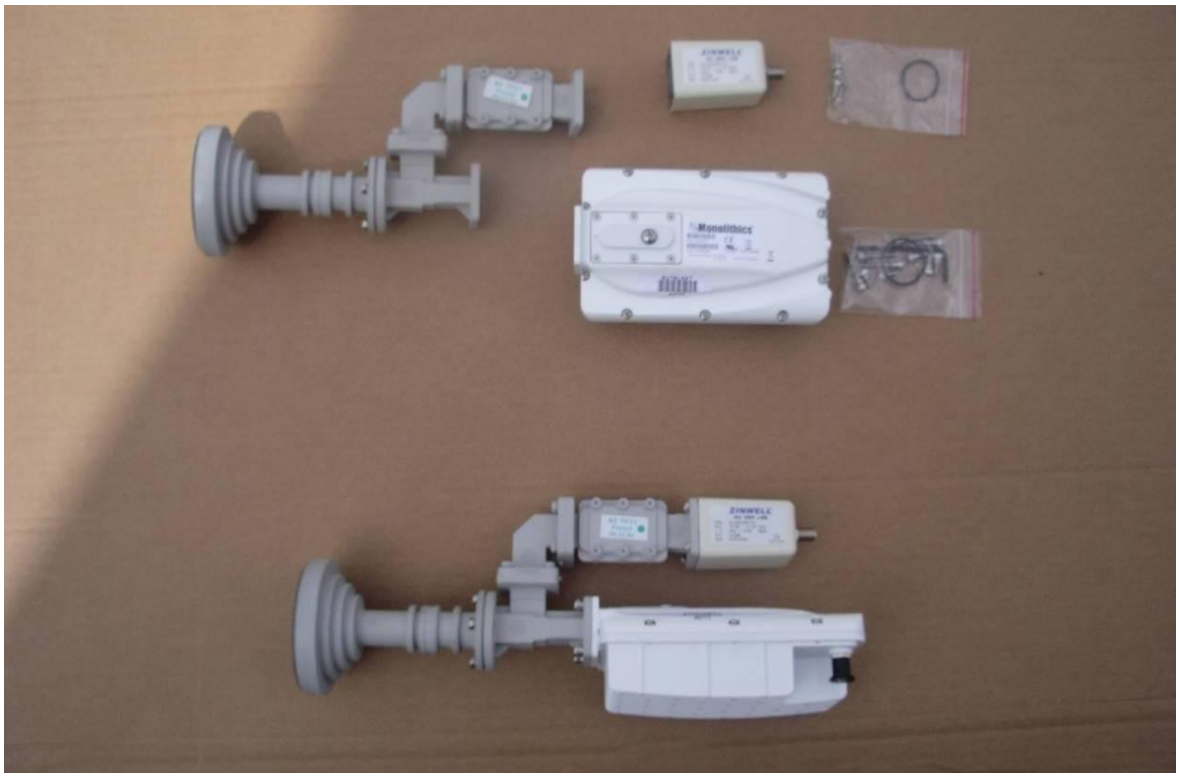
6.1 – Contents of Package

The modem and its power supply

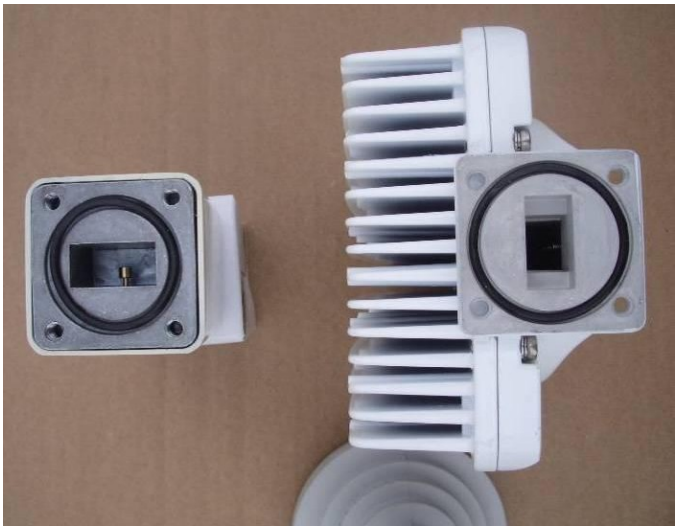
Zinwell LNB with Circular rubber joint and screw

6.2 – BUC

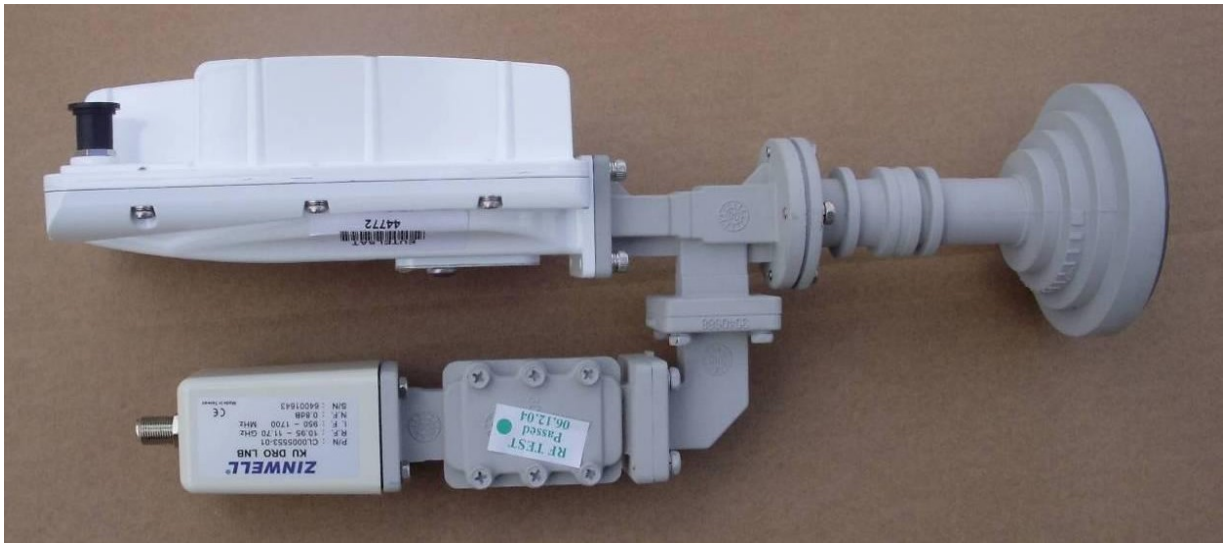
BUC with joint and screws



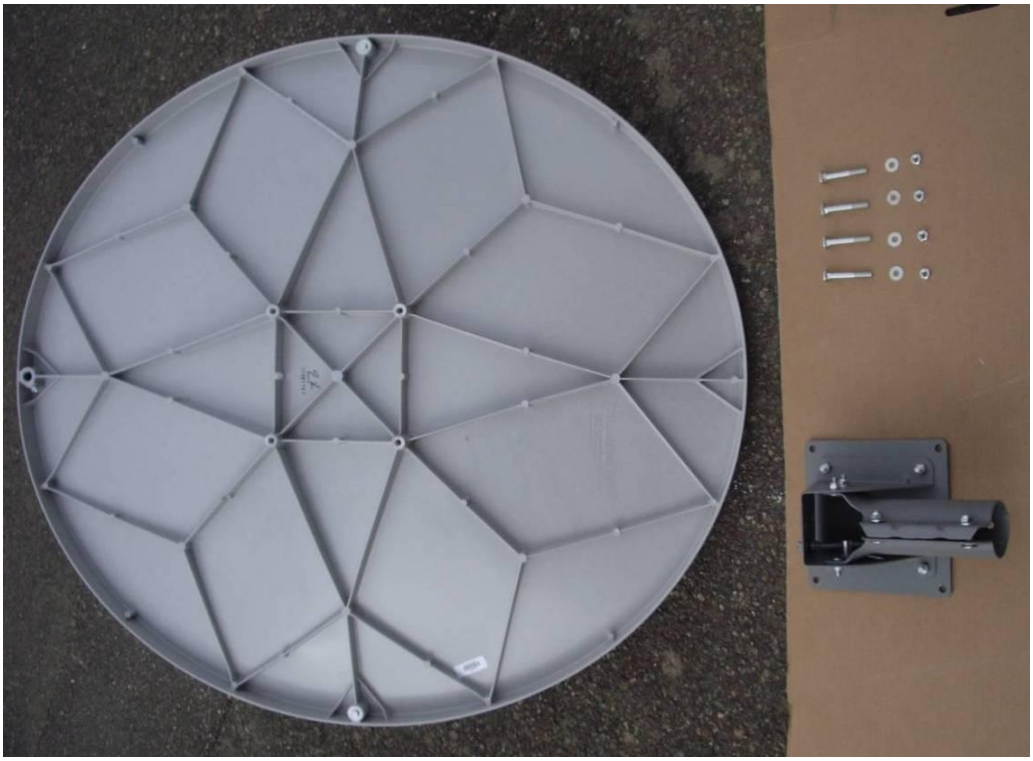
ODU with OMT and wave guide



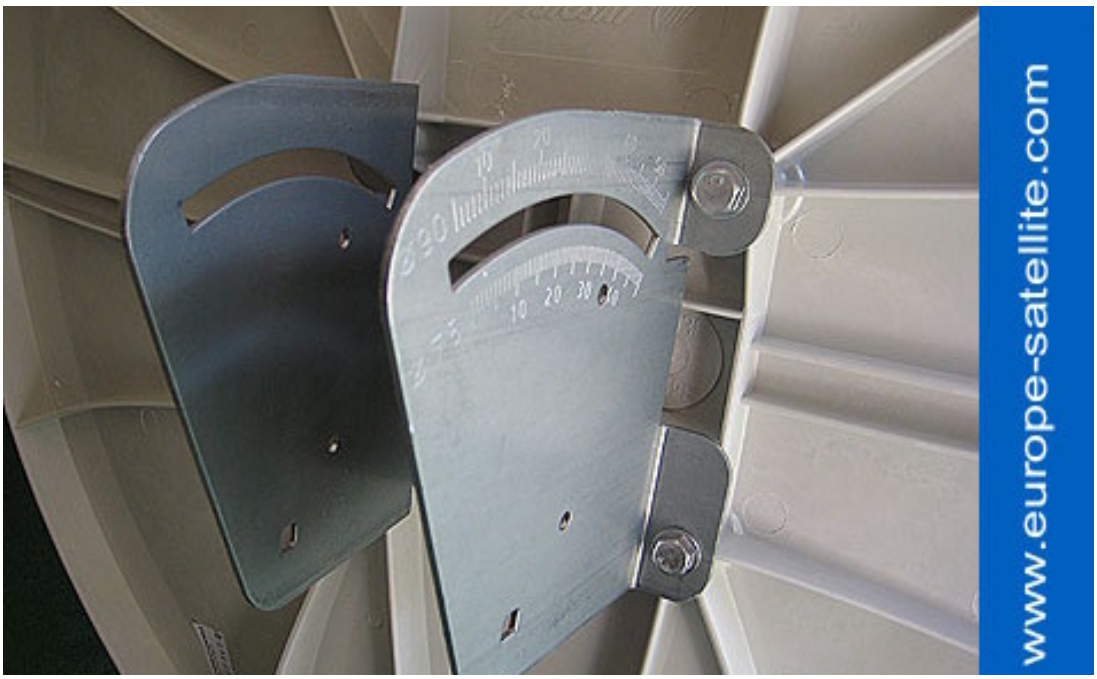
It is very important to put in place the rubber circular joints



6.3 – Antenna and antenna support

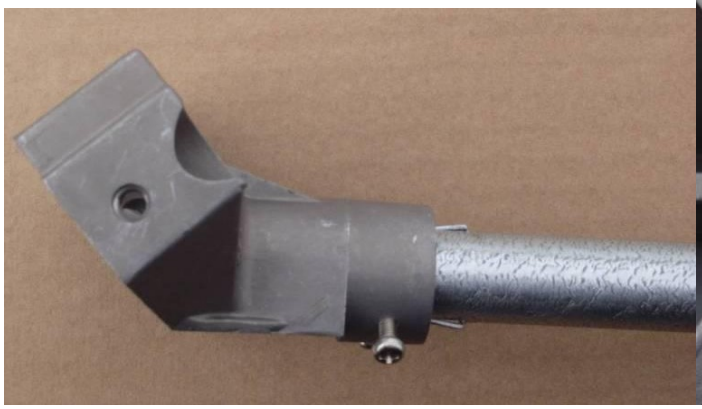
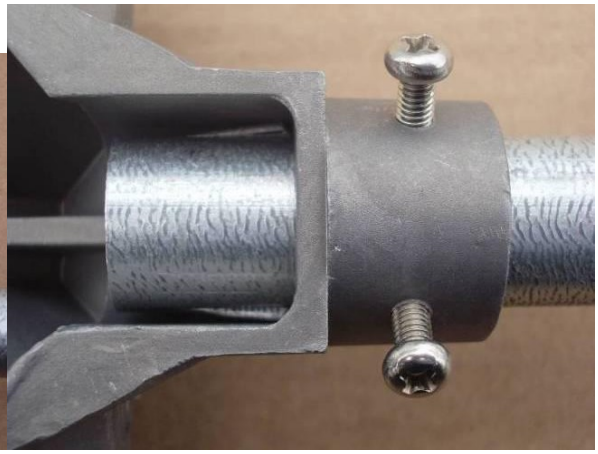


Insert 4 x bolts as shown below with washers


www.europe-satellite.com

6.4 – Antenna arms



Antenna arms and Feed horn bracket

Antenna arms from another angle

Antenna arms next to parabol

You must make sure the bottom arm sits in fully in hole

The grub screw for the bottom arm must be unscrewed to allow the arm to fully enter its mounting hole. Then the grub screw must be tightened ontoi the arm

6.5.A Mounting of antenna on support

Different elements for the support

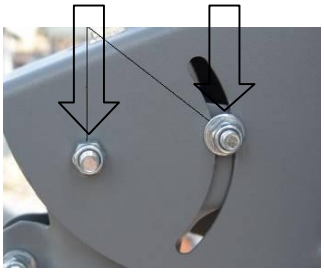
Antenna mounting

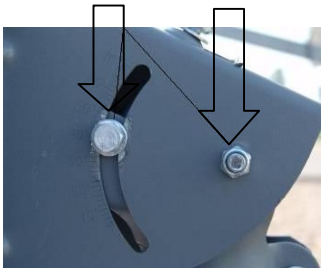
6.5.B Wall mount

How to adjust antenna in Azimuth (Left and right) and Elevation

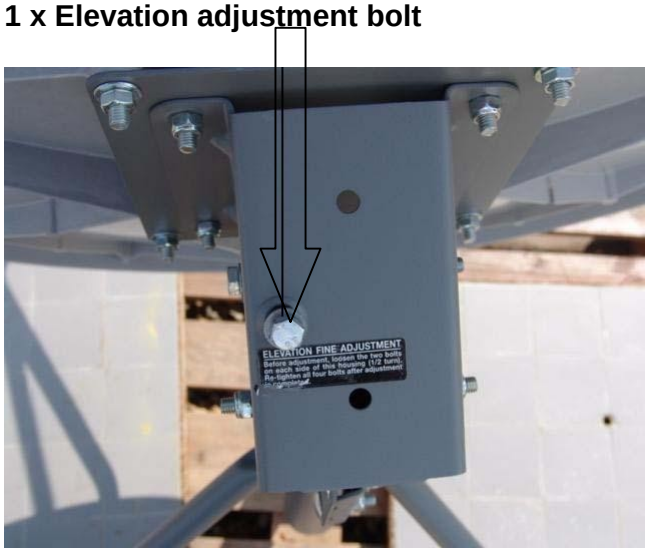
2 x Azimuth bolts which also secure antenna to pole or mount

4 x Elevation bolts which secure antenna when you have found satellite





1 x Elevation adjustment bolt



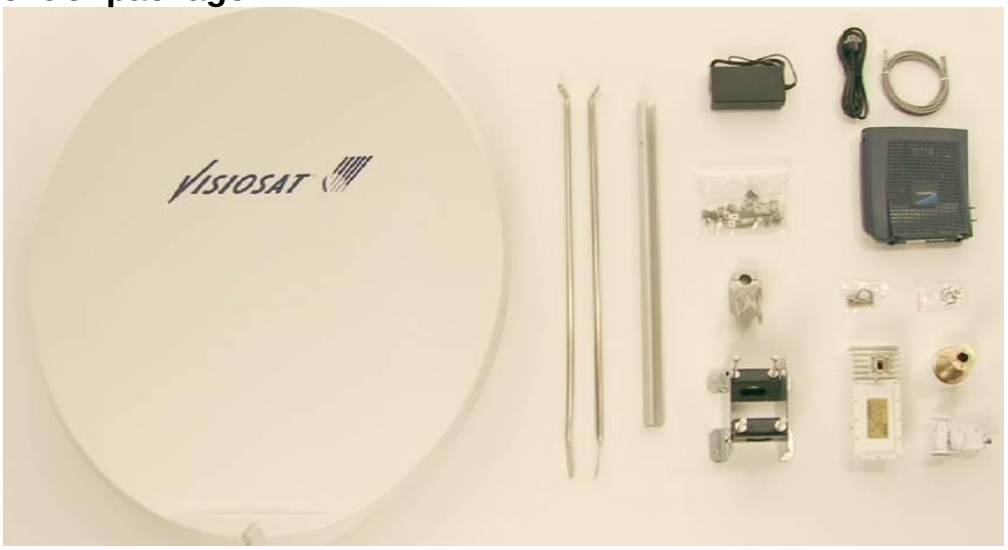
7 ODU and Antenna Installation for Visiosat Antenna SMC 90

The Tooway terminal with the visiosat antenna can be delivered with 3 different configurations of the OutDoor electronic unit.

a/ Visiosat feed – Apersat
b/ Visiosat feed – Invacom OMT/LNB – Invacom BUC
c/ Visiosat feed – Invacom OMT/LNB – USM BUC

The first part describes the assembly of the outdoor electronics. Please identify first which configuration is actually delivered.

7.1 Content of package



7.2 Assembly OutDoor electronic Unit.

7.2.1 **Visiosat feed – Apersat OMT - Zinwell LNB - USM BUC**

ODU material as it arrives

Assembly Feed and OMT with 6 bolts

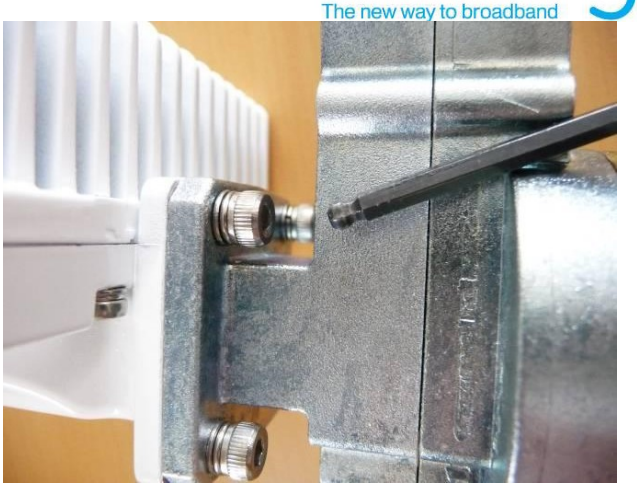
Important! Insert Rubber ring at feed, LNB and BUC

Tighten the six bolts with a special Allen key

Mount LNB and BUC

Put rubber ring at BUC

Make sure that wave guides of BUC and OMT are in the same direction



Fix BUC with 4 short bolts use Allen key with a ball

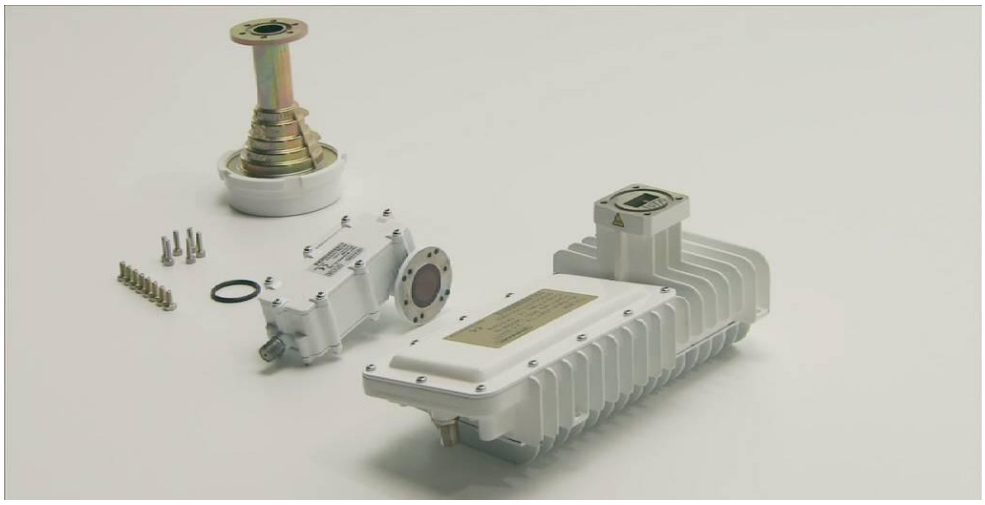
Make sure that wave guides of LNB and OMT are in the same direction and put rubber ring to LNB

Mout LNB using short bolts

Fix the LNB

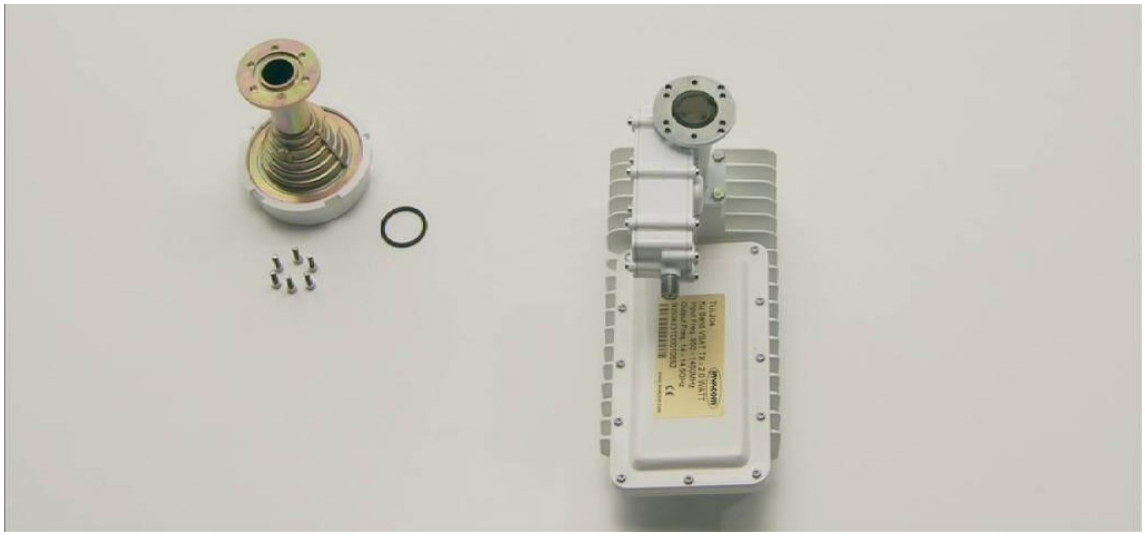
The ODU is ready

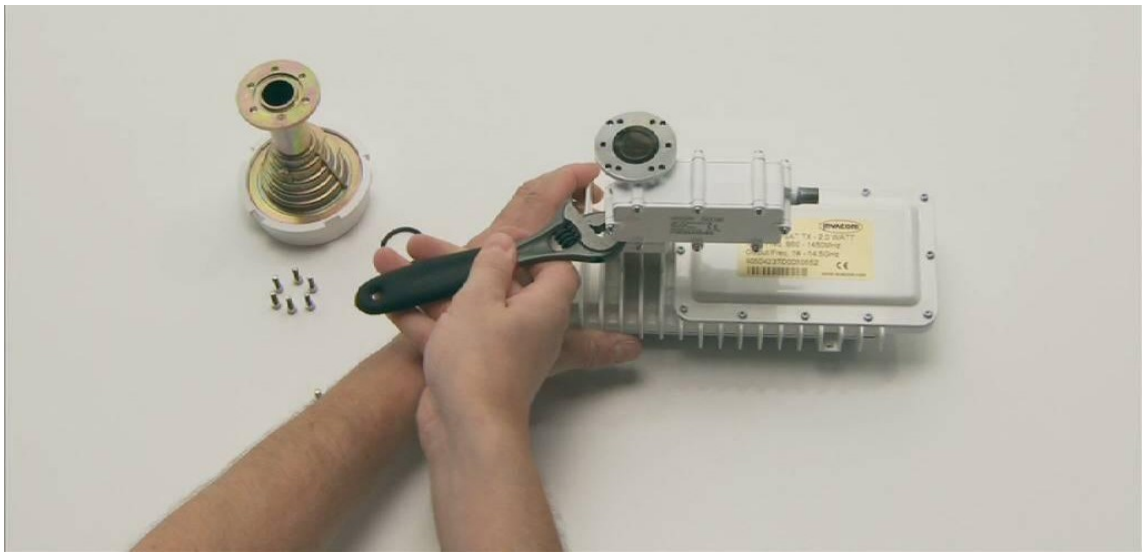
7.2.2 Visiosat feed –



Assembly Out door Unit Invacom OMT/LNB, Invacom Buc

Put rubber-ring to seal joint between BUC and OMT





Fixation of OMT/LNB with BUC

Put rubber-ring to seal joint between OMT and Feed

The complet Out Door Unit

7.2.3 Visiosat feed – Invacom OMT/LNB – USM BUC

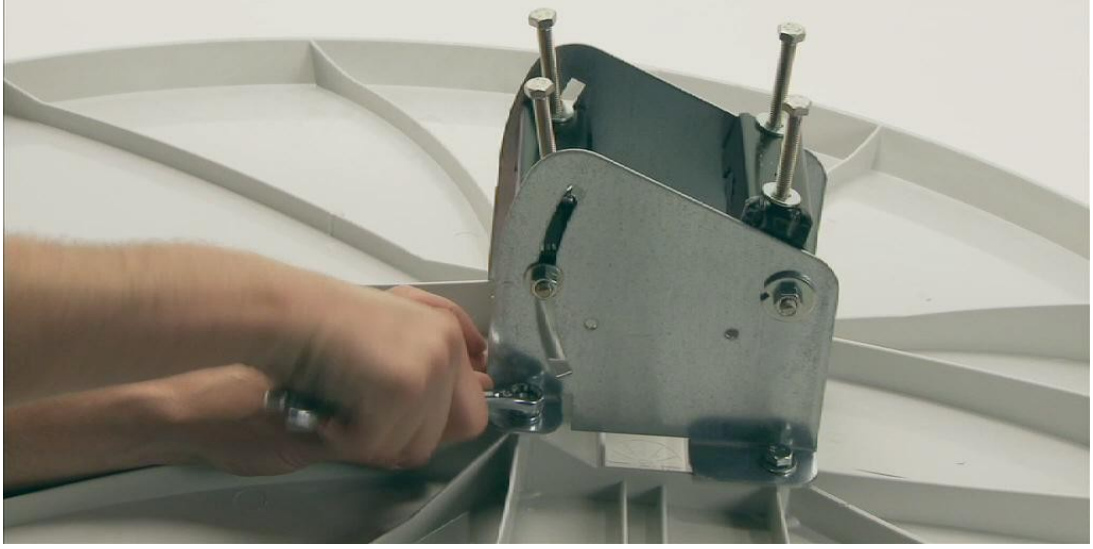
Tools for assembly and final ODU configuration

Mounting the Feed to the OMT/LNB

Mounting the BUC to the OMT/LNB

7.3 Assembly of Antenna

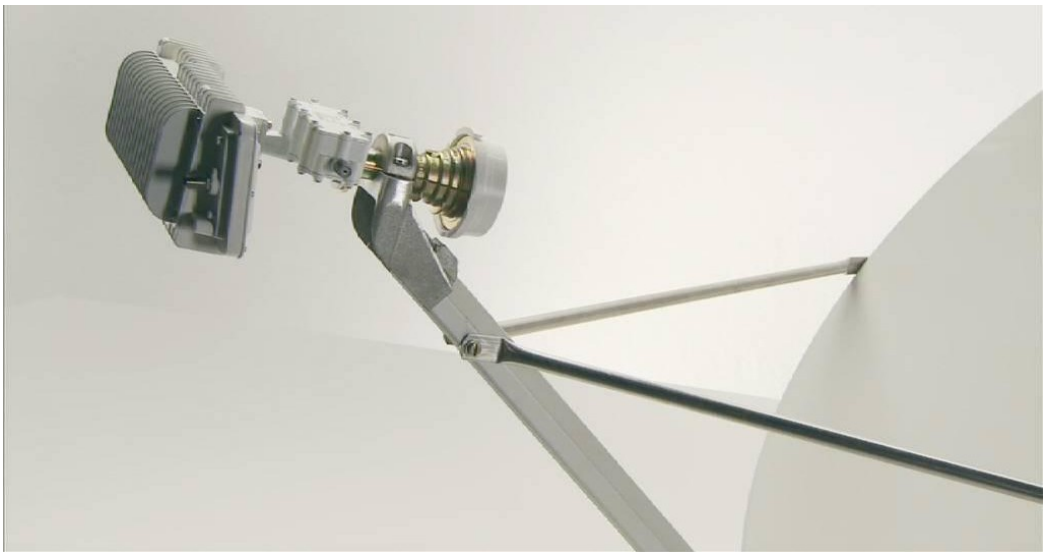
Assembly of AZ/EL mount with reflector



7.4 Assembly of the feed arm and ODU

Mounting the feed arm to the reflector

Mounting of the shots to hold the feed arm



The complete ODU and antenna

8 Antenna pointing of Tooway terminal

8.1 Presumptions and Preparation

The following 2 procedures are for installers who have:

1. **already successfully pointed television satellite Antennas to Hot Bird 13° east or similar positions**
2. **have a satellite meter able to detect and identify digital TV carriers in DVB standard. Examples: Horizon (USB plus), Promax (TV explorer), Emitor (Satlook)**

8.1.1 Impotant please note :

1. No TV channels on EB 3, pointing is to data carriers in DVB standard.

2. Carrier optimisation is only possible usi
reading for Polarisation.

3. The Tooway terminal LNB is single polarisation, single band, just one Voltage 18 V, no 22 Khz, no DiSEcQ.

4. The LNB is not a universal LNB, its LO frequency is either 10 GHz in low band or 11.3 GHz in high band, not switchabel. Change of frequency means change of LNB.

5. For the different spots of EB3 the following LNB's are required:
EB3 Spot A, D => low band LNB 10 GHz LO frequency
EB3 Spot C => high band LNB, 11.3 GHz LO frequency

6. Polarisation is to adjust manually and with an accuracy of 1°. The ODU is normally not straight in a horizontal or vertical position but need to be rotated for polarization optimisation.

7. The procedure will use the DVB carrier of the Skylogic D Star service for pointing as the Tooway carrier is not a DVB carrier and it more difficult to optimise. If the terminal points optimum to the relevant D Star carrier it points automatically optimal to the Tooway carrier on the same spot.

8.1.2 Procedure 1 or procedure 2?

Procedure 1 is for installers used to working from the elevation angle needed to find the correct satellite.
If you are installers and you have the habits to pointed television satellite Antennas to Hot Bird 13° east or similar positions, this procedure is simpler and quicker than the procedure 2.

If you never pointed television satellite Antennas to Hot Bird 13° east or similar positions or if you want a maximum precision, procedure 2 is better than procedure 1 for you.

8.1.3 Adjust settings of the satellite meter to LNB LO frequencies

Usually satellite meters are pre-programmed for universal LNB's with LO frequencies 9.75 GHz for low band and 10.6 GHz for high band so the display shows the satellite downlink frequency.

1. Change the settings of the satellite meter to LNB Lo frequencies 10 GHz for low band and 11.3 GHz for high band

If not possible

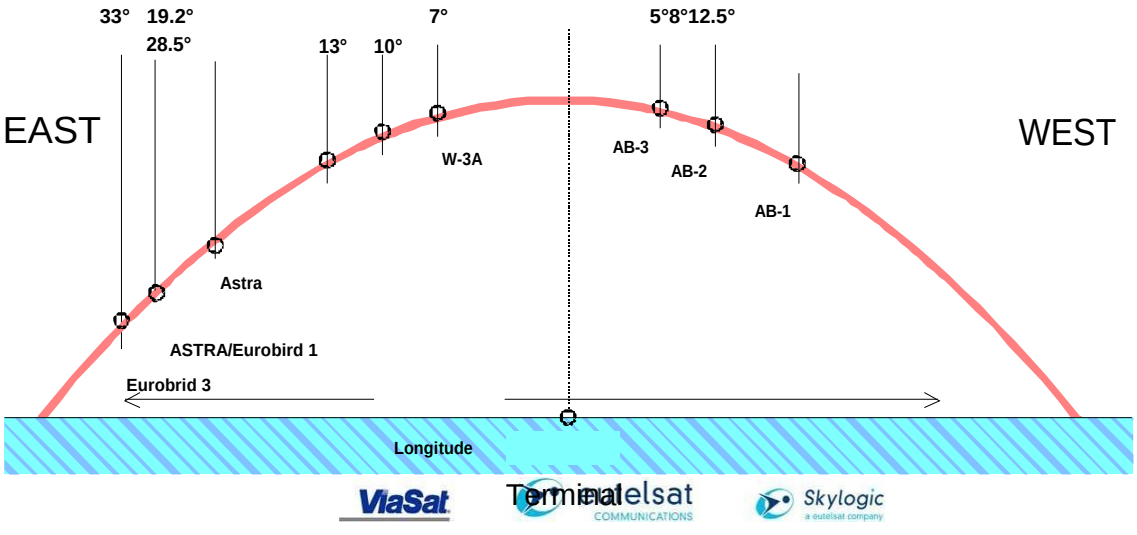
2. Change the setting of the satellite meter to read the IF frequency directly.
   LNB LO frequency = 0.

3. If it is not possible to change the LNB LO frequency setting please assume a 9.75 and 10.6 GHz presetting. In this case, it is necessary to calculate the correct frequencies as follows:

Displayed frequency on sat meter = Real downlink frequency + 250 MHz for low band
and
Displayed frequency on sat meter = Real downlink frequency + 700 MHz for high band

We have defined two procedures to antenna pointing. The first is based on an elevation and polarization angle calculated from a website. The second approach is based on the idea of finding a well known satellite position and moving across several other satellite positions until you find Eurobird 3.

This diagram gives you an idea of the number of satellites and the positions of those satellites



8.2 Procedure 1

What follows is a brief overview of the main points of the procedure

- **Install antenna in a good site**
-
- **Visit satsig website to ascertain the elevation and Polarization angles Set a rough polarization angle using the feed horn markings**
- **Set a rough elevation angle taking into account the scale inaccuracy of 4°**
- **Swing antenna in arc to find satellite**
- **Verify you have the correct satellite by DVB interrogation**
- **Maximise carrier BER using first Azimuth and then lock off Azimuth**
- **Maximise carrier using Elevation and then Lock off Elevation**
- **Maximise polarization**
- **Lock off polarization**

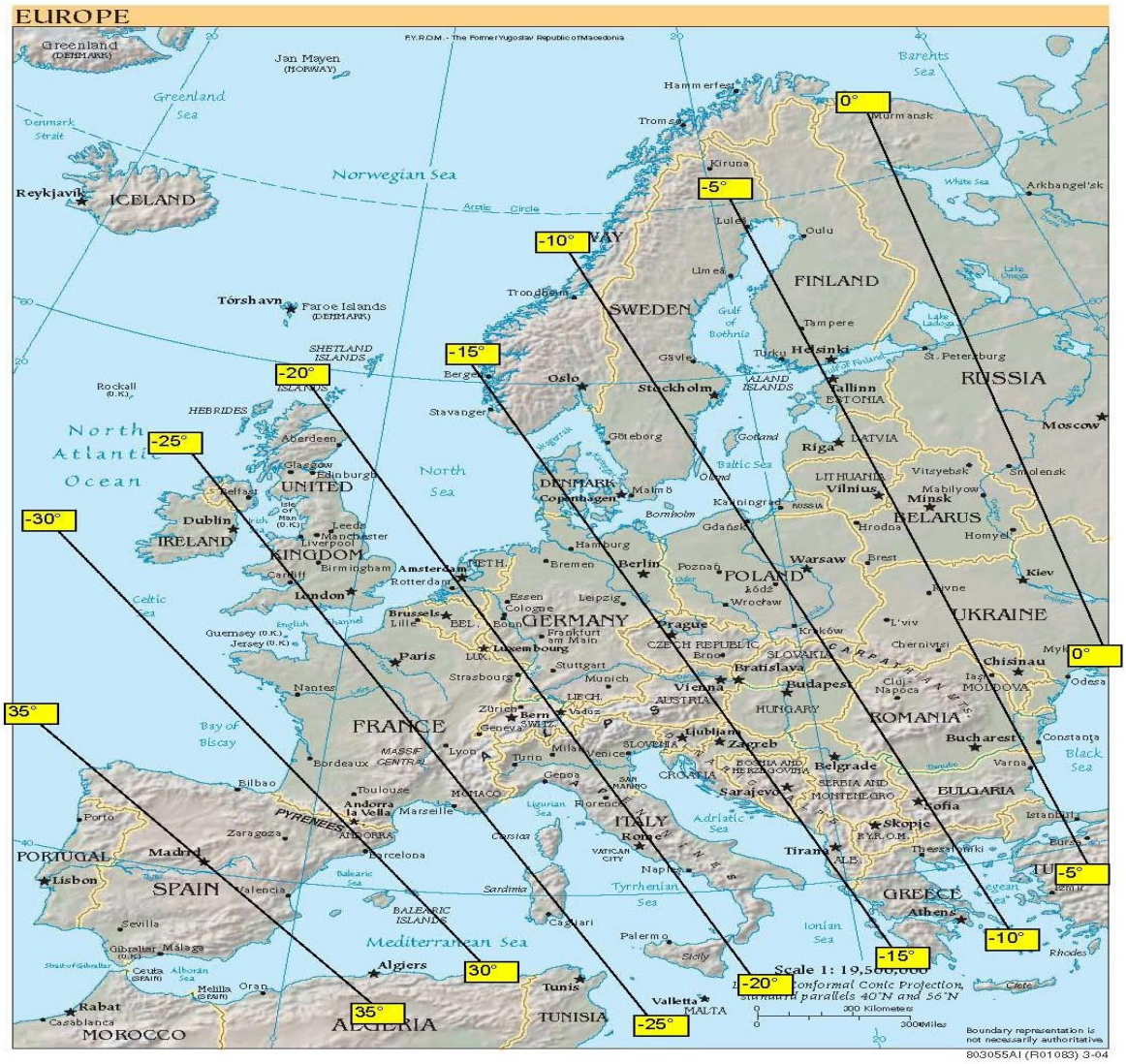
8.2.1 Get your pointing angles of EB3

For getting the relevant pointing angels of your location, please look to the following URL:
http://www.satsig.net/maps/lat-long-finder.htm

You have to enter the city nearest to you and then choose the satellite Eurobird 3 at 33° East

Set you polarization angle to the approximate value indicated in the website and verify it is correct with the map below

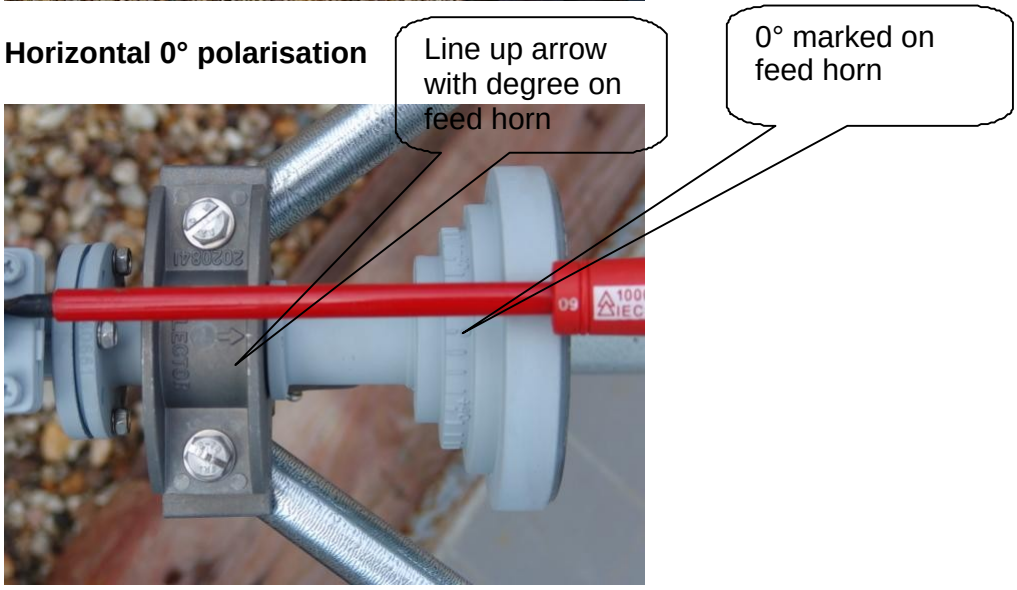
8.2.2 Polarization angles



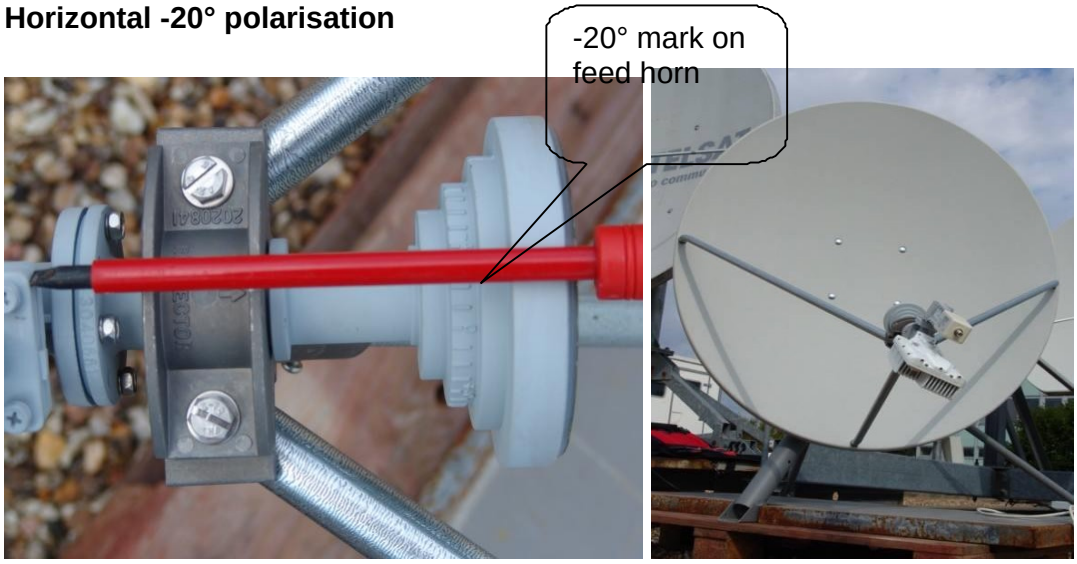
The following pictures are a guide for polarisation angles detailed in the above map

Horizontal polarization for Eurobird 3 spots A & D

Horizontal 0° polarisation

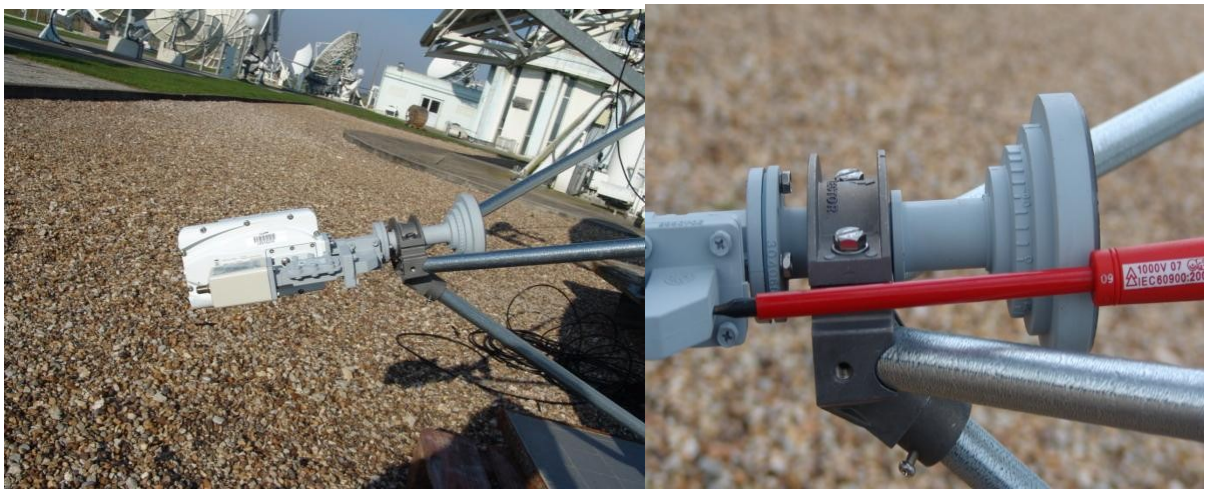


Horizontal -20° polarisation

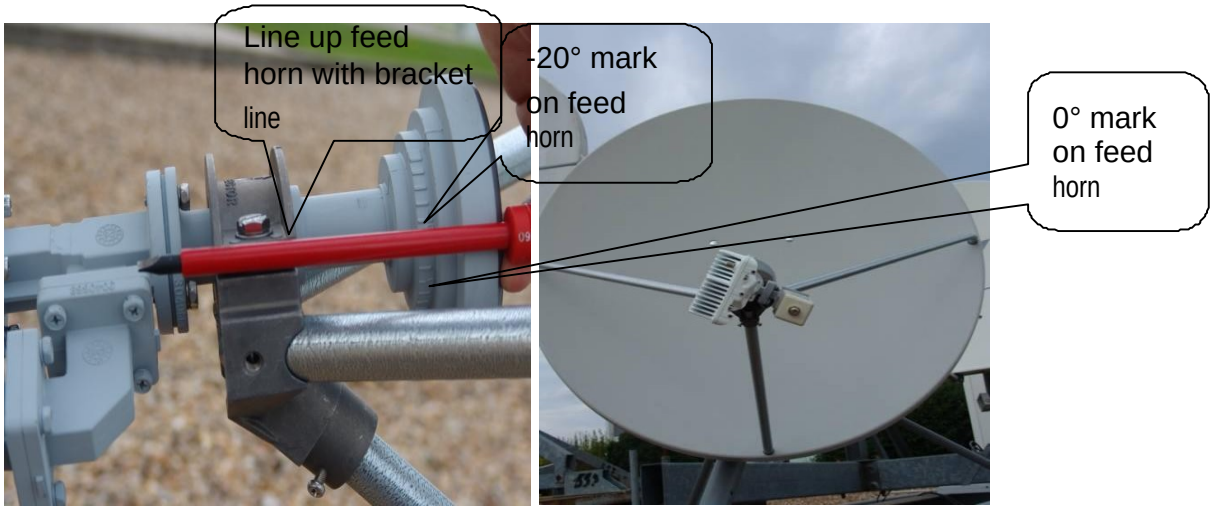


Vertical Polarization For Eurobird 3 spot C

Vertical 0° polarisation

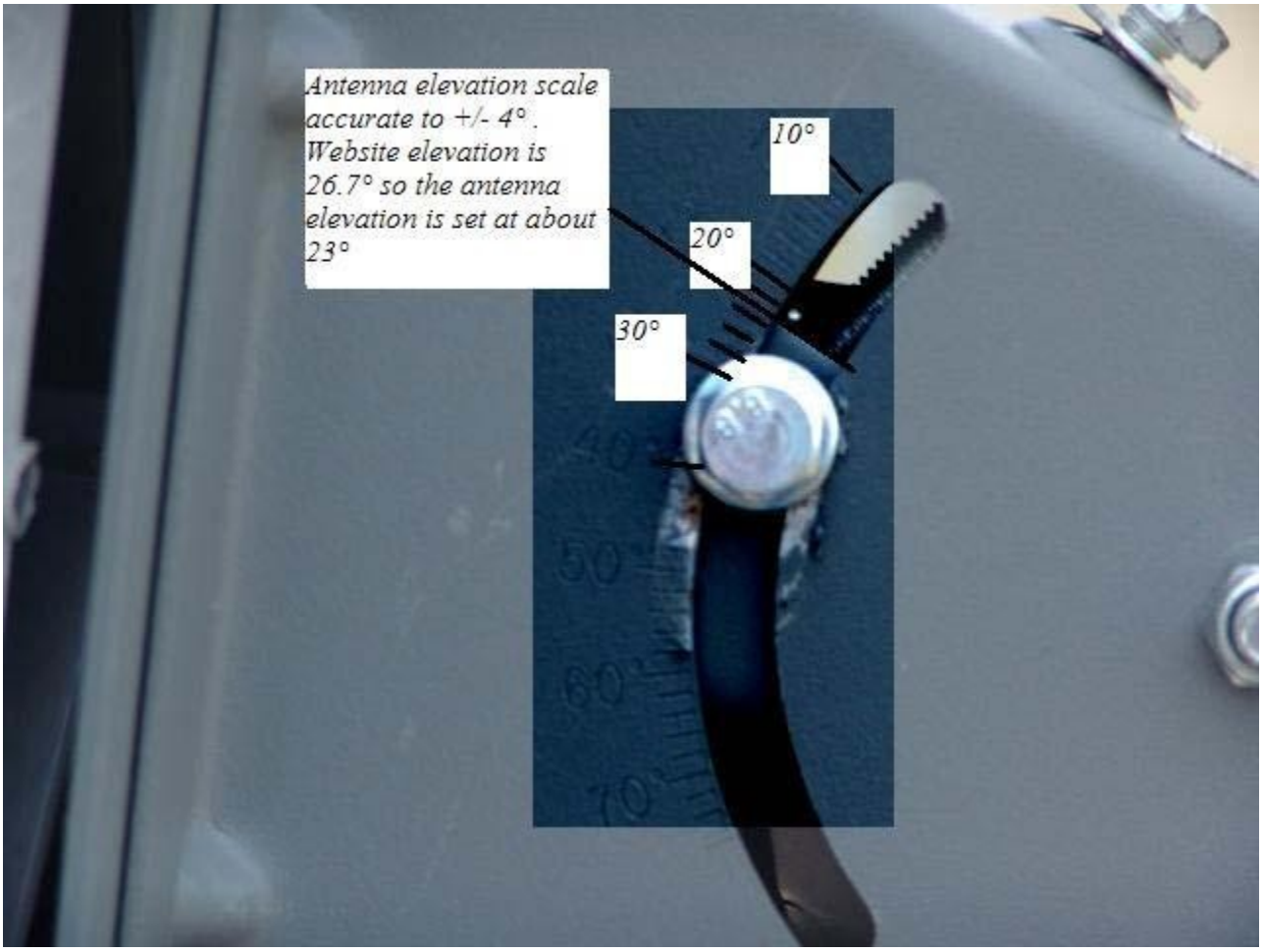


Vertical -20° polarisation



8.2.3 Elevation angle

Once you have your elevation angle from the website http://www.satsig.net/maps/lat-long-finder.htm . Set the antenna elevation to about 4° below the calculated figure in the website (see picture)



Now turn the antenna left to right in a slow arc. This arc should be from SE to SW or 120° to 240°

If you do not see any carriers raise the elevation by about 2° and repeat previous step

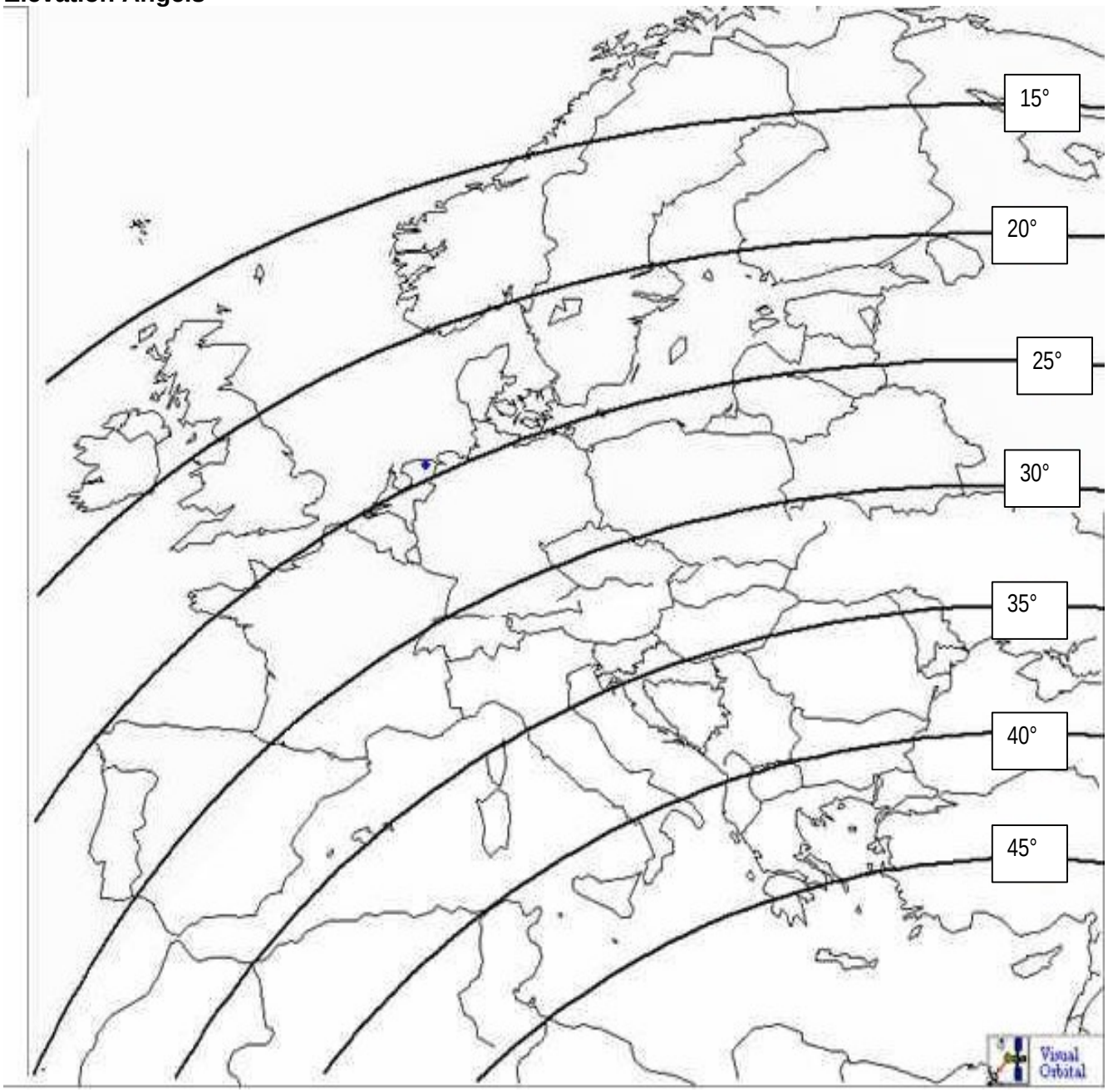
If you still do not see any carriers reduce the elevation by 6° and repeat the arc from SE to SW

NB

- **If you still do not see any carriers then verify the elevation angle calculated is correct for the installation. (City name or satellite)**
- **Does the noise floor of the analyser change when you unplug it from the LNB. If the noise floor does not change then the LNB is probably dead.**
- **Verify there are no obstacles blocking the line of sight**

The following graphs give an indication about the Elevation and Polarisation angels in Europe:

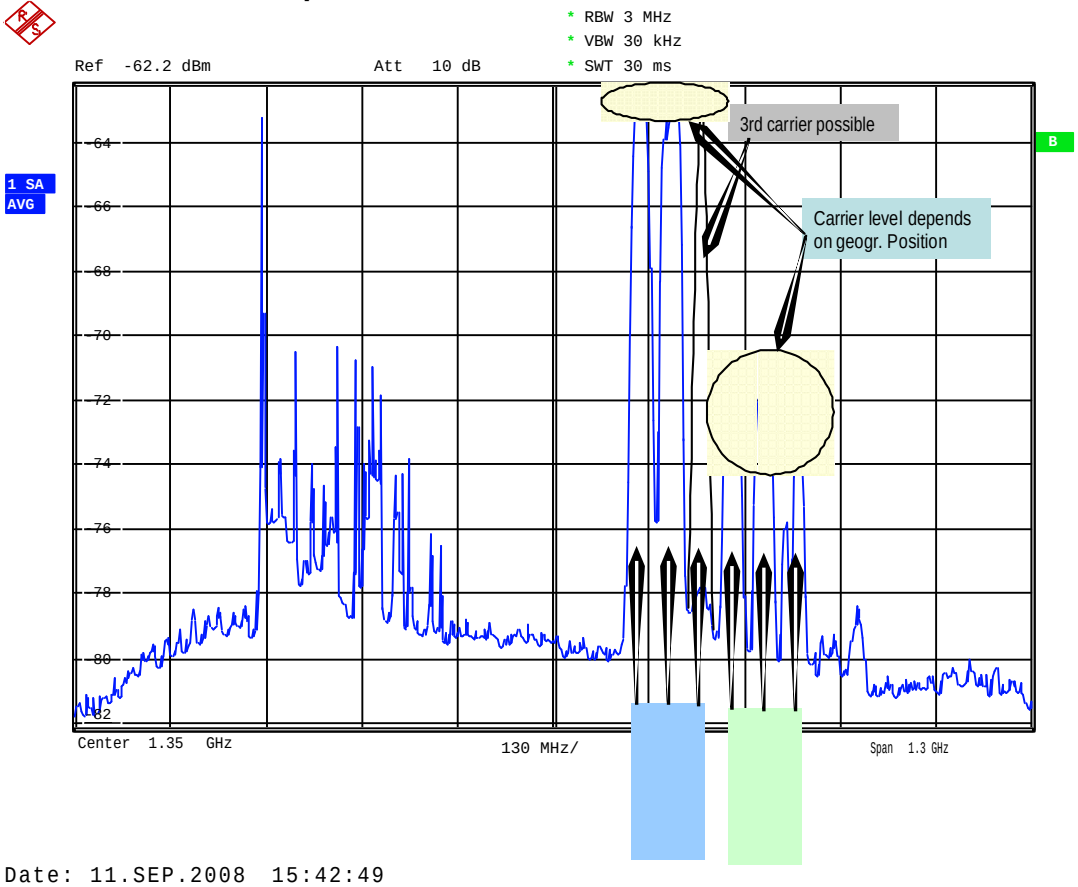
Elevation Angels



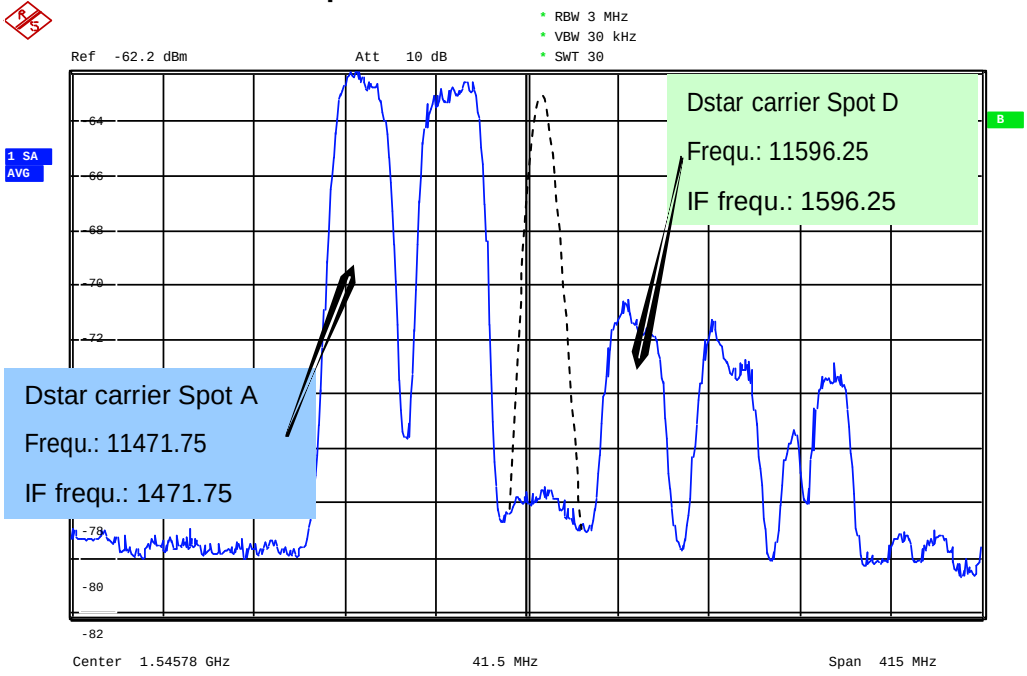
IMPORTANT : Once you have found the carriers please verify it is the correct satellite reading the PID on the DVB carrier at 1471 MHz on Horizontal polarization for A & D spot. For C spot on Vertical polarization please verify the DVB carrier at 1222 MHz. Both of these carriers should identify themselves as Skylogic or EB3.

You must obtain this followings graph when you find the satellites:

Eurobird 3 A and D spot

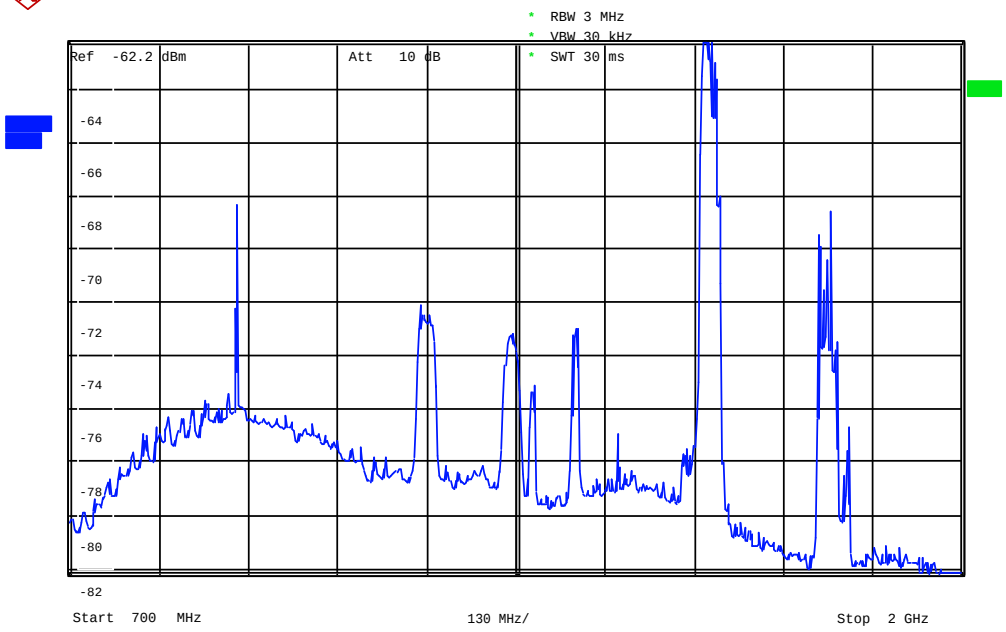


Take a closer look at spot A & D



Date: 11.SEP.2008 15:46:00

Euobird 3 C spot



Date: 11.SEP.2008 16:00:08

Optimise in the following sequence

Azimuth – Elevation- Polarisation

Make sure you lock off the 2 bolts for Azimuth before maximising on elevation. Once elevation is maximised lock off the 4 bolts to secure the elevation. Once elevation and azimuth are locked off tight then optimise polarization and tighten the 2 screws on the neck of the feed horn.

Maximise the carrier strength as this will ensure optimum performance for the Tooway

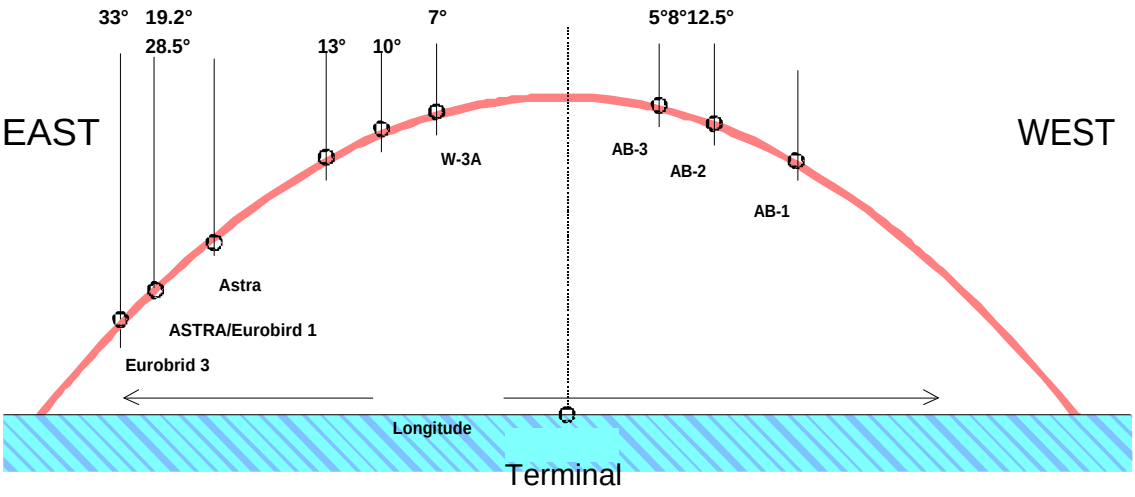
You should expect at least 10-4 BER as a minimum

8.3 Procedure 2 - Pointing of the antenna to EB3 Spot A or D (low band LNB)

The following procedure describes how to find Eurobird 3 (EB3) on 33 ° East from pointing to Hot Bird 13° East.

In short the installation will proceed on the following steps:

- Find Hot Bird 13° East – Identify a TV channel
- Go to the ASTRA position 19.2° East - Identify a TV channel
- Go to ASTRA/Eutelsat Position 28.5° east - Identify a TV channel
- Finally go to EB3 on 33° East check carriers and optimise the pointing



8.3.1 Get you reference TV channels

Go to the URL: http://www.lyngsat.com/europe.html

Pointing to EB3 Spot A, D, (low band)	Pointing to EB3 Spot C (high band)
Identify digital TV channel non scrambled on **horizontal polarisation, low band (10.95 - 11.7 GHz)** on each position Hot Bird – ASTRA 19.2° East - 28.5° East	Identify digital TV channel non scrambled on **vertical polarisation, high band (11.7 – 12.75GHz)** on each position Hot Bird – ASTRA 19.2° East - 28.5° East

Note the relevant data of a TV channel

8.3.2 Adjust settings of the satellite meter to LNB LO frequencies

Usually satellite meters are pre-programmed for universal LNB's with LO frequencies 9.75 GHz for low band and 10.6 GHz for high band so the display shows the satellite downlink frequency.

1. Change the settings of the satellite meter to LNB Lo frequencies 10 GHz for low band and 11.3 GHz for high band

If not possible

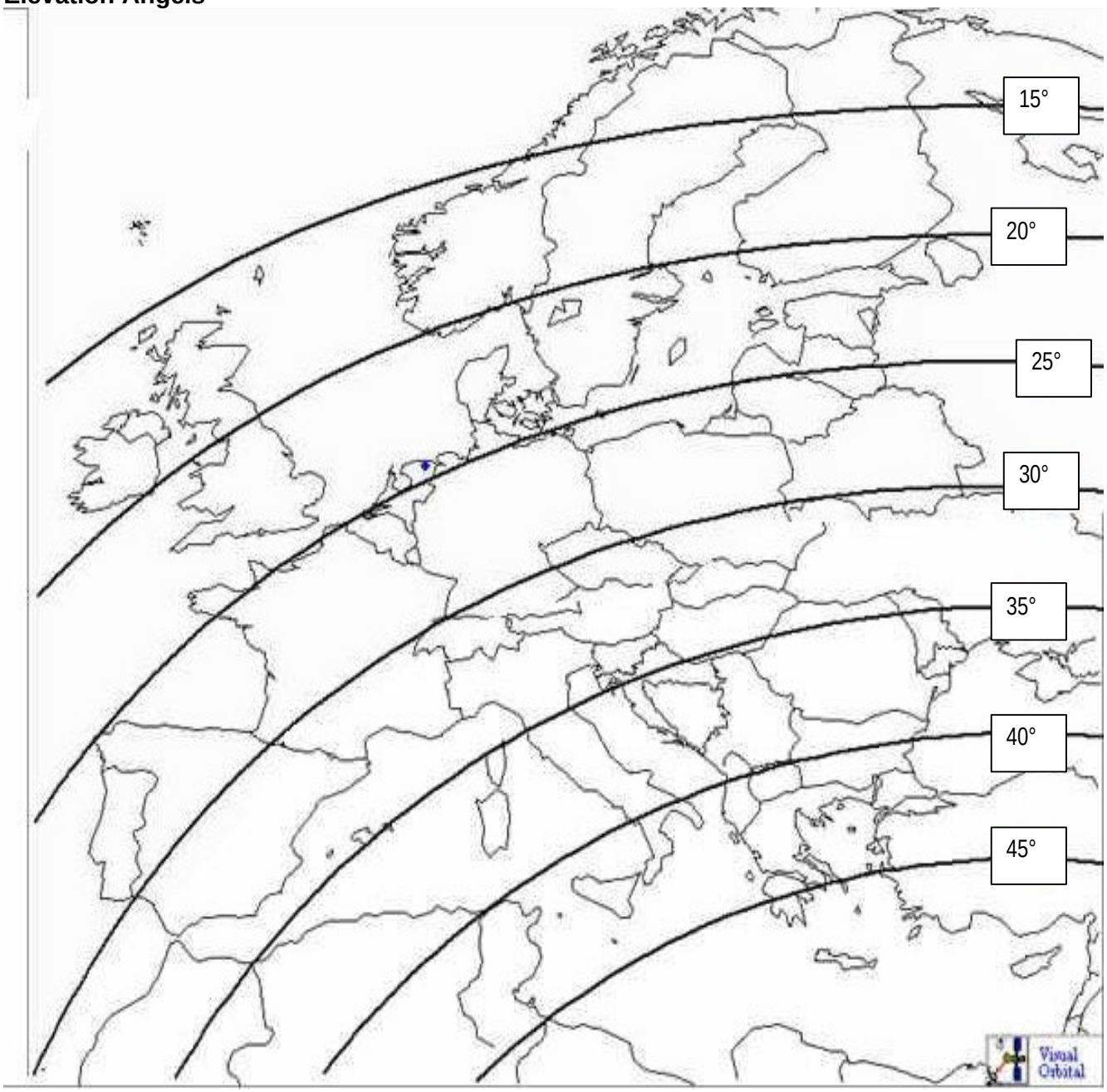
2. Change the setting of the satellite meter to read the IF frequency directly.
   LNB LO frequency = 0.

3. If it is not possible to change the LNB LO frequency setting please assume a 9.75 and 10.6 GHz presetting. In this case, it is necessary to calculate the correct frequencies as follows:

Displayed frequency on sat meter = Real downlink frequency + 250 MHz for low band
and
Displayed frequency on sat meter = Real downlink frequency + 700 MHz for high band

The following graphs give an indication about the Elevation and Polarisation angels in Europe:

Elevation Angels

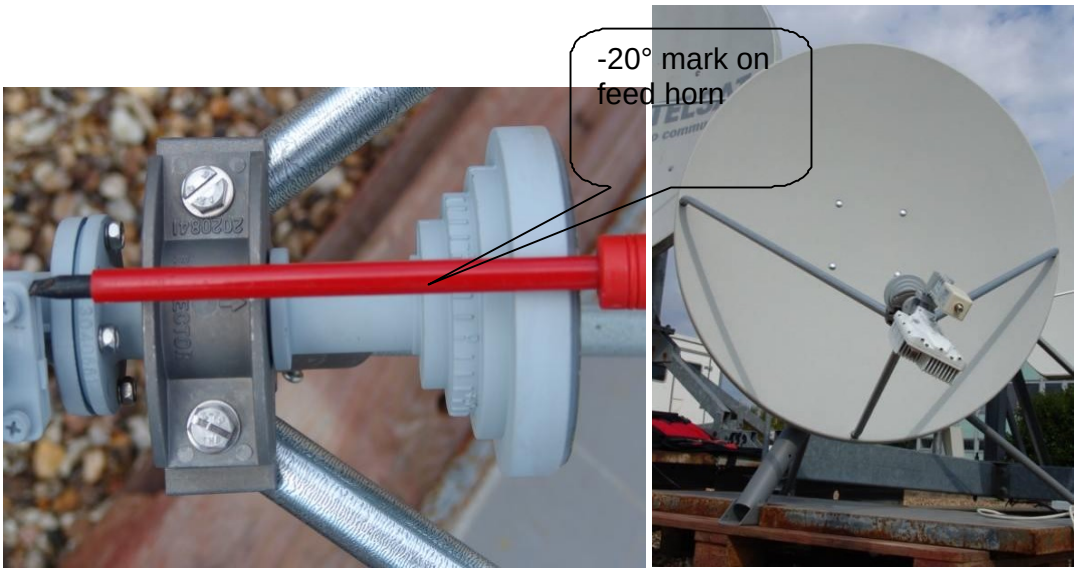


<u>IMPORTANT :</u> Once you have found the carriers please verify it is the correct satellite reading the PID on the DVB carrier at 1471 MHz on Horizontal polarization for A & D spot. For C spot on Vertical polarization please verify the DVB carrier at 1222 MHz. Both of these carriers should identify themselves as Skylogic or EB3.

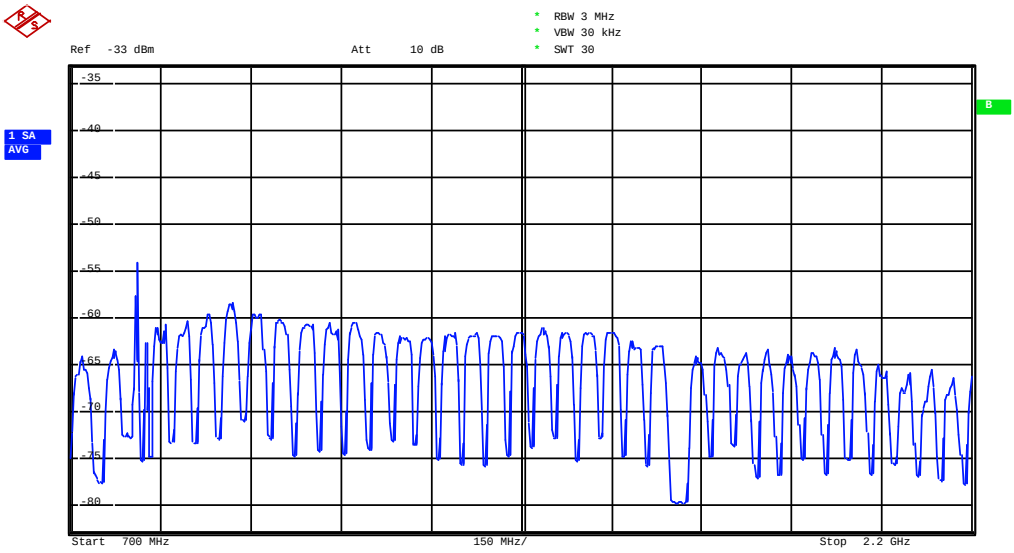
8.3.3 Rough pointing

Important information:
The antenna size is 1.05 m in Ku band, the opening angle to detect any carrier is about 2°. Unfortunately the accuracy of the elevation reading on the antenna is also only about 2° to 4°.

Adjust the ODU to horizontal polarisation . The polarization in the picture below is -20°



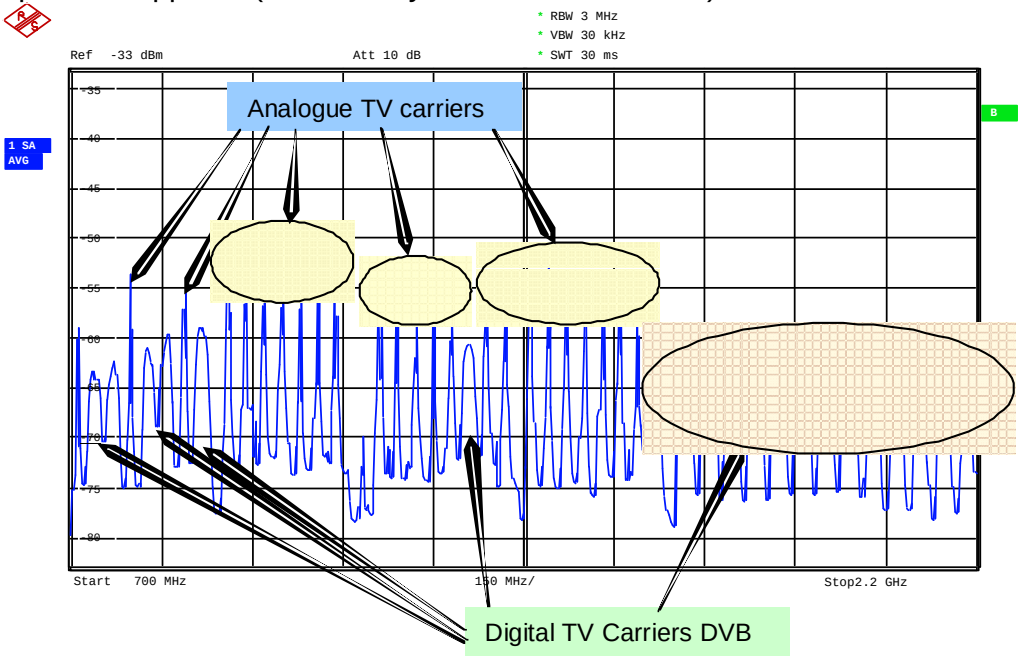
Point the antenna to Hot bird position 13° East, switch the sat meter to low band, the sat meter shall display digital TV carriers over the entire spectrum;



Pick your selected TV carrier to check that the position is correct

Now reduce your elevation until you see the carrier levels reduce

Point to ASTRA 19.2° East
Stand behind the antenna and move the antenna about 5° to the left until the following spectrum appears (if necessary reduce the Elevation):



Date: 11.SEP.2008 16:24:35

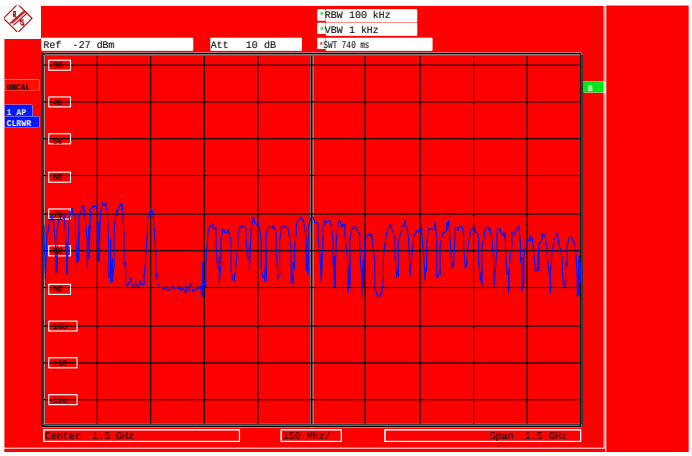
Analogue TV channels are in the lower frequencies rage.
Pick your selected TV carrier to check that the position is correct

Now reduce your elevation until the carriers start to reduce significantly virtually to the noise floor

Point to ASTRA/Eurobird 1 position 28.5° East

Stand behind the antenna and move the antenna about 10° to the left until the following spectrum appears (lower antenna Elevation as necessary):
28 east Horizontal Low band

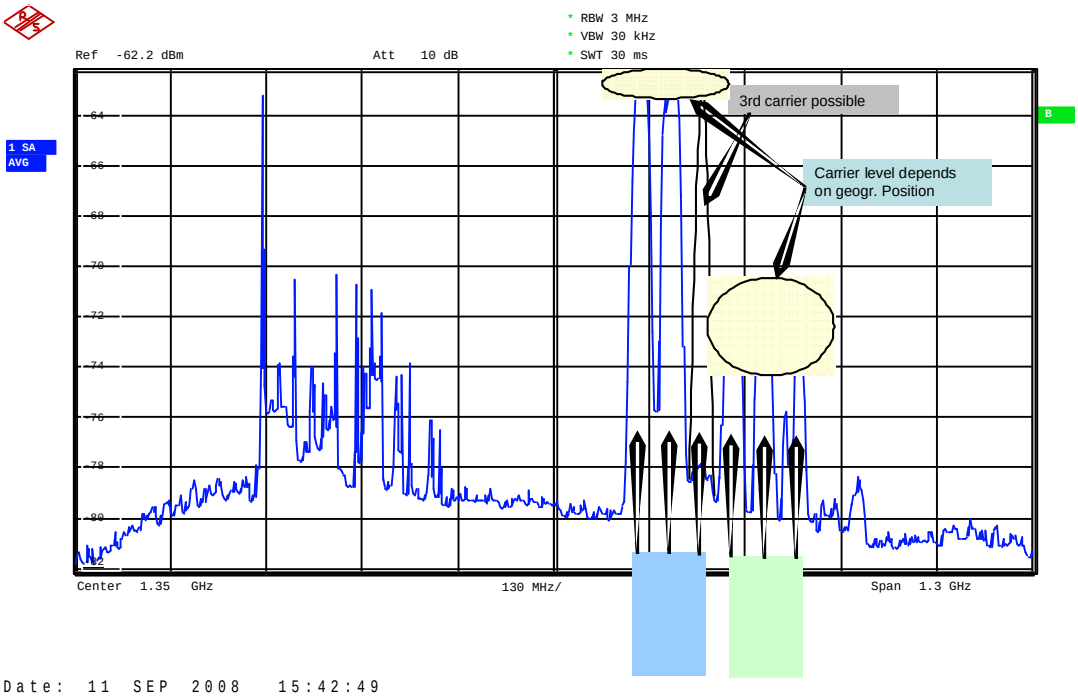
Pick a TV channel and interrogate the DVB to verify it is the correct satellite



Now reduce your elevation until the carriers start to reduce

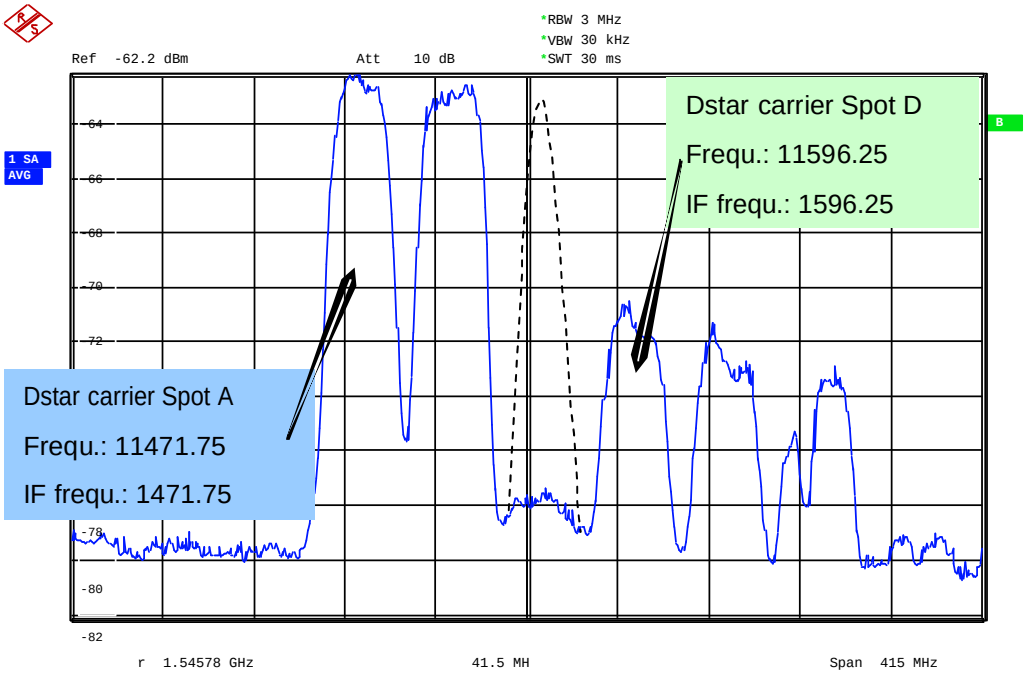
Point to Eurobird 3 position 33° East

Stand behind the antenna and move the antenna about 5° to the left until the following spectrum appears (lower antenna Elevation as necessary):



Date: 11 SEP 2008 15:42:49

Take a closer look to the carriers

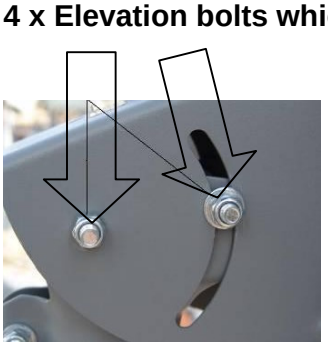


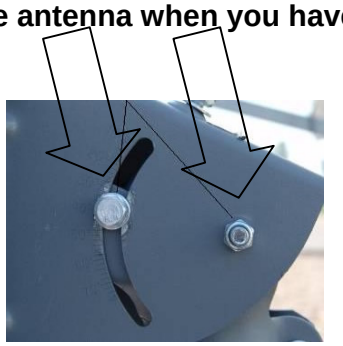
8.3.4 Pointing optimisation

Once got the correct satellite position, tighten the antenna fixation screws so that the antenna can be moved in Azimuth and Elevation but with minimum unnecessary movement.

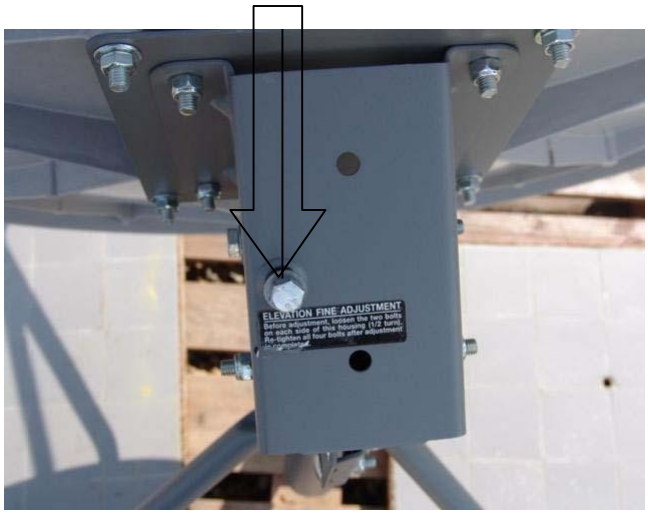
2 x Azimuth bolts securing antenna to pole or mount

4 x Elevation bolts which secure antenna when you have found satellite





1 x Elevation adjustment bolt



- Adjust roughly the AZ pointing by slowly moving the entire antenna
- Adjust the Elevation pointing (Make sure that the screws for adjusting Elevation are not tight)
- Depending on the service r
  Sat Meter and identify either DVB Carrier Spot A or DVB Carrier Spot D.
- The Sat Meter carrier i
- Skylogic 33° East EB3 “Spot A” or “Spot D”
- Read the BER of the carrier.
- Turn the Outdoor Electronics and the Feed to optimise the BER Value.

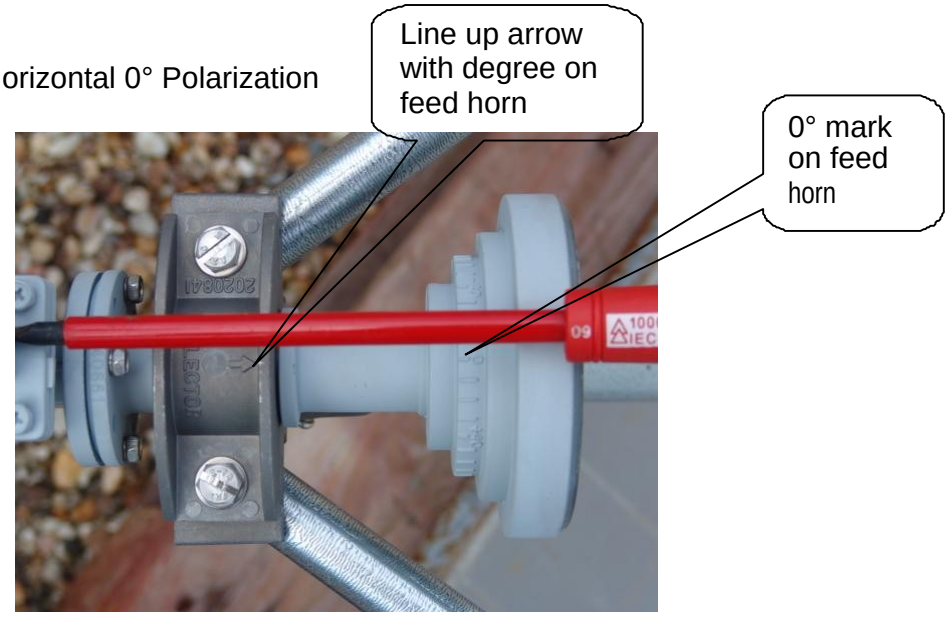
(Please note the BER Value should be as low as possible 10 e-3 10 e-4 10 e-5 or better) The value shall be at the minimum XX x 10 e-4 that means values like XX x 10 e-5 or XX x 10 e-6 are better.

If it is not possible to reach a value of XX x 10 e-4 (that means the value is at XX x10e-3) It is necessary to change the place of installation or go for a bigger antenna.

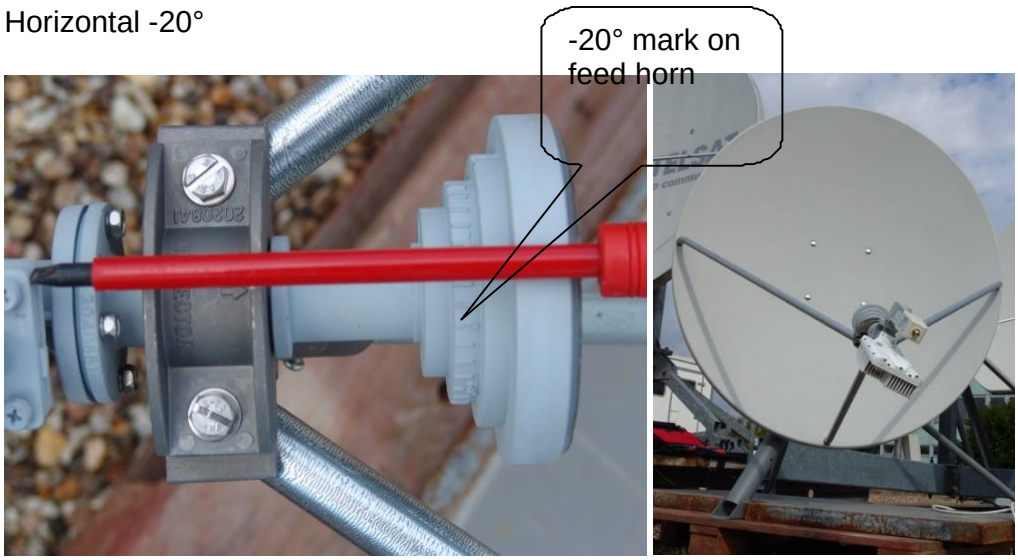
The accuracy of the polarisation adjustment should be within 1°. Once the best value is found fix the screws that hold the feed.

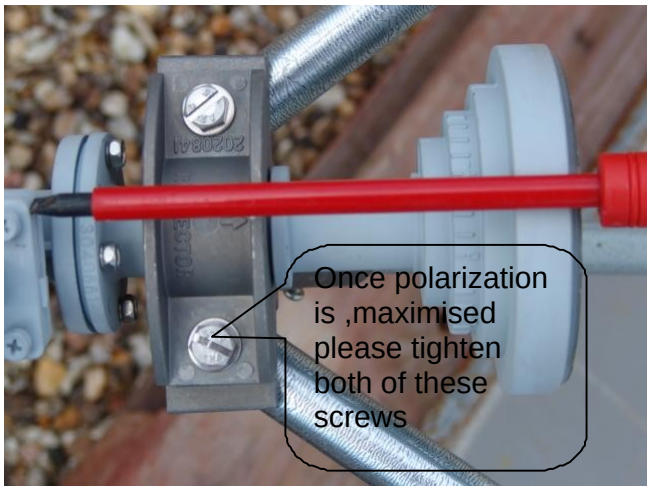
Horizontal polarization

Horizontal 0° Polarization



Horizontal -20°





- On the satellite Meter go back to the spectrum display and readout the level of the carrier selected for the polarisation.
- Fine adjust the AZ by slowly swiffeling ximum readout of the carrier level is reached.
- Fix the AZ screws tightly and dB.
- Fine adjust the Antenna Elevation Angle until the maximum readout of the carrier level.
- Fix the El screws tightly and verify that the value does not decrease by more than 0.3 dB.

- Make sure that the antenna is not moving

Disconnect the satellite meter cable form the RX connector of the transceiver,
Connect the TX cable to transceiver and satellite modem,
Connect the RX cable to transceiver and satellite modem,
Connect you laptop to the satellite modem with an Ethernet cable and
Power up the laptop and satellite modem.

Configure Network Connections of laptop to get IP address from DHCP server.

Wait for about 15 minutes maximum until the RX LED is on steady.

Important at the end of this step the RX LED needs to be on steady, If not refer to the section troubleshooting of the satellite terminal

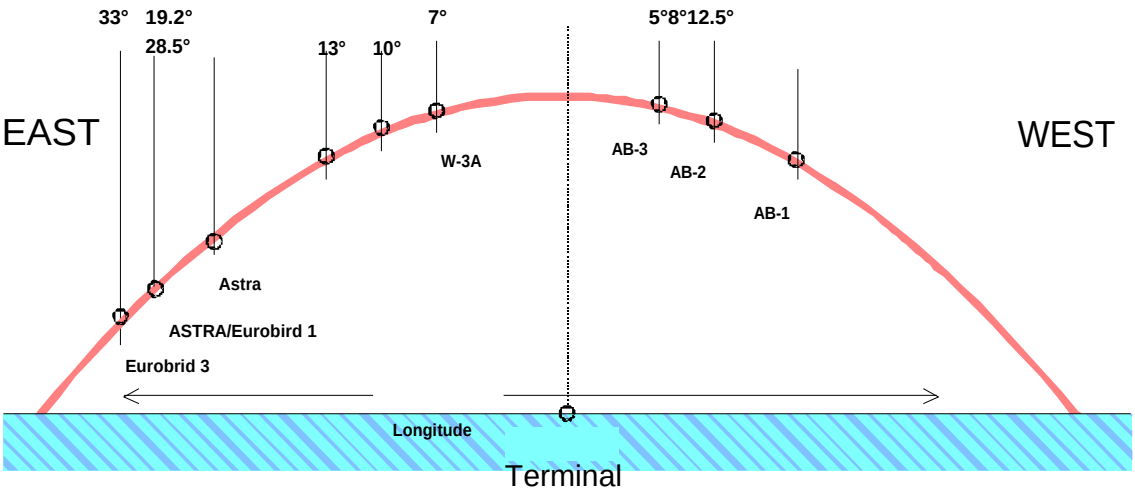
After finishing the work, please make sure that you leave the customer's place tidy and clean and that you have all your tools and waste produced either with you or at the customer's bin.

8.4 Pointing of the antenna to EB3 Spot C (High band LNB)

The following procedure describes how to find Eurobird 3 (EB3) on 33 ° East from pointing to Hot Bird 13° East.

In short the installation will proceed on the following steps:

- Find Hot Bird 13° East – Identify a TV channel
- Go to the ASTRA position 19.2° East - Identify a TV channel
- Go to ASTRA/Eutelsat Position 28.5° east - Identify a TV channel
- Finally go to EB3 on 33° East check carriers and optimise the pointing



8.4.1 Get you reference TV channels

Go to the URL: http://www.lyngsat.com/europe.html

Pointing to EB3 Spot A, D, (low band)	Pointing to EB3 Spot C (high band)
Identify digital TV channel non scrambled on **horizontal polarisation, low band (10.95 - 11.7 GHz)** on each position Hot Bird – ASTRA 19.2° East - 28.5° East	Identify digital TV channel non scrambled on **vertical polarisation, high band (11.7 – 12.75GHz)** on each position Hot Bird – ASTRA 19.2° East - 28.5° East

Note the relevant data of a TV channel

8.4.2 Adjust settings of the satellite meter to LNB LO frequencies

Usually satellite meters are pre-programmed for universal LNB's with LO frequencies 9.75 GHz for low band and 10.6 GHz for high band so the display shows the satellite downlink frequency.

4. Change the settings of the satellite meter to LNB Lo frequencies 10 GHz for low band and 11.3 GHz for high band

If not possible

5. Change the setting of the satellite meter to read the IF frequency directly.
   LNB LO frequency = 0.

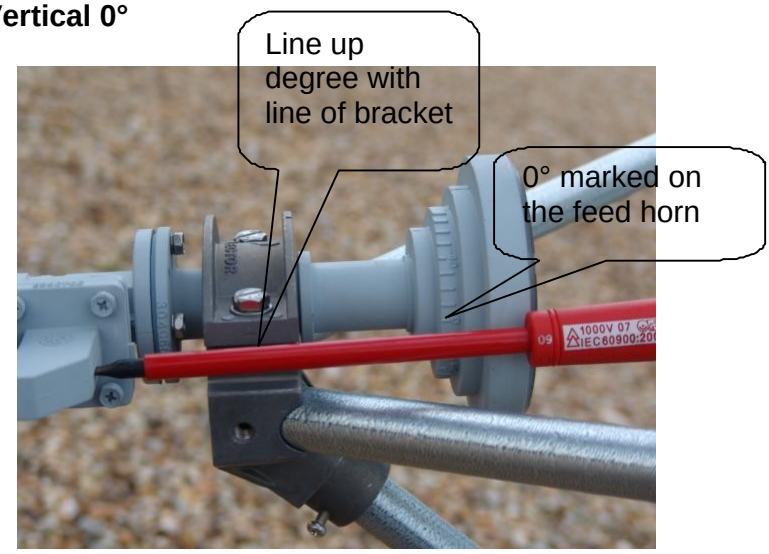
6. If it is not possible to change the LNB LO frequency setting please assume a 9.75 and 10.6 GHz presetting. In this case, it is necessary to calculate the correct frequencies as follows:

Displayed frequency on sat meter = Real downlink frequency + 250 MHz for low band
and
Displayed frequency on sat meter = Real downlink frequency + 700 MHz for high band

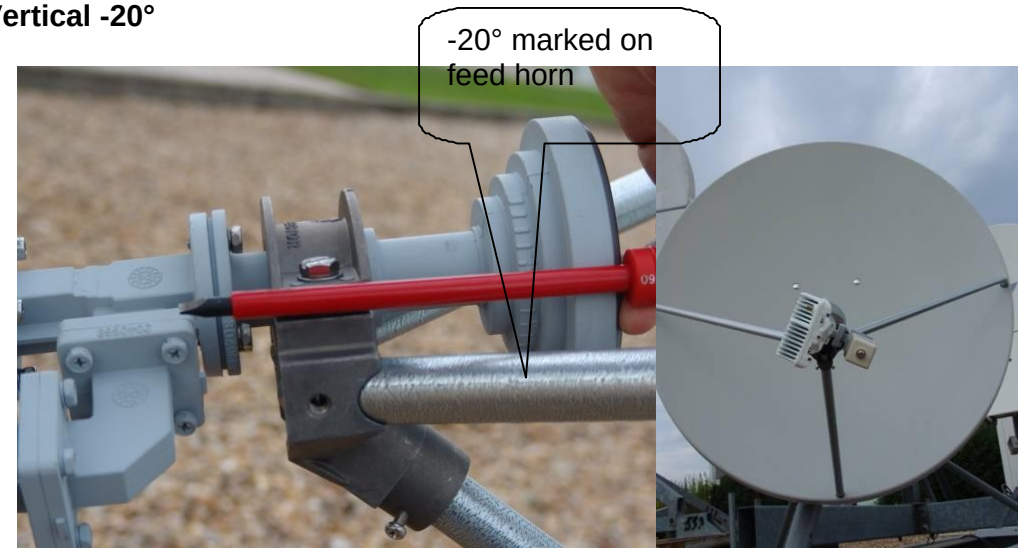
8.4.3 Rough Pointing

Vertical polarization

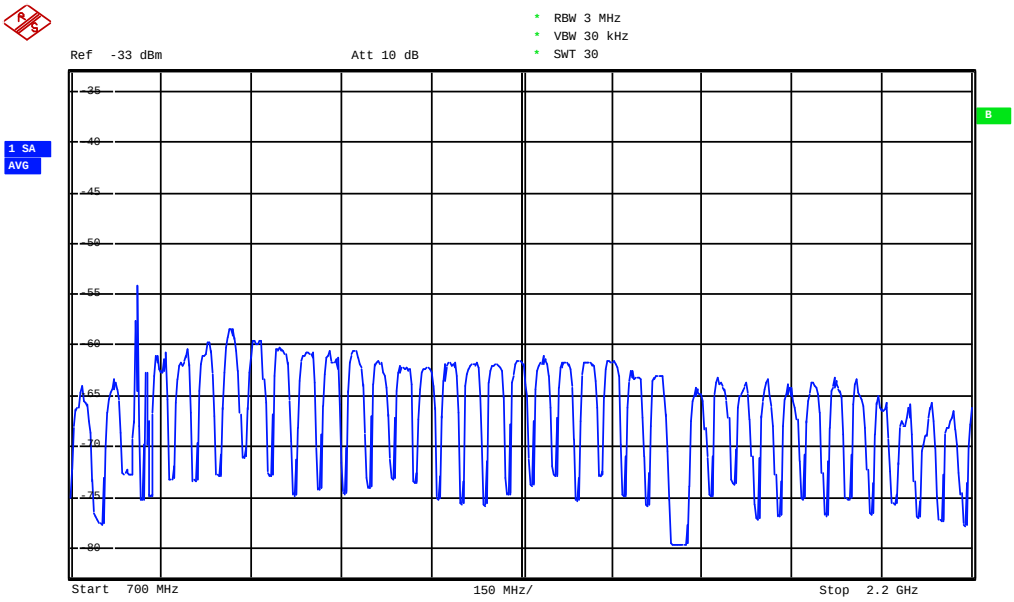
Vertical 0°



Vertical -20°



Point the antenna to Hot bird position 13° East, switch the sat meter to low band, the sat meter shall display digital TV carriers over the entire spectrum;



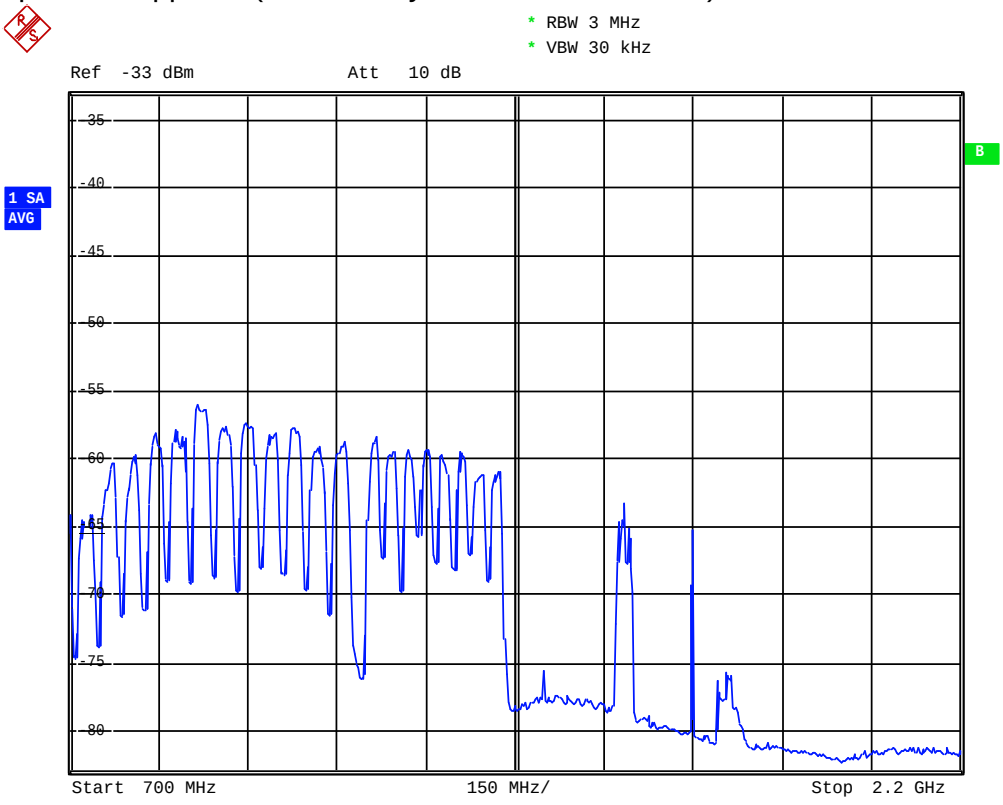
Date: 11.SEP.2008 16:32:25

Pick your selected TV carrier to check that the position is correct

Now reduce your elevation until you see the carrier levels reduce

Point to ASTRA 19.2° East High band

Stand behind the antenna and move the antenna about 5° to the left until the following spectrum appears (if necessary reduce the Elevation):



Date: 11.SEP.2008 16:26:29

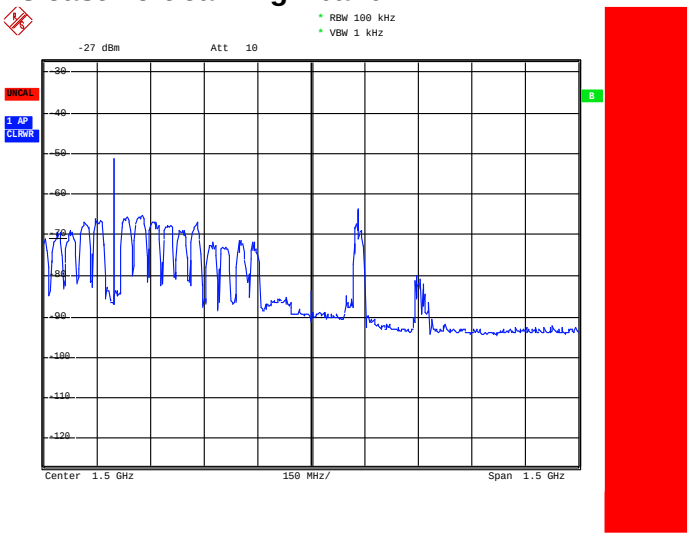
Analogue TV channels are in the lower frequencies rage.
Pick your selected TV carrier to check that the position is correct

Now reduce your elevation until you see the carrier levels reduce significantly virtually to the noise floor

Point to ASTRA/Eurobird 1 position 28.5° East

Stand behind the antenna and move the antenna about 10° to the left until the following spectrum appears (lower antenna Elevation as necessary):

28 east Verticall High band

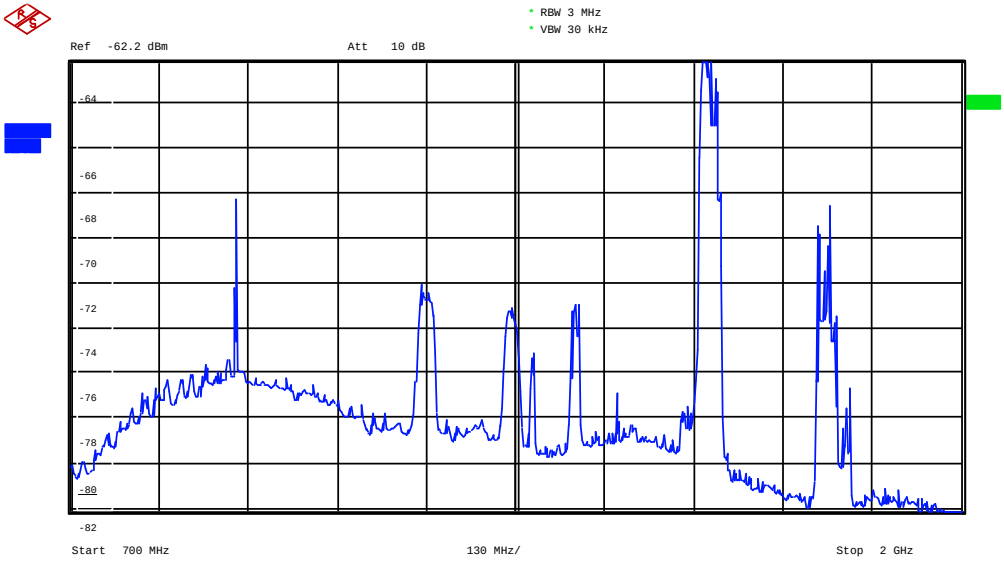


Date: 16.SEP.2008 15:29:20

Now reduce your elevation until you see the carrier levels reduce

Point to Eurobird 3 position 33° East

Stand behind the antenna and move the antenna about 5° to the left until the following spectrum appears (lower antenna Elevation as necessary):



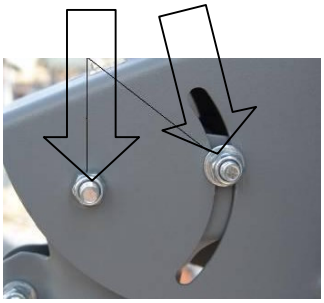
Date: 11.SEP.2008 16:00:08

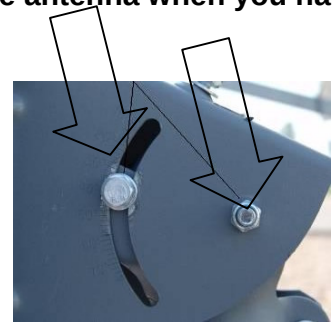
8.4.4 Pointing optimisation

Once got the correct satellite position, tighten the antenna fixation screws so that the antenna can be moved in Azimuth and Elevation but with minimum unnecessary movement.

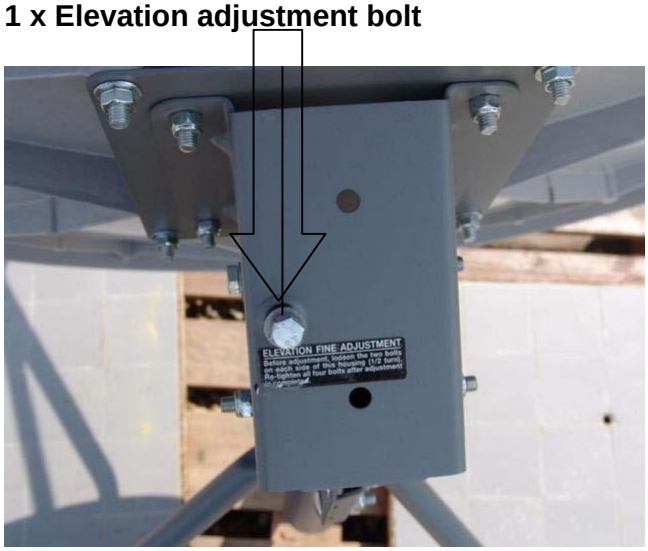
2 x Azimuth bolts securing antenna to pole or mount

4 x Elevation bolts which secure antenna when you have found satellite





1 x Elevation adjustment bolt



- Adjust roughly the AZ pointing by slowly moving the entire antenna
- Adjust the Elevation pointing (Make sure that the screws for adjusting Elevation are not tight)
- Depending on the service r
  Sat Meter and identify either DVB Carrier Spot A or DVB Carrier Spot D.
- The Sat Meter carrier i
- Skylogic 33° East EB3 “Spot A” or “Spot D”
- Read the BER of the carrier.
- Turn the Outdoor Electronics and the Feed to optimise the BER Value.

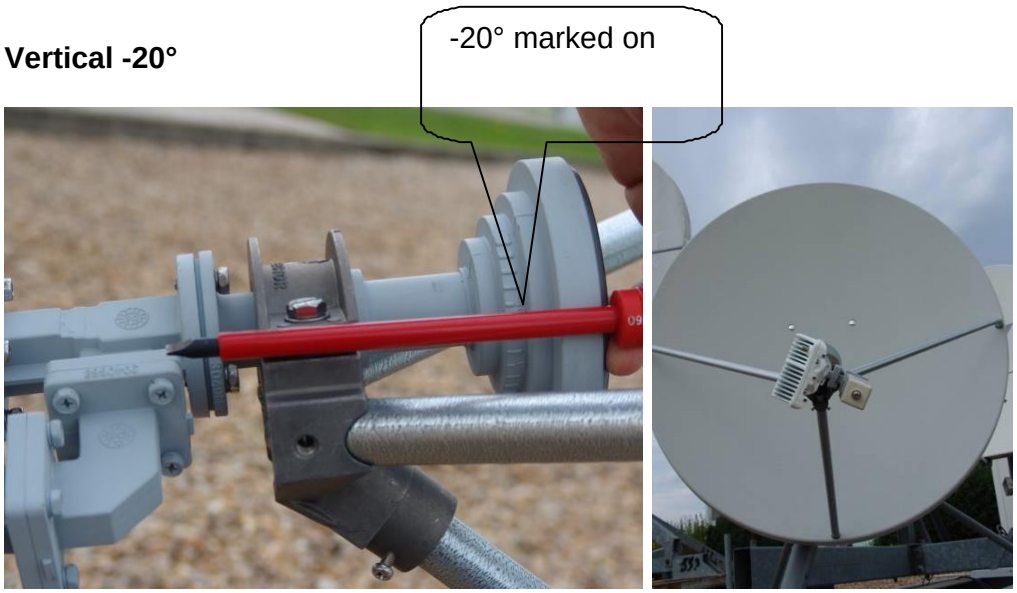
(Please note the BER Value should be as low as possible 10 e-3 10 e-4 10 e-5 or better) The value shall be at the minimum XX x 10 e-4 that means values like XX x 10 e-5 or XX x 10 e-6 are better.

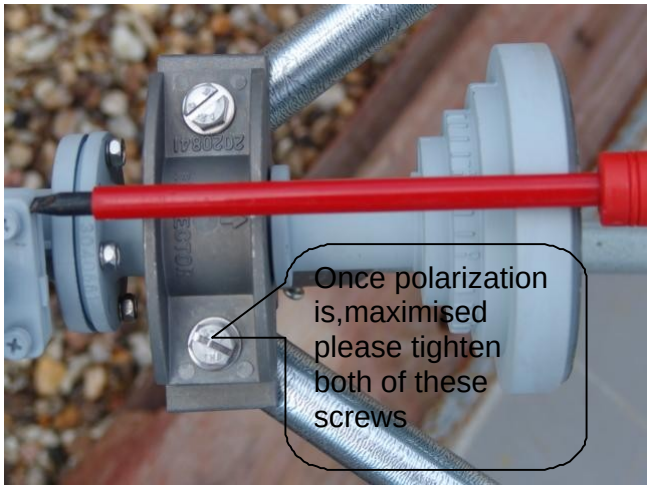
If it is not possible to reach a value of XX x 10 e-4 (that means the value is at XX x10e-3) It is necessary to change the place of installation or go for a bigger antenna.

The accuracy of the polarisation adjustment should be within 1°. Once the best value is found fix the screws that hold the feed.

8.4.5 Vertica Polarization

Vertical -20°





- On the satellite Meter go back to the spectrum display and readout the level of the carrier selected for the polarisation.
- Fine adjust the AZ by slowly turning mum readout of the carrier level is reached.
- Fix the AZ screws tightly and verify that the value does not decrease by more than 0.3 dB.
- Fine adjust the Antenna Elevation Angle until the maximum readout of the carrier level.
- Fix the El screws tightly and verify that the value does not decrease by more than 0.3 dB.
- Make sure that the antenna is not moving


VISIOSAT
www.isatellite.co.uk
www.europe-satellite.com
www.europe-satellite.com


www.europe-satellite.com

Disconnect the satellite meter cable form the RX connector of the transceiver,
Connect the TX cable to transceiver and satellite modem,
Connect the RX cable to transceiver and satellite modem,
Connect you laptop to the satellite modem with an Ethernet cable and
Power up the laptop and satellite modem.

Configure Network Connections of laptop to get IP address from DHCP server.

Wait for about 15 minutes maximum until the RX LED is on steady.

Important at the end of this step the RX LED needs to be on steady, If not refer to the section troubleshooting of the satellite terminal

After finishing the work, please make sure that you leave the customer's place tidy and clean and that you have all your tools and waste produced either with you or at the customer's bin.

9 The carrier acquisition process and log in to the network

9.1 Pre adjusted parameters by Skylogic

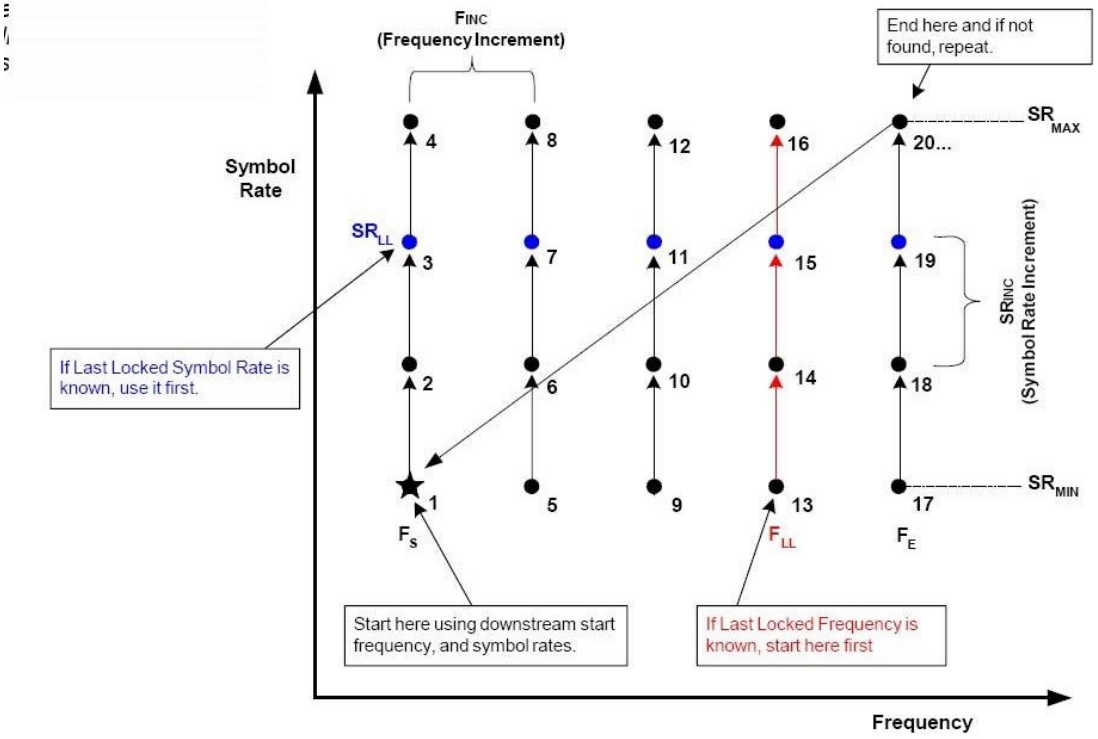
Command[1]	Parameter	Purpose
downstream-frequency	**Start Frequency in MHz (F_S) (default: 950)**	Specifies the downstream (SM receive) start frequency limit used in search. Also see the **last-ds-freq** command.
	End Frequency in MHz (F_E) (default: 1700)	The end frequency limit used in search
	Frequency Increment in MHz (F_{INC}) (default: 10)	The frequency step size used in search
last-ds-freq	**Last Locked (Downstream) Frequency in Hz (F_{LL}) (default: 0)**	Specifies the last locked downstream frequency. May be used to reduce search time if downstream frequency is known. The search for downstream frequency will start with this frequency unless a value of "0" is entered. If "0" is entered, the SM starts the search with the downstream-frequency entered with the **downstream-frequency | Enter start frequency in MHz** command.
downstream-symbol-rates	**Min. Symbol Rate in Msps (SR_{MIN}) (default: 5)**	Specifies the downstream (SM receive) minimum symbol rate limit used in search. Also see the **last-ds-sym** command.
	Max. Symbol Rate in Msps (SR_{MAX}) (default: 15)	The maximum symbol rate limit used in search
	Symbol Rate Increment in Msps (SR_{INC}) (default: 10)	The symbol rate step size used in search
last-ds-sym	**Last Locked (Downstream) Symbol Rate in symbols-per-second (SR_{LL}) (default: 0)**	Specifies the last locked downstream symbol rate. May be used to reduce search time if downstream symbol rate is known. The search for downstream symbol rate will start with this rate unless a value of "0" is entered. If "**0**" is entered, the SM starts the search with the downstream-symbol rate entered with the **downstream-symbol rates | Enter Min. Symbol Rate in Msps** command.
upstream-search	**Frequency Search Offset in MHz (F_{MAX}) (default: 0.045)**	The maximum offset frequency in MHz from nominal frequency that the SM will use in its search for upstream lock.
	Number of Frequency Search Steps (F_N) (default: 19)	The total number of frequency appraisals to be made over ± F_{MAX} range.
	Max. Power in dBm (P_{MAX}) (default: 0)	The highest power to be used in the upstream search, in dBm (This is not necessarily equal to the highest possible SM power output).
	Min. Power in dBm (P_{MIN}) (default: -10)	The lowest power to be used in the upstream search, in dBm (This is not necessarily equal to the lowest possible SM power output).
	Number of Power Search Steps (P_N) (default: 2)	The total number of power levels to be appraised between P_{MIN} and P_{MAX} during upstream search.

9.2 Searching for the Channels and Registering the SM

Each time the SM is powered on, the program automatically searches for the downstream and upstream channels. The program first searches for the downstream channel and then searches for the upstream channel. The first time the SM is powered on from the factory, it uses the factory default values as indicated

9.2.1 Downstream Search

The first time the SM is powered on from the factory, the program uses the default values to automatically scan over the full range of receive frequencies between 950 and 1700 MHz in 10 MHz increments (steps). At each downstream frequency tested, the SM will attempt to acquire a downstream frequency at predefined symbol rates over the entire frequency band. The process repeats until the downstream channel is found.

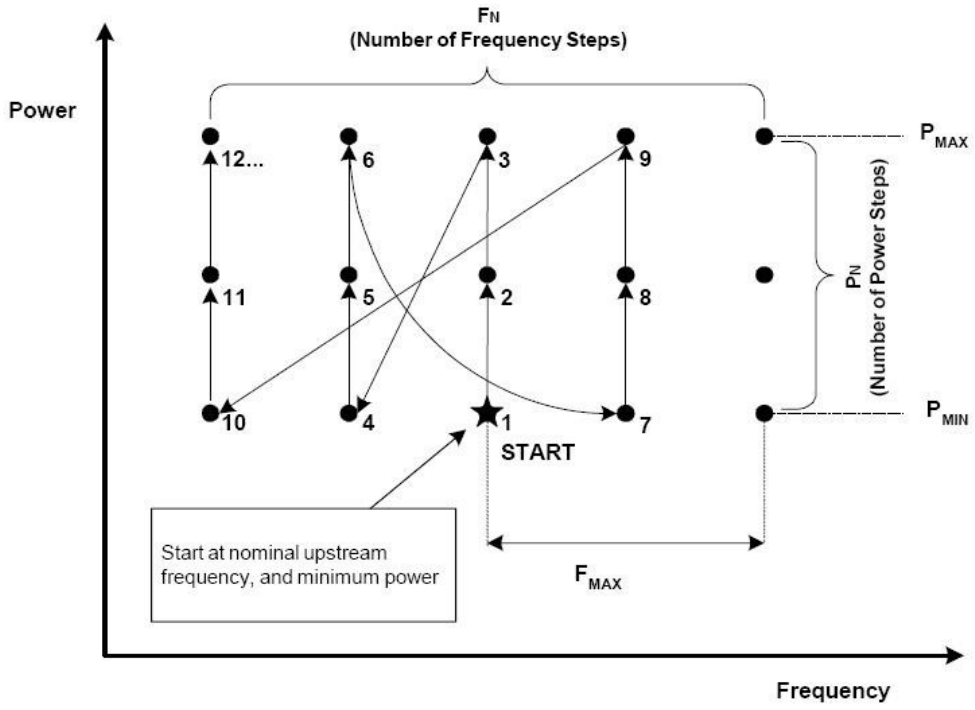


The SM-1100 (Ku-Band) will look for predefined symbol rates of: 25, and 20 Msps. If the cannot find the predefined symbol rates it also look for 5, 10 and Msps.

9.2.2 Upstream Search

After the downstream channel is found, the SM program attempts to register with the gateway on an upstream channel. The program waits to acquire Upstream Channel Descriptors (UCDs) on the downstream channel and builds a list of upstream channel frequencies and symbol rates from those messages.

The program then chooses one of the frequencies from the list as the nominal frequency, tunes the transmitter, and attempts to range and register on that frequency. If the program is unable to range on a frequency, it attempts to range and register on various neighbouring frequencies within a ± 45 kHz range using a default step size of ± 5 kHz.



10 Trouble shooting Satellite Terminal

Symptom
PWR Indicator - Does Not Light
RX Indicator – 1 Flash Continuously
RX Indicator – 2 Flashes Continuously
RX Indicator – 3 Flashes Continuously
RX Indicator – On but Cannot Access Internet
TX Indicator - Does Not Flash During Upstream Transmission
LAN Indicator - Does Not Flash or Light
RX Indicator - Flashing Very Fast

10.1 PWR Indicator – Does not light

Check that Sate Modem is Power connected. => OK?
Unplug Power connection, wait for one Minute and plug it again => OK?
Change Modem or call Help Line

10.2 RX indicator – 1flash continuously => Terminal not acquiring downstream

(more than 20 minutes)

Check cables Satellite Modem and ODU and swap cables => OK?
Check DC Power at the RX input of Transceiver => OK?
Check antenna Pointing => OK?
Check weather conditions => OK?
Unplug Power connection, wait for one Minute and plug it again => OK?
Change Modem or Transceiver or call Help Line

10.3 RX indicator – 2flash continuously=> Downstream acquired, trying to range

Check antenna Pointing => OK?
Check weather conditions => OK?
Change Transceiver => OK?
Unplug Power connection, wait for one Minute and plug it again => OK?
Change Modem or call Help Line

RX indicator – 3flash continuously => Ranging OK, Terminal tries to register

Unplug Power connection, wait for one Minute and plug it again => OK?

Change Modem or call Help Line

10.4 TX indicator - Does not Flash during Upstream Transmission

TX indicator flashed shortly during power up => No, change modem
Possible to surf the Internet => Yes, change modem
Unplug Power, wait for one Minute and plug it again => No, call Help Line

10.5 LAN indicator does not flash or light

Check Ethernet Cable => OK?
Check computer network configuration => OK?
All other indicators as for nominal operation? => YES
Unplug Power, wait for one Minute and plug it again => OK?
Change Modem or call Help Line

10.6 RX indicator On but cannot access internet

Check that only one computer is connected to satellite modem => OK?
Unplug Power, wait for one Minute and plug it again => OK?
Change Modem or call Help Line

10.7 RX indicator flashing very fast => Terminal boot failure

Unplug Power connection, wait for one Minute and plug it again => OK?
Change Modem or call Help Line

11 Terminal Self activation pre-registration

The Tooway service procedures are focussing on supporting a big amount of terminals and installations per distributor with standard service accounts in a low cost automated way.

Pre-registration

Satellite terminals

Upon arrival of the bulk, of ordered terminal hardware the distributor pre-registers at Skylogic the MAC address of all satellite modems received.
This gives information about the modems that will be installed in the next time and is imperatively required for the self activation process. The MAC pre-registration has no further commitment nor any associated cost for the distributor.

Service accounts

In relation to the number of terminals pre-registered and the distributors market assumptions the distributor requests Skylogic to open a number of accounts for the different service classes he offered. The maximum number should not exceed the number of service classes' times the number of terminals pre-registered. As the service accounts are still not activated this has no further commitment nor any associated cost for the distributor.

For each service account, the distributor receives two numbers form Skylogic:
the **Satellite Account Identifier (SAI)** and the **PIN** number.
The PIN number consists of a pre**fix (identifier of the distributor)** and a **Serial Number.**

The SAI number is for the distributors internal account administration whereas the **PIN** number is necessary for the terminal self-activation. Consequently, either the final customer and/or the installer need to have this number.

Skylogic can allow the distributor to choose the format and length of both numbers. Only characters and numbers are allowed.

In this stage, the terminal MAC address is not jet linked to a service account, the terminal modem is in the state **"Unprovisioned".**

The self-activation process links a terminal MAC address to a service account, the satellite modem is than in the state **"Provisioned**", the account activated and from that moment, Skylogic bills for the service.

12. Self Activation Procedure

The SelfActivation procedure allows for the activation of tooway™ accounts on unprovisioned Terminal; this procedure is based on automatic operations between the Terminal and the tooway™ platform, and requires a very minimal intervention from end user (or installer) through a self guided web interface.

SelfActivation can be performed either at first activation, or in other cases (e.g. Terminal swap).

Aim of the SelfActivation is to:

- to verify a series of connectivity parameters;
- to bind an unprovisioned Terminal to a tooway™ account and its service class through end user authentication.

SelfActivation pre-requirements are:

- a valid account is already created on OSS, and its Locking Status is “Not Locked”;[1]
- Equipment installation (antenna, cabling, terminal) on end user site meet specifications.

[1] By default, for tooway™ standard products, all “*free”* Accounts are set on “*Not Locked*”

12.1 The Satellite Terminal Activation Interface

The SelfActivation procedure can be initiated through the Satellite Terminal Activation Interface, a web interface automatically available to any CPE (*Customer Premise Equipment*) connected via Ethernet to an un-provisioned Terminal; end users are not required to install any specific software.

In order to access to this interface, it is necessary to check the following conditions:

- Tooway™ terminal must be synchronized (online) into the tooway™ network; this requires:
  - a proper ODU (Outdoor Unit) installation and pointing,
  - that the Terminal is properly connected to the ODU;
  - that the Terminal is properly connected to a DC supplier;
  - that the Terminal RX led is stable.
- Then it is needed to verify that end user CPE is properly connected to the Terminal through an Ethernet straight cable (please verify that TCP/IP configuration on the CPE is in automatic mode for both IP and DNS); end user CPE must have installed an internet browser (e.g., IExplorer, Firefox, or Opera).

Then, as soon as the end user tries to reach any web site, he/she will be automatically redirected to the *Satellite Terminal Activation Interface* (see *Figure 1*), and the SelfActivation procedure starts.

NB: once in the Satellite Terminal Activation Interface, end users may change the language through the options on the top-right of the page; it is possible to change as needed between English, German, French, Italian, and Spanish.

12.2 Step 1

SelfActivation procedure initiates when the end user clicks on the "*Activate*" button on the Satellite Terminal Activation Page:

• if the antenna dish is well pointed and SNR (Signal to noise Ratio) values are acceptable, it will then appear the message shown in screenshot at Figure 1.

• If not so, it will be displayed a message informing on the bad SNR value; in these cases end users are suggested to contact their distributor contact point to request for further assistance.

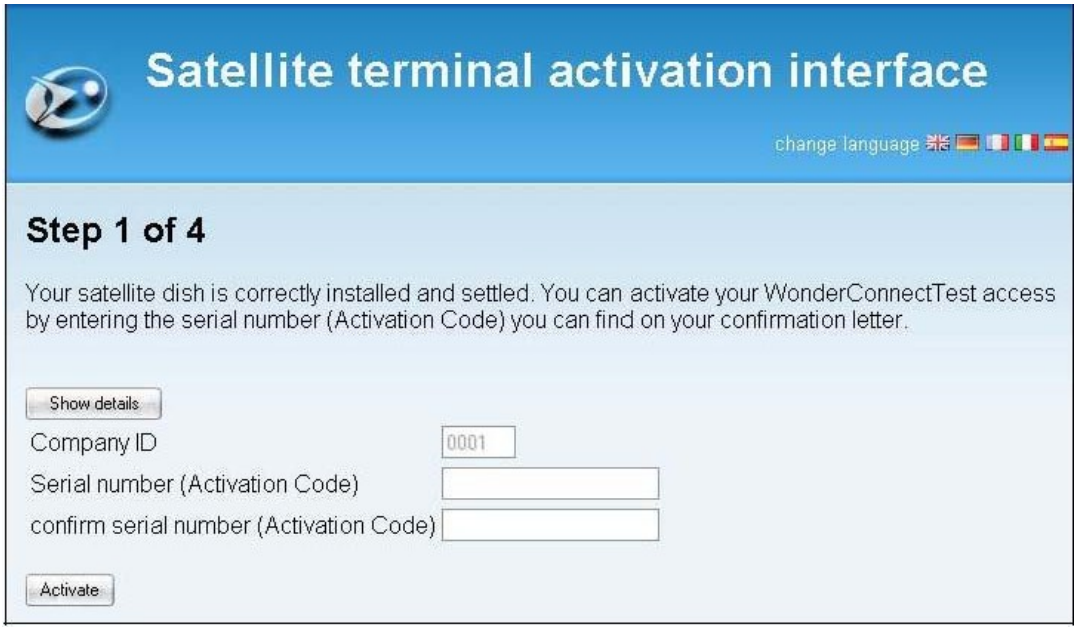


Figure 1 – Satellite Terminal Activation Interface – Step 1

If needed to have details on current RF (Radio Frequency) details, such as, RX and TX power in dBm and Upstream SNR value, it is now possible to click on the "*Show Details*" button.

If the terminal has been properly registered in advance in Skylogic OSS (Terminal Registration), the "*Company ID*" *(previously known as Prefix)* field will be already pre-filled and it will be grey back grounded, otherwise this field will be empty and, in order to proceed, it will be needed to insert the "C*ompany ID*" string manually.

After typing the "Activation Code" (previously known as Serial Number) in the text field, end user shall click on the "*Activate*" button, so that all information can be sent to Skylogic OSS for verification.

12.3 Step 2 and 3

If all data are confirmed to be valid, the end user will be displayed of a confirmation page (*Figure* 2); to proceed it is now needed to click on "*Next*" button in order to reboot the terminal and let it load the new service configuration file sent remotely by the system (see *Figure 3*):
If, diversely, the end user has inserted a wrong "*Company ID*", or "Activation Code*"* the message shown at Figure 4 will appear.

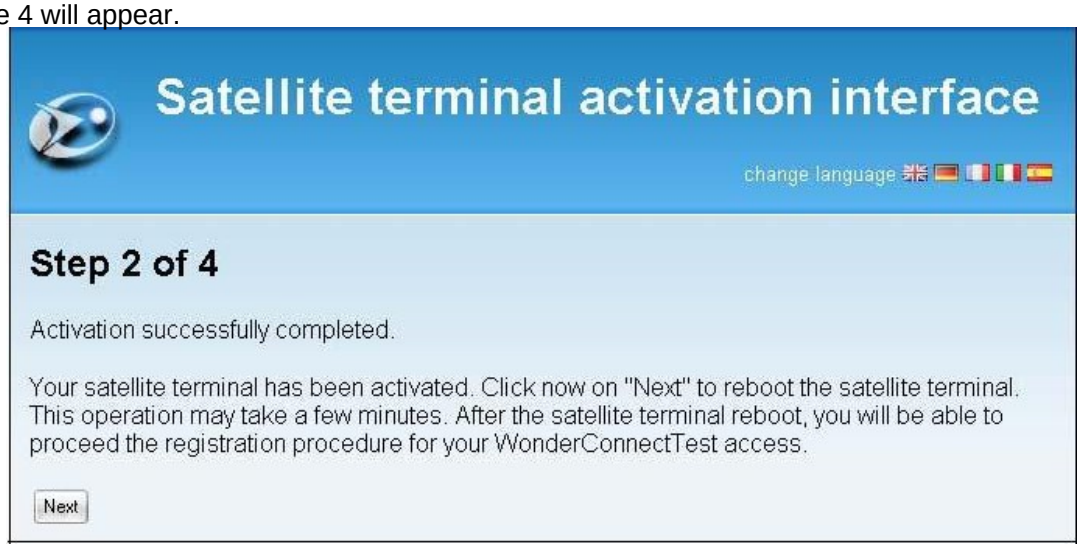


Figure 2 – Confirmation Page

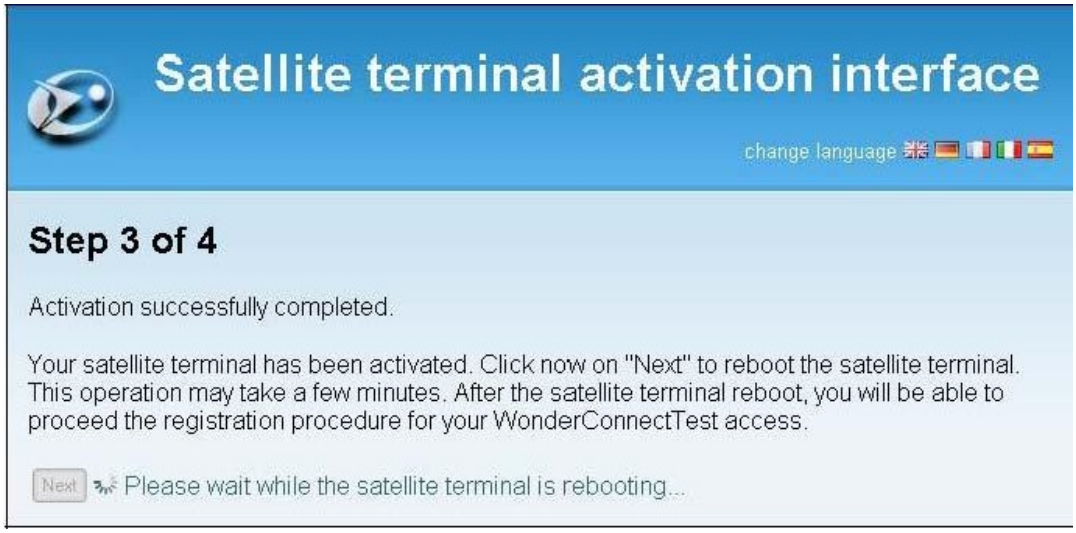


Figure 3 – Terminal Reboot

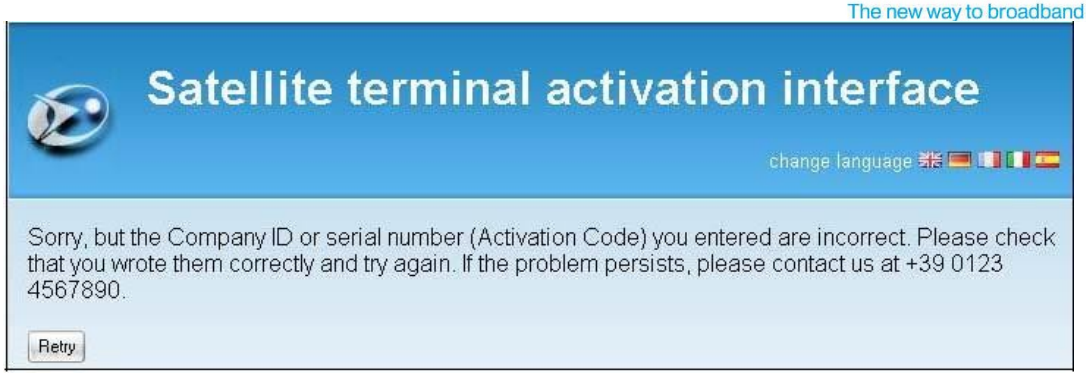


Figure 4 - Error Message Page

12.4 Step 4

After the reboot, the following page will appear (see *Figure 5*): service has been properly activated; end user may commence to browse the internet, and SelfActivation procedure has been successfully completed.

Figure 3 – Activation Confirmation Page

13 List of literature used:

Surf beam satellite modem Installation and configuration guide, Release 3.2, Viasat

System Integration installation documents

Eutelsat and Skylogic internal presentations