PRODUCT DESCRIPTION
FOR
COMPACT SSA

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VERSION 1.0

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Version History

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Authorized Distribution

Version	Description
Version 1.0	Customer, Agent, VASTech

Content

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1 INTRODUCTION

1.1 SCOPE OF DOCUMENT

In this document VASTech provides an overview of a COMPACT SATELLITE SIGNAL ANALYZER (Compact SSA).

1.2 DOCUMENT LAYOUT

This document contains:

- System requirements for such a typical solution, in par. 2;
- An overview of the solution offered, in par. 3;
- Protocol description supported by the solution in par. 4; and
- The Customer Furnished Equipment (CFE) and other assumptions that have to be met for the deployment of this solution is described in par. 5.

1.3 CONFIDENTIALITY AND DISTRIBUTION

This document is provided in confidence and is authorized for distribution only to the parties indicated on page ii.

1.4 BACKGROUND

The VASTech SSA is able to lock on the detected satellite frequencies; providing the protocol tree for each frequency, with access to the content (audio, data, internet, DCME, etc) for the purpose of analysis and determining the "**intelligence value"** of these satellite carriers. The intelligence extraction is typically done using a full scale satellite listening post consisting of many large satellite antennas with a fully configured and high capacity SSA (e.g. a Full SSA).

Before investing in such a Full SSA many customers would like to make a smaller initial investment to test this "**intelligence value**" and for these customers VASTech has created the Compact SSA.

The Compact SSA allows agencies to quickly connect in the L-Band output of the Satellite Monitoring Station to quickly identify and classified the polarizations, frequencies, modem parameters up to the protocol tree.

Content analysis is possible; accessing the audio and the Internet sessions of specific carries as well as identifying of DCME terminal types uses between countries and decompress the mono DCME carrier to enable the user to listen to the decompressed audio for the purpose of analysis. Point codes also are available, indicated the country of origin and destination, when signalling is present inside the carrier. After complete information is extracted, the Monitoring Agency can make firm decisions of which satellite to intercept, based on the intelligence provided by the SSA system.

1.5 REASONS FOR USING SATELLITE MONITORING

Satellite monitoring is one of the easiest ways in which a Monitoring Agency located in one area can monitor the telecommunications taking place in another area where they might not have physical access to the telecommunications network being monitored. For example, the Monitoring Agency might deploy a number of Compact SSA stations in the white areas in Figure 1 to monitor the telephony traffic in the pink areas being served by the same satellite spot beams.

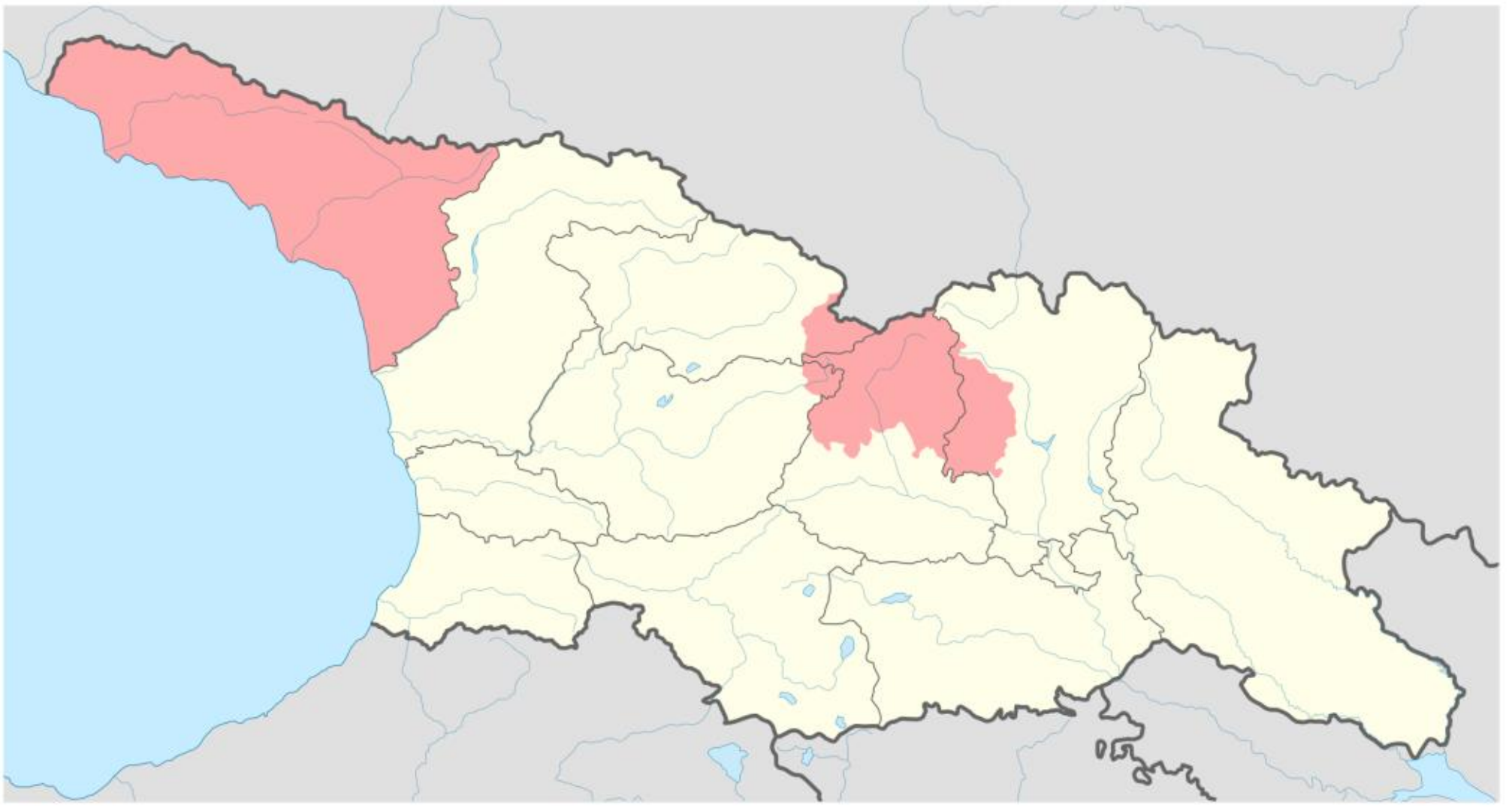

Figure 1: Monitoring telecommunications traffic in the pink areas from the white areas

Placement of the different mobile stations will be critical to uncover the maximum intelligence value from the satellite signals. Survey work, prior to project deployment, will ensure that the correct locations are selected.

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2 REQUIREMENTS AND ASSUMPTIONS

2.1 REQUIREMENTS

The capability delivered with a Compact Satellite Signal Analyzer system includes:

- ✓ Scan and Analysis of 1 x C-Ku band satellite polarization;
- ✓ Retention of content for a period of two days;
- ✓ Administration workstation for configuration; and
- ✓ Operator workstation for analysis.

3 SOLUTION OFFERED

The proposed Compact SSA system is shown below.

Height 17.75"h

Width 19"w

Depth 30"d

Figure 2: Compact SSA System *

* Picture for illustration purpose only. Final System may divert from the above illustration. L-Band splitter and digital KVM switch not included in this representation but are part of the Bill of Material. See BOM part 3.1

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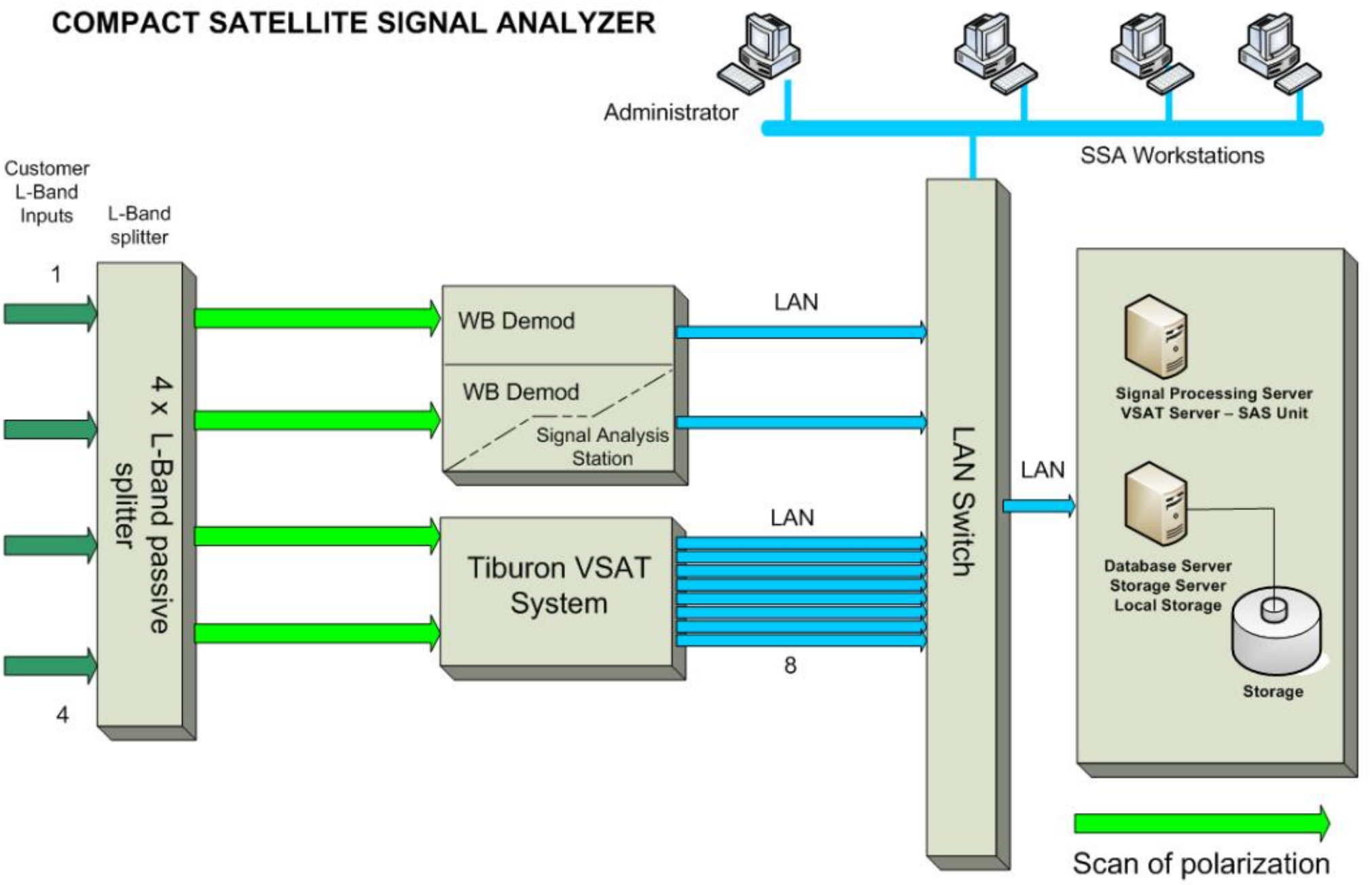

Figure 3: SSA Building Blocks *

* Picture for illustration purpose only

As a general rule on satellite antennas and scanning of signals:

"The bigger the antenna the better the results that the user can expect"

Ideally 18 metres or bigger scanning antenna is the preferable option when the target signals are located in global beams. Typically, global beams are established between communications through antennas with large diameter (e.g. 18 - 30 meters) allowing the satellite operator to transmit and receive with a minimum of energy required, thus for scanning and interception if the user aim to scan these type of links, often the limitation on the antenna size plays a major role. This is a primary consideration when using the Full SSA.

Smaller antennas are suitable for signals concentrated in regional or zone beams. And these are typically the beams that will be investigated using the Compact SSA.

3.1 BILL OF MATERIAL (BOM)

- 1 (one) portable rack mount case with wheels (17.75" x 19" x 30") 10U
- 1 (one) Tiburon / Wideband Demodulator card *rack (4U) *new hardware design
- 2 (two) New generation Wide band demodulator card set (46 Mbaud), including 2 x L-Band inputs

- 1 (one) Tiburon card set with 8 demodulators with VSAT inbound demodulation capabilities (5.6 Mbaud), including 2 x L-Band inputs
- 1 (one) L-Band RF passive splitter (4 ports)
- 2 (two) processing servers Dual Processor Quad core, 1U each.
- 1 (one) rack mounted LCD 17" screen, mouse and keyboard
- 1 (one) Digital KVM switch (2-4 ports)
- 1 (one) Managed LAN switch (12 ports)
- 1 (one) Administrator Workstation Desktop or Laptop

This configuration will allow an Administrator to do full analyses of one (1) polarization or one (1) set of C-Ku Band satellite signals.

Please kindly note that the Signal Analyzer Station (S.A.S.), components on the S.S.A. that allows the user to tweak the configuration and signals, uses one channel of the two channels of the Wide Band demodulator. This means that when the user is using the SAS functionality, the system will have one Wide Band channel available for Wide Band frequencies and scanning.

3.2 DELIVERABLES RELATED TO THE COMPACT SSA

3.2.1 SSA System

The Satellite Signal Analyzer consists of two Quad Core, Dual Processor 1U server, or similar. These servers load-share the different software components, including the Processing Server, Domain Controllers, Signalling System Server, Database server, File Server, and local storage. The OS runs on 64 bits for all processing servers, allowing multi-core utilization for the load-sharing, as well as balancing processing capability.

The SSA is contained in one dedicated 4U chassis. This chassis hosts the Medium Band Demodulator (Tiburon System), providing fully independent channels with 8 logical channels. The 4U chassis will also host the dual channel new generation Wideband demodulator card, with 1 x wide band stereo carrier capacity (or 2 channels of one direction). One of the Wideband card channels can be utilized as Signal Analysis Station (SAS), providing SAS capabilities. This dual configuration allows the Administrator to use two Wideband channels or change the configuration to set one Wideband channel and one channel for the use of the SAS unit, for Signal Analysis, if required.

The compact SSA will be mounted in a portable 10U case, fitted with wheels. The system will also include a 1U rack mounted LCD screen, keyboard and mouse, a digital KVM switch and a 12 port LAN switch.

3.2.1.1 L-Band Splitter (Passive 4 Port)

For minimum configuration a 4 port L Band splitter will be included. This will allow the customer to connect up to 1x polarization /1 x C-Ku Band inputs. The user can scan any polarization by changing the input of the passive L-Band splitter.

3.2.1.2 Wide Band Demodulator

The wideband demodulator (WBDEM) receives, demodulates and analyses satellite BPSK, QPSK, OQPSK, 8PSK, 8QAM and 16QAM signals with data rates from 64 kbps to 140 Mbps. The standard wide band demodulator can lock on DVB, DVB-S and DVB-DSNG satellite signals but not DVB-S2 signals. DVB-S2 signal are demodulated by using the DVB Demodulator. DVB-S2 demodulator is not included in this proposal.

The WBDEM delivers processed streams to a processing server for decoding and processing of various protocols. Proprietary protocol is used for transmitting streams of processed data over the LAN network.

3.2.1.3 Signal Analysis Station

The Signal Analyzer Station (SAS) performs signal analysis in automated and manual mode, providing enhanced real-time tools for manual signal analysis. The SAS is capable of providing detection of signal centre frequency, bandwidth of signal; S/N ratio, modulation type, and symbol rate of each carrier provided that the received carriers have acceptable S/N ratios on the selected satellite polarization.

The Signal Analyzer Station (SAS), when in use, will utilize one of the channels of the Wideband card with dual channels included. In this setup the system will have one Wideband channel and one SAS channel, plus one Tiburon card set with 8 channels output.

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3.2.1.4 Medium Band Demodulator

The Medium Band Demodulator (Tiburon System) is a multi-channel system for receiving and demodulating multiple satellite carriers on one receiver card.

The receiver subsystem can consists of 1 x receiver cards where the receiver cards have dual 70 MHz IF inputs and are capable of demodulating up to 4 independent satellite signals per IF (x logical channels in total) with a symbol rate up to 2.5 Mbaud from each one of the 70 MHz inputs. The 4 x signals must be located within 36 MHz bandwidth.

A Voltage Controlled Oscillator (VCO) provides a stable clock to all receivers and down converters.

The cluster demodulates BPSK, QPSK, OQPSK, 8PSK, 16QAM and 8QAM signals and decodes Viterbi (Intelsat, DVB), Sequential, RS, Trellis and Turbo Product Codes in conjunction with the processing server software module.

The Tiburon can monitor inbound signals from Hughes Personal Earth Station PES 5000 terminals (VSAT). It decodes the IP protocol and extracts content of inbound traffic. The system can simultaneously process up to 8 inbound signals with symbol rates up to 256 kbps, if the customer receiver card is equipped with 8 channels.

The Medium Band Demodulator included in the Compact SSA supports the following:

- VSAT Hughes TES/PES Outbound/Inbound processing function (IP base traffic - Exclude any encryption),

When deployed with a Wideband Demodulator, the SSA can simultaneously process 8 inbound and 1 outbound signal of the following Hughes equipment: standard ODLC multiplexing equipment (HUB) and TES/PES 5000 VSAT terminals.

This Compact SSA also includes support for the following:

- VSAT GilatDailWay - Outbound processing function (modified Viterbi, Gilat Frame, FrameRelay) (Exclude any encryption / security). Inbound capability is under development.
- VSAT iDirect Outbound/Inbound processing function (NetModem protocol, Inbound Turbo coder, Inbound framer, exclude NetModem security)

4 SSA - PROTOCOLS IMPLEMENTED

Below is list of protocols that have been implemented for processing by the SSA:

Feature	Notes
Modulation	
BPSK	Implemented
QPSK	Implemented
O-QPSK	Implemented
TPSK/8-PSK	Implemented
8-QAM	Implemented
16-QAM	Implemented
16-APSK	For DVB type signals
32-APSK	For DVB type signals
DVB-S2(ACM,CCM)	For DVB type signals
Error Correction Code	
Reed-Solomon Code (RS):	
126/112	Implemented
194/178	Implemented
204/188	Implemented
208/192	Implemented
219/201	Implemented
225/205	Implemented
204/188/8 (DVB-S)	Implemented
160/146 (DVB-S)	Implemented
Convolutional encoding	
Viterbi:	
[1/2]	Implemented
[2/3]	Implemented
[3/4]	Implemented
[4/5]	Implemented
[5/6]	Implemented
[7/8]	Implemented
Viterbi DVB:	

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Feature	Notes
[2/3]	Implemented
[3/4]	Implemented
[4/5]	Implemented
[5/6]	Implemented
[7/8]	Implemented
Gilat:	
g[1/2]	Implemented
g[2/3]	Implemented
g[3/4]	Implemented
g[4/5]	Implemented
g[5/6]	Implemented
g[7/8]	Implemented
Convolutional code with interleaving(HNS):	In development
i[1/2]	
i[2/3]	
i[3/4]	
i[4/5]	
i[5/6]	
i[7/8]	
Sequential Systematic Code (SSC):	Implemented - PES
[1/2]	Implemented - PES
[3/4]	Implemented - PES
[7/8]	Implemented - PES
DSNG (TPSK):	
[5/6]	Implemented
[8/9]	Implemented
Turbo Product Code (TPC):	
[1/2](28,22)x(32,26)x(4,3)	Implemented
[1/2](32,26)x(32,26)x(4,3)	Implemented
[3/4](58,51)x(56,48)	Implemented
[3/4](64,57)x(15,13)	Implemented
[3/4](64,57)x(46,39)	Implemented
[7/8](16,15)x(16,15)	Implemented

Feature	Notes
[7/8](32,24)+(128,120)x(127,119)	Implemented
[0,49](32,26)x(32,26)x(4,3)	Implemented
[0,53](32,26)x(32,21)	Implemented
[0,79](64,57)x(64,57)	Implemented
[0,79](64,57)x(64,57)	Implemented
[0,88](128,120)x(128,120)	Implemented
[0,94](64,63)x(63,61)	Implemented
[0,66](32,26)x(32,26)	Implemented
[0,79](64,57)x(64,57)	Implemented
Trellis	Implemented
LDPC	In development
Scrambler	
Additive	
[11,9] (Edmac)	Implemented
[15,14] (RS-I, RS-DVB, IBS)	Implemented
[12,9,3,2]	Implemented
Multiplicative	
[20,3] (v.35)	Implemented
DVB	Implemented
Intelsat IBS	Implemented
Framing	
IBS	Implemented
IBS with variable periods	Implemented
IDR	Implemented
G.704	Implemented
DVB-S	Implemented
DVB-S2	Implemented
Edmac (1008;2928)	Implemented
Gilat	Implemented
Hughes (In route, Out route)	Implemented
Framer 16	Implemented
Framer 32	Implemented

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Feature	Notes
VSAT	
Hughes (HNS) PES	Inbound/Outbound
Hughes TES (ICC, OCC, SCPC)	Inbound/Outbound
GilatDailWay	Outbound only Inbound in development
GilatFaraWay	Inbound/Outbound Q1-2014
iDirectNetModem/NetModem2/iNfiniti Series	Inbound/Outbound
iDirect Evolution Series	Inbound/Outbound
DCME – Voice only decompression	
DTX-240T	Implemented
DTX-240 (D, E, F)	Implemented
DTX-360	Implemented
DTX-600 (G.768)	Implemented
DX-3000	Implemented
DX-7000 A(G.768)	Implemented
IESS-501	Implemented
TC-2000	Implemented
DTX 600 IP (G.769)	Implemented
Celtic 3G	Implemented
MUX	
Static:	
T1876	Special types
V10	Special types
V16	Special types
Mux 160	Newbridge type
Dynamic:	
IBA	In progress.
Signaling	
ITU SS7:	
ISUP	OPC/DPC decoding
SCCP	SMS extraction
GSM:	
Abis - GSM	Implemented. ITU version

Feature	Notes
	Audio channels available based on Vox. Signalling extraction – display of telephone numbers and operator
Protocols	
Data Link Level	
HDLC	Implemented
Frame Relay	Implemented
Cisco	Implemented
PPP	Implemented
Ethernet	Implemented
Netmodem	Implemented
Network Level	
IPv4	Implemented
ODLC	Implemented
SDLC	Implemented
Transport Level	
TCP	Implemented
UDP	Implemented
RTP	Implemented
Application Level	
HTTP 1.0,1.1	Implemented
HTML	Implemented
SMTP	Implemented
POP3	Implemented
FTP	Implemented
ICQ	Text only
AOL Messenger	Text only
MSN Messenger	Text only
Yahoo Messenger	Text only
Telnet	Implemented
SIP	Standard ITU

Feature	Notes
H.323	Standard ITU
Speech Codecs	
G.711	Implemented
G.722	Implemented
G.722.1, 2	Implemented
G.723.1	Implemented
G.726	Implemented
G.728	Implemented
G.729	Implemented
GSM AMR	Implemented
GSM FR	Implemented
GSM HR	Implemented
O-ADPCM	Implemented
OKI ADPCM	Implemented
Fax Protocols (Optional Off-line)	
V.17 (7200, 9600, 12000, 14400 bps)	Implemented
V.21 (300 bps)	Implemented
V.27ter (2400, 4800 bps)	Implemented
V.29 (4800, 7200, 9600 bps)	Implemented
V.34 (2400-14400 bps)	Implemented

VASTech cannot guarantee the decoding of any protocol not specified in the table above.

The software will however also support other protocols in the future.

VASTech will also endeavor to implement other protocols on demand based on customer requirements depending on the resources available in VASTech.

Please discuss any protocol requirements with VASTech

4.1 SIGNAL ANALYSIS

The signal analysis view: where the user allocates the wide band receiver capabilities to analyse a selected signal in order to determine the signal parameters: centre frequency, signal bandwidth, modulation type, symbol rate, coding/ECC type and signal protocols used inside a

selected signal. The Signal Analysis Station provides also the spectrum output, waterfall display and signal constellation output from the software, as is shown in the following figure.

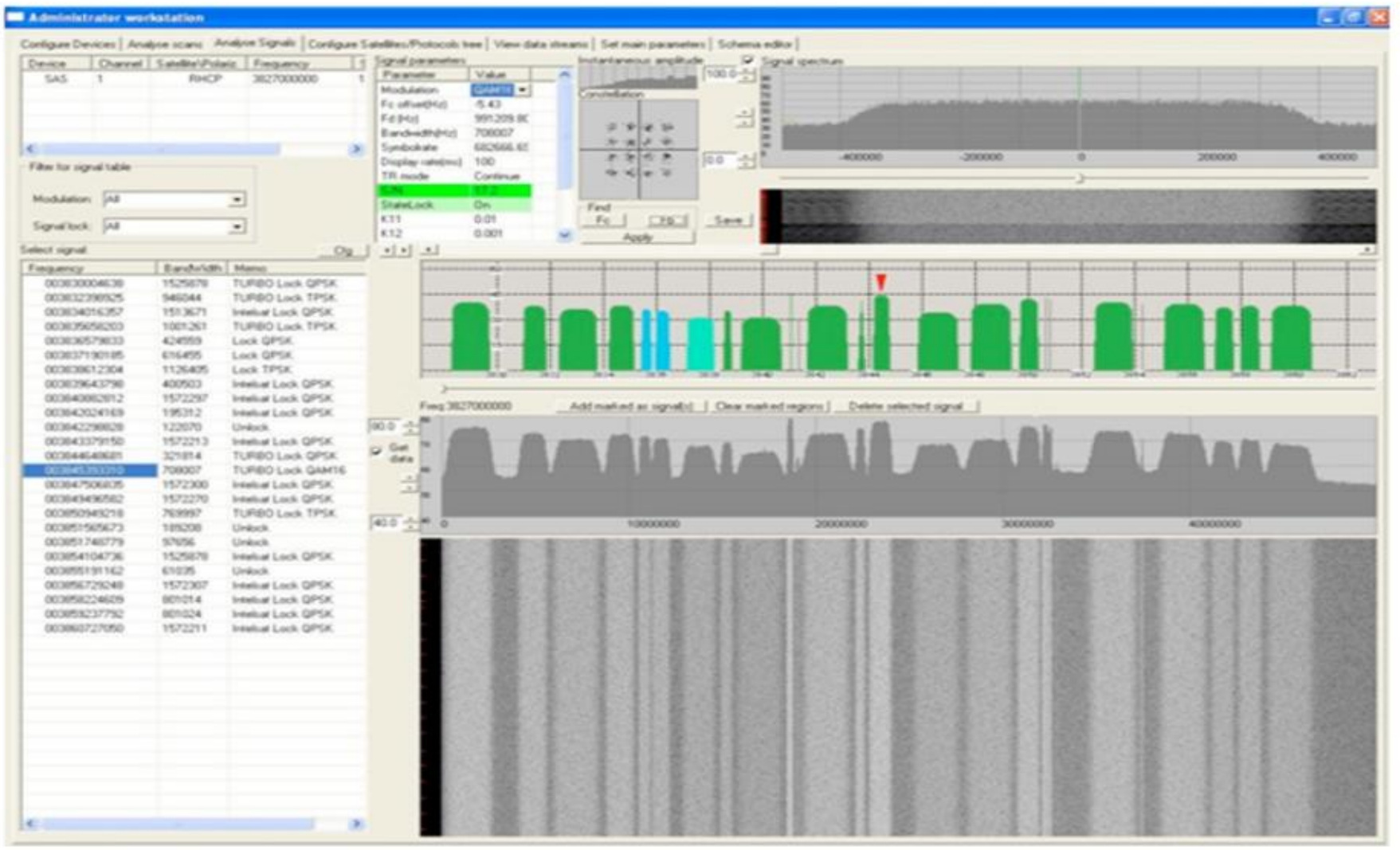

Fig 5: Signal Analysis GUI

4.1.1 Internet Analysis

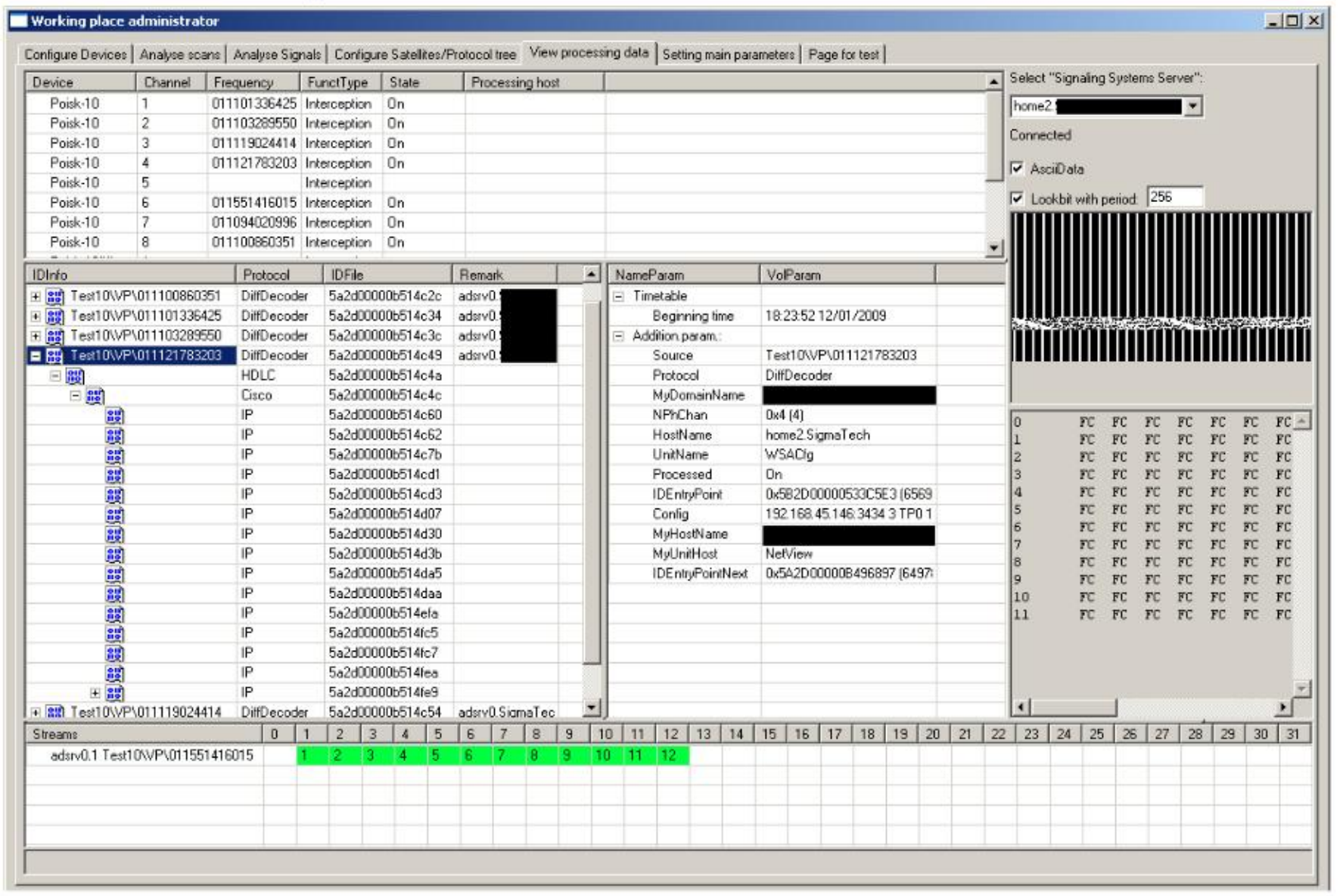

Fig 6: Internet Protocols detected

Figure 6 shows an example of a full decoding path with protocols for an Internet signal. On the right-hand window, the raw data from the session will be visible.

4.1.2 Database Server and Storage File Server

The results of spectrum satellite scans are stored in a database, including the modem parameters.

There are two types of databases for storing information. One database contains the scanned results of the satellite polarizations and the second database contains the captured content from selected satellite signals containing internet or voice sessions. The first database for scanned results will be available on the local drive of the Administrator and the content database and Storage File Server will be available on the local storage HDD of one of the two servers included in the Compact SSA Solution.

Storage dimensioning:

Please kindly note the Compact SSA Solution store on local HDD and is aim to be used for analysis. The storage capabilities are hence limited.

- SSA storage dimensioned for content on this option: 2 days online (4 duplex channels)

4.2 COMPARATIVE TABLE (SSA AND COMPACT SSA)

Features	Satellite Signal Analyzer	Compact SSA	Item
Wide band	Yes, scalable	Yes, 2 channels	1
V-SAT	Yes, scalable	Yes, 8 channels	2
Satellite Signal Analysis	Yes, scalable	Yes, 1 channel (loses 1 Wide band channel, item 1)	3
DVB-S2	Yes, scalable	None (Wide band can detect DVB-S, item 1)	4
Polarisations	Yes, scalable	1	5
DCME	Yes, with audio extraction	Yes, with audio extraction	6
Storage	Medium and long term	Limited to short term	7
Processing servers	Yes, scalable	2	8
Digital L-Band Switch	Yes, scalable	Not, 4 ports L-Band RF passive splitter	9
Workstation administrators	Yes, scalable	1	10
Interception capabilities	Yes, scalable	Limited (by channels and storage)	11

Table 1

5 CUSTOMER FURNISHED EQUIPMENT AND SERVICES

In addition to other remarks in this BUDGETARY PROPOSAL, pricing is calculated on the basis that the CUSTOMER will provide, at no cost to VASTech, the Customer Furnished Equipment and Services (CFE) as listed in this paragraph.

5.1 CUSTOMER SITE

Pricing of this offer is calculated on the basis that the Customer will provide, at no cost to VASTech, the Customer Furnished Equipment and Services (CFE) as listed below:

- Cable ducting for RF and power cables between antennas, antenna control (outdoor control box) system and equipment room.
- Earth station antenna with all required RF hardware components to provide a suitable L-Band signal as input signal to the SSA system. Might require site inspection by VASTech engineers.
- Site preparation and maintenance against VASTech specifications, including the supply of installation space, electrical power including all electrical cables for antenna power and sufficient air-conditioning, including uninterruptible power supply (UPS) power. The environment and UPS requirements shall be specified by VASTech.
- Tested network cabling and infrastructure external to the SSA rack systems, including routers and switches for connection of Administrator and User workstations in different rooms in the case where the Administrators and users are not in the same room as the SSA equipment.
- All third-party software that is not specified in this offer for example, antivirus software, firewall software.
- Supply of all third-party viewer software that is utilized on the OWS (Operator WorkStation) computers for internet content search such as, MS Word Suite, WinZip or WinRAR, Graphical file viewers, media players and any other third-party software necessary to open and view standard Internet content.
- All LAN cables and infrastructure required for SSA, Wideband Internet user workstations as well as Medium Band users that are in locations other than the SSA hardware.
- Training room, tables, electrical and LAN ports, including projector, screen and whiteboard for training.
- The Compact SSA System does not complied to military vibration and shock adsorbing tests and must be transported with care.

5.1.1 Electrical power and air-conditioning

- All electrical installations. See 5.3.1
- The Compact SSA equipment must be operated in an air-conditioned environment with the front and backlit removed from Portable case (Recommended temp < 20 degrees Celsius). Front and back lid must be opened to allow air circulations.
- The Compact SSA must be placed at a steady place, flat and free of vibrations.

- Customer will provide a qualified electrical engineer for verification of electrical connections before actually electrical elements are switched on.

5.2 GENERAL

- Access to the site of VASTech personnel and VASTech sub–contractors for installation and configuration of the system.
- Local transport in customer' country and secure storage of delivered items.
- First line maintenance of the SSA system, including the complete maintenance of the CFE infrastructure. It is specifically noted that failures in the uninterruptible power supply to the systems may cause data loss and may require a rebuild of the systems database. Such work is not included in this offer and will be quoted separately.
- First line maintenance is defined as the basic troubleshooting of procedures to sort failures (e.g. check power is on, check cable is connected, check alignment is correct, check frequencies are correct etc).
- Work-area for VASTech support personnel when on-site.

5.3 ENVIRONMENTAL SPECIFICATIONS

5.3.1 Power supply

220V single phase supplies should be available for the Compact SSA rack connection. These supplies should be fed directly from the customer's UPS grid.

The following general specifications are applicable:

- Input voltage 110 - 220/230V (Please inform VASTech in cases power is only 110 Volt)
- Input circuit breaker 2 x 16 Amps per SSA portable rack containing all servers as well as demodulation and analysis hardware.
- Electrical cables with 1 x independent power points from a circuit breaker to connect to the Compact SSA rack
- Wire size for the feed: 16mm2/conductor or larger (equivalent to 3mm diameter or larger).
- Earth leakage systems must be in place and tested.
- All earth cables must be well grounded and comply with international standards.
- Voltage on the earth should be stable and less than 4.6 Volts.
- The Compact SSA rack must be earthed to a central earth cable.

5.3.2 Air-Conditioning

The air-conditioning system must be capable to keep the systems at, or less than 20 degrees Celsius at all times with the computer systems running at full capacity.

Front and back lid must be opened to allow air circulations.

Humidity must be kept as low as possible but not higher than 70%.

If the customer cannot provide sufficient air-conditioning at the installation site VASTech will not be responsible for any failure on any equipment. In such cases all warrantees will be voided if the customer switches on the equipment.

5.3.3 Floor Structure

Calculated weight:

Compact SSA equipment: 45 kilograms

(Approximately 65 kilograms included case rack with wheels and cables).

5.3.4 Dust control

Observations of dust control are required.

6 CONTACT INFORMATION

6.1 GENERAL

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--End of Product Description--