The SKYWAN 5G satellite IP router has integrated an MF-TDMA modem and a DVB-S2 receiver. Whether you need a star, multi star, hybrid or full mesh network, the unique hardware design of SKYWAN 5G reliably fits all existing topologies within the VSAT world. Each unit can act either as a HUB or so-called Master Station, thus highlighting its agility in its network role. Geographical redundancy of the master station is already built-in. The device is so flexible that you can change your topology at a later point, use the unit for other networks or even split or pool networks together.

If additional TDMA inbound carriers are needed in one place you can easily cascade units to one stack, where all are managed by the node controller unit and using a single modulator avoids extra output power backoff. Since the optional available DVB outbound channel is not used for signalisation, multiple independent DVB carriers can be used in one network. In addition to the ACM support in DVB, an automatic registration at the DVB gateway is supported to simplify operation.

APPLICATION & FEATURE SUPPORT FOR:

- Cellular Backhaul/Mesh interconnection of Cells
- Air Traffic Control Networks
- Energy Sector, Oil & Gas
- Access for rural Wireless/Cellular Networks
- Disaster Recovery & Emergency Response
- Closed Enterprise Networks
- Governmental & Administration Networks
- Defence
- Broadcast/Satcom on the Move

YOUR HIGHLIGHTS

Get all-in-one – the reliable ONE solution
Gain flexible topology – star to mesh networks
Gain space & portability – smallest unit available
Gain powerful performance – with easy interface
Generate savings – lower cost of ownership

KEY FEATURES

- One unit does it all – simplified logistics
- Software defined WAN router supporting changes at runtime
- Cascading of stacked units to one node
- Dual demodulator TDMA + DVB-S2
- BPSK-16 APSK (24 MODCODs) for TDMA
- TDMA mod/demod up to 12 Msp/20 Mbps
- COTM support with Doppler Shift compensation and COTM antenna interface
- DVB-S2 receiver unicast IP output up to 80 Mbps
- ACM in DVB-S2 with auto registration at DVB-HUB
- High packet processing rate for Layer 2 and 3
- IP router incl. OSPF, BGP, GRE, VRF, VLAN etc.
- Service Quality based on PHB classes and multiple transmission queues
- Built-in automatic geographical redundancy of master node
- NMS as virtual appliance and Web-GUI
- Device features can be customized and then easily extended later on
TECHNICAL SPECIFICATIONS
SKYWAN 5G (SINCE V1.6.138)

VSAT NETWORK

Network Topology
Star/Hybrid/True Full Mesh, Multi-Master: fully-redundant network control function with seamless switchover/DVB-S2 star overlay/Multiple DVB-S2 Gateways per network/Dynamic DVB-S2 Receiver assignment over MF-TDMA control link

Supported Satellites/Transponders
Geostationary, transparent bent-pipes, cross-strapped transponders, HTS spot beams, meshed over HTS spot beams

Type & Number of Modems
1x MF-TDMA modulator, 1x TDMA demodulator, 1x DVB-S2 receiver (ETSI)

Access Type TDMA
MF-TDMA with fast frequency hopping in Tx (16 channel) and fixed Rx home channel, pure data channels, Beam Switching, Communication-On-The-Move (COTM) with Doppler shift compensation, Bandwidth-on-Demand DAMA/real-time/non-real-time/guaranteed throughput/QoS classes

Access Type TDM/DVB-S2
DVB-S2 receiver with Adaptive Coding and Modulation (ACM)/MPE and ULE

Stacking
Cascading of multiple units to one stack for up to 4 TDMA demodulators

Modulation & FEC Code Rates

<table>
<thead>
<tr>
<th>Modulation &amp; FEC Code Rates</th>
<th>TDM (Turbo-ϕ)</th>
<th>TDM - DVB-S2(X)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BPSK: 1/3, 2/5, 4/9, 1/2, 2/3</td>
<td>QPSK: 1/2, 2/3, 3/4, 5/6, 7/8, 9/10</td>
<td>8PSK: 3/4, 5/6, 7/8, 9/10</td>
</tr>
<tr>
<td>BPSK: 3/4, 5/6, 7/8, 9/10</td>
<td>16APSK: 3/4, 5/6, 7/8, 9/10</td>
<td>32APSK: 3/4, 5/6, 7/8, 9/10</td>
</tr>
<tr>
<td>QPSK: 2/3, 3/4, 4/5, 5/6, 6/7</td>
<td>16APSK: 2/3, 3/4, 4/5, 5/6, 6/7, 7/8</td>
<td>64APSK: 3/4, 5/6, 7/8, 9/10</td>
</tr>
<tr>
<td>QPSK: 2/3, 3/4, 4/5, 5/6, 6/7, 7/8</td>
<td>16APSK: 2/3, 3/4, 4/5, 5/6, 7/8, 9/10</td>
<td>32APSK: 3/4, 5/6, 7/8, 9/10</td>
</tr>
<tr>
<td>8PSK: 3/4, 5/6, 7/8, 9/10</td>
<td>16APSK: 2/3, 3/4, 4/5, 5/6, 7/8, 9/10</td>
<td>64APSK: 3/4, 5/6, 7/8, 9/10</td>
</tr>
</tbody>
</table>

Eb/No (BER 10^-7, incl. 0.5 dB margin)

<table>
<thead>
<tr>
<th>Eb/No (BER 10^-7, incl. 0.5 dB margin)</th>
<th>QPSK 1/2: 2.4 dB</th>
<th>QPSK 1/2: 1.2 dB</th>
</tr>
</thead>
<tbody>
<tr>
<td>8PSK 2/3: 5.8 dB</td>
<td>QPSK 1/2: 2.4 dB</td>
<td>8PSK 9/10: 7.3 dB</td>
</tr>
<tr>
<td>16APSK 8/2 dB</td>
<td>QPSK 9/10: 8.4 dB</td>
<td>16APSK 9/10: 8.4 dB</td>
</tr>
<tr>
<td>16APSK 9/10: 8.4 dB</td>
<td>32APSK 4/5: 9.9 dB</td>
<td>32APSK 4/5: 9.9 dB</td>
</tr>
</tbody>
</table>

Roll-off
0.4, 0.2, 0.1
0.35, 0.25, 0.20, 0.15, 0.10, 0.05

Modem Symbol Rate
200 kbps – 12 Mps, variable in 1 kbps increments
Up to 45 Mps, variable in 1 kbps increments

User Data Rate
Up to 20 Mbps per Tx or Rx unit, carrier user data rate starting at ~64 kbps, slot assigned traffic starting at ~4 kbps
Up to 80 Mbps unicast/60 Mbps multicast user data rate on LAN port, starting at 3 kbps

VSAT Data Throughput
Tx 20 Mbps/Rx up to 120 Mbps per stack/Switching packet rate in total up to 65,000 pps

BASEBAND INTERFACES

LAN Interface
Four GbE RJ-45 ports, VLAN/VRF/GRE/Jumbo Frames (max 1600 Byte) configurable per port, local switching
IPv4/IPv6 (tunnel)/Static Routing/OSPF/BGP/Multi VRF support (up to 8) including Virtual Channel Groups (VCGr2) and VLAN/GRE/Multicast Forwarding/IGMP/2/IGMP/3/Class Selector/ DSCP/OpenAMIP/3/DHCP Server

IP Features
Load Balancing/Header Compression/Traffic Filtering with real-time flow detection and Shaping for QoS based on configurable PHB rules (up to 14 classes per VRF)/Option: Encryption (AES-256) based on plugin board

Traffic Processing
Load Balancing/Header Compression/Traffic Filtering with real-time flow detection and Shaping for QoS based on configurable PHB rules (up to 14 classes per VRF)/Option: Encryption (AES-256) based on plugin board

Serial RS232/Console
SUB DB-9S socket for management access via command line interface
8 pin connector DIN 45326 – contains Rx lock signal (5 VDC) indicator and Tx inhibit with cable detect support

Aux-Port
8 pin connector DIN 45326 – contains Rx lock signal (5 VDC) indicator and Tx inhibit with cable detect support

Display and 5-button switch
Notification of status information (reception level, IP-address etc.)

USB-A 2.0 ports
1x front panel port for image updates and configuration uploads, 1x rear port

16dB range, 18 dB range with HW revision ≥A5
Anticipated release of ACM sw support: First half of 2020
1dB range, 1dB range with HW revision ≥A5
Patent EP 2871895 A1
Patent facilitating data exchange with compliant antenna control units (ACUs)
## TECHNICAL SPECIFICATIONS

**SKYWAN 5G** (SINCE V1.6.138)

<table>
<thead>
<tr>
<th>RF INTERFACES</th>
<th>E-11B14129 SKYWAN 5G</th>
<th>E-11B17369 SKYWAN 5G-SR</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Rear View with Interfaces</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 MHz Reference Port</td>
<td>–</td>
<td>SMA-connector (50 Ohm female)</td>
</tr>
<tr>
<td>Tx Modulator Port</td>
<td>F-connector (75 Ohm female)</td>
<td>SMA-connector (50 Ohm female)</td>
</tr>
<tr>
<td></td>
<td>L-Band 950 – 2150 MHz/-3… -43 dBm</td>
<td>L-Band 950 – 2150 MHz/-3… -43 dBm</td>
</tr>
<tr>
<td>Rx Demodulator Port</td>
<td>F-connector (75 Ohm female)</td>
<td>SMA-connector (50 Ohm female)</td>
</tr>
<tr>
<td></td>
<td>L-Band 950 – 2150 MHz/0…-70 dBm</td>
<td>L-Band 950 – 2150 MHz/0…-70 dBm</td>
</tr>
<tr>
<td></td>
<td>common used Rx port for DVB-S2 and TDMA receiver</td>
<td>common used Rx port for DVB-S2 and TDMA receiver</td>
</tr>
<tr>
<td><strong>10 MHz reference signal</strong></td>
<td>Configurable by software on Tx and Rx port</td>
<td>Configurable by software on Tx and Rx port, always on at 10 MHz REF OUT port</td>
</tr>
<tr>
<td><strong>Frequency Step Size</strong></td>
<td>Tx and Rx center frequency configurable in 100 Hz steps</td>
<td></td>
</tr>
<tr>
<td><strong>LNB</strong></td>
<td>Software configurable 0/13/18 VDC support, 22 kHz signal – internal/external PLL</td>
<td></td>
</tr>
<tr>
<td><strong>BUC</strong></td>
<td>Software enabled internal 24 VDC support, up to 85 W on IDU F-/SMA-connector (typical 6-8 W Ku)</td>
<td></td>
</tr>
<tr>
<td><strong>Others</strong></td>
<td>Radios with L-Band interface – Ka, Ku, Ext Ku, C, X</td>
<td></td>
</tr>
<tr>
<td><strong>Shared Amplifier</strong></td>
<td>Multiple SKYWAN 5G modulators can be operated in a multi-carrier setup utilizing the same RF-transmitter without requiring a back-off. Depending on the configured mode, traffic is routed through a single SKYWAN 5G unit or all transmitters are scheduled in sequence to prevent parallel transmission.</td>
<td></td>
</tr>
</tbody>
</table>

### 10 MHz REFERENCE SIGNAL SPECIFICATION

<table>
<thead>
<tr>
<th>Nominal Frequency</th>
<th>10 MHz; frequency tolerance ≤ ±2 x 10⁻⁷ (60 minutes after power on)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Level</td>
<td>Tx: typ. +4 dBm (+3 dBm ... +7 dBm, &lt; -40 dBm when switched off)</td>
</tr>
<tr>
<td></td>
<td>Rx: typ. -1 dBm (-3 dBm ... +1 dBm, &lt; -46 dBm when switched off)</td>
</tr>
<tr>
<td></td>
<td>10 MHz REF OUT; min. +8 dBm</td>
</tr>
<tr>
<td>Frequency Stability</td>
<td>temperature range 0 °C ... +70 °C: ±25 x 10⁻⁹</td>
</tr>
<tr>
<td></td>
<td>versus supply voltage changes Vs ±5%: ±5 x 10⁻⁹</td>
</tr>
<tr>
<td></td>
<td>versus load changes 50 Ω ±10%: ±5 x 10⁻⁹</td>
</tr>
<tr>
<td>Aging</td>
<td>±1 x 10⁻⁶ per day ±1 x 10⁻⁷ per year ±6 x 10⁻⁷ per 10 years</td>
</tr>
<tr>
<td>Phase Noise</td>
<td>1 Hz: -85 dBc 10 Hz: -115 dBc 100 Hz: -140 dBc</td>
</tr>
<tr>
<td></td>
<td>1 kHz: -145 dBc 10 kHz: -155 dBc 100 kHz: -155 dBc</td>
</tr>
</tbody>
</table>

Note: For an optimal and reliable system performance use the SKYWAN 5G reference signal to clock the outdoor equipment (BUC/LNB).
TECHNICAL SPECIFICATIONS
SKYWAN 5G (SINCE V1.6.138)

RENDUNACY

Type
1+1 node redundancy, hot standby

N+M node redundancy, hot standby

Interconnection
LAN Ethernet connection with external switch

External Switch Requirement
VLAN (802.1Q) capable switch with high MTBF and redundant power supply

Switchover
Automatic, no operator intervention required. Operational parameters are mirrored to backup unit for seamless switchover.

Failure Detection
Active monitoring of keep alive signals

Stacking
In a network node with stacked units, the backup unit is agnostic for the function it takes over, it can replace either a Node Controller or a Receiver. Up to 4 active units plus up to 4 backup units form the N+M redundant node.

Operator Support
NMS integrated configuration and monitoring, status display in NMS and SKYWAN 5G front panel

NETWORK MANAGEMENT

Security Architecture
Secure logins (https), role based views/LDAP support, all management interfaces via ssh only

NMS Platform
SKYWAN 5G NMS – virtual appliance

NMS Architecture
Web based application/identical GUI look and feel on NMS and IDU reduces training to a minimum/central NMS server, can be placed everywhere (only IP connectivity needed) mainly for planning & configuration, network runs without NMS always on or connected, NMS Redundancy, NETCONF (RFC 6241)

IDU Management
Remote access with in-band management (from central NMS station over satellite), additional SNMP access for monitoring, local access via WEB-GUI and CLI or integrated console port (RS 232), NETCONF (RFC 6241)

Multi-Language Support
Multi-Language WebUI for NMS and modem, all text can be translated and customized by the operator with the SKYWAN 5G Translation Editor.

MECHANICAL/EVIRONMENTAL

Dimensions (H x W x D)
44.45 mm (1 RU) x 483 mm (19") x 410 mm (Packing box: 580 x 540 x 159 mm)

Weight
Below 3.4kg (Packing box: 5kg)

Input Power/Power Consumption
100 – 260 VAC , 50/60 Hz , 40 VA nominal (without BUC/LNB)

Operating Temperature/Humidity
0 °C ... +55 °C, 5% - 85% non-condensing

Storage Temperature/Humidity
-40 °C ... +70 °C, 5% - 95% non-condensing

Altitude
Up to 5000m above sea level

Compliance
Fully CE compliant with RoHS and REACH, Anatel certified, no export limitations for product

Radio Standards
EN 301 428 Ku-Band VSAT, EN 301 443 C-Band VSAT

Safety
EN 62368-1 Safety IT Equipment (CB Scheme)

Emission Standards
EN 61000-6-3 Generic Emission Standard, EN 61000-3-2 Harmonics, EN 55022 Emission IT Class B, EN 61000-3-3 Flicker

Immunity Standard
EN 61000-6-1 Generic Immunity Standard, EN 55024 Immunity IT