In varied situations – from rough environments to when deployable antenna systems or a tower installation are needed – the SKYWAN 5G Outdoor is the modem of choice. It incorporates the full feature set of the indoor rack 1U SKYWAN 5G VSAT satellite router and is encapsulated in a tough IP65 chassis. The Outdoor version uses the identical software and is controlled the same way as the indoor units. The embedded MF-TDMA and DVB-S2 modem, with its QoS enhanced IP Router with VRF (Virtual Routing and Forwarding) capabilities, is managed by an NMS (Network Management System). The SKYWAN 5G Outdoor supports cascading or N+M redundancy and an internal encryption board with AES-256 if required.

APPLICATIONS

- 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 5G 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

- Built for deployable terminals and cellular network installation
- Robust IP65 chassis
- COTM support with Doppler Shift compensation and COTM antenna interface
- Display and joystick for local set-up
- External AC power supply
- Options for external cooling and weather/sun protection
**SKYWAN 5G OUTDOOR (SINCE V1.6.138)**

### TECHNICAL SPECIFICATIONS

#### VSAT NETWORK

- **Network Topology**: Star/Hybrid/True Full Mesh, Multi-Master: fully-redundant network control function with seamless switchover

- **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**: TDMA Adaptive Coding and Modulation (ACM) for QPSK up to 16APSK

- **Stacking**: DVB-S2 receiver with Adaptive Coding and Modulation (ACM)/MPE and ULE

- **Modulation & FEC Code Rates**
  - **TDMA (Turbo-ϕ)**
    - BPSK: 1/3, 2/5, 4/9, 1/2, 2/3
    - QPSK: 1/3, 2/5, 4/9, 1/2, 2/3, 3/4, 4/5, 5/6, 6/7
    - 8PSK: 2/3, 3/4, 4/5, 5/6, 6/7
    - 16APSK: 2/3, 3/4, 4/5, 5/6, 6/7

- **Eb/No (BER 10^-7, incl. 0.5 dB margin)**
  - QPSK 1/2: 2.4 dB
  - 8PSK 2/3: 5.8 dB
  - 16APSK 3/4: 8.2 dB

- **Roll-off**: 0.4, 0.2, 0.1

- **Modem Symbol Rate**
  - 200 kbps – 12 MspS, 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

- **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 1,600 Byte) configurable per port, local switching

- **IP Features**: IPv4/IPv6 (tunnel)/Static Routing/OSPF/BGP/Multi VRF support (up to 8) including Virtual Channel Groups (VCGr) and VLAN/GRE/Multicast Forwarding/IGMPv2/IGMPv3/DefServ/Class Selector/DSCP/OpenAMP/DHCP Server

- **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)

- **Serial RS232/Console**: 8 pin connector DIN 45326 – contains Rx lock signal (5 V DC) indicator and Tx inhibit with cable detect support

- **Aux-Port**: Notification of status information (receive level, IP-address etc.)

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

#### RF INTERFACES

- **Tx Modulator Port**: N-connector (50 Ohm female) L-Band 950 – 2150 MHz/-3 ... -43 dBm

- **Rx Demodulator Port**: N-connector (50 Ohm female) L-Band 950 – 2150 MHz/0 ... -70 dBm

- **10 MHz reference signal**: Common used Rx port for DVB-S2 and TDMA receiver

- **Frequency Step Size**: Configurable by software on Tx and Rx port

- **LNB**: Tx and Rx center frequency configurable in 100 Hz steps

- **Software configurable 0/13/18 V DC support, 22 kHz signal – internal/external PLL

---

1. 6dB range, 18 dB range with HW revision ≥A5
2. Anticipated release of ACM sw support: First half of 2020
4. facilitating data exchange with compliant antenna control units (ACUs)
SOFTWARE ENABLED INTERNAL 24 V DC SUPPORT, UP TO 85 W ON IDU N-CONNECTOR (TYPICAL 6 – 8 W KU)

RADIOS WITH L-BAND INTERFACE – KA, KU, EXT KU, C, X

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.

REduNDANCY

TYPE 1+1 NODE REDUNDANCY, HOT STANDBY

LAN ETHERNET CONNECTION WITH EXTERNAL SWITCH

VLAN (802.1Q) CAPABLE SWITCH WITH HIGH MTBF AND REDUNDANT POWER SUPPLY

AUTOMATIC, NO OPERATOR INTERVENTION REQUIRED. OPERATIONAL PARAMETERS ARE MIRRORED TO BACKUP UNIT FOR SEAMLESS SWITCHOVER.

ACTIVE MONITORING OF KEEP ALIVE SIGNALS

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.

NMS INTEGRATED CONFIGURATION AND MONITORING, STATUS DISPLAY IN NMS AND SKYWAN 5G FRONT PANEL

10 MHz REFERENCE SIGNAL SPECIFICATION

NOMINAL FREQUENCY 10 MHz; FREQUENCY TOLERANCE ≤±2 x 10⁻⁷ (60 MINUTES AFTER POWER ON)

POWER LEVEL

TX: TYP. +4 dBm (+3 dBm ... +7 dBm, <-40 dBm WHEN SWITCHED OFF)

RX: TYP. -1 dBm (-3 dBm ... +1 dBm, <-46 dBm WHEN SWITCHED OFF)

FREQUENCY STABILITY

VERSUS SUPPLY VOLTAGE CHANGES VS ±5 %:

VERSUS LOAD CHANGES 50 Ω ±10 %:

AGING

±1 x 10⁻⁶ PER DAY

±1 x 10⁻⁷ PER YEAR

±6 x 10⁻⁷ PER 10 YEARS

PHASE NOISE

1 Hz: -85 dBC

1 kHz: -145 dBC

10 kHz: -155 dBC

NOTE: FOR AN OPTIMAL AND RELIABLE SYSTEM PERFORMANCE USE THE SKYWAN 5G REFERENCE SIGNAL TO CLOCK THE OUTDOOR EQUIPMENT (BUC/LNB).

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

OPTIONAL; PRE-INSTALLED ON NMS SERVER MACHINE

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 INTERFACES

REMOTE ACCESS WITH IN-BAND MANAGEMENT (FROM CENTRAL NMS STATION OVER SATELITE), 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 MODERN, ALL TEXT CAN BE TRANSLATED AND CUSTOMIZED BY THE OPERATOR WITH THE SKYWAN 5G TRANSLATION EDITOR.
### TECHNICAL SPECIFICATIONS

#### SKYWAN 5G OUTDOOR (SINCE V1.6.138)

#### MECHANICAL/ENVIRONMENTAL

<table>
<thead>
<tr>
<th></th>
<th>SKYWAN 5G Outdoor</th>
<th>SKYWAN 5G Outdoor Enclosure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dimensions (H x W x D)</strong></td>
<td>80 mm x 440 mm x 250 mm</td>
<td>450 mm x 486 mm x 100 mm</td>
</tr>
<tr>
<td><strong>Weight</strong></td>
<td>6.5 kg (including external power supply, DVB-S2 receiver card and optional encryption card)</td>
<td></td>
</tr>
<tr>
<td><strong>Mounting Options</strong></td>
<td>indoor, outdoor, mast, in Outdoor Enclosure (additional protection for mechanical action, environmental impact, solar radiation, unauthorized access)</td>
<td></td>
</tr>
<tr>
<td><strong>Input Power/Power Consumption</strong></td>
<td>24 V DC, 40 VA nominal (without BUC/LNB), Binder M12-A Serien 713 Power (4 pins, waterproof, screw lock)</td>
<td></td>
</tr>
<tr>
<td><strong>External Power Supply</strong></td>
<td>Mean Well HEP-150-24 A: Input 100 – 260 V AC, 1.7 A, 50/60 Hz, Output 24 V DC, 6.3 A</td>
<td></td>
</tr>
<tr>
<td><strong>Operating Temperature/Humidity</strong></td>
<td>-20 °C to +55 °C, 5 % – 95 % non-condensing</td>
<td></td>
</tr>
<tr>
<td><strong>Storage Temperature/Humidity</strong></td>
<td>-40 °C to +55 °C, 5 % – 95 % non-condensing with Outdoor Enclosure and heater</td>
<td></td>
</tr>
<tr>
<td><strong>Altitude</strong></td>
<td>Up to 5,000 m above sea level</td>
<td></td>
</tr>
<tr>
<td><strong>International Protection Marking</strong></td>
<td>IP65 for base unit and power supply/IP55 for fans mounted at outside of base unit</td>
<td></td>
</tr>
<tr>
<td><strong>Regulatory Approvals</strong></td>
<td>Fully CE compliant with RoHS and REACH, no export limitations for product</td>
<td></td>
</tr>
</tbody>
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**HEADQUARTERS**
ND SatCom GmbH
Graf-von-Soden-Strasse 88090 Immenstaad
Germany
PHONE: +49 7545 939 0
FAX: +49 7545 939 8780
E-Mail: info@ndsatcom.com

**CHINA**
ND SatCom (Beijing) Co. Ltd.
PHONE: +86 10 6590 6809/6878

**MIDDLE EAST**
ND SatCom FZE
PHONE: +971 4886 5012

**WEST AFRICA**
ND SatCom Senegal
PHONE: +221 77 569 8017

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