DVB-S2X Wideband Modulator
L-band Output

WORK Microwave’s Wideband Modulator provides operators a platform for transferring Transport Streams in DVB-S2 multicast format as well IP/Ethernet data over DVB-S2/DVB-S2X satellite connections. Ethernet frames and IP packets are encapsulated directly within DVB-S2 baseband frames, resulting in low encapsulation overhead. For maximum bandwidth efficiency and ease of operation the device uses Generic Stream Encapsulation according to TS 102 606.

An aggregate data throughput of more than 1 Gbps can be achieved. Symbol rates up to 400 MspS are supported.

The unit is suitable for uplinks of High Throughput Satellites. It supports Broadcast, Broadband or hybrid Broadcast/Broadband systems.

OptiACM
An integrated OptiACM controller provides adaptive or variable FEC- and modulation setting for point-to-point or point-to-multipoint IP applications.

Predistortion
Broadcast Predistortion and Extended Predistortion - operating in the background during regular transmission - mitigates the negative effects in the filters and amplifiers of satellites by automatically compensating for linear and non linear distortions. Subsequently the satellite link can be operated with less back off/higher power and a higher signal-to-noise ratio increases beam coverage ensuring higher throughput and availability for the satellite operator.

High signal integrity
Low spurious emissions make the modem perfect for use in environments with demanding requirements, like high-power uplinks. Sophisticated temperature compensation guarantees output stability over a very wide temperature range.

Operating and control - easy integration into your system
The modem can be operated via push buttons on the front panel using intuitive display menus or via remote control (RS232, RS422/485 and TCP/IP over Ethernet). For the remote control addressable packet-based commands, a Web interface (HTTP browser). Detailed monitoring of system parameters is possible.

Key features
- Up to 12 ASI Input Interfaces for Multiple Transport Stream Inputs
- Up to 8 Transport Stream over IP Inputs
- Up to 4 Inputs for GSE encapsulators
- DVB-S2 - ETSI EN 302 307
  DVB-S2X - ETSI EN 302 307-2
- DVB-S2/S2X modulations:
  QPSK / 8PSK / 16APSK / 32APSK
  64APSK / 128APSK / 256APSK coming soon
- Normal and short FEC frames, pilots on or off
- Broadcast Predistortion including automatic group delay and dynamic constellation predistortion for QPSK and 8PSK (preliminary option XB)
- Extended Predistortion including automatic group delay and static constellation predistortion up to 32APSK (preliminary option XE)
- Physical layer framing with scrambling codes 0 to 262141 according to DVB-S2
- Physical layer framing according DVB-S2 Annex M (time-slicing)
- Physical layer framing according DVB-S2X Annex E, Format 4: “Flexible Format with VL-SNR PLH Tracking”
- Symbol rates from 1 MspS to 400 MspS
- Roll-Off: 35 %, 25 %, 20 %, 15 %, 10 %, 5 %

Visit us at www.work-microwave.com
• Adjustable digital gain slope equalizer
• Low spurious output
• OptiACM system for optimized bandwidth usage and extended weather insensitivity for IP transmission
• Gigabit Ethernet data interface
• IP and baseband traffic shaping
• Generic Stream Encapsulation (GSE) direct to DVB-S2 baseband frames
• Multiprotocol Encapsulation (MPE)
• Operates as Layer 2 Bridge, Layer 3 Bridge or Layer 3 Router
• Capacity calculator, optional capacity limitation per TS input
• Transmit mute input
• Tx Monitor Output on Frontpanel
• Remote control through RS232, RS422/485 (2-wire or 4-wire) interfaces, TCP/IP over Ethernet, Web browser interface

• 10 MHz Reference OCXO included
• Ext. 10 MHz reference input
• 10 MHz reference output
• Summary alarm output with dual change over switch contacts
• Operating temperature range 0 °C to 50 °C (32 °F to 122 °F)
• CE compliant
• 3 years warranty

Open questions, demo units
If you need more information about WORK Microwave’s satellite modulators or if you would like to have demo a unit, please contact us via e-mail: sales@work-microwave.com or call us. We are glad to assist you.

Inputs

<table>
<thead>
<tr>
<th>TS</th>
<th>DVB-S2 Mode Adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 12</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>TSoIP</th>
<th>TSoIP to TS Converter</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 8</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>IP</th>
<th>DVB-GSE Encapsulator</th>
</tr>
</thead>
<tbody>
<tr>
<td>up to 4</td>
<td></td>
</tr>
</tbody>
</table>

DVB-S2/DVB-S2X Multistreams
- Stream Adaption
- FEC Encoding
- Merging
- Mapping
- Framing
- Modulation

RF
L-Band, Symbolrate up to 400 Msps
DVB-S2X Wideband Modulator

<table>
<thead>
<tr>
<th>Modulator Type:</th>
<th>SDMW</th>
</tr>
</thead>
<tbody>
<tr>
<td>IF-Output Frequency:</td>
<td>L-band Output 950...2150 MHz</td>
</tr>
<tr>
<td>Frequency Resolution:</td>
<td>1 Hz</td>
</tr>
</tbody>
</table>

**Phase Noise:**
- 10 Hz: -65 dB
- 100 Hz: -75 dB
- 1 kHz: -88 dB
- 10 kHz: -90 dB
- 100 kHz: -100 dB
- 1 MHz: -120 dB
- 10 MHz: -125 dB
- 100 MHz: -130 dB

**IF-Output Characteristics:**
- Impedance: 50 Ω
- Return Loss: > 18 dB
- Output Power: -30 dBm ... 0 dBm, 0.1 dB steps, ±0.5 dBm accuracy
- Output Power muted: < -85 dBm
- Connector: SMA female

**Monitoring Output (on front panel):**
- Output Power: -20 dB of L-band Output
- Impedance: 50 Ω
- Return Loss: > 18 dB
- Connector: SMA female

**Spurious Outputs:**
- Signal related: < -55 dBc, nearby carrier
- < -50 dBc, unmodulated carrier, 950 ... 2150 MHz

**Frequency and Clock Stability:**
- 2 x 10^-14 (30 °C ... 60 °C, after warm up), aging: ±1 x 10^-12 per day, ±1 x 10^-10 per year

**Symbol Rate:**
- Maximum: 1 Mbps ... 400 Mpbs
- Step size: 1 sps

**Modulation / Encoding DVB-S2X:**
- MODCods non-linear:
  - Normal FEC frame: QPSK 13/45, 9/20, 11/20
  - BPSK 23/36, 25/36, 13/18
  - 16APSK 26/45, 3/5, 28/45, 23/36, 25/36, 13/18, 7/9, 77/90
  - 32APSK 32/45, 11/15, 7/9
- MODCods non-linear (short FEC frame):
  - QPSK 7/15, 8/15, 26/45, 32/45
  - 16APSK 7/15, 8/15, 26/45, 32/45
  - 32APSK 2/3, 32/45
- MODCods linear:
  - BPSK 5/9-L, 26/45-L
  - 16APSK 1/2-L, 8/15-L, 5/9-L, 3/5-L, 2/3-L
  - 32APSK 2/3-L, 25/36-L
  - Contact factory for 64APSK, 128APSK, 256 APSK modulation types

**Physical Layer Framing:**
- Outer BCH Code: FEC-frames, nldpc = 64000 (normal FEC Frame)
- nldpc = 16000 (short FEC Frame)
- Inner LDPC Code: QPSK 1/4, 1/3, 2/5, 1/2, 3/5, 2/3, 3/4, 4/3, 5/6, 6/5, 8/9, 9/10
- BPSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10
- 16APSK 3/5, 2/3, 3/4, 5/6, 8/9, 9/10
- 32APSK 3/4, 4/5, 5/6, 8/9, 9/10

**Physical Layer Scrambling:**
- Physical Layer Scrambling: yes
- Pilots Insertion: on / off
- Physical Layer Scrambling N = 0 ... 262141 (ETS1 EN 302307)

**Packet Stuffing:**
- Dummy PLFRAME insertion when the data rate to transmit is higher than the data rate at the inputs

**Signal Spectrum Mask:**
- α = 0.35, 0.25, 0.20 according ETSI EN 302307
- α = 0.15, 0.10, 0.05 according ETSI EN 302307-2

**Broadcast Predistortion (Option XB):**
- Extended Predistortion (Option XE):
  - Hardware and signal processing can be enabled through custom field selectable firmware options.
  - An external windows PC is required to run the application program, which optimizes the predistortion parameters in the background of live transmissions (if activated), by reading information from a reference demodulator. For all communication between the reference demodulator, the application program and the modulator IP connectivity is used.

**Stream Adaption:**
- Stream Adaption: yes
- Baseband Scrambling: yes (according ETSI EN 302307)

**Transport Stream Inputs:**
- Up to 12 x ASI (BNC female 75 Ω)
- Supporting up to 12 Multiple Transport Stream Input (auto switching dual input)
- Alternatively for 8 out of 12 inputs Transport Stream over IP Inputs (Connector RJ-45, 100/1000 Mbps, auto sensing), IPv4, UDP and RTP support, FEC according SMPTE 2022 1/2, Jitter tolerance 1...500 ms, Conversion TS over IP to TS.

**Multiple Transport Stream Input Operation:**
- Individual modulation and FEC (MODCOD) configuration per TS input.
- Modulation / Coding / Modulation / Encoding / Symbol Rate
- Capacity calculator, capacity limitation per TS input can be activated.

**Transport Stream Frames Size:**
- 195 or 204 bytes
- 3 kbps ... 213 Mbps (ASI interface)
- 10 kbps ... 213 Mbps (TS over IP interface)

**Transport Stream Mode Adoption DVB-S2:**
- Input Stream Synchroniser yes (according ETSI EN 302307 Annex D.2)
- Null-Packet Deletion yes (according ETSI EN 302307 Annex D.3)
- CRC-8 Encoder: yes
- Baseband Header Insertion: yes

 Specifications continued next page
### GSE Encapsulator

**Baseband Channels:**
16 baseband channel with separate DVB-S2 baseband settings (MODCOD, FEC frame length, pilots, encapsulation type, multistream ID, timeout)

**OptiACM:**
CCM / VCM / ACM functionality for point-to-point and point-to-multipoint links
16 ACM channels with separate MODCOD range and Es/N0 sensitivity
ACM channels arbitrary assignable to baseband channels

**BB Traffic Shaper:**
Baseband channel limits based on symbol rate for virtual share of the carrier
Guaranteed and limited bandwidth individually configurable

**Data Interface:**
Ethernet (1x RJ-45, 10/100/1000 Mbps auto sensing)

**IP Data Rate:**
up to 400 Mbps or 80000 pps

**Network Operation:**
Layer 2: Bridge (Ethernet frame transmission)
Layer 3: STP/RSTP, Bridge/Router (IP packet transmission), IPv4, IPv6
256 IP/subnet routes per port
16 DVB-S2 baseband channels

**Data Encapsulation:**
Generic Stream Encapsulation (GSE) according ETSI TS 102606
Multiprotocol Encapsulation (MPE) according to ETSI EN 301192

**IP Traffic Shaper:**
64 independent rules
Guaranteed and limited bandwidths
Fixed or dynamically integrated into ACM (bind to MODCOD)
Match criteria: source/destination IP subnet, source MAC, UDP/TCP port ranges, TOS/DS field, packet size
(Active IP Traffic shaper reduces max. packet rate to typ. 50000 pps)

---

### Monitoring and Control Interface

**Protocol:** SNMP (tbc)
**Connection:** UDP over Ethernet (10/100 Mbps auto sensing) IPv4, IPv6, connector RJ-45

**Protocol:** HTTP (web browser interface)
**Connection:** TCP/IP over Ethernet (10/100 Mbps, auto sensing) IPv4, IPv6, connector RJ-45

**Protocol:** Multipoint
**Connection:** RS232 or RS422/RS485 (configurable), connector DSUB09 female or TCP/IP over Ethernet (10/100 Mbps, auto sensing) IPv4, IPv6, connector RJ-45

**Alarm Interface:**
Alarm: two potential free contacts (DPDT), Mute Input: TTL logic input with internal pull up

**Internal Fan**
Fan included

**Temperature Range:**
0°C ... 50°C operating -30°C ... 80°C storage

**Relative Humidity:**
< 95% non condensing

**User Interface:**
LCD-Display 2 x 40 characters, 4 cursor keys, 4 function keys

**Mains Power Consumption:**
Typ 78 W / 115 VA (2 x GSE Encapsulator, 2x TSoIP Module)

**Mains Power Input Connector:** IEC C14

**Mains Fuse:**
2 x 5 A, time lag fuse

**Dimension and Weight:**
483 x 49 x 470 mm³ (WxHxD), 2 RU (19")
approx. 15 kg max

---

Specifications are subject to change

---

**Order Information:**

**SDMW**
Wideband Modulator with L-band Output 50 Ω (customized options on request)

---

Trade Mark of the DVB Digital Video Broadcasting Project

---

Trade Mark of the DVB Digital Video Broadcasting Project