Star Microwave All-Outdoor All-IP Overview
This complete outdoor solution is ideally suited for backhaul networks, WiMAX operators, ISPs, next generation mobile, and enterprise/campus networks requiring a low cost highly competitive Gigabit IP scalable radio system that exceeds carrier-grade standards for reliability, quality, and environmental compliance.

This Ethernet ONLY radio system is a full-featured compact split mount digital radio offering full duplex committed data rates over 300 Mbps (>600 Mbps aggregate) in IP based networks. The radio supports software configurable capacity selection from 11 to over 300 Mbps using from 7 to 56 MHz channel bandwidths. By utilizing advanced Forward Error Correction (FEC) provides superior link performance and reliability at a low cost.

This full duplex (FD) point to point all-outdoor microwave full duplex radio system is a flexible, low-cost, feature-rich solution for microwave radios in the global telecommunications market.

The ODU incorporates a unique, single-chip ASIC modem featuring integrated FEC with selectable coding rates using LDPC. Modulation and data throughput rates are QPSK to 256 QAM. Standard interfaces include link traffic 1000BaseT, NMS 100/1000BaseT and Serial port.

Cirius AO
The simplified all-outdoor solution:

- offers volume capacity and proven performance for applications worldwide.
- represents a new generation of roof/tower installation at the most competitive price
- with easy installation using only CAT5e/6 Ethernet cable to be run
- incorporates digital filtering for the various data bandwidths
- is designed to simplify product logistics and overall product life cycle costs.
- all-outdoor architecture reduces capital and operating expenditures for field installation, maintenance, training, and spares while maximizing product reliability
- includes advanced features such as support for ring/consecutive point configurations. This creates a self-healing redundancy that is more reliable than traditional point-to-point routed networks
- Protected (1+1), 2x (2+0) Capacity, FD and other configurations possible with compatible POE router/switch
- connects directly to antennas from many manufacturers
The **StarMicrowave All-Outdoor All-IP** is a low-cost point to point FD providing all IP digital microwave radio system for Ethernet payload.

The **StarMicrowave All-Outdoor All-IP** meets carrier-grade standards for performance, reliability, and quality.

The **StarMicrowave All-Outdoor All-IP** supports capacities over 300 Mbps (600 Mbps bi-directional) using the widest channel spacing.

The **StarMicrowave All-Outdoor IP** operates in the standard ETSI band frequencies.

**Transmit Power / Receiver Thresholds**

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Modulation</th>
<th>6 GHz</th>
<th>10 MHz</th>
<th>20 MHz</th>
<th>30 MHz</th>
<th>40 MHz</th>
<th>50 MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 GHz QPSK</td>
<td>16 QAM</td>
<td>32 QAM</td>
<td>64 QAM</td>
<td>128 QAM</td>
<td>256 QAM</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 MHz</td>
<td>N/A</td>
<td>N/A</td>
<td>23 / -80</td>
<td>23 / -77</td>
<td>23 / -74</td>
<td>N/A</td>
<td></td>
</tr>
<tr>
<td>11 GHz QPSK</td>
<td>16 QAM</td>
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<td>64 QAM</td>
<td>128 QAM</td>
<td>256 QAM</td>
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<td></td>
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<tr>
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<td>N/A</td>
<td>20 / -80.5</td>
<td>20 / -77.5</td>
<td>20 / -74.5</td>
<td>N/A</td>
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</tr>
<tr>
<td>30 MHz</td>
<td>23.5 / -86.5</td>
<td>22.5 / -81</td>
<td>22.5 / -76.5</td>
<td>22.5 / -73.5</td>
<td>22 / -70.5</td>
<td>20 / -67</td>
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</tr>
<tr>
<td>40 MHz</td>
<td>N/A</td>
<td>23.5 / -80</td>
<td>23.5 / -75.5</td>
<td>23.5 / -72.5</td>
<td>22 / -69.5</td>
<td>20 / -66</td>
<td></td>
</tr>
<tr>
<td>18 GHz QPSK</td>
<td>16 QAM</td>
<td>32 QAM</td>
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<tr>
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<td>N/A</td>
<td>23 / -80.5</td>
<td>20 / -77.5</td>
<td>19 / -74.5</td>
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<td>N/A</td>
<td>23 / -77</td>
<td>20.5 / -74</td>
<td>19 / -71.5</td>
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<tr>
<td>40 MHz</td>
<td>N/A</td>
<td>24 / -80</td>
<td>23 / -75.5</td>
<td>20.5 / -72.5</td>
<td>19 / -69.5</td>
<td>17 / -66</td>
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<td>24 / -79</td>
<td>23 / -74.5</td>
<td>20.5 / -71.5</td>
<td>19 / -68.5</td>
<td>17 / -65</td>
<td></td>
</tr>
<tr>
<td>23 GHz QPSK</td>
<td>16 QAM</td>
<td>32 QAM</td>
<td>64 QAM</td>
<td>128 QAM</td>
<td>256 QAM</td>
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<tr>
<td>10 MHz</td>
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<td>N/A</td>
<td>23 / -80</td>
<td>20.5 / -77</td>
<td>19 / -74</td>
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<tr>
<td>20 MHz</td>
<td>N/A</td>
<td>N/A</td>
<td>23 / -76.5</td>
<td>20.5 / -73.5</td>
<td>19 / -71</td>
<td>17 / -67.5</td>
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<tr>
<td>30 MHz</td>
<td>24 / -86</td>
<td>24 / -80.5</td>
<td>23 / -76</td>
<td>20.5 / -73</td>
<td>19 / -70</td>
<td>17 / -66.5</td>
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<tr>
<td>40 MHz</td>
<td>N/A</td>
<td>24 / -79.5</td>
<td>23 / -75</td>
<td>20.5 / -72</td>
<td>19 / -69</td>
<td>17 / -65.5</td>
<td></td>
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<tr>
<td>50 MHz</td>
<td>N/A</td>
<td>24 / -78.5</td>
<td>23 / -74</td>
<td>20.5 / -71</td>
<td>19 / -68</td>
<td>17 / -64.5</td>
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<tr>
<td>26 GHz QPSK</td>
<td>16 QAM</td>
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<td>256 QAM</td>
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<tr>
<td>10 MHz</td>
<td>N/A</td>
<td>N/A</td>
<td>22 / -80</td>
<td>20 / -77</td>
<td>19 / -74</td>
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<tr>
<td>20 MHz</td>
<td>N/A</td>
<td>N/A</td>
<td>22 / -76.5</td>
<td>20 / -73.5</td>
<td>19 / -71</td>
<td>17 / -67.5</td>
<td></td>
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<tr>
<td>30 MHz</td>
<td>23 / -86</td>
<td>23 / -80.5</td>
<td>22 / -76</td>
<td>20 / -73</td>
<td>19 / -70</td>
<td>17 / -66.5</td>
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<tr>
<td>40 MHz</td>
<td>N/A</td>
<td>23 / -79.5</td>
<td>22 / -75</td>
<td>20 / -72</td>
<td>19 / -69</td>
<td>17 / -65.5</td>
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<tr>
<td>38 GHz QPSK</td>
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<td>32 QAM</td>
<td>64 QAM</td>
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<td>256 QAM</td>
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<td></td>
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<tr>
<td>10 MHz</td>
<td>N/A</td>
<td>N/A</td>
<td>19 / -77</td>
<td>17 / -74</td>
<td>16 / -71</td>
<td>N/A</td>
<td></td>
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<tr>
<td>20 MHz</td>
<td>N/A</td>
<td>N/A</td>
<td>19 / -73.5</td>
<td>17 / -70.5</td>
<td>16 / -68</td>
<td>14 / -64.5</td>
<td></td>
</tr>
<tr>
<td>30 MHz</td>
<td>20 / -83</td>
<td>20 / -77.5</td>
<td>19 / -73</td>
<td>17 / -70</td>
<td>16 / -67</td>
<td>14 / -63.5</td>
<td></td>
</tr>
<tr>
<td>40 MHz</td>
<td>N/A</td>
<td>20 / -76.5</td>
<td>19 / -72</td>
<td>17 / -69</td>
<td>16 / -66</td>
<td>14 / -62.5</td>
<td></td>
</tr>
<tr>
<td>50 MHz</td>
<td>N/A</td>
<td>20 / -75.5</td>
<td>19 / -71</td>
<td>17 / -68</td>
<td>16 / -65</td>
<td>14 / -61.5</td>
<td></td>
</tr>
</tbody>
</table>

**Technical Information**

The **StarMicrowave All-Outdoor All-IP** is a low-cost point to point FD providing all IP digital microwave radio system for Ethernet payload.

**Key Features**

- Single ODU for simplified operation
- Browser based GUI for easy setup and management
- Standard IP and Serial Interfaces
- Supports NMS and SNMP
- Adaptive Coding Modulation Option

**Benefits**

- Low Cost Means - More Cost Effective
- Quick to Deploy
- Lowest cost licensed deployments
- Easily Setup and Activated

**Applications**

- Ethernet IP
- IP Radio Networks
- G3/G4 Backhaul
- WiMAX / LTE backhaul

**Services Available**

- Technical Support
- Installation and Setup
- Maintenance
- Application Support
- Hardware Support
- Extended Warranty

For more information on any of our products or services - please contact us.
### RF/ODU Specifications

#### Frequency Range

<table>
<thead>
<tr>
<th>Description</th>
<th>Specifications - Typical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency Band (GHz)</td>
<td></td>
</tr>
<tr>
<td>6L* 6U* 7 8 11 13 15 18 23 26 28 32 38</td>
<td></td>
</tr>
<tr>
<td>Frequency Bands</td>
<td></td>
</tr>
<tr>
<td>5.9 to 6.4</td>
<td>6.5 to 6.9</td>
</tr>
</tbody>
</table>

#### T/R Spacing (MHz)

- *Future 240, 252.04
- *Future 160, 170
- 154, 160, 161, 168, 196, 245
- 119, 126, 151, 208, 261, 312
- 490, 500, 530, 266
- 315, 420, 475, 490, 640, 644, 728
- 1008, 1010, 1560
- 1008, 1200, 1232
- 800, 1008, 1260

#### Transmitter

- Type: Dual Conversion – Transmitter Power by Modulation Type
- Xmit Pwr: Refer to Chart – Page 2
- Xmit Attn Step (dB): 5, .5, .5, .5, .5, .5, .5, .5, .5, .5, .5, .5
- Tx Power Accuracy: Over Command Range ± 2.0 dB (max)
- Output Power Muted: < -50 dBm
- ATPC Range: 24 dBm
- Frequency Accuracy: ± 7 ppm maximum, includes temp variation and aging, ± 8 ppm for 8GHz TR3I 1.32 and TRIS1 .614, ± 9 ppm for 6GHzTR252.04

#### Receiver

- Typical Threshold: Refer to Chart – Page 2
- CW Interferences*: Meets ETSI Requirements

#### ODU Interface

- Connector Type: Sealed 3xRJ45 (Traffic, NMS and Serial)
- Cable Type: CAT5/6e (Outdoor/UV)

#### Primary Power

- Power Dissipation max.: -30 to -60 VDC 58 W, 50 W, 56 W
- Protection Circuit: Power and protected by IDU (inrush current – ETS 300 132-2)

#### Power Dissipation (per Frequency Bands, per Model)

<table>
<thead>
<tr>
<th>RACH-x0</th>
<th>RACH-x1</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>58 W max.</td>
<td>62 W max.</td>
</tr>
<tr>
<td>50 W max.</td>
<td>54 W max.</td>
</tr>
<tr>
<td>56 W max.</td>
<td>60 W max.</td>
</tr>
</tbody>
</table>

#### Environmental, Etc.

- Operating: ETS 300-019-2-4 Class 4M5 to (-33 to 55°C)
- Cold Start Conditions: Power Supply Operational @ -45°C. ODU will transmit, no guarantee of quality of service.
- Storage: ETS 300-019-2-1
- Transport: ETS 300-019-2-2
- Mechanical: Weight (5.6 kg), Size (276mm Diameter x 140mm Depth)
- Finish: Corro-Coat PE 71-190Z (Powder Coat), Gloss White
- Ground Lug: M5 x .8 x 9.5 long

#### Rectangular Waveguide

- WR5, WR6, WR-28, WR-28, N/A

### Throughput*/Modulation/Bandwidth

<table>
<thead>
<tr>
<th>Modulation Type</th>
<th>Channel Bandwidth (MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td>QPSK</td>
<td>44 Mbps</td>
</tr>
<tr>
<td>16 QAM</td>
<td>89 Mbps</td>
</tr>
<tr>
<td>32 QAM</td>
<td>36 Mbps</td>
</tr>
<tr>
<td>64 QAM</td>
<td>45 Mbps</td>
</tr>
<tr>
<td>128 QAM</td>
<td>53 Mbps</td>
</tr>
<tr>
<td>256 QAM</td>
<td>123 Mbps</td>
</tr>
</tbody>
</table>

* Throughput in each direction—for Full Duplex Link capacity, double the throughputs in the chart above.
Outdoor Unit (ODU) Interface
- Emissions Bandwidths ANSI
- Command Interface ODU specific

Network Management
- Support SNMP
- Connector 1/10/100/1000BaseTX

Payload Parameters
- IP Interface 1x100/1000BaseT, RJ-45 connector,
  Standards Compliance IEEE 802.3ab (100/100BaseT), 802.1Q (VPN)

Modem Capability
- Capacity Options Throughput can exceed 300 Mbps
- Modulation Programmable: QPSK, 16-QAM, 32-QAM, 64-QAM, 128-QAM, 256-QAM
- FEC (LDPC—Low Density Parity Check)

Configuration
- Radio Protection and East-West Repeater can be managed with 2x install and router managed failover

Environmental
- Operating Temperature PoE and ODU: -33° to +55°C (ODU)
- Altitude 4500 meters
- Humidity IDU: 95% non-condensing, ODU: 100% all-weather
- Power Input -48V DC (-30 to –60 VDC)
- Power Consumption: ≤58 watts
- Power Connection is Power over Ethernet (PoE)
- Cooling Natural Convection

Management
- Protocol SNMPv2
- Local Access Ethernet 100/1000Base-T, RJ-45
- Remote Access In/Out-of-band integrated routing over link and interconnected LANs
- Craft Interface: RS-232/RJ-45 port or remote via telnet session

Customer Network Data Interface Options

Physical Ports
- Ethernet Full Duplex 1000BaseTx—Traffic Port
- Ethernet Full Duplex 100BaseTx—NMS Port
- Serial RS-232—Serial Port (factory use only)

Connector Type
- RJ-45 x 3

Compliance
- Ethernet IEEE 802.3
- RS-232C

Auxiliary Connections
- RS232 port for high-level management

Options
- Can use Third-party E1 to IP products to carry a few legacy circuits

Network Interface
- Standard Configuration
  - Scalable Ethernet
  - Traffic In/Out-band NMS
  - 10/100/1000 BaseTx

Network Processor
- Standard Configuration
  - Flexible Platform Processor
  - OAM&P Security
  - Built-in Web Server

Modem
- Standard Configuration
  - Flexible modulation: QPSK - 256QAM
  - Selectable Error - Correction Coding
  - Equalization
  - Pre-distortion
  - Built-in Link Support: BER

Options
- Adaptive Modulation available as a selectable mode of operation
- Indoor or Outdoor PoE

Network Interface Options

- Can handle legacy T1s with third party T1 over IP products
- Adaptive Coding & Modulation (ACM)

Network Processor Options

- Supports NMS Protocols:
  - SNMPv2, SNMPv3, SSH, Telnet & TFTP
  - QoS Performance Features:
    - VLAN Tagging per 802.1q, Priority queuing per 802.1p, Flow Control per 802.3x

Environmental Options

- Can handle legacy T1s with third party T1 over IP products
- Adaptive Coding & Modulation (ACM)