# Integra-E3

SAF Tehnika with over 20 years of microwave point-to-point radio design and manufacturing experience is pleased to introduce the newest member of the Integra family of radios. The Integra-E3: Having the same Integra family characteristics of high-reliability, carrier grade features and performance, and 5-year warranty extends the Integra family into the E-band frequencies, delivering 10 Gbps capacity.

The Integra-E3 supports Adaptive Code Modulation and Bandwidth (ACMB) in which the coding rate, modulation and bandwidth changes are set in real time based on the link's conditions. This feature enables significant increase in payload capacity and link availability. ACMB switching is hitless, that is, the link stays locked, and data is transmitted without errors.

The Integra-E3 especially addresses the security concerns, incorporating the FIPS197 certified AES256 traffic encryption, which plays a vital role in protecting the confidentiality and integrity of the information being transmitted.

In most countries E-band radios are easy to deploy with no or minimal licensing requirements. Reducing time to deployment and reducing Total Cost of Ownership (TCO).

The ATEX Zone 2/22 compliant Integra-E3 product has been developed for certain industries where harsh explosive environments are often observed. Please ask SAF Tehnika representatives for more information.

Pic 1. The exterior of Integra-E3 with antenna flange up

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## Technical specification

| | | Integra-E3 |
|---|---|---|
| **General** | | |
| Concept / form factor | | FODU with direct-mount antenna |
| Frequency band | | 71 - 76 GHz paired with 81 - 86 GHz |
| Duplex shift | | 10 GHz |
| Frequency stability | | ± 10 ppm |
| Capacity | | Up to 10 Gbps at 2000 MHz 128QAM |
| Max modulation | | 1024QAM |
| Configurations | | 1+0 |
| ATPC | | Yes |
| ACMB | | Adaptive Code Modulation and Bandwidth (ACMB), Hitless |
| Channel bandwidth | | 62.5, 125, 250, 500, 1000, and 2000 MHz |
| FEC | | LDPC FEC by default. R&S available for backwards compatibility. |
| **Ports** | | |
| Ethernet | 2 x SFP+ | For Fiber Optics up to 10 Gbps (1, 2.5 and 10 Gbps speed supported) |
| | 1 x RJ-45 | Gigabit Ethernet electrical port with built-in PoE splitter and surge arrestor |
| Power | DC port | Screw type terminal block, pluggable, 2 pin, centerline 3.81 mm / 0.15 inches |
| Service ports | 3.5 mm | Audible alignment and RSSI |
| | USB B | RS232 serial over USB B-Type |
| | LED | Power On, RSL |
| Antenna | SAF2 | Circular waveguide flange Ø 3.18 mm |
| **Ethernet** | | |
| Ethernet | | Built-in Carrier Ethernet 10 Gigabit Switch |
| VLAN | | 802.1Q 4096 VLANs, QinQ (Provider Bridging), VLAN Rate |
| Synchronization | | SyncE, IEEE-1588 v2 PTP transparent clock (TC) mode* |
| Quality of Service | | 8 level 802.1p, 64 level DSCP, CoS, 8 level MPLS-TP exp bit,<br>Port-based priority. Per port egress schedulers: SP, RR, WRR, DWRR. |
| Spanning Tree Prot. | | 802.1d-1998 STP, 802.1d-2004 RSTP |
| Jumbo frames | | Yes, 12288 bytes |
| Protection | | LSP (Link State propagation) with Backup link switching, each Ethernet port separately configurable. |
| Encryption | | AES256 traffic encryption** |
| Management | | SNMP v1/2c/3, SSH, Telnet, HTTPS, Serial, RADIUS, Network Time Protocol |
| | | In-band Management over same ETH port. Out-band Management is configurable using VLANS. |
| Performance monitoring | | Performance graphs, constellation diagram, alarms, detailed counters |
| **Electrical** | | |
| Power consumption | | Up to 55 W |
| Voltage range | | 36...57 V DC |
| Surge protection. | | DC power port conforms to IEC EN 61000-4-5 Class 3, up to 2KV surge |

** Inquire SAF representative for more information*

*** Integra-E3 encryption algorithm fully complies with Federal Information Processing Standards Publication 197 (2001), and has been certified with the validation # A5174: SAF FIPS AES-256 Encryption Engine*

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## Mechanical specification

| Mechanical & Environmental | |
|---|---|
| Stationary use | Conforms to ETSI EN 300 019 Class 4.1, IP67, NEMA 6 |
| Temperature range | -33...+55 °C / -28...+130 °F |
| Size | 280 x 400 x 70 mm / 11.02" x 15.8" x 2.8" (including cable gland) |
| Weight | 7.1 kg / 15.7 lbs |
| Mount | Mount on antenna |
| Antenna | External antenna, direct-mount (slip-fit) with SAF2 adaptation |

Pic 2. The exterior of Integra-E3 with rear side up

## Tx Power Ranges for Integra-E3

| Modulation | Tx power, dBm |
|---|---|
| BPSK/4 | -2 ... +19 |
| BPSK/2 | -2 ... +19 |
| BPSK | -2 ... +19 |
| 4QAM | -2 ... +19 |
| 16 QAM | -2 ... +18 |
| 32 QAM | -2 ... +17 |
| 64 QAM | -2 ... +16 |
| 128 QAM | -2 ... +15 |
| 256 QAM | -2 ... +14** |
| 512 QAM | -2 ... +13 |
| 1024 QAM | -2 ... +12 |

** +13 dBm in backwards compatibility mode with R&S FEC

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# Guaranteed RSL Thresholds and Capacity for Integra-E3[1, 2, 3]

| Forward Error Correction | | LDPC (default, recommended) | | R&S (for backwards compatibility) | |
|---|---|---|---|---|---|
| Bandwidth, MHz | Modulation | RSL Threshold, dBm | Capacity, Mbps | RSL Threshold, dBm | Capacity, Mbps |
| 62.5 | BPSK /2 | - | - | -90.5 | 9 |
| | BPSK | -86.5 | 34 | -87.5 | 19 |
| | 4QAM | -84.5 | 68 | -81.5 | 65 |
| | 16QAM | -77 | 136 | -74 | 131 |
| | 32QAM | -72.5 | 170 | -71 | 164 |
| | 64QAM | -71 | 205 | -68 | 197 |
| | 128QAM | -68 | 239 | -64.5 | 230 |
| | 256QAM | -65 | 273 | -61.5 | 263 |
| | 512QAM | -62 | 307 | - | - |
| | 1024QAM | -59 | 341 | - | - |
| 125 | BPSK /4 | - | - | -90 | 11 |
| | BPSK /2 | - | - | -86.5 | 23 |
| | BPSK | -82.5 | 79 | -83 | 46 |
| | 4QAM | -80 | 158 | -77.5 | 156 |
| | 16QAM | -73 | 317 | -70 | 313 |
| | 32QAM | -70 | 396 | -67 | 392 |
| | 64QAM | -67 | 476 | -64 | 471 |
| | 128QAM | -64.5 | 555 | -61 | 549 |
| | 256QAM | -61.5 | 634 | -58 | 628 |
| | 512QAM | -58.5 | 714 | - | - |
| | 1024QAM | -55.5 | 793 | - | - |
| 250 | BPSK /4 | - | - | -86.5 | 30 |
| | BPSK /2 | -84 | 82 | -83.5 | 60 |
| | BPSK | -78.5 | 173 | -80 | 120 |
| | 4QAM | -76.5 | 364 | -74 | 363 |
| | 16QAM | -69.5 | 728 | -67 | 727 |
| | 32QAM | -66 | 910 | -64 | 909 |
| | 64QAM | -63.5 | 1092 | -61 | 1091 |
| | 128QAM | -60.5 | 1275 | -57.5 | 1273 |
| | 256QAM | -58 | 1457 | -54.5 | 1455 |
| | 512QAM | -55 | 1639 | - | - |
| | 1024QAM | -52 | 1821 | - | - |
| 500 | BPSK /4 | -82 | 105 | -83 | 67 |
| | BPSK /2 | -79.5 | 169 | -80 | 134 |
| | BPSK | -76 | 337 | -76 | 268 |
| | 4QAM | -73 | 720 | -71 | 719 |
| | 16QAM | -66 | 1440 | -64 | 1440 |
| | 32QAM | -63 | 1800 | -61 | 1800 |
| | 64QAM | -60 | 2160 | -57.5 | 2160 |
| | 128QAM | -57 | 2520 | -54.5 | 2520 |
| | 256QAM | -54.5 | 2881 | -52 | 2881 |
| | 512QAM | -51.5 | 3241 | - | - |
| | 1024QAM | -48.5 | 3601 | - | - |
| 1000 | BPSK /4 | -79.5 | 172 | -79.5 | 134 |
| | BPSK /2 | -76 | 331 | -76.5 | 269 |
| | BPSK | -72.5 | 661 | -73 | 538 |
| | 4QAM | -69.5 | 1433 | -67.5 | 1431 |
| | 16QAM | -62.5 | 2867 | -60.5 | 2864 |
| | 32QAM | -59.5 | 3584 | -57.5 | 3581 |
| | 64QAM | -56.5 | 4300 | -54 | 4297 |
| | 128QAM | -53.5 | 5017 | -51.5 | 5014 |
| | 256QAM | -50.5 | 5734 | -48.5 | 5730 |
| | 512QAM | -47.5 | 6451 | - | - |
| | 1024QAM | -44 | 7167 | - | - |
| 2000 | BPSK /4 | -76 | 325 | -76 | 286 |
| | BPSK /2 | -72.5 | 649 | -73 | 571 |
| | BPSK | -69.5 | 1298 | -69.5 | 1143 |
| | 4QAM | -65.5 | 2857 | -64 | 2855 |
| | 16QAM | -58.5 | 5714 | -57 | 5713 |
| | 32QAM | -55 | 7143 | -54 | 7142 |
| | 64QAM | -52.5 | 8572 | -51 | 8570 |
| | 128QAM | -49 | 10000 | -48 | 9999 |

1 The LDPC Forward Error Correction mode is the default one and recommended for all modulation schemes. Reed-Solomon Forward Error Correction is available for backwards compatibility.

2 BPSK /2 means BPSK operation with a half of bandwidth, BPSK /4 means BPSK operation with a quarter of bandwidth.

3 Capacity data is specified with AES switched off. Note that enabling AES encryption adds frame overhead, as a result decreasing available payload capacity.

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