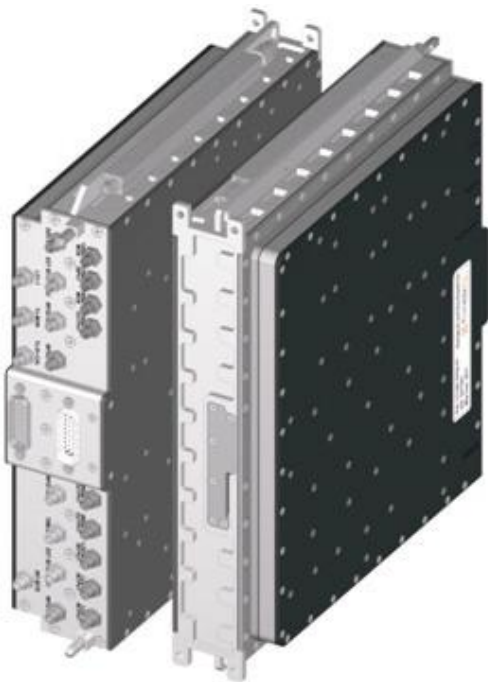
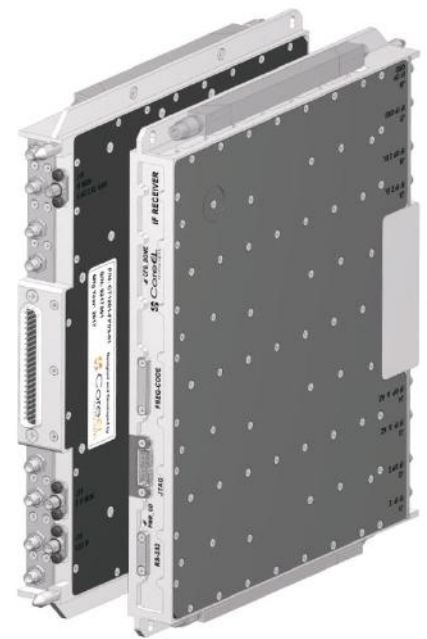


AESA Exciter Receiver Modules (Synthesizer, IF Receiver and Waveform Generator)

The Synthesizer (SYNTH) Module, IF Receiver (IFRx) Module and Waveform generator (WFG) Module are designed and developed by CoreEL. These modules are developed in house using of-the-shelf commercially available components like Ceramic Filters, LC packaged filters, Semi-conductor devices, Chip Resistors, Chip capacitors, chip inductors etc. These Modules will be used in Exciter Receiver Processor Unit (ERPU) as part of AESA Radar. AESA is an X-band, solid-state active phased array radar. Active phased array technology enables the user to achieve a longer detection range, high mission reliability and multi-target tracking capability. This radar is capable of adding new dimension to Air-to-Air (A/A), Air-to-Ground (A/G) and Air-to-Sea (A/S) operational modes of the fighter aircraft as compared to Mechanically Scanned Array (MSA) radar.



Synthesizer Module



IF Receiver Module



Waveform Generator Module

| Parameter | Units | Specification |
|-----------------------------|-------|---|
| Transmit Drive | | |
| Frequency | GHz | 9.0 to 10.0 |
| Phase Noise | | Dynamic: Better then -70dBc/Hz@100Hz offset Static: Better then -80dBc/Hz@100Hz offset |
| Output Power and its ripple | | 15dBm±2.5dBm (over temperature & for CW spots over 9-10GHz) ±1.5dBm (Over temperature & w.r.t carrier over 240MHz BW) |
| Frequency switching time | uSec | <1 |
| Spurious Levels | | <-65dBc over 10MHz bandwidth <-55dBc over 9-10GHz |
| Harmonics Level | dBc | <-60 |
| Carrier, LSB level | dBc | <-60 |
| LO-1 | | |
| Frequency and BW | | <i>As per Error! Reference source not found.</i> |
| Output Power and its ripple | | +6dBm ±2.5dBm (over temperature & for CW spots over 7.37-8.37GHz) ±1.5dBm (Over temperature & w.r.t carrier over 300MHz BW). |
| Spurious Levels | dBc | <-55 for FL,FM,FH spots distributed over 7.37 to 8.37 GHz. |
| Harmonics Level | dBc | <-60 |
| Spurious Levels | | <-50dBc over 500MHz BW |
| Harmonics Level | dBc | <-60 |
| LO2 | | |
| Frequency | | <i>As per Error! Reference source not found.</i> |
| Output Power (Mon Port) | | -10dBm ±2dBm (over temperature) |
| Spurious Levels | | <-50dBc over 500MHz BW |
| Harmonics Level | dBc | <-60 |
| Internal BITE | | |
| Frequency | GHz | 9.0 to 10.0 |
| Level | | 0±2.5dBm (over temperature & BW) |
| Level Control | | Through 7 bit Digital Attenuator with 1dB Step |
| Phase Control | | Through QPSK modulator with 2 bit control |

| Master Oscillator | | |
|------------------------------|-----|---|
| Frequency | | 120 MHz |
| Stability | | Better than 0.1 ppm |
| Phase Noise (static) | | Better than -130dBc/Hz @100 Hz offset |
| ADC Clock | | |
| Frequency | MHz | 160 |
| Level | | 2 dBm \pm 1 dB over temp @ 50 Ohm, Sine Wave |
| Jitter | | < 1 p sec rms Integrated over Nyquist bandwidth |
| Clock for Waveform Generator | | |
| Frequency | MHz | 480 |
| Level | | +2 dBm \pm 1 dB (over temperature) |

Table 1: Specification of Wideband and Narrowband Mode

| | WIDEBAND MODE | NARROWBAND MODE |
|------------------------|--|--|
| Transmit Drive | LFM Signal 9 to 10GHz Carrier spots BW Varies as per <i>Error! Reference source not found.</i> 1 to 100 μ Sec | LFM/Poly phase/Barker signal 9 to 10GHz Carrier spots BW : 5 MHz 1 to 100 μ Sec |
| LO1 | 7360-8360 MHz LFM BW Varies as per <i>Error! Reference source not found.</i> 25 to 130 μ Sec | 7360-8360 MHz CW |
| LO2 | 1440 MHz CW | 1560 MHz CW |
| IF1 | 1640 MHz, BW = 60 MHz | 1630 MHz, BW = 5 MHz |
| IF2 | 200 MHz, BW = 60 MHz | 70 MHz, BW = 5 MHz |
| Sampling Clock for ADC | 160 MHz | 160 MHz |
| Doppler Compensation | N.A | 70 MHz \pm 40 KHz |
| Doppler Resolution | N.A | 2 Hz |
| Number of Waveforms | Always LFM BW Varies as per Error! Reference source not found. | 256 |

Table 2: Modes of SAR

| Modes of SAR | Transmit Drive (9 – 10 GHz) | LO1 (7.360 – 8.360 GHz) |
|--------------|-----------------------------|-------------------------|
| Mode-1 | BW = 180 MHz | BW = 240 MHz |
| Mode-2 | BW = 240 MHz | BW = 300 MHz |

| Parameters | Units | Specifications |
|---|--------|---|
| RF Input frequency range | MHz | 1630 (Narrow Band) and 1640 (Wide Band) |
| Number of Channels | | 4 |
| Nominal Conversion Gain over channel and over temp | | 15 ± 2.0 dB (with AGC = 15 dB) 30 ± 2.0 dB (with AGC = 0 dB) |
| Input VSWR | | 1:1.8 (max.) |
| Maximum Input Power (No damage) | | +15dBm |
| IF Output Frequency | MHz | 200 |
| IF Filter bandwidth | MHz | 60 MHz (1 dB) |
| IF Filter Rejection | | -50 dBc at 70 MHz away from center freq. |
| Phase Linearity over IF bandwidth | | ± 5°(max) |
| LO2 Frequency | MHz | 1440 |
| Spectral purity | | -55 dBc over 100 MHz bandwidth |
| IF Output Frequency | MHz | 70 MHz |
| IF Filter Bandwidth | | 6.5 ± 0.5MHz (1 dB) in narrowband mode |
| IF Filter Rejection | | -40 dBc at 7 MHz away from center freq. |
| Phase Linearity over IF bandwidth | | ± 5°(max) |
| LO2 Frequency | MHz | 1560 |
| Spectral purity | | -70 dBc over 10 MHz bandwidth |
| Output VSWR | | 1:1.8 (max.) |
| Second Image Rejection | | 60 dB |
| Maximum Output level | | +11 dBm |
| Gain variation in all conditions | dBm | ± 2 |
| Isolation between Channels | dB | 60 |
| Gain matching between Channels | dBm | ±1 (with cal attn. at center value) |
| Phase matching between Channels | Degree | ±5 (with cal phase. at center value) |
| Gain control (GC) attenuation range | dB | 31 |
| GC attenuation resolution | dB | 1.0 |
| Gain Attenuation switching speed | ns | 200 Max |
| GC attenuation control | | 5 bit common to all receivers |
| GC attenuation matching between | dB | ± 1 |
| GC setting for nominal conversion gain | dB | 15 |
| <p>There is one digital attenuator for gain calibration facility at 1630MHz. Digital attenuator resolution is 0.5dB and the control bits for each of 4 channels are 4 bit (LVTTTL) independent.</p> | | |
| <p>There is one Digital phase shifter for phase calibration facility at 1630MHz. The Digital phase shifter resolution is 5.6 degree with 4 bit (LVTTTL) independent for all receiver channels</p> | | |

| Specifications |
|---|
| <p>The WFG Module will receive the below mentioned frequencies.</p> <ul style="list-style-type: none">• 960 MHz = Level 1dBm \pm 1dB• 480 MHz = Level 1dBm \pm 1dB |
| <p>The WFG Module generates the below mentioned IF frequencies.</p> <ul style="list-style-type: none">• Waveform 1 = 70MHz (\pm 2.5 MHz)• DDS1 ((WFG-1) = 203.75 (\pm 11.25 MHz)/ 203.75 (\pm 15 MHz)• DDS2 (WFG-2) = 201.25 (\pm 15 MHz)/ 201.25 (\pm 18.75 MHz)• DDS3 = 148.75 – 193.75 MHz |
| <p>The Waveform1 DAC (70MHz) is used in sweep mode for WB mode.</p> |
| <p>The Waveform2 DAC (for LO1 generation) is used in sweep mode.</p> |
| <p>The Part number for the FPGA used is XC7K325T-1FFG900I.</p> |
| <p>Interfaces LAN, JTAG, RS 232.</p> |

CoreEL Technologies is a Customer Application Specific Product & Solutions (CASPS) company offering innovative solutions from its diverse portfolio of expertise that includes Intellectual Property (IP) cores, system design, manufacturing, sustenance and OEM solutions in the form of EDA tools, Mechanical Engineering tools, COTS products and Technology Training. CoreEL's strength lies in its ability to blend deep domain knowledge with the right ingredients across its portfolio of offerings. It is a leading developer of advanced electronic system level products and solutions to three primary markets- Aerospace & Defence, Digital Media Broadcast, and Universities and Institutions of Higher Learning.