SIGNAL PROCESSING AND DATA PROCESSING PRODUCTS

1 Main Weather Radar System Products

Weather radar systems with selected partners	>>>	SYSTEMS
ATC primary radar weather channel	>>>	GWSP
GAMIC Digital Receiver Technology (ENIGMA)		
GAMIC Signal Doppler Processors	>>>	ENIGMA III+ and IV
FROG – MURAN	>>>	Data processing suite MULTI-RADAR-NETWORKS
Radar Hardware Upgrade/Dopplerization	>>>	UPGRADE - Service

2 ENIGMA MODELS and PERFORMANCE OPTIONS

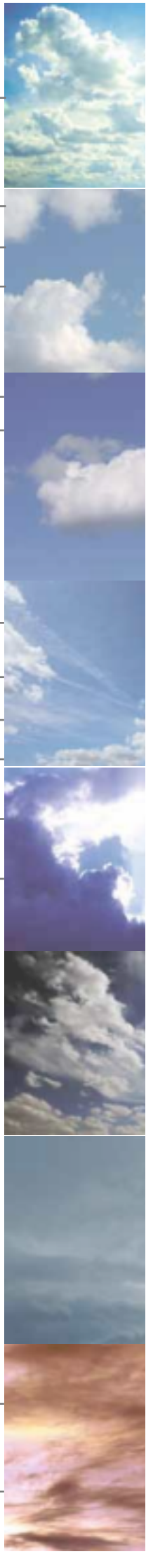
	ITEM	DECRIPTION, SHORT SPECIFICATIONS	SPECIFICATIONS AND ADVANTAGES
A	**ENIGMA IV - SPECIAL** - IFD+, Host, includes DPOL **OPTION**: KLYSTRON, TWT, Solid State transmitters	5 Channel @ 16 bit > 110dB dynamic range	- typ. > 4000 range bins single pol mode **- typ. > 2000 range bins dual pol mode** Pulse Compression
B	**ENIGMA IV - ID** - IFD+ and PC Host, includes DPOL **OPTION:** KLYSTRON, TWT, Solid State	5 Channel @ 16 bit > 110dB dynamic range	- typ. > 8000 range bins single pol mode **- typ. > 4000 range bins dual pol mode** Pulse Compression
C	**ENIGMA IV - DS** - IFD+and ultra high power 8-core-CPU PC host, includes DPOL **OPTION:** KLYSTRON, TWT, Solid State	5 Channel @ 16 bit > 110dB dynamic range	- minimum. > 8000 range bins in dual pol mode, all algorithm switched **- up to 16000 range bin** Pulse Compression

ENIGMA III+ and ENIGMA IV - IF DIGITIZER (IFD)

IF Receiver inputs	3 channel, horizontal, vertical and reference Internal 5 x 16 bit channels: • 2 x horizontal • 2 x vertical • 1x Burst
IF frequency	30 MHz or 60 MHz (other frequencies optional)
IF Dynamic range	> 110 dB (2 us pulse width)

ENIGMA III+ and ENIGMA IV - HOST

Number of bins	ENIGMA III+ = 4096
Main features:	• DUAL CORE PC host • PCI + host board • XMT “COHO” board - optional **ENIGMA IV = 8000 Single and dual polarization version** • 8 – CORE PC host • PCI ++ host board • XMT “COHO” board - optional *Dual polarization version*
Typical Base Resolution	25 - 125m
Range	10-400km
PRF	10-3000 Hz
Number of Pulse Widths	4 with independent configurable matched filters (up to 1280 taps)
Dual PRF Stagger Modes	None, 2/3, 3/4 and 4/5
Output data	**Corrected reflectivity Z** • Uncorrected reflectivity UZ • Attenuation Corrected Reflectivity AZh • Radial velocity V • Folded Radial Velocity VF • Spectral Width W • Clutter power CCOR • Signal quality index SQI • In phase/Quadrature signal I, Q • Logarithmic power LOG • Signal Noise Ration SNR • Censor Map • Power spectrum DFT • RhoHV (Dual polarized radar) • PhiDP (Dual polarized radar) • PhiH (Dual polarized radar H-transmit) • KDP (Dual polarized radar) • ZDR (Dual polarized radar) • Attenuation Corrected ZDR (Dual polarized radar) • LDR (Dual polarized radar H-transmit) • RhoH (Dual polarized radar H-transmit)
Processing Modes	• Pulse Pair Processing (PPP) • FFT Processing (FFT) • DFT Processing (DFT) • Staggered PRT Processing (DPRT)

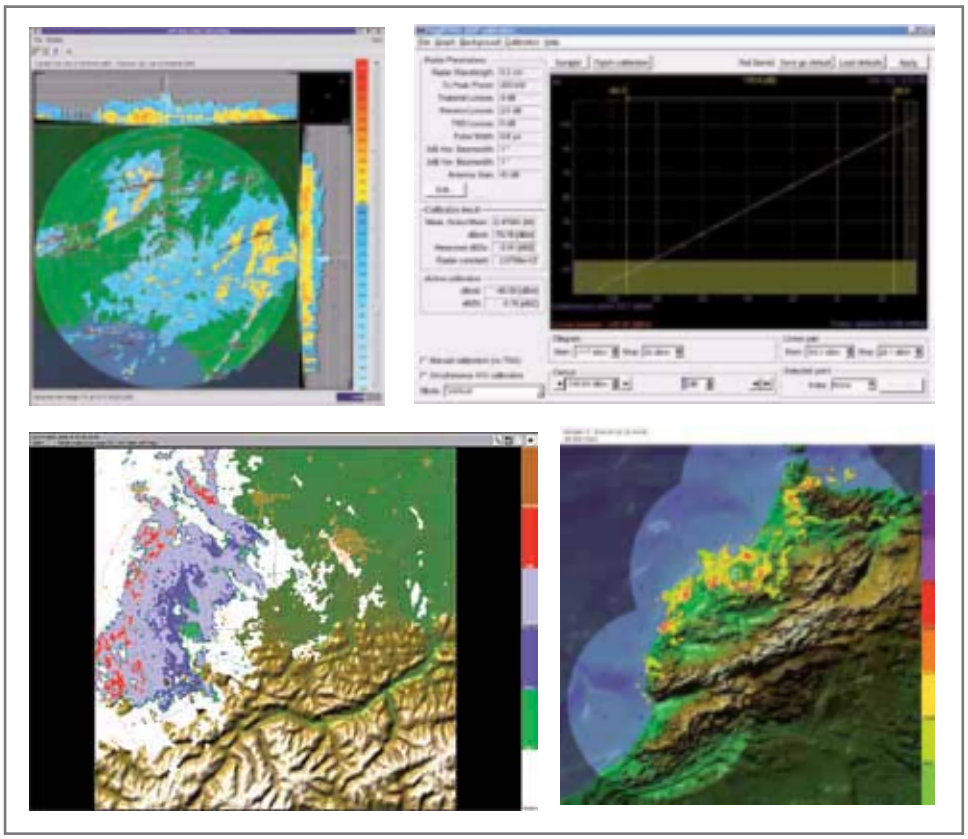


PPP	• Selectable 40dB and 50dB IIR filter coefficients • Filter width adjustable in 8 steps (All pass, Filter 1-7) • Range adjustable 1-400km • Range mask for range and elevation dependent filter selection • Filter zeroing on/off • Configurable filter stabilization delay' • Clutter micro suppression
FFT and DFT	• Adaptive filter width adjustable in 8 steps (All pass, Filter 1-7) • Range adjustable 1-400km • Range mask for range and elevation dependent filter selection • Clutter micro suppression • Selectable interpolation: • DC cancellation • Half plane subtraction • Interpolation • Dual slope interpolation • Selectable tapering window • Rectangle • Hamming • Blackman-Harris 3 • Blackman-Harris 4 • Bartlett • Hann • Welch • Kaiser-Bessel
DPRT	• Selectable statistical clutter filtering • Filter width adjustable in 8 steps (Allpass, Filter 1-7) • Range adjustable 1-400km • Rangemask for range and elevation dependent filter selection • Clutter micro suppression
Time Averaging	Adjustable time samples (8-1024) or Dynamic angle syncing (0.05°-5°)
Data quality algorithms	• Rain attenuation correction • 1/r² range normalization • Gas attenuation correction • Configurable reflectivity speckle remover (2 Dimensional) • Configurable velocity speckle remover • Configurable spectrum width speckle remover • Configurable dual polarization moment speckle remover • Configurable thresholding with NOISE, CCOR,SIGPOW, RHOHV and SQI • Second trip removal • Configurable KDP interpolation (Gaussan, B-Sline, 0.125-5km)
Sector Blanking	• 32 configurable azimuth/elevation sectors (0.05° resolution)
I/Q Recorder	Pulse wise I/Q recording in 32Bit IEEE floating point format to the internal hard disk
Configuration	FROG/MURAN Network capable GUI, telnet or through the built in HTTP server (comprehensive browser interface).
Status Output	• ASCII BITE through telnet port • HTTP Server interface • ASCII Log messages through telnet port
Matched Filter Designer	GUI program for semi automatic calculation of matched filter coefficients (for transmitter pulse) and verification. Comprehensive AFC configuration and visualization.
Status Information	• Host CPU load, CPU temperature and Memory usage • Host Voltages • IFD power supply • IFD temperatures • A/D converter status • AFC Status • Sector blanking status • Number of pulses for autocorrelation
PCI Receiver Card	Standard PCI card. • Buffered 5V, 50Ohm trigger output • Parallel standard angle TAG input (Azimuth and Elevation) • Optional: Serial (3 wire) angle TAG input • Coaxial high speed serial uplink (isolated) • Fiber optic 1.2 GBits/s downlink
Host Enclosure	Standard 19" rack mount (3 or 4 HE). Depth 420mm or custom enclosure.
Host Boot Media	Robust flash disk for antenna mount receiver or single hard disk drive. Optional: RAID 10 for I/Q recorder (Rack mount only)
Host Power Consumption	< 400 W, 230 V, 50 Hz

5 FROG-MURAN SOFTWARE

- Data systems for weather Radar, X-, C-, S-Band. Magnetron + Klystron, including Dual Polarization

- **FROG – RTNG -** Real Time Radar Processors
- **PROGEN -** Comprehensive Radar Product Algorithms for Meteorology, Hydrology, ATC and Governmental Users,
- **COLIBRI II -** Product Visualization
- **FROG-3D –** Interactive 3-dimensional data presentation
- **MURAN -** Data dissemination and wide area network message switching,
- **MOSAIC -** Radar Compositing
- **Internet Server -** for Data access via Browser + PC
- Now casting STP, Radar data based
- **WWARN -** Weather Decision Aid Systems
- **TOOLKIT -** Scientific Weather Sensor Processing
- **ASTERIX -** ATC console weather data generator



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