NRAS in SAAB U/SME-250

Development of a Digital Receiver
31 May 2018

~ Travis Milewski

Travis Milewski – Brief Background

- UCT Electrical Engineering Graduate
- Software and Systems Engineer
- SAAB Avitronics from 2002 to 2006 (PTAC and MTAC)
- SAAB Grintek Defence from 2014 to Present
- Other less interesting places in between
- Water-saving Capetonian
- One DIY house, one wife, 2 kids, 2 cats, 4 dogs, no time
- Technical Product Manager, USME
- Currently working on:

Narrowband RADAR Analysis System for USME-250

(NRAS)

A Discussion…

…more than a presentation…

…so please feel free to stop me and ask questions ☺

Context: SAAB USME (Current Generation)

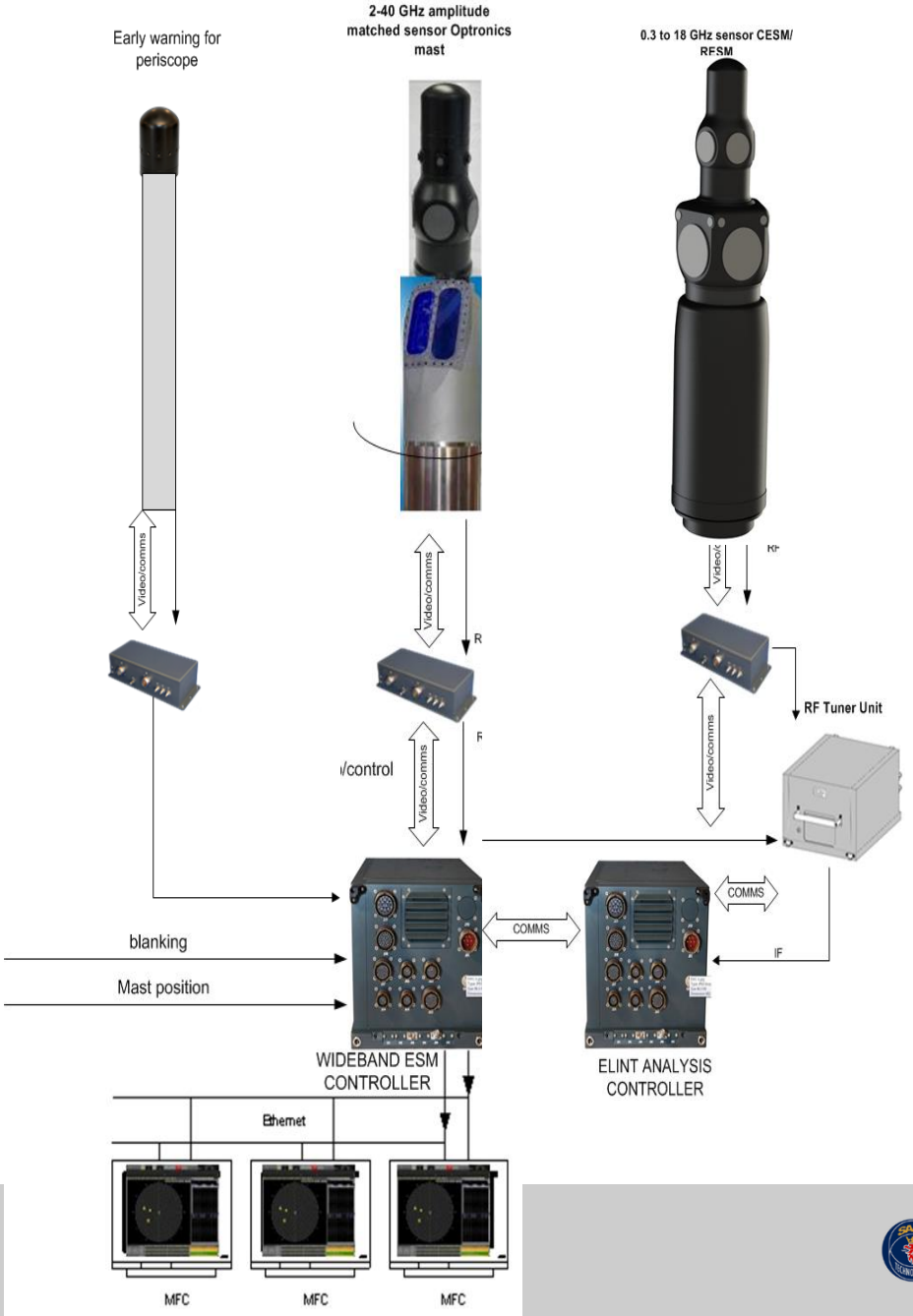
- **Base System (USME-150)**
  - Electronic Warfare Controller (with AQR and RWS subsystems).
  - Compact Direction Finding Antenna.
  - ESM capabilities with automatic DF, and Designated ELINT functions.
  - 2-18 GHz Coverage.

- **Base System + NRAS (USME-250**)
  - USME-150 Functions.
  - Digital Analysis Receiver.
  - Designated and automatic ELINT functions.
  - 0.5-18 GHz Coverage.

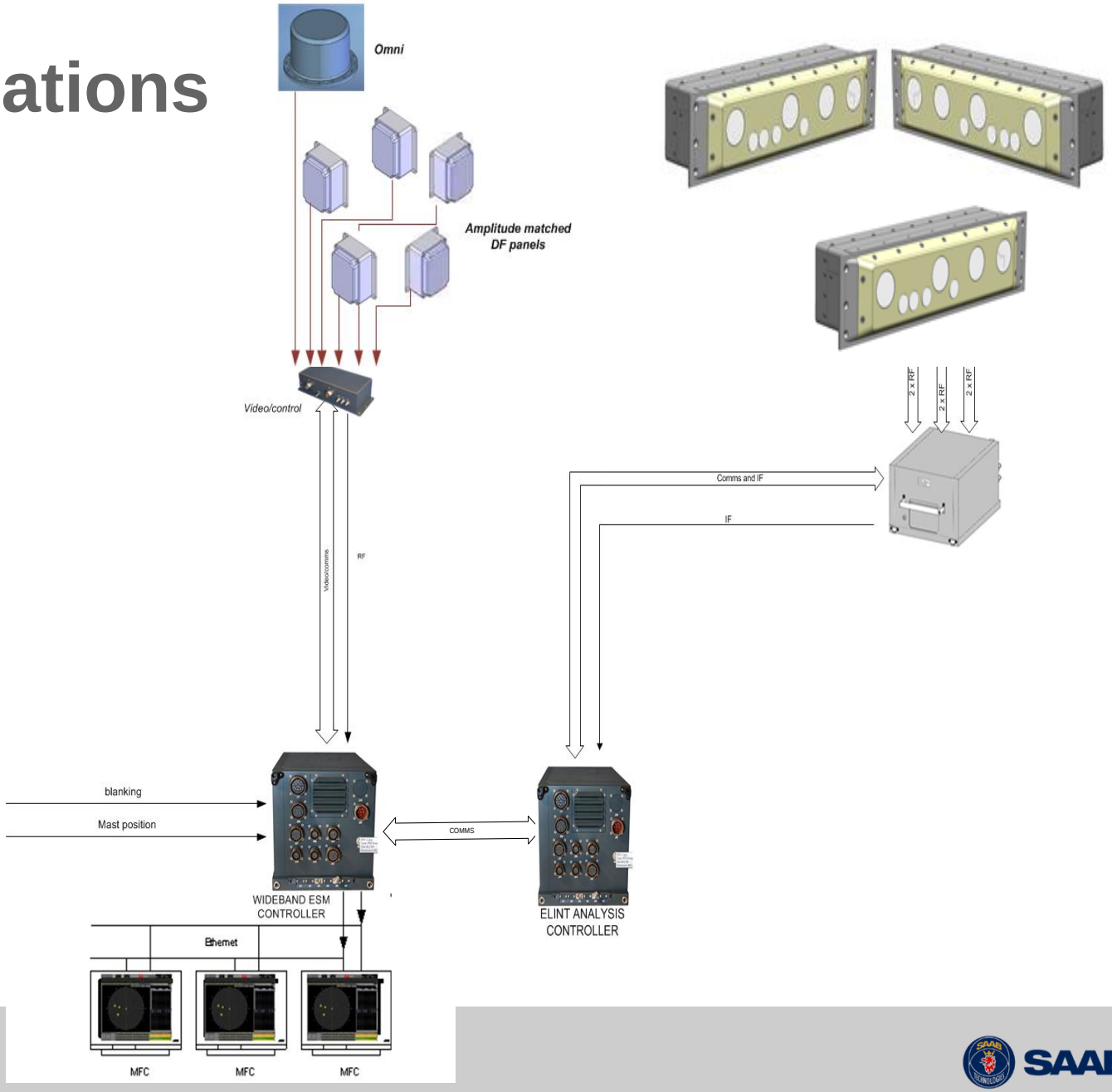
NRAS (DRx) Main Components

- Sensor: Compact Phase Interferometer Unit (CPIU)
- Tuner: RF Tuner Unit (RFTU)
- Elint Controller (ETC)
  - Data Processor (DP)
    - Sampling and Channeliser
    - Post Processing
    - Deinterleaver
  - Elint Processor (EP)
    - Tasking
    - Tracking
    - Management functions

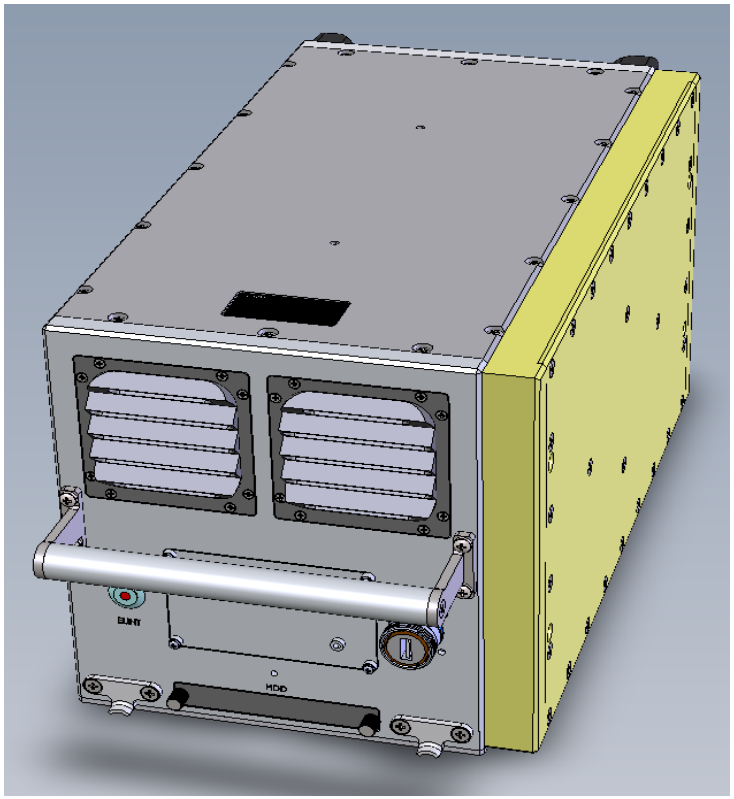
UME Installations



SME Installations



NRAS ETC Dimensions

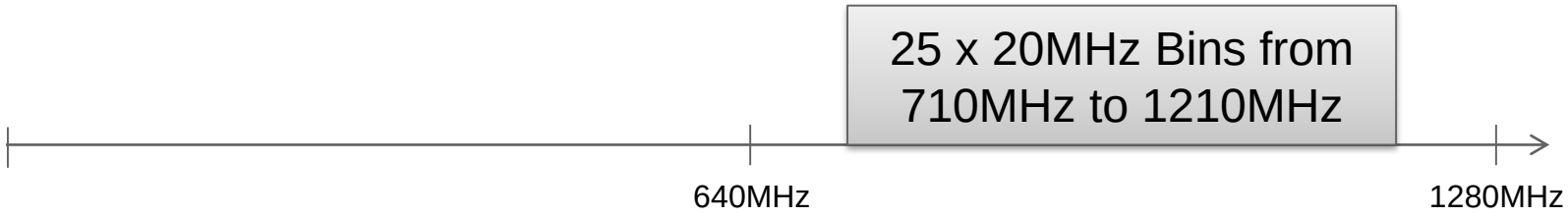


Approx. Dimensions:
H: 220mm
W: 220mm
D: 400mm

EWC and ETC Side by Side in 19” Rack

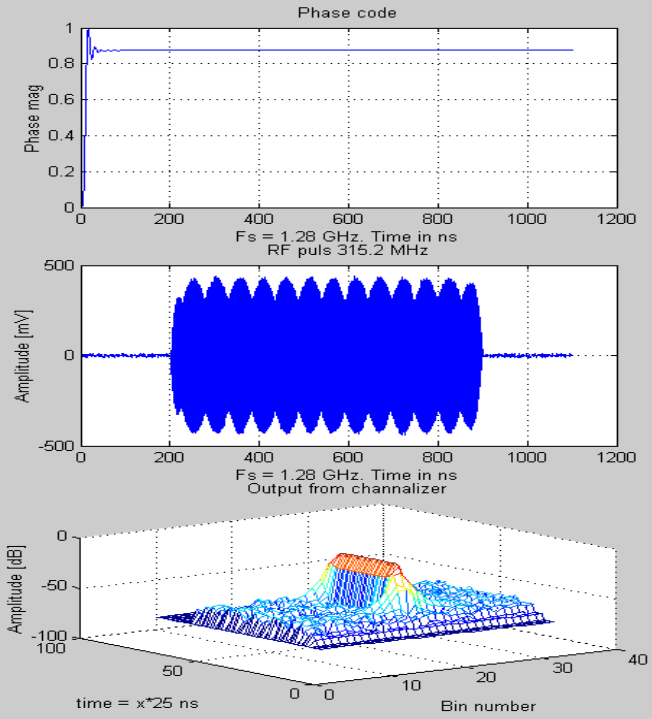
Some Details – Part 1

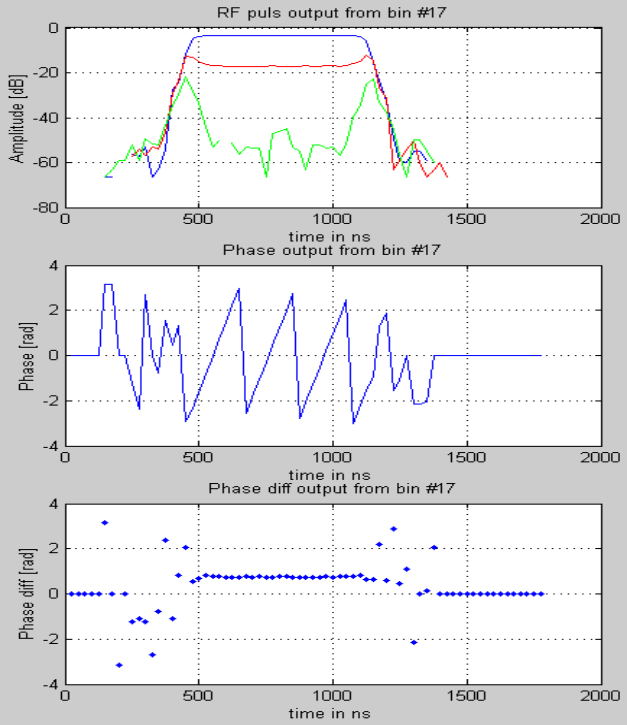
- Tune (RF to IF) near the Sensor
- Exploring Fibre-Optic IF Cables
- Real Sampling in the Second Nyquist Zone
- 500MHz IBW, with 20MHz Channeliser Bin Width
- Two RF/IF Channels, but provision for four



Some Details – Part 2

- I&Q Data from the Channeliser into Intrapulse (Power, Phase and Frequency)





Some Details – Part 3

- AOA per SDW (Phase and Amplitude DF)
- Simultaneous Signals in different Bins
- Pulsed and CW Signals in the same captures
- Benefits and Parameters:
  - PRI Accuracy: Tends to the clock stability with large, stable pulse buffers
    - At least 12.5ns Res. with 25ns Accuracy (RMS) below 8ms
  - PW Accuracy: No DLVA to stretch the pulse as a function of power
    - At least 12.5ns Res. with 25ns Accuracy (RMS), up to 1ms
  - Frequency Accuracy: Slope of the phase
    - Less than 1MHz (RMS) accuracy; kHz-accuracy for longer pulses
  - AOA Accuracy: Dependent on Front-End Design and Calibration
    - Less than 2º (RMS)

Some Details – Part 4

- Deinterleaving on the DP Card
- Mode and Emitter Tracking on the EP, perhaps even preliminary identification
- Consolidation at a higher level with parallel receiver inputs, including formal identification
- Presentation of Signal Information on the HMI

Questions

Thank you!

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