Ground-Plane SAR Image Synthesis Using *Lyra*

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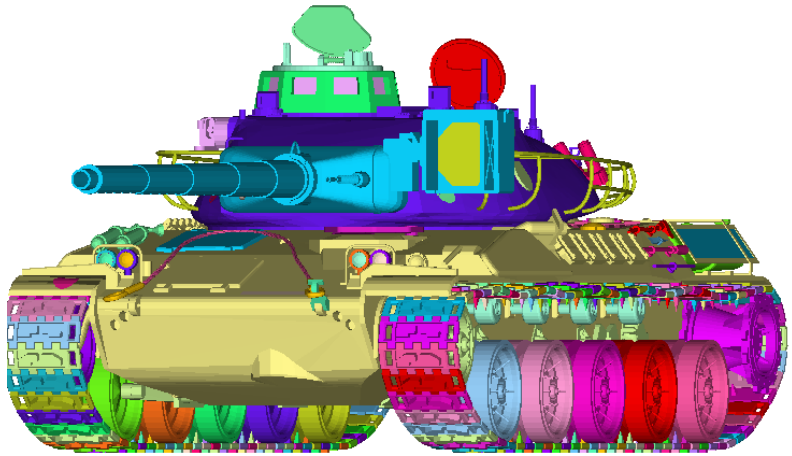
Lyra Overview

- ***Lyra*** **is a fast, synthetic SAR image generation tool**
- **Uses same high-frequency scattering algorithms as *lucernhammer MT***
  - **Multi-threaded scattering and image calculations.**
- **Fast slant- and ground-plane SAR image generation via scattering centers and FFT-based convolution**
- **Supported outputs over elevation/azimuth angle and polarization**
  - **Complex-value SAR image**
  - **Ground-plane clutter mask**
    - **Shadowing function computed via ray tracer**
  - **Original Scattering Center Database**
    - **End-user can use to generate their own SAR images**

Example: AMX-30 Ground Plane SAR Images

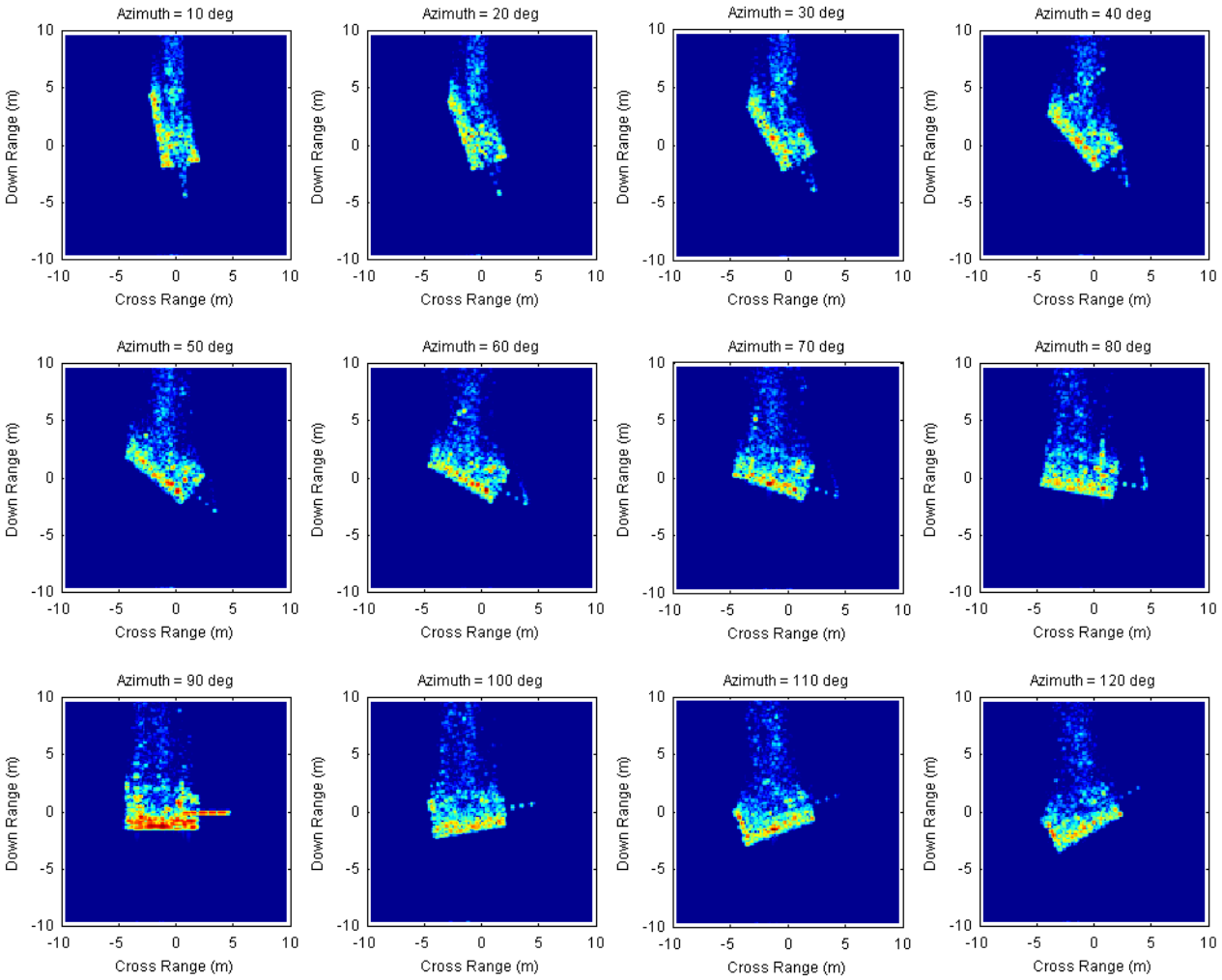
- Compute series of SAR images of AMX-30 Main Battle Tank
- Model of AMX-30 obtained from a repository of free computer graphics models
  - The converted facet model has 201074 triangles.
- Bottom of model set in *xy* plane with main gun along *x* axis
- SAR images generated every 10 degrees between 10 and 120 degrees azimuth
- Center frequency of 10 GHz, down and cross-range resolutions of 15 cm.
  - SBR uses 15 rays per wavelength. Edge diffraction is not used.

AMX-30 Main Battle Tank
(wikipedia image)

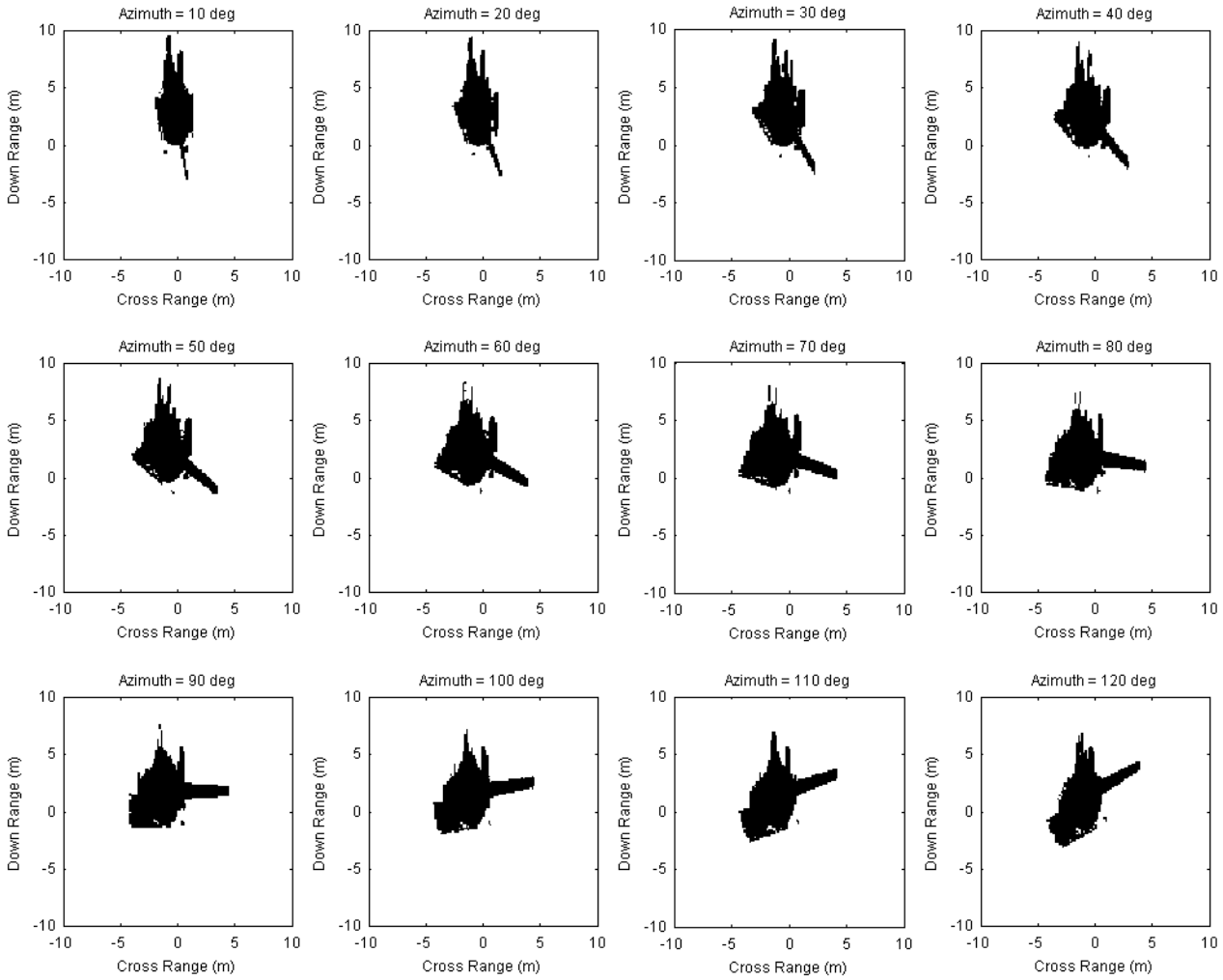


AMX-30 Main Battle Tank
(Facet model rendering via *Emerald*)

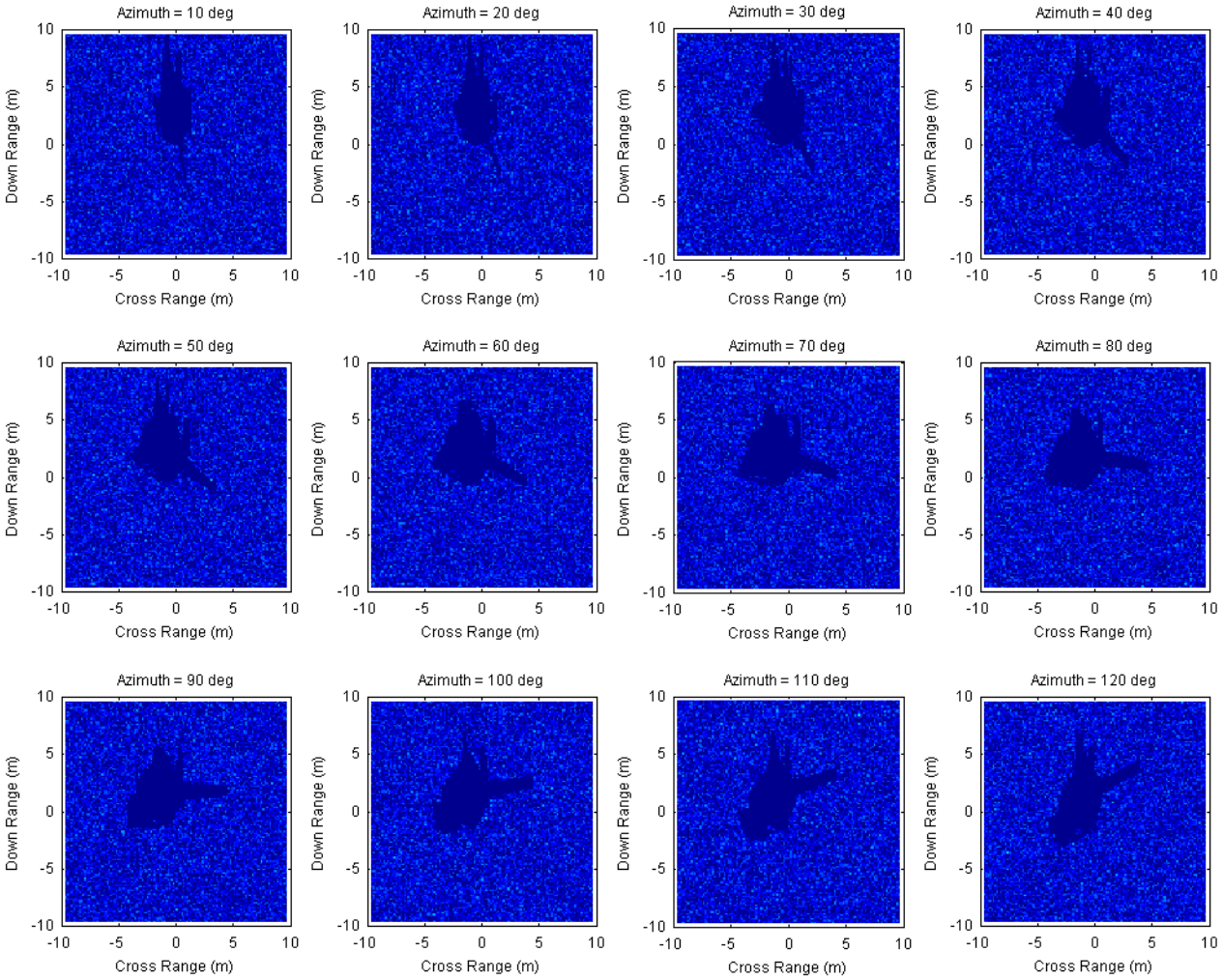
Ground-Plane SAR Imagery: VV-Polarization



Ground-Plane Clutter Mask



Notional Ground Clutter (noise), Plus Clutter Mask



SAR Imagery Plus Additive, Masked Background Clutter