

 <b>MOTION IMAGERY STANDARDS BOARD</b>  <b>STANDARD</b>  <b>Video National Imagery Interpretability Rating Scale (VNIIRS)</b>	<b>MISB ST 0901.3</b>  <b>5 October 2017</b>
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## 1 Scope

This standard defines the Video National Imagery Interpretability Rating Scale (VNIIRS), which is a user-based visual interpretability scale for Motion Imagery. This standard includes the background of the VNIIRS design, instructions for its use, and rating criteria for Electro-Optical (EO) Reflective sensors. This standard does not currently address EO Emissive or Synthetic Aperture Radar (SAR) sensors.

The EO Reflective VNIIRS criteria were developed using single-source, true-color data from an airborne sensor. Applicability to other EO Reflective data sources (e.g. visible panchromatic, daytime midwave infrared, shortwave infrared) is anticipated, but has not been verified.

## 2 References

- [1] NIIRS Standard version 1.1, NGA STND.0040 1.1, Dec 2016
- [2] MISP-2018.1 Motion Imagery Standards Profile, Oct 2017
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### 3 Terms and Definitions

<b>Observe</b>	To watch carefully especially with attention to details or behavior for the purpose of arriving at a judgment. Observing an activity implies that the activity is detected with sufficient confidence to distinguish it from similar activities. For example, observing a person texting on a cell phone would imply that the observer can clearly see that the subject is not writing on a notepad.
<b>Maneuver</b>	An act or instance of changing the direction or speed of a moving ship, vehicle, etc. Recognizing a maneuver implies that the observer can see the pattern of motion of the objects involved.
<b>By Type</b>	The capability to determine that two detected objects are of different types or classes based on one or more distinguishable features.

## 4 Acronyms

<b>EO</b>	Electro-Optical
<b>GEOINT</b>	Geospatial Intelligence
<b>GSD</b>	Ground Sample Distance
<b>IR</b>	Infrared
<b>NGA</b>	National Geospatial-Intelligence Agency
<b>NIIRS</b>	National Imagery Interpretability Rating Scale
<b>NSG</b>	National System for Geospatial Intelligence
<b>NSGPM</b>	NSG Policy Memorandum
<b>OB</b>	Order of Battle
<b>SAR</b>	Synthetic Aperture Radar
<b>ST</b>	Standard
<b>STND</b>	Standard
<b>VNIIRS</b>	Video National Imagery Interpretability Rating Scale

## 5 Revision History

Revision	Date	Summary of Changes
ST 0901.3	10/05/2017	<ul style="list-style-type: none"> <li>Revised 'Scope', 'Introduction', 'Scale Design', and 'Rating Interpretability Using the VNIIRS'</li> <li>Updated references and acronym list</li> <li>Added/updated definitions</li> <li>Removed 'Criteria Structure' and 'Using the Video-NIIRS in Analyst Ratings'</li> <li>Modified 'quality' to be 'interpretability' throughout</li> <li>Reworded guidance to allow fractional VNIIRS ratings</li> <li>Removed Level 2 paragraph</li> <li>Updated VNIIRS criteria</li> <li>Formalized 'shall' statements as requirements ST 0901.3-01, -02 &amp; -03</li> </ul>

## 6 Background

VNIIRS defines a user-based, visual interpretability scale for Motion Imagery. When used in this context, interpretability refers to the potential of the analyst to extract specific intelligence data for a particular intelligence task. The intelligence potential of Motion Imagery is not a measure of its esthetic value. VNIIRS applies strictly to a user's ability to visually recognize activities and details in Geospatial Intelligence (GEOINT) Motion Imagery.

## ST 0901.3 Video National Imagery Interpretability Rating Scale (VNIIRS)

Measures of interpretability are used in various ways:

- By users to describe a user's visual interpretability needs
- By mission planners in predictive equations
- By users to measure visual interpretability of collected images
- By developers to assess sensor design, performance and image interpretability

It is important to recognize that VNIIRS provides a scale comprised of interpretability criteria. These criteria are used by analysts to rate Motion Imagery, or used to create imagery quality equations, to predict VNIIRS ratings. Rules of thumb that equate a specific Ground Sample Distances (GSD) to specific VNIIRS levels should be used only as coarse estimates. The VNIIRS rating of Motion Imagery varies with the sensor design, atmospheric conditions, target illumination, compression and a host of other factors. The only highly reliable measure of VNIIRS results from the visual examination of Motion Imagery by experienced GEOINT or Motion Imagery analysts.

### 6.1 Scale Design

VNIIRS levels are numbered from three to eleven. Following the NSG Common NIIRS Policy [1], VNIIRS level 5 corresponds to the interpretability of Motion Imagery with 20.8-inch GSD. The scale is designed to have an approximate log-linear relationship with spatial resolution, meaning that the spatial resolution changes by a factor of two for every change of one in the VNIIRS level.

The scale provides criteria in the form of activities familiar to experienced Motion Imagery analysts covering three Orders of Battle (OBs) or Content Domains: Naval, Air and Cultural. Many of the criteria are applicable to additional OBs. The scale can be extrapolated to apply to scenes in a Motion Imagery clip which do not specifically include the activities described in the criteria.

### 6.2 Rating Interpretability Using the VNIIRS

The assignment of an integer VNIIRS value to a Motion Imagery clip indicates that a user will be able to visually discern at least one activity listed, or an activity with comparable characteristics, at that assigned VNIIRS level and as well as all activities, listed or comparable, at lower VNIIRS levels. Decimal ratings should be given based on a user's perception of how close the user thinks the Motion Imagery clip is to the next VNIIRS level.

Severe obliquity and extreme slant range increase the variability of GSD within the frame. This leads to increased variability in user ratings; therefore, subjective ratings are more repeatable for Motion Imagery clips collected close to nadir view.

Requirement	
ST 0901.3-01	A VNIIRS rating of Motion Imagery shall be based on ratable content closest to the spatial center of the Motion Imagery frames.

### ST 0901.3 Video National Imagery Interpretability Rating Scale (VNIIRS)

Zoom factor, sensor modalities (i.e. switching between EO and IR sensor modes) and phenomenology may change frequently over the course of Motion Imagery collection.

Requirement	
ST 0901.3-02	A VNIIRS rating shall be derived where Motion Imagery collection conditions (e.g. ground sample distance, platform and sensor dynamics) are unchanging.

Unless otherwise noted, the mention of a specific object of interest in a VNIIRS criterion presumes the Motion Imagery has the spatial resolution required to visually discern the object based on its form and structure alone. The VNIIRS criterion task to “observe” presumes that the Motion Imagery has the temporal resolution to reliably recognize the stated activity.

During the collection of Motion Imagery there will be cases, such as surveillance of an empty street, when no movement or activity is evident. In these cases, an analyst can still provide an interpretability rating based on what should be possible to observe. The lack of any movement or activity in Motion Imagery does not degrade interpretability.

Requirement	
ST 0901.3-03	Where the interpretability of Motion Imagery is precluded by obscuration, degradation or low resolution, a VNIIRS rating of 0 shall be assigned.

## 7 The Scale

The VNIIRS criteria are organized by interpretability level, which assigned a “Rating Level” from 3 to 11. At each level, there are multiple criteria supporting multiple Orders of Battle.

# EO Reflective

## Video National Imagery Interpretability Rating Scale (VNIIRS)

### Rating Level 3

Observe a group of vehicles as they maneuver on a roadway  
Observe a rail transport carrying double stacked intermodal containers as it travels along a railway (length approx. 16 m)  
Observe wing configuration of a large aircraft during taxi or tow (wingspan approx. 40 to 80 m)

### Rating Level 4

Observe an 18-wheel tractor-trailer rig or large bus by type as it maneuvers on a roadway (length approx. 15 to 23 m)  
Observe large (e.g., Cyclone class) coastal patrol boat maneuvering while underway (length approx. 55 m)

### Rating Level 5

Observe heavy equipment by type as it operates at a construction site (e.g., bulldozer, excavator, dump truck, loader)  
Observe the rotation of main rotor blades on a helicopter during warm up (rotor blade diameter approx. 10 to 18 m)  
Observe a small (e.g., FB RIB 33/36 PB/WPB) patrol boat maneuvering while underway (length approx. 8 to 11 m)

### Rating Level 6

Observe a motorcycle or recreation vehicle (e.g., ATV, dirt bike, golf cart) as it maneuvers (length approx. 2 to 2.5 m)  
Observe a small helicopter by type during taxi or tow (e.g., RS – HERMIT, US – MD530)  
Observe a group of crew members as they move on the deck of an amphibious assault ship

### Rating Level 7

Observe objects being loaded onto or unloaded from a vehicle (e.g., RPG-7 Launcher)  
Observe a person entering or exiting a vehicle  
Observe the movement of control surfaces on an identified light transport aircraft during preflight checkout or taxi (approx. width 1 m, on aircraft with wingspan of 18 m or less)

### Rating Level 8

Observe a person taking off or putting on an article of clothing (e.g., jacket, shirt, pants)  
Observe a person handling an assault rifle (e.g., M16A4, AK-47/74 variants)  
Observe a radar array antenna as it rotates on a vessel (length less than 1 m)

### Rating Level 9

Observe a person using a handheld communication device (cell phones, two-way radio, PDA)  
Observe a person securing an article of clothing (e.g., zipping or buttoning a jacket)  
Observe a crew manned defense armament by type rotating on a coastal patrol boat (e.g., MK38 25mm, .50 cal. machine gun)

### Rating Level 10

Observe a person's hand gestures (e.g., clapping, waving)  
Observe a business envelope sized object being exchanged between people (approx. 10 cm by 20 cm)

### Rating Level 11

Observe a person placing or removing an item from a shirt/pants pocket (item approx. 5 cm)  
Observe a wristwatch on the wrist of a moving person (wristwatch width approx. 5 cm)