License Plate Design for IR Camera Readability
Greg Florin – 3M Company
Motor Vehicle Agency Specifies and Approves Correctional Industries or Equivalent Manufactures

Motorists Installs on Vehicle

Motorists Drives Vehicle

Applications That Use A License Plate

- Electronic Tolling
- Law Enforcement
- Border Control
- Access Control
- High Occupancy Toll Lanes
- Cordon Pricing
- Stolen Vehicle Identification
- Parking
- Other Regulatory Compliance
- Electronic Vehicle Registration (EVR)
- Other Applications
- Public/Motorist
- State Branding/Tourism
- Organizations

Safe Drivers · Safe Vehicles · Secure Identities · Saving Lives
What do these applications want in a license plate?

- Read the Plate Day & Night
- See the plate at night – safety
- State Identification
- Highlight Features of the state – (MN – Land of 10,000 Lakes)
- Call out an Organization
- A Beautiful plate
- Process a Transaction – Tolling, Parking, Etc.
- Vehicle Identification
Plate design decisions made and approved based on human readability

- Dark characters on light background easiest to read
- Specialty plates use growing
- Complex graphics can hinder human readability
- Retroreflectivity required to read at night
• Invented in 1976, prototyped on the road in 1979
• First arrest via ALPR detection for a stolen car was made in 1981
• Saw wide usage starting in the 1990’s
• Two lighting methods in use – Infrared & Visible
• Primary users are Tolling and Law Enforcement
  • Law Enforcement uses 100% infrared light
  • Tolling uses 50% infrared and 50% visible light
• Many other secondary ALPR users
• Challenges with IR reading of License Plates
  • Low/No light return from ALPR light source
  • Low contrast between the background and characters
  • Interference between background and other information on the plate
    • Plate Readable to a human may be difficult to read in the IR
  • Small Letters such as stacked characters
  • State Identification
• Show how plate looks to the human eye and an infrared camera during design process
• Provide IR read accuracy range based on design
• Adjust design to improve IR readability
  • Minimal impact to visual appearance and readability
• Allows DMV and IR ALPR users to work together to optimize visual and IR readability
• Allows for creation of IR readable license plate standards
• Efficient plate design process – reduce need to create plate samples
Visible Spectrum Proof

AAMVA
AB123
Infrared Design

Initial, Simulated Infrared Spectrum Proof

AAMVA
AB123
Infrared Design

Simulated Infrared Spectrum Proof
Designed for Maximum IR Readability

AAMVA
AB123
Infrared Design

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Actual Images of Plates

Visible Spectrum Proof

Image of Plate Designed for Maximum IR Readability ~850nm

Image of Infrared Spectrum Plate at 855nm
• Important to consider IR readability when designing a new plate
• 3M has developed technology and process that allows “seeing” and analyzing the design in IR before making samples
• Other technology developments provide a path to new plate making methods
• Future solutions include machine readable data to improve read accuracy and provide a broader data set
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