PUBLIC-INTEREST FINDING FOR PROPRIETARY-MATERIAL USE

ROUTE: VAR DES NO: VAR
PROJECT NO: VAR COUNTY: VAR
PROJECT DESCRIPTION: Programmatic approval.
FHWA OVERSIGHT: ☒YES ☐NO
PROPRIETARY MATERIAL:
5 GHz Unlicensed Frequency Band Radios:

Tsunami MP.11	Model 5054 Base Unit (BSU)/Subscriber Unit (SU)/ 5012 Subscriber Unit,
Tsunami MP8100	Model MP-8100 BSU/SU/ 8150 CPE Subscriber Unit,
Tsunami GX	Model GX-200,

Manufactured by Proxim Wireless Corporation.

1. Description of Need:

The ITS Technology Deployment Division of the Indiana Department of Transportation is seeking approval to create a recurring special provision and ultimately incorporate into the Standard Specifications equipment essential to the creation and maintenance of the INDOT ITS network.

Wireless communication devices are an integral part of the INDOT ITS network. Along with fiber optic cables they guaranty data flow between the field components and TMC. Radios are the preferred wireless communication devices because of the wide band, absence of the monthly usage fees (unlicensed frequencies), and low cost installation. Selection of Proxim radios out of multiple models, available on the market, is based on the fact, that only desired radios are meeting all requirements. Multitude of configurations allows designer select model guarantying required functionalities.

Required functionalities include:

- Provide stable reliable radio link.
- Provide radio link, capable of carrying multiple multicast and data streams.
- Provide separation of multiple networks in one physical location.
- Provide cost flexibility in one link (combination of high cost and low cost units).
- Provide ability of point-to-point and point-to-multipoint communication.
- Provide wide range of the bandwidth.

2. Product History: These devices have been introduced for testing in 2005 and were excepted and used ever since. Approximately 600 of Proxim radios are currently being used in Indiana. They demonstrate very high reliability (over 96% uptime) and maintainability. Desired product is currently listed on INDOT Approved Materials List for Traffic Signal and ITS Control Equipment under ITS Wireless Communication Equipment. Testing was conducted according the **ITM No. 948-10P**

3. Product Availability: Google search for 5GHz radios returns multiple devices, meeting some of the requirements, but not all. Testing results for various make radios are presented in the following matrix:

	Manufacturers / Specifications	Systech Telecom (Libra 5800)	Firetide	Encom Radio Services, Inc.	SmartBridges	Proxim	Novaroam
Frequency range	Non- Licensed, 5 GHz	Yes	Yes	Yes	Yes	Yes	N/A
Throughput – max	54 Mbps	Yes	Yes	Yes	Yes	Yes	No
Throughput – min	12 Mbps	No	N/A	Yes-900Mhz	No	Yes	Yes
Maximum data rate	1.5 Mbps	N/A	N/A	N/A	N/A	Yes	Yes
TCP/IP compatible		Yes	Yes	Yes	Yes	Yes	Yes
Communication mode	Point-to-Point	Yes	No - Mesh	Yes	Yes	Yes	Yes
	Point-to-Multipoint	Yes	No - Mesh	Yes	No	Yes	No
Power-over-Ethernet	120 VAC	Yes	Yes	Yes/No for 900MHz	Yes	Yes	Yes
	48 VDC	No	N/A	Yes	Yes	Yes	Yes
Management	Ethemet/Serial	Yes	Requires	Yes	Yes	Yes	Yes
	Web Based	No	purchase of	Yes-High End only	Yes	Yes	No
	Telnet	Yes	proprietary S/W	No	No	Yes	Yes
Mode of operation	Bridge	Yes	No	Yes	Yes	Yes	Yes
	Router	No	Yes	Yes	Yes	Yes	Yes
Availability		Available through distributor	Available through distributor	Available through distributor	Available through distributor	Available through distributor	Available through distributor
Performance record		High failure rate	In 6 month of testing had never worked properly	High failure rate and complicated management. Low end and high end radios are not compatible.	Low data rate and high failure rate.	Very reliable, easy to manage locally and remotely, high end and low end radios are compatible.	Do not have high end radios, require big antennas, inadequate tech support
Comments		Not acceptable	Not acceptable	Not acceptable	Not acceptable	Accepted, entered in approved materials list.	Not acceptable

4. **Product Cost**: Equipment available on the market does not provide required functionality and reliability as it shown in the table in paragraph 3. There is no equipment on the market to make cost comparison. The next closest product is the HD26342 priced at $975.00. However, this product does not meet broadband and reliability requirements.

5. **Project Compatibility**: Desired product is compatible with existing ITS hardware. Application matrix below describes which model can be used for which application. The lowest cost Proxim radio model is being selected for any particular project based on the technology needs.

Function \ Model	5054-BSU-R	5054-BSU-R-LR	5054-SU-R	5054-SU-R-LR	5012-SUA	MP-8100	QB-8100	MP-8150-CPE	GX - 200	5054-PA50-23, 29	P, PL, PX, PLX
Base Station Unit, Regular Range (2 Mile)	X										
Base Station Unit, Extended Range (20 Miles)		X				X	X				
Subscriber Unit, Regular Range (2 Miles)			X								
Subscriber Unit, Extended Range (20 Miles)				X		X	X				
Subscriber Unit, Regular Range (2 Miles)					X			X			
Multicast capable	X	X	X	X		X	X	X	X		
Point – to - Point	X	X	X	X	X		X	X			
Point – to - Multipoint	X	X	X	X		X			X		
Broad Band , MHz	20	20	20	20	20	40	40	20	50		
Throughput, Mbps	54	54	54	54	12	300	300	100	204/102		
Type										Flat	Parabolic
Gain, db										23, 29	32
Cost	$1,736	$2001	$865	$959	$350	$1,800	$1,800	$400	$8,999	$144	$350
Application	Nodes of Spur links, Relay	Nodes of Spur links, Relay	CCTV at the end of Spur	CCTV at the end of Spur	Detecti on sites	CCTV links, Relay	CCTV links, Relay	CCTV at the end of Spur	Relay sites		

6. **Maintenance**: Desired equipment is designed such a way, that most of maintenance functions: monitoring up/down time, restoring functionality, updating/upgrading – can be done remotely, which drives down maintenance cost. Training is available by manufacturer (as needed) and on line in Wiki Notes, accessible for

tech personnel from any location in Indiana. Low failure rate (less than 5%), compact design, and short order turn around time results in the minimal storage requirement.

7. **Engineering Analysis:** This application is programmatic by nature and unique not to a specific ITS project, but to the ITS architecture that is already in place. Proxim radios provide the best functionality of known similar products and are the most reliable.

8. **Expanded Economic Analysis:** There are over 700 units of various models of Proxim radio installed in Indiana to support ITS Network. Annual replacement rate, including damage done by lightning, is no more than 20 units a year, majority are the low cost 5012 units. While testing other models ITS Technicians were replacing 10% of installed radios at least once a year. Replacement of Proxim radios is predominantly driven by technology progress, rather than wear.

9. **Contractual or Performance Implications:** Use of desired items does not impose any restrictions on the use of other items on the contracts.

10. **Attach Supplemental Documentation:** Attached are:
    a) INDOT ITS Architecture;
    b) ITM # 948-10P ITS Ethernet Switches.

11. **Length of Time that Approval is Effective:** 10/2011 until 10/2013

Prepared By: Konstantin Veygman

Field Engineer

INDOT-ITS Technology Deployment Division

Date:

Based upon the above finding, the use of the proprietary material listed is in the public interest and is hereby approved.

APPROVED: [signature] Date: 22 Dec 2011
INDOT Deputy Commissioner
Engineering Services and Design Support

APPROVED: _____ Date: 1-5-2012

Federal Highway Administration

INDOT has developed ITS infrastructure in urban areas statewide. It consists of vehicle detection, Closed Circuit TV cameras (CCTV), Highway Advisory Radio (HAR) sites, Dynamic (Variable) Message Signs (DMS), Travel Time Signs (TTS), and Virtual Weigh-in-motion (VWIM), Weigh-in-Motion (WIM), and Automatic Traffic Recorder (ATR) stations.

All data collected by the detectors and cameras is distributed to the Traffic Management Centers (TMCs). Information addressed to the driving public is sent from TMCs to the DMSs, HARs, and TTSs.

Communication to and from TMCs is provided via hybrid wireless/fiber optic means. The communication system is based on a "Back Bone", consisting of several nodes called Communication Data Processors (CDPs), connected with each other via redundant circuits (licensed wireless or fiber optic). The TMC is connected directly to the CDPs. Networking and communication equipment located at the TMC comprises the TMC Core Devices group. Field Core Devices installed at CDPs and major nodes include FCC Licensed and non-licensed wireless equipment, terminating and interfacing Fiber Optic equipment, and other networking equipment.

A typical INDOT ITS System consists of up to 3 distinguished groups of devices, described as follows.

1. Traffic Management Center (TMC) Core Devices. This group consists of major networking and communication equipment.
2. Field Core Devices. This group consists of FCC Licensed and non licensed wireless equipment, terminating and interfacing Fiber Optic equipment, and all networking equipment.
3. Field Devices. This group consists of:

    a) Public information devices: DMS, TTS, HAR;
    b) Detection devices: CCTV Cameras, non-invasive inductive detectors, microwave detectors;
    c) Communication and networking devices: field processors, radios, fiber optic equipment, field switches.
    d) Traffic Monitoring System devices: Virtual Weigh-in-motion (VWIM), Weigh-in-Motion (WIM), and Automatic Traffic Recorder (ATR): system controllers, roadway sensors, and communication and networking devices.

Existing ITS infrastructure is being expanded according with ITS Strategic Deployment Plan located at:
http://trafficwise.org/stratplan/TrafficManagementStrategicPlan_v2-4.pdf

Each ITS project involving Federal Funds adheres to the National ITS Architecture and the Systems Engineering Process as defined in 23 CFR 940. A Systems Engineering form is being completed and submitted to the FHWA for review and approval on each federally funded ITS project.

INDIANA DEPARTMENT OF TRANSPORTATION
OFFICE OF MATERIALS MANAGEMENT

PROCEDURE FOR BENCH TESTING, FIELD TESTING, AND APPROVAL LIST REQUIREMENTS FOR 5 GHz UNLICENSED FREQUENCY BAND RADIOS
ITM No. 948-10P

1.0 SCOPE.

1.1 This test procedure covers the methods that a 5 GHz Unlicensed Frequency Band Radio is evaluated in the field, and is placed, maintained, or removed from an approval list.

1.2 The values stated in either English or acceptable SI metric units are to be regarded separately as standard, as appropriate for a specification with which this ITM is used. Within the text, SI metric units are shown in parenthesis. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other, without combining values in any way.

1.3 This ITM may involve hazardous materials, operations, and equipment and may not address all of the safety problems associated with the use of the test method. The user of the ITM is responsible for establishing appropriate safety and health practices and determining the applicability of regulatory limitations prior to use.

2.0 REFERENCES.

2.1 Indiana Standards.

806 Approval List Requirements

2.2 NTCIP Standards.

1103 NTCIP Transportation Management Protocol (TMP)
9012 NTCIP Testing Guide for Users

3.0 TERMINOLOGY. Definitions for terms and abbreviations shall be in accordance with the Department's Standard Specifications, Section 101 and NEMA TS-2 Section 1.

4.0 SIGNIFICANCE AND USE. This ITM is used to evaluate, approve, maintain approval, and remove from the approval listing a 5 GHz Unlicensed Frequency Band Radio which is placed on the Department's List of Approved Traffic Signal and ITS Control Equipment. Each model of the 5 GHz Unlicensed Frequency Band Radio will be bench tested and field tested separately.

5.0 APPARATUS.

5.1 Complete ITS fully functional system

6.0 SAMPLING.

The manufacturer shall furnish, at no cost to the Department, one randomly selected production-run 5 GHz Unlicensed Frequency Band Radio of each model for bench testing and field testing.

7.0 PROCEDURE.

7.1 The manufacturer of the material shall submit the Preliminary Product Material Evaluation Form (Appendix A) for each model type of the 5 GHz Unlicensed Frequency Band Radio which the manufacturer is requesting to be added to the listing.

7.2 The manufacturer of the material shall submit with the Evaluation Form the following:

7.2.1 An invoice showing an initial zero dollar amount ($0.00) for the use of the evaluation sample material during the evaluation. The invoice shall also list the deferred cost of the material that the Department would pay if the material is purchased instead of returned upon the successful completion of the evaluation.

7.2.2 A certification of environmental testing shall be furnished with each major unit approval request indicating the unit has been tested and is in accordance with the environmental requirements from NTCIP. The certification shall specify the model and serial number of the 5 GHz Unlicensed Frequency Band Radio tested. A complete log of each test shall be provided to the Department and will be maintained by the Department. The log shall indicate which, if any, component failed during the test, when the component failed, and the steps taken to repair the 5 GHz Unlicensed Frequency Band Radio. The log shall include the date of testing, name and title of person conducting the tests, a record of conditions throughout the tests, and a temperature and humidity verses time chart. The maximum report interval of any chart shall be 24 h. The chart shall be from a recording machine used to monitor the status of the environmental chamber during testing.

7.2.3 Operation and Maintenance Manual(s), including theory of operation, schematics and components parts listing

7.2.4 One randomly selected production run 5 GHz Unlicensed Frequency Band Radio for bench testing and field testing

7.2.5 List of required software and any additional items required to realize the full potential of the product.

8.0 **SUBMITTAL REVIEW.** The documentation, including the environmental testing, will be reviewed for usability of the 5 GHz Unlicensed Frequency Band Radio with Department approved NTCIP based ITS system in Indiana. The manufacturer's recommended schedule and extent of maintenance will be reviewed for acceptability.

9.0 **BENCH TESTING.** The 5 GHz Unlicensed Frequency Band Radio will be bench tested for compatibility with all ITS equipment assemblies used by the Department. The 5 GHz Unlicensed Frequency Band Radio will be verified for full NTCIP functionality and full manufacturer's claimed optional functionality.

10.0 **FIELD TESTING.** The field testing of the 5 GHz Unlicensed Frequency Band Radio will consist of installing the 5 GHz Unlicensed Frequency Band Radio in an ITS cabinet on the tower for a period of up to 12 months to monitor the following:

10.1 A log of any failures for the 5 GHz Unlicensed Frequency Band Radio

10.2 The relative ease of use for the field personnel

10.3 Overall build quality and expected lifecycle of the 5 GHz Unlicensed Frequency Band Radio. The build quality and expected lifecycle shall be comparable with existing 5 GHz Unlicensed Frequency Band Radios.

11.0 **REPORT.** A final report will include the notations and findings from the electronic bench test and field testing results and documentation.

12.0 **APPROVAL LIST.**

12.1 **Approval of 5 GHz Unlicensed Frequency Band Radio.** The 5 GHz Unlicensed Frequency Band Radio model may be placed on the approval list when the following conditions are met:

12.1.1 A potential net benefit to the Department is realized by inclusion of the item on the approved list.

12.1.2 The unit passes the NTCIP environmental requirements.

12.1.3 The required documentation is submitted.

12.1.4 The bench and field testing are completed with satisfactory results.

12.1.5 No excessive amount of routine or periodic maintenance is required.

12.1.6 There are no failures with any of the different types of ITS assemblies or individual components used by the Department.

12.1.7 All manuals, documents, and required software to realize the full potential of the Aries Field Processor are submitted

12.1.8 Only minimal maintenance operations were necessary during the field testing.

12.2 Maintaining Approval.

12.2.1 The ITS Technology Deployment Division of TMBU shall be notified each time any update or revision is made, and an explanation of the changes and benefits of the change shall be submitted. Operations Support Division will determine if and to what extent a revision is to be placed into field operation and may fully re-evaluate the 5 GHz Unlicensed Frequency Band Radio with the revision.

12.2.2 If the manufacturer makes any changes to an approved model to correct a non-NTCIP compliant or safety issue, the Department shall be notified immediately. The manufacturer shall correct all existing equipment purchased by the Department either directly, by contract, or through agreement prior to the change being incorporated at the manufacturer's production level.

12.2.3 A design change to an approved model shall require a submittal of the documented changes. At the discretion of the Department, resubmission of the model for testing and evaluation may be required. Permanent addition or removals of component parts or wires, printed circuit board modifications, or revisions to memory or processor software are examples of items that are considered to be design changes.

12.3 Removal from Approval List. 5 GHz Unlicensed Frequency Band Radio will be removed from an approval list for, but not limited to, the following reasons:

12.3.1 Changes in the 5 GHz Unlicensed Frequency Band Radio components or production process that fail testing and/or evaluation

12.3.2 If three consecutive years elapse without furnishing the 5 GHz Unlicensed Frequency Band Radio

12.3.3 Performance of the 5 GHz Unlicensed Frequency Band Radio no longer meets the intended purpose

12.3.4 Recurring similar product failures indicate a manufacturer's defect

INDIANA DEPARTMENT OF TRANSPORTATION
DIVISION OF OPERATIONS SUPPORT
PRELIMINARY INFORMATION FOR PRODUCT MATERIAL EVALUATION

Trade Name _____ Date _____

Manufacturer _____ Patented? Yes _____ No _____ Applied for _____

Address _____
Street No (P. O. Box) City State Zip Code

Representative _____ Phone No ( )_____

Address _____
Street No (P. O. Box) City State Zip Code

Product Information _____

_____

Materials Composition _____

_____

_____

** Is this product considered HAZARDOUS MATERIAL when disposing of non-used or surplus materials? Yes _____ No _____

** What is the shelf life of this material? Years _____Months _____N/A_____

Recommended Use-Primary _____

_____

_____

Recommended Use-Alternate _____

_____

_____

Advantages and/or Benefits _____

_____

_____

** Materials specifications by manufacturer, installation/operation manual, maintenance manual, literature, test results, guarantee, hazardous material data sheets, plan, picture or sketch must be submitted with this form. In the case of electronic devices the schematic diagram, parts list, and parts layout diagram must be submitted for each printed circuit board within the device.

Meets following specifications:

AASHTO _____ _____

ASTM _____ _____

OTHER _____

Use by highway authorities or similar agencies in other states.

Agency	Years Used	Remarks

** Has product ever been evaluated by and rejected for use by a governmental agency?

Yes _____ No _____ If yes, by what agency and for what reason?

_____

_____

Will demonstration be provided? Yes _____ No _____

Availability: Seasonal _____ Nonseasonal _____ Delivery at site _____

After receipt of order, are quantities limited? Yes _____ No _____

** Will FREE SAMPLES be furnished? Yes _____ No _____
If yes, Quantity Furnished _____

** If the sample is salvageable, do you desire to have it returned Yes _____ No _____

(Desired return of salvageable samples will be at the supplier's expense.)
(The manufacturer agrees upon the return of salvageable samples, such samples may be damaged or non-operable. Normal care will be taken that the samples, when returned, are in operable condition; INDOT, however, does not guarantee that the returned samples are operable.)

Will laboratory analysis be furnished? Yes _____ No _____

** Approximate cost _____ Royalty Cost _____

When was the product introduced to the market? _____

This product is an alternate for what product? _____

_____

_____

Will warranty be provided? Yes _____ No _____ If yes, for how long? _____

Background of company, including principal products _____

_____

_____

_____

What offices of the Indiana Department of Transportation have been contacted?

_____

Additional Information _____

_____

_____

_____

(Attach additional sheets as necessary)

Person furnishing information _____
Name Title

Address _____
Street No (P. O. Box) City State Zip Code

Items marked ** MUST BE RESPONDED TO or further consideration may not be given for this product.

Please mail this form to:

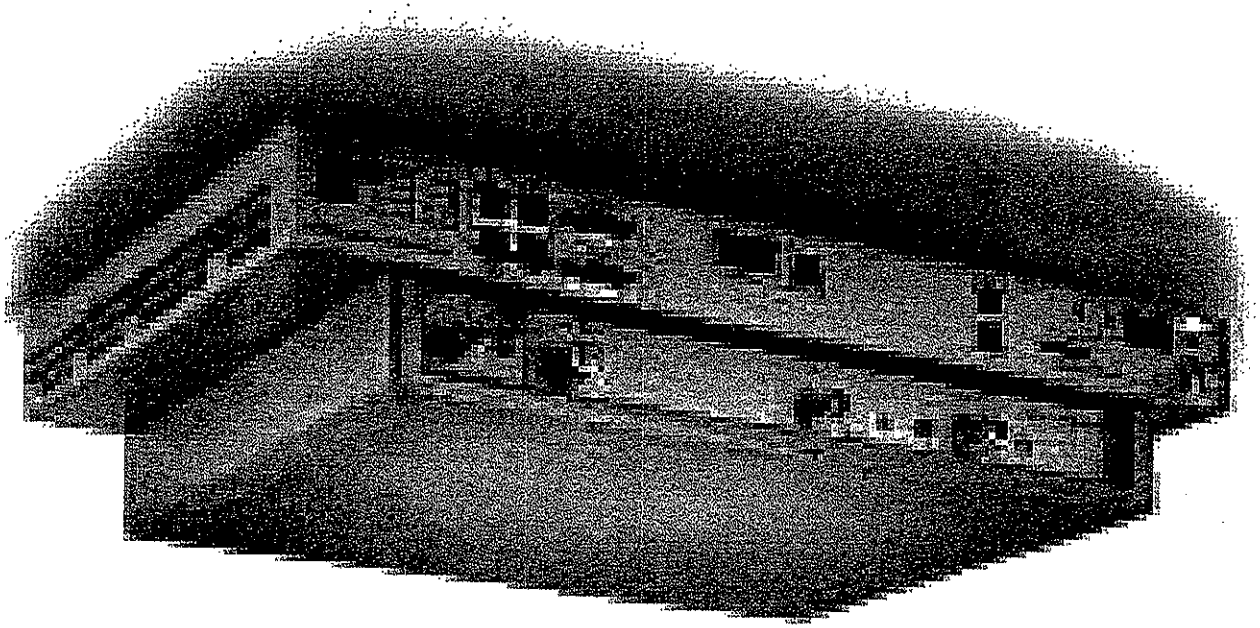
Manager, Office of Traffic Engineering
100 N. Senate Ave., Room N925
Indianapolis, IN 46204-2249

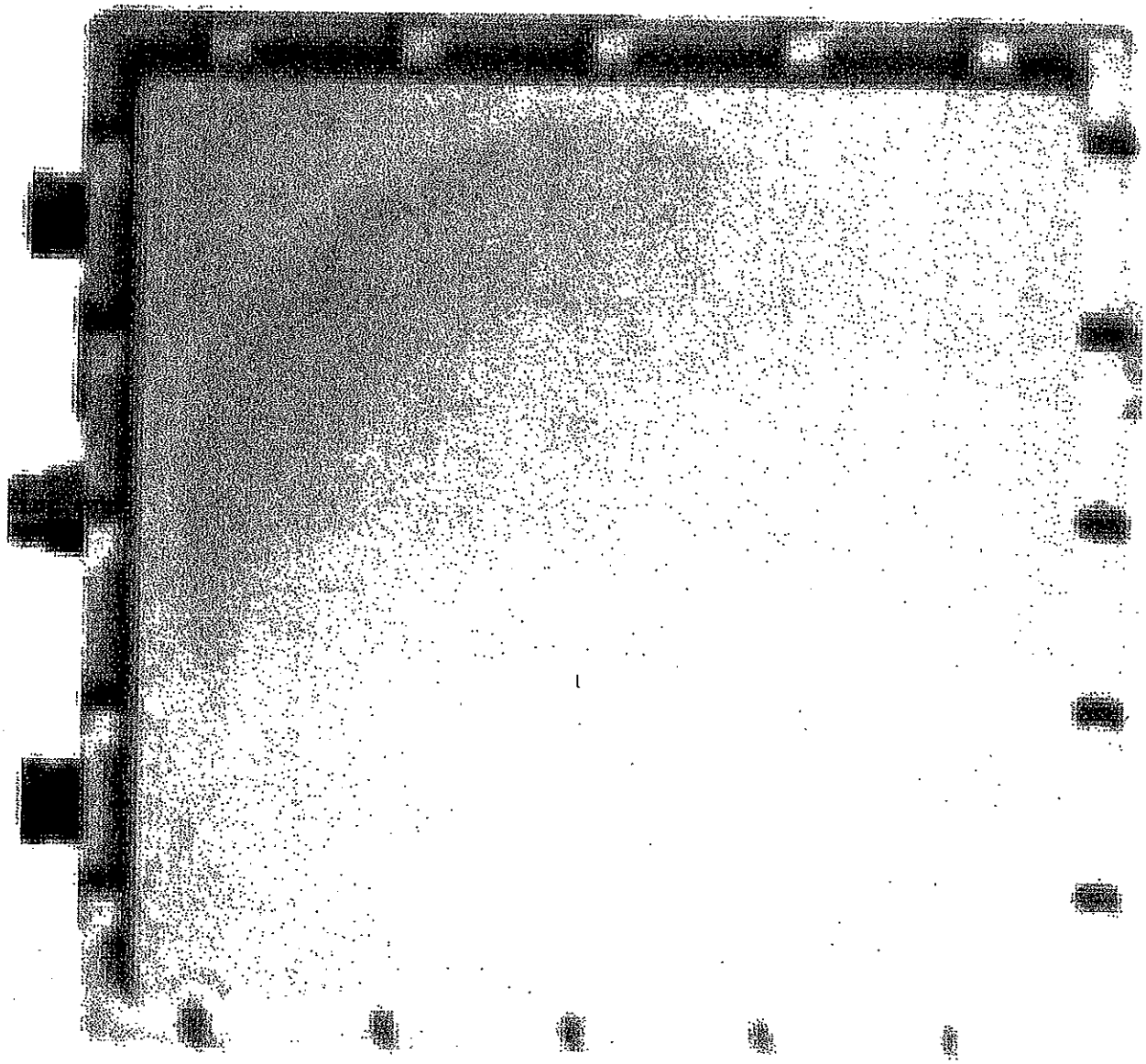
If INDOT elects to evaluate your product/material - traffic signal equipment will be shipped to:

Electronic Technician 1
Indiana Department of Transportation
7701 East Melton Road
Gary, IN 46403

While all other materials to be evaluated will be shipped to:

ITS Field Engineer
Indiana Department of Transportation
8620 East. 21st Street
Indianapolis, IN 46219





5 GHz Unlicensed Frequency Band Radios

PROGRAMMATIC APPROVAL - APPENDIX

PROGRAMMATIC APPROVAL PERIOD: October 2011 – October 2013

PROPRIETARY MATERIAL:
Proxim Wireless Corporation
Tsunami MP-8100 Model # MP-8150 CPE
Tsunami GX Model GX-200

ADDITIONAL PARTS:
The following parts have been added to the programmatic approval for the 5 GHz Unlicensed Frequency Band Radios, as being necessary for a synchronization when replacing discontinued by manufacturer named above models:

1. Tsunami MP-8100 Model ## MP-8150-SUR and MP-8150- SUR-100
2. Tsunami GX Model GX-800

EFFECTIVE DATE:
The effective date of the programmatic approval for the 5 GHz Unlicensed Frequency Band Radios is October, 2011. The effective date of this Appendix is July, 2012.

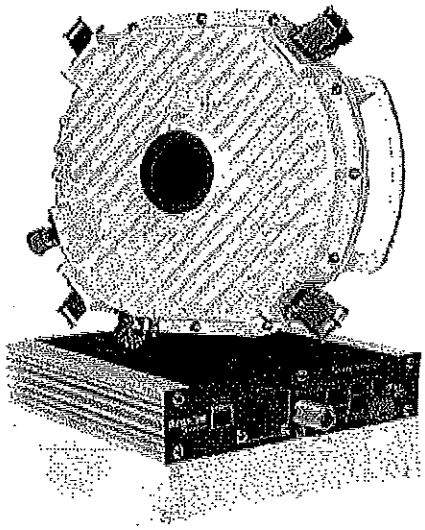
APPROVED: John E. Wyatt

~~Deputy Commissioner~~, Director
Engineering Services & Design
Support, INDOT

Digitally signed by Louis J Haasis
DN: cn=Louis J Haasis, o=Ind Div, ou, email=Lou.haasis@dot.gov, c=US
Date: 2012.07.17 10:15:31 -04'00'

Division Administrator, FHWA

PREPARED BY:
Date: 7/2/2012
Konstantin Veygman
ITS Field Engineer
ITS Technology Deployment Division
317-899-8606

Tsunami® GX800

High Performance PtP Microwave Products for Licensed Bands