

# PROJECT 25 PHASE 2 TDMA TRUNKED SUITE OF TIA-102 STANDARDS

STATUS: CORE DEFINITION DOCUMENTS ARE PUBLISHED

# PROJECT 25 PHASE 2 TDMA TRUNKING

The TIA-102 suite of standards are used for the design and manufacture of interoperable Project 25 communications products for mission critical operations. P25 has gained worldwide acceptance for public safety and public service in addition to many other industries such as utilities, airports, transit, petroleum and chemical companies.

The Common-Air-Interface (CAI) is one of the most widely deployed Project 25 interfaces enabling interoperable communications between P25 radios and between P25 radios and P25 infrastructure regardless of the manufacturer. The P25 Phase 2 TDMA trunked suite of standards adds TDMA voice service to the existing P25 FDMA trunked voice and packet data services already defined.

P25 Phase 2 TDMA capable systems will use the P25 Phase 1 FDMA control channel for both FDMA and TDMA call requests. This allows systems to support Phase 1 calls as well as Phase 2 calls.

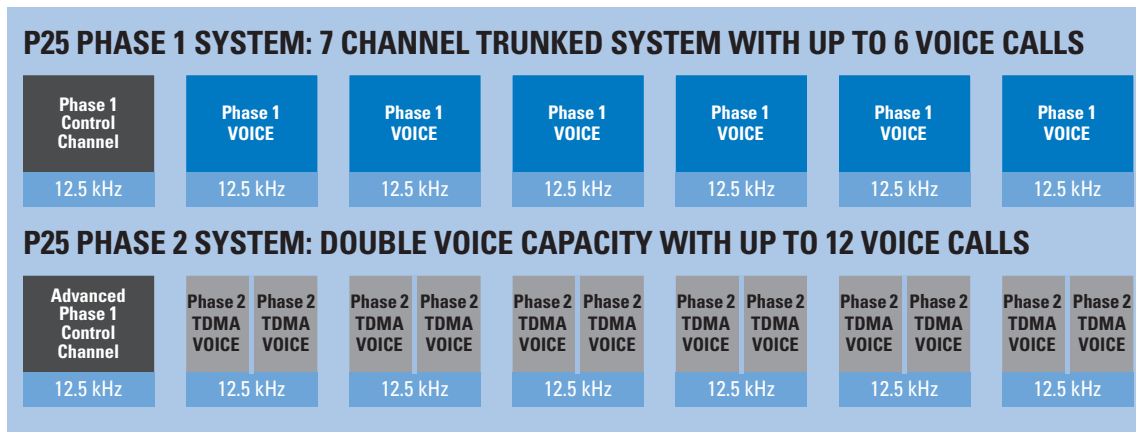
P25 Phase 2 TDMA capable systems will also use Phase 1 FDMA packet data service to support P25 OTAR, P25 Location service, POP25 (OTAP) and text messaging. It is therefore important that P25 Phase 2 TDMA capable system continue to support P25 Phase 1 FDMA features and operation.

P25 Phase 2 TDMA trunked operation will meet the 2013 FCC equipment certification requirement for 6.25 kHz channel equivalence mode in UHF and VHF bands and the 2015 FCC equipment certification requirement for 6.25 kHz equivalence mode in 700 MHz band plans. It will also meet the 6.25 kHz channel equivalence 2017 FCC regulatory requirement for operation in the 700 MHz band plans.

P25 Phase 2 TDMA provides organizations flexibility in how they leverage their current frequency allocations. A 7 channel system implementing P25 Phase 2 TDMA could double system capacity or it could keep the voice capacity the same and free up channels for data operations.

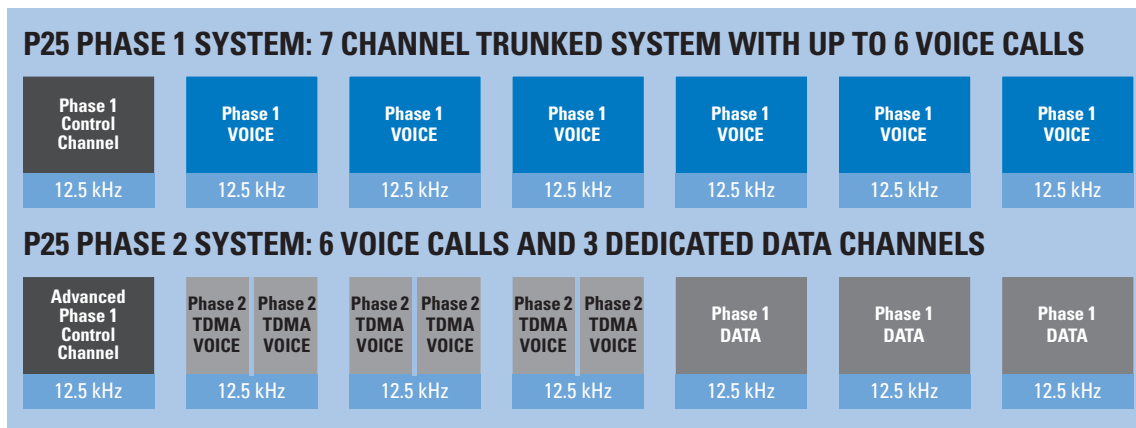
The P25 Phase 2 TDMA Common Air Interface is an addition to the P25 Standard and does not replace the P25 Phase 1 FDMA Common Air Interface.

## USE CASE: INCREASED VOICE CAPACITY WITH PHASE 2 TDMA



Organizations utilizing a P25 trunked system with Phase 2 TDMA operation can double their voice capacity. They go from having up to 6 simultaneous voice calls using P25 Phase 1 FDMA trunked operation to the ability to have up to 12 simultaneous voice calls using P25 Phase 2 TDMA trunked operation.

## USE CASE: SAME VOICE CAPACITY PLUS ADDITIONAL DATA CAPACITY WITH PHASE 2 TDMA



Organizations can use the additional system capacity afforded by P25 Phase 2 TDMA Trunked operation to maintain the same number of simultaneous voice calls and add data channels providing advanced data functionality such as OTAR, location service, OTAP, and text messaging.

# P25 PHASE 2 TDMA TRUNKED CORE DEFINITION DOCUMENTS ARE PUBLISHED

## COMPLETION OF THE CORE DEFINITION DOCUMENTS DIRECTLY ENABLES DEVELOPMENT OF INTEROPERABLE P25 PHASE 2 TDMA TRUNKED EQUIPMENT.

Phase 2 TDMA Trunked TIA-102 standards documents can be segmented into two main categories:

**The Core Definition Documents** are those TIA-102 Standards documents that enable manufacturers to develop and implement interoperable P25 Phase 2 TDMA trunked equipment.

**The Testing TIA-102 Documents** are used by manufacturers to verify that their product implementation adheres to the Phase 2 TDMA Trunked Core Definition Documents.

### STATUS OF THE PHASE 2 TDMA TRUNKED SUITE OF TIA STANDARD DOCS

CORE DEFINITION DOCS USED TO ENABLE DEVELOPMENT	2008	2009	2010	2011 (1H)	2011 (2H)
TDMA Physical Layer Doc		PUBLISHED			
TDMA CAI MAC Layer Doc			PUBLISHED		
Control Channel Updates	PUBLISHED				
Encryption Updates		PUBLISHED			
Half-Rate Vocoder Annex		PUBLISHED			
TESTING DOCS USED TO VERIFY IMPLEMENTATION	2008	2009	2010	2011 (1H)	2011 (2H)
TDMA CAI Conformance Tests				APPROVED TO MOVE TO TR-8 Anticipate February	
TDMA M&P Conformance Tests			APPROVED TO MOVE TO TR-8		
TDMA Transcvr Msmt Methods				APPROVED FOR TIA PUBLICATION Anticipate March	
TDMA Interoperability Tests				APPROVED TO MOVE TO TR-8 Anticipate February	
TDMA Transcvr Perf Recomnds					APPROVED FOR TIA PUBLICATION Anticipate July

### APPROVAL STEPS FOR TIA/PROJECT 25

#### STEP 1

#### APPROVAL TO MOVE TO TR-8

A document has been sent to the appropriate TR-8 subcommittee to determine if additional work is required or if it is suitable for ballot. Once the document is balloted and approved, it will move onto the next stage: "Approved for TIA Publication". Motorola estimates it may take up to six months to advance to Step 3.

#### STEP 2

#### APPROVED FOR TIA PUBLICATION

A document is determined to be complete. The chair of the TR-8 subcommittee forwards the document onto TIA for publication. Motorola estimates it takes approximately one month to move to Step 3.

#### STEP 3

#### PUBLISHED BY TIA

A document is published as a TIA-102 standard document.

Source: TDMA Task Group Overall 2-slot TDMA Documentation Schedule – January, 2011

## CORE DEFINITION DOCUMENTS ENABLES DEVELOPMENT

The Core Definition Documents are those documents that enable the development of P25 Phase 2 TDMA trunked interoperable equipment. The documents include the following:

**Project 25 Phase 2 Two-Slot Time Division Multiple Access Physical Layer Protocol Specification Standard (TDMA Physical Layer Doc)** standardizes modulation and data rate for P25 Phase 2 TDMA operation in a 12.5 kHz channel. Published in July 2009. TIA-102. BBAB.

**Project 25 Phase 2 Two-Slot Time Division Multiple Access Media Access Control Layer Protocol Specification – Trunked Voice Services (TDMA CAI MAC Layer Doc)** standardizes protocol, messages, and procedures for the P25 Phase 2 TDMA air interface. Published in December 2010. TIA-102. BBAC

**Control Channel Updates** standardizes control channel messages and procedures to enable P25 Phase 2 TDMA radio registration and call assignment. Published November 2009. TIA-102. AABC-C.

**Encryption Updates** standardizes voice/data encryption synchronization on a P25 Phase 2 TDMA channel. Published August 2009. TIA-102. AAAD-A.

**Half Rate Vocoder Annex** defines lower bit-rate vocoder for the higher spectral efficiency of a TDMA air interface. Published 2009. TIA-102.BABA-1.

The P25 Phase 2 TDMA Trunking Core Definition documents are now complete.

Manufacturers now have the information necessary to build interoperable P25 Phase 2 TDMA trunking equipment. Several manufacturers, including Motorola, have already filed with the FCC for the Phase 2 modulation schemes – HCPM and HDQPSK.

## TESTING DOCUMENTS VERIFIES IMPLEMENTATION

The Testing Documents enable manufacturers to verify implementation P25 Phase 2 TDMA Trunked operations. The documents include the following:

**Project 25 Phase 2 Two-Slot Time Division Common Air Interface Conformance Tests (TDMA CAI Conformance Tests)** are the standard MAC protocol tests. TIA-102.BCAD

**Project 25 Phase 2 Two-Slot Time Division Messages and Procedures Conformance Tests (TDMA M & P Conformance Tests)** are the standard MAC messages and procedures tests. TIA-102.BCAE

**Project 25 Phase 2 Two-Slot Time Division Transceiver Measurement Methods (TDMA Transcvr Msmt Methods)** are the standardized test methods for measuring transmitter and receiver performance. TIA-102.CCAA.

**Project 25 Phase 2 Two-Slot Time Division Interoperability Tests (TDMA Interoperability Tests)** are the standard tests for interoperability between radios and infrastructure. Addendum to TIA-102.CABC.

**Project 25 Phase 2 Two-Slot Time Division Transceiver Performance Recommendations (TDMA Transcvr Perf Recomnds)** are the standardized performance specs for the transmitter and receiver measurement methods. TIA-102.CCAB.

The suite of P25 Phase 2 TDMA trunked testing documents to verify implementation of the standard are well underway.

# MOTOROLA IMPLEMENTS THE STANDARDS

**Motorola’s ASTRO 25 Phase 2 TDMA trunked release timing and technical implementation has been planned so that it is tightly aligned with P25/TIA standards activities.** Agencies looking to purchase a P25 system can purchase an ASTRO 25 system with P25 Phase 2 TDMA trunked functionality designed to the TIA-102 Suite of Standards.

As of January 2011, Motorola has 11 contracts for Project 25 Phase 2 TDMA systems.

In support of the standard, Motorola has already implemented enhancements specified in the P25 Phase 2 TDMA TIA-102 core documents such as the dual rate vocoder in the APX™ subscriber portfolio and the MCC 7500 console. Key systems components in ASTRO 25, like G-series products (stations, controllers, comparators) and the MCC 7500 console, are software upgradeable to Phase 2 TDMA.

assignment through Dynamic Dual Mode is part of the core call processing application and is transparent to users and requires no intervention from users or network operators.

Interoperability and compatibility with Phase 1 FDMA has been a key priority of the standard. Motorola has designed the Dynamic Dual Mode feature to achieve seamless interoperability between Phase 1 FDMA and Phase 2 TDMA services. With Dynamic Dual Mode (DDM), calls in an ASTRO 25 system are dynamically assigned as Phase 1 FDMA or Phase 2 TDMA depending on the resources that participate in a call. When all the resources (stations, subscribers) in a call are TDMA capable the call is processed as a TDMA call. If any of the resources is only capable of Phase 1 FDMA then the call is processed as a Phase 1 FDMA call. The call



## ADDITIONAL INFORMATION

### Glossary of Terms

- P25 – Project 25
- TIA – Telecommunication Industry Association
- TIA-102 – TIA Standards Document issued by TIA
- TDMA – Time Division Multiple Access
- FDMA – Frequency Division Multiple Access
- CAI – Common Air Interface
- MAC – Media Access Control Layer
- FCC – Federal Communications Commission
- HCPM – Harmonized Continuous Phase Modulation
- HDQPSK – Harmonized Differential Quadrature Phase Shift Keying

### Project 25 Information Sources

- Project 25 Technology Interest Group (PTIG) [www.project25.org](http://www.project25.org)
- TIA (Telecommunication Industry Association) [www.tiaonline.org/standards/](http://www.tiaonline.org/standards/)
- Motorola Project 25 Website [www.motorola.com/project25](http://www.motorola.com/project25)
- Motorola White Paper [Project 25 Standard, Interoperable communications for public safety agencies](#)
- Motorola Webinar [Join the Project 25 Webinar Now](#)

Motorola Solutions, Inc. 1301 E. Algonquin Road, Schaumburg, Illinois 60196 U.S.A. [motorola.com/project25](http://motorola.com/project25)

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