PMRExpo 2022

DMR Tier III Update

Alessandro Guido
DMR Standardisation & Certification, Leonardo S.p.A.
Technical Working Group Laboratory Coordinator, DMR Association

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Agenda

- DMR Tiers
- DMRA Update
- Why Interoperability?
- Insights in the Interoperability Process
- Tier III Interoperability
- New Features and Updates
- Tier III IOP Certificate Example

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DMR Tiers

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DMR Tier 1: Unlicensed

- Products for license-free, non-professional use: PMR446

DMR Tier 2: Conventional

- Professional licensed conventional radio systems operating in PMR frequency bands 30 to 1000 MHz. Targeted at users who need smooth migration from analogue with existing spectrum & licensing, spectral efficiency, advanced voice features and integrated IP data services in licensed bands

DMR Tier 3: Trunked

- Professional trunking operation in frequency bands 30 to 1000 MHz. The ETSI Tier III standard is derived from MPT1327 and is based on Tier II building blocks and features with plenty of additional added-value features

DMR Tiers and Features - ETSI DMR Standard Parts

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Current (March 2022) Standard

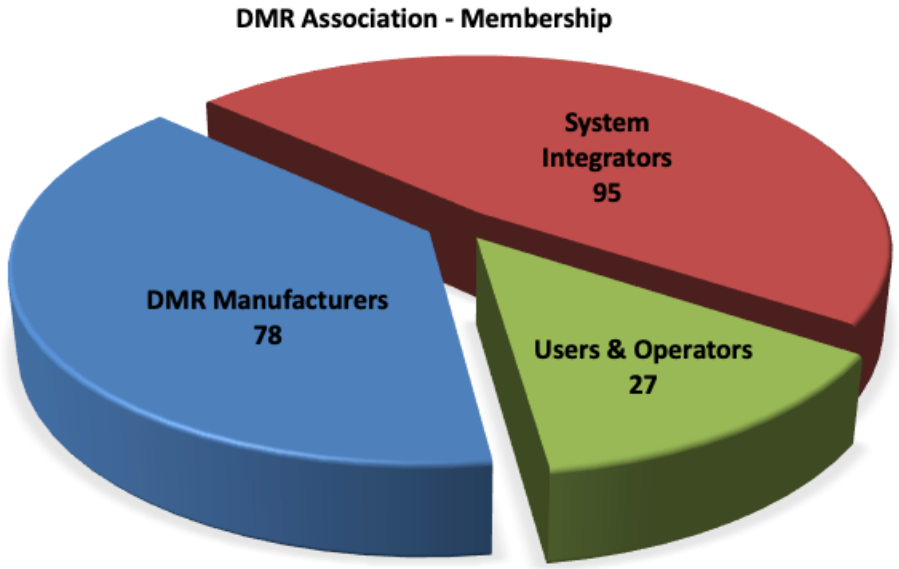
- ETSI TS 102 361-1 V2.5.1 (2017-10) DMR Air Interface Protocol
- ETSI TS 102 361-2 V2.4.1 (2017-10) DMR Voice and Generic Services
- ETSI TS 102 361-3 V1.3.1 (2017-10) DMR Data Protocol
- ETSI TS 102 361-4 V1.11.1 (2021-01) DMR Trunking Protocol
- ETSI TR 102 398 V1.4.1 (2018-11) DMR General System Design

ETSI World Class Standards

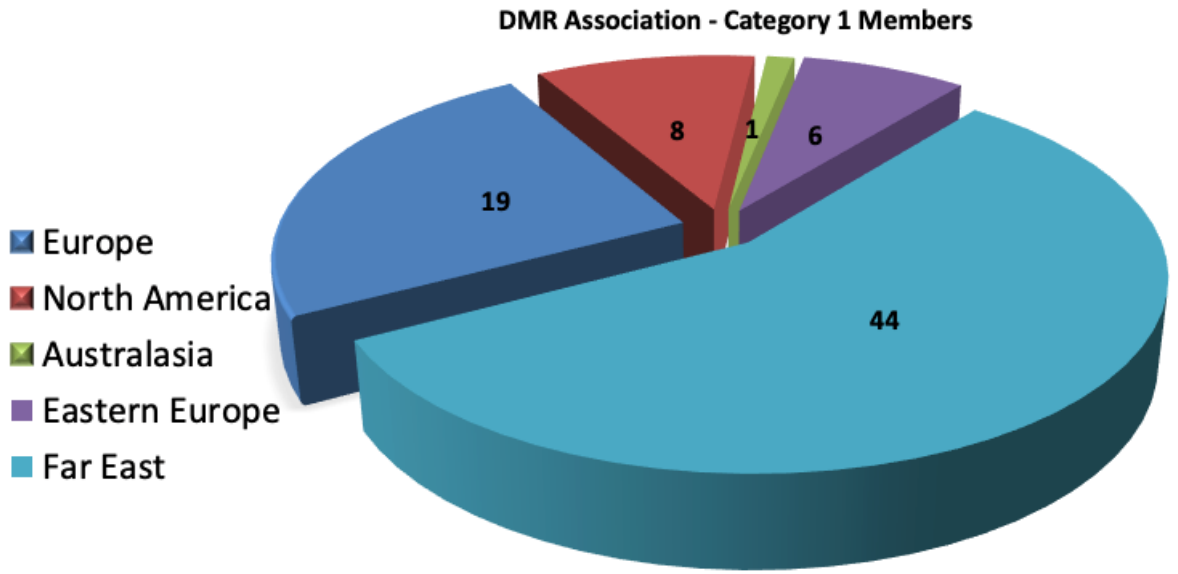
All these documents can be publicly downloaded from the ETSI or DMR Association websites:

www.etsi.org
www.dmrassociation.org

DMRA Update



Total of 200 Members Globally



78 of them are Manufacturers (Category 1)

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DMR Association: Mission and Objectives

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For DMR we do:

- Operate an equipment interoperability testing and certification program
- Communicate with the user community to capture new requirements
- Enhance the feature set of DMR with new functions
- Offer education and updates about the standard
- Give advice to regulators to ascertain an environment in which the technology can flourish

Why Interoperability?

- An Interoperability (IOP) Certification process ensures users and equipment suppliers benefit from an open multi-vendor market for DMR systems and equipment
- A multi-vendor market brings proven benefits to users such as choice of equipment, price and quality
- Users can be confident that products awarded an Interoperability Certificate have been rigorously tested and the functions listed in the Certificate fully meet the DMR standard
- Interoperable manufacturers radios increases competition and reduces prices

Best Practice IOP from mature Standards - Principles and background

- Reviewed P25 and TETRA as examples of high quality interoperability process
- Both processes are extremely thorough as fits requirements of govt. public safety users and contracts worth $100's millions
- Reviewed ETSI DMR Special Task Force conformance work from time of DMR standardisation
- Took elements of P25, TETRA and ETSI processes and simplified to make appropriate for PMR users

Insights in the Interoperability Process

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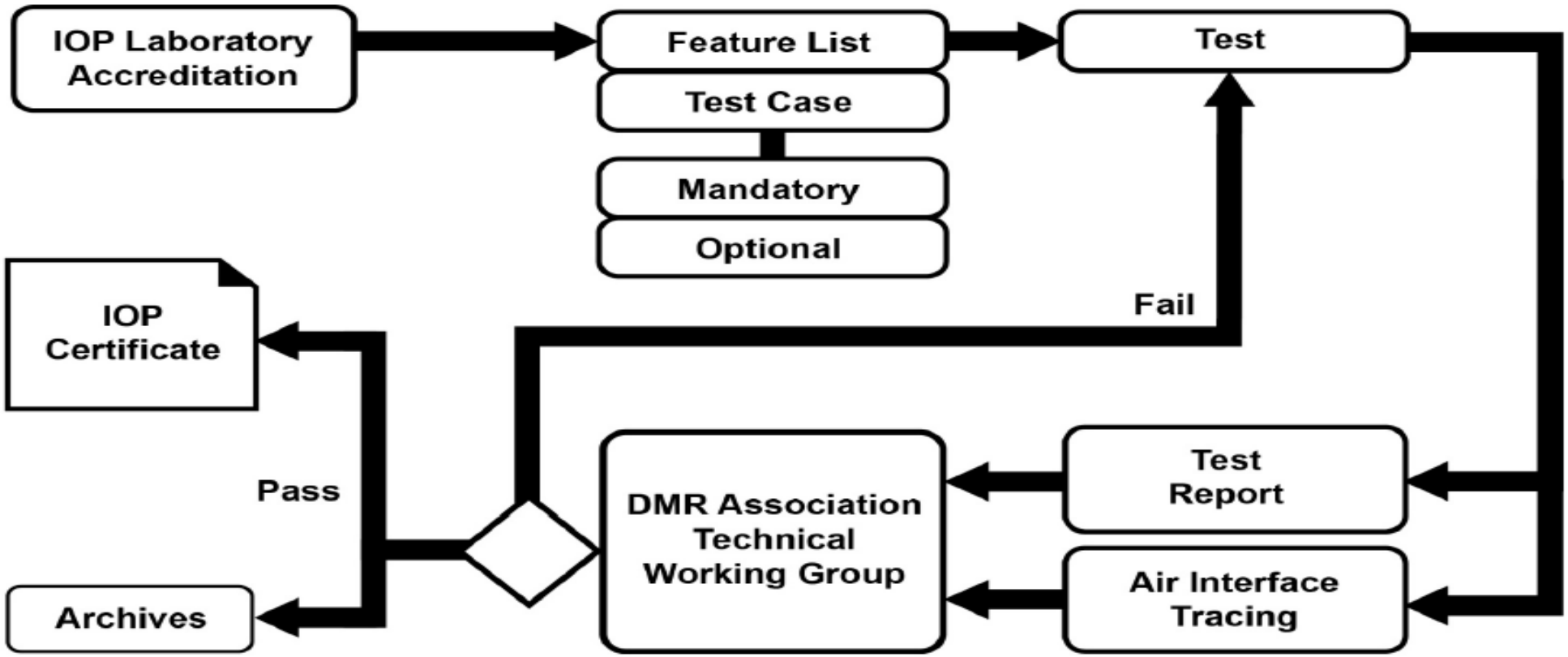

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Insights in the Interoperability Process

- The whole Test Process is regulated by a DMR Association document, the “Interoperability Laboratory Recognition Process and Test Session Procedures”
- The DMRA Technical Working Group (TWG) appoints a Laboratory Co-ordinator who is responsible for managing the Recognition Process of DMRA Recognized Interoperability Laboratories
- Written quality standards and processes for Labs wanting to run tests – reference to ISO 9001 processes
- All Labs wanting to run a test session must self-declare compliance with these standards and be acknowledged by TWG
- Labs can be challenged to demonstrate compliance

Insights in the Interoperability Process

- DMRA TWG appoints an Interoperability Co-ordinator who is responsible for managing the Test Session Procedure
- New products submitted for interoperability testing must comply with all applicable conformity regulation governing access to the relevant market
- IOP invitations are open to all members of the TWG
- The DMR Interoperability Testing and Certification process follows clearly defined rules over the different phases, from “Decision to Test” to “Certificate Issue”
  - Test reports are written following a well-defined form
  - Log files of tests must be collected
  - Laboratory managers and vendors must sign off all testing
  - Tests performed according to agreed detailed specifications

Interoperability: Summary

- An Interoperability Certification Process ensures users and equipment suppliers benefit from an open multi-vendor market for DMR systems and equipment
- Process is well defined, clear, robust and appropriate
- Process tests significant functionalities (important to users) and represents a base level of conformance (as a double check)
- Positive feedback from users

DMR Association: Website - IOP Certificates

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Certificates and Summary of the Test Results

Please Note: Starting from session 2018-001 IOP up to 2020-002 certificates are digitally signed and protected against modification using a GlobalSign CA2 certificate.
From 2020-003 onwards all documents are signed using DocuSign. A certificate's authenticity can be verified by opening the document in Adobe Acrobat DC or Adobe Acrobat Reader DC. The document signing certificate information will be visible at the top of the certicate page. For any queries on the validity or authenticity of DMRA IOP certificates please contact the Chair of the Technical Working Group twgchair@dmrassociation.org.
Furthermore note that from session 2018-001 all Tier 3 IOP sessions include the version of TS 102 361-4 supported during the test session which allows the viewer to determine version compatibility.

Search for Certificates By Certificate Date

– 2022

2022-003 Tier 3 DAMM Tetraflex BS422 SYS and Tait TP9500 MS Certificate

2022-003 Tier 3 DAMM Tetraflex BS422 SYS and Tait TP9500 MS Certificate

2022-003 Tait Model Class Declaration

+ 2021

+ 2020

+ 2019

+ 2018

+ 2017

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Mandatory versus Optional tests

- There are tests for both Tier 2 and Tier 3 features
- DMRA TWG has defined two types of test for each Tier:
  - Mandatory tests on features defined in the ETSI DMR standard
  - Optional tests on features defined either in ETSI DMR standard or in DMRA standard
- For Tier 2:
  - Mandatory: Group Call, Individual Call (PATCS), Individual Call (OACSU), All Call
  - Optional: Radio Check, Call Alert, Radio Disable/Enable, Remote Monitor, Emergency Alarm, Emergency call, Messaging
- For Tier 3 the Mandatory list is similar to Tier II
  - Plus Registration, Roaming, Queuing and Native Addressing Plan
  - Optional Tests are for Multi-site trunking and many other features, cfr. next slides

Tier 3 Interoperability: Optional Features Set 1

Optional Features (Set 1)
Multisite Talkgroup Voice Service
Multisite Individual Voice Service
Multisite Short Data Messaging
Status Service Delivery
Stun/Revive
Kill
Emergency Alarm
Emergency Voice Service
MS Initiated Payload Interrupt MS De-key with Cease Transmission Request
Single Talkgroup Subscription
Talkgroup Subscription List
Single Talkgroup Attachment
Talkgroup Attachment List
Half Duplex Telephone Voice Service
Full Duplex Telephone Voice Service
Full Duplex MS to MS Individual Call
Location – USBD Polling
Text Message Service
Registration with Authentication
Emergency Pre-emption with MS De-key

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Tier 3 Interoperability: Optional Features Set 2 (Planned for Q1/23)

Ambient Listening Service

- Success
- Call termination through MS Dekey
- Payload interrupt for initiator to respond

Radio Check

- MS Radio Check successful
- Talkgroup Presence Check on TSCC
- Talkgroup Presence Check on payload channel

DGNA

- DGNA Address Mode: Add 1 TG, single site
- DGNA Address Mode: Add multiple TGs, multisite
- DGNA Address Mode: Remove all DGNA added TGs, multisite
- DGNA Alias Mode: Add 1 TG and alias, multisite
- DGNA Alias Mode: Remove added TG and alias, multisite

Call Diversion

- Divert individual voice call to another MS, single site
- Divert individual status message to another MS, single site
- Divert individual text message (IP Data) to another MS, single site
- Divert individual voice call to a TG, multsite
- Divert individual voice call to telephone, single site
- Cancel call diversion by initiator
- Cancel call diversion by target

LIP Location via IP Data

- Immediate Location Report
- Basic Location Report Request
- Short Location Error Reporting
- Location Report Disable with acknowledgement Request
- Location Report Enable with acknowledgement Request
- Dynamically modifiable reporting
- Emergency Location Report
- Location on PTT

Encryption

- ARC4 Encryption Individual Voice, Single Site
  - Success
  - Failure (target wrong key)
- ARC4 Encryption Talkgroup Voice, MultiSite
- ARC4 Encryption Talkgroup Voice, Late Entry
- ARC4 Encryption Telephone to Talkgroup
- ARC4 Encryption Individual Text Message (IP Data)
  - Success
  - Failure (target wrong key)
- ARC4 Encryption Talkgroup Text Message (IP Data)
- AES256 Encryption Individual Voice, Single Site
  - Success
  - Failure (target wrong key)
- AES256 Encryption Talkgroup Voice, MultiSite
- AES256 Encryption Talkgroup Voice, Late Entry
- AES256 Encryption Telephone to Talkgroup
- AES256 Encryption Individual Text Message (IP Data)
  - Success
  - Failure (target wrong key)
- AES256 Encryption Talkgroup Text Message (IP Data)

Announce Logical Physical Channel

- Modify the frequency plan for a payload channel

Offset Control Channel

- Offset Mode Voice Call, Single Site

Short Data Message to a Group

- Short Data Message to a Group

Mass Re-Registration

- Mass Re-Registration

Hibernating Control Channel

- Hibernating Control Channel

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Tier 3 Interoperability: IOP Certificate

DMR Association Interoperability Certificate

Certificate Number: xxxxx

This DMR Association Interoperability Certificate documents that the manufacturer A product as detailed in Table A below:

TABLE A : DMR EQUIPMENT TESTED		
Manufacturer		
Model		
Firmware	ID	Version

has successfully passed the DMR Association Tier 3 Mandatory and Optional interoperability tests outlined in the DMR Association test specification documents: *Interoperability Testing for DMR Tier 3 Systems V X.X of Month Year* carried out on days month year with the manufacturer B product referenced in Table B below with tests undertaken as indicated in the following pages.

TABLE B : DMR EQUIPMENT TESTED		
Manufacturer		
Model		
Firmware	ID	Version

The DMR Association hereby declares that the product in Table A when tested with the product in Table B passed interoperability Test Cases as set out in the feature summary below.

The DMR Association hereby declares that the testing took place according to the procedures and in a laboratory meeting the criteria set out in the DMR Association document: *Interoperability Laboratory Recognition Process and Test Session Procedures, V X.X of Month Year.*

Issue Date: DD/MM/YYYY

Digitally Signed by Chair of the DMR Association Technical Working Group

Tier 3 Interoperability: IOP Certificate

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ETSI STANDARD SUPPORTED

ETSI Standard Supported	<Version of TS 102 361-4 supported by the system>.

FEATURE SUMMARY

Mandatory Features

Feature	Result
Registration	Pass
Single Site Talkgroup Voice Service	Pass
Single Site Individual Voice Service	Pass
Hunting	Pass
Single Site Short Data Messaging	Pass
Native Addressing	Pass

Optional Features

Feature	Result
Multisite Talkgroup Voice Service	Pass/Not Tested
Multisite Individual Voice Service	Pass/Not Tested
Multisite Short Data Messaging	Pass/Not Tested
Status Service Delivery	Pass/Not Tested
Stun/Revive	Pass/Not Tested
Kill	Pass/Not Tested
Emergency Alarm	Pass/Not Tested
Emergency Voice Service	Pass/Not Tested
MS Initiated Payload Interrupt MS De-key with Cease Transmission Request	Pass/Not Tested
Single Talkgroup Subscription	Pass/Not Tested
Talkgroup Subscription List	Pass/Not Tested
Single Talkgroup Attachment	Pass/Not Tested
Talkgroup Attachment List	Pass/Not Tested
Half Duplex Telephone Voice Service	Pass/Not Tested
Full Duplex Telephone Voice Service	Pass/Not Tested
Full Duplex MS to MS Individual Call	Pass/Not Tested
Location – USBD Polling	Pass/Not Tested
Text Message Service	Pass/Not Tested
Registration with Authentication	Pass/Not Tested
Emergency Pre-emption with MS De-key	Pass/Not Tested

MANDATORY FEATURE DETAILED SUMMARY

Registration	
Registration Accepted	Pass
Registration Not Accepted	(See Note 1)
MS Refused	Pass/Not Tested
MS Denied	Pass/Not Tested
De-registration	Pass
Single Site Talkgroup Voice Service	
Message Trunking	(See Note 2)
Call Granted	Pass/Not Tested
Call Refused	Pass/Not Tested
Call Queued	Pass/Not Tested
Broadcast Call	Pass/Not Tested
Transmission Trunking	(See Note 2)
Call Granted	Pass/Not Tested
Call Refused	Pass/Not Tested
Call Queued	Pass/Not Tested
Single Site Individual Voice Service	
Single Frequency OACSU Call	
Call Granted and ended by calling party	Pass
Call Granted and ended by called party	Pass
OACSU Call	
Call Granted	Pass
Call Refused	Pass
Call Queued	Pass
FOACSU Call	
Call Accepted	Pass
Call Refused by user	Pass
Hunting	
Site Change	Pass
Single Site Short Data Messaging	
Individual Message	Pass
Native Addressing	
Group Call	Pass
Individual Call	Pass
NOTES Note 1: Only one of 'MS Refused' or 'MS Denied' is required Note 2: Only one of 'Message Trunking' or 'Transmission Trunking' is required	

Tier 3 Interoperability: IOP Certificate

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OPTIONAL FEATURE DETAILED SUMMARY

Multisite Talkgroup Voice Service	
Message Trunking	(See Note 1)
Call Granted	Pass/Not Tested
Call Queued, origin site busy	Pass/Not Tested
Call Queued, destination site busy	(See Note 2)
All Start	Pass/Not Tested
Fast Start	Pass/Not Tested
Broadcast Call	Pass/Not Tested
Transmission Trunking	(See Note 1)
Call Granted	Pass/Not Tested
Call Queued, origin site busy	Pass/Not Tested
Call Queued, destination site busy	(See Note 2)
All Start	Pass/Not Tested
Fast Start	Pass/Not Tested
Multisite Individual Voice Service	
OACSU Call	
Call Granted	Pass/Not Tested
Call Queued	Pass/Not Tested
FOACSU Call	
Call Accepted	Pass/Not Tested
Call Refused by user	Pass/Not Tested
Multisite Short Data Messaging	
Individual Message	Pass/Not Tested
Status Service Delivery	
Individual Status Message	Pass/Not Tested
Talkgroup Status Message	Pass/Not Tested
Talkgroup Status Message Failed - Source Not Allowed	Pass/Not Tested
Individual Status Message Failed - Target Not Available	Pass/Not Tested
Stun and Revive	
Without Authentication	Pass/Not Tested
With Authentication	Pass/Not Tested
With Authentication Failed – Wrong Key	Pass/Not Tested
Kill	
Failed – Wrong Key	Pass/Not Tested
Kill Successful	Pass/Not Tested
NOTES Note 1: Only one of 'Message Trunking' or 'Transmission Trunking' is required Note 2: Only one of 'All Start' or 'Fast Start' is required	

Optional Feature Detailed Summary (cont.)

Emergency Alarm	
Emergency Alarm to Talkgroup	Pass/Not Tested (see Note 1)
Cancel Emergency Alarm to Talkgroup	Pass/Not Tested
Emergency Alarm to Individual	Pass/Not Tested
Cancel Emergency Alarm to Individual	Pass/Not Tested
Emergency Voice Service	
Emergency Talkgroup Voice Call Granted	Pass/Not Tested (see Note 2)
Emergency Talkgroup Voice Call Refused	Pass/Not Tested (see Note 2)
Individual Emergency Voice Call Granted – Single Site	Pass/Not Tested
Emergency Pre-Emption with MS De-key.	Pass/Not Tested
Individual Emergency Voice Call Granted – Multisite	Pass/Not Tested
MS Initiated Payload Interrupt MS De-key with Cease Transmission Request	
Talkgroup Voice Call Interrupt Success	Pass/Not Tested
Talkgroup Voice Call Interrupt Failed – Not Supported in TX MS	Pass/Not Tested
Individual Voice Call Interrupt Success	Pass/Not Tested
Individual Voice Call Interrupt Failed - Not Supported in TX MS	Pass/Not Tested
Registration with Authentication	
Registration with Authentication	Pass/Not Tested
Registration with Authentication Failed – Wrong Key	Pass/Not Tested
Single Talkgroup Subscription (see Note 3)	
Registration and Single Talkgroup Subscription Accepted	Pass/Not Tested
Registration and Single Talkgroup Subscription Refused	Pass/Not Tested
Single Talkgroup Subscription Change Accepted	Pass/Not Tested
Talkgroup Subscription List (see Note 4)	
Registration and Talkgroup Subscription List Accepted	Pass/Not Tested
Registration and Talkgroup Subscription List Refused	Pass/Not Tested
Talkgroup Subscription List Change Accepted	Pass/Not Tested
Registration with Authentication and Talkgroup Subscription List accepted	Pass/Not Tested
Single Talkgroup Attachment (see Note 5)	
Registration and Single Talkgroup Attachment Accepted	Pass/Not Tested
Registration and Single Talkgroup Attachment Refused	Pass/Not Tested
Registration Accepted, Single Talkgroup Attachment Not Accepted	Pass/Not Tested
Single Talkgroup Attachment Change	Pass/Not Tested
NOTES Note 1: Only this test case is required for feature support Note 2: Only these test cases are required for feature support Note 3: All three test cases must be performed successfully for feature support. Note 4: The first three test cases must be performed successfully for feature support. Note 5: The first, second and fourth test cases must be performed successfully for feature support.	

Tier 3 Interoperability: IOP Certificate

Optional Feature Detailed Summary (cont.)

Talkgroup Attachment List (see Note 1)	
Registration and Talkgroup Attachment List Accepted	Pass/Not Tested
Registration and Talkgroup Attachment List Refused	Pass/Not Tested
Registration Accepted, Talkgroup Attachment List Not Accepted	Pass/Not Tested
Talkgroup Attachment List Change	Pass/Not Tested
Registration with authentication and Talkgroup Attachment List Accepted	Pass/Not Tested
Half Duplex Telephone Voice Service (See Note 2)	
MS to Telephone Granted	Pass/Not Tested
MS to Telephone Refused	Pass/Not Tested
Telephone to MS Granted	Pass/Not Tested
Telephone to MS Refused	Pass/Not Tested
Telephone to Talkgroup Granted	Pass/Not Tested
Full Duplex MS to MS Voice Service (See Note 3)	
OACSU Individual Voice Call Granted	Pass/Not Tested
FOACSU Individual Voice Call Granted	Pass/Not Tested
Individual Voice Call Denied – Duplex Not Supported	Pass/Not Tested
Full Duplex Telephone Voice Service	
MS to Telephone Call Granted	Pass/Not Tested
Telephone to MS Call Granted	Pass/Not Tested
Location – USBD Polling	
MS with GNSS Fix on TSCC	Pass/Not Tested
MS without GNSS Fix on TSCC	Pass/Not Tested
MS not Supporting USBD on TSCC	Pass/Not Tested
MS with GNSS Fix on TSCCAS	Pass/Not Tested
MS without GNSS Fix on TSCCAS	Pass/Not Tested
MS not Supporting USBD on TSCCAS	Pass/Not Tested
Stunned MS with GNSS Fix on TSCCAS	Pass/Not Tested
Text Message Service	
MS to MS Single Site	Pass/Not Tested
MS to MS Text Message Failed – Target Not Available	Pass/Not Tested
MS to Talkgroup Text Message	Pass/Not Tested
MS to MS Multisite	Pass/Not Tested
NOTES Note 1: The first, second and fourth test cases must be performed successfully for feature support Note 2: Only these test cases are required for feature support Note 3: Only one of 'OACSU' or 'FOACSU' is required.	

Optional Feature Detailed Summary (cont.)

Authentication (see Note 1)	
Registration	Pass/Not Tested
Stun/Revive	Pass/Not Tested
Kill	Pass/Not Tested
Talkgroup Subscription	Pass/Not Tested
Talkgroup Attachment	Pass/Not Tested
Emergency Pre-emption PTT De-key	
Emergency Talkgroup Call Granted with Call Pre-emption	Pass/Not Tested
NOTES Note 1: Only this test case is required for feature support	

Tier 3 Interoperability: IOP Certificate

DMR Association Interoperability Certificate

Certificate Number: 10072

This DMR Association Interoperability Certificate documents that the DAMM Cellular Systems A/S product as detailed in Table A below:

TABLE A : DMR EQUIPMENT TESTED		
Manufacturer	DAMM Cellular Systems A/S	
Model	BS422 (Tetraflex)	
Firmware	**ID**	**Version**
	NA	NC (Ver.8.13 2022-01-17)

has successfully passed the DMR Association Tier 3 Mandatory and Optional interoperability tests outlined in the DMR Association test specification documents: *Interoperability Testing for DMR Tier 3 Systems V 3.2 of July 2018* carried out on 1st – 2nd of March 2022 with the Tait International Ltd. product referenced in Table B below with tests undertaken as indicated in the following pages.

TABLE B : DMR EQUIPMENT TESTED		
Manufacturer	Tait International Ltd.	
Model	TP9560	
Firmware	**ID**	**Version**
	NA	2.28.11.0105

The DMR Association hereby declares that the product in Table A when tested with the product in Table B passed interoperability Test Cases as set out in the feature summary below.

The DMR Association hereby declares that the testing took place according to the procedures and in a laboratory meeting the criteria set out in the DMR Association document: *Interoperability Laboratory Recognition Process and Test Session Procedures, V 2.07 of February 2022.*

Issue Date: 23/06/2022

Digitally Signed by Chair of the DMR Association Technical Working Group

DocuSigned by:
Tom Bolin
1DE4CB90A78C43B...

DocuSign Envelope ID: 65A17748-B223-4327-A374-85AE29F31152

NOTE:

All products belonging to the same model classes, meaning equipment that DAMM Cellular Systems A/S and Tait International Ltd. have determined, through engineering analysis or internal functional testing, to be functionally equivalent to the products in Table A and Table B, may be declared interoperable by DAMM Cellular Systems A/S and Tait International Ltd.

LIABILITY DISCLAIMER

The DMR Association declares that the IOP validation process has been carried out with the best possible endeavors in order to ensure the most reliable verdicts. Nevertheless, the DMR Association takes no responsibility for, and shall have no liability as a verdict of damages, losses, or injuries of any kind that may be caused by non-coherence to the functions listed in the certificates of products that are awarded a DMR Interoperability Certificate.

Individual manufacturers are responsible for ensuring that the behaviour of any equipment for which Interoperability is claimed is identical to that of the equipment that passed the DMR Association interoperability certification process.

See below for feature summary

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Thank you for your attention!

alessandro.guido@leonardo.com
https://dmrassociation.org