CASE STUDY 701 v1.2

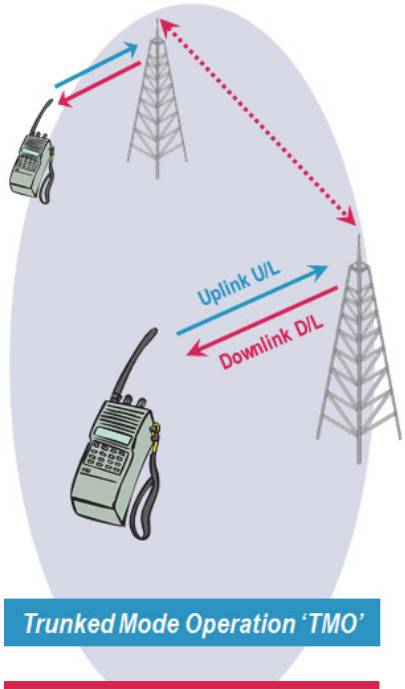
Prosecution of TETRA TMO Mobile Stations

INTRODUCTION

This Case Study explores the techniques & procedures by which Teams using **go2signals** can prosecute TETRA Trunked-Mode Operation (TMO) Uplink activations from cell-specific Handheld Transceivers (HTs) & Mobile Units (MUs). HTs & MUs are collectively known as 'Mobile Stations' (MSs).

When active in speech or messaging, or simply 'auto-handshaking' with their parent cell's TETRA Base-Station (TBS), MSs will send a network/cell-specific '**Short Subscriber Identifier**' (SSI) as part of their Uplink metadata. These SSIs can be considered as similar in concept to commercial cellular-telephone networks' use of 'Temporary Mobile Subscriber Identifiers' (TMSIs).

Detection & tracking of these TETRA cell-specific Uplink SSIs can deliver valuable Indications & Warnings to improve the Situational Awareness picture, and can also contribute to Network & Traffic Analysis initiatives, including (but not limited to) 'Pattern-Of-Life' Data Analytics & Reporting.



Trunked Mode Operation 'TMO'

U/L & D/L using 'half-duplex' working

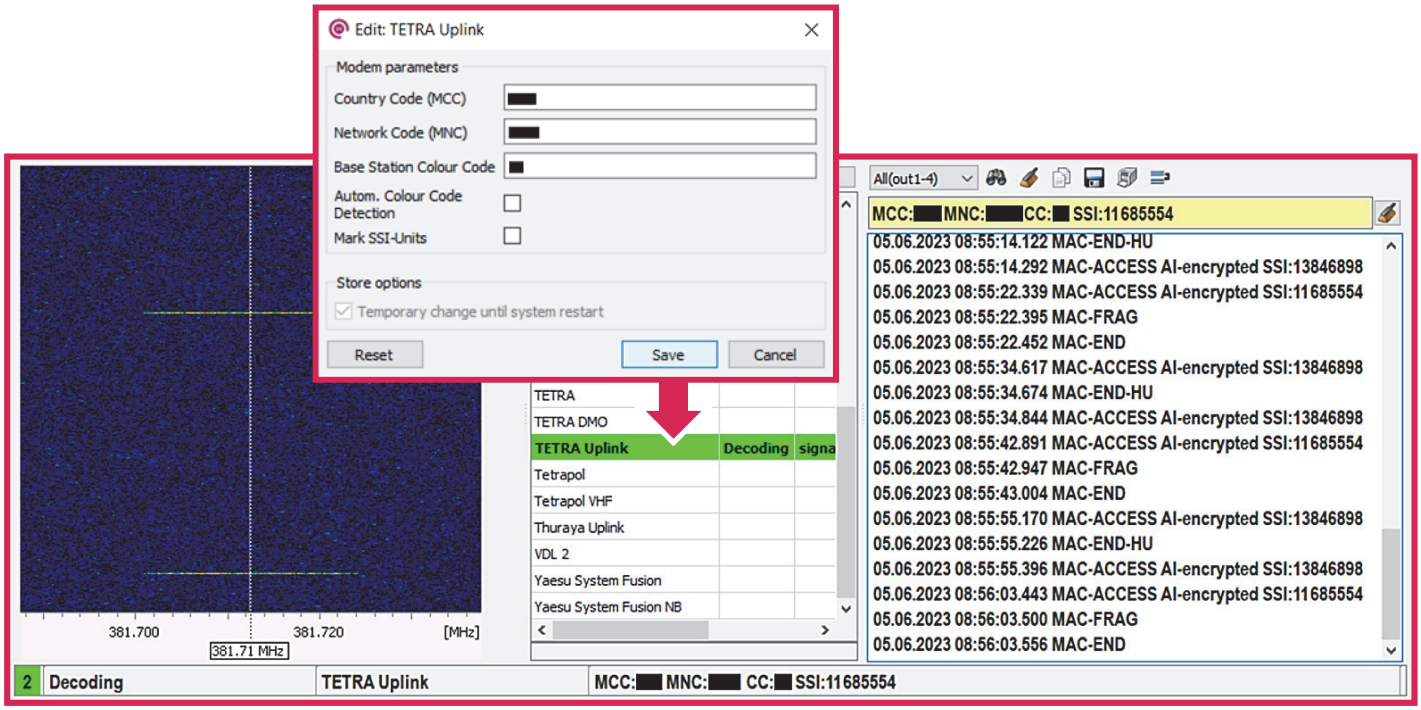
TETRA HT using TMO (at remote sub-arctic location)

BACKGROUND

When a TETRA Mobile Station is functioning in cellular Trunked-Mode Operation with a TETRA Base-Station's TMO Downlink, the cell's Mobile Country Code (MCC), Mobile Network Code (MNC), & Colour-Code (CC) are used by the Mobile Station to 'scramble' its TMO Uplink emissions.

The MCC, MNC & CC are broadcast continuously by the cell's TBS Broadcast Control Channel (BCCH) Downlink – the BCCH can be prosecuted by the **go2signals** Operator to recover the cell's MCC, MNC & CC.

When prosecuting a TMO Uplink, the link's MCC, MNC & CC are required by the **go2signals** Production-Channel's decoders to 'descramble' the TMO Uplink's emissions, which will then enable successful decoding of the Uplink's speech-content (if not encrypted) and metadata - to enable this, a cell-specific Modem Descriptor File (MDF) is created manually by the **go2signals** Operator by modification of the delivered general-purpose 'TETRA Uplink' MDF and imported as a cell/location-specific MDF into the **go2signals** decoder library.

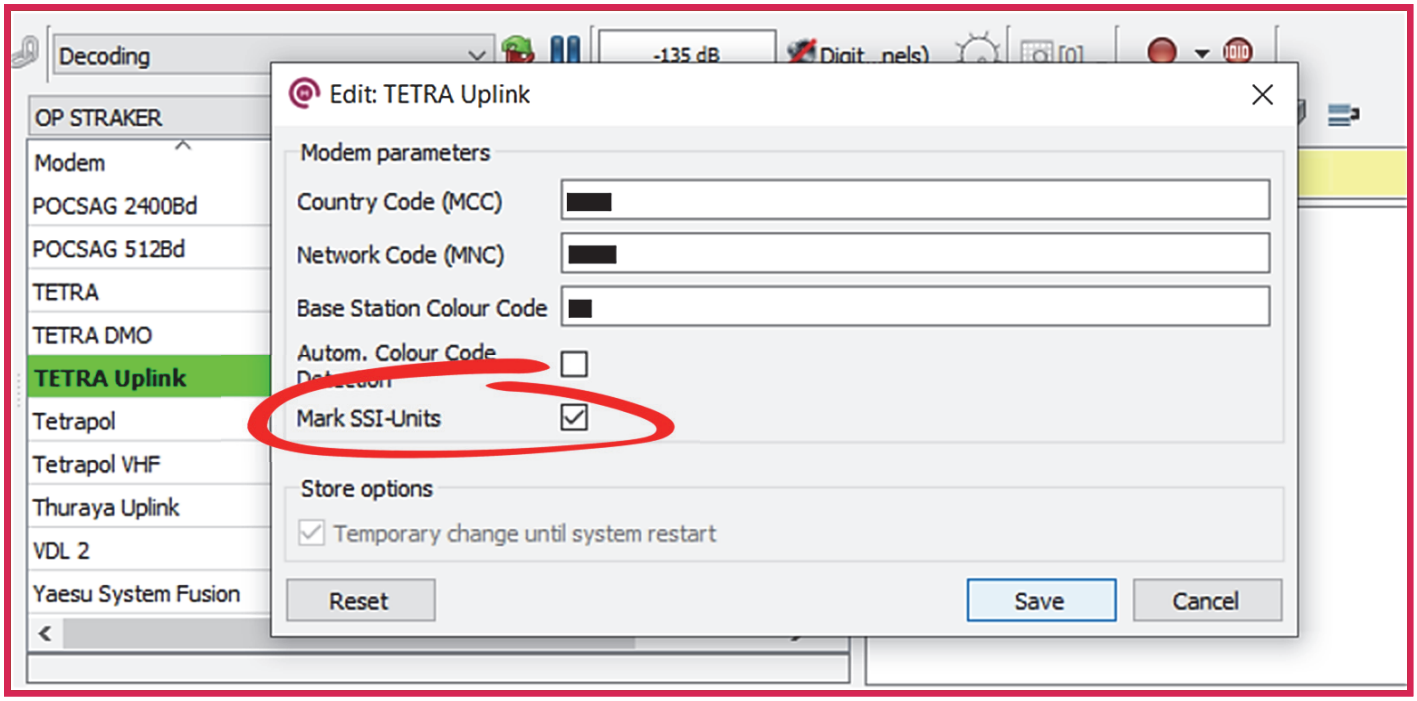


Manual creation of cell-specific Tetra Uplink MDF to enable descrambling & decoding of the cell's TMO Uplinks – decoded metadata showing multiple SSIs

PARSING SHORT SUBSCRIBER IDENTIFIERS

A TETRA TMO cell's Downlink & Uplink frequencies are referred to as Absolute Radio Frequency Channel Numbers (ARFCNs). A cell's Uplink ARFCN is often (but not always) 10 MHz below the cell's Downlink ARFCN.

go2signals v23.2 (and later) enables the parsing of cell-specific TETRA Uplink ARFCNs' successive SSI-related emissions as individual time-stamped events. The capability is enabled by selection of the 'Mark SSI-Units' option in the TETRA Uplink Editor.



Mark SSI-Units enabled via tick-box

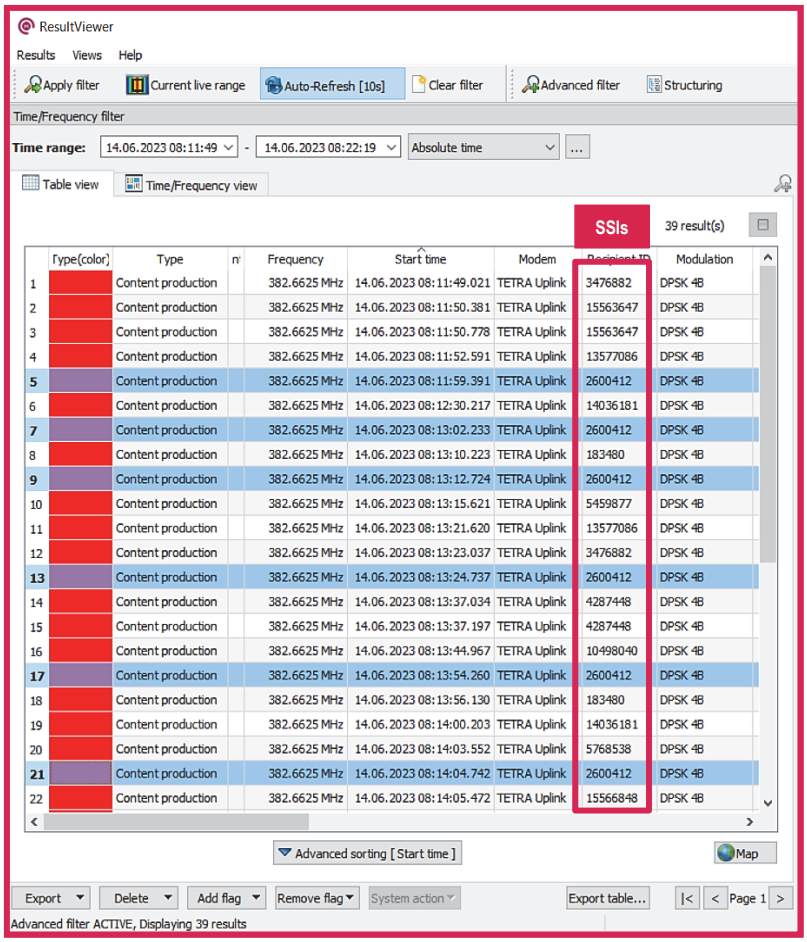
THE RESULTS

The image (R) shows cell-specific & individually parsed SSI results in ResultViewer. In this example, the results have been filtered in Time-order (to milliseconds).

The highlighted example shows consecutive 'hits' of cell-specific SSI **2600412** over a 125-second time period (note that a vehicle travelling at 60 Km/H can travel >2Km in 125 seconds).

Subject to a sensor-specific integration overhead (including the System Integrator's preferred data-formatting), all time-stamped SSI 'hits' can be exported in real or near-real time to their host CEMA sensor's Geospatial/Mission Information System (G/MIS) for correlation (in the time domain) of each decoded SSI with its sensor-derived geolocation solution.

This fused capability enables real or near real-time geospatial tracking & identification of individual TETRA Mobile Stations for I&W, Network/Traffic-Analysis & Data-Analytics using the System Integrator's preferred G/MIS or other Visual Analysis Environment.



	Type(color)	Type	Frequency	Start time	Modem		Modulation
1		Content production	382.6625 MHz	14.06.2023 08:11:49.021	TETRA Uplink	3476882	DPSK 4B
2		Content production	382.6625 MHz	14.06.2023 08:11:50.381	TETRA Uplink	15563647	DPSK 4B
3		Content production	382.6625 MHz	14.06.2023 08:11:50.778	TETRA Uplink	15563647	DPSK 4B
4		Content production	382.6625 MHz	14.06.2023 08:11:52.591	TETRA Uplink	13577086	DPSK 4B
5		Content production	382.6625 MHz	14.06.2023 08:11:59.391	TETRA Uplink	2600412	DPSK 4B
6		Content production	382.6625 MHz	14.06.2023 08:12:30.217	TETRA Uplink	14036181	DPSK 4B
7		Content production	382.6625 MHz	14.06.2023 08:13:02.233	TETRA Uplink	2600412	DPSK 4B
8		Content production	382.6625 MHz	14.06.2023 08:13:10.223	TETRA Uplink	183480	DPSK 4B
9		Content production	382.6625 MHz	14.06.2023 08:13:12.724	TETRA Uplink	2600412	DPSK 4B
10		Content production	382.6625 MHz	14.06.2023 08:13:15.621	TETRA Uplink	5459877	DPSK 4B
11		Content production	382.6625 MHz	14.06.2023 08:13:21.620	TETRA Uplink	13577086	DPSK 4B
12		Content production	382.6625 MHz	14.06.2023 08:13:23.037	TETRA Uplink	3476882	DPSK 4B
13		Content production	382.6625 MHz	14.06.2023 08:13:24.737	TETRA Uplink	2600412	DPSK 4B
14		Content production	382.6625 MHz	14.06.2023 08:13:37.034	TETRA Uplink	4287448	DPSK 4B
15		Content production	382.6625 MHz	14.06.2023 08:13:37.197	TETRA Uplink	4287448	DPSK 4B
16		Content production	382.6625 MHz	14.06.2023 08:13:44.967	TETRA Uplink	10498040	DPSK 4B
17		Content production	382.6625 MHz	14.06.2023 08:13:54.260	TETRA Uplink	2600412	DPSK 4B
18		Content production	382.6625 MHz	14.06.2023 08:13:56.130	TETRA Uplink	183480	DPSK 4B
19		Content production	382.6625 MHz	14.06.2023 08:14:00.203	TETRA Uplink	14036181	DPSK 4B
20		Content production	382.6625 MHz	14.06.2023 08:14:03.552	TETRA Uplink	5768538	DPSK 4B
21		Content production	382.6625 MHz	14.06.2023 08:14:04.742	TETRA Uplink	2600412	DPSK 4B
22		Content production	382.6625 MHz	14.06.2023 08:14:05.472	TETRA Uplink	15566848	DPSK 4B

ResultViewer - Cell-specific TETRA TMO Uplink SSI 'hits' filtered in TOI-order

go2signals Operator prosecuting a TETRA network

TETRA NETWORKS' SSI MANAGEMENT

Operational caveat: all suppliers of TETRA technologies & networks should comply with the European Telecommunications Standards Institute (ETSI) published TETRA standards, but it is feasible that some global Network Operators' management & use of SSIs is at variance to the published standard. Persistent, location-specific Network Analysis results by deployed Teams using **go2signals** will determine an individual network's SSI management configurations & structure.