Selective Signaling – 1 /4 (SS1/SS4) Emulation and Analysis

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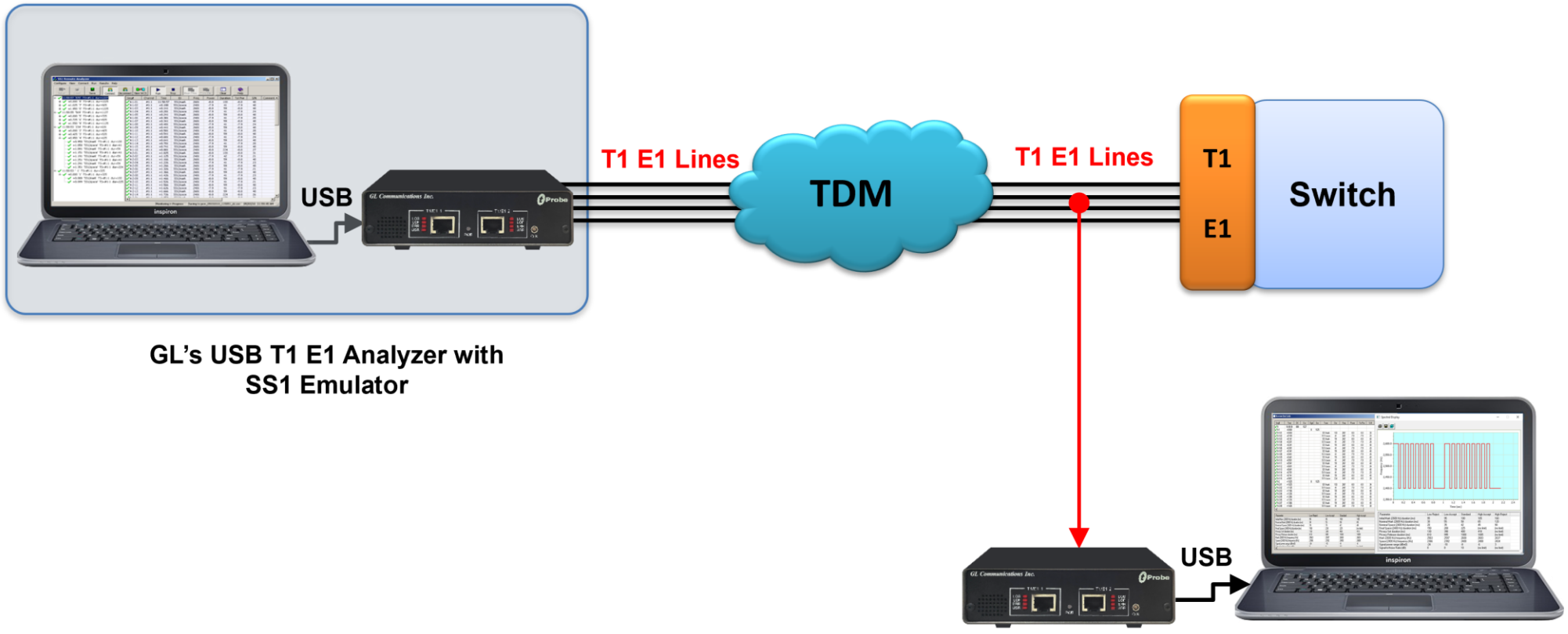
Real-time/Remote SS1/SS4 Emulator & Analyzer



GL's USB T1 E1 Analyzer with SS1 Emulator

GL's USB T1 E1 Analyzer with SS1 Analyzer

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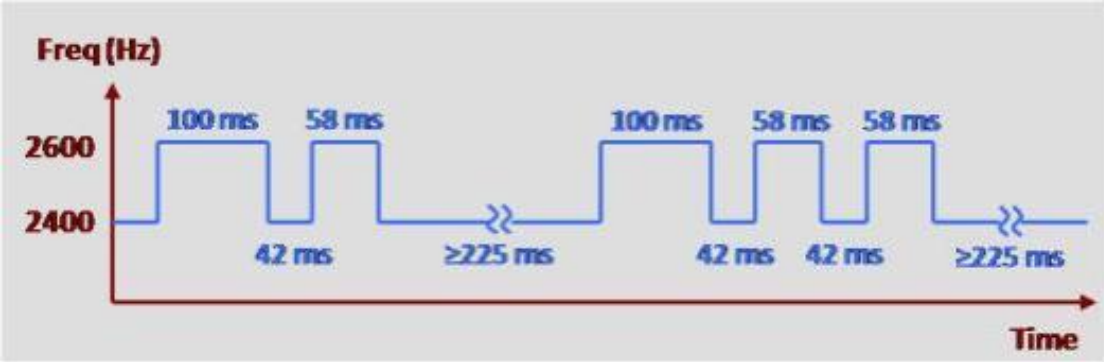
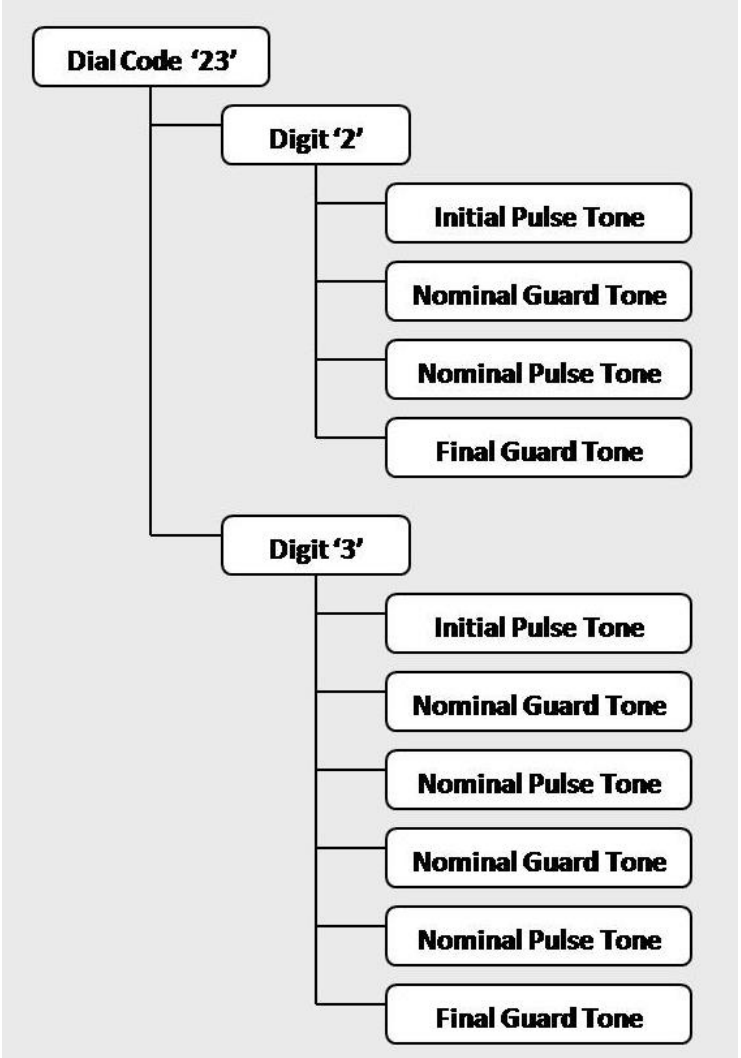
SS1/SS4 Protocol

'23' as a Waveform



'23' as a Tree Structure



Tone Specifications

Tone	Frequency	Duration
Initial Pulse Tone	2600 Hz	100 ms.
Nominal Pulse Tone	2600 Hz	58 ms.
Nominal Guard Tone	2400 Hz	42 ms.
Final Guard Tone	2400 Hz	225 ms.

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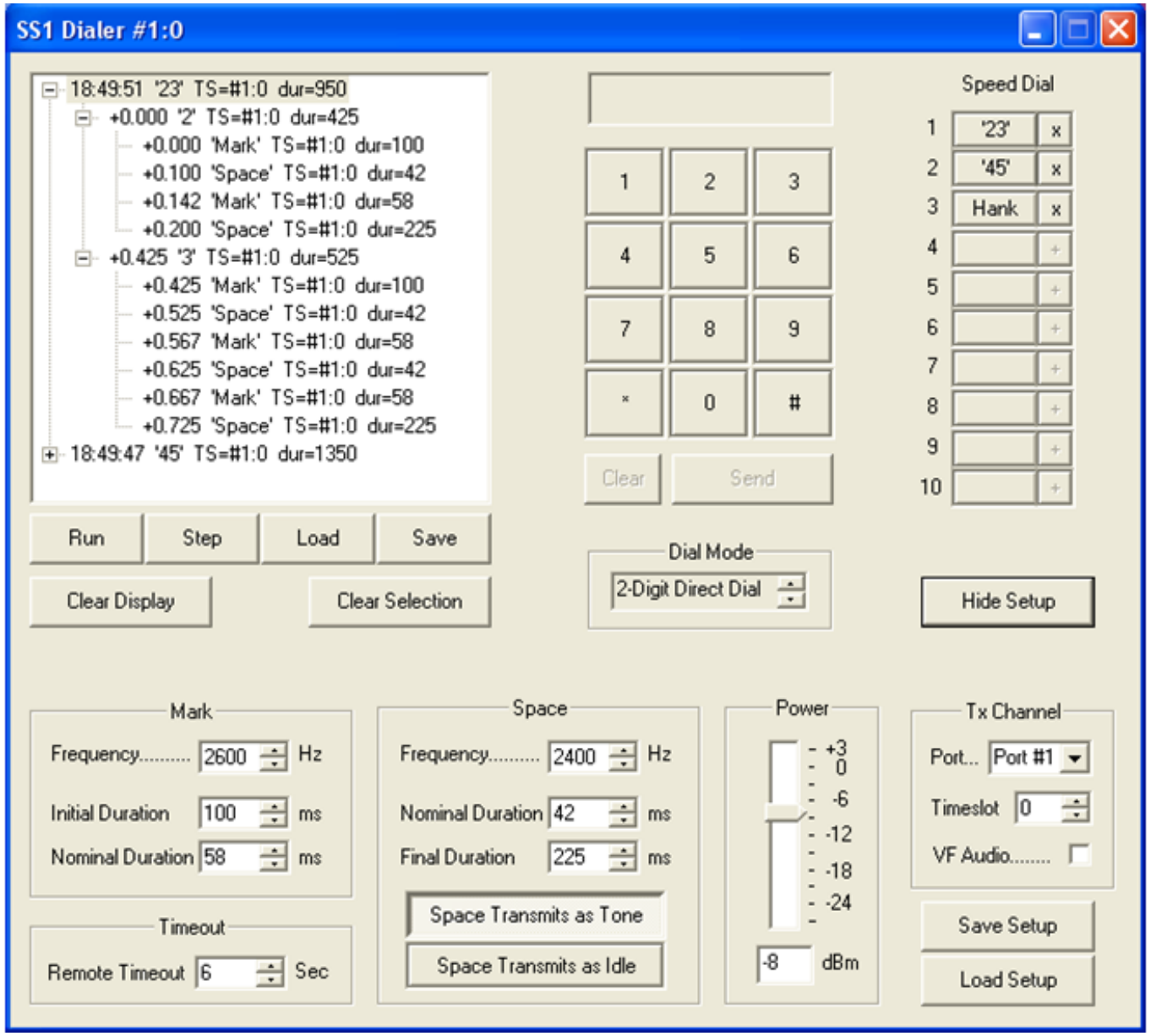
Highlights

- Real-time and File-based analysis using SS1/SS4 Analyzer
- Generate and introduce SS1/SS4 Dial Codes on Transmit Channels using SS1/SS4 Dialer
- Control ‘mark’ & ‘space’ frequency, duration, and power during transmission of SS1/SS4 Tones
- Dual monitoring capability allowing multiple instances of SS1/SS4 analyzer to simultaneously tap East and West direction traffic
- Analyzer can capture either TDM or audio signals
- Analyzer can analyze either 2-digit or 3-digit dial codes
- Analyzer displays received dial codes, including the characteristics of the underlying tones
- Save analyzer results to Microsoft® Access and Microsoft® Excel file formats
- Operate the SS1/SS4 Analyzer either remotely from the data acquisition site, or on the local PC
- Allows easy review of faulty dial code sequence while capture is ongoing
- Spectral Graph feature presents a captured dial code as a graphical waveform

SS1/SS4 Emulator ("SS1 Dialer")



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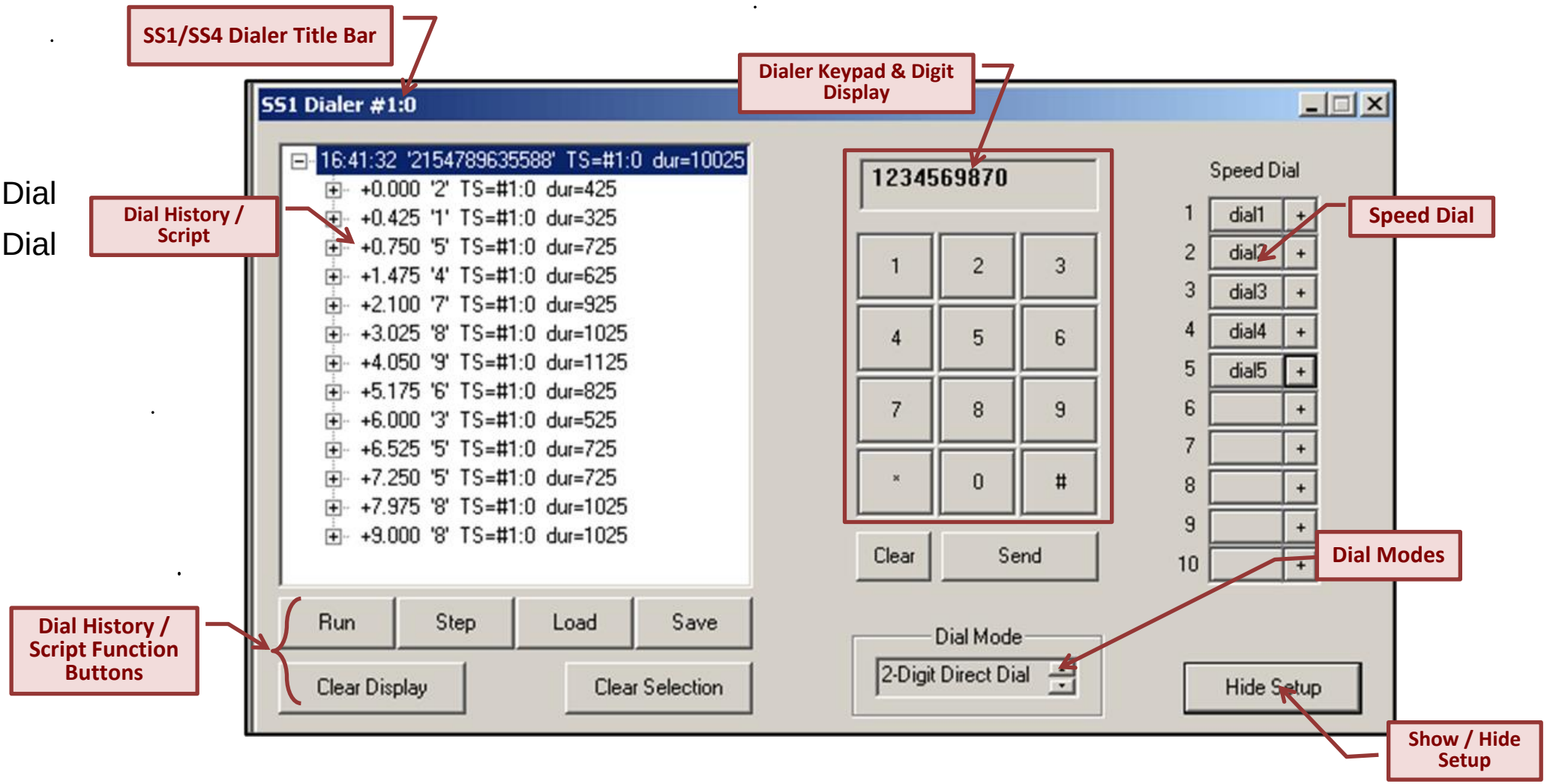
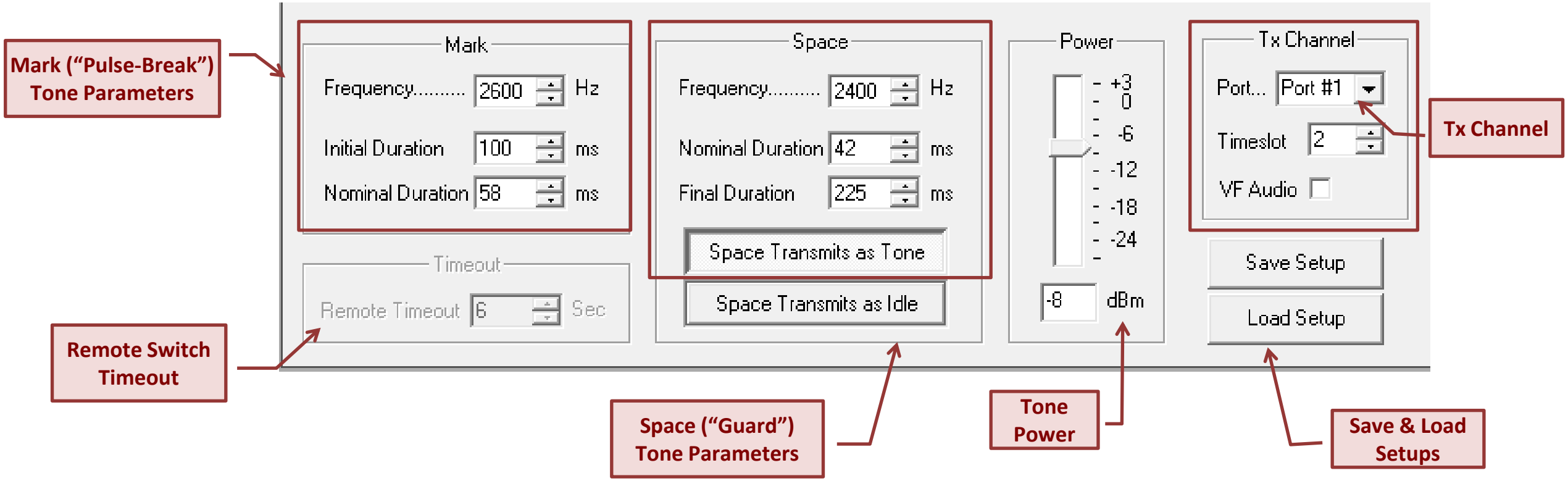
SS1/SS4 Dialing

Dial Modes –

- Key & Send
- 2-Digit Burst
- 3-Digit Burst
- 2-Digit Direct Dial
- 3-Digit Direct Dial



SS1/SS4 Dialer Setup



- Setup Dial Code with Pulse-Break ("mark") and Guard Tone ("space") frequencies, duration, power, and other parameters related to form SS1 Digits
- Spaces can be transmitted either as guard tones or quiet intervals
- Transmit on either digital time slots (channels) via VF Audio
- Digit timeout imposed in Direct Dial modes

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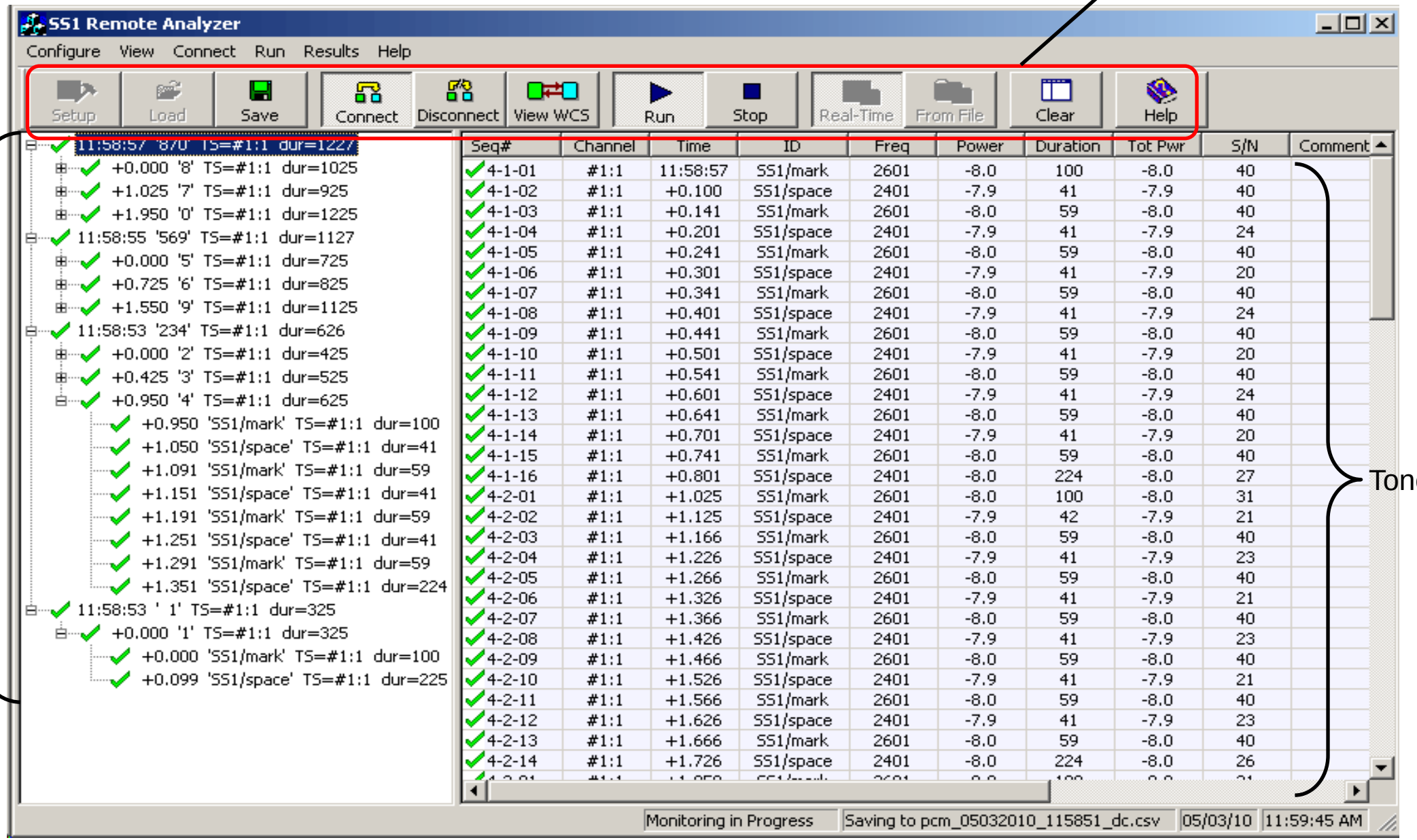
SS1/SS4 Analyzer



Dial Code View or "Tree View"

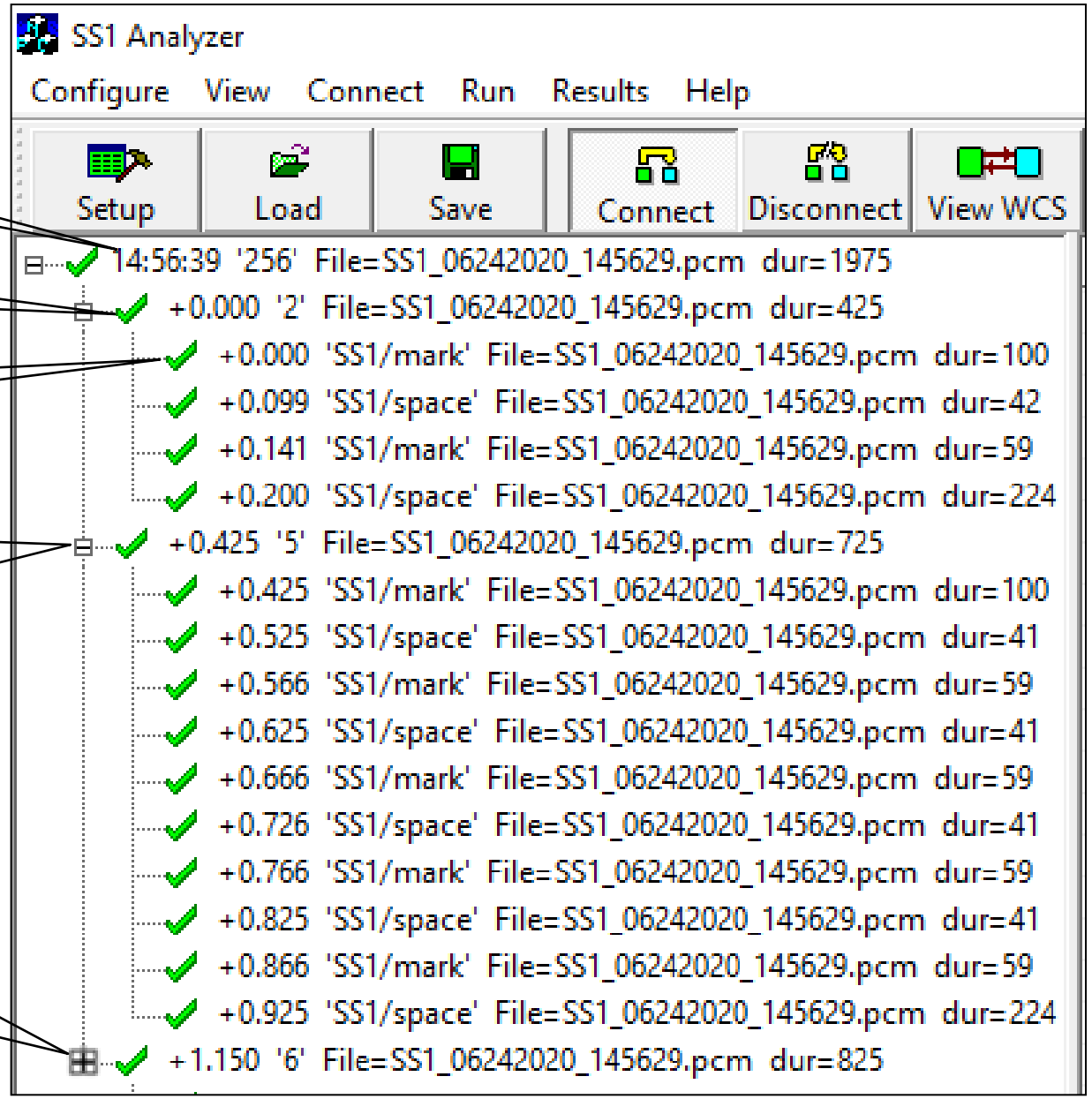
Dial Code Record

Digit Record

Tone Record

"Collapse" branches of the protocol tree by clicking on "-" boxes

"Expand" branches of the protocol tree by clicking on "+" boxes



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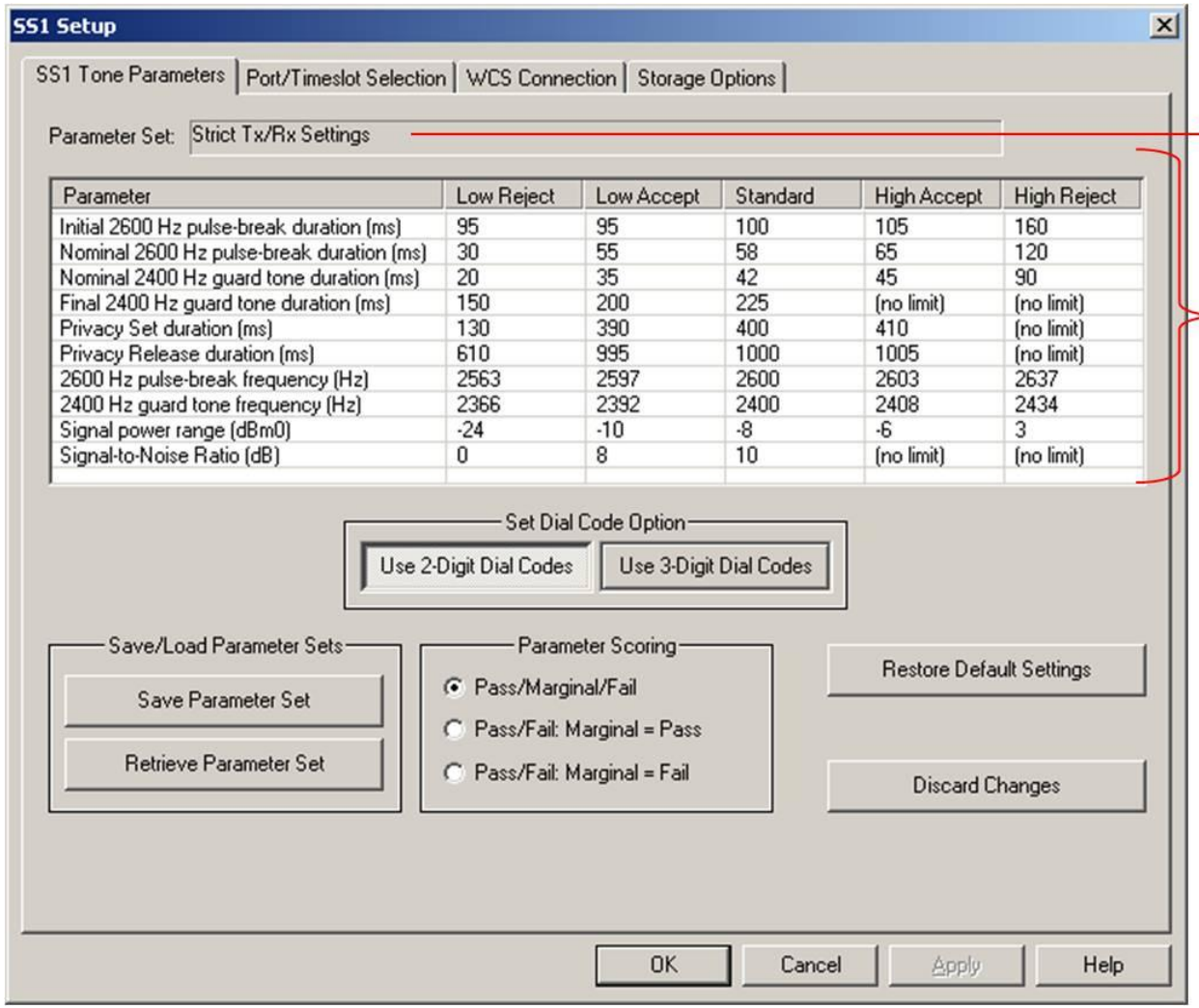
Tone Parameters

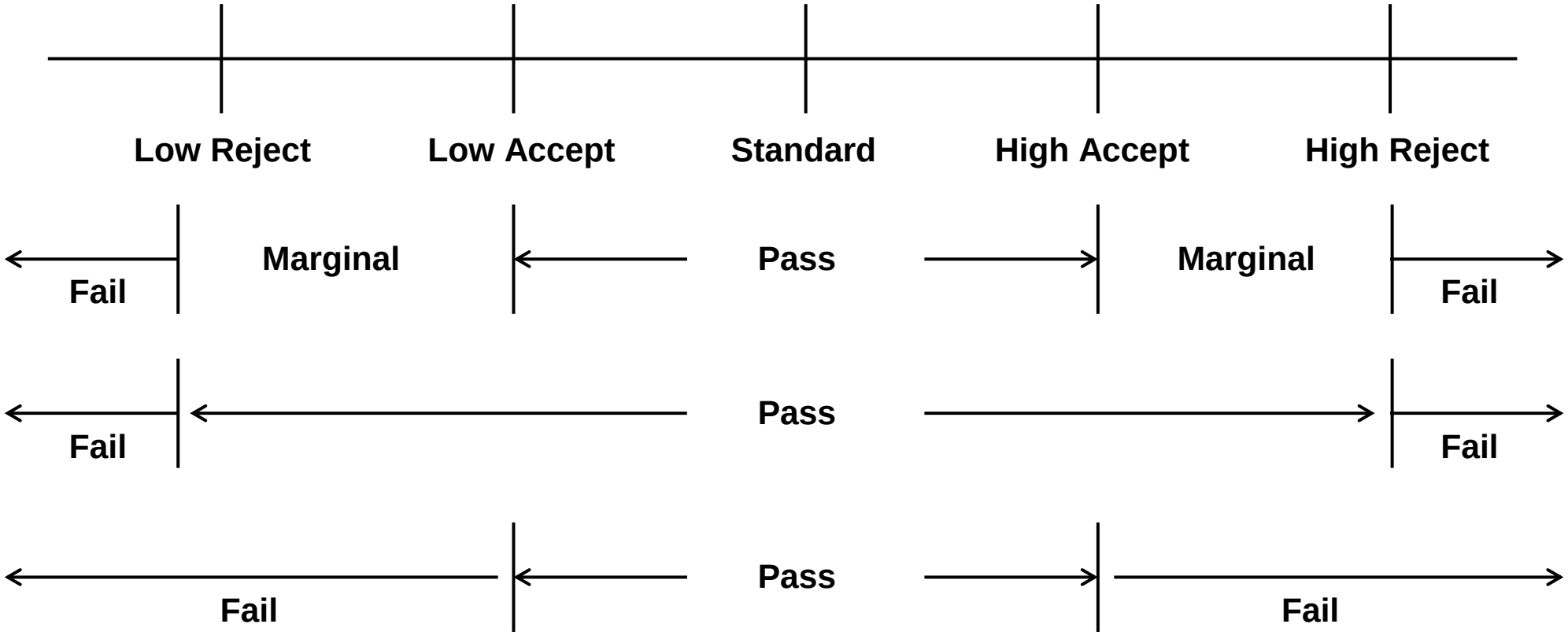
- Implements a wider range of values, which place lower and upper bounds on the FAIL range
- Measurements falling outside this range disqualify a signal from being an SS1 Signaling Tone



Current Parameter Set

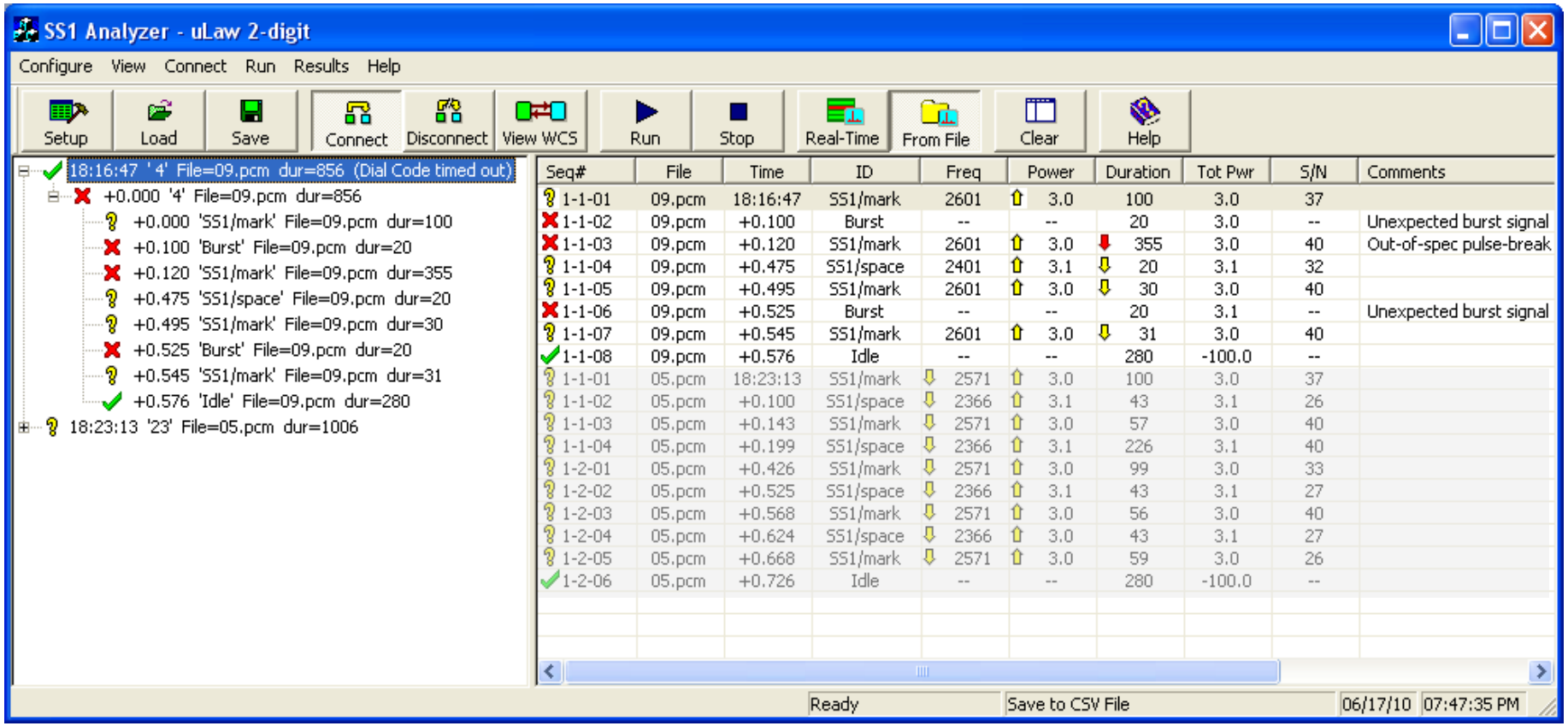
Table of Tone Parameters

Parameter Scoring Options



- Pass/Marginal/Fail option - evaluates tones and their associated digits and dial codes records as PASS, MARGINAL, or FAIL
- Pass/Fail: Marginal=Pass option causes all MARGINAL scores to be reported as PASSes
- Pass/Fail: Marginal=Fail option causes all MARGINAL scores to be reported as FAILures

Things Do Go Wrong!



- Out-of-spec measurements are indicated by arrows, showing the direction of deviation
- Digits and dial codes containing out-of-spec measurements are marked as such:
  - "?" indicates MARGINAL
  - "X" indicates FAIL

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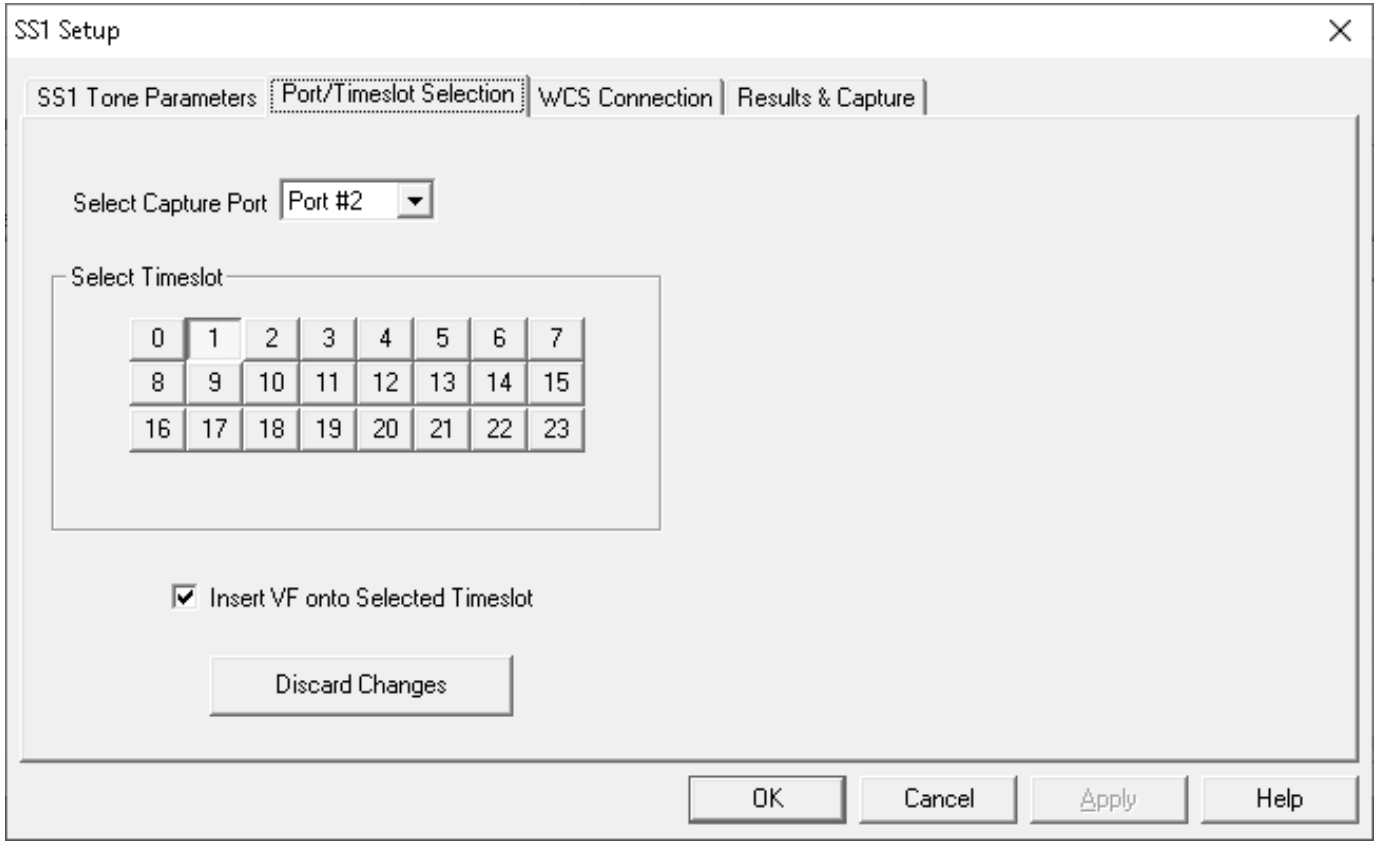
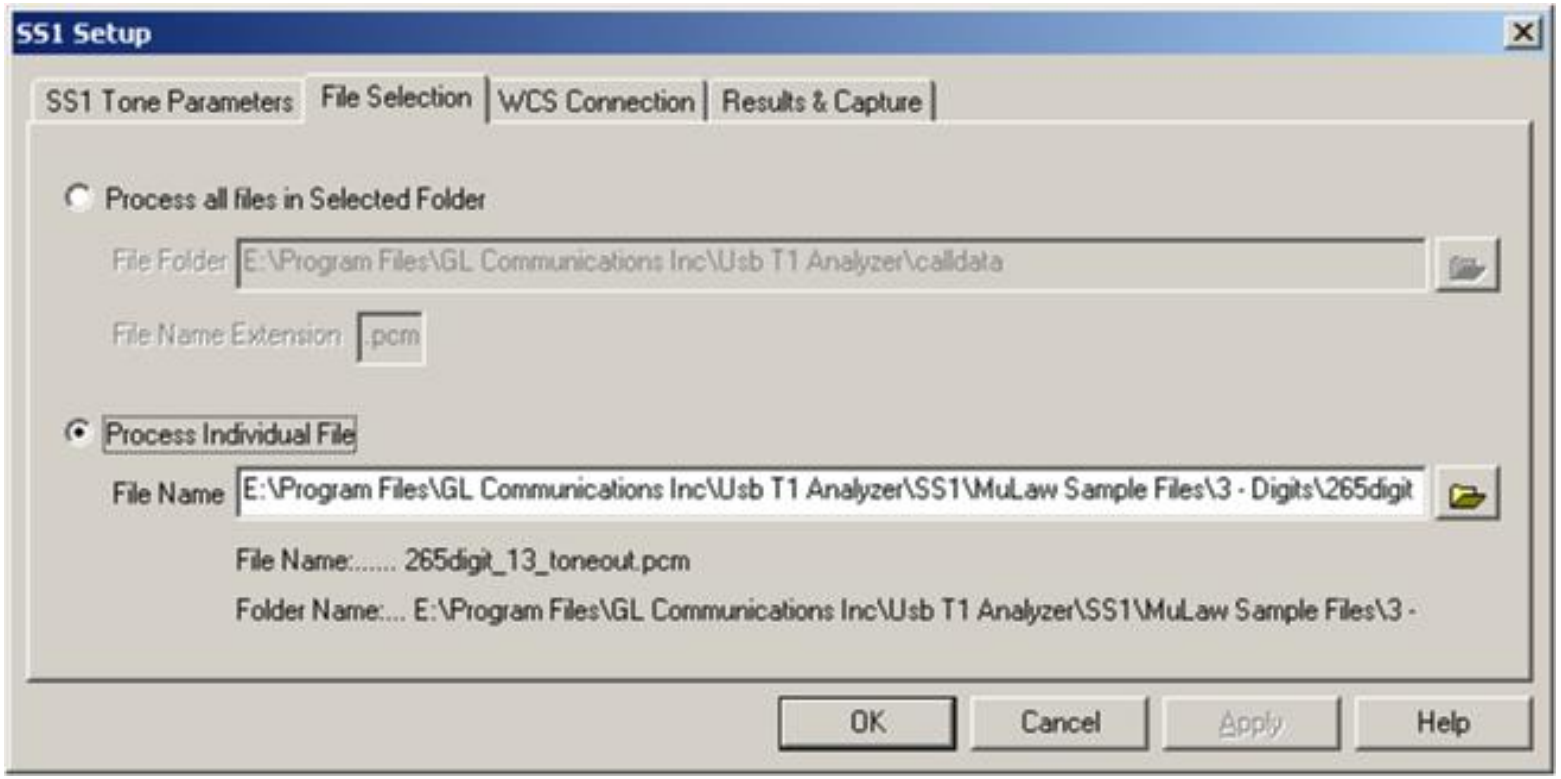
Real-Time Port/Timeslot Selection



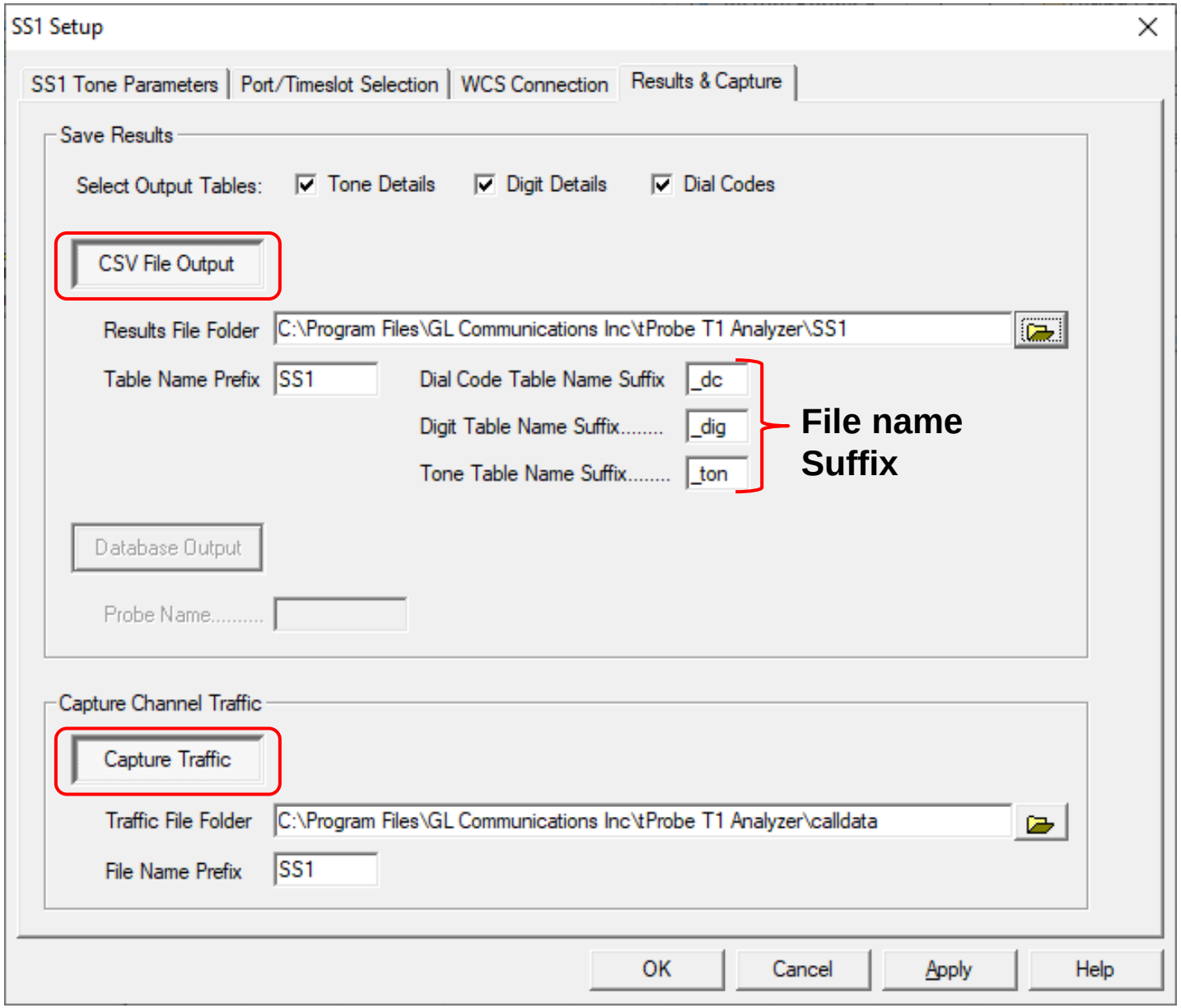
- Internally, signal data is always captured on a TDM channel or “timeslot”
- GL’s T1 cards provide VF Input and Output jacks through which audio signals can be inserted onto a TDM channel
- This Setup tab only available when Real-Time monitoring has been selected

Offline Analysis File Selection



- In Offline analysis, specify the file(s) on which to perform SS1/SS4 analysis. File formats supported are A-law or μ-law PCM files
  - Analyze all files in a folder with a given file name extension, or
  - Analyze a specific file
  - This Setup tab is only available when File Input has been selected

Results and Capture



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Output Result Files

Dial Code Table

Microsoft Excel - SS1_06172010_190516_dc.csv

File Edit View Insert Format Tools Data Window Help

Arial

A1 DC Seq#

	A	B	C	D	E	F
1	DC Seq#	File	Time	Dial Code	Dur	Score
2	1	01.pcm	17:54:27	23	1006	PASS
3	2	02.pcm	18:03:39	45	1406	PASS
4	3	03.pcm	18:22:41	67	1806	PASS
5	4	04.pcm	18:22:57	89	2206	PASS
6	5	05.pcm	18:23:13	23	1006	PASS
7	6	06.pcm	18:23:29	45	1406	FAIL
8	7	07.pcm	18:23:45	67	1797	PASS
9	8	08.pcm	18:24:01	89	2326	PASS
10	9	09.pcm	18:16:47	4	856	FAIL
11	10	10.pcm	18:19:27	44	1460	FAIL
12	11	10.pcm	18:19:28	1	401	PASS
13	12	11.pcm	18:21:31	67	1565	FAIL
14	13	12.pcm	18:24:47	89	2506	PASS
15	14	13.pcm	18:25:05	23	1006	PASS

SS1_06172010_190516_dc

Ready

Digit Table

Microsoft Excel - SS1_06172010_190516_dig.csv

File Edit View Insert Format Tools Data Window Help

Arial

A1 DC Seq#

	A	B	C	D	E	F	G	H
1	DC Seq#	Dig Seq#	File	Time	Offset	Digit	Dur	Score
2	1	1	01.pcm	17:54:27	0	2	425	PASS
3	1	2	01.pcm		0.425	3	581	PASS
4	2	1	02.pcm	18:03:39	0	4	625	PASS
5	2	2	02.pcm		0.625	5	781	PASS
6	3	1	03.pcm	18:22:41	0	6	825	PASS
7	3	2	03.pcm		0.825	7	981	PASS
8	4	1	04.pcm	18:22:57	0	8	1025	PASS
9	4	2	04.pcm		1.025	9	1181	PASS
10	5	1	05.pcm	18:23:13	0	2	426	PASS
11	5	2	05.pcm		0.426	3	581	PASS
12	6	1	06.pcm	18:23:29	0	4	624	FAIL
13	6	2	06.pcm		0.624	5	782	FAIL
14	7	1	07.pcm	18:23:45	0	6	820	PASS
15	7	2	07.pcm		0.82	7	977	PASS
16	8	1	08.pcm	18:24:01	0	8	1085	PASS
17	8	2	08.pcm		1.085	9	1241	PASS
18	9	1	09.pcm	18:16:47	0	4	856	FAIL

SS1_06172010_190516_dig

Ready

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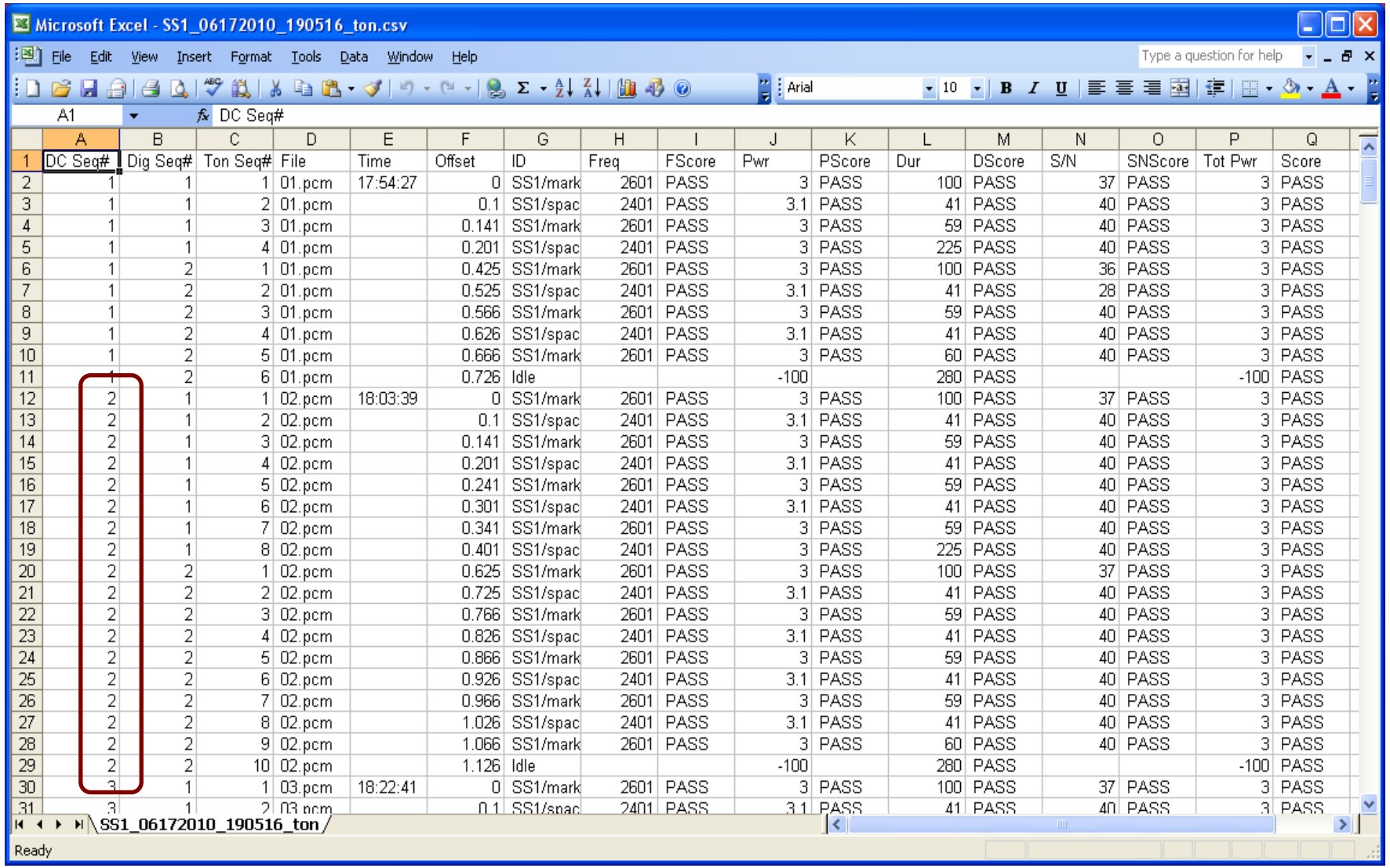
Output Result Files

Tone Table



Microsoft Excel - SS1_06172010_190516_ton.csv

File Edit View Insert Format Tools Data Window Help

Type a question for help

Arial 10

A1 DC Seq#

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q
1	DC Seq#	Dig Seq#	Ton Seq#	File	Time	Offset	ID	Freq	FScore	Pwr	PScore	Dur	DScore	S/N	SNScore	Tot Pwr	Score
2	1	1	1	01.pcm	17:54:27	0	SS1/mark	2601	PASS	3	PASS	100	PASS	37	PASS	3	PASS
3	1	1	2	01.pcm		0.1	SS1/spac	2401	PASS	3.1	PASS	41	PASS	40	PASS	3	PASS
4	1	1	3	01.pcm		0.141	SS1/mark	2601	PASS	3	PASS	59	PASS	40	PASS	3	PASS
5	1	1	4	01.pcm		0.201	SS1/spac	2401	PASS	3	PASS	225	PASS	40	PASS	3	PASS
6	1	2	1	01.pcm		0.425	SS1/mark	2601	PASS	3	PASS	100	PASS	36	PASS	3	PASS
7	1	2	2	01.pcm		0.525	SS1/spac	2401	PASS	3.1	PASS	41	PASS	28	PASS	3	PASS
8	1	2	3	01.pcm		0.566	SS1/mark	2601	PASS	3	PASS	59	PASS	40	PASS	3	PASS
9	1	2	4	01.pcm		0.626	SS1/spac	2401	PASS	3.1	PASS	41	PASS	40	PASS	3	PASS
10	1	2	5	01.pcm		0.666	SS1/mark	2601	PASS	3	PASS	60	PASS	40	PASS	3	PASS
11	1	2	6	01.pcm		0.726	Idle			-100		280	PASS			-100	PASS
12	2	1	1	02.pcm	18:03:39	0	SS1/mark	2601	PASS	3	PASS	100	PASS	37	PASS	3	PASS
13	2	1	2	02.pcm		0.1	SS1/spac	2401	PASS	3.1	PASS	41	PASS	40	PASS	3	PASS
14	2	1	3	02.pcm		0.141	SS1/mark	2601	PASS	3	PASS	59	PASS	40	PASS	3	PASS
15	2	1	4	02.pcm		0.201	SS1/spac	2401	PASS	3.1	PASS	41	PASS	40	PASS	3	PASS
16	2	1	5	02.pcm		0.241	SS1/mark	2601	PASS	3	PASS	59	PASS	40	PASS	3	PASS
17	2	1	6	02.pcm		0.301	SS1/spac	2401	PASS	3.1	PASS	41	PASS	40	PASS	3	PASS
18	2	1	7	02.pcm		0.341	SS1/mark	2601	PASS	3	PASS	59	PASS	40	PASS	3	PASS
19	2	1	8	02.pcm		0.401	SS1/spac	2401	PASS	3	PASS	225	PASS	40	PASS	3	PASS
20	2	2	1	02.pcm		0.625	SS1/mark	2601	PASS	3	PASS	100	PASS	37	PASS	3	PASS
21	2	2	2	02.pcm		0.725	SS1/spac	2401	PASS	3.1	PASS	41	PASS	40	PASS	3	PASS
22	2	2	3	02.pcm		0.766	SS1/mark	2601	PASS	3	PASS	59	PASS	40	PASS	3	PASS
23	2	2	4	02.pcm		0.826	SS1/spac	2401	PASS	3.1	PASS	41	PASS	40	PASS	3	PASS
24	2	2	5	02.pcm		0.866	SS1/mark	2601	PASS	3	PASS	59	PASS	40	PASS	3	PASS
25	2	2	6	02.pcm		0.926	SS1/spac	2401	PASS	3.1	PASS	41	PASS	40	PASS	3	PASS
26	2	2	7	02.pcm		0.966	SS1/mark	2601	PASS	3	PASS	59	PASS	40	PASS	3	PASS
27	2	2	8	02.pcm		1.026	SS1/spac	2401	PASS	3.1	PASS	41	PASS	40	PASS	3	PASS
28	2	2	9	02.pcm		1.066	SS1/mark	2601	PASS	3	PASS	60	PASS	40	PASS	3	PASS
29	2	2	10	02.pcm		1.126	Idle			-100		280	PASS			-100	PASS
30	3	1	1	03.pcm	18:22:41	0	SS1/mark	2601	PASS	3	PASS	100	PASS	37	PASS	3	PASS
31	3	1	2	03.pcm		0.1	SS1/spac	2401	PASS	3.1	PASS	41	PASS	40	PASS	3	PASS

SS1_06172010_190516_ton

Ready

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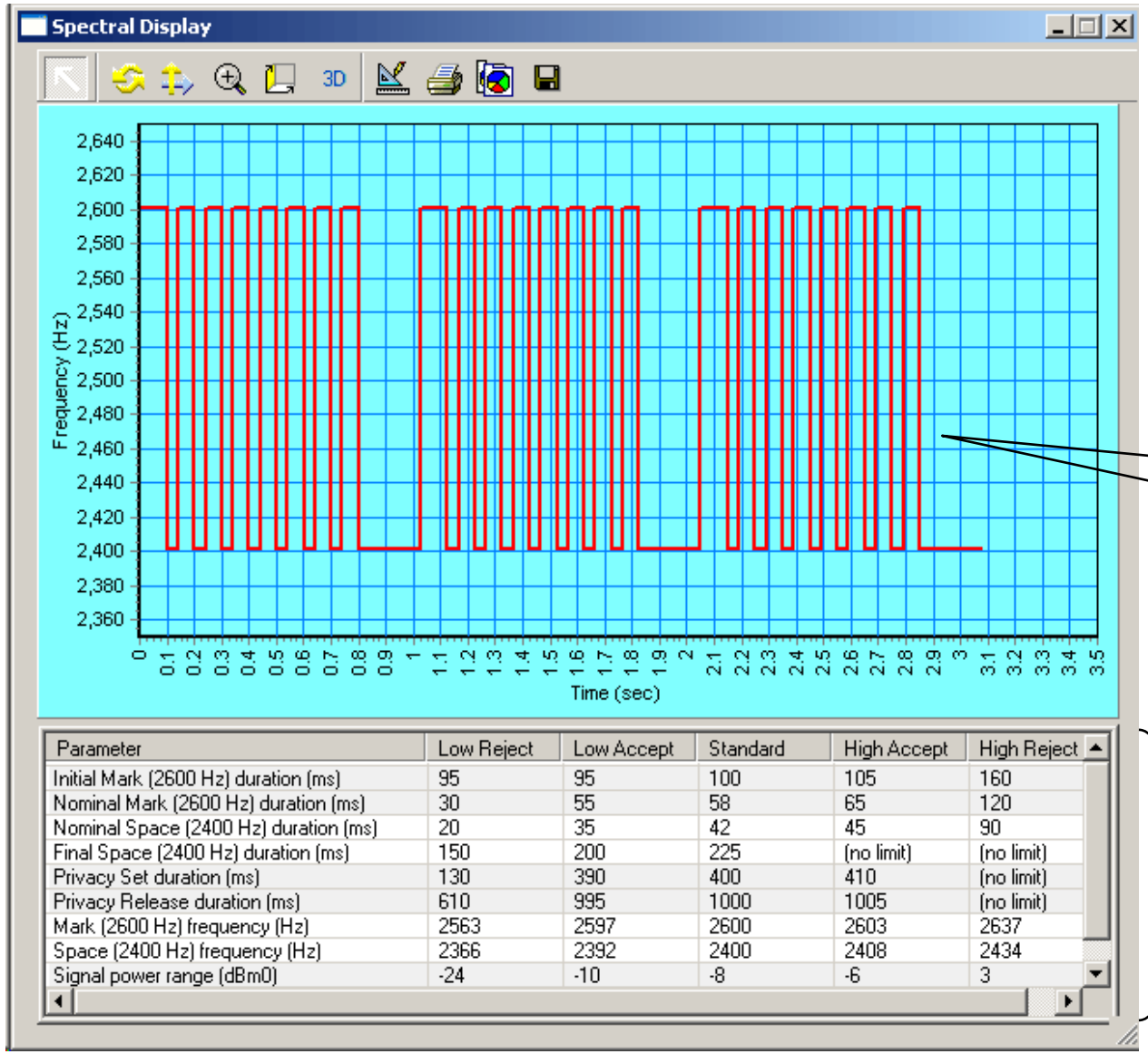
Spectral Display



Graphical Waveform of the Dial Code

Parameter	Low Reject	Low Accept	Standard	High Accept	High Reject
Initial Mark (2600 Hz) duration (ms)	95	95	100	105	160
Nominal Mark (2600 Hz) duration (ms)	30	55	58	65	120
Nominal Space (2400 Hz) duration (ms)	20	35	42	45	90
Final Space (2400 Hz) duration (ms)	150	200	225	(no limit)	(no limit)
Privacy Set duration (ms)	130	390	400	410	(no limit)
Privacy Release duration (ms)	610	995	1000	1005	(no limit)
Mark (2600 Hz) frequency (Hz)	2563	2597	2600	2603	2637
Space (2400 Hz) frequency (Hz)	2366	2392	2400	2408	2434
Signal power range (dBm0)	-24	-10	-8	-6	3

Tone Parameters

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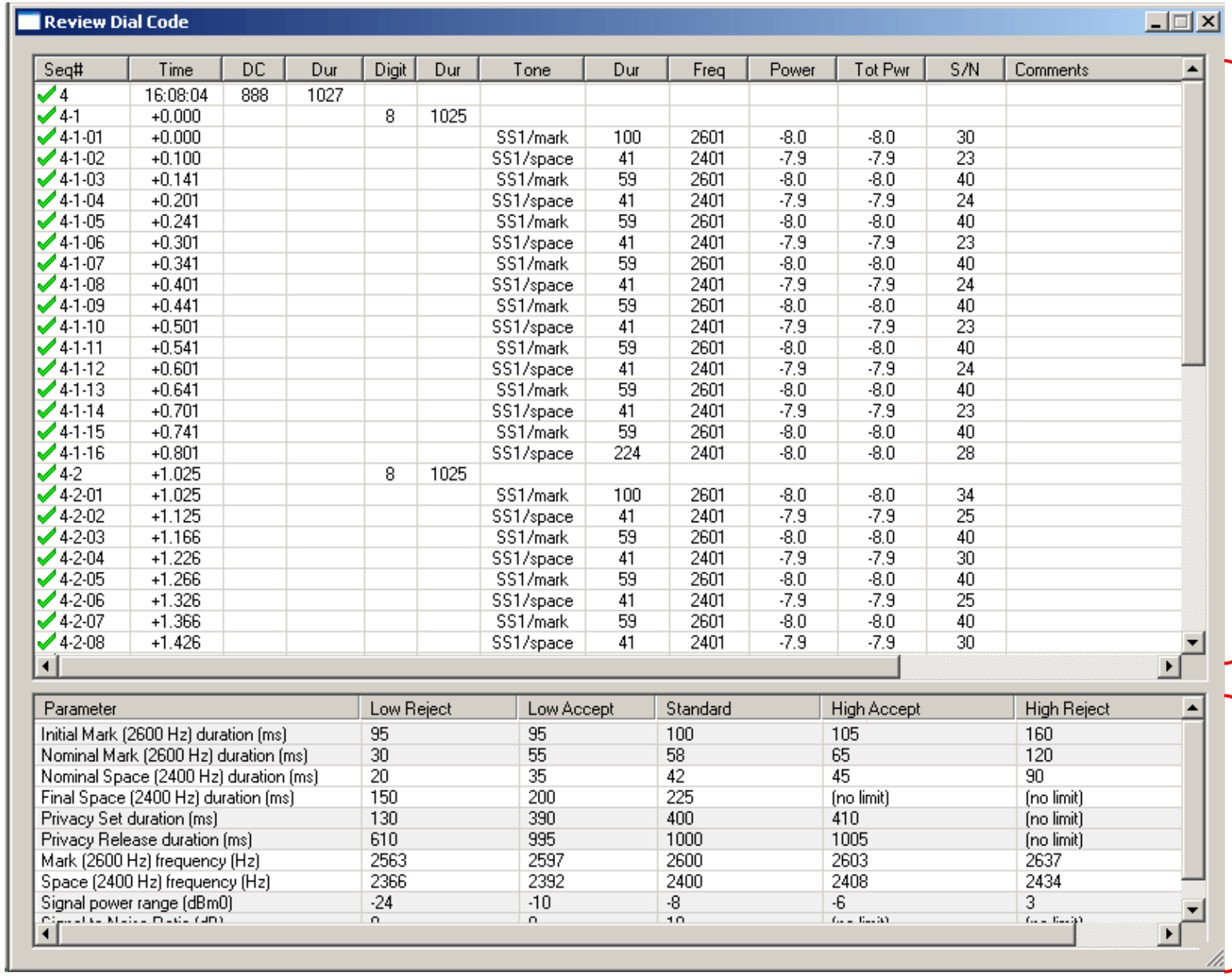
Review Dial Code Details



Seq#	Time	DC	Dur	Digit	Dur	Tone	Dur	Freq	Power	Tot Pwr	S/N	Comments
4	16:08:04	888	1027									
4-1	+0.000			8	1025							
4-1-01	+0.000					SS1/mark	100	2601	-8.0	-8.0	30	
4-1-02	+0.100					SS1/space	41	2401	-7.9	-7.9	23	
4-1-03	+0.141					SS1/mark	59	2601	-8.0	-8.0	40	
4-1-04	+0.201					SS1/space	41	2401	-7.9	-7.9	24	
4-1-05	+0.241					SS1/mark	59	2601	-8.0	-8.0	40	
4-1-06	+0.301					SS1/space	41	2401	-7.9	-7.9	23	
4-1-07	+0.341					SS1/mark	59	2601	-8.0	-8.0	40	
4-1-08	+0.401					SS1/space	41	2401	-7.9	-7.9	24	
4-1-09	+0.441					SS1/mark	59	2601	-8.0	-8.0	40	
4-1-10	+0.501					SS1/space	41	2401	-7.9	-7.9	23	
4-1-11	+0.541					SS1/mark	59	2601	-8.0	-8.0	40	
4-1-12	+0.601					SS1/space	41	2401	-7.9	-7.9	24	
4-1-13	+0.641					SS1/mark	59	2601	-8.0	-8.0	40	
4-1-14	+0.701					SS1/space	41	2401	-7.9	-7.9	23	
4-1-15	+0.741					SS1/mark	59	2601	-8.0	-8.0	40	
4-1-16	+0.801					SS1/space	224	2401	-8.0	-8.0	28	
4-2	+1.025			8	1025							
4-2-01	+1.025					SS1/mark	100	2601	-8.0	-8.0	34	
4-2-02	+1.125					SS1/space	41	2401	-7.9	-7.9	25	
4-2-03	+1.166					SS1/mark	59	2601	-8.0	-8.0	40	
4-2-04	+1.226					SS1/space	41	2401	-7.9	-7.9	30	
4-2-05	+1.266					SS1/mark	59	2601	-8.0	-8.0	40	
4-2-06	+1.326					SS1/space	41	2401	-7.9	-7.9	25	
4-2-07	+1.366					SS1/mark	59	2601	-8.0	-8.0	40	
4-2-08	+1.426					SS1/space	41	2401	-7.9	-7.9	30	

Parameter	Low Reject	Low Accept	Standard	High Accept	High Reject
Initial Mark (2600 Hz) duration (ms)	95	95	100	105	160
Nominal Mark (2600 Hz) duration (ms)	30	55	58	65	120
Nominal Space (2400 Hz) duration (ms)	20	35	42	45	90
Final Space (2400 Hz) duration (ms)	150	200	225	(no limit)	(no limit)
Privacy Set duration (ms)	130	390	400	410	(no limit)
Privacy Release duration (ms)	610	995	1000	1005	(no limit)
Mark (2600 Hz) frequency (Hz)	2563	2597	2600	2603	2637
Space (2400 Hz) frequency (Hz)	2366	2392	2400	2408	2434
Signal power range (dBm0)	-24	-10	-8	-6	3

Review Dial Code

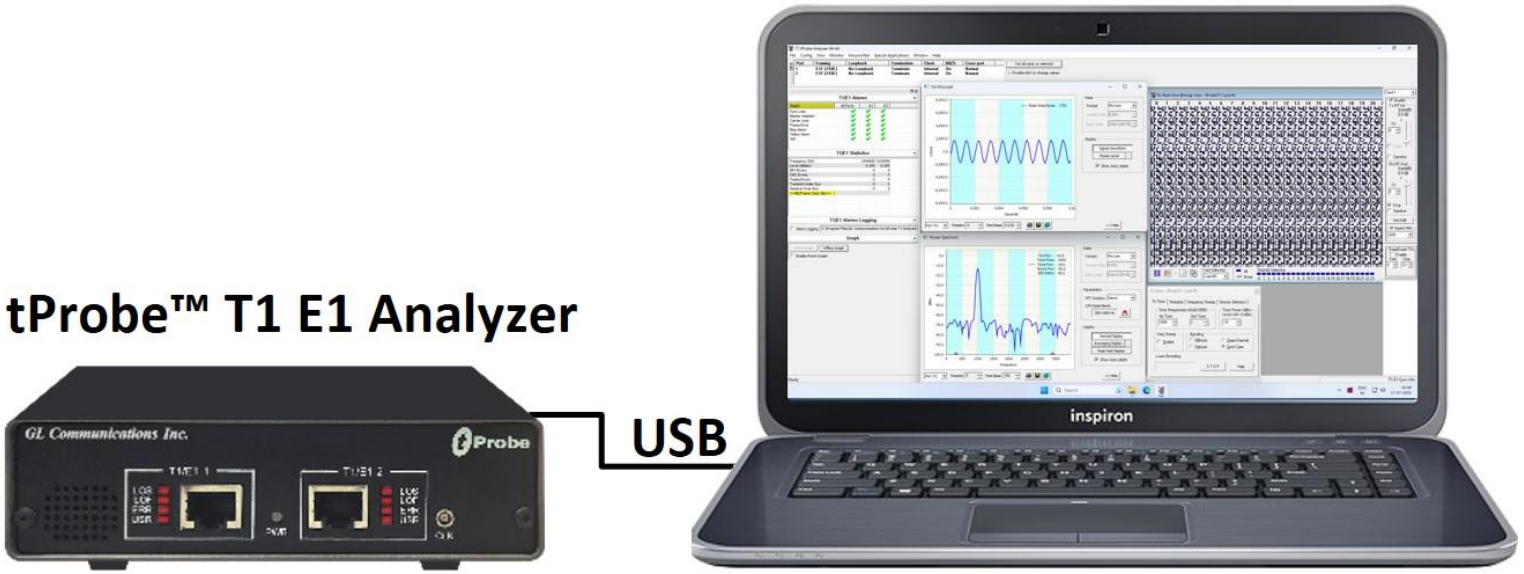
Tone Parameters

GL Communications

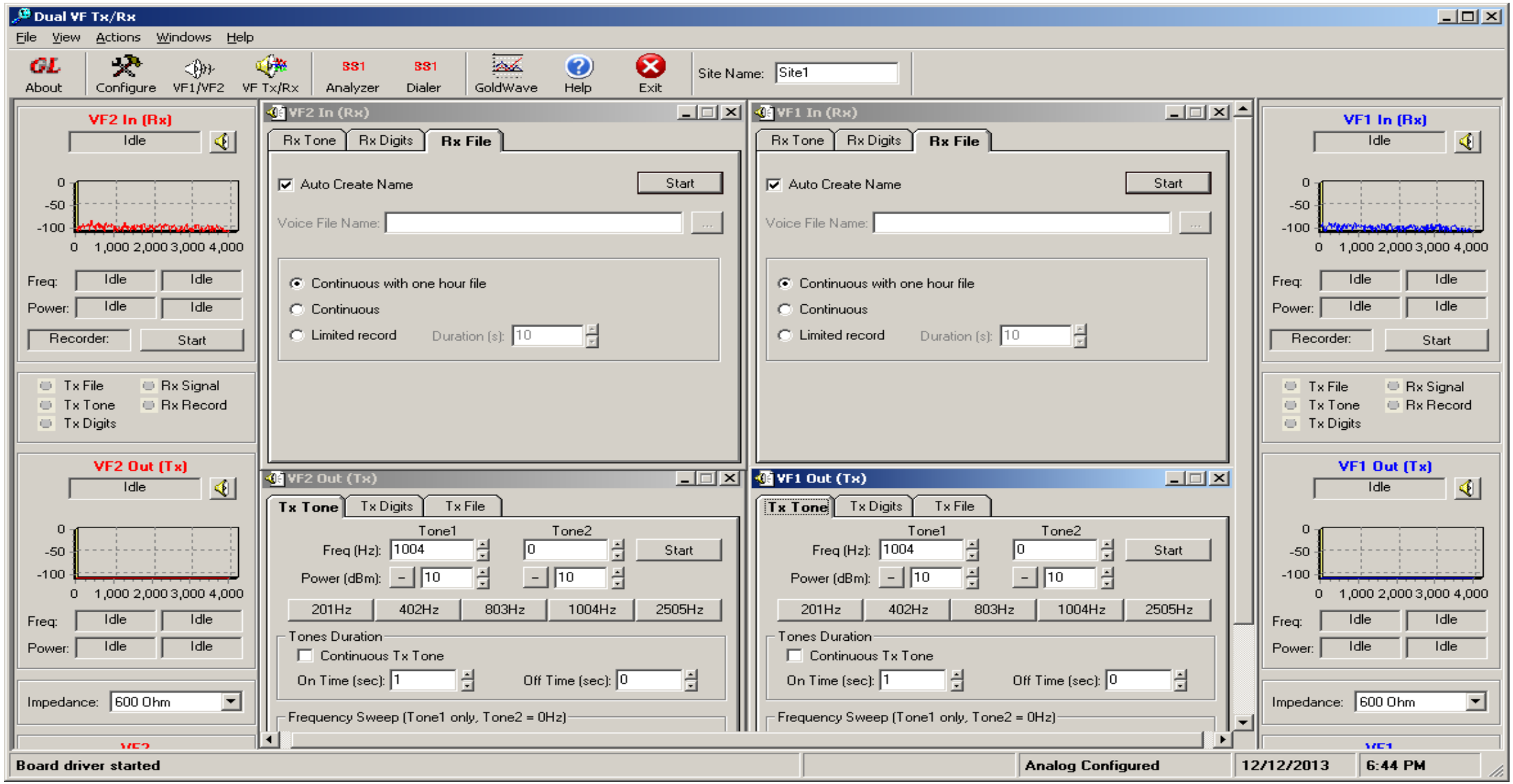
Dual VF Tx Rx

Dual VF Tx Rx

- Bantam Interface Connectivity for VF- Inputs and VF- Outputs
- Support two VF interfaces per card
- Each VF interface supports independent Tx/Rx
- Multiple cards supported per system
- Mode 1: VF1 (Tx/Rx) and VF2 (Tx/Rx)
- Mode 2: VF Tx and VF Rx

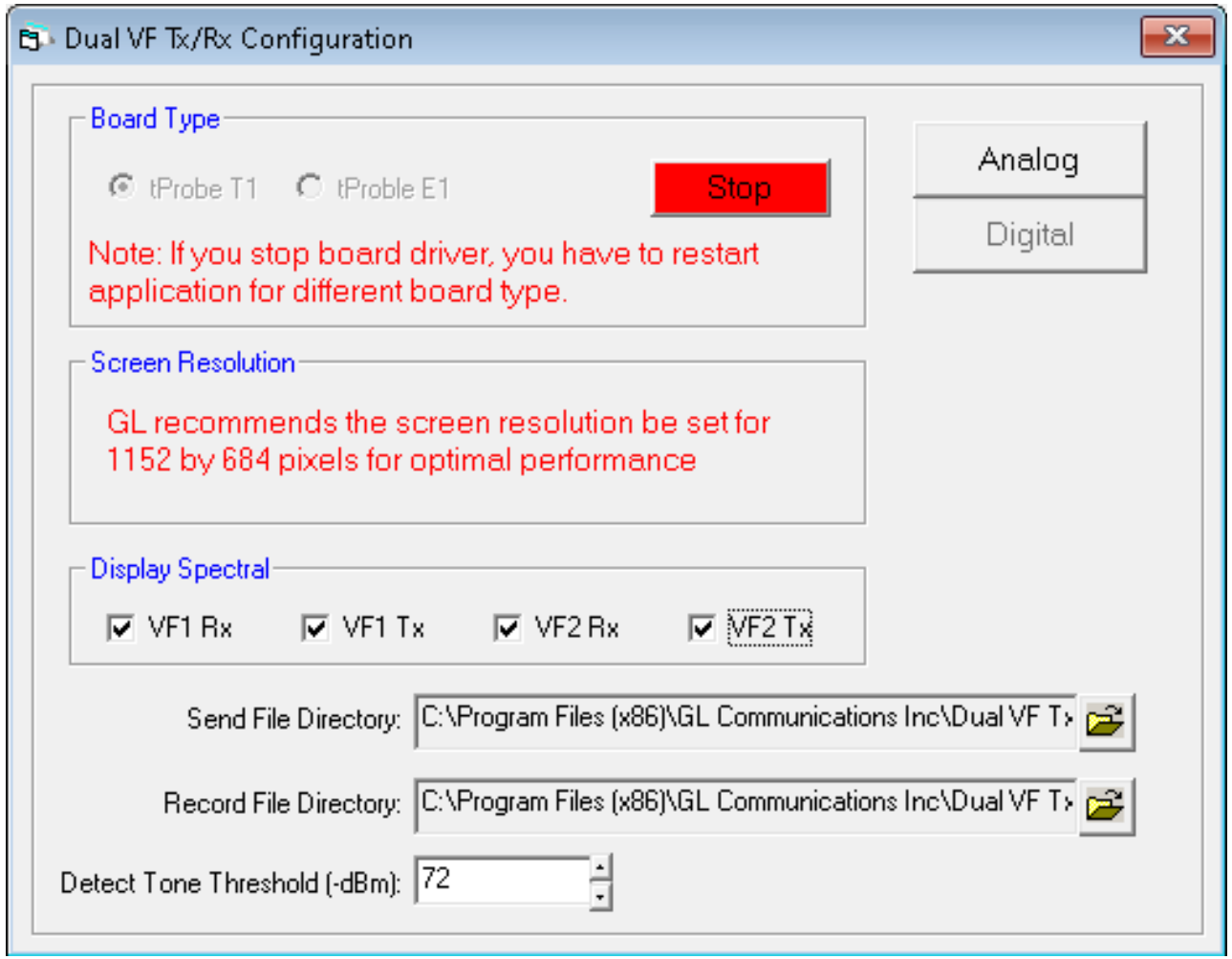


Dual VF Tx Rx GUI

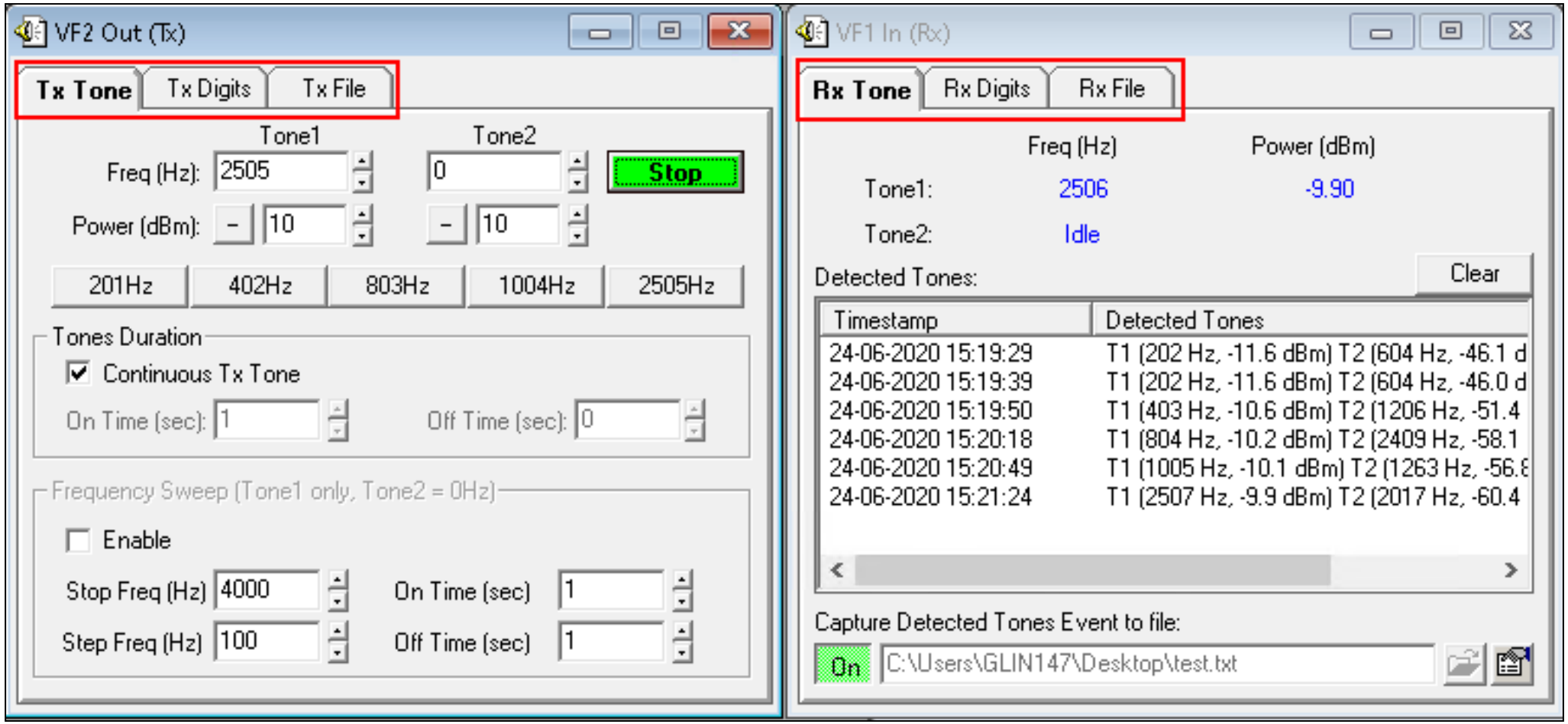


Analog Interface Configuration

- Board Type option allows Dual VF Tx Rx application to automatically connect to the T1 E1 devices when invoked, displaying the board in use
- Audio traffic and files can be saved to the directory used for transmit and receive traffic. The tone threshold value for Tone detection can be set up to 80 dBm



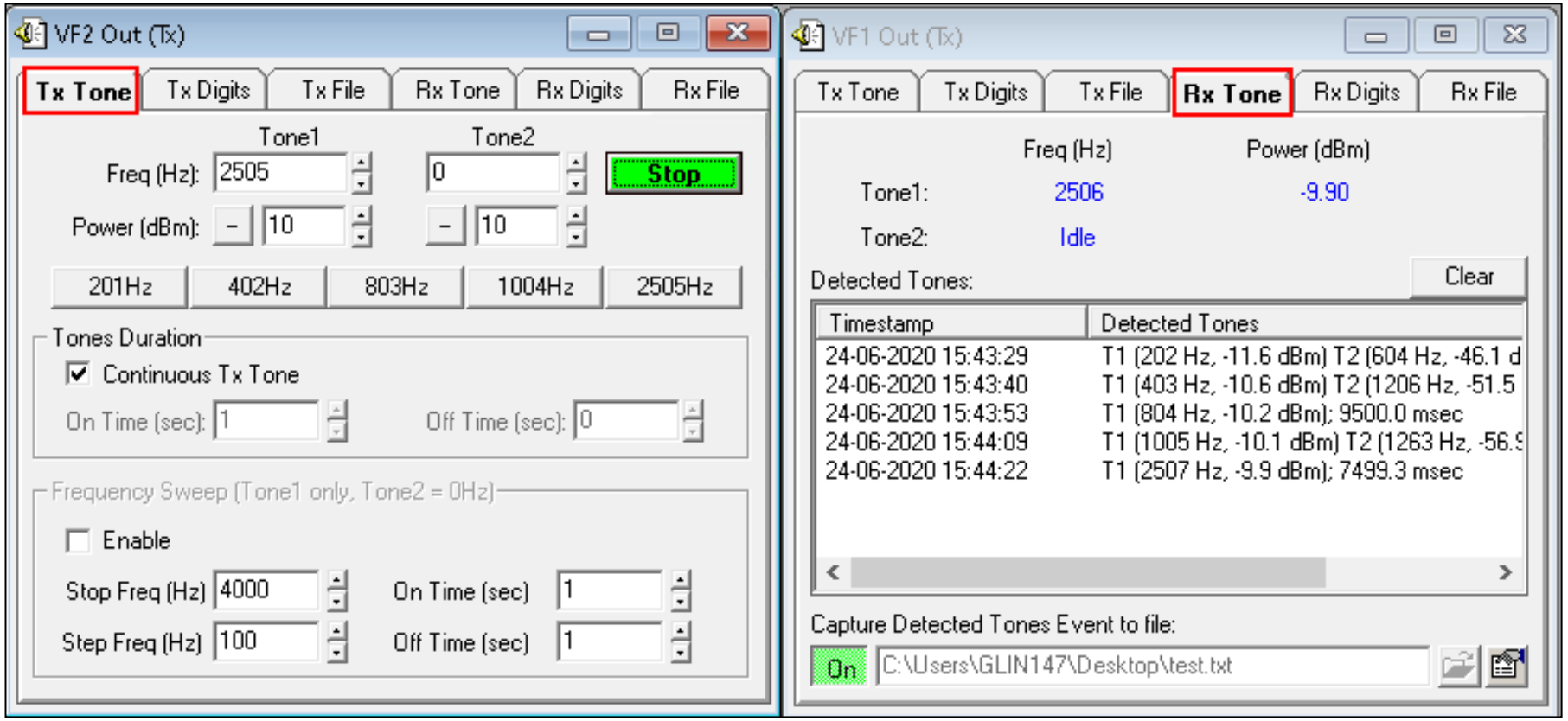
VF Tx/Rx Actions



- In VF Tx /Rx operational mode, Tx/Rx functions are supported on a single VF port (either VF1 or VF2)
- Sending and receiving traffic functions such as Tones, Digits, and Files are possible

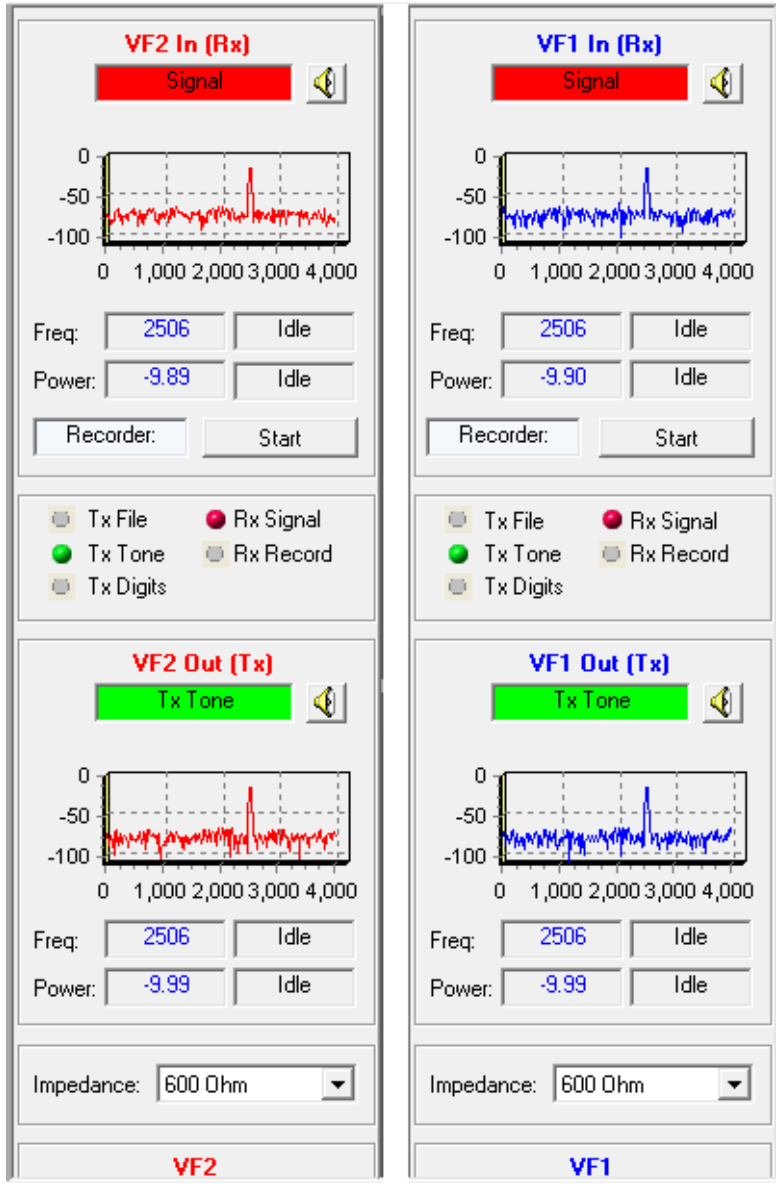
VF1 and VF2 (Tx / Rx) Actions

- In VF1/VF2 operational mode for each VF interface supports independent Tx/Rx between VF1 (Tx/Rx) and VF2 (Tx/Rx) simultaneously
- The transmit actions on one VF port will be received on another VF port
- The sending and receiving traffic functions such as Tones, Digits, and Files are possible
- The VF Tx/Rx Tones, Digits, and Files status and the spectral can be viewed for sending VF ports in the VF Status and Spectral Display



VF Status and Spectral Display

- The Side panels display
  - ➢ Tx/Rx status for the tone, digits, voice transmitted/received on any particular VF port
  - ➢ Frequency, Power count status of the VF In and Out
  - ➢ Data transmitted or received on a specified VF port graphically (spectral Power (dBm) Vs Frequency (Hz))
  - ➢ Sending/Receiving Speakers for Tx/Rx ports
  - ➢ Multiple impedance options for audio In and Out ports



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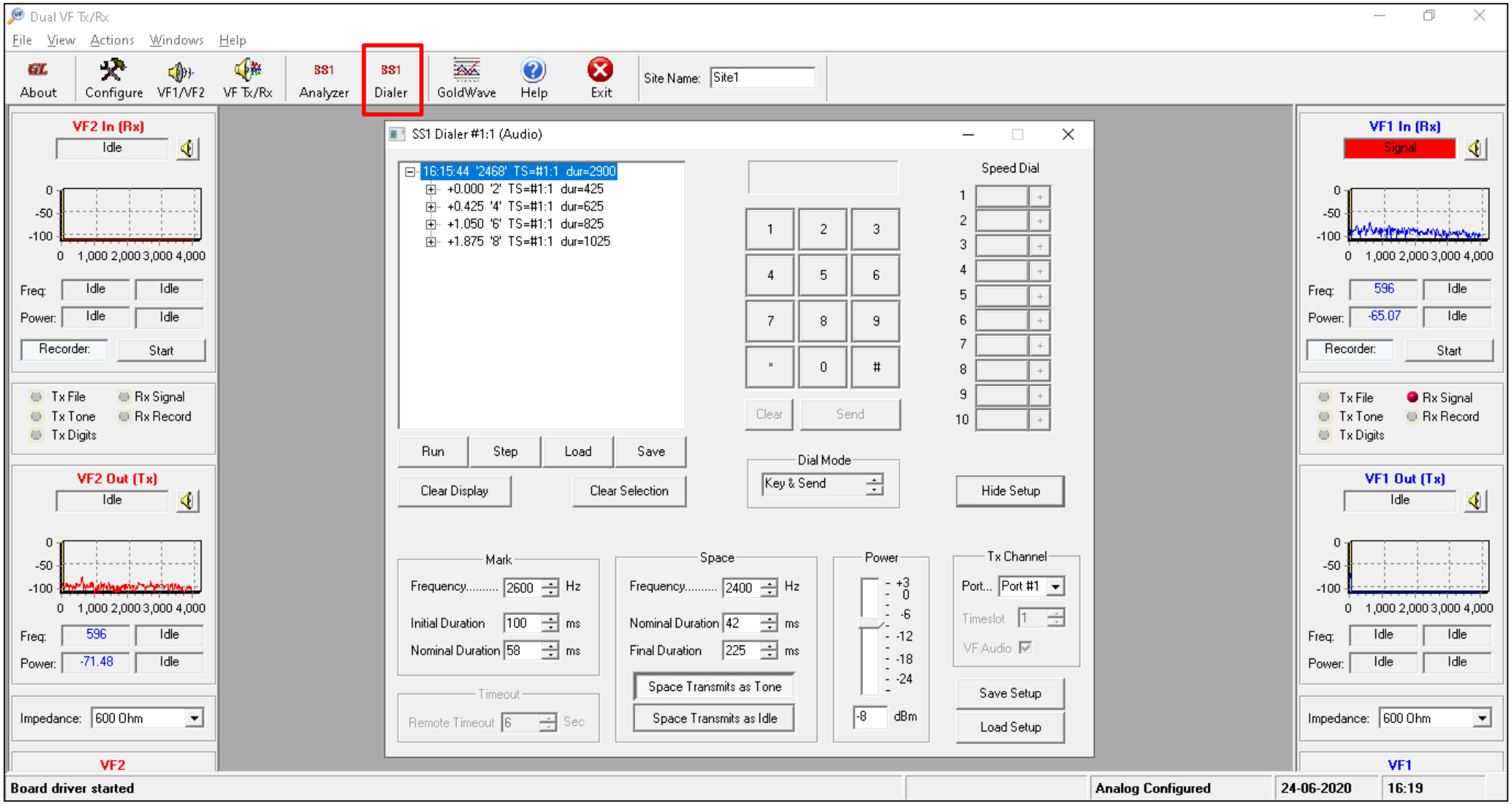
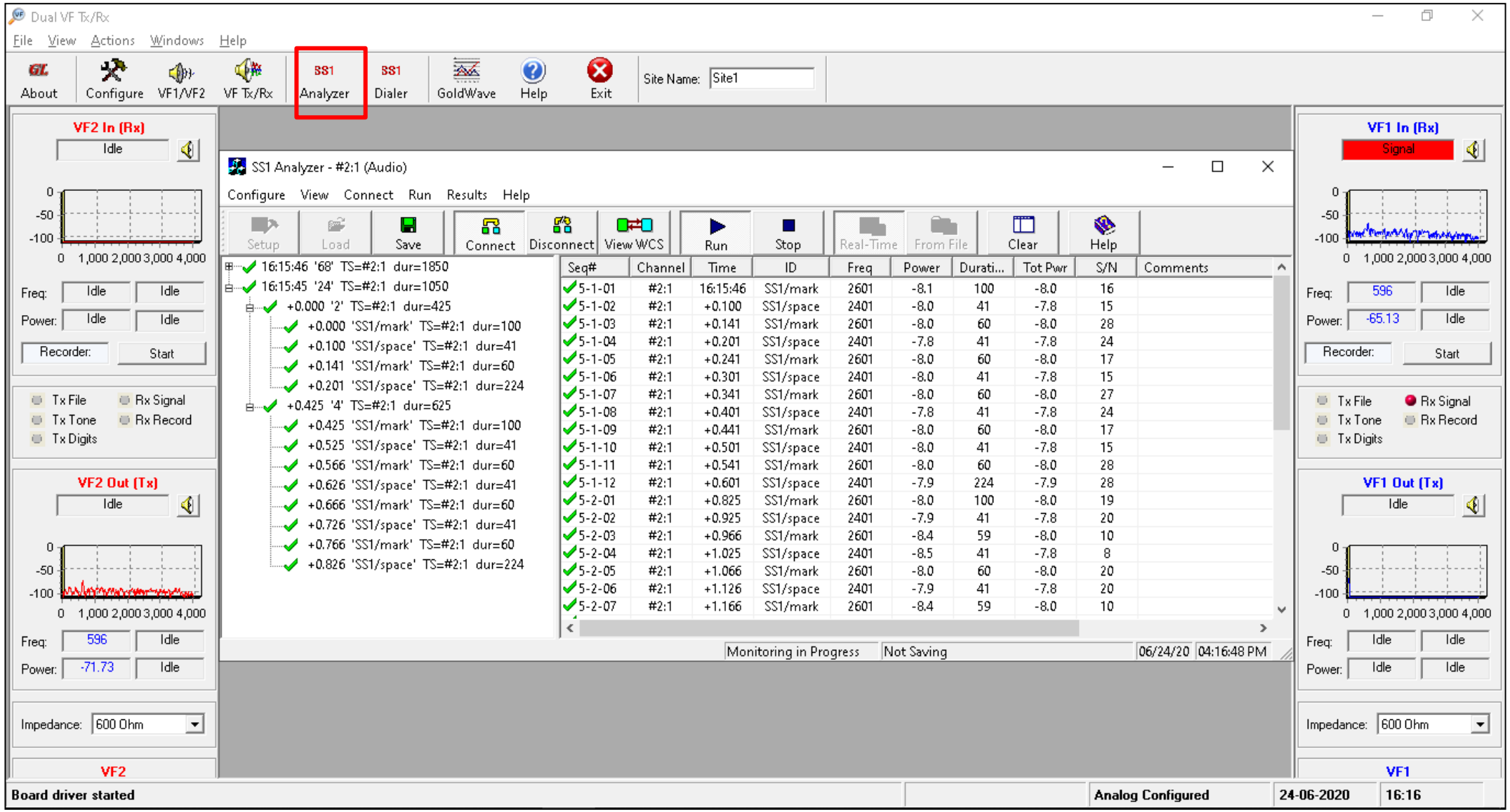
Dual VF Tx Rx with SS1/SS4 Dialer

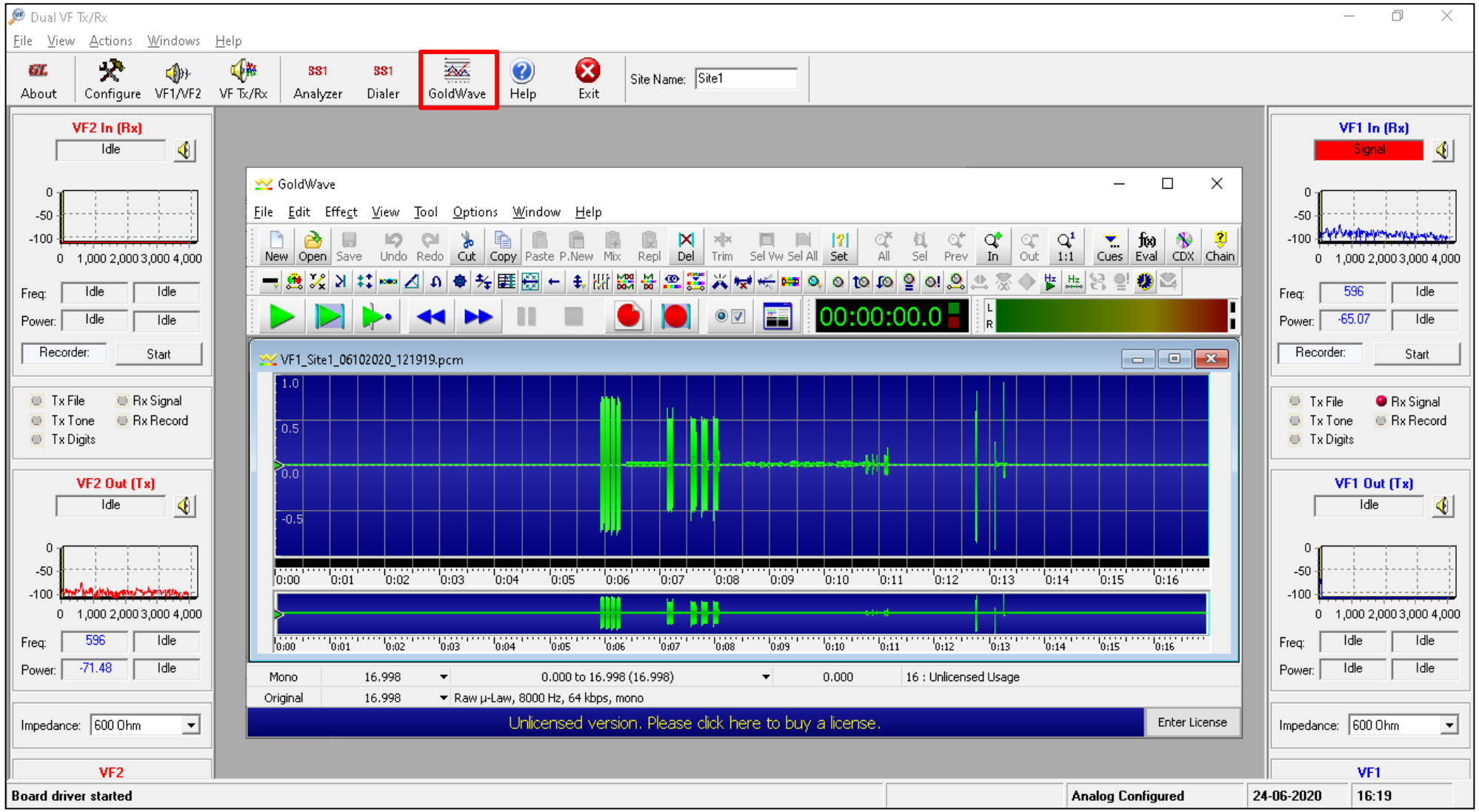


Dual VF Tx Rx with SS1/SS4 Analyzer



Goldwave Capabilities

- Dual VF Tx Rx includes Goldwave capabilities to view and analyze send and receive audio files
- Any chosen mono and stereo files that have been recorded can be viewed, heard, and analyzed using Goldwave



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Thank you