

Spectrum Monitoring Tasks

Spectrum Management Training Program

Elective Module EM1-Option 1 : Spectrum Monitoring

Outline

- Spectrum Monitoring Tasks
- Types of Measurements
- Measurement Equipment
- Multiple Display Format

Spectrum Monitoring Tasks

- Tasks derived from the Radio Regulations (RR)
- Tasks on a national basis
- Tasks assigned to the radio inspection service
- Co-operation of radio monitoring and inspection services
- Cooperation with other bodies (police and courts)

Spectrum Monitoring Tasks

- Tasks derived from the Radio Regulations (RR)
 - Compliance with frequency assignments
 - Frequency band observations and Channel Occupancy
 - Investigation of interference
 - Identifying unauthorized users

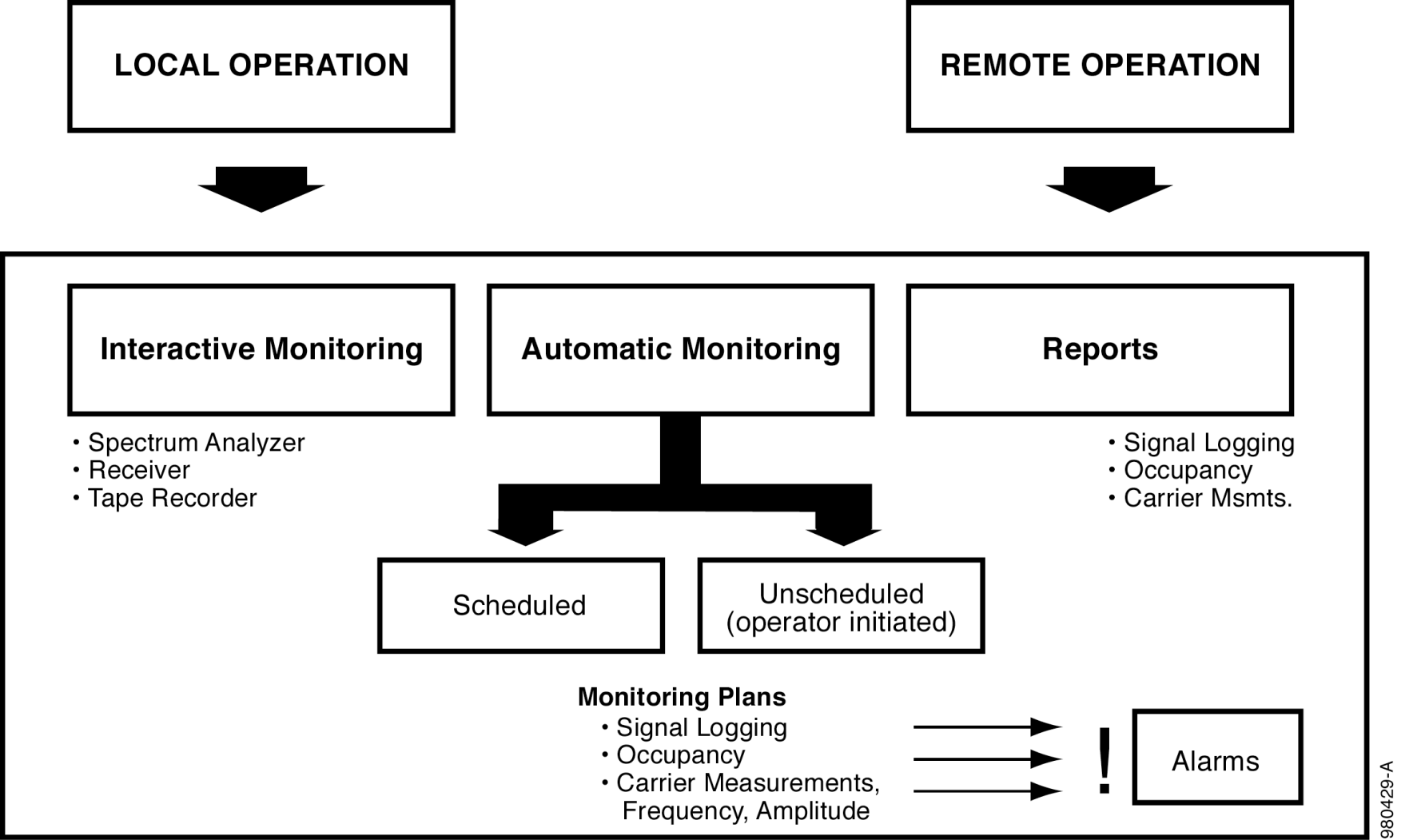
Spectrum Monitoring Tasks

- National Tasks
 - Special occasions (major events)
 - Radio coverage measurements
 - Radio compatibility
 - Technical and Scientific studies

Spectrum Monitoring Tasks

- Assigned to the radio inspection service
 - inspecting radio equipment on site;
 - measuring radio equipment to rule out health hazards from electromagnetic radiation;
 - processing cases of electromagnetic compatibility (EMC) relating to non-radio equipment;
 - market surveillance activities when radio equipment or other electronic equipment is put on the market.

Spectrum Monitoring Tasks

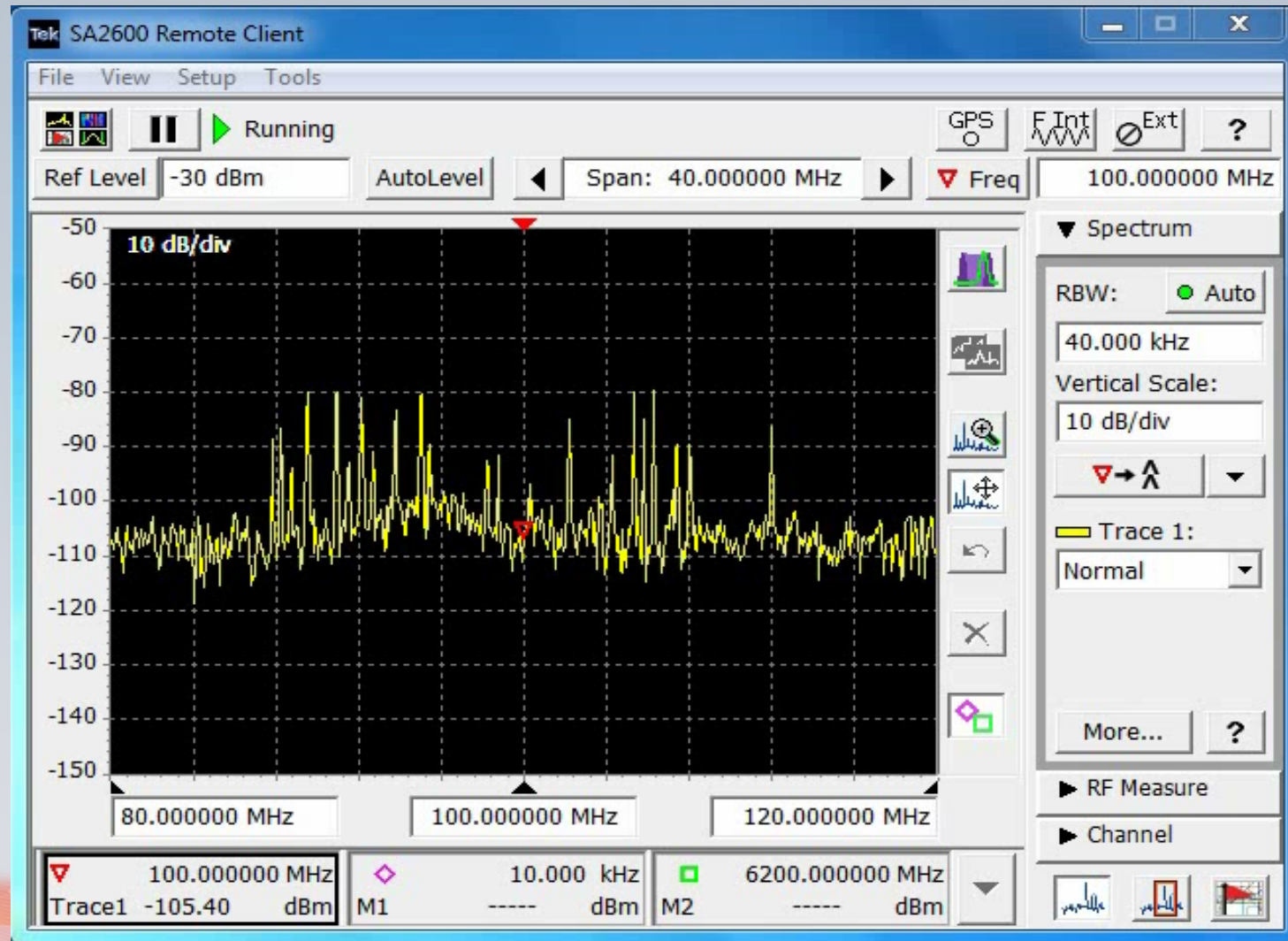


980429-A

Types of measurements

- Frequency measurements
- Field strength and power-flux density measurements at fixed points
- Bandwidth measurements
- spectrum occupancy measurements
- Direction Finding

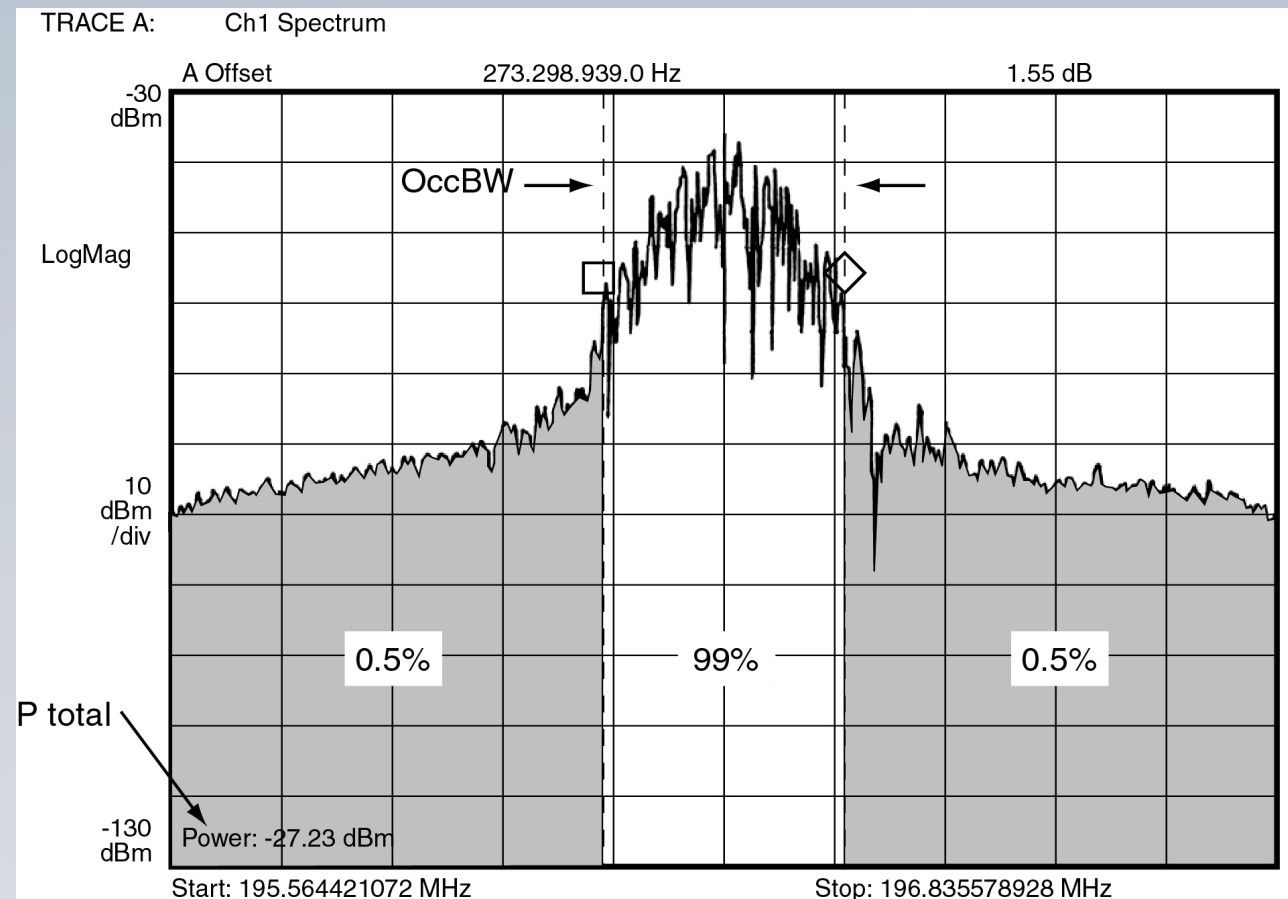
Frequency Measurement



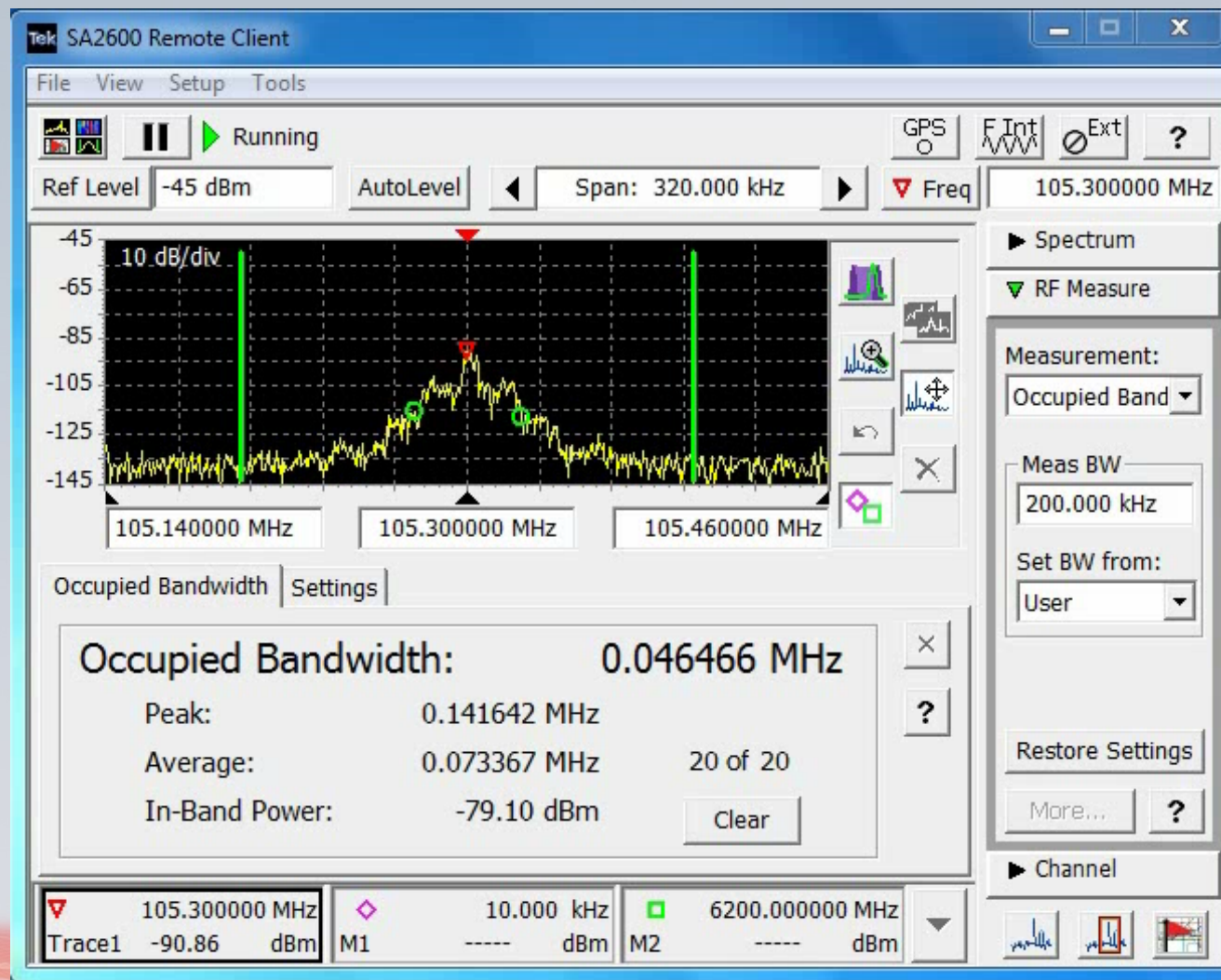
Field Strength Measurement



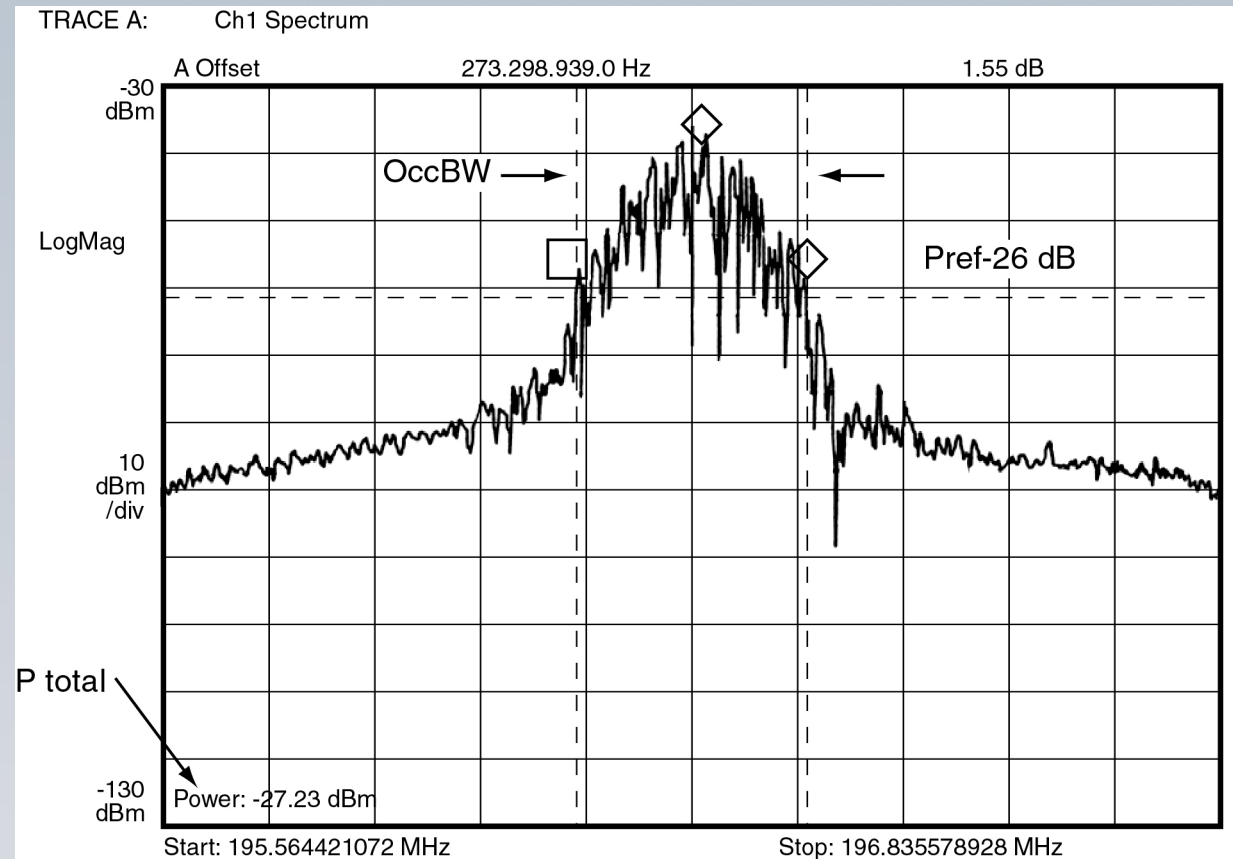
Bandwidth Measurement (β) Method



Bandwidth Measurement (β) Method



Bandwidth Measurement x-dB Method



Bandwidth Measurement x -dB Method

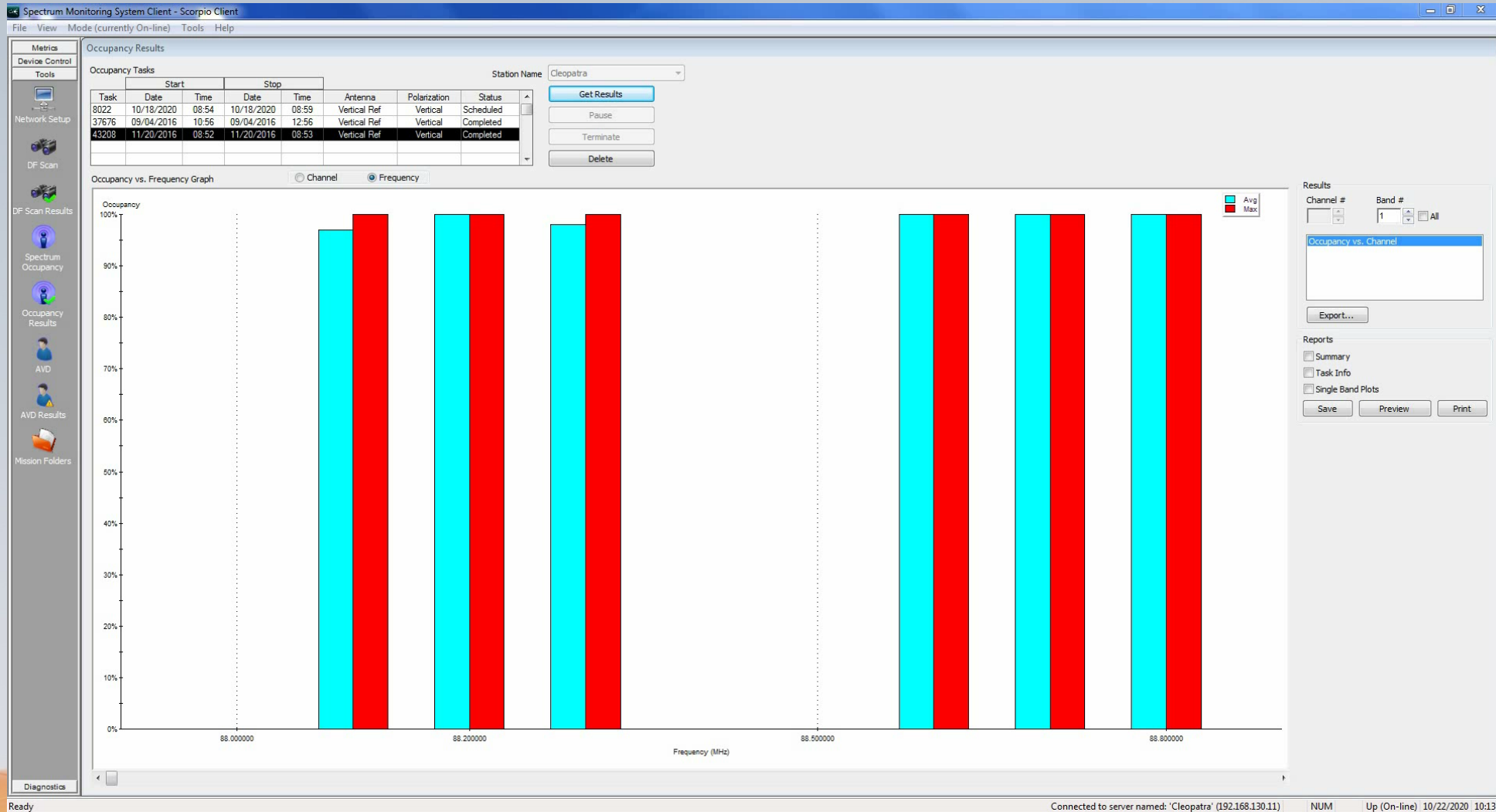
Measuring x -dB Bandwidth

1. Center the display to the authorized frequency
2. Set the 0-dB reference
3. Reset the RBW=1/100 of necessary bandwidth
4. Set VBW to 1 MHz to ensure no averaging
5. Set Trace to Max Hold
6. Set Marker 1 to Center Frequency
7. Use Delta Markers1 to find point x -dB below fundamental frequency.

Spectrum Occupancy Measurement

- Observations to assist in tracking interference or improper spectrum usage
- Observations for frequency management use such as spectrum planning and allocation, channel usage reports, etc.
- Detecting unauthorized use

Spectrum Occupancy Measurement



Ready

Connected to server named: 'Cleopatra' (192.168.130.11) NUM Up (On-line) 10/22/2020 10:13

Spectrum Occupancy Measurement

Navigator - UMS300-100783

File

File List File Info Import/Export Transfer Files Process Statistics Report Generation

Show All Display Filter Measurement Result

ARGUS DB Full View

File Name	File Type	Records	Size	Created At	Modified At	Mode	Control Unit	Measurement Un	User Group	User	Start Time	Write Access	Column Names	Latitude	Longitude
<input type="checkbox"/> 2490-2700_M2	Measureme...	126006	4184 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	31°05'19.1"N	027°53'40.6"E
<input type="checkbox"/> 3290-3820_5	Measureme...	212004	7040 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	31°05'00.2"N	027°56'21.3"E
<input type="checkbox"/> 2700-3290_5	Measureme...	177003	5878 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	31°05'00.2"N	027°56'21.3"E
<input type="checkbox"/> 2490-2700_5	Measureme...	105005	3487 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	31°05'00.2"N	027°56'21.3"E
<input type="checkbox"/> 2200-2490_5	Measureme...	116004	3852 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	31°05'00.2"N	027°56'21.3"E
<input type="checkbox"/> 3290-3820_4	Measureme...	212004	7040 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	31°04'07.1"N	028°10'06.0"E
<input type="checkbox"/> 2700-3290_4	Measureme...	177003	5878 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	31°04'07.1"N	028°10'06.0"E
<input type="checkbox"/> 2490-2700_4	Measureme...	63003	2092 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	31°04'07.1"N	028°10'06.0"E
<input type="checkbox"/> 2200-2490_4	Measureme...	116004	3852 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	31°04'07.1"N	028°10'06.0"E
<input type="checkbox"/> 3290-3820_3	Measureme...	106002	3520 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	31°02'28.3"N	028°22'15.7"E
<input type="checkbox"/> 2700-3290_3	Measureme...	177003	5878 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	31°02'28.3"N	028°22'15.7"E
<input type="checkbox"/> 2490-2700_3	Measureme...	84004	2790 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	31°02'28.3"N	028°22'15.7"E
<input type="checkbox"/> 2200-2490_3	Measureme...	116004	3852 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	31°02'28.3"N	028°22'15.7"E
<input checked="" type="checkbox"/> FM2	Measureme...	10668933	354242 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	30°29'05.3"N	029°12'46.8"E
<input type="checkbox"/> FM	Measureme...	454542	15093 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	30°29'00.7"N	029°16'37.7"E
<input type="checkbox"/> 3290-3820_2	Measureme...	159003	5280 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	30°26'52.1"N	029°32'18.7"E
<input type="checkbox"/> 2700-3290_2	Measureme...	295005	9796 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	30°26'52.1"N	029°32'18.7"E
<input type="checkbox"/> 2490-2700_2	Measureme...	147007	4882 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	30°26'52.1"N	029°32'18.7"E
<input type="checkbox"/> 2200-2490_2	Measureme...	145005	4815 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	30°26'52.1"N	029°32'18.7"E
<input type="checkbox"/> 3290-3820_M1	Measureme...	212004	7040 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	30°06'25.3"N	030°04'13.9"E
<input type="checkbox"/> 2490-2700_M1	Measureme...	105005	3487 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	30°06'27.5"N	030°04'49.0"E
<input type="checkbox"/> 3290-3820_1	Measureme...	212004	7040 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	30°06'04.8"N	031°11'02.0"E
<input type="checkbox"/> 2700-3290_1	Measureme...	177003	5878 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	30°06'04.8"N	031°11'02.0"E
<input type="checkbox"/> 2490-2700_1	Measureme...	84004	2790 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time_Frequ...	30°06'04.8"N	031°11'02.0"E

Type of statistic: Frequency Band Occupancy

Show data as: Value over threshold Occupancy per time interval

Parameter: Level

Minimum: -111.0 dBm

Maximum: -45.2 dBm

Threshold: []

Time interval: 15 min

Calculate [OK] [Cancel]

Channel Occupancy Measurement

Navigator - UMS300-100783

File List | File Info | Import/Export | Transfer Files | Process | Statistics | Report Generation

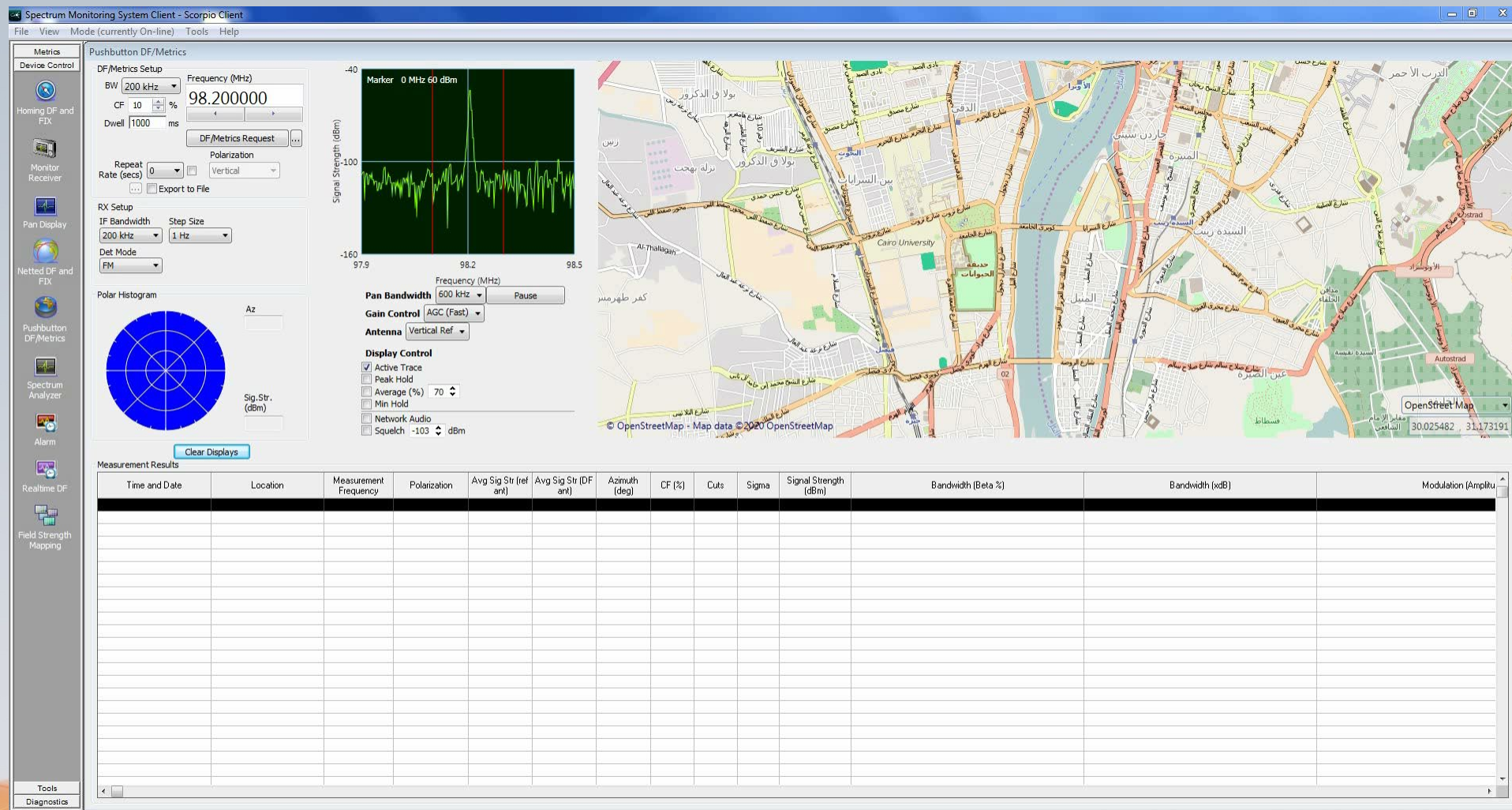
Show All | Display Filter | Measurement Result

ARGUS DB | Full View

File Name	File Type	Records	Size	Created At	Modified At	Mode	Control Unit	Measurement Un	User Group	User	Start Time	Write Access	Column Names	Latitude	Longitude
<input type="checkbox"/> 2490-2700_9	Measureme...	147007	4882 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°21'17.3"N	027°16'25.2"E
<input type="checkbox"/> 2200-2490_9	Measureme...	145005	4815 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°21'17.4"N	027°16'25.2"E
<input type="checkbox"/> 3290-3820_8	Measureme...	159003	5280 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°20'53.2"N	027°14'31.4"E
<input type="checkbox"/> 2700-3290_8	Measureme...	177003	5878 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°20'53.2"N	027°14'31.4"E
<input type="checkbox"/> 2490-2700_8	Measureme...	168008	5579 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°20'53.1"N	027°14'31.4"E
<input type="checkbox"/> 2200-2490_8	Measureme...	145005	4815 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°20'53.1"N	027°14'31.4"E
<input type="checkbox"/> 2490-2700_M3	Measureme...	84004	2790 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°19'56.7"N	027°15'36.8"E
<input type="checkbox"/> 3290-3820_7	Measureme...	212004	7040 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°19'31.5"N	027°16'17.4"E
<input type="checkbox"/> 2700-3290_7	Measureme...	177003	5878 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°19'31.5"N	027°16'17.4"E
<input type="checkbox"/> 2490-2700_7	Measureme...	105005	3487 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°19'31.5"N	027°16'17.4"E
<input type="checkbox"/> 2200-2490_7	Measureme...	116004	3852 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°19'31.5"N	027°16'17.5"E
<input type="checkbox"/> 3290-3820_6	Measureme...	159003	5280 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°17'25.8"N	027°20'11.9"E
<input type="checkbox"/> 2700-3290_6	Measureme...	118002	3919 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°17'25.8"N	027°20'11.9"E
<input type="checkbox"/> 2490-2700_6	Measureme...	105005	3487 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°17'25.1"N	027°20'13.3"E
<input type="checkbox"/> 2200-2490_6	Measureme...	116004	3852 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°17'25.1"N	027°20'13.3"E
<input type="checkbox"/> 2490-2700_M2	Measureme...	126006	4184 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°05'19.1"N	027°53'40.6"E
<input type="checkbox"/> 3290-3820_5	Measureme...	212004	7040 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°05'00.2"N	027°56'21.3"E
<input type="checkbox"/> 2700-3290_5	Measureme...	177003	5878 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°05'00.2"N	027°56'21.3"E
<input type="checkbox"/> 2490-2700_5	Measureme...	105005	3487 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°05'00.2"N	027°56'21.3"E
<input type="checkbox"/> 2200-2490_5	Measureme...	116004	3852 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°05'00.2"N	027°56'21.3"E
<input type="checkbox"/> 3290-3820_4	Measureme...	212004	7040 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°04'07.1"N	028°10'06.0"E
<input type="checkbox"/> 2700-3290_4	Measureme...	177003	5878 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°04'07.1"N	028°10'06.0"E
<input type="checkbox"/> 2490-2700_4	Measureme...	63003	2092 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°04'07.1"N	028°10'06.0"E
<input type="checkbox"/> 2200-2490_4	Measureme...	116004	3852 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°04'07.1"N	028°10'06.0"E
<input type="checkbox"/> 3290-3820_3	Measureme...	106002	3520 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°02'28.3"N	028°22'15.7"E
<input type="checkbox"/> 2700-3290_3	Measureme...	177003	5878 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°02'28.3"N	028°22'15.7"E
<input type="checkbox"/> 2490-2700_3	Measureme...	84004	2790 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°02'28.3"N	028°22'15.7"E
<input type="checkbox"/> 2200-2490_3	Measureme...	116004	3852 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	31°02'28.3"N	028°22'15.7"E
<input type="checkbox"/> FM2	Measureme...	10668933	354242 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	30°29'05.5"N	029°12'46.8"E
<input type="checkbox"/> FM	Measureme...	454542	15093 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	30°29'00.7"N	029°16'37.7"E
<input type="checkbox"/> 3290-3820_2	Measureme...	159003	5280 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	30°26'52.1"N	029°32'18.7"E
<input type="checkbox"/> 2700-3290_2	Measureme...	295005	9796 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	30°26'52.1"N	029°32'18.7"E
<input type="checkbox"/> 2490-2700_2	Measureme...	147007	4882 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	30°26'52.1"N	029°32'18.7"E
<input type="checkbox"/> 2200-2490_2	Measureme...	145005	4815 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	30°26'52.1"N	029°32'18.7"E
<input type="checkbox"/> 3290-3820_M1	Measureme...	212004	7040 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	30°06'25.3"N	030°04'13.9"E
<input type="checkbox"/> 2490-2700_M1	Measureme...	105005	3487 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	30°06'27.5"N	030°04'49.0"E
<input type="checkbox"/> 3290-3820_1	Measureme...	212004	7040 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	30°06'04.8"N	031°11'02.0"E
<input type="checkbox"/> 2700-3290_1	Measureme...	177003	5878 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	30°06'04.8"N	031°11'02.0"E
<input type="checkbox"/> 2490-2700_1	Measureme...	84004	2790 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	30°06'04.8"N	031°11'02.0"E
<input type="checkbox"/> 2200-2490_1	Measureme...	116004	3852 kB	10/24/2020 ...	10/24/2020 ...	DMM	MMS01	UMS300-10...	1	Argus	10/24/2020 ...	TRUE	Time,Frequ...	30°06'04.8"N	031°11'02.0"E

Open As:

Direction Finding Measurement



Ready

Connected to server named: 'Cleopatra' (192.168.130.11) NUM Up (On-line) 10/22/2020 10:21

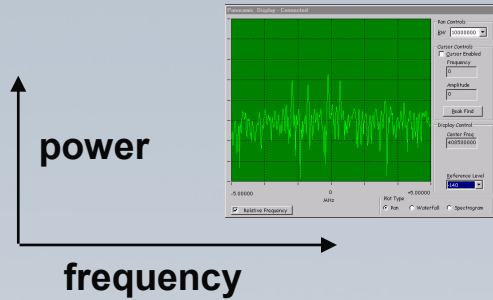
Measurement Equipment

- Omnidirectional antennas
- Directional antennas
- Receivers
- Direction finders
- Frequency measuring equipment
- Field-strength meters

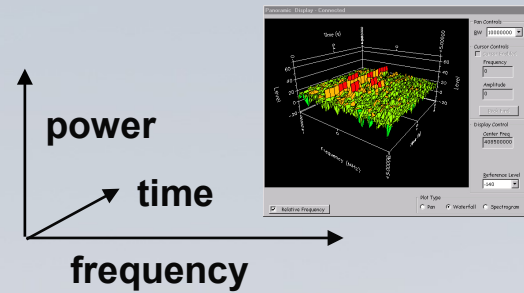
Measurement Equipment

- Bandwidth measurement equipment
- Channel occupancy measurement equipment
- Spectrum analyzers
- Vector signal analyzers or modulation analyzers
- Signal generators
- Recording equipment

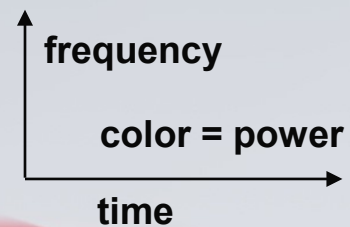
Multiple Display Formats



Trace displays show relative power of multiple signals.

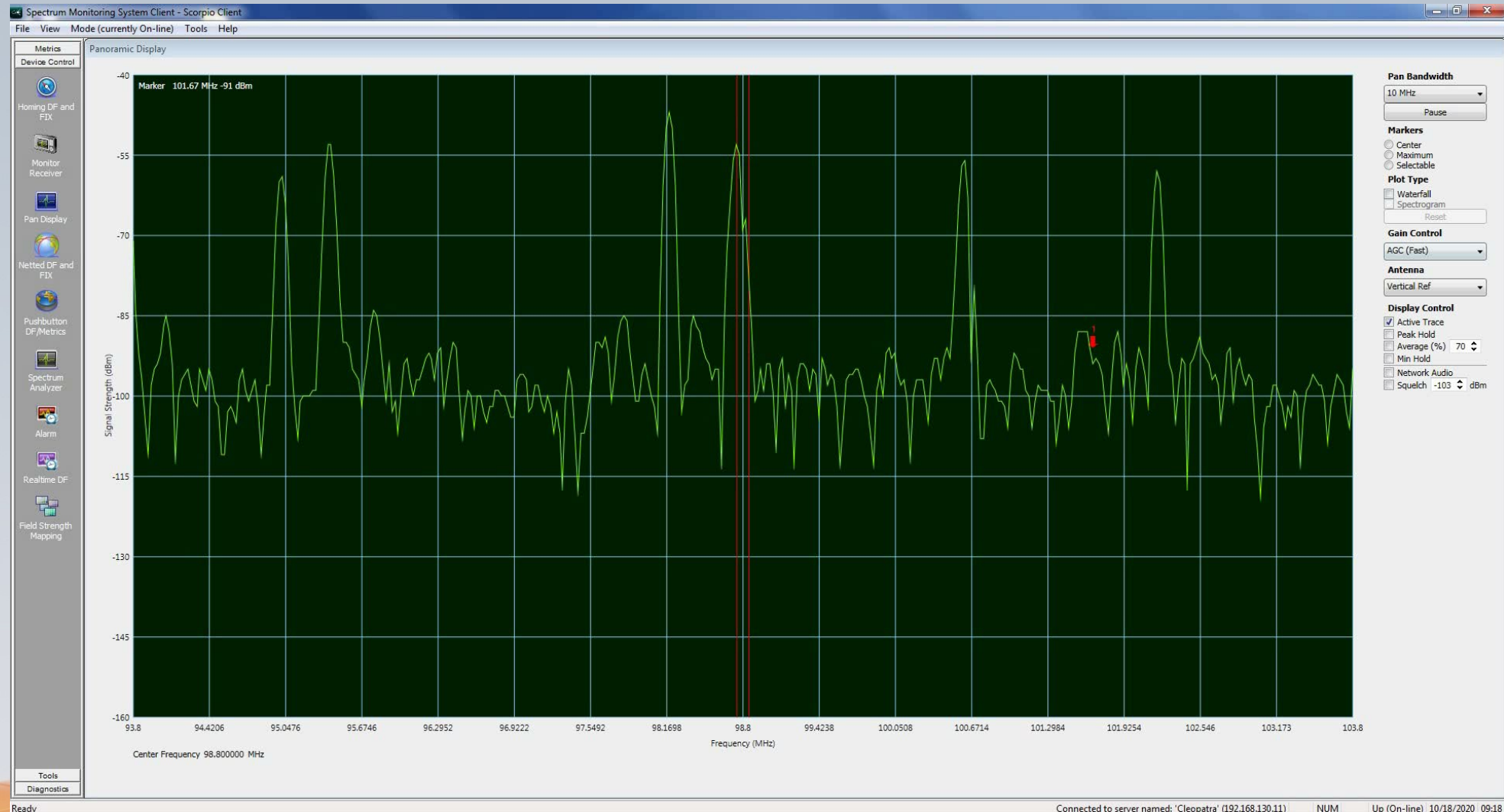


Waterfall displays give time perspective to complex signals.



Spectrogram displays help identify two-way communications.

Multiple Display Formats



Multiple Display Formats

