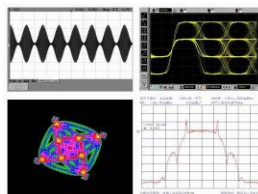


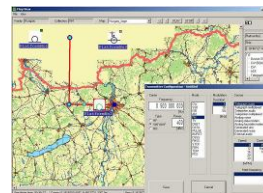
Analog-



and digital hw



Signal processing-



and operating sw



Equipment



System

Integrált felderítő és zavaró rendszer (INTERJAM)

Dr. Eged Bertalan

Sagax Communications Ltd., 1096 Budapest Haller u. 11-13. Hungary

Tartalom

•	Technikai felderítés és elektronikai harc	(2)
-	Doktrina elemek	1
-	Műveleti összefüggések	1
•	Szoftver rádió alapú eszközök	(3)
-	Szoftver rádiós készülékek	1
-	A szoftver rádió technológia alapelve	1
-	Fizikai méret csökkenés, képességek növekedése	1
•	Felderítő eszközbázis	(4)
-	Kereső vevőkészülék	1
-	Monitoring vevőkészülék	1
-	Demodulátor és dekóder	1
-	Tároló szerver	1
•	Rendszer integráció	(11)
-	Mobilizálható kivitel	1
-	Intergrált állomások	1
-	Vezérlő programok	1
-	Kijelzési képességek	3
-	Jelfelfedési funkcionalitás	2
-	Naplózás és adtbázis	3
•	Összefoglalás	(1)
		(20)

Technikai felderítés és elektronikai harc doktrina elemek

- A felderítés minden ország saját feladata

NATO Allied Joint Publications AJP 3.6

- ISTAR képességekkel rendelkező felajánlott csapatok

NATO 2006 Force Proposals for Hungary (2006-2016), EL0583

- Képességalapú haderőfejlesztést kell megvalósítani, amely lehetővé teszi a hatékony reagálást a biztonsági környezet változásaira. A hadfelszerelés fejlesztésének legfontosabb feladatai:

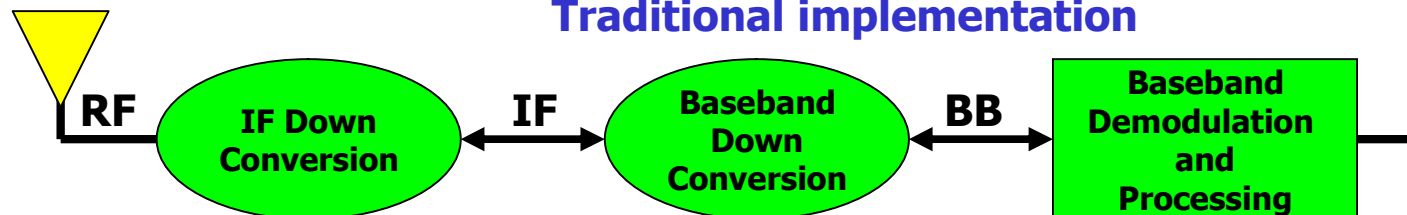
– a technikai felderítőeszközök rendszerbe állítása.

Magyar Köztársaság Nemzeti Katonai Stratégia 2009

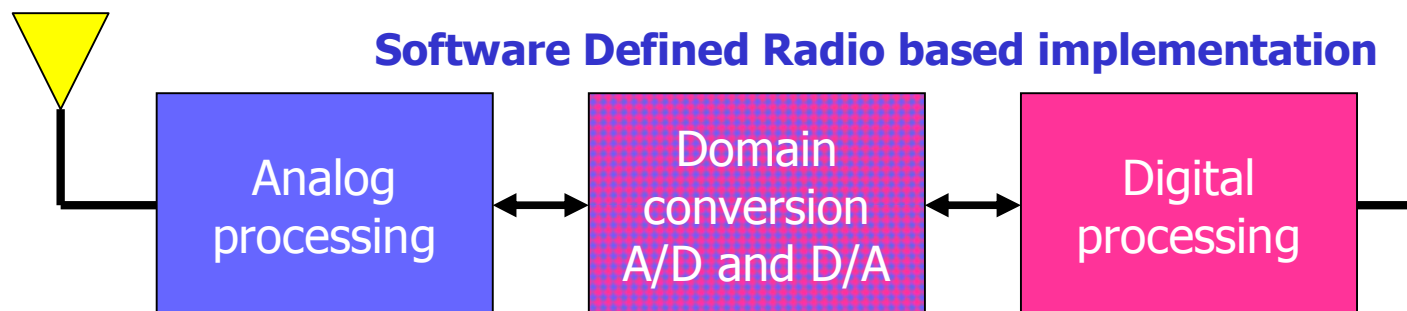
SIGINT-COMINT-ESM-ECM-EW

Rádióelektronikai eszköz modell

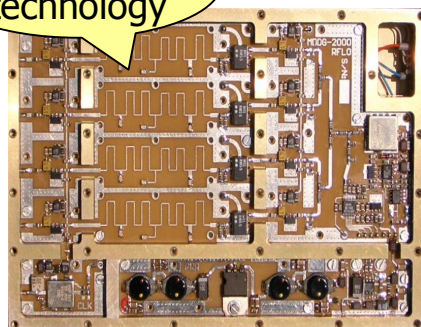
Traditional implementation



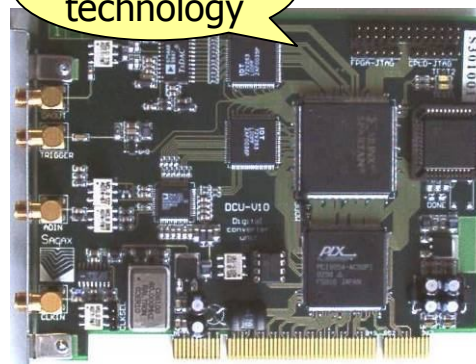
Software Defined Radio based implementation



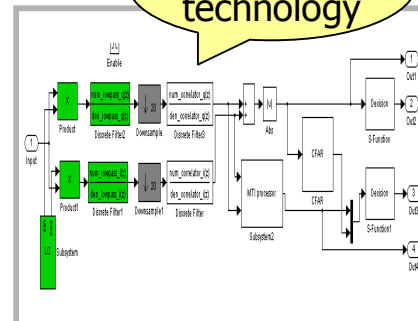
RF
technology



Conversion
technology



DSP
technology

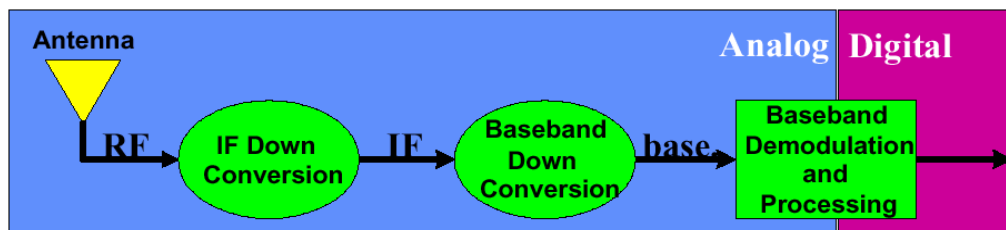


GUI
technology

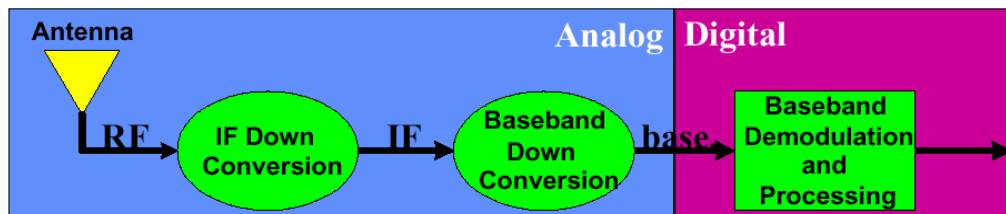


SDR megvalósítási szintek

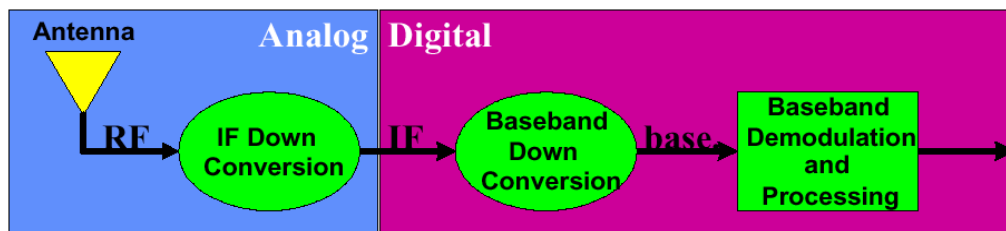
Digital signals



Digital BB



Digital IF



Digital RF



Méret csökkenés – képesség növekedés



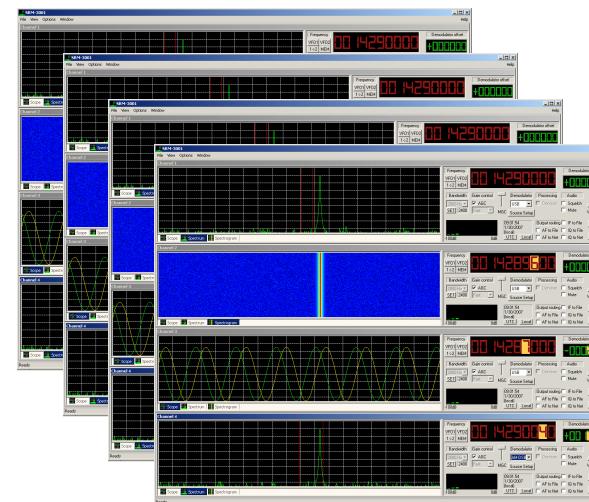
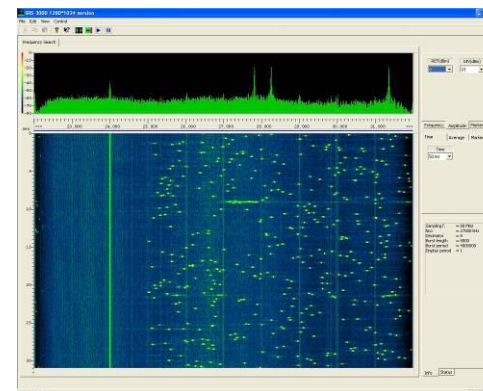
DCU-314

Max. 4 analog I/O channels
1 clock I/O channel
80MSPS/14bit sampling
500MHz bandwidth
80 bit front-end bus
Xilinx Virtex II FPGA
64bit/66MHz PCI interface

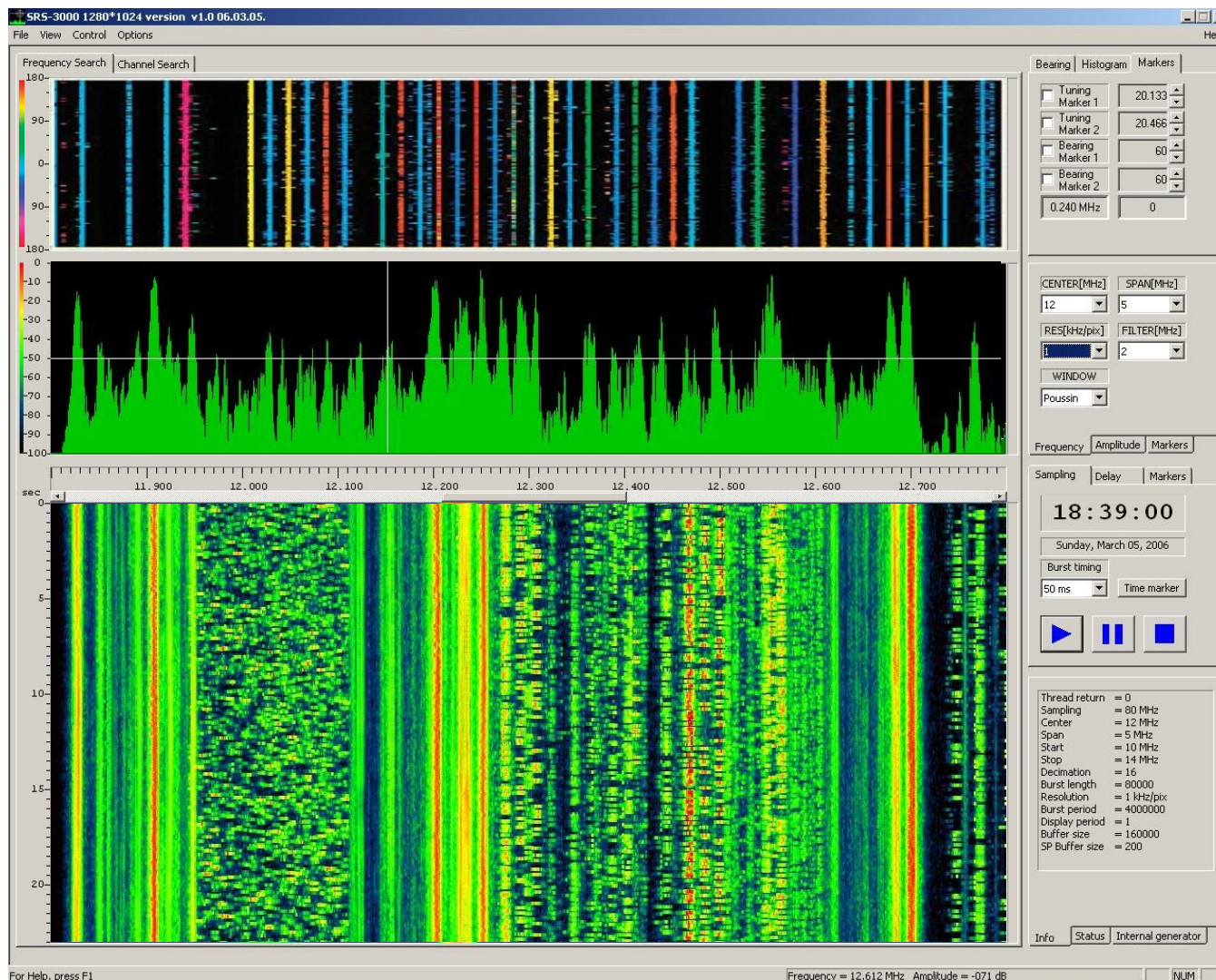


DRU-304

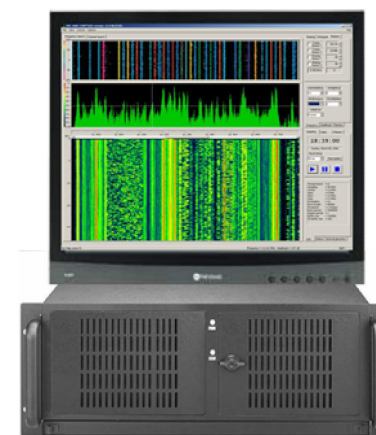
Max. 4 analog I/O channels
1 clock I/O channel
80MSPS/14bit sampling
500MHz bandwidth
Xilinx Virtex II FPGA
Max. 16 digital tuner
64bit/66MHz PCI interface



Kereső vevőkészülék

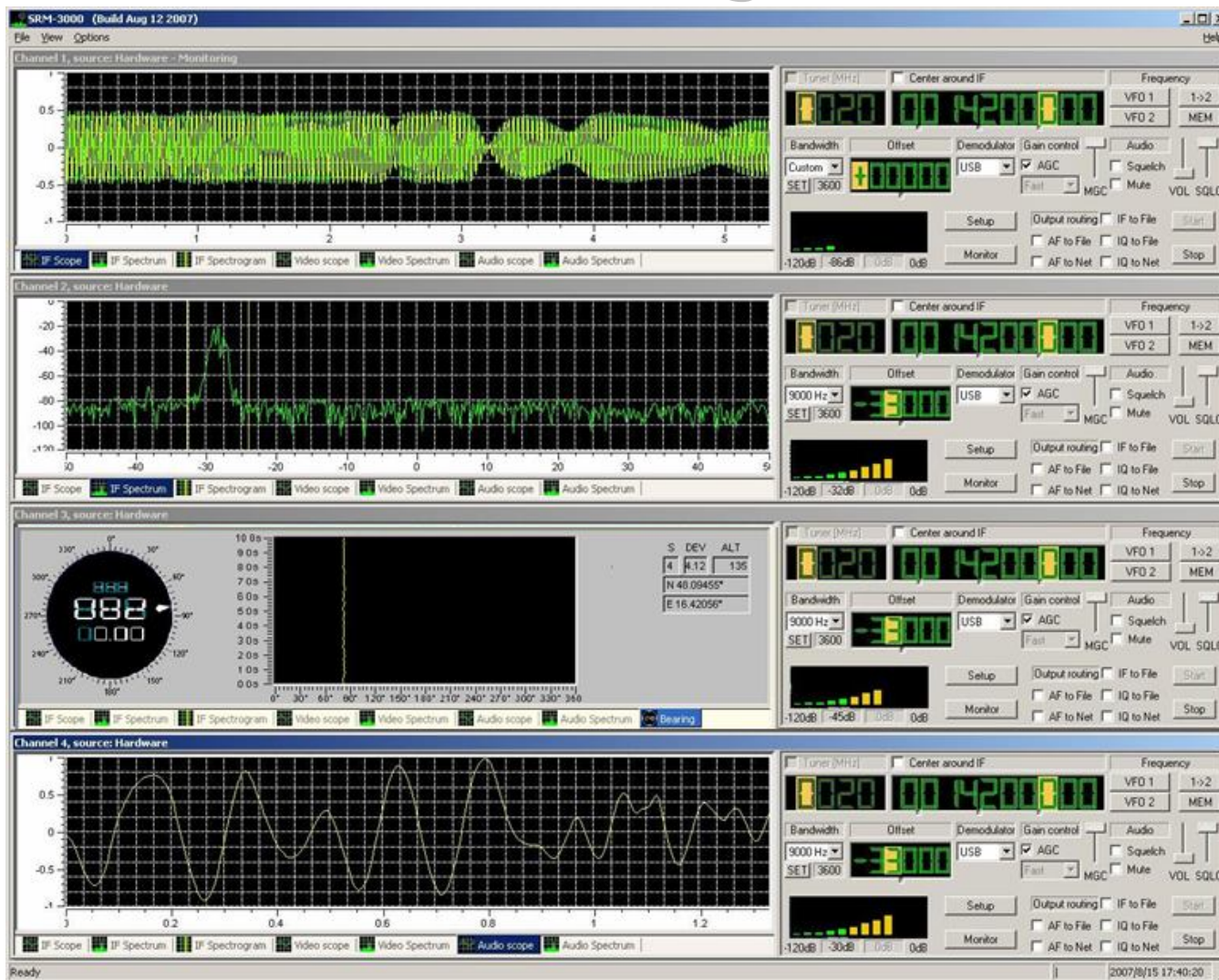


- 40MHz instantaneous bandwidth
- 1ms time resolution
- 1KHz frequency resolution
- 1200/3200 pixel display
- Full or partial bandwidth processing



SRS-3000 receiver

Monitoring vevőkészülék

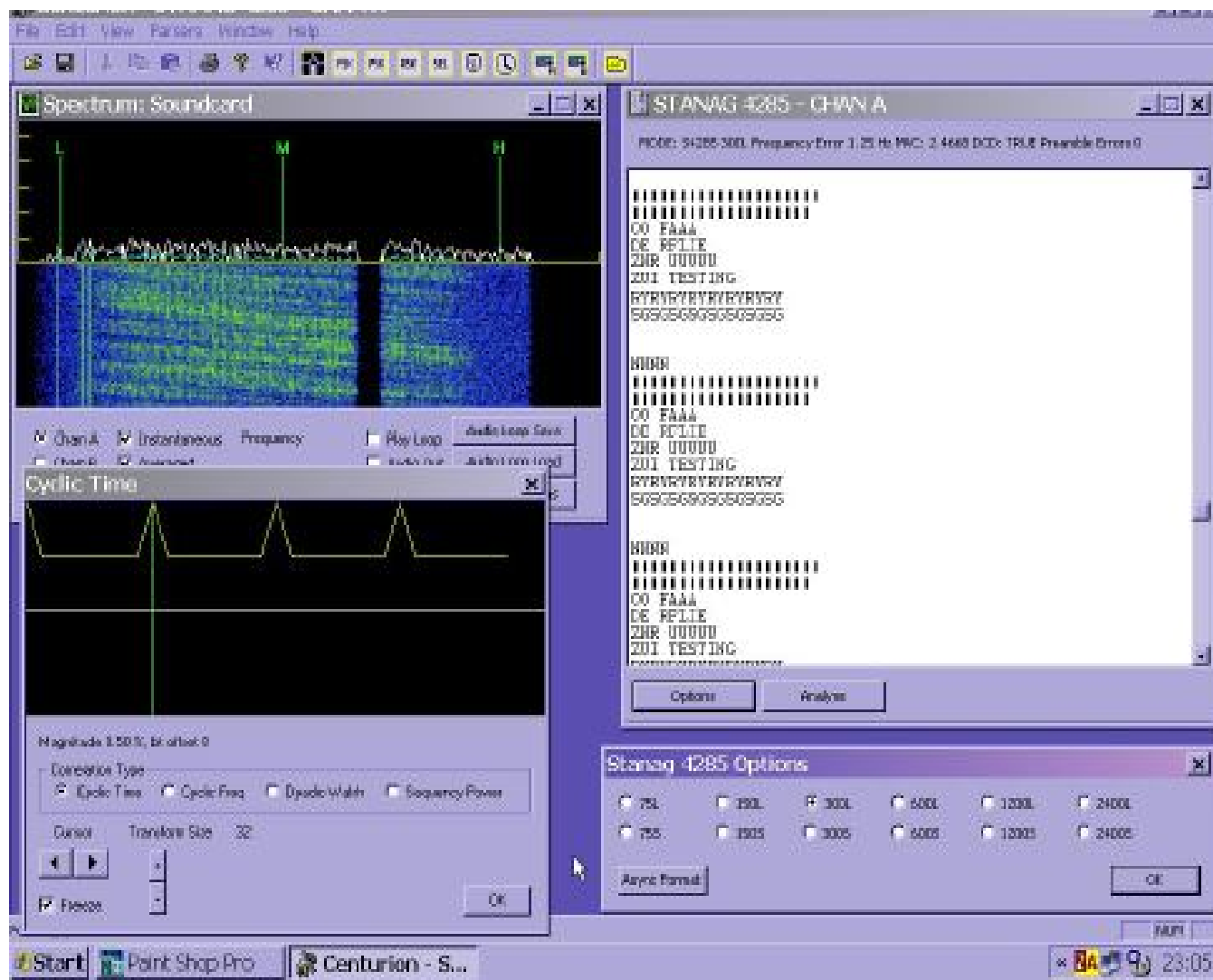


- Integrated front-end tuner
- 20-3000MHz VUHF
- 1.5-32MHz HF
- 400KHz IF bandwidth
- AM/FM/SSB/ISB demodulation
- Hard disk recording facility

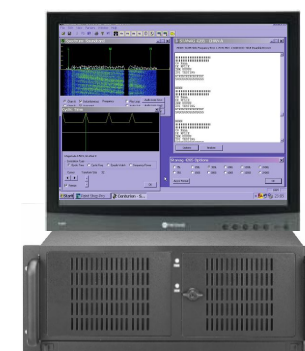


SRM-3000 receiver

Demodulátor és dekóder

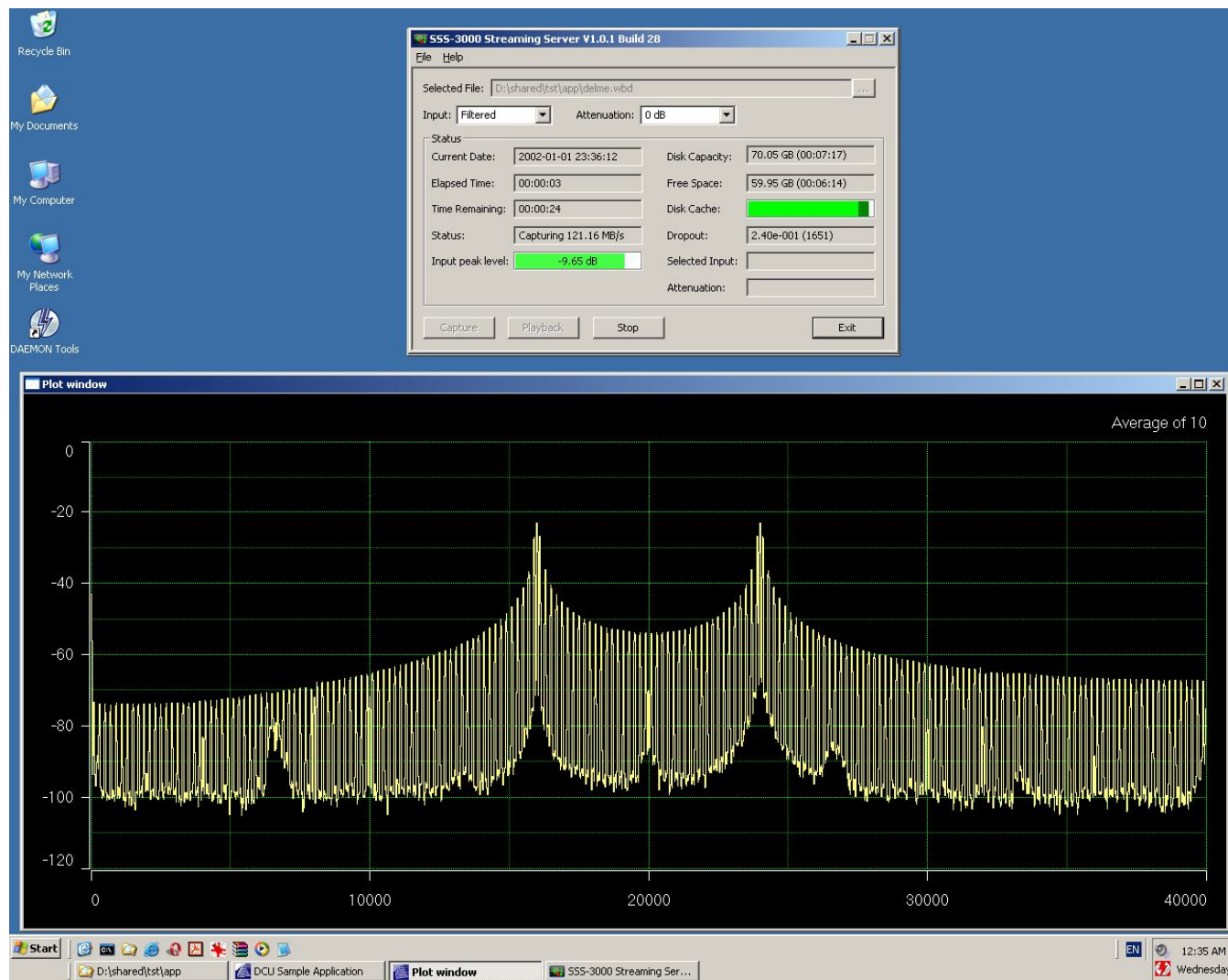


- Different signal input interfaces
- Digital demodulators
- Large number of signal decoding
- Advanced signal analysis functions
- Powerful signal intelligence tools
- Signal classification option

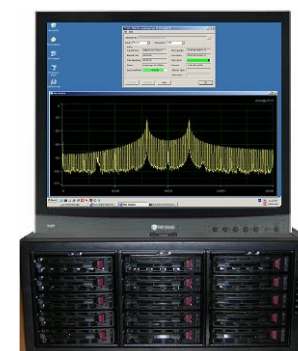


SDW-3000 decoder

Tároló/késleltető szerver



- Compact design with graphical user interface
- Up to 40MHz wide instantaneous real-time bandwidth
- Analog or digital input and output
- Up to 8TB storage capacity in 4U
- Stand-alone or network access



SSS-3000 server

Könnyű járműves nagy mobilitású telepítés



Elektronika a raktérben

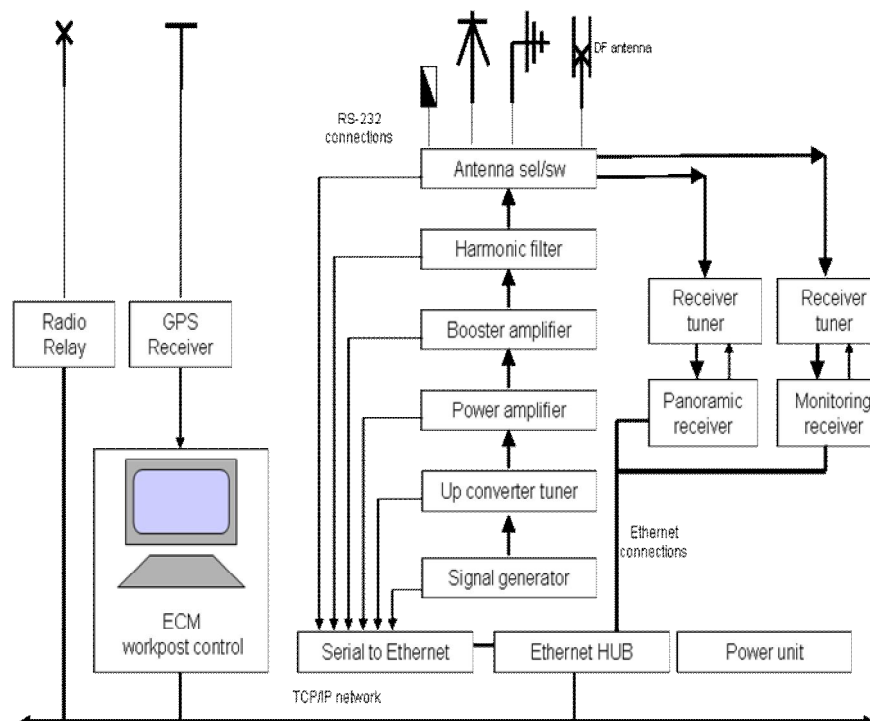
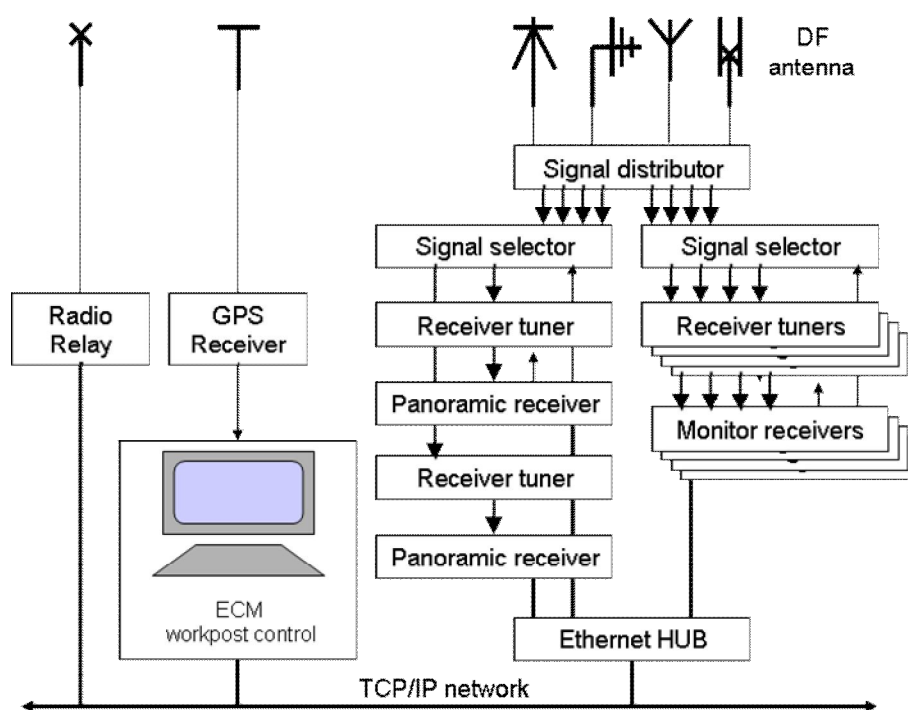


Kezelőfelület a kabinban

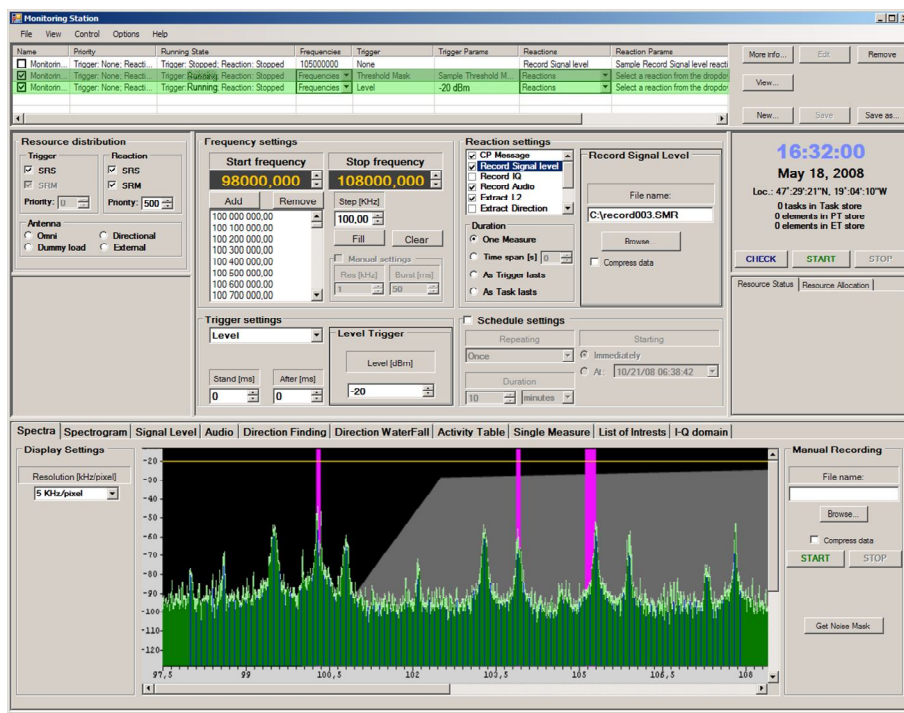


Transit cases

Felderítő és zavaró állomás

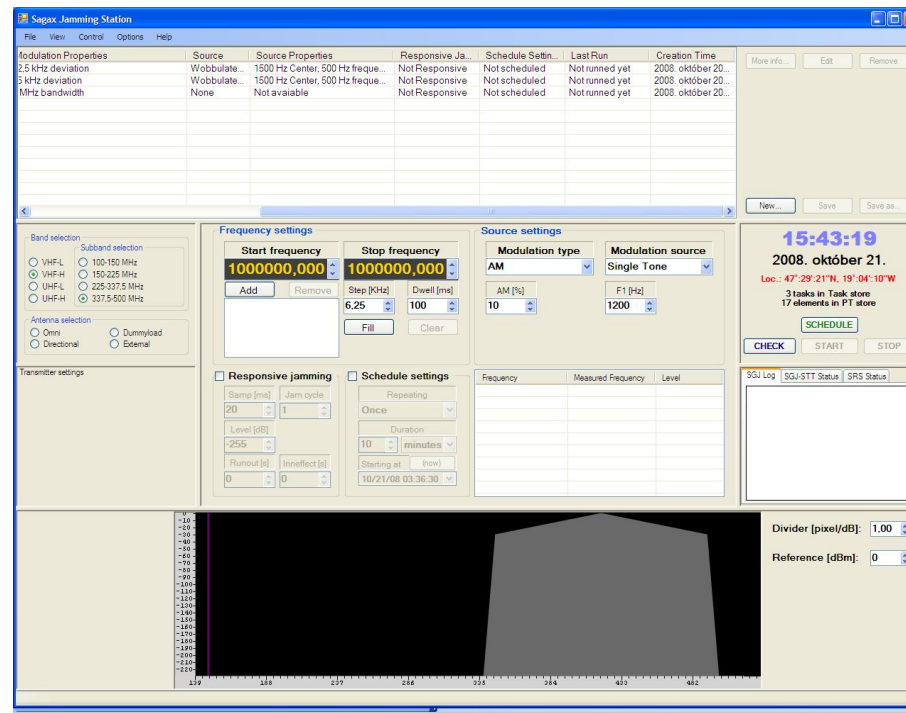


Állomás prototípusok (12U 19" méretben)



Felderítő (ESM) állomás

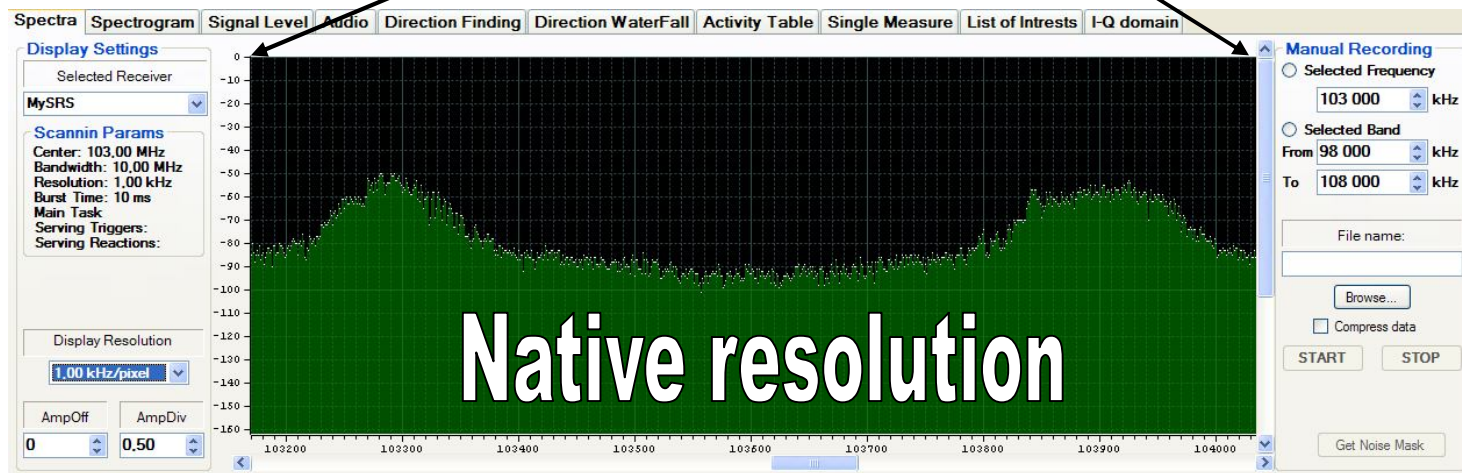
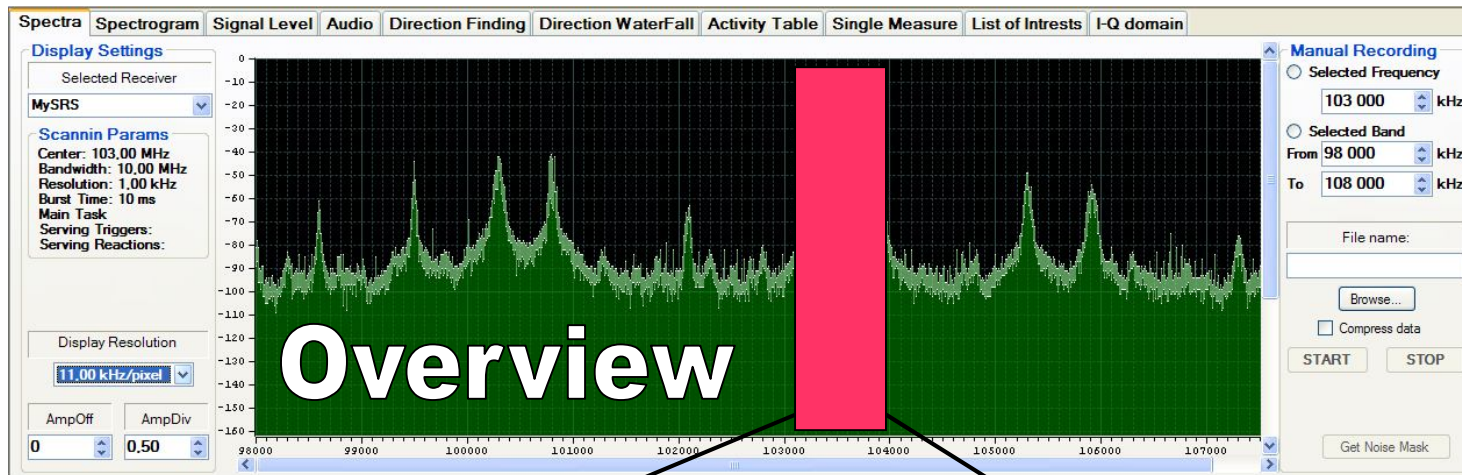
0.09-3000MHz frekvencia tartomány
2/4 független kereső vevőkészülék
4/16/64 monitoring csatorna
Helyi vagy távoli rögzítési lehetőség
Íránymérési képességekkel bővíthető
Helyi vagy távoli vezérlés lehetősége



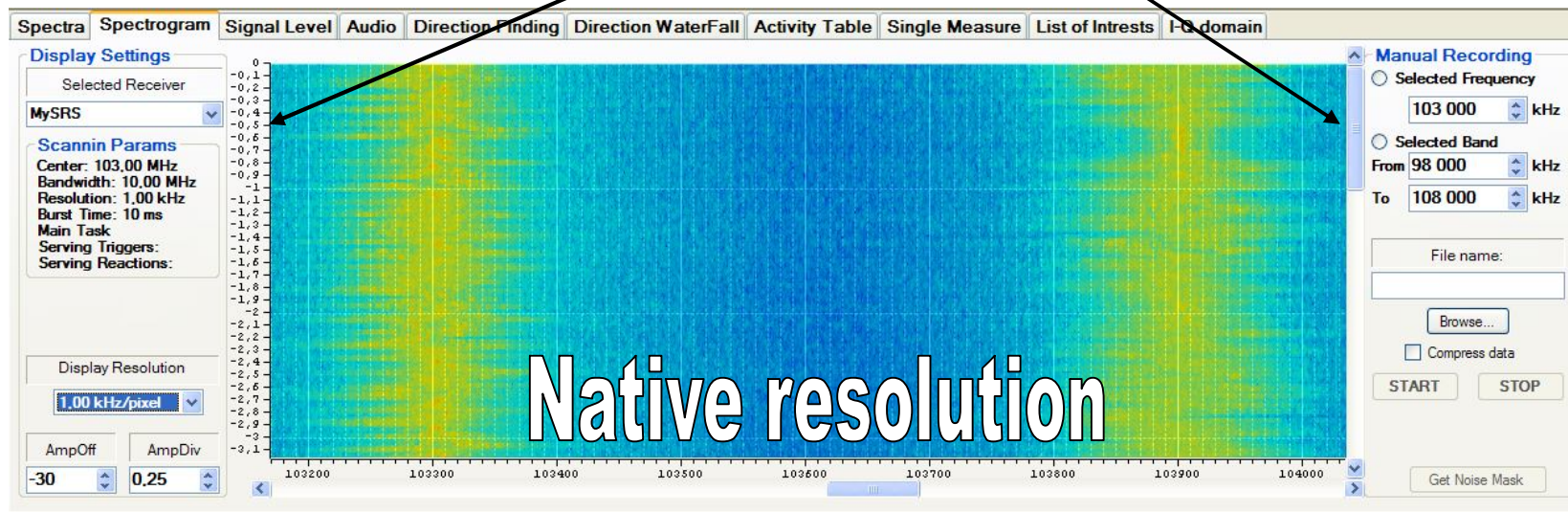
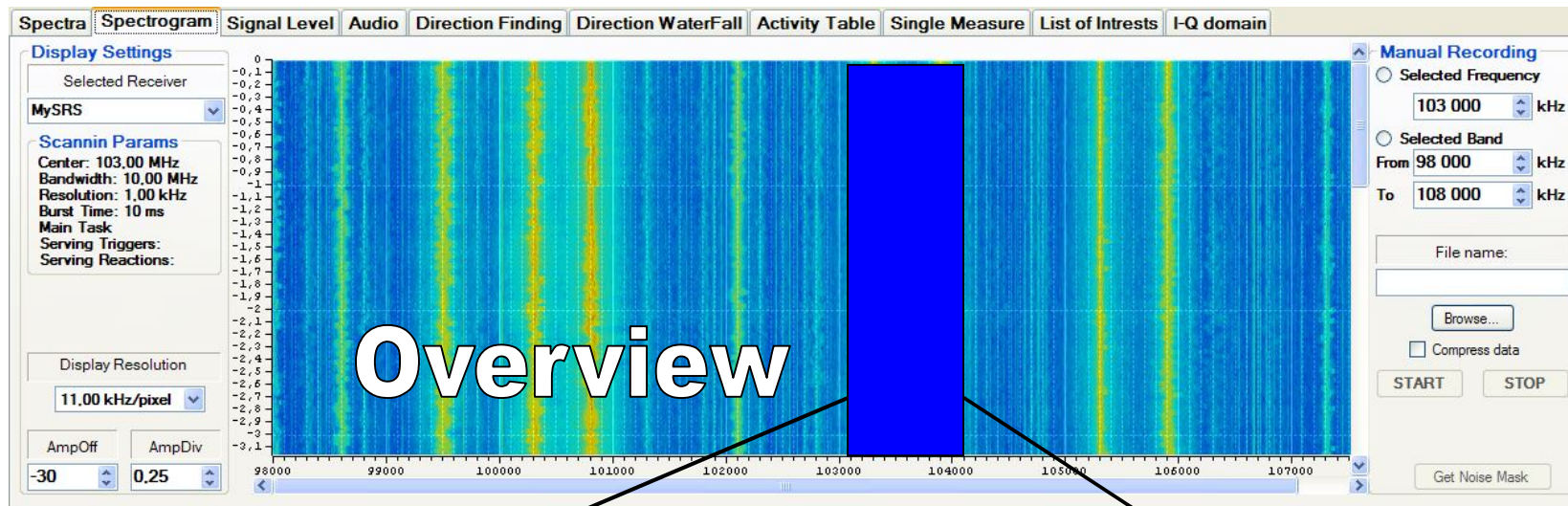
Zavaró (ECM) állomás

Adó 100-500MHz frekvencia tartomány
Folyamatos és felelő (responsive) üzemmód
100ms válaszidejű akcióképesség (1ms opció)
Széles adaptálható moduláló jelkinálat
1000W adó kimenő teljesítmény
Akkumulátoros üzem csökkentett képességekkel

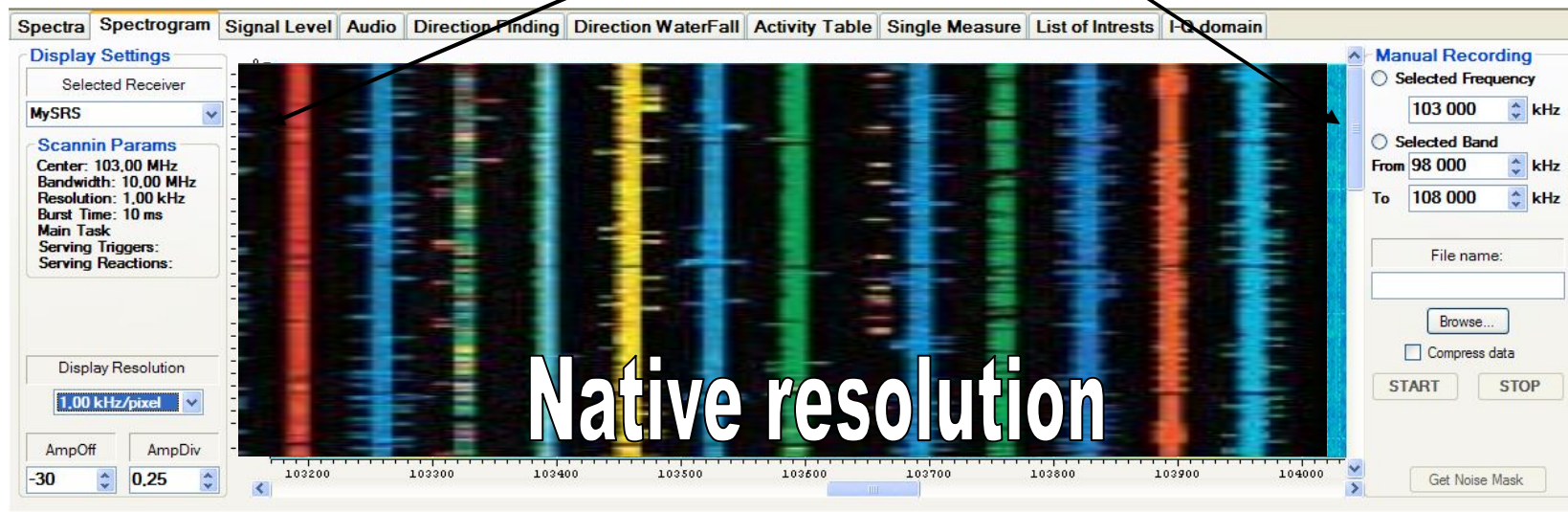
Spectrum Display



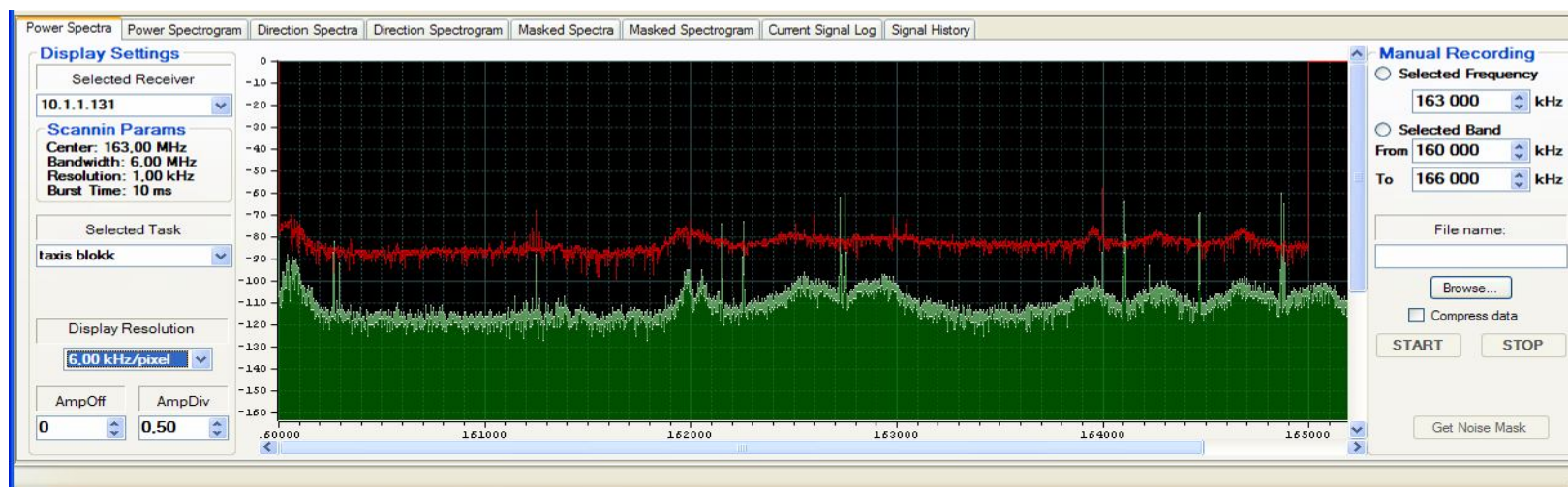
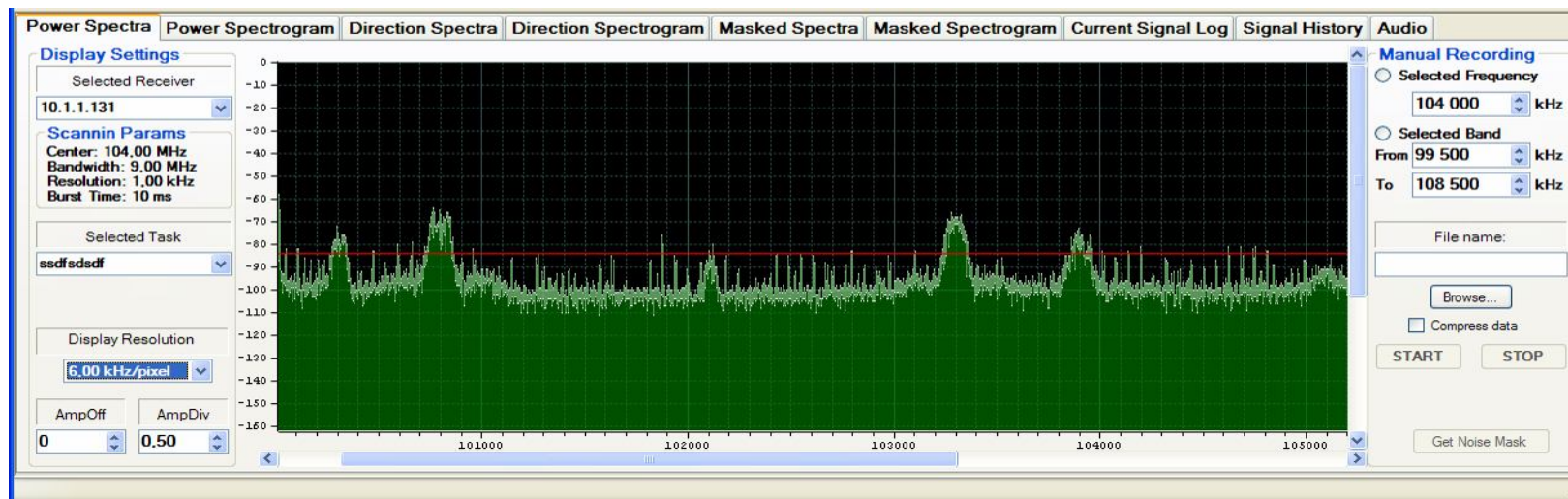
Spectrogram Display



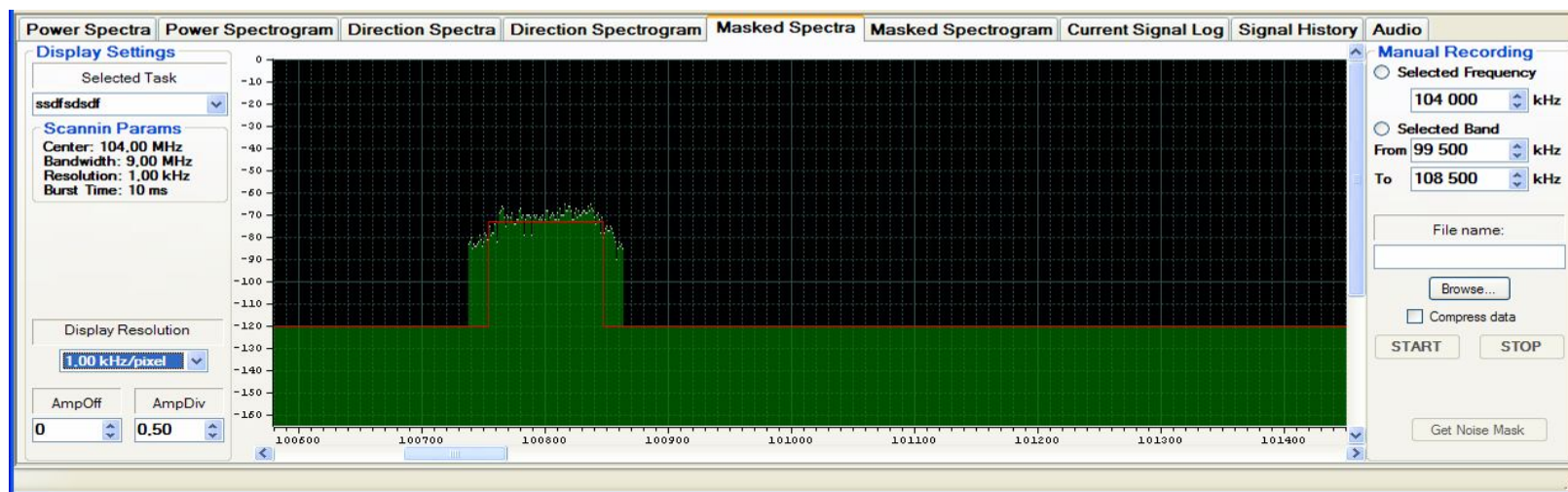
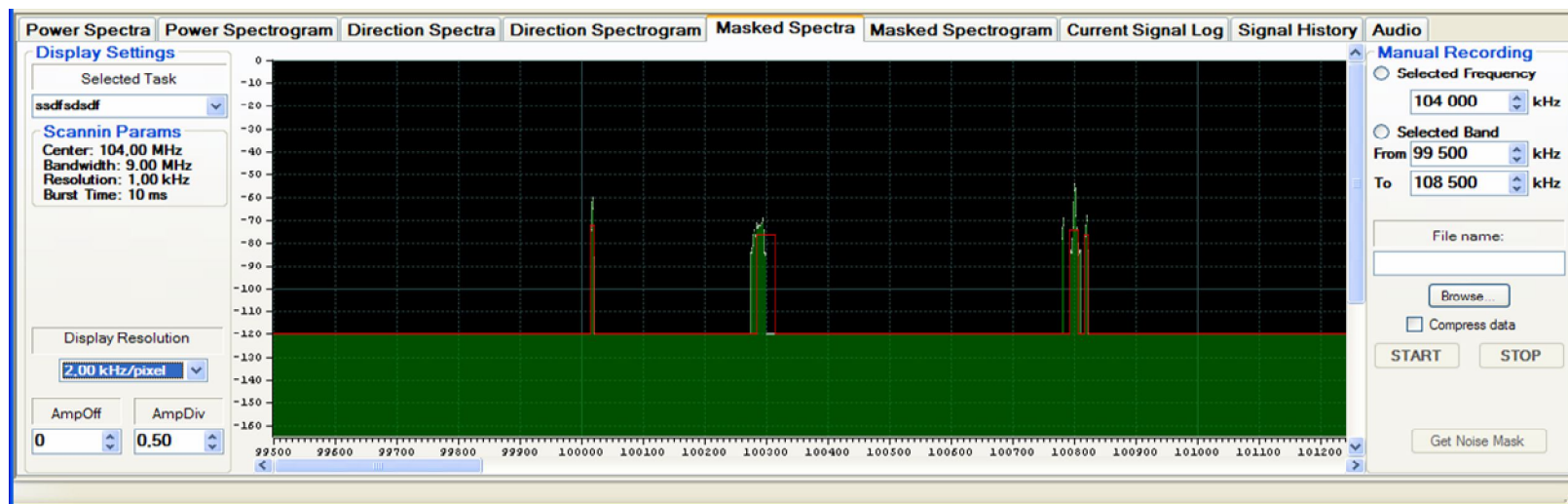
Directogram Display



Level threshold



Detected signals



Current signal log list

Monitoring Station

File View Control Options Help

Name	Priority	Running State	Frequencies	Trigger	Trigger Params	Reactions	Reaction Params	Schedule	Creation Time
Commer...	Threshold: 0; Re...	Stopped	98000-1080...	Level	0 dB	Record Audio	AM_DSB demodulati...	Not scheduled	2009.02.24. 18:...

More info...

Edit

Remove

View...

New...

Save

Save as...

Resource distribution

Trigger

Reaction

Priority: 0

Priority: 0

Antenna

1

2

3

4

Frequency settings

Start frequency

Stop frequency

98000,000

108000,000

Add

Remove

Manual settings

Res [kHz]

Burst [ms]

1

10

Schedule settings

Repeating

Starting

Once

Immediately

Duration

10

minutes

At: 2/24/09 06:05:21

Threshold

Type

Level [dB]

-80

Enter [pcs]

30

Level

Gather

1

Overlap [%]

50

Trigger settings

Level

Level Trigger

Stand [ms]

After [ms]

0

0

Level [dBm]

0

Reaction settings

Record Audio

Record Signal Level

Folder and File Name:

Commercial FM

Browse...

Params from L2 Reaction

Bandwidth: 400

Hz

Modulation: AM-DSB

Folder for each frequency

Compress data

Duration

One Measure

Time span [s]

1

As Trigger lasts

As Task lasts

16:32:00

May 18, 2008

Loc.: 47°:29':21"N, 19°:04':10"W

0 tasks in Task store

0 elements in PT store

0 elements in ET store

CHECK

START

STOP

Resource Status

Resource Allocation

Power Spectra

Power Spectrogram

Direction Spectra

Direction Spectrogram

Masked Spectra

Masked Spectrogram

Current Signal Log

Signal History

Audio

Task Name	Initial Frequency	Initial Bandwidth	Activity	First Seen	Last Seen	Average Length	Occurrence Rate	Actual Strength	Total Frequency	Total Bandwidth	Total Strength	Average Freque...	Ave
Commercial FM	100017,5 kHz	5 kHz	100,00 %	2009.02.24.18:0...	2009.02.24.18:0...	36410 ms	1,648 1/min	-70 dB	100017,487 kHz	5,033 kHz	-69 dB	100017,543 kHz	5,45
Commercial FM	100796,616 kHz	94,566 kHz	97,86 %	2009.02.24.18:0...	2009.02.24.18:0...	939,105 ms	62,620 1/min	-72 dB	100800,677 kHz	79,708 kHz	-70 dB	100794,514 kHz	81,6
Commercial FM	103302,966 kHz	114,466 kHz	95,00 %	2009.02.24.18:0...	2009.02.24.18:0...	784,84 ms	72,508 1/min	-70 dB	103301,143 kHz	98,977 kHz	-66 dB	103299,575 kHz	114,
Commercial FM	103905,033 kHz	64,933 kHz	87,94 %	2009.02.24.18:0...	2009.02.24.18:0...	285,437 ms	184,565 1/min	-73 dB	103904,141 kHz	68,478 kHz	-66 dB	103902,667 kHz	57,3
Commercial FM	105282,633 kHz	5,933 kHz	89,91 %	2009.02.24.18:0...	2009.02.24.18:0...	346,034 ms	155,844 1/min	-78 dB	105294,236 kHz	43,251 kHz	-65 dB	105289,644 kHz	23,9
Commercial FM	107782,55 kHz	5,033 kHz	86,93 %	2009.02.24.18:0...	2009.02.24.18:0...	228,172 ms	228,653 1/min	-71 dB	107791,287 kHz	36,689 kHz	-65 dB	107799,824 kHz	71,8
Commercial FM	100300,3 kHz	46,933 kHz	63,04 %	2009.02.24.18:0...	2009.02.24.18:0...	104,628 ms	357,474 1/min	-73 dB	100298,713 kHz	46,88 kHz	-46 dB	100302,122 kHz	38,2
Commercial FM	105320,55 kHz	6,1 kHz	41,34 %	2009.02.24.18:0...	2009.02.24.18:0...	72,655 ms	337,262 1/min	-72 dB	105317,519 kHz	19,964 kHz	-30 dB	105317,677 kHz	16,2

Signal history list

Power Spectra	Power Spectrogram	Direction Spectra	Direction Spectrogram	Masked Spectra	Masked Spectrogram	Current Signal Log	Signal History					
Task Name	Initial Frequency	Initial Bandwidth	Activity	First Seen	Last Seen	Average Length	Occurrence Rate	Actual Strength	Total Frequency	Total Bandwidth	Total Strenght	
taxis blokk	164882,058 kHz	4,431 kHz	78,88 %	2009.03.18.18:4...	2009.03.18.18:5...	11475,648 ms	8,357 1/min	-77 dB	164882,019 kHz	4,562 kHz	-76 dB	
taxis blokk	164869,931 kHz	4,294 kHz	70,40 %	2009.03.18.18:4...	2009.03.18.18:5...	3166,287 ms	31,460 1/min	-78 dB	164869,886 kHz	8,217 kHz	-74 dB	
taxis blokk	164469,882 kHz	4,235 kHz	63,01 %	2009.03.18.18:4...	2009.03.18.18:5...	1437,354 ms	68,735 1/min	-79 dB	164469,929 kHz	4,582 kHz	-77 dB	
taxis blokk	164482,333 kHz	4,901 kHz	63,09 %	2009.03.18.18:4...	2009.03.18.18:5...	1777,5 ms	49,091 1/min	-79 dB	164482,225 kHz	4,584 kHz	-79 dB	
taxis blokk	162270,196 kHz	4,862 kHz	56,92 %	2009.03.18.18:4...	2009.03.18.18:5...	4722,376 ms	20,469 1/min	-78 dB	162270,011 kHz	5,579 kHz	-75 dB	
taxis blokk	164107,46 kHz	5,784 kHz	46,88 %	2009.03.18.18:4...	2009.03.18.18:5...	5826,933 ms	13,534 1/min	-77 dB	164107,45 kHz	5,523 kHz	-74 dB	
taxis blokk	164076,813 kHz	7,627 kHz	40,79 %	2009.03.18.18:4...	2009.03.18.18:5...	4991,926 ms	11,204 1/min	-77 dB	164076,88 kHz	6,56 kHz	-72 dB	
taxis blokk	161026,215 kHz	8,431 kHz	36,44 %	2009.03.18.18:4...	2009.03.18.18:5...	489,92 ms	105,437 1/min	-79 dB	161026,299 kHz	7,593 kHz	-77 dB	
taxis blokk	162751,568 kHz	5,529 kHz	32,10 %	2009.03.18.18:4...	2009.03.18.18:5...	5379,625 ms	9,050 1/min	-77 dB	162751,532 kHz	7,597 kHz	-72 dB	
taxis blokk	164052,5 kHz	5,705 kHz	30,47 %	2009.03.18.18:4...	2009.03.18.18:5...	339,856 ms	68,241 1/min	-79 dB	164052,594 kHz	6,4 kHz	-79 dB	
taxis blokk	162727,215 kHz	4,823 kHz	23,59 %	2009.03.18.18:4...	2009.03.18.18:4...	3367,666 ms	4,096 1/min	-78 dB	162727,054 kHz	6,105 kHz	-73 dB	
taxis blokk	162182,107 kHz	4,294 kHz	23,59 %	2009.03.18.18:4...	2009.03.18.18:5...	3658,315 ms	7,646 1/min	-76 dB	162182,121 kHz	4,723 kHz	-75 dB	
taxis blokk	164319,872 kHz	4,686 kHz	21,69 %	2009.03.18.18:4...	2009.03.18.18:4...	8967,266 ms	4,171 1/min	-77 dB	164319,96 kHz	4,272 kHz	-74 dB	
taxis blokk	164657,284 kHz	5,274 kHz	21,33 %	2009.03.18.18:4...	2009.03.18.18:5...	592,48 ms	74,141 1/min	-76 dB	164657,277 kHz	4,976 kHz	-76 dB	
taxis blokk	161026 kHz	4 kHz	21,26 %	2009.03.18.18:4...	2009.03.18.18:5...	458,473 ms	153,023 1/min	-79 dB	161026,005 kHz	4 kHz	-77 dB	
taxis blokk	163470,039 kHz	4,823 kHz	19,15 %	2009.03.18.18:4...	2009.03.18.18:5...	6362,666 ms	7,888 1/min	-75 dB	163470,012 kHz	5,254 kHz	-73 dB	
taxis blokk	160801 kHz	4 kHz	18,63 %	2009.03.18.18:4...	2009.03.18.18:5...	2640,76 ms	10,060 1/min	-90 dB	160801,099 kHz	4,845 kHz	-81 dB	
taxis blokk	164895 kHz	4 kHz	15,96 %	2009.03.18.18:4...	2009.03.18.18:5...	3930,72 ms	5,678 1/min	-80 dB	164895,042 kHz	4,668 kHz	-79 dB	
taxis blokk	162151,068 kHz	4,45 kHz	7,66 %	2009.03.18.18:4...	2009.03.18.18:5...	340,315 ms	33,333 1/min	-81 dB	162150,984 kHz	4,625 kHz	-78 dB	
taxis blokk	163201,313 kHz	4,862 kHz	6,76 %	2009.03.18.18:4...	2009.03.18.18:4...	2246,833 ms	1,362 1/min	-76 dB	163201,719 kHz	4,973 kHz	-70 dB	
taxis blokk	164094,941 kHz	4,549 kHz	3,47 %	2009.03.18.18:4...	2009.03.18.18:4...	1173,857 ms	2,067 1/min	-77 dB	164095,028 kHz	6,269 kHz	-72 dB	
taxis blokk	160326,049 kHz	11,078 kHz	2,66 %	2009.03.18.18:4...	2009.03.18.18:5...	814,2 ms	6,774 1/min	-79 dB	160326,217 kHz	8,94 kHz	-79 dB	
taxis blokk	164300,95 kHz	4,529 kHz	1,03 %	2009.03.18.18:4...	2009.03.18.18:4...	1562 ms	,524 1/min	-79 dB	164301,176 kHz	5,144 kHz	-78 dB	

Save

Signal history list

Microsoft Excel - History_2009.03.18.15.25.48.csv

File Edit View Insert Format Tools Data Window Help

Type a question for help

100%

Reply with Changes... End Review...

Arial 8

B I U

% , .0 .00

G11 2009.03.18 15:23:00

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
	BursTime	Frequency	Bandwidth	LastStart	FirstStart	LastStop	FirstStop	MikroSecsOf	MikroSecsOf	NumOfScans	NumOfOnSc	FreqSum	FreqSumSqrC	FreqRunning	FreqRunning	BwSum
2	10000	162727035	6191	2009.03.18 15:25	2009.03.18 15:22	2009.03.18 15:25	2009.03.18 15:23	120600000	89360000	12060	8936	1,45E+12	2806334271	162727298.5	342883.2320	69821
3	10000	164895035	4797	2009.03.18 15:24	2009.03.18 15:22	2009.03.18 15:24	2009.03.18 15:23	120600000	10950000	12060	1095	1,81E+11	212252454	164895039.2	408635.4387	5290
4	10000	164107388	5909	2009.03.18 15:25	2009.03.18 15:22	2009.03.18 15:25	2009.03.18 15:23	120270000	38570000	12027	3857	6,33E+11	1366957891	164107421.5	455589.2631	26315
5	10000	164052969	4242	2009.03.18 15:25	2009.03.18 15:23	2009.03.18 15:25	2009.03.18 15:23	118670000	72910000	11867	7291	1,20E+12	1514256497	164053119.4	220112.1966	36674
6	10000	164301085	4373	2009.03.18 15:25	2009.03.18 15:23	2009.03.18 15:25	2009.03.18 15:23	116870000	99010000	11687	9901	1,63E+12	1476903351	164301108.8	129220.9999	51785
7	10000	164319833	5424	2009.03.18 15:25	2009.03.18 15:23	2009.03.18 15:25	2009.03.18 15:23	116030000	56150000	11603	5615	9,23E+11	1517418662	164319785.6	188250.3365	35898
8	10000	164469989	4444	2009.03.18 15:25	2009.03.18 15:23	2009.03.18 15:25	2009.03.18 15:23	115230000	73520000	11523	7352	1,21E+12	1220641473	164469786.0	233268.3603	39684
9	10000	164882171	5656	2009.03.18 15:25	2009.03.18 15:23	2009.03.18 15:25	2009.03.18 15:23	114960000	96220000	11496	9622	1,59E+12	8351789149	164882444.6	502435.1175	67889
10	10000	165326242	5717	2009.03.18 15:25	2009.03.18 15:23	2009.03.18 15:25	2009.03.18 15:23	114960000	47970000	11496	4797	7,93E+11	1324895403	165326234.5	143012.7006	37621
11	10000	162751525	7494	2009.03.18 15:23	2009.03.18 15:23	2009.03.18 15:24	2009.03.18 15:23	111530000	28660000	11153	2866	4,66E+11	867050368	162751409.6	311307.7670	25100
12	10000	165801010	4020	2009.03.18 15:25	2009.03.18 15:23	2009.03.18 15:25	2009.03.18 15:23	110200000	73610000	11020	7361	1,22E+12	2273404657	165801614.6	230665.5631	64662
13	10000	160801000	4000	2009.03.18 15:24	2009.03.18 15:23	2009.03.18 15:24	2009.03.18 15:23	110080000	5460000	11008	546	87797349000	1479694	160801000.0	25.09516782	2190
14	10000	167150979	4888	2009.03.18 15:25	2009.03.18 15:23	2009.03.18 15:25	2009.03.18 15:23	103360000	62820000	10336	6282	1,05E+12	645700263	167151009.6	522332.8486	30039
15	10000	160282646	4505	2009.03.18 15:25	2009.03.18 15:23	2009.03.18 15:25	2009.03.18 15:23	101040000	20210000	10104	2021	3,24E+11	641027193	160282529.6	263337.5915	10833
16	10000	161026181	4707	2009.03.18 15:25	2009.03.18 15:23	2009.03.18 15:25	2009.03.18 15:23	99000000	32700000	9900	3270	5,27E+11	1109177574	161025915.6	813848.8434	22427
17	10000	162151191	4868	2009.03.18 15:25	2009.03.18 15:23	2009.03.18 15:25	2009.03.18 15:23	91110000	32790000	9111	3279	5,32E+11	1335615652	162151056.0	1610444.991	28089
18	10000	162270116	5606	2009.03.18 15:25	2009.03.18 15:24	2009.03.18 15:25	2009.03.18 15:24	62950000	37700000	6295	3770	6,12E+11	932001451	162270154.1	152691.5905	23345
19	10000	164869787	8080	2009.03.18 15:25	2009.03.18 15:24	2009.03.18 15:25	2009.03.18 15:24	57330000	37650000	5733	3765	6,21E+11	849961910	164869952.5	45240.47419	32222
20	10000	164094944	8858	2009.03.18 15:25	2009.03.18 15:25	2009.03.18 15:25	2009.03.18 15:25	34610000	20580000	3461	2058	3,38E+11	498822694	164095053.4	115068.7896	16806
21	10000	163677575	4949	2009.03.18 15:25	2009.03.18 15:25	2009.03.18 15:25	2009.03.18 15:25	17570000	4030000	1757	403	65961792500	331421899	163676073.6	894194.1974	2517
22	10000	164619575	9131	2009.03.18 15:25	2009.03.18 15:25	2009.03.18 15:25	2009.03.18 15:25	12810000	4840000	1281	484	79675897000	275030794	164619462.3	1170038.113	4482
23																
24																

History_2009.03.18.15.25.48

Draw AutoShapes

Ready

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Összefoglaló

- Felderítési feladatok
- Szoftver rádió technológia
- Rendszer komponensek
- Intergrált rendszer

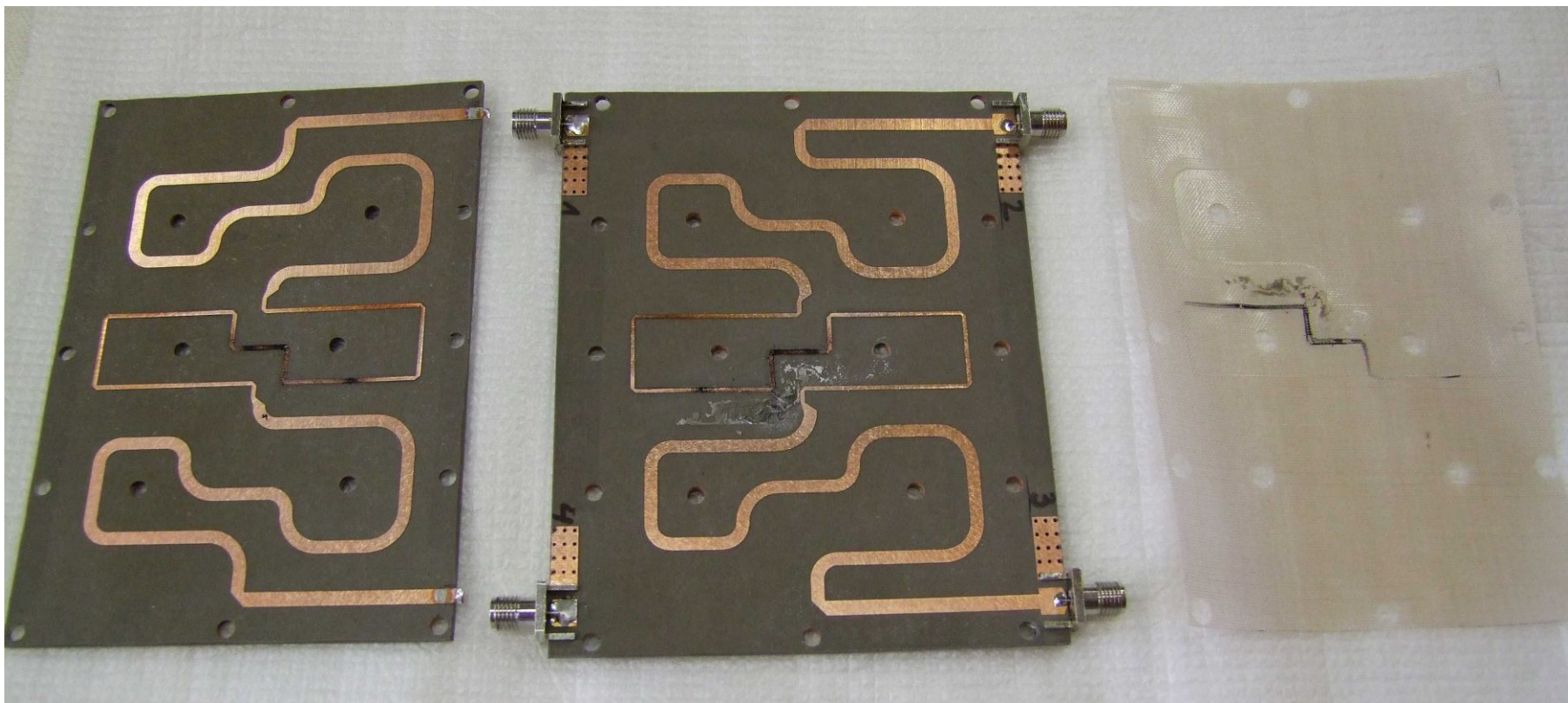


„önálló államhoz nemzeti ipar kell”

1842 Ipari kiállítás

1844 Védegylet a hazai ipar védelmében

Teljsítmény összegző



Ezüstözés hatása

