Branch of Join Stock Company «United Rocket and Space Corporation»

"INSTITUTE OF SPACE DEVICE ENGINEERING"
(Branch JSC «URSC» – «ISDE»)

«Antenna modules of the GNSS user equipment: innovative approaches»

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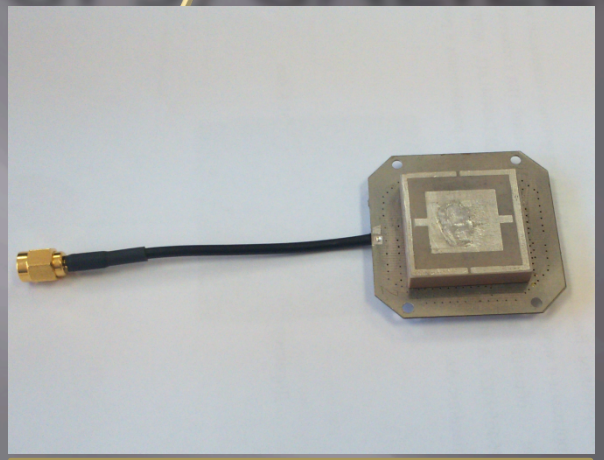
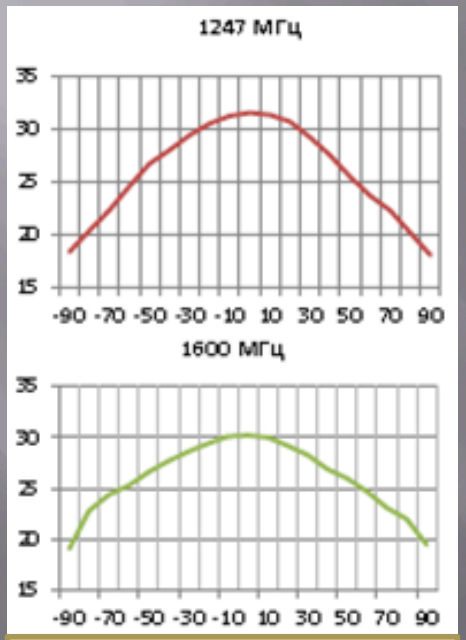
Basic GNSS modules GLONASS/ GPS/GALILEO

Working Bands	L1: 1562-1610 MHz L2: 1237-1256 MHz
Axial ratio	In nadir for L1 and L2 better then 3
Gain	≥30 дБ.

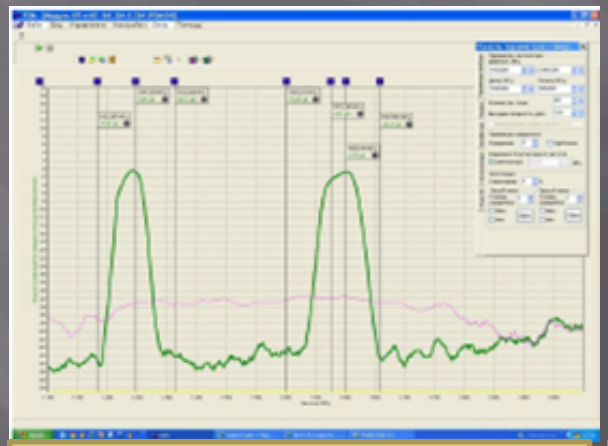


Module ASNP-8

Module ASNM-6



Radiation patterns



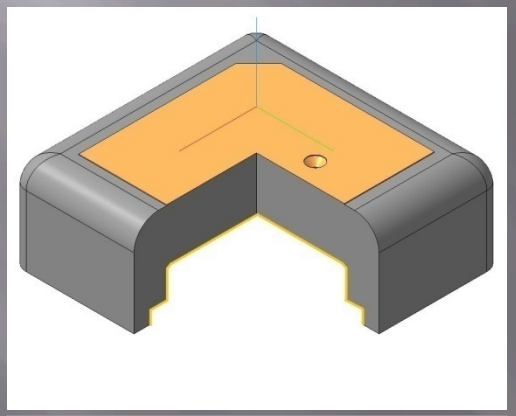
AFC

Module ASNB-1

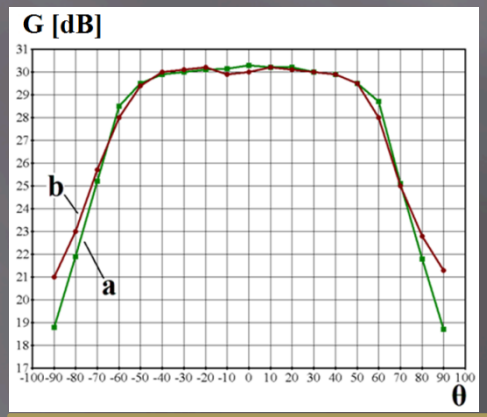
Traditional and all-ceramic modules

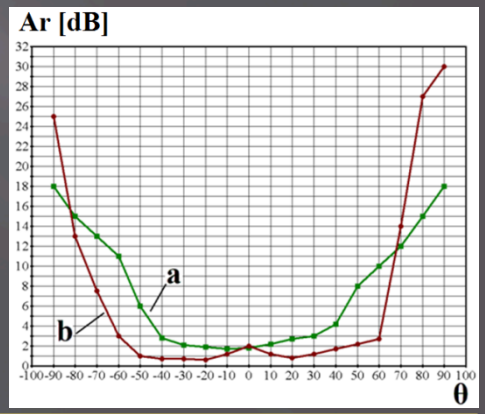
Module ASNM-5

Module ASNK-1



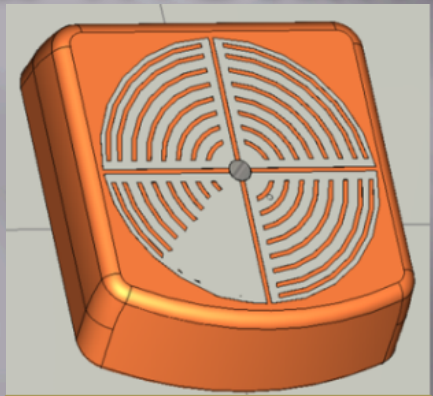
A cup-shaped antenna element





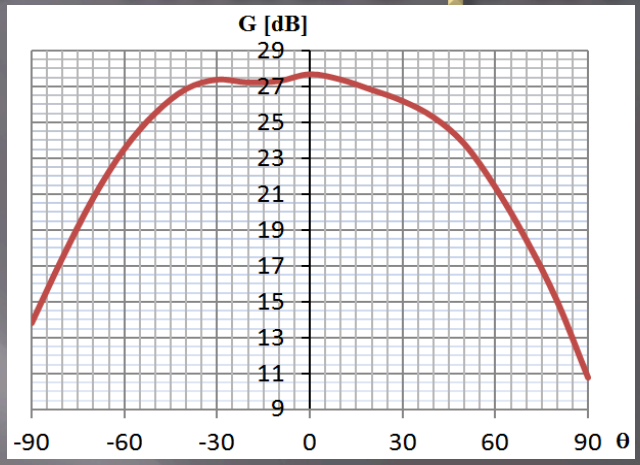
Amplitude (left) and polarization (right) radiation patterns of traditional (a) and all-ceramic (b) antenna modules

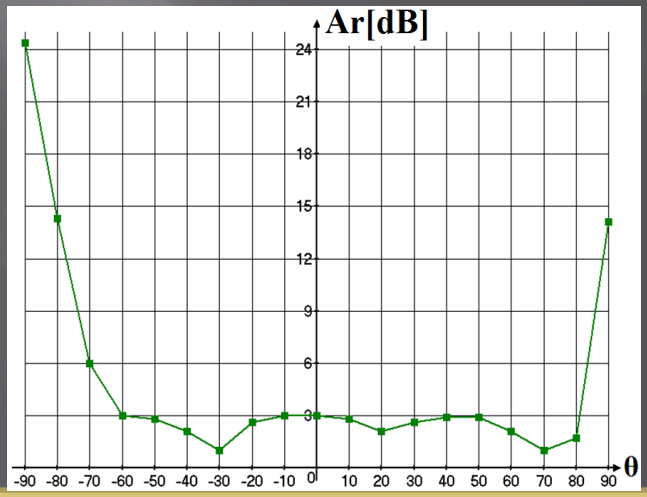
All-ceramic Module, based on a metamaterial - made patch



Antenna topology

Module ASNK-3

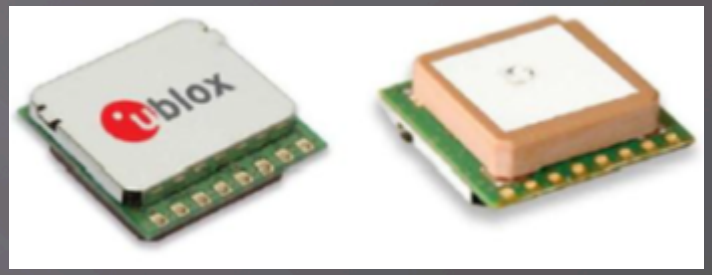




Measured amplitude and polarization radiation patterns

Embedded receiving modules

Module PAM-2
Dimensions 30*30*10



Module PAM-7Q
Dimensions 22*22*8

Working Band	1571-1610 MHz
Axial ratio	θ≤60° ≤10
Power supply voltage	3±0.3 V
Supply current	85 mA

Captured satellites map

Traditional and all-ceramic receiving antenna modules

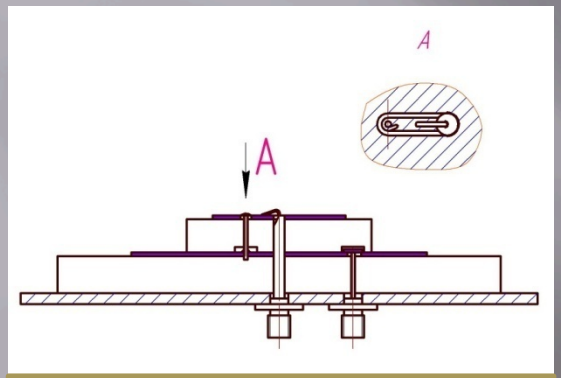
Module PAM-1

Module PAM-4

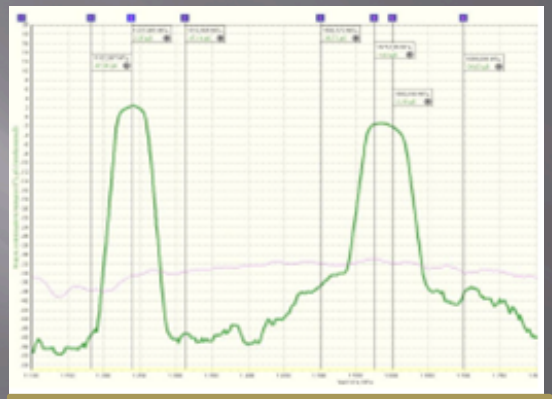
Captured satellites map

Captured satellites map

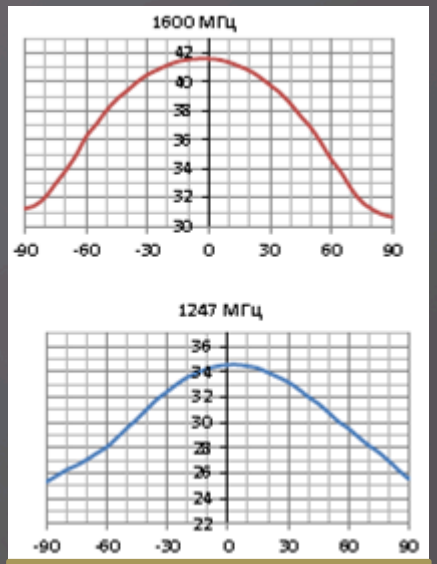
Double frequency modules with stacked microstrip antenna



Schema of a stacked MSA with antenna elements opposite feeding



AFC



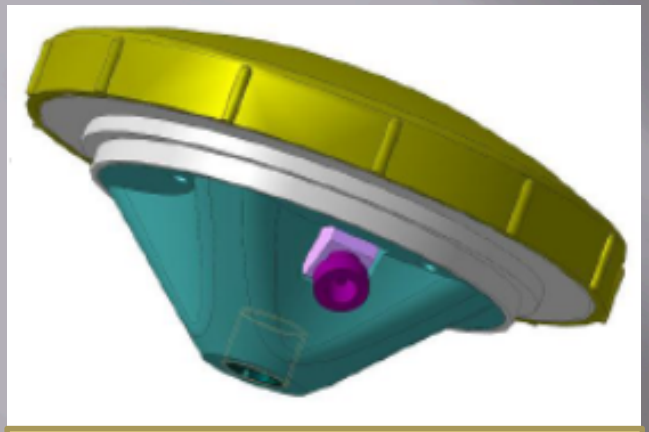
Radiation patterns

Module AA2-NKS

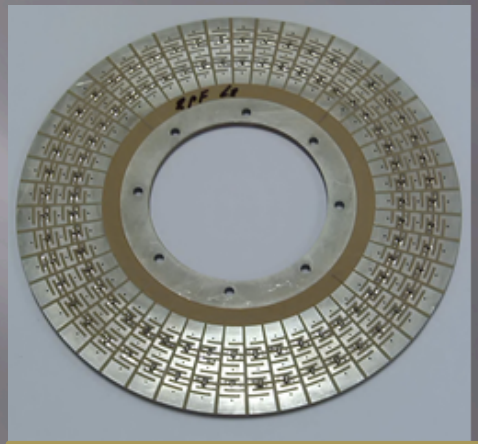
Module AA2-KKS

Working Bands	L1: 1571-1610 MHz L2: 1237-1256 MHz
Axial ratio	L1: $\theta \leq 50°$ - <6 L2: $\theta \leq 40°$ - <6
Phase center stability	Better then 5 mm.

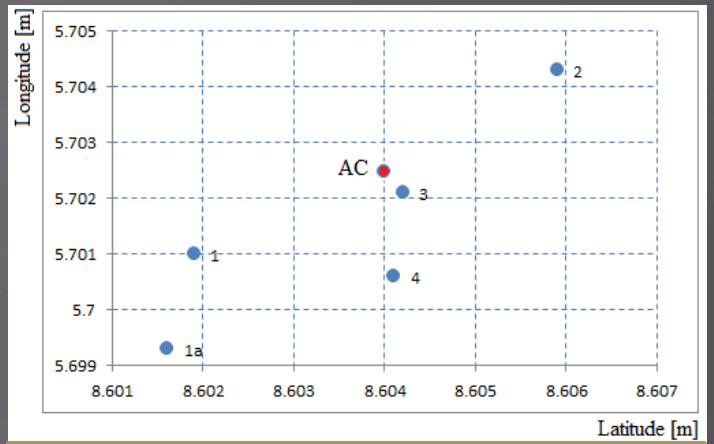
Geodesic double frequency module with metamaterial



Module ASNG-3

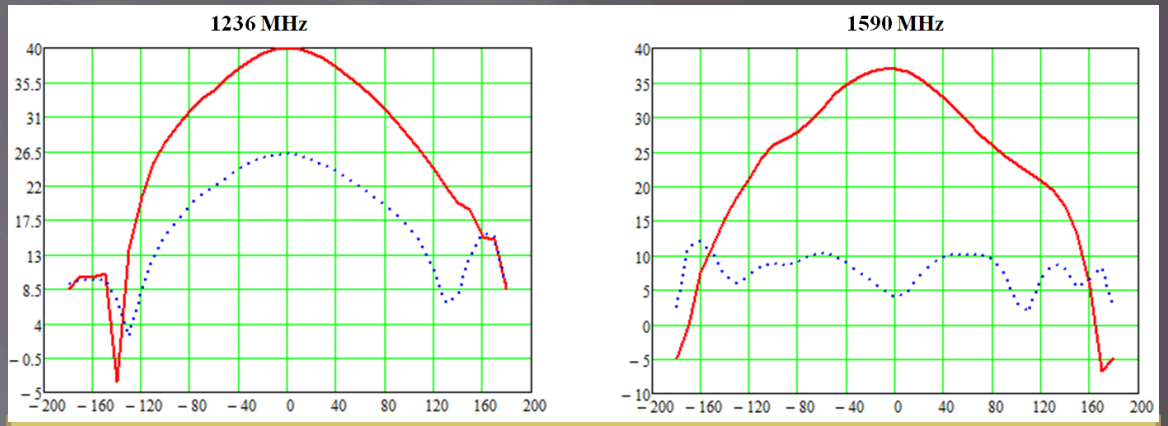


Metamaterial ground plane



Phase center deviations

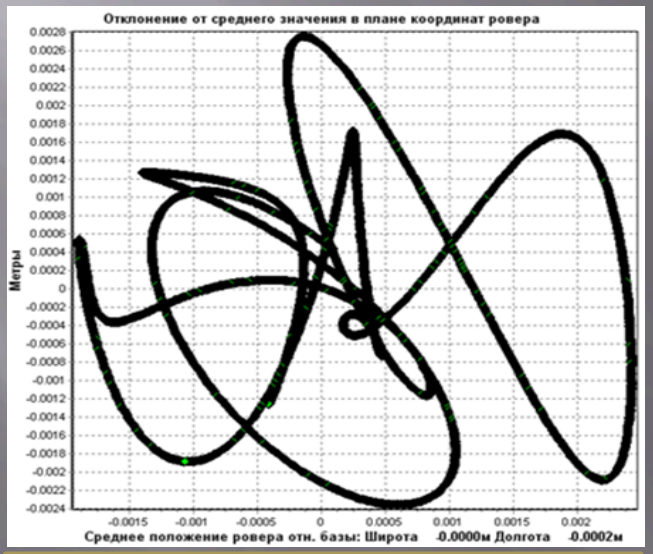
Multipath mitigating level	L1: -40 дБ L2: -35 дБ
Phase center stability	2.0
Gain	+35 дБ
Noise	≤ 3 дБ
Axial Ratio	θ=0° 1.5 θ=40° ≤5



Amplitude radiation patterns

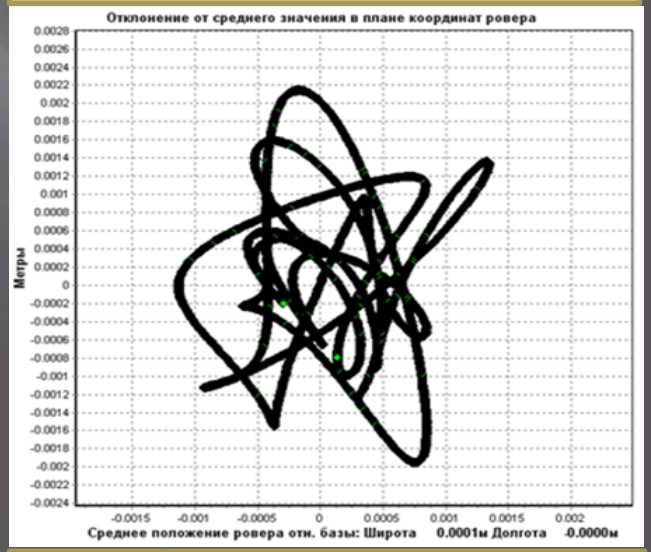
Operational characteristics of modules «G3T» and ASNG-3

Module G3T
Dimensions: D165x62



G3T longitude and latitude deviations

Module АСНГ-3
Dimensions: D180x93



ASNG-3 longitude and latitude deviations

THE END

Thank you for your attention!