



BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS, FACULTY OF ELECTRICAL ENGINEERING
DEPARTMENT OF BROADBAND INFOCOMMUNICATIONS AND ELECTROMAGNETIC THEORY
SPACE RESEARCH GROUP

*Amateur or professional?
The answer is not trivial!*

IONOSPHERE TOPSIDE SOUNDING

presented by

Dr. András **Gschwindt** associate professor HA5WH

Csaba **Szombathy** assistant lecturer HA5MRC

The Space Research Group of BUTE

Our History in Brief

Space related activities since the 1970s:

Date of launch	Satellite	Device
June 19 1976	Intercosmos 15	ETMSZ-PS
September 24 1977	Intercosmos 17	BPCS
October 24 1978	Intercosmos 18	BP-21
February 27 1979	Intercosmos 19	SSPI/ BPCS
November 1 1979	Intercosmos 20	SSPI/BE-7
May 23 1980	P3A (OSCAR9)	BCR
February 4 1981	Intercosmos 21	SSPI/BE-7
June 16 1983	P3B OSCAR10	BCR
December 15 1984	Vega 1 and 2	Tünde-PS
December 15 1984	Vega 1 and 2	Bliszi-PS
December 15 1984	Vega 1 and 2	TV-PS

Date of launch	Satellite	Device
December 15 1984	Vega 1 and 2	Plazmag-PS
June 15 1988	P3C OSCAR13	BCR
September 28 1989	Intercosmos 24 Intercosmos 24	ODCS-PS SAS-PS
1996	MIR	PSU for multioptical scanner
2000 (postponed)	CESAR	
2000	P3D AO-40	•BCR •"MONITOR" experiment
March 02 2004	Roland (Rosetta)	PSU
Expected in 2005	P3Express	BCR



= Radio Amateur Projects

The Objective:

Ionosphere Topside Sounding

Most of the current measurement systems are terrestrial and measure reflective properties → many characteristics of the ionosphere are deduced indirectly

Refined prediction and improved propagation models

Topside sounding: direct investigation of transparency and refraction properties

Benefits...

Immediate, on-line measurement data

...for the "Amateur" and scientific communities:

- Better understanding → new (?) models and prediction
- Investigation and mapping of exit points of the topside ionosphere for HF ducts
- Direct transmission from HAARP to ISS
- Solar emissions monitoring
- Ionospheric occultations

...for professionals:

Monitoring of ground emitters from LW to SW



Optimization of broadcast power



Reduction of RF environmental pollution (basis of a possible public service such as the meteorological satellites)

The predecessors

Successful experiments*

- Alouette I - 1962
- Explorer XX – 1964
- Alouette II – 1965
- ISIS I - 1969
- ISIS II – 1971
- ISS II - 1978
- IK 19 – 1979
- Cosmos - 1986

Our recent project

- MONITOR experiment
- Development between 1996 and 2000
- Launched in 2001 on board of OSCAR 40 (currently in standby mode)
- Principle: remote controlled HF receiver, data transferred via the telemetry system of the satellite

*Reference: David J. Palmer's and Professor Martin Sweeting's article, titled "Ionospheric Sounding on a Microsatellite"; <http://www.ee.surrey.ac.uk/SSC/>

...and what we offer:

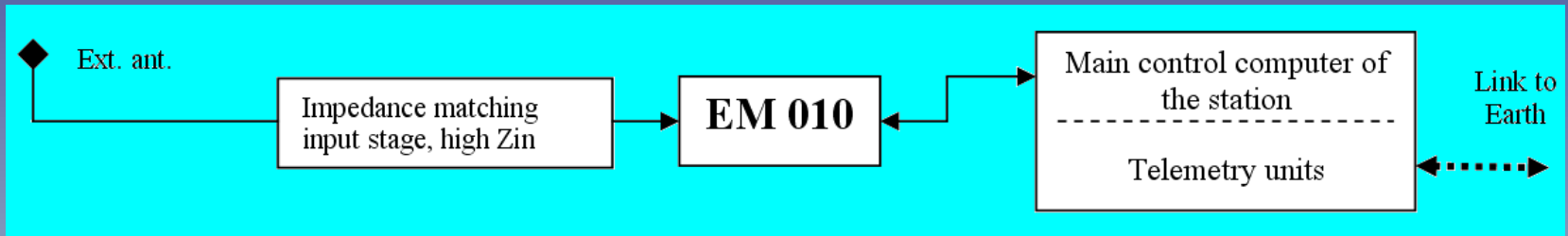
Co-operation with Rohde & Schwarz: Offered HF Receiver Type EM010

- robust construction
(intended for **military** use)
- **terrestrial equipment is already in use** in our Radio Club
 - proven hardware and software
 - only adaptation but no fundamental development is required
- **flying equipment is provided by R&S free of charge**
- **shock and vibration tests shall be performed by R&S**



Public test opportunity: <http://webradio.ha5mrc.hu>

The Preliminary Block Diagram

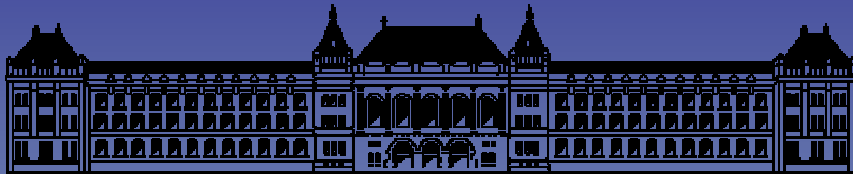


- matching with a high input impedance amplifier
(compromise between bandwidth and noise figure)
- data acquisition: either via the telemetry system
OR
an independent Internet connection

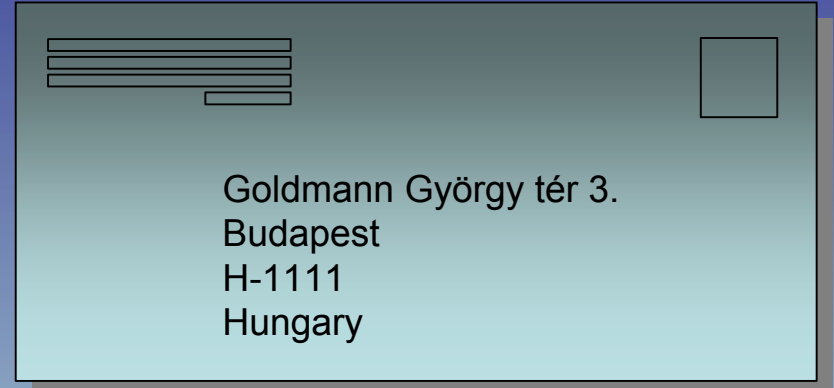
Summary: Pros for the Project

- performance by a group with an experience of about 3 decades,
- exploiting the opportunities offered by the SW beacon network,
- flying unit provided free of charge,
- terrestrial unit is already under test,
- minimal software development is required,
- valuable scientific results expected,
- direct benefits for the amateur community: immediate wave propagation and transparency map,
- the applicant group has already developed devices for MIR, therefore it is aware of the related requirements and the difficulties that might be expected on the ISS.

Availabilities



BUDAPEST UNIVERSITY OF TECHNOLOGY AND ECONOMICS
FACULTY OF ELECTRICAL ENGINEERING
DEPARTMENT OF BROADBAND INFOCOMMUNICATIONS AND
ELECTROMAGNETIC THEORY
SPACE RESEARCH GROUP



Goldmann György tér 3.
Budapest
H-1111
Hungary

Dr. András Gschwindt HA5WH

associate professor
head of the Space Research Group

Telephone#: +36 1 463 32 88
Facsimile#: +36 1 463 32 90
E-mail: gschwindt@mht.bme.hu

Csaba Szombathy HA5MRC

assistant lecturer
head of the R&S Reference Laboratory at BUTE

Telephone/fax.: +36 1 463 27 75
E-mail: szombathy@mht.bme.hu

Thank you for your attention.