



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

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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:

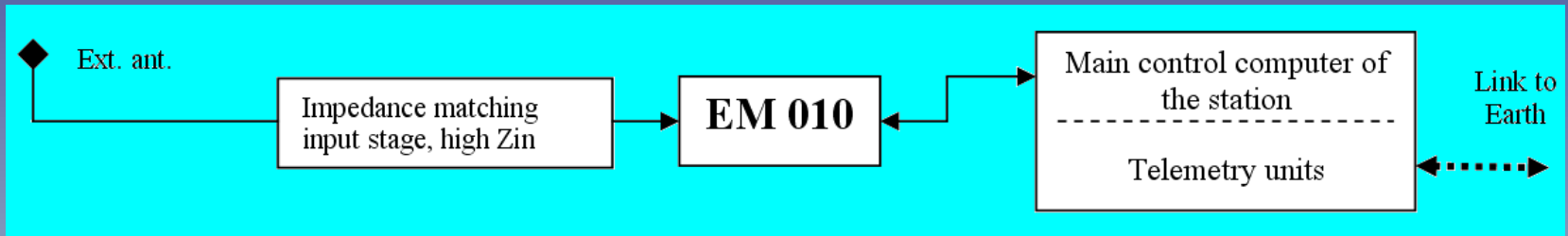
Co-operation with Rohde & Schwarz: Offered HF Receiver Type EM010

- 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

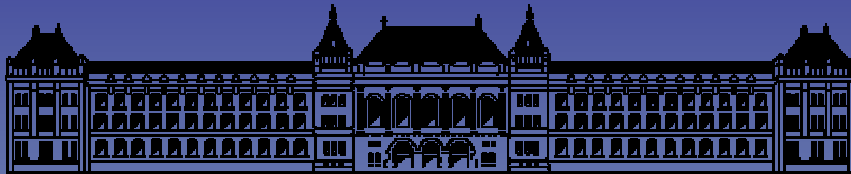


- matching with a high input impedance amplifier
(compromise between bandwidth and noise figure)
- data acquisition: either via the telemetry system
OR
an independent Internet connection

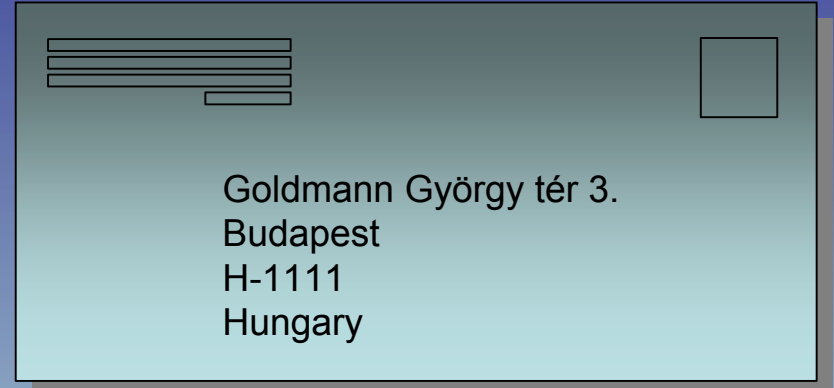
Summary: Pros for the Project

- 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



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Thank you for your attention.