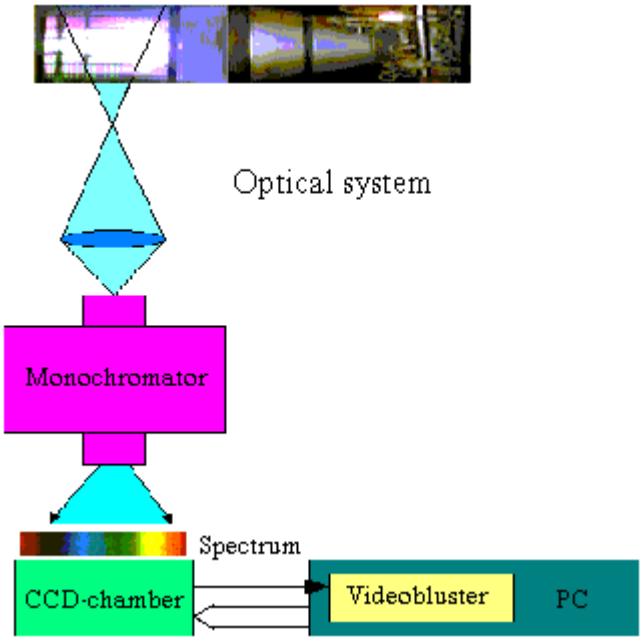
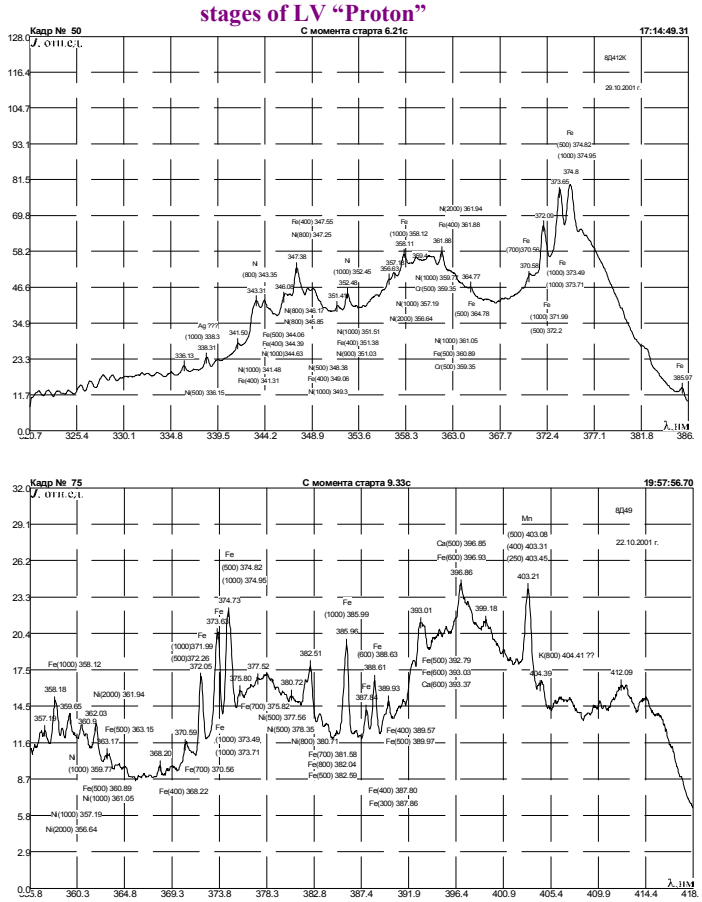
DIAGNOSTICS OF LRE ON SPECTRUM OF PLUME RADIATION

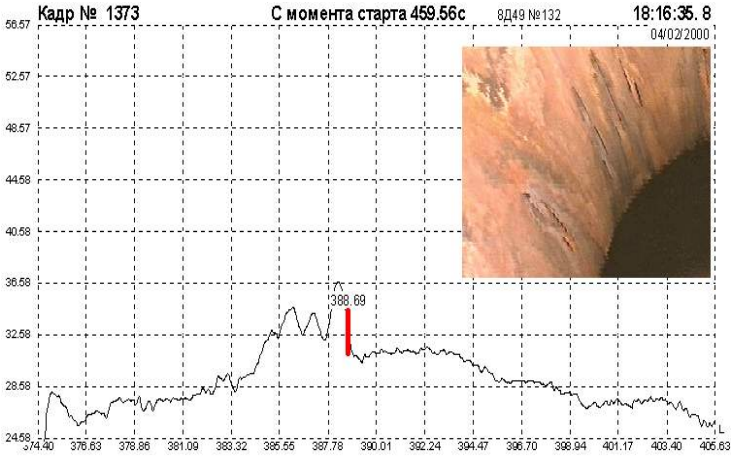


Spectra of plume radiation of the engines in the II and III stages of LV "Proton"

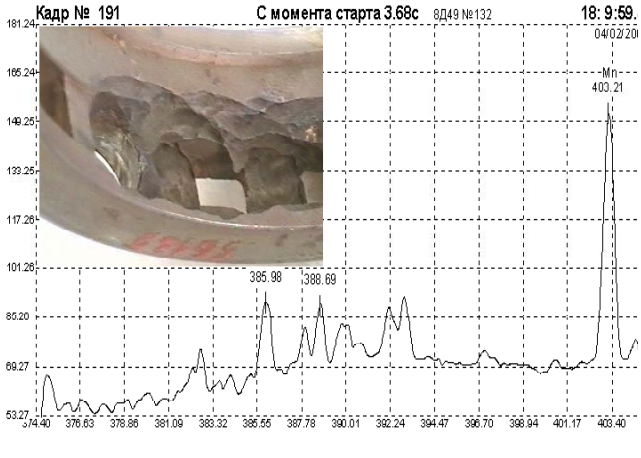


Main characteristics of the equipment:

- **spectral range – 300-900 nm**
- **spectral range of single measurement – 60 nm**
- **maximum spectral resolution – 0.02 nm**
- **rate of measurements – 3-100 spectra/s.**



Spectrum of radiation at availability of leaks and burnt-out of the combustion chamber



Spectrum of plume radiation at ignition of steel elements of the engine construction

Fraction of atoms from total amount of metal behind Mach disk (temperature 3100 K, pressure 0.2 MPA)

Metal	Fe	Ni	Cr	Al
Fraction of atoms	0,56	0,85	0,03	0,02

Minimum recording relative concentrations Cmin and mass flow rate Gmin

Element	Length of wave, nm	II stage of LV "Proton""	
		Cmin	Gmin, g/s
Al	394,4/396,15	$5 \cdot 10^{-7}$	0,1
Fe	371.99/373,6/374,8 385.99/388.63	$5 \cdot 10^{-8}$	0,01
Ni	352,454/361,94	$1 \cdot 10^{-8}$	0,002
Mn	403,08/403,31/403,45	$3 \cdot 10^{-9}$	0,0006

Method of spectrophotometric diagnostics of LRE is based on measurement of spectrum of radiation of an engine plume, separation of the lines of chemical elements ablating from the elements of the engine construction or presenting as pollution in fuel, inter-engine cavities and stand systems in spectrum and assessment of degree os ablation and contamination. Method allows to work in real time can be effectively used not only in the systems of diagnostics but also in emergency systems for prevention of LRE ignition or development of intense erosion processes. Another important advantage of this method is contactlessness – great scope of information about the technical state of the engine which is in spectrum of radiation of the engine is measured by equipment located out of engine.