Since 1998, physicists of MPL are involved in the collaboration based on the accelerator ELSA in Bonn. The collaboration includes more than 10 institutions, mostly from Germany. The accelerator ELSA has intense beams of tagged photons with the energy up to 3000 MeV and a photon spectrometer − the Crystal Barrel. This device covering a solid angle close to 4π allows to study simultaneously several processes of the photoproduction of different neutral mesons: $\gamma p \to \pi^0 p$, $\gamma p \to \eta p$, $\gamma p \to \pi^0\pi^0 p$, $\gamma p \to \pi^0 \eta p$ and so on by detecting from two to eight photons resulted from the decay of neutral mesons produced in reactions under study. One of main scientific goals is a search for so called "missing" resonances which are predicted by theoretical models but were not observed till now in πN scattering. Experiments were carried out with both a liquid hydrogen target and a liquid deuterium one; it has given a chance to study the photoproduction not only off the proton but also off the neutron.

The main part of experimental setup is the multi-photon spectrometer Crystal Barrel. This device, now named CBELSA, with its excellent photons detection capability is the ideal instrument to study the above mentioned reactions over the full dynamical range. The CBELSA is equipped with 1290 CsI(Tl) crystals, the thickness of each crystal being 30 cm (16 radiation lengths). To provide the possibility to detect and identify also charged particles (protons, deuterons), a scintillating fibre detector surrounding the target is inserted in the central part of the CBELSA. Besides, starting from November 2002 the TAPS spectrometer is placed just downstream of the Crystal Barrel with the aim to detect particles (neutrals and charged) emitted from the target in the forward direction. The TAPS spectrometer consists of 528 BaF_2 crystals; the thickness of each crystal is 25 cm that corresponds to 12 radiation lengths. The angular coverage is from ±5° to ±30° relatively to the incident beam direction. Thus, the combination CBELSA + TAPS create a unique detector of neutral and charged particles having 99% of 4π geometrical acceptance and excellent energy and angular resolution.

During the years 2000−2003, numerous runs of data-taking were performed at the energies of incident electrons of 1400, 2600 and 3200 MeV; the energy of tagged bremsstrahlung photons defined by characteristics of a tagging system and covers typically the range from 25% to 95% of the incident electron energy. The main components of the tagging system are a photon-production target (radiator), a dipole magnet, which deflects the bremsstrahlung electrons according to their specific momenta, and a detector for tracing the paths of the electrons. The detector part of the tagging system consists of a ladder of 14 scintillation counters and two multiwire proportional chambers. In addition, last two years the existing tagging system is equipped with a set of 500 scintillating fibres allowing to tag photon flux up to 10^7 1/s with a high efficiency. During the rather long period of data taking the Crystal Barrel collaboration has got a huge amount of valuable information. Processing and analysis of these data are underway now.

In 2006−2007 a very serious upgrade of the experimental setup was accomplished. As a result, the spectrometer CBELSA was moved to another beam line and now multi-photon events can be detected with its help using not only the liquid hydrogen target but also the polarized one inserted into the inner cavity of the Crystal Barrel. Besides, the Crystal Barrel is equipped additionally with two forward detectors (Forward Plug and Mini-TAPS) which provide the detection of photons and charged particles emitted from the target at small angles − from ±1° to ±30°. In the course of the upgrade the tagging system was essentially improved − owing to the installation of new scintillation counters and an array of scintillating fibres the dynamic diapason of the tagging system was widened and its energy resolution has become higher.

Experiments at the upgraded setup started in 2008. In this experiments the double polarization parameters are being measured, which play a key role in disentangling the high-mass spectrum of N^* and Δ resonance; different combinations of beam and target polarization provide the tools to identify different partial wave contributions. First physicals results are obtained.