POLARIMETRY OF TRANSNEPTUNIAN OBJECTS AND CENTAURS WITH VLT. I. N. Belskaya[1], S. Bagnulo[2], M. A. Barucci[3] , K. Muinonen[4], G. P. Tozzi[5], S. Fornasier[3,6], L. Kolokolova[7]. [1]Astronomical Observatory of Kharkiv National University (Sumska Str. 35, Kharkiv 61022, Ukraine, irina@astron.kharkov.ua), [2]Armagh Observatory (College Hill, Armagh BT61 9DG, Northern Ireland, U.K. sba@arm.ac.uk), [3]LESIA, Observatoire de Paris (5, pl. Jules Janssen, FR-92195 Meudon cedex, France, antonella.barucci@obspm.fr), [4]Observatory, University of Helsinki (PO Box 14, 00014, Finland, muinonen@cc.helsinki.fi,) [5]INAF - Oss. Astrofisico di Arcetri (Largo E. Fermi 5, I-50125 Firenze, Italy, tozzi@arcetri.astro.it), [6]University of Paris 7 "Denis Diderot" (10 rue Alice Domon et Leonie Duquet, 75013 Paris, France, sonia.fornasier@obspm.fr), [7]University of Maryland (College Park, MD, USA, ludmilla@astro.umd.edu).

Introduction: The first polarimetric observations for a transneptunian object (except Pluto) were carried out in 2002 with the FORS1 instrument (imaging polarimetry mode) at the 8.2 m VLT Unit Telescope by Boehnhardt et al. [1]. Observations of (28978) Ixion revealed a pronounced branch of negative polarization (up to 1.3%) in the phase angle range of 0.2-1.3°. These observations have demonstrated both the capability of the instrument to provide good-quality observations of faint objects (~20^m), and the capability of the polarimetric technique to study distant objects even if they are observable only at very small phase angles. Later, three other distant objects have been observed: (2060) Chiron, (50000) Quaoar, and 29981 (1999 TD_{10}) [2,3]. Obtained data have shown a noticeable diversity in the behavior of the polarization phase dependences. Their modeling assumed a two-component surface media consisting of dark and bright components with different single-scatterer albedos and mean free paths [1-3].

The aim of new polarimetric observations within the ESO-VLT Large program [4] was to probe surface properties of objects from different dynamical groups by means polarimetry and to make conclusions on their similarities and differences.

Observations and results: Seven objects were selected for polarimetric observations: a dwarf planet Eris, classical objects (20000) Varuna and (38628) Huya, scattered disk object 26375 (1999 DE_9), Centaurs (2060) Chiron, (5145) Pholus and (10199) Chariklo. The main selection criteria were: (a) the brightness of objects $m_R<21^m$ to allow polarimetric measurements with an error ~0.05% in less or about 2 hours telescope time; (b) the availability of basic information of object's physical properties (size, geometric albedo, assumed surface composition from spectral data); (c) the diversity of physical and dynamical properties of the selected sample.

Measurements of the linear polarization in the Bessell *R* filter were made with the FORS1 instrument. Taking advantage of the flexibility offered by the VLT service observing mode, we planned observations of each object to cover the maximum possible range of phase angles and to obtain sufficient number of points equally distributed over the phase range. We present preliminary results of the observational program started in Oct 2006 and planned to be completed in Sep 2008.

(2060) Chiron. Observations were carried out in the phase angle range of 0.5-1.6° in order to determine more precisely the position of polarization minimum α_{min}. According to previous observations made in the phase angle range of 1.4-4.2° the minimum should occur at α<2° [2]. New observations are complementary to the previous ones and give α_{min}=1.6°.

(20000) Varuna. Observations in the phase angle range of 0.1-1.3° revealed distinct branch of negative polarization similar to that measured for Ixion [1].

(136199) Eris. A small negative polarization was measured in the phase angle range of 0.15-0.5°. A sharp peak expected for such a bright object within the mechanism of coherent backscattering was not found. It was interpreted together with brightness phase curve as possible indication on rather large particles covered Eris surface [5].

Observations of four other objects have not been yet fully completed with phase angle coverage. However, already obtained data provide an evidence for their differing polarization phase curves without any apparent correlation with the dynamical groups. A possible trend is found between the geometric albedo and the negative polarization degree measured at α~1.3° resembling that for asteroids. If the correlation confirmed, it may allow an independent estimation of surface albedos based on polarimetric observations.

Conclusions: Polarimetric observations of 7 objects made within the ESO-VLT Large program enlarge to 11 the number of TNOs and Centaurs for which polarimetric data are available. They allowed probing their surface properties and making first conclusions on possible relationship with other physical and dynamical parameters.

References: [1] Boehnhardt H. et al.. (2004) *A&A, 415,* L21–L25. [2] Bagnulo S. et al. (2006) *A&A, 450,* 1239-1248. [3] Rousselot P. et al. (2005) *EMP, 97,* 353–364. [4] Barucci M.A. (2008) *ACM Abstr.* [5] Belskaya I.N. et al. (2008) *A&A, 479,* 265-269.