Contribution to SLR by a Prague group – SLR and enabling technology

First SLR at Skalka Obsy. world 3rd group	1970	Skalka, Czechoslovakia.
Mobile SLR operational	1973	Riga
Mobile SLR moved to Africa	1974	Helwan
Establishing the INTERKOSMOS SLR network 1.generation of laser (ruby,30 ns)	1974 – 1986	Bolivia, Ecuador, Cuba, Poland, Vietnam, India, USSR, Bulgary,…
Construction of Helwan 2 SLR, automated telescope, full computer control, 2.generation of laser (ruby,2-5 ns)	1981	Helwan
Upgrade of laser (Nd:YAG SHG train pulses ~ 20 ps), laser Coudé path	1982	Helwan
Single Photon Avalanche Detectors (SPADs) for SLR	1984	Prague
Two wavelength laser ranging on streak camera, ground	1984	Prague
First satellite echoes 0.532 & 1.064 um on SPAD	1986	Helwan
First femtosecond resolution two wavelength laser ranging to ground target (streak camera)	1988	Prague
Routine SLR using SPAD, ~ 1 cm precision	1989	Graz
First streak camera satellite echoes in SLR	1991	Graz
Multiple wavelengths SLR on SPAD routine operation	1993	Graz
First eysafe SLR at 1.54 um, ~1 cm precision	1997	Tokyo
Time Walk Compensated SPAD detector for SLR (developed and assembled together with Graz) installed on > 25 SLR sites	1997 – now	worldwide
Portable Calibration Standard – reduction of station biases to < 1cm	1997-2000	Tokyo, ChangChun, Shanghai, Zimmerwald, Wettzell, Graz, Herstmonceux, ...
SPAD detectors for laser time transfer space missions	2007	LTT, Compass GNSS, China, 4 mission

	2008	T2L2, Jason-2, CNES +NASA
Sub-ps NPET timing system for SLR	2010	Prague, Graz
Sub-ps resolution and stability Start detector	2011	Prague, Graz
Sub-ps stability 1-photon SPAD detectors for SLR	2013	Prague
European Laser Timing ESA mission, laser time transfer with ps precision and < 25 ps accuracy		Prague, Graz, Wettzell under construction since 2008