

## REPORT FOR VISIT TO TORINO, 19.01.-26.01.2014

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### UNIVERSAL SETS FOR STRICT NON-SELFDUAL POINTCLASSES

0.1. **Purpose of the visit.** The main purpose of the visit was to continue work with Alessandro Andretta (University of Torino) on an extension of the main result of [1]. Another purpose was to continue a project with Daisuke Ikegami (University of Torino) on forcing over models without choice.

0.2. **Description of the work carried out during the visit.** In a project with Alessandro Andretta, we consider the problem of finding universal sets for pointclasses of the form  $\Gamma \setminus \check{\Gamma}$ , where  $\Gamma$  is a non-selfdual pointclass on the Cantor space. Hjorth, Humphries, and Miller proved [1] that such universal sets exist for  $\Gamma = \mathbf{\Pi}_\alpha^0$  for  $\alpha \geq 3$  and for  $\Gamma = \mathbf{\Pi}_n^1$  assuming projective determinacy. We have a proof sketch of the extension of this result to all non-selfdual pointclasses in the Cantor space such that the Lipschitz game is determined for  $\Gamma$  sets. It turned out that there are difficulties for the case of pointclasses below  $\mathbf{\Pi}_2^0$  and that this case requires a separate proof.

In a project with Daisuke Ikegami, we consider forcing over models without choice and generic absoluteness without choice. The main goal of this project is to find principles of generic absoluteness which are inconsistent with choice but which may hold in models without choice where every uncountable cardinal is singular, such as Gitik's model.

0.3. **Description of the main results obtained.** With Alessandro Andretta, we worked on an extension of the main result of [1] to all non-selfdual pointclasses. With Daisuke Ikegami, we showed that the measure algebra, given by Borel codes, is a complete Boolean algebra even without any choice. The same is true for measure algebras on other cardinals. We used this to give a proof of Woodin's conjecture for a statement  $\varphi$  such that  $\varphi$  and  $\neg\varphi$  can be forced, provably in ZF. We also showed that iterated Hechler forcing over Gitik's model does not collapse cardinals and forces the bounding number to be  $\omega_1$  independent of the length of the iteration.

0.4. **Future collaboration with host institution (if applicable).** Alessandro Andretta is invited to Bonn in the summer semester 2014 to continue the collaboration.

0.5. **Projected publications/articles resulting or to result from your grant.** We plan to publish the results, the title of the papers are not yet determined.

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*Date:* March 11, 2014.

## REFERENCES

- [1] Greg Hjorth, Leigh Humphries, and Arnold W. Miller. Universal sets for pointsets properly on the  $n$ th level of the projective hierarchy. *J. Symbolic Logic* Volume 78, Issue 1 (2013), 237-244.
- [2] Alessandro Andretta. More on Wadge determinacy. *Annals of Pure and Applied Logic* 144 (2006) 2-32.
- [3] Alessandro Andretta. Equivalence between Wadge and Lipschitz determinacy. *Annals of Pure and Applied Logic* 123 (2003) 163-192.
- [4] John Steel. Analytic sets and Borel isomorphisms. *Fundamenta Mathematicae* 108 (2) (1980) 83-88.