1 Introductory talk — 29th March

2 Complex oriented descent — 5th April

Discuss §2 of [HKR00] on the splitting principle, also called *complex oriented descent*. It might be helpful to start by recalling the definition of a complex orientable cohomology theory, and stating the result for the computation of $E^*(\mathbf{CP}^\infty)$ when E is complex orientable. If time allows, say something about the proof for this last statement and give some examples of complex orientable cohomology theories. (There are many references for this, including [Hop99, §1], [Lur10, Lecture 4], and [Pst21, §1].) Propositions 2.4 and 2.5 of [HKR00] are the unequivariant version of the splitting principle, and Proposition 2.6 is the equivariant version.

3 A generalised Artin's theorem — 12th April

The goal is to prove a generalised Artin's theorem, specifically, Theorem A of [HKR00], as outlined in §1.1. (If time allows, include a brief discussion of the original theorem by Artin.) The proof is covered in §3; specifically, Theorem 3.3 implies Theorem A. An additional source is §5 of [Kuh89].

4 Complex oriented Euler characteristics — 19th April

Prove Theorem B of [HKR00] computing the Morava K-theory Euler characteristic (see §1.2 for an overview). This is the subject of §4 of [HKR00], and again §5 of [Kuh89] is an additional source.

5 Formal groups and $E^*(\mathrm{B}A)$ — 26th April

The proof of Theorem C of [HKR00] will need prerequisites about formal groups and $E^*(\mathrm{B}A)$; this is the subject of §5 of [HKR00]. For §5.1 about formal groups, there are many additional references, such as [Lur10, Lecture 12]. The main focus should be on §5.3 and §5.4.

6 Generalised characters, part I — 3rd May

This is the first of two talks discussing §6 of [HKR00]. Start with the overview and algebraic background described in §1.3, and cover §6.1–6.3. You can have a look at [Sta13] as an additional source.

7 Generalised characters, part II — 17th May

Continue the discussion of §6 of [HKR00], proving Theorems C and D. These proofs are given in §6.4 and §6.5, respectively. To illustrate Theorem D, discuss Example 6.16. You can have a look at [Sta13] as an additional source.

8 The E-theory of $B\Sigma_n$ — 21st June

The goal of this talk is to give an overview of [Str98], computing the Morara E-theory of $B\Sigma_n$. Explain the full statement of Theorem 1.1, and give an outline for how it is proved. You can use the outline given immediately after the statement of Theorem 1.1. In this outline, focus on the places where the HKR-character theory is used, specifically Theorem C of [HKR00].

9 Applications to power operations — 28st June

This talk should give an introduction to power operations and then describe these in the case of Morava E-theory. This is a generalisation of the Adams operations on (p-complete) K-theory. The power operations on Morava E-theory are computed in various papers by Rezk [Rez09; Rez], but another nice source is [BF15] (which also improves upon Rezk's work). Discuss the monad $\mathbb{T}$ and its completed variant $\widehat{\mathbb{T}}$ from [BF15, §3]. Describe why this monad captures 'all' power operations, in the sense of Proposition 3.18 and Theorem 3.19 of [BF15]. Illustrate how at height $n = 1$ this reduces to the case of Adams operations; see [BF15, Thm. 6.14].

10 Chromatic Smith theory — 12th July

The goal of this talk is to cover the recent paper [BK23]. This gives an easier proof of a key result in [Bar+19]; see Theorem 1.1 of [BK23]. Emphasise the parts of the proof where HKR character theory is used. If you want, you can make a brief comment on the reformulation of this result in terms of Balmer spectra, as in [Bar+19].

References

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[Str98] N. P. Strickland. *Morava E-theory of Symmetric Groups*. 28th Jan. 1998. arXiv: math/9801125.