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Erratum to “Growth of Sobolev norms in the cubic defocusing nonlinear Schrödinger equation”

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The goal of this note is to make a correction in Appendix C of the article [GK15]. This correction does not affect Theorem 1 but it does affect Theorem 7 in Appendix C.

To prove Theorem 7, one needs to estimate the size of the modes which belong to the set $\Lambda \subset \mathbb{Z}^2$. This estimate is crucial because it is used to bound the original Sobolev norm and thus also the time T .

At the end of page 144 of [GK15], it is stated that all $n \in \Lambda$ satisfy

$$|n| \leq 60^{3N^2}.$$

This estimate should be replaced by

$$|n| \leq (N2^N)^{32N(N2^N)^{16}+1}. \quad (0.1)$$

How to obtain this estimate is explained in [GHP16, Lemma 3.20 and Corollary 3.22]. That paper deals with a more general setting and includes the cubic defocusing NLS (1.1) of [GK15].

This corrected estimate leads to the following modification of Theorem 7 of [GK15].

Theorem 0.1. *Let $s > 1$. Then there exists $c > 0$ with the following property: for any small $\mu \ll 1$ and large $\mathcal{A} \gg 1$ there exists a global solution $u(t, x)$ of [GK15, (1.1)] and a time T satisfying*

$$0 < T \leq e^{(\mathcal{A}/\mu)^c}$$

such that

$$\|u(T)\|_{H^s} \geq \mathcal{A} \quad \text{and} \quad \|u(0)\|_{H^s} \leq \mu.$$

Note that in this corrected version the time is slower than in the original version.

The proof of [GK15, Theorem 7] only needs to be modified as follows. The corrected estimate (0.1) of this erratum implies that now the constant S_3 defined in [GK15, (3.20)] has a different size. Indeed, its estimate given in [GK15, (C.1)] has to be replaced by

$$S_3 \lesssim e^{B^N}$$

for some $B > 0$. This implies that

$$\lambda \sim \frac{1}{\mu} e^{B^N}$$

and therefore

$$\lambda \lesssim e^{(A/\mu)^c}$$

for some $c > 0$. With these corrections, one gets the corrected version of Theorem 7.

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References

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- [GK15] Guardia, M., Kaloshin, V.: Growth of Sobolev norms in the cubic defocusing nonlinear Schrödinger equation. *J. Eur. Math. Soc.* **17**, 71–149 (2015) [Zbl 1311.35284](#) [MR 3312404](#)