



On the diagonals of a Rees algebra

Olga Lavila Vidal

ADVERTIMENT. La consulta d'aquesta tesi queda condicionada a l'acceptació de les següents condicions d'ús: La difusió d'aquesta tesi per mitjà del servei TDX (www.tdx.cat) ha estat autoritzada pels titulars dels drets de propietat intel·lectual únicament per a usos privats emmarcats en activitats d'investigació i docència. No s'autoritza la seva reproducció amb finalitats de lucre ni la seva difusió i posada a disposició des d'un lloc aliè al servei TDX. No s'autoritza la presentació del seu contingut en una finestra o marc aliè a TDX (framing). Aquesta reserva de drets afecta tant al resum de presentació de la tesi com als seus continguts. En la utilització o cita de parts de la tesi és obligat indicar el nom de la persona autora.

ADVERTENCIA. La consulta de esta tesis queda condicionada a la aceptación de las siguientes condiciones de uso: La difusión de esta tesis por medio del servicio TDR (www.tdx.cat) ha sido autorizada por los titulares de los derechos de propiedad intelectual únicamente para usos privados enmarcados en actividades de investigación y docencia. No se autoriza su reproducción con finalidades de lucro ni su difusión y puesta a disposición desde un sitio ajeno al servicio TDR. No se autoriza la presentación de su contenido en una ventana o marco ajeno a TDR (framing). Esta reserva de derechos afecta tanto al resumen de presentación de la tesis como a sus contenidos. En la utilización o cita de partes de la tesis es obligado indicar el nombre de la persona autora.

WARNING. On having consulted this thesis you're accepting the following use conditions: Spreading this thesis by the TDX (www.tdx.cat) service has been authorized by the titular of the intellectual property rights only for private uses placed in investigation and teaching activities. Reproduction with lucrative aims is not authorized neither its spreading and availability from a site foreign to the TDX service. Introducing its content in a window or frame foreign to the TDX service is not authorized (framing). This rights affect to the presentation summary of the thesis as well as to its contents. In the using or citation of parts of the thesis it's obliged to indicate the name of the author.

UNIVERSITAT DE BARCELONA

Departament d'Àlgebra i Geometria

ON THE DIAGONALS OF A REES ALGEBRA

Olga Lavila Vidal



MATÈRIES

Bibliography

- [AHT] I.M. Aberbach, C. Huneke, N.V. Trung, *Reduction numbers, Briançon–Skoda theorems and the depth of Rees rings*, Compositio Math. 97 (1995), 403–434.
- [AM] R. Achilles, M. Manaresi, *Multiplicities of a bigraded ring and intersection multiplicity*, Math. Ann. 309 (1997), 573–591.
- [ABW] K. Akin, D.A. Buchsbaum, J. Weyman, *Resolutions of determinantal ideals: The submaximal minors*, Adv. Math. 39 (1981), 1–30.
- [ACD] A. Aramova, K. Crona, E. De Negri, *Bigeneric initial ideals, diagonal subalgebras and bigraded Hilbert functions*, preprint.
- [BaSt] D. Bayer, M. Stillman, *A criterion for detecting m -regularity*, Invent. Math. 87 (1987), 1–11.
- [Ber] A. Bertram, *An application of a log version of the Kodaira vanishing theorem to embedded projective varieties*, preprint.
- [BEL] A. Bertram, L. Ein, R. Lazarsfeld, *Vanishing Theorems, a Theorem of Severi, and the equations defining projective varieties*, J. Amer. Math. Soc. 4 (1991), 587–602.
- [BCNR] A.M. Bigatti, A. Capani, G. Niesi, L. Robbiano, *Hilbert-Poincaré Series and Elimination Problems*, preprint.
- [BoSa] G. Boffi, R. Sánchez, *On the resolutions of the powers of the Pfaffian ideal*, J. Algebra 152 (1992), no. 2, 463–491.
- [Bou] J.F. Boutout, *Singularités rationnelles et quotients par les groupes reductifs*, Invent. Math. 88 (1987), 65–68.

- [Bro] M.P. Brodmann, *The asymptotic nature of the analytic spread*, Math. Proc. Camb. Phil. Soc. 86 (1979), 35–39.
- [BroSha] M.P. Brodmann, R.Y. Sharp, *Local cohomology, An algebraic introduction with geometric applications*, Cambridge studies in advanced mathematics 60, Cambridge University Press, 1998.
- [Bru] W. Bruns, *Algebras Defined by Powers of Determinantal Ideals*, J. Algebra 142 (1991), 150–163.
- [BH1] W. Bruns, J. Herzog, *Cohen Macaulay rings*, Cambridge studies in advanced mathematics 39, Cambridge University Press, 1993.
- [BH2] W. Bruns, J. Herzog, *On computation of a-invariants*, manuscripta math. 77 (1992), 201–213.
- [BV] W. Bruns, U. Vetter, *Determinantal Rings*, Lecture Notes in Mathematics, 1327, Springer–Verlag, 1988.
- [Bur] L. Burch, *Codimension and analytic spread*, Proc. Camb. Phil. Soc. 72 (1972), 369–373.
- [CNR] A. Capani, G. Niesi, L. Robbiano, *CoCoa, a system for doing Computations in Commutative Algebra*, 1995.
- [Cha] K. Chandler, *Regularity of the powers of an ideal*, Comm. Algebra 25 (12) (1997), 3773–3776.
- [Con] A. Conca, *Hilbert function and resolution of the powers of the ideal of the rational normal curve*, preprint.
- [CD] A. Conca, E. De Negri, *M-sequences, graph ideals and ladder ideals of linear type*, J. Algebra 211 (1999), 599–624.
- [CHTV] A. Conca, J. Herzog, N.V. Trung, G. Valla, *Diagonal subalgebras of bigraded algebras and embeddings of blow-ups of projective spaces*, Amer. J. Math. 119 (1997), 859–901.
- [CV] A. Conca, G. Valla, *Hilbert function of powers of ideals of low codimension*, preprint.
- [CZ] T. Cortadellas, S. Zarzuela, *On the Cohen-Macaulay property of the fiber cone of ideals with reduction number at most one*, preprint.

- [CH] S.D. Cutkosky, J. Herzog, *Cohen-Macaulay coordinate rings of blowup schemes*, Comment. Math. Helv. 72 (1997), 605–617.
- [CHT] S.D. Cutkosky, J. Herzog, N.V. Trung, *Asymptotic behaviour of the Castelnuovo-Mumford regularity*, Compositio Math., to appear.
- [Eis] D. Eisenbud, *Commutative Algebra with a View Toward Algebraic Geometry*, Springer-Verlag, GTM 150, 1994.
- [EG] D. Eisenbud, S. Goto, *Linear free resolutions and minimal multiplicities*, J. Algebra 88 (1984), 107–184.
- [EH] D. Eisenbud, C. Huneke, *Cohen-Macaulay Rees algebras and their specializations*, J. Algebra 81 (1983), 202–224.
- [ERT] D. Eisenbud, A. Reeves, B. Totaro, *Initial ideals, Veronese subrings, and rates of algebras*, Adv. Math. 109 (1994), 168–187.
- [EK] S. Eliahou, M. Kervaire, *Minimal resolutions of some monomials ideals*, J. Algebra 129 (1990), 1–25.
- [GG] A. Geramita, A. Gimigliano, *Generators for the defining ideal of certain rational surfaces*, Duke Math. J. 62, no1 (1991), 61–83.
- [GGH] A. Geramita, A. Gimigliano, B. Harbourne, *Projectively normal but superabundant embeddings of rational surfaces in projective spaces*, J. Algebra 169 (1994), 791–804.
- [GGP] A. Geramita, A. Gimigliano, Y. Pitteloud, *Graded Betti numbers of some embedded rational n-folds*, Math. Ann. 301 (1995), 363–380.
- [Gi] A. Gimigliano, *On Veronesean surfaces*, Proc. Koninkl. Ned. Akad. van Wetenschappen, Ser. A, 92 (1989), 71–85.
- [GL] A. Gimigliano, A. Lorenzini, *On the ideal of Veronesean surfaces*, Can. J. Math. 45 (1993), 758–777.
- [GH] S. Goto, S. Huckaba, *On graded rings associated to analytic deviation one ideals*, Amer. J. Math. 116 (1994), 905–919.
- [GN] S. Goto, Y. Nakamura, *Cohen-Macaulay Rees algebras of ideals having analytic deviation two*, Tôhoku Math. J. 46 (1994), 671–686.

- [GW1] S. Goto, K. Watanabe, *On graded rings I*, J. Math. Soc. Japan 30 (1978), 179–213.
- [GW2] S. Goto, K. Watanabe, *On graded rings II*, Tokyo J. Math. 1 (1978), 237–261.
- [Har] R. Hartshorne, *Algebraic Geometry*, GTM 52, Springer-Verlag, 1977.
- [HHK] M. Herrmann, E. Hyry, T. Korb, *On Rees algebras with a Gorenstein Veronese subring*, J. Algebra 200 (1998), 279–311.
- [HHR] M. Herrmann, E. Hyry, J. Ribbe, *On the Cohen-Macaulay and Gorenstein properties of multigraded Rees algebras*, manuscripta math. 79 (1993), 343–377.
- [HHRT] M. Herrmann, E. Hyry, J. Ribbe, Z. Tang, *Reduction numbers and multiplicities of multigraded structures*, J. Algebra 197 (1997), no. 2, 311–341.
- [HIO] M. Herrmann, S. Ikeda, U. Orbanz, *Equimultiplicity and blowing up*, Berlin-Heidelberg, Springer, 1988.
- [HRS] M. Herrmann, J. Ribbe, P. Schenzel, *On the Gorenstein property of form rings*, Math. Z. 213 (1993), 301–309.
- [HRTZ] M. Herrmann, J. Ribbe, N.V. Trung, S. Zarzuela, *Bounds for the multiplicities of almost complete intersections*, manuscripta math. 72 (1991), no. 3, 275–296.
- [HRZ] M. Herrmann, J. Ribbe, S. Zarzuela, *On the Gorenstein property of Rees and form rings of powers ideals*, Trans. Amer. Math. Soc. 342 (1994), 631–643.
- [HS] J. Herzog, H. Srinivasan, *Bounds for multiplicities*, Trans. Amer. Math. Soc. 350 (1998), no. 7, 2879–2902.
- [HSV1] J. Herzog, A. Simis, W.V. Vasconcelos, *Approximation Complexes of Blowing-Up Rings*, J. Algebra 74 (1982), 466–493.
- [HSV2] J. Herzog, A. Simis, W.V. Vasconcelos, *On the canonical module of the Rees algebra and the associated graded ring of an ideal*, J. Algebra 105 (1987), 285–302.

- [HM] S. Huckaba, T. Marley, *Depth Properties of Rees Algebras and Associated Graded Rings*, J. Algebra 156 (1993), 259–271.
- [Hu1] C. Huneke, *Linkage and Koszul homology of ideals*, Amer. J. Math. 104 (1982), 1043–1062.
- [Hu2] C. Huneke, *The Koszul homology of an ideal*, Adv. Math. 56 (1985), 295–318.
- [Hu3] C. Huneke, *The Theory of d-Sequences and Powers of Ideals*, Adv. Math. 46 (1982), 249–279.
- [HS] C. Huneke, J. D. Sally, *Birational extensions in dimension two and integrally closed ideals*, J. Algebra 115 (1988), 481–500.
- [Hy] E. Hyry, *The diagonal subring and the Cohen-Macaulay property of a multigraded ring*, Trans. Amer. Math. Soc., to appear.
- [IT] S. Ikeda, N.V. Trung *When is the Rees algebra Cohen-Macaulay ?*, Comm. Algebra 17 (1989), 2893–2922.
- [KMV] D. Katz, S. Mandal, J. Verma, *Hilbert functions of bigraded algebras*, in " Proceedings of the First ICTP Workshop on Commutative Algebra 1992", World Scientific, London, 1994.
- [KKMS] G. Kempf, F. Knudsen, D. Mumford, B. Saint-Donat, *Toroidal embeddings*, LNM 339, Springer-Verlag, 1973.
- [Ko1] V. Kodiyalam, *Homological invariants of powers of an ideal*, Proc. Amer. Math. Soc. 118 (1993), 757–764.
- [Ko2] V. Kodiyalam, *Asymptotic behaviour of the Castelnuovo-Mumford regularity*, Proc. Amer. Math. Soc., to appear.
- [Li] J. Lipman, *Cohen-Macaulayness in graded algebras*, Math. Res. Letters 1 (1994), 149–157.
- [Mat] H. Matsumura, *Graded rings and modules*, Lecture notes in pure and applied mathematics 153, Marcel Dekker, 1993.
- [RV] L. Robbiano, G. Valla, *Hilbert-Poincaré Series of Bigraded Algebras*, Boll. Unione Mat. Ital. Sez. B Artic. Ric. Mat. (8) 1 (1998), no. 3, 521–540.

- [Sch1] P. Schenzel, *Dualisierende Komplexe in der lokalen Algebra und Buchsbaum-Ringe*, LNM 907, Springer-Verlag, Berlin-Heidelberg-New York, 1982.
- [Sch2] P. Schenzel, *Castelnuovo's index of regularity and reduction numbers*, Topics in Algebra, Banach Center Publications, Vol. 26, Part 2, PWN-Polish Scientific Publishers, Warsaw 1990.
- [Sha] K. Shah, *On the Cohen-Macaulayness of the Fiber Cone of an Ideal*, J. Algebra 143 (1991), 156–172.
- [STV] A. Simis, N.V. Trung, G. Valla, *The diagonal subalgebra of a blow-up algebra*, J. Pure Appl. Algebra 125 (1998), 305–328.
- [Sjo] R. Sjögren, *On the regularity of graded k -algebras of Krull dimension ≤ 1* , Math. Scand. 71 (1992), 167–172.
- [Swa] I. Swanson, *Powers of ideals, primary decompositions, Artin-Rees lemma and regularity*, Math. Ann. 307 (1997), 299–313.
- [Tr1] N.V. Trung, *Reduction exponent and degree bound for the defining equations of graded rings*, Proc. Amer. Math. Soc. 101 (1987), 229–236.
- [Tr2] N.V. Trung, *The largest non-vanishing degree of graded local cohomology modules*, preprint.
- [TVZ] N.V. Trung, D.Q. Viêt, S. Zarzuela, *When is the Rees Algebra Gorenstein?*, J. Algebra 175 (1995), 137–156.
- [Ul] B. Ulrich, *Lectures on Linkage and Deformation*, Workshop on Commutative Algebra, Trieste, 1992.
- [Wa1] K. Watanabe, *Certain invariant subrings are Gorenstein I*, Osaka J. Math. 11 (1974), 1–8.
- [Wa2] K. Watanabe, *Certain invariant subrings are Gorenstein II*, Osaka J. Math. 11 (1974), 379–388.
- [Yos] Y. Yoshino, *The canonical modules of graded rings defined by generic matrices*, Nagoya Math. J. 81 (1981), 105–112.

