cases	doc_1		doc_2		decision	id
	authors	• Sergei Gukov • Edward Witten	**authors**	• Sergei Gukov • Edward Witten	DUPLICATES	12
	title	Rigid Surface Operators	**title**	Rigid Surface Operators		
	publication_date	2010-01-01 00:00:00	**publication_date**	2008-04-09 00:00:00		
	source	SupportedSources.INTERNET_ARCHIVE	**source**	SupportedSources.INTERNET_ARCHIVE		
	journal	International Press of Boston	**journal**			
	volume		**volume**			
	doi	10.4310/atmp.2010.v14.n1.a3	**doi**			
	urls	• https://web.archive.org/web/20180719194758/http://www.intlpress.com/site/pub/files/_fulltext/journals/atmp/2010/0014/0001/ATMP-2010-0014-0001-a003.pdf	**urls**	• https://archive.org/download/arxiv-0804.1561/0804.1561.pdf		
	id	id-4508389253365022450	**id**	id710264168091713047		
	abstract	Surface operators in gauge theory are analogous to Wilson and 't Hooft line operators except that they are supported on a two-dimensional surface rather than a one-dimensional curve. In a previous paper, we constructed a certain class of half-BPS surface operators in N = 4 super Yang-Mills theory, and determined how they transform under S-duality. Those surface operators depend on a relatively large number of freely adjustable parameters. In the present paper, we consider the opposite case of half-BPS surface operators that are "rigid" in the sense that they do not depend on any parameters at all. We present some simple constructions of rigid half-BPS surface operators and attempt to determine how they transform under duality. This attempt is only partially successful, suggesting that our constructions are not the whole story. The partial match suggests interesting connections with quantization. We discuss some possible refinements and some string theory constructions which might lead to a more complete picture. e-print archive: http://lanl.arXiv.org/abs/hep-th//0804.1561 88 SERGEI GUKOV AND EDWARD WITTEN 157 8 Stringy constructions of rigid surface operators 160 8.1 Holographic description 160 90 SERGEI GUKOV AND EDWARD WITTEN 8.2 Application: SO(2N) gauge theory 162 8.3 Intersecting brane models 164 8.4 Bubbling geometries 166 Acknowledgments 168 Appendix A Rigid nilpotent orbits for exceptional groups 169 Appendix B Orthogonal and symplectic Lie algebras and duality 171 References 176 RIGID SURFACE OPERATORS 95 Î³. More exactly, to study N = 4 super Yang-Mills theory in the presence of the surface operator, one performs the path integral (or one quantizes) in a space of fields that take the form given in equation (2.4) modulo terms that are less singular than 1/r. There are two important caveats. First, it turns out that one can add an additional parameter Î·, also t-valued. Î· is a sort of two-dimensional theta angle and plays an important role because it transforms into Î± under duality. (For rigid surface operators, Î· at most has only a discrete analog.) Second, to quantize in the presence of the singularity described in (2.4), one should divide only by gauge transformations that, along the locus D of the singularity, take values in the subgroup of G that commutes with Î±, Î², and Î³ (and Î·). Generically, this subgroup is the maximal torus T. But in general, it may be any subgroup L of G that contains T. Such a subgroup is called a Levi subgroup. In studying a surface operator of this type, we regard the choice of L as part of the definition. Having chosen L, we pick Î±, Î², Î³, and Î· to be an L-regular quadruple, meaning that the subgroup of G that commutes with all four of them is precisely L. Then, to calculate Yang-Mills observables in the presence of the surface operator, we perform a path integral over fields with the indicated type of singularity, dividing by gauge transformations that along D are L-valued. This gives a surface operator that varies smoothly with Î±, Î², Î³, Î· as long as those parameters form an L-regular quadruple. But when the parameters are varied so that the unbroken group becomes a larger group L , a singularity emerges. In a sense, the residue of this singularity is a surface operator that can be constructed in the same way, but starting with L rather than L. One of the main ideas in [2] was to study the monodromies in the space of L-regular parameters. Limit for Î±, Î², Î³ â†' 0 As a preliminary to discussing rigid surface operators, we will consider what happens to the above construction in the limit that Î±, Î², Î³ â†' 0. To keep things simple, we begin with the case G = SU(2). For more detail on the following, see [2, Section 3.3]. The naive idea is that the singularity of A and Ï† is linear in Î±, Î², and Î³, so that if we set Î±, Î², Î³ to zero, there is no singularity and no surface operator. However, as we have already noted, the definition of the surface operator is that A and Ï† have singularities proportional to Î±, Î², Î³ modulo terms that are less singular than 1/r. Generically, for Î±, Î², Î³ â†' 0, we should not conclude that A and Ï† are non-singular, but only that they are less singular than 1/r. In fact, Hitchin's equations do have a rotationally symmetric solution that	**abstract**	Surface operators in gauge theory are analogous to Wilson and 't Hooft line operators except that they are supported on a two-dimensional surface rather than a one-dimensional curve. In a previous paper, we constructed a certain class of half-BPS surface operators in N=4 super Yang-Mills theory, and determined how they transform under S-duality. Those surface operators depend on a relatively large number of freely adjustable parameters. In the present paper, we consider the opposite case of half-BPS surface operators that are "rigid" in the sense that they do not depend on any parameters at all. We present some simple constructions of rigid half-BPS surface operators and attempt to determine how they transform under duality. This attempt is only partially successful, suggesting that our constructions are not the whole story. The partial match suggests interesting connections with quantization. We discuss some possible refinements and some string theory constructions which might lead to a more complete picture.		
	versions		**versions**			