
Contribution ID: **93** Type: **not specified**

# Magnesium di-Boride: A novel solution for a transversely polarized target holding field in CLAS12

*Monday 26 September 2016 17:30 (25 minutes)*

Three A-rated proposals to study the 3D structure of the nucleon with the CLAS12 detector require a transversely polarized target [1]. A minimal R B × dL is needed to limit beam deflection by the transverse holding field of such a target. At the same time, the axial field of the CLAS12 central solenoid must be canceled over the same region. Finally, adequate field uniformity to allow NMR polarization monitoring is highly desirable. Magnesium di-Boride, a high Tc superconductor [2], offers a novel solution to these requirements. A cylindrical shell of the material can simultaneously trap and maintain a uniform transverse internal field while shielding the external axial field. This passive solution has significant advantages over designs utilizing current carrying coils including improved performance, reduced dE/dx and simplicity of fabrication and operation. A series of calculations with ELEKTRA, one of the OPERA suite of programs [3], has been carried out that define a base design diameter, length and thickness. Validation of the calculations has been made through modeling and comparison to measurements with a two-thirds scale prototype MgB2 cylinder under test at Universit'a di Ferrara in cooperation with Edison-Milan [4].

References
[1] https://www.jlab.org/Hall-B/clas12-web/clas12-expt2.jpg.
[2] J.J. Rabbers. et al, Supercond. Sci. Technol. 23 (2010) 125003.
[3] Cobham Technical Services - Vector Fields Software.
[4] M. Statera, et al, IEEE Transactions on Applied Superconductivity, Vol. 25, No. 3 (June, 2015) 4501004.

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**Session Classification:** Targets

**Track Classification:** H. Targets