# WQB quadrupole field quality with the pole profile approximated by spline

V.S.Kashikhin, August 3, 2004

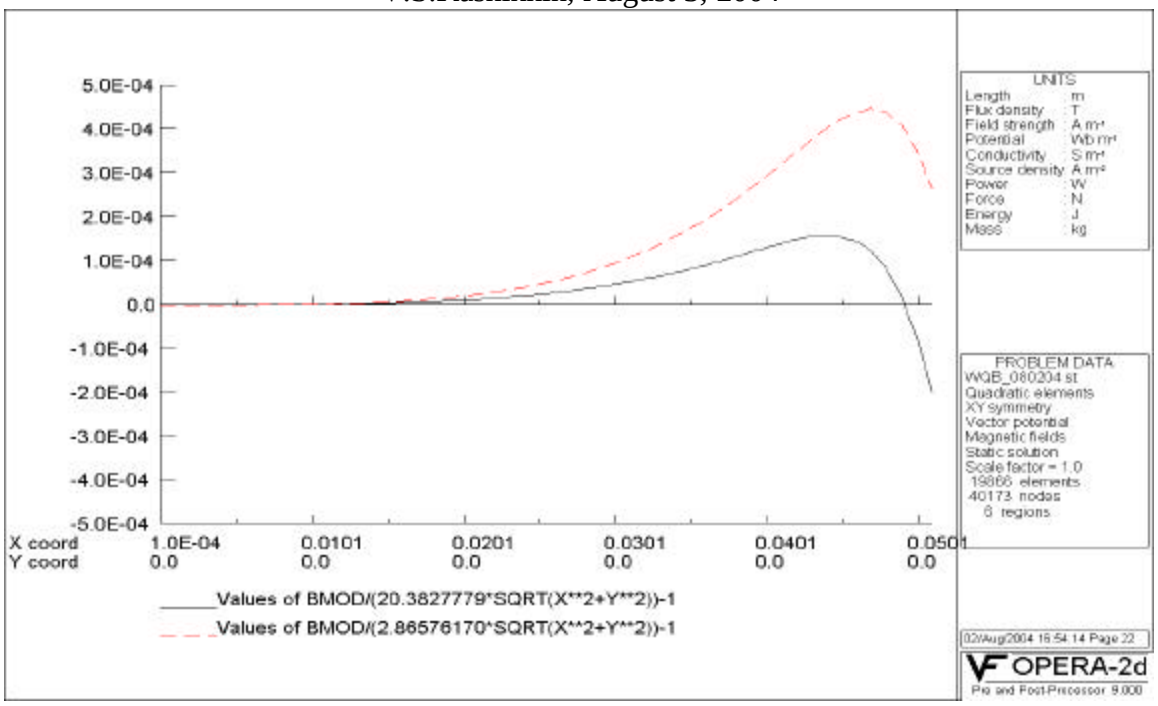


**Fig.1. Field non-linearity in the quadrupole middle plane**

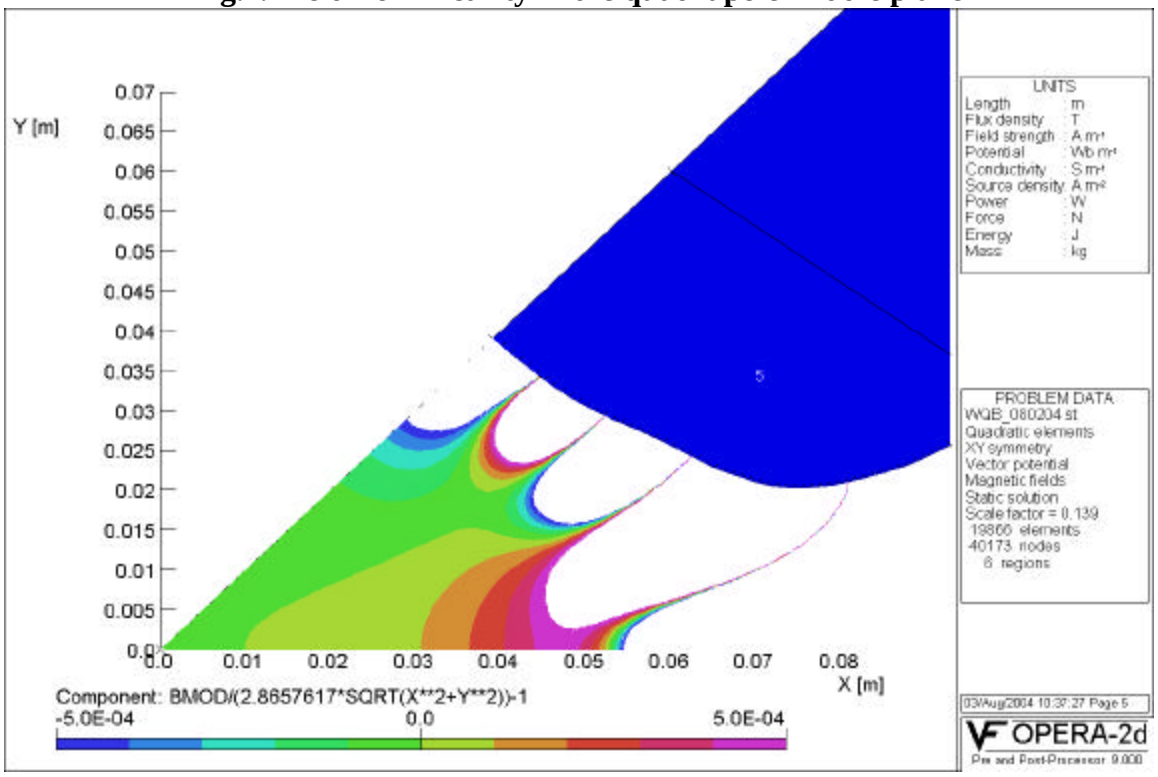


**Fig.2. Field quality at injection. Gradient 2.8658T/m at 500 A.**

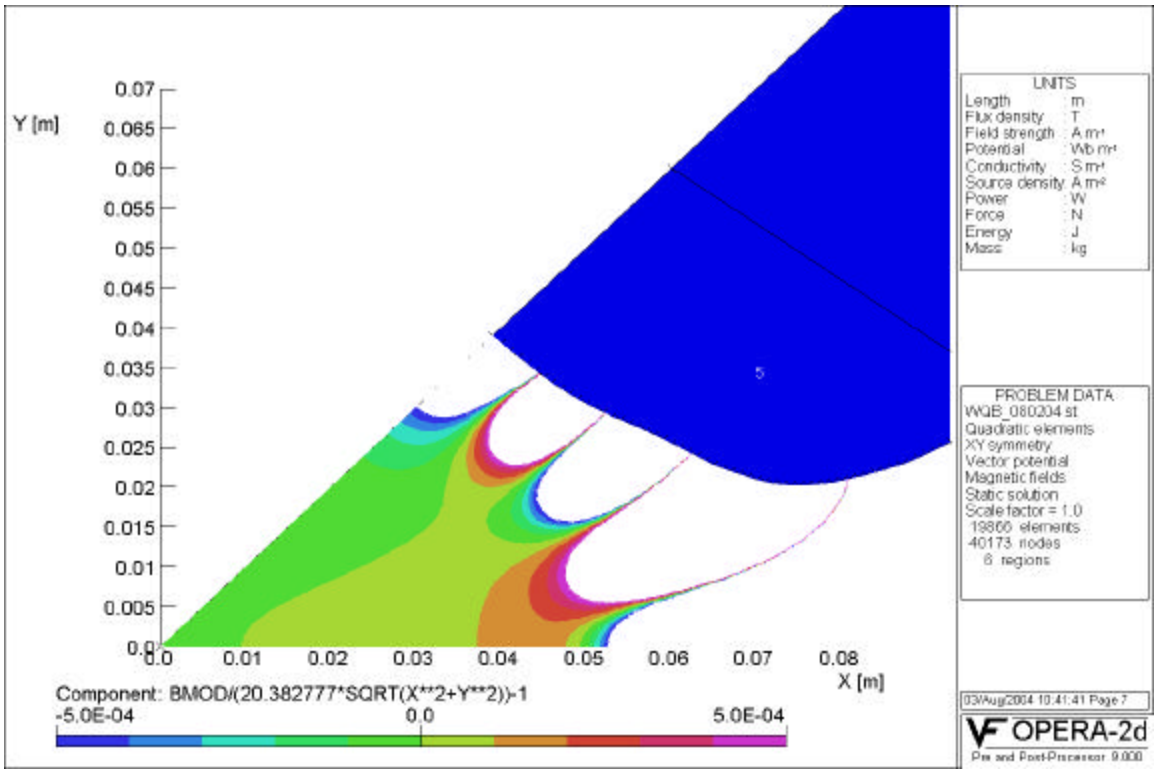


**Fig.3. Field quality at maximum current 3600 A. Gradient is 20.3828T/m.**

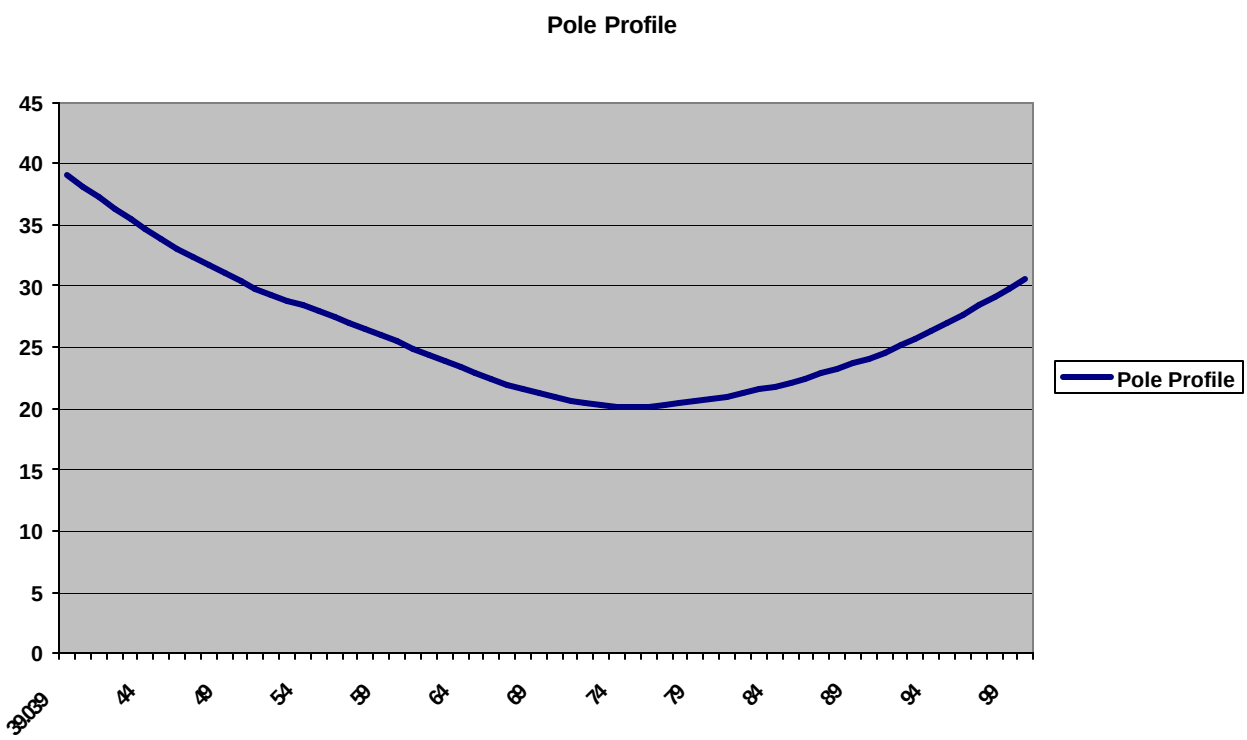


**Fig. 4. Pole profile coordinates in mm.**

**WQB Pole Profile Coordinates. The first line is for the pole tip center. The pole profile is symmetrical relatively 45 degrees line going from the magnet center.**

| X, mm | Y, mm | X, inches | Y, inches |
|---|---|---|---|
| 39.0394 | 39.0394 | 1.53698425 | 1.53698425 |
| 40 | 38.1018 | 1.57480315 | 1.50007087 |
| 41 | 37.1737 | 1.61417323 | 1.4635315 |
| 42 | 36.287 | 1.65354331 | 1.42862205 |
| 43 | 35.4275 | 1.69291339 | 1.39478346 |
| 44 | 34.596 | 1.73228346 | 1.36204724 |
| 45 | 33.7964 | 1.77165354 | 1.33056693 |
| 46 | 33.032 | 1.81102362 | 1.30047244 |
| 47 | 32.3056 | 1.8503937 | 1.27187402 |
| 48 | 31.62 | 1.88976378 | 1.24488189 |
| 49 | 30.9778 | 1.92913386 | 1.21959843 |
| 50 | 30.381 | 1.96850394 | 1.19610236 |
| 51 | 29.8291 | 2.00787402 | 1.17437402 |
| 52 | 29.313 | 2.04724409 | 1.15405512 |
| 53 | 28.8229 | 2.08661417 | 1.13475984 |
| 54 | 28.3501 | 2.12598425 | 1.11614567 |
| 55 | 27.8863 | 2.16535433 | 1.09788583 |
| 56 | 27.4237 | 2.20472441 | 1.07967323 |
| 57 | 26.9548 | 2.24409449 | 1.0612126 |
| 58 | 26.4715 | 2.28346457 | 1.04218504 |
| 59 | 25.9678 | 2.32283465 | 1.02235433 |
| 60 | 25.447 | 2.36220472 | 1.00185039 |
| 61 | 24.9149 | 2.4015748 | 0.98090157 |
| 62 | 24.3777 | 2.44094488 | 0.95975197 |
| 63 | 23.8427 | 2.48031496 | 0.93868898 |
| 64 | 23.3209 | 2.51968504 | 0.91814567 |
| 65 | 22.8238 | 2.55905512 | 0.8985748 |
| 66 | 22.362 | 2.5984252 | 0.8803937 |
| 67 | 21.9428 | 2.63779528 | 0.86388976 |
| 68 | 21.5657 | 2.67716535 | 0.84904331 |
| 69 | 21.2283 | 2.71653543 | 0.83575984 |
| 70 | 20.9286 | 2.75590551 | 0.82396063 |
| 71 | 20.6662 | 2.79527559 | 0.81362992 |
| 72 | 20.4469 | 2.83464567 | 0.80499606 |

| | | | |
|---|---|---|---|
| 73 | 20.2779 | 2.87401575 | 0.79834252 |
| 74 | 20.1667 | 2.91338583 | 0.79396457 |
| 75 | 20.1214 | 2.95275591 | 0.7921811 |
| 76 | 20.1469 | 2.99212598 | 0.79318504 |
| 77 | 20.2352 | 3.03149606 | 0.79666142 |
| 78 | 20.3751 | 3.07086614 | 0.80216929 |
| 79 | 20.5553 | 3.11023622 | 0.80926378 |
| 80 | 20.7644 | 3.1496063 | 0.81749606 |
| 81 | 20.9931 | 3.18897638 | 0.8265 |
| 82 | 21.2405 | 3.22834646 | 0.83624016 |
| 83 | 21.5078 | 3.26771654 | 0.84676378 |
| 84 | 21.7967 | 3.30708661 | 0.8581378 |
| 85 | 22.1087 | 3.34645669 | 0.87042126 |
| 86 | 22.4455 | 3.38582677 | 0.8836811 |
| 87 | 22.8091 | 3.42519685 | 0.89799606 |
| 88 | 23.2017 | 3.46456693 | 0.91345276 |
| 89 | 23.6258 | 3.50393701 | 0.93014961 |
| 90 | 24.084 | 3.54330709 | 0.94818898 |
| 91 | 24.5796 | 3.58267717 | 0.96770079 |
| 92 | 25.116 | 3.62204724 | 0.9888189 |
| 93 | 25.6939 | 3.66141732 | 1.01157087 |
| 94 | 26.3103 | 3.7007874 | 1.03583858 |
| 95 | 26.9615 | 3.74015748 | 1.06147638 |
| 96 | 27.6428 | 3.77952756 | 1.08829921 |
| 97 | 28.3493 | 3.81889764 | 1.11611417 |
| 98 | 29.0752 | 3.85826772 | 1.14469291 |
| 99 | 29.8142 | 3.8976378 | 1.1737874 |
| 100 | 30.56 | 3.93700787 | 1.20314961 |

## Summary

The field quality for magnet central cross section is in the range of +/- 5 units for aperture diameter 100 mm. The pole profile coordinates in the drawing should be shown with the accuracy no less than 0.1 mil.