

# Phantom

transfer function

# เพิ่มเงื่อนไขตรวจสอบค่า $T2^*$

- การตรวจสอบว่าค่า  $T2^*$  ที่ได้ถูกต้องหรือไม่
  - 1. ค่า ratio ต้องมีค่าต่ำกว่า 0.317
  - 2. ค่า  $T2^*$  ต้องไม่ติดลบ
- ถ้าไม่ถูกต้องจะกำหนดให้ค่า  $T2^*$  มีค่าต่ำกว่า 1.097 โดยกำหนดให้มีค่าเท่ากับ 0.549 เพื่อง่ายแก่การ plot chart

# Result

## 1.5Tesla CMRtools Result

| date        | T2* value |           |           |           |           |           |           |           |           |            |            |            |            |            |            |
|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|------------|------------|
|             | position1 | position2 | position3 | position4 | position5 | position6 | position7 | position8 | position9 | position10 | position11 | position12 | position13 | position14 | position15 |
| 2014-09-30' | 7.472     | 3.860     | 2.094     | 12.325    | 55.463    | 8.954     | 4.320     | 2.377     | 1.683     | 51.289     | 14.185     | 7.781      | 4.056      | 2.160      | 2.079      |
| 2014-10-08' | 7.617     | 3.926     | 1.958     | 17.812    | 88.170    | 9.677     | 4.505     | 2.350     | 1.802     | 63.018     | 14.653     | 7.503      | 3.959      | 2.077      | 2.714      |
| 2014-10-15' | 8.033     | 4.015     | 2.069     | 17.659    | 82.364    | 10.235    | 4.758     | 2.418     | 1.638     | 55.377     | 15.233     | 7.933      | 4.152      | 2.170      | 2.612      |
| 2014-10-22' | 7.733     | 3.981     | 2.103     | 16.333    | 99.779    | 10.323    | 4.708     | 2.386     | 1.673     | 64.793     | 14.631     | 7.857      | 4.067      | 2.199      | 2.391      |
| 2014-11-05' | 7.672     | 3.933     | 2.198     | 19.128    | 98.721    | 10.082    | 4.626     | 2.408     | 1.727     | 58.036     | 14.813     | 7.833      | 4.088      | 2.328      | 2.294      |
| 2014-11-12' | 7.579     | 3.885     | 2.129     | 19.123    | 104.508   | 9.946     | 4.633     | 2.417     | 1.575     | 69.908     | 14.425     | 7.528      | 3.844      | 2.228      | 2.726      |
| 2014-11-19' | 7.957     | 4.128     | 2.162     | 14.417    | 90.513    | 10.242    | 4.753     | 2.462     | 1.727     | 62.562     | 15.178     | 8.150      | 4.178      | 2.299      | 2.309      |
| 2014-11-26' | 8.363     | 4.320     | 2.316     | 13.467    | 89.903    | 10.683    | 4.893     | 2.554     | 1.668     | 49.213     | 16.303     | 8.689      | 4.442      | 2.444      | 2.114      |
| 2014-12-03' | 8.453     | 4.375     | 2.384     | 11.064    | 83.863    | 10.372    | 5.004     | 2.571     | 1.617     | 49.300     | 16.338     | 8.792      | 4.517      | 2.456      | 1.910      |
| 2014-12-10' | 8.037     | 4.180     | 2.196     | 8.043     | 79.613    | 10.233    | 4.773     | 2.530     | 1.490     | 42.714     | 14.799     | 8.030      | 4.195      | 2.248      | 1.818      |
| 2014-12-17' | 7.981     | 4.110     | 2.192     | 2.392     | 88.821    | 10.259    | 4.673     | 2.466     | 1.487     | 40.002     | 14.936     | 8.020      | 4.148      | 2.187      | 1.769      |
| 2014-12-24' | 8.146     | 4.167     | 2.197     | 12.296    | 70.749    | 10.327    | 4.750     | 2.466     | 1.527     | 36.942     | 15.194     | 8.184      | 4.206      | 2.260      | 1.919      |
| 2015-01-21' | 7.914     | 4.166     | 2.260     | 9.619     | 60.496    | 10.507    | 4.804     | 2.636     | 1.609     | 27.603     | 15.063     | 8.042      | 4.184      | 2.257      | 1.819      |
| 2015-01-28' | 7.981     | 4.216     | 2.304     | 14.208    | 112.086   | 10.664    | 4.980     | 2.663     | 1.671     | 40.998     | 15.403     | 8.218      | 4.290      | 2.334      | 2.053      |
| 2015-02-04' | 7.421     | 3.892     | 2.169     | 18.980    | 101.124   | 10.182    | 4.718     | 2.596     | 1.597     | 46.076     | 14.100     | 7.394      | 3.805      | 2.185      | 2.540      |
| mean        | 7.891     | 4.077     | 2.182     | 13.791    | 87.078    | 10.179    | 4.727     | 2.487     | 1.633     | 50.522     | 15.017     | 7.997      | 4.142      | 2.256      | 2.205      |

# Result

## 1.5Tesla MRIM Result

| date        | T2* value |           |           |           |           |           |           |           |           |            |            |            |            |            |            |
|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|------------|------------|
|             | position1 | position2 | position3 | position4 | position5 | position6 | position7 | position8 | position9 | position10 | position11 | position12 | position13 | position14 | position15 |
| 2014-09-30' | 7.207     | 3.644     | 2.031     | 1.807     | 0.549     | 8.906     | 4.248     | 2.207     | 1.316     | 0.549      | 13.905     | 7.425      | 3.701      | 1.891      | 1.487      |
| 2014-10-08' | 7.440     | 3.686     | 1.868     | 1.494     | 0.549     | 9.271     | 4.253     | 2.245     | 1.242     | 0.549      | 14.382     | 7.053      | 3.633      | 2.431      | 1.636      |
| 2014-10-15' | 7.741     | 3.705     | 1.826     | 1.620     | 0.549     | 10.015    | 4.431     | 2.333     | 1.209     | 0.549      | 15.131     | 7.572      | 3.778      | 2.394      | 1.628      |
| 2014-10-22' | 7.449     | 3.685     | 2.054     | 1.691     | 0.549     | 9.890     | 4.370     | 2.294     | 1.110     | 0.549      | 14.322     | 7.463      | 3.910      | 1.869      | 1.514      |
| 2014-11-05' | 7.494     | 3.679     | 1.936     | 1.637     | 0.549     | 9.629     | 4.454     | 2.337     | 1.158     | 0.549      | 14.522     | 7.408      | 3.651      | 1.896      | 1.580      |
| 2014-11-12' | 7.420     | 3.680     | 2.020     | 1.773     | 0.549     | 9.539     | 4.556     | 2.339     | 1.136     | 0.549      | 14.363     | 7.281      | 3.583      | 2.443      | 1.600      |
| 2014-11-19' | 7.795     | 3.904     | 1.906     | 1.564     | 0.549     | 9.954     | 4.456     | 2.297     | 1.212     | 0.549      | 14.953     | 7.803      | 3.924      | 1.975      | 1.536      |
| 2014-11-26' | 8.149     | 4.043     | 2.040     | 1.434     | 0.549     | 10.152    | 4.545     | 2.374     | 1.247     | 0.549      | 15.928     | 8.268      | 4.098      | 2.402      | 1.507      |
| 2014-12-03' | 8.297     | 4.070     | 2.028     | 1.422     | 0.549     | 10.086    | 4.861     | 2.437     | 1.205     | 0.549      | 16.331     | 8.506      | 4.224      | 2.376      | 1.407      |
| 2014-12-10' | 7.919     | 3.933     | 1.910     | 1.312     | 0.549     | 9.950     | 4.529     | 2.388     | 1.174     | 0.549      | 14.711     | 7.678      | 3.809      | 2.144      | 1.370      |
| 2014-12-17' | 7.670     | 3.858     | 1.889     | 1.332     | 0.549     | 9.997     | 4.486     | 2.430     | 1.184     | 0.549      | 14.873     | 7.730      | 3.954      | 2.128      | 1.395      |
| 2014-12-24' | 7.901     | 3.911     | 1.907     | 1.264     | 0.549     | 9.937     | 4.445     | 2.397     | 1.206     | 2.037      | 14.909     | 7.770      | 4.026      | 2.163      | 1.448      |
| 2015-01-21' | 7.647     | 3.970     | 2.091     | 1.286     | 0.549     | 10.280    | 4.693     | 2.647     | 1.332     | 1.867      | 14.823     | 7.585      | 3.968      | 2.198      | 1.396      |
| 2015-01-28' | 7.934     | 3.952     | 2.072     | 1.489     | 0.549     | 10.348    | 4.700     | 2.542     | 1.353     | 0.549      | 15.234     | 7.839      | 3.932      | 1.935      | 1.503      |
| 2015-02-04' | 7.360     | 3.680     | 2.011     | 1.643     | 0.549     | 9.854     | 4.478     | 2.440     | 1.258     | 0.549      | 14.090     | 7.040      | 3.472      | 1.807      | 1.568      |
| mean        | 7.695     | 3.827     | 1.973     | 1.518     | 0.549     | 9.854     | 4.500     | 2.380     | 1.223     | 0.736      | 14.832     | 7.628      | 3.844      | 2.137      | 1.505      |

T2\* value on table = 0.549 mean T2\* value less than 1.097

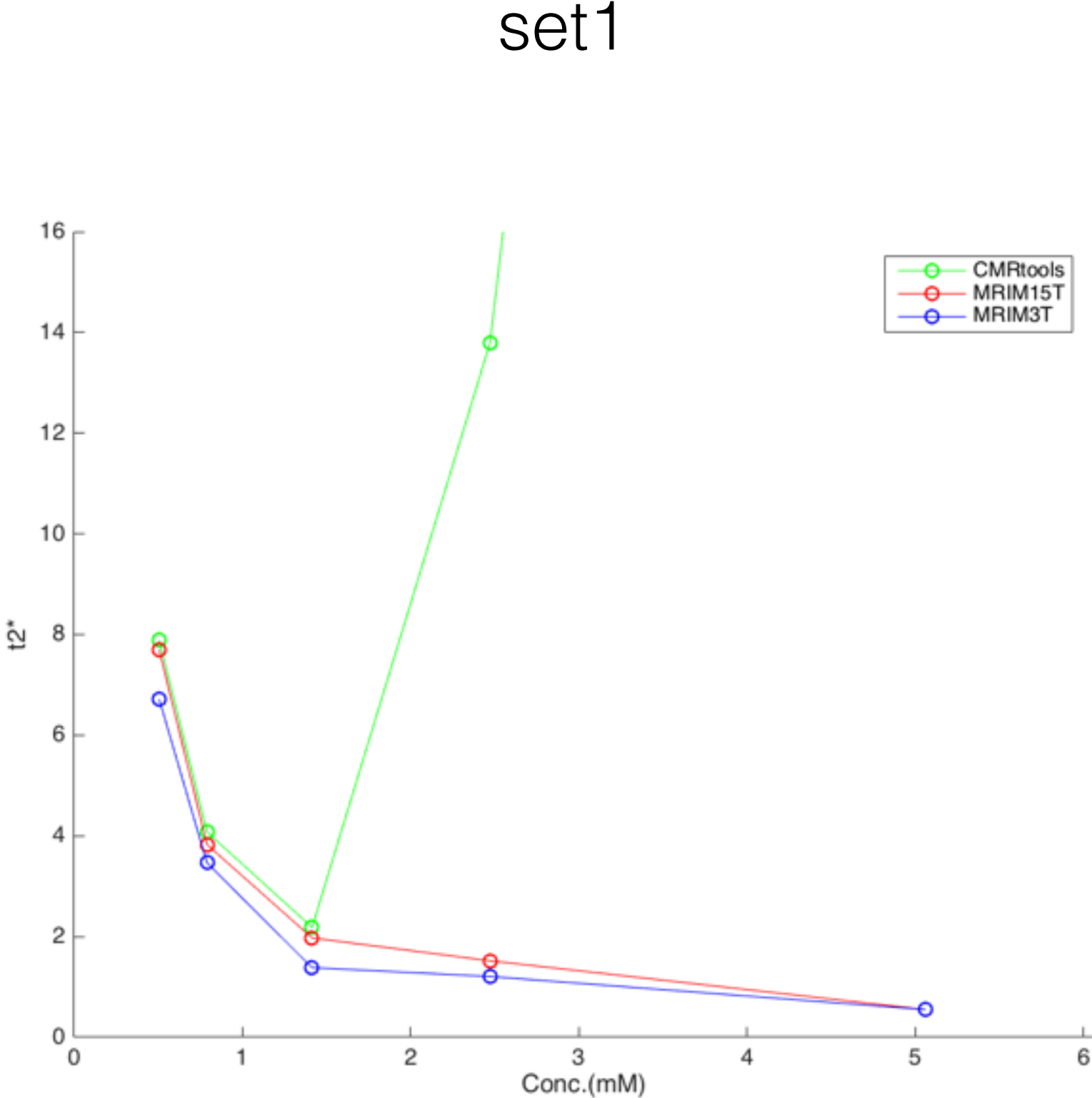
# Result

## 3Tesla MRIM Result

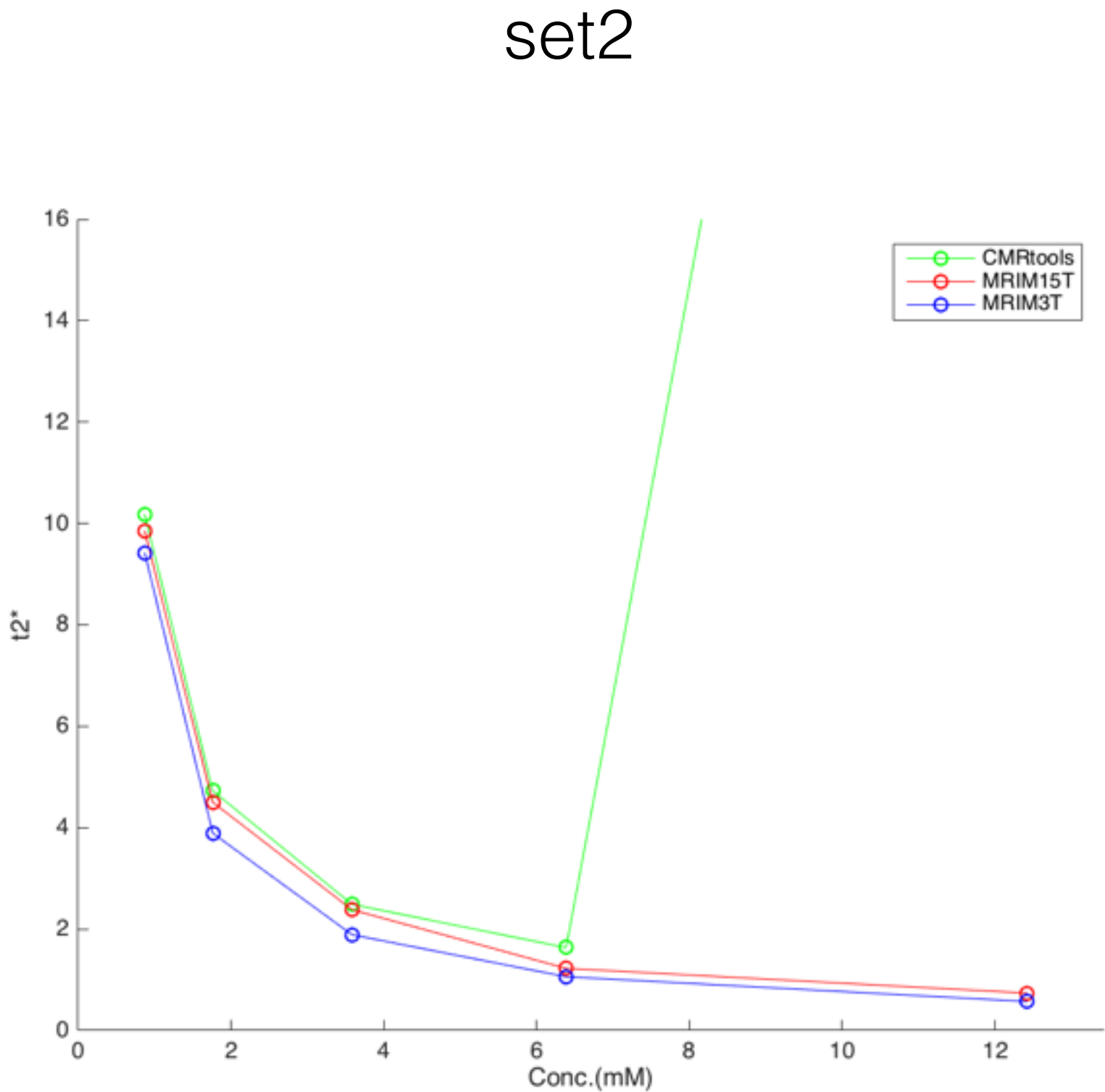
| date        | T2* value |           |           |           |           |           |           |           |           |            |            |            |            |            |            |
|-------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|------------|------------|
|             | position1 | position2 | position3 | position4 | position5 | position6 | position7 | position8 | position9 | position10 | position11 | position12 | position13 | position14 | position15 |
| 2014-09-30' | 5.459     | 2.864     | 1.771     | 1.565     | 0.549     | 6.624     | 2.949     | 2.036     | 1.094     | 0.549      | 17.389     | 5.914      | 2.998      | 1.643      | 1.146      |
| 2014-10-08' | 6.507     | 3.523     | 1.473     | 1.668     | 0.549     | 9.287     | 3.907     | 2.196     | 0.549     | 0.549      | 11.171     | 6.314      | 3.987      | 1.089      | 1.140      |
| 2014-10-15' | 6.835     | 3.586     | 1.500     | 1.635     | 0.549     | 8.497     | 4.231     | 2.183     | 1.175     | 0.549      | 15.874     | 6.909      | 3.780      | 1.196      | 1.184      |
| 2014-10-22' | 6.872     | 3.590     | 1.692     | 1.606     | 0.549     | 8.660     | 3.623     | 2.074     | 1.128     | 0.549      | 12.666     | 6.640      | 3.965      | 1.421      | 0.967      |
| 2014-11-05' | 7.808     | 3.479     | 1.372     | 0.549     | 0.549     | 10.816    | 4.965     | 1.849     | 1.210     | 0.549      | 13.094     | 6.346      | 3.833      | 1.617      | 1.606      |
| 2014-11-12' | 6.508     | 3.240     | 0.992     | 0.549     | 0.549     | 8.857     | 5.048     | 1.926     | 1.262     | 0.549      | 9.919      | 5.560      | 3.227      | 1.476      | 1.542      |
| 2014-11-19' | 7.081     | 3.449     | 1.341     | 1.388     | 0.549     | 8.231     | 3.930     | 2.170     | 0.921     | 0.549      | 10.281     | 6.108      | 3.762      | 1.428      | 1.488      |
| 2014-11-26' | 8.647     | 3.762     | 1.487     | 1.051     | 0.549     | 11.591    | 4.985     | 1.600     | 1.139     | 0.549      | 17.732     | 6.961      | 3.986      | 1.752      | 1.064      |
| 2014-12-03' | 7.376     | 3.595     | 1.374     | 1.054     | 0.549     | 6.210     | 3.464     | 1.662     | 0.927     | 0.549      | 9.666      | 6.228      | 3.389      | 1.631      | 1.049      |
| 2014-12-10' | 5.453     | 3.291     | 1.083     | 2.139     | 0.549     | 8.525     | 3.233     | 1.549     | 1.175     | 0.549      | 7.174      | 5.065      | 2.655      | 1.741      | 1.792      |
| 2014-12-17' | 6.116     | 3.445     | 1.362     | 0.916     | 0.549     | 12.673    | 3.281     | 1.619     | 0.856     | 0.549      | 10.074     | 6.209      | 3.380      | 1.407      | 1.129      |
| 2014-12-24' | 6.615     | 3.417     | 1.217     | 1.280     | 0.549     | 10.846    | 4.021     | 1.917     | 1.173     | 0.549      | 10.913     | 6.507      | 3.741      | 1.446      | 1.434      |
| 2015-01-21' | 7.199     | 3.438     | 1.342     | 1.338     | 0.549     | 11.279    | 4.105     | 1.766     | 1.018     | 0.549      | 12.445     | 6.544      | 3.459      | 1.589      | 1.121      |
| 2015-01-28' | 6.797     | 3.418     | 1.250     | 0.801     | 0.549     | 8.200     | 3.441     | 1.702     | 1.065     | 0.868      | 12.581     | 6.258      | 3.443      | 1.745      | 0.913      |
| 2015-02-04' | 5.430     | 3.816     | 1.472     | 0.549     | 0.549     | 11.056    | 3.157     | 2.054     | 1.183     | 0.549      | 10.160     | 6.081      | 3.768      | 1.334      | 1.297      |
| mean        | 6.714     | 3.461     | 1.382     | 1.206     | 0.549     | 9.423     | 3.889     | 1.887     | 1.058     | 0.570      | 12.076     | 6.243      | 3.558      | 1.501      | 1.258      |

T2\* value on table = 0.549 mean T2\* value less than 1.097

| position | T2* mean value |        |        | Conc.  |
|----------|----------------|--------|--------|--------|
|          | CMRtools       | 1.5T   | 3T     |        |
| 1        | 7.891          | 7.695  | 6.714  | 0.505  |
| 2        | 4.077          | 3.827  | 3.461  | 0.789  |
| 3        | 2.182          | 1.973  | 1.382  | 1.413  |
| 4        | 13.791         | 1.518  | 1.206  | 2.470  |
| 5        | 87.078         | 0.549  | 0.549  | 5.059  |
| 6        | 10.179         | 9.854  | 9.423  | 0.871  |
| 7        | 4.727          | 4.500  | 3.889  | 1.761  |
| 8        | 2.487          | 2.380  | 1.887  | 3.584  |
| 9        | 1.633          | 1.223  | 1.058  | 6.387  |
| 10       | 50.522         | 0.736  | 0.570  | 12.421 |
| 11       | 15.017         | 14.832 | 12.076 | 1.060  |
| 12       | 7.997          | 7.628  | 6.243  | 1.682  |
| 13       | 4.142          | 3.844  | 3.558  | 3.375  |
| 14       | 2.256          | 2.137  | 1.501  | 6.956  |
| 15       | 2.205          | 1.505  | 1.258  | 9.698  |

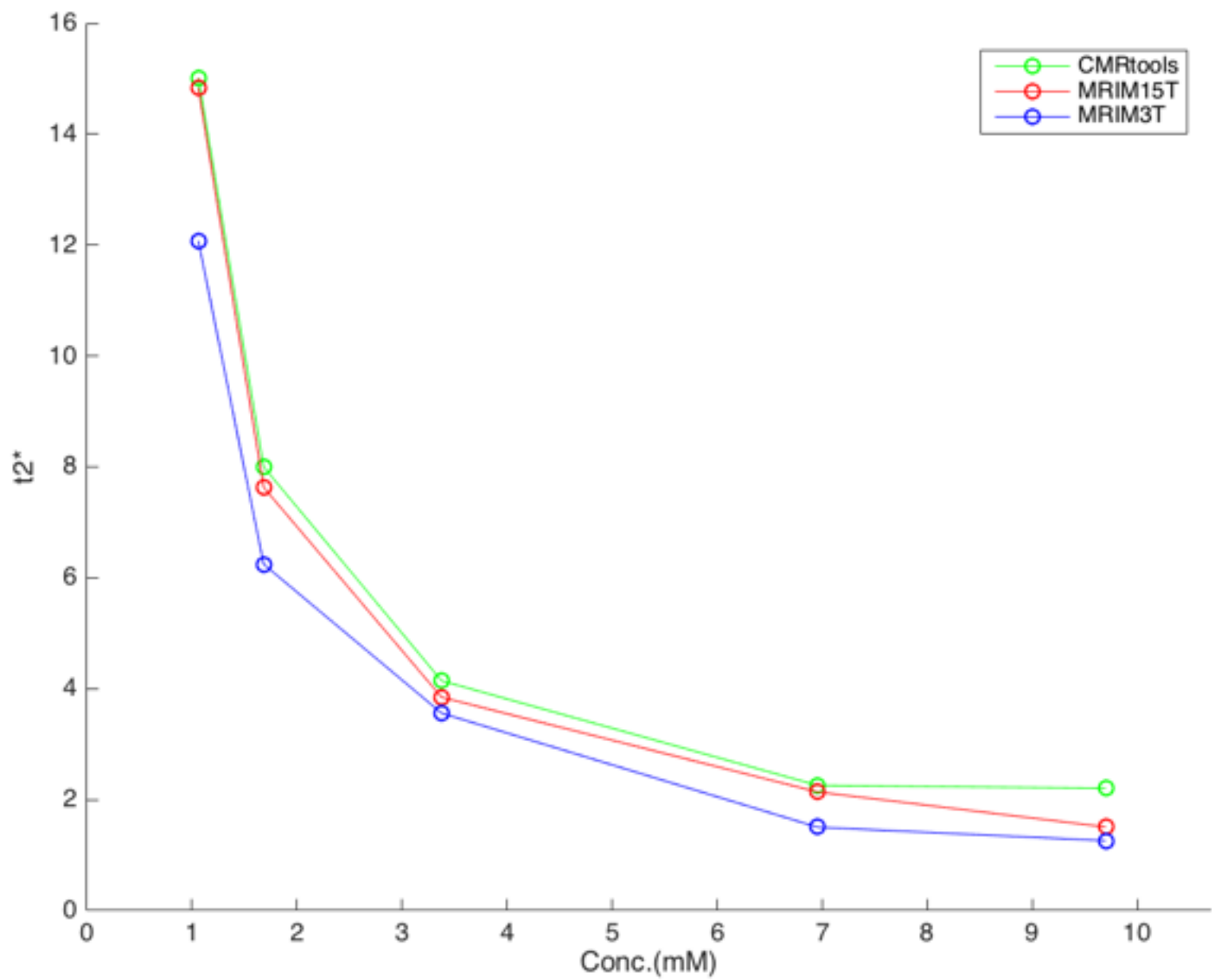


| position | T2* mean value |        |        | Conc.  |
|----------|----------------|--------|--------|--------|
|          | CMRtools       | 1.5T   | 3T     |        |
| 1        | 7.891          | 7.695  | 6.714  | 0.505  |
| 2        | 4.077          | 3.827  | 3.461  | 0.789  |
| 3        | 2.182          | 1.973  | 1.382  | 1.413  |
| 4        | 13.791         | 1.518  | 1.206  | 2.470  |
| 5        | 87.078         | 0.549  | 0.549  | 5.059  |
| 6        | 10.179         | 9.854  | 9.423  | 0.871  |
| 7        | 4.727          | 4.500  | 3.889  | 1.761  |
| 8        | 2.487          | 2.380  | 1.887  | 3.584  |
| 9        | 1.633          | 1.223  | 1.058  | 6.387  |
| 10       | 50.522         | 0.736  | 0.570  | 12.421 |
| 11       | 15.017         | 14.832 | 12.076 | 1.060  |
| 12       | 7.997          | 7.628  | 6.243  | 1.682  |
| 13       | 4.142          | 3.844  | 3.558  | 3.375  |
| 14       | 2.256          | 2.137  | 1.501  | 6.956  |
| 15       | 2.205          | 1.505  | 1.258  | 9.698  |



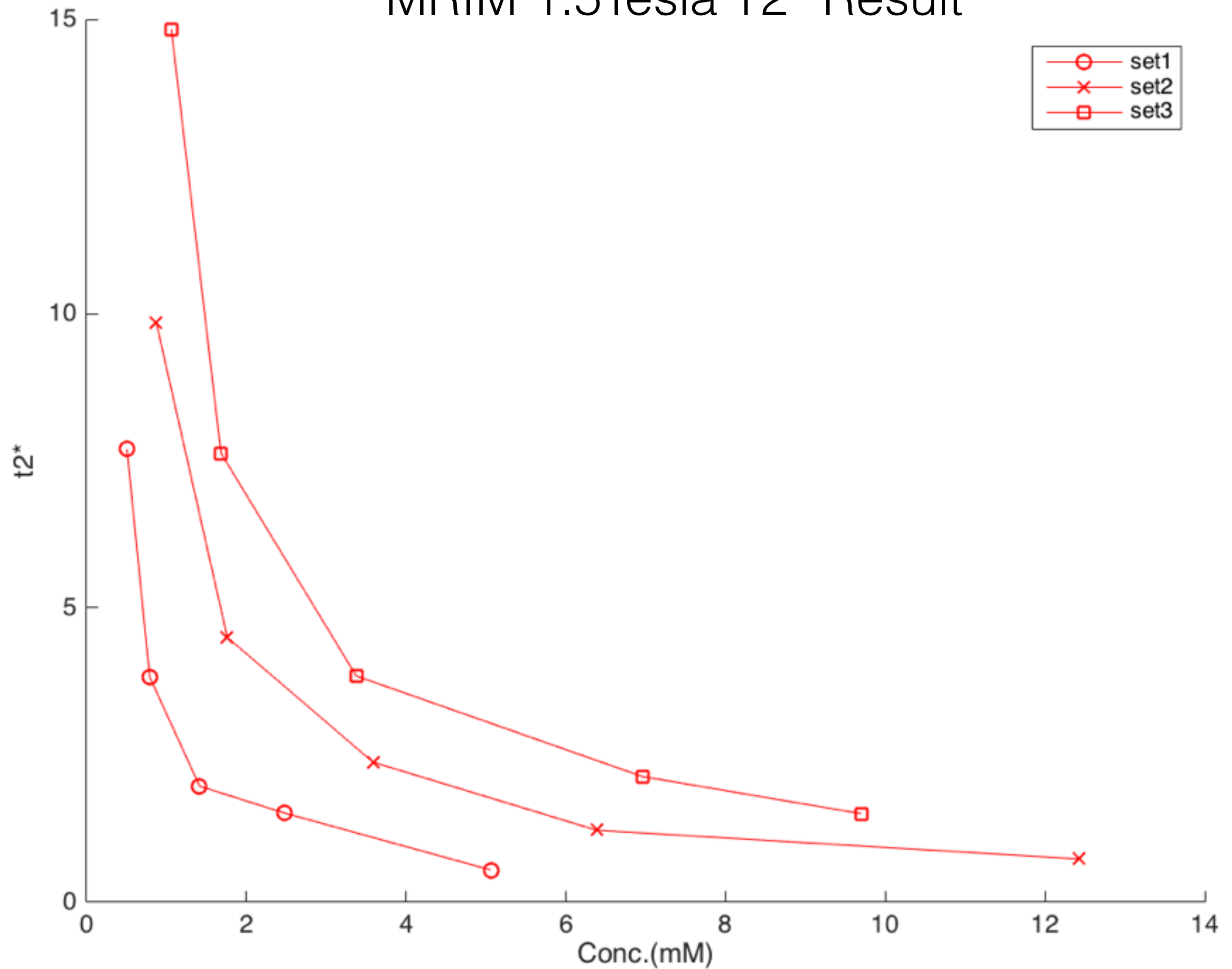
| position | T2* mean value |        |        | Conc.  |
|----------|----------------|--------|--------|--------|
|          | CMRtools       | 1.5T   | 3T     |        |
| 1        | 7.891          | 7.695  | 6.714  | 0.505  |
| 2        | 4.077          | 3.827  | 3.461  | 0.789  |
| 3        | 2.182          | 1.973  | 1.382  | 1.413  |
| 4        | 13.791         | 1.518  | 1.206  | 2.470  |
| 5        | 87.078         | 0.549  | 0.549  | 5.059  |
| 6        | 10.179         | 9.854  | 9.423  | 0.871  |
| 7        | 4.727          | 4.500  | 3.889  | 1.761  |
| 8        | 2.487          | 2.380  | 1.887  | 3.584  |
| 9        | 1.633          | 1.223  | 1.058  | 6.387  |
| 10       | 50.522         | 0.736  | 0.570  | 12.421 |
| 11       | 15.017         | 14.832 | 12.076 | 1.060  |
| 12       | 7.997          | 7.628  | 6.243  | 1.682  |
| 13       | 4.142          | 3.844  | 3.558  | 3.375  |
| 14       | 2.256          | 2.137  | 1.501  | 6.956  |
| 15       | 2.205          | 1.505  | 1.258  | 9.698  |

set3

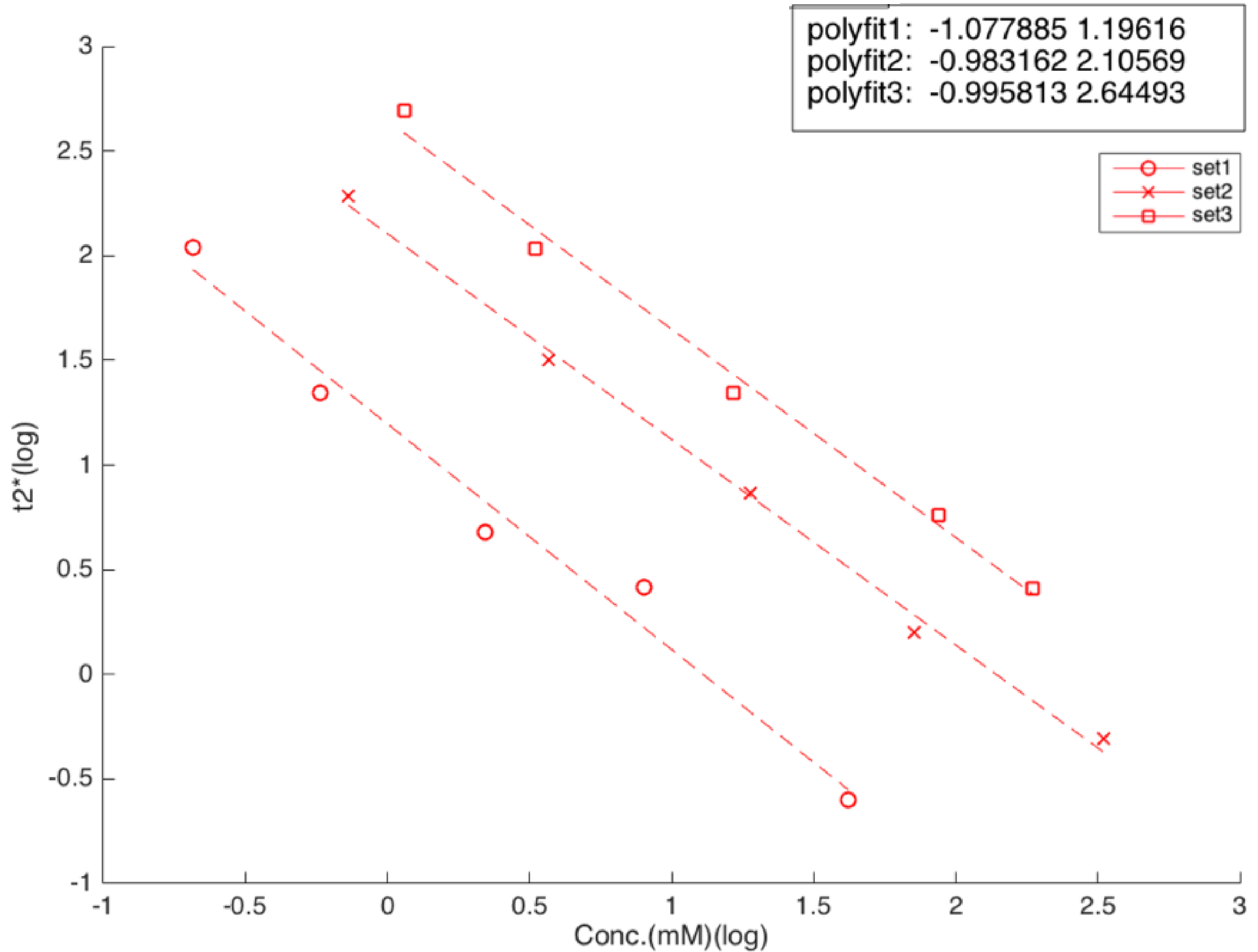




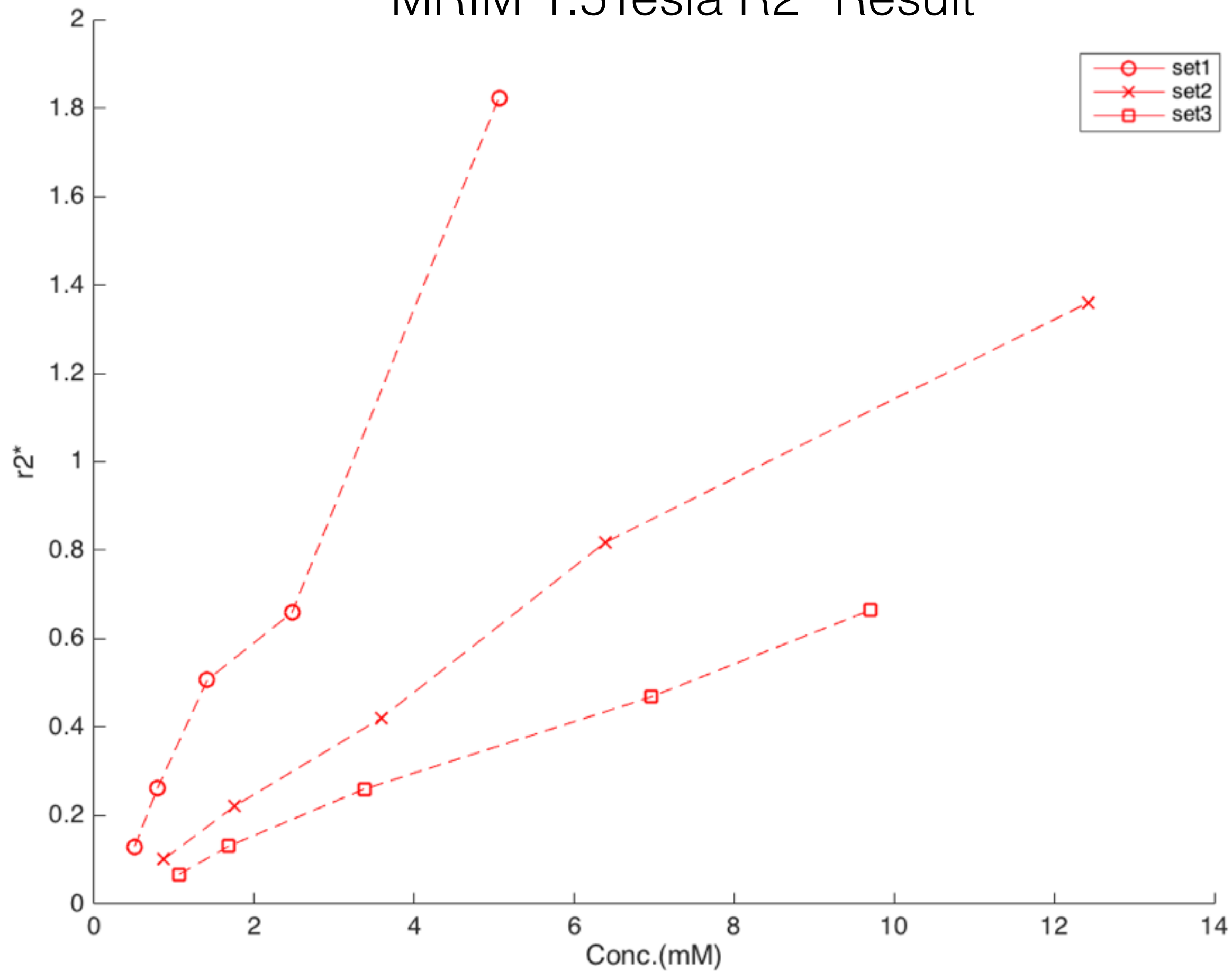
# MRIM 1.5Tesla T2\* Result



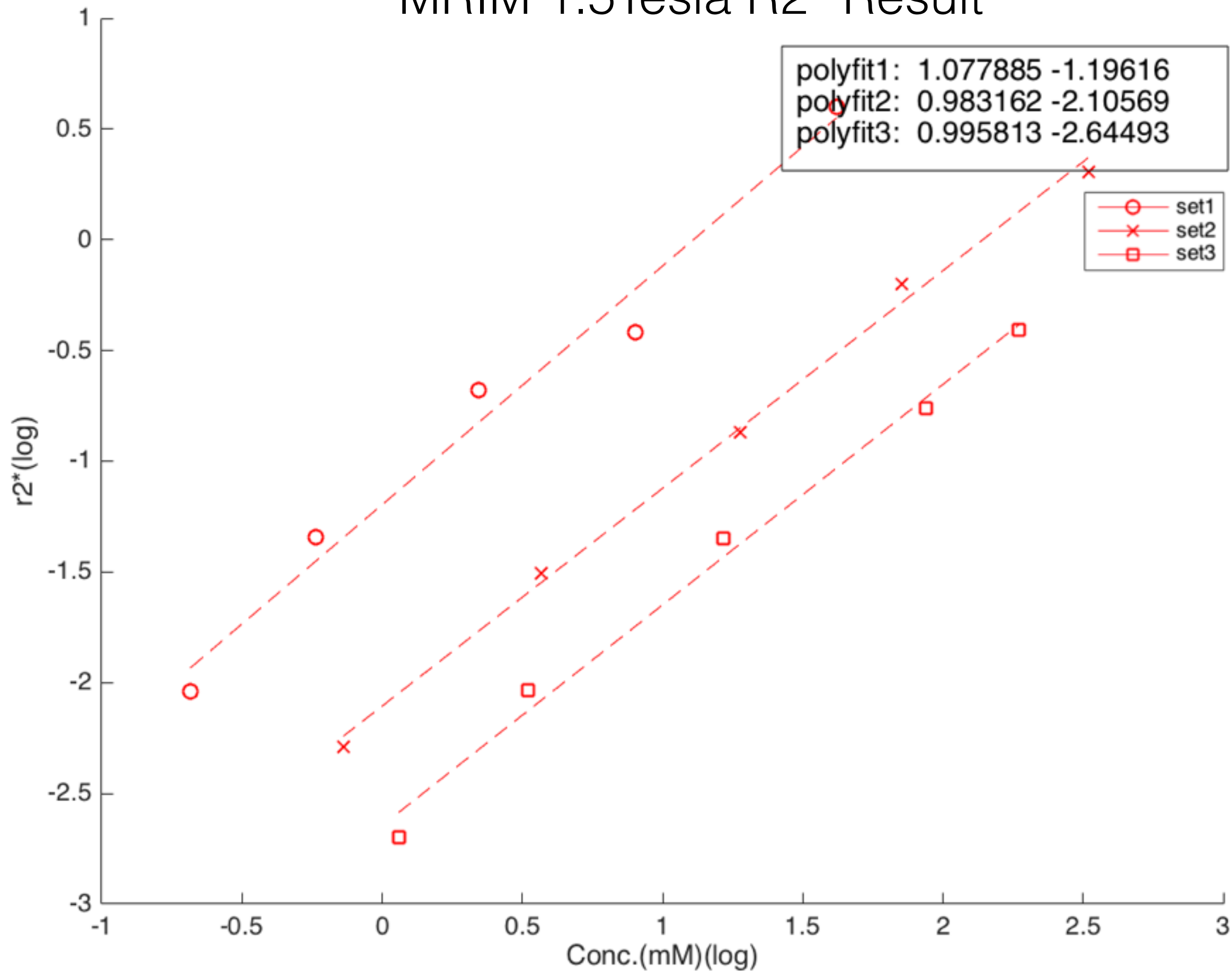
# MRIM 1.5Tesla T2\* Result



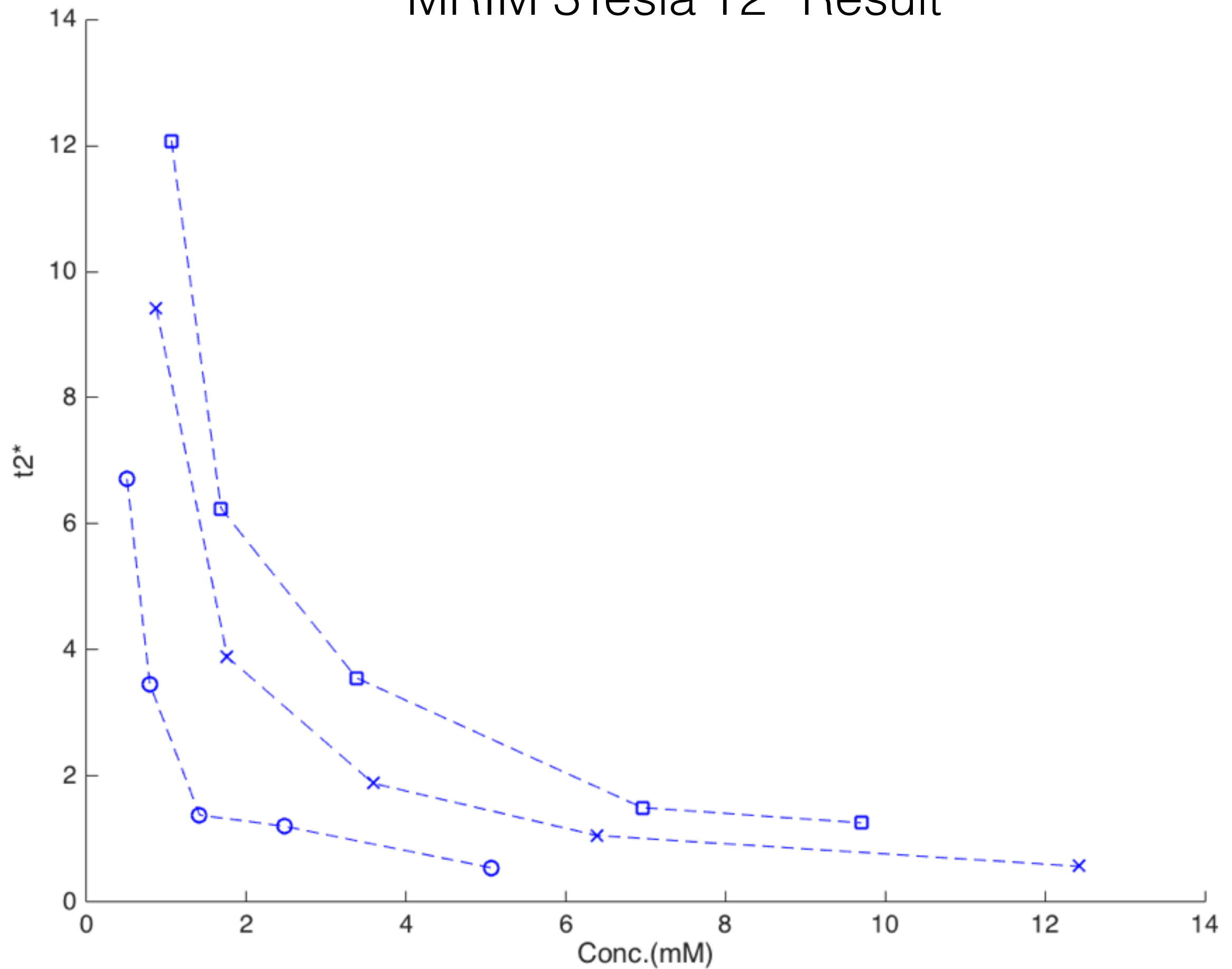
# MRIM 1.5Tesla R2\* Result



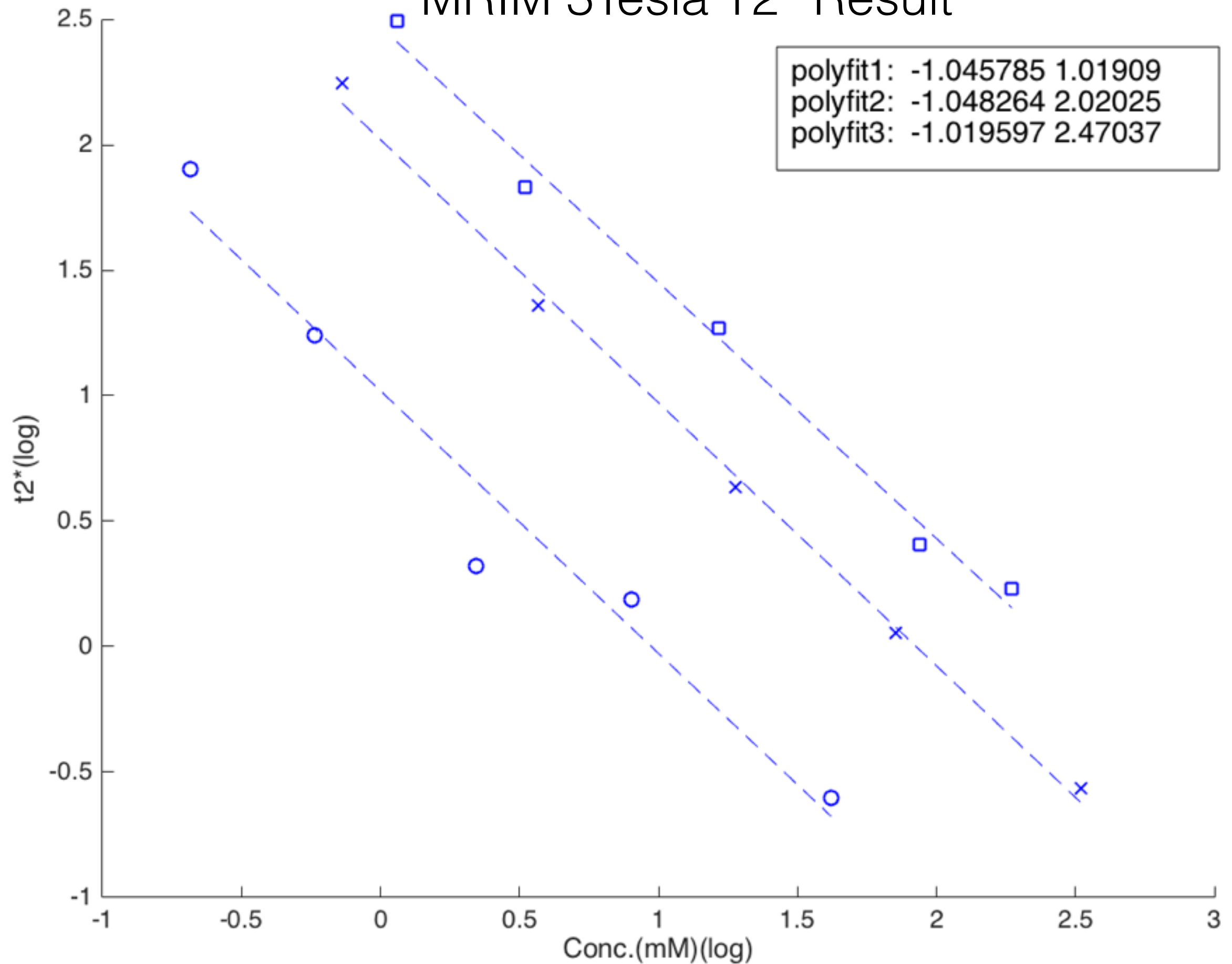
# MRIM 1.5Tesla R2\* Result



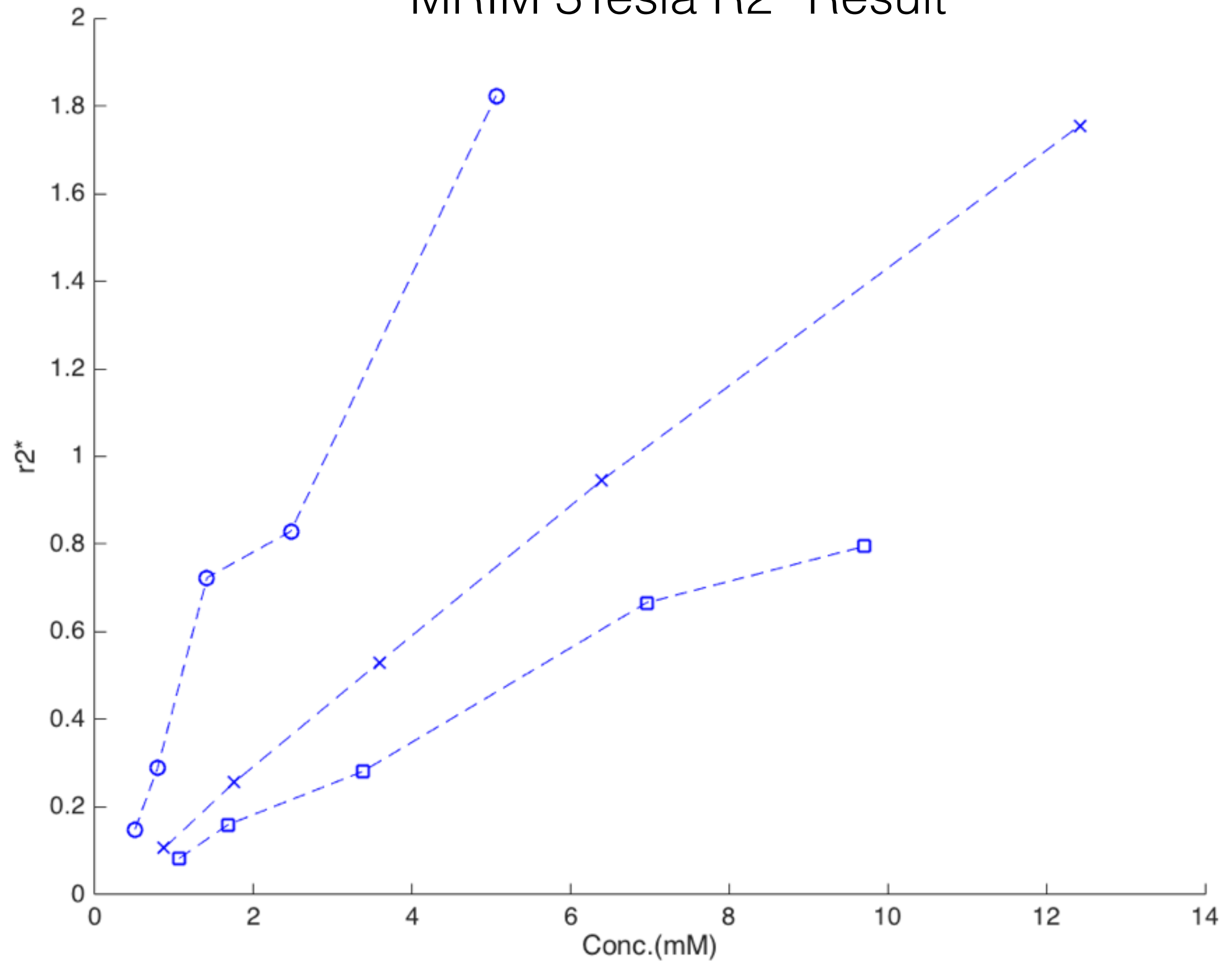
# MRIM 3Tesla T2\* Result



# MRIM 3Tesla T2\* Result



# MRIM 3Tesla R2\* Result



# MRIM 3Tesla R2\* Result

