

Feature Selective Validation (FSV) For Comparison and Validation of Data Sets

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How Good is the Agreement?

- “I know it when I see it”
- Very subjective
- Feature Selective Validation (FSV)
attempts to respond similar to an “expert”
 - Provides different levels of information
 - FSV compared well to a survey of “experts”

Feature Selective Validation (FSV) Technique

- Developed to better match human experts
- Included in IEEE Standard 1597
- Better than simple subtraction when data not 100% aligned
- Free software available
 - http://ing.univaq.it/uaqemc/FSV_4_0_3L//

Feature Selective Validation (FSV)

- **Amplitude Difference Measure (ADM)**
 - Shows agreement of overall trends
- **Feature Difference Measure (FDM)**
 - Shows agreement of rapidly changing features
- **Global Difference Measure (GDM)**
 - Overall comparison – combination of ADM and FDM

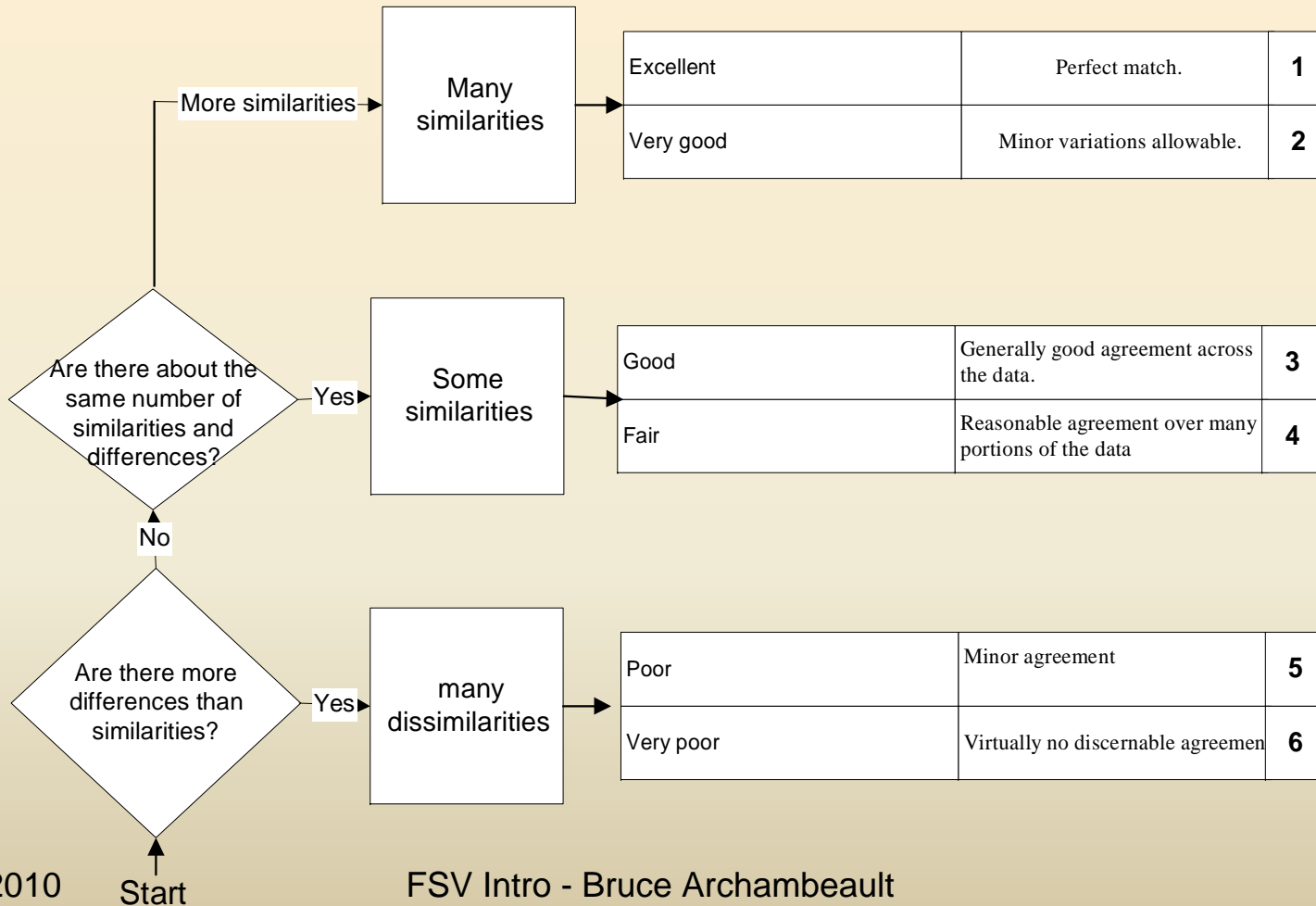
FSV Scale

Adequacy of comparison
or required visual compensation

Characteristics

Descriptor

Quality of comparison



FSV Results

- Many different results can be used as appropriate for two data sets
- A/F/GDMi
 - Point by point comparison
- A/F/GDMc
 - Confidence histogram showing % in each category of agreement
- **GRADE & SPREAD**

Ways to Measure 'Goodness'

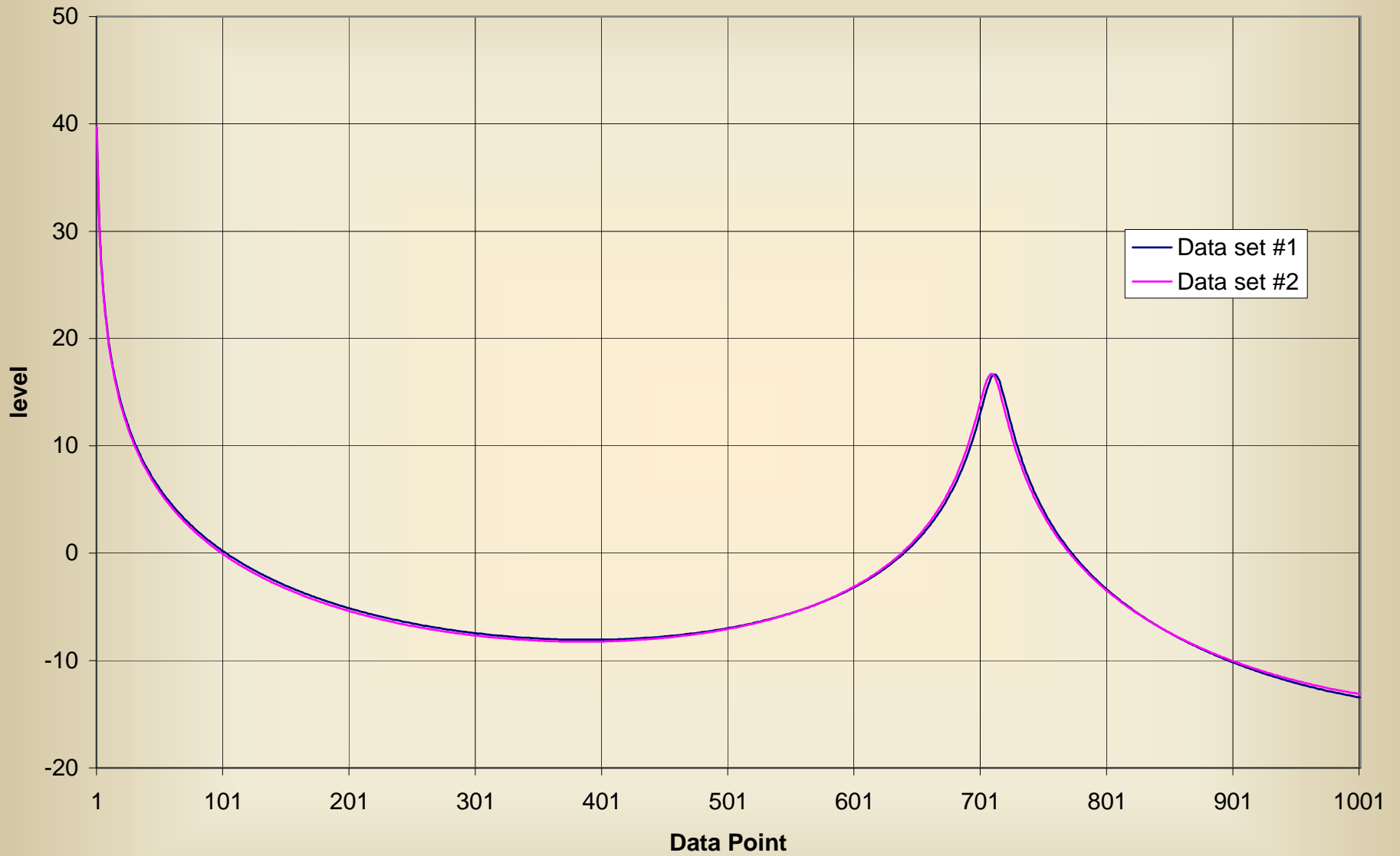
- **Spread**

- Starting with highest category in histogram, determine how many categories are needed to have 85%

- **Grade**

- Starting at Excellent in histogram, determine how many categories are needed to have 85%

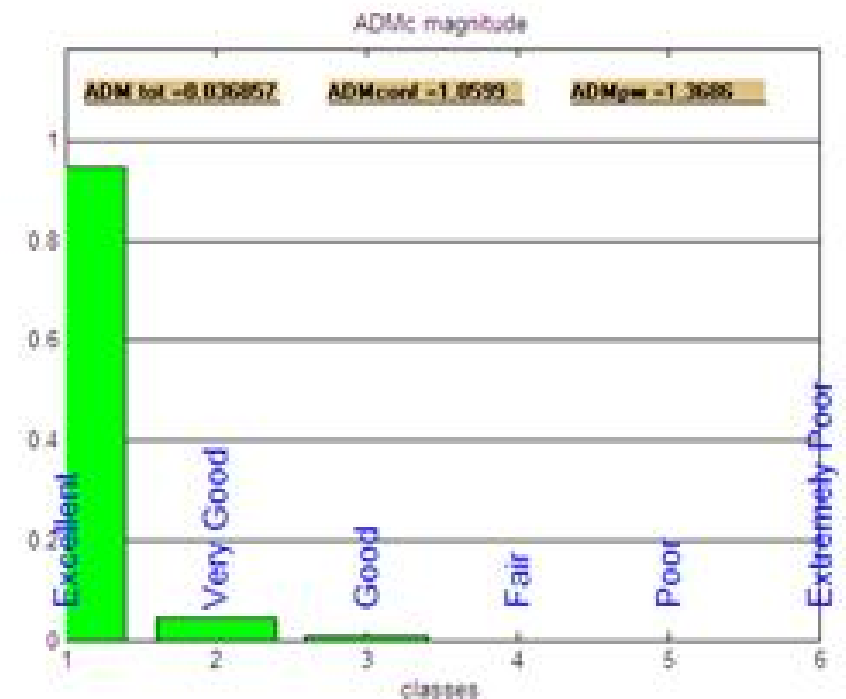
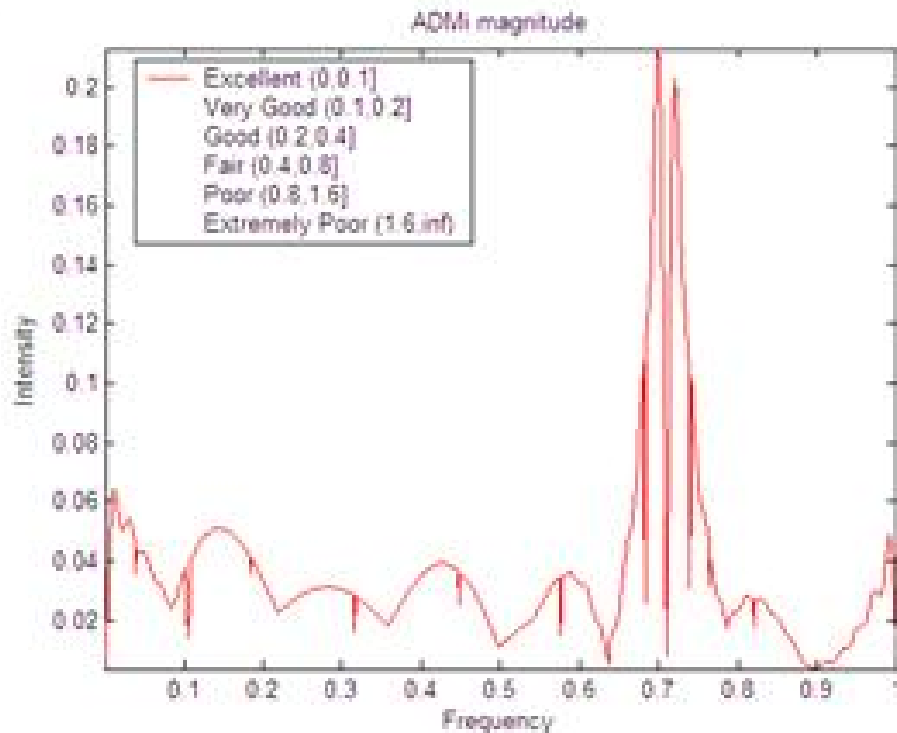
Example #1 for FSV Comparison



ADM Results for Example #1 (GRADE=1, SPREAD=1)

ADM_i

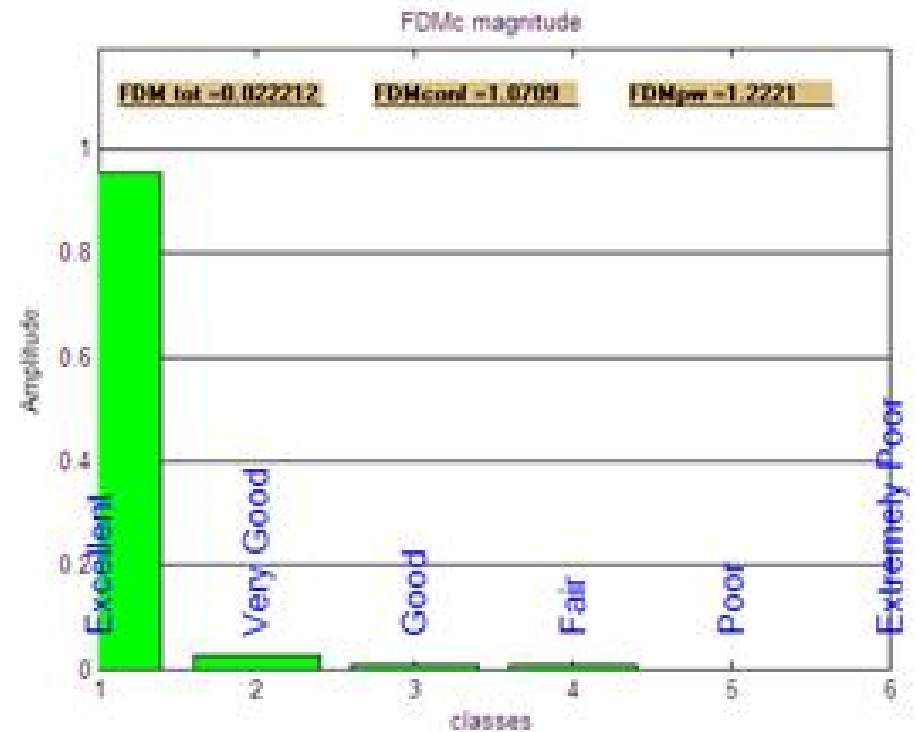
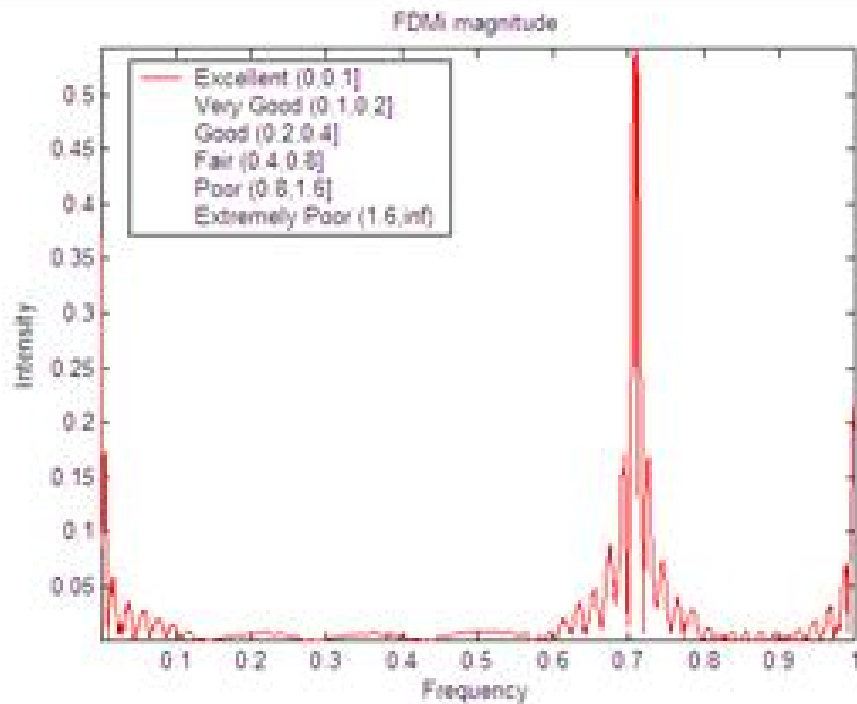
ADM_c



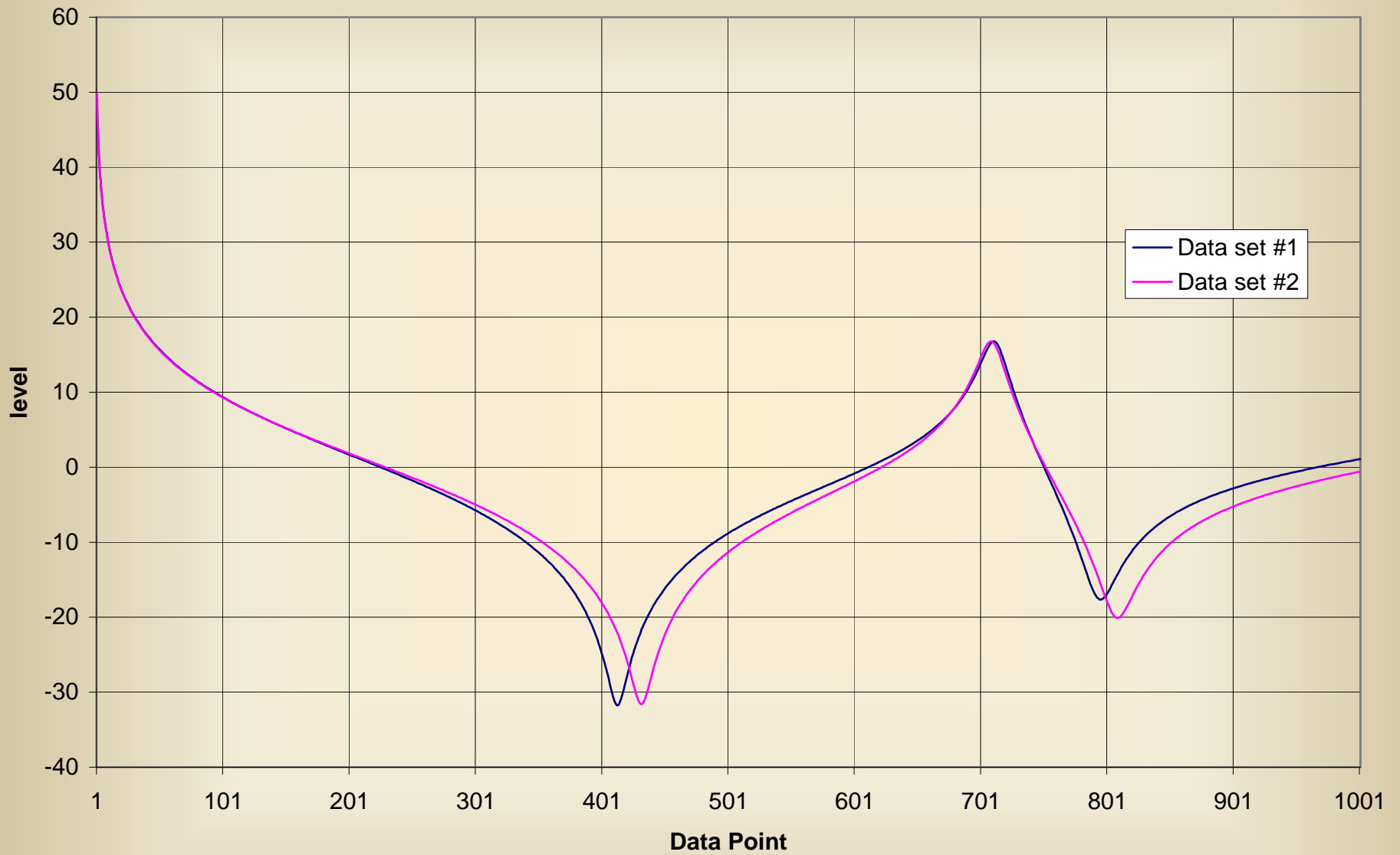
FDM Results for Example #1 (GRADE=1, SPREAD=1)

FDMi

FDMc



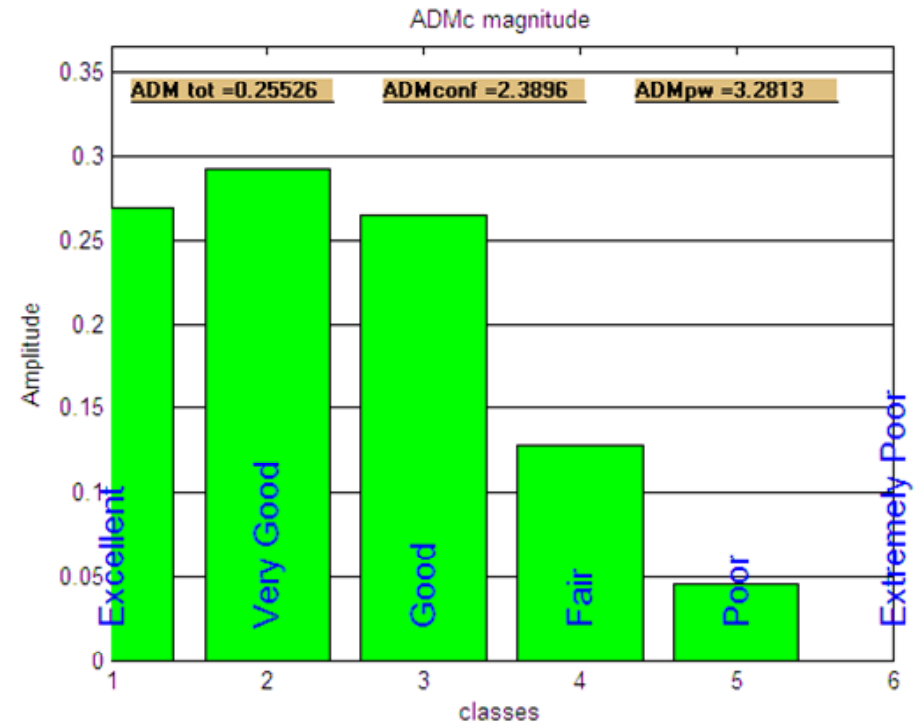
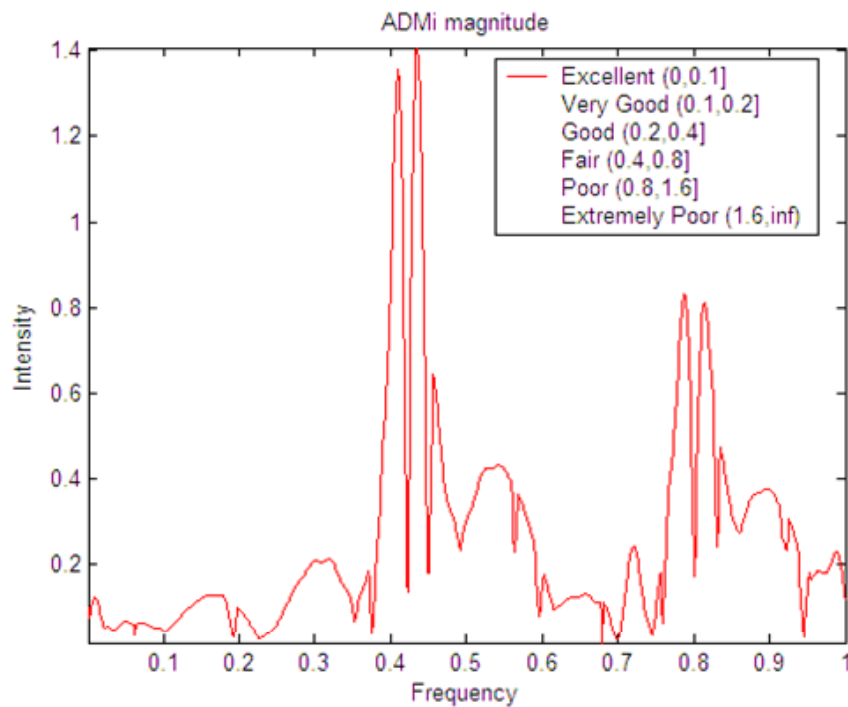
Example #2 for FSV Comparison



ADM Results for Example #2 (GRADE=4, SPREAD=4)

ADM_i

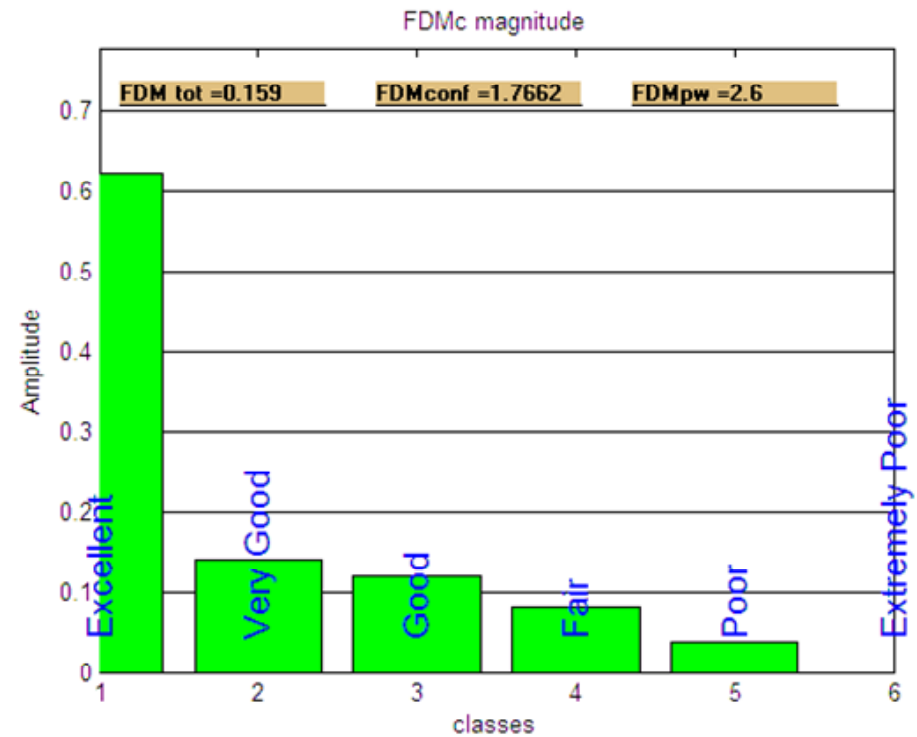
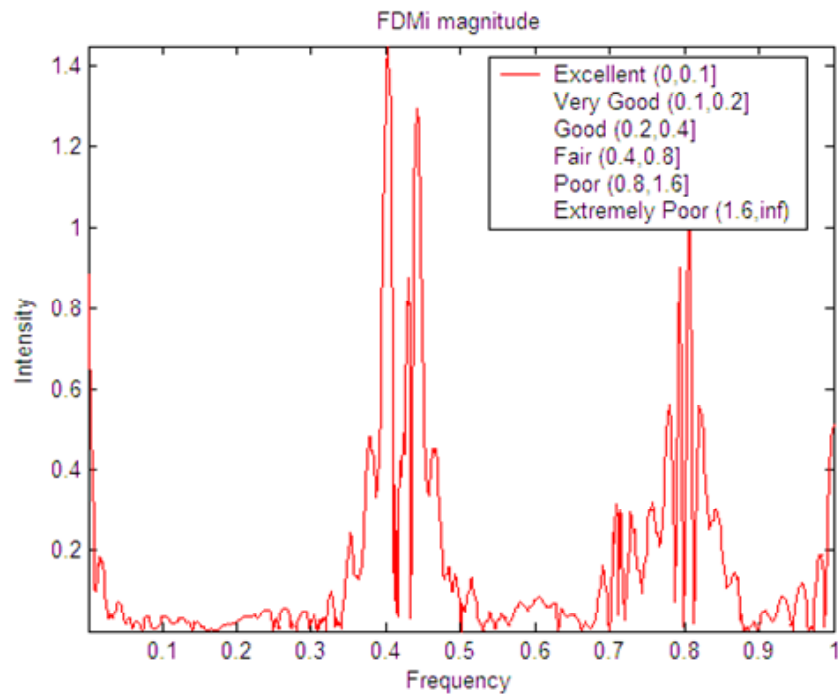
ADM_c



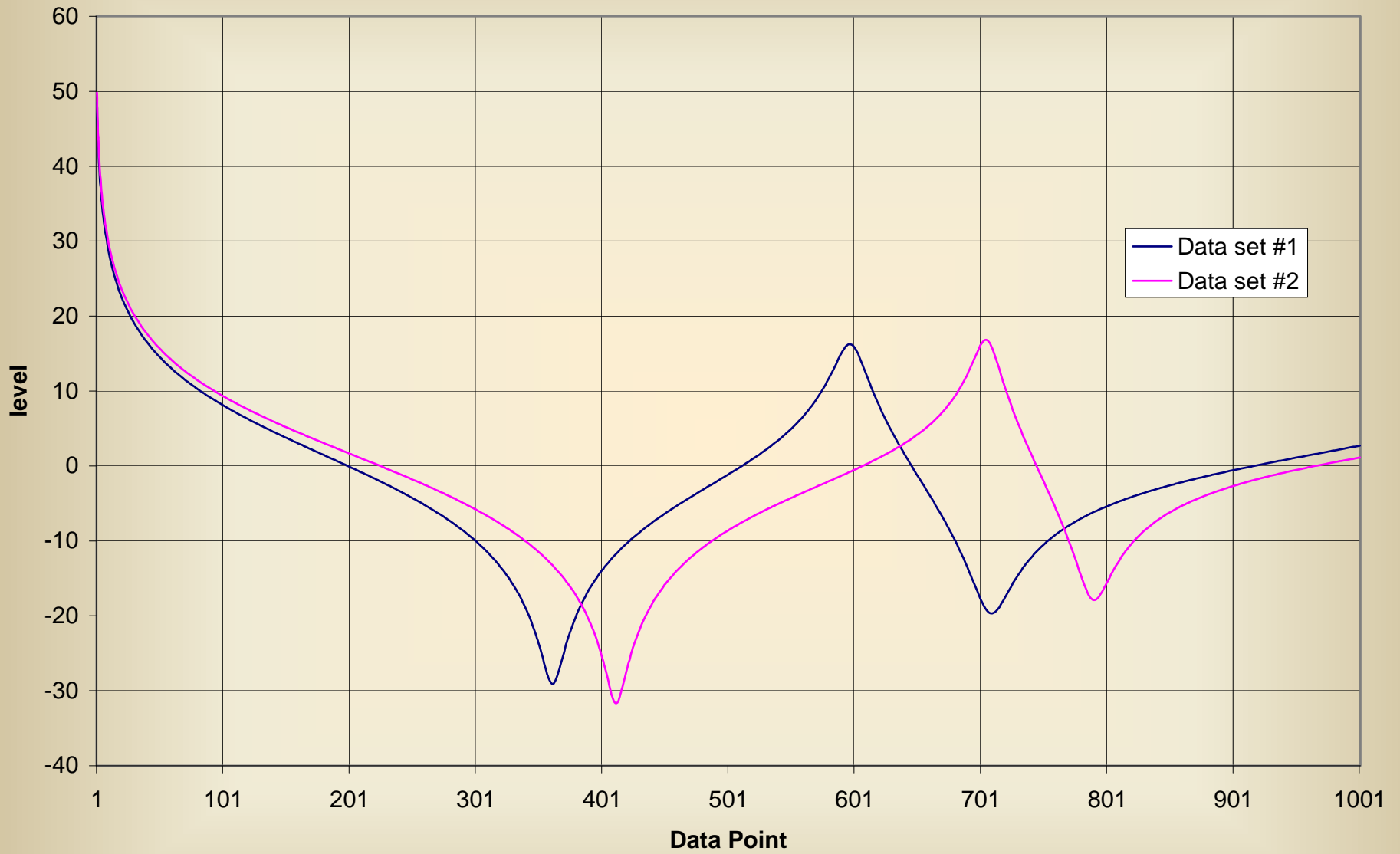
FDM Results for Example #2 (GRADE=3, SPREAD=3)

FDMi

FDMc



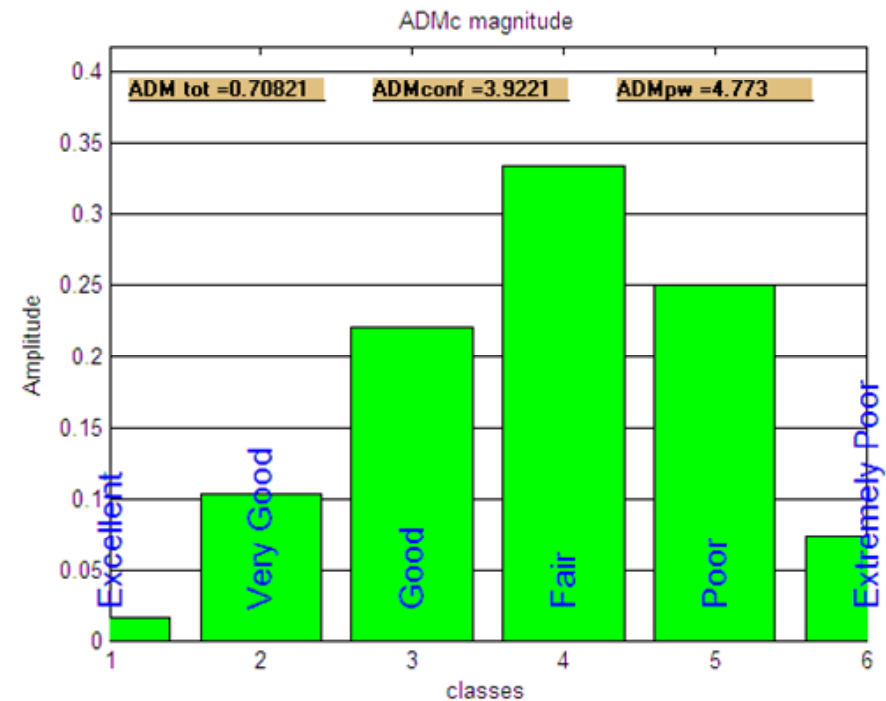
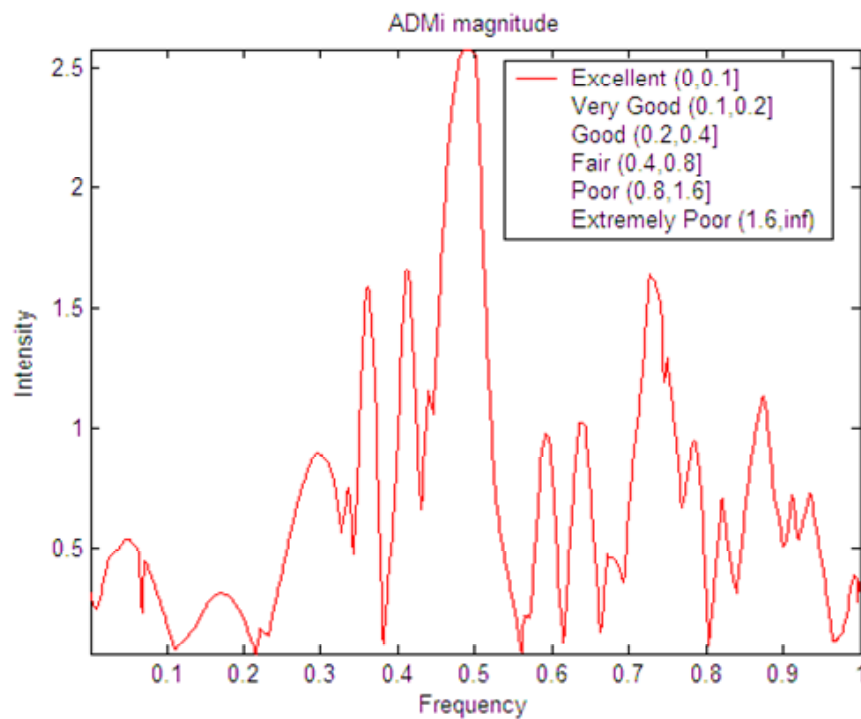
Example #3 for FSV Comparison



ADM Results for Example #3 (GRADE=5, SPREAD=4)

ADM_i

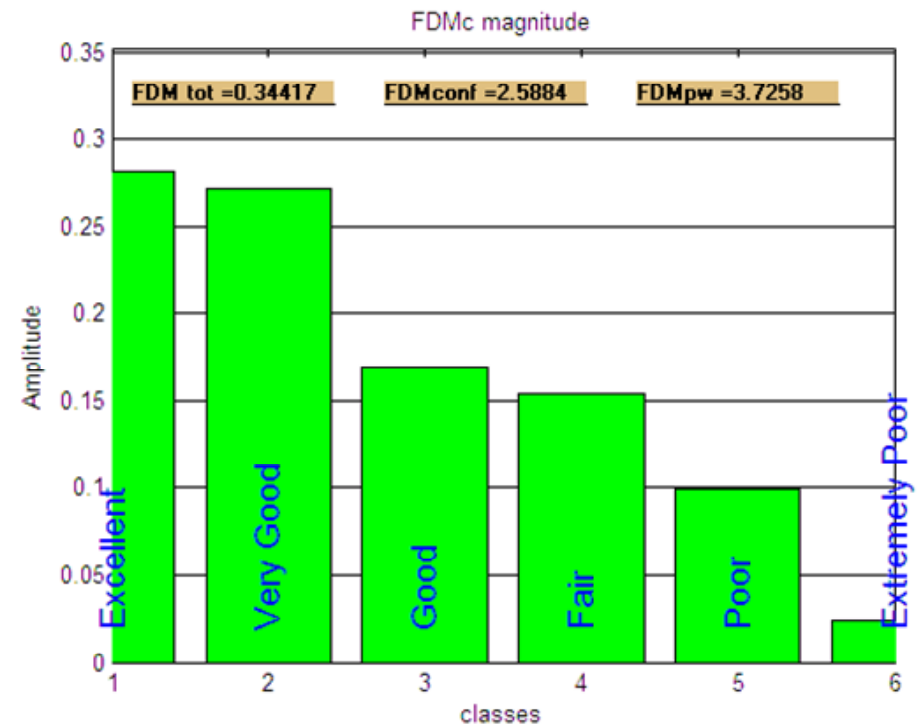
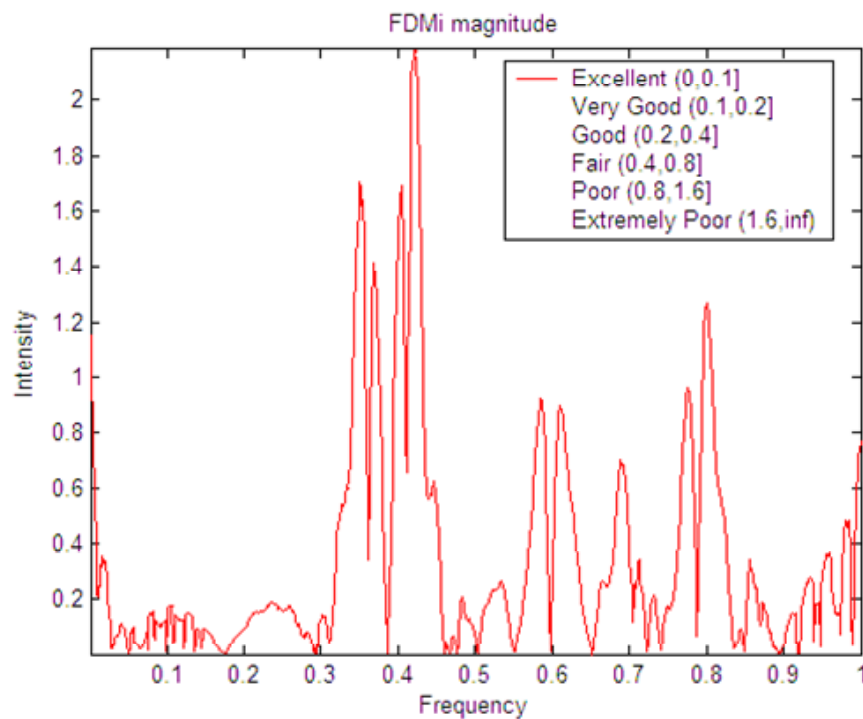
ADM_c



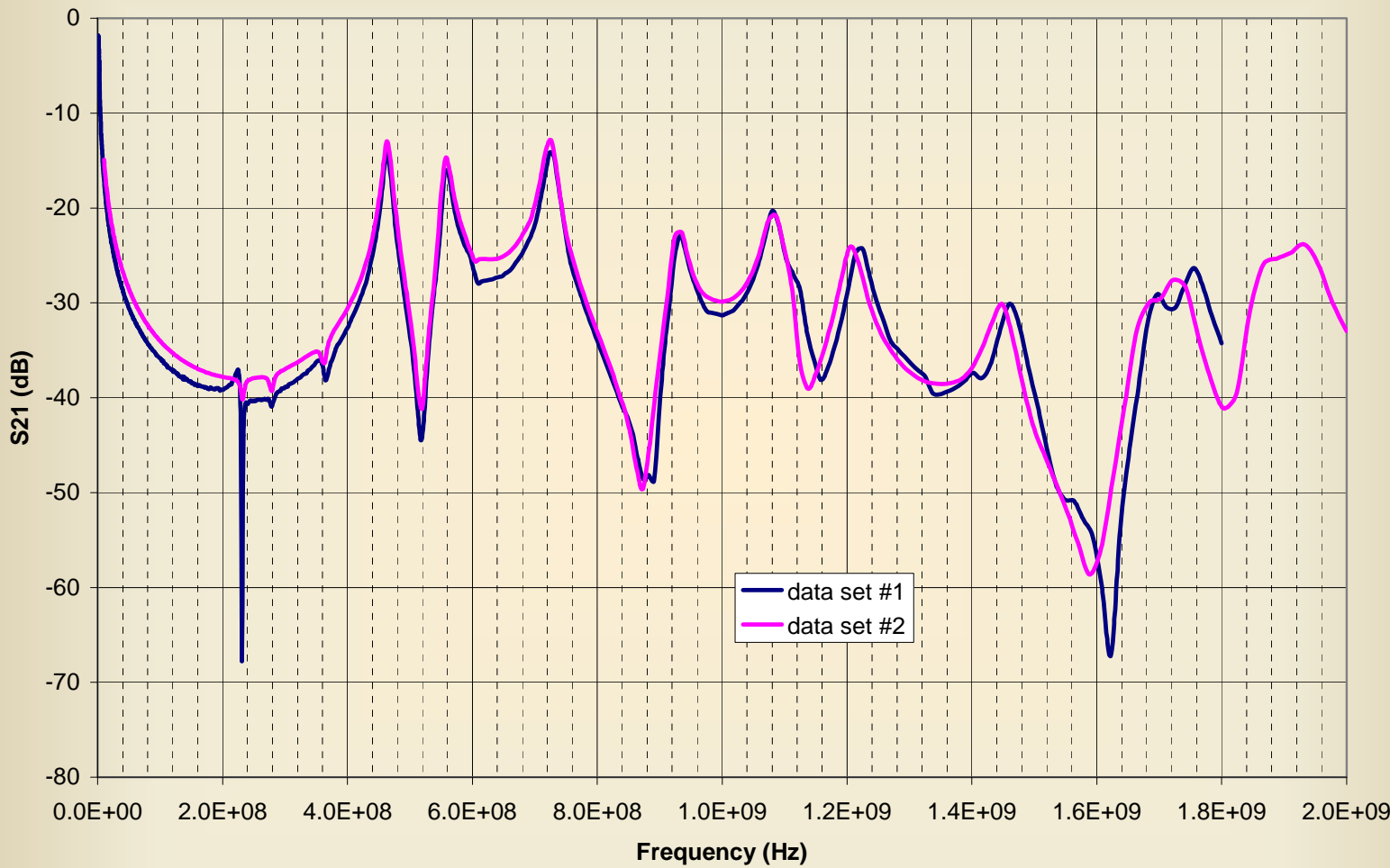
FDM Results for Example #3 (GRADE=4, SPREAD=4)

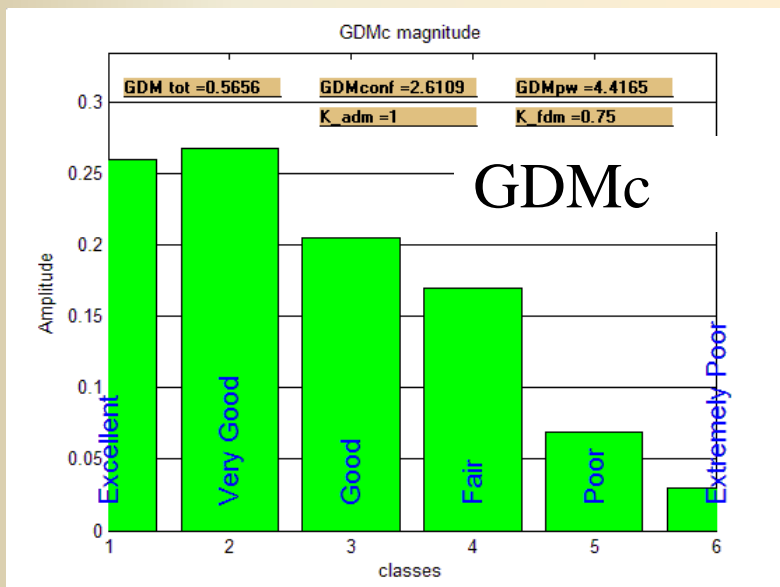
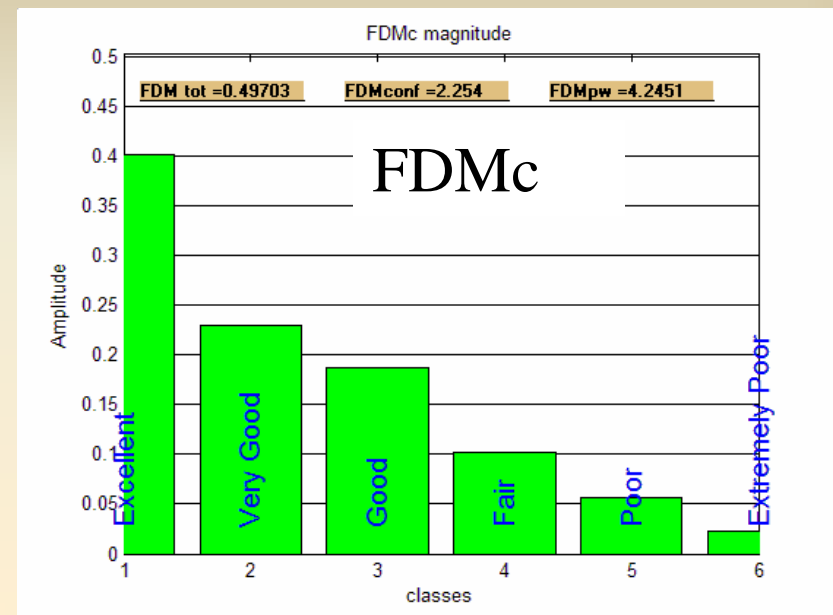
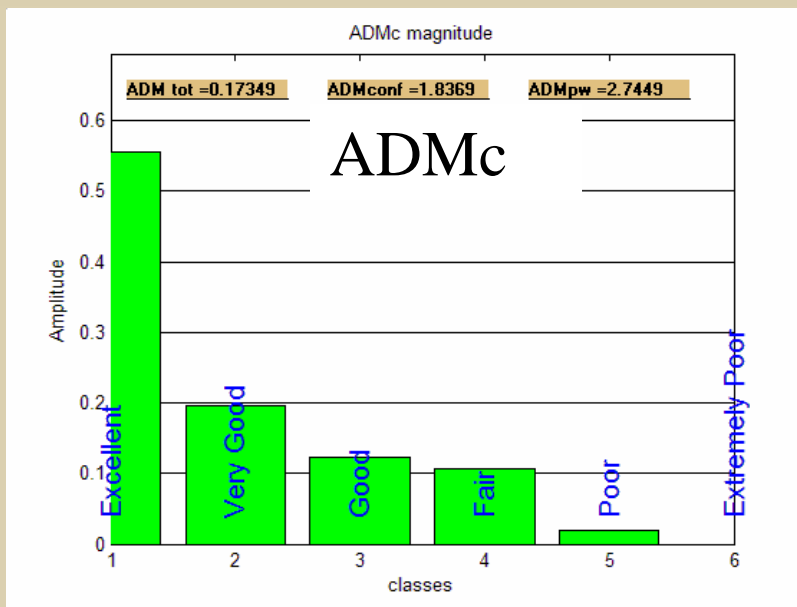
FDMi

FDMc



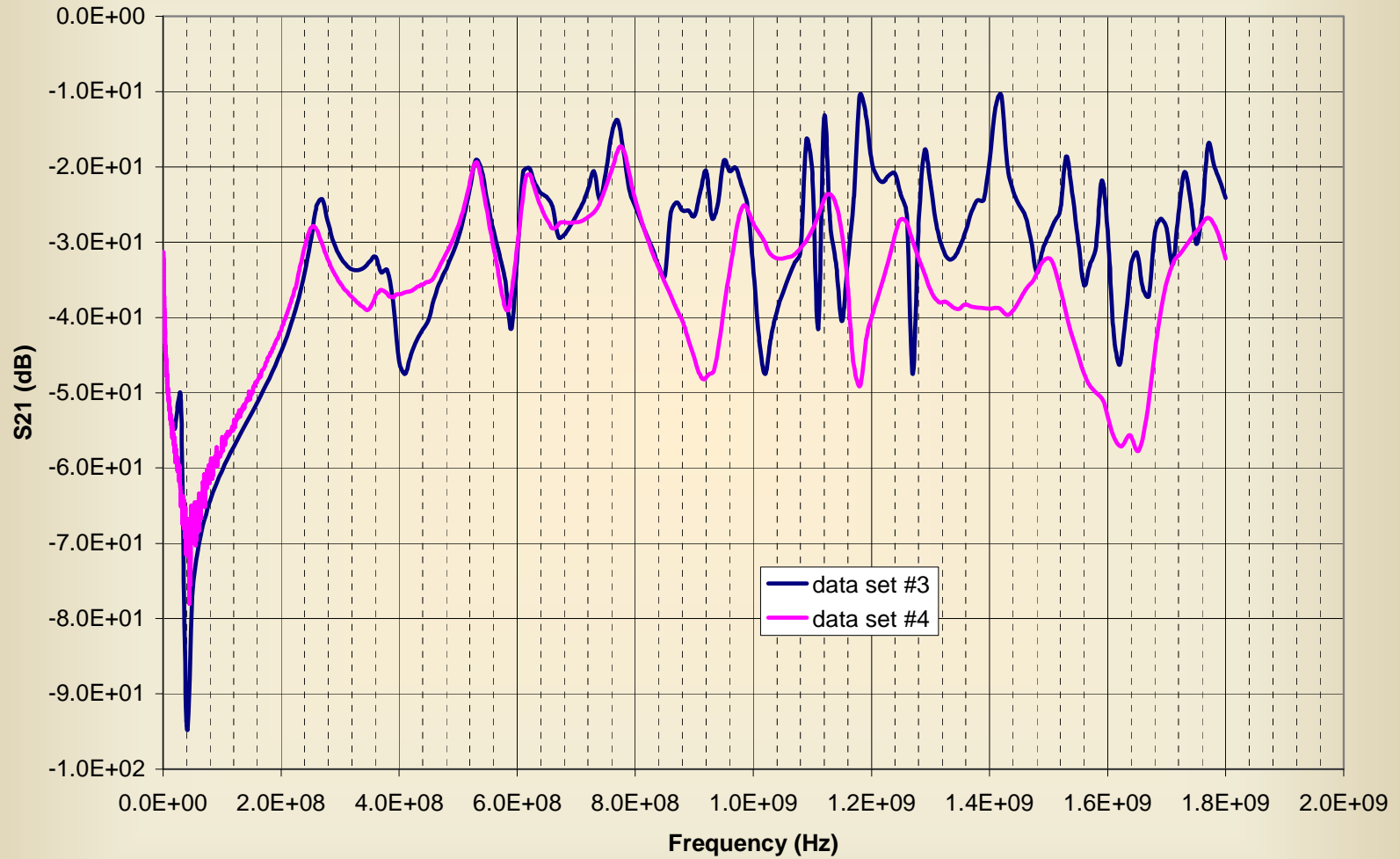
Original Data for FSV Example #1

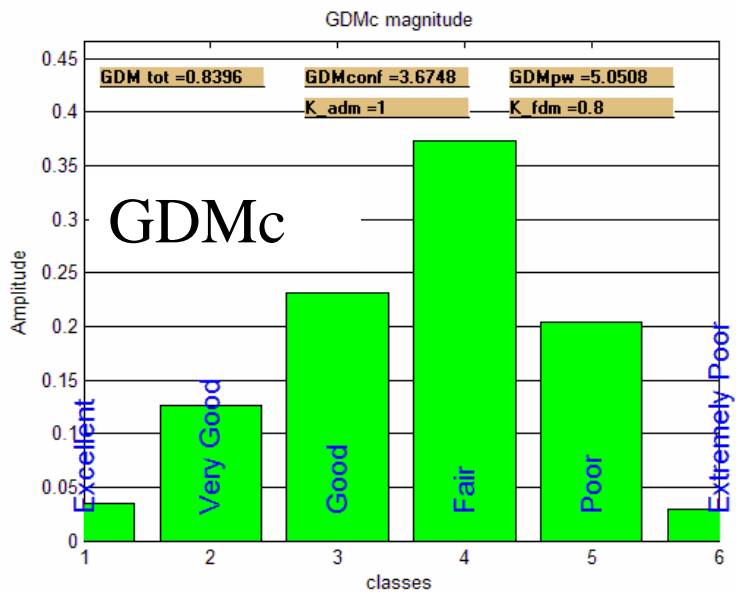
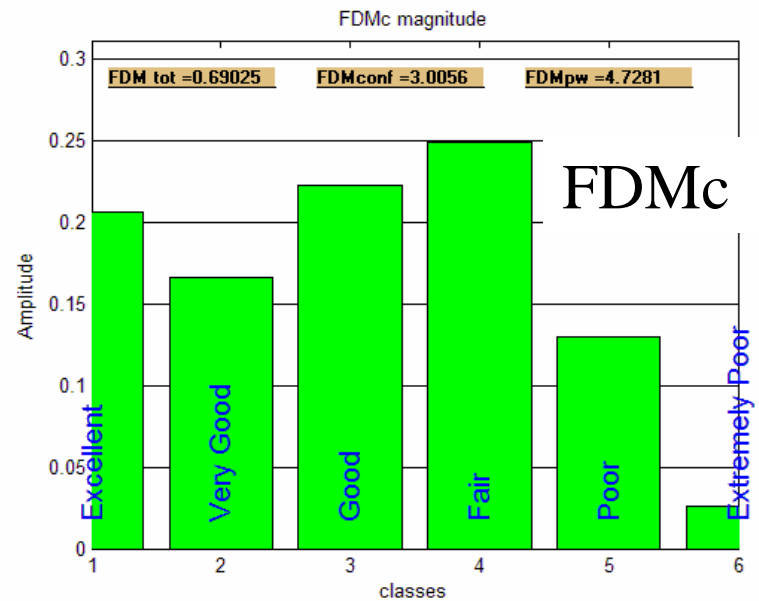
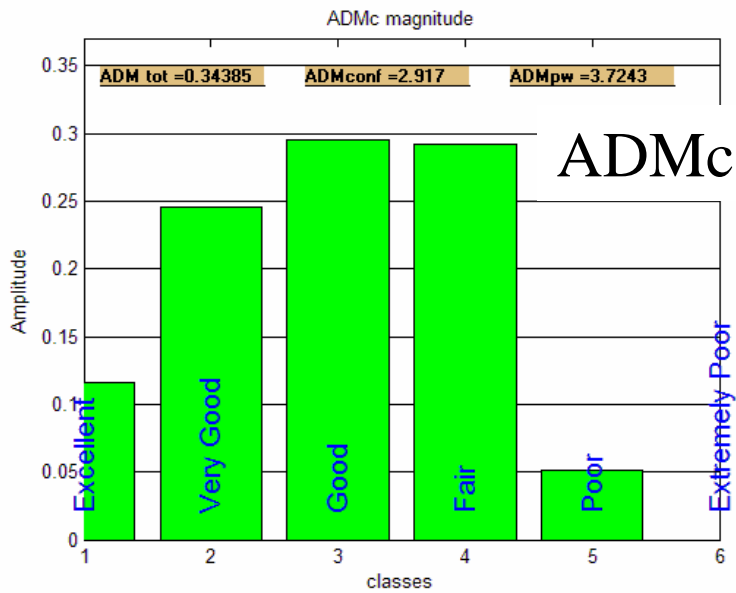




	Grade	Grade Range	Spread	Spread Range
ADM	3	Excellent-Good	3	Excellent-Good
FDM	4	Excellent-Fair	4	Excellent-Fair
GDM	4	Excellent-Fair	4	Excellent-Fair

Original Data for FSV Example #2





	Grade	Grade Range	Spread	Spread Range
ADM	4	Excellent-Fair	4	Excellent-Fair
FDM	5	Excellent-Poor	5	Excellent-Poor
GDM	5	Excellent-Poor	4	Very Good-Poor

Grade & Spread Interpretations

GRADE Number	SPREAD Number	Meaning
Low (1-2)	Low (1-2)	Very Good to Excellent agreement
Low (1-2)	Medium (3-4)	Good to Very Good agreement
Low (1-2)	High (5-6)	Unlikely to occur
Medium (3-4)	Low (1-2)	Fair to Good agreement
Medium (3-4)	Medium (3-4)	Poor to Good agreement
Medium (3-4)	High (5-6)	Very Poor to Very good agreement
High (5-6)	Low (1-2)	Very Poor to Poor agreement
High (5-6)	Medium (3-4)	Very Poor to Good agreement
High (5-6)	High (5-6)	Very Poor to Very Good agreement

FSV Summary

- General FSV information
 - <http://www.ewh.ieee.org/cmte/tc9/>
 - <http://www.eng.dmu.ac.uk/FSVweb/>
- FSV Tool available for download
 - University of L'Aquila
 - **http://ing.univaq.it/uaqemc/FSV_4_0_3L/**
- FSV provides information on:
 - Overall trends (ADM)
 - Rapidly varying features (FDM)
 - Combination (GDM)
- Can be used as:
 - Point-by-point comparison
 - Overall average
 - Confidence level

Validation Summary

- Three different levels of validation
- Most important to practicing engineer is specific model validation
- Intermediate results and different simulation technique are the best source of validation
- Use other approaches as desired
- BEWARE of measurement comparison
- **NEVER TRUST** a single model result!

Validation Summary (2)

- It is not sufficient to simply 'believe' the results are correct
- Previous model validation on different problems does not guarantee results from new models
- GIGO applies!!!
- Need to understand the physics of the problem
- Need to understand the limitations of the modeling technique and software tools