FIDE ETHICS COMMISSION

MOTIVATION

in re:

CASE NO: 8/2015 : **ALLEGED CHEATING BY Mr IVAN TETIMOV (BUL) - BENIDORM 2014**

CASE NO: 2/2016 : **ALLEGED CHEATING BY Mr ARCANGELO RICCIARDI (ITA) - IMPERIA OPEN, 2015**

1. **Introduction:**

    1.1. This is the combined motivation for the decisions of the FIDE Ethics Commission ("**EC**") in case numbers 8/2015 and 2/2016.

    1.2. These decisions, dealing with the problem of computer-aided cheating in chess, are ground-breaking. Not only were they the first cases in FIDE's disciplinary regime where statistical evidence of the probability of cheating was taken into account at all, but, as will be seen hereunder, the statistical evidence was indeed found to be of decisive significance for the outcome of the cases. In other words, without the EC's reliance on the statistical evidence, the degree of certainty about the respondents' guilt required for a conviction might not have been reached.

1.3. The decisions further create a precedent for the acceptability, within FIDE's disciplinary regime, of the **Regan statistical model** and recognise the invaluable work which Professor Kenneth Regan of New York, USA has done in the past ten years to establish a scientific approach, and to develop a specific methodology, for the reliable use of statistical evidence for cheating-detection in chess.

1.4. As such, the reasoning and conclusions in these two cases set a standard for the EC's future treatment of computer-assisted cheating cases in circumstances where the physical or observational evidence on their own may be insufficient for a guilty verdict.

2. **Background:**

2.1. Cheating in chess can occur in many forms, for example, collusion with spectators or other players, assistance by chess engines and rating manipulation by practices of "sandbagging" and the filing of false tournament reports.

2.2. The biggest threat, because of the extent of the advantage obtained and the potential difficulty of detection, must surely be the use of technology for purposes of cheating. This form of cheating can take place in a tournament situation by way of direct access by the player to an electronic device loaded with chess software, or in communication with an accomplice who operates the chess program remotely. The Ethics cases

of Vermeulen (6/2014) and Nigalidze (7/2015) are examples of the first type. The case of Feller (2/2011) is a hybrid one where the chess engine's moves were signalled to the player by an intermediary present on the playing floor.

2.3.   Since the mid 1970's chess-playing computers or software have been accessible to the average consumer. Today there are many chess engines that can be downloaded from the Internet and used on an individual's smartphone, personal computer or other electronic device. The best of these chess engines (with ratings in the range between 3000 and 3400) are stronger today than the best human chess player (rated about 2830 in standard chess).

2.4.   Chess engines will continue to improve until reaching an ELO rating level of about 3600, the level of perfect play, according to Prof Regan's model. Accordingly, players today are inclined to treat chess engines as analytical tools rather than opponents.

2.5.   Computer chess engines are also used in an endeavour to detect the use of computer-assistance by a player in a tournament game. Games can be analysed after the fact to give a probabilistic determination on whether a player received surreptitious help. However, mere correspondence with the chess engine's top move choices (move-matching) does not prove cheating. As explained by Prof Regan, different chess positions have different character. Some positions have just a single

move for one to stay in the game or a single move to keep one's advantage. When that is the case, a strong chess player is highly likely to find such a move, as will the computer – and there will thus be a match. Given the forcing nature of the position, or the existence of well-known theory of an opening, a high correspondence with the best computer move in each position is of little value on its own.

2.6.   This point is illustrated by the infamous "Toiletgate" scandal in 2006 where Kramnik was accused by Topolov's manager of using computer assistance based upon "*coincidence statistics of the moves of GM Kramnik with recommendations of chess program Fritz 9*". It was pointed out that out of the first five games played in the World Championship, about 78% of Kramnik's moves matched with the first line of Fritz 9. This is a false comparison and is not representative of a scientific approach in the interpretation of these coincidences as most of the relevant 32 moves were completely forced and several other positions had multiple moves of equal-top value.

2.7.   Both Topolov and his manager, Danailov, were subsequently sanctioned by the EC (case no. 4/2006) for making unsubstantiated accusations of cheating.

2.8.   Another case (1/2009) concerned Shakhriyar Mamedyarov making unjustified accusations of cheating against Igor Kurnosov during the Aeroflot Tournament in Moscow 2009. These accusations were

made on the basis that the "*moves from [Kurnosov] were given as first choice by Rybka, which quickly allowed him to win the game*". Mamedyarov was found guilty of a breach of art. 2.2.9 of the FIDE Code of Ethics and sanctioned.

2.9. In promoting a scientific approach, Prof Regan has created a predictive analytic algorithm to help detect cheating in chess. A detailed discussion of Prof Regan's model follows hereunder.

3. **The parties:**

3.1. In case no. 8/2015, the respondent was **Mr Ivan Tetimov** of Bulgaria, born on 17 December 1988 and with FIDE ID. no. 2908719. Mr Tetimov's FIDE rating is 2158.

3.2. In case no. 2/2016, the respondent was **Mr Arcangelo Ricciardi** of Italy, born on 28 June 1978 and with FIDE ID. no. 852384. Mr Ricciardi's FIDE rating is 1868.

3.3. In both cases the complainant was the FIDE Presidential Board.

4. **The complaints and appointment of IC's:**

4.1. On 6 September 2015, and at its meeting in Abu Dhabi, the FIDE Presidential Board referred a complaint against each of Messrs Tetimov and Ricciardi to the EC concerning an alleged violation of clause 2.2.5 of the FIDE Code of Ethics (*Cheating or attempts at cheating during games and tournaments*).

4.2. At the same meeting the Presidential Board nominated an independent investigatory chamber (IC) of the EC to investigate the complaint in Tetimov's case and to report to the EC as envisaged in paragraph 2.5 of Chapter 8 of the FIDE Statutes.

4.3. In **Tetimov's case** the IC consisted of Klaus Deventer (GER) as chairman, Yuri Garrett (ITA) and Andy Howie (SCO).

4.4. On the same occasion the Presidential Board also approved the formation of a standing Anti-cheating Investigatory Chamber with a panel of members. Subsequently, on 13 October 2015, the chairman of the Anti-cheating Committee (as it then was) nominated three members of the panel to investigate the complaint against Ricciardi and report to the EC as envisaged in paragraph 2.5 of Chapter 8 of the FIDE statutes.

4.5. In **Ricciardi's case** the IC was composed of Laurent Freyd (FRA) as chairman, Yuliya Levitan (USA) and Andy Howie (SCO).

5. **The competence of the Ethics Commission:**

5.1. The complaint against **Tetimov** relates to his performance in the International Chess Festival held in Benidorm, Spain in 2014.

5.2. The complaint against **Ricciardi** relates to his performance in the International Chess Festival of Imperia, Italy in 2015.

5.3. Both tournaments were open international tournaments with participants from many countries. The tournaments cannot be described as national events or falling within the exclusive domain of the local chess federations. Cheating at the mentioned tournaments was not a purely internal or domestic matter, as the alleged conduct affected players of various national federations of FIDE. Such conduct would also threaten the integrity of the FIDE rating system as both tournaments were rated by FIDE.

5.4. In addition, in the case of **Tetimov**, the alleged conduct took place by a Bulgarian player in the territory of the Spanish chess federation which does not enjoy powers of discipline over him.

5.5. In the case of **Ricciardi**, although the alleged offence was committed by an Italian player in the territory of the Italian chess federation, and the national federation indeed took disciplinary steps, the sanction imposed by the Italian chess federation is limited to its territorial jurisdiction. FIDE is at liberty to consider the complaint against Mr Ricciardi afresh with a view of imposing a sanction with world-wide force.

5.6. In terms of clause 1.4 of the FIDE Code of Ethics, the Code is applicable *inter alia* to all competitors in FIDE registered tournaments.

5.7.   In the premises, the EC enjoys the necessary competence to receive and adjudicate the complaints in respect of both Tetimov and Ricciardi.

6.   **The EC proceedings:**

6.1.   The EC received the final report of the IC in the **Tetimov** case on 9 November 2015. Mr Tetimov was furnished with a copy thereof and invited to make written submissions to the EC regarding the issue of his guilt or innocence as well as the issue of a suitable sanction.

6.2.   Mr Tetimov replied with a short e-mail statement on 22 November 2015 in which he questioned the assertion of Mr De la Cruz that the latter was unaware of where Reinaldo could be found. Tetimov also accused Mr De la Cruz of a contradiction in his testimony about which ear was checked first.

6.3.   On 10 February 2017, Mr Tetimov was advised of the EC's decision, in terms of Rule 8 of its Procedural Rules, to conduct an oral hearing and that his presence at the hearing was required. The hearing was scheduled to take place on 8-9 April 2017 in Madrid, Spain.

6.4.   Nothing further was heard from Mr Tetimov by the EC, despite a further reminder on 23 March 2017, and he failed to attend the hearing.

6.5.   In the case of **Ricciardi**, the final report of the IC was received on 2 March 2016 and forwarded to Mr Ricciardi with an invitation to him to make written submissions

regarding the issue of his guilt or innocence, as well as the issue of a suitable sanction.

6.6.   The EC received a 5-page defensive statement together with annexures from Mr Ricciardi on 21 April 2016, prepared and co-signed by his lawyers, Mr Ricardo Borasio and Ms Andrea Ventura.

6.7.   On 10 February 2017, notice was given to Mr Ricciardi of the oral hearing scheduled for Madrid, Spain on 8-9 April 2017. It was recorded that the hearing had specifically been arranged to take place in Europe over a weekend in order to facilitate as far as possible, the respondents' presence.

6.8.   On 14 March 2017, attorney Borasio advised that Mr Ricciardi was unable to attend the hearing in Madrid due to financial and economic difficulties. He reiterated the claim of Mr Ricciardi's innocence and offered for Mr Ricciardi to answer the questions of the EC at the headquarters of the Italian Federation in Milan, Italy.

6.9.   A complete bundle of all the documents filed in each of case no. 8/2015 and case no. 2/2016, including the expert's reports, were made available to the respondents in advance of the hearing.

6.10.   The hearing took place on the morning of Sunday, 9 April 2017 at the Ayre Gran Hotel, Colon, Madrid. Both the respondents were absent.

6.11.   The hearing was held to receive the expert evidence of two computer science and mathematics experts in the

persons of Prof Kenneth Regan (USA) and Dr Mark Watkins (AUS):

6.11.1   Prof Regan is an Associate Professor with tenure in Computer Science at the State University of New York at Buffalo, with a doctorate in Mathematics from Oxford University in 1986. His primary research field is Theoretical Computer Science. Regan is also a FIDE International Master.

6.11.2   Dr Watkins obtained his Ph.D. in Mathematics from the University of Georgia in Athens, State of Georgia, USA in the year 2000. He is presently attached to the School of Mathematics, University of Sydney, New South Wales, Australia. His primary research interests lie in Computational and Analytic Number Theory.

6.12.   Prof Regan has been a member of the Anti-cheating Committee established by FIDE and the Association of Chess Professionals (ACP) since 2013-2014. He has also provided initial reports to the respective IC's in both the Tetimov and Ricciardi cases. Dr Watkins, on the other hand, has had no formal involvement in FIDE previously, and has been called by the EC as an independent expert for purposes of the verification of Prof Regan's technical evidence and findings.

6.13.   Relying in part on the expert evidence indicating an extremely high statistical probability of cheating, the EC

found both players guilty of cheating and sanctioned then with a 2-year ban each. The decisions were communicated to the respondents on 19 April 2017.

7. **Standard of proof:**

   7.1. The common law has developed two standards of proof, one for criminal cases and one for civil matters. In sports law disputes, as now settled by the Court of Arbitration for Sport ("CAS"), a third standard of proof is utilised, namely "comfortable satisfaction", which is said to fall in-between the criminal and the civil standards of proof.

   7.2. The standard of persuasion in criminal cases is that an accused person should be acquitted unless the trier of fact is satisfied "beyond reasonable doubt" of the person's guilt. In civil cases, such a degree of certainty is not required and a mere preponderance of evidence (balance of probability) on either side may be sufficient to tip the scales.

   7.3. In sports law, in serious matters such as an alleged fraud, it is not necessarily sufficient that some persuasion is fixed intermediate between the criminal and civil standards - the more serious the allegation, and its consequences, the higher the level of proof and closer to the criminal standard is required for a matter to be substantiated.

   7.4. Regarding chases of cheating at chess, and in particular cheating in the form of obtaining illicit computer assistance, these cases can be regarded as a *specie* of

fraud. In FIDE's anti-cheating guidelines, severe sanctions are proposed for players found guilty of cheating, namely up to a 3-year suspension from all FIDE rated events upon a first offence and up to a 15-year suspension in the case of a second or later offence.

7.5. Sports disciplinary matters are not governed by the principles of criminal law and a presumption of innocence on the part of a respondent does not operate.

7.6. The burden of proof falls on FIDE to prove that the respondent violated Article 2.2.5 of the FIDE Code of Ethics. Once a *prima facie* case has been established, the onus of rebuttal shifts to the respondent, and a failure by him to adduce any evidence to upset the *prima facie* conclusion, would normally result in the *prima facie* finding becoming conclusive.

8. **The IC investigation & observational evidence in Tetimov's case:**

8.1. The XIII Gran Tourneo Internacional Aficionados chess festival took place in Benidorm, Spain from 28 November 2014 until 7 December 2014. IO Alfonso Pedraza was the Festival Director (Organiser)

8.2. The top section, category A for sub-2300 players, attracted 167 players of at least 27 different federations. IA Valerio de la Cruz was the Chief Arbiter for the category A tournament.

8.3. Mr Ivan Tetimov with a rating of 2158 participated in category A of the tournament until his disqualification in

the last (tenth) round. At that stage Tetimov was leading the tournament with 8 points (7 wins and 2 draws). This "achievement" was attained against opposition with an average rating of 2185.

8.4. The details of Tetimov's results in the tournament were as follows:

Round	Opponent	Result
1	Angels Cucarella Montell (1954)	1
2	Marta Garcia Martin (1913)	1
3	Ramon Ibanez Aullana (2268)	½
4	Jose Vicente Jiminez Martinez (2257)	½
5	Vicente Cano Gimenez (2265)	1
6	Alexandre Platel (2219)	1
7	Andrei Olhovik (2270)	1
8	Mikhail Kultiyasov (2228)	1
9	Enrique Tejedor Fuente (2288)	1

8.5. The reason for Tetimov's expulsion related to his refusal to permit a bodily inspection after the conclusion of the ninth round. Tetimov appealed to the Appeals Committee which decided on 7 December 2014 to ratify his expulsion but to maintain the result of a win for him in the ninth round as his refusal to subject himself to an inspection occurred after completion of the game.

8.6. On 10 February 2015, IA De la Cruz sent a post-tournament complaint to FIDE.

8.7. In the report of the Chief Arbiter, he outlined the following: During the ninth round, the Arbiter's team observed some suspicious behaviour by Tetimov in his game played on the first board. During the last two hours of the game Tetimov held the thumb of his left

13

hand over his left ear, whilst making and recording all his moves with his right hand. After the game was finished and resulted in a win for Tetimov, the Chief Arbiter informed him that he is required, in terms of Article 11.3b of the FIDE Laws of Chess, to subject himself to an inspection in private. Tetimov first agreed and asked for permission to first go to the bathroom to wash his face. This request was refused. Tetimov was asked to sit down on a chair. The Chief Arbiter, in the presence of Mr Pedraza, inspected Mr Tetimov's right ear, using a flash light, but nothing was found. When the Chief Arbiter wanted to inspect Tetimov's left ear, the player became very nervous and flatly refused to continue with the inspection. Tetimov was told that his refusal could lead to consequences, but he persisted in his attitude and left. His disqualification followed.

8.8. In his appeal to the Appeals Committee, Tetimov explained that he was asked in the Spanish language to subject himself to an inspection to see whether or not he carried any electronic device. There was an attempt to explain to him the process to be followed, but Tetimov's grasp of the Spanish language is very limited. He was asked whether he wished a witness of his choice to be present during the inspection and he nominated one Roi Reinaldo. Although Reinaldo was easily reachable according to Tetimov, when he appeared to be absent from the tournament hall, the inspection nevertheless proceeded.

8.9. At the time of the inspection, with the aid of a cell phone torch, Pedraza informed Tetimov that in the circumstances he could refuse to be searched. The Chief Arbiter, however, said that such refusal "would have consequences". Tetimov claimed not to have understood what "consequences" meant and that he understood that nothing would happen if he refused the inspection. In particular, he did not understand that he could forfeit the game. Tetimov submitted that in the face of such drastic action, the Arbiter's team had to ensure that he fully understood the consequences of a refusal to be searched and to ensure that his nominated witness was present to avoid any misunderstandings. Tetimov claimed that he refused to be inspected because he felt really uncomfortable and offended.

8.10. In Tetimov's reply to the IC, he stated as follows:

> "After finalisation of my ninth game I was requested by the Arbiter to be inspected. I agreed presuming that I can exercise the right that the person according to my choice is allowed to accompany me. The presence of this person should guarantee the objectivity of my inspection, but I was refused to make use of this right. So I was forced to stop the so called inspection which – under this conditions – could lead to totally distorted results. At no point of time the arbiters informed me about the consequences of the inspection as well as the consequences of my refusal."

8.11. In the response by the Chief Arbiter, Mr De la Cruz confirmed that he offered Tetimov the opportunity of having a witness of the inspection present and that Tetimov nominated his friend, Reinaldo. The Chief Arbiter's question as to where Mr Reinaldo could be located was met with silence. No alternative witness was nominated. When the tournament director arrived, Tetimov did not insist with the request for the presence of a witness and allowed the inspection to begin with his right ear. He only refused a further inspection when the Chief Arbiter wanted to inspect his left ear.

8.12. In his report, the Chief Arbiter further stated that only once the sanction was announced, did Tetimov claim that he did not understand what the words "have consequences" meant and that he was unaware of the consequences of refusing an inspection. As he was already subjected to an inspection at a previous tournament in August 2014, his claim that he did not know the consequences of his actions, were not taken seriously by the arbiters. In addition, Tetimov at no time asked for a translator and asked for the sanction letter in the Spanish language.

8.13. The IC further relied on a statistical report by Prof Regan concerning Tetimov's games in Benidorm. Prof Regan concluded that the test gave a provisional z-score of 4,71 for Tetimov's performance which represented odds of over 800,000:1. This is substantially above the 2,75 threshold in the ACC Regulations for statistical support in

the presence of independent evidence (such as behavioural or physical) which is itself about the standard civil minimum of $z = 2,00$.

8.14.   The IC expressed the view that there was no reasonable doubt that Mr Tetimov had made himself guilty of cheating in the Benidorm tournament. Although there was no direct proof, the circumstances allowed only one conclusion, namely that Tetimov had used illegal electronic assistance. The Chief Arbiter described a "suspicious attitude" on the part of Tetimov which prompted the inspection. When he tried to inspect Mr Tetimov's left ear, he became nervous and refused further inspection. The IC believes that there was a micro-receiver or something similar in Mr Tetimov's left ear. The IC pointed out that Tetimov did not directly deny the accusation, but relied on alleged procedural irregularity and misunderstandings, as well as his feelings of discomfort and being offended, for his refusal to continue with the inspection.

8.15.   The IC asked that Mr Tetimov be found guilty of a violation of Article 2.2.5 of the FIDE Code of Ethics and recommended a sanction of two years as it was Tetimov's first offence against the Code of Ethics. It is submitted by the IC that the case is neither especially severe nor are there special reasons to assume a milder case.

9. **Provisional Evaluation**: **Tetimov**

9.1. In Tetimov's case one finds the strange behaviour of the player over the extent of two hours during his ninth round game where the thumb of his left hand was kept in place over his left ear. In addition, there is the player's refusal to permit an inspection of his left ear and the evidence that he was nervous at the time. If one further takes into account his extra-ordinary results with a 88,9% score against opposition of a similar strength to himself, then a strong suspicion arises that Tetimov's play benefited from outside assistance.

9.2. However, a performance above one's own rating level is, on its own, no evidence whatsoever which can ground a <u>reasonable</u> suspicion of cheating, let alone a conviction.

9.3. As pointed out in Sandu's case (Ethics case no. 3/2015), it is crucial that objective grounds are present for a reasonable suspicion of cheating to exist. Such objective grounds would typically, but not exclusively, exist in the case of abnormal behaviour during or before the game, possession of devices or any kind of equipment that could be used for the transmission of information to and/or from the accused chess-player during the game, such factors being usually combined with extraordinary play that can be technically and reliably proven in accordance with a standard of comfortable satisfaction to result from or be associated with computer or other external assistance.

9.4. In Tetimov's case, no communication device was found upon him. No explanation was offered by Tetimov for his strange posture during the game, and his refusal to allow an inspection of his left ear (but not the right ear) has not been satisfactorily explained (save to state that it was at this time that Padroza informed him that the inspection was not mandatory). Although these factors are indeed suspicious, without taking into account the statistical evidence, the fact-finder cannot be convinced at the level of comfortable satisfaction that the only reasonable explanation is that cheating had indeed taken place.

9.5. It follows that, had it not been for the outcome of Prof Regan's statistical examination, the EC might have been bound to give Tetimov the benefit of the doubt and acquit him.

10. **The IC investigation & observational evidence in Ricciardi's case:**

10.1. Ricciardi participated in the 57th Festival "Internazionale Di Imperi" (International Chess Festival of Imperia) held in Northern Italy during the period 30 August until 6 September 2015.

10.2. The top section attracted 63 players from 8 federations. The tournament took place over 9 rounds and was won by GM Igor Naumkin (RUS).

10.3. Ricciardi rated 1829 was ranked 35th in the tournament.

10.4.   However, after seven rounds, Ricciardi was leading the tournament with a score of 6 (5 wins and 2 draws).

10.5.   The details of Ricciardi's results in the tournament were as follows:

Round	Opponent		Result
1	Nicola Ferrari	(1979)	1
2	Federico Nastro	(2029)	1
3	Andreas Zach	(2326)	½
4	Nikolay Legky	(2407)	1
5	Stefan Mazur	(2378)	1
6	Pierluigi Passerotti	(2264)	1
7	Omar Stoppa	(2260)	½

10.6.   Ricciardi's performance aroused the interest of the Chief Arbiter IA Jean Coqueraut ("Coqueraut"), who watched Ricciardi closely and noticed the following suspicious circumstances:

10.6.1.   Ricciardi wore a shirt of dark and thick fabric and kept his shirt fully buttoned up, which was unsuitable attire for the warm climate of the tournament room which had no air-conditioning;

10.6.2.   Ricciardi perspired profusely and, without ever getting up, received tissues to wipe himself from a lady who accompanied him regularly;

10.6.3.   Ricciardi sat at the board in a rigid and upright position with very little adjustment and without rising ever during the games in spite of long hours of play. In front of his chest, between his

shirt and the chessboard, Ricciardi kept a bottle of mineral water;

10.6.4.   Ricciardi almost always held his arms tightly folded in front of him, with the thumb of his right arm under his left armpit;

10.6.5.   During the games, Ricciardi was batting his eyelids in a most unnatural way, i.e. a rapid closing and opening of the eyelids before executing his moves. He often did not look at the board whilst thinking;

10.6.6.   At the end of the games, Ricciardi declined the invitations of his opponents to analyse their games.

10.6.7.   Ricciardi played strongly but was using more or less the same amount of time for every move in all complex positions. He would also often announce to his opponents, better players than him, that they are lost.

10.7.   After the fifth round of the tournament, Ricciardi was subjected to a control by Coqueraut and another arbiter during which it was found that he had nothing in his pockets, but he refused to take off his shirt.

10.8.   Before the eighth round of play, Ricciardi was again subjected to control after the Chief Arbiter had received in-tournament complaints in writing from other players. Ricciardi again refused to open his shirt and was then asked to pass through a metal detector which sounded

an alarm. Upon inspection it was found that Ricciardi had a pendant hanging from his neck connected with wires to a small box under his armpit. The apparatus was sewn with thread to the undershirt / tank top that Ricciardi was wearing.

10.9.   Ricciardi claimed that the pendant was a "luck charm" and refused the arbiters the opportunity for closer inspection and possible seizure of the objects.

10.10. Soon thereafter, Ricciardi declared his intention to abandon the tournament and he left the tournament venue.

10.11. The tournament officials suspected that the pendant contained a small video camera and that the equipment was used to transmit the moves to an accomplice with a chess computer who used Morse Code to transmit the computer moves back to Ricciardi. The Chief Arbiter suspected that Ricciardi was deciphering the Morse Code signals when he blinked.

10.12. Ricciardi was expelled from the tournament and all his games declared lost by default on the basis that he was found in possession of a forbidden electronic communication device.

10.13. During the period January until April 2016, internal disciplinary proceedings were conducted by the Italian Chess Federation against Ricciardi relating to the mentioned incident. Three judges sat as the Federal Supreme Court. Ricciardi was legally represented by

attorneys Riccardo Borasio and Andrea Ventura of Biella, Italy. A hearing was held at the end of which the Federal Court found Ricciardi guilty of a violation of Art. 3C.1 of the Rules of Justice and Discipline (requiring a player to maintain a conduct consistent with the principles of loyalty and fairness) and imposed a 2-year suspension as a sanction.

10.14. The Chief Arbiter also submitted a post-tournament complaint to FIDE. As part of the investigation by the Investigatory Chamber, the games played by Ricciardi at Imperia 2015 were submitted to Prof Kenneth Regan for computer analysis. Prof Regan performed a provisional test with the Rybka chess engine on the first six games of Ricciardi from Imperia (assuming an adjusted rating of 1900) which produced z-scores of 4.47 on the Move-Matching percentage (MM) test, 4.91 on the Equal-top-value moves (EV) test and 3.73 on the Average-Scaled-Difference (ASD) test. According to Prof Regan's findings, if Ricciardi's performances from his previous tournament played in Milan were added, the test scores increased even further. Prof Regan concluded in his report that, in the light of the high z-scores, a finding could be made that Ricciardi benefited from computer assistance with a degree of conviction well beyond the standard of comfortable satisfaction.

10.15. The IC sent correspondence to Ricciardi, at his address as supplied by the Italian Chess Federation, on three occasions inviting his comments on the allegations of

cheating made against him. No response was received by the IC from Ricciardi (although Ricciardi claims in front of the EC that he never received any correspondence from the IC).

10.16. Based on the evidence, the IC submitted that Ricciardi was guilty of cheating and recommended a suspension for a period of three years as an appropriate sanction.

11. **Provisional Evaluation: Ricciardi:**

11.1. In the defensive statement filed by Ricciardi's legal representatives in the proceedings before the EC, the following grounds of defence are advanced:

11.1.1. The proceedings against Ricciardi are inadmissible because the IC investigation took more than 120 days, whereas the Anti-Cheating Guidelines prescribe that the investigation by the IC must be completed within a maximum of 60 days from receipt of the complaint.

11.1.2. The disciplinary proceedings taken by the Italian Federation of Chess suffer from many contradictions by the witnesses and errors of law. Attention is drawn to the finding in the judgment of the Italian Federal Court that no reliable evidence was gained on the technical features of the mechanism that would have allowed Ricciardi to communicate with the outside world and receive replies from the

outside. It is submitted that Ricciardi was condemned for cheating despite the fact that the prosecution was unable to explain how Ricciardi had cheated.

11.1.3. In similar vein Ricciardi argued before the EC that he could not be found guilty of "computer-assisted cheating" as there was no proof that a computer or any other electronic device was found on the body of Ricciardi.

11.1.4. It is further submitted that in Ricciardi's case there is only statistical evidence and nothing else. As an evaluation based purely on a statistical examination is very controversial in the chess world, a player should not be convicted of cheating unless there are, beside the statistical evidence, factual evidence and proof implicating him.

11.1.5. Finally, it is contended that Ricciardi won his games based solely on his skills and a player cannot be banned merely because he achieved extraordinary results. Ricciardi has had a steady improvement in his results and his rating as a result of the fact that he practices meditation and yoga to control his emotions and tension.

11.2. As pointed out by the IC, whilst the Anti-Cheating Guidelines indeed provide for an investigation to be

completed in 60 days, this presumes full and timely cooperation from the suspected person. In the present case, Ricciardi failed to response to both postal and e-mail enquiries. In addition, the Guidelines do not state that an investigation will be invalid if it runs past 60 days and no prejudice to Ricciardi has been shown as a result of the longer period of investigation.

11.3. It also needs to be pointed out that the IC investigation is merely a precursor to the proceedings before the EC. The EC is not bound by the Anti-Cheating Guidelines. The task of the IC is to investigate the facts of the matter in order to facilitate the enquiry before the EC.

11.4. The EC is also not bound by the findings of the Federal Court of the Italian Chess Federation and if Ricciardi is dissatisfied with the outcome of those proceedings, his remedy is to appeal to the Italian Federal Court of Appeal.

11.5. Based on its own jurisdiction, the EC is entitled to consider the matter *de novo*, but at the same time take account of the evidence produced at the hearing at federation level. In any event, it appears that the Italian Court made a well-reasoned analysis of the presented evidence and concluded that - "*In this specific case there are serious, precise and concordant presumptions that, assessed as a whole, lead to the conclusion that Ricciardi has used fraudulent means during the tournament in Imperia of 2015.*"

11.6.   It is true that in the present case there is no conclusive evidence that the apparatus found on Ricciardi's body had any computer-like features, or was a communication device which had the actual ability to communicate with someone outside the tournament hall. However, such evidence is not necessary for a conviction if the cumulative effect of all the circumstantial evidence persuades the fact-finder, at the level of the required conviction, that computer-assisted cheating had indeed taken place.

11.7.   As pointed out above, the required standard of proof is one of "comfortable satisfaction", not proof to an absolute certainty. The fact-finder must be able to draw the inference of cheating from the evidence. In criminal law context, the inference must be the only reasonable inference. In civil law context, the inference must be the most reasonable one amongst a number of reasonable possibilities.   In sports law, there must be clear, convincing and satisfactory evidence amounting to comfortable satisfaction, which is a higher level of persuasion than the civil standard but lower than the criminal standard.

11.8.   If the observational evidence in Ricciardi's case is considered to the exclusion of the statistical evidence, one finds the strange and abnormal behaviour of the player described above, together with the fact that he concealed the presence of the apparatus under his shirt and avoided an inspection of the apparatus when this

was discovered. Once the extraordinary good results of the player are taken into account, the most natural conclusion, in the absence of a reasonable alternative explanation put forward by Ricciardi, is that Ricciardi benefited in his games from computer assistance.

11.9. Ricciardi's explanations amount to an allegation that the pendant was a "lucky charm" and that his good results were achieved by the practices of yoga and meditation. No explanation is offered for the presence of the box under his armpit and the wires protruding therefrom. No explanation is offered for the lengths undertaken by Ricciardi to conceal the apparatus and for his failure to allow a proper inspection of the apparatus. In fact, Ricciardi's defence consisted mainly therein that his accusers are put to the proof that the apparatus had in fact the ability to communicate with the outside world. In these circumstances, Ricciardi's explanations are sufficiently at odds with the proven circumstantial evidence to arrive at a conclusion that his version can be safely rejected.

11.10. The conclusion of the EC is that, even in the absence of the statistical evidence referred to hereunder, the other evidence against Ricciardi is probably sufficient for a conviction on the "comfortable satisfaction" standard of proof. However, the EC is required to take into account all the evidence put before it, including the statistical evidence, and then reach its final conclusion.

12. **Professor Regan's system**

12.1. Prof Regan's statistical model is based upon the scientific principles of predictive analytics.

12.2. Predictive analytics is an area of statistics that deals with extracting information from data and using it to predict trends and behaviour patterns. Predictive analytics encompasses a variety of statistical techniques from predictive modelling, machine learning, and data mining that analyse current and historical facts to make predictions or projections about unknown events. Often the unknown event of interest is in the future, but predictive analytics can be applied to any type of unknown whether it be in the past, present or future. For example, identifying suspects after a crime has been committed, or credit card fraud as it occurs.

12.3. Predictive analytics is widely applied today in a number of fields such as actuarial science, marketing, financial services, insurance, telecommunications, retail, travel, healthcare, child protection, pharmaceuticals and capacity planning. It is used primarily for customer analytics (predicting customer behaviour), employee performance analytics (productivity and performance assessment, personnel evaluation), operational analytics (to plan business operations, infrastructure and inventory), and threat and fraud analytics (to detect suspicious activities / risk assessment).

12.4. One of the best-known applications is credit scoring, which is used throughout financial services. Scoring models process a customer's credit history, loan application, customer data, etc., in order to rank-order individuals by their likelihood of making future credit payments on time.

12.5. Predictive analytics describe the techniques, tools and technologies that use data to find models; models that can anticipate outcomes with a significant probability of accuracy. However, predictive models are about probabilities, for example a certain percentage chance that an event may occur, and not about absolutes (certainty).

12.6. The hallmark of a predictive analytic model is that it projects probabilities for events in a set of possible outcomes. The events could be natural disasters, results of competitions, decisions of deliberative bodies, financial returns, anything unknown with well-defined outcomes. The model can apply to a whole series of events. In Prof Regan's case the events are choices of chess moves in a series of positions.

12.7. The predictive analytics process consist of (i) the collection, preparation and analysis of historical and current data containing certain attributes and known outcomes with the objective of discovering useful information and arriving at conclusions, (ii) the use of statistical analysis to validate the assumptions, hypothesis and test them using standard statistical

methods, (iii) the use of algorithms applied to the training data to automatically create accurate predictive models (mathematical formulae and/or rules) about unknown outcomes, (iv) evaluation of the model against a testing data set, and thereafter (v) deployment of the predictive model by feeding new data with the same attributes but unknown outcomes through the model and application of the analytical results in an automated decision making process to obtain results, reports and output, and (vi) to continuously manage, monitor and review the model's performance in the real world to ensure that it is providing the results expected.

12.8.   In similar fashion, Prof Regan built his statistical model. It does not try to predict individual chess moves, but rather aggregates over large enough samples of games of the numbers of moves satisfying certain properties in terms of parameters representing a non-cheating player's skills.

12.9.   The parameters have been trained to reference points on the ELO rating scale by analysing many thousands of games by players rated at those point in an intensive "multi-PV" mode. This is supplemented by analysis to the same depths in the engine's quicker "single-PV" playing mode of approaching a million games including those from every GM-level event in the history of chess.

12.10. Chess engines operate in one of two modes, single-PV and multi-PV. They focus on what they deem to be the best move in single-PV mode, testing its value rather than also testing other (inferior) moves for comparison.

Multi-PV guarantees full evaluation to a determined search-depth of a determined number of "best" moves. Setting the best moves search at 50 lines essentially gives an evaluation at the selected search depth of every reasonable legal move in the position. Multi-PV working requires more time than single single-PV but is required if the full-move context of a move is to be considered.

12.11. Chess engines deliver their verdicts on the available moves at each nominal ply-depth of their forward-search process. Moves may "swing up" or "swing down" as they gain or lose apparent merit at increased depths. However, it is clear that chess engine's "centipawn" evaluations are not definitive but merely best estimates. They vary from engine to engine on the same position. Only in end-game zone where tablebases have been computed, does an infallible benchmark exist.

12.12. In constructing a mathematical proof to see if someone cheated, the challenge is that so many variables and outliers must be taken into account. Part of the problem is that sample sizes tend to be small – maybe 150 or 200 moves per player for an entire tournament. Another problem lies in how computerised chess programs evaluate positions. They are given in increments of 1-100th's of the value of a pawn (centipawn). A change in the computer's assessment of a position measured in centipawn might change the correspondence of the human player's move with the computer's best moves. Human players' judgment and choice of a particular line

do not depend on an evaluation of the position measured in 1-100$^{th's}$ of a pawn, but follows a more robust assessment.

12.13. Prof Regan decided that he needed to have his program running in multi-line mode so that he could see where and why the programs changed their evaluations. He wanted to create a model of how often the moves of players of varying ability matched those of chess programs, so he began building a database by downloading and analysing games dating to the early 19th century. In each game, Prof Regan had the computer evaluate each position in single-line mode to a depth of 13 ply (6 or 7 moves by each player). As of his first model deployment in July 2011, he had analysed nearly 200,000 games, including all of those from the top 50 major tournaments in history. An updated deployment in July 2014 was based on more games and incorporated versions of the Houdini, Komodo and Stockfish engines in a cross-validation capacity. He has also analysed 6 000 to 7 000 games in multi-line mode to create models of different player abilities.

12.14. Subsequently, Prof. Regan ran almost every top-level event in the entire history of chess (except for national leagues) through Rybka 3 and other engines. Since 2015 he has run every game of every event appearing in "The Week in Chess" and certain other FIDE events in Single-PV mode. This yields over 34 000 player-performances of at least 100 analysed moves each (including book

moves after move 8) per year. Having such large amounts of data provides context and comparison for outlier results.

12.15. Prof Regan's statistical-analysing program allows inputting parameters corresponding to any ELO rating, and generates confidence intervals for its hypothesis tests, which have been verified on practical data. The process of taking and analysing data is automated, with no *ad hoc* judgment about when or whether a particular move is a match, using chess-engine settings that reproduce. To test someone for cheating, Prof Regan runs that player's relative skill ranking (known as an ELO ranking), against the comparative model.

12.16. Prof Regan's model is organised around the following principle: *The likelihood of a move being played is a function of its value in relation to the values of other possible moves, and of parameters expressing the skill profile of the player*.

12.17. The essence is that if a certain move has clear standout value over other moves, then it is very likely that a good human player will find such a singular move, and hence agree with strong computer programs which certainly find it. Whereas, when several moves in a position have nearly-equal optimal value, then if many players – of any skill – are given the position, those moves will have nearly equal frequency.

12.18. Exactly what the model does is take the move values and player-parameters and generate projected probabilities for every legal move in every position. Simply summing the projections for the engine's first move at every game turn gives the baseline projection for agreement with these moves. The theory provides not only baseline projections, but also their standard deviations which combine to define the z-scores of actual observations.

12.19. Prof Regan's model is of the generically recognised kind and is trained by standard data-gathering and regression procedures. There are no elements specific to any aspect of chess apart from the move values provided by the strong chess programs which are used as a jury. All other chess content and all human relevance are derived from how the model is trained on large sets of games played by humans of all skill levels as measured by ELO ratings. No parameters are tailored to any particular player based on "profiling" or other considerations. If one's rating is R, then one's baseline projection comes from observed behaviour by other players rated at or near R.

12.20. Prof Regan uses four different chess programs in the design and operation of his model. The Rybka 3 engine remains the "standard candle" with an empirical calibration process. In addition, various versions of the Houdini, Komodo and Stockfish engines are used. The theory of the model does not try to determine which

particular engine a player might be using, but rather aims for a generic test of proximity to engines on the whole.

12.21. In order to provide a statistical judgment in any particular case, Prof Regan's model uses three separate statistical tests, each producing a z-score to indicate variance with the projected performance:

12.21.1. The Move-Matching percentage (MM);

12.21.2. Equal-top value moves (EV); and

12.21.3. Scaled Difference, i.e. total error (SD) and Average Scaled Difference (ASD) when averaged over all analyses positions.

12.22. The move-matching test calculates the agreement of the player's moves with the chess engine's first line, expressed as a percentage. For example, agreement on 150 turns out of a total turns of 250 in the sample = 60%.

12.23. The equal-top value (EV) test applies in positions where two or more moves are tied for optimal and tests the correspondence of the player's move with one of the computer's moves which is evaluated as one of the equally best moves.

12.24. The Scaled Difference (SD) test measures the total error measured in fractions of a pawn made by the player, as judged by the best-moves of the computer, over all the moves in the sample. The Average Scaled Difference

(ASD) measures the average error per move in the sample.

12.25. The outcomes of the MM, EV and SD tests are converted into z-scores indicating the probability of fair play / cheating by comparing the player's actual performance with the projected (expected) performance of a player of the same strength. If the deviation is sufficiently significant, it provides statistical proof of the probability of cheating.

12.26. A z-score is expressed in terms of standard deviations from the mean. The mean is the average of all data points in the data set or sequence. A standard deviation is a measurement used to quantify the variability of data dispersion in a set of values. A z-score is simply the value, minus the mean, divided by the standard deviation. The standard deviation is calculated from the move probabilities according to the laws of multinomial Bernoulli trials---in the simple case where each position has just two reasonable moves and those moves have equal values, the standard deviation equals the square root of half the number of positions.

12.27. Z-scores are expressed in units of standard deviations, called "sigmas". One of the most common probability calculations is determining, given the measured z value from the test, the probability of the result being due to chance. Every z-value includes a statement of odds against that – or higher – deviation. The larger the value

of z, the less probable the test result is due to chance. For example:

12.27.1. 6 sigma means about 1,000,000,000:1 odds;

12.27.2. a 5-sigma deviation equals more than 3,000,000:1 odds;

12.27.3. a 4.76-sigma deviation equals about 1,000,000:1 odds;

12.27.4. a 4,5-sigma deviation equals about 300,000:1 odds;

12.27.5. a 4-sigma deviation equals about 32,000:1 odds;

12.27.6. a 3-sigma deviation equals about 740:1 odds; and

12.27.7. a 2-sigma deviation equals about 44:1 odds.

12.28. The odds that come with z-scores really represent frequencies of natural occurrence. Prof Regan illustrates the resultant odds with reference to the frequency in units of "weeks of TWIC". (The Week In Chess). One week of published games represents about 1000 player-performances. So if one finds a 4-sigma deviation (32 000:1 odds), it means that one can expect naturally such a performance by a non-cheating player every 32 weeks. A variation of 5-sigma (more than 3 000 000:1 odds) means that one can expect such a natural performance once in 3 000 weeks (more than sixty years) of TWIC.

12.29. The interpretation of odds against fair-play hence involves a so-called "transposed conditional"---and it should be understood that they are only "face-value odds" which may be lessened or strengthened by other factors.   Keeping this in mind helps avoid well-documented "fallacies" of statistical interpretation which have figured in some historical judgements now regarded as incorrect.

12.30. Apart from the abovementioned three statistical tests, Prof Regan uses two further measures which do not produce a predictive score:

12.30.1.   The Intrinsic Performance Rating (IPR) measure; and

12.30.2.   The Raw Outlier Index (ROI).

12.31. The IPR measure rates players intrinsically by the quality of their decisions, as benchmarked by computer programs run to sufficient depth. It is not concerned with the results of a player which may be subject to both luck when an opponent blunders and to drift in the player pool. Therefore a player's IPR can be regarded as his or her "performance rating", based upon the quality of his or her play in the sample.   It is particularly useful to determine whether the measured quality of play is in ranges commonly associated with computer engines as opposed to human players, i.e. IPR's above 3 000. The IPRNB measure refers to the intrinsic performance rating over non-book moves only.

12.32. The IPR's over ELO 3 000 can also be compared with the historical record as only a few IPR's over 3 000 have been recorded by the world's top players. The IPR quantifies the benefit obtained by the alleged use of engines in comparison to the player's actual ELO rating.

12.33. FIDE uses an internet-based game screening tool which checks all available games from a tournament, whether in progress or afterwards. The results of the screening tests do not represent statistical judgments. Instead, they tally the MM and ASD figures without regard to the context of game situations. These two figures are synthesised along with the player's rating into a "raw outlier index" on a zero-to-hundred scale. The scale is designed so that 50 is the expectation for one's rating at standard time controls, 40-60 is the "completely normal" range, 60-70 the "yellow" range, and above 70 is "orange". A ROI performance above 70 is an indicator of possible foul play warranting further testing. The screening tests help arbiters to allocate resources of watching some players more carefully but discreetly, and also act as a quick filter for whether any complaints that may arise are well- or ill-founded.

12.34. The screening tests are run using the current versions of the Komodo and Stockfish engines. These are Stockfish 8 and Komodo 11.2.2 at present.

12.35. The ROI figures provide immediate comparison and contrast to the mass of other players, from the world champion down to junior players, all equally graded in

proportion to rating on the ROI scale. A ROI performance above 70 is indicative of foul play.

12.36. Upon receiving a set of games to test, as well as the player's rating and other information, the procedure followed by Prof Regan is as follows:

12.36.1. A chess program is run to obtain sufficiently deep evaluations of all available moves in every relevant position. The program's multi-PV mode is used, setting it to evaluate upwards of 50 legal moves in any position. The analysis and search statistics are automatically saved to text files for further processing.

12.36.2. Further scripts are run on the analysis data to extract the particular information needed for the statistical tests.

12.36.3. Certain moves are excluded from the sample, namely moves 1-8 of any game, moves in repeating sequences and positions where the engines judge one side ahead by more than 3,00 (3 pawns). Book moves after move 8 are also excluded and the analysis starts with the first "novelty" (taken as the first move not previously played by a player rated 2300 or above). Move 71 and later are also excluded. Other move exclusions may be made based on supplementary information.

12.36.4. Prof Regan runs his statistical program to generate projections, measure deviations and compete confidence intervals for several aggregate statistics. The parameter settings are derived from the post-tournament ELO; the main tests are MM, EV and SD. The program computes projections and z-scores according to the well-known statistical theory of independent Bernoulli trials and Gaussian normal distribution.

12.36.5. An adjustment is made to allow for move decisions not being truly independent, and for other possible sources of systematic modelling error. The resulting adjusted z-scores are final outputs used to indicate "statistical (un)likelihood".

12.36.6. Computing a player's IPR involves a reverse process that generates parameters corresponding to a player's performance, from which an Elo rating is calculated. This yields the player's IPR for the given set of games. The IPR has no official standing but serves to explain the interpretation of the official tests to the chess community.

12.36.7. Whereas the IPR uses statistical regression over the "small data" of a player's games, the only regression on which the official tests are based

involved training the model on "large data" of thousands of games.

12.36.8. As a separate test, Prof Regan runs the same games in the single-PV mode for purposes of scientific control.

12.36.9. Informed by the above tests, Prof Regan renders a report giving interpretations and conclusions from the results.

12.37. There are three tiers of application for anti-cheating computer software:

12.37.1. Hints to arbiters during competitions (screening tests);

12.37.2. Support of observational evidence of cheating (full test) in a disciplinary hearing; and

12.37.3. Stand-alone indication of cheating in a disciplinary hearing.

12.38. According to the ACC Guidelines:

12.38.1. A z-score under 2,00, commonly regarded as a failure to pass the 5% confidence threshold, may be considered a finding that statistical evidence does not support a complaint;

12.38.2. A z-score of 2,75 or greater, representing a 0,3% confidence threshold, may constitute strong supporting evidence in the presence of physical or observational evidence.

12.38.3. Higher thresholds may be deemed needed for further stages of a FIDE-level investigative or judicial process, in consultation with the EC.

12.39. The ACC currently believes that the system has not yet been implemented at a high enough level to be considered for sole judgment. According to Prof Regan, the possibility for relying exclusively on statistical evidence of cheating requires a z-score higher than 5-sigma (3 000 000:1 odds). A possible argument could be made for accepting z-scores of 4,75 or 4,5 for this purpose. However, this issue does not arise in the present cases.

12.40. In his evidence before the EC, Dr Watkins expressed support for Prof Regan's approach and noted that such methods of predictive analytics are widely used in a number of fields today. According to Dr Watkins, rather than arguing directly against Prof Regan's methodology, a weightier dispute would be presented by a respondent putting forth an alternative analysis which leads to a different conclusion, in which the Ethics Commission would have to decide on whether the alternative was sufficiently credible to diminish Prof Regan's conclusions from the "comfortable satisfaction" standard.

12.41. Although the internals of Prof Regan's models are potentially within the scope of a possible defence before the EC, Dr Watkins personally did not find this to be something of significant controversy.

12.42. Dr Watkins points out that the z-scores should not be taken in a vacuum as a litmus test of guilt or innocence, but are an element of evidence that can be disputed by the accused and ultimately the EC must weigh any considerations in a proper context. The raw probabilistic numerology of z-scores is of the greatest relevance only when the accused person offers no credible alternative explanation to its occurrence.

12.43. Dr Watkins finds an analogy in WADA's Operating Guidelines for the Athlete Biological Passport (ABP), which is also a statistical-based methodology that ultimately falls under the "comfortable satisfaction" rubric and that has been considered by the CAS. In this context, CAS has held that the statistical result for the athlete does not *per se* mean that an anti-doping rule violation has occurred, but rather that the athlete has to explain the result's cause.

12.44. There is the potential for an accused person to produce his own statistical analysis, to challenge any of Prof Regan's assumptions or inputs, for example, the ELO estimation of the player, or to bring evidence of home-study and preparation which would account for the player playing the particular line. Other defences are not excluded.

12.45. In legal context, one could thus say a sufficiently high z-score passes the evidentiary burden to the accused. If the accused fails to provide a reasonable alternative hypothesis to rebut the *prima facie* evidence and

inference of cheating, or fails to provide an explanation at all, a conviction would normally follow.

13.   **Expert statistical evidence in Tetimov's case**

13.1.   Tetimov's FIDE rating was 2158 at the time of the 2014 Benidorm A tournament. The *chess-results* entry for him shows a rating gain of +77.8 points over the games that were played. Accordingly, under the 'null hypothesis' of fair play, his rating was entered as 2236. In line with Prof. Regan's protocols, his program built in 24 further points of slack allowing for uncertainty about the rating, giving 2260 in the central fit of the settings-to-ELO regression from the large-data training sets.

13.2.   Prof Regan identified the first "novelty" in each of the 9 games played by Tetimov and moves before these novelties were eliminated, as well as moves in repeating sequences and moves when one side was ahead more than 3,00. In the result, Rybka 3 gave a sample size of 288 moves by Mr Tetimov; the other engines differed slightly owing to some positions nipping under or over the 3,00 cut-off with different engines. The sample size was 287 turns for Houdini 4; 285 for Komodo 10.2 and 292 for Stockfish 7.

13.3.   Prof Regan performed the official test with the Rybka 3 chess engine and thereafter secondary (back-up) tests with Houdini 4, Komodo 10.2 and Stockfish 7 engines.

13.4.   In each case, the z-scores produced by the MM, EV and SD tests were aggregated and weighted to give a combined test score.

13.5.   Prof Regan also applied his IPRNB and ROI measures as further substantiation for the statistical results obtained.

13.6.   The results of the various tests are summarised in the following table:

Tetimov: Z-scores and other test results						
	MM	EV	SD	Combined	IPRNB	ROI (zero-100)
Rybka	3,833	4,23	4,71	4,517	3105 (+/- 105)	--
Houdini	4,13	4,15	4,46	4,50	3070 (+/- 130)	--
Komodo	4,85	4,33	4,07	4,69	3030 (+/- 175)	87
Stockfish	2,33	2,70	3,46	3,00	2900 (+/- 155)	73

13.7.   Apart from the slightly anomalous result produced by Stockfish, the outcome of the various tests is a z-score of about 4,50 (translating into odds of 300 000:1), an IPRNB in excess of 3 000 rating and values of 73 and 87 on the ROI.

13.8.   Prof Regan points out that the results provide extremely strong support for the other evidence in this case.   It does not matter whether the other evidence is conclusive of itself.   Accordingly, Prof Regan believes

that the results of his model are definitive and the likelihood of fair play by Tetimov is lower than the 1 in 300 000 figure given by the official tests, as corroborated by the tests of the other prominent engines. Put another way, Prof Regan is convinced that the fair-play hypothesis must be rejected and hence that Tetimov benefitted from computer assistance, to a degree well beyond the standard of comfortable satisfaction as required.

14. **Expert statistical evidence in Ricciardi's case**

14.1. Ricciardi's FIDE rating was listed as 1829 at the time of the 2015 Imperia Open. There seems to be no *chess-results* entry for his participation. Prof Regan has calculated his rating game under the "null hypothesis" of fair play and adjusted his rating for purposes of the test to 1950. The model analyser used settings corresponding to 1968 in the central fit of the settings-to-ELO regression on large data. It follows that Ricciardi received the benefit of being evaluated on the basis of what could be expected from him if he was a 1968 rated player.

14.2. Prof Regan identified the "novelty" in each of the first six games (the 7th round game was too short to include). Moves before these novelties were eliminated, as well as moves in repeating sequences and moves where the one side was ahead more than 3,00.

14.3. Rybka 3 gave a sample size of 124 moves for Mr Ricciardi; the other engines differed slightly owing to

some positions nipping under or over the 3,00 cut-off with different engines. For Houdini 4, the sample size was 116 moves; and for both Komodo 10.2 and Stockfish 7 the sample size was 117 moves.

14.4. The official test was performed with the Rybka 3 engine and based upon the model projections, separate z-scores were calculated for the MM, EV and SD tests. These results were aggregated and weighted and produced a combined test result.

14.5. In addition, Prof Regan applied also his IPRNB and ROI measures which gave further support to the statistical tests.

14.6. The following table summarises the results of the various tests:

Ricciardi: Z-scores and other test results						
	MM	**EV**	**SD**	**Combined**	**IPRNB**	**ROI (zero-100)**
Rybka	4,201	4,67	3,474	4,365	3070 (+/- 235)	--
Houdini	5,16	5,34	3,60	4,99	3125 (+/- 285)	--
Komodo	5,81	5,39	3,32	5,13	3095 (+/- 345)	82
Stockfish	3,99	4,57	3,38	4,22	3035 (+/- 260)	83

14.7. The Stockfish 7 results agree closely with the official ones using Rybka 3, the other results are higher, but agree with

each other. Also the IPRNB of nearly 3 100 and the ROI values are 82 and 83 respectively.

14.8. Again, the results provide extremely strong support for the other evidence in this case. It does not matter whether the other evidence is conclusive of itself. Accordingly, Prof Regan believes that the results of his model are definitive and the likelihood of fair play by Tetimov is lower than the 1 in 150 000 figure given by the official test, as corroborated by the tests with the other prominent engines. Put another way, Prof Regan is convinced that the fair-play hypothesis must be rejected and hence that Ricciardi benefitted from computer assistance, to a degree well beyond the standard of comfortable satisfaction as required.

15. **Conclusions: verdict**

Mr Tetimov

15.1. Mr Tetimov has failed to rebut the abovementioned statistical and other evidence to the effect that he benefited from illegal computer assistance in the relevant tournament. Prof Regan's evidence in this regard, as supported by Dr Watkins' evidence, is accepted by the EC.

15.2. When the expert evidence is considered in conjunction with the available physical and observational evidence (see paragraphs 8 & 9 above), the EC is comfortably satisfied that Mr Tetimov has indeed made himself guilty

of cheating and has accordingly violated Article 2.2.5 of the FIDE Code of Ethics.

Mr Ricciardi

15.3.   Mr Ricciardi has failed to rebut the abovementioned statistical and other evidence to the effect that he benefited from illegal computer assistance in the relevant tournament.   Prof Regan's evidence in this regard, as supported by Dr Watkins' evidence, is accepted by the EC.

15.4.   When the expert evidence is considered in conjunction with the available physical and observational evidence (see paragraphs 10 & 11 above), the EC is comfortably satisfied that Mr Ricciardi has indeed made himself guilty of cheating and has accordingly violated Article 2.2.5 of the FIDE Code of Ethics.

15.5.   In the result, both Mr Tetimov and Mr Ricciardi were found guilty of a violation of Article 2.2.5 of the Code of Ethics.

16.   **Conclusion: Sanctions**

16.1.   Mr Tetimov was sanctioned with a world-wide ban of two years to take effect from 18 April 2017 and to end on 17 April 2019.   During this period Mr Tetimov is prohibited from participating as a player in any rated chess competition or any chess-related activity as an arbiter, organiser or representative of any chess body.

16.2. Mr Ricciardi was sanctioned with a world-wide ban of two years to take effect, in conjunction with the suspension imposed by the Italian Chess Federation, from 18 April 2016 and to end on 17 April 2018. During this period Mr Ricciardi's is prohibited from participating as a player in any rated chess competition or any chess-related activity as an arbiter, organiser or representative of any chess body.

DATE: 1 March 2018

F P Strydom

_____

CHAIRMAN:

FIDE ETHICS COMMISSION